BERGER LAHR

Catalogue

Intelligent Compact Drives IclA Ixx

a company of Schneider Electric

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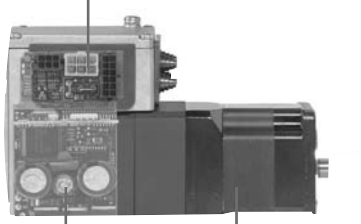


Product overview

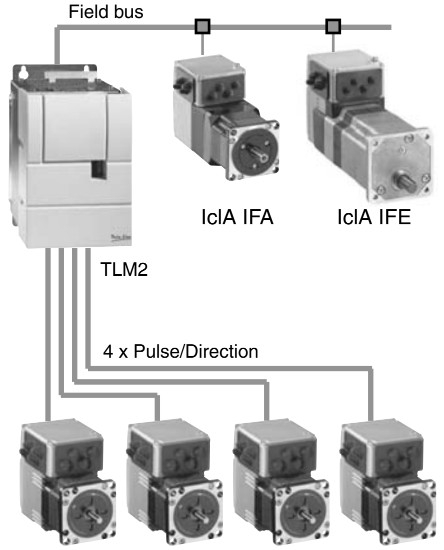
IclA intelligent compact drives consist of a motor and control electronics. Control takes place over a fieldbus or pulse interface. IclA are used as a decentralised drive in machine building and automation technology. This is how the connection with a motion controller, such as the TLM2 from Berger Lahr or a programmable logic controller can perform a complex automation task, simply and economically. Function modules are available for simple motion programming with a Berger Lahr motion controller. The IclA compact drives from Berger Lahr have the following characteristics:

Compactness

The motor and electronics create a compact unit with small dimensions. Thus no space is needed for the control electronics in the switching cabinet and the space requirements in the machine are low.

Simplicity

Integration of the motor and electronics reduces the installations costs and simplifies electromagnetic compatibility. Also, the simple to operate PC software for the IclA allows for easy commissioning.



Openness

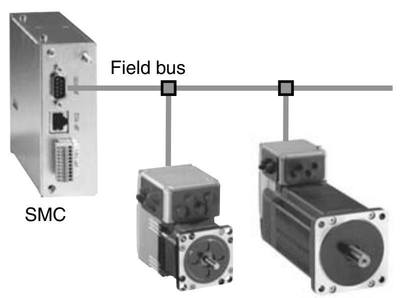
The compact drives are fitted with a fieldbus interface which allows communication over CANopen, Profibus DP or RS485. Compact drives with a stepper motor can also be alternatively obtained with a pulse/direction interface. This open communication concept allows integration into existing system environments.

Flexibility

IclA compact drives are available in several type of motor designs, including AC-synchronous, servomotor, EC motor and stepper motor. Each design offers a unique advantage depending on specification.

Safety

The integrated "Power Removal" safety function enables a stop of category 0 or 1 as per EN 60204-1 without external power contactors. This reduces the system costs and the response times. The drive meets the requirements of the IEC 61508 SIL 2 as well as EN 954-1 category 3.



Product overview IclA intelligent compact drives

IclA IFA6x	IclA IFE71	IclA IxS6x	IclA IxS9x
			

IclA with fieldbus interface		
IclA IFA with AC synchronous servomotor	**IFA6x**	
Torque range	0.26 ... 0.45 Nm; peak torque: 0.4 ... 0.72 Nm	
Speed range	up to 7,500 1/min (without transmission)	
Positioning resolution	0.02°	
Interfaces	Fieldbus interface: Profibus DP, CANopen or RS485 24 V signal interface with 4 free programmable input/output signals; interface for safety function "Power removal“	
Operating modes	Homing, jog, profile position, profile velocity, electronic gear	
Configuration	over fieldbus or parameter switch: Baud rate, network addresses and terminating resistor	
IclA IFE with EC motor	**IFE71**	
Torque range	0.17 Nm; 3.1 ... 11 Nm (with spur wheel gear)	
Speed range	up to 4,800 1/min (without transmission)	
Detent torque	0.08 Nm (without transmission); 1 ... 8 Nm (with spur wheel gear)	
Positioning resolution	0.26° ... 1.67° (with spur wheel gear)	
Interfaces	Fieldbus interface: Profibus DP, CANopen or RS485 24 V signal interface with 4 free programmable input/output signals; interface for safety function "Power removal"	
Operating modes	Homing, jog, profile position, profile velocity	
Configuration	over fieldbus or parameter switch: Baud rate, network addresses and terminating resistor	
IclA IFS with three-phase stepper motor	**IFS6x**	**IFS9x**
Torque range	0.45 ... 1.5 Nm (without transmission)	2 ... 6 Nm (without transmission)
Speed range	up to 2,000 1/min (without transmission)	up to 1,000 1/min (without transmission)
Positioning resolution	0.018°	
Interfaces	Fieldbus interface: Profibus DP, CANopen or RS485 24 V signal interface with 4 free programmable input/output signals; interface for safety function "Power removal"	
Operating modes	Homing, jog, profile position, profile velocity	
Configuration	over fieldbus or parameter switch: Baud rate, network addresses and terminating resistor	
IclA with pulse/direction interface		
IclA IDS with three-phase stepper motor	**IDS6x**	**IDS9x**
Torque range	0.45 ... 1.5 Nm (without transmission)	2 ... 6 Nm (without transmission)
Speed range	up to 2,000 1/min (without transmission)	up to 1,000 1/min (without transmission)
Positioning resolution	0.036°	
Interfaces	Multifunctional interface for pulse/direction or AB signals (encoder); Service interface RS485; 24 V signal interface; interface for safety function "Power Removal“	
Functions	Current reduction, stall detection, input/output signal assignment	
Configuration	over the parameter switch: Motor phase current, step count, phase current lowering, stall detection, RS485 terminating resistor, input/output signal assignment	

Product description

The IclA IFx intelligent compact drives consist of the motor, control electronics and a field bus interface (CANopen, Profibus DP or RS485).
The IclA IFx product group includes:

- IFA with AC synchronous servomotor
- IFE with EC motor (brushless DC motor)
- IFS with three-phase stepper motor

IclA IFA – the compact drive for dynamic processes
The IclA IFA has an AC synchronous servomotor. This motor has a high dynamic response, because it can be subjected to short-term overcurrent during acceleration.

IclA IFE – the compact drive for automatic format changes
The IclA IFE is fitted with an EC motor (brushless DC motor). The EC motors installed in the drive have a high holding torque when without power. A holding brake is generally unnecessary. Due to electronic processing with the IclA IFE, the positioning characteristics are similar to an absolute value encoder.

IclA IFS – the compact drive for short-line positioning
The IclA IFS with its three-phase stepper motor provides high torque at low speeds. The IclA compact drive with its synchronous characteristics is ideally suited for high resolution positioning operations. Commissioning of the stepper motor drive is easy because controller setting is not required.

Special features

IclA IFA

- High dynamics and high peak torque
- High resolution single-turn absolute value encoder with a resolution of 16384 increments
- Optionally with integrated holding brake
- Optionally with planetary gear

IclA IFE

- High holding torque without power
- Quasi-absolute value sensor, therefore homing not required after switching off and on
- Optionally with spur wheel gear or planetary gear

IclA IFS

- High continuous standstill torque
- Good synchronous characteristics
- High positioning resolution (0.018°)
- Optionally with holding brake (IFS9x only)
- Optionally with planetary gear

Electronics

The electronic system is comprised of control electronics and a power amplifier. They have a common power supply and are not electrically isolated.
The compact drive can be configured and actuated via the fieldbus interface.
There are also four 24 V I/O points available. Each can be configured as an input or output.

Connections

The IclA IFx intelligent compact drives have the following connections:

- supply voltage V_{DC}
- Fieldbus interface: Profibus DP, CANopen or RS485
- 24 V signal interface for four inputs/outputs
- Signal interface for "Power Removal" safety function

Fieldbus interface

Depending on the device version, the following fieldbuses can be connected to the fieldbus interface:

- PROFIBUS DP-V0 (data format according to Profidrive V2.0 PPO Type 2)
- CANopen (DS301 protocol)
- RS485 (Berger Lahr protocol, compatible to TwinLine)

The fieldbus interface is used for setting parameters and control of the compact drive. The compact drive can also be operated with a PC and the "IclA Easy" PC software via the fieldbus interface. A fieldbus converter is required for this, e.g. USB-CAN, RS232-RS485 or CP551 from Siemens for Profibus.

24 V I/O signal interface

Four 24 V signals are available, which can be used as both input and output.
The 24 V signals are freely accessible to the master controller over the fieldbus. They can also be used for predefined functions, such as for connection of limit and reference switches.
The 24 V power supply to the outputs is internal via the supply voltage of the compact drive (standard). Alternatively, the outputs and the sensors can be powered by a separate power supply unit (optional).

Signal interface for "Power Removal" safety function

The integrated "Power Removal" safety function enables a stop of category 0 or 1 as per EN 60204-1 without external power contactors. The supply voltage must not be interrupted. This reduces the system costs and response times.
The safety function is activated via two redundant 24 V input signals (low active).

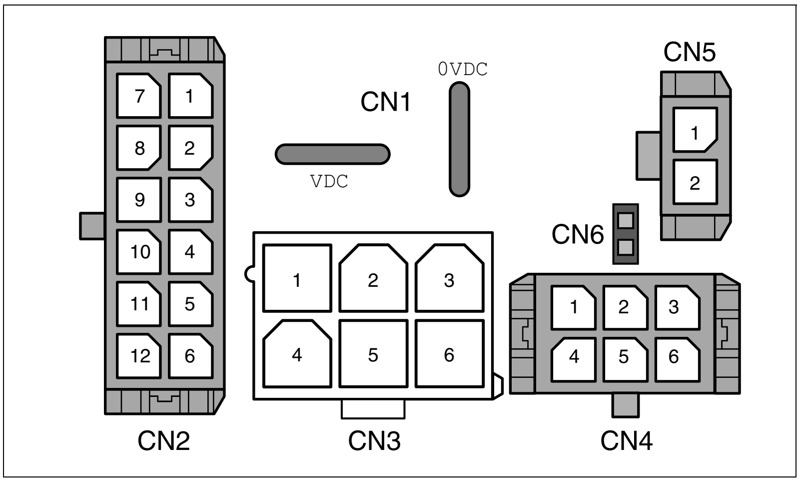
Connection technologies

Circuit board plug connector

Circuit board plug connectors are used for cabling series machines with cable harnesses.

- Fieldbus and I/O signal connection with "Molex Micro Fit" plug connector
- Power supply connection with "AMP Positive Lock" crimp contacts

Two cable entries are required for cabling the compact drive (see accessories).

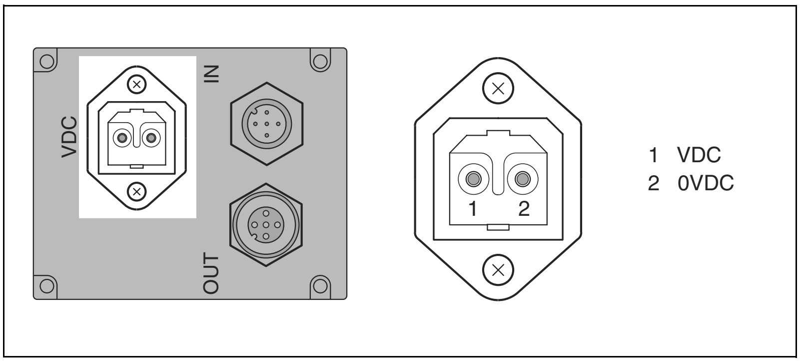


Printed circuit board plug connectors, overview of all connections

Terminal	Assignments
CN1	Supply voltage VDC
CN2	For all IFx: Interface for Profibus DP
	For IFA only: interface for Profibus DP and electronic gear operating mode (reference signal)
CN3	Interface for CAN or RS485
CN4	24 V interface
CN5	Interface for "Power Removal" safety function
CN6	Jumper for disabling "Power Removal" safety function

Industrial plug connectors (option)

Compact drives with industrial plug connectors are generally used in specialised machines and small production runs.
The device version with industrial plug connectors has a connector housing cover with two M12 circular connectors (5-pin) for the fieldbus terminal and a Hirschmann STASEI 200 connector for connection of the power supply.

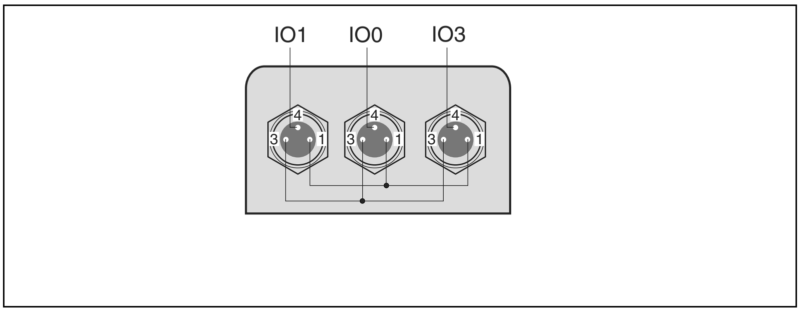


Industrial plug connectors, overview of connections

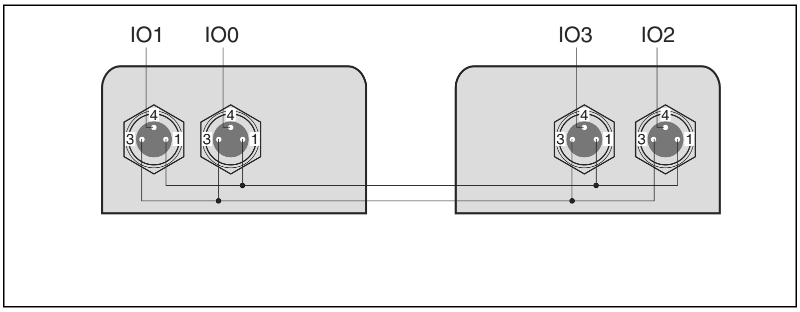
I/O signal inserts

One or two I/O signal inserts with industrial plug connectors can be ordered for connection of the I/O signals (see accessories).
The 24 V power supply to the outputs is internal via the power supply or an external power supply unit (optional). Various I/O signal inserts are available for this.

I/O signal inserts with internal 24 V signal power supply

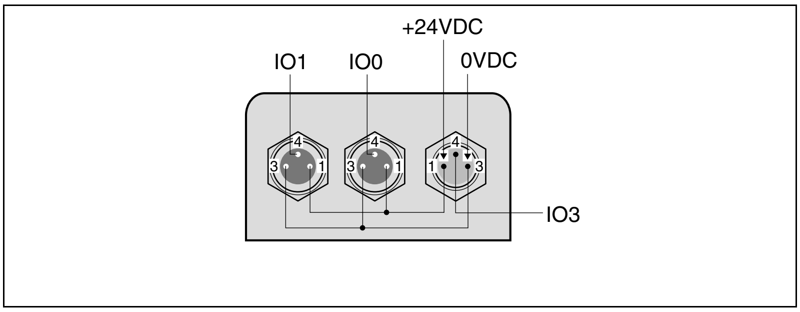


Insert for three I/O signals

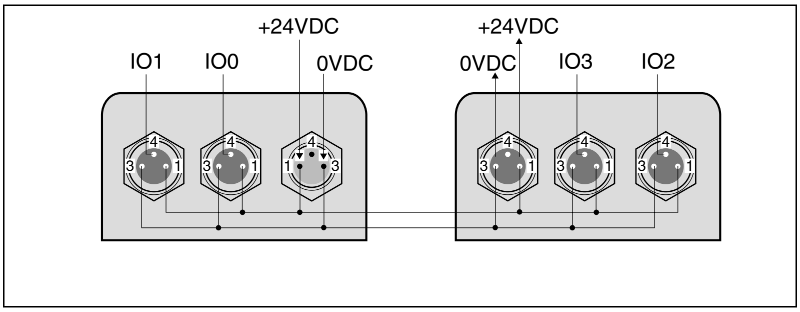


Inserts for four I/O signals

I/O signal inserts with external 24 V signal power supply

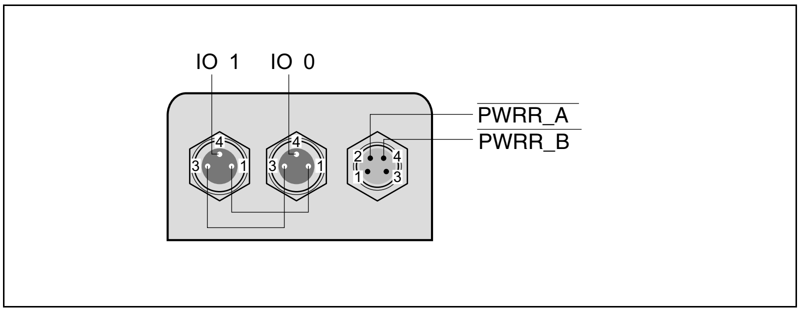


Insert for three I/O signals

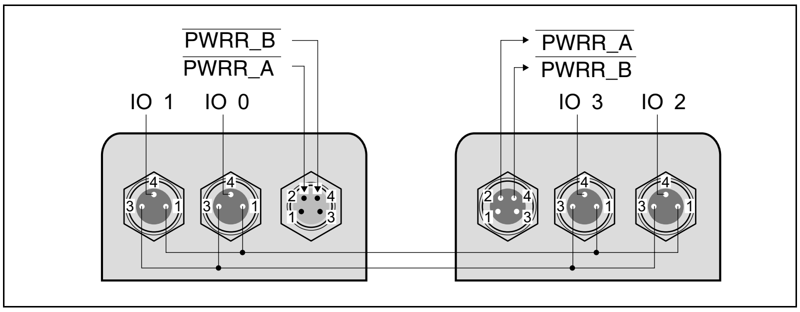


Inserts for four I/O signals

I/O signal inserts with "Power Removal" safety function and internal 24 V signal power supply



Insert for two I/O signals and signals for safety function



Inserts for four I/O signals and signals for safety function

Functions

Configuration via parameter switches

The following settings can be made on the compact drive via parameter switches:

Profibus DP
- Setting fieldbus address
- Activating terminating resistor

CAN and RS485
- Setting fieldbus address
- Setting baud rate
- Activating terminating resistor
- Setting pulse input for electronic gear operating mode (pulse/direction or A/B signals, with IclA IFA only)

Operating modes

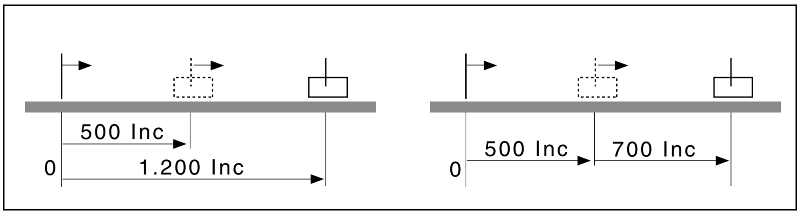
Overview

The following operating modes can be set via fieldbus:
- Profile position
- Profile velocity
- Homing
- Electronic gear (IclA IFA only)
- Jog

Profile position

In "profile position" operating mode the motor is positioned from a point A to a point B with a positioning command.

Setting options
The positioning path can be input in two ways:
- Absolute positioning, reference point is the zero point of the axis
- Relative positioning, reference point is the current position of the motor



"Profile position" operating mode, absolute and relative

Reference value default
The reference value is set via fieldbus or with the PC software "IclA Easy".

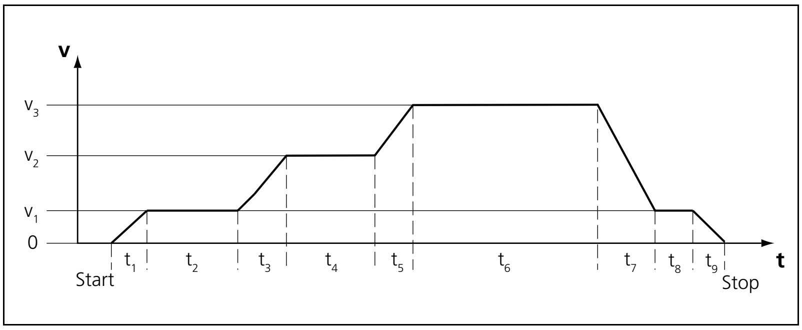
Example of application
Pick-and-place with a linear robot

Profile velocity

In the "profile velocity" operating mode a setpoint speed for the motor is set and a movement without a target position is started. This speed is maintained until a different setpoint speed is input or the operating mode is changed.

Reference value default
The reference value is set via fieldbus or with the PC software "IclA Easy".

Example of application
Coating application in CD manufacture



Profile velocity

t_1, t_3, t_5	= acceleration
t_2, t_4, t_6, t_8	= constant movement
t_7, t_9	= braking

Homing

There are two types of "homing":

- Reference movement
  Specifying the dimension reference by approaching a limit or reference switch
- Dimension setting
  Specifying the dimension reference relative to the current motor position

Reference movement
In the reference movement a defined position on the axis is approached. The defined position is specified by a mechanical switch:

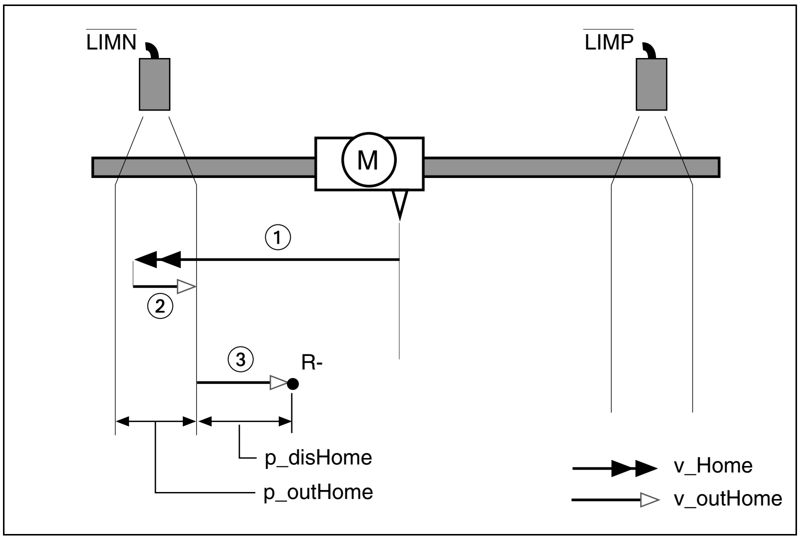
- Limit switch
- Reference switch `REF`

Types of reference movements
There are six standard reference movements:

- Movement to negative limit switch `LIMN`
- Movement to positive limit switch `LIMP`
- Movement to reference switch `REF` with first movement in counter-clockwise direction of rotation
- Movement to reference switch `REF` with first movement in clockwise direction of rotation
- Reference movement to index pulse in clockwise or counter-clockwise direction of rotation (IFA and IFS with index pulse encoder only)
- Reference movement to block = mechanical stop (IFE only)

The standard reference movements can be conducted with and without index pulse.

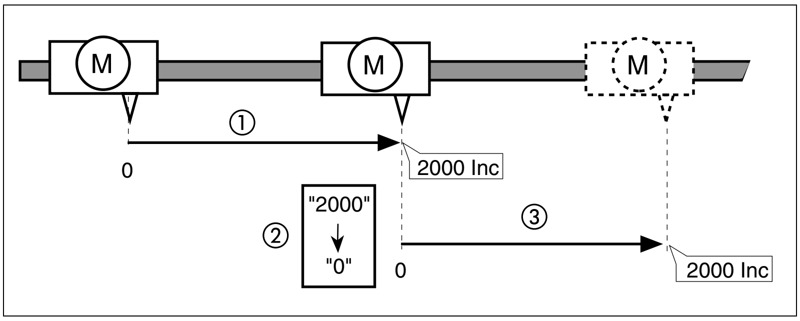
Example 1: Reference movement towards limit switch



"Homing" operating mode, reference movement to limit switch

(1) Movement to limit switch at search speed
(2) Movement to switching edge at clearance speed
(3) Movement to distance to switching edge at clearance speed

Example 2: Dimension setting
Dimension setting can be used to carry out a continuous motor movement without exceeding positioning limits.



Positioning by 4000 increments with set dimensions

(1) The motor is positioned by 2000 Inc.
(2) By setting dimensions to 0 the current motor position is set to position value 0 and the new zero point is simultaneously defined.
(3) After triggering a new travel command by 2000 Inc the new target position is 2000 Inc.

This method avoids crossing absolute position limits during a positioning operation because the zero point is continuously tracked.

Reference value default
The reference value is set via fieldbus or with the PC software "IclA Easy".

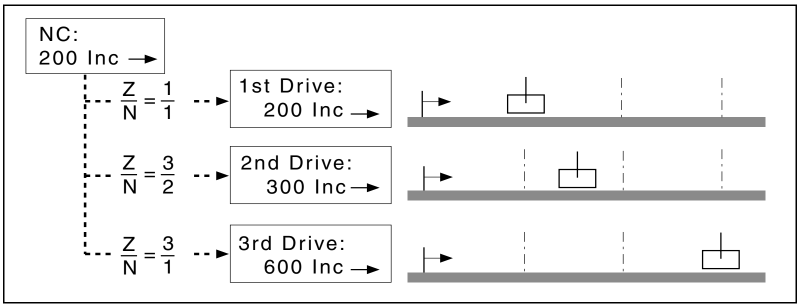
Example of application
Before absolute positioning in "profile position" operating mode.

Electronic gear (possible with IclA IFA only)

In the "electronic gear" operating mode the reference signal from an encoder (A/B signals) or a controller (pulse/direction signals) are fed in and a new position setpoint is calculated with an adjustable gear ratio.

Reference value default
The reference value is set with pulse/direction or A/B encoder signals (adjustable with parameter switch). The reference value for IclA IFA with Profibus can only be set with pulse/direction signals.

Example of application
Synchronisation of motion sequences, e.g. cutting material on a conveyor.



"Electronic gear" operating mode

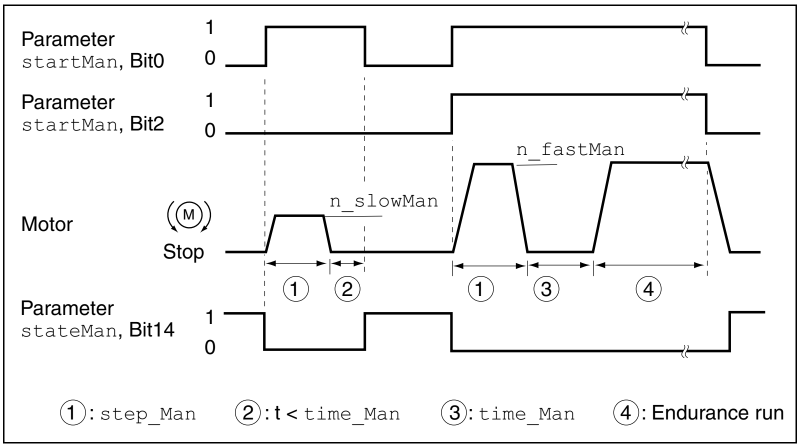
Jog

The motor traverses by one traverse unit or at constant speed in continuous running. The length of the path unit, the speed steps and the switching time in continuous operation can be set by manual actuation.

Reference value default
The reference value is set via fieldbus or with the PC software "IclA Easy".

Example of application

Setting up the machine during commissioning



Jog, slow and fast

Safety function

Definition

Power Removal
The "Power Removal" safety function switches off the motor torque safely. The supply voltage must not be interrupted. There is no monitoring at standstill.

Category 0 stop (EN 60204-1)
Standstill by immediate power shutdown to the machine drive elements (i.e. an uncontrolled stop).

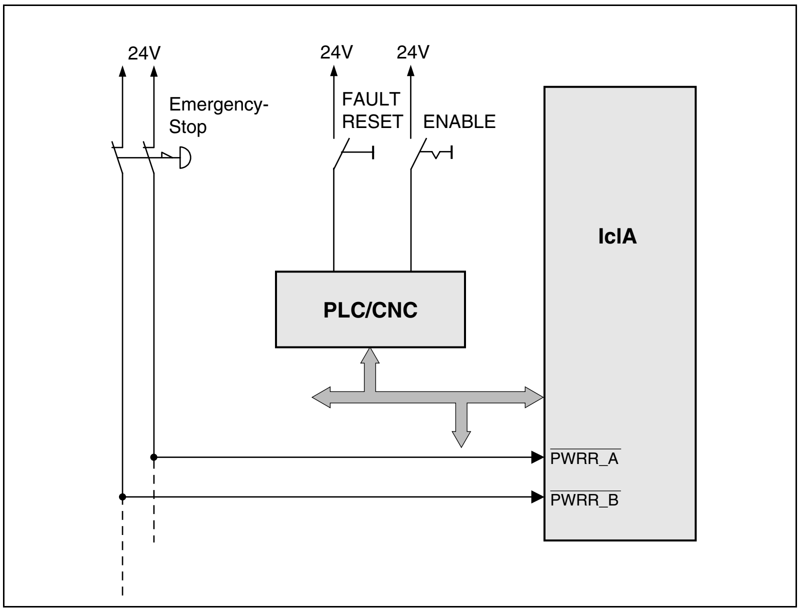
Category 1 stop (EN 60204-1)
A controlled stop in which the machine drive elements are retained to effect the standstill. Power feed is only interrupted when everything has come to a standstill.

Description

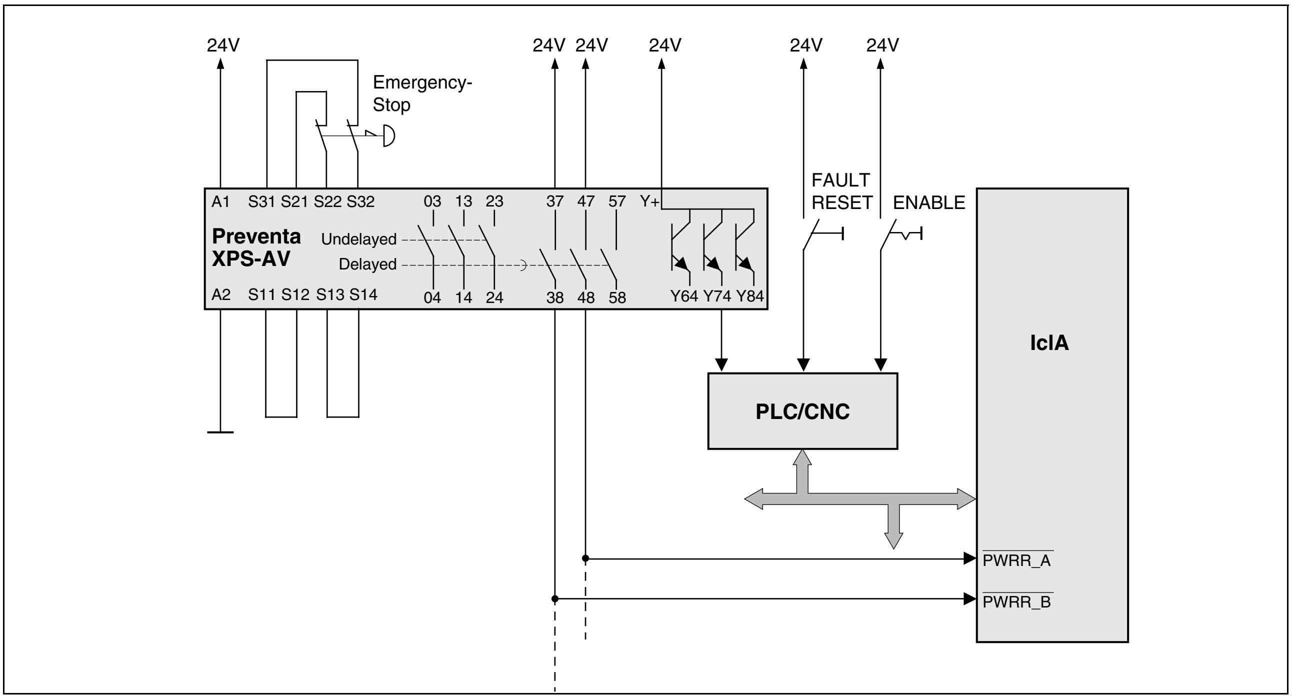
The "Power Removal" safety function integrated into the product can be used to implement the Emergency Stop control function (EN 60204-1) for Category 0 Stop and Category 1 Stop. This safety function also prevents the compact drive from unexpected restart.
The following safety levels are implemented in accordance with the standards for functional safety:

- IEC 61508; SIL 2; Functional safety of electrical/electronic/programmable electronic safety-related systems.
- pr IEC 62061; SIL 2; Safety of Machines - Functional safety of electrical, electronic and programmable controllers of machines
- EN 954-1, Category 3: Safety of machinery, Safety of components of control devices, Part 1: General design requirements
- pr EN 13849-1, Category 3: Safety of machinery, Safety of components of control devices, Part 1: General design requirements

Examples of applications for the safety function



Example category 0 stop



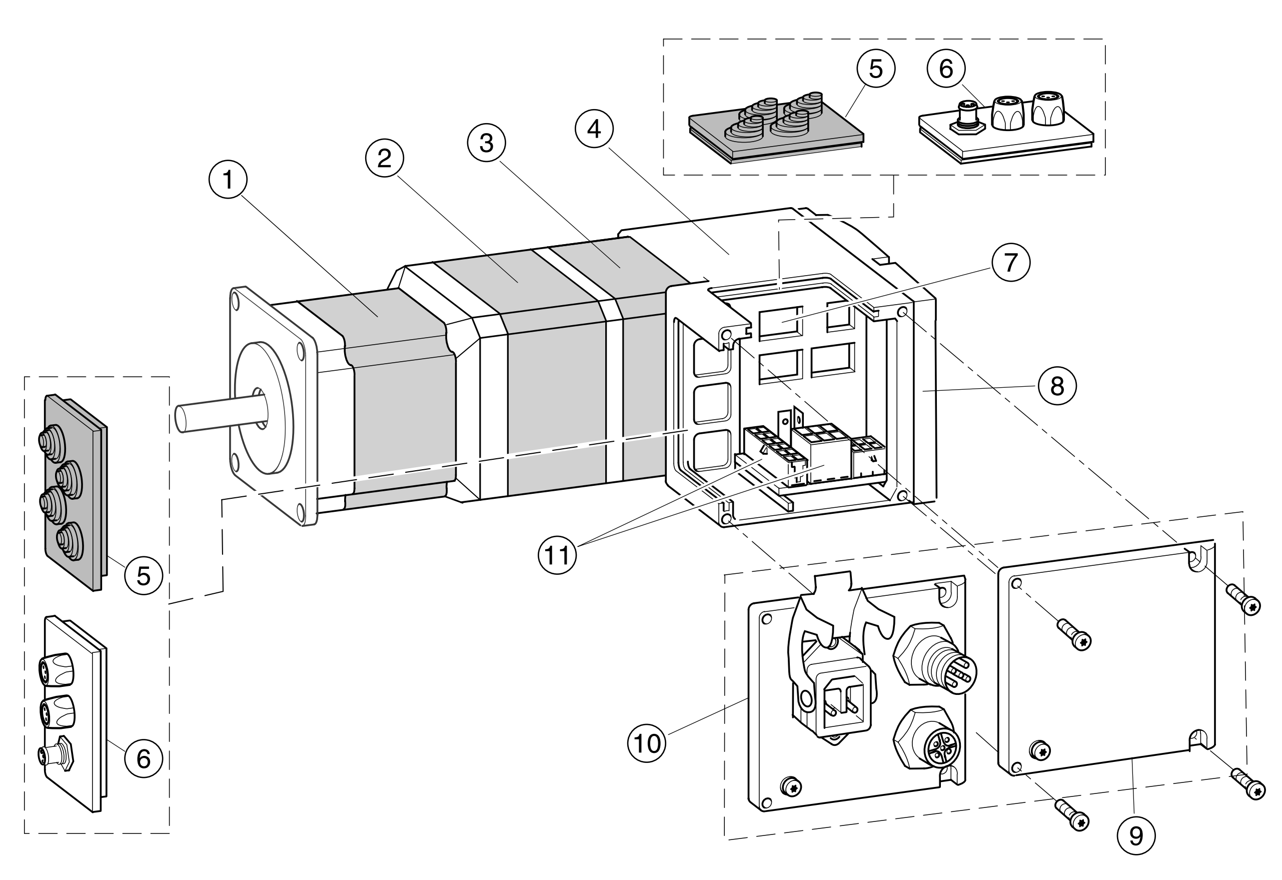
Example category 1 stop

Additional operating functions

Additional operating functions can be activated over the fieldbus or by PC.

- Reverse the direction of rotation of the motor
- Setting travel profile via profile generator
- Trigger Quick Stop function
- Fast position capture via signal input (Capture)
- Programming inputs/outputs

IclA IFA
Product overview



Components of the IclA IFA compact drive

(1) Synchronous AC-servomotor
(2) Brake (optional)
(3) Encoder
(4) Electronics housing
(5) Plug-in unit cable entry (accessory)
(6) I/O plug-in unit with industrial plug connector (accessory)
(7) Parameter switches
(8) Electronics cover, must not be removed
(9) Plug cover, to be removed on installation
(10) Cover with industrial plug connector for VDC supply voltage and IN/OUT fieldbus terminal (optional)
(11) Electrical terminals

Technical data

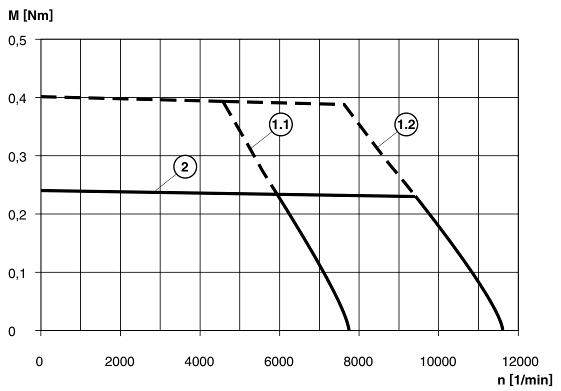
IFA6x mechanical data

		IFA61/../3D		IFA61/../5D		IFA62/../3D		IFA62/../5D	
Nominal voltage	V_{DC}	24	36	24	36	24	36	24	36
Nominal speed	1/min	5100	7500	3200	5500	3100	5000	2600	4300
Max. torque M_{max} [1]	Nm	0.43		0.6		0.61		0.72	
Continuous torque M_{d0} [2]	Nm	0.26		0.26		0.41		0.45	
Positioning resolution	Incr.	16384				16384			
Accuracy of positioning sensor	°	±0.05				±0.05			
Moment of inertia J_R	kgcm²	0.1				0.18			
Weight m	kg	1.4				1.7			
Shaft load									
• Max. radial force [3]	N	89				107			
• Max. axial force tension	N	104				104			
• Max. axial force compression	N	104				104			
• Nominal bearing life L_{10h} [4]	h	20000				20000			
Holding brake									
Holding torque M_H	Nm	1.2							
Electrical pick-up power	W	10							
Energise time (release brake)	ms	14							
De-energise time (lock brake)	ms	13							
Moment of inertia	kgcm²	0.07							
Weight m	kg	0.400							

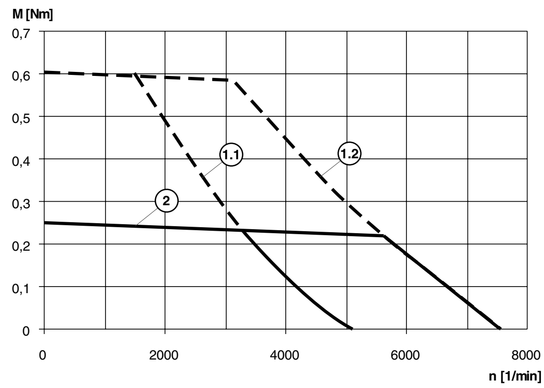
1) Max. 2.5 s
2) At 20 1/min; at 0 1/min the continuous torque is reduced to 89% of the input value
3) Reference point of radial force: 10 mm distance from flange
4) Operating hours at 10% failure probability; conditions for shaft load: speed of rotation 4000 1/min, 100% duty cycle at rated torque, ambient temperature 40 °C

Characteristic curves

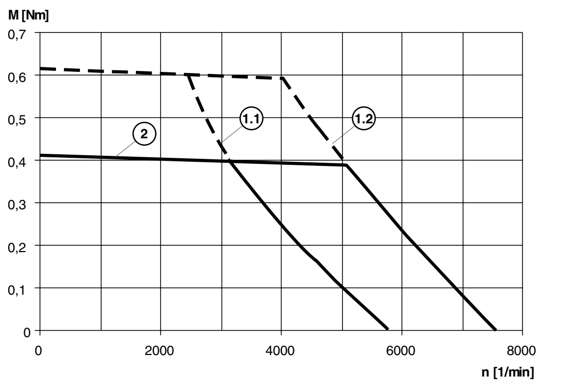
IFA61 torque characteristic with 3D winding



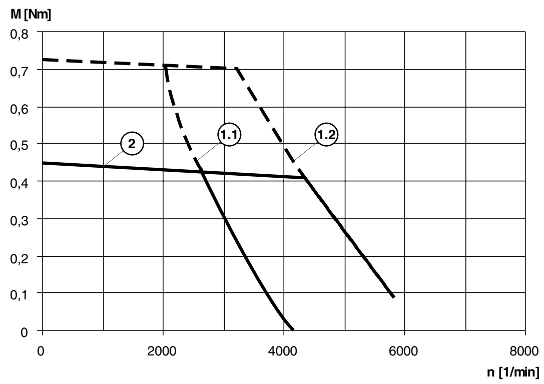
IFA61 torque characteristic with 5D winding



IFA62 torque characteristic with 3D winding



IFA62 torque characteristic with 5D winding



(1.1) Max. torque at 24 V
(1.2) Max. torque at 36 V

(2) Continuous torque

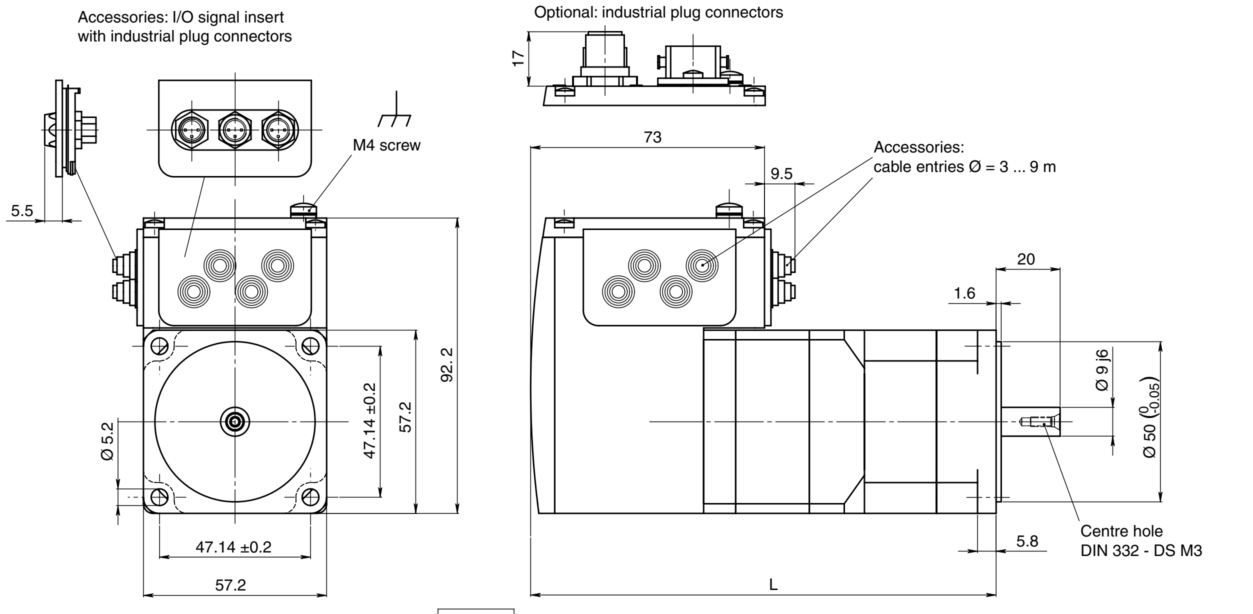
Electrical Data			
Supply voltage		Corresponding to PELV / DIN 19240, no inverse-polarity protection !	
Supply voltage (absolute limit values)	V_{DC}	18 ... 40	
Nominal voltage	V_{DC}	24 / 36	
Ripple at nominal voltage	V_{SS}	≤ 3.6	
Max. current consumption	A	5	
Inrush current		charging current of capacitor C = 1500 µF	
External backup fuse	A	10, characteristic: slow-acting fuse	
24V signal interface			
		4 signals, each can be used as input or output GND galvanically connected with power supply GND, no inverse-polarity protection !	
24V signal inputs			
Low level IO0..IO3	V / mA	≤ 4.5 / ≤ 0.7	
High level IO0..IO3	V / mA	≥ 15 / ≥ 2	
Admissible voltage range	V	0 ... 30	
Debouncing time IO0 to I03	ms	0.1	
Debouncing time IO2,IO3 with capture	ms	0.01	
24V signal outputs		Switching to Plus, short-circuit proof, inductively chargeable (1000 mH / 100 mA)	
		with external power supply	**with internal power supply**
Supply	V_{DC}	10 ... 30	23 ... 25
Switching current	mA	≤ 100 (per output)	≤ 200 (total)
			The internal power supply is protected against: • short-circuiting of the ouput voltage • overloading of the output voltage (limit set at 6 W output power)
Fieldbus interfaces			
CAN			
Signal inputs/outputs		according to ISO 11898, no galvanic isolation	
Transfer rate	kBaud	50 / 100 / 125 / 250 / 500 / 800 / 1000	
Transfer protocol		CANopen according to DS301	
RS485			
Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire	
Transfer rate	kBaud	9.6 / 19.2 / 38.4	
Transfer protocol		Berger Lahr protocol, compatible to Twin Line	
Profibus DP			
Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire	
Transfer rate	kBaud	9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 / 1500 / 3000 / 6000 / 12000	
Transfer protocol		Profibus DP-V0, data format according to Profidrive V2.0 PPO Typ 2	

Environmental conditions		
Ambient temperature [1)]	°C	0 ... 65; 50 ... 65: reduced power rating: 2%/K
Max. admissible motor temperature	°C	110
Installation height without reduced power rating	m	< 1000 m above sea level
Temperature for transportation and storage	°C	-25 ... +70
Relative humidity	%	15 ... 85
Vibration strain		as per DIN EN 60068-2-6
• Acceleration amplitude	m/s²	20
• Frequency range	Hz	10 ... 500
• Number of cycles		10
Continuous shock		as per DIN EN 60068-2-29
• Number of shocks [2)]		1000
• Peak acceleration	m/s²	150
Protection class according to EN 60529		IP54 complete device except for shaft bushing; IP41 shaft bushing
Heat class according to DIN EN 60034-1		155 (F)
Shaft eccentricity and axial precision		as per EN 50347 (IEC 60072-1)

1) Limit values of a flange-mounted motor (i.e. steel plate 300x300x10 mm)
2) In each case in positive and negative direction per axis (X, Y, Z)

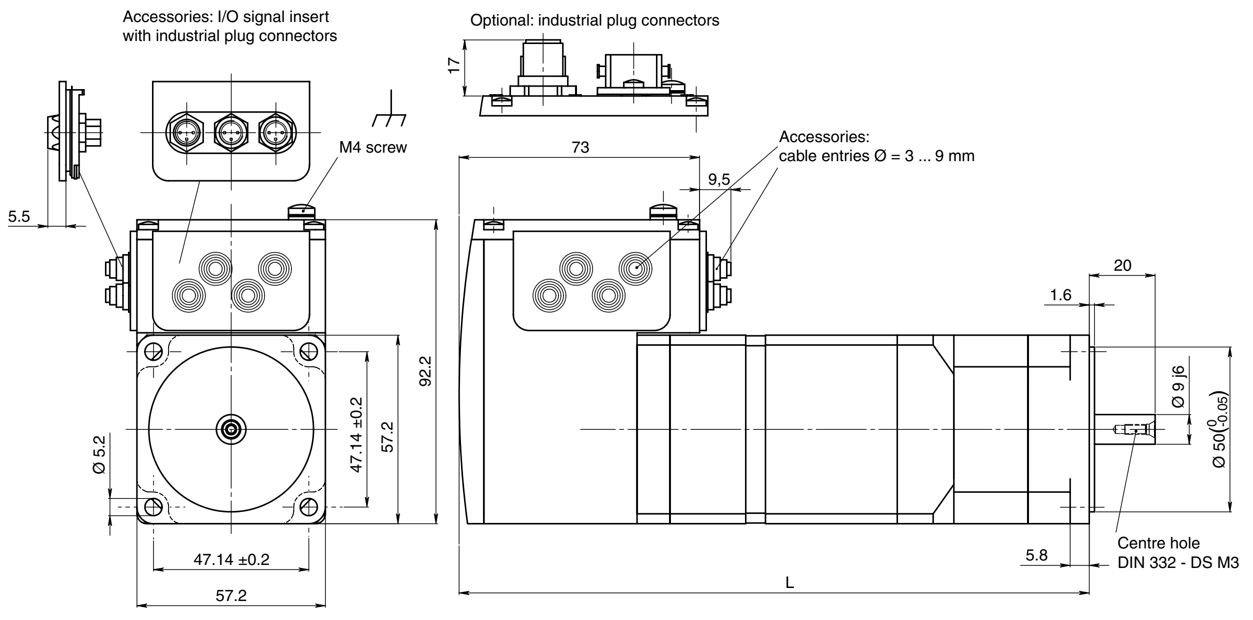
Safety functions		
Life time corresponding to safety life cycle (IEC 61508)	years	20
SFF (Safe Failure Function) (IEC 61508)	%	67
Probability of failure (PFH) (IEC 61508	1/h	$1.84 \cdot 10^{-9}$
Response time (until shutdown of power amplifier)	ms	< 50
Permitted test pulse width of upstream devices	ms	≤ 1

Dimensional drawings



	L mm
IFA 61	145.3
IFA 62	163.8

Intelligent Compact Drive IclA IFA6x



	L mm
IFA 61	190.8
IFA 62	209.3

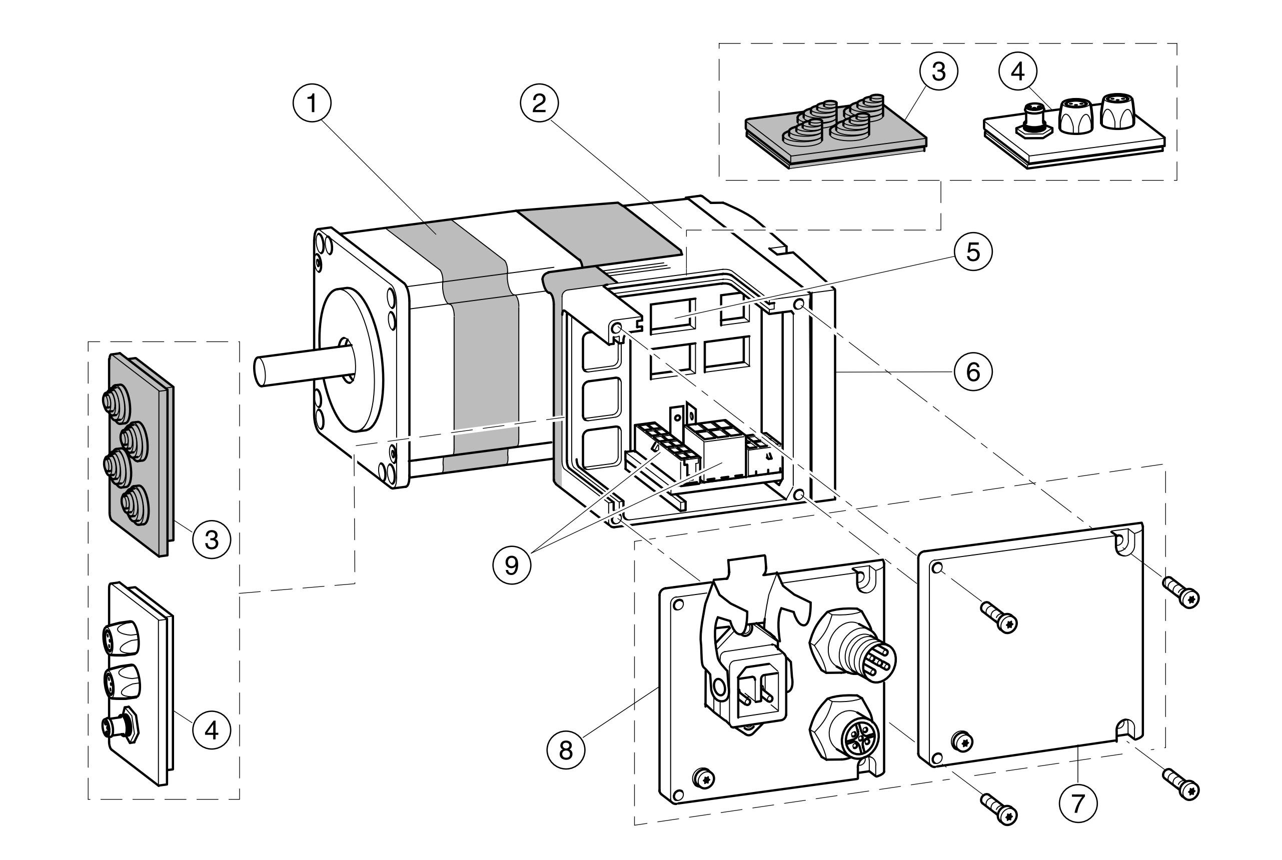
Intelligent Compact Drive IclA IFA6x with holding brake

IclA with fieldbus interface

Type code																						
Example:	**I**	**F**	**A**	**6**	**1**	**/**	**2**	**CAN**	**IS**	**D**	**S**	**/**	**3 D**	**C**	**–**	**B**	**54**	**O-001**	**R**	**P**	**P**	**41**
Product family I = IclA intelligent compact drive	**I**	F	A	6	1	/	2	CAN	IS	D	S	/	3 D	C	–	B	54	O-001	R	P	P	41
Controller type F = positioning controller with fieldbus	I	**F**	A	6	1	/	2	CAN	IS	D	S	/	3 D	C	–	B	54	O-001	R	P	P	41
Motor type A = servomotor	I	F	**A**	6	1	/	2	CAN	IS	D	S	/	3 D	C	–	B	54	O-001	R	P	P	41
Motor size 6 = motor flange [cm] 1, 2 = motor length index	I	F	A	**6**	**1**	/	2	CAN	IS	D	S	/	3 D	C	–	B	54	O-001	R	P	P	41
Nominal supply voltage 2 = 24 / 36 V_{DC}	I	F	A	6	1	/	**2**	CAN	IS	D	S	/	3 D	C	–	B	54	O-001	R	P	P	41
Fieldbus interface DP0 = Profibus DP V0 CAN = CANopen DS301 485 = RS485	I	F	A	6	1	/	2	**CAN**	IS	D	S	/	3 D	C	–	B	54	O-001	R	P	P	41
Signal interface power supply – = none (external power supply unit required) IS = internal 24V power supply unit	I	F	A	6	1	/	2	CAN	IS	D	S	/	3 D	C	–	B	54	O-001	R	P	P	41
Hardware option D = parameter switch for configuration	I	F	A	6	1	/	2	CAN	IS	**D**	S	/	3 D	C	–	B	54	O-001	R	P	P	41
Software version S = Standard	I	F	A	6	1	/	2	CAN	IS	D	**S**	/	3 D	C	–	B	54	O-001	R	P	P	41
Winding type 3D = high speed of rotation, delta connection 5D = high torque, delta connection	I	F	A	6	1	/	2	CAN	IS	D	S	/	**3 D**	C	–	B	54	O-001	R	P	P	41
Measuring system C = Singleturn encoder	I	F	A	6	1	/	2	CAN	IS	D	S	/	3 D	**C**	–	B	54	O-001	R	P	P	41
Holding brake – = no holding brake B = with holding brake	I	F	A	6	1	/	2	CAN	IS	D	S	/	3 D	C	**–**	B	54	O-001	R	P	P	41
Connection technology B = printed circuit board plug connector I = industrial plug connector	I	F	A	6	1	/	2	CAN	IS	D	S	/	3 D	C	–	**B**	54	O-001	R	P	P	41
Overall degree of protection (except for shaft bushing) 54 = IP54	I	F	A	6	1	/	2	CAN	IS	D	S	/	3 D	C	–	B	**54**	O-001	R	P	P	41
Gear O-001 = no gearbox PLE 60 planetary gear, gear ratio: 2-003 = 3 : 1 2-005 = 5 : 1 2-008 = 8 : 1	I	F	A	6	1	/	2	CAN	IS	D	S	/	3 D	C	–	B	54	**O-001**	R	P	P	41
Shaft type R = round, smooth shaft (without gearbox) K = parallel key (with gearbox only)	I	F	A	6	1	/	2	CAN	IS	D	S	/	3 D	C	–	B	54	O-001	**R**	P	P	41
Centring collar diameter: P = Standard	I	F	A	6	1	/	2	CAN	IS	D	S	/	3 D	C	–	B	54	O-001	R	**P**	P	41
Shaft diameter P = Standard	I	F	A	6	1	/	2	CAN	IS	D	S	/	3 D	C	–	B	54	O-001	R	P	**P**	41
Shaft bushing degree of protection 41 = IP41 - without gearbox 54 = IP54 - with gearbox	I	F	A	6	1	/	2	CAN	IS	D	S	/	3 D	C	–	B	54	O-001	R	P	P	**41**

IclA IFE

Product overview



Components of the IclA IFE compact drive

(1) EC motor
(2) Electronics housing
(3) Plug-in unit cable entry (accessory)
(4) I/O plug-in unit with industrial plug connector (accessory)
(5) Parameter switches
(6) Electronics cover, must not be removed
(7) Plug cover, to be removed on installation
(8) Cover with industrial plug connector for VDC supply voltage and IN/OUT fieldbus terminal (optional)
(9) Electrical terminals

Technical data

IFE71 mechanical data without gearbox

Rated supply voltage	V_{DC}	24	36
Nominal current	A	4.7	5.1
Rated speed	1/min	4000	4800
Nominal output	W	74	117
Nominal torque M_N	Nm	0.175	0.24
Max. torque M_{max}	Nm	0.26	0.36
Max. idle current	A	1	0.6
Max. ready current	A	0.1	0.06
Detent torque (without current)	Nm	0.08	
Moment of inertia	kgcm²	0.149	
Max. speed	1/min	5000	
Positioning resolution	Incr.	12	
Accuracy of positioning sensor	Incr.	±1	
Weight m	kg	1.4	
Shaft load			
• Max. radial force [1]	N	80	
• Max. axial force tension	N	30	
• Max. axial force compression	N	30	
• Nominal bearing life L_{10h} [2]	h	20000	

1) Reference point of radial force: 12.5 mm distance from flange
2) Operating hours at a failure probability of 10%

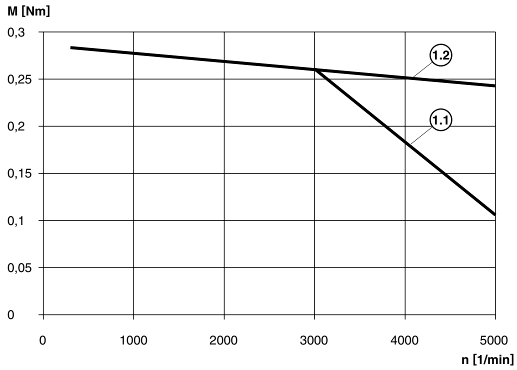
IFE71 mechanical data with spur wheel gear

		V-018		V-038		V-054		V-115	
Gear speeds		3		3		4		4	
Step-up gearing		160:9		75:2		490:9		3675:32	
Rated supply voltage	V_{DC}	24	36	24	36	24	36	24	36
Nominal current	A	4.5	4	4	3.4	4.3	3.5	2.6	2.1
Rated motor speed of rotation	1/min	4000	4800	4000	4800	4000	4800	4000	4800
Nominal output speed	1/min	225	270	107	128	73	88	35	42
Nominal output torque M_N	Nm	3.1	3.5	5.8	6.0	9.5	10.0	10.0	11.0
Nominal output	W	74	98	65	81	73	88	38	48
Max. idle current	A	1	0.6	1	0.6	1	0.6	1	0.6
Max. ready current	A	0.1	0.06	0.1	0.06	0.1	0.06	0.1	0.06
Detent torque (without current)	Nm	1.1		3.0		3.3		8.0	
Moment of inertia output	kgcm²	48		211		441		1962	
Max. speed	1/min	281		133		92		44	
Positioning resolution motor	Incr.	12							
Positioning accuracy motor	Incr.	±1							
Positioning resolution output	°	1.667		0.8		0.55		0.26	
Torsional backlash	°	≤ 1							
Weight m	kg	1.85							
Shaft load (short-time operation)									
• Max. radial force [1]	N	200							
• Max. axial force	N	80							
• Nominal bearing life L_{10h} [2]	h	2500							
Shaft load (long-term operation)									
• Max. radial force	N	200							
• Max. axial force	N	10							
• Nominal bearing lifetime L_{10h} [2]	h	15000		15000		15000 [3]		15000 [4]	

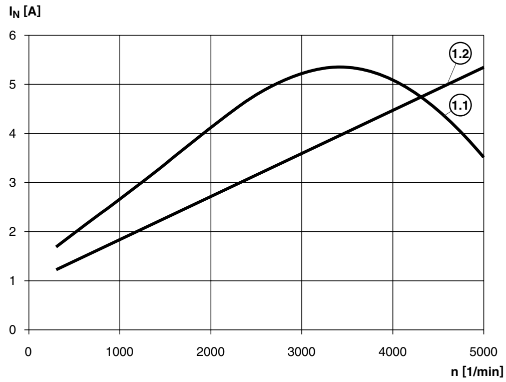
1) Reference point of radial shaft load: 12.5 mm distance from flange
2) Operating hours at a failure probability of 10%
3) At reduced rated drive torque M_N = 6 Nm; 2500 h at maximum torque
4) At reduced rated drive torque M_N = 8 Nm; 2500 h at maximum torque

Characteristic curves

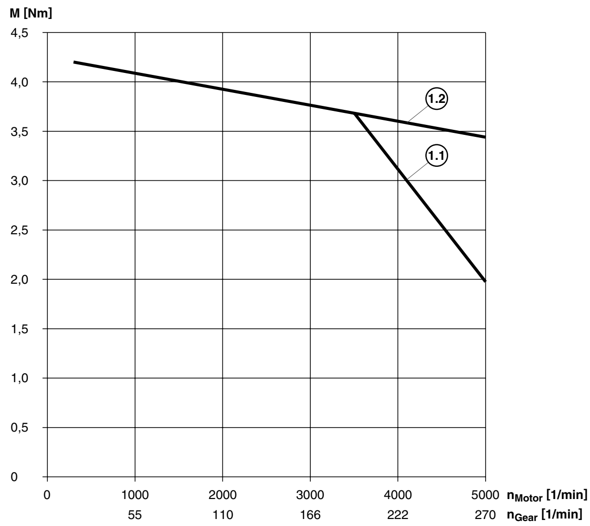
IFE71 torque characteristic without gearbox

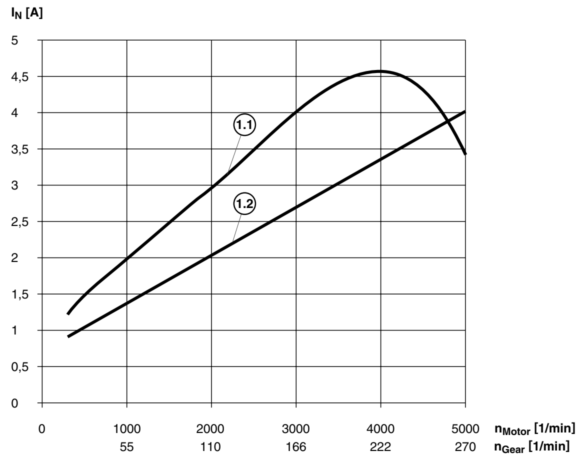


IFE71 current characteristic

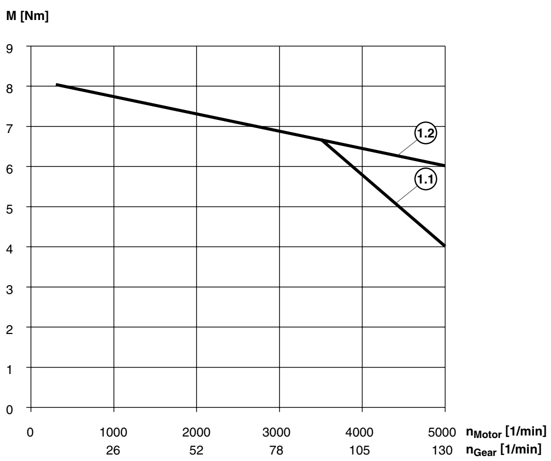


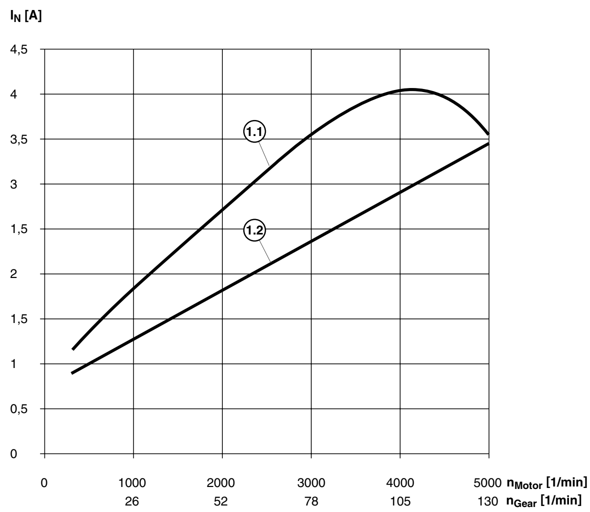
with spur wheel gear V-018





with spur wheel gear V-038



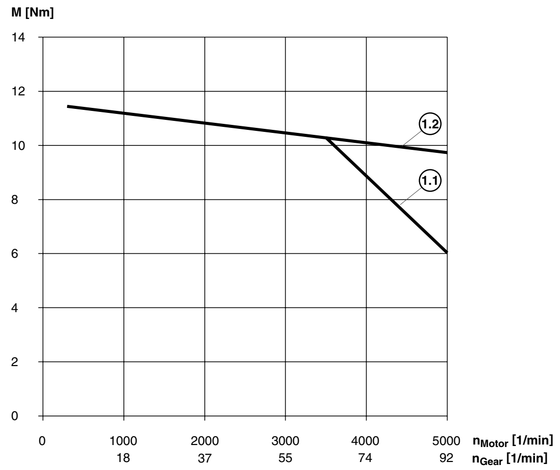


(1.1) Max. torque or current at 24 V

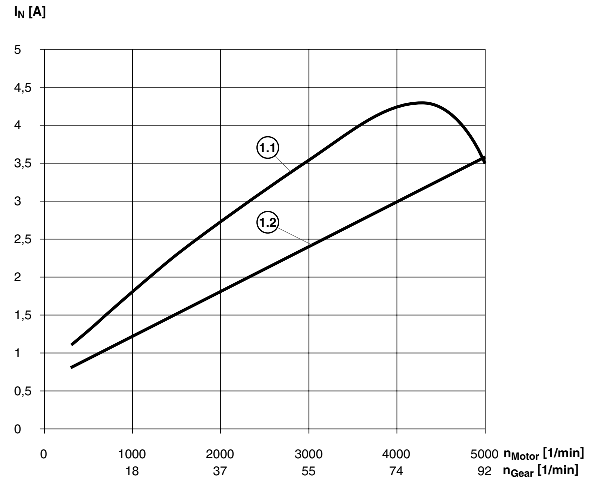
(1.2) Max. torque or current at 36 V

Characteristic curves

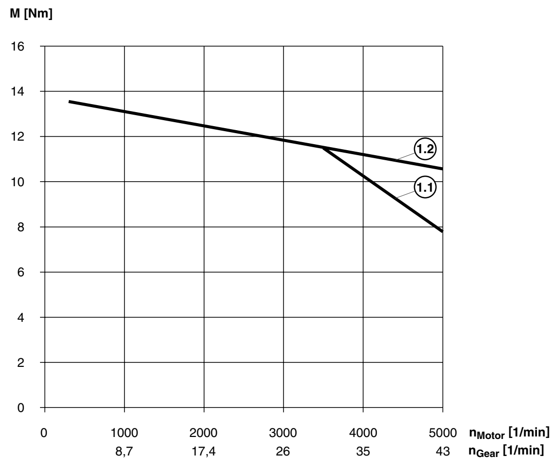
IFE71 torque characteristic with spur wheel gear V-054

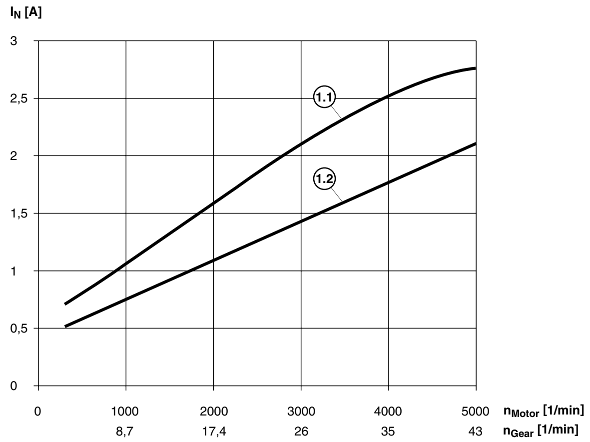


IFE71 current characteristic



with spur wheel gear V-115





(1.1) Max. torque or current at 24 V
(1.2) Max. torque or current at 36 V

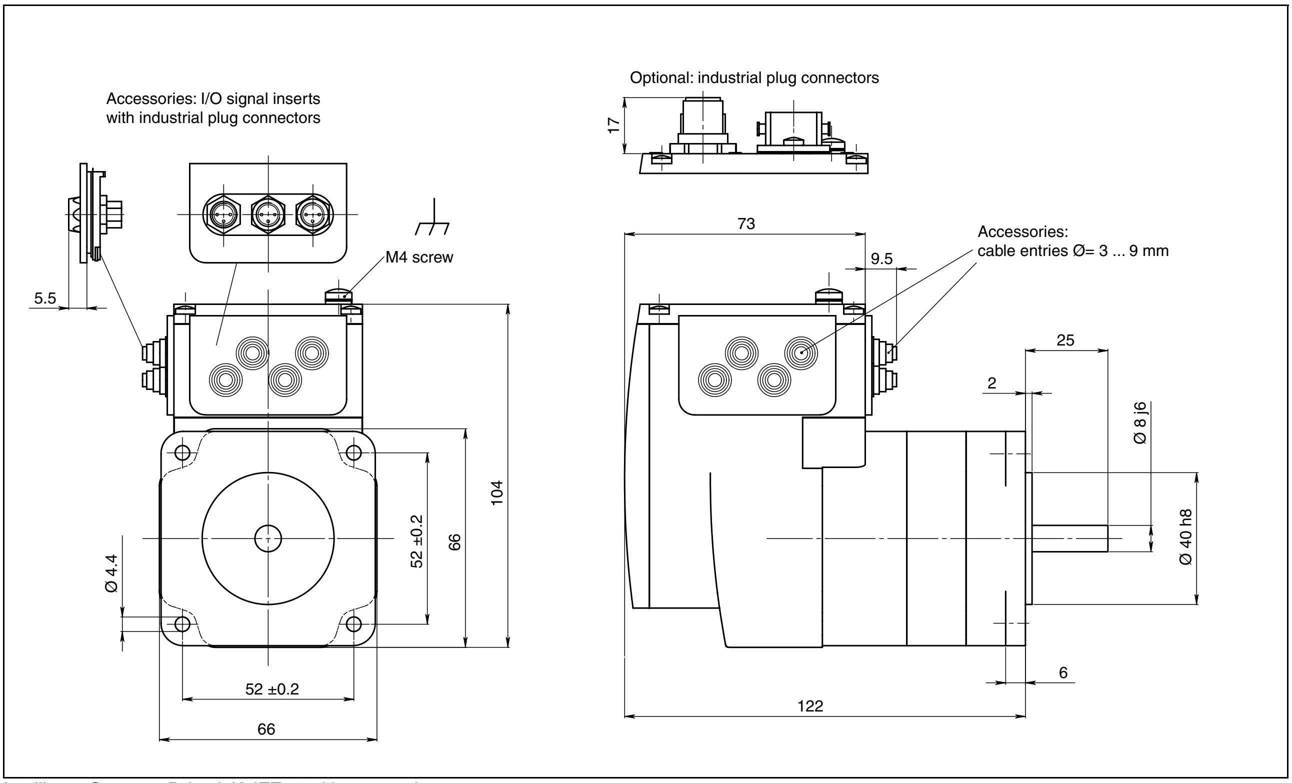
Electrical Data			
Supply voltage		Corresponding to PELV / DIN 19240, no inverse-polarity protection !	
Supply voltage (absolute limit values)	V_{DC}	18 ... 40	
Nominal voltage	V_{DC}	24 / 36	
Ripple at nominal voltage	V_{SS}	≤ 3.6	
Max. current consumption	A	6	
Inrush current		charging current of capacitor C = 1500 µF	
External backup fuse	A	10, characteristic: slow-acting fuse	
24V signal interface			
		4 signals, each can be used as input or output GND galvanically connected with power supply GND, no inverse-polarity protection !	
24V signal inputs			
Low level IO0..IO3	V / mA	≤ 4.5 / ≤ 0.7	
High level IO0..IO3	V / mA	≥ 15 / ≥ 2	
Admissible voltage range	V	0 ... 30	
Debouncing time IO0 to I03	ms	0.1	
24V signal outputs		Switching to Plus, short-circuit proof, inductively chargeable (1000 mH / 100mA)	
		with external power supply	**with internal power supply**
Supply voltage	V_{DC}	10 ... 30	23 ... 25
Switching current	mA	≤ 100 (per output)	≤ 200 (total)
			The internal power supply is protected against: • short-circuiting of the ouput voltage • overloading of the output voltage (limit set at 6 W output power)
Fieldbus interfaces			
CAN			
Signal inputs/outputs		according to ISO 11898, no galvanic isolation	
Transfer rate	kBaud	50 / 100 / 125 / 250 / 500 / 800 / 1000	
Transfer protocol		CANopen according to DS301	
RS485			
Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire	
Transfer rate	kBaud	9.6 / 19.2 / 38.4	
Transfer protocol		Berger Lahr protocol, compatible to Twin Line	
Profibus DP			
Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire	
Transfer rate	kBaud	9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 / 1500 / 3000 / 6000 / 12000	
Transfer protocol		Profibus DP-V0, data format according to Profidrive V2.0 PPO Typ 2	

Environmental conditions		
Ambient temperature [1]	°C	0 ... 65; 50 ... 65: reduced power rating: 2%/K
Max. admissible motor temperature	°C	110
Installation height without reduced power rating	m	< 1000 m above sea level
Temperature for transportation and storage	°C	-25 ... +70
Relative humidity	%	15 ... 85
Vibration strain		as per DIN EN 60068-2-6
• Acceleration amplitude	m/s²	20
• Frequency range	Hz	10 ... 500
• Number of cycles		10
Continuous shock		as per DIN EN 60068-2-29
• Number of shocks [2]		1000
• Peak acceleration	m/s²	150
Protection class according to EN 60529		IP54 complete device except for shaft bushing; IP41 shaft bushing
Heat class according to DIN EN 60034-1		155 (F)
Shaft eccentricity and axial precision		as per EN 50347 (IEC 60072-1)

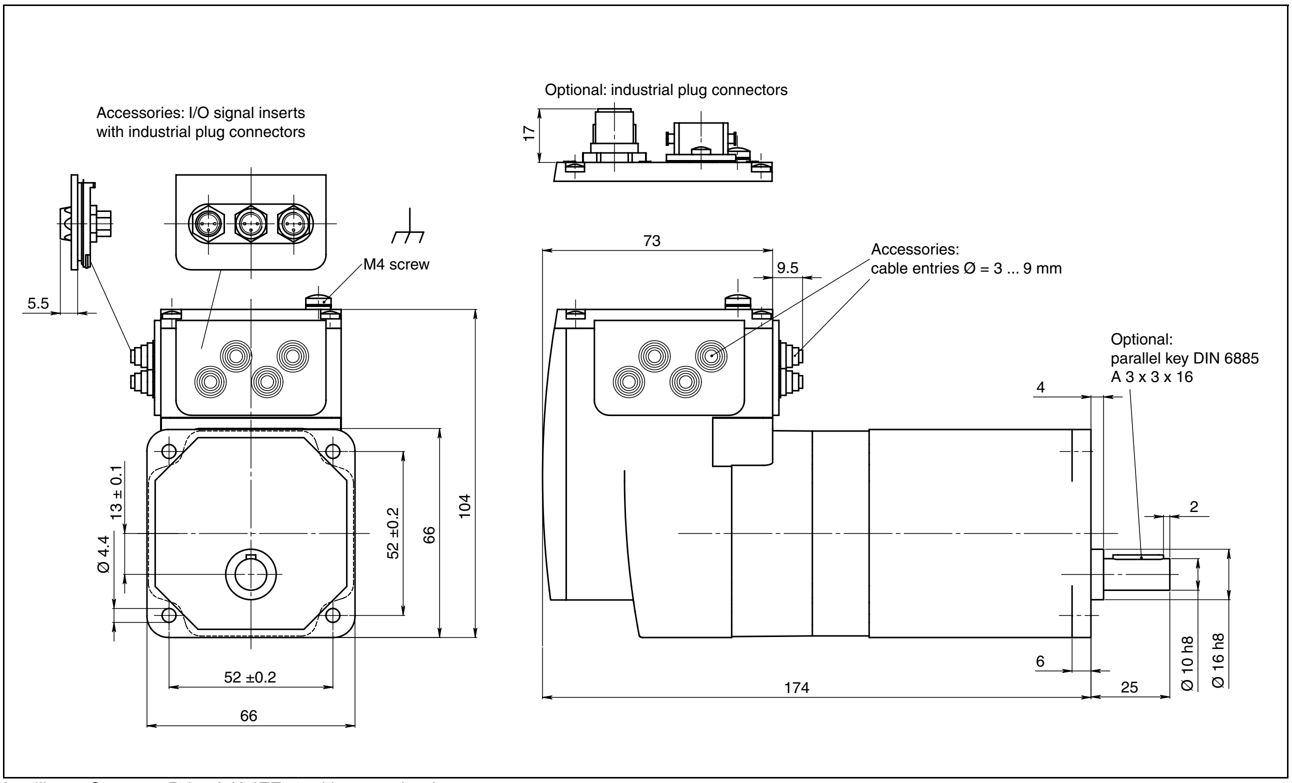
1) Limit values with flanged motor (e.g. steel plate 300x300x10 mm)
2) In each case in positive and negative direction per axis (X, Y, Z)

Safety functions		
Life time corresponding to safety life cycle (IEC 61508)	years	20
SFF (Safe Failure Function) (IEC 61508)	%	67
Probability of failure (PFH) (IEC 61508	1/h	$1.84 \cdot 10^{-9}$
Response time (until shutdown of power amplifier)	ms	< 50
Permitted test pulse width of upstream devices	ms	≤ 1

Dimensional drawings



Intelligent Compact Drive IclA IFE71 without gear box



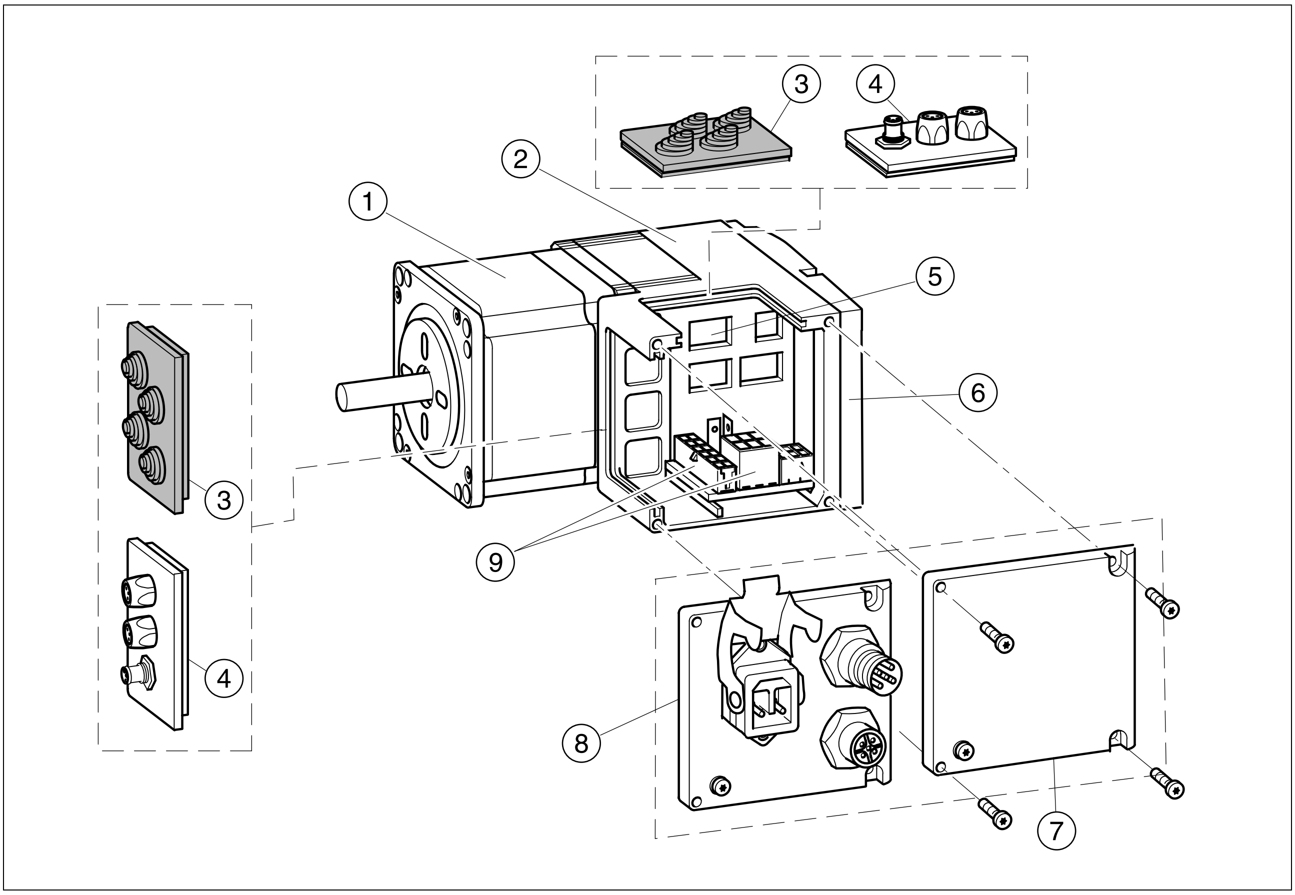
Intelligent Compact Drive IclA IFE71 with spur wheel gear

Type code

Example:	**I**	**F**	**E**	**7**	**1**	**/**	**2**	**DP0**	**–**	**D**	**S**	**/**	**–**	**Q**	**D**	**B**	**54**	**/**	**V-018**	**K**	**P**	**P**	**54**
Product family I = IclA intelligent compact drive	**I**	F	E	7	1	/	2	DP0	–	D	S	/	–	Q	D	B	54	/	V-018	K	P	P	54
Controller type F = positioning controller with fieldbus	I	**F**	E	7	1	/	2	DP0	–	D	S	/	–	Q	D	B	54	/	V-018	K	P	P	54
Motor type E = EC motor	I	F	**E**	7	1	/	2	DP0	–	D	S	/	–	Q	D	B	54	/	V-018	K	P	P	54
Motor size 7 = motor flange [cm] 1 = index motor length	I	F	E	**7**	**1**	/	2	DP0	–	D	S	/	–	Q	D	B	54	/	V-018	K	P	P	54
Nominal supply voltage 2 = 24 / 36 V_{DC}	I	F	E	7	1	/	**2**	DP0	–	D	S	/	–	Q	D	B	54	/	V-018	K	P	P	54
Fieldbus interface DP0 = Profibus DP V0 CAN = CANopen DS301 485 = RS485	I	F	E	7	1	/	2	**DP0**	–	D	S	/	–	Q	D	B	54	/	V-018	K	P	P	54
Signal interface power supply – = none (external power supply unit required) IS = internal 24 V power supply unit	I	F	E	7	1	/	2	DP0	**–**	D	S	/	–	Q	D	B	54	/	V-018	K	P	P	54
Hardware option D = parameter switch for configuration	I	F	E	7	1	/	2	DP0	–	**D**	S	/	–	Q	D	B	54	/	V-018	K	P	P	54
Software version S = Standard	I	F	E	7	1	/	2	DP0	–	D	**S**	/	–	Q	D	B	54	/	V-018	K	P	P	54
Winding type – = Standard	I	F	E	7	1	/	2	DP0	–	D	S	/	**–**	Q	D	B	54	/	V-018	K	P	P	54
Measuring system Q = quasi absolute encoder	I	F	E	7	1	/	2	DP0	–	D	S	/	–	**Q**	D	B	54	/	V-018	K	P	P	54
Holding brake D = no holding brake (detent torque without power)	I	F	E	7	1	/	2	DP0	–	D	S	/	–	Q	**D**	B	54	/	V-018	K	P	P	54
Connection technology B = printed circuit board plug connector I = industrial plug connector	I	F	E	7	1	/	2	DP0	–	D	S	/	–	Q	D	**B**	54	/	V-018	K	P	P	54
Overall degree of protection (except for shaft bushing) 54 = IP54	I	F	E	7	1	/	2	DP0	–	D	S	/	–	Q	D	B	**54**	/	V-018	K	P	P	54
Gear O-001 = no gearbox Spur wheel gear, gear ratio: V-018 = 160 : 9 V-038 = 75 : 2 V-054 = 490 : 9 V-115 = 3675 : 32 PLE 40 planetary gear, gear ratio: 1-016 = 16 : 1 1-040 = 40 : 1 1-060 = 60 : 1 1-120 = 120 : 1	I	F	E	7	1	/	2	DP0	–	D	S	/	–	Q	D	B	54	/	**V-018**	K	P	P	54
Shaft type R = round, smooth shaft (without gearbox) K = parallel key (with gearbox only)	I	F	E	7	1	/	2	DP0	–	D	S	/	–	Q	D	B	54	/	V-018	**K**	P	P	54
Centring collar diameter: P = Standard	I	F	E	7	1	/	2	DP0	–	D	S	/	–	Q	D	B	54	/	V-018	K	**P**	P	54
Shaft diameter P = Standard	I	F	E	7	1	/	2	DP0	–	D	S	/	–	Q	D	B	54	/	V-018	K	P	**P**	54
Shaft bushing degree of protection 41 = IP41 - without gearbox 54 = IP54 - with gearbox	I	F	E	7	1	/	2	DP0	–	D	S	/	–	Q	D	B	54	/	V-018	K	P	P	**54**

IclA IFS

Product overview



Components of the IclA IFS compact drive

(1) Three-phase stepper motor
(2) Electronics housing
(3) Plug-in unit cable entry (accessory)
(4) I/O plug-in unit with industrial plug connector (accessory)
(5) Parameter switches
(6) Electronics cover, must not be removed
(7) Plug cover, to be removed on installation
(8) Cover with industrial plug connector for VDC supply voltage and IN/OUT fieldbus terminal (optional)
(9) Electrical terminals

Technical data

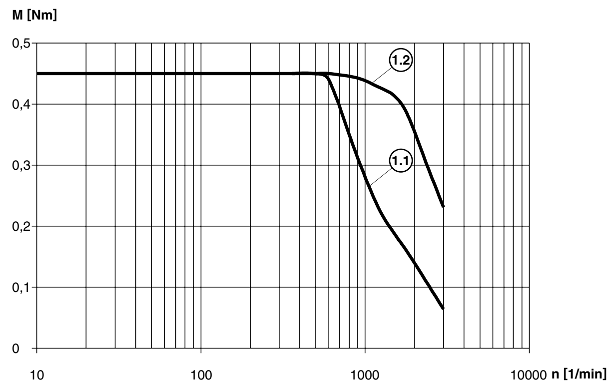
IFS6x mechanical data

		IFS61	IFS62	IFS63
Max. torque M_{max}	Nm	0.45	0.9	1.5
Holding torque M_H	Nm	0.51	1.02	1.7
Moment of inertia	kgcm²	0.1	0.22	0.38
Positioning resolution	Incr.	20.000		
Systematic angular tolerance per step [1]	‘	±6		
Weight m	kg	1.3	1.6	2.0
Shaft load [2]				
• Max. radial force [3]	N	24	24	50
• Max. axial force pull	N	100		
• Max. axial force push	N	8.4		
• Nominal bearing life L_{10h} [4]	h	20.000		

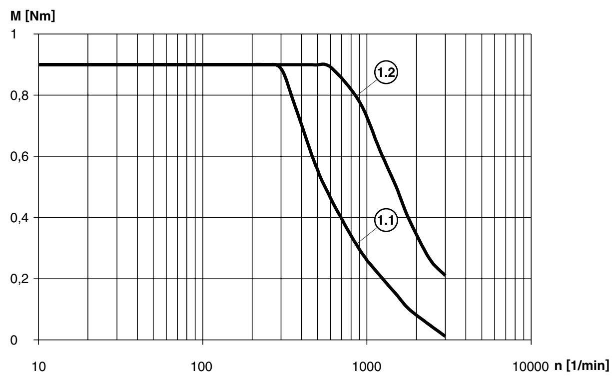
[1] Measured at 1000 steps/revolution
[2] Conditions for the shaft load: speed of rotation 60 1/min, 100% duty cycle at rated torque, ambient temperature 40 °C
[3] Reference point of radial force: 10.5 mm distance from flange
[4] Operating hours at a failure probability of 10%

Characteristic curves

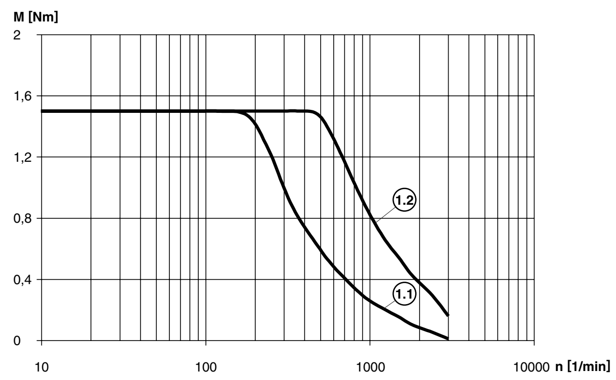
IFS61 torque characteristic



IFS62 torque characteristic



IFS63 torque characteristic



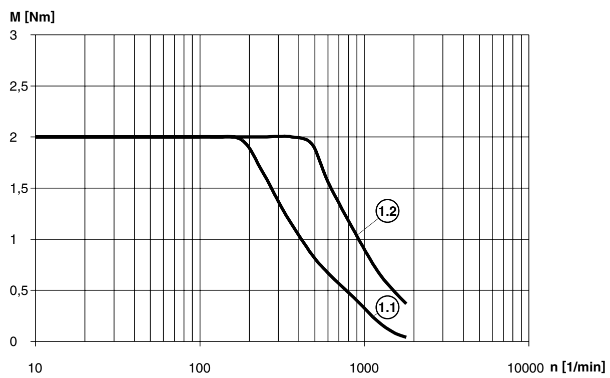
(1.1) Max. torque at 24 V
(1.2) Max. torque at 36 V

IFS9x mechanical data					
		IFS91	IFS92	IFS93	
Winding type				**Standard**	**3D**
Max. torque M_{max}	Nm	2.0	4.0	6.0	4.5
Holding torque M_H	Nm	2.0	4.0	6.0	4.5
Moment of inertia	kgcm²	1.1	2.2	3.3	
Positioning resolution	Incr.	20.000			
Systematic angle tolerance per step [1]	‘	±6			
Weight m	kg	2.6	3.6	4.7	
Shaft load [2]					
• Max. radial force [3]	N	100	100	110	
• Max. axial force pull	N	170			
• Max. axial force push	N	30			
• Nominal bearing life L_{10h} [4]	h	20.000			
Holding brake					
Holding torque M_H	Nm	6			
Electrical pick-up power	W	22			
Energise time (release brake)	ms	40			
De-energise time (close brake)	ms	20			
Moment of inertia	kgcm²	0.2			
Weight m	kg	1.8			

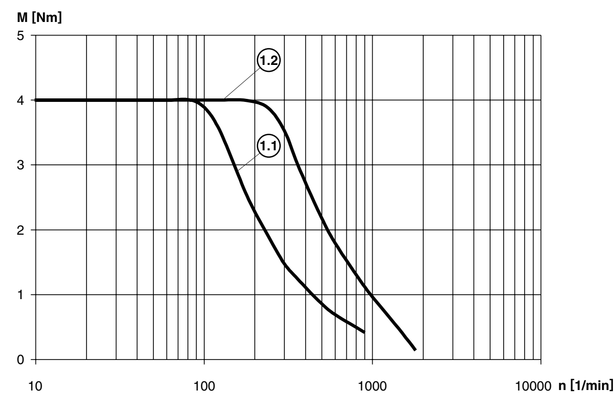
1) Measured at 1000 steps/revolution, unit in minutes of arc
2) Conditions for the shaft load: speed of rotation 60 1/min, 100% duty cycle at rated torque, ambient temperature 40 °C
3) Reference point of radial force: 10.5 mm distance from flange
4) Operating hours at a failure probability of 10%

Characteristic curves

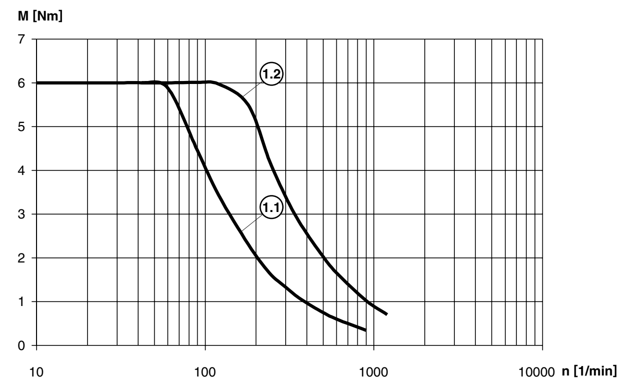
IFS91 torque characteristic



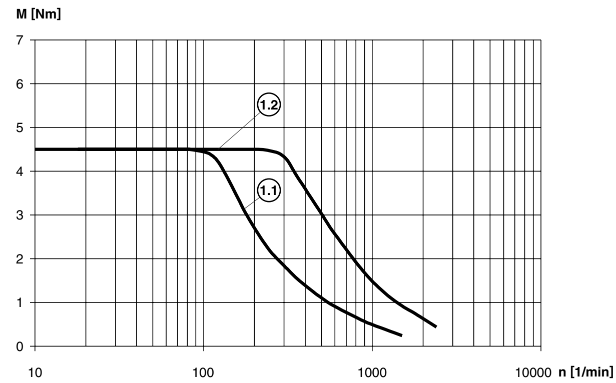
IFS92 torque characteristic



IFS93 torque characteristic



IFS93 torque characteristic with 3D winding



(1.1) Max. torque at 24 V
(1.2) Max. torque at 36 V

Electrical Data

Supply voltage		Corresponds to PELV as per DIN 19240, no inverse-polarity protection	
Supply voltage (absolute limit values)	V_{DC}	18 ... 40	
Nominal voltage	V_{DC}	24 / 36	
Ripple at nominal voltage	V_{SS}	≤ 3.6	
Max. current consumption			
• IFS6x	A	3.5	
• IFS9x	A	5	
Inrush current		charging current of capacitor C = 1500 µF	
External backup fuse	A	10, characteristic: slow-acting fuse	
24V signal interface		4 signals, each can be used as input or output GND galvanically connected with power supply GND, no inverse-polarity protection !	
24V signal inputs			
Low level IO0..IO3	V / mA	≤ 4.5 / ≤ 0.7	
High level IO0..IO3	V / mA	≥ 15 / ≥ 2	
Admissible voltage range	V	0 ... 30	
Debouncing time IO0 to I03	ms	0.1	
Debouncing time IO2,IO3 with capture	ms	0.01	
24V signal outputs		Switching to Plus, short-circuit proof, inductively chargeable (1000 mH / 100 mA)	
		with external power supply	**with internal power supply**
Supply	V_{DC}	10 ... 30	23 ... 25
Switching current	mA	≤ 100 (per output)	≤ 200 (total)
			The internal power supply is protected against: • short-circuiting of the ouput voltage • overloading of the output voltage (limit set at 6 W output power)
Fieldbus interfaces			
CAN			
Signal inputs/outputs		according to ISO 11898, no galvanic isolation	
Transfer rate	kBaud	50 / 100 / 125 / 250 / 500 / 800 / 1000	
Transfer protocol		CANopen according to DS301	
RS485			
Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire	
Transfer rate	kBaud	9.6 / 19.2 / 38.4	
Transfer protocol		Berger Lahr protocol, compatible to Twin Line	
Profibus DP			
Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire	
Transfer rate	kBaud	9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 / 1500 / 3000 / 6000 / 12000	
Transfer protocol		Profibus DP-V0, data format according to Profidrive V2.0 PPO Typ 2	

Environmental conditions

Ambient temperature [1]	°C	0 ... 65; 50 ... 65: reduced power rating: 2%/K
Max. admissible motor temperature	°C	110
Installation height without reduced power rating	m	< 1000 m above sea level
Temperature for transportation and storage	°C	-25 ... +70
Relative humidity	%	15 ... 85
Vibration strain		as per DIN EN 60068-2-6
• Acceleration amplitude	m/s²	20
• Frequency range	Hz	10 ... 500
• Number of cycles		10
Continuous shock		as per DIN EN 60068-2-29
• Number of shocks [2]		1000
• Peak acceleration	m/s²	150
Protection class according to EN 60529		IP54 complete device except for shaft bushing; IP41 shaft bushing
Insulation material class according to DIN EN 60034-1		155 (F)
Shaft eccentricity and axial precision		as per EN 50347 (IEC 60072-1)

[1] Limit values with flanged motor (e.g. steel plate 300x300x10 mm)

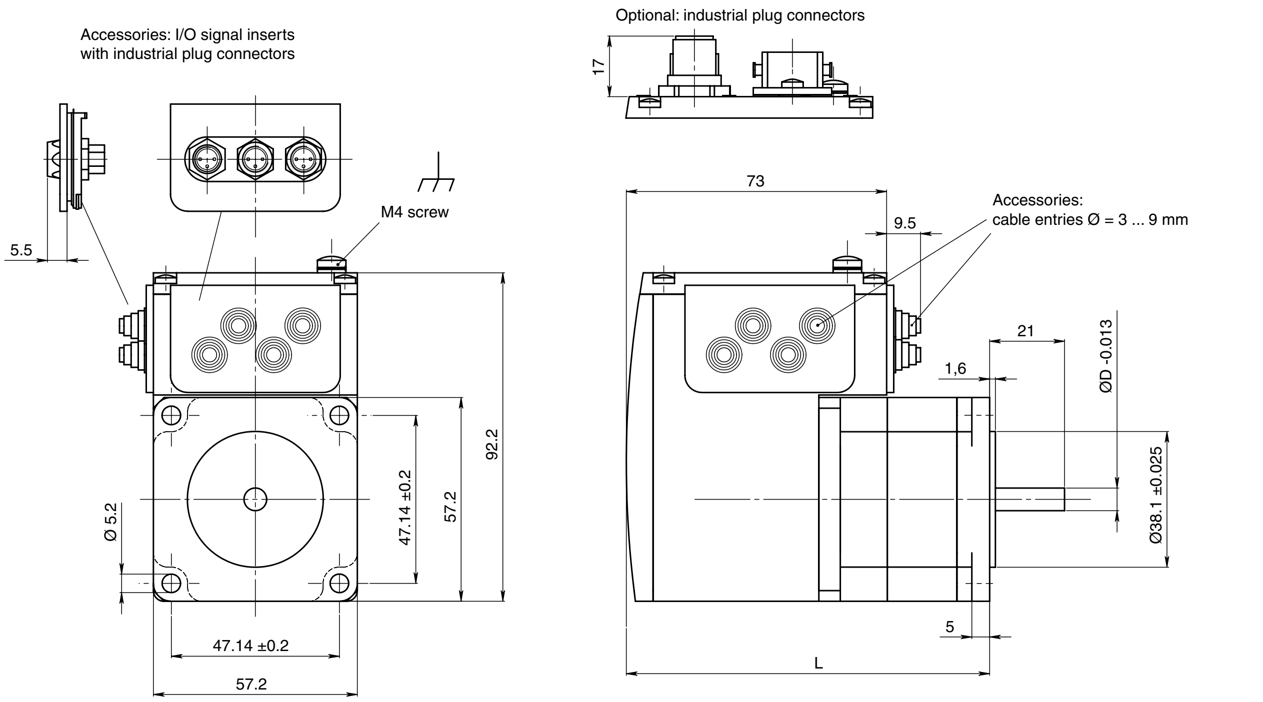
[2] In each case in positive and negative direction per axis (X, Y, Z)

Safety functions

Life time corresponding to safety life cycle (IEC 61508)	years	20
SFF (Safe Failure Function) (IEC 61508)	%	67
Probability of failure (PFH) (IEC 61508	1/h	$1.84 \cdot 10^{-9}$
Response time (until shutdown of power amplifier)	ms	< 50
Permitted test pulse width of upstream devices	ms	≤ 1

Dimensional drawings

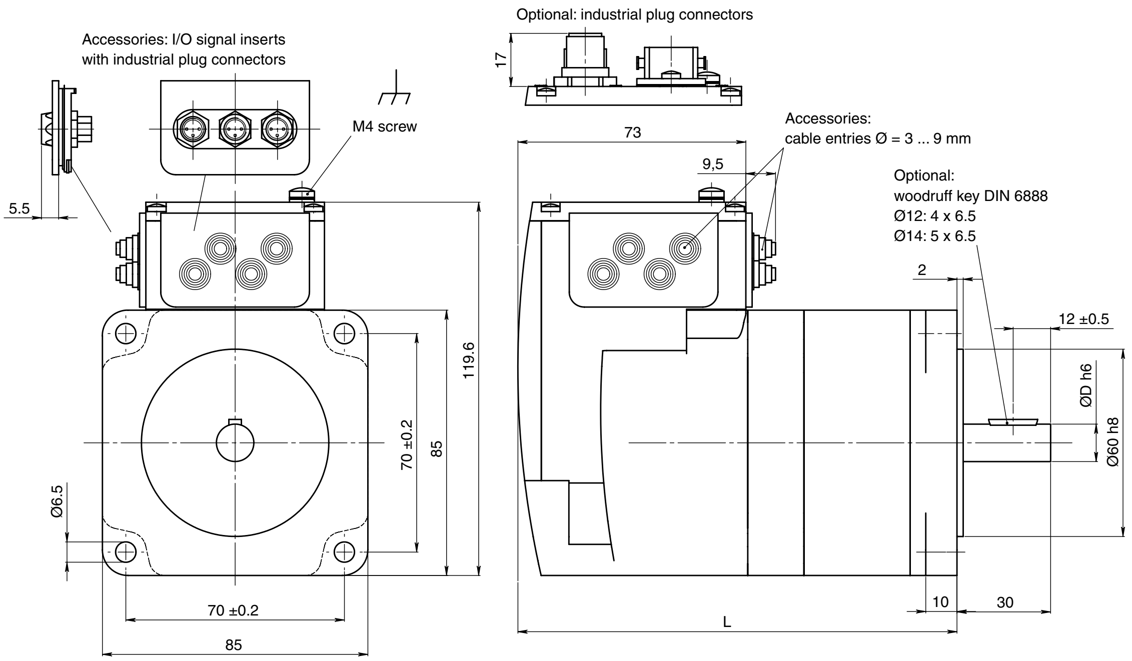
Dimensional drawings IFS6x



	L mm	D mm
IxS61	101.9	6.35
IxS62	115.9	6.35
IxS63	138.9	8.00

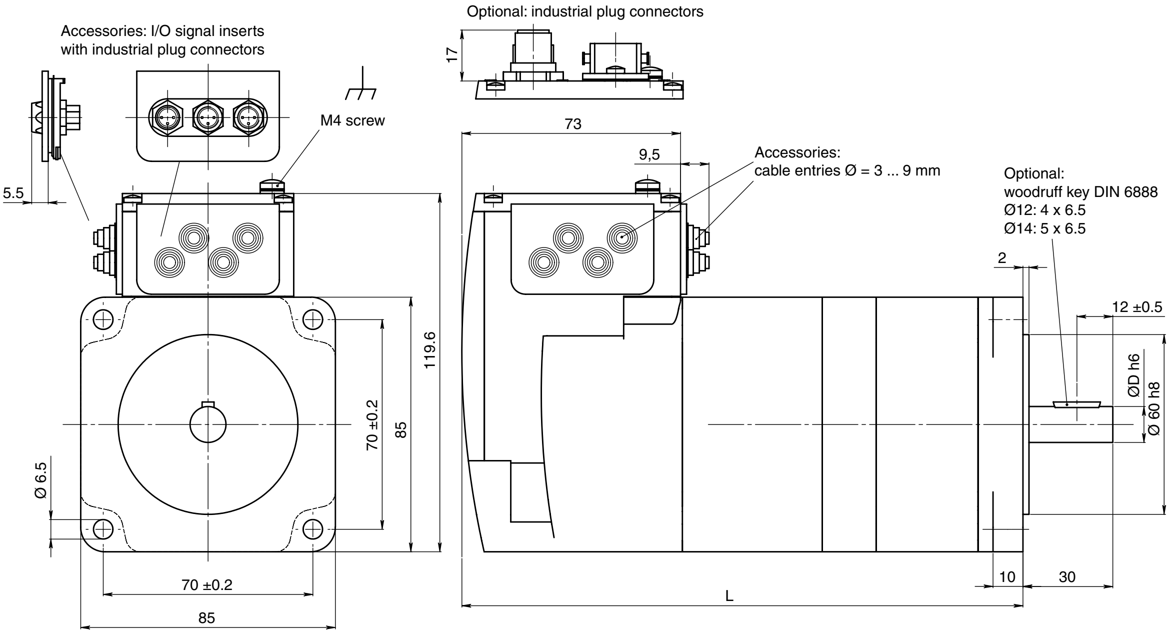
Intelligent Compact Drive IclA IFS6x

Dimensional drawings IFS9x



	L mm	D mm
IxS91	140.6	12
IxS92	170.6	12
IxS93	200.6	14

Intelligent compact drive IclA IFS9x



	L mm	D mm
IxS91	187.3	12
IxS92	217.3	12
IxS93	247.3	14

Intelligent Compact Drive IclA IFS9x with holding brake

Type code

Type code IFS6x

Example:	I	F	S	6	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Product family I = IclA intelligent compact drive	**I**	F	S	6	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Controller type F = positioning controller with fieldbus	I	**F**	S	6	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Motor type S = stepper motor	I	F	**S**	6	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Motor size 6 = motor flange [cm] 1, 2, 3 = motor length index	I	F	S	**6**	**1**	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Nominal supply voltage 2 = 24 to 36 V_{DC}	I	F	S	6	1	/	**2**	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Communications interface DP0 = Profibus DP V0 CAN = CANopen DS301 485 = RS485	I	F	S	6	1	/	2	**CAN**	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Signal interface power supply – = none (external power supply unit required) IS = internal 24 V power supply unit	I	F	S	6	1	/	2	CAN	**IS**	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Hardware option D = parameter switch for configuration	I	F	S	6	1	/	2	CAN	IS	**D**	S	/	–	–	–	B	54	O-001	R	P	P	41
Software version S = Standard	I	F	S	6	1	/	2	CAN	IS	D	**S**	/	–	–	–	B	54	O-001	R	P	P	41
Winding type – = Standard	I	F	S	6	1	/	2	CAN	IS	D	S	/	**–**	–	–	B	54	O-001	R	P	P	41
Measuring system – = no measuring system I = index pulse encoder	I	F	S	6	1	/	2	CAN	IS	D	S	/	–	**–**	–	B	54	O-001	R	P	P	41
Holding brake – = no holding brake	I	F	S	6	1	/	2	CAN	IS	D	S	/	–	–	**–**	B	54	O-001	R	P	P	41
Connection technology B = printed circuit board plug connector I = industrial plug connector	I	F	S	6	1	/	2	CAN	IS	D	S	/	–	–	–	**B**	54	O-001	R	P	P	41
Overall degree of protection (except for shaft bushing) 54 = IP54	I	F	S	6	1	/	2	CAN	IS	D	S	/	–	–	–	B	**54**	O-001	R	P	P	41
Gear O-001 = no gearbox PLE 60 planetary gear, gear ratio: 2-003 = 3 : 1 2-005 = 5 : 1 2-008 = 8 : 1	I	F	S	6	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	**O-001**	R	P	P	41
Shaft type R = round, smooth shaft (without gearbox) K = parallel key (with gearbox only)	I	F	S	6	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	**R**	P	P	41
Centring collar diameter: P = Standard	I	F	S	6	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	**P**	P	41
Shaft diameter P = Standard	I	F	S	6	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	**P**	41
Shaft bushing degree of protection 41 = IP41 - without gearbox 54 = IP54 - with gearbox	I	F	S	6	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	**41**

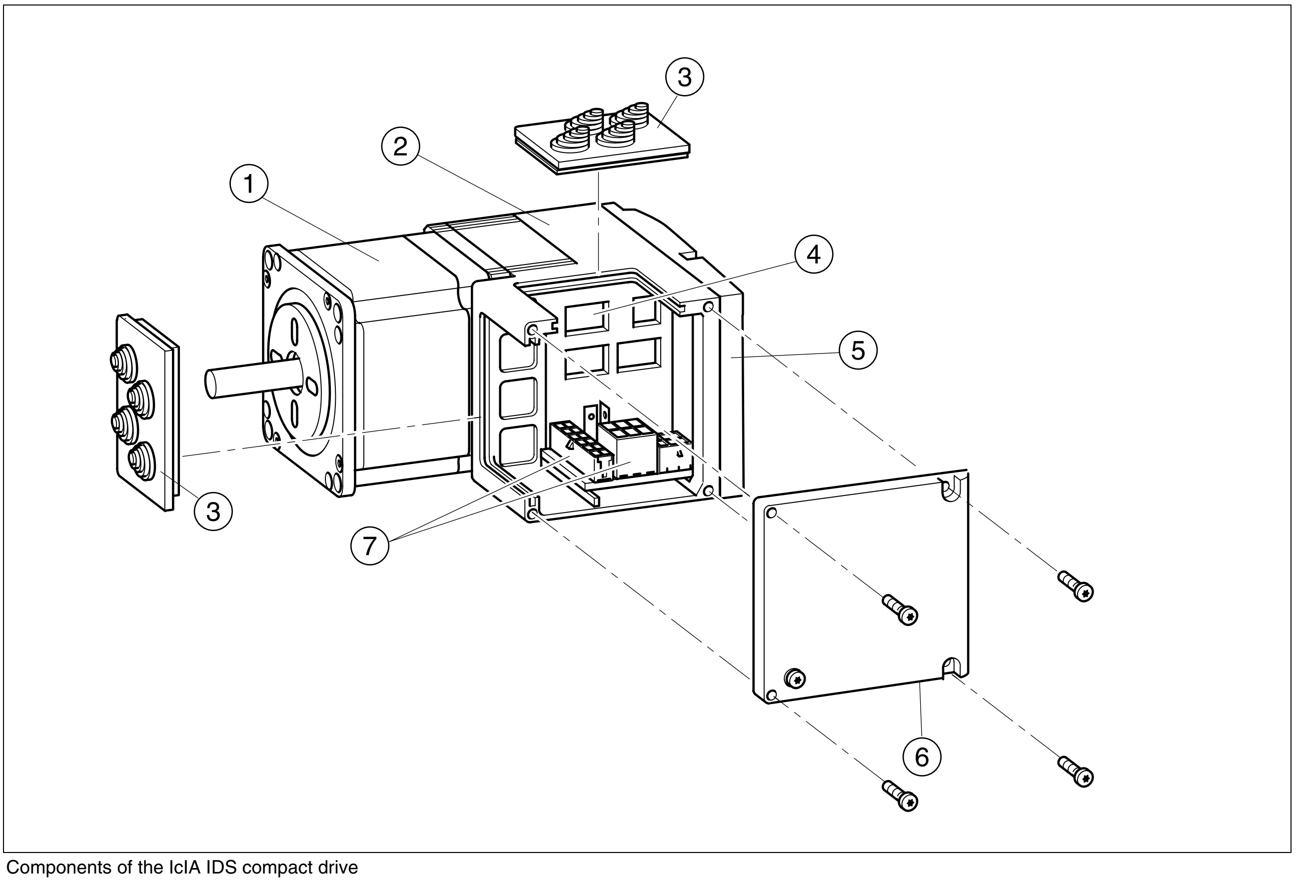
IclA with fieldbus interface

Type code IFS9x

Example:	**I**	**F**	**S**	**9**	**1**	**/**	**2**	**CAN**	**IS**	**D**	**S**	**/**	**–**	**–**	**–**	**B**	**54**	**O-001**	**R**	**P**	**P**	**41**
Product family I = IclA intelligent compact drive	**I**	F	S	9	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Controller type F = positioning controller with fieldbus	I	**F**	S	9	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Motor type S = stepper motor	I	F	**S**	9	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Motor size 9 = motor flange [cm] 1, 2, 3 = motor length index	I	F	S	**9**	**1**	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Nominal supply voltage 2 = 24 to 36 V_{DC}	I	F	S	9	1	/	**2**	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Communications interface DP0 = Profibus DP V0 CAN = CANopen DS301 485 = RS485	I	F	S	9	1	/	2	**CAN**	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Signal interface power supply - = none (external power supply unit required) IS = internal 24V power supply unit	I	F	S	9	1	/	2	CAN	**IS**	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Hardware option D = parameter switch for configuration	I	F	S	9	1	/	2	CAN	IS	**D**	S	/	–	–	–	B	54	O-001	R	P	P	41
Software version S = Standard	I	F	S	9	1	/	2	CAN	IS	D	**S**	/	–	–	–	B	54	O-001	R	P	P	41
Winding type – = Standard 3D = higher speed (with IFS93)	I	F	S	9	1	/	2	CAN	IS	D	S	/	**–**	–	–	B	54	O-001	R	P	P	41
Measuring system – = no measuring system I = index pulse encoder	I	F	S	9	1	/	2	CAN	IS	D	S	/	–	**–**	–	B	54	O-001	R	P	P	41
Holding brake – = no holding brake B = with holding brake	I	F	S	9	1	/	2	CAN	IS	D	S	/	–	–	**–**	B	54	O-001	R	P	P	41
Connection technology B = printed circuit board plug connector I = industrial plug connector	I	F	S	9	1	/	2	CAN	IS	D	S	/	–	–	–	**B**	54	O-001	R	P	P	41
Overall degree of protection (except for shaft bushing) 54 = IP54	I	F	S	9	1	/	2	CAN	IS	D	S	/	–	–	–	B	**54**	O-001	R	P	P	41
Gear O-001 = no gearbox PLE 80 planetary gear, gear ratio: 3-003 = 3 : 1 3-005 = 5 : 1 3-008 = 8 : 1	I	F	S	9	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	**O-001**	R	P	P	41
Shaft type R = round, smooth shaft (without gearbox) W = woodruff key as per DIN 6888 (without gearbox) K = parallel key (with gearbox only)	I	F	S	9	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	**R**	P	P	41
Centring collar diameter: P = Standard	I	F	S	9	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	**P**	P	41
Shaft diameter P = Standard	I	F	S	9	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	**P**	41
Shaft bushing degree of protection 41 = IP41 - without gearbox 54 = IP54 - with gearbox	I	F	S	9	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	**41**

IclA IDS

Product overview



Components of the IclA IDS compact drive

(1) Three-phase stepper motor
(2) Electronics housing
(3) Plug-in unit cable entry (accessory)
(4) Parameter switches
(5) Electronics cover, must not be removed
(6) Plug cover, to be removed on installation
(7) Electrical terminals

IclA with pulse/direction interface

Product description

The IDS intelligent compact drives consist of a three-phase stepper motor and control electronics with pulse/direction interface.

Application options

The IclA IDS contains a three-phase stepper motor and control electronics with pulse interface. Pulse/direction signals of a master controller, e.g. multi-axis motion controller or AB signals of an encoder, are converted directly into a movement.

Special features

- High continuous standstill torque
- Good synchronous characteristics
- High positioning resolution (0.018°)
- Optionally with planetary gear (IDS9x also with holding brake)

Control

The IclA IDS rotates the shaft as specified by a reference value. The reference value signal is generated by a controller or an encoder and is sent to the multifunction interface as a pulse signal.
The step count (steps per revolution) can be set with a parameter switch.

Electronics

The electronic system comprises control and power electronics. They have a common power supply and are not electrically isolated. It is controlled via the multifunction interface.
The electronics are thermally isolated from the motor by a plastic component.

Connections

The IclA IDS intelligent compact drives have the following connections:

- Power supply
- Multifunction interface
- Service interface, for commissoning
- 24 V signal interface for four inputs/outputs
- Signal interface for "Power Removal" safety function

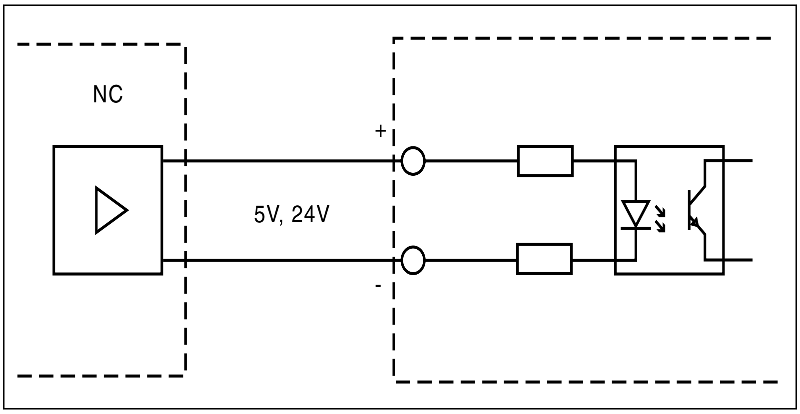
The cabling is connected with printed circuit board plug connectors.

Multifunction interface

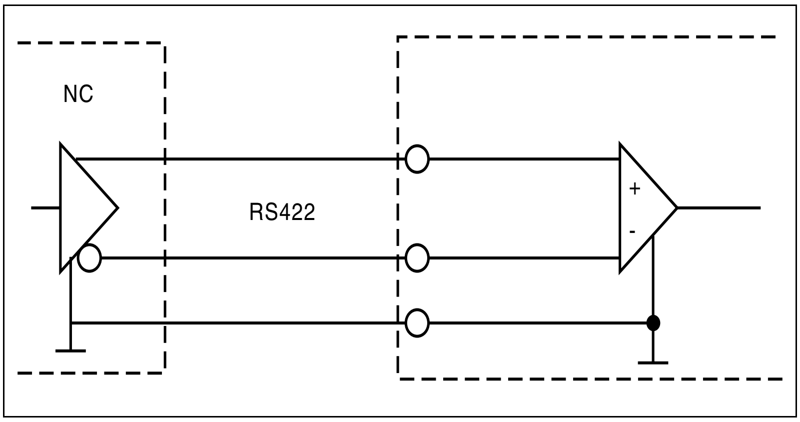
The multifunction interface operates at one of the following signal levels depending on the device model:

- 24 V signals optically isolated (PD1)
- 5 V signals optically isolated (PD2)
- 5 V differential signals without electrical isolation (PD3)

The reference pulses are fed in through two of the inputs, either as pulse/direction signals or as AB signals. The other inputs have the functions "power amplifier enable / pulse blocking" and "step size switching / PWM motor current control".



Circuits of signal inputs in PD1 and PD2



Circuits of signal inputs with PD3

IclA with pulse/direction interface

Service interface

The service interface is a RS485 bus interface for service purposes.
A PC can be connected to the service interface using an RS485-RS232 converter.
The "IclA Easy" PC commissioning software can be used for items such as reading out the error memory or monitoring the temperature.

24 V signal interface

Two inputs and two outputs are available. The inputs are used for "step size adjustment" and "power amplifier activation / pulse blocking". The outputs have the functions "power amplifier standby" and "fault output / index pulse".
The 24-V-supply of the outputs is internal via the supply voltage of the compact drive (standard). Alternatively, the outputs and the sensor mechanism can be supplied with power via a separate power supply (optional).

Signal interface for "Power Removal" safety function

The integrated "Power Removal" safety function enables a stop of category 0 or 1 as per EN 60204-1 without external power contactors. The supply voltage must not be interrupted. This reduces the system costs and response times.
The safety function is activated via two redundant 24 V input signals (low active).

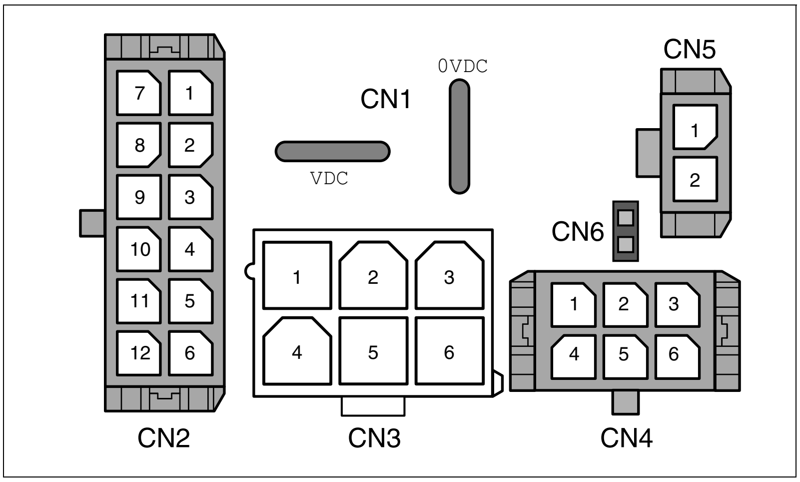
Connection technology

Circuit board plug connector

Circuit board plug connectors are used for cabling series machines with cable harnesses.

- I/O signal connection with "Molex Micro Fit" plug connector
- Power supply connection with "AMP Positive Lock" crimp contacts

Two cable entries are required for cabling the compact drive (see accessories).



Overview of all connections

Terminal	Assignments
CN1	Supply voltage VDC
CN2	Multifunction interface
CN3	Service interface
CN4	24 V signal interface
CN5	Interface for "Power Removal" safety function
CN6	Jumper for disabling "Power Removal" safety function

Functions

Overview

The following functions can be set on the IclA IDS compact drive via the parameter switches:

- Step count: 200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000
- Motor phase current (25% ... 100% of nominal current)
- Current reduction to 70% of specified motor phase current at standstill
- Functions of the signal inputs
  - Reference pulses fed as pulse/direction or AB signals ("PULSE/DIR / A/B" signal input)
  - Release or block power amplifier ("ENABLE / GATE" signal input)
  - Release or block reference pulse ("ENABLE / GATE" signal input)
  - Control motor phase current with PWM signal ("PWM / STEP2_INV" signal input)
  - Increase or reduce step count by a factor of 10, e.g. 200/2000 ("PWM / STEP2_INV" signal input)
- Functions of the signal outputs
  - Output error signal ("FAULT / INDEXPULSE" signal output)
  - Output index pulse signal ("FAULT / INDEXPULSE" signal output), possible only with compact drives with index pulse encoder
  - The operating readiness is signalled via the "ACTIVE" signal output.
- Activating blocking detection. If the actual position deviates from the setpoint position by more than one revolution, an error is reported and the power to the compact drive is switched off. In this operating status the motor has no torque. Possible only with compact drives with index pulse encoder.
- Switching on RS485 terminating resistor
- Switch on and off "Power Removal" safety function

Setting number of steps

The number of steps per axis revolution can be set via the step count.

Example:
At a step count of 1000 the compact drive runs exactly one complete motor revolution at 1000 pulses. At a pulse frequency of 1 kHz this yields a speed of 1 1/s = 60 1/min
The "STEP2_INV" setting at the parameter switch can be inverted via the input signal `STEP2_INV` of the multifunction interface or the 24 V signal interface.

Setting options via parameter switches
Step count: 200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000 per revolution

Setting motor phase current

The motor phase current is set with a rotary switch. A high motor phase current generates a high motor torque.

Setting options via rotary switches
Motor phase current: 25% ... 100% (in 5% steps) of nominal current

Activating motor phase current reduction

If the full holding torque is not required, the "motor phase current reduction" function can be used to reduce the holding torque.
Advantage: Motor and electrics heat up less and the efficiency is improved.
The motor phase current is reduced to approximately 70% of the set motor phase current 100 ms after receiving the last pulse edge.
The motor phase current is set with a rotary switch. A high motor phase current generates a high motor torque.

Setting options via parameter switches
Enable/disable motor phase current reduction

Setting function of the "ENABLE / GATE" signal input

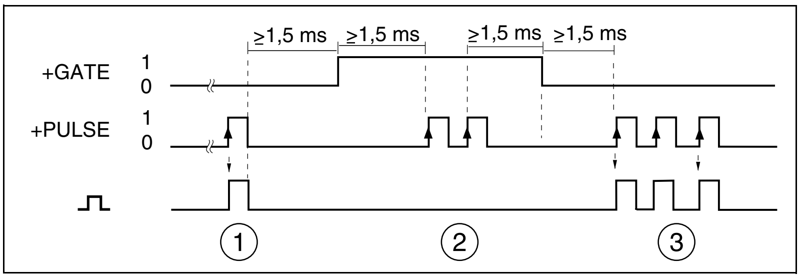
The `ENABLE/GATE` signal is available at the following interfaces:

- 24V signal interface
- Multifunction interface

The `ENABLE/GATE` signal can have two functions:

"ENABLE" function: release/enable power amplifier
The "ENABLE" function releases the power amplifier to allow control of the motor.

"GATE" function: release/enable pulse input
The "GATE" function blocks the pulses at the reference value input without switching off the operating readiness. In a multi-axis system single axes can be selected with the "GATE" function.



Signal sequences when switching on the compact drive with the GATE function

(1) Motor step

(2) No motor steps

(3) Motor steps

The diagram shows the motor movement with the "GATE" function activated. There must be no pulse pending for 1.5 ms before and after switching the `GATE` signal to ensure that the compact drive can follow the pulse preset step by step. If the time period is not met, the LED signals a warning. The warning does not affect the operating readiness of the compact drive.

Setting options via parameter switches
Setting function of the "ENABLE / GATE" signal input

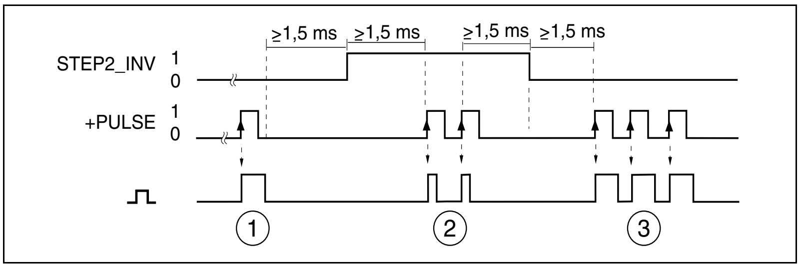
Setting function of the "STEP2_INV / PWM" signal input

The STEP2_INV/PWM signal is available at the following interfaces:

- Multifunction interface
- 24 V signal interface (STEP2_INV only)

The STEP2_INV/PWM signal can have two functions:

"STEP2_INV" function
This function can be used if high-accuracy positioning is required but the output frequency of the master controller is limited.
The number of steps can be increased or reduced by a factor of 10 with the signal input.
If the "STEP2_INV" function is activated, the setting of the parameter switch 1.1 is inverted.



Signal sequences when switching the STEP2_INV signal

(1) Large motor step
(2) Motor steps lower by a factor of 10
(3) Large motor steps

"PWM" function
The "PWM" function (pulse width modulation) can be used to reduce the motor phase current and as a result the torque by 0% to 100% of the motor phase current that is set at the "HEX" rotary switch.
At constant HIGH level no motor phase current flows (current reset to zero). At constant LOW level the motor operates at the specified maximum motor phase current.
If a rectangular-pulse signal is fed, the motor phase current can be set with the pulse-pause ratio.

Setting options via parameter switches
Setting function of the "STEP2_INV / PWM" signal input

Setting function of the "FAULT / INDEXPULSE" signal output

For compact drives with index pulse the index pulse signal can be switched to the "FAULT / INDEXPULSE" signal output (possible with compact drives with index pulse encoder only).
The `FAULT/INDEXPULSE` signal is available at the following interfaces:

- 24 V signal interface

The `FAULT/INDEXPULSE` signal can have two functions:

"FAULT" function
The "FAULT" function shows an error status. An error can be reset by locking and enabling the power amplifier (`ENABLE` signal): LOW --> HIGH).

"INDEXPULSE" function
If the compact drive has the optional internal Hall sensor on the motor shaft, the Hall sensor sends the `INDEXPULSE` signal once per revolution.

Setting options via parameter switches
Setting function of the "FAULT / INDEXPULSE" signal output

Activating blocking detection

The compact drive is fitted with stall detection as an option. The stall detection responds if the actual position of the axis deviates from the setpoint position by more than one revolution. The function is only available on compact drives with index pulse.
If the stall detection responds, the power to the compact drive is disconnected and the "FAULT" signal output is set.
Stall detection is only possible with a compact drive with index pulse encoder.

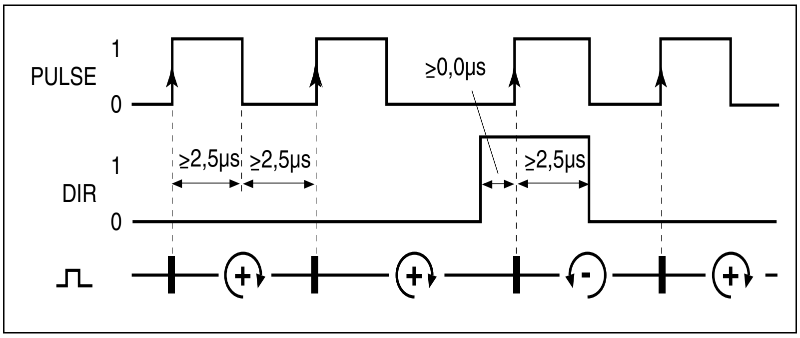
Setting options via parameter switches
Activating/Deactivating blocking detection

Setting function of the "DIR / A and PULSE / B" signal inputs

The values of the setpoint position can be fed in at the multifunction interface as pulse/direction signals or A/B encoder signals. The compact drive converts the input signals to a motor movement.
Two interface modes are available:

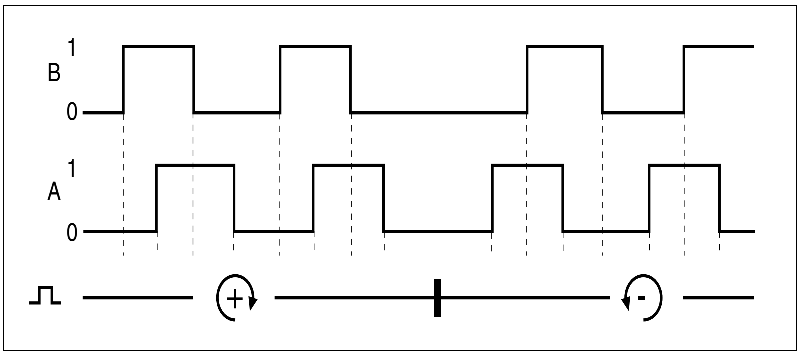
- PULSE/DIR
- A/B

"PULSE/DIR" interface mode
The motor executes an angular increment with the rising edge of the `PULSE` signal. The direction of rotation is controlled by the `DIR` signal.



Pulse/direction signals

"A / B" interface mode
A/B encoder signals can be fed as a reference value selection via the "A / B" interface mode.



A/B encoder signals

Setting options via parameter switches
Setting function of the "DIR / A and PULSE / B" signal inputs

Safety function

Definition

Power Removal
The "Power Removal" safety function switches off the motor torque safely. The supply voltage must not be interrupted. There is no monitoring at standstill.

Category 0 stop (EN 60204-1)
Standstill by immediate power shutdown to the machine drive elements (i.e. an uncontrolled stop).

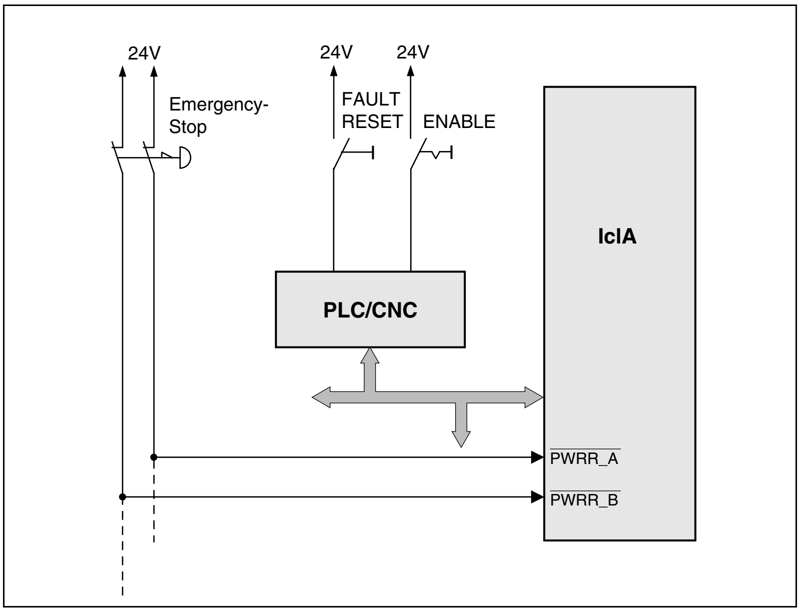
Category 1 stop (EN 60204-1)
A controlled stop in which the machine drive elements are retained to effect the standstill. Power feed is only interrupted when everything has come to a standstill.

Description

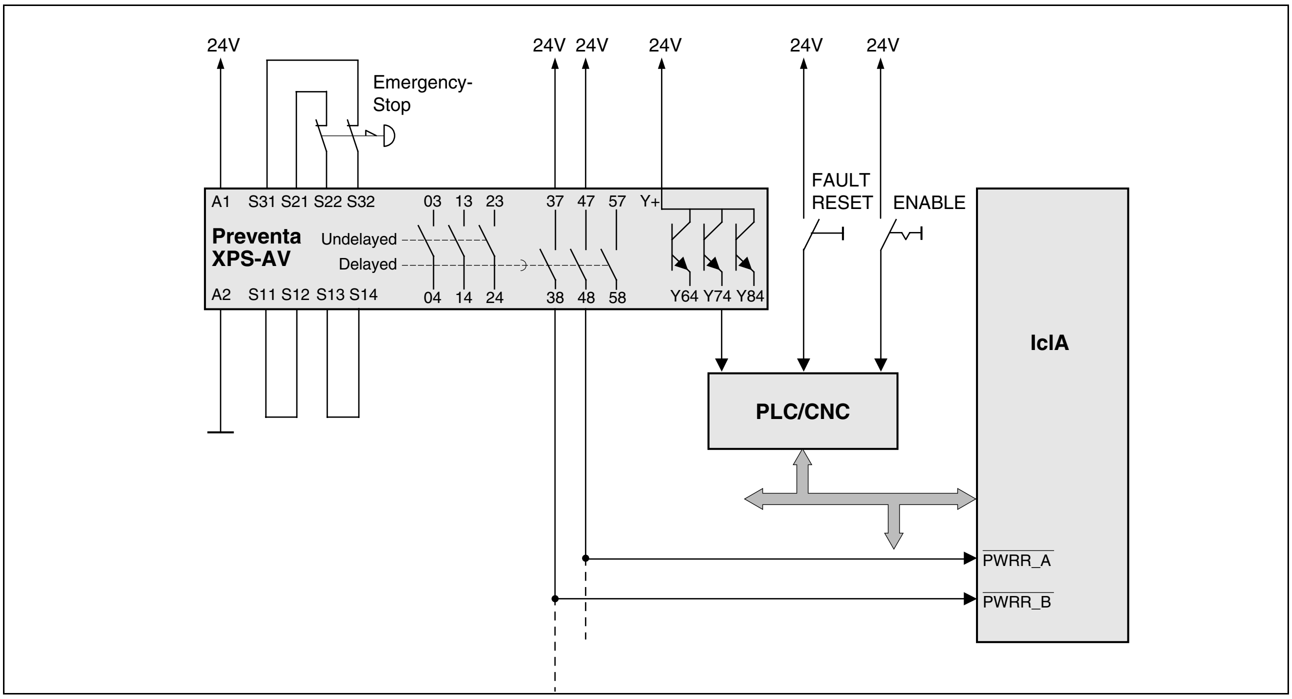
The "Power Removal" safety function integrated into the product can be used to implement the Emergency Stop control function (EN 60204-1) for Category 0 Stop and Category 1 Stop. This safety function also prevents the compact drive from unexpected restart.
The following safety levels are implemented in accordance with the standards for functional safety:

- IEC 61508, SIL 2: Functional safety of electrical/electronic/programmable electronic safety-related systems
- pr IEC 62061, SIL 2: Safety of machinery, Functional safety of electrical, electronic and programmable controllers of machines
- EN 954-1, Category 3: Safety of machinery, Safety of components of control devices, Part 1: General design requirements
- pr EN 13849-1, Category 3: Safety of machinery, Safety of components of control devices, Part 1: General design requirements

Examples of applications for the safety function



Example category 0 stop



Example category 1 stop

Technical data

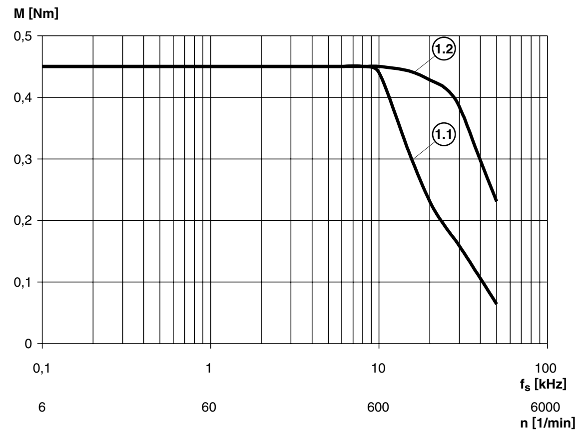
IDS6x mechanical data

		IDS61	IDS62	IDS63
Max. torque M_{max}	Nm	0.45	0.90	1.50
Holding torque M_H	Nm	0.51	1.02	1.70
Moment of inertia	kgcm²	0.1	0.22	0.38
Number of steps		200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000		
Step angle	°	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036		
Systematic angle tolerance per step [1]	’	±6	±6	±6
Weight	kg	1.3	1.6	2.0
Shaft load [2]				
• Max. radial force [3]	N	24	24	50
• Max. axial force tension	N	100		
• Max. axial force compression	N	8.4		
• Nominal bearing life L_{10h} [4]	h	20000		

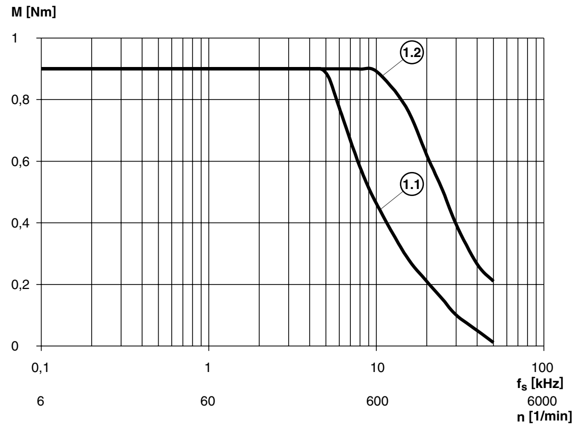
1) Measured at 1000 steps/revolution, unit in minutes of arc
2) Conditions for the shaft load: speed of rotation 60 1/min, duty cycle at torque, ambient temperature 40 °C
3) Reference point of radial force: 10.5 mm distance from flange
4) Operating hours at a failure probability of 10%

Characteristic curves

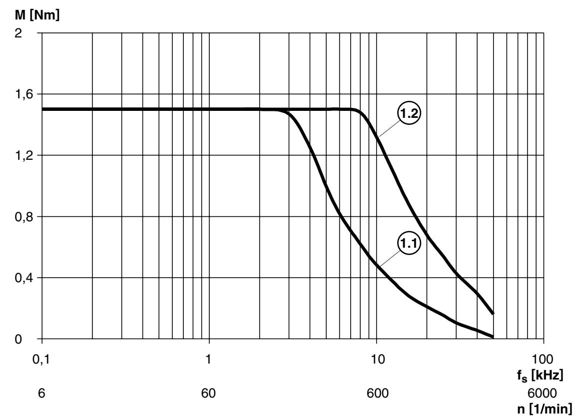
IDS61 torque characteristic



IDS62 torque characteristic



IDS63 torque characteristic



(1.1) Max. torque at 24 V
(1.2) Max. torque at 36 V
measured at 1000 steps/revolution

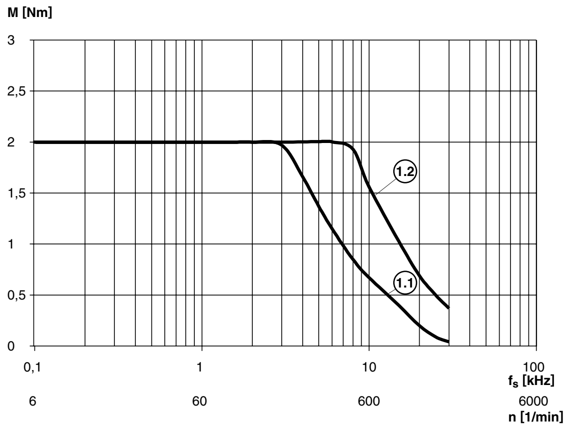
IDS9x mechanical data

		IDS91	IDS92	IDS93	IDS93
Windingtype				**Standard**	**3 D**
Max. torque M_{max}	Nm	2.0	4.0	6.0	4.5
Holding torque M_H	Nm	2.0	4.0	6.0	4.5
Moment of inertia	kgcm²	1.1	2.2	3.3	
Number of steps		200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000			
Step angle	°	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036			
Systematic angle tolerance per step [1]	’	±6			
Weight m	kg	2.6	3.6	4.7	
Shaft load [2]					
• Max. radial force [3]	N	100	100	110	
• Max. axial force tension	N	170			
• Max. axial force compression	N	30			
• Nominal bearing life L_{10h} [4]	h	20000			
Holding brake					
Holding torque M_H	Nm	6			
Electrical pick-up power	W	22			
Energise time (release brake)	ms	40			
De-energise time (close brake)	ms	20			
Moment of inertia	kgcm²	0.2			
Weight m	kg	1.8			

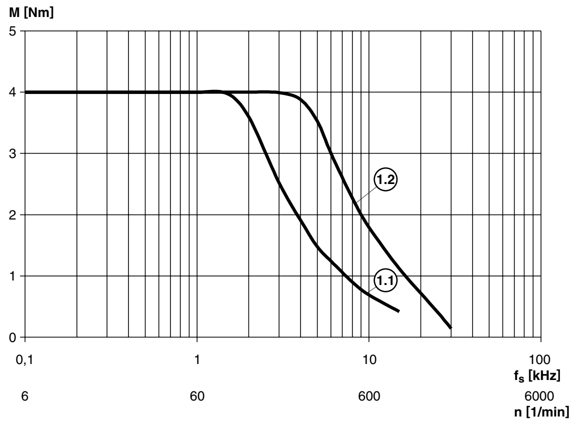
[1] Measured at 1000 steps/revolution, unit in minutes of arc
[2] Conditions for the shaft load: speed of rotation 60 1/min, duty cycle at torque, ambient temperature 40 °C
[3] Reference point of radial force: 10.5 mm distance from flange
[4] Operating hours at a failure probability of 10%

Characteristic curves

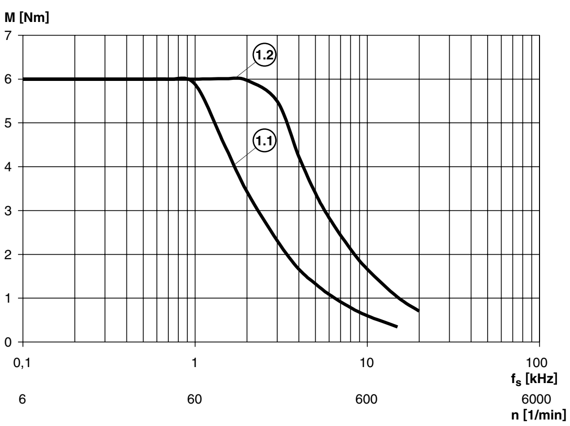
IDS91 torque characteristic



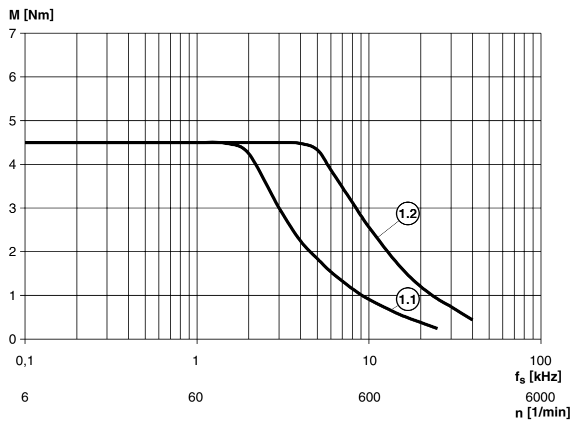
IDS92 torque characteristic



IDS93 torque characteristic



IDS93 torque characteristic with 3D winding



(1.1) Max. torque at 24 V
(1.2) Max. torque at 36 V
measured at 1000 steps/revolution

Electrical data

Power supply		Corresponding to PELV / DIN 19240, no inverse-polarity protection !		
Supply voltage	VDC	18 ... 40		
Rated supply voltage	VDC	24 / 36		
Ripple at nominal voltage	V_{SS}	≤ 3.6		
Max. power consumption				
• IDS6x	A	3.6		
• IDS9x	A	5		
Starting current		charging current of capacitor C = 1500 µF		
External fuse	A	10, characteristic: slow-acting fuse		
24 V signal interface		4 signals, each can be used as input or output, GND galvanically connected with power supply GND, no inverse-polarity protection !		
24 V signal inputs				
Low level IO0..IO3	V/mA	≤ 4.5 / ≤ 0.7		
High level IO0..IO3	V/mA	≥ 15 / ≥ 2		
Admissible voltage range	V	0 ... 30		
Debounce time IO0 to IO3	ms	0.1		
Debounce time IO2, IO3 at capture function	ms	0.01		
24 V signal outputs		Switching to Plus, short-circuit proof, inductively chargeable (1000 mH / 100 mA)		
		with external power supply	**with internal power supply**	
Supply voltage	V_{DC}	10 ... 30	23 ... 25	
Switching current	mA	≤ 100 (per output)	≤ 200 (total)	
			The internal power supply is protected against: • short-circuiting of the ouput voltage • overloading of the output voltage (limit set at 6 W output power)	
Multifunction interface		PD1 (24V)	PD2 (5V)	PD3
Inputs				
Electrically isolated		yes	yes	no
Low level	V / mA	≤ 3 / ≤ 0.2	≤ 0.4 / ≤ 0.2	RS422
High level	V / mA	≤ 20 / ≤ 7	≥ 2.5 / ≥ 7 [1)]	RS422
Admissible voltage range	V	-3 ... 30	-5.25 ... +5.25	-2 ... +26 [2)]
Input resistance	Ω	2000	140	5000
PULSE/DIR frequency input	kHz	≤ 200	≤ 200	≤ 200
PWM frequency input current reduction	kHz	6...25	6 ... 25	6 ... 25
Output		short-circuit resistant, , no inverse-polarity protection to 100 mA, inductively chargea-ble (1000 mH / 100 mA)		
Electrically isolated		yes	yes	no
Max. switching voltage	V	30	30	30
Max. switching current	mA	100	100	100
Internal voltage drop at 10 mA / 100 mA	V	≤1.6 / 1.9	≤1.6 / 1.9	≤0.2 / 0.2

1) From pulse frequency 50 kHz: high level ≥ 3.5 V
2) Voltage related to GND

Environmental conditions

Ambient temperature [1)]	°C	0 ... 65; 50 ... 65: reduced power rating: 2%/K
Max. admissible motor temperature	°C	110
Installation height without reduced power rating	m	< 1000 m above sea level
Temperature for transportation and storage	°C	-25 ... +70
Relative humidity	%	15 ... 85
Vibration strain		as per DIN EN 60068-2-6
• Acceleration amplitude	m/s²	20
• Frequency range	Hz	10 ... 500
• Number of cycles		10
Continuous shock		as per DIN EN 60068-2-29
• Number of shocks [2)]		1000
• Peak acceleration	m/s²	150
Protection class according to EN 60529		IP54 complete device except for shaft bushing; IP41 shaft bushing
Heat class according to DIN EN 60034-1		155 (F)
Shaft eccentricity and axial precision		as per EN 50347 (IEC 60072-1)

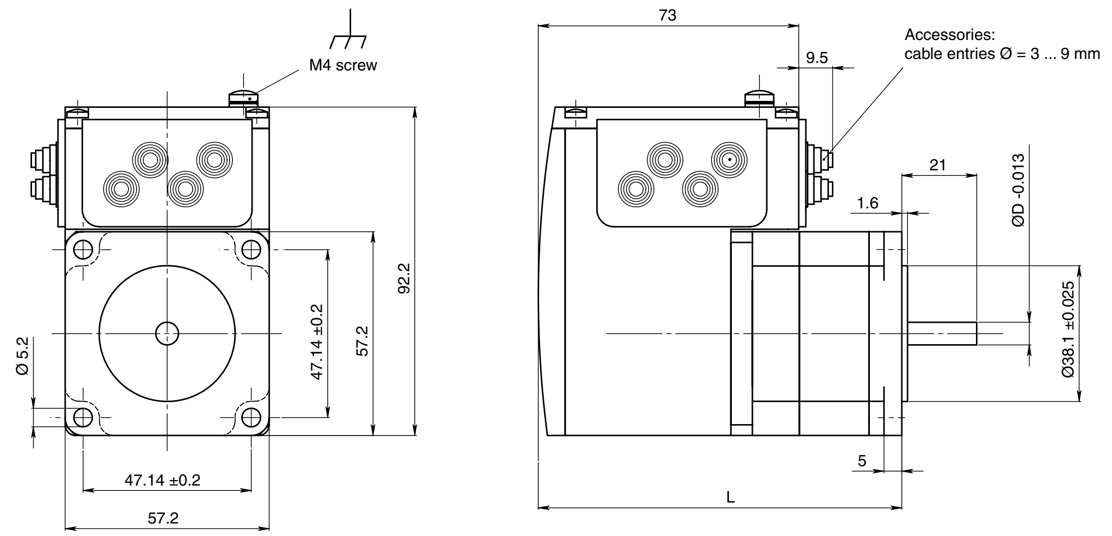
1) Limit values with flanged motor (e.g. steel plate 300x300x10 mm)
2) In each case in positive and negative direction per axis (X, Y, Z)

Safety functions

Life time corresponding to safety life cycle (IEC 61508)	years	20
SFF (Safe Failure Function) (IEC 61508)	%	67
Probability of failure (PFH) (IEC 61508	1/h	$1.84 \cdot 10^{-9}$
Response time (until shutdown of power amplifier)	ms	< 50
Permitted test pulse width of upstream devices	ms	≤ 1

Dimensional drawings

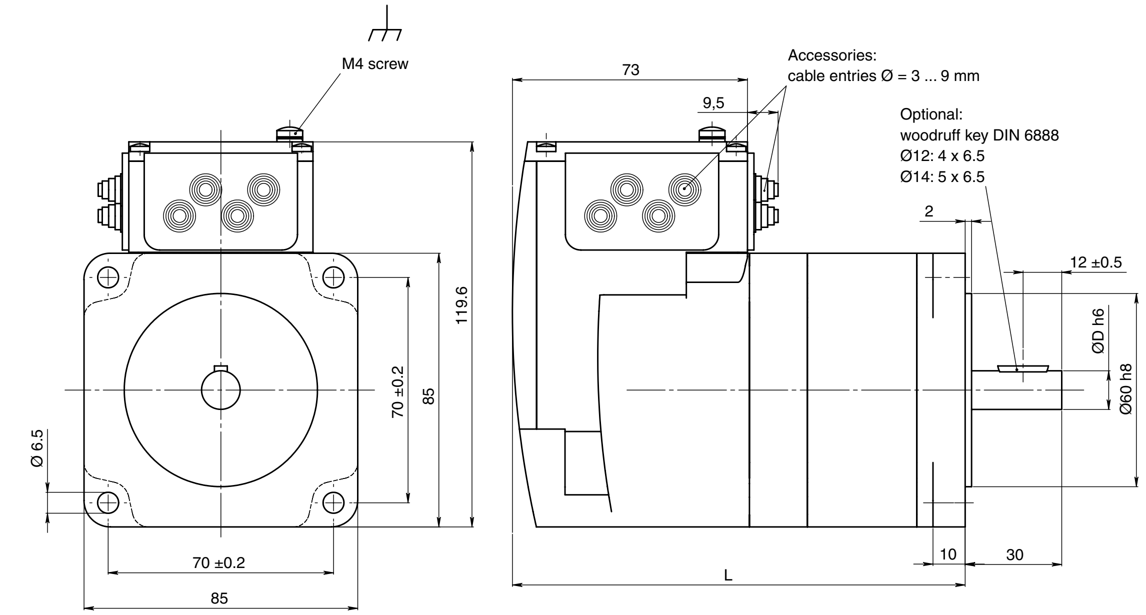
Dimensional drawings IDS6x



	L mm	D mm
IxS61	101.9	6.35
IxS62	115.9	6.35
IxS63	138.9	8.00

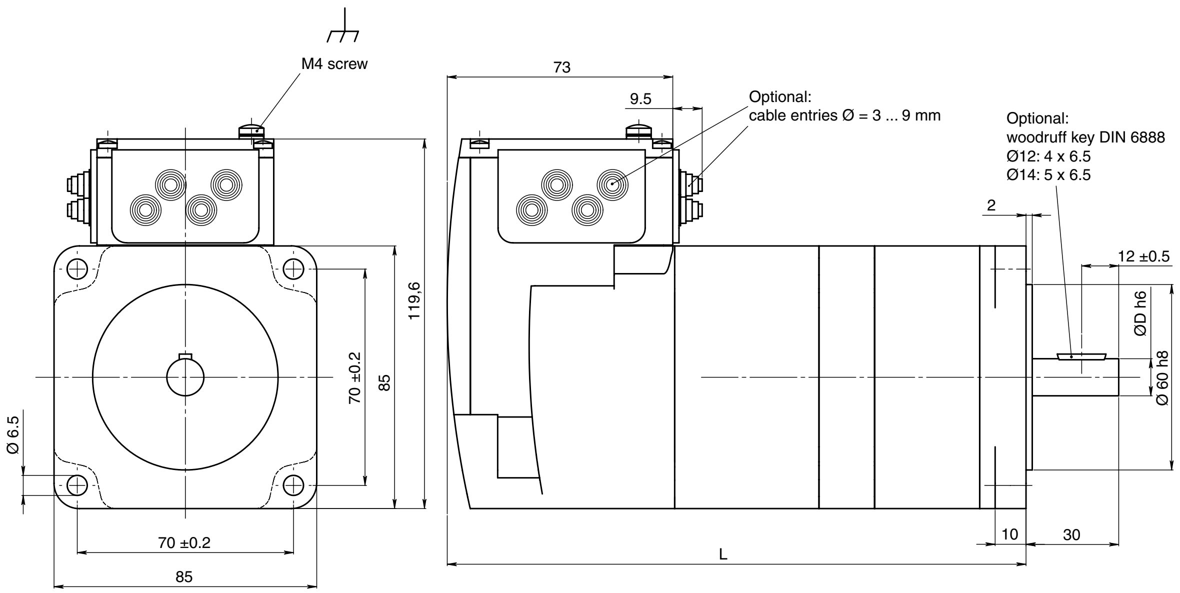
Intelligent Compact Drive IclA IDS6x

Dimensional drawings IDS9x



	L mm	D mm
IxS91	140.6	12
IxS92	170.6	12
IxS93	200.6	14

Intelligent Compact Drive IclA IDS9x



	L mm	D mm
IxS91	187.3	12
IxS92	217.3	12
IxS93	247.3	14

Intelligent Compact Drive IclA IDS9x with holding brake

Type code

Type code IDS6x

Example:	I	D	S	6	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Product family I = IclA intelligent compact drive	**I**	D	S	6	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Controller type D = power electronics	I	**D**	S	6	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Motor type S = stepper motor	I	D	**S**	6	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Motor size 6 = motor flange [cm] 1, 2, 3 = motor length index	I	D	S	**6**	**1**	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Nominal supply voltage 2 = 24 to 36 V_{DC}	I	D	S	6	1	/	**2**	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Communications interface PD1 = 24 V signals, optically isolated PD2 = 5 V signals, optically isolated PD3 = 5 V signals, push-pull (RS422)	I	D	S	6	1	/	2	**PD3**	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Signal interface power supply – = none (external power supply unit required) IS = internal 24V power supply unit	I	D	S	6	1	/	2	PD3	**IS**	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Hardware option D = parameter switch for configuration	I	D	S	6	1	/	2	PD3	IS	**D**	S	/	–	–	–	B	54	O-001	R	P	P	41
Software version S = Standard	I	D	S	6	1	/	2	PD3	IS	D	**S**	/	–	–	–	B	54	O-001	R	P	P	41
Winding type – = Standard	I	D	S	6	1	/	2	PD3	IS	D	S	/	**–**	–	–	B	54	O-001	R	P	P	41
Measuring system – = no measuring system I = index pulse encoder	I	D	S	6	1	/	2	PD3	IS	D	S	/	–	**–**	–	B	54	O-001	R	P	P	41
Holding brake – = no holding brake	I	D	S	6	1	/	2	PD3	IS	D	S	/	–	–	**–**	B	54	O-001	R	P	P	41
Connection technology B = printed circuit board plug connector	I	D	S	6	1	/	2	PD3	IS	D	S	/	–	–	–	**B**	54	O-001	R	P	P	41
Overall degree of protection (except for shaft bushing) 54 = IP54	I	D	S	6	1	/	2	PD3	IS	D	S	/	–	–	–	B	**54**	O-001	R	P	P	41
gear O-001 = no gearbox PLE 60 planetary gear, gear ratio: 2-003 = 3 : 1 2-005 = 5 : 1 2-008 = 8 : 1	I	D	S	6	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	**O-001**	R	P	P	41
Shaft type R = round, smooth shaft (without gearbox) K = parallel key (with gearbox only)	I	D	S	6	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	**R**	P	P	41
Centring collar diameter: P = Standard	I	D	S	6	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	**P**	P	41
Shaft diameter P = Standard	I	D	S	6	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	**P**	41
Shaft bushing degree of protection 41 = IP41 - without gearbox 54 = IP54 - with gearbox		D	S	6	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	**41**

IclA with pulse/direction interface

Type code IDS9x

Example:	**I**	**D**	**S**	**9**	**1**	**/**	**2**	**PD3**	**IS**	**D**	**S**	**/**	**–**	**–**	**–**	**B**	**54**	**O-001**	**R**	**P**	**P**	**41**
Product family I = IclA intelligent compact drive	**I**	D	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Controller type D = power electronics	I	**D**	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Motor type S = stepper motor	I	D	**S**	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Motor size 9 = motor flange [cm] 1, 2, 3 = motor length index	I	D	S	**9**	**1**	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Nominal supply voltage 2 = 24 to 36 V_{DC}	I	D	S	9	1	/	**2**	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Communications interface PD1 = 24 V signals, optically isolated PD2 = 5 V signals, optically isolated PD3 = 5 V signals, push-pull (RS422)	I	D	S	6	1	/	2	**PD3**	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Signal interface power supply – = none (external power supply unit required) IS = internal 24V power supply unit	I	D	S	9	1	/	2	PD3	**IS**	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Hardware option D = parameter switch for configuration	I	D	S	9	1	/	2	PD3	IS	**D**	S	/	–	–	–	B	54	O-001	R	P	P	41
Software version S = Standard	I	D	S	9	1	/	2	PD3	IS	D	**S**	/	–	–	–	B	54	O-001	R	P	P	41
Winding type – = Standard 3D = higher speed of rotation (with IFS93)	I	D	S	9	1	/	2	PD3	IS	D	S	/	**–**	–	–	B	54	O-001	R	P	P	41
Measuring system – = no measuring system I = index pulse encoder	I	D	S	9	1	/	2	PD3	IS	D	S	/	–	**–**	–	B	54	O-001	R	P	P	41
Holding brake – = no holding brake B = with holding brake	I	D	S	9	1	/	2	PD3	IS	D	S	/	–	–	**–**	B	54	O-001	R	P	P	41
Connection technology B = printed circuit board plug connector	I	D	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	**B**	54	O-001	R	P	P	41
Overall degree of protection (except for shaft bushing) 54 = IP54	I	D	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	**54**	O-001	R	P	P	41
Gear O-001 = no gearbox PLE 80 planetary gear, gear ratio: 3-003 = 3 : 1 3-005 = 5 : 1 3-008 = 8 : 1	I	D	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	**O-001**	R	P	P	41
Shaft type R = round, smooth shaft (without gearbox) W = disc spring as per DIN 6888 (without gearbox) K = parallel key (with gearbox only)	I	D	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	**R**	P	P	41
Centring collar diameter: P = Standard	I	D	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	**P**	P	41
Shaft diameter P = Standard	I	D	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	**P**	41
Shaft bushing degree of protection 41 = IP41 - without gearbox 54 = IP 54 - with gearbox		D	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	**41**

Planetary gear

Description

The IclA intelligent compact drives can be supplied with a planetary gear as an option. Different planetary gears are available depending on the motor. The following table shows the available planetary gears.

IclA compact drive	Planetary gear	
	Diameter	Reduction ratio
IDS6x, IFS6x	60	3: 1
		5: 1
		8: 1
IDS9x, IFS9x	80	3: 1
		5: 1
		8: 1
IFA6x	60	3: 1
		5: 1
		8: 1
IFE71	40	16: 1
		40: 1
		60: 1
		120: 1

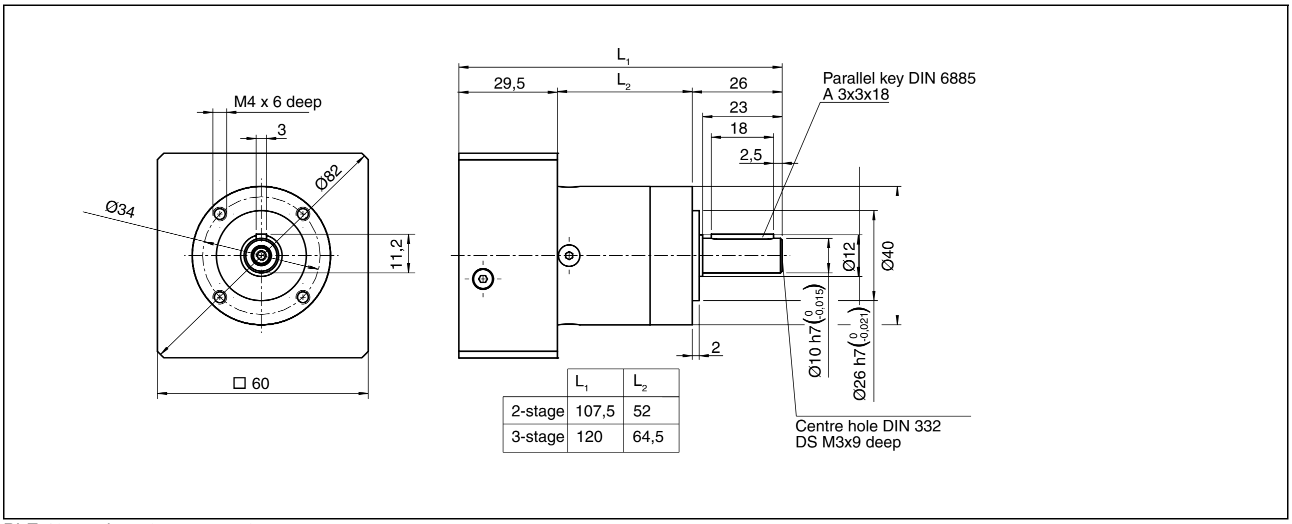
Technical data

Gear		PLE 40				PLE 60			PLE 80		
Reduction ratio		**16**	**40**	**60**	**120**	**3**	**5**	**8**	**3**	**5**	**8**
Torsional play	arcmin	<30				< 20			< 12		
Torsion rigidity	Nm/arcmin	1.1	1.1	1.0	1.0	2.3			6		
Rated output torque [1]	Nm	20	18	20	18	12	16	15	40	50	50
Moment of inertia	kgcm²	0.022	0.016	0.029	0.029	0.135	0.078	0.065	0.77	0.45	0.39
Max. radial force	N	200				500			950		
Max. axial force	N	200				600			1200		
Weight	kg	0.45	0.45	0.55	0.55	0.9			2.1		
Gear stages		2		3		1			1		
Max. drive speed	1/min	18.000				13.000			7.000		
Rec. drive speed	1/min	4.500				4.000			4.000		
Efficiency	%	94	94	90	90	96			96		
Min. operating temperature	°C	-25				-25			-25		
Max. operating temperature	°C	+90				-90			-90		
Max. operating temperature (short-term)	°C	+120				+120			+120		
Bearings		Deep-groove ball bearing				Deep-groove ball bearing			Deep-groove ball bearing		
Degree of protection		IP 54				IP 54			IP 54		
Lubrication		life lubrication				life lubrication			life lubrication		
Life time	h	10.000				20.000			20.000		

[1] The actual output torque is calculated from the motor torque x reduction ratio x efficiency of the gearbox.

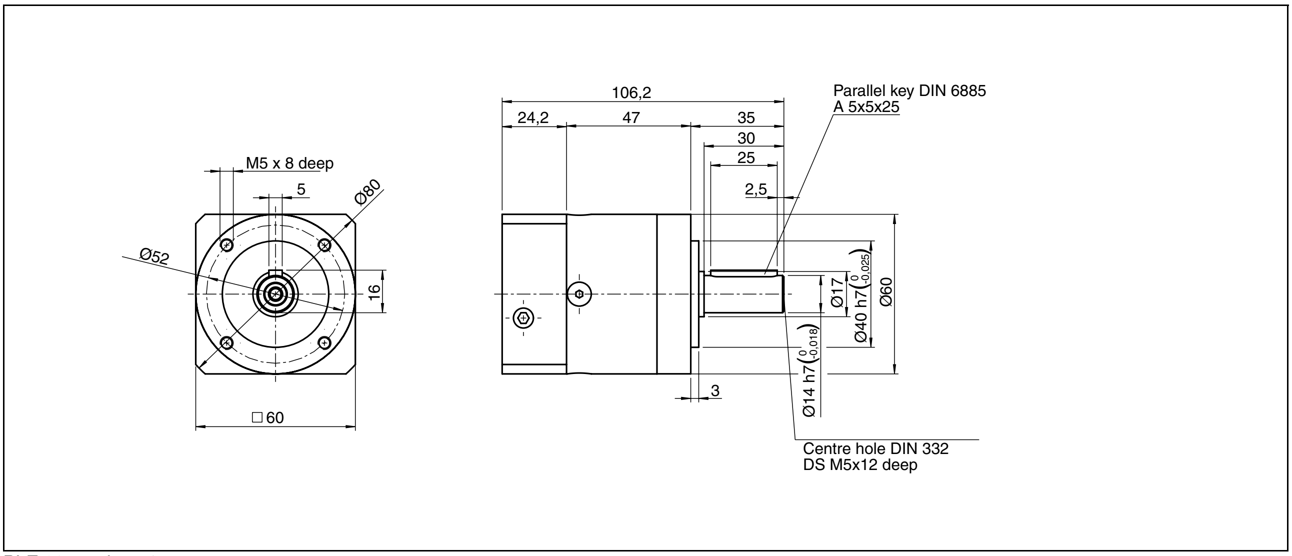
CAUTION: the actual output torque must be less than the rated output torque of the gearbox, otherwise the gearbox may be damaged.

Dimensional drawings

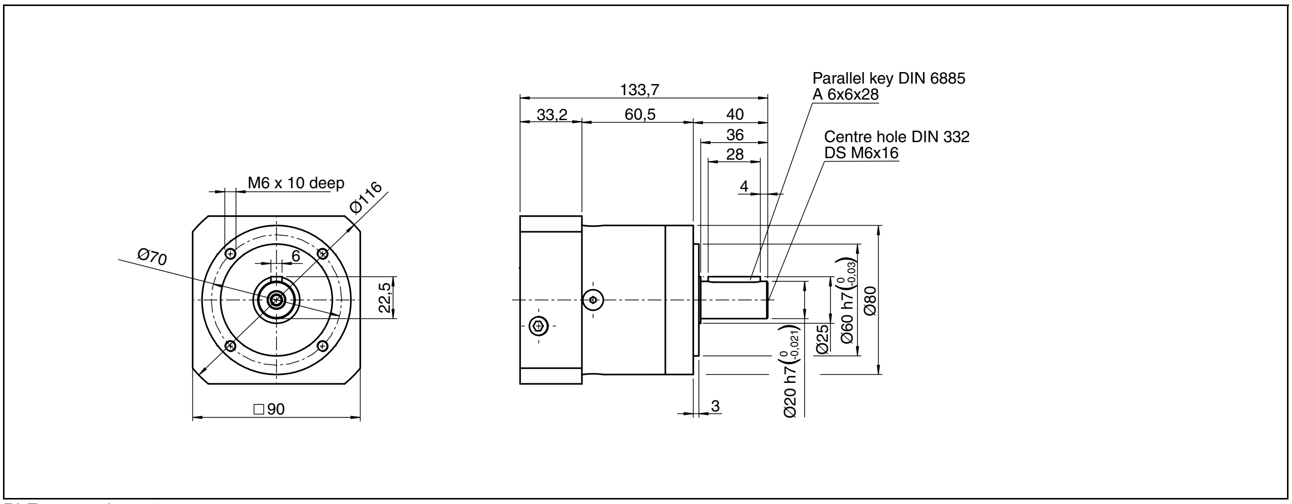


	L_1	L_2
2-stage	107,5	52
3-stage	120	64,5

PLE 40 gearbox, 2-stages or 3-stages



PLE 60 gearbox, 1-stage



PLE 80 gearbox, 1-stage

Accessories

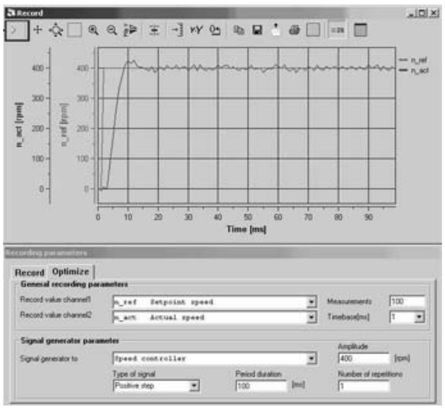
Software and documentation

Designation	Description	Order no.
IclA CD-ROM	Contents: • Catalogue, German and English • Documentation, German and English • IclA Easy commissioning software • EDS file for IclA IFx with CAN bus • GSD file for IclA IFx with Profibus	**0098441113207**

The "IclA Easy" commissioning software is included on the IclA CD-ROM. The latest version is available for download at http:// www. berger-lahr.com.

"IclA Easy" commissioning software

Display of status and device information



Optimising the controller with IclA IFA

The "IclA Easy" commissioning software offers the following functions:

- Input and display of device parameters
- Archiving and duplication of device parameters
- Display of status and device information
- Positioning the motor with the PC
- Triggering reference movements
- Access to all documented parameters
- Diagnostics of breakdown
- Optimising the controller (IclA IFA only)

Requirements and interfaces

"IclA Easy" runs on a PC with Microsoft Windows 98/ME/NT/2000/XP. The program communicates with the compact drives via RS485, CAN or Profibus DP with the aid of a fieldbus converter.

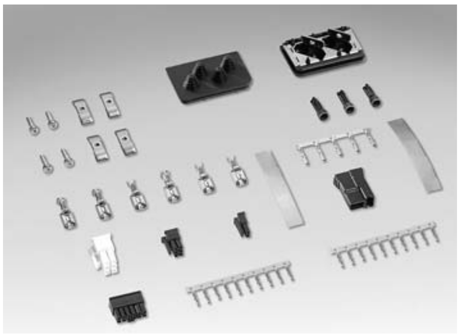
Supported fieldbus converters

Compact drive interface	PC interface	Required fieldbus converter	Reference source
RS485	USB	NuDAM ND-6530	www.acceed.com
	RS232	NuDAM ND-6520	www.acceed.com
CAN	USB	PCAN-USB, Peak	www.peak-system.com
	parallel	PCAN dongle, Peak	www.peak-system.com
Profibus DP	PCMCIA	Siemens CP5511/12	www.ad.siemens.com
	PCI	Siemens CP5611/13	www.ad.siemens.com
Profibus DP	USB	Softing ProfilUSB	www.softing.com

Reference source

The "IclA Easy" commissioning software is included on the IclA CD-ROM. The latest version is available for download at http://www.berger-lahr.com.

Accessories for IclA IDS and IclA IFx compact drives with printed circuit board plug connectors

Designation	Description		Order no.
IclA Ixx Installation set			
	Contents: • Connector shell • Shielding foil • Crimp contacts • 2 cable entries • 3 crimp end connector • Connector shell (Power Removal) • Crimp contacts (Power Removal)		**0062501521001**
IclA Ixx Cable Entries			
	For max. 4 cables with a cable cross section of 3 to 9 mm. Two cable entries per compact drive are required. The cable entries are for sealing, strain relief and shield connection.	2 units	**0062501520002**
		10 units	**0062501520001**
IclA IDx Cable (power, P/D)			
	For connection of pulse/direction interface with a master controller and power supply; cUL-approved; suitable for trailing cable applications; meets DESINA standard; incl. second cable entry	3 m	**0062501464030**
		5 m	**0062501464050**
		10 m	**0062501464100**
		15 m	**0062501464150**
		20 m	**0062501464200**
IclA IFx Cable (power, CAN, RS485, Profibus)			
	Cable for connection to the fieldbus and power supply. The cable can be used for initial commissioning of the compact drive. A second cable entry is supplied.		
	• CAN	3 m	**0062501462030**
	• RS485	3 m	**0062501463030**
	• Profibus	3 m	**0062501484030**

Accessories for IclA IFx compact drives with industrial plug connectors

I/O signal inserts

Designation	Description	Order no.
IclA IFx Insert 3I/O		
	Insert for three I/O signals Contents: • 1 insert with 3 M8 female connectors (3-pin) for connection of 3 I/O signals • 1 blind insert	**0062501533001**
	Matching connector set: IclA IFx connector set 3 I/O	**0062501534002**
IclA IFx Insert 4I/O		
	Insert for four I/O signals Contents: • 2 inserts with 2 M8 female connectors (3-pin) each for connection of 4 I/O signals	**0062501533002**
	Matching connector set: IclA IFx connector set 2 I/O (2x)	**0062501534001**
IclA IFx Insert 3I/O 24V		
	Insert for 3 I/O signals and external 24 V signal power supply Contents: • 1 insert with 2 M8 female connectors and 1 M8 connector for connection of 3 I/O signals and 24 V signal power supply • 1 blind insert	**0062501524001**
	Matching connector set: IclA IFx connector set 3 I/O 24V	**0062501523001**
IclA IFx Insert 4I/O 24V		
	Inserts for 4 I/O signals and external 24V signal power supply Contents: • 1 insert – 2 M8 female connectors (3-pin) for connection of 2 I/O signals – 1 M8 connector (3-pin) for connection of 24 V signal power supply (IN) • 1 insert – 2 M8 female connectors (3-pin) for connection of 2 I/O signals – 1 M8 connector (3-pin) for connection of 24 V signal power supply (out)	**0062501527001**
	Matching connector set: IclA IFx connector set 4 I/O 24V	**0062501523002**

Accessories for IclA IFx compact drives with industrial plug connectors

I/O signal inserts

Designation	Description	Order no.
IclA IFx Insert 2I/O 1PWRR		
	Inserts for 2 I/O signals and signals for Power Removal safety function Contents: • 1 insert – 2 M8 female connectors (3-pin) for connection of 2 I/O signals – 1 M8 connector (4-pin) for connection of signal for Power Removal • 1 blind insert	**0062501533003**
	Matching connector set:	
	IclA IFx connector set 2 I/O	**0062501534001**
	IclA Ixx cable (PWRR M8x4)	**00625014850xx**
IclA IFx Insert 4I/O 2PWRR		
	Inserts for 4 I/O signals and signals for Power Removal safety function Contents: • 1 insert – 2 M8 female connectors (3-pin) for connection of 2 I/O signals – 1 M8 connector (4-pin) for connection of signals for Power Removal • 1 insert – 2 M8 female connectors (3-pin) for connection of 2 I/O signals – 1 M8 female connector (4-pin) for forwarding signals for Power Removal	**00 62501533004**
	Matching connector set:	
	IclA IFx connector set 2 I/O (2x)	**0062501534001**
	IclA IFx connector set 1 PWRR-Exit	**0062501534005**
	IclA Ixx cable (PWRR M8x4)	**00625014850xx**

Accessories for IclA IFx compact drives with industrial plug connectors

Connector sets for I/O signal inserts

Designation	Description	Order no.
IclA IFx Connector 2 I/O 	Connector set for fitting to cables for 2 I/O signals Contents: • 2 M8 circular connector plug (3-pin) **Note: two connector sets are required for IclA IFx inserts with 4 I/O signals.**	**0062501534001**
IclA IFx Connector 3 I/O 	Connector set for fitting to cables for 3 I/O signals Contents: • 3 M8 circular connector plug (3-pin)	**0062501534002**
IclA IFx Connector 3 I/O 24V 	Connector set for fitting to cables for 3 I/O signals and 1 power supply cable Contents: • 2 M8 circular connector plug (3-pin) • 1 M8 circular connector socket (3-pin)	**0062501523001**
IclA IFx Connector 4 I/O 24V 	Connector set for fitting to cables for 4 I/O signals and 2 power supply cables Contents: • 5 M8 circular connector plug (3-pin) • 1 M8 circular connector socket (3-pin)	**0062501523002**

Accessories for IclA IFx compact drives with industrial plug connectors

Connector sets for I/O signal inserts

Designation	Description	Order no.
IclA IFx Connector 1PWRR output		
	Connector set for fitting to cables for forwarding signals for safety function Power Removal Contents: • 1 M8 circular connector plug (4-pin)	**0062501534005**

Connector sets for fieldbus

Designation	Description	Order no.
IclA IFx Connector Profibus M12		
	For fabrication of Profibus cables Contents: • 1 M12 circular connector plug (B-coded) • 1 M12 circular connector socket (B-coded) • 1 M12 protective cap	**0062501525001**
IclA IFx Connector CAN / RS485 M12		
	For fabrication of CAN cables or RS485 cables Contents: • 1 M12 circular connector plug (A-coded) • 1 M12 circular connector socket (A-coded) • 1 M12 protective cap	**0062501526001**

Accessories for IclA IFx compact drives with industrial plug connectors

Cable

Designation	Description		Order no.
IclA IFx Cable (power, CAN, RS485, Profibus)			
	Cable for connection to the fieldbus and power supply. The cable can be used for initial commissioning of the compact drive. A second cable entry is supplied.		
	• CAN	3 m	**0062501462030**
	• RS485	3 m	**0062501463030**
	• Profibus	3 m	**0062501484030**
IclA Ixx Cable (power: STAK)			
	For connection of power supply; cUL-approved; for trailing cable applications; complies with DESINA standard	3 m	**0062501470030**
		5 m	**0062501470050**
		10 m	**0062501470100**
		15 m	**0062501470150**
		20 m	**0062501470200**
	(IclA Ixx cable not suitable for IDS)		
IclA Ixx Cable (PWRR M8x4) xx m			
	Cable with M8 female connector (4-pin) for connection of signals for Power Removal safety function	3 m	**0062501485030**
		5 m	**0062501485050**
		10 m	**0062501485100**
		15 m	**0062501485150**
		20 m	**0062501485200**

Conversion tables

Rotor inertia

	lb·in^2	lb·ft^2	lb·in·s^2	lb·ft·s^2 slug·ft^2	kg·cm^2	kg·cm·s^2	g·cm^2	g·cm·s^2	oz·in^2	oz·in·s^2
lb·in^2	–	6.94 x 10^{-3}	2.59 x 10^{-3}	2.15 x 10^{-4}	2.926	2.98 x 10^{3}	2.92 x 10^{3}	2.984	16	4.14 x 10^{-2}
lb·ft^2	144	–	0.3729	3.10 x 10^{-2}	421.40	0.4297	4.21 x 10^{5}	429.71	2304	5.967
lb·in·s^2	386.08	2.681	–	8.33 x 10^{-2}	1.129 x 10^{3}	1.152	1.129 x 10^{6}	1.152 x 10^{3}	6.177 x 10^{3}	16
lb·ft·s^2 slug·ft^2	4.63 x 10^{3}	32.17	12	–	1.35 x 10^{4}	13.825	1.355 x 10^{7}	1.38 x 10^{4}	7.41 x 10^{4}	192
kg·cm^2	0.3417	2.37 x 10^{-3}	8.85 x 10^{-4}	7.37 x 10^{-6}	–	1.019 x 10^{-3}	1000	1.019	5.46	1.41 x 10^{-2}
kg·cm·s^2	335.1	2.327	0.8679	7.23 x 10^{-2}	980.66	–	9.8 x 10^{5}	1000	5.36 x 10^{3}	13.887
g·cm^2	3.417 x 10^{-4}	2.37 x 10^{-6}	8.85 x 10^{-7}	7.37 x 10^{-8}	1 x 10^{-3}	1.01 x 10^{-6}	–	1.01 x 10^{-3}	5.46 x 10^{-3}	1.41 x 10^{-6}
g·cm·s^2	0.335	2.32 x 10^{-3}	8.67 x 10^{-4}	7.23 x 10^{-5}	0.9806	1 x 10^{-3}	980.6	–	5.36	1.38 x 10^{-2}
oz·in^2	0.0625	4.3 x 10^{-4}	1.61 x 10^{-6}	1.34 x 10^{-6}	0.182	1.86 x 10^{-4}	182.9	0.186	–	2.59 x 10^{-3}
oz·in·s^2	24.13	0.1675	6.25 x 10^{-2}	5.20 x 10^{-3}	70.615	7.20 x 10^{-2}	7.06 x 10^{4}	72	386.08	–

Torque

	lb·in	lb·ft	oz·in	Nm	kg·m	kg·cm	g·cm	dyne·cm
lb·in	–	8.333 x 10^{-2}	16	0.113	1.152 x 10^{-2}	1.152	1.152 x 10^{3}	1.129 x 10^{6}
lb·ft	12	–	192	1.355	0.138	13.825	1.382 x 10^{4}	1.355 x 10^{7}
oz·in	6.25 x 10^{-2}	5.208 x 10^{-3}	–	7.061 x 10^{-3}	7.200 x 10^{-4}	7.200 x 10^{-2}	72.007	7.061 x 10^{4}
Nm	8.850	0.737	141.612	–	0.102	10.197	1.019 x 10^{4}	1 x 10^{7}
kg·m	86.796	7.233	1.388 x 10^{3}	9.806	–	100	1 x 10^{5}	9.806 x 10^{7}
kg·cm	0.8679	7.233 x 10^{-2}	13.877	9.806 x 10^{-2}	10^{-2}	–	1000	9.806 x 10^{5}
g·cm	8.679 x 10^{-4}	7.233 x 10^{-6}	1.388 x 10^{-2}	9.806 x 10^{-6}	1 x 10^{-5}	1 x 10^{-3}	–	980.665
dyne·cm	8.850 x 10^{-7}	7.375 x 10^{-8}	1.416 x 10^{-5}	10^{-7}	1.019 x 10^{-8}	1.0197 x 10^{-6}	1.019 x 10^{-6}	–

Power

	H.P.	W
H.P.	–	745.7
(lb·in)(deg./sec)	2.645 x 10^{-6}	1.972 x 10^{-3}
(lb·in)(RPM)	1.587 x 10^{-6}	1.183 x 10^{-2}
(lb·ft)(deg./sec)	3.173 x 10^{-5}	2.366 x 10^{-2}
(lb·ft)(RPM)	1.904 x 10^{-4}	0.1420
W	1.31 x 10^{-3}	–

Length

	in	ft	yd	m	cm	mm
in	–	0.0833	0.028	0.0254	2.54	25.4
ft	12	–	0.333	0.3048	30.48	304.8
yd	36	3	–	0.914	91.44	914.4
m	39.37	3.281	1.09	–	100	1000
cm	0.3937	0.03281	1.09 x 10-2	0.01	–	10
mm	0.03937	0.00328	1.09 x 10-3	0.001	0.1	–

Rotation

	RPM	rad/sec	deg./sec	1/min
RPM	–	0.105	6.0	1
rad/sec	9.55	–	57.30	9.55
deg./sec	0.167	1.745 x 10^{-2}	–	0.167
1/min	1	0.105	6.0	–

Weight

	lb	oz	slug	kg	g
lb	–	16	0.0311	0.453592	453.592
oz	6.35 x 10^{-2}	–	1.93 x 10^{-3}	0.028349	28.35
slug	32.17	514.8	–	14.5939	1.459 x 10^{4}
kg	2.20462	35.274	0.0685218	–	1000
g	2.205 x 10^{-3}	3.527 x 10^{-3}	6.852 x 10^{-5}	0.001	–

Force

	lb	oz	g	dyne	N
lb	–	16	453.592	4.448 x 10^{5}	4.4482
oz	0.0625	–	28.35	2.780 x 10^{4}	0.27801
g	2.205 x 10^{-3}	0.03527	–	1.02 x 10^{-3}	N.A.
dyne	2.248 x 10^{-6}	3.59 x 10^{-6}	980.7	–	0.0001
N	0.22481	3.5967	N.A.	100,000	–

Temperature

	°F	°C
°F	–	Subtract 32 and multiply by $^5/_9$.
°C	Multiply by $^9/_5$ and add 32.	–

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Catalogue

Intelligent Compact Drives IclA N065

a company of Schneider Electric

Product description

The IclA N065 DC024 intelligent compact drives are servo drives based on an electronically commutated three-phase synchronous motor, referred to as an EC motor, and a block-commutated positioning controller. Power and control electronics with fieldbus terminal, motor, position sensor and gearing are integrated in the compact unit.

Areas of application

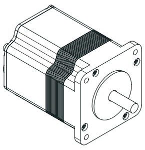
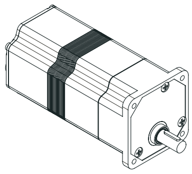
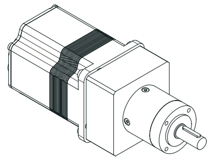
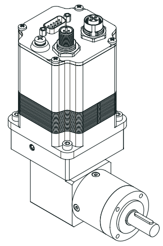
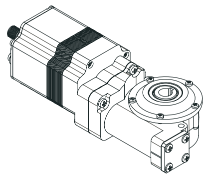
The compact drives are designed primarily for automatic positioning of format axes during setup of production machines or for point-to-point positioning of handling systems.

Special features

- Compact construction
- Low wiring requirements
- Integrated positioning and speed control functions as specified by CiA profiles DS301 and DS402
- Fieldbus interface
- High power density
- High availability
- 4 gearing models

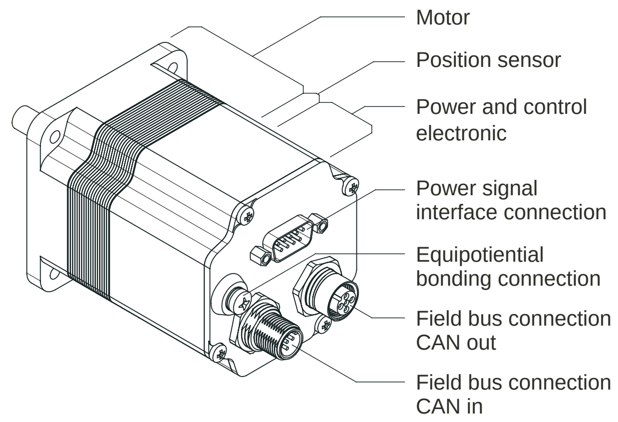
The magnetisation of the motors guarantees high detent torque, making it unnecessary to use a holding brake in many applications. The motors have an internal resolution of 12 increments per revolution. Spur wheel gearing, planetary gearing, angular planetary gearing and spur wheel angular worm gearing are available.

Product offer

without gearing	with spur wheel gearing	with planetary gearing	with angular planetary gearing	with angular worm gearing
				

IclA N065 without gearing

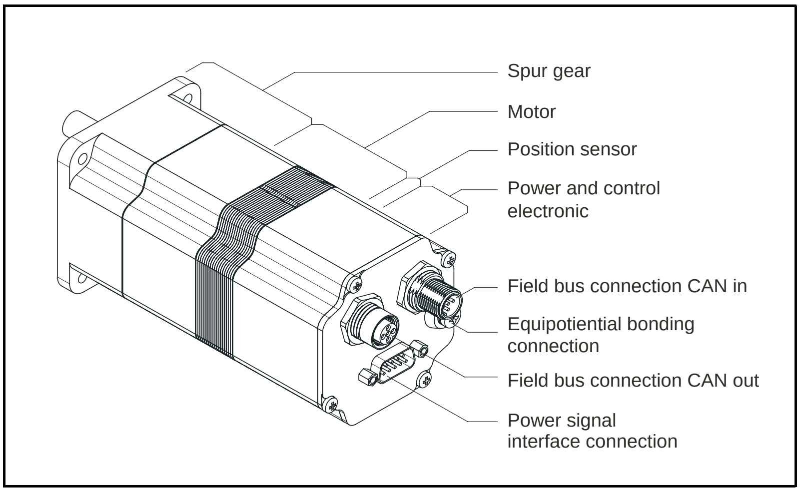
The electronically commutated three-phase synchronous motor in combination with the rare-earth magnets offers outstanding power density and very high efficiency. The motors have a high detent torque, making it unnecessary to use a holding brake in most cases. The motors have an internal resolution of 12 increments per revolution.



IclA N065 O-000 intelligent compact drive as direct drive

IclA N065 with spur wheel gearing

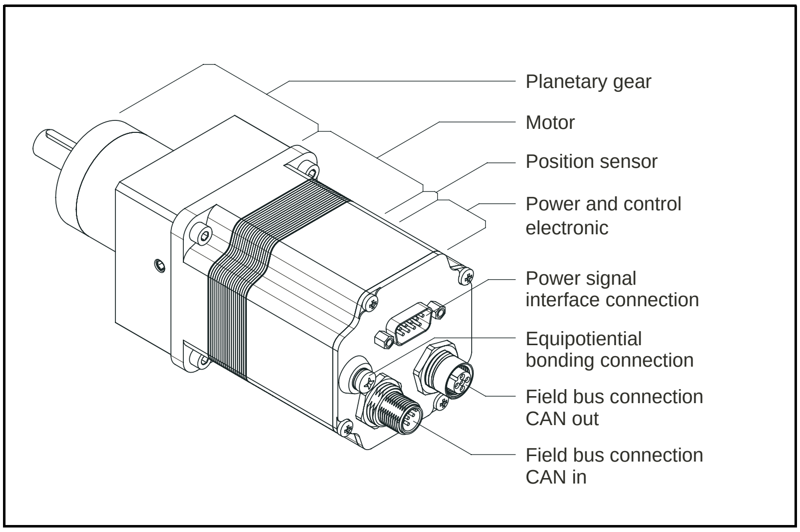
The IclA N065 V-••• compact drive is fitted with a 2, 3 or 4-ratio spur wheel gearing. The gear teeth are metal and fitted with needle bearings. An important feature is the high power density, the low torsional backlash and the compact length of the drive system with spur wheel gearing.



IclA N065 V-••• intelligent compact drive with spur wheel gearing

IclA N065 with planetary gearing

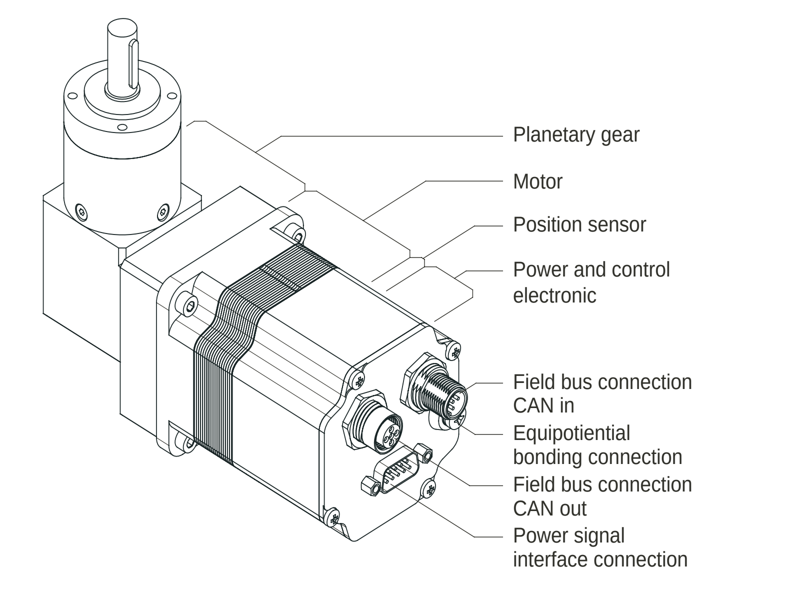
The IclA N065 1-••• compact drive is fitted with 2 or 3-ratio planetary gearing. The drive systems with planetary gearing have minimum torsional backlash and very high output torque with very high efficiency.



IclA N065 1-••• intelligent compact drive with planetary gearing

IclA N065 with angular planetary gearing

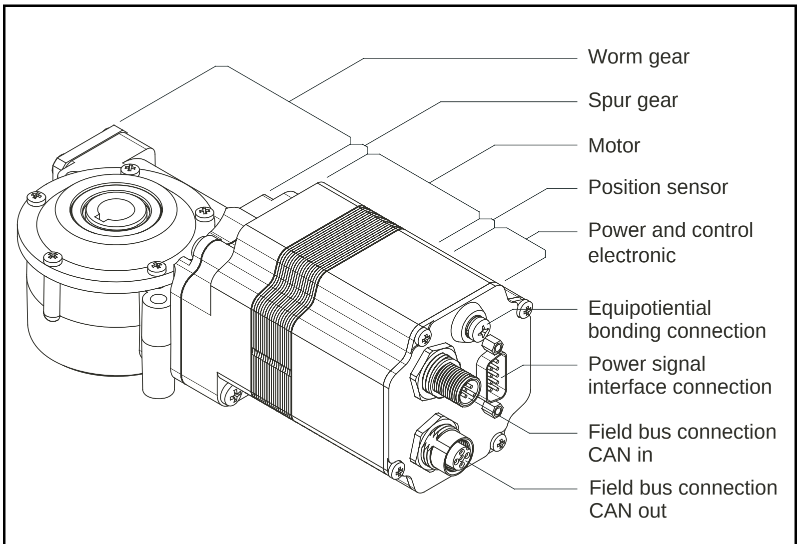
IclA N065 G-••• compact drive is fitted with 2 or 3-ratio planetary gearing with an additional bevel gear ratio. The drive systems with angular planetary gearing have minimum torsional backlash and very high output torque with very high efficiency.



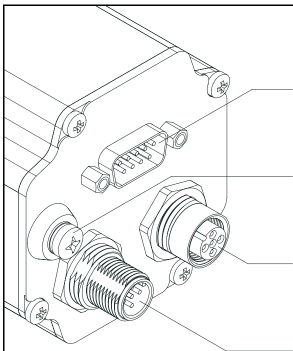
IclA N065 G-••• intelligent compact drive with angular planetary gearing

IclA N065 with angular worm gearing

IclA N065 U-••• compact drive is fitted with a 1 or 2-ration spur wheel gearing and angular worm gearing. The drive systems with angular worm gearing have minimum torsional backlash and very high output torque. The spur wheel and worm reduction combination can be set according to the application for high efficiency values up to self-locking. This type of gearing often proves suitable for implementation of compact and complex installation situations.



IclA N065 U-••• intelligent compact drive with angular worm gearing



Connections

Overview

Connections of the IclA N065 intelligent compact drives:

- Signal interface
- Connection for equipotential bonding conductor
- CAN fieldbus interface

Signal interface

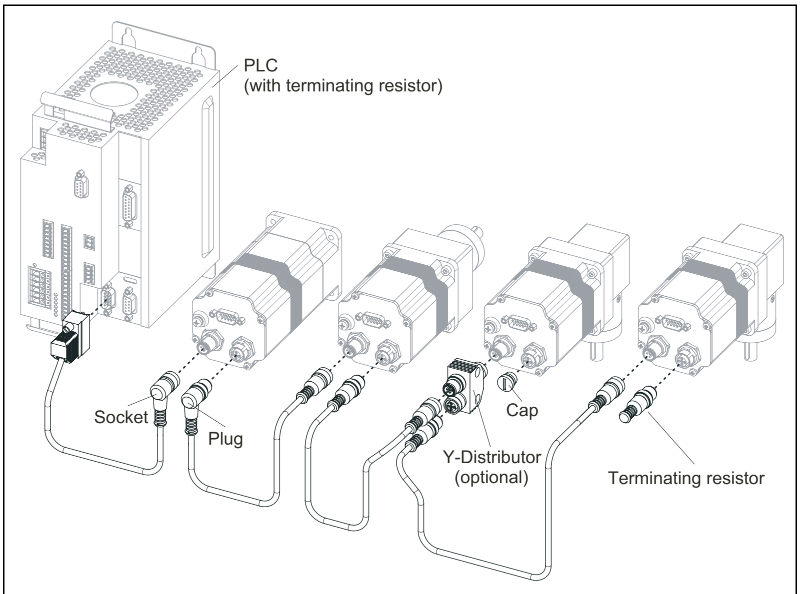
The signal interface is a 9-pin SubD connector supplied by FCT electronic GmbH (www.fct-electronic.de) and has the following functions:

- supply voltage connection
- power for manual mode control signals
- connection for enable signal
- power connection for signal interface

CAN fieldbus interface

CAN in input
The "CAN in" input for the CAN fieldbus is a 5-pin M12 flange connector supplied by Franz Binder GmbH (www.binder-connector.de).

CAN out output
The compact drive also has a
5-pin M12 flange socket supplied by Franz Binder GmbH for networking the CAN fieldbus. Additional network devices can be connected here.



Networking of four IclA N065 with a PLC

Functions

Operating modes

Overview

The following operating modes can be set with signals:

- Jog

The following operating modes can be set via fieldbus:

- Jog
- Homing
- Profile position
- Speed control mode

Jog

Jogging via signals
In manual operation using signals the compact drive moves at an adjustable speed within the referenced work stroke. The direction of movement and the jog or continuous operation operating modes are preset over two signal inputs.

Jog via fieldbus
In manual operation via fieldbus the compact drive can also be moved clockwise or counterclockwise within the homing range. The direction of motion and the speed are specified over the fieldbus.

Homing

The compact drive must be homed for "Manual Operation" and "Profile Position" operating modes. The homing specifies three limit switch points for every direction of motion. The compact drive monitors them continuously for overshoot. A homing is also retained after switching the compact drive off and on if the drive was not rotated when the power was off.

Profile position

In "profile position" operating mode the homed compact drive can be moved from point A to point B. A trapeze profile is specified; application-specific trapeze profiles with values for final speed with acceleration and deceleration ramps can be saved in nine additional parameter sets.

Speed control mode

In "speed control" operating mode travel commands are processed via the fieldbus. In this operating mode the drive requires homing if the software limit switches are used. The function of the software limit switches can be disabled by setting parameters of all software limit switches to the minimum or maximum range limits. The compact drive can then also be moved in speed control mode without homing. The reference value of a travel command is the set speed of the drive movement. The acceleration and braking ramp is parameterised and can be adjusted for the specific application.

Operating functions

Communication configuration

Communication parameters of the compact drive can be set for data exchange over fieldbus.
In the CANopen network the baud rate and node number parameters can be modified with LSS (Layer Setting Services).

Configuration mode

Parameter values for the compact drive can only be set via the fieldbus. The configuration mode offers the option of adjusting the compact drive for the operating conditions.

ENABLE

The "ENABLE" function is triggered by a fieldbus command (1st channel) or by interruption of the control signal ENABLE (2nd channel).
The current travel command is cancelled in different ways.
In the case of the fieldbus command an error flag is set and the motor is brought to a standstill with the Quick Stop ramp.
The interruption of the emergency stop control signal ENABLE triggers a time-delayed deactivation of the power electronics. The compact drive is braked at maximum power. After elapse of the delay time the power electronics are disabled. The error flag is set.

Additional operating functions

Various operating functions provide protection against damage and malfunctions:

- Start diagnosis at Power On (self-test of the integrated electronics)
- Current limiting
- Overload monitoring
- Voltage monitoring
- Temperature monitoring
- Start-up error detection
- Rotational speed monitoring
- Block movement detection
- Commutation error and Hall sensor error detection
- Protection against externally applied acceleration
- Electronic log-book
- Watchdog (program sequence monitoring)

IclA N065 without gearing

Technical data

Pole pair count p		2
Nominal voltage U_{DC}	V	24
Nominal speed n_N	1/min	4350
Nominal current $I_{N\ DC}$	A	3.79
Nominal output P_N	W	71
Nominal motor torque M_N	Nm	0.155
Ready-for-operation current I_0	A	0.09
Max. phase current î	A	6.0
Torque constant k_M	Nm/A	0.036
Starting torque M_{max}	Nm	0.22
Detent torque M_S	Nm	0.08
Moment of inertia	kgcm²	0.151
Max. speed of rotation	1/min	5000
Positioning resolution	Inc/rev.	12
Positioning resolution	°	30
Positioning accuracy	Inc.	±1
Mass m	kg	0.8
Shaft load		
• Max. radial force F_R [1]	N	80
• Max. axial force pull F_A	N	30
• Nominal bearing lifetime L_{10h} [2]	h	20000

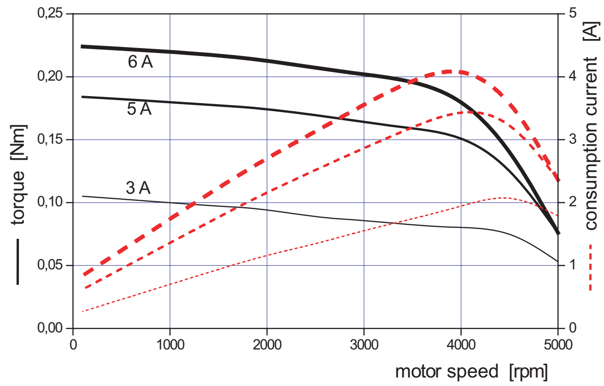
[1] Action point of the radial shaft load: 12.5 mm distance from flange
[2] Operating hours at a probability of failure of 10%

Ambient conditions

Operating temperature as per DIN EN 60721-3-3, Class 3K3	°C	+5 ... +40 (without power reduction)
Storage temperature as per DIN EN 60721-3-1, Class 1K4	°C	-25 ... +55
Transport temperature as per DIN EN 60721-3-2, Class 2K3	°C	-25 ... +70
Installation height without power reduction	m	<1000 above MSL
Vibration strain		sinusoidal, as per DIN EN 60068-2-6
• Acceleration amplitude:	m/s^2	50
• Frequency range	Hz	10 ... 300
• Amplitude	mm	0.35
Continuous shock		semisinusoidal, as per DIN EN 60068-2-27
• Peak acceleration	m/s^2	300
• Duration	m/s	18
Relative humidity		
• Operation	%	5 ... 85
	g/m^3	1 ... 25
• Long-term storage	%	5 ... 95
	g/m^3	1 ... 29
Degree of protection as per DIN EN 60034-5		IP 65 total device except for shaft bushing; IP 41 shaft bushing

Characteristic curves

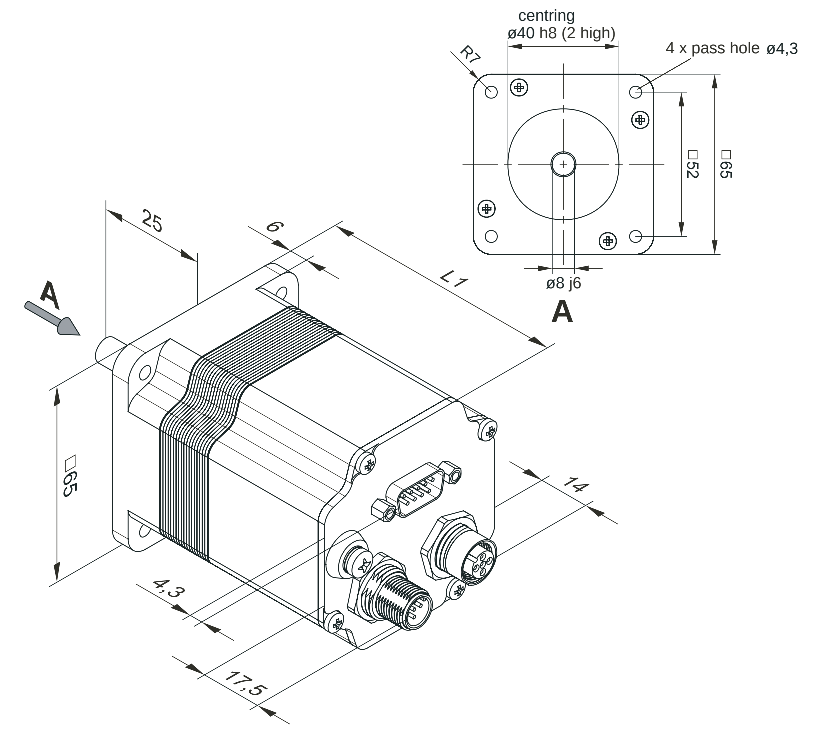
IclA N065 DC024 without gearing



Electrical interfaces

Power supply		reverse-polarity-protected
Nominal power supply range	V_{DC}	19.2 ... 28.8
Ripple at nominal voltage	V	≤3.6
Inrush current	A	Load current for DC bus capacity (500 µF)
24V signal interface		4 signal inputs, 0VDC internally connected with 0VDC supply voltage, reverse-polarity-protected
Permissible low level	V / mA	≤4.5 / ≤0.7
Permissible high level	V / mA	≥15 / ≥2
Admissible voltage range	V	0 ... 30
Signal input debounce time	ms	50 (in manual mode) without debounce (homing movement switch and end position sensors)
CANopen fieldbus interface		CANIn/CANOut - topology
Signal inputs/outputs		according to ISO 11898, no galvanic isolation
Transmission rate	kBaud	10 / 20 / 50 / 100 / 125 / 250 / 500 / 800 / 1000
Transmission protocol		
• Communications profile		DS301 V4.02
• Device profile		DSP 402 V2.0

Dimensional drawings



Dimensional drawing of IclA N065 O-000 without gearing

IclA N065 with spur wheel gearing

Technical data

with spur wheel gearing ...		V-007	V-018	V-038	V-054	V-115
Nominal voltage	V	24	24	24	24	24
Nominal speed	1/min	4000	4000	4000	4000	4000
Nominal output torque	Nm	1.1	2.7	5.8	7.9	12.3
Nominal output speed	1/min	586	225	107	73	35
Nominal output	W	68	64	64	61	45
Nominal current	A	4.43	4.43	4.43	4.43	3.16
Ready-for-operation current	A	0.09	0.09	0.09	0.09	0.09
Max. phase current	A	6.0	6.0	6.0	6.0	4.5
Maximum speed	1/min	733	281	133	92	44
Gear speeds		2	3	3	4	4
Gear efficiency		0.90	0.86	0.86	0.81	0.81
Ratio		430: 63	160: 9	75: 2	490: 9	3675: 32
Torque constant	Nm/A	0.036	0.036	0.036	0.036	0.036
Starting torque	Nm	1.3	3.3	6.9	9.6	15.2
Moment of inertia [1]	g cm²	151	151	151	151	151
Moment of inertia [2]	kg m²	0.0007	0.0048	0.0212	0.0448	0.1992
Detent torque	Nm	0.5	1.3	2.8	4.1	8.6
Positioning resolution	Inc./rev	12	12	12	12	12
Positioning resolution	°	4.40	1.69	0.80	0.55	0.26
Positioning accuracy	Inc.	±1	±1	±1	±1	±1
Mass	kg	1.1	1.2	1.2	1.2	1.2
Number of pole pairs		2	2	2	2	2
Torsional backlash	°	≤1.5	≤1.0	≤1.0	≤1.0	≤1.0
Shaft load						
• Short-term operation						
- Max. radial force [3]	N	200	200	200	200	200
- Max. axial force	N	80	80	80	80	80
- Nominal service life L_{10h} [4]	h	2500	2500	2500	2500	2500
• Continuous operation						
- Max. radial force [3]	N	200	200	200	200	200
- Max. axial force	N	10	10	10	10	10
- Nominal service life L_{10h} [4]	h	15000	15000	15000	15000	15000

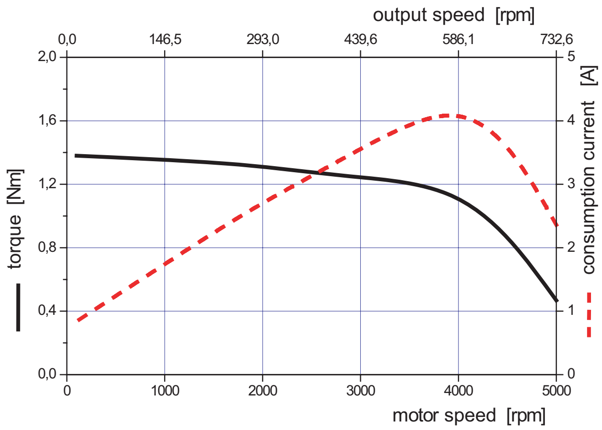
[1] With reference to motor shaft
[2] with reference to gearing output shaft
[3] action point of the radial shaft load: 12.5 mm distance from flange
[4] operating hours at a probability of failure of 10%

Ambient conditions

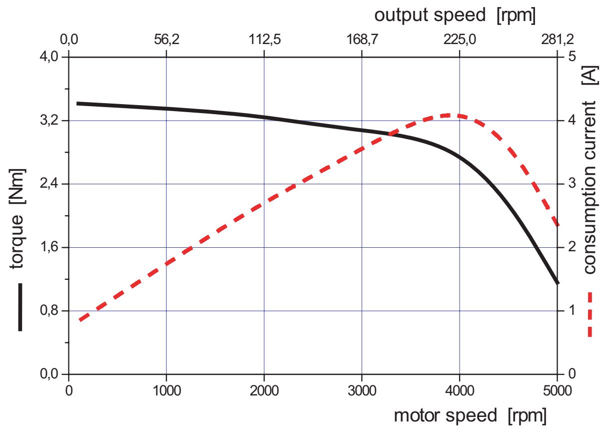
Operating temperature as per DIN EN 60721-3-3, Class 3K3	°C	+5 ... +40 (without power reduction)
Storage temperature as per DIN EN 60721-3-1, Class 1K4	°C	-25 ... +55
Transport temperature as per DIN EN 60721-3-2, Class 2K3	°C	-25 ... +70
Installation height without power reduction	m	<1000 above MSL
Vibration strain		sinusoidal, as per DIN EN 60068-2-6
• Acceleration amplitude:	m/s^2	50
• Frequency range	Hz	10 ... 300
• Amplitude	mm	0.35
Continuous shock		semisinusoidal, as per DIN EN 60068-2-27
• Peak acceleration	m/s^2	300
• Duration	m/s	18
Relative humidity		
• Operation	%	5 ... 85
	g/m^3	1 ... 25
• Long-term storage	%	5 ... 95
	g/m^3	1 ... 29
Degree of protection as per DIN EN 60034-5		IP 65 total device except for shaft bushing; IP 54 shaft bushing

Characteristic curves

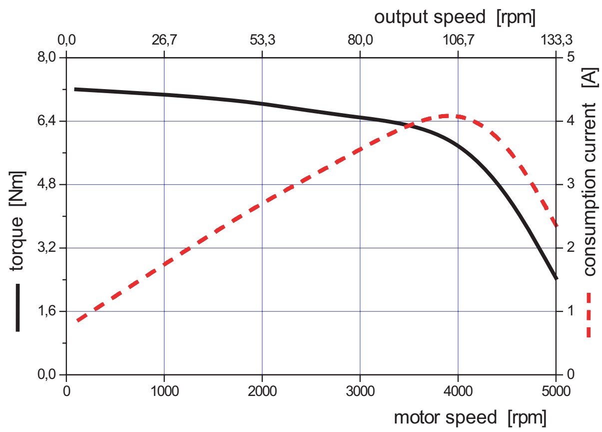
IclA N065 DC024 with spur wheel gearing V-007



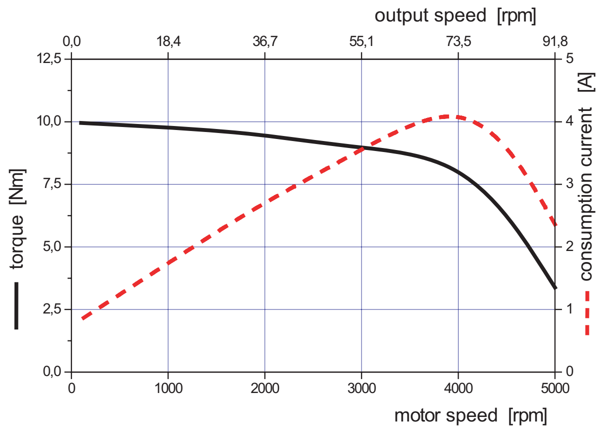
IclA N065 DC024 with spur wheel gearing V-018



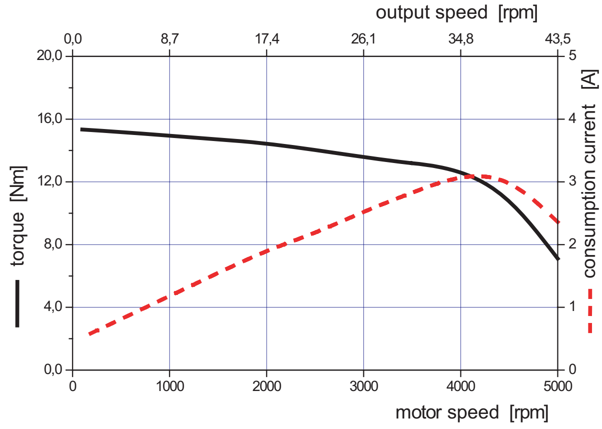
IclA N065 DC024 with spur wheel gearing V-038



IclA N065 DC024 with spur wheel gearing V-054



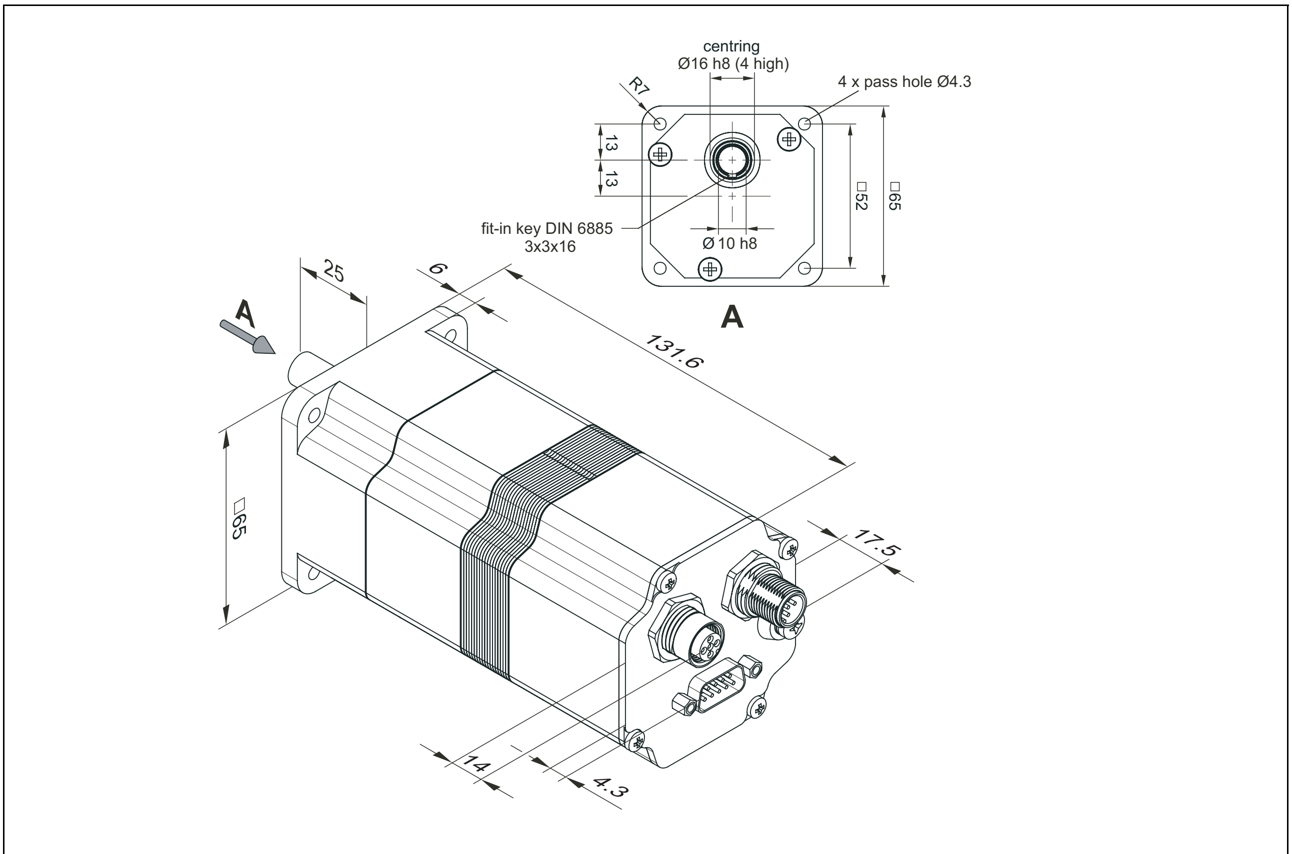
IclA N065 DC024 with spur wheel gearing V-115



Electrical interfaces

Power supply		reverse-polarity-protected
Nominal power supply range	V_{DC}	19.2 ... 28.8
Ripple at nominal voltage	V	≤3.6
Inrush current	A	Load current for DC bus capacity (500 µF)
24V signal interface		4 signal inputs, 0VDC internally connected with 0VDC supply voltage, reverse-polarity-protected
Permissible low level	V / mA	≤4.5 / ≤0.7
Permissible high level	V / mA	≥15 / ≥2
Admissible voltage range	V	0 ... 30
Signal input debounce time	ms	50 (in manual mode) without debounce (homing movement switch and end position sensors)
CANopen fieldbus interface		CANIn/CANOut - topology
Signal inputs/outputs		according to ISO 11898, no galvanic isolation
Transmission rate	kBaud	10 / 20 / 50 / 100 / 125 / 250 / 500 / 800 / 1000
Transmission protocol		
• Communications profile		DS301 V4.02
• Device profile		DSP 402 V2.0

Dimensional drawings



Dimensional drawing of IclA N065 DC024 V-••• with spur wheel gearing

IclA N065 with planetary gearing

Technical data

with planetary gearing ...		**1-016**	**1-040**	**1-060**	**1-120**
Nominal voltage	V	24	24	24	24
Nominal speed	1/min	4000	4000	4000	4000
Nominal output torque	Nm	2.7	6.8	9.7	18.0
Nominal output speed	1/min	250	100	67	33
Nominal output	W	71	71	67	63
Nominal current	A	4.43	4.43	4.43	3.85
Ready-for-operation current	A	0.09	0.09	0.09	0.09
Max. phase current	A	6.0	6.0	6.0	5.4
Maximum speed	1/min	313	125	83	42
Gear speeds		2	2	3	3
Gear efficiency		0.94	0.94	0.90	0.90
Ratio		16:1	40:1	60:1	120:1
Torque constant	Nm/A	0.036	0.036	0.036	0.036
Starting torque	Nm	3.3	8.1	11.6	21.0
Moment of inertia [1]	g cm²	151	151	151	151
Moment of inertia [2]	kg m²	0.0039	0.0242	0.0544	0.2174
Detent torque	Nm	1.2	3.0	4.5	9.0
Positioning resolution	Inc./rev	12	12	12	12
Positioning resolution	°	1.88	0.75	0.50	0.25
Positioning accuracy	Inc.	±1	±1	±1	±1
Mass	kg	1.4	1.4	1.5	1.5
Number of pole pairs		2	2	2	2
Torsional backlash	°	≤0.58	≤0.58	≤0.67	≤0.67
Shaft load					
• Max. radial force [3]		200	200	200	200
• Max. axial force		200	200	200	200
• Nominal service life L_{10h} [4]		10000	10000	10000	10000

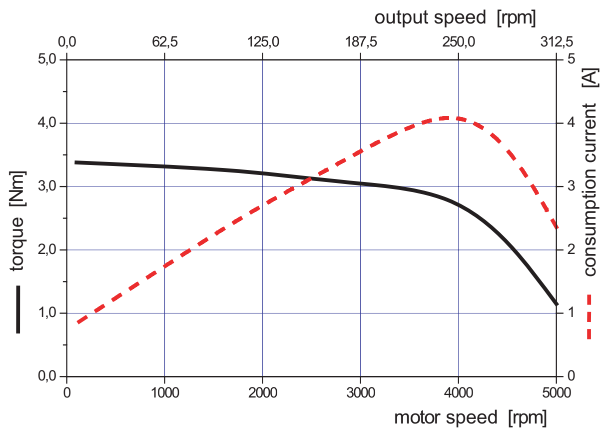
1) With reference to motor shaft
2) with reference to gearing output shaft
3) with reference to the centre of the output shaft
4) operating hours at a probability of failure of 10%

Ambient conditions

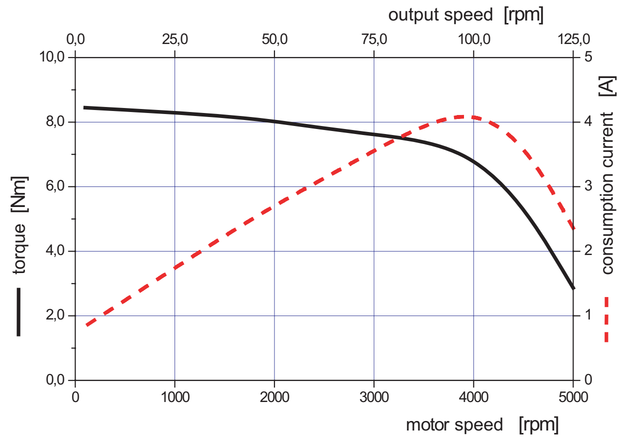
Operating temperature as per DIN EN 60721-3-3, Class 3K3	°C	+5 ... +40 (without power reduction)
Storage temperature as per DIN EN 60721-3-1, Class 1K4	°C	-25 ... +55
Transport temperature as per DIN EN 60721-3-2, Class 2K3	°C	-25 ... +70
Installation height without power reduction	m	<1000 above MSL
Vibration strain		sinusoidal, as per DIN EN 60068-2-6
• Acceleration amplitude:	m/s^2	50
• Frequency range	Hz	10 ... 300
• Amplitude	mm	0.35
Continuous shock		semisinusoidal, as per DIN EN 60068-2-27
• Peak acceleration	m/s^2	300
• Duration	m/s	18
Relative humidity		
• Operation	%	5 ... 85
	g/m^3	1 ... 25
• Long-term storage	%	5 ... 95
	g/m^3	1 ... 29
Degree of protection as per DIN EN 60034-5		IP 65 total device except for shaft bushing; IP 43 shaft bushing

Characteristic curves

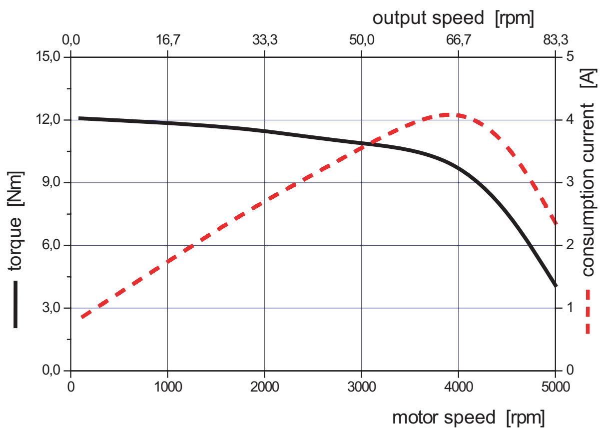
IclA N065 DC024 with planetary gearing 1-016



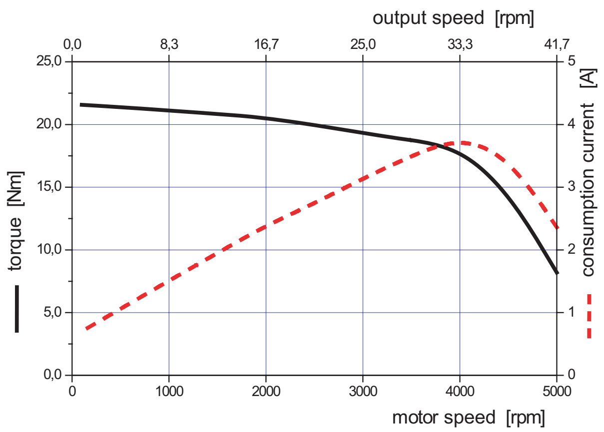
IclA N065 DC024 with planetary gearing 1-040



IclA N065 DC024 with planetary gearing 1-060



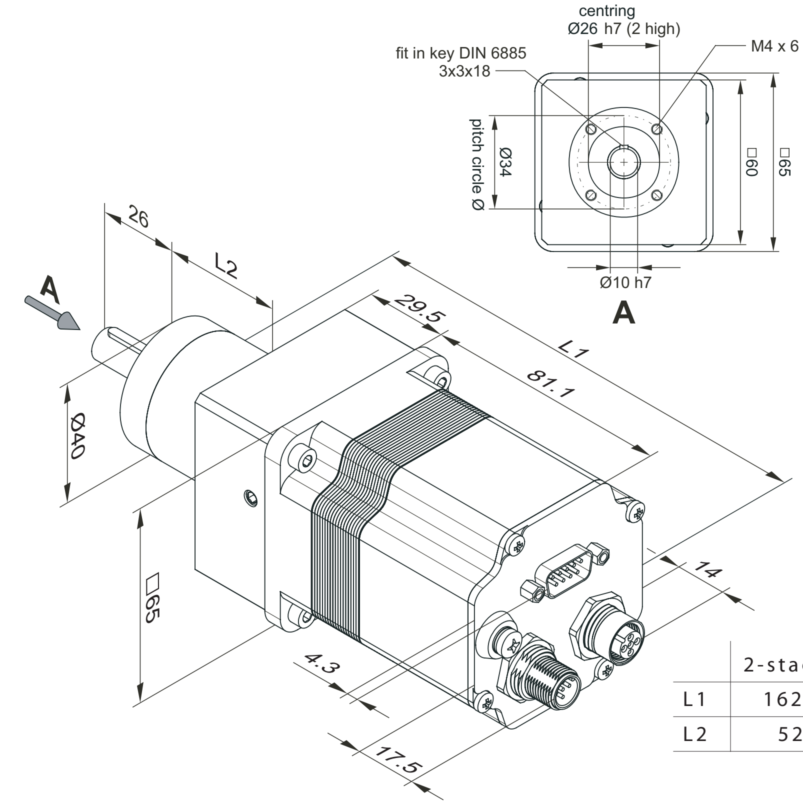
IclA N065 DC024 with planetary gearing 1-120



Electrical interfaces

Power supply		reverse-polarity-protected
Nominal power supply range	V_{DC}	19.2 ... 28.8
Ripple at nominal voltage	V	≤3.6
Inrush current	A	Load current for DC bus capacity (500 µF)
24V signal interface		4 signal inputs, 0VDC internally connected with 0VDC supply voltage, reverse-polarity-protected
Permissible low level	V / mA	≤4.5 / ≤0.7
Permissible high level	V / mA	≥15 / ≥2
Admissible voltage range	V	0 ... 30
Signal input debounce time	ms	50 (in manual mode) without debounce (homing movement switch and end position sensors)
CANopen fieldbus interface		CANIn/CANOut - topology
Signal inputs/outputs		according to ISO 11898, no galvanic isolation
Transmission rate	kBaud	10 / 20 / 50 / 100 / 125 / 250 / 500 / 800 / 1000
Transmission protocol		
• Communications profile		DS301 V4.02
• Device profile		DSP 402 V2.0

Dimensional drawings



	2-stage	3-stage
L1	162.6	174.6
L2	52.0	64.0

Dimensional drawing of IclA N065 DC024 1-••• with planetary gearing

IclA N065 with angular planetary gearing

Technical data

IclA® N065	Unit	G-016	G-040	G-060	G-120
Nominal voltage	V	24	24	24	24
Nominal speed	1/min	4000	4000	4000	4000
Nominal output torque	Nm	2.6	6.6	9.5	18.0
Nominal output speed	1/min	250	100	67	33
Nominal output	W	69	69	66	63
Nominal current	A	4.43	4.43	4.43	3.95
Ready-for-operation current	A	0.09	0.09	0.09	0.09
Max. phase current	A	6.0	6.0	6.0	5.5
Maximum speed	1/min	313	125	83	42
Gear speeds		2	2	3	3
Gear efficiency		0.92	0.92	0.88	0.88
Ratio		16:1	40:1	60:1	120:1
Torque constant	Nm/A	0.036	0.036	0.036	0.036
Starting torque	Nm	3.2	8.0	11.5	21.0
Moment of inertia [1]	g cm²	151	151	151	151
Moment of inertia [2]	kg m²	0.0039	0.0242	0.0544	0.2174
Detent torque	Nm	1.2	3.0	4.5	9.0
Positioning resolution	Inc./rev	12	12	12	12
Positioning resolution	°	1.88	0.75	0.50	0.25
Positioning accuracy	Inc.	±1	±1	±1	±1
Mass	kg	1.6	1.6	1.7	1.7
Number of pole pairs		2	2	2	2
Torsional backlash	°	≤0.75	≤0.75	≤0.83	≤0.83
Shaft load					
• Max. radial force [3]	N	200	200	200	200
• Max. axial force	N	200	200	200	200
• Nominal service life L_{10h} [4]	h	10000	10000	10000	10000

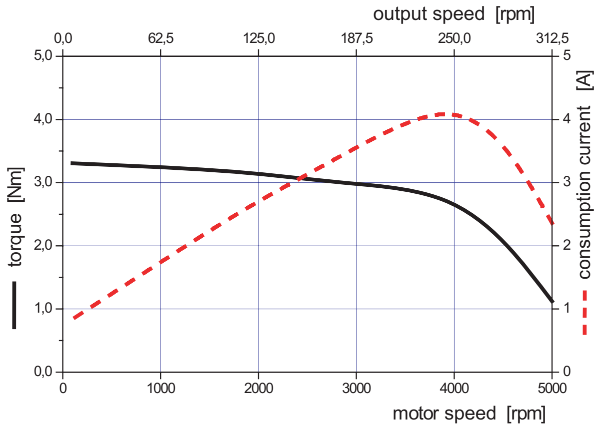
1) With reference to motor shaft
2) With reference to gearing output shaft
3) With reference to the centre of the output shaft
4) Operating hours at a probability of failure of 10%

Ambient conditions

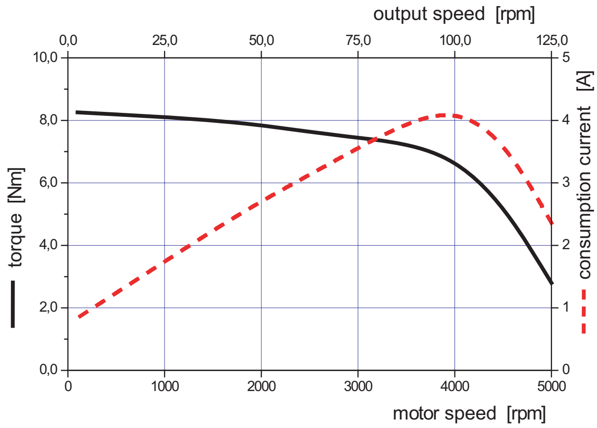
Operating temperature as per DIN EN 60721-3-3, Class 3K3	°C	+5 ... +40 (without power reduction)
Storage temperature as per DIN EN 60721-3-1, Class 1K4	°C	-25 ... +55
Transport temperature as per DIN EN 60721-3-2, Class 2K3	°C	-25 ... +70
Installation height without power reduction	m	<1000 above MSL
Vibration strain		sinusoidal, as per DIN EN 60068-2-6
• Acceleration amplitude:	m/s^2	50
• Frequency range	Hz	10 ... 300
• Amplitude	mm	0.35
Continuous shock		semisinusoidal, as per DIN EN 60068-2-27
• Peak acceleration	m/s^2	300
• Duration	m/s	18
Relative humidity		
• Operation	%	5 ... 85
	g/m^3	1 ... 25
• Long-term storage	%	5 ... 95
	g/m^3	1 ... 29
Degree of protection as per DIN EN 60034-5		IP 65 total device except for shaft bushing; IP 43 shaft bushing

Characteristic curves

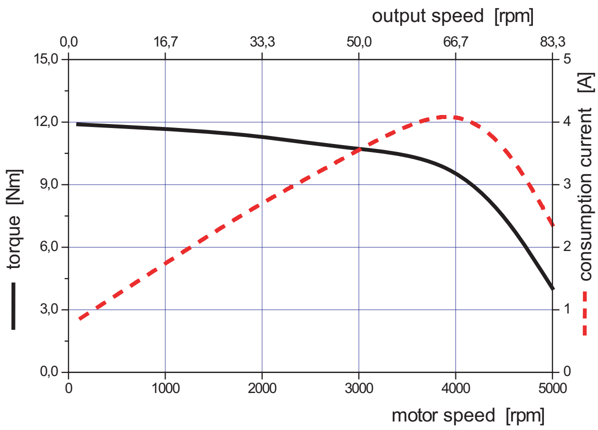
IclA N065 DC024 with angular planetary gearing G-016



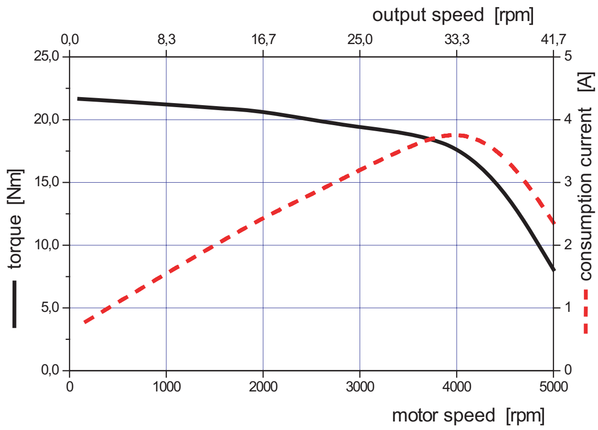
IclA N065 DC024 with angular planetary gearing G-040



IclA N065 DC024 with angular planetary gearing G-060



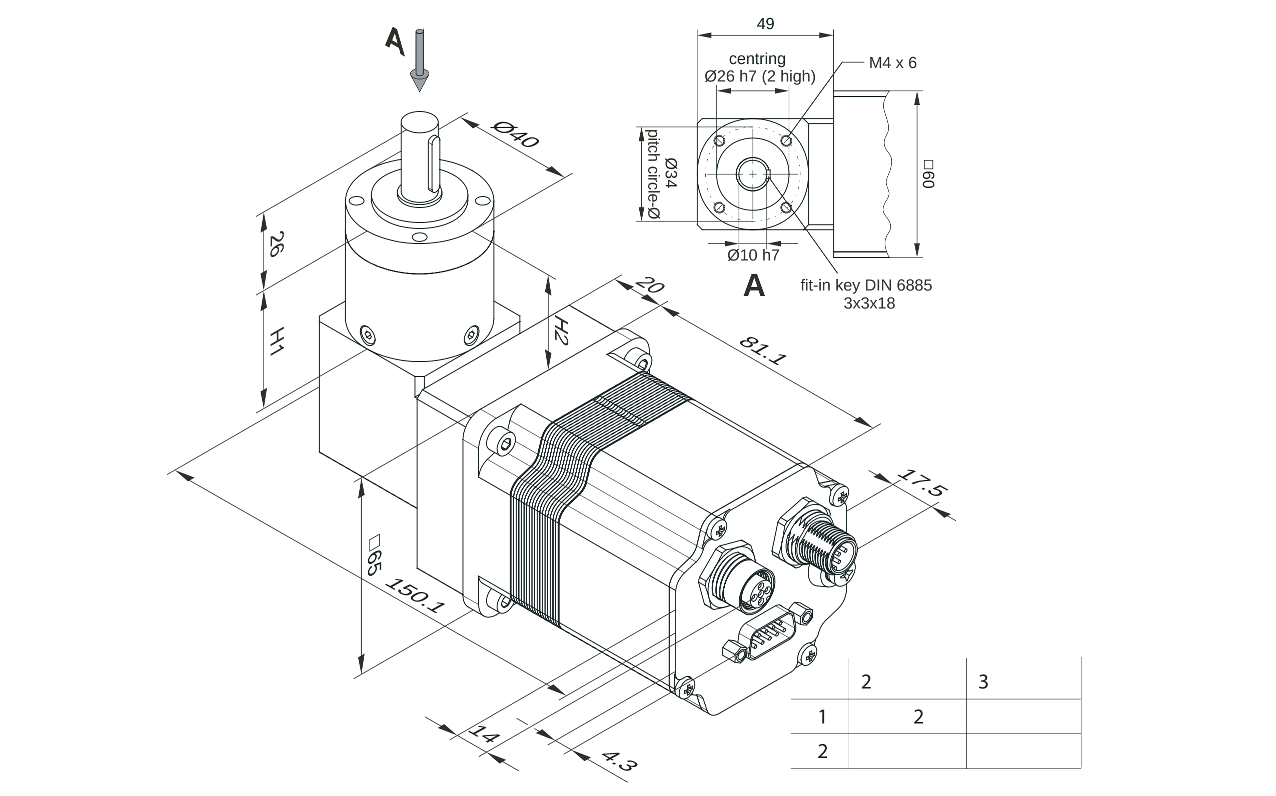
IclA N065 DC024 with angular planetary gearing G-120



Electrical interfaces

Power supply		reverse-polarity-protected
Nominal power supply range	V_{DC}	19.2 ... 28.8
Ripple at nominal voltage	V	≤3.6
Inrush current	A	Load current for DC bus capacity (500 µF)
24V signal interface		4 signal inputs, 0VDC internally connected with 0VDC supply voltage, reverse-polarity-protected
Permissible low level	V / mA	≤4.5 / ≤0.7
Permissible high level	V / mA	≥15 / ≥2
Admissible voltage range	V	0 ... 30
Signal input debounce time	ms	50 (in manual mode) without debounce (homing movement switch and end position sensors)
CANopen fieldbus interface		CANIn/CANOut - topology
Signal inputs/outputs		according to ISO 11898, no galvanic isolation
Transmission rate	kBaud	10 / 20 / 50 / 100 / 125 / 250 / 500 / 800 / 1000
Transmission protocol		
• Communications profile		DS301 V4.02
• Device profile		DSP 402 V2.0

Dimensional drawings



Dimensional drawing of IclA N065 DC024 G-••• with angular planetary gearing

IclA N065 with angular worm gearing

Technical data

IclA® N065		U-024	U-054	U-092	U-115
Nominal voltage	V	24	24	24	24
Nominal speed	1/min	4000	4000	4000	4000
Nominal output torque	Nm	2.6	6.0	9.2	10.6
Nominal output speed	1/min	168	75	44	35
Nominal output	W	46	47	42	39
Nominal current	A	4.43	4.43	4.43	4.43
Ready-for-operation current	A	0.09	0.09	0.09	0.09
Max. phase current	A	6.0	6.0	6.0	6.0
Maximum speed	1/min	189	93	54	44
Gear speeds		2	3	3	3
Gear efficiency		0.61	0.62	0.56	0.51
Ratio		525: 22	1715: 32	735: 8	3675: 32
Torque constant	Nm/A	0.036	0.036	0.036	0.036
Starting torque	Nm	2.2	5.0	7.8	8.9
Moment of inertia [1]	g cm²	165	150	150	150
Moment of inertia [2]	kg m²	0.009	0.043	0.127	0.198
Detent torque	Nm	2.9	6.5	12.3	16.7
Positioning resolution	Inc./rev	12	12	12	12
Positioning resolution	°	1.26	0.56	0.33	0.26
Positioning accuracy	Inc.	±1	±1	±1	±1
Mass	kg	1.7	1.7	1.7	1.7
Number of pole pairs		2	2	2	2
Torsional backlash	°	≤1.5	≤1.0	≤1.0	≤1.0
Shaft load					
• Max. radial force	N	200	200	200	200
• Max. axial force	N	80	80	80	80
• Nominal service life L_{10h} [3]	h	9000	9000	6000	3000

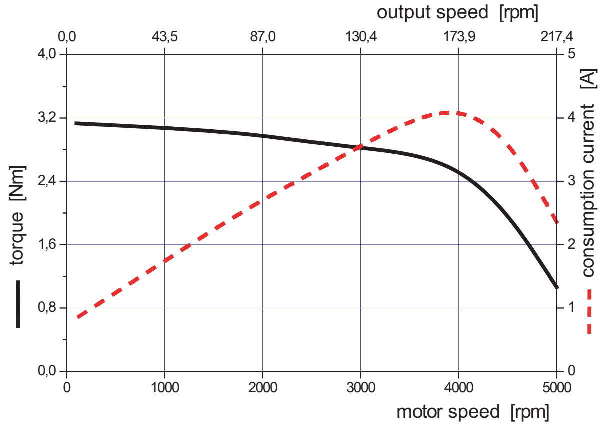
1) With reference to motor shaft
2) With reference to gearing output shaft
3) Operating hours at a probability of failure of 10%

Ambient conditions

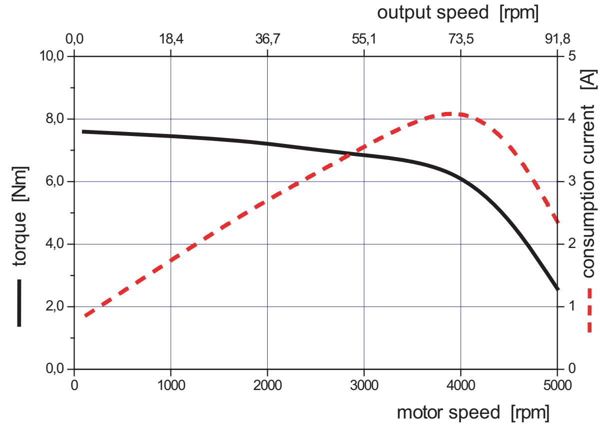
Operating temperature as per DIN EN 60721-3-3, Class 3K3	°C	+5 ... +40 (without power reduction)
Storage temperature as per DIN EN 60721-3-1, Class 1K4	°C	-25 ... +55
Transport temperature as per DIN EN 60721-3-2, Class 2K3	°C	-25 ... +70
Installation height without power reduction	m	<1000 above MSL
Vibration strain		sinusoidal, as per DIN EN 60068-2-6
• Acceleration amplitude:	m/s²	50
• Frequency range	Hz	10 ... 300
• Amplitude	mm	0.35
Continuous shock		semisinusoidal, as per DIN EN 60068-2-27
• Peak acceleration	m/s²	300
• Duration	m/s	18
Relative humidity		
• Operation	%	5 ... 85
	g/m³	1 ... 25
• Long-term storage	%	5 ... 95
	g/m³	1 ... 29
Degree of protection as per DIN EN 60034-5		IP 65 total device

Characteristic curves

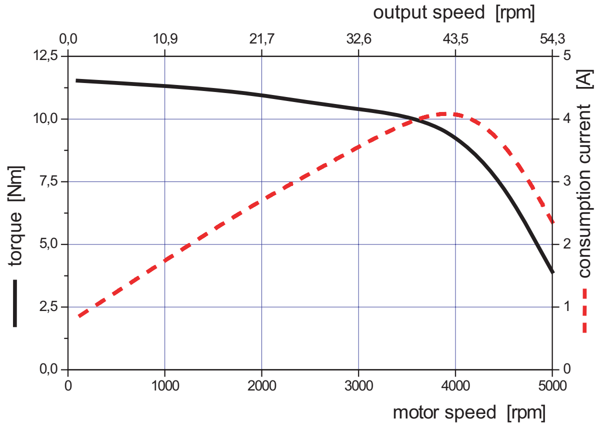
IclA N065 DC024 with angular worm gearing U-024



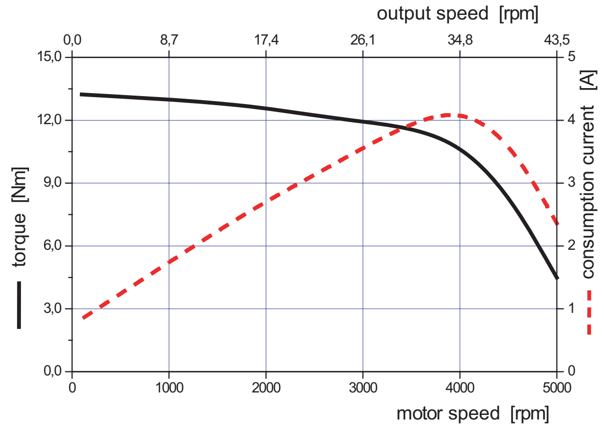
IclA N065 DC024 with angular worm gearing U-054



IclA N065 DC024 with angular worm gearing U-092



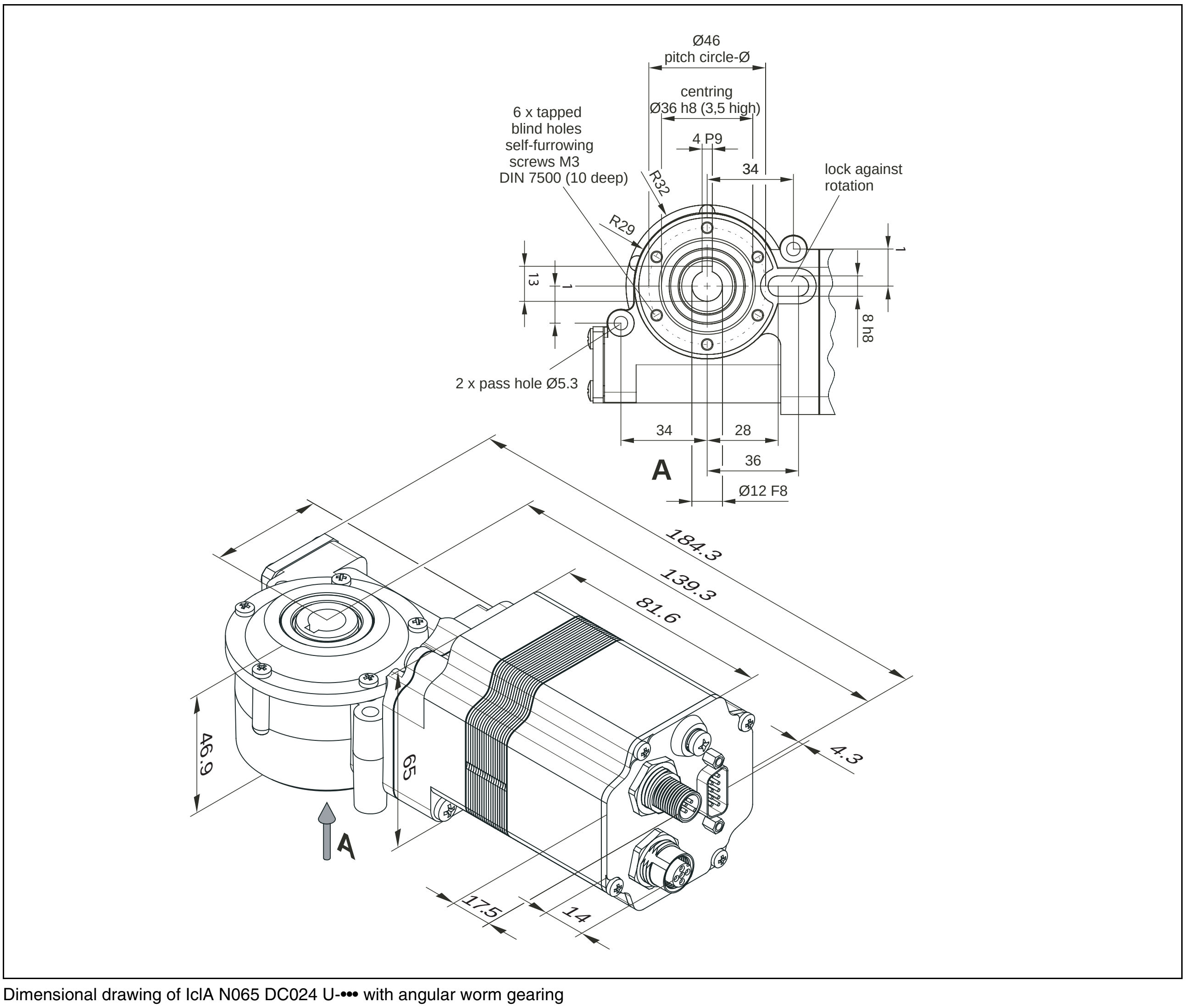
IclA N065 DC024 with angular worm gearing U-115



Electrical interfaces

Power supply		reverse-polarity-protected
Nominal power supply range	V_{DC}	19.2 ... 28.8
Ripple at nominal voltage	V	≤3.6
Inrush current	A	Load current for DC bus capacity (500 µF)
24 V signal interface		4 signal inputs, 0VDC internally connected with 0VDC supply voltage, reverse-polarity-protected
Permissible low level	V / mA	≤4.5 / ≤0.7
Permissible high level	V / mA	≥15 / ≥2
Admissible voltage range	V	0 ... 30
Signal input debounce time	ms	50 (in manual mode) without debounce (homing movement switch and end position sensors)
CANopen fieldbus interface		CANIn/CANOut - topology
Signal inputs/outputs		according to ISO 11898, no galvanic isolation
Transmission rate	kBaud	10 / 20 / 50 / 100 / 125 / 250 / 500 / 800 / 1000
Transmission protocol		
• Communications profile		DS301 V4.02
• Device profile		DSP 402 V2.0

Dimensional drawings



Dimensional drawing of IclA N065 DC024 U-••• with angular worm gearing

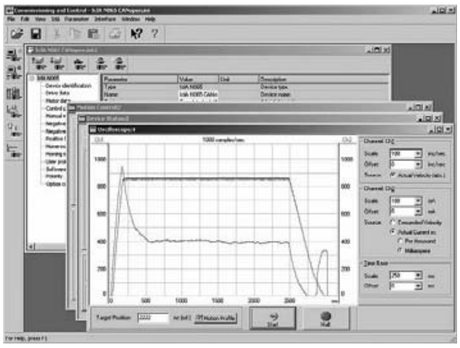
Type code

Example:			**IclA**	**N06**	**5**	**/**	**2**	**DC024**	**V-007**	**K**	**CAN**	**00**
Product family Intelligent Compact Drive IclA			**IclA**	N06	5	/	2	DC024	V-007	K	CAN	00
Size (flange) N06 = 66 mm			IclA	**N06**	5	/	2	DC024	V-007	K	CAN	00
Motor package length 5 = 18 mm			IclA	N06	**5**	/	2	DC024	V-007	K	CAN	00
not used			IclA	N06	5	/	2	DC024	V-007	K	CAN	00
Pole pair count 2			IclA	N06	5	/	**2**	DC024	V-007	K	CAN	00
Supply voltage DC024 = 24VDC			IclA	N06	5	/	2	**DC024**	V-007	K	CAN	00
Supply voltage DC024 = 24VDC			IclA	N06	5	/	2	DC024	**V-007**	K	CAN	00
Gearbox type	Gear ratio		IclA	N06	5	/	2	DC024	**V-007**	K	CAN	00
O- without gearing		O-000										
V - with spur wheel gearing	430:63 160:9 75:2 490:9 3675:32	V-007 V-018 V-038 V-054 V-118										
1 - with planetary gearing	16:1 40:1 60:1 120:1	1-016 1-040 1-060 1-120										
G - with angular planetary gearing	16:1 40:1 60:1 120:1	G-016 G-040 G-060 G-120										
U - with worm gearing	525:22 1715:32 735:8 3675:32	U-024 U-054 U-092 U-115										
Shaft type R = round, smooth shaft (gearbox type O and V only) K = parallel key (gearbox type V, 1 and G only) F = D-shaped shaft (gearbox type V only) H = hollow shaft (gearbox type U only)			IclA	N06	5	/	2	DC024	V-007	**K**	CAN	00
Communication interface CAN = CANopen			IclA	N06	5	/	2	DC024	V-007	K	**CAN**	00
Reserve 00			IclA	N06	5	/	2	DC024	V-007	K	CAN	**00**

Accessories

Software and documentation

IclA CCT commissioning software



The IclA CCT commissioning software supports you when commissioning the IclA N065.
You will require a CAN interface board from IXXAT Automation, a hardware driver for Windows and a licence for the IXXAT CANopen master API, Version 4.0 or compatible, to be able to start the program.

System requirements
Windows 98 or higher; Windows NT4 SP3
Pentium 233 MHz or higher
32 MB RAM; 10 MB free hard-disk space

Order data

Designation	Description		Order number
IclA CD-ROM	Contents: • Catalogues, German/English • Documentation, German/English • "IclA CCT" commissioning software • EDS file for IclA N065 with CAN bus		**0098441113207**
IclA N065 Documentation	DIN A4, bound	German	**0098441113267**
		English	**0098441113268**
CANopen documentation	DIN A4, bound	German	**0098441113269**
		English	**0098441113270**

Signal interface

The signal interface is a 9-pin SubD connector supplied by FCT electronic GmbH.

Order data

Designation	Description		Order number
IclA cable for signal interface IP65	with 9-pin sub-D socket for connection to signal interface	5m	**5900000024**
		10m	**5900000034**
		20m	**5900000035**

Accessories for signal interface of IclA N065 are supplied by the following company. When ordering please note the degree of protection of the compact drive (IP 65 recommended):

FCT electronic GmbH
Schatzbogen 13
D-81829 Munich
Telephone: +49 (0) 89 420004-0
Fax: +49 (0) 89 420004-10
Internet: http://www.fct-electronic.de

CAN fieldbus interface

The CAN fieldbus interface consists of a 5-pin M12 flange connector (CAN in) and a 5-pin M12 flange socket (CAN out) supplied by Franz Binder GmbH.

Accessories for the fieldbus interface of the IclA N065 are supplied by the following companies:

Franz Binder GmbH & Co. elektrische Bauelemente KG
Rötelstraße 27
D-74172 Neckarsulm
Telephone: +49 (0) 7132 325 - 0
Fax: +49 (0) 7132 325 - 150
E-mail: info@binder-connector.de
Internet: http://www.binder-connector.de

Hans Turck GmbH & Co. KG
Witzlebenstraße 7
D-45472 Mühlheim an der Ruhr
Telephone: +49 (0) 208 4952-0
Fax: +49 (0) 208 4952-264
E-mail: turckmh@mail.turck-globe.de
Internet: http://www.turck.com

Conversion tables

Rotor inertia

	lb·in²	lb·ft²	lb·in·s²	lb·ft·s² slug·ft²	kg·cm²	kg·cm·s²	g·cm²	g·cm·s²	oz·in²	oz·in·s²
lb·in²	–	6.94×10^{-3}	2.59×10^{-3}	2.15×10^{-4}	2.926	2.98×10^{-3}	2.92×10^{3}	2.984	16	4.14×10^{-2}
lb·ft²	144	–	0.3729	3.10×10^{-2}	421.40	0.4297	4.21×10^{5}	429.71	2304	5.967
lb·in·s²	386.08	2.681	–	8.33×10^{-2}	1.129×10^{3}	1.152	1.129×10^{6}	1.152×10^{3}	6.177×10^{3}	16
lb·ft·s² slug·ft²	4.63×10^{3}	32.17	12	–	1.35×10^{4}	13.825	1.355×10^{7}	1.38×10^{4}	7.41×10^{4}	192
kg·cm²	0.3417	2.37×10^{-3}	8.85×10^{-4}	7.37×10^{-6}	–	1.019×10^{-3}	1000	1.019	5.46	1.41×10^{-2}
kg·cm·s²	335.1	2.327	0.8679	7.23×10^{-2}	980.66	–	9.8×10^{5}	1000	5.36×10^{3}	13.887
g·cm²	3.417×10^{-4}	2.37×10^{-6}	8.85×10^{-7}	7.37×10^{-8}	1×10^{-3}	1.01×10^{-6}	–	1.01×10^{-3}	5.46×10^{-3}	1.41×10^{-6}
g·cm·s²	0.335	2.32×10^{-3}	8.67×10^{-4}	7.23×10^{-5}	0.9806	1×10^{-3}	980.6	–	5.36	1.38×10^{-2}
oz·in²	0.0625	4.3×10^{-4}	1.61×10^{-6}	1.34×10^{-6}	0.182	1.86×10^{-4}	182.9	0.186	–	2.59×10^{-3}
oz·in·s²	24.13	0.1675	6.25×10^{-2}	5.20×10^{-3}	70.615	7.20×10^{-2}	7.06×10^{4}	72	386.08	–

Torque

	lb·in	lb·ft	oz·in	Nm	kg·m	kg·cm	g·cm	dyne·cm
lb·in	–	8.333×10^{-2}	16	0.113	1.152×10^{-2}	1.152	1.152×10^{3}	1.129×10^{6}
lb·ft	12	–	192	1.355	0.138	13.825	1.382×10^{4}	1.355×10^{7}
oz·in	6.25×10^{-2}	5.208×10^{-3}	–	7.061×10^{-3}	7.200×10^{-4}	7.200×10^{-2}	72.007	7.061×10^{4}
Nm	8.850	0.737	141.612	–	0.102	10.197	1.019×10^{4}	1×10^{7}
kg·m	86.796	7.233	1.388×10^{3}	9.806	–	100	1×10^{5}	9.806×10^{7}
kg·cm	0.8679	7.233×10^{-2}	13.877	9.806×10^{-2}	10^{-2}	–	1000	9.806×10^{5}
g·cm	8.679×10^{-4}	7.233×10^{-5}	1.388×10^{-2}	9.806×10^{-5}	1×10^{-5}	1×10^{-3}	–	980.665
dyne·cm	8.850×10^{-7}	7.375×10^{-8}	1.416×10^{-5}	10^{-7}	1.019×10^{-8}	1.0197×10^{-6}	1.019×10^{-6}	–

Power

	H.P.	W
H.P.	–	745.7
W	1.31×10^{-3}	–

Rotation

	1/min (rpm)	rad/sec	deg./sec
1/min (rpm)	–	0.105	6.0
rad/sec	9.55	–	57.30
deg./sec	0.167	1.745×10^{-2}	–

Temperature

	°F	°C
°F	–	$(\vartheta - 32) \cdot {}^{5}/_{9}$
°C	$\vartheta \cdot {}^{9}/_{5} + 32$	–

Length

	in	ft	yd	m	cm	mm
in	–	0.0833	0.028	0.0254	2.54	25.4
ft	12	–	0.333	0.3048	30.48	304.8
yd	36	3	–	0.914	91.44	914.4
m	39.37	3.281	1.09	–	100	1000
cm	0.3937	0.03281	1.09 x 10-2	0.01	–	10
mm	0.03937	0.00328	1.09 x 10-3	0.001	0.1	–

Weight

	lb	oz	slug	kg	g
lb	–	16	0.0311	0.453592	453.592
oz	6.35×10^{-2}	–	1.93×10^{-3}	0.028349	28.35
slug	32.17	514.8	–	14.5939	1.459×10^{4}
kg	2.20462	35.274	0.0685218	–	1000
g	2.205×10^{-3}	3.527×10^{-3}	6.852×10^{-5}	0.001	–

Force

	lb	oz	gf	dyne	N
lb	–	16	453.592	4.448×10^{5}	4.4482
oz	0.0625	–	28.35	2.780×10^{4}	0.27801
gf	2.205×10^{-3}	0.03527	–	980,665	N.A.
dyne	2.248×10^{-6}	3.59×10^{-6}	1.02×10^{-3}	–	0.0001
N	0.22481	3.5967	N.A.	100,000	–

Example for conversion:
Conversion of a 10 inch length measurement into metres. Look for the entry “in” (= inch) in the “Length” table in the left column and the entry “m” (= metre) in the header. The table cell at the point of intersection of the column and the row will show the conversion factor: “0.0254”. Multiply 10 inches by 0.0254 and you will get the value in metres: 10 in x 0.0254 = 0.254 m.

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Motion control

Lexium 05

Catalogue
May
06

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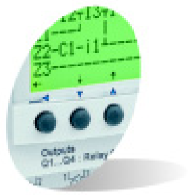
Flexibility

- Interchangeable modular functions, to better meet the requirements for extensions
- Software and accessories common to multiple product families

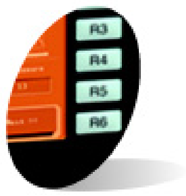
Ingenuity

- Auto-adapts to its environment, "plug & play"
- Application functions, control, communication and diagnostics embedded in the products
- User-friendly operation either directly on the product or remotely



Simplicity

- Cost effective "optimum" offers that make selection easy for most typical applications
- Products that are easy to understand for users, electricians and automation specialists
- User-friendly intuitive programming



Compactness

- High functionality in a minimum of space
- Freedom in implementation

Openness

- Compliance with field bus, connection, and software standards
- Enabling decentralised or remote surveillance via the web with Transparent Ready products

Contents

Lexium 05 motion control

Lexium 05 offer

Lexium 05 servo drives

BSH servo motors

Services

Lexium 05 motion control
Presentation

Lexium 05 servo drive

BSH servo motor

An extended offer

The range of Lexium 05 servo drives that are compatible with BSH servo motors constitutes a compact and dynamic combination for machines across a wide power and supply voltage range:

■ Lexium 05 servo drive:
□ 100…120 V single phase, 0.4 to 1.4 kW
□ 200…240 V single phase, 0.75 to 2.5 kW
□ 200…240 V three-phase, 0.75 to 3.2 kW
□ 380…480 V three-phase, 1.4 to 6 kW
■ BSH servo motor:
□ Nominal torque: 0.42 to 33.5 Nm
□ Nominal speed: 1250 to 6000 rpm

The Lexium 05 range is enhanced by GBX planetary gearboxes. These are easy to mount, lubricated for life and available in 12 reduction ratios: 3:1 to 40:1.
GBX gearboxes are economical, and designed for applications requiring very limited play.

Lexium 05 servo drives comply with EN 50178 and IEC/EN 61800-3 international standards and carry UL (USA), cUL (Canada) approvals and CE marking.

A complete piece of equipment

Lexium 05 integrates functions and components that are usually external. This enables users to maintain particularly compact dimensions and makes it easier to integrate the servo drive in control enclosures or machines.

Electromagnetic compatibility (EMC)

The incorporation of "conducted and radiated" level A EMC filters in LXM 05●●●●F1, LXM 05●●●●M2 and LXM 05●●●●N4 servo drives simplifies installation and provides a very economical means of complying with CE marking requirements.
LXM 05●●●●M3X servo drives are available without an EMC filter. If compliance with EMC standards is required, filters which are available as an option can be installed by the customer.

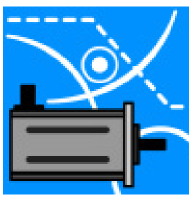
Safety

The Lexium 05 servo drive is incorporated in the safety system of installations. It integrates the "Power Removal" safety function which prevents accidental starting of the motor.
This function is compliant with machine standard EN 954-1 category 3, standard IEC/EN 61508 SIL2 for electrical installations and draft standard IEC/EN 61800-5-2 for power drives.

Braking

Lexium 05 servo drives integrate a resistor as standard, which does away with the need to use an external braking resistor in most applications.

Dynamic and powerful



Lexium 05: A Telemecanique branded servo drive offer

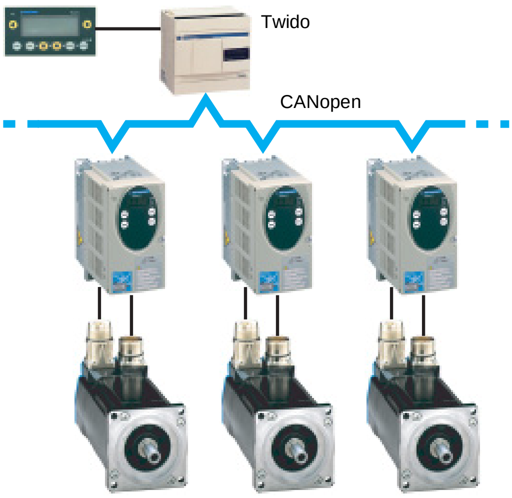
Thanks to their new winding technology based on salient poles, BSH servo motors are compact and offer a high power density.
The low inertia of the rotor and the slight notching effect make it possible to meet demands for accuracy and dynamic performance.

This dynamic performance is enhanced by the fast sampling time of the Lexium 05 servo drive control loops:

■ 62.5 µs for the current loop
■ 250 µs for the speed loop
■ 250 µs for the position loop

Functions: pages 6 to 11, 54 and 55
Characteristics: pages 12 to 15, 56 to 79
References: pages 16, 80 to 82
Dimensions: pages 30 to 33, 83 to 85
Schemes: pages 34 to 44

Lexium 05 motion control
Presentation



Control and interfaces

The Lexium 05 servo drive can control BSH servo motors in accordance with a large number of control modes:
- Point-to-point mode: relative and absolute movements
- Electronic gearing mode
- Speed control with acceleration/deceleration ramp
- Instantaneous speed control
- Current control
- Manual movement for easy setup

The Lexium 05 servo drive has three control interfaces as standard:
- Interface for CANopen, Modbus, or Profibus DP communication network
- Two ± 10 V analog reference inputs to give the speed or current reference, and limit the speed or current
- One RS 422 (A/B) incremental encoder or pulse/direction input. This input can also be configured as an output to emulate an encoder (ESIM).
- These interfaces are supplemented by logic inputs and outputs which can be used as Source (positive logic) or Sink (negative logic) in order to adapt to the outputs of controllers that are available on the market.

Simplicity

Integration

Its high integration level, compact size, the ability to mount it side by side, and its ability to operate at ambient temperatures of 50°C without derating, enable the size of enclosures to be reduced.
Low-power servo drives can be mounted on DIN rails.

Wiring

Spring terminals are used to save time, and avoid periodic checking of tightening torques.

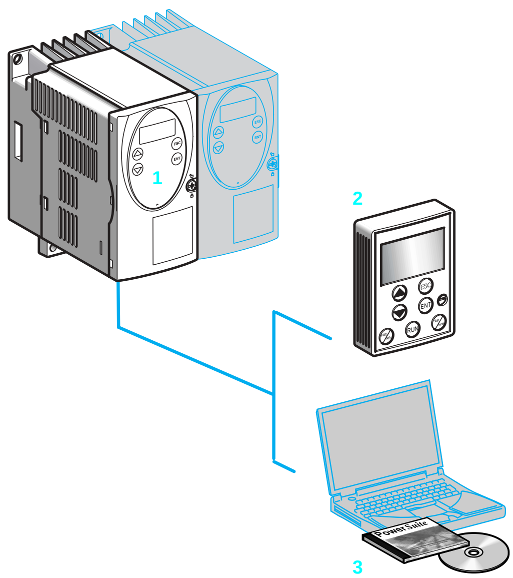
Setup

Thanks to the SinCos Hiperface® encoder of BSH motors, Lexium 05 automatically receives data from the servo motor.
The parameters of the servo motor do not need to be set manually.

The "Simply Start" menu, which is available with the PowerSuite software workshop, ensures that the installation operates within a few seconds.

The Lexium 05 auto-tuning function and its new algorithm automatically define the optimum gains of the control loops in accordance with the mechanics for different types of movement, including vertical movements.

The oscilloscope function of the PowerSuite software workshop is used to display the electrical and mechanical values of the axis. The Fourier series transform (FFT) can be used for fine analysis of the signals from the machine.



Dialogue tool

Integrated 7-segment display terminal 1

The Lexium 05 servo drive is supplied with an integrated 7-segment display terminal, which is used to set the servo drive parameters, display errors and monitor the system.
It is also used to control the servo drive in manual operation.

Remote LCD terminal 2

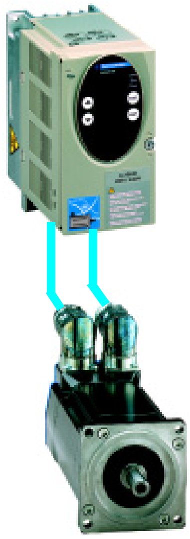
Available as an option, it can be mounted on an enclosure door so that the monitoring and adjustment functions and manual operation are always accessible. Its IP 65 protection enables it to be used in difficult environments.

PowerSuite 3

The PowerSuite software workshop is used to configure, set and debug the Lexium 05 axis in the same way as for all other Telemecanique variable speed drives and starters. It can be used with a direct connection or a Bluetooth® wireless connection.
See page 52.

Lexium 05 motion control

BSH servo motor and Lexium 05 servo drive combinations



BSH servo motors			Lexium 05 single-phase servo drives (1)						
			115 V single-phase, with integrated EMC input filter				230 V single-phase, with integrated EMC input filter		
			LXM 05●				LXM 05●		
			D10F1	D17F1	D28F1		D10M2	D17M2	D28M2
	M_0	n_N	0.4 kW	0.65 kW	1.4 kW	n_N	0.75 kW	1.2 kW	2.5 kW
BSH 0551T	**0.5 Nm**	3000 rpm	1.4 Nm			6000 rpm	1.4 Nm		
BSH 0552M	**0.9 Nm**					1500 rpm	2.3 Nm		
BSH 0552P	**0.9 Nm**					4000 rpm	2.7 Nm		
BSH 0552T	**0.9 Nm**	3000 rpm	1.77 Nm	2.7 Nm		6000 rpm	1.77 Nm		
BSH 0553M	**1.3 Nm**					1500 rpm	4.2 Nm		
BSH 0553P	**1.3 Nm**					4000 rpm	3.18 Nm		
BSH 0553T	**1.3 Nm**	3000 rpm		3.31 Nm		6000 rpm		3.31 Nm	
BSH 0701P	**1.4 Nm**					3000 rpm	3.2 Nm		
BSH 0701T	**1.4 Nm**	2500 rpm	2.42 Nm			5000 rpm		3.19 Nm	
BSH 0702M	**2.1 Nm**					1500 rpm	6.8 Nm		
BSH 0702P	**2.2 Nm**					3000 rpm	5.37 Nm	7.55 Nm	
BSH 0702T	**2.12 Nm**	2500 rpm		4.14 Nm		6000 rpm		4.14 Nm	6.8 Nm
BSH 0703M	**2.8 Nm**					1500 rpm	10 Nm		
BSH 0703P	**3.1 Nm**					3000 rpm		7.28 Nm	10.3 Nm
BSH 0703T	**2.8 Nm**	2500 rpm			7.38 Nm	6000 rpm			7.38 Nm
BSH 1001T	**3.4 Nm**	2500 rpm			8.5 Nm	4000 rpm			8.5 Nm
BSH 1002P	**5.8 Nm**					2000 rpm			18.3 Nm
BSH 1003P	**7.8 Nm**					2000 rpm			22.79 Nm

Where:
M_0 = stall torque
n_N = maximum nominal speed (see characteristics pages 56 to 78)

1.4 Nm Peak stall torque that can be supplied by the BSH servo motor and Lexium 05 servo drive combination

*(1) In the reference, replace ● with **A** for the CANopen version with analog inputs, and with **B** for the Profibus DP version.*

Lexium 05 motion control
BSH servo motor and Lexium 05 servo drive combinations

BSH servo motors	M_0	n_N	Lexium 05 three-phase servo drives *(1)*: 230 V three-phase, without integrated EMC input filter, LXM 05● *(1)* D10M3X 0.75 kW	D17M3X 1.4 kW	D42M3X 3.2 kW	n_N	400/480 V three-phase, with integrated EMC input filter, LXM 05● *(1)* D14N4 1.4 kW	D22N4 2.0 kW	D34N4 3.0 kW	D57N4 6.0 kW
BSH 0551T	0.5 Nm	6000 rpm	1.4 Nm							
BSH 0552M	0.9 Nm	1500 rpm	2.3 Nm							
BSH 0552P	0.9 Nm	4000 rpm	2.7 Nm			6000 rpm	2.7 Nm			
BSH 0552T	0.9 Nm	6000 rpm	1.77 Nm							
BSH 0553M	1.3 Nm	1500 rpm	4.2 Nm							
BSH 0553P	1.3 Nm	4000 rpm	3.18 Nm			6000 rpm	3.87 Nm			
BSH 0553T	1.3 Nm	6000 rpm		3.31 Nm						
BSH 0701M	1.4 Nm	1500 rpm	3.2 Nm							
BSH 0701P	1.4 Nm	3000 rpm	3.2 Nm							
BSH 0701T	1.4 Nm	6000 rpm	2.41 Nm	3.19 Nm						
BSH 0702M	2.1 Nm	1500 rpm	6.8 Nm							
BSH 0702P	2.2 Nm	3000 rpm	5.37 Nm	7.55 Nm		6000 rpm	7.55 Nm			
BSH 0702T	2.12 Nm	4500 rpm			6.8 Nm					
BSH 0703M	2.8 Nm	1500 rpm	10 Nm			3000 rpm	10.3 Nm			
BSH 0703P	3.1 Nm	3000 rpm		7.28 Nm		6000 rpm		8.92 Nm		
BSH 0703T	2.8 Nm	6000 rpm			10.25 Nm					
BSH 1001M	3.4 Nm					2000 rpm	8.5 Nm			
BSH 1001P	3.3 Nm	2000 rpm		9.45 Nm		4000 rpm		9.45 Nm		
BSH 1001T	3.4 Nm	4000 rpm			8.5 Nm					
BSH 1002M	5.5 Nm					2000 rpm	16 Nm			
BSH 1002P	5.8 Nm	2000 rpm		12.35 Nm		4000 rpm		15.43 Nm		
BSH 1002T	5.52 Nm	4000 rpm			16 Nm					
BSH 1003M	7.8 Nm					2000 rpm		27.8 Nm		
BSH 1003P	8 Nm	2000 rpm			28.3 Nm	4000 rpm			26.97 Nm	
BSH 1004P	10 Nm	1500 rpm			30.41 Nm	3000 rpm			22.53 Nm	30.41 Nm
BSH 1401P	11.1 Nm					2500 rpm			26.2 Nm	
BSH 1401T	11.1 Nm	2500 rpm			24.77 Nm					
BSH 1402M	19.5 Nm					1250 rpm			57.1 Nm	
BSH 1402P	19.5 Nm	1500 rpm			46.72 Nm	3000 rpm				57.42 Nm
BSH 1402T	14.73 Nm	2000 rpm			25.04 Nm					
BSH 1403M	27.8 Nm					1500 rpm			76.66 Nm	88.17 Nm
BSH 1403P	27.8 Nm					3000 rpm				57.24 Nm
BSH 1404M	33.4 Nm					1500 rpm				126.45 Nm
BSH 1404P	33.4 Nm					3000 rpm				60.04 Nm
BSH 2051M	36 Nm					1500 rpm				68.3Nm

Where:
M_0 = stall torque
n_N = maximum nominal speed (see characteristics pages 56 to 78)

1.4 Nm: Peak stall torque that can be supplied by the BSH servo motor and Lexium 05 servo drive combination

*(1) In the reference, replace ● with **A** for the CANopen version with analog inputs, and with **B** for the Profibus DP version.*

Lexium 05 motion control

Lexium 05 servo drives

General overview of Lexium 05 functions

The Lexium 05 servo drive integrates a large number of functions, enabling it to be used in a wide range of industrial applications.

There are two main function families:
- Conventional adjustment functions, such as:
  - Homing
  - Manual mode
  - Auto-tuning of the servo drive/servo motor combination

- Operating modes:
  - Position control:
    - Point-to-point mode
    - Electronic gearing mode
  - Speed control:
    - Speed control with acceleration/deceleration ramp
    - Instantaneous speed control
  - Current control:
    - Current regulation

Two types of operation are possible:
- Local mode
- Fieldbus mode

In local mode:

The servo drive parameters are defined via:
- The user interface
- The remote display terminal
- The PowerSuite software

Movements are then determined by:
- Analog signals (± 10 V)
- RS 422 type signals (pulse/direction or A/B signals)

In this mode, limit switches and homing switches are not managed by the servodrive.

In fieldbus mode:
- All the servo drive parameters and those associated with the operating modes can be accessed via:
- The fieldbus, in addition to the access via the user interface
- The remote display terminal
- The PowerSuite software

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Lexium 05 motion control

Lexium 05 servo drives

Adjustment functions

Homing

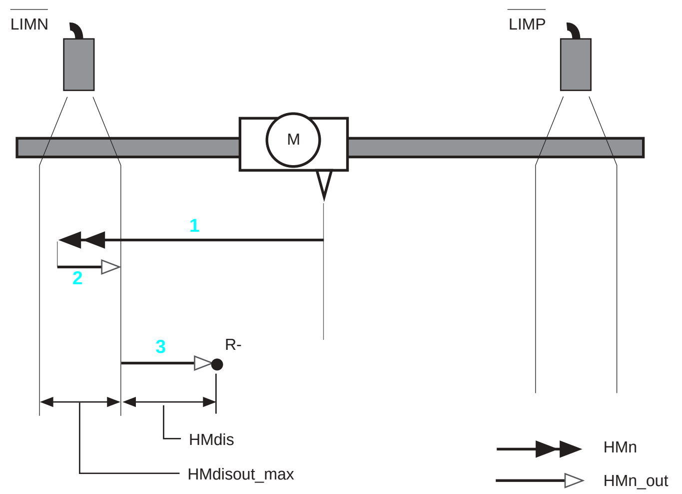
Before performing an absolute movement in point-to-point mode, a homing operation must be carried out.
Homing consists of associating an axis position with a known mechanical position. This position then becomes the reference position for any subsequent movement of the axis.

Homing is carried out by:
- Immediately writing the actual position register
- Movements up to a reference sensor

Homing with search for sensors

Four types of homing with movement to sensors are possible:
- Homing on - limit switch, "LIMN"
- Homing on + limit switch, "LIMP"
- Homing on reference contact "REF" with initial movement in negative direction of rotation
- Homing on reference contact "REF" with initial movement in positive direction of rotation

These homing movements can be performed with or without taking the "Zero marker" pulse into account.

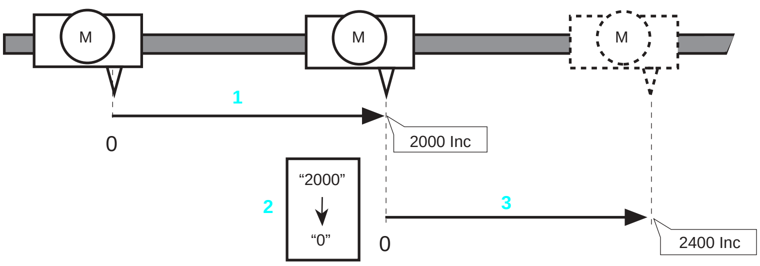


1 Move at search speed HMn
2 Move at output speed HMn_out
3 Clearance at distance HMdis at output speed HMn_out

Homing operating mode: Example with limit switch and clearance from sensor edge

Forced homing

Forced homing consists of setting the current motor position as the new reference point to which all subsequent positioning data refer.



After power-up, the position value is 0
1 Start movement towards the home point: the servo motor is positioned using a relative movement of 2000 increments
2 Forced homing to value 0 by writing the actual position expressed in user units
3 Initiation of a command to move 2400 increments to the absolute position. The target position is 2400 increments (4400 increments if forced homing had not been performed).

Forced homing operating mode

Homing parameters

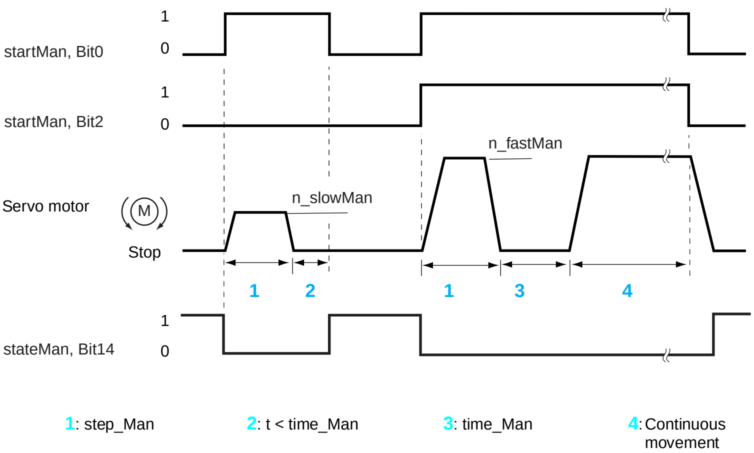
The homing parameters are transmitted via the fieldbus or using PowerSuite software.

Manual mode

This mode enables an axis to be moved manually. The movement can be carried out over one movement step or continuously, at constant speed. Two speeds of movement are available (slow or fast). Various parameters are used to configure the manual movement.

Setpoint value

The parameters are transmitted via the fieldbus, the PowerSuite software or the servo drive user interface.



Adjustment of the machine in manual mode

On a rising edge of a “startMan” control bit, a movement step is performed 1 at low or high speed depending on the command on a second bit, “speedMan”.
If the “startMan” control bit is maintained active beyond the waiting time “timeMan” - example 3 -, the movement is restarted and continues 4 monitored by the operator, until the “startMan” command returns to inactive level.
A “stateMan” bit reflects the state - ready/rotating - of the servo motor in manual mode.

Auto-tuning of the servo drive/servo motor combination

The auto-tuning function integrated in the servo drive enables automatic tuning of the servo control parameters to be performed after the initial configuration.
This function is activated via:
- The user interface
- The remote display terminal
- The PowerSuite software

This procedure requires the servo motor to be coupled to its mechanism. Additional parameters can be used to limit the amplitude and the direction of the movements performed during the auto-tuning phase.

The PowerSuite software also provides screens for carrying out these servo control adjustments conventionally.

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Operating mode

The following table summarizes the various possible operating modes, the control types and the sources of setpoint values.

Operating mode	Control via fieldbus	Control local	Setpoint value via
Point-to-point mode	Functions available	Functions not available	Fieldbus or PowerSuite software
Electronic gearing mode	Functions available	Functions available	Pulse/direction signals or A/B signals
Speed control with ramp	Functions available	Functions not available	Fieldbus or PowerSuite software
Instantaneous speed control	Functions available	Functions available	Analog input, fieldbus or PowerSuite software
Current control	Functions available	Functions available	Analog input, fieldbus or PowerSuite software

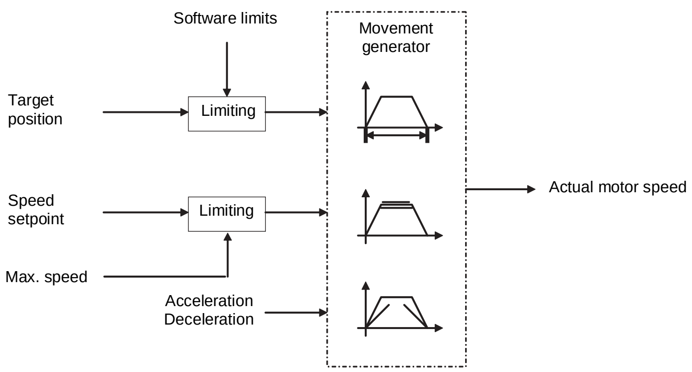
Functions available
Functions not available

Point-to-point mode

This mode, also referred to as PTP (Point To Point), is used to move the axis from a position A to a position B. The movement can be absolute: this consists of expressing position B in relation to a home position (the axis must have previously been referenced), or relative: in this case the movement is performed in relation to the current position of the axis (A). The movement is performed according to acceleration, deceleration and speed parameters.

Setpoint value

The homing parameters are transmitted via the fieldbus or using the PowerSuite software.



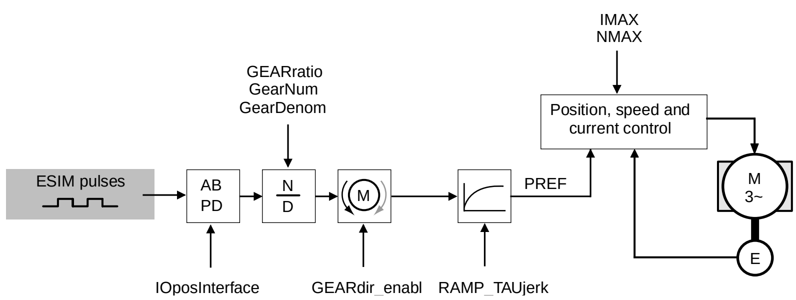
Point-to-point mode, absolute and relative

Possible applications

A motion controller for coordinated axes or a PLC can manage several axes controlled via fieldbus. This mode is often used in material handling, automated inspection, etc.

Electronic gearing mode

In this mode a master/slave relationship is established between a number of Lexium 05 or between a Lexium 05 and an external master (external A/B encoder, pulse/direction signals). This relationship can be assigned a fixed or variable ratio. The ratio and operating direction parameters can be accessed dynamically via fieldbus.



Electronic gearing mode (continued)

Possible applications

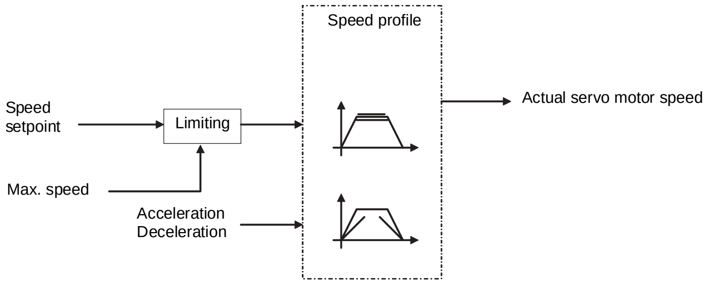
This mode is used in material handling, conveying and sectional production line applications, as well as in the fields of plastics and fibres.

Speed control with acceleration/deceleration ramp

In this operating mode, the speed setpoint is applied according to an acceleration/deceleration ramp that can be adjusted using parameters. The speed setpoint can be modified during the movement. Current limiting is also possible.
The position control that is present in the background allows flexible synchronization of two axes that are in speed control mode, and enables position control mode to be entered on the fly.

Setpoint value

The setpoint value is transmitted via the fieldbus or using the PowerSuite software.



Speed control with acceleration/deceleration ramp operating mode

Possible applications

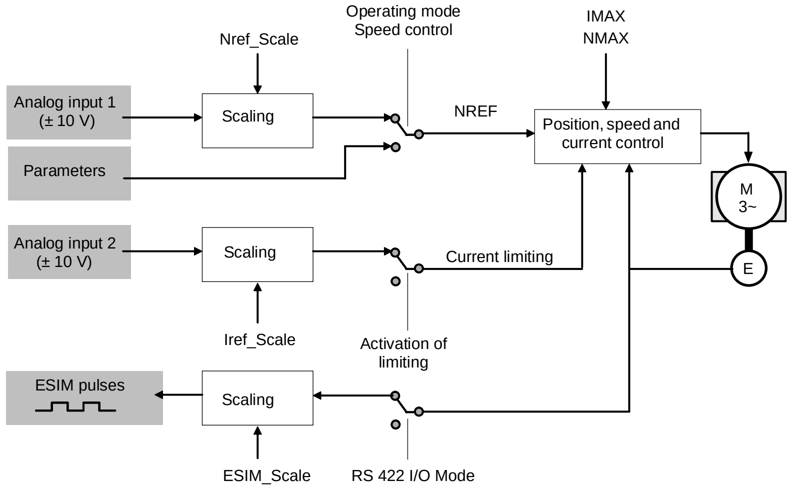
This mode is mainly used with infinite axes.
Examples include turntable management, printing, labelling applications, etc.

Instantaneous speed control

In this mode the Lexium 05 servo drive can be used with an analog output motion controller. It is suitable for all other high performance speed control requirements.

Setpoint value

The setpoint value is transmitted via analog input 1, the fieldbus or the PowerSuite software. Analog input 2 can be used for current or speed limiting.



Instantaneous speed control operating mode

Use with analog output motion controller

The axis position feedback can be provided to the motion controller by the ESIM (Encoder SIMulation) output on the Lexium 05 servo drive.

Instantaneous speed control (continued)

Possible applications

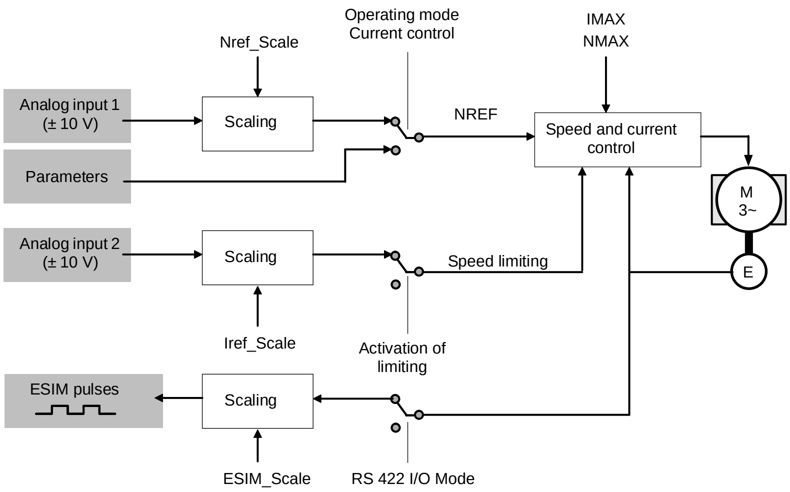
- Material handling
- Packaging
- Cutting to length
- Winding and unwinding applications

Current control

Current control is necessary for servo motor torque control. This mode, which can be provided in addition to the other modes, is used in machine phases where torque control is crucial.

Setpoint value

The setpoint value is transmitted via analog input 1, the fieldbus or the PowerSuite software. Analog input 2 can be used for current or speed limiting. The position and speed of the servo motor are transmitted to the motion controller by the encoder simulation signals (ESIM) of the RS 422 interface.



Current control operating mode, effects of the adjustable parameters

Possible applications

- Car assembly applications (tool fixing machine)
- Special machines

Other functions

Other functions for monitoring and setting operating parameters can be activated via:
- The “logic” I/O
- The fieldbus
- The PowerSuite software
- The servo drive user interface

- Control functions:
  - Status monitoring in movement mode
  - Monitoring of the axis signals
  - Monitoring of the internal signals specific to the servo drive
  - Monitoring switching
  - Monitoring the communication on the fieldbus
- Entering the various scaling factors
- Adjusting the movement generator
- Activation of the STOP signal
- Triggering the fast stop function (Quick-Stop)
- Activation of the motor brake via the HBC (Holding Brake Controller)
- Reversing the direction of rotation of the motor
- Reading the analog input values
- Determining the logic of the signals

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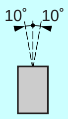
Environmental characteristics

Conformity to standards			Lexium 05 servo drives have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control equipment (IEC, EN), including: low voltage, IEC/EN 61800-5-1, IEC/EN 50178, IEC/EN 61800-3 (conducted and radiated EMC immunity and emissions)
EMC immunity			IEC/EN 61800-3, environments 1 and 2 IEC/EN 61000-4-2 level 3 IEC/EN 61000-4-3 level 3 IEC/EN 61000-4-4 level 4 IEC/EN 61000-4-5 level 3
Conducted and radiated EMC emissions for servo drives			IEC/EN 61800-3, environments 1 and 2, categories C2, C3
	LXM 05●D10F1…D28F1 LXM 05●D10M2...D28M2 LXM 05●D14N4...D57N4		EN 55011 class A group 2, IEC/EN 61800-3 category C3 With additional EMC filter *(1)*: EN 55011 class A group 1, IEC/EN 61800-3 category C2
	LXM 05●D10M3X...D42M3X		With additional EMC filter *(1)*: EN 55011 class A group 1, IEC/EN 61800-3 category C2
CE marking			The drives are CE marked in accordance with the European low voltage (73/23/EEC and 93/68/EEC) and EMC (89/336/EEC) directives
Product certification			UL (USA), cUL (Canada)
Degree of protection			IEC/EN 61800-5-1, IEC/EN 60529
	LXM 05●D10F1…D28F1 LXM 05●D10M2...D28M2 LXM 05●D10M3X...D42M3X LXM 05●D14N4...D57N4		IP 41 on the upper part with protective cover in place IP 20 after removal of the protective cover (see page 48)
Vibration resistance	LXM 05●D10F1…D28F1 LXM 05●D10M2...D28M2 LXM 05●D10M3X...D42M3X LXM 05●D14N4...D57N4		According to IEC/EN 60068-2-6: 1.5 mm peak to peak from 3 Hz to 13 Hz 1 gn from 13 Hz to 150 Hz
Shock resistance	LXM 05●D10F1…D28F1 LXM 05●D10M2...D28M2 LXM 05●D10M3X...D42M3X LXM 05●D14N4...D57N4		According to IEC/EN 61131 paragraph 6.3.5.2 15 gn for 11 ms conforming to IEC/EN 600028-2-27
Maximum ambient pollution	LXM 05●D10F1…D28F1 LXM 05●D10M2...D28M2 LXM 05●D10M3X...D42M3X LXM 05●D14N4...D57N4		Degree 2 conforming to IEC/EN 61800-5-1
Environmental conditions	LXM 05●D10F1…D28F1 LXM 05●D10M2...D28M2 LXM 05●D10M3X...D42M3X LXM 05●D14N4...D57N4		IEC 60721-3-3 classes 3C1
Relative humidity			According to IEC 60721-3-3, class 3K3, 5% to 93%, without condensation
Ambient air temperature around the device	Operation	**°C**	- 10…+ 50 Temperature derating and limitations: see mounting recommendations page 48
	Storage	**°C**	- 25…+ 70
Type of cooling	LXM 05●D10F1 LXM 05●D10M2 LXM 05●D10M3X		Natural convection
	LXM 05●D17F1...D57N4		Fan
Maximum operating altitude		**m**	1000 without derating Up to 2000 under the following conditions: ■ Temperature 40°C max. ■ Mounting distance between servo drives > 50 mm ■ Protective film removed
Operating position Maximum permanent angle in relation to the normal vertical mounting position			

(1) See table on page 27 to check permitted cable lengths.

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Lexium 05 motion control

Lexium 05 servo drives

Drive characteristics

Switching frequency		**kHz**	4 or 8 depending on rating and associated servo motor. See pages 56 to 78

Electrical power characteristics

Power supply	Voltage	**V**	100 - 15%...120 + 10% single phase for LXM 05●D10F1…D28F1 200 - 15%...240 + 10% single phase for LXM 05●D10M2...D28M2 200 - 15%...240 + 10% three-phase for LXM 05●D10M3X...D42M3X 380 - 15%...480 + 10% three-phase for LXM 05●D14N4...D57N4
	Frequency	**Hz**	50 - 5%...60 + 5%
	Transient overvoltage		Overvoltage category III
	Inrush current	**A**	< 60
	Leakage current	**mA**	< 30
External 24 V ⎓ power supply (not provided) *(1)*	Input voltage	**V**	24 (-15 / +20%)
	Input current (no-load)	**A**	1
	Ripple		⩽ 5%
Signalling			1 red LED: LED lit indicates the presence of servo drive voltage
Output voltage			Maximum three-phase voltage equal to line supply voltage
Electrical isolation			Between power and control sections (inputs, outputs, power supplies)

Connection cable characteristics

Recommended cable type for mounting in an enclosure			Single-strand IEC cable, ambient temperature 45°C, copper 90°C XLPE/EPR or copper 70°C PVC

Connection characteristics (terminals for the power supply, the DC bus, and the servo motor)

Servo drive terminals		**R/L1, S/L2, T/L3 (power supply)**	**PA/+, PBI, PBe (external braking resistor)**	**U/T1, V/T2, W/T3 (servo motor)**
Maximum wire size and tightening torque for the power supply, servo motor, braking resistor and DC bus terminals	LXM 05●D10F1 LXM 05●D10M2 LXM 05●D10M3X	2.5 mm² (AWG 14) 0.8 Nm	2.5 mm² (AWG 14) 0.8 Nm	See characteristics of VW3 M5 10● R●●● cables on page 79
	LXM 05●D17F1 LXM 05●D17M2 LXM 05●D17M3X LXM 05●D14N4	6.0 mm² (AWG 10) 1.2 Nm	6.0 mm² (AWG 10) 1.2 Nm	
	LXM 05●D28F1 LXM 05●D22N4 LXM 05●D28M2 LXM 05●D42M3X LXM 05●D34N4	6.0 mm² (AWG 10) 1.2 Nm	6.0 mm² (AWG 10) 1.2 Nm	
	LXM 05●D57N4	16.0 mm² (AWG 6) 2.2 Nm	16.0 mm² (AWG 6) 2.2 Nm	

(1) Please consult our specialist catalogue “Interfaces, I/O splitter boxes and power supplies”.

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Lexium 05 motion control

Lexium 05 servo drives

Control signal characteristics

Protection	Inputs		Against reverse polarity
	Outputs		Against short-circuits
Electrical link			Presence of an electrical link on the 0 V ⎓
24 V ⎓ I/O logic			Positive or negative (default: positive)
Logic inputs			
	Number		4
	Power supply	**V ⎓**	24
	Sampling period	**ms**	0.25
	Debounce filtering	**ms**	1
	Positive logic *(Sink)*		State 0 if < 5 V or input not wired, state 1 if > 15 V Logic inputs conforming to standard IEC/EN 61132-2 type 1
	Negative logic *(Source)*		State 0 if > 19 V or logic input not wired, state 1 if < 9 V
Safety inputs PWRR_A, PWRR_B			
	Type		Inputs for the "Power Removal" safety function
	Number		2
	Power supply	**V ⎓**	24
	Input filtering	**ms**	1
	Response time	**ms**	⩽ 10
	Positive logic *(Sink)*		State 0 if < 5 V or input not wired, state 1 if > 15 V Logic inputs conforming to standard IEC/EN 61132-2 type 1
Logic outputs			
	Type		24 V ⎓ logic outputs: positive logic (Source) or negative logic (Sink)
	Number		2
	Output voltage	**V**	⩽ 30, conforming to standard IEC/EN 61131-2
	Sampling period	**ms**	1
	Max. breaking current	**mA**	50
	Voltage drop	**V**	1 (at 50 mA load)

Analog inputs *(1)*

			ANA1+/ANA1-	ANA2+/ANA2-
	Resolution	**bit**	14	
	Range		Differential ± 10 V	
	Input resistance	**kΩ**	⩾ 10	
	Sampling period	**µs**	250	
	Absolute error		Less than ±1%, less than ±2% over the temperature range	
	Linearity		Less than ±0.5%	

Pulse/direction, A/B encoder signals			
Type			RS 422 link
Common mode range		**V**	- 7...+ 12
Input resistance		**kΩ**	5
Input frequency	Pulse/direction	**kHz**	⩽ 200
	A/B signals	**kHz**	⩽ 400
ESIM (encoder emulation) output signals			
Logic level			RS 422 link
Output frequency		**kHz**	⩽ 450
Servo motor encoder feedback signals			
Voltages	Encoder power supply	**V**	+ 10 /100 mA
	SinCos input signals	**V**	1 V_{SS} with 2.5 V offset 0.5 V_{SS} at 100 kHz
Input resistance		**Ω**	120

Operational safety characteristics

Protection	Of the machine		“Power Removal” (PWR) safety function which forces stopping and/or prevents unintended operation of the servo motor, conforming to EN 954-1 category 3 and draft standard IEC/EN 61800-5-2
	Of the system process		“Power Removal” (PWR) safety function which forces stopping and/or prevents unintended operation of the servo motor, conforming to IEC/EN 61508 level SIL2 and draft standard IEC/EN 61800-5-2

(1) Only available on LXM 05AD●●●●● servo drives.

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Lexium 05 motion control

Lexium 05 servo drives

Communication port characteristics

CANopen protocol, LXM 05AD●●●●● servo drives

Structure	Connectors	RJ45 (labelled CN4) or spring terminals (labelled CN1)
	Network management	Slave
	Transmission speed	125 kbps, 250 kbps, 500 kbps or 1 Mbps
	Address (Node ID)	1 to 127, configurable via the display terminal or the PowerSuite software workshop
	Polarization	Line termination impedances are integrated in the servo drive and are switchable
Services	PDO	Implicit exchange of PDO (Process Data Objects): ■ 3 PDO conforming to DSP 402 modes (position control and speed profile modes) ■ 1 configurable mapping PDO
	PDO modes	Event-triggered, Time-triggered, Remotely-requested, Sync (cyclic), Sync (acyclic)
	PDO mapping	1 configurable PDO
	Number of SDO	Explicit exchange of SDO (Service Data Objects): ■ 2 receive SDO ■ 2 transmit SDO
	Emergency	Yes
	Profile	CiA DSP 402: CANopen “Device Profile Drives and Motion Control” Position control and speed profile modes
	Communication monitoring	Node guarding, heartbeat
Diagnostics	Using LEDs	2 LEDs: “RUN” and “ERROR” on integrated 7-segment display terminal Display of faults Full diagnostics with the PowerSuite software workshop
Description file		A single eds file for the whole range is supplied on the documentation CD-ROM. This file contains the description of the servo drive parameters

Modbus Protocol, LXM 05●D●●●●● servo drives

Structure	Connector	RJ45 (labelled CN4)
	Physical interface	2-wire RS 485 multidrop
	Transmission mode	RTU
	Transmission speed	Configurable via the display terminal or the PowerSuite software workshop: 9600, 19200, or 38400 bps
	Format	Configurable via the display terminal or the PowerSuite software workshop: ■ 8 bits, odd parity, 1 stop ■ 8 bits, even parity, 1 stop ■ 8 bits, no parity, 1 stop ■ 8 bits, no parity, 2 stop
	Polarization	No polarization impedances These must be provided by the wiring system (for example, in the master)
	Number of servo drives	31 Lexium 05 servo drives maximum
	Address	1 to 247, configurable via the display terminal or the PowerSuite software workshop.
Services	Messaging	Read Holding Registers (03) 63 words maximum Write Single Register (06) Write Multiple Registers (16) 61 words maximum Read/Write Multiple Registers (23) 63/59 words maximum Read Device Identification (43) Diagnostics (08)
	Communication monitoring	Monitoring function (node guarding) can be activated “Time out” can be set between 0.1 s and 10s
Diagnostics		Display of faults on integrated 7-segment display terminal

Profibus DP protocol, LXM 05BD●●●●● servo drives

Structure	Connector	Spring terminals (labelled CN1)
	Physical interface	2-wire RS 485 multidrop
	Transmission speed	9600 bps, 19.2 kbps, 45.45 kbps, 93.75 kbps, 187.5 kbps, 500 kbps, 1.5 Mbps, 3 Mbps, 6 Mbps or 12 Mbps
	Address	1 to 126, configurable via the integrated 7-segment display terminal or the PowerSuite software workshop
Services	Periodic variables	PPO type 2 8 PKW bytes 12 Process Data bytes
	Communication monitoring	Can be inhibited “Time out” can be set via the Profibus DP network configurator
Diagnostics		Two LEDs: RUN and ERR Display of faults on integrated 7-segment display terminal Full diagnostics with the PowerSuite software workshop
Description file		A single gsd file for the whole range is supplied on the documentation CD-ROM. This file does not contain the description of the servo drive parameters

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Lexium 05 motion control

Lexium 05 servo drives

LXM 05●D10F1
LXM 05●D10M2
LXM 05●D10M3X

LXM 05●D17F1
LXM 05●D17M2
LXM 05●D17M3X
LXM 05●D14N4

LXM 05●D28F1
LXM 05●D28M2
LXM 05●D42M3X
LXM 05●D22N4
LXM 05●D34N4

LXM 05●D57N4

Lexium 05 servo drives

Output current				Nominal power	Line current		Max. prospective line Isc	Reference *(1)*	Weight
Continuous (RMS)		Peak (RMS) *(2)*							
at 4 kHz	at 8 kHz	at 4 kHz	at 8 kHz	at 4 kHz	at U1 *(3)*	at U2 *(3)*			
A	A	A	A	kW	A	A	kA		kg
Single-phase supply voltage: 110…120 V ∿ *(3)* 50/60 Hz, with integrated EMC filter									
4	3.2	7	6	0.4	7.6	7	1	**LXM 05AD10F1**	1.100
8	7	12	11	0.65	11.5	10.5	1	**LXM 05AD17F1**	1.400
15	13	20	20	0.85	22.6	20.7	1	**LXM 05AD28F1**	2.000
Single-phase supply voltage: 200…240 V ∿ *(3)* 50/60 Hz, with integrated EMC filter									
4	3.2	7	6	0.75	8.1	6.7	1	**LXM 05AD10M2**	1.100
8	7	12	11	1.2	12.7	10.5	1	**LXM 05AD17M2**	1.400
15	13	20	20	2.5	23	19.2	1	**LXM 05AD28M2**	2.000
Three-phase supply voltage: 200…240 V ∿ *(3)* 50/60 Hz, without integrated EMC filter									
4	3.2	7	6	0.75	5.2	4.3	5	**LXM 05AD10M3X**	1.100
8	7	12	11	1.4	9	7.5	5	**LXM 05AD17M3X**	1.300
17	15	30	30	3.2	19	15.8	5	**LXM 05AD42M3X**	1.900
Three-phase supply voltage: 380…480 V ∿ *(3)* 50/60 Hz, with integrated EMC filter									
6	5	10	7.5	1.4	4.2	3.3	5	**LXM 05AD14N4**	1.400
9	7	16	14	2	6.3	5	5	**LXM 05AD22N4**	2.000
15	11	24	18	3	9.7	7.7	5	**LXM 05AD34N4**	2.000
25	20	40	30	6	17.7	14	22	**LXM 05AD57N4**	4.800

(1) References for models with Profibus DP communication: replace **LXM 05A** *with* **LXM 05B** *at the beginning of the reference.*
(2) Maximum value for 3 seconds.
(3) Nominal supply voltage, min. U1, max. U2: 110 (U1)…120 V (U2), 200 (U1)…240 V (U2), 380 (U1)…480 V (U2).

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Lexium 05 motion control

Lexium 05 servo drives

VW3 A31101

Separate parts

The Lexium 05 servo drive can be connected to a remote display terminal. The remote display terminal can be mounted on the door of an enclosure with IP 65 protection on the front panel.
The terminal provides access to the same functions as the integrated display and keypad on the servo drive. It can be used to:

- Configure, adjust and control the servo drive remotely
- Provide a remote display

Description	Use	Reference	Weight kg
Remote display terminal	For all Lexium 05. Kit comprising: ■ Display terminal, 5 m cable equipped with 2 connectors ■ Seal and screws for IP 65 mounting on an enclosure door	**VW3 A31101**	0.380
Plates for mounting on ⌴ rail width 35 mm	For LXM 05●D10F1/M2/M3X	**VW3 A11851**	0.200
	For LXM 05●D17F1/M2/M3X and LXM 05●D14N4	**VW3 A31852**	0.220

Connectors

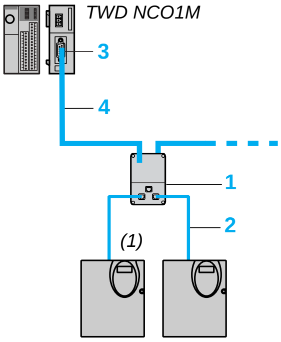
Description		Reference	Weight kg
Molex connectors	10-way female connectors for CN5	**VW3 M8 212**	–
(order in multiples of 5)	12-way female connectors for CN2	**VW3 M8 213**	–

Documentation

Description		Reference	Weight kg
Simplified Lexium 05 user's manual and CD-ROM, containing: ■ A variables user's manual ■ A Modbus and CANopen user's manual ■ A Profibus DP user's manual	Supplied with the Lexium 05 servo drive	–	–

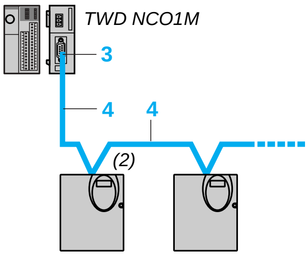
Note: *The manuals and quick reference guides for servo drives and servo motors are available on the website: www.telemecanique.com.*

Twido

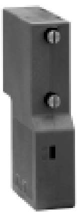


Connection to Lexium 05AD via RJ45 connector (CN4)

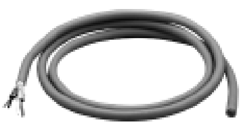
Twido



Connection to Lexium 05AD via spring terminals (CN1)

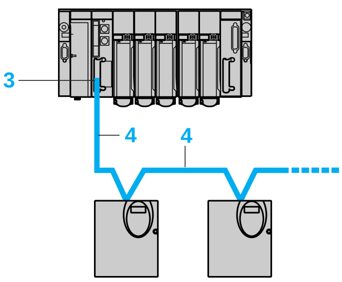


TSX CAN KCDF 90T



TSX CAN CA/CB/CD

Premium



Connection to Lexium 05BD via spring terminals (CN1)

CANopen machine bus

The Lexium 05AD servo drive can be connected directly to the CANopen machine bus via spring terminals, or using an RJ45 connector (which supports the CANopen and Modbus protocols).
The communication function provides access to the servo drive's configuration, adjustment, control and monitoring functions.
Each servo drive incorporates line terminators that can be disconnected via a switch.

Connection via RJ45 connector (CN4)

Designation	Description	Item no.	Reference	Weight kg
IP 20 junction box	2 RJ45 ports	1	**VW3 CAN TAP2**	0.480

Designation	Description	Length m	Item no.	Reference	Weight kg
Cables for CANopen bus	2 RJ45 connectors	0.3	2	**VW3 CAN CARR03**	0.050
		1	2	**VW3 CAN CARR1**	0.500

Connection via terminals (CN1)

Designation	Description	Item no.	Reference	Weight kg
CANopen IP 20 SUB-D connector (controller side)	90° angled female 9-way SUB-D. Switch for line terminator	3	**TSX CAN KCDF90 T**	0.046

CANopen cables *(3)*

Description	Length m	Item no.	Reference	Weight kg
Standard cables, CE marking Low smoke emission, halogen-free Flame retardant (IEC 60332-1)	50	4	**TSX CAN CA 50**	4.930
	100	4	**TSX CAN CA 100**	8.800
	300	4	**TSX CAN CA 300**	24.560
UL certification, CE marking Flame retardant (IEC 60332-2)	50	4	**TSX CAN CB 50**	3.580
	100	4	**TSX CAN CB 100**	7.840
	300	4	**TSX CAN CB 300**	21.870
Cable for harsh environments *(4)* or mobile installations, CE marking Low smoke emission, halogen-free Flame retardant (IEC 60332-1)	50	4	**TSX CAN CD 50**	3.510
	100	4	**TSX CAN CD 100**	7.770
	300	4	**TSX CAN CD 300**	21.700

Profibus DP fieldbus

The Lexium 05BD servo drive can be connected directly to the Profibus DP bus via spring terminals.
The communication function provides access to the same functions as those described for CANopen.

Cables

Designation	Length m	Item no.	Reference	Weight kg
Profibus DP trunk cables	**100**	4	**TSX PBS CA 100**	–
	400	4	**TSX PBS CA 400**	–

(1) RJ45 connector CN4
(2) Spring terminals CN1, terminals 21, 22, 23.
(3) For other CANopen bus connection accessories, please consult our catalogue "Machines & installations with CANopen".
(4) Harsh environment:
- *Resistance to hydrocarbons, industrial oils, detergents, solder splashes*
- *Relative humidity up to 100%*
- *Saline atmosphere*
- *Significant temperature variations*
- *Operating temperature between - 10°C and + 70°C*

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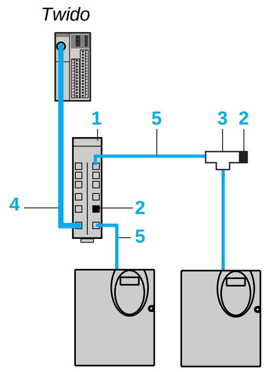


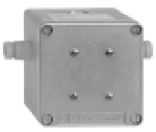
Lexium 05AD connection via RJ45 connector (CN4)

Modbus serial link

The Lexium 05 servo drive can be connected directly to Modbus using an RJ45 connector (which supports the Modbus and CANopen protocols).
The communication function provides access to the servo drive's configuration, adjustment, control and monitoring functions.

Connection accessories

Description	Length m	Item no.	Unit reference	Weight kg
Junction box 3 screw terminals, RC line terminator. To be connected using cable VW3 A8 306 D30	–	–	**TSX SCA 50**	0.520
Subscriber socket 2 15-way female SUB-D connectors and 2 screw terminals, RC line terminator. To be connected using cable VW3 A8 306	–	–	**TSX SCA 62**	0.570
Modbus splitter block 10 RJ45 connectors and 1 screw terminal	–	1	**LU9 GC3**	0.500
Modbus line terminator (2) – For RJ45 – R = 120 Ω, C = 1 nf	–	2	**VW3 A8 306 RC**	0.200
For RJ45 – R = 150 Ω	–	2	**VW3 A8 306 R**	0.200
For screw terminals – R = 120 Ω, C = 1 nf	–	–	**VW3 A8 306 DRC**	0.200
For screw terminals – R = 150 Ω	–	–	**VW3 A8 306 DR**	0.200
Modbus RJ45 T-junction boxes (with integrated cable)	0.3	3	**VW3 A8 306 TF03**	0.190
	1	3	**VW3 A8 306 TF10**	0.210
Cable for Twido controller serial link 1 mini-DIN connector, 1 RJ45 connector	0.3	4	**TWD XCA RJ 003**	–
	1	4	**TWD XCA RJ 010**	0.090
	3	4	**TWD XCA RJ 030**	0.160


TSX SCA50


TSX SCA62

Connection cables

Description	Connectors	Length m	Item no.	Reference	Weight kg
Cables for Modbus connection	1 RJ45 connector and one end with flying leads	3	–	**VW3 A8 306 D30**	0.150
	1 RJ45 connector and 1 15-way male SUB-D connector for TSX SCA 62	3	–	**VW3 A8 306**	0.150
	2 RJ45 connectors	0.3	5	**VW3 A8 306 R03**	0.050
		1	5	**VW3 A8 306 R10**	0.050
		3	5	**VW3 A8 306 R30**	0.150
RS 485 double shielded twisted pair Modbus cables	Supplied without connector	100	–	**TSX CSA 100**	5.680
		200	–	**TSX CSA 200**	10.920
		500	–	**TSX CSA 500**	30.000


LU9 GC3

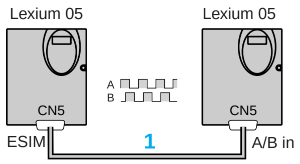
(1) For connections for other PLCs, please consult our specialist automation product catalogues.
(2) Sold in lots of 2.

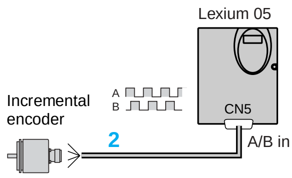
Lexium 05 servo drives

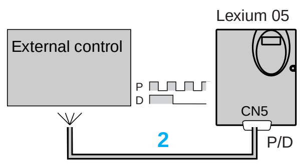
Equipped cables for Modicon Premium motion control modules (1)

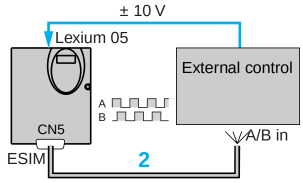
From	To	Length m	Reference	Weight kg
Lexium 05 servo drive Simulated incremental encoder feedback interface	TSX CAY ●● Premium module, encoder input. *Cables equipped with a 10-way Molex connector on the Lexium 05 side (CN5), and a 15-way SUB-D connector on the TSX CAY ●● side*	0.5	**VW3 M8 203 R05**	0.020
		1.5	**VW3 M8 203 R15**	0.030
		3	**VW3 M8 203 R30**	0.040
		5	**VW3 M8 203 R50**	0.050
TSX CFY ●● Premium module	Lexium 05 servo drive, pulse/direction interface *Cables equipped with a 10-way Molex connector on the Lexium 05 side (CN5), and a 15-way SUB-D connector on the TSX CFY ●● side*	0.5	**VW3 M8 204 R05**	0.020
		1.5	**VW3 M8 204 R15**	0.030
		3	**VW3 M8 204 R30**	0.040
		5	**VW3 M8 204 R50**	0.050

Equipped cables for RS 422 control









From	To	Length m	Item no.	Reference	Weight kg
Lexium 05 servo drive	Lexium 05 servo drive, master/slave connection *Cables equipped at both ends with a 10-way Molex connector for CN5*	0.5	1	**VW3 M8 202 R05**	0.025
		1.5	1	**VW3 M8 202 R15**	0.035
		3	1	**VW3 M8 202 R30**	0.045
		5	1	**VW3 M8 202 R50**	0.055
External encoder, **external control**	Lexium 05 servo drive (CN5 A/B input) (CN5 pulse/direction input)	0.5	2	**VW3 M8 201 R05**	0.020
		1.5	2	**VW3 M8 201 R15**	0.030
Lexium 05 servo drive	External or other type of control *Cables equipped at one end with a 10-way Molex connector for CN5, and flying leads at the other end*	3	2	**VW3 M8 201 R30**	0.040
		5	2	**VW3 M8 201 R50**	0.050

RS 422 interface accessories

VW3 M3 102 (USIC)

Designation	Description	Length m	Reference	Weight kg
Splitter block for encoder signals *(RVA)*	For distributing A/B encoder signals or pulse/direction signals to five Lexium 05 servo drives. Includes a 24 V ⎓ / 5 V power supply for external encoder	–	**VW3 M3 101**	0.700
Cascading cable	For cascading two VW3 M3 101 *(RVA)* splitter blocks	0.5	**VW3 M8 211 R05**	–
RS 422 converter *(USIC)*	For adapting 24 V control signals to RS 422 standard	–	**VW3 M3 102**	–

Equipped cables for RS 422 interface

From	To	Length m	Reference	Weight kg
Lexium 05 servo drive (encoder simulator)	VW3 M3 101 *(RVA)* for ESIM distribution	0.5	**VW3 M8 209 R05**	0.020
Splitter block VW3 M3 101 *(RVA)*	Lexium 05 servo drive, input CN5	1.5	**VW3 M8 209 R15**	0.030
Converter **VW3 M3 102** *(USIC)*	Lexium 05 servo drive, input CN5 *Cables equipped with a 10-way Molex connector on the Lexium 05 side (CN5), and a 15-way SUB-D connector on the VW3 M3 10● side*	3	**VW3 M8 209 R30**	0.040
		5	**VW3 M8 209 R50**	0.050

(1) For other Modicon Premium connection cables, please consult our catalogue.

Note: *ESIM (Encoder SIMulation) designates encoder output signals simulated by the servo drives (available on Lexium 05 CN5, configured as output).*

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Other connection cables

Description		Length m	Reference	Weight kg
Pulse/direction control cables	Siemens S5 IP 247 to Lexium 05	3	**VW3 M8 205 R30**	–
	Siemens S5 IP 267 to Lexium 05	3	**VW3 M8 206 R30**	–
	Siemens S7 FM 353 to Lexium 05 *Cables equipped with a 10-way Molex connector on the Lexium 05 side (CN5), and a 9-way SUB-D connector on the other end*	3	**VW3 M8 207 R30**	–
Encoder feedback cable	Lexium 05 to Siemens S7 FM 354 *Cable equipped with a 10-way Molex connector on the Lexium 05 side (CN5), and a 15-way SUB-D connector on the FM 354 side*	3	**VW3 M8 208 R30**	–
PLC to VW3 M3 102 cables *(USIC)*	For pulse/direction signals *Cable equipped with a 15-way SUB-D connector on the VW3 M3 102 (USIC) side, and flying leads at the other end*	0.5	**VW3 M8 210 R05**	–
		1.5	**VW3 M8 210 R15**	–
		3	**VW3 M8 210 R30**	–
		5	**VW3 M8 210 R50**	–

Lexium 05 motion control

Lexium 05 servo drives
Option: braking resistors

Braking resistors

Internal braking resistor

A braking resistor is built into the servo drive to absorb the braking energy. If the DC bus voltage in the servo drive exceeds a specified value, this braking resistor is activated. The restored energy is converted into heat by the braking resistor.

External braking resistor

An external braking resistor is necessary for applications in which the servo motor has to be braked frequently and the internal braking resistor cannot dissipate the excess braking energy.

If an external braking resistor is used, the internal braking resistor must be deactivated. To do this, the shunt between PA/+ and PBI must be removed and the external braking resistor connected between PA/+ and PBE (see page 41).

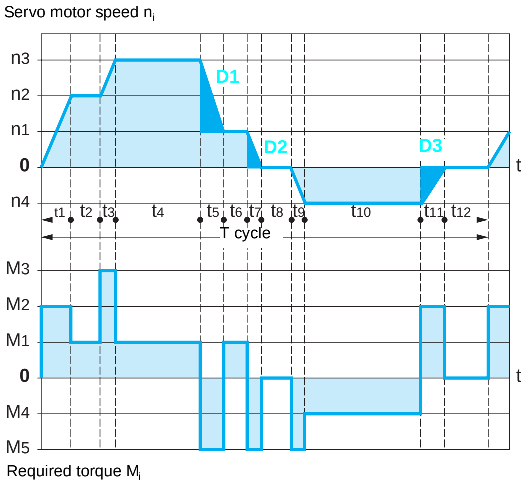
Two or more external braking resistors can be connected in parallel. The servo drive monitors the power dissipated in the braking resistor.

Sizing the braking resistor

During braking or deceleration requested by the servo drive, the kinetic energy of the moving load must be absorbed by the servo drive. The energy generated by deceleration charges the capacitors integrated in the servo drive. When the voltage at the capacitor terminals exceeds the permitted threshold, the braking resistor (internal or external) will be activated automatically in order to dissipate this energy. In order to calculate the power to be dissipated by the braking resistor, the user needs a knowledge of the timing diagram giving the servo motor torques and speeds as a function of time in order to identify the curve segments in which the servo drive decelerates the load.

Servo motor cycle timing diagram

These curves are the same as those used on page 92 for selecting the size of the servo motor. The curve segments to be taken into account, when the servo drive is decelerating, are marked in blue by D_i.



Sizing the braking resistor (continued)

Calculation of the constant deceleration energy

To do this, the user must know the total inertia, defined as follows:
J_t: Total inertia
where:
J_t = Jm (servo motor inertia) + Jc (load inertia). For Jm, see pages 56 to 78.
The energy E_i of each deceleration segment is defined as follows:

$$E_i = \frac{1}{2}J_t \cdot \omega_i^2 = \frac{1}{2}J_t \cdot \left(\frac{2\pi n_i}{60}\right)^2$$

Which gives the following for the various segments:

$$E_1 = \frac{1}{2}J_t \cdot \left(\frac{2\pi[n_3 - n_1]}{60}\right)^2$$

$$E_2 = \frac{1}{2}J_t \cdot \left(\frac{2\pi n_1}{60}\right)^2$$

$$E_3 = \frac{1}{2}J_t \cdot \left(\frac{2\pi n_4}{60}\right)^2$$

where E_i is in joules, J_t in kgm^2, ω in radians and n_i in rpm.

Energy absorbed by the internal capacitor

The energy absorption capacity of the servo drive **Edrive** (without using an internal or external braking resistor) is given for each servo drive on page 24.
In the remainder of the calculation, only take account of the D_i segments, for which the energy E_i is greater than the absorption capacities given in the table opposite.
This additional energy E_{Di} must be dissipated in the resistor (internal or external):
$E_{Di} = E_i - Edrive$ (in joules).

Calculation of the continuous power

The continuous power Pc is calculated for each machine cycle:

$$Pc = \frac{\Sigma E_{Di}}{Tcycle}$$

where **Pc** is in W, E_{Di} in joules and **T cycle** in s.

Selecting the braking resistor (internal or external)

Note: *This is a simplified selection method. In extreme applications, for example with vertical axes, this method is inadequate. In this case, please consult your Regional Sales Office.*

The selection is carried out in two steps:

1 The maximum energy during a braking procedure must be less than the peak energy that can be absorbed by the internal braking resistor: $E_{Di} < EPk$ and the continuous power of the internal braking resistor must in turn not exceed: $Pc < PPr$. If these conditions are met, the internal braking resistor is adequate.

2 If one of the above conditions is not met, an external braking resistor must be used to satisfy these conditions.
The value of the external braking resistor must be between the minimum and maximum values given in the table. Otherwise the servo drive may be subject to disturbance and the load will no longer be braked safely.

Lexium 05 motion control

Lexium 05 servo drives

Option: braking resistors

Characteristics

			LXM 05●	D10F1	D17F1	D28F1	D10M2	D17M2	D28M2	D10M3X	D17M3X	D42M3X
Supply voltage			**V**	115			230			230		
Number of phases				Single-phase						Three-phase		
Load threshold			**V ⎓**	250			430			430		
Energy absorption of the internal capacitors		Edrive	**Joule (Ws)**	10.8	16.2	26	17.7	26.6	43	17.7	26.6	43
Internal resistor	Resistance		Ω	40		10	40		20	40		20
	Continuous power	PPr	**W**	20	40	60	20	40	60	20	40	60
	Peak energy	EPk	**Joule (Ws)**	500		1000	900		1600	900		1600
External resistor	Min. resistance		Ω	27	20	10	50	27	16	50	27	10
	Max. resistance		Ω	45	27	20	75	45	27	75	45	20
	Degree of protection			IP 65								

			LXM 05●	D14N4		D22N4		D34N4		D57N4	
Supply voltage			**V**	400	480	400	480	400	480	400	480
Number of phases				Three-phase							
Load threshold			**V ⎓**	780							
Energy absorption of the internal capacitors		Edrive	**Joule (Ws)**	26	6	52	12	52	12	104	10
Internal resistor	Resistance		Ω	40		30				20	
	Continuous power	PPr	**W**	40		60				100	
	Peak energy	EPk	**Joule (Ws)**	1000		1600				2000	
External resistor	Min. resistance		Ω	60		25				10	
	Max. resistance		Ω	80		36				21	
	Degree of protection			IP 65							

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Lexium 05 motion control

Lexium 05 servo drives

Option: braking resistors

VW3 A7 60● R●●

References

External braking resistors

Value	Continuous power PPr	Peak energy EPk 115 V	230 V	400 V	Length of connection cable	Reference	Weight
W	W	Ws	Ws	Ws	m		kg
10	400	18800	13300	–	0.75	**VW3 A7 601 R07**	1.420
					2	**VW3 A7 601 R20**	1.470
					3	**VW3 A7 601 R30**	1.620
27	100	4200	3800	1900	0.75	**VW3 A7 602 R07**	0.630
					2	**VW3 A7 602 R20**	0.780
					3	**VW3 A7 602 R30**	0.900
	200	9700	7400	4900	0.75	**VW3 A7 603 R07**	0.930
					2	**VW3 A7 603 R20**	1.080
					3.00	**VW3 A7 603 R30**	1.200
	400	25500	18100	11400	0.75	**VW3 A7 604 R07**	1.420
					2	**VW3 A7 604 R20**	1.470
					3	**VW3 A7 604 R30**	1.620
72	100	5500	3700	3000	0.75	**VW3 A7 605 R07**	0.620
					2	**VW3 A7 605 R20**	0.750
					3	**VW3 A7 605 R30**	0.850
	200	14600	9600	7600	0.75	**VW3 A7 606 R07**	0.930
					2	**VW3 A7 606 R20**	1.080
					3	**VW3 A7 606 R30**	1.200
	400	36500	24700	18300	0.75	**VW3 A7 607 R07**	1.420
					2	**VW3 A7 607 R20**	1.470
					3	**VW3 A7 607 R30**	1.620

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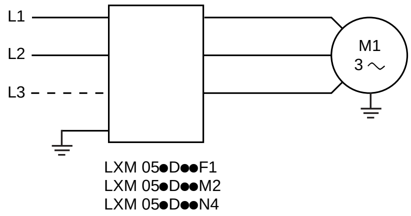
Lexium 05 motion control

Lexium 05 servo drives

Option: additional EMC input filters

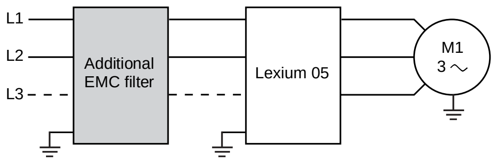


Integrated EMC input filter

Function

Lexium 05 LXM 05●D●●F1/M2/N4 servo drives have built-in radio interference input filters to comply with the EMC standard for variable speed electrical power drive "products" IEC/EN 61800-3, edition 2, category C3 in environment 2, and to comply with the European directive on EMC (electromagnetic compatibility).

For Lexium 05 servo drive	Maximum servo motor cable length according to EMC category
	IEC 61800-3, category C3 in environment 2
	Switching frequency 4 kHz (default)
	m
Single-phase supply voltage	
LXM 05AD10F1	10
LXM 05AD10M2	10
LXM 05AD17F1	10
LXM 05AD17M2	10
LXM 05AD28F1	10
LXM 05AD28M2	10
Three-phase supply voltage	
LXM 05AD14N4	10
LXM 05AD22N4	10
LXM 05AD34N4	10
LXM 05AD57N4	10



Additional EMC input filters

Applications

Additional filters can be used to meet more stringent requirements: these filters are designed to reduce conducted emissions on the line supply below the limits of standard IEC 61800-3 edition 2 categories C2 and C3. These additional filters are mounted either underneath the Lexium 05 servo drives, or to the side of the product. They act as a support for the drives and are attached to them via tapped holes.

For servo drives that are not equipped with an EMC filter, reference LXM 05●D●●M3X, an additional EMC filter must be provided.

Use according to the type of line supply

These built-in or additional filters can only be used on TN (neutral connection) and TT (neutral to earth) type supplies.

The filters must not be used on IT (impedance or isolated neutral) type supplies. For LXM 05●D●●F1/M2/N4 servo drives with integrated filter, the filter must be disconnected using the selector switch on the servo drive (see page 45).

Standard IEC/EN 61800-3, appendix D2.1, states that on IT (isolated or impedance earthed neutral) type supplies, filters can adversely affect the operation of the insulation monitors. In addition, the effectiveness of additional filters on this type of line supply depends on the type of impedance between neutral and earth, and therefore cannot be predicted.

Note: *If a machine is to be installed on an IT supply, one solution is to insert an isolation transformer in order to re-create a TT system on the secondary side.*

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Schemes:
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Lexium 05 motion control

Lexium 05 servo drives

Option: additional EMC input filters

Characteristics of servo drive/EMC filter mounting

Conformity to standards			EN 133200
Degree of protection			IP 41 on the upper part with protective cover in place IP 20 after removal of the protective cover (see page 48)
Relative humidity			According to IEC 60721-3-3, class 3K3, 5% to 85%, without condensation or dripping water
Ambient temperature around the device	Operation	°C	- 10…+ 50
	Storage	°C	- 25…+ 70
Altitude		m	1000 m without derating Up to 2000 m under the following conditions: ■ Max. temperature 40°C ■ Mounting distance between servo drives > 50 mm ■ Removal of the protective cover
Vibration resistance	Conforming to IEC 60068-2-6		10 Hz to 57 Hz: amplitude 0.075 mm 57 Hz to 150 Hz: 1 g
Shock resistance	Conforming to IEC 60068-2-27		15 gn for 11 ms
Maximum nominal voltage	Single-phase 50/60 Hz	V	120 + 10% 240 + 10%
	Three-phase 50/60 Hz	V	240 + 10% 480 + 10%

Application, category: EN 61800-3: 2001-02; IEC 61800-3, Ed. 2	Description
Category C2 in environment 1	Restricted distribution, for domestic use, sale conditioned by the competence of the user and the distributor on the subject of EMC compatibility
Category C3 in environment 2	Use in industrial premises

References

VW3 A31402

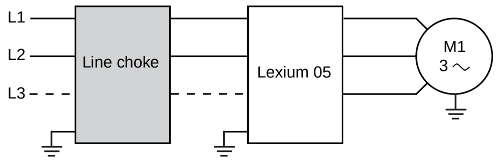
Additional EMC input filters

For Lexium 05 servo drive	Maximum servo motor cable length according to EMC category, IEC 61800-3 — Category C2 in environment 2 — Switching frequency 4 kHz (default)	Category C3 in environment 2 — Switching frequency 4 kHz (default)	Category C3 in environment 2 — Switching frequency 8 kHz	Reference	Weight
	m	m	m		kg
Single-phase supply voltage					
LXM 05●D10F1 **LXM 05●D10M2**	20	40	100	**VW3 A31401**	0.600
LXM 05●D17F1 **LXM 05●D17M2**	20	40	100	**VW3 A31403**	0.775
LXM 05●D28F1 **LXM 05●D28M2**	20	40	100	**VW3 A31405**	1.130
Three-phase supply voltage					
LXM 05●D10M3X	20	40	100	**VW3 A31402**	0.550
LXM 05●D17M3X **LXM 05●D14N4**	20	40	100	**VW3 A31404**	0.900
LXM 05●D42M3X **LXM 05●D22N4** **LXM 05●D34N4**	20	40	100	**VW3 A31406**	1.350
LXM 05●D57N4	20	40	100	**VW3 A31407**	3.150

Dimensions: page 32
Schemes: page 41

Lexium 05 motion control
Lexium 05 servo drives
Option: line chokes

Line chokes



A line choke is used to provide improved protection against overvoltages on the line supply and to reduce the current harmonics produced by the servo drive.

The recommended chokes limit the line current.
They have been developed in line with standard EN 50178 (VDE 0160 level 1 high energy overvoltages on the line supply).

The inductance values are defined for a voltage drop of between 3% and 5% of the nominal line voltage. Values higher than this will cause loss of torque.
These chokes must be installed upstream of the servo drive.

A number of servo drives can be used on one line choke. The current consumption of all the servo drives must not exceed the nominal current of the line choke (at nominal voltage).

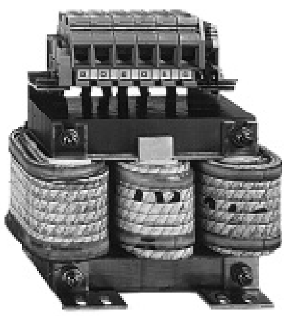
Applications

The use of line chokes is recommended in particular under the following circumstances:
- Close connection of several servo drives in parallel
- Line supply with significant disturbance from other equipment (interference, overvoltages)
- Line supply with voltage imbalance between phases greater than 1.8% of the nominal voltage
- Servo drive supplied by a line with very low impedance (in the vicinity of a power transformer 10 times more powerful than the servo drive rating)
- Installation of a large number of servo drives on the same line
- Reduction of overloads on the cos φ correction capacitors, if the installation includes a power factor correction unit

General characteristics

Type of line choke			VZ1 L007UM50	VZ1 L018UM20	VW3 A4 551	VW3 A4 552	VW3A4 553
Conformity to standards			EN 50178 (VDE 0160 level 1 high energy overvoltages on the line supply)				
Voltage drop			Between 3% and 5% of the nominal supply voltage. Values higher than this will cause loss of torque				
Degree of protection	Choke		IP 00				
	Terminals		IP 20				
Inductance value		**mH**	5	2	10	4	2
Nominal current		**A**	7	18	4	10	16
Losses		**W**	20	30	45	65	75

References



VW3 A4 55●

Line chokes

For LXM 05● servo drive	Line current without choke		Line current with choke		Reference	Weight
	U min.	U max.	U min.	U max.		
	A	A	A	A		kg
Single-phase supply voltage: 100…120 V 50/60 Hz *(1)*						
D10F1	7.6	7.0	5.9	5.4	**VZ1L007UM50**	0.880
D17F1	11.5	10.5	9.7	8.9	**VZ1L018UM20**	1.990
D28F1	15.7	14.4	13.3	12.2		
Single-phase supply voltage: 200…240 V 50/60 Hz *(1)*						
D10M2	8.1	6.7	6.3	5.3	**VZ1L007UM50**	0.880
D17M2	12.7	10.5	10.7	8.9	**VZ1L018UM20**	1.990
D28M2	23.0	19.2	20.2	16.8		
Three-phase supply voltage: 200…240 V 50/60 Hz *(1)*						
D10M3X	5.2	4.2	2.7	2.2	**VW3 A4 551**	1.500
D17M3X	9.0	7.5	5.2	4.3	**VW3 A4 552**	3.000
D42M3X	19.0	15.8	12.2	10.2	**VW3 A4 553**	3.500
Three-phase supply voltage: 380…480 V 50/60 Hz *(1)*						
D10N4	4.2	3.3	2.2	1.8	**VW3 A4 551**	1.500
D22N4	6.3	5.0	3.4	2.7		
D34N4	9.7	7.7	5.8	4.6	**VW3 A4 552**	3.500
D57N4	17.7	14.0	9.8	7.8		

(1) Nominal supply voltage: U min…U max.

Dimensions:
page 32

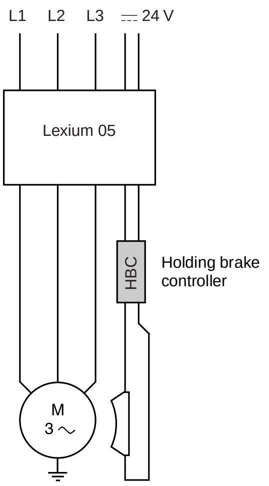
Schemes:
page 41

Lexium 05 motion control

Lexium 05 servo drives

Option: holding brake controller

Holding brake controller



If a servo motor has a holding brake, it must be given an appropriate control logic (HBC, *Holding Brake Controller*), which releases the brake when power is supplied to the servo motor and immobilizes the servo motor shaft when it is stationary.

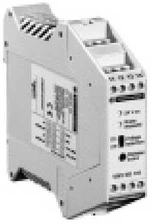
The holding brake controller amplifies the braking control signal transmitted by the Lexium 05 servo drives, so that the brake is deactivated quickly, then reduces the brake control power so as to decrease the dissipated heat.

Characteristics

Mounting on rail				⌐⌙ 55
Degree of protection				IP 20
Supply voltage			**V**	19.2…30
Input current			**A**	0.5 A + brake nominal current
Brake output	Voltages	Before power reduction	**V**	⎓ 23…25
		After power reduction	**V**	⎓ 17…19
	Maximum current		**A**	1.6
	Time before voltage reduction		**ms**	1000

Note: *Electrical isolation between the 24 V power supply, the control input and the brake control output.*

Reference


VW3 M3 103

Holding brake controller

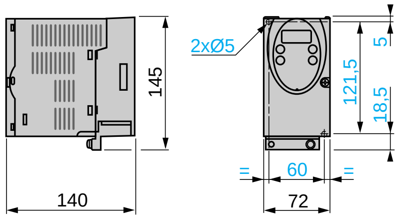
Designation	Description	Reference	Weight kg
Holding brake controller	⎓ 24 V power supply Max. power 50 W IP 20, for mounting on 55 mm ⌐⌙ rail	**VW3 M3 103**	0.600

Dimensions: page 32
Schemes: page 41

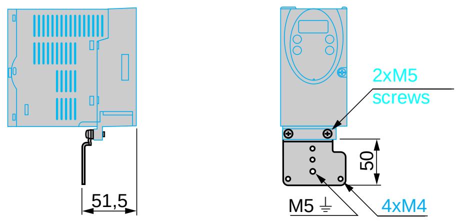
Lexium 05 motion control
Lexium 05 servo drives

Dimensions

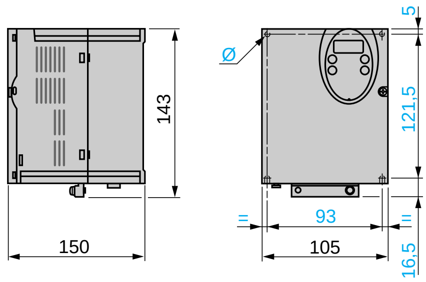
LXM 05●D10F1, LXM 05●D10M2, LXM 05●D10M3X



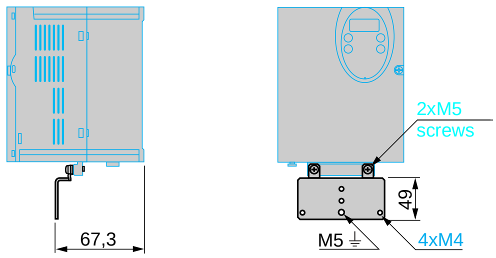
EMC mounting plate (supplied with servo drive)



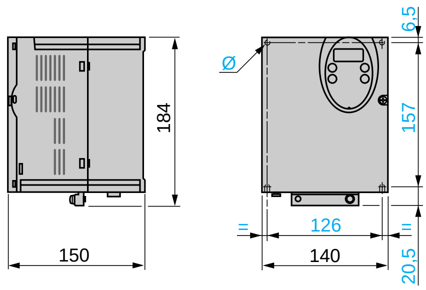
LXM 05●D17F1, LXM 05●D17M2, LXM 05●D14N4, LXM 05●D17M3X



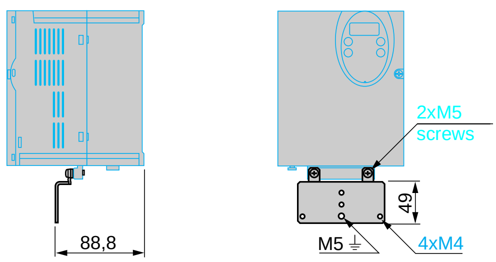
EMC mounting plate (supplied with servo drive)



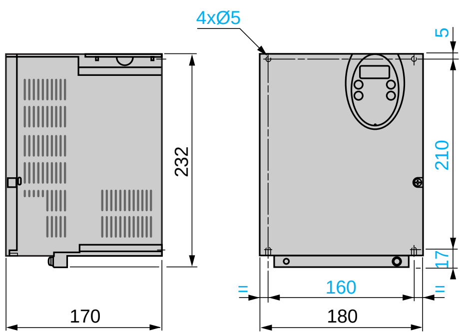
LXM 05●D28F1, LXM 05●D28M2, LXM 05●D34N4, LXM 05●D42M3X



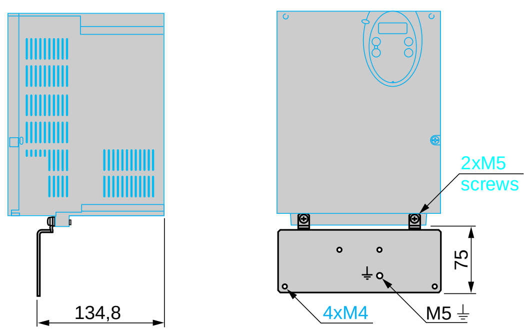
EMC mounting plate (supplied with servo drive)



LXM 05●D57N4



EMC mounting plate (supplied with servo drive)



Presentation: pages 2 and 3
Functions: pages 6 to 11
Characteristics: pages 12 to 15
References: page 16
Schemes: pages 34 to 44

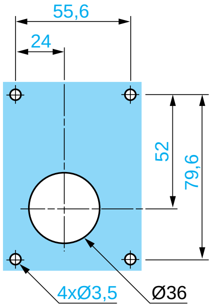
Lexium 05 motion control

Options: remote display terminal, plates for mounting on ⌐⊔⌐ rail and braking resistors

Dimensions (continued)

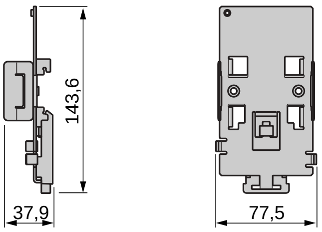
Remote display terminal

VW3 A31101

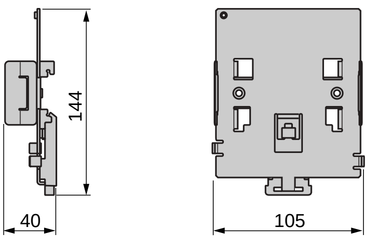


Plates for mounting on ⌐⊔⌐ rail

VW3 A11851

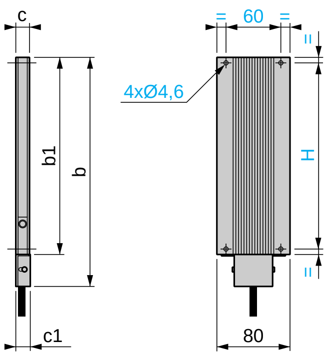


VW3 A31852



Braking resistors

VW3 A7 60● R●●



VW3	b	b1	c	c1	H
A7 602, 605	145	110	15	15.5	98
A7 603, 606	251	216	15	15.5	204
A7 601, 604, 607	257	216	30	–	204

Characteristics:
page 24

References:
pages 17 and 25

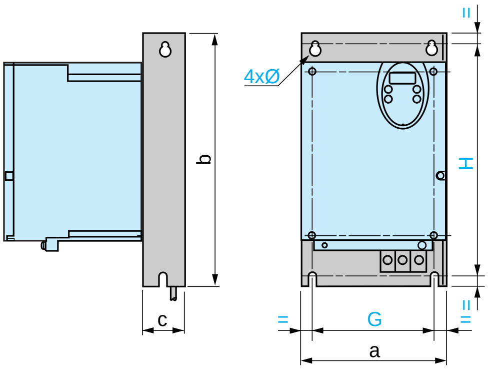
Schemes:
page 41

Lexium 05 motion control
Options: additional EMC input filters and line chokes

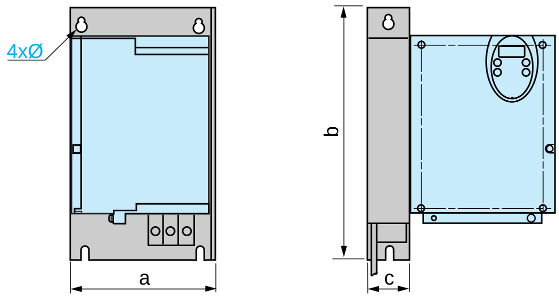
Dimensions (continued)

Additional EMC input filters

Mounting the filter under the servo drive



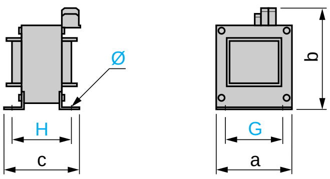
Mounting the filter next to the servo drive



VW3	a	b	c	G	H	Ø
A31401, A31402	72	195	37	52	180	M4
A31403	107	195	35	85	180	M4
A31404	107	195	42	85	180	M4
A31405	140	235	35	120	215	M4
A31406	140	235	50	120	215	M4
A31407	180	305	60	140	285	M4

Single-phase line chokes

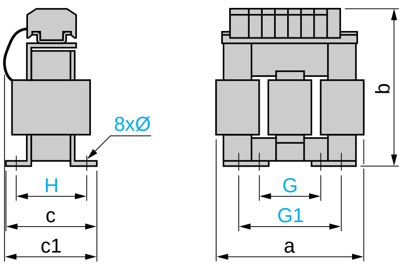
VZ1 L0●●●UM●0



VZ1	a	b	c	G	H	Ø
L007UM50	60	100	95	50	60	4 x 9
L018UM20	85	120	105	70	70	5 x 11

Three-phase line chokes

VW3 A4 55●



VW3	a	b	c	c1	G	G1	H	Ø
A4 551	100	135	55	60	40	60	42	6 x 9
A4 552	130	155	85	90	60	80.5	62	6 x 12
A4 553	130	155	85	90	60	80.5	62	6 x 12

Presentation:
pages 26 and 28
References:
pages 27 and 28
Schemes:
page 41

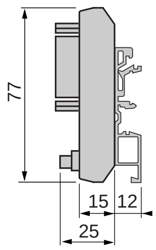
Lexium 05 motion control

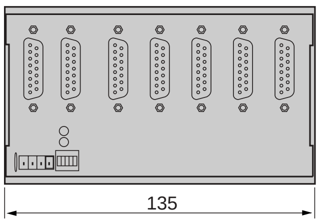
Options: splitter block, USIC and holding brake controller

Dimensions (continued)

Splitter block

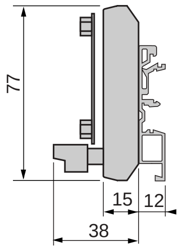
VW3 M3 101

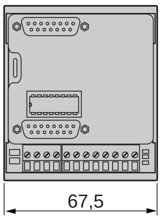




RS 422 converter (USIC)

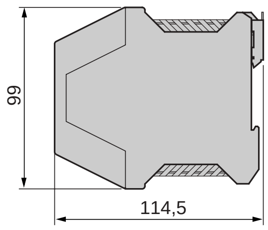
VW3 M3 102

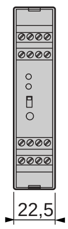




Holding brake controller

VW3 M3 103





References:
pages 20 and 29

Schemes:
page 41

Lexium 05 motion control

Lexium 05 servo drives

Safety requirements

"Power Removal" safety function

The Lexium 05 servo drive integrates the "Power Removal" safety function which prevents unintended operation of the servo motor. The servo motor no longer produces any torque.

This safety function:

- Complies with the standard for safety of machinery EN 954-1, category 3
- Complies with the standard for functional safety IEC/EN 61508, SIL2 capability (safety control-signalling applied to processes and systems)

The SIL (Safety Integrity Level) capability depends on the connection diagram for the servo drive and for the safety function. Failure to observe the setup recommendations could inhibit the SIL capability of the "Power Removal" safety function.

- Complies with draft product standard IEC/EN 61800-5-2 for both stop functions:
  - Safe Torque Off ("STO")
  - Safe Stop 1 ("SS1")

The "Power Removal" safety function has a redundant electronic architecture *(1)* which is monitored continuously by a diagnostics function.

This level SIL2 and category 3 safety function is certified as conforming to these standards by the TUV certification body in the context of a voluntary certification program.

Categories relating to safety according to EN 954-1

Category	Basic safety principle	Control system requirements	Behaviour in the event of a fault
B	Selection of components that conform to relevant standards	Control according to good engineering practice	Possible loss of the safety function
1	Selecting components and safety principles	Use of tried and tested components and proven safety principles	Possible loss of the safety function with a lower probability than in **B**
2	Selecting components and safety principles	Cyclic testing. The intervals between tests must be appropriate to both the machine and its application	Fault detected at each test
3	Structure of the safety circuits	A single fault must not result in loss of the safety function. The fault must be detected if this is reasonably possible	Safety function ensured, except in the event of an accumulation of faults
4	Structure of the safety circuits	A single fault must not result in loss of the safety function. The fault must be detected when or before the safety function is next invoked. An accumulation of faults must not result in loss of the safety function.	Safety function always ensured

The machinery manufacturer is responsible for selecting the safety category. The category depends on the level of risk factors given in standard EN 954-1.

Safety Integrity Levels (SIL) according to standard IEC/EN 61508

SIL1 according to standard IEC/EN 61508 is comparable to category 1 according to EN 954-1 (SIL1: mean probability of undetected hazardous failure per hour between 10^{-5} and 10^{-6}).
SIL2 according to standard IEC/EN 61508 is comparable to category 3 according to EN 954-1 (SIL2: mean probability of undetected hazardous failure per hour between 10^{-6} and 10^{-7}).

(1) Redundant: Consists of mitigating the effects of the failure of one component by means of the correct operation of another, assuming that faults do not occur simultaneously on both.

Lexium 05 motion control

Lexium 05 servo drives
Safety requirements

“Power Removal” safety function considerations

The “Power Removal” safety function cannot be considered as a means of electrical disconnection of the servo motor (no electrical isolation); if necessary, a Vario switch disconnector must be used.
The “Power Removal” safety function is not designed to compensate for any malfunction in the servo drive process control or application functions.
The output signals available on the servo drive must not be considered as safety-related signals (e.g. “Power Removal” active); these are Preventa-type safety module outputs which must be integrated into a safety control-signalling circuit.

The schemes on the following pages take into account conformity with standard IEC/EN 60204-1 which defines three stopping categories:

- Category 0: Stopping by immediate removal of the power from the actuators (e.g. uncontrolled stop)
- Category 1: Controlled stop maintaining the power on the actuators until the machine stops, then removal of the power when the actuators stop when the machine stops
- Category 2: Controlled stop maintaining the power on the actuators

Connection diagrams and applications

Conformity to category 1 of standard EN 954-1 and level SIL1 according to standard IEC/EN 61508

Use of the connection diagrams on page 36, which use a line contactor or a Vario switch disconnector between the servo drive and the servo motor: In this case, the “Power Removal” safety function is not used and the servo motor stops in accordance with **category 0** of standard IEC/EN 60204-1.

Conformity to category 3 of standard EN 954-1 and level SIL2 according to standard IEC/EN 61508

The connection diagrams use the “Power Removal” safety function of the Lexium 05 servo drive combined with a Preventa safety module to monitor the emergency stop circuits.

Machines with short freewheel stopping times (low inertia or high resistive torque, see page 37).
When the activation command is given on the $\overline{\text{PWRR\_A}}$ and $\overline{\text{PWRR\_B}}$ inputs with the controlled servo motor, the servo motor power supply is cut immediately and the servo motor stops according to **category 0** of standard IEC/EN 60204-1.
Restarting is not permitted even when the activation command is given after the servo motor has come to a complete stop.
This safe stop is maintained as long as the $\overline{\text{PWRR\_A}}$ and $\overline{\text{PWRR\_B}}$ inputs remain activated.

This diagram must also be used for hoisting applications.
On a “Power Removal” command, the servo drive requires the brake to be engaged, but a Preventa safety module contact must be inserted in series in the brake control circuit to engage it safely when a request is made to activate the “Power Removal” safety function.

Machines with long freewheel stopping times (high inertia or low resistive torque, see pages 38 and 39).
When the activation command is given, deceleration of the servo motor controlled by the servo drive is first requested, then, following a time delay controlled by an XPS AV (Preventa-type) fault relay which corresponds to the deceleration time, the “Power Removal” safety function is activated by the $\overline{\text{PWRR\_A}}$ and $\overline{\text{PWRR\_B}}$ inputs.
The servo motor stops according to **category 1** of standard IEC/EN 60204-1 (“SS1”).

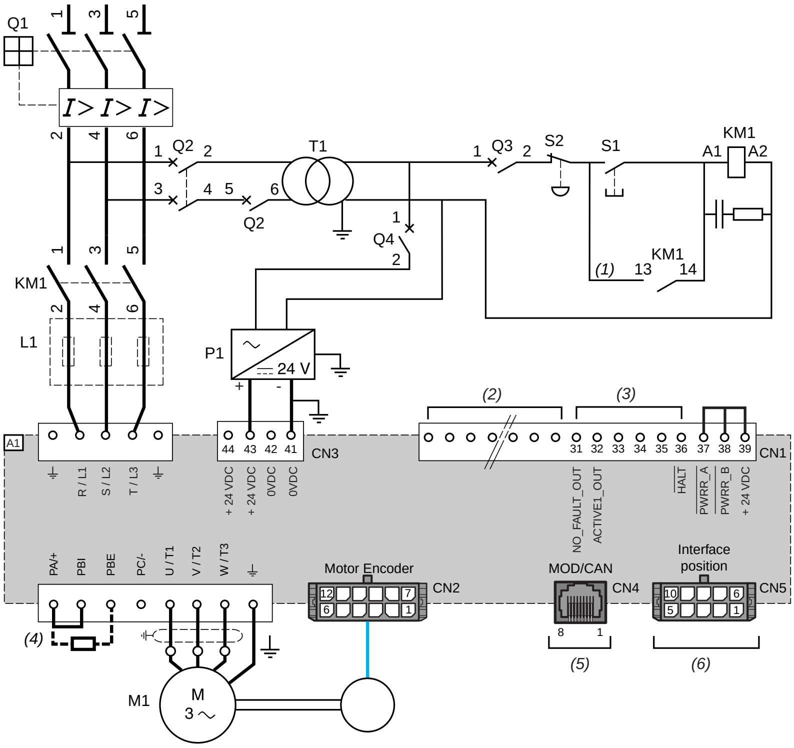
Note: Periodic test*: The “Power Removal” safety input must be activated at least once a year for preventive maintenance purposes. The servo drive must be switched off before preventive maintenance is carried out, and then powered up again. If the power supply to the servo motor is not switched off during testing, safety integrity is no longer assured for the “Power Removal” safety function. The servo drive must therefore be replaced to ensure the operational safety of the machine or the system process.*

Presentation: pages 2 and 3 | Functions: pages 6 to 11, 54 and 55 | Characteristics: pages 12 to 15, 56 to 79 | References: pages 16, 80 to 82 | Dimensions: pages 30 to 33, 83 to 85

Schemes conforming to standards EN 954-1 category 1, IEC/EN 61508 SIL1 capability, in stopping category 0 according to IEC/EN 60204-1

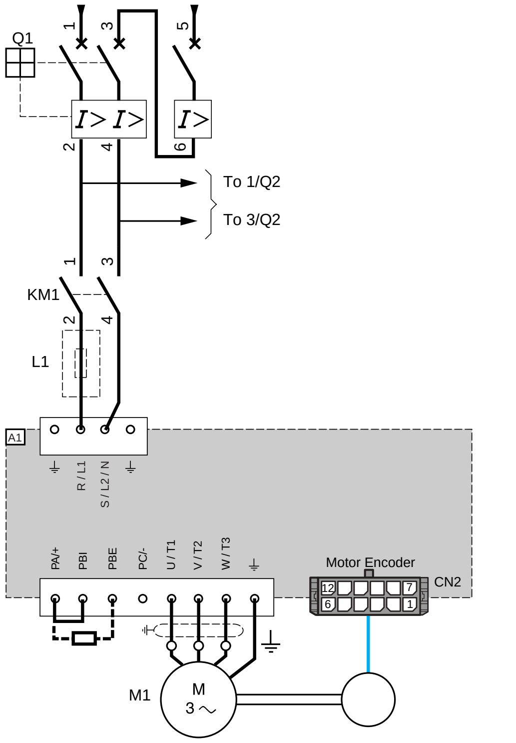
LXM 05●D●●M3X, LXM 05●D●●N4

Three phase power supply with upstream breaking via contactor



LXM 05●D●●F1, LXM 05●D●●M2

Power section for single phase power supply



Note: *All terminals are located at the bottom of the servo drive. Fit interference suppressors to all inductive circuits near the servo drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

Compatible components

(for a complete list of references, please consult our “Motor starter solutions - Control and protection components" catalogue).

Ref.	Description
A1	Lexium 05 servo drive, see page 16
KM1	Line contactor, see motor starters on pages 46 and 47
L1	Line choke, see page 28
M1	BSH servo motor, see pages 80 and 81
P1	Phaseo (SELV) power supply ⎓ 24 V, please consult our “Interfaces, I/O splitter boxes and power supplies” catalogue
Q1	Circuit-breaker, see motor starters on pages 46 and 47
Q2	GV2 L magnetic circuit-breaker rated at twice the nominal primary current of T1
Q3, Q4	GB2 CB05 thermal magnetic circuit-breaker
S1, S2	XB4 B or XB5 A “Start” and “Emergency stop” pushbuttons
T1	220 V secondary transformer

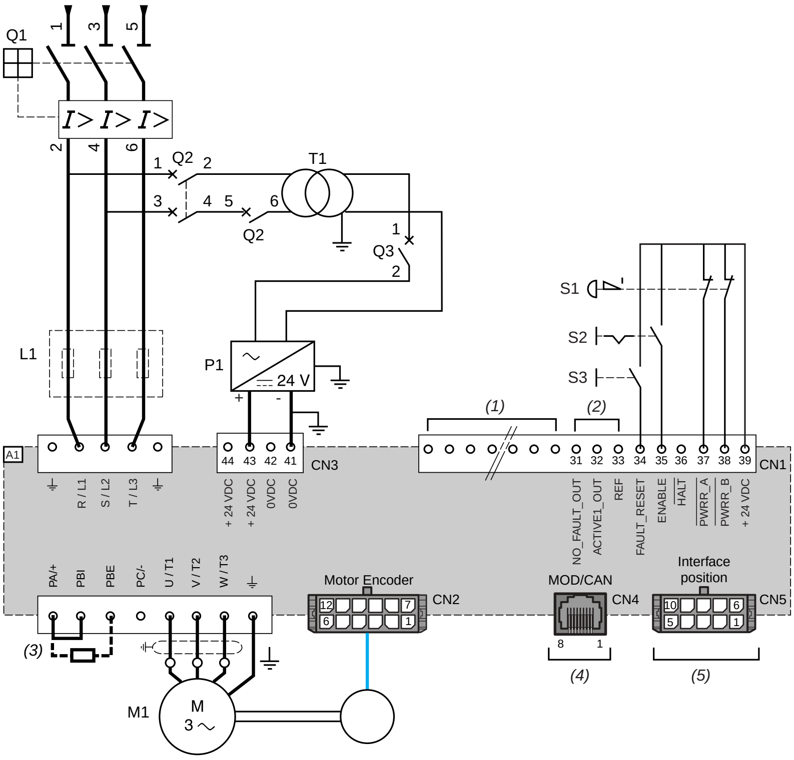
(1) Insert (in series) a contact of the relay controlled by the “NO_FAULT_OUT” (31) logic output: On a servo drive fault, KM1 (line contactor) opens.
(2) Specific spring terminals according to the type of servo drive (see page 42)
(3) 4 logic inputs and 2 logic outputs ⎓ 24 V (see page 42)
(4) External braking resistor (see page 25)
(5) CANopen bus or Modbus serial link on RJ45 connector. Can also be used to connect a PC terminal (equipped with PowerSuite software workshop) or the remote terminal VW3 A31101.
(6) Molex connector for connecting A/B encoder signals or pulse/direction signals (see page 44)

Schemes conforming to standards EN 954-1 category 3, IEC/EN 61508 SIL2 capability, in stopping category 0 according to IEC/EN 60204-1

The diagram below is shown in local control mode via logic I/O. In communication network control mode, the inputs marked 34 and 35 on the CN1 spring terminals must be controlled via the network. In this network mode, inputs 34 and 35 have the assignments "LIMN" and "LIMP".

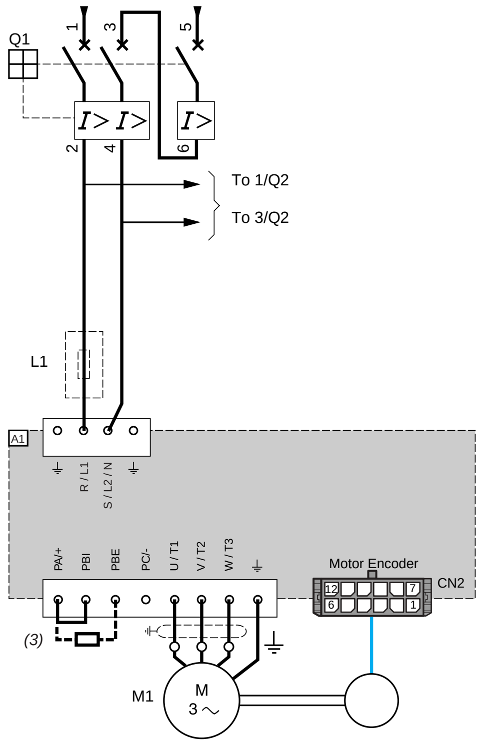
LXM 05●D●●M3X, LXM 05●D●●N4

Three phase power supply, low inertia machine, vertical movement



LXM 05●D●●F1, LXM 05●D●●M2

Power section for single phase power supply



Note: *All terminals are located at the bottom of the servo drive. Fit interference suppressors to all inductive circuits near the servo drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

Compatible components
(for the complete list of references, please consult our "Motor starter solutions - Control and protection components" catalogue).

Ref.	Description
A1	Lexium 05 servo drive, see page 16
L1	Line choke, see page 28
M1	BSH servo motor, see pages 80 and 81
P1	Phaseo (SELV) power supply ⎓ 24 V, please consult our "Interfaces, I/O splitter boxes and power supplies" catalogue
Q1	Circuit-breaker, see motor starters on pages 46 and 47
Q2	GV2 L magnetic circuit-breaker rated at twice the nominal primary current of T1
Q3	GB2 CB05 thermal magnetic circuit-breaker
S1	XB4 B or XB5 A "Emergency stop" dual contact pushbutton
S2	XB4 B or XB5 A "Enable" stay-put pushbutton
S3	XB4 B or XB5 A "Reset" pushbutton
T1	220 V secondary transformer

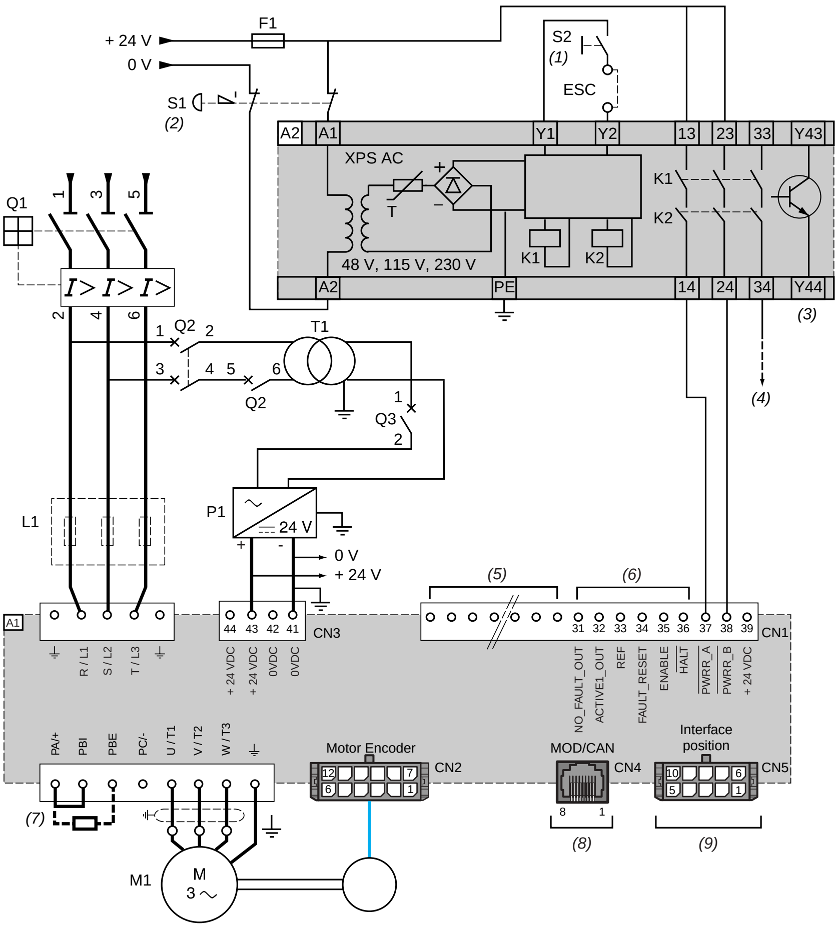
(1) Specific spring terminals according to the type of servo drive (see page 42)
(2) 1 logic input and 2 logic outputs ⎓ 24 V (see page 42)
(3) External braking resistor (see page 25)
(4) CANopen bus or Modbus serial link on RJ45 connector. Can also be used to connect a PC terminal (equipped with PowerSuite software workshop) or the remote terminal VW3 A31101.
(5) Molex connector for connecting A/B encoder signals or pulse/direction signals (see page 44)

Schemes conforming to standards EN 954-1 category 3, IEC/EN 61508 SIL2 capability, in stopping category 0 according to IEC/EN 60204-1 (continued)

The diagram below is shown in local control mode via logic I/O. In communication network control mode, the inputs marked 34 and 35 on the CN1 spring terminals must be controlled via the network. In this network mode, inputs 34 and 35 have the assignments “LIMN” and “LIMP”.

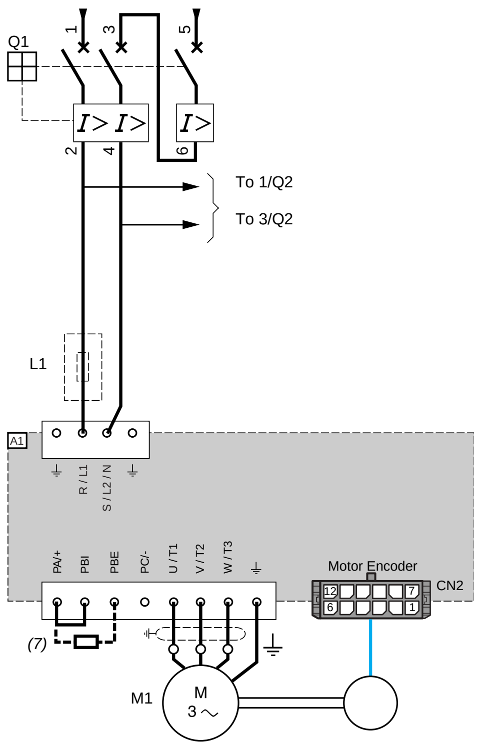
LXM 05●D●●M3X, LXM 05●D●●N4

Three phase power supply, low inertia machine, vertical movement



LXM 05●D●●F1, LXM 05●D●●M2

Power section for single phase power supply



Note: *All terminals are located at the bottom of the servo drive. Fit interference suppressors to all inductive circuits near the servo drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

Compatible components (for a complete list of references, please consult our “Motor starter solutions. Control and protection components” and “Safety solutions using Preventa” catalogues).

Ref.	Description
A1	Lexium 05 servo drive, see page 16
A2	Preventa XPS AC safety module for monitoring emergency stops and switches. The XPS AC safety module can manage the “Power Removal” function of several servo drives on the same machine.
F1	Fuse
L1	Line choke, see page 28
M1	BSH servo motor, see pages 80 and 81
P1	Phaseo (SELV) power supply ⎓ 24 V, please consult our “Interfaces, I/O splitter boxes and power supplies” catalogue
Q1	Circuit-breaker, see motor starters on pages 46 and 47
Q2	GV2 L magnetic circuit-breaker rated at twice the nominal primary current of T1
Q3	GB2 CB05 thermal magnetic circuit-breaker
S1	XB4 B or XB5 A “Emergency stop” pushbutton with 2 contacts
S2	XB4 B or XB5 A spring return pushbutton
T1	220 V secondary transformer

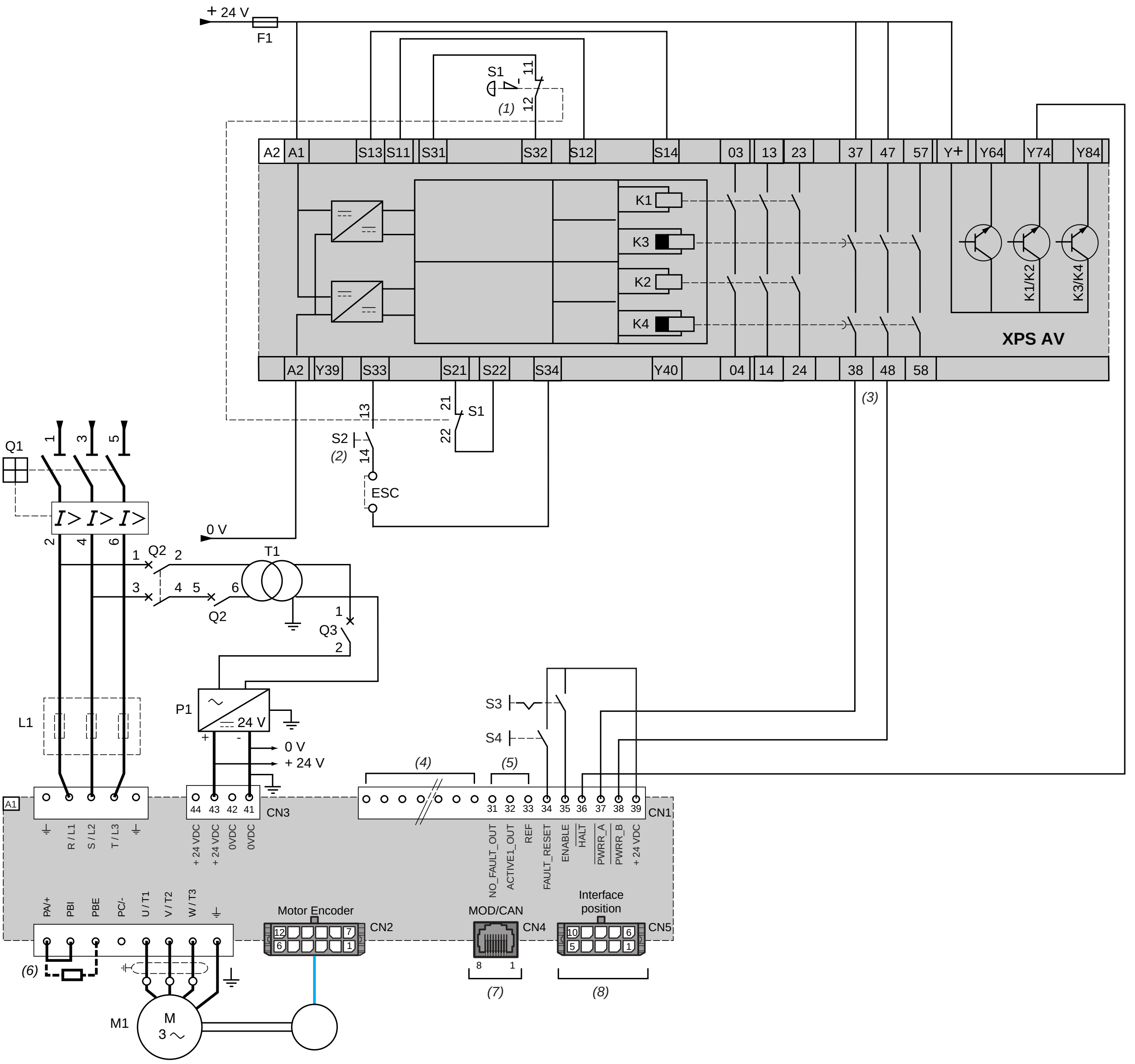
(1) S2: Resets the XPS AC module on power-up or after an emergency stop. ESC can be used to set external starting conditions.
(2) S1: Requests uncontrolled stopping of the movement and activates the “Power Removal” safety function.
(3) The logic output can be used to indicate that the machine is in a safe stop state.
(4) To “Power Removal” safety function of an Altivar 71 variable speed servo drive (for example).
(5) Specific spring terminals according to the type of servo drive (see page 42)
(6) 4 logic inputs and 2 logic outputs ⎓ 24 V (see page 42)
(7) External braking resistor (see page 25)
(8) CANopen bus or Modbus serial link on RJ45 connector. Can also be used to connect a PC terminal (equipped with PowerSuite software workshop) or the remote terminal VW3 A31101.
(9) Molex connector for connecting A/B encoder signals or pulse/direction signals (see page 44)

Schemes conforming to standards EN 954-1 category 3, IEC/EN 61508 SIL2 capability, in stopping category 1 according to IEC/EN 60204-1

The diagram below is shown in local control mode via logic I/O. In communication network control mode, the inputs marked 34 and 35 on the CN1 spring terminals must be controlled via the network. In this network mode, inputs 34 and 35 have the assignments “LIMN” and “LIMP”.

LXM 05●D●●M3X, LXM 05●D●●N4

Three phase power supply, high inertia machine



***Note:** All terminals are located at the bottom of the servo drive. Fit interference suppressors to all inductive circuits near the servo drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

Compatible components (see page 40)

(1) S1: Requests controlled stopping of the movement and activates the “Power Removal” safety function.
(2) S2: Resets the XPS AT module on power-up or after an emergency stop. ESC can be used to set external starting conditions.
(3) Time-delayed opening safety outputs, 300 seconds max. (stopping category 1)
(4) Specific spring terminals according to the type of servo drive(see page 42)
(5) 1 logic input and 2 logic outputs ⎓ 24 V (see page 42)
(6) External braking resistor (see page 25)
(7) CANopen bus or Modbus serial link on RJ45 connector. Can also be used to connect a PC terminal (equipped with PowerSuite software workshop) or the remote terminal VW3 A31101.
(8) Molex connector for connecting A/B encoder signals or pulse/direction signals (see page 44)

Schemes conforming to standards EN 954-1 category 3, IEC/EN 61508 SIL2 capability, in stopping category 1 according to IEC/EN 60204-1 (continued)

LXM 05●D●●M3X, LXM 05●D●●N4

Three phase power supply, high inertia machine (continued)

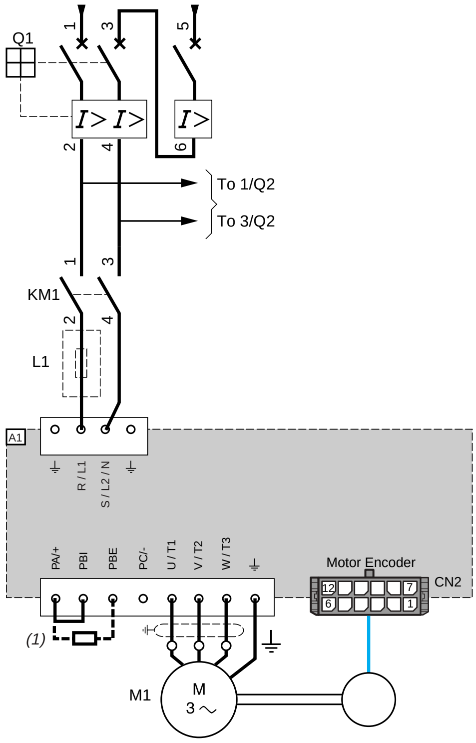
Compatible components (for a complete list of references, please consult our "Motor starter solutions. Control and protection components" and "Safety solutions using Preventa" catalogues).

Ref.	Description
A1	Lexium 05 servo drive, see page 16
A2 *(1)*	Preventa XPS AV safety module for monitoring emergency stops and switches. One safety module can manage the "Power Removal" function for several drives on the same machine, but the time delay must be adjusted on the servo drive controlling the servo motor that requires the longest stopping time.
F1	Fuse
L1	Line choke, see page 28
M1	Lexium BSH AC servo motor, see pages 80 and 81
P1	Phaseo (SELV) power supply ⎓ 24 V, please consult our "Interfaces, I/O splitter boxes and power supplies" catalogue
Q1	Circuit-breaker, see motor starters on pages 46 and 47
Q2	GV2 L magnetic circuit-breaker rated at twice the nominal primary current of T1
Q3	GB2 CB05 thermal magnetic circuit-breaker
S1	XB4 B or XB5 A "Emergency stop" dual contact pushbutton
S2	XB4 B or XB5 A "Start" pushbutton
S3	XB4 B or XB5 A "Enable" stay-put pushbutton
S4	XB4 B or XB5 A "Reset" pushbutton
T1	220 V secondary transformer

(1) For stopping times requiring more than 30 seconds in category 1, use a Preventa XPS AV safety module which can provide a maximum time delay of 300 seconds.

LXM 05●D●●F1, LXM 05●D●●M2

Power section for single phase power supply, high inertia machine



Note: *All terminals are located at the bottom of the servo drive. Fit interference suppressors to all inductive circuits near the servo drive or connected in the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

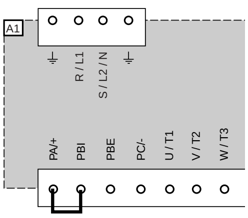
Compatible components (for a complete list of references, please consult our "Motor starter solutions. Control and protection components" and "Safety solutions using Preventa" catalogues).

Ref.	Description
A1	Lexium 05 servo drive, see page 16
L1	Line choke, see page 28
M1	Lexium BSH AC servo motor, see pages 80 and 81
Q1	Circuit-breaker, see motor starters on pages 46 and 47
Q2	GV2 L magnetic circuit-breaker rated at twice the nominal primary current of T1

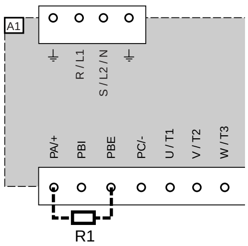
(1) External braking resistor (see page 25)

Braking resistor

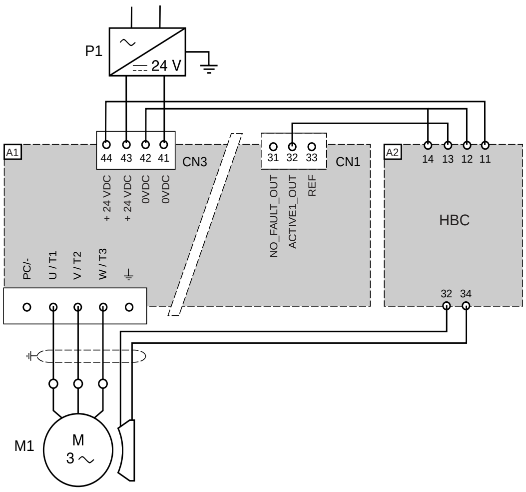
Internal resistor



External resistor



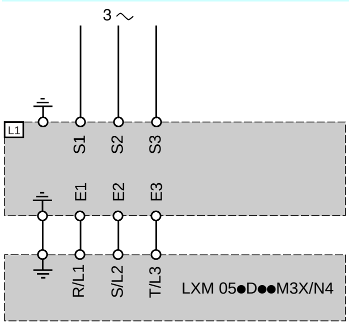
Holding brake controller



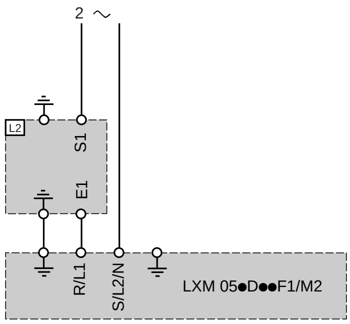
Compatible components	
Ref.	**Description**
A1	Lexium 05 servo drive, see page 16
A2	Holding brake controller VW3 M3103, see page 29
M1	BSH servo motor with holding brake, see pages 80 and 81
P1	Phaseo (SELV) power supply ⎓ 24 V, please consult our “Interfaces, I/O splitter boxes and power supplies” catalogue
R1	External braking resistor VW3 A7 60●R●●, see page 25

Line chokes

Three phase power supply VW3 A4 552/553/554



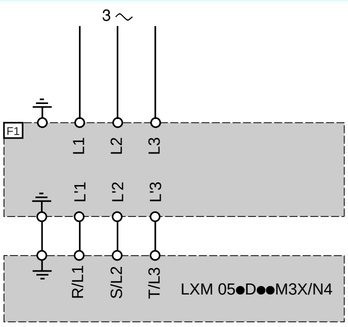
Single phase power supply VZ1L0●●UM●0



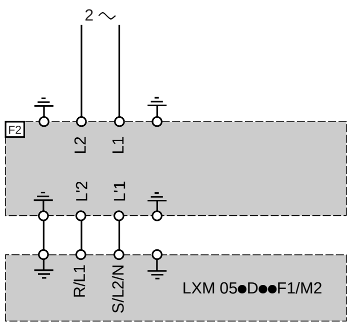
Compatible components	
Ref.	**Description**
L1	Three phase line choke VW3 A4 552/553/554, see page 28
L2	Single phase line choke VZ1L0●●UM●0, see page 28

Additional EMC input filters VW3 A3140●

Three phase power supply



Single phase power supply



Compatible components	
Ref.	**Description**
F1	Three phase additional EMC input filter VW3 A31402/404/406/407, see page 27
F2	Single phase additional EMC input filter VW3 A31401/403/405, see page 27

Note: *The additional EMC input filters are connected as close as possible to the servo drive, directly upstream of the drive.*

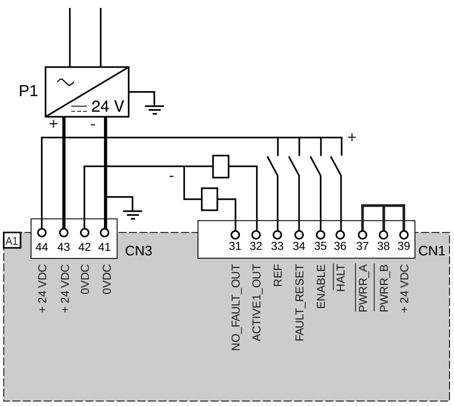
Logic I/O

The servo drive parameters are used to adapt the logic operation of the 4 logic inputs/2 logic outputs (⎓ 24 V) to the technology of the peripherals connected to the servo drive I/O (sensors, preactuators, PLC I/O, etc):

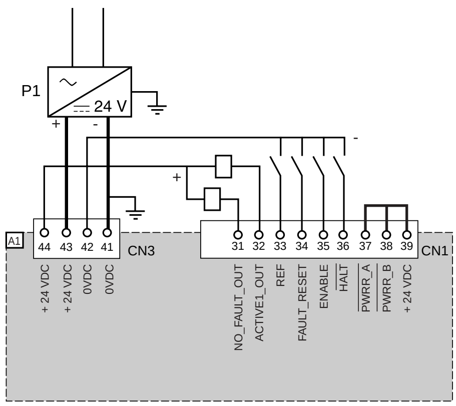
- Positive logic (default setting) for connection to PNP transistor sensors
- Negative logic for connection to NPN transistor peripherals

External ⎓ 24 V power supply

Positive logic (default setting) *(1)*



Negative logic *(2)*

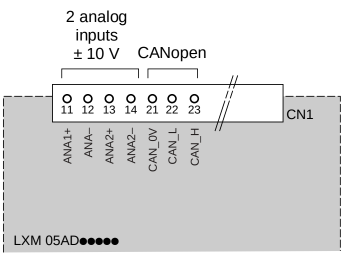


Logic I/O ⎓ 24 V	
Ref.	**Description**
31 "NO_FAULT_OUT" output	Servo drive fault
32 "ACTIVE1_OUT" output	Control of holding brake controller VW3 M3103
33 "REF" input	Not used *(3)*
34 "FAULT_RESET" input	Reset, fault acknowledgement *(3)*
35 "ENABLE" input	Enable servo drive power bridge *(3)*
36 "HALT" input	Stop servo drive (stopping category 1)

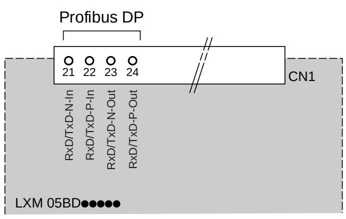
Compatible components	
Ref.	**Description**
A1	Lexium 05 servo drive, see page 16
P1	Phaseo (SELV) power supply ⎓ 24 V, please consult our "Interfaces, I/O splitter boxes and power supplies" catalogue

(1) Positive logic: Sink input, Source output
(2) Negative logic: Source input, Sink output
(3) If the servo drive is controlled via the communication network, these inputs have other assignments. Please consult the user's manual.

Specific spring terminals for LXM 05AD●●●●●



Specific spring terminals for LXM 05BD●●●●●



Servo drive control by Twido programmable controller

Via CANopen machine bus

Schemes and references, see page 18.

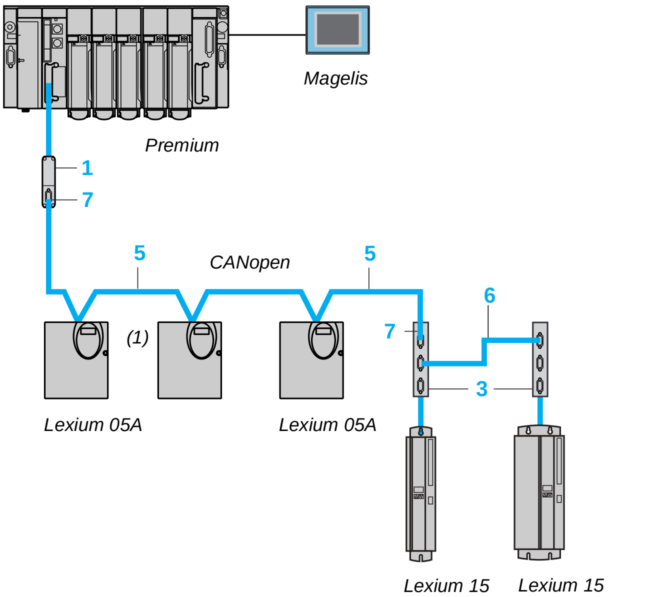
Via Modbus serial link

Schemes and references, see page 19.

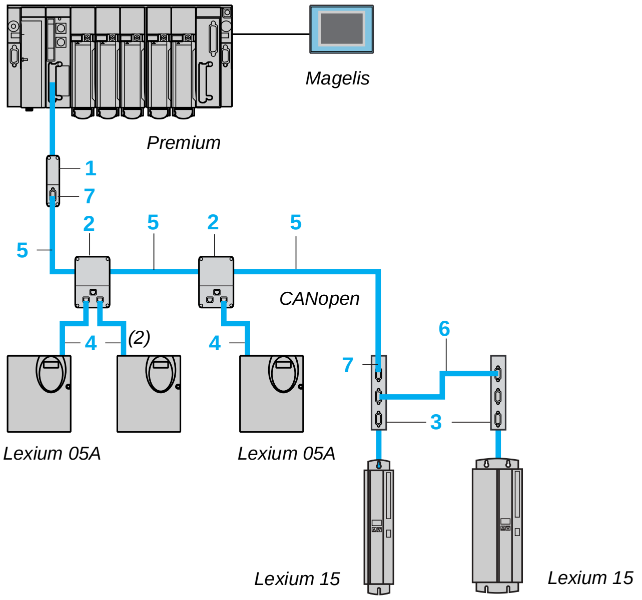
Servo drive control by Modicon Premium automation platform

Via CANopen machine bus

Example of daisy chain connection



Example of tap junction connection



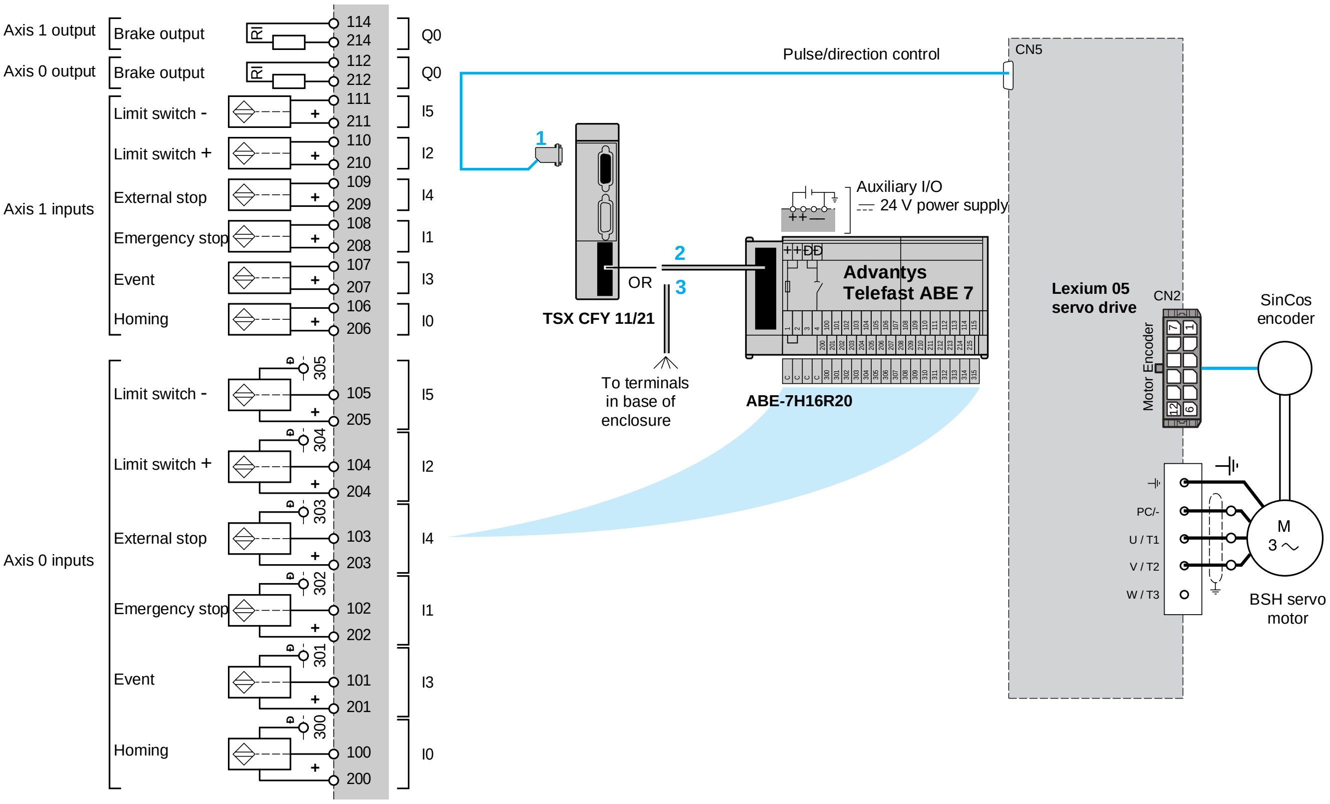
1 PCMCIA card with tap junction and cable L = 0.5 m, TSX CPP 110
2 Junction box with 2 RJ 45 ports, VW3 CAN TAP2 *(3)*
3 CANopen bus adaptor for Lexium 15 servo drive (CANopen standard hardware interface), AM0 2CA 001V000
4 Cable fitted with 2 RJ45 connectors, VW3 CAN CARR03/1 (L = 0.3 or 1 m)
5 CANopen standard cables, TSX CAN CA/CB/CD 50/100/300 (L = 50, 100 or 300 m), with flying leads at both ends
6 Cable fitted with 2 SUB-D connectors (9-way, 1 male and 1 female), TLA CD CBA 005/015/030/050 (L = 0.5, 1.5, 3 or 5 m)
7 9-way female SUB-D IP 20 connector with line terminator, TSX CAN KCDF 90T/180T/90TP (right-angled, straight or right-angled with SUB-D for diagnostic tool)

See references on page 18.

(1) Connection to spring terminals (CN1)
(2) Connection to RJ45 connector (CN4)
(3) Disconnect the line termination resistors from the junction box VW3 CAN TAP2 (included in the Lexium 05A servo drive).

Servo drive control by Modicon Premium automation platform (continued)

Connection example for TSX CFY 11/21 motion control modules

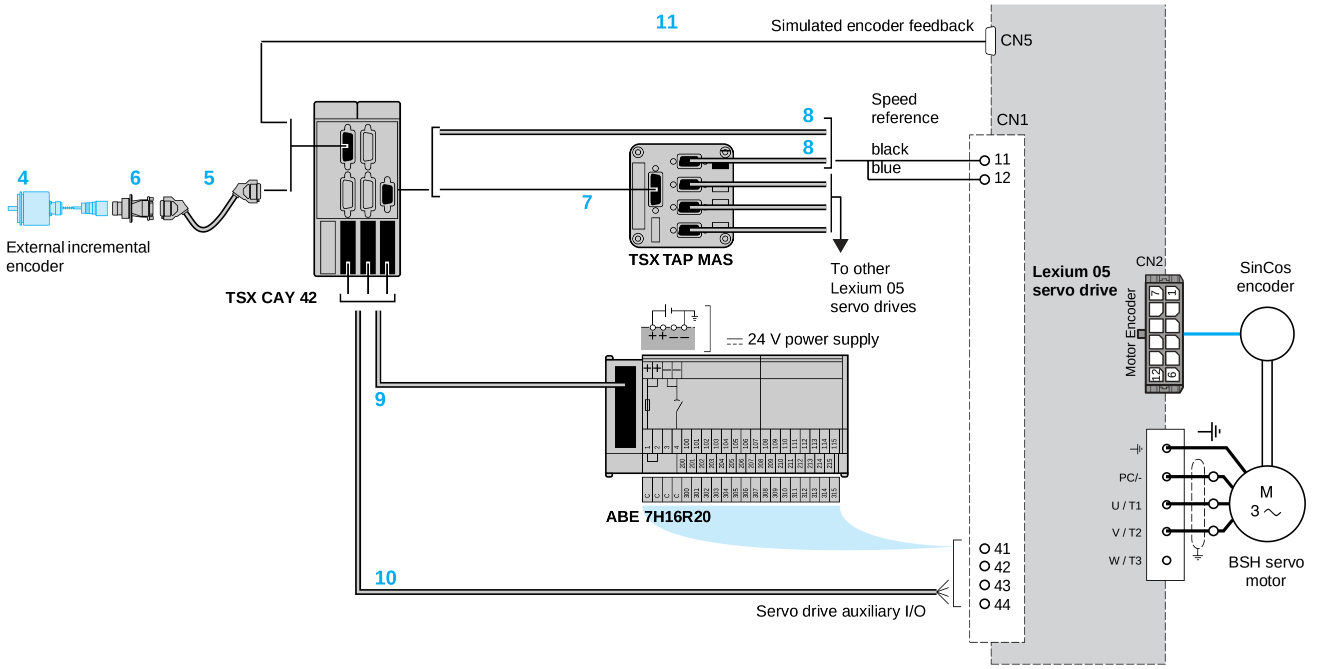


1 Cable with connectors VW3 M8 204 R●● (pulse/direction), see page 20

2 Cable with connectors TSX CDP053/103/203/303/503 (L = 0.5, 1, 2, 3 or 5 m)

3 Cable with connector at one end and flying leads at the other TSX CDP 301/501/1001 (L = 3, 5 or 10 m), see TSX CFY installation manual

Connection example for TSX CAY21/41/22/42/33 motion control modules



4 Absolute or incremental encoder

5 Cable with connectors TSX CCP S15 050/100 and TSX CCP S15 (L = 0.5, 1 or 2.5 m)

6 Connector TSX TAP S15 05

7 Cable with connectors TSX CXP 213/613 (L = 2.5 or 6 m)

8 Cable with connectors TSX CDP 611 (L = 6 m)

9 Cable with connectors TSX CDP053/103/203/303/503 (L = 0.5, 1, 2, 3 or 5 m)

10 Cable with connector at one end and flying leads at the other TSX CDP 301/501/1001 (L = 3, 5 or 10 m)

11 Cable with connectors VW3 M8 203 R●● (simulated incremental encoder feedback), see page 20

Lexium 05 motion control

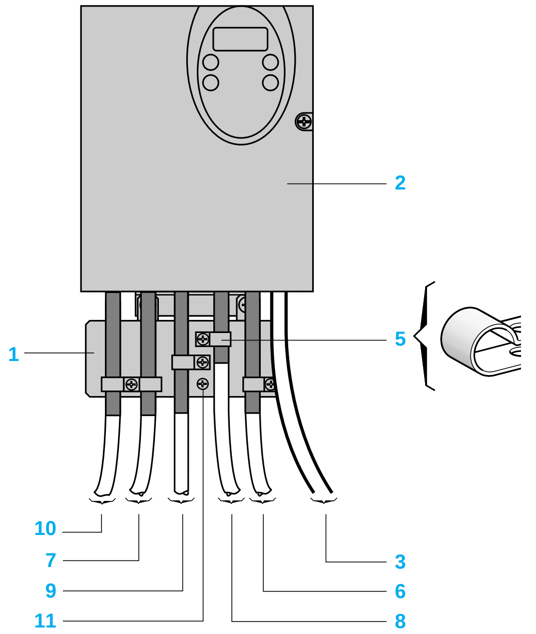
Lexium 05 servo drives
Electromagnetic compatibility

Connections for ensuring conformity to EMC standards

Principle

■ The earths between the servo drive, servo motor and cable shielding must have "high frequency" equipotentiality.
■ Use shielded cables with shielding connected to earth throughout 360° at both ends for the servo motor cable, the braking resistor cable and the control-signalling cables. Conduit or metal ducting can be used for part of the shielding length provided that there is no break in the continuity of the earth connections.
■ Ensure maximum separation between the power supply cable (line supply) and the servo motor cable.

Installation diagram for LXM 05●D●●●● servo drives



1 Steel plate *supplied* with the servo drive, to be mounted on it (earthed casing)
2 Lexium 05 servo drive
3 Unshielded power supply wires or cable
4 Unshielded wires for the output of the fault relay contacts
5 Attach and earth the shielding of cables 6, 7, 8, 9 and 10 as close as possible to the servo drive:
- Strip the shielding.
- Attach the cable to the plate 1 by attaching the clamp to the stripped part of the shielding.
The shielding must be clamped tightly enough to the steel plate to ensure good contact.
6 Shielded cable for connecting the BSH servo motor power
7 Shielded cable for connecting the BSH servo motor encoder
8 Shielded cable for connecting the position interface signals (A/B encoder or pulse/direction)
9 Shielded cable for connecting the communication network (CANopen, Modbus or Profibus DP)
10 Shielded cable for connecting the braking resistor
For cables 6, 7, 8, 9, 10, the shielding must be connected to earth at both ends. The shielding must be continuous and intermediate terminals must be placed in EMC shielded metal boxes.
11 Earth screw for servo motor cable

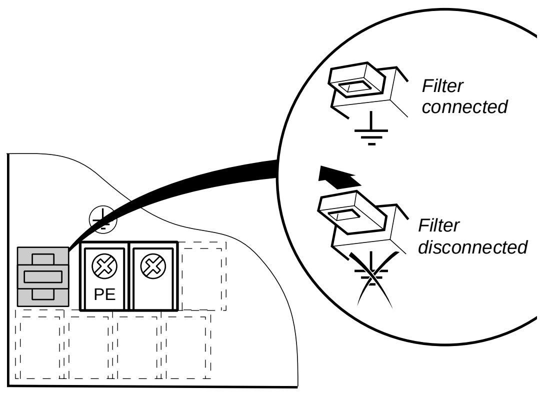
Note: *The HF equipotential earth connection between the servo drive, servo motor and cable shielding does not remove the need to connect the PE protective conductors (green-yellow) to the appropriate terminals on each unit.*
If using an additional EMC input filter, it should be mounted beneath the servo drive and connected directly to the line supply via an unshielded cable. Link 3 on the servo drive is via the filter output cable.

Operation on an IT system

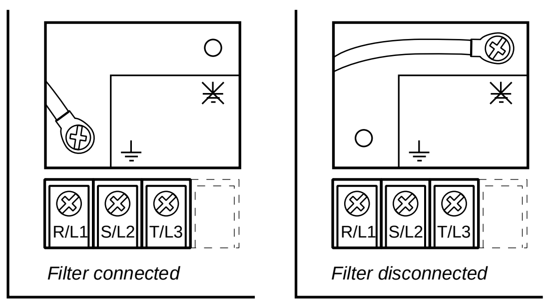
Principle

IT system: Isolated or impedance earthed neutral
Use a permanent insulation monitor compatible with non-linear loads, such as a Merlin Gerin type XM200 (please consult your Regional Sales Office).

LXM 05●D●●F1/M2/N4 servo drives have an integrated EMC filter. These filters must be isolated from earth for use on an IT system. For this disconnection see below, depending on the model.



LXM 05●D●●F1
LXM 05●D●●M2
LXM 05●D14/22/34N4



LXM 05●D57N4

Lexium 05 motion control
Motor starters
Protection by circuit breaker

Applications

The combinations listed below can be used to create a complete motor starter unit comprising a circuit breaker, a contactor and a Lexium 05 servo drive.
The circuit breaker provides protection against accidental short-circuits, disconnection and, if necessary, isolation.
The contactor starts up and manages any safety features, as well as isolating the servo motor on stopping.
The servo drive controls the servo motor, provides protection against short-circuits between the servo drive and the servo motor and protects the motor cable against overloads. The overload protection is provided by the motor thermal protection of the servo drive.

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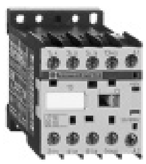

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GV2 L●●
+
LC1 K06●●●●
+
LXM 05●D●●●●●

Motor starters for Lexium 05 servo drives

Servo drive	Nominal power	Circuit-breaker		Max. prsp. line Isc	Contactor *(1)* Add the voltage reference to the basic reference to obtain the full reference *(2)*
		Reference	Rating		
	kW		A	kA	
Single phase supply voltage: 100…120 V					
LXM 05●D10F1	0.4	**GV2 L14**	10	1	**LC1 K0610●●**
LXM 05●D17F1	0.65	**GV2 L16**	14	1	**LC1 K0610●●**
LXM 05●D28F1	1.4	**GV2 L20**	18	1	**LC1 K0610●●**
Single phase supply voltage: 200…240 V					
LXM 05●D10M2	0.75	**GV2 L14**	10	1	**LC1 K0610●●**
LXM 05●D17M2	1.2	**GV2 L16**	14	1	**LC1 K0610●●**
LXM 05●D28M2	2.5	**GV2 L22**	25	1	**LC1 D09●●**
Three-phase supply voltage: 200…240 V					
LXM 05●D10M3X	0.75	**GV2 L10**	6.3	5	**LC1 K0610●●**
LXM 05●D17M3X	1.4	**GV2 L16**	14	5	**LC1 K0610●●**
LXM 05●D42M3X	3.2	**GV2 L22**	25	5	**LC1 D09●●**
Three-phase supply voltage: 380…480 V					
LXM 05●D14N4	1.4	**GV2 L14**	10	5	**LC1 K0610●●**
LXM 05●D22N4	2	**GV2 L14**	10	5	**LC1 K0610●●**
LXM 05●D34N4	3	**GV2 L16**	14	5	**LC1 K0610●●**
LXM 05●D57N4	6	**GV2 L22**	25	5	**LC1 D09●●**

(1) Composition of contactors:
- *LC1 K06: 3 poles + 1 "N/O" auxiliary contact*
- *LC1 D09: 3 poles + 1 "N/O" auxiliary contact + 1 "N/C" auxiliary contact*

(2) Usual control circuit voltages, see table below:

AC control circuit

	Volts ∿	**24**	**48**	**110**	**220**	**230**	**240**
LC1-K	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
	Volts ∿	**24**	**48**	**110**	**220/230**	**230**	**230/240**
LC1-D	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	–	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**

***Note:** For other voltages between 24 V and 660 V, or for a DC control circuit, please consult your Regional Sales Office.*

Presentation: pages 2 and 3 | Functions: pages 6 to 11, 54 and 55 | Characteristics: pages 12 to 15, 56 to 79 | References: pages 16, 80 to 82 | Dimensions: pages 30 to 33, 83 to 85

Lexium 05 motion control

Motor starters

Protection using fuses

Protection using class J fuses (UL standard)

Servo drive	Nominal power	Fuse to be placed upstream
	kW	A
Single phase supply voltage: 100…120 V		
LXM 05●D10F1	0.4	10
LXM 05●D17F1	0.65	15
LXM 05●D28F1	1.4	25
Single phase supply voltage: 200…240 V		
LXM 05●D10M2	0.75	10
LXM 05●D17M2	1.2	15
LXM 05●D28M2	2.5	25
Three-phase supply voltage: 200…240 V		
LXM 05●D10M3X	0.75	10
LXM 05●D17M3X	1.4	10
LXM 05●D42M3X	3.2	25
Three-phase supply voltage: 380…480 V		
LXM 05●D14N4	1.4	10
LXM 05●D22N4	2	15
LXM 05●D34N4	3	15
LXM 05●D57N4	6	25

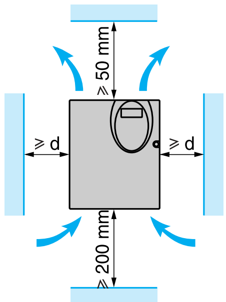
Presentation: pages 2 and 3
Functions: pages 6 to 11, 54 and 55
Characteristics: pages 12 to 15, 56 to 79
References: pages 16, 80 to 82
Dimensions: pages 30 to 33, 83 to 85

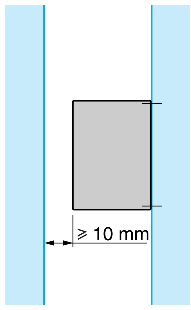
Mounting recommendations

Lexium 05 servo drives, reference LXM 05●D10●●, are cooled by natural convection.

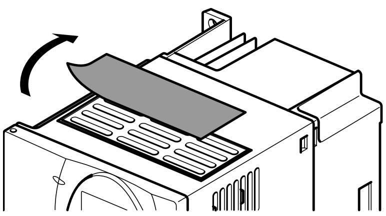
The other Lexium 05 servo drives, references LXM 05●D17●● to LXM 05●D57N4, have an integrated fan.

When installing the servo drive in the electrical enclosure, the instructions below should be followed with regard to the temperature and protection index:
- Provide sufficient cooling of the servo drive by complying with the minimum mounting distances.
- Do not mount the servo drive near heat sources.
- Do not mount the servo drive on flammable materials.
- Do not heat the servo drive cooling air by currents of hot air from other equipment and components, for example from an external braking resistor.
- If the servo drive is used above its thermal limits, the control stops due to overtemperature.
- When IP 20 protection is sufficient, we recommend that the protective film is removed once installation is complete.
- Mount the servo drive vertically (± 10%).





***Note:** For cables that are connected via the underside of the servo drive, at least 200 mm free space is required under the unit to comply with the bending radius of the connection cables.*



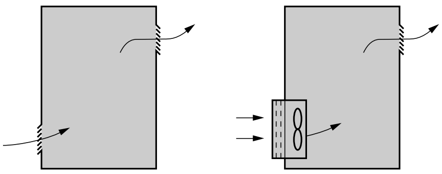
Remove the protective cover if IP 20 is sufficient

Ambient temperature	Mounting distances	Instructions to be followed
- 10°C to + 40°C	d > 50 mm	–
	10 < d < 50 mm	Remove the protective cover
	0 < d < 10 mm	Remove the protective cover
+ 40°C to + 50°C	d > 50 mm	Remove the protective cover
	d < 50 mm	Remove the protective cover Reduce the output current by 2.2% per °C above 40°C

***Note:** Do not use insulated enclosures as they have a poor level of conductivity.*

Lexium 05 motion control

Lexium 05 servo drives



Natural convection *Forced cooling*

Recommendations for mounting in a wall-mounted or floor-standing enclosure

To ensure good air circulation in the servo drive:

- Fit ventilation grilles on the enclosure
- Ensure that ventilation is adequate: if not, install a forced ventilation unit with a filter
- Any apertures and/or fans must provide a flow rate at least equal to that of the servo drive fans (see below)
- Use special filters with IP 54 protection
- Remove the protective film stuck on the upper part of the servo drive

Dissipated power and fan flow rate compatible with Lexium 05 servo drive

Servo drive	Dissipated power	Ventilation	Flow rate
LXM 05●D10F1 LXM 05●D10M2 LXM 05●D10M3X	43 W 48 W 43 W	Natural convection	0.3 m^3/min
LXM 05●D17F1 LXM 05●D17M2 LXM 05●D17M3X LXM 05●D14N4	76 W 74 W 68 W 65 W	Integrated fan	0.55 m^3/min
LXM 05●D28F1 LXM 05●D22N4 LXM 05●D28M2 LXM 05●D42M3X LXM 05●D34N4	150 W 90 W 142 W 132 W 147 W	Integrated fan	1.55 m^3/min
LXM 05●D57N4	240 W	Integrated fan	1.75 m^3/min

Metal dust and damp proof wall-mounted or floor-standing enclosure (IP 54 degree of protection)

The servo drive must be mounted in a dust and damp proof enclosure in certain environmental conditions, such as dust, corrosive gases, high humidity with risk of condensation and dripping water, splashing liquid, etc.
In these cases, Lexium 05 servo drives can be installed in an enclosure where the internal temperature must not exceed 50°C.

Calculating the dimensions of the enclosure

Maximum thermal resistance Rth (°C/W)

The thermal resistance is defined by the following formula:

$$R_{th} = \frac{\theta° - \theta e}{P}$$

θ° = maximum temperature inside the enclosure in °C
θe = maximum external temperature in °C
P = total power dissipated in the enclosure in W

Power dissipated by the servo drive: see table above. Add the power dissipated by the other equipment components.

Useful heat exchange area of the enclosure S (m^2)

For a wall-mounted enclosure, the useful heat exchange area is defined as the sum of the areas of the two sides + top + front panel.

$$S = \frac{k}{R_{th}}$$

k = thermal resistance per m^2 of the enclosure

For metal enclosures:

- k = 0.12 with internal fan,
- k = 0.15 without fan

***Note:** Do not use insulated enclosures as they have a poor level of conductivity.*

PowerSuite software workshop

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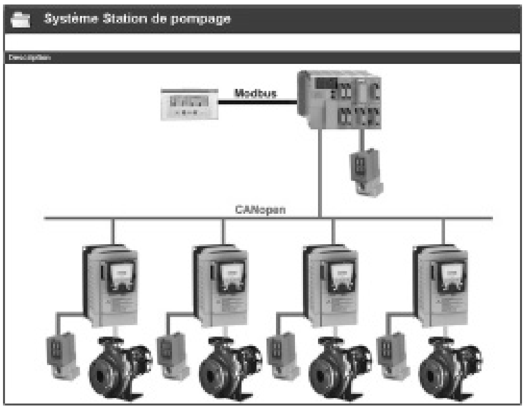

PowerSuite screen on PC
Installed base management

Presentation

The PowerSuite software workshop for PC is a user-friendly tool designed for setting up control devices for the following Telemecanique brand motors:

- TeSys U controller-starters
- Altistart soft start/soft stop units
- Altivar variable speed drives
- Lexium 05 servo drives

It includes various functions designed for setup phases such as:

- Preparing configurations
- Start-up
- Maintenance

In order to simplify the start-up and maintenance phases, the PowerSuite software workshop can use the Bluetooth® wireless link.

Functions *(1)*

Preparing configurations

The PowerSuite software workshop can be used on its own to generate the device configuration. It can be saved, printed and exported to office automation software.

The PowerSuite software workshop can also be used to convert:

- An Altivar 28 drive configuration to an Altivar 31 drive configuration
- An Altivar 38 drive configuration to an Altivar 61 drive configuration
- An Altivar 58 or Altivar 58F drive configuration to an Altivar 71 drive configuration.

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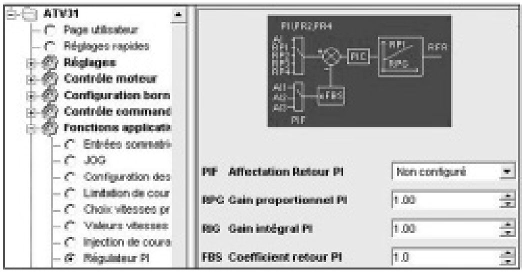

PowerSuite screen on PC
View of PI regulator function parameters

Start-up

When the PC is connected to the device, the PowerSuite software workshop can be used to:

- Transfer the generated configuration
- Adjust
- Monitor. This option has been enhanced with new functions such as:
  - □ The oscilloscope
  - □ The high-speed oscilloscope (minimum time base: 2 ms)
  - □ The FFT *(Fast Fourier Transform)* oscilloscope
  - □ Displaying communication parameters
- Control
- Save the final configuration

Maintenance

In order to simplify maintenance operations, the PowerSuite software workshop can be used to:

- Compare the configuration of a device currently being used with a saved configuration
- Manage the user's installed base of equipment, in particular:
  - □ Organize the installed base into folders (electrical equipment, machinery, workshops, etc.)
  - □ Store maintenance messages
  - □ Simplify Ethernet connection by storing the IP address

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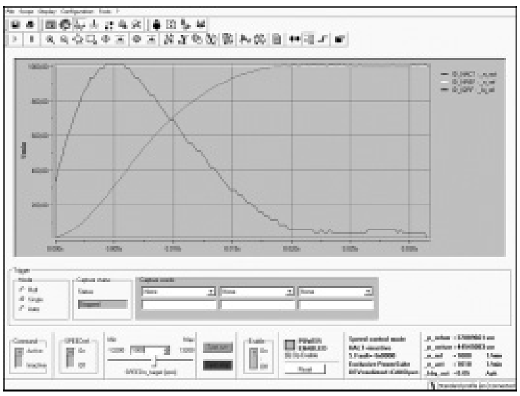


View of the FTT oscilloscope function

User interface

The PowerSuite software workshop can be used to:

- Present the device parameters arranged by function in the form of illustrated views of diagrams or simple tables
- Customize the parameter names
- Create:
  - □ A user menu (choice of particular parameters)
  - □ Monitoring control panels with graphic elements (cursors, gauges, bar charts
- Perform sort operations on the parameters
- Display text in five languages (English, French, German, Italian and Spanish). The language changes immediately and there is no need to restart the program.

It also has online contextual help:

- On the PowerSuite tool
- On the device functions by direct access to the user manuals

(1) Some functions are not available for all devices.
See the table of function availability, page 51.

References:
page 52

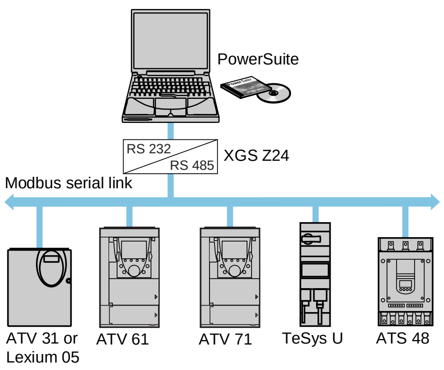
PowerSuite software workshop

Function availability for the PowerSuite software workshop

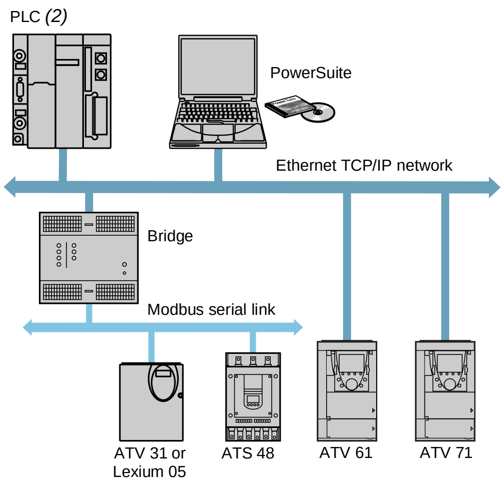
Functions not listed in the table are available for all devices.

Function available with devices	Controller-starter	Soft start/ soft stop unit	Drives				Servo drives
	TeSys U	ATS 48	ATV 11	ATV 31	ATV 61	ATV 71	LXM 05
Monitoring	■	■	□	■	■	■	■
Oscilloscope	□	□	□	■	■	■	■
High-speed oscilloscope	□	□	□	□	■	■	■
FFT oscilloscope	□	□	□	□	■	■	■
Display of communication parameters	□	□	□	□	■	■	■
Control	■	■	□	■	■	■	■
Customization of parameter names	□	□	■	■	■	■	■
Creation of a user menu	□	□	■	■	■	■	■
Creation of monitoring control panels	□	□	□	■	■	■	■
Sort operation on parameters	□	□	■	■	■	■	■

■ Functions available
□ Functions not available



Modbus multidrop connection



Ethernet connection

Connections *(1)*

Modbus serial link

The PowerSuite software workshop can be connected directly to the device terminal port or Modbus serial link port via the serial port on the PC.

Two types of connection are possible:
- With a single device (point-to-point connection), using a VW3 A8 106 PC serial port connection kit
- With a number of devices (multidrop connection), using the XGS Z24 interface.

Ethernet TCP/IP communication network

The PowerSuite software workshop can be connected to an Ethernet TCP/IP network.
In this case, the devices can be accessed:
- Using a VW3 A3 310 communication card for the Altivar 61 and 71 drives
- Using a TSX ETG 100 Ethernet/Modbus bridge

Bluetooth® wireless link

The PowerSuite software workshop can communicate via a Bluetooth® radio link with a device equipped with a Bluetooth® - Modbus VW3 A8 114 adapter. The adapter plugs into the device connector terminal port or Modbus serial link port and has a range of 10 m (class 2).

If the PC does not have Bluetooth® technology, use the VW3 A8 115 USB-Bluetooth® adapter.

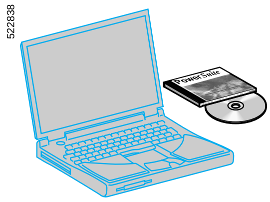
Remote maintenance

Using a simple Ethernet connection, the PowerSuite software workshop can be used for remote monitoring and diagnostics.
When devices are not connected to the Ethernet network, or it is not directly accessible, various remote transmission solutions may be possible (modem, teleprocessing gateway, etc.). Please consult your Regional Sales Office.

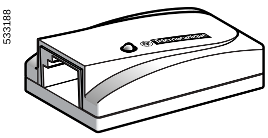
(1) Please refer to the compatibility table on page 53.
(2) Please refer to our "Automation platform Modicon Premium and Unity - PL7 software" and "Automation platform Modicon TSX Micro - PL7 software" catalogues.

PowerSuite software workshop

PowerSuite software workshop



VW3 A8 104



VW3 A8 114

Description	Composition	Reference	Weight kg
PowerSuite CD-ROM	■ 1 program for PC in English, French, German, Italian and Spanish ■ Variable speed drive, starter and servo drive technical manuals ■ ABC Configurator software for the LUF P communication gateways	**VW3 A8 104**	0.100
PowerSuite update CD-ROM *(1)*	■ 1 program for PC in English, French, German, Italian and Spanish ■ Variable speed drive and starter technical manuals	**VW3 A8 105**	0.100
Connection kit for PC serial port for point-to-point Modbus connection	■ 1 x 3 m cable with 2 RJ45 connectors ■ 1 RS 232/RS 485 converter with one 9-way female SUB-D connector and 1 RJ45 connector ■ 1 converter for the ATV 11 drive, with one 4-way male connector and one RJ45 connector ■ 1 RJ45/9-way male SUB-D adapter for connecting ATV 38/58/58F drives ■ 1 RJ45/9-way female SUB-D adapter for connecting ATV 68 drives.	**VW3 A8 106**	0.350
RS 232-RS 485 interface for multidrop Modbus connection	1 multidrop Modbus converter for connection to screw terminals. Requires a 24 V ⎓ (20...30 V), 20 mA power supply *(2)*.	**XGS Z24**	0.105
Modbus-Bluetooth® adapter *(3)*	■ 1 Bluetooth® adapter (10 m range, class 2) with 1 RJ45 connector ■ 1 x 0.1 m cable with 2 RJ45 connectors for PowerSuite ■ 1 x 0.1 m cable with 1 RJ45 connector and 1 mini DIN connector for TwidoSoft ■ 1 RJ45/9-way male SUB-D adapter for connecting ATV 38/58/58F drives.	**VW3 A8 114**	0.155
USB-Bluetooth® adapter for PC	This adapter is required for a PC which is not equipped with Bluetooth® technology. It is connected to a USB port on the PC. Range of 10 m (class 2).	**VW3 A8 115**	0.290

(1) Updates a version ⩾ V1.40 with the latest available version. For versions < V1.40, you should order the PowerSuite CD-ROM, VW3 A8 104.
(2) Please consult our specialist catalogue "Power supplies, splitter blocks and interfaces".
(3) Can also be used to communicate between a Twido PLC and the TwidoSoft software workshop.

Presentation:
page 50

Functions:
pages 50 and 51

Compatibility of PowerSuite software workshop with the following devices *(1)*

Connection	Controller-starter	Soft start/ soft stop unit	Drives				Servo drives
	TeSys U	ATS 48	ATV 11	ATV 31	ATV 61	ATV 71	LXM 05A *(2)*
Modbus	V1.40	V1.30	V1.40	V2.0	V2.3	V2.2	V2.2
Ethernet (device equipped with an Ethernet TCP/IP card)					V2.3	V2.2	
Ethernet via Ethernet/Modbus bridge		V1.50		V2.0	V2.3	V2.2	V2.2
Bluetooth®		V2.2		V2.2	V2.3	V2.2	V2.2

Compatible software versions
Incompatible software versions

Hardware and software environments

The PowerSuite software workshop can operate in the following PC environments and configurations:
- Microsoft Windows® 98 SE, Microsoft Windows® 2000 SP4, Microsoft Windows® XP SP1, SP2,
- Pentium III, 800 MHz, hard disk with 300 MB available, 128 MB RAM
- SVGA or higher definition monitor

(1) Minimum software version
(2) For the LXM 05B●●●●●● servo drives, please consult your Regional Sales Office.

Presentation: page 50
Functions: pages 50 and 51
References: page 52

Lexium 05 motion control
BSH servo motors

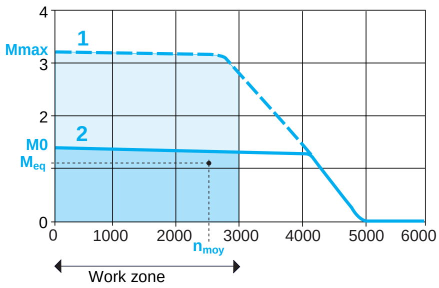
BSH servo motor with straight connectors

BSH servo motor with angled connectors

Presentation

BSH servo motors are the ideal choice to meet the requirements of dynamics and precision. With five flange sizes and a variety of lengths, there is a suitable solution for most applications, covering a torque range from 0.42 to 33.5 Nm for speeds ranging from 1250 to 6000 rpm.

Their new winding technology based on salient poles makes BSH servo motors very compact in comparison with conventional servo motors.
BSH servo motors are available in 5 flange sizes: 55, 70, 100, 140 and 205 mm.
Thermal protection is provided by a temperature probe integrated in the servo motors. They are certified “Recognized” by the Underwriters Laboratories and comply with standard UL1004 (except for the BSH 1404P servo motor) and with European directives (CE marking).
BSH servo motors are available with the following variants:
- IP40 or IP65 degree of protection
- With or without holding brake
- Straight or angled connectors
- Single turn or multiturn SinCos encoder
- Smooth or keyed shaft end



Torque/speed characteristics

BSH servo motors provide torque/speed curve profiles similar to the example shown on the left with:
1 Peak torque, depending on the servo drive model
2 Continuous torque, depending on the servo drive model
where:
- 6000 (in rpm) corresponds to the servo motor's maximum mechanical speed
- M_{max} (in Nm) represents the peak stall torque value
- M_n (in Nm) represents the continuous stall torque value

Principle for determining servo motor size according to the application

The torque/speed curves can be used to determine the correct servo motor size.
For example, for a 115 V single phase supply voltage, the curves used are curves 1 and 2.
1 Locate the work zone of the application in terms of speed.
2 Verify, using the servo motor cycle timing diagram, that the torques required by the application during the various phases of the cycle are located within the area bounded by curve 1 in the work zone.
3 Calculate the average speed n_{avg} and the equivalent thermal torque M_{eq} (see page 92).
4 The point defined by n_{avg} and M_{eq} must be located below curve 2 in the work zone.

***Note:** For sizing of servo motors: see page 92.*

Functions

General functions

BSH servo motors have been developed to meet the following requirements:
- Functional characteristics, ruggedness, safety, etc in accordance with IEC/EN 60034-1
- Ambient operating temperature: - 20...40°C according to DIN 50019R14. Maximum 55°C with derating from 40°C of 1% per °C
- Relative humidity: Class F according to DIN 400
- Altitude: 1000 m without derating, 2000 m with k = 0.86 *(1)*, 3000 m with k = 0.8
- Storage and transport temperature: - 25...70°C
- Winding insulation class: F (maximum temperature for windings 155°C) according to DIN VDE 0530
- Power and sensor connections via straight or angled connectors
- Thermal protection by built-in PTC thermistor probe, controlled by the Lexium 05 servo drive
- Out-of-round, concentricity and perpendicularity between flange and shaft according to DIN 42955, class N
- Flange compliant with standard DIN 42948
- Permitted mounting positions: no mounting restrictions for IMB5 - IMV1 and IMV3 according to DIN 42950
- Polyester resin based paint: opaque black RAL 9005

(1) k: derating factor

Characteristics: pages 56 to 79
References: pages 80 to 82
Dimensions: pages 83 to 85

Lexium 05 motion control
BSH servo motors

Functions (continued)

General functions (continued)

■ Degree of protection:
□ Servo motor casing: IP 65 in accordance with IEC/EN 60529
□ Shaft end: IP 40 or IP 65 in accordance with IEC/EN 60529 *(1)*
■ Integrated sensor: SinCos Hiperface single turn or multiturn high resolution encoder
■ Smooth or keyed shaft end in standard sizes (according to DIN 42948)

Holding brake (depending on model)

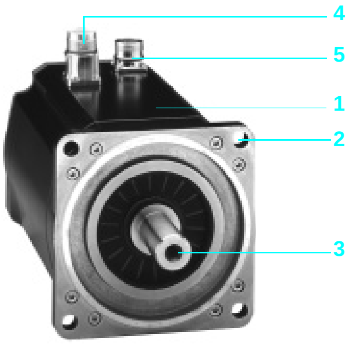
The integrated brake fitted on BSH servo motors (depending on the model) is a failsafe electro-magnetic holding brake.

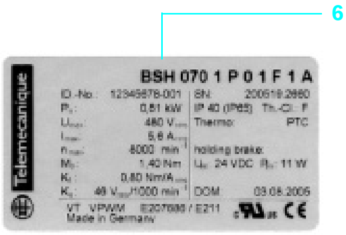
⚠ **Do not use the holding brake as a dynamic brake for deceleration, as this will quickly damage the brake.**

Built-in encoder

The servo motor is fitted with a SinCos Hiperface® high resolution single turn (4096 points) or multiturn (4096 points x 4096 turns) absolute encoder providing angular precision of the shaft position, accurate to less than ± 1.3 arc minutes.

This performs the following functions:
■ Gives the angular position of the rotor so that flows can be synchronized
■ Measures the servo motor speed via the associated Lexium 05 servo drive. This information is used by the speed controller of the Lexium servo drive.
■ Measures the position information for the Lexium servo drive position controller
■ Measures and sends position information in incremental format for the position feedback of a motion control module ("simulated encoder" output of the Lexium 05 servo drive)





Description

BSH servo motors with a 3-phase stator and a 6- to 10-pole rotor (depending on model) with Neodymium Iron Borium (NdFeB) magnets consist of:

1. A casing with a square cross-section, protected by RAL 9005 opaque black paint
2. A 4-point axial fixing flange in accordance with DIN 42948
3. A standard shaft end in accordance with DIN 42948, smooth or keyed (depending on the model)
4. A threaded dust and damp proof male straight connector for connecting the power cable *(2)*
5. A threaded dust and damp proof male straight connector for connecting the encoder cable *(2)*
6. A manufacturer's rating plate on the right side

Connectors to be ordered separately, for connection to Lexium 05 servo drives, see page 82.
Schneider Electric has taken particular care to ensure compatibility between BSH servo motors and Lexium 05 servo drives. This compatibility can only be assured by using cables and connectors sold by Schneider Electric, see page 82.

(1) IP 40 mounted in position IMV3 (vertical mounting with shaft end at the top)
(2) Other model with angled connector that can be rotated through 330°

Presentation: page 54 | Characteristics: pages 56 to 79 | References: pages 80 to 82 | Dimensions: pages 83 to 85

Characteristics with BSH 0551T servo motors

Type of servo motor			**BSH 0551T**		
Associated with Lexium 05 servo drive			**LXM 05●D10F1**	**LXM 05●D10M2**	**LXM 05●D10M3X**
Line supply voltage		**V**	115 single phase	230 single phase	230 3-phase
Switching frequency		**kHz**	8		
Torque	Continuous stall M_0	**Nm**	0.5		
	Peak stall M_{max}	**Nm**	1.4		
Nominal operating point	Nominal torque	**Nm**	0.46	0.43	0.42
	Nominal speed	**rpm**	3000	6000	
Maximum current		**A rms**	6.2		

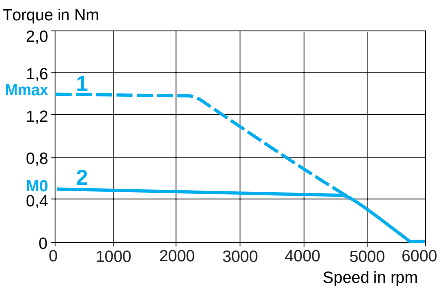
Servo motor characteristics

Maximum mechanical speed			**rpm**	9000
Constants (at 120°C)	Torque		**Nm/A rms**	0.36
	Back emf		**V_{rms}/krpm**	22
Rotor	Number of poles			6
	Inertia	Without brake J_m	**kgcm²**	0.059
		With brake J_m	**kgcm²**	0.1113
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	12.2
	Inductance (phase/phase)		**mH**	20.8
	Electrical time constant		**ms**	1.705
Holding brake (depending on model)				See page 86

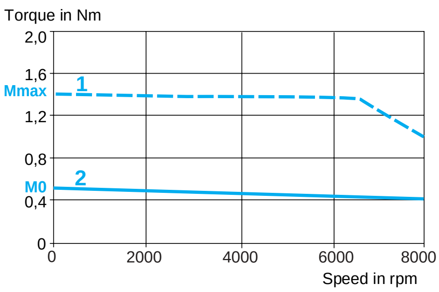
Speed/torque curves

BSH 0551T servo motors

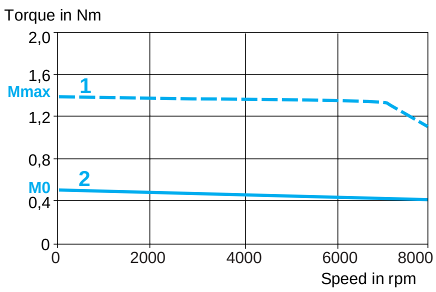
With LXM 05●D10F1 servo drive
115 V single phase



With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

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Lexium 05 motion control

BSH servo motors

Characteristics of BSH 0552M/0552P servo motors

Type of servo motor				BSH 0552M		BSH 0552P		
Associated with Lexium 05 servo drive				LXM 05 ●D10M2	LXM 05 ●D10M3X	LXM 05 ●D10M2	LXM 05 ●D10M3X	LXM 05 ●D14N4
Line supply voltage			V	230 single phase	230 3-phase	230 single phase	230 3-phase	400/480 3-phase
Switching frequency			kHz	4		8		
Torque	Continuous stall	M_0	Nm	0.9				
	Peak stall	M_{max}	Nm	2.3		2.7		
Nominal operating point	Nominal torque		Nm	0.85		0.8		0.70
	Nominal speed		rpm	1500		4000		6000
Maximum current			A rms	2.9		5.9		

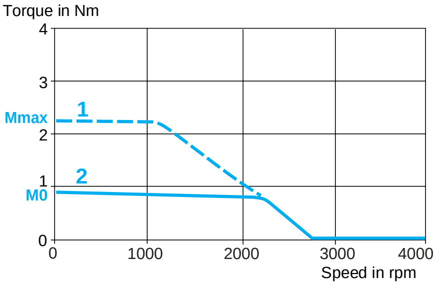
Servo motor characteristics

Maximum mechanical speed			rpm	9000				
Constants (at 120°C)	Torque		Nm/A rms	1.33		0.7		
	Back emf		V_{rms}/krpm	74		40		
Rotor	Number of poles			6				
	Inertia – Without brake	J_m	kgcm²	0.096				
	Inertia – With brake	J_m	kgcm²	0.1613				
Stator (at 20°C)	Resistance (phase/phase)		Ω	60.2		17.4		
	Inductance (phase/phase)		mH	122		35.3		
	Electrical time constant		ms	1.24				
Holding brake (depending on model)				See page 86				

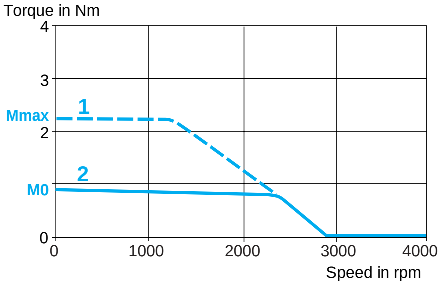
Speed/torque curves

BSH 0552M servo motor

With LXM 05●D10M2 servo drive
230 V single phase

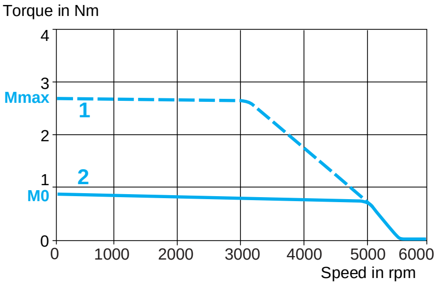


With LXM 05●D10M3X servo drive
230 V 3-phase

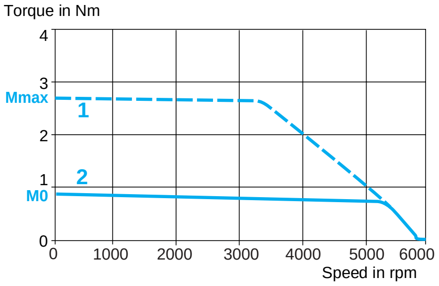


BSH 0552P servo motor

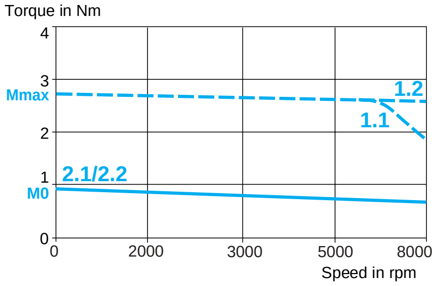
With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



With LXM 05●D14N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

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Characteristics of BSH 0552T servo motors

Type of servo motor			BSH 0552T			
Associated with Lexium 05 servo drive			**LXM 05 ●D10F1**	**LXM 05 ●D17F1**	**LXM 05 ●D10M2**	**LXM 05 ●D10M3X**
Line supply voltage		**V**	115 single phase	115 single phase	230 single phase	230 3-phase
Switching frequency		**kHz**	8			
Torque	Continuous stall M_0	**Nm**	0.9			
	Peak stall M_{max}	**Nm**	1.77	2.7	1.77	
Nominal operating point	Nominal torque	**Nm**	0.8		0.72	
	Nominal speed	**rpm**	3000		6000	
Maximum current		**A rms**	10.3			

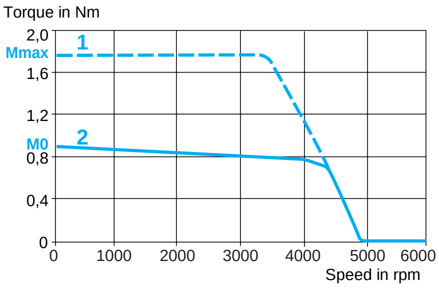
Servo motor characteristics

Maximum mechanical speed		**rpm**	9000
Constants (at 120°C)	Torque	**Nm/A rms**	0.36
	Back emf	**V_{rms}/krpm**	22
Rotor	Number of poles		6
	Inertia – Without brake J_m	**$kgcm^2$**	0.14
	Inertia – With brake J_m	**$kgcm^2$**	0.1613
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	5.2
	Inductance (phase/phase)	**mH**	10.6
	Electrical time constant	**ms**	1.24
Holding brake (depending on model)			See page 86

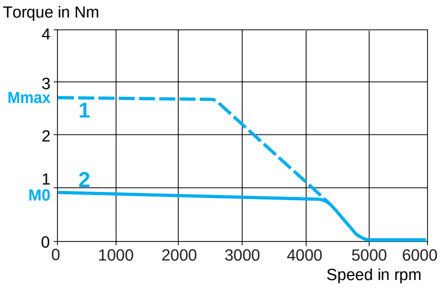
Speed/torque curves

BSH 0552T servo motor

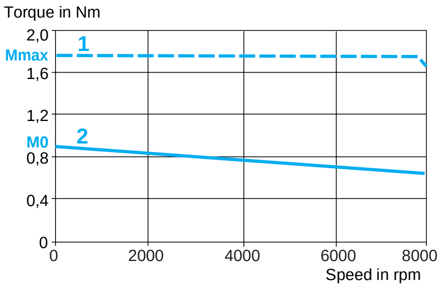
With LXM 05●D10F1 servo drive
115 V single phase



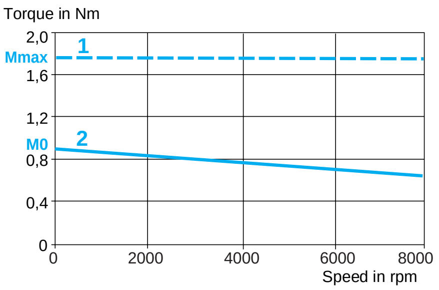
With LXM 05●D17F1 servo drive
115 V single phase



With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

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Lexium 05 motion control
BSH servo motors

Characteristics of BSH 0553M servo motors

Type of servo motor				**BSH 0553M**	
Associated with Lexium 05 servo drive				**LXM 05 ●D10M2**	**LXM 05 ●D10M3X**
Line supply voltage			**V**	230 single phase	230 3-phase
Switching frequency			**kHz**	4	
Torque	Continuous stall	M_0	**Nm**	1.3	
	Peak stall	M_{max}	**Nm**	4.2	
Nominal operating point	Nominal torque		**Nm**	1.2	
	Nominal speed		**rpm**	1500	
Maximum current			**A rms**	4.3	

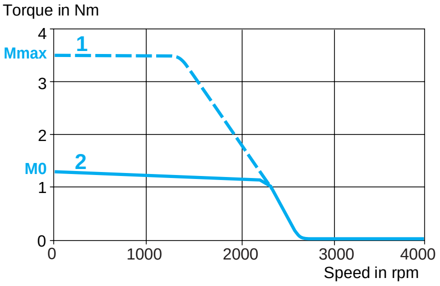
Servo motor characteristics

Maximum mechanical speed				**rpm**	9000
Constants (at 120°C)	Torque			**Nm/A rms**	1.33
	Back emf			**V_{rms}/krpm**	79
Rotor	Number of poles				6
	Inertia	Without brake	J_m	**kgcm²**	0.134
		With brake	J_m	**kgcm²**	0.2113
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	38.4
	Inductance (phase/phase)			**mH**	92.2
	Electrical time constant			**ms**	1.5
Holding brake (depending on model)					See page 86

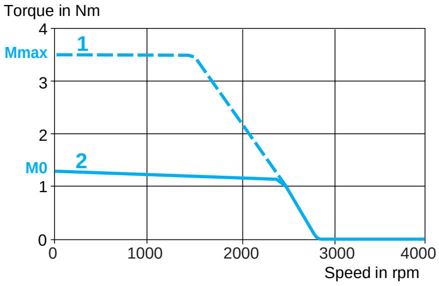
Speed/torque curves

BSH 0553M servo motors

With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

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Lexium 05 motion control
BSH servo motors

Characteristics of BSH 0553P/0553T servo motors

Type of servo motor				BSH 0553P			BSH 0553T		
Associated with Lexium 05 servo drive				**LXM 05 ●D10M2**	**LXM 05 ●D10M3X**	**LXM 05 ●D14N4**	**LXM 05 ●D17F1**	**LXM 05 ●D17M2**	**LXM 05 ●D17M3X**
Line supply voltage			**V**	230 single phase	230 3-phase	400/480 3-phase	115 single phase	230 single phase	230 3-phase
Switching frequency			**kHz**	8					
Torque	Continuous stall	M_0	**Nm**	1.3					
	Peak stall	M_{max}	**Nm**	3.18		3.87	3.31		
Nominal operating point	Nominal torque		**Nm**	1		0.9	11	0.9	
	Nominal speed		**rpm**	4000		6000	3000	6000	
Maximum current			**A rms**	8.7			15.2		

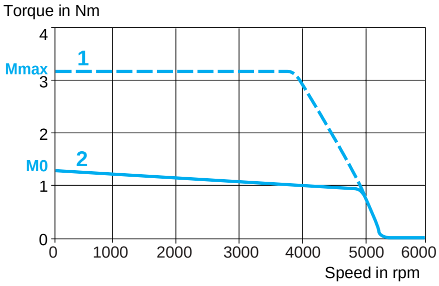
Servo motor characteristics

					BSH 0553P	BSH 0553T
Maximum mechanical speed				**rpm**	9000	
Constants (at 120°C)	Torque			**Nm/A rms**	0.7	0.39
	Back emf			**V_{rms}/krpm**	41	22
Rotor	Number of poles				6	
	Inertia	Without brake	J_m	**kgcm²**	0.134	
		With brake	J_m	**kgcm²**	0.2113	
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	10.4	3.1
	Inductance (phase/phase)			**mH**	25	7.4
	Electrical time constant			**ms**	1.5	
Holding brake (depending on model)					See page 86	

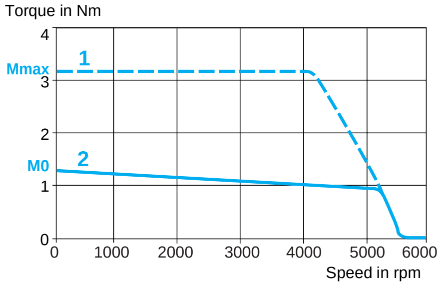
Speed/torque curves

BSH 0553P servo motors

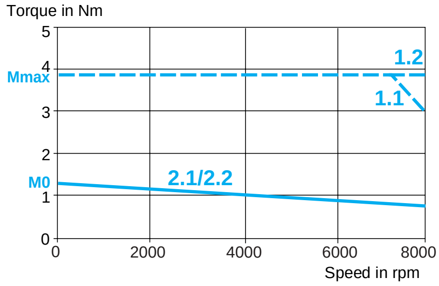
With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase

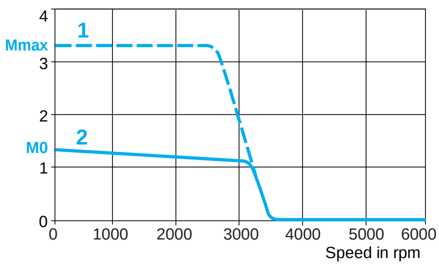


With LXM 05●D14N4 servo drive
400/480 V 3-phase

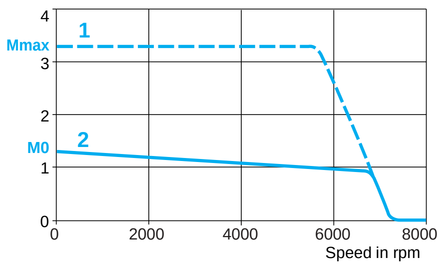


BSH 0553T servo motor

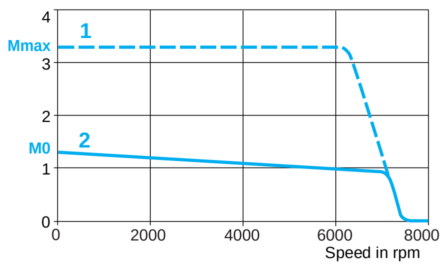
With LXM 05●D17F1 servo drive
115 V single phase



With LXM 05●D17M2 servo drive
230 V single phase



With LXM 05●D17M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

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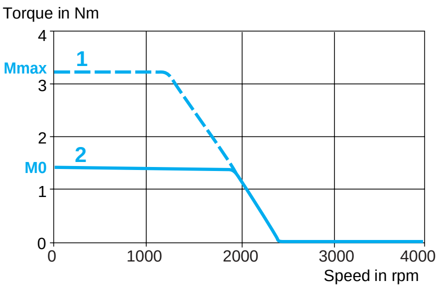
Characteristics of BSH 0701M/0701P servo motors

Type of servo motor			BSH 0701M	BSH 0701P	
Associated with Lexium 05 servo drive			LXM 05 ●D10M3X	LXM 05 ●D10M2	LXM 05 ●D10M3X
Line supply voltage		V	230 3-phase	230 single phase	230 3-phase
Switching frequency		kHz	4		
Torque	Continuous stall M_0	Nm	1.4		
	Peak stall M_{max}	Nm	3.2		
Nominal operating point	Nominal torque	Nm	1.36	1.3	
	Nominal speed	rpm	1500	3000	
Maximum current		A rms	2.8	5.3	
Servo motor characteristics					
Maximum mechanical speed		rpm	8000		
Constants (at 120°C)	Torque	Nm/A rms	1.6	0.8	
	Back emf	V_{rms}/krpm	91	46	
Rotor	Number of poles		6		
	Inertia – Without brake J_m	kgcm²	0.25		
	Inertia – With brake J_m	kgcm²	0.322		
Stator (at 20°C)	Resistance (phase/phase)	Ω	41.6	10.4	
	Inductance (phase/phase)	mH	173.2	38.8	
	Electrical time constant	ms	4.16	3.73	
Holding brake (depending on model)			See page 86		

Speed/torque curves

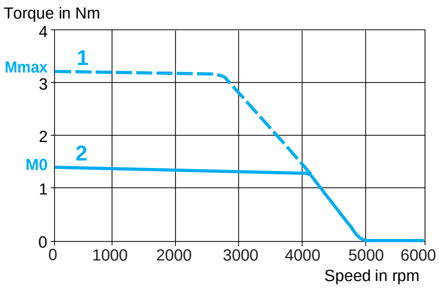
BSH 0701M servo motor

With LXM 05●D10M3X servo drive
230 V 3-phase

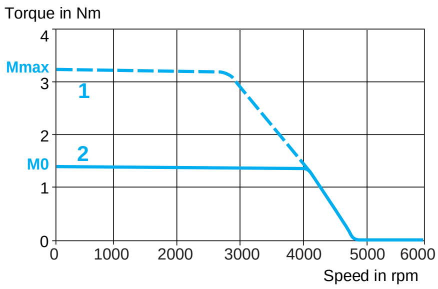


BSH 0701P servo motor

With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

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Characteristics of BSH 0701T servo motors

Type of servo motor				**BSH 0701T**			
Associated with Lexium 05 servo drive				**LXM 05 ●D10F1**	**LXM 05 ●D17M2**	**LXM 05 ●D10M3X**	**LXM 05 ●D17M3X**
Line supply voltage			**V**	115 single phase	230 single phase	230 3-phase	230 3-phase
Switching frequency			**kHz**	8			
Torque	Continuous stall	M_0	**Nm**	1.4			
	Peak stall	M_{max}	**Nm**	2.42	3.19	2.41	3.19
Nominal operating point	Nominal torque		**Nm**	1.43	1.32	1.2	1.32
	Nominal speed		**rpm**	2500	5000	6000	5000
Maximum current			**A rms**	9.9			

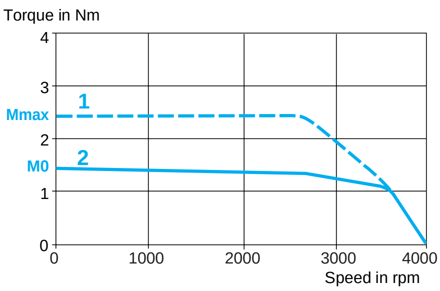
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	0.46
	Back emf		**V_{rms}/krpm**	27
Rotor	Number of poles			6
	Inertia: Without brake	J_m	**kgcm²**	0.25
	Inertia: With brake	J_m	**kgcm²**	0.322
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	3.3
	Inductance (phase/phase)		**mH**	12.6
	Electrical time constant		**ms**	3.81
Holding brake (depending on model)				See page 86

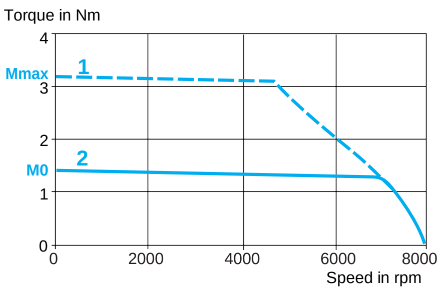
Speed/torque curves

BSH 0701T servo motor

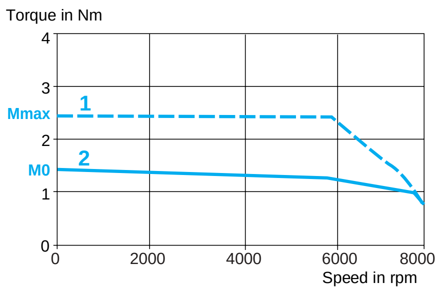
With LXM 05●D10F1 servo drive
115 V single phase



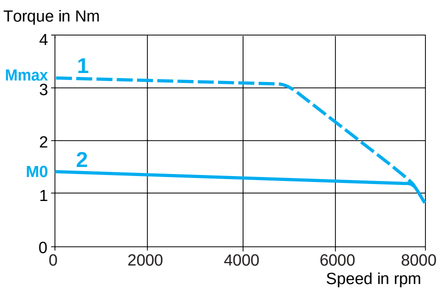
With LXM 05●D17M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



With LXM 05●D17M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Characteristics of BSH 0702M servo motors

Type of servo motor				**BSH 0702M**	
Associated with Lexium 05 servo drive				**LXM 05●D10M2**	**LXM 05●D10M3X**
Line supply voltage			**V**	230 single phase	230 3-phase
Switching frequency			**kHz**	4	
Torque	Continuous stall	M_0	**Nm**	2.1	
	Peak stall	M_{max}	**Nm**	6.8	
Nominal operating point	Nominal torque		**Nm**	2.12	
	Nominal speed		**rpm**	1500	
Maximum current			**A rms**	5.9	

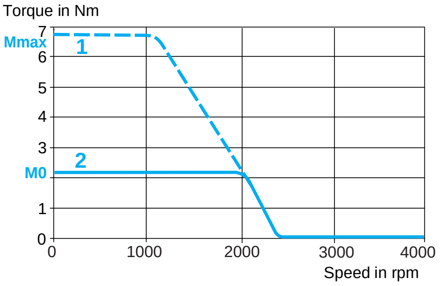
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	1.46
	Back emf			**V_{rms}/krpm**	93
Rotor	Number of poles				6
	Inertia	Without brake	J_m	**$kgcm^2$**	0.41
		With brake	J_m	**$kgcm^2$**	0.482
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	17.3
	Inductance (phase/phase)			**mH**	84.4
	Electrical time constant			**ms**	4.88
Holding brake (depending on model)					See page 86

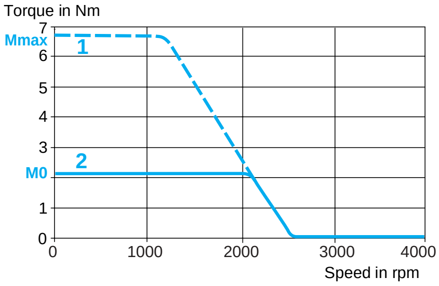
Speed/torque curves

BSH 0702M servo motor

With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

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Characteristics of BSH 0702P servo motors

Type of servo motor				BSH 0702P				
Associated with Lexium 05 servo drive				**LXM 05 ●D10M2**	**LXM 05 ●D17M2**	**LXM 05 ●D10M3X**	**LXM 05 ●D17M3X**	**LXM 05 ●D14N4**
Line supply voltage			**V**	230 single phase	230 single phase	230 3-phase	230 3-phase	400/480 3-phase
Switching frequency			**kHz**	4				
Torque	Continuous stall	M_0	**Nm**	2.2				
	Peak stall	M_{max}	**Nm**	5.37	7.55	5.37	7.55	
Nominal operating point	Nominal torque		**Nm**	1.9				1.6
	Nominal speed		**rpm**	3000				6000
Maximum current			**A rms**	9.8				

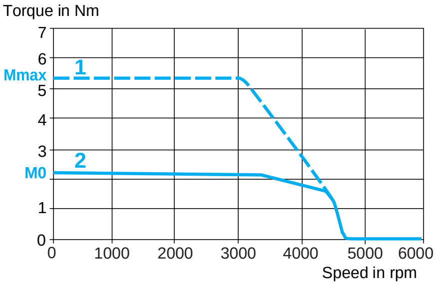
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	0.77
	Back emf		**V_{rms}/krpm**	48
Rotor	Number of poles			6
	Inertia – Without brake	J_m	**kgcm²**	0.41
	Inertia – With brake	J_m	**kgcm²**	0.482
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	4.2
	Inductance (phase/phase)		**mH**	21.3
	Electrical time constant		**ms**	5.07
Holding brake (depending on model)				See page 86

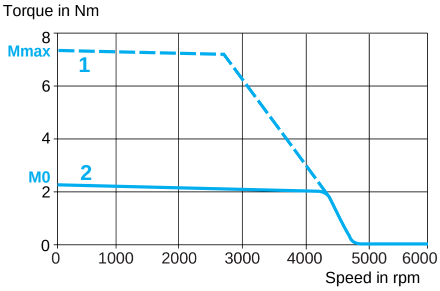
Speed/torque curves

BSH 0702P servo motor

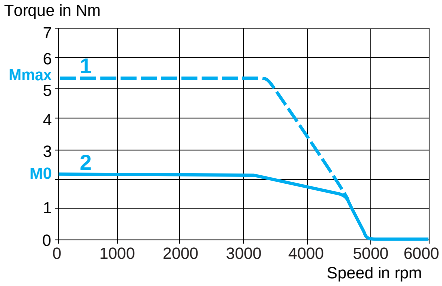
With LXM 05●D10M2 servo drive
230 V single phase



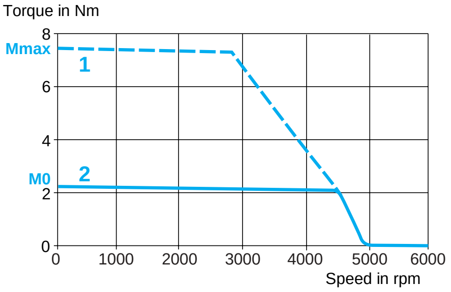
With LXM 05●D17M2 servo drive
230 V single phase



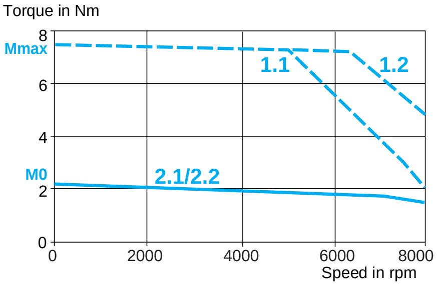
With LXM 05●D10M3X servo drive
230 V 3-phase



With LXM 05●D17M3X servo drive
230 V 3-phase



With LXM 05●D14N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Characteristics of BSH 0702T servo motors

Type of servo motor				BSH 0702T			
Associated with Lexium 05 servo drive				LXM 05 ●D17F1	LXM 05 ●D17M2	LXM 05 ●D28M2	LXM 05 ●D42M3X
Line supply voltage			V	115 single phase	230 single phase	230 single phase	230 3-phase
Switching frequency			kHz	8			
Torque	Continuous stall	M_0	Nm	2.12			
	Peak stall	M_{max}	Nm	4.14		6.8	
Nominal operating point	Nominal torque		Nm	1.9	1.7	1.76	
	Nominal speed		rpm	2500	6000	4500	
Maximum current			A rms	20.6			

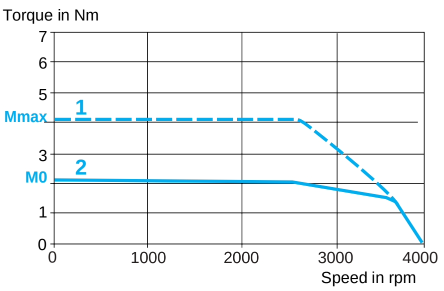
Servo motor characteristics

Maximum mechanical speed			rpm	8000
Constants (at 120°C)	Torque		Nm/A rms	0.42
	Back emf		V_{rms}/krpm	28
Rotor	Number of poles			6
	Inertia, Without brake	J_m	$kgcm^2$	0.41
	Inertia, With brake	J_m	$kgcm^2$	0.482
Stator (at 20°C)	Resistance (phase/phase)		Ω	1.5
	Inductance (phase/phase)		mH	6.6
	Electrical time constant		ms	4.4
Holding brake (depending on model)				See page 86

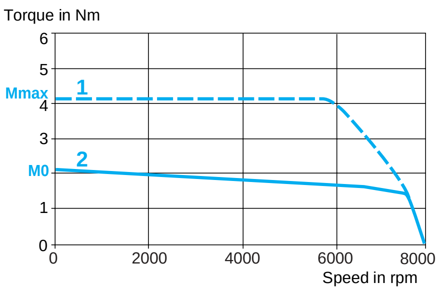
Speed/torque curves

BSH 0702T servo motor

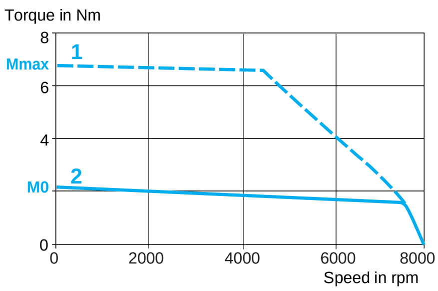
With LXM 05●D17F1 servo drive
115 V single phase



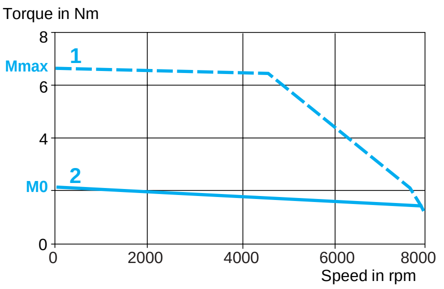
With LXM 05●D17M2 servo drive
230 V single phase



With LXM 05●D28M2 servo drive
230 V single phase



With LXM 05●D42M3X servo drive 230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

Characteristics of BSH 0703M servo motors

Type of servo motor				BSH 0703M		
Associated with Lexium 05 servo drive				**LXM 05●D10M2**	**LXM 05●D10M3X**	**LXM 05●D14N4**
Line supply voltage			**V**	230 single phase	230 3-phase	400/480 3-phase
Switching frequency			**kHz**	4		
Torque	Continuous stall	M_0	**Nm**	2.8		
	Peak stall	M_{max}	**Nm**	10		10.3
Nominal operating point	Nominal torque		**Nm**	2.7		2.5
	Nominal speed		**rpm**	1500		3000
Maximum current			**A rms**	7.3		

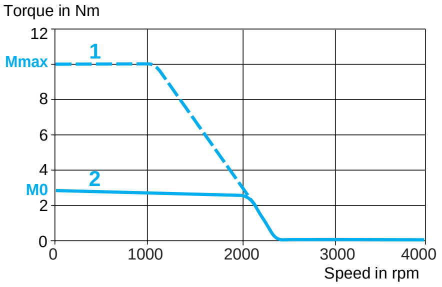
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	1.48
	Back emf		**V_{rms}/krpm**	96
Rotor	Number of poles			6
	Inertia	Without brake J_m	**kgcm²**	0.58
		With brake J_m	**kgcm²**	0.81
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	10.7
	Inductance (phase/phase)		**mH**	48.1
	Electrical time constant		**ms**	4.5
Holding brake (depending on model)				See page 86

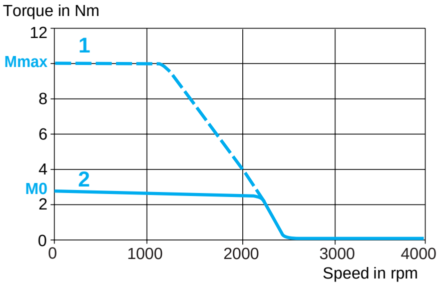
Speed/torque curves

BSH 0703M servo motor

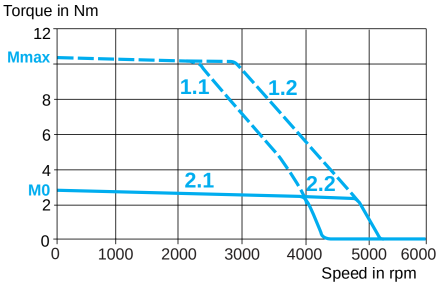
With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



With LXM 05●D14N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase

1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

Characteristics of BSH 0703P servo motors

Type of servo motor				BSH 0703P			
Associated with Lexium 05 servo drive				**LXM 05 ●D17M2**	**LXM 05 ●D28M2**	**LXM 05 ●D17M3X**	**LXM 05 ●D22N4**
Line supply voltage			**V**	230 single phase	230 single phase	230 3-phase	400/480 3-phase
Switching frequency			**kHz**	8			
Torque	Continuous stall	M_0	**Nm**	3.1			
	Peak stall	M_{max}	**Nm**	7.28	10.3	7.28	8.92
Nominal operating point	Nominal torque		**Nm**	2.8	2.3	2.8	2.3
	Nominal speed		**rpm**	3000			6000
Maximum current			**A rms**	15.2			

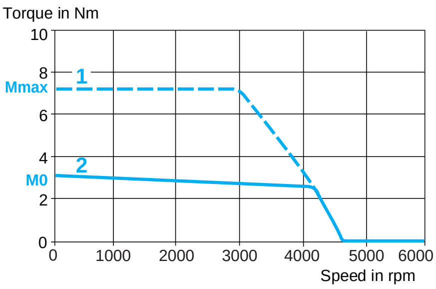
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	0.78
	Back emf			**V_{rms}/krpm**	49
Rotor	Number of poles				6
	Inertia	Without brake	J_m	**kgcm²**	0.58
		With brake	J_m	**kgcm²**	0.81
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	2.7
	Inductance (phase/phase)			**mH**	13
	Electrical time constant			**ms**	4.81
Holding brake (depending on model)					See page 86

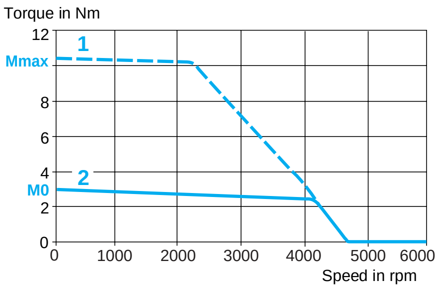
Speed/torque curves

BSH 0703P servo motor

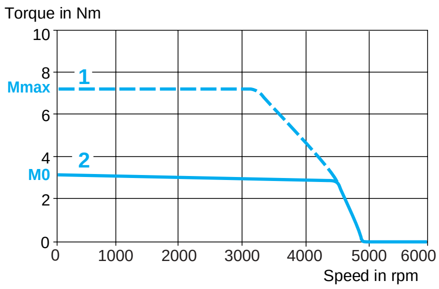
With LXM 05●D17M2 servo drive
230 V single phase



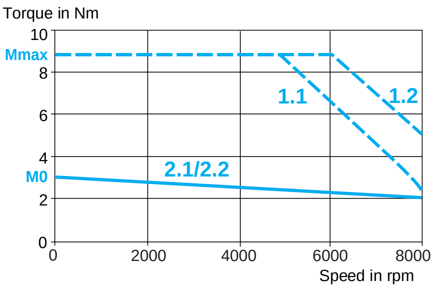
With LXM 05●D28M2 servo drive
230 V single phase



With LXM 05●D17M3X servo drive
230 V 3-phase



With LXM 05●D22N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

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References: pages 80 to 82
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Characteristics of BSH 0703T servo motors

Type of servo motor				BSH 0703T		
Associated with Lexium 05 servo drive				**LXM 05●D28F1**	**LXM 05●D28M2**	**LXM 05●D42M3X**
Line supply voltage			**V**	115 single phase	230 single phase	230 3-phase
Switching frequency			**kHz**	8		
Torque	Continuous stall	M_0	**Nm**	2.8		
	Peak stall	M_{max}	**Nm**	7.38		10.25
Nominal operating point	Nominal torque		**Nm**	2.55	2.1	
	Nominal speed		**rpm**	2500	6000	
Maximum current			**A rms**	30.9		

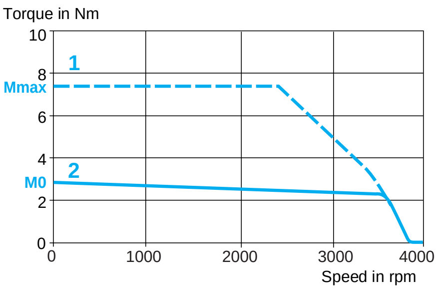
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	0.42
	Back emf		**V_{rms}/krpm**	29
Rotor	Number of poles			6
	Inertia	Without brake J_m	**kgcm²**	0.58
		With brake J_m	**kgcm²**	0.81
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1
	Inductance (phase/phase)		**mH**	4.4
	Electrical time constant		**ms**	4.4
Holding brake (depending on model)				See page 86

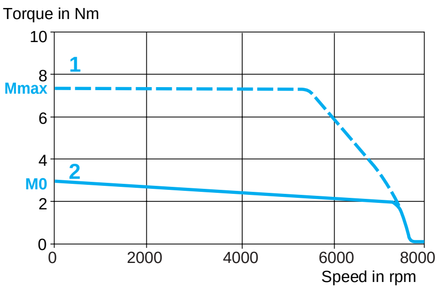
Speed/torque curves

BSH 0703T servo motor

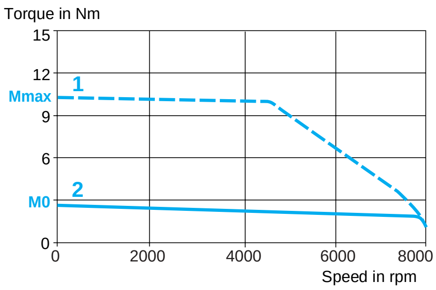
With LXM 05●D28F1 servo drive
115 V single phase



With LXM 05●D28M22 servo drive
230 V single phase



With LXM 05●D42M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Lexium 05 motion control

BSH servo motors

Characteristics of 1001M/1001P servo motors

Type of servo motor				BSH 1001M	BSH 1001P	
Associated with Lexium 05 servo drive				**LXM 05 •D14N4**	**LXM 05 •D17M3X**	**LXM 05 •D22N4**
Line supply voltage			**V**	400/480 3-phase	230 3-phase	400/480 3-phase
Switching frequency			**kHz**	4		
Torque	Continuous stall	M_0	**Nm**	3.4	3.3	
	Peak stall	M_{max}	**Nm**	8.5	9.45	
Nominal operating point	Nominal torque		**Nm**	3.1		2.8
	Nominal speed		**rpm**	2000		4000
Maximum current			**A rms**	5.9	12	

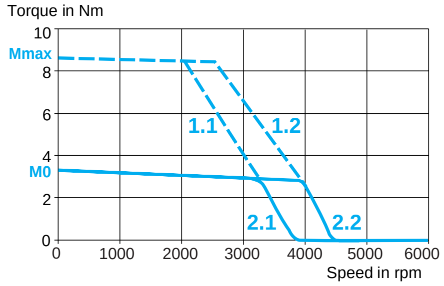
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000		
Constants (at 120°C)	Torque		**Nm/A rms**	1.84	0.89	
	Back emf		**V_{rms}/krpm**	112	60	
Rotor	Number of poles			8		
	Inertia	Without brake J_m	**kgcm²**	1.40		
		With brake J_m	**kgcm²**	2.013		
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	18.4	3.8	
	Inductance (phase/phase)		**mH**	61.5	17.6	
	Electrical time constant		**ms**	3.34	4.63	
Holding brake (depending on model)				See page 86		

Speed/torque curves

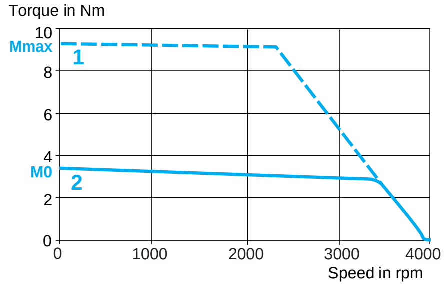
BSH 1001M servo motor

With LXM 05•D14N4 servo drive
400/480 V 3-phase

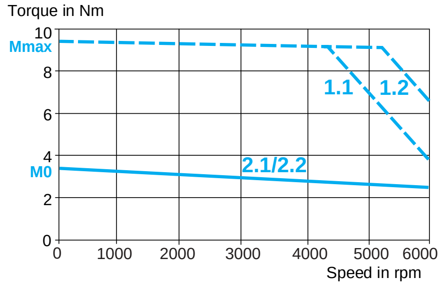


BSH 1001P servo motor

With LXM 05•D17M3X servo drive
230 V 3-phase



With LXM 05•D22N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
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Dimensions: pages 83 to 85

Characteristics of BSH 1001T servo motors

Type of servo motor			**BSH 1001T**		
Associated with Lexium 05 servo drive			**LXM 05 ●D28F1**	**LXM 05 ●D28M2**	**LXM 05 ●D42M3X**
Line supply voltage		**V**	115 single phase	230 single phase	230 3-phase
Switching frequency		**kHz**	8		
Torque	Continuous stall M_0	**Nm**	3.4		
	Peak stall M_{max}	**Nm**	8.5		
Nominal operating point	Nominal torque	**Nm**	3	2.8	
	Nominal speed	**rpm**	2500	4000	
Maximum current		**A rms**	23		

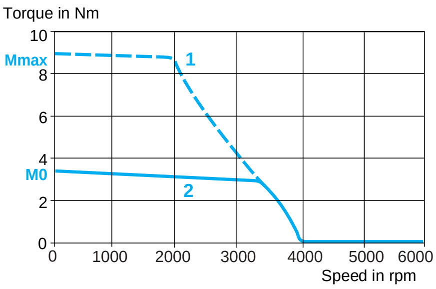
Servo motor characteristics

Maximum mechanical speed		**rpm**	6000
Constants (at 120°C)	Torque	**Nm/A rms**	0.52
	Back emf	**V_{rms}/krpm**	28
Rotor	Number of poles		8
	Inertia – Without brake J_m	**kgcm²**	1.40
	Inertia – With brake J_m	**kgcm²**	2.013
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	0.9
	Inductance (phase/phase)	**mH**	4
	Electrical time constant	**ms**	4.44
Holding brake (depending on model)			See page 86

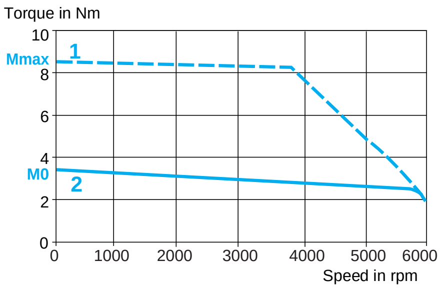
Speed/torque curves

BSH 1001T servo motor

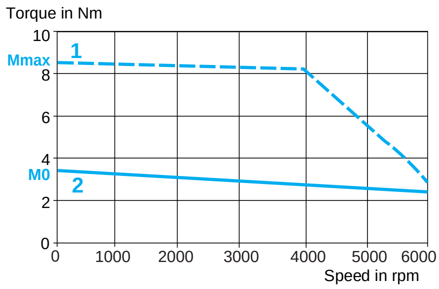
With LXM 05●D28F1 servo drive
115 V single phase



With LXM 05●D28M2 servo drive
230 V single phase



With LXM 05●D42M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

Characteristics of BSH 1002M/1002P/1002T servo motors

Type of servo motor			BSH 1002M	BSH 1002P			BSH 1002T
Associated with Lexium 05 servo drive			LXM 05 ●D14N4	LXM 05 ●D28M2	LXM 05 ●D17M3X	LXM 05 ●D22N4	LXM 05 ●D42M3X
Line supply voltage		V	400/480 3-phase	230 single phase	230 3-phase	400/480 3-phase	230 3-phase
Switching frequency		kHz	4	8			
Torque	Continuous stall M_0	Nm	5.5	5.8			5.52
	Peak stall M_{max}	Nm	16	18.23	12.35	15.43	16
Nominal operating point	Nominal torque	Nm	5.1	5.2		4.6	4.4
	Nominal speed	rpm	2000			4000	
Maximum current		A rms	7.4	17.8			31.2

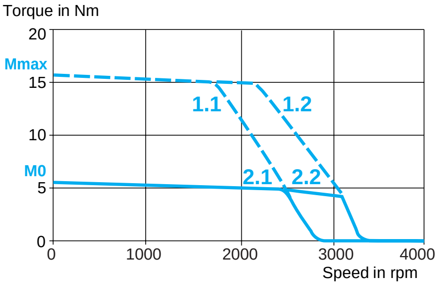
Servo motor characteristics

Maximum mechanical speed			rpm	6000		
Constants (at 120°C)	Torque		Nm/A rms	2.28	1.21	0.65
	Back emf		V_{rms}/krpm	146	77	33
Rotor	Number of poles			8		
	Inertia	Without brake J_m	kgcm²	2.31		
		With brake J_m	kgcm²	2.923		
Stator (at 20°C)	Resistance (phase/phase)		Ω	8.6	2.4	0.6
	Inductance (phase/phase)		mH	46.1	12.7	2.9
	Electrical time constant		ms	5.98	5.91	6.00
Holding brake (depending on model)				See page 86		

Speed/torque curves

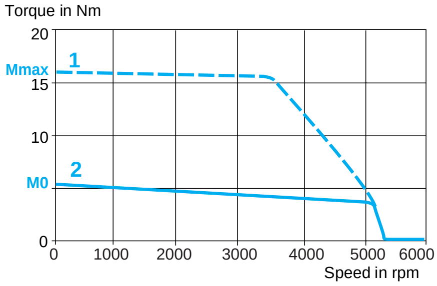
BSH 1002M servo motor

With LXM 05●D14N4 servo drive
400/480 V 3-phase



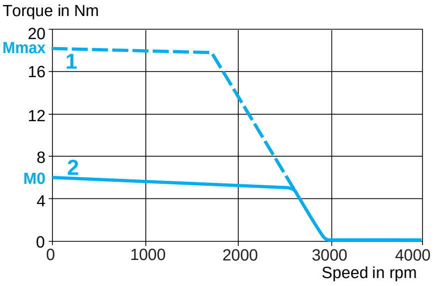
BSH 1002T servo motor

With LXM 05●D17M3X servo drive
230 V 3-phase

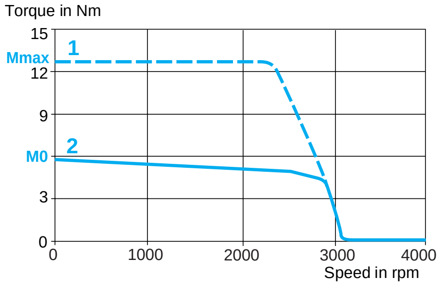


BSH 1002P servo motor

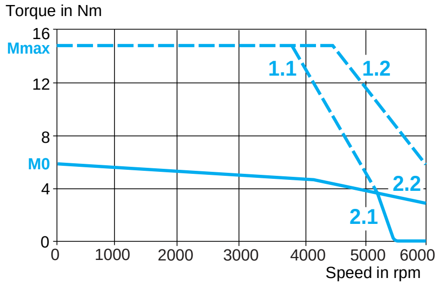
With LXM 05●D28M2 servo drive
230 V single phase



With LXM 05●D17M3X servo drive
230 V 3-phase



With LXM 05●D22N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation:
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References:
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Dimensions:
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Characteristics of BSH 1003M/1003P servo motors

Type of servo motor				BSH 1003M	BSH 1003P		
Associated with Lexium 05 servo drive				LXM 05 ●D22N4	LXM 05 ●D28M2	LXM 05 ●D42M3X	LXM 05 ●D34N4
Line supply voltage			V	400/480 3-phase	230 single phase	230 3-phase	400/480 3-phase
Switching frequency			kHz	4			
Torque	Continuous stall	M_0	Nm	7.8	8		
	Peak stall	M_{max}	Nm	27.28	22.79	28.31	26.97
Nominal operating point	Nominal torque		Nm	6.6	7		5.7
	Nominal speed		rpm	2000			4000
Maximum current			A rms	15.6	28.3		

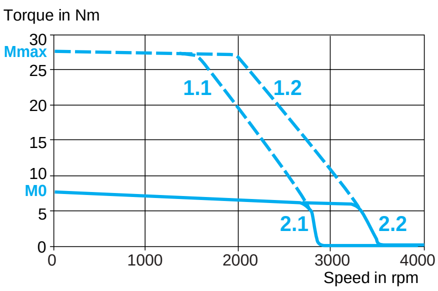
Servo motor characteristics

Maximum mechanical speed			rpm	6000			
Constants (at 120°C)	Torque		Nm/A rms	2.24	1.12		
	Back emf		V_{rms}/krpm	144	77		
Rotor	Number of poles			8			
	Inertia – Without brake	J_m	$kgcm^2$	3.22			
	Inertia – With brake	J_m	$kgcm^2$	3.833			
Stator (at 20°C)	Resistance (phase/phase)		Ω	5.3	1.43		
	Inductance (phase/phase)		mH	33.7	8.8		
	Electrical time constant		ms	6.36	6.15		
Holding brake (depending on model)				See page 86			

Speed/torque curves

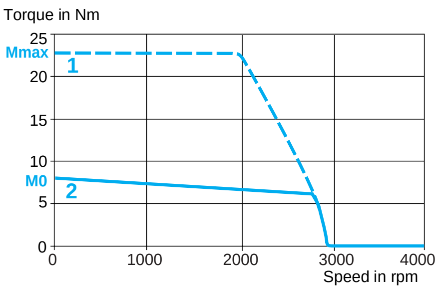
BSH 1003M servo motor

With LXM 05●D22N4 servo drive
400/480 V 3-phase

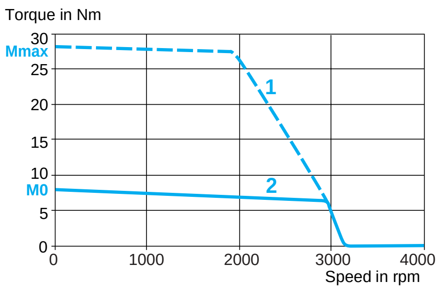


BSH 1003P servo motor

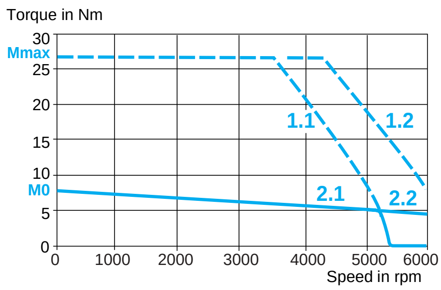
With LXM 05●D28M2 servo drive
230 V single phase



With LXM 05●D42M3X servo drive
230 V 3-phase



With LXM 05●D34N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
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Characteristics of BSH 1004P servo motors

Type of servo motor					BSH 1004P		
Associated with Lexium 05 servo drive					LXM 05●D42M3X	LXM 05●D34N4	LXM 05●D57N4
Line supply voltage				V	230 3-phase	400/480 3-phase	400/480 3-phase
Switching frequency				kHz	8		
Torque	Continuous stall		M_0	Nm	10		
	Peak stall		M_{max}	Nm	30.41	22.53	30.41
Nominal operating point	Nominal torque			Nm	9.5	7.9	7.9
	Nominal speed			rpm	1500	3000	3000
Maximum current				A rms	23.5		

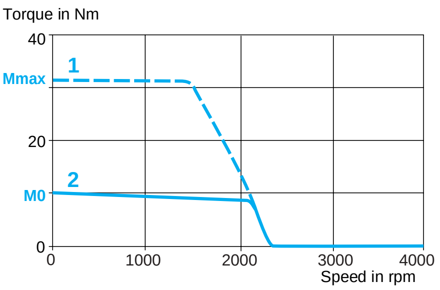
Servo motor characteristics

Maximum mechanical speed				rpm	6000
Constants (at 120°C)	Torque			Nm/A rms	1.62
	Back emf			V_{rms}/krpm	103
Rotor	Number of poles				8
	Inertia	Without brake	J_m	kgcm²	4.22
		With brake	J_m	kgcm²	5.245
Stator (at 20°C)	Resistance (phase/phase)			Ω	1.81
	Inductance (phase/phase)			mH	11.8
	Electrical time constant			ms	6.52
Holding brake (depending on model)					See page 86

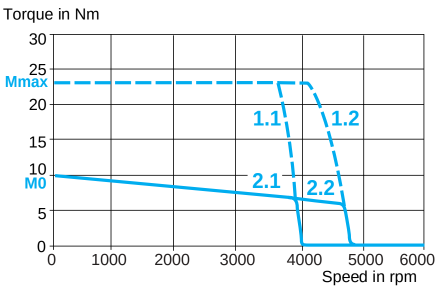
Speed/torque curves

BSH 1004P servo motor

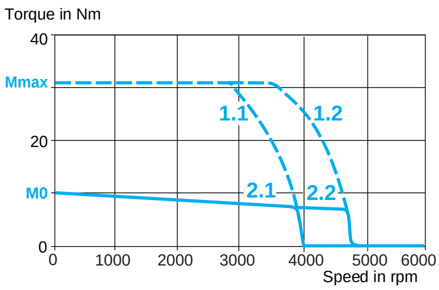
With LXM 05●D42M3X servo drive
230 V 3-phase



With LXM 05●D34N4 servo drive
400/480 V 3-phase



With LXM 05●D57N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase

1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Characteristics of BSH 1401P/1401T servo motors

Type of servo motor				BSH 1401P	BSH 1401T
Associated with Lexium 05 servo drive				LXM 05●D34N4	LXM 05●D42M3X
Line supply voltage			V	400/480 3-phase	230 3-phase
Switching frequency			kHz	4	
Torque	Continuous stall	M_0	Nm	11.1	
	Peak stall	M_{max}	Nm	26.2	24.77
Nominal operating point	Nominal torque		Nm	9.55	9.47
	Nominal speed		rpm	2500	
Maximum current			A rms	20.8	37.1

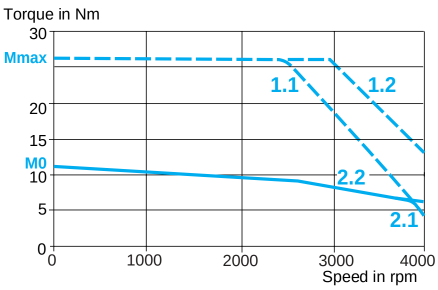
Servo motor characteristics

Maximum mechanical speed			rpm	4000	
Constants (at 120°C)	Torque		Nm/A rms	1.43	0.8
	Back emf		V_{rms}/krpm	100	56
Rotor	Number of poles			10	
	Inertia Without brake	J_m	kgcm²	7.41	
	With brake	J_m	kgcm²	8.56	
Stator (at 20°C)	Resistance (phase/phase)		Ω	1.41	0.44
	Inductance (phase/phase)		mH	15.6	4.92
	Electrical time constant		ms	11.06	11.18
Holding brake (depending on model)				See page 86	

Speed/torque curves

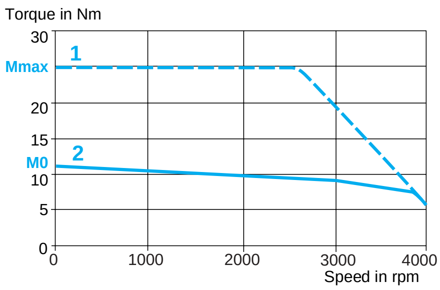
BSH 1401P servo motor

With LXM 05●D34N4 servo drive
400/480 V 3-phase



BSH 1401T servo motor

With LXM 05●D42M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

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Characteristics of BSH 1402M/1402P/1402T servo motors

Type of servo motor				BSH 1402M	BSH 1402P		BSH 1402T
Associated with Lexium 05 servo drive				**LXM 05 ●D34N4**	**LXM 05 ●D42M3X**	**LXM 05 ●D57N4**	**LXM 05 ●D42M3X**
Line supply voltage			**V**	400/480 3-phase	230 3-phase	400/480 3-phase	230 3-phase
Switching frequency			**kHz**	4			
Torque	Continuous stall	M_0	**Nm**	19.5			
	Peak stall	M_{max}	**Nm**	57.1	46.72	57.42	25.04
Nominal operating point	Nominal torque		**Nm**	17.1	13.7	12.3	14.44
	Nominal speed		**rpm**	1250	1500	3000	2000
Maximum current			**A rms**	22.4	44.1		75.2

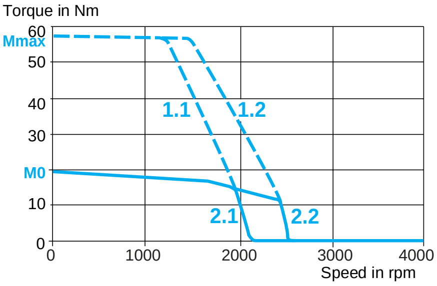
Servo motor characteristics

Maximum mechanical speed			**rpm**	4000			
Constants (at 120°C)	Torque		**Nm/A rms**	2.91	1.47		0.87
	Back emf		**V_{rms}/krpm**	199	101		59
Rotor	Number of poles			10			
	Inertia	Without brake J_m	**$kgcm^2$**	12.68			
		With brake J_m	**$kgcm^2$**	13.83			
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	2.32	0.6		0.21
	Inductance (phase/phase)		**mH**	28.59	7.4		2.54
	Electrical time constant		**ms**	12.32	12.33		12.2
Holding brake (depending on model)				See page 86			

Speed/torque curves

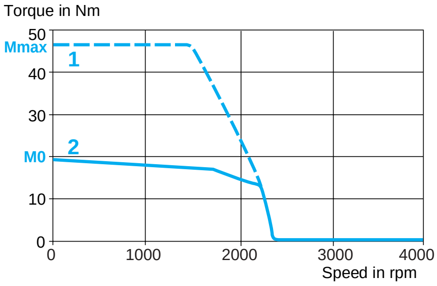
BSH 1402M servo motor

With LXM 05●D34N4 servo drive
400/480 V 3-phase

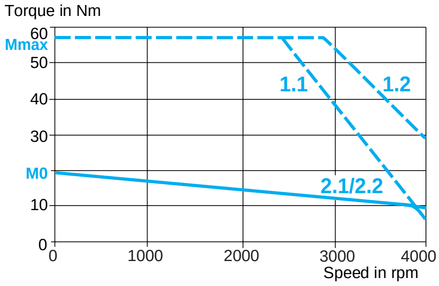


BSH 1402P servo motor

With LXM 05●D42M3X servo drive
230 V 3-phase

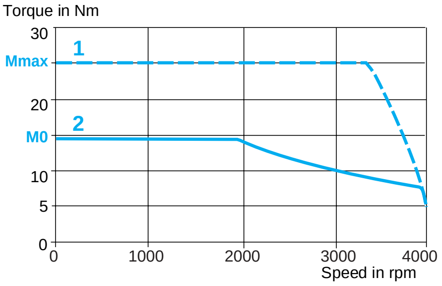


With LXM 05●D57N4 servo drive
400/480 V 3-phase



BSH 1402T servo motor

With LXM 05●D42M3X servo drive 230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

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Lexium 05 motion control
BSH servo motors

Characteristics of BSH 1403M/1403P servo motors

Type of servo motor				BSH 1403M		BSH 1403P
Associated with Lexium 05 servo drive				**LXM 05●D34N4**	**LXM 05●D57N4**	**LXM 05●D57N4**
Line supply voltage			**V**	400/480 3-phase		
Switching frequency			**kHz**	4		
Torque	Continuous stall	M_0	**Nm**	27.8		
	Peak stall	M_{max}	**Nm**	76.66	88.17	57.24
Nominal operating point	Nominal torque		**Nm**	21.5	21.2	12.9
	Nominal speed		**rpm**	1250	1500	3000
Maximum current			**A rms**	27.5		75.2

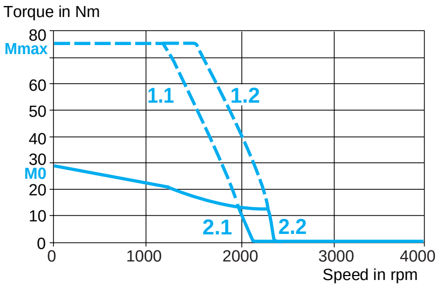
Servo motor characteristics

Maximum mechanical speed			**rpm**	4000	
Constants (at 120°C)	Torque		**Nm/A rms**	3.09	1.58
	Back emf		**V_{rms}/krpm**	205	105
Rotor	Number of poles			10	
	Inertia – Without brake	J_m	**kgcm²**	17.94	
	Inertia – With brake	J_m	**kgcm²**	23.44	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.52	0.4
	Inductance (phase/phase)		**mH**	19.39	5.1
	Electrical time constant		**ms**	12.76	12.75
Holding brake (depending on model)				See page 86	

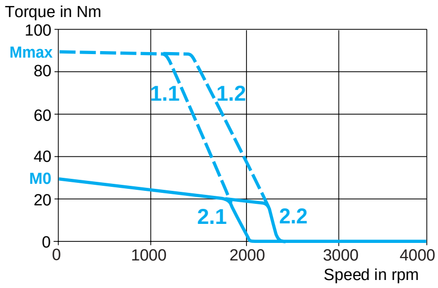
Speed/torque curves

BSH 1403M servo motor

With LXM 05●D34N4 servo drive
400/480 V 3-phase

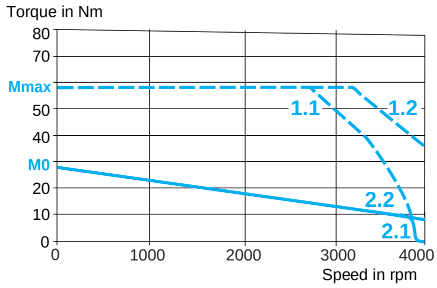


With LXM 05●D57N4 servo drive
400/480 V 3-phase



BSH 1403P servo motor

With LXM 05●D57N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

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References: pages 80 to 82
Dimensions: pages 83 to 85

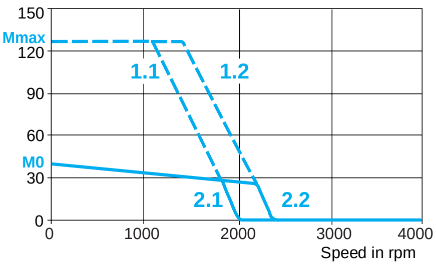
Characteristics of BSH 1404M/1404P servo motors

					BSH 1404M	BSH 1404P
Type of servo motor					**BSH 1404M**	**BSH 1404P**
Associated with Lexium 05 servo drive					**LXM 05●D57N4**	
Line supply voltage				**V**	400/480 3-phase	
Switching frequency				**kHz**	4	
Torque	Continuous stall		M_0	**Nm**	33.4	
	Peak stall		M_{max}	**Nm**	126.45	60.04
Nominal operating point	Nominal torque			**Nm**	26.3	16.1
	Nominal speed			**rpm**	1500	3000
Maximum current				**A rms**	47.8	95.6
Servo motor characteristics						
Maximum mechanical speed				**rpm**	4000	
Constants (at 120°C)	Torque			**Nm/A rms**	3.12	1.57
	Back emf			**V_{rms}/krpm**	208	104
Rotor	Number of poles				10	
	Inertia	Without brake	J_m	**$kgcm^2$**	23.70	
		With brake	J_m	**$kgcm^2$**	29.20	
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	1.12	0.28
	Inductance (phase/phase)			**mH**	15.6	3.9
	Electrical time constant			**ms**	13.93	
Holding brake (depending on model)					See page 86	

Speed/torque curves

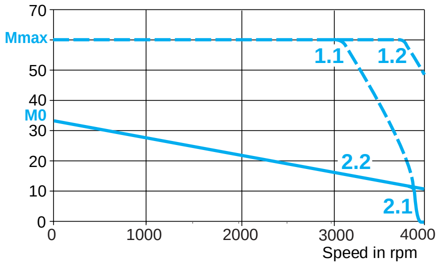
BSH 1404M servo motor

With LXM 05●D57N4 servo drive
400/480 V 3-phase



BSH 1404P servo motor

With LXM 05●D57N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Characteristics of BSH 2051M servo motors

Type of servo motor				**BSH 2051M**
Associated with Lexium 05 servo drive				**LXM 05●D57N4**
Line supply voltage			**V**	400/480 3-phase
Switching frequency			**kHz**	4
Torque	Continuous stall	M_0	**Nm**	36
	Peak stall	M_{max}	**Nm**	68.3
Nominal operating point	Nominal torque		**Nm**	33.5
	Nominal speed		**rpm**	1500
Maximum current			**A rms**	31.8

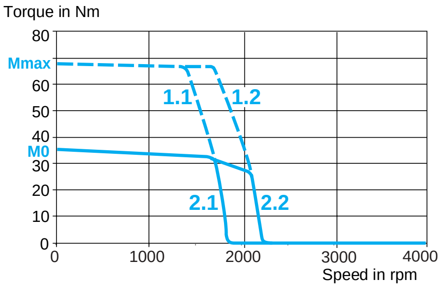
Servo motor characteristics

Maximum mechanical speed				**rpm**	3800
Constants (at 120°C)	Torque			**Nm/A rms**	3.16
	Back emf			**V_{rms}/krpm**	208
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**$kgcm^2$**	62
		With brake	J_m	**$kgcm^2$**	78
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	1.6
	Inductance (phase/phase)			**mH**	15.2
	Electrical time constant			**ms**	9.50
Holding brake (depending on model)					See page 86

Speed/torque curves

BSH 2051M servo motor

With LXM 05●D57N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

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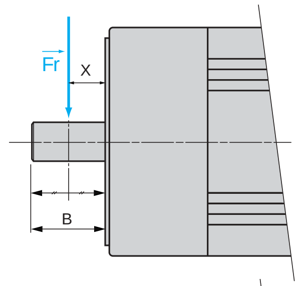

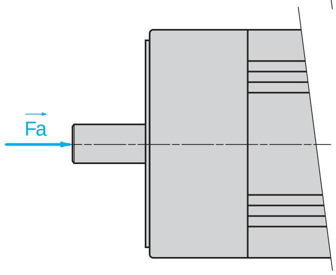

Radial and axial forces permissible on the motor shaft

Even when the servo motors are used under optimum conditions, their lifetime is limited by that of the bearings.

Conditions	
Nominal lifetime of bearings *(1)*	L_{10h} = 20,000 hours
Ambient temperature (temperature of bearings ~ 100°C)	40°C
Force application point	Fr applied at the middle of the shaft end X = B/2 (dimension B see pages 83 to 85)

(1) Hours of use with 10% probability of failure

⚠ The following conditions must be observed:

- Radial and axial forces must not be applied simultaneously.
- Shaft end with IP 40 or IP 65 protection.
- The bearings cannot be changed by the user as the built-in position sensor has to be realigned if the unit is dismantled.

			Maximum radial force Fr							
Mechanical speed		**rpm**	**1000**	**2000**	**3000**	**4000**	**5000**	**6000**	**7000**	**8000**
Servo motor	BSH 0551	**N**	340	270	240	220	200	190	180	170
	BSH 0552	**N**	370	290	260	230	220	200	190	190
	BSH 0553	**N**	390	310	270	240	230	210	200	190
	BSH 0701	**N**	660	520	460	410	380	360	–	–
	BSH 0702	**N**	710	560	490	450	410	390	–	–
	BSH 0703	**N**	730	580	510	460	430	400	–	–
	BSH 1001	**N**	900	720	630	570	530	–	–	–
	BSH 1002	**N**	990	790	690	620	–	–	–	–
	BSH 1003	**N**	1050	830	730	660	–	–	–	–
	BSH 1004	**N**	1070	850	740	–	–	–	–	–
	BSH 1401	**N**	2210	1760	1530	–	–	–	–	–
	BSH 1402	**N**	2430	1930	1680	–	–	–	–	–
	BSH 1403	**N**	2560	2030	1780	–	–	–	–	–
	BSH 1404	**N**	2660	2110	1840	–	–	–	–	–
	BSH 2051	**N**	3730	2960	2580	–	–	–	–	–
			Maximum axial force: Fa = 0.2 x Fr							

Characteristics of servo motor-servo drive power connection cables

		VW3 M5 101R●●●	**VW3 M5 102R●●●**	**VW3 M5 103R●●●**
Outer cover, insulation		PUR (RAL 2003 orange), TPM or PP/PE		
Capacity	**pF/m**	< 70 (conductors/shielding)		
Number of conductors (shielded)		[(4 x 1.5 mm²) + (2 x 1.0 mm²)]	[(4 x 2.5 mm²) + (2 x 1.0 mm²)]	[(4 x 4 mm²) + (2 x 1.0 mm²)]
Connectors		1 industrial connector (motor side) and 1 end with flying leads (drive side)		
External diameter	**mm**	12 ± 0.2	14.3 ± 0.3	16.3 ± 0.3
Curvature radius	**mm**	90, suitable for daisy-chain, cable carrier chain	110, suitable for daisy-chain, cable carrier chain	125, suitable for daisy-chain, cable carrier chain
Operating voltage	**V**	600		
Maximum length	**m**	75 *(1)*		
Operating temperature	**°C**	- 40…+ 90 (fixed), - 20…+ 80 (mobile)		
Certifications		UL, CSA, VDE, CE, DESINA		

Characteristics of servo motor-servo drive encoder connection cables

		VW3 M8 101R●●●
Encoder type		**SinCos encoder**
Outer cover, insulation		PUR (RAL 6018 green), polyester
Number of conductors (shielded)		5 x (2 x 0.25 mm²) + (2 x 0.5 mm²)
External diameter	**mm**	8.8 ± 0.2
Connectors		1 industrial connector (motor side) and 1 x 12-way Molex connector (drive side)
Min. curvature radius	**mm**	68, suitable for daisy-chain, cable carrier chain
Operating voltage	**V**	350 (0.25 mm²), 500 (0.5 mm²)
Maximum length	**m**	75 *(1)*
Operating temperature	**°C**	- 50…+ 90 (fixed) - 40…+ 80 (mobile)
Certifications		UL, CSA, VDE, CE, DESINA

(1) For cables longer than 75 m, please consult your Regional Sales Office.

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Lexium 05 motion control
BSH servo motors

105222

BSH 070●● ●●●1A

105223

BSH 070●● ●●●2A

BSH servo motors

The BSH servo motors shown below are supplied without a gearbox.
For GBX gearboxes, see page 90.

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 05●	Maximum nominal speed *(1)*	Reference *(2)*	Weight *(3)*
Nm	Nm	rpm		rpm		kg
0.5	1.4	9000	D10F1	3000	**BSH 0551T ●●●●A**	0.800
			D10M2	6000		
			D10M3X	6000		
0.9	1.77	9000	D10F1	3000	**BSH 0552T ●●●●A**	1.100
			D10M2	6000		
			D10M3X	6000		
	2.3	9000	D10M2	1500	**BSH 0552M ●●●●A**	1.100
			D10M3X	1500		
	2.7	9000	D17F1	3000	**BSH 0552T ●●●●A**	1.100
			D10M2	4000	**BSH 0552P ●●●●A**	1.100
			D10M3X	4000		
			D14N4	6000		
1.3	3.18	9000	D10M2	4000	**BSH 0553P ●●●●A**	1.400
			D10M3X	4000		
	3.31	9000	D17F1	3000	**BSH 0553T ●●●●A**	1.400
			D17M2	6000		
			D17M3X	6000		
	3.87	9000	D14N4	6000	**BSH 0553T ●●●●A**	1.400
	4.2	9000	D10M2	1500	**BSH 0553M ●●●●A**	1.400
			D10M3X	1500		
1.4	2.41	8000	D10M3X	6000	**BSH 0701T ●●●●A**	2.100
	2.42	8000	D10F1	2500		
	3.19	8000	D17M3X	5000		
			D17M2	5000		
	3.2	8000	D10M3X	1500	**BSH 0701M ●●●●A**	2.100
			D10M2	3000	**BSH 0701P ●●●●A**	2.100
			D10M3X	4500		
2.1	6.8	8000	D10M2	1500	**BSH 0702M ●●●●A**	2.800
			D10M3X	1500		
2.12	4.14	8000	D17F1	2500	**BSH 0702T ●●●●A**	2.800
			D17M2	6000		
	6.8	8000	D28M2	4500		
			D42M3X	4500		
2.2	5.37	8000	D10M2	3000	**BSH 0702P ●●●●A**	2.800
			D10M3X	3000		
	7.55	8000	D14N4	6000		
			D17M2	3000		
			D17M3X	3000		
2.8	7.38	8000	D28F1	2500	**BSH 0703T ●●●●A**	3.600
			D28M2	6000		
	10	8000	D10M2	1500	**BSH 0703M ●●●●A**	3.600
			D10M3X	1500		
	10.25	8000	D42M3X	6000	**BSH 0703T ●●●●A**	3.600
	10.3		D14N4	3000	**BSH 0703M ●●●●A**	3.600
3.1	7.28	8000	D17M2	3000	**BSH 0703P ●●●●A**	3.600
			D17M3X	3000		
	8.92	8000	D22N4	6000		
	10.3	8000	D28M2	3000		

(1) Derating possible according to the supply voltage, see characteristics on pages 56 to 78.
(2) To complete each reference, see the table opposite.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 86.

BSH servo motors (continued)

105224

BSH 100●● ●●●1A

105230

BSH 140●● ●●●1A

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 05●	Maximum nominal speed (1)	Reference (2)	Weight (3)
Nm	Nm	rpm		rpm		kg
3.3	9.45	6000	D17M3X	2000	**BSH 1001P ●●●●A**	4.300
			D22N4	4000		
3.4	8.5	6000	D14N4	2000	**BSH 1001M ●●●●A**	4.300
			D28F1	2500	**BSH 1001T ●●●●A**	4.300
			D28M2	4000		
			D42M3X	4000		
5.5	16	6000	D14N4	2000	**BSH 1002M ●●●●A**	5.800
5.52	16	6000	D42M3X	4000	**BSH 1002T ●●●●A**	5.800
5.8	12.35	6000	D17M3X	2000	**BSH 1002P ●●●●A**	5.800
	15.43	6000	D22N4	4000		
	18.23	6000	D28M2	2000		
7.8	27.8	6000	D22N4	2000	**BSH 1003M ●●●●A**	7.500
8	22.79	6000	D28M2	2000	**BSH 1003P ●●●●A**	7.500
	26.97	6000	D34N4	4000		
	28.31	6000	D42M3X	2000		
10	22.53	6000	D34N4	3000	**BSH 1004P ●●●●A**	9.200
	30.41	6000	D42M3X	1500		
			D57N4	3000		
11.1	24.77	4000	D42M3X	2500	**BSH 1401T ●●●●A**	11.900
	26.2	4000	D34N4	2500	**BSH 1401P ●●●●A**	11.900
14.73	25.04	4000	D42M3X	2000	**BSH 1402T ●●●●A**	16.600
19.5	46.72	4000	D42M3X	1500	**BSH 1402P ●●●●A**	16.600
	57.1	4000	D34N4	1250	**BSH 1402M ●●●●A**	16.600
	57.42	4000	D57N4	3000	**BSH 1402P ●●●●A**	16.600
27.8	57.24	4000	D57N4	3000	**BSH 1403P ●●●●A**	21.300
	76.66	4000	D34N4	1250	**BSH 1403M ●●●●A**	21.300
	88.17	4000	D57N4	1500		
33.4	60.04	4000	D57N4	3000	**BSH 1404P ●●●●A**	26.000
	126.45	4000	D57N4	1500	**BSH 1404M ●●●●A**	26.000
36	68.3	3800	D57N4	1500	**BSH 2051M ●●●●A**	33.000

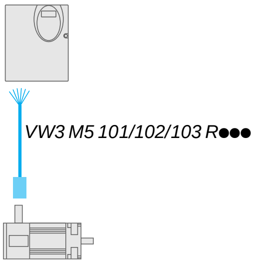
(1) Derating possible according to the supply voltage, see characteristics on pages 56 to 78.
(2) To complete each reference, see the table below.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 86.

To order a BSH motor, complete each reference as appropriate:

		BSH 0701P	●	●	●	●	A
Shaft end	IP 40	Smooth	**0**				
		Keyed	**1**				
	IP 65	Smooth	**2**				
		Keyed	**3**				
Integrated sensor	Single turn, SinCos Hiperface® 4096 points/turn			**1**			
	Multiturn, SinCos Hiperface® (no. of turns: 4096)			**2**			
Holding brake	Without				**A**		
	With				**F**		
Connection	Straight connectors					**1**	
	Rotatable right-angled connectors					**2**	
Flange	International standard						**A**

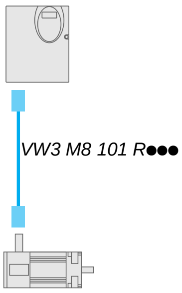
Presentation: pages 54 and 55
Characteristics: pages 56 to 78
Dimensions: pages 83 to 85

Connection cables



Cables equipped with one connector (servo motor side)

Description	From servo motor	To LXM 05● servo drive	Composition	Length m	Reference	Weight kg
Power cables	BSH 055●● BSH 070●● BSH 100●● BSH 1401P BSH 1402M BSH 1402P BSH 1403M BSH 1404M	All types	[(4 x 1.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 101 R30**	0.810
				5	**VW3 M5 101 R50**	1.210
				10	**VW3 M5 101 R100**	2.290
				15	**VW3 M5 101 R150**	3.400
				20	**VW3 M5 101 R200**	4.510
				25	**VW3 M5 101 R250**	6.200
				50	**VW3 M5 101 R500**	12.325
				75	**VW3 M5 101 R750**	18.450
	BSH 1401T BSH 1402T BSH 1403P BSH 1404P	D42M3X D57N4	[(4 x 2.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 102 R30**	1.070
				5	**VW3 M5 102 R50**	1.670
				10	**VW3 M5 102 R100**	3.210
				15	**VW3 M5 102 R150**	4.760
				20	**VW3 M5 102 R200**	6.300
				25	**VW3 M5 102 R250**	7.945
				50	**VW3 M5 102 R500**	16.170
				75	**VW3 M5 102 R750**	24.095
	BSH 2051M	D57N4	[(4 x 4 mm²) + (2 x 1 mm²)]	3	**VW3 M5 103 R30**	1.330
				5	**VW3 M5 103 R50**	2.130
				10	**VW3 M5 103 R100**	4.130
				15	**VW3 M5 103 R150**	6.120
				20	**VW3 M5 103 R200**	8.090
				25	**VW3 M5 103 R250**	11.625
				50	**VW3 M5 103 R500**	23.175
				75	**VW3 M5 103 R750**	34.725



Cables equipped with two connectors

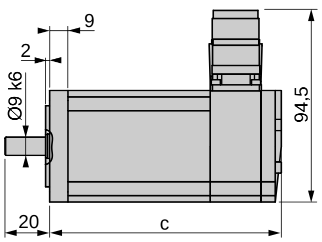
Description	From servo motor	To LXM 05● servo drive	Composition	Length m	Reference	Weight kg
SinCos Hiperface® encoder cables	BSH, all types	All types	5 x (2 x 0.25 mm²) + (2 x 0.5 mm²)	3	**VW3 M8 101 R30**	0.800
				5	**VW3 M8 101 R50**	1.200
				10	**VW3 M8 101 R100**	2.250
				15	**VW3 M8 101 R150**	3.450
				20	**VW3 M8 101 R200**	4.350
				25	**VW3 M8 101 R250**	4.950
				50	**VW3 M8 101 R500**	13.300
				75	**VW3 M8 101 R750**	17.650

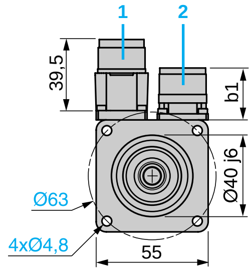
Presentation:
pages 54 and 55

Characteristics:
pages 79

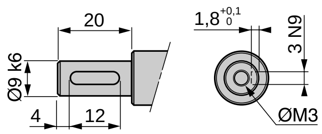
Lexium 05 motion control
BSH servo motors

BSH 055 (Example with straight connectors: servo motor/brake power supply 1 and encoder 2)



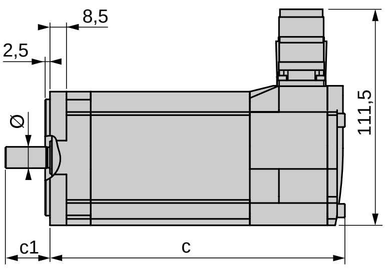


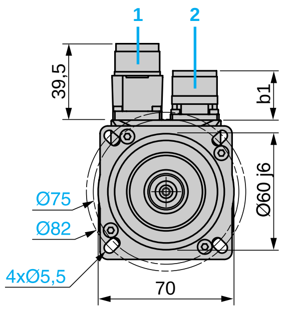
Shaft end, keyed slot (optional)



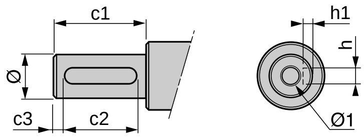
	Straight connectors	Rotatable angled connectors		
	b1	**b1**	**c** (without brake)	**c** (with brake)
BSH 0551	25.5	39.5	132.5	159
BSH 0552	25.5	39.5	154.5	181
BSH 0553	25.5	39.5	176.5	203

BSH 070 (Example with straight connectors: servo motor/brake power supply 1 and encoder 2)





Shaft end, keyed slot (optional)



	Straight connectors	Rotatable angled connectors									
	b1	**b1**	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**c3**	**h**	**h1**	**Ø**	**Ø1**
BSH 0701	25.5	39.5	154	180	23	18	2.5	4 N9	$2.5^{+0.1}_{0}$	11 k6	M4
BSH 0702	25.5	39.5	187	213	23	18	2.5	4 N9	$2.5^{+0.1}_{0}$	11 k6	M4
BSH 0703	25.5	39.5	220	256	30	20	5	5 N9	$3^{+0.1}_{0}$	14 k6	M5

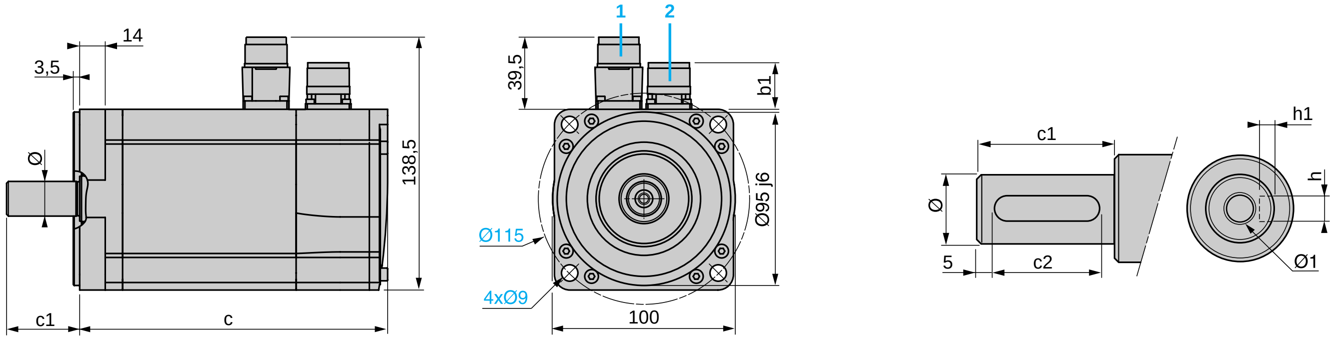
Presentation:
pages 54 and 55

Characteristics:
pages 56 to 79

References:
pages 80 to 82

BSH 100 (Example with straight connectors: servo motor/brake power supply 1 and encoder 2)

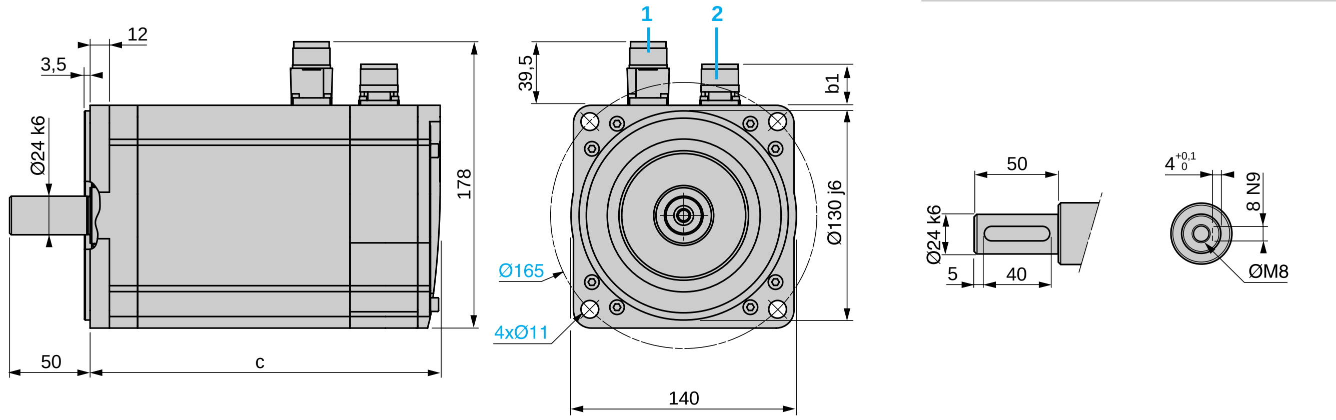
Shaft end, keyed slot (optional)



	Straight connectors	Rotatable angled connectors								
	b1	**b1**	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**h**	**h1**	**Ø**	**Ø1**
BSH 1001	25.5	39.5	169	200	40	30	6 N9	3.5 $^{+0.1}_{0}$	19 k6	M6
BSH 1002	25.5	39.5	205	236	40	30	6 N9	3.5 $^{+0.1}_{0}$	19 k6	M6
BSH 1003	25.5	39.5	241	272	40	30	6 N9	3.5 $^{+0.1}_{0}$	19 k6	M6
BSH 1004	25.5	39.5	277	308	50	40	8 N9	4 $^{+0.1}_{0}$	24 k6	M8

BSH 140 (Example with straight connectors: servo motor/brake power supply 1 and encoder 2)

Shaft end, keyed slot (optional)



	Straight connectors	Rotatable angled connectors		
	b1	**b1**	**c** (without brake)	**c** (with brake)
BSH 1401	25.5	39.5	218	256
BSH 1402	25.5	39.5	273	311
BSH 1403	25.5	39.5	328	366
BSH 1404	25.5	39.5	383	421

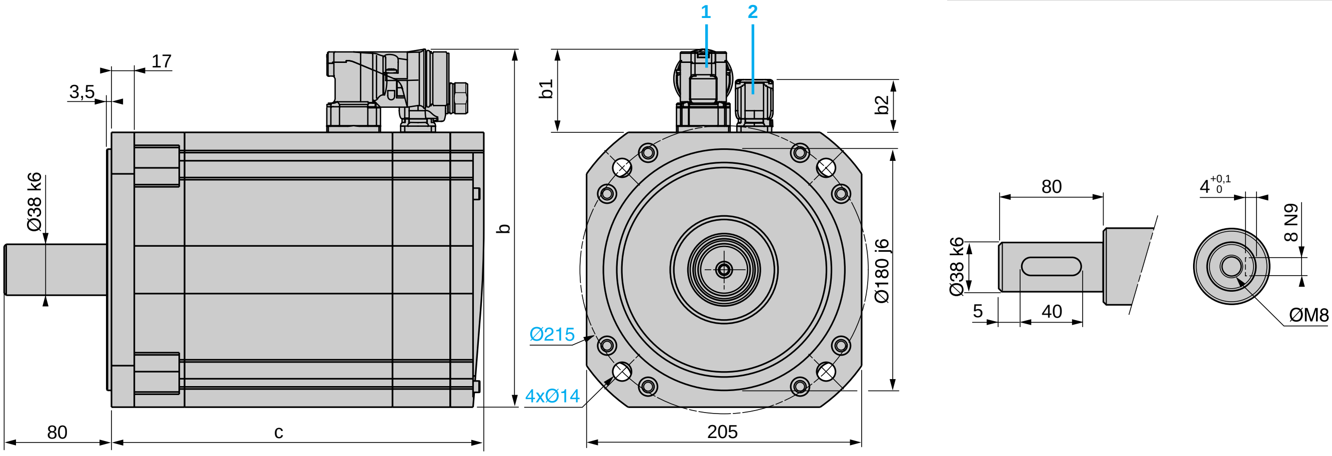
Presentation:
pages 54 and 55

Characteristics:
pages 56 to 79

References:
pages 80 to 82

BSH 2051 (Example with rotatable angled connectors: servo motor/brake power supply 1 and encoder 2)

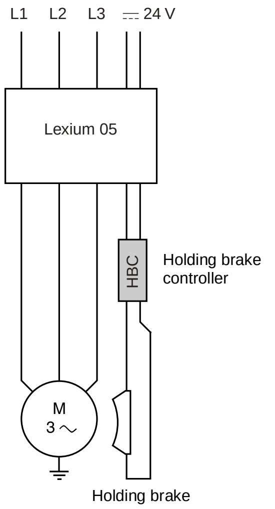
Shaft end, keyed slot (optional)



	Straight connectors			Rotatable angled connectors				
	b	**b1**	**b2**	**b**	**b1**	**b2**	**c** (without brake)	**c** (with brake)
BSH 2051	259	54	25.5	267	70	39.5	321	370.5

Lexium 05 motion control
BSH servo motors
Option: holding brake integrated in servo motor

Holding brake
Presentation



The holding brake integrated in the BSH servo motor is an electromagnetic pressure spring brake that blocks the servo motor axis once the motor current has been switched off. In the event of an emergency, such as a power outage or an emergency stop, the drive is immobilized, thus significantly increasing safety. Blocking the servo motor axis is also necessary in cases of torque overload, such as in the case of vertical axis movement.

The holding brake is activated using an external device, the holding brake controller *(HBC)* **VW3 M3 103** (see page 29).

This device also ensures electrical isolation.

Characteristics

Type of servo motor	**BSH**	**0551 0552 0553**	**0701 0702**	**0703**	**1001 1002 1003**	**1004**	**1401 1402**	**1403 1404**	**2051**
Holding torque M_{Br}	**Nm**	0.8	2.0	3.0	9.0	12.0	23	36	80
Rotor moment of inertia (brake only) J_{Br}	**kgcm²**	0.0213	0.072	0.23	0.613	1.025	1.15	5.5	16
Electrical clamping power P_{Br}	**W**	10	11	12	18		24	26	40
Supply voltage	**V**	24 + 6/- 10%							
Opening time	**ms**	12	25	35	40	45	50	100	200
Closing time	**ms**	6	8	15	18	20	25	30	50
Weight (brake only)	**kg**	0.080	0.450	0.320	0.450	0.690	1.100	1.790	3.600

References


BSH servo motor

For selection of BSH servo motor with **F** or without **A** holding brake, see references on page 81.

Dimensions:
pages 33, 83 to 85
Schemes:
page 41

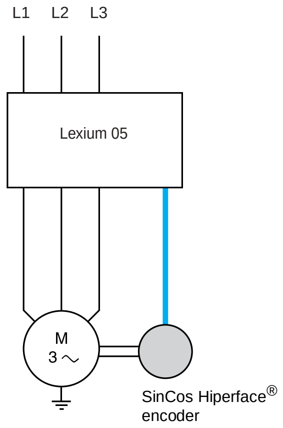
Lexium 05 motion control

BSH servo motors

Option: encoder integrated in the servo motor

Encoder integrated in the BSH servo motor

Presentation



The standard measurement device is the SinCos Hiperface® single turn or multiturn encoder integrated in BSH servo motors. This measurement device is perfectly suited to the Lexium 05 range of servo drives.

Use of this interface enables:

- Automatic identification of the BSH servo motor data by the servo drive
- Automatic initialization of the servo drive's control loops, thus simplifying installation of the motion control device

Characteristics

Type of encoder		Single turn SinCos	Multiturn SinCos
Sinus periods per turn		128	128
Number of points		4096	4096 x 4096 turns
Encoder precision		± 1.3 arc minutes	
Measurement method		Optical, high resolution	
Interface		Hiperface®	
Operating temperature	°C	- 5...+ 110	

References

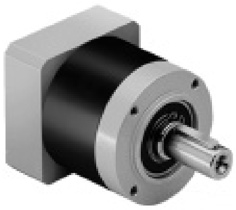
BSH servo motor

For selection of the SinCos Hiperface® single turn **1** or multiturn **2** encoder integrated in BSH servo motor, see references on page 81.

Dimensions:
pages 83 to 85

Lexium 05 motion control
BSH servo motors
Option: GBX planetary gearboxes

Presentation



GBX planetary gearbox

In many cases, motion control requires the use of a planetary gearbox to adapt the speeds and torques, while continuing to provide the precision required by the application.

Schneider Electric has chosen to use GBX gearboxes (made by Neugart) with the BSH range of servo motors. These gearboxes are lubricated for life, and are designed for applications that do not require very low backlash. The fact that their use in combination with BSH servo motors has been fully verified and that they are easily assembled, ensures simple, risk-free operation.

The planetary gearboxes are available in 5 sizes (GBX 40...GBX 160) and with 12 reduction ratios (3:1...40:1) (see the table below).

The continuous and peak stall torques available at the gearbox output are obtained by multiplying the characteristic values of the servo motor by the reduction ratio and efficiency of the gearbox (0.96 or 0.94 depending on the reduction ratio).

The following table gives the most appropriate servo motor/gearbox combinations. For other combinations, please see the servo motor data sheets.

BSH servo motor/GBX gearbox combinations

Type of servo motor	Reduction ratio											
	3:1	4:1	5:1	8:1	9:1	12:1	15:1	16:1	20:1	25:1	32:1	40:1
BSH 0551	GBX 40	GBX 40	GBX 40	GBX 60	GBX 40	GBX 40	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60	_GBX 60 *_
BSH 0552	GBX 60	GBX 60	GBX 60	GBX 60	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60	_GBX 60 *_	_GBX 60 *_	_GBX 60 *_
BSH 0553	GBX 60	GBX 60	GBX 60	_GBX 60 *_	GBX 40	GBX 60	GBX 60	GBX 60	GBX 60	_GBX 60 *_	_GBX 60 *_	_GBX 60 *_
BSH 0701	GBX 60	GBX 60	GBX 80	GBX 80	GBX 60	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120
BSH 0702	GBX 80	GBX 80	GBX 80	GBX 80	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120
BSH 0703	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BSH 1001	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 160
BSH 1002	GBX 80	GBX 80	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BSH 1003	GBX 80	GBX 120	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BSH 1004	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	_GBX 160 *_	_GBX 160 *_	_GBX 160 *_
BSH 1401	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	_GBX 160 *_	_GBX 160 *_	_GBX 160 *_
BSH 1402	GBX 160	GBX 160	GBX 160	GBX 160	_GBX 160 *_	GBX 160	GBX 160	GBX 160	GBX 160	_GBX 160 *_	_GBX 160 *_	_GBX 160 *_
BSH 1403	GBX 160	GBX 160	GBX 160	GBX 160	_GBX 160 *_	GBX 160	GBX 160	GBX 160	GBX 160	_GBX 160 *_	_GBX 160 *_	_GBX 160 *_
BSH 1404	GBX 160	GBX 160	GBX 160	GBX 160	_GBX 160 *_	GBX 160	GBX 160	GBX 160	GBX 160	_GBX 160 *_	_GBX 160 *_	_GBX 160 *_
BSH 2051	_GBX 160 *_	_GBX 160 *_	_GBX 160 *_	_GBX 160 *_	–	–	–	–	–	–	–	–

GBX 60 * — *For combinations in italics and with an asterisk, you must check that the application will not result in the continuous output torque of the gearbox being exceeded (see values on page 89).*

Characteristics: page 89
References: page 90
Dimensions: page 91

Lexium 05 motion control

BSH servo motors

Option: GBX planetary gearboxes

Characteristics of GBX gearboxes

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Type of gearbox			Planetary gearbox with single reduction stage and straight teeth				
Backlash in reverse direction	**3:1...8:1**	**min arc**	< 30	< 20	< 12	< 8	< 6
	9:1...40:1		< 35	< 25	< 17	< 12	< 10
Torsional rigidity	**3:1...8:1**	**Nm/min arc**	1.0	2.3	6	12	38
	9:1...40:1		1.1	2.5	6.5	13	41
Sound level		**dB (A)**	55	58	60	65	70
Casing			Black anodised aluminium				
Shaft material			C 45				
Shaft output dust and damp protection			IP 54				
Lubrication			Lubricated for life				
Average service life *(1)*		**h**	30,000				
Mounting position			Any position				
Operating temperature		**°C**	- 25...+ 90				

Characteristics of BSH servo motor/GBX gearbox combinations

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Efficiency	**3:1...8:1**		0.96				
	9:1...40:1		0.94				
Maximum permitted radial force *(1) (2)*	L_{10h} = 10,000 hours	**N**	200	500	950	2000	6000
	L_{10h} = 30,000 hours		160	340	650	1500	4200
Maximum permitted axial force *(1)*	L_{10h} = 10,000 hours	**N**	200	600	1200	2800	8000
	L_{10h} = 30,000 hours		160	450	900	2100	6000
Gearbox moment of inertia	**3:1**	**kgcm²**	0.031	0.135	0.77	2.63	12.14
	4:1	**kgcm²**	0.022	0.093	0.52	1.79	7.78
	5:1	**kgcm²**	0.019	0.078	0.45	1.53	6.07
	8:1	**kgcm²**	0.017	0.065	0.39	1.32	4.63
	9:1	**kgcm²**	0.030	0.131	0.74	2.62	–
	12:1	**kgcm²**	0.029	0.127	0.72	2.56	12.37
	15:1	**kgcm²**	0.023	0.077	0.71	2.53	12.35
	16:1	**kgcm²**	0.022	0.088	0.50	1.75	7.47
	20:1	**kgcm²**	0.019	0.075	0.44	1.50	6.64
	25:1	**kgcm²**	0.019	0.075	0.44	1.49	5.81
	32:1	**kgcm²**	0.017	0.064	0.39	1.30	6.36
	40:1	**kgcm²**	0.016	0.064	0.39	1.30	5.28
Continuous output torque M_{2N} *(1)*	**3:1**	**Nm**	4.5	12	40	80	400
	4:1	**Nm**	6	16	50	100	450
	5:1	**Nm**	6	16	50	110	450
	8:1	**Nm**	5	15	50	120	450
	9:1	**Nm**	16.5	44	130	210	–
	12:1	**Nm**	20	44	120	260	800
	15:1	**Nm**	18	44	110	230	700
	16:1	**Nm**	20	44	120	260	800
	20:1	**Nm**	20	44	120	260	800
	25:1	**Nm**	18	40	110	230	700
	32:1	**Nm**	20	44	120	260	800
	40:1	**Nm**	18	40	110	230	700

(1) Values given at an output shaft speed of 100 rpm, cyclic ratio = 1 (S1 mode) for electrical machines with an ambient temperature of 30°C.
(2) Force applied midway along the output shaft.

Presentation:
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References:
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Dimensions:
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Lexium 05 motion control

BSH servo motors
Option: GBX planetary gearboxes

References

GBX ●●●

Size	Reduction ratio	Reference (1)	Weight kg
GBX 40	3:1, 4:1, 5:1 and 8:1	**GBX 040 ●●● ●●● ●F**	0.350
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 040 ●●● ●●● ●F**	0.450
GBX 60	3:1, 4:1, 5:1 and 8:1	**GBX 060 ●●● ●●● ●F**	0.900
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 060 ●●● ●●● ●F**	1.100
GBX 80	3:1, 4:1, 5:1 and 8:1	**GBX 080 ●●● ●●● ●F**	2.100
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 080 ●●● ●●● ●F**	2.600
GBX 120	3:1, 4:1, 5:1 and 8:1	**GBX 120 ●●● ●●● ●F**	6.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 120 ●●● ●●● ●F**	8.000
GBX 160	3:1, 4:1, 5:1 and 8:1	**GBX 160 ●●● ●●● ●F**	18.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 160 ●●● ●●● ●F**	22.000

To order a GBX planetary gearbox, add the following to each of the above references:

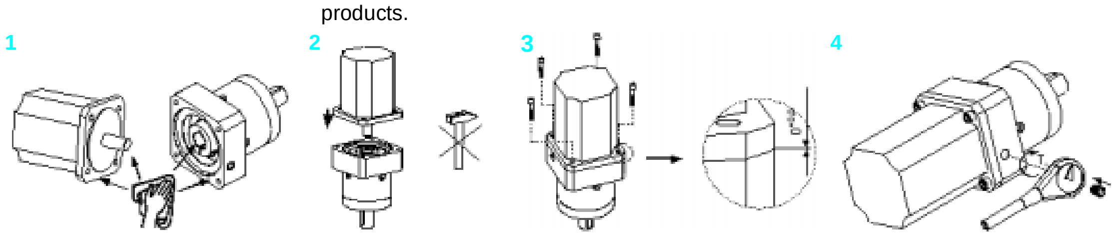
		GBX	●●●	●●●	●●●	●	F
Size	Diameter of the casing (see table of combinations with BSH servo motor, page 88)	40 mm	**040**				
		60 mm	**060**				
		80 mm	**080**				
		120 mm	**120**				
		160 mm	**160**				
Reduction ratio		3:1		**003**			
		4:1		**004**			
		5:1		**005**			
		8:1		**008**			
		9:1		**009**			
		12:1		**012**			
		15:1		**015**			
		16:1		**016**			
		20:1		**020**			
		25:1		**025**			
		32:1		**032**			
		40:1		**040**			
Associated BSH servo motor	Type	BSH 055			**055**		
		BSH 070			**070**		
		BSH 100			**100**		
		BSH 140			**140**		
		BSH 205			**205**		
	Model	BSH ●●●1				**1**	
		BSH ●●●2				**2**	
		BSH ●●●3				**3**	
		BSH ●●●4				**4**	
BSH servo motor adaptation							**F**

Mounting

No special tool is required for mounting the GBX planetary gearbox on the BSH servo motor. The usual rules for mechanical mounting must be followed:

1 Clean the bearing surfaces and seals.
2 Align the shafts that are to be coupled, and assemble in vertical position.
3 Uniform adhesive force of the servo motor flange on the gearbox flange, with tightening of the Phillips screws.
4 Correct tightening torque of the TA ring using a torque wrench (2...40 Nm depending on the gearbox model).

For more information, please consult the instruction sheets supplied with the products.



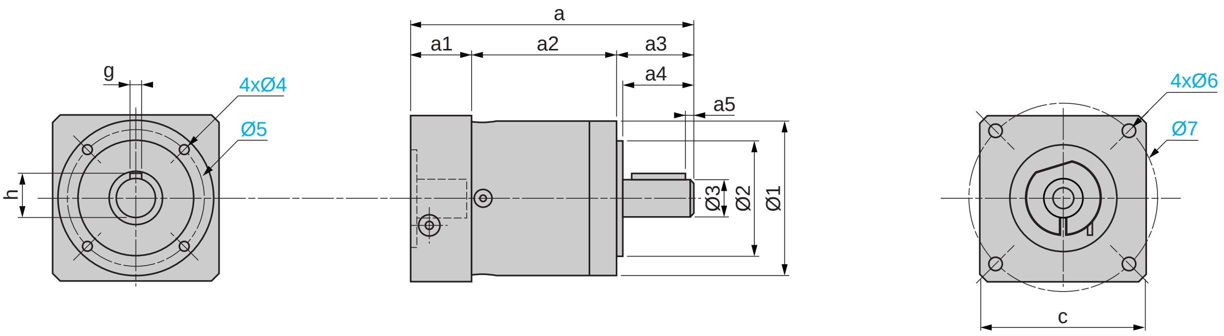
Telemecanique

Lexium 05 motion control

BSH servo motors
Option: GBX planetary gearboxes

Dimensions

Assembly on servo motor side

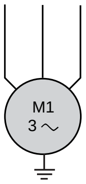


GBX	c	a	a1	a2	a3	a4	a5	h	g	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7
040 003...008	40	93.5	28.5	39	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
040 009...016	40	106.5	28.5	52	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
060 003...008	60	106.5	24.5	47	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
060 009...040	60	118.5	24.5	59	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
080 003...008	90	134	33.5	60.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
080 009...032	90	151	33.5	77.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
120 003...008	115	176.5	47.5	74	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
120 009...040	115	203.5	47.5	101	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
160 003...008	140	255.5	64.5	104	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165
160 009...040	140	305	64.5	153.5	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165

Presentation:
page 88

Characteristics:
page 89

References:
page 90

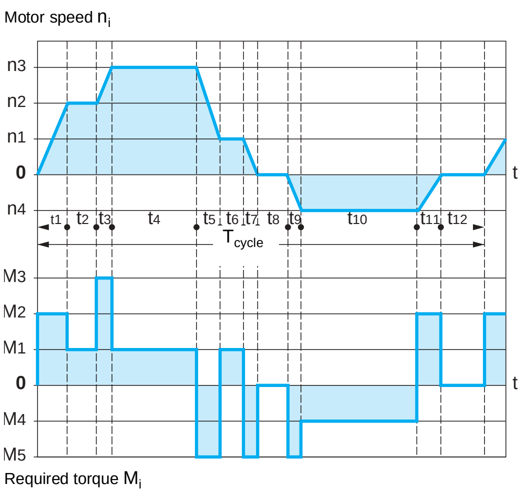


Sizing the servo motor

The "**Lexium Sizer**" sizing tool is available on the www.telemecanique.com website to help you size your servo motor.

These 2 pages are provided to help you understand the calculation method used.

To be able to size the servo motor you need to know the equivalent thermal torque and the average speed required by the mechanism to be used with the servo motor. Both values are calculated using the motor cycle timing diagram and should be compared with the torque/speed curves given for each servo motor (see BSH servo motor curves, on pages 56 to 78).



Motor cycle timing diagram

The motor cycle is made up of several sub-cycles, the duration of which is known. Each sub-cycle is divided into phases which correspond to the periods of time during which the motor torque is constant (1 to 3 phases maximum per sub-cycle).
This division into phases can be used to calculate the following for each phase:
- Duration (tj)
- Speed (n_i)
- Required torque value (M_i)

The curves on the left show the four types of phase:
- Constant acceleration during times t_1, t_3 and t_9
- At work during times t_2, t_4, t_6 and t_{10}
- Constant deceleration during times t_5, t_7 and t_{11}
- Motor stopped during times t_8 and t_{12}

The total duration of the cycle is:
$T_{cycle} = t_1 + t_2 + t_3 + t_4 + t_5 + t_6 + t_7 + t_8 + t_9 + t_{10} + t_{11} + t_{12}$

Calculating the average speed n_{avg}

The average speed is calculated using the formula: $n_{avg} = \dfrac{\sum |ni| \cdot t_j}{\sum t_j}$

- n_i corresponds to the different work speeds
- $\dfrac{ni}{2}$ corresponds to the average speeds during the acceleration phases constant and constant deceleration

In the above example:

Duration tj	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}	t_{12}
Speed $\|ni\|$	$\frac{\|n2\|}{2}$	$\|n2\|$	$\frac{\|n3\| + \|n2\|}{2}$	$\|n3\|$	$\frac{\|n3\| + \|n1\|}{2}$	$\|n1\|$	$\frac{\|n1\|}{2}$	0	$\frac{\|n4\|}{2}$	$\|n4\|$	$\frac{\|n4\|}{2}$	0

The average speed is calculated as follows:

$$n_{avg} = \frac{\frac{n2}{2} \cdot t1 + n2 \cdot t2 + \frac{n3 + n2}{2} \cdot t3 + n3 \cdot t4 + \frac{n3 + n1}{2} \cdot t5 + n1 \cdot t6 + \frac{n1}{2} \cdot t7 + \frac{n4}{2} \cdot t9 + n4 \cdot t10 + \frac{n4}{2} \cdot t11}{Tcycle}$$

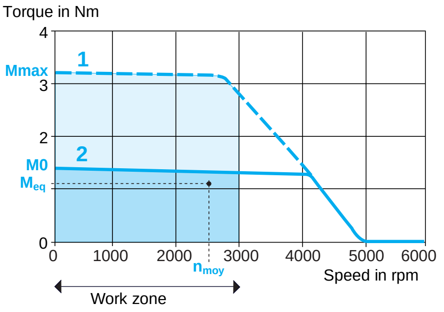
Calculating the equivalent thermal torque M_{eq}

The equivalent thermal torque is calculated using the formula:

$$M_{eq} = \sqrt{\frac{\sum Mi^2 \cdot t_j}{Tcycle}}$$

In the above example, this formula gives the following calculation:

$$M_{eq} = \sqrt{\frac{M2^2 \cdot t1 + M1^2 \cdot t2 + M3^2 \cdot t3 + M1^2 \cdot t4 + M5^2 \cdot t5 + M1^2 \cdot t6 + M5^2 \cdot t7 + M5^2 \cdot t9 + M4^2 \cdot t10 + M2^2 \cdot t11}{Tcycle}}$$



Sizing the servo motor (continued)

Determining the size of the servo motor

The point defined by the two preceding calculations (average speed and equivalent thermal torque) where the:

- horizontal axis represents the average speed n_{avg}
- vertical axis represents the thermal torque M_{eq}

must be within the area bounded by curve 2 and the work zone.

The motor cycle timing diagram should also be used to ensure that all torques M_i required for the different speeds n_i during the various cycle phases are within the area bounded by curve 1 and the work zone.

1 Peak torque
2 Continuous torque

The efficiency of Telemecanique branded *solutions*

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Lexium 05: 4 to 25 A eff
BSH motors: 0.5 to 36 Nm

Motion control:
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BDH motors: 0.18 to 53 Nm
BSH motors: 0.5 to 90 Nm

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Motion control

Lexium 15

Catalogue
May

06

a brand of Schneider Electric

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This international site allows you to access all the Telemecanique products in just 2 clicks via comprehensive range data-sheets, with direct links to:

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- Interchangeable modular functions, to better meet the requirements for extensions
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- Auto-adapts to its environment, "plug & play"
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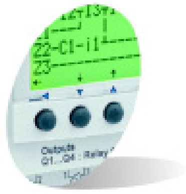
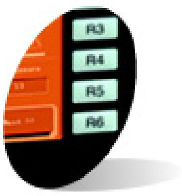
- User-friendly operation either directly on the product or remotely



Simplicity

- Cost effective “optimum” offers that make selection easy for most typical applications
- Products that are easy to understand for users, electricians and automation specialists
- User-friendly intuitive programming



Compactness

- High functionality in a minimum of space
- Freedom in implementation

Openness

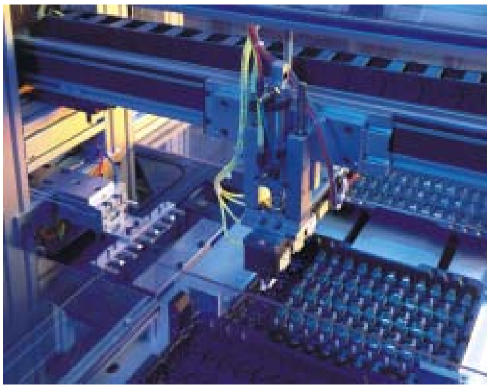
- Compliance with field bus, connection, and software standards
- Enabling decentralised or remote surveillance via the web with Transparent Ready products

Lexium 15 Motion control

Lexium 15 motion control
Presentation

Lexium 15 LP, 15 MP and 15 HP servo drives

Single axis application



Multi-axis application

Presentation

The compact dimensions of the Lexium 15 servo drive combined with the wide range of power ratings and power supplies available make it the ideal solution to meet the application requirements of all kinds of machinery.

This range is designed to control the torque, speed and/or position of BSH and BDH servo motors.

These motor-drive units are designed for high-performance applications requiring highly precise and dynamic position monitoring algorithms.

Lexium 15 servo drives

Applications

The Lexium 15 range of servo drives is designed to meet the requirements of the following types of application:

■ Single axis:
The integrated position indexer in Lexium 15 servo drives makes it possible to control the operation of a single axis.

■ Master/slave:
Operation in electrical shaft mode synchronizes the movement of several axes.

There are numerous communication bus and network connection possibilities available for both these types of application, including CANopen, Fipio, Modbus Plus and Profibus DP, all enabling integration into a distributed automation architecture.

For multi-axis applications, you can also add:

■ A Motion Controller axis card (▲), which extends the operating capabilities of Lexium 15 servo drives to include applications requiring complex synchronization of several axes (cam profile, cut on-the-fly, etc.)

■ A SERCOS option card, which, when connected to TSX CSY motion control modules on a Premium PLC, means that Lexium 15 servo drives can meet the performance requirements of complex applications.

Operating modes

Lexium 15 servo drives feature a large number of operating modes:

■ Conventional adjustment modes:
□ Homing
□ Manual
■ Position control operating modes:
□ Point-to-point mode
□ Motion tasks
□ Electronic gearing
■ Speed operating mode:
□ Speed regulation
■ Torque operating mode:
□ Torque control

Configuration and setup

Unilink setup software is used to configure and adjust the parameters of Lexium 15 servo drives.

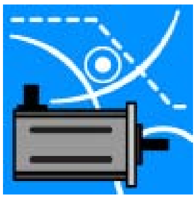
▲ Available: 1st quarter 2007

Functions: pages 14, 82 and 148 | Characteristics: pages 24, 84 and 150 | References: pages 28, 130 and 178 | Dimensions: pages 48, 134 and 182 | Schemes: page 50

Lexium 15 motion control
Presentation

BSH 1001, BSH 1401 servo motors

BDH 0701, BDH 1882 servo motors



Lexium 15: A Telemecanique branded servo motor offer

BSH and BDH servo motors

BSH and BDH servo motors are synchronous three phase motors.

They feature an integrated sensor, which can be a Resolver (BDH servo motor only) or a Hiperface®SinCos absolute encoder.
They can be supplied with or without a parking brake.

Two ranges of motors are offered to meet specific application requirements:
- BSH servo motors satisfy the demands for dynamics and high-performance
- BDH servo motors satisfy the demands for compactness and adaptability

BSH servo motors: Dynamics and high-performance

Thanks to their new winding technology based on salient poles, BSH servo motors are compact and offer a high power density.
The rotor's low inertia and the slight notching effect make it possible to meet the demands of both precision and dynamics.

The dynamics are enhanced by the fast sampling time of the Lexium 15 servo drive control loops:
- 62.5 µs for the current loop
- 250 µs for the speed loop
- 250 µs for the position loop

BDH servo motors: Compactness and adaptability

The design of the windings based on salient poles has been optimized for BDH servo motors to achieve one of the best torque/size ratios available on the market.

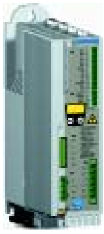
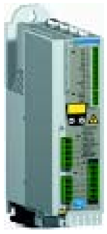
This compactness is available across 7 different flange sizes and, when combined with various measuring systems, offers optimum adaptability when designing your machines.

Functions: pages 14, 82 and 148 | Characteristics: pages 24, 84 and 150 | References: pages 28, 130 and 178 | Dimensions: pages 48, 134 and 182 | Schemes: page 50

Lexium 15 motion control
Lexium 15 LP servo drives
LP servo drive/servo motor combinations

Lexium 15 LP servo drive/BDH or BSH servo motor combinations



Servo motors			Lexium 15 LP servo drives					
			Supply voltage 200…240 V three-phase			Supply voltage 208…480 V three-phase		
BDH (IP 54 or IP 67)	BSH (IP 40 or IP 65)	Max. speed	LXM 15LD13M3	LXM 15LD21M3	LXM 15LD28M3	LXM 15LU60N4	LXM 15LD10N4	LXM 15LD17N4
			Continuous output current (RMS)					
		rpm	3 A	6 A	10 A	1.5 A	3 A	6 A
BDH 0401B		8000	0.18/0.61 Nm					
BDH 0402C		8000	0.31/1.08 Nm					
BDH 0403C		8000	0.41/1.46 Nm					
	BSH 0551P	6880	0.5/1.4 Nm			0.5/1.4 Nm		
	BSH 0551T	8000	0.5/1.4 Nm					
BDH 0582C		8000				0.84/2.34 Nm		
BDH 0582E		8000	0.87/2.42 Nm					
	BSH 0552M	6160				0.9/2.25 Nm		
	BSH 0552P	5920	0.9/2.7 Nm			0.9/2.26 Nm		
	BSH 0552T	8000	0.9/2.54 Nm					
BDH 0583C		8000				1.13/3.2 Nm		
BDH 0583D		8000	1.16/3.58 Nm				1.16/3.58 Nm	
BDH 0583F		8000		1.18/3.52 Nm				
	BSH 0553M	4880				1.3/3.5 Nm		
	BSH 0553P	8000	1.3/4.2 Nm				1.3/3.87 Nm	
BDH 0584C		8000				1.38/3.94 Nm		
	BSH 0701T	8000	1.4/3.19 Nm	1.4/3.19 Nm			1.4/2.91 Nm	
	BSH 0701P	4880	1.41/2.66 Nm			1.41/2.66 Nm		
BDH 0584D		8000	1.41/4.4 Nm				1.41/4.4 Nm	
BDH 0584F		8000		1.42/4.46 Nm				
BDH 0701C		8000				1.15/3.34 Nm		
BDH 0701E		8000	1.2/3.24 Nm					
BDH 0702C		5120				2.00/5.74 Nm		
BDH 0702D		7760	2.04/6.51 Nm				2.04/6.51 Nm	
BDH 0702H		8000		2.1/5.36 Nm				
BDH 0703C		3840				2.71/7.83 Nm		
BDH 0703E		6480	2.79/8.55 Nm				2.79/8.55 Nm	
BDH 0703H		6630		2.88/7.35 Nm				
BDH 0841C		5280				1.95/5.12 Nm		
BDH 0841E		6000	2.02/5.33 Nm				2.02/5.13 Nm	
BDH 0841H		6000		2.06/4.78 Nm				
	BSH 0702M	4960				2.12/5.63 Nm		
	BSH 0702P	8000	2.2/5.63 Nm				2.2/4.85 Nm	
	BSH 0702T	8000		2.12/5.45 Nm				2.12/4.47 Nm
	BSH 0703P	8000		2.83/9.28 Nm				2.83/7.71 Nm
	BSH 0703T	8000			2.83/7.38 Nm			

0.18/0.61 Nm *The 1st value corresponds to the continuous torque on stopping. The 2nd value corresponds to the peak torque on stopping.*

Selection example:

The servo motor **BDH 0401B** *combined with servo drive* **LXM 15LD13M3** *meets the requirements of applications needing a maximum of 0.18 Nm continuous torque on stopping, 0.61 Nm peak torque on stopping and 8000 rpm mechanical speed.*

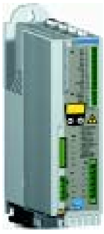
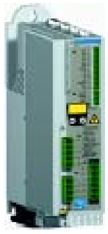
Functions: pages 14, 82 and 148
Characteristics: pages 24, 84 and 150
References: pages 28, 130 and 178
Dimensions: pages 48, 134 and 182
Schemes: page 50

Lexium 15 motion control

Lexium 15 LP servo drives

LP servo drive/servo motor combinations

Lexium 15 LP servo drive/BDH or BSH servo motor combinations (continued)

Servo motors			Lexium 15 LP servo drives					
			Supply voltage 200…240 V three-phase			Supply voltage 208…480 V three-phase		
BDH (IP 54 or IP 67)	**BSH** (IP 40 or IP 65)	**Max. speed**	**LXM 15LD13M3**	**LXM 15LD21M3**	**LXM 15LD28M3**	**LXM 15LU60N4**	**LXM 15LD10N4**	**LXM 15LD17N4**
			Continuous output current (RMS)					
		rpm	**3 A**	**6 A**	**10 A**	**1.5 A**	**3 A**	**6 A**
BDH 0842C		3000				3.35/9.37 Nm		
	BSH 1001P	3780		3.39/7.08 Nm			3.39/6.19 Nm	
	BSH 1001T	6000			3.39/8.5 Nm			
BDH 0842E		5640	3.42/9.72 Nm				3.42/9.41 Nm	
BDH 0842G		6000		3.53/9.56 Nm				3.53/8.66 Nm
BDH 0842J		6000			3.56/7.56 Nm			
BDH 0843E		4140					4.7/11.7 Nm	
BDH 0843G		6000		4.8/13.2 Nm				4.8/11.68 Nm
BDH 0843K		6000			4.9/9.02 Nm			
	BSH 1002P	6000		5.8/14.79 Nm				5.8/12.13 Nm
	BSH 1002T	5340			5.5/11.59 Nm			
BDH 0844E		3480					5.76/14.1 Nm	
BDH 0844G		6000		5.88/16.1 Nm				5.88/13.97 Nm
BDH 0844J		4980			6/12.18 Nm			
BDH 1081E		4200					4.7/10.71 Nm	
BDH 1081G		6000		4.75/10.82 Nm				4.75/10.82 Nm
BDH 1081K		6000			4.9/9.22 Nm			
	BSH 1003M	2640					7.76/15.19 Nm	7.76/22.95 Nm
	BSH 1003P	3060			7.8/19.69 Nm			
BDH 1082E		2580					8.34/18.08 Nm	
BDH 1082G		3960		8.43/19.51 Nm				8.43/19.51 Nm
BDH 1082K		3660			8.6/16.9 Nm			
	BSH 1004M	2400					9.31/19.8 Nm	9.31/29.87 Nm
BDH 1083G		3000						11.4/25.8 Nm
BDH 1083K		2820			11.6/22.9 Nm			
BDH 1084G		2460						14.3/31.7 Nm
BDH 1084K		2280			14.4/28.1 Nm			
BDH 1382G		2880						11.9/25.6 Nm
BDH 1382K		2700			12.2/22.7 Nm			
BDH 1383G		1920						16.5/38.4 Nm
BDH 1383K		2000			16.8/31 Nm			

3.35/9.37 Nm *The 1st value corresponds to the continuous torque on stopping. The 2nd value corresponds to the peak torque on stopping.*

Selection example:

The servo motor **BDH 0842C** *combined with servo drive* **LXM 15LU60N4** *meets the requirements of applications needing a maximum of 3.35 Nm continuous torque on stopping, 9.37 Nm peak torque on stopping and 3000 rpm mechanical speed.*

Functions:
pages 14, 82 and 148
Characteristics:
pages 24, 84 and 150
References:
pages 28, 130 and 178
Dimensions:
pages 48, 134 and 182
Schemes:
page 50

Lexium 15 motion control

Lexium 15 MP servo drives

MP servo drive/servo motor combinations

Lexium 15 MP servo drive/BDH or BSH servo motor combinations

Servo motors			Lexium 15 MP servo drives Supply voltage 208…480 V three-phase		
BDH (IP 54 or IP 67)	BSH (IP 40 or IP 65)	Max. speed	LXM 15MD28N4	LXM 15MD40N4	LXM 15MD56N4
			Continuous output current (RMS)		
		rpm	10 A	14 A	20 A
BDH 0842J		6000	3.56/7.56 Nm		
BDH 0843K		6000	4.9/9.02 Nm		
BDH 0844J		4980	6/12.18 Nm		
BDH 1081K		6000	4.9/9.22 Nm		
	BSH 1003P	6000	7.8/19.69 Nm	7.8/23.17 Nm	
BDH 1082K		3660	8.6/16.9 Nm		
BDH 1082M		5160		8.6/16.7 Nm	
	BSH 1004M	2400		9.31/34.17 Nm	
	BSH 1004P	4800	9.31/25.7 Nm	9.31/33.83 Nm	
	BSH 1004T	4080		9.31/21.04 Nm	
BDH 1083K		2820	11.6/22.9 Nm		
BDH 1083M		4000		11.4/22.1 Nm	
BDH 1083P		5700			11.4/22.2 Nm
	BSH 1401M	2360	11.1/26 Nm		
	BSH 1401P	4000	11.1/23.33 Nm	11.1/23.33 Nm	
	BSH 1401T	3920			11.1/23.33 Nm
BDH 1084K		2280	14.4/28.1 Nm		
BDH 1084L		3000		14.1/27.28 Nm	
BDH 1084N		4260			14.1/25.5 Nm
BDH 1382K		2700	12.2/22.7 Nm		
BDH 1382M		6000		12.2/22.8 Nm	
BDH 1382P		5220			12.3/23.2 Nm
BDH 1383K		2000	16.8/31 Nm		
BDH 1383M		5760		17/31.4 Nm	
BDH 1383N		6000			17/34.8 Nm
	BSH 1402M	2360		19.5/47.5 Nm	
	BSH 1402P	4000		19.5/39.33 Nm	19.5/47.5 Nm
BDH 1384K		3120	20.8/41.2 Nm		
BDH 1384L		4260		21/41.9 Nm	
BDH 1384P		6000			20.4/40.2 Nm
BDH 1385K		2820	24.8/46.8 Nm		
BDH 1385M		3840		25/47.6 Nm	
BDH 1385N		5160			24.3/50.2 Nm
	BSH 1403M	2200		27.8/71.67 Nm	
	BSH 1403P	4000			27.8/57.32 Nm
BDH 1882K		2220	29.7/59.4 Nm		
BDH 1882M		3060		30/59.8 Nm	
BDH 1882P		4500			29.4/58.4 Nm
	BSH 1404M	2040		33.4/82.32 Nm	33.4/95 Nm
	BSH 2051M	2200		36/68.33 Nm	36/68.33 Nm
BDH 1883M		2280		42/80.7 Nm	
BDH 1883P		3360			41.6/79.4 Nm
BDH 1884L		1740		53/108 Nm	
BDH 1884P		5520			52.5/106 Nm

3.56/7.75 Nm *The 1st value corresponds to the continuous torque on stopping. The 2nd value corresponds to the peak torque on stopping.*

Selection example:

The servo motor **BDH 0842J** *combined with servo drive* **LXM 15MD28N4** *meets the requirements of applications needing a maximum of 3.56 Nm continuous torque on stopping, 7.56 Nm peak torque on stopping and 6000 rpm mechanical speed.*

Lexium 15 motion control
Lexium 15 HP servo drives
HP servo drive/servo motor combinations

Lexium 15 HP servo drive/BSH servo motor combinations

Servo motors	Lexium 15 HP servo drives Supply voltage 208…480 V three-phase

BSH (IP 40 or IP 65)	Max. speed	LXM 15HC11N4X	LXM 15HC20N4X
		Continuous output current (RMS)	
	rpm	40 A	70 A
BSH 2051M	2200	36/68.33 Nm	
BSH 2051P	3500	36/82 Nm	
BSH 2052M	2190	65/200 Nm	65/200 Nm
BSH 2052P	3000	65/118.54 Nm	65/193.45 Nm
BSH 2053M	2190	90/227.18 Nm	90/300 Nm
BSH 2053P	3000		90/202.96 Nm

36/68.33 Nm *The 1st value corresponds to the continuous torque on stopping. The 2nd value corresponds to the peak torque on stopping.*

Selection example:

The servo motor **BSH 2051M** *combined with servo drive* **LXM 15HC11N4X** *meets the requirements of applications needing a maximum of 36 Nm continuous torque on stopping, 68.33 Nm peak torque on stopping and 2200 rpm mechanical speed.*

Functions: pages 14, 82 and 148 | Characteristics: pages 24, 84 and 150 | References: pages 28, 130 and 178 | Dimensions: pages 48, 134 and 182 | Schemes: page 50

Lexium 15 motion control

Lexium 15 LP, 15 MP and 15 HP servo drives


Lexium 15 LP, 15 MP and 15 HP servo drives


BSH 0701 servo motor


BSH 1401 servo motor


BDH 0701 servo motor


BDH 1081 servo motor

An offer tailored to your needs

The Lexium 15 range of servo drives combined with BSH and BDH servo motors constitutes an offer that is perfectly tailored to the requirements of your applications.

This offer covers a wide range of supply voltages and power ratings.
In order to keep costs down and ensure ease of adaptation to different applications, the Lexium 15 range of servo drives comprises 3 models:
- **Lexium 15 LP servo drives:**
  - 200…240 V single phase, 0.9 kW to 1.2 kW (LXM 15LD●●M3)
  - 200…240 V 3-phase, 1 kW to 3.4 kW (LXM 15LD●●M3)
  - 208…480 V 3-phase, 1.1 kW to 4.3 kW (LXM 15L●●●N4)
- **Lexium 15 MP servo drives:**
  - 208…480 V 3-phase, 5.7 kW to 11.4 kW (LXM 15MD●●N4)
- **Lexium 15 HP servo drives:**
  - 208…480 V 3-phase, 22.3 kW to 42.5 kW (LXM 15HC●●N4X)

Lexium servo motors:
- **BSH servo motors** (see pages 178 to 181):
  - Nominal torque: from 0.5 Nm to 90 Nm
  - Nominal speed: from 1500 to 8000 rpm
- **BDH servo motors** (see pages 130 to 133):
  - Nominal torque: from 0.18 Nm to 53 Nm
  - Nominal speed: from 1000 to 8000 rpm

The Lexium 15 motion control offer also includes GBX planetary gearboxes. Easy to mount and lubricated for life, these gearboxes are available in 12 reduction ratios, ranging from 3:1 to 40:1. GBX gearboxes are economical and are designed for high inertia applications.

Lexium 15 servo drives comply with EN 50178, IEC/EN 61439-1, IEC/EN 60204-1, EN 292 and IEC/EN 61800-3 international standards, and carry UL (USA) and cUL (Canada) approvals, and CE marking.

A complete unit

The Lexium 15 motion control offer integrates functions and components that are usually external. This enables users to maintain particularly compact dimensions and makes it easier to integrate the servo drive in enclosures or machines.

Electromagnetic compatibility, EMC

The incorporation of class A EMC filters in Lexium 15 LP and Lexium 15 MP servo drives makes it easier to install machines and render them compliant for CE marking, while being very economical.
Lexium 15 HP servo drives are designed without an EMC filter. Filters, available as an option, can be installed by the customer to reduce the level of emissions, see pages 44 and 45.

Safety

The Lexium 15 servo drive is incorporated in the safety system of installations. It integrates the "Power Removal" safety function which prevents accidental starting of the servo motor. This function complies with:
- Machinery standard EN 954-1 category 3 for Lexium 15 LP servo drives
- Machinery standard EN 954-1 category 1 for Lexium 15 MP and Lexium 15 HP servo drives

The "Power Removal" safety function describes the wiring of your safety circuits. The diagrams on pages 50 to 59 show wiring that complies with standard EN 954-1 categories 1, 2, 3 or 4.

Braking

Lexium 15 LP and Lexium 15 MP servo drives integrate a resistor as standard, which does away with the need to use an external braking resistor in most applications.
Lexium 15 HP servo drives are designed without an integrated braking resistor. Braking resistors are available as an option.

Functions:
pages 14 to 23
Characteristics:
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Dimensions:
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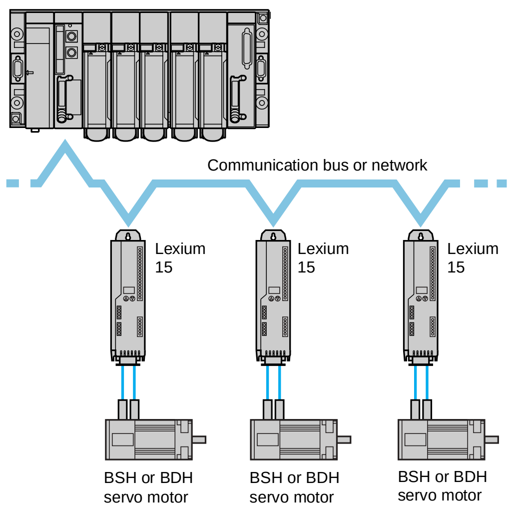

Example of an architecture

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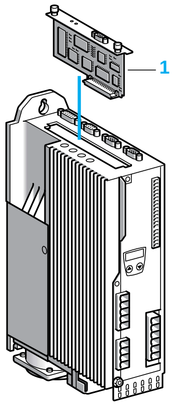

Lexium 15 LP and 15 MP servo drives: mounting the option card

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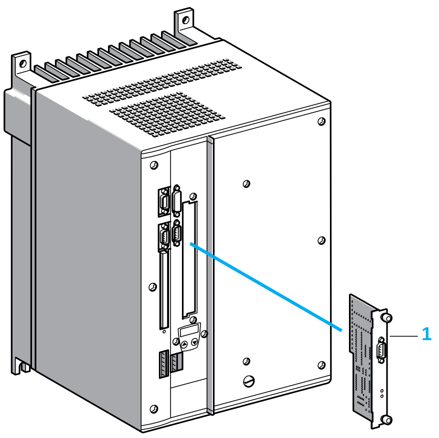


Lexium 15 HP servo drive: mounting the option card

Control and interfaces

The Lexium 15 multifunction servo drive range can be controlled in a number of ways:

■ The programming of motion tasks in its integrated position indexer provides an economical, dynamic solution (10 ms response time and +/- 1 ms "jitter") for your single axis applications

■ A wide range of position feedback possibilities for Lexium 15 servo drives (A/B incremental encoder; SSI, EnDat®, Hiperface®, etc, absolute encoders) provides, with no additional option card, infinite openness for simple master/slave applications or those which require the use of an external encoder.

In addition to the above possibilities for controlling the Lexium 15 servo drive, there is a wide range of option cards. The additional I/O card and communication cards enable you to get the best from your machine.

The Lexium 15 servo drive also integrates more conventional control functions such as a pulse/direction input and two ± 10 V analog reference inputs in order to adapt to all types of axis control cards.

The SERCOS option card extends the control possibilities of the servo drive even further, enabling it to meet the requirements of complex multi-axis applications.

Simplicity

Integration

Its high level of integration, compact size and the ability to mount it side by side enable the size of enclosures to be reduced.

Setup

Using the SinCos Hiperface® encoder on BSH and BDH servo motors, the Lexium 15 servo drive automatically receives data from the servo motor. The parameters of the motor do not need to be set manually.

The Unilink software graphic interface guides you through the configuration of each of the parameters of your axes.

The ability to program motion tasks enables fast configuration of machines. Simply enter the data of the various sequences of the application and set the parameters of the movement sequencing.

With its Oscilloscope and Bode Diagram functions, the Unilink software can be used for accurate setting of the various servo drive filter parameters for optimum machine control.

Options

The Lexium 15 servo drive can take one of the following option cards 1:

■ Communication cards, see pages 30 to 37

■ SERCOS card, see page 38

■ I/O extension card, see page 39

External options can be used with the Lexium 15 servo drive:

■ Braking resistors, see pages 40 to 43

■ Additional EMC input filters, see pages 44 and 45

■ Line chokes, see page 46

■ Motor chokes, see page 47

Lexium 15 motion control

Lexium 15 servo drives

Motion control applications

The Lexium 15 servo drive integrates the CANopen protocol as standard.
It is also possible to connect to other communication buses and networks by adding an option card:

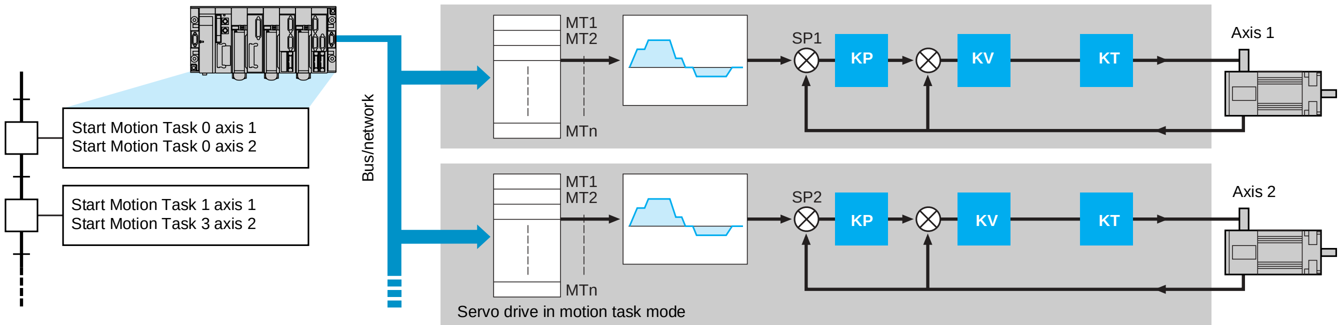
- Fipio
- Modbus Plus
- Profibus DP

For applications requiring fast synchronization of axes, the Lexium 15 servo drive can be connected to a SERCOS module using its option card.

This type of architecture provides a high-performance response to four types of application:

- Applications with independent servo drives
- Applications with independent axes controlled by controller
- Applications with master/slave operation
- Applications with coordinated axes

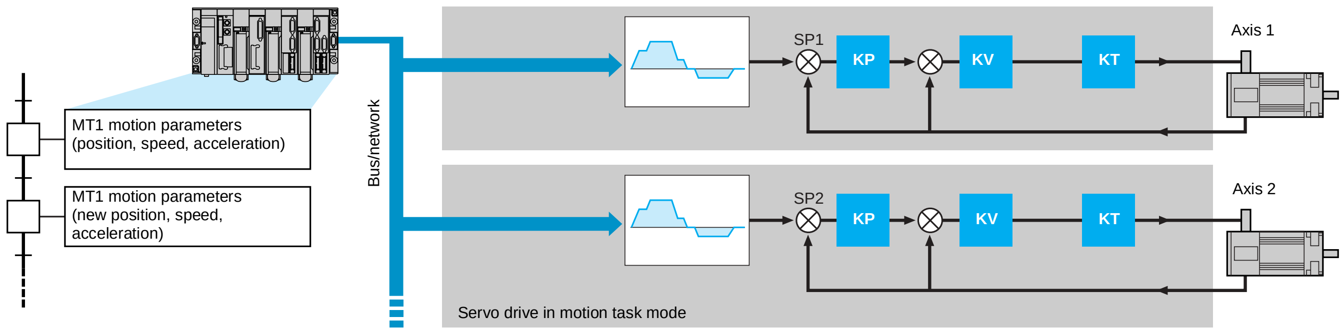
Applications with independent servo drives



The “Motion Tasks” (MT) for each Lexium 15 servo drive are managed using simple motion task activation/deactivation commands (start, stop, etc.) from the controller.

***Note:** Typical number of servo drives controlled: 16*

Applications with independent axes controlled by controller



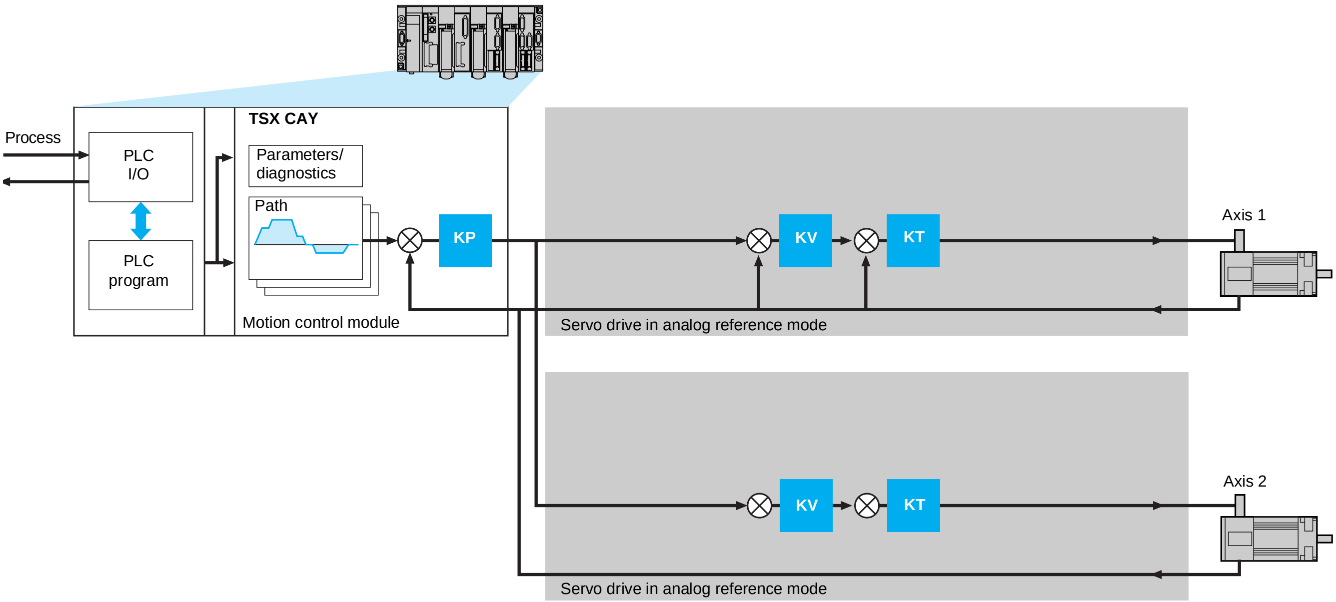
The controller synchronizes the “Motion Tasks” (MT) commands executed in each Lexium 15 servo drive.

***Note:** Typical number of servo drives controlled: 4 to 8*

Functions: pages 14 to 23 | Characteristics: pages 24 to 27 | References: pages 28 and 29 | Dimensions: pages 48 and 49 | Schemes: pages 50 to 61

Motion control applications (continued)

Applications with master/slave operation



The Lexium 15 servo drive with analog reference is used with the TSX CAY 2●/33/4● motion control module (with Premium platform).

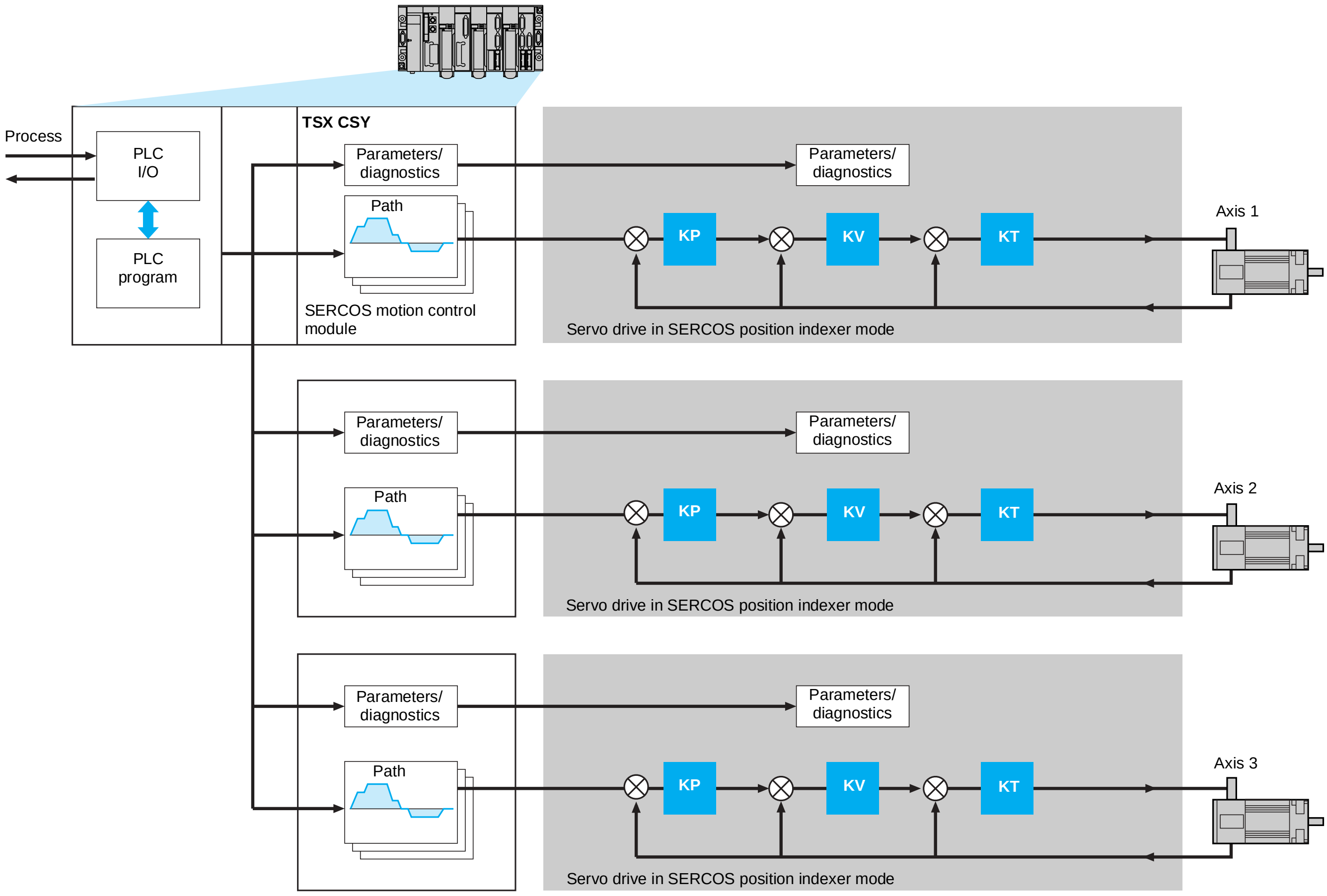
The KP position loop is executed in the automation platform TSX CAY control module. It is configured and adjusted using PL7 Junior/Pro or Unity Pro programming software. The KV speed loop and KT torque loop of the Lexium 15 are configured and adjusted using Unilink software.

The motion program, which defines the paths, is in the Premium platform application program. The position and speed setpoints are calculated by the motion control module.

Note: *Typical number of servo drives controlled: 2 to 4*

Motion control applications (continued)

Applications with coordinated axes



The Lexium 15 servo drive equipped with the AM0 SER 001V000 SERCOS option card is used with the TSX CSY 84/85 and TSX CSY 164 motion control modules (with Premium platform).

The KP position loop, KV speed loop and KT torque loop of the Lexium 15 servo drive are configured and adjusted using Unilink software.

The motion program, which defines the paths, is in the Premium platform application program. The position setpoints are calculated by the motion control module (position mode).
The motion control module can also calculate the speed reference (speed mode) or the current reference (torque mode). These two modes can be accessed with the assistance of Schneider Electric application services.

Note: *Typical number of servo drives controlled: 2 to 16*

Motion control applications (continued)

Debugging

Unilink, PL7 Junior/Pro and Unity Pro software provide simple solutions for debugging motion control applications.

In the context of programming applications with independent servo drives, Unilink software makes the programming of motion tasks and the configuration of your network architecture easier.
It can be used to adjust the following communication bus and network parameters:
- The address of each of the master controller's slave servo drives
- The transmission speed
- The network monitoring parameters

This software also provides access to the debugging and diagnostics screens specific to each communication bus and network.

On the PLC side, in addition to these services there are screens specific to the PL7 Junior/Pro and Unity Pro software for debugging and diagnostics of communication buses and networks:
- Access to CanOpen Motion Function Blocks under Unity Pro
- Fipio, Modbus Plus and Profibus DP service screens under PL7 Junior/Pro or Unity Pro.

In the context of programming applications with master/slave operation or applications with coordinated axes, the Unilink software can be used to adjust the control parameters of each of the axes.

On the PLC side, the position parameters are accessed via PL7 Junior/Pro or Unity Pro software using the parameter screens of the TSX CAY and TSX CSY motion control modules.

Lexium 15 motion control

Lexium 15 servo drives

Overview of the functions of Lexium 15 servo drives

Lexium 15 servo drives integrate numerous operating modes, enabling them to be used in a wide range of industrial applications.

These functions include:

- Conventional adjustment modes:
  - Homing
  - Manual

- Operating modes:
  - Position control:
    - Point-to-point
    - Motion tasks
    - Electronic gearing
  - Speed control:
    - Speed control according to an acceleration ramp
    - Instantaneous speed control
  - Torque control:
    - Torque control

Each of these operating modes is available offline and/or via the communication buses and networks.

Offline

The servo drive parameters are defined using Unilink configuration software.
Movements are then controlled by:

- The position indexer integrated in the servo drive by programming motion tasks
- Analog signals (± 10 V) (14 resolution bits)
- RS 422/485 signals (pulse/direction or A/B signals)

In this mode, limit switches and homing switches are not managed by the servo drive.

Via communication buses and networks

All the servo drive parameters and those associated with the operating modes can be accessed via the communication buses and networks, in addition to access via the Unilink configuration software.
The following table shows, for each of the operating modes, the type of control and the available sources of setpoint values.

Operating mode	Control		Transmission of the setpoint value
	Via communication buses and networks	Offline	
Adjustment modes			
Homing	Functions available	Functions available	Communication buses and networks or Unilink software
Manual	Functions available	Functions available	Communication buses and networks, Unilink software, encoder signals, pulse/direction or A/B signals
Operating modes			
Point-to-point	Functions available	Functions not available	Communication buses and networks
Motion tasks	Functions available	Functions available	Communication buses and networks or Unilink software
Electronic gearing	Functions available	Functions available	Encoder signals, pulse/direction or A/B signals
Speed control according to an acceleration ramp	Functions available	Functions not available	Communication buses and networks
Instantaneous speed control	Functions available	Functions available	Analog input or communication buses and networks
Torque control	Functions available	Functions available	Analog input or communication buses and networks

Functions available
Functions not available

Presentation: pages 8 and 9
Characteristics: pages 24 to 27
References: pages 28 and 29
Dimensions: pages 48 and 49
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Homing mode

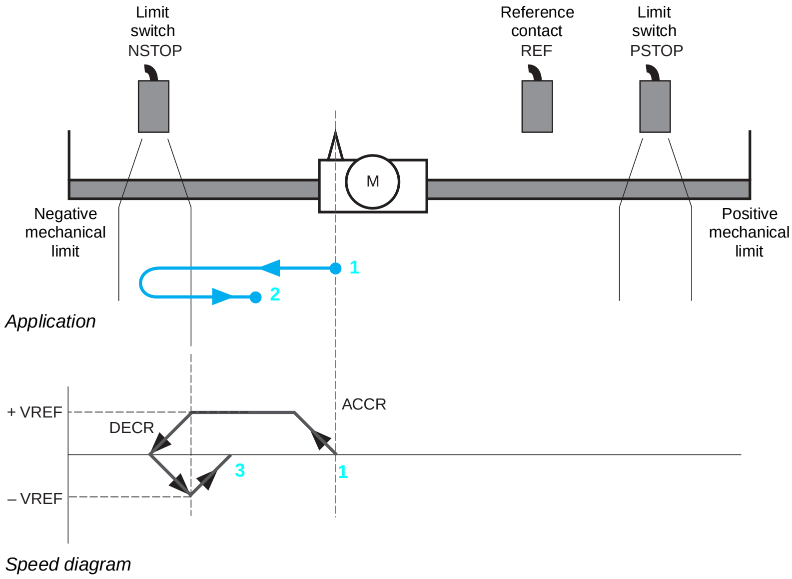
Before performing a movement, a homing operation must be carried out.
Homing consists of associating an axis position with a known mechanical position. This position then becomes the reference position for any subsequent movement of the axis.

Homing is carried out by:
- Either searching for a reference sensor
- Or one servo motor revolution with a "Zero marker"
- Or immediately writing the actual position register (forced homing)

Homing with search for reference sensor

There are 5 possible types of homing with search for reference sensor:
- Homing on - limit switch, "NSTOP"
- Homing on + limit switch, "PSTOP"
- Homing on reference contact "REF" with initial movement in negative direction of rotation
- Homing on reference contact "REF" with initial movement in positive direction of rotation
- Homing on the mechanical limit of the axis

These homing movements can be performed with or without taking the "Zero marker" pulse into account.



Example of a homing movement on "NSTOP" limit switch with "Zero marker".

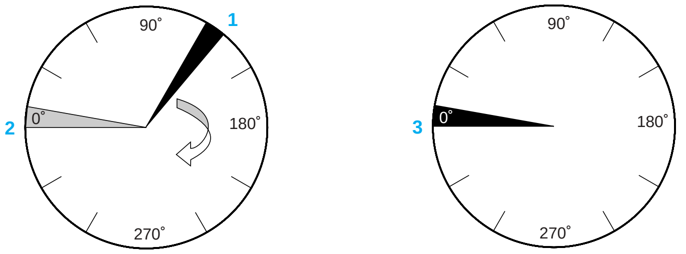
1 Start point of the homing movement
2 New homing point of the movement
3 Zero marker
ACCR: homing acceleration ramp
DECR: homing deceleration ramp
VREF: homing speed

Lexium 15 motion control
Lexium 15 servo drives
Adjustment modes

Homing mode (continued)

Homing on one servo motor revolution with a “Zero marker”

Homing on one revolution consists of setting the “Zero marker” point as the new reference point.

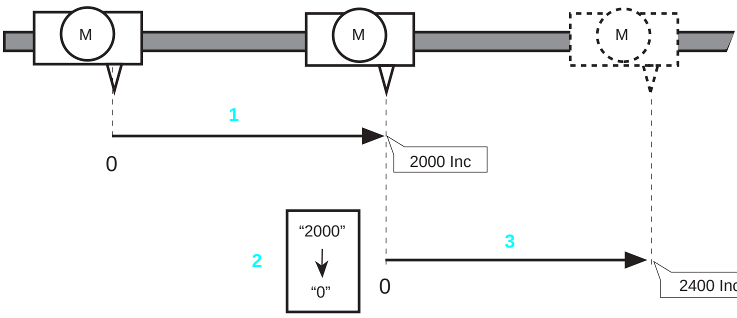


1 Start point of the homing movement
2 Zero marker
3 New homing point of the movement

Forced homing

Three types of forced homing are possible:

■ Simple forced homing: the current position of the servo motor is set as the new reference point, and the following error is lost
■ Forced homing without loss of following error: the actual position of the servo motor is set as the new reference point, and the following error is retained
■ Forced homing on SSI encoder: this is simple forced homing specific to SSI encoders. When the application is started, the position is read in the encoder and set as the new reference point.



Operating mode with forced homing

After power-up, the position value is 0.

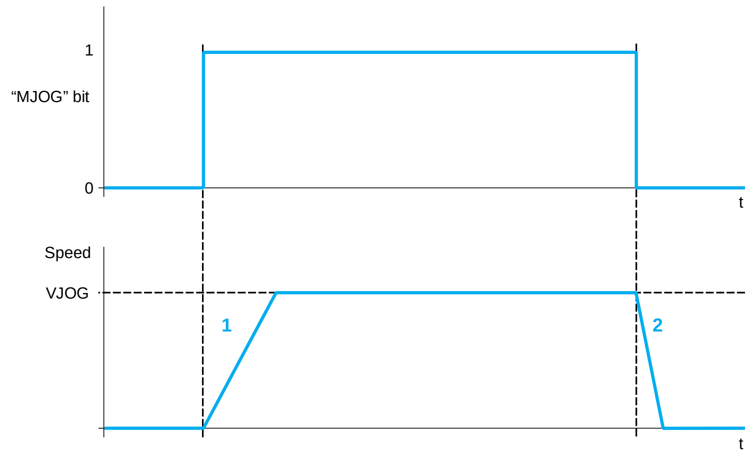
1 Start towards the home point: the motor is positioned using a relative movement of 2000 increments.
2 Forced homing to value 0 by writing the actual position expressed in user units.
3 Initiation of a command to move 2400 increments to the absolute position. The final position is 2400 increments (4400 increments if forced homing has not been performed).

Manual mode

This mode enables an axis to be moved manually when the speed and motion tasks operating modes are selected. The movement is performed continuously at a constant speed as long as this mode is activated. Various parameters such as acceleration, movement speed and deceleration are used to configure manual mode.

This adjustment mode can be configured via communication buses and networks or via Unilink software.

Example



Adjustment of the machine in manual mode

1 The acceleration ramp can be configured via the "ACCR" parameter
2 The deceleration ramp can be configured via the "DECR" parameter

On a rising edge of the "MJOG" bit, a movement is made according to the acceleration ramp "ACCR" up to manual movement speed "VJOG".
On a falling edge of the "MJOG" bit, the movement speed decreases according to the deceleration ramp "DECR".

Presentation: pages 8 and 9 | Characteristics: pages 24 to 27 | References: pages 28 and 29 | Dimensions: pages 48 and 49 | Schemes: pages 50 to 61

Lexium 15 motion control

Lexium 15 servo drives
Operating modes

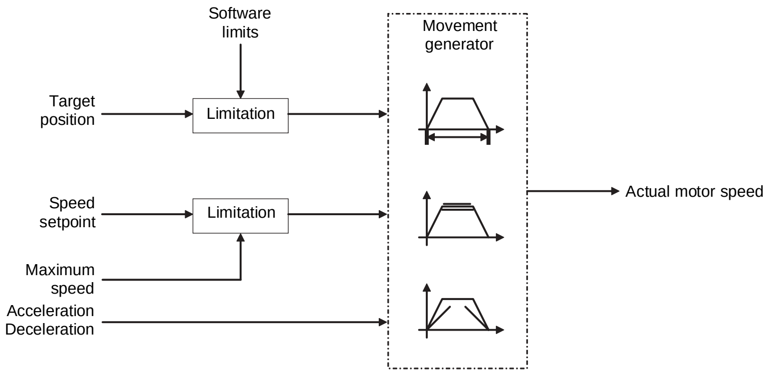
Point-to-point mode

This mode, also referred to as PTP (Point To Point), is used to move the axis from a position A to a position B. The movement can be:
- **Absolute:** this consists of expressing position B in relation to a home position. The axis must have previously been referenced.
- **Relative:** in this case the movement is performed in relation to the current position of the axis (A).

The movement is performed according to acceleration, deceleration and speed parameters.

Setpoint value

The setpoint values are transmitted via the communication bus or network.



Point-to-point operating mode

Possible applications

A motion controller for coordinated axes or a PLC can manage several axes controlled via fieldbus. This mode is often used in material handling, automated inspection, etc.

Motion tasks mode

This mode is used for programming the parameters required for making rapid movements. It is used for absolute or relative axis movements, from a point A to a point B in accordance with a predefined movement (in this mode, point A can be entered on the fly). Then, from point B to another point C, in accordance with another movement.
The movement is performed according to selected acceleration, deceleration and speed parameters.
It is also possible to choose the type of sequencing for these two movements, as well as the required profile (Trapeze or Sinus^2).

Presentation: pages 8 and 9 | Characteristics: pages 24 to 27 | References: pages 28 and 29 | Dimensions: pages 48 and 49 | Schemes: pages 50 to 61

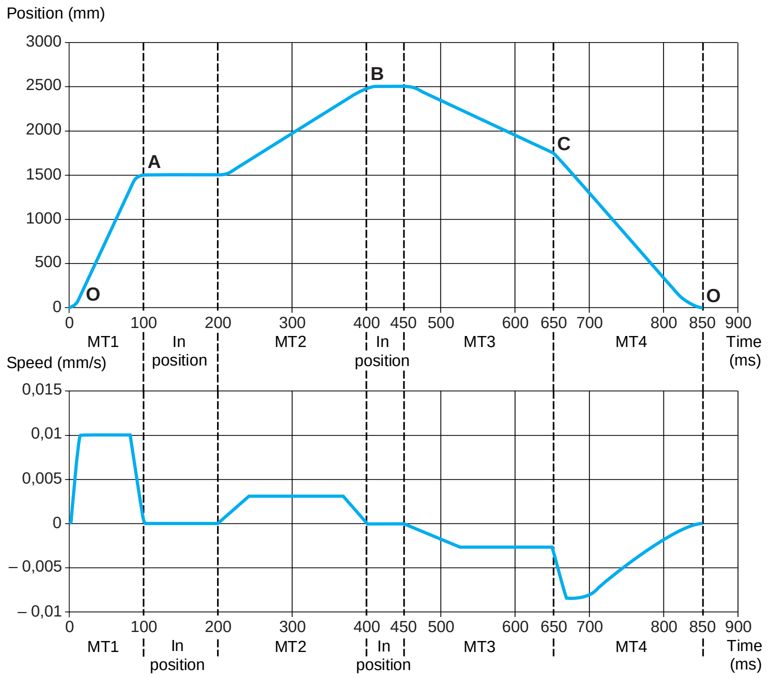
Lexium 15 motion control

Lexium 15 servo drives
Operating modes

Motion tasks mode (continued)

Examples of motion tasks

The movement performed below is made up of 4 motion tasks:
- Motion task 1 is used to move from the home point **O** to point **A** in 100 ms following a Sinus^2 speed profile. The axis remains in position for 100 ms.
- Motion task 2 is used to move from the point **A** to point **B** in 200 ms following a trapezoid speed profile. The axis remains in position for 50 ms.
- Motion task 3 is used to move from point **B** to point **C** in 200 ms following a negative trapezoid speed profile. The movement is then linked directly to the next task.
- Motion task 4 moves the axis from point **C** to home point **O** in 200 ms following a Sinus^2 speed profile which has a very high deceleration component (smooth approach to home position **O**).



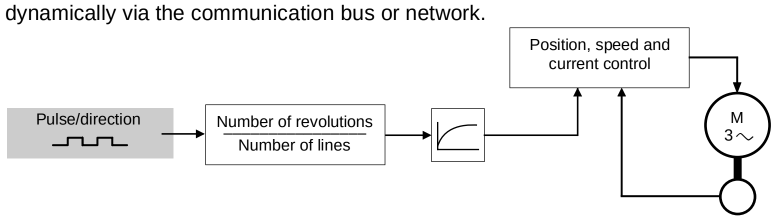
Example of a movement performed using 4 motion tasks

Electronic gearing mode

In this mode a master/slave relationship is established between a number of Lexium 15 servo drives or between a Lexium 15 servo drive (slave) and an external motion controller (master).

This mode can handle 5 types of control signal:
- External or simulated A/B encoder
- Pulse/direction signals
- EnDAT encoder
- Hiperface® encoder
- External or simulated SSI encoder

This relationship can be assigned a fixed or variable ratio. The ratio and direction of operation parameters can be accessed statically via Unilink software, and dynamically via the communication bus or network.



Electronic gearing operating mode

Possible applications

This mode is used in material handling, conveying or sectional production line applications, as well as in the fields of plastics and fibers.

Presentation: pages 8 and 9
Characteristics: pages 24 to 27
References: pages 28 and 29
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Lexium 15 motion control

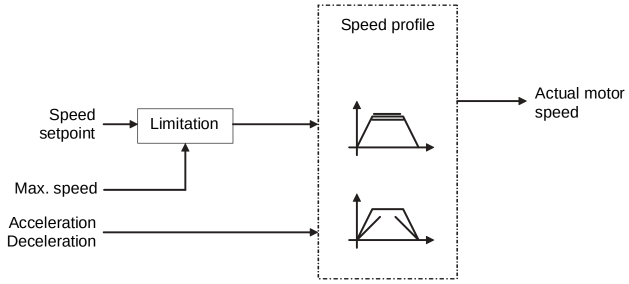
Lexium 15 servo drives
Operating modes

Speed control according to acceleration ramp mode

In this operating mode, the speed setpoint is applied according to an acceleration/deceleration ramp that can be adjusted using parameters. The speed setpoint can be modified during the movement. Torque limiting is also possible.

Setpoint value

The setpoint value is transmitted via the communication bus or network.



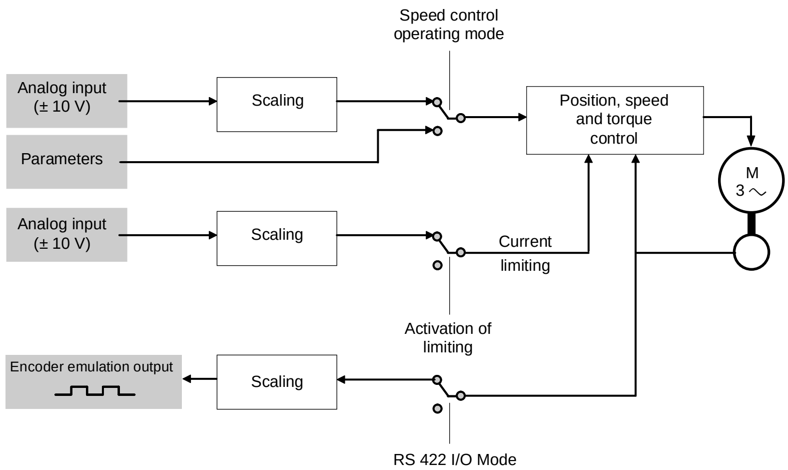
Speed control according to acceleration ramp operating mode

Instantaneous speed control

In this mode the Lexium 15 servo drive can be used with a motion controller with analog output. It is suitable for all other high performance speed control requirements.

Setpoint value

The setpoint value is transmitted via analog input 1 (AI1+/AI1-), the communication bus or the network. Analog input 2 (AI2+/AI2-) can be used to limit the torque or speed, or for precise adjustment of the setpoint.



Instantaneous speed control operating mode

Use with analog output motion controller

The axis position feedback can be provided to the motion controller by the Encoder emulation output (X5) on the Lexium 15 servo drive.

Possible applications

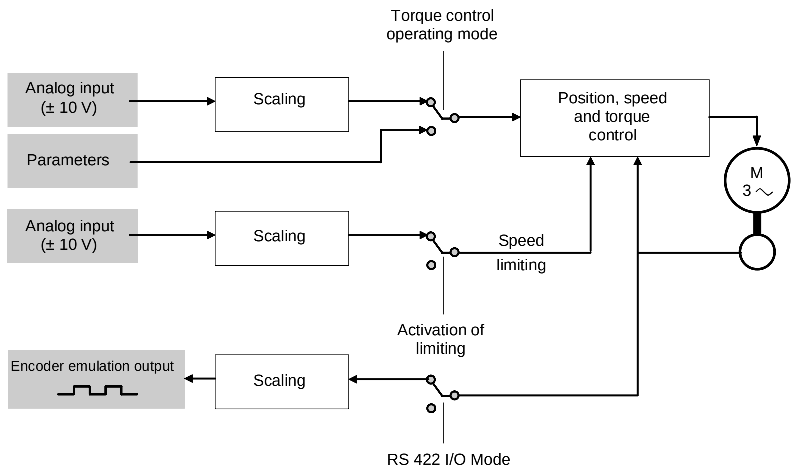
- Material handling
- Cutting to length
- Winding and unwinding applications

Torque control mode

This mode, which can be added onto the other modes, is used in machine phases where torque control is crucial.

Setpoint value

The setpoint value is transmitted via analog input 1 (AI1+/AI1-), the communication bus or network. Analog input 2 (AI2+/AI2-) can be used to limit the current.
The position of the servo motor is transmitted to the motion controller by the encoder emulation output (X5) on the Lexium 15 servo drive.



Torque control operating mode

Possible applications

- Car assembly applications (tool fixing machine)
- Special machines

Other functions

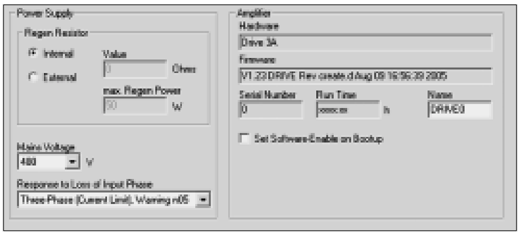
It is possible to activate other functions for setting operating parameters via logic I/O, the communication bus or network, or Unilink software.

- Automatic start
- Programming of emergency stop sequences (categories 0, 1 or 2)
- Position register for controlling logic outputs
- Switching commands on the fly
- Starting motion tasks
- Signaling the end of movement by logic inputs
- Starting a series of ASCII commands on a logic input edge

Lexium 15 motion control

Lexium 15 servo drives

Unilink software



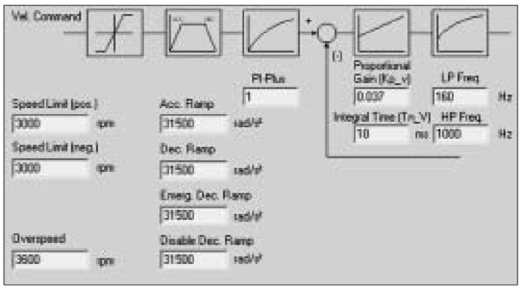
Example of parameter setting with Unilink software

Presentation

Unilink software for PC is a tool for configuring Lexium 15 servo drive operating parameters.
Its simple, easy-to-follow graphic interface helps to reduce setup costs.

It incorporates various functions for the setup phases, such as:
- ■ Parameter setting
- ■ Advanced adjustment of the various control loops
- ■ Programming motion tasks
- ■ Supervision

This software is available in two versions, for configuring Lexium 15 LP servo drives (Unilink L) and Lexium 15 MP/15 HP servo drives (Unilink MH). It is supplied with the servo drive as standard.



Example of adjusting the speed loop with Unilink software

Functions

Parameter setting

Unilink software can be used to configure:

■ The servo drive parameters such as the supply voltage, the breaking resistance, the ID, the address of the drive on the network, etc

■ BDH and BSH servo motors:

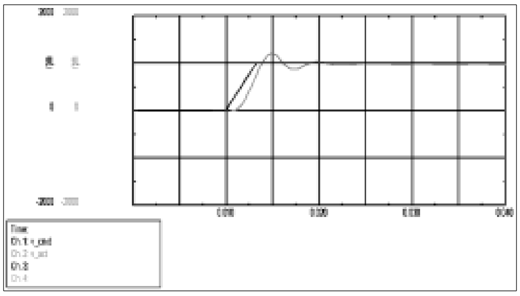
□ Automatically, using the motor parameters stored in the memory of the SinCos Hiperface® absolute encoder

□ Simply, using the Unilink software's motor database, which contains the parameters of all the servo motors sold by Schneider Electric

■ The parameters of third party servo motors by simply entering motor parameters such as the type of position sensor, the maximum speed, the minimum and maximum motor currents, etc

■ Operation in simple master/slave mode by setting the parameters of the incremental (A/B) or SSI absolute encoder emulation output, the encoder input and pulse/direction input

■ The functions associated with the logic and analog I/O, such as capture of position registers, control of motion tasks or speed, torque and coupling ratio adjustment in the context of electronic gearing type applications.



Oscilloscope function

Sophisticated adjustment of the various control loops

Unilink software can be used to access the following control loop parameters:

■ Torque control. The motor database that can be accessed via Unilink software is used to automatically configure the KT gain of the current loop for optimum regulation of the motor torque.

■ Speed control. Provides access to the KV gain parameters of the speed loop, as well as to the parameters of the internal PID controller. Other service parameters such as maximum speed, overspeed threshold, acceleration and deceleration ramps and the emergency stop deceleration time can also be accessed.

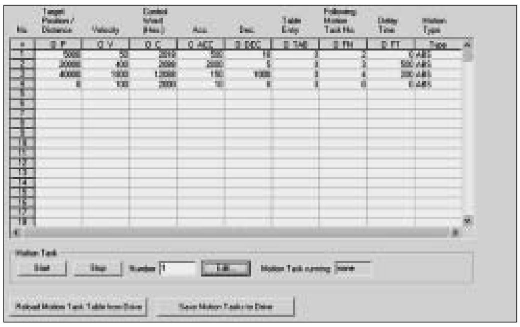
■ Position control. In integrated position indexer operating mode, the software can be used to optimize the adjustment of the KP gain of the position loop.

With its Oscilloscope and Bode Diagram functions, Unilink software simplifies the optimization of these control loops.

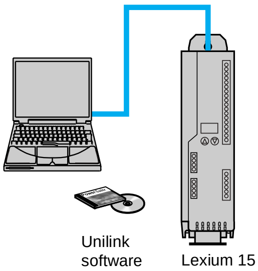
Presentation:
pages 8 and 9
Characteristics:
pages 24 to 27
References:
pages 28 and 29
Dimensions:
pages 48 and 49
Schemes:
pages 50 to 61

Lexium 15 motion control

Lexium 15 servo drives
Unilink software



Example of programming a motion task



PC/Lexium 15 servo drive connection

Functions (continued)

Programming of motion tasks

For each motion task, Unilink software can be used to set the parameters for the type of speed profile, the position to be reached and the setpoint speed.
These motion tasks can be absolute, relative in relation to a known position or relative in relation to a position register.
The sequencing of the motion tasks can be direct, delayed or triggered by a logic input.

Supervision

When the axis is set up, the Unilink software Monitor can be used to supervise the speed, temperature, current, voltage, position and following error parameters that allow the user to check that the application is operating correctly.

Setup and connection

Preparation of the configurations

Unilink software can be used on its own for configuring the Lexium 15 servo drive. The configurations can be saved, printed, etc.

Online mode

In online mode, it is possible, using the RS232 link, to load the parameters of the Lexium 15 servo drive in the PC and vice versa.
It is also possible to supervise the correct operation of the Lexium 15 servo drive and the communication buses and networks in offline mode.

PowerSuite

For easier setup of applications requiring other types of servo drives (Lexium 05) or variable speed drives (Altivar), Unilink can be launched via the PowerSuite software workshop *(1)*.

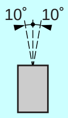
(1) This function is available from version 2.40 ▲ of PowerSuite.

▲ Available 4th quarter 2006

Lexium 15 motion control

Lexium 15 servo drives

Environmental characteristics

Conformity to standards				Lexium 15 servo drives have been developed to conform to the strictest levels of international standards and the recommendations relating to electrical industrial control equipment (IEC, EN), including: ■ EN 50178, IEC/EN 61439-1, IEC/EN 60204-1 for low voltages ■ IEC/EN 60204-1, EN 292 for machine safety ■ IEC/EN 61800-3 for EMC immunity and conducted and radiated emissions
	EMC immunity			IEC/EN 61800-3, environment 2 IEC/EN 61000-6-1 level 3 IEC/EN 61000-6-2 level 3
	EMC conducted and radiated emissions			EN 61800-3, environments 1 and 2, categories C2 and C3
		LXM 15L●●●●●		EN 55011 class A group 1, IEC/EN 61800-3 category C2 for cable lengths < 10 m EN 55011 class A group 2, IEC/EN 61800-3 category C3 for cable lengths 10…50 m
		LXM 15MD●●N4		IEC/EN 61800-3 category C3
		LXM 15HC●●N4X		With additional EMC filter *(1)*: ■ EN 55011 class A group 1, IEC/EN 61800-3 category C3
CE marking				The servo drives are CE marked in accordance with the European low voltage (73/23/EEC) and EMC (89/336/EEC) directives
Product certification				UL (USA), cUL (Canada)
Degree of protection				IP 20
Vibration resistance				According to IEC/EN 60068-2-6: 1.5 mm peak to peak from 10…57 Hz 1 gn from 57…150 Hz
Shock resistance				4 gn for 22 ms according to IEC/EN 60028-2-27
Maximum ambient pollution		LXM 15L●●●●●		Degree 2 according to IEC 60664-1
		LXM 15MD●●N4 LXM 15HC●●N4X		Degree 2 according to EN 60204 and EN 50178
Environmental conditions				IEC 60721-3-3 class 3C1
Relative humidity				According to IEC 60721-3-3, class 3K3, 5…85%, without condensation
Ambient air temperature around the device	Operation	LXM 15L●●●●●	°C	0…40 without derating 40…55 with derating of the motor output current by 2.5% per additional °C
		LXM 15MD●●N4 LXM 15HC●●N4X	°C	0…45 without derating 45…55 with derating of the motor output current by 2.5% per additional °C
	Storage		°C	- 25…+ 70
Type of cooling		LXM 15LD13M3 LXM 15LU60N4		Natural convection
		LXM 15LD21M3, LD28M3 LXM 15LD10N4, LD17N4 LXM 15MD●●N4 LXM 15HC●●N4X		Fan
Maximum operating altitude			m	0…1000 without derating 1000…2500 with derating of the motor output current by 1.5% per additional 100 m
Operating position Maximum permanent angle in relation to the normal vertical mounting position				

(1) See page 45 to check the permitted cable lengths.

Lexium 15 motion control
Lexium 15 servo drives

Drive characteristics

Switching frequency		**kHz**	8

Control loop characteristics

Torque		**µs**	62.5
Speed		**µs**	250
Position		**µs**	250

Electrical power characteristics

Power supply	Voltages	**V**	200 - 15%…240 + 10% single phase for LXM 15LD●●M3 200 - 15%…240 + 10% 3-phase for LXM 15LD●●M3 208 - 10%…480 + 10% 3-phase for LXM 15●●●●N4, LXM 15HC●●N4X
	Frequency	**Hz**	50 - 5%…60 + 5%
	Inrush current	**A**	Internal limitation
	Neutral connection		Compatible with TN and TT connection. For IT connection, an isolation transformer must be used on the power supply, see page 61
24 V⎓ external power supply *(1)*	Input voltage	**V**	24…28 20…30 for LXM 15D13M3, LXM 15LU60N4 used with a servo motor without brake
	Input current (no-load)	**A**	2.5 1 for LXM 15D13M3, LXM 15LU60N4 used with a servo motor without brake
	Ripple		⩽ 5%
Output voltage			Maximum 3-phase voltage equal to line supply voltage
Electrical isolation			Between power and control (inputs, outputs, sources)

Connection characteristics (power supply, braking resistor, DC bus and motor terminals)

Servo drive terminals		**R/L1, S/L2, T/L3 (power supply)**	**PA/+, PC/-, PBi, PBe (external braking resistor and DC bus)**	**U/T1, V/T2, W/T3 (motor)**
Maximum wire size and tightening torque of power supply, braking resistor, DC bus and motor terminals	LXM 15L●●●●●	1.5 mm² (AWG 14) 0.6 Nm	1.5 mm² (AWG 14) 0.6 Nm	See characteristics of VW3 M5 10● R●●● cables, pages 129 and 176
	LXM 15MD28N4	1.5 mm² (AWG 14) 0.5…0.6 Nm	1.5 mm² (AWG 14) 0.5…0.6 Nm	See characteristics of VW3 M5 20● R●●● cables, pages 129 and 177
	LXM 15MD40N4, MD56N4	4.0 mm² (AWG 12) 0.5…0.6 Nm	4.0 mm² (AWG 12) 0.5…0.6 Nm	
	LXM 15HC●●N4X	25 mm² (AWG 2) 6…8 Nm	25 mm² (AWG 2) 6…8 Nm	See characteristics of VW3 M5 10● R●●●, VW3 M5 30● R●●● cables, pages 176 and 177

(1) Please consult our "Interfaces, I/O splitter boxes and power supplies" specialist catalogue.

Presentation: pages 8 and 9 | Functions: pages 14 to 23 | References: pages 28 and 29 | Dimensions: pages 48 and 49 | Schemes: pages 50 to 61

Control signal characteristics

Type of servo drive			LXM 15L●●●●●	LXM 15MD●●N4, LXM 15HC●●N4X
Protection	Inputs		Against reverse polarity	
	Outputs		Against short-circuits	
Electrical link			Presence of an electrical link on the 0 V ⎓	
Relay outputs				
Type			Relay output, 1 N/O contact	
Number			1 (R1A, R1C)	
Maximum switching capacity			On resistive load (cos φ = 1): 0.5 A for 125 V ∿ or 30 V ⎓	
Maximum response time		**ms**	4	
Logic inputs				
Type			Logic inputs conforming to standard IEC 61131-2 type 1	
Number			5 including one ENABLE input (LI1, LI2, LI3, LI4)	
Power supply		**V**	20…30 ⎓	
Sampling period		**ms**	0.25	1 in normal cycle, 0.05 in fast cycle
Positive logic (Sink)			State 0 if < 5 V or input not wired State 1 if > 11 V	State 0 if < 7 V or input not wired State 1 if > 12 V
Safety inputs				
Type			Inputs for the "Power Removal" safety function	
Number			1 (PWR)	2 (PWRI+, PWRI-)
Power supply		**V**	24 ⎓	
Response time		**ms**	1.5	20
Positive logic (Sink)			State 0 if < 5 V or input not wired State 1 if > 15 V	State 0 if < 7 V or input not wired State 1 if > 12 V
Logic outputs				
Type			Logic outputs 24 V ⎓ positive logic (Source)	Logic outputs 24 V ⎓ negative logic (Sink)
Number			2 (LO1, LO2)	
Output voltage		**V**	30 max.	
Sampling period		**ms**	0.25	1
Max. breaking current		**mA**	10	
Analog inputs				
Type			±10 V differential analog inputs	
Number			2 (AI1+/AI1-, AI2+/AI2-)	
Resolution			14 bits (AI1+/AI1-) 12 bits (AI2+/AI2-)	
Input resistance		**kΩ**	20	
Sampling period		**ms**	0.0625	0.25
Analog outputs				
Type			–	±10 V analog outputs
Number			0	2 (Analog Out 1, Analog Out 2)
Resolution		**bit**	–	10
Output impedance		**kΩ**	–	2.2
Response time		**ms**	–	5

Control signal characteristics (continued)

Type of servo drive			LXM 15L●●●●●	LXM 15MD●●N4, LXM 15HC●●N4X
Resolver feedback				
	Type		Resolver feedback input	
	Number		1; 9-way female SUB-D connector (X2)	
Voltages	Sensor power supply		4.75 V ∿, 35 mA max.	
	Resolver input signals		7 V ± 10%	
	Resolution		14 bits	
Input resistance		kΩ	24.5	
Motor encoder feedback signals				
Type			Encoder feedback input	
Number			1; 15-way female SUB-D connector (X1)	
Voltages	Encoder power supply		+ 10 V/100 mA	
	SinCos input signals		1 V_{SS} with 2.5 V offset 0.5 V_{SS} at 100 kHz	
Pulse/direction, A/B encoder signals				
Type			RS 422 and RS 485 link compatible input	
Number			1; 9-way male SUB-D connector (X5)	
Common mode range		V	- 7…+ 12	
Input frequency	Pulse/direction	kHz	⩽ 100	
	A/B signals	MHz	⩽ 1.5	
Output signals for encoder emulation				
Type			RS 422/485 link compatible output	
Number			1; 9-way male SUB-D connector (X5)	
Logic level			0 V or 5 V	
Output frequency		MHz	⩽ 1.5	

Connection characteristics of the control signal terminals

Servo drive terminals			+24 VDC, 0 VDC (power supply)	R1●, LI●, Enable, LO●, PWR●, AI● and Analog Out● (I/O)
Maximum wire size and tightening torque	LXM 15L●●●●●		2.5 mm^2 (AWG 14) - ; spring terminal	0.5 mm^2 (AWG 20) - ; spring terminal
	LXM 15MD●●N4		2.5 mm^2 (AWG 14) 0.5…0.6 Nm	0.5 mm^2 (AWG 20) 0.5…0.6 Nm
	LXM 15HC●●N4X		2.5 mm^2 (AWG 14) 0.3 Nm	0.5 mm^2 (AWG 20) 0.3 Nm

Operational safety characteristics

Machine protection	LXM 15L●●●●●		“Power Removal” (PWR) safety function, which forces stopping and/or prevents unintended restarting of the motor, conforming to EN 954-1 category 3
	LXM 15MD●●N4, LXM 15HC●●N4X		“Power Removal” (PWR) safety function, which forces stopping and/or prevents unintended restarting of the motor, conforming to EN 954-1 category 1

Characteristics of the communication port

CANopen protocol

Structure	Connector		9-way male SUB-D
	Network management		Slave
	Transmission speed		125 kbps to 1 Mbps
	Address (Node ID)		1 to 127, configurable via the terminal or the Unilink software
	Polarization		Impedance line terminators are integrated in the servo drive and are switchable
Services	PDO		Implicit exchange of PDO (Process Data Objects): - 3 PDO (position control and speed profile modes) - 1 configurable mapping PDO
	Emergency		Yes
	Profile		Position control and speed profile modes
	Communication monitoring		Node guarding, heartbeat
Description file			EDS files supplied on the documentation CD-ROM These files contain the description of the servo drive parameters

Lexium 15 motion control

Lexium 15 LP, 15 MP and 15 HP servo drives

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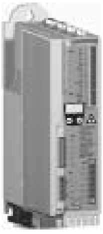

LXM 15LD13M3

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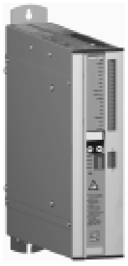

LXM 15MD28N4

Lexium 15 LP servo drives

Output currents *(1)* Permanent (RMS)	Transient (RMS for 2 s)	Transient (peak current)	Nominal power *(1)*	Line currents at U1 *(2)*	Line currents at U2 *(2)*	Apparent power	Reference	Weight
A	A	A	kW	A	A	kVA		kg
Single phase supply voltage: 200…240 V∼ *(2)* 50/60 Hz, with integrated EMC filter								
3	9	13	0.9	7.7	7.6	1.1	**LXM 15LD13M3**	2.600
4	9	13	1.2	10.1	9.9	2.4	**LXM 15LD21M3**	2.600
4	9	13	1.2	10.4	10.1	4	**LXM 15LD28M3**	2.600
Three phase supply voltage: 200…240 V∼ *(2)* 50/60 Hz, with integrated EMC filter								
3	9	13	1	4.7	4.6	1.1	**LXM 15LD13M3**	2.600
6	15	21	2.1	8.8	8.6	2.4	**LXM 15LD21M3**	2.600
10	20	28	3.4	14	13.7	4	**LXM 15LD28M3**	2.600
Three phase supply voltage: 208…480 V∼ *(2)* 50/60 Hz, with integrated EMC filter								
1.5	4.5	6	1.1	2.8	2.5	1.2	**LXM 15LU60N4**	2.700
3	7.5	10	2.1	3.9	4.5	2.5	**LXM 15LD10N4**	2.700
6	12	17	4.3	6.9	8.2	5	**LXM 15LD17N4**	2.700

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LXM 15MD56N4

Lexium 15 MP servo drives

Output currents *(1)* Permanent (RMS)	Transient (RMS for 2 s)	Transient (peak current)	Nominal power *(1)*	Line currents at U1 *(2)*	Line currents at U2 *(2)*	Apparent power	Reference	Weight
A	A	A	kW	A	A	kVA		kg
Three phase supply voltage: 208…480 V∼ *(2)* 50/60 Hz, with integrated EMC filter								
10	20	28	5.7	9.7	12.6	7	**LXM 15MD28N4**	4.000
14	28	40	7.9	15.4	17.7	10	**LXM 15MD40N4**	5.000
20	40	56	11.4	19.9	24.5	14	**LXM 15MD56N4**	7.500

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LXM 15HC20N4X

Lexium 15 HP servo drives

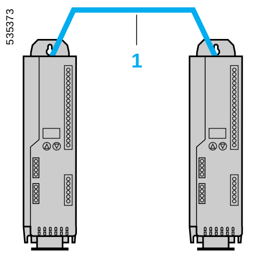
Output currents *(1)* Permanent (RMS)	Transient (RMS for 2 s)	Transient (peak current)	Nominal power *(1)*	Line currents *(3)* at U1 *(2)*	Line currents *(3)* at U2 *(2)*	Apparent power	Reference	Weight
A	A	A	kW	A	A	kVA		kg
Three phase supply voltage: 208…480 V∼ *(2)* 50/60 Hz, without integrated EMC filter *(4) (5)*								
40	80	112	22.3	35	36.6	30	**LXM 15HC11N4X**	19.500
70	140	198	42.5	60.6	60.9	50	**LXM 15HC20N4X**	21.000

(1) These values are given for a nominal switching frequency of 8 kHz.
(2) Nominal supply voltage, min. U1, max. U2: 200 (U1)…240 V (U2) or 208 (U1)…480 V (U2).
(3) The line currents are given for a connection with line choke. For a connection without line choke, see page 46.
(4) EMC filters available as an option (see page 45).
(5) When the line supply has a TT or TN load system, a line choke MUST be used (see page 46). For an IT system, see page 61.

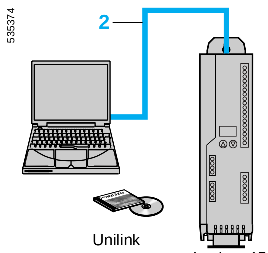
Lexium 15 motion control

Lexium 15 LP, 15 MP and 15 HP servo drives

Option: Accessories



Connection via extension cables



PC/Lexium 15 servo drive connection

Accessories

Designation	Use	Reference	Weight kg
Backup key One key needed per servo drive	Memory backup device Saves the servo drive working parameters Fast servo drive parameter setting without a PC	**VW3 M8 701**	–

Connection accessories

Connectors

Designation	Use	Reference	Weight kg
Sets of replacement connectors	Female screw connectors for terminals X0, X3, X4, X8 and X9 for LXM 15LD●●M3	**VW3 M4 501**	–
	Female screw connectors for terminals X0, X3, X4, X8 and X9 for LXM 15L●●●N4	**VW3 M4 502**	–
	Female screw connectors for terminals X3, X4, X7, X8, X0A and X0B for LXM 15MD●●N4	**VW3 M4 503**	–
	Female screw connectors for terminals X3, X4 and X10 for LXM 15HC●●N4X	**VW3 M4 504**	–

Cables

Designation	Use From	Use To	Length m	Item no.	Reference	Weight kg
Extension cables equipped with two 9-way female SUB-D connectors	Lexium 15	Lexium 15	0.5	1	**VW3 M8 501 R05**	–
			2	1	**VW3 M8 501 R20**	–
			6	1	**VW3 M8 501 R60**	–
Connection cable for PC serial port equipped with two 9-way female SUB-D connectors	PC serial port	Lexium 15	3	2	**VW3 M8 601 R30**	–

Documentation

Designation	Reference	Weight kg
Simplified installation manual and documentation CD-ROM supplied with the Lexium 15 servo drive	–	–

Note: *The manuals and quick reference guides for servo drives and servo motors are available on the website: www.telemecanique.com*

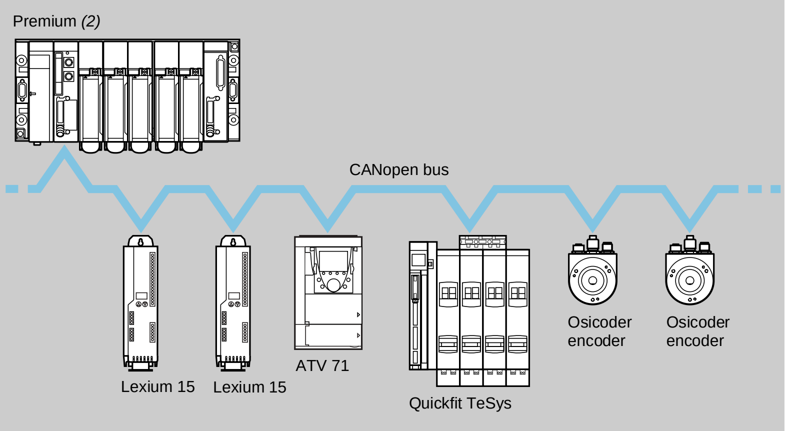
Presentation: pages 8 and 9
Functions: pages 14 to 23
Characteristics: pages 24 to 27
Dimensions: pages 48 and 49
Schemes: pages 50 to 61

Lexium 15 motion control
Communication buses and networks

Presentation

The Lexium 15 servo drive integrates the CANopen communication protocol as standard *(1)*.
By adding one of the communication cards (available as options), the Lexium 15 servo drive can also be connected to the following communication buses and networks:
- Fipio bus
- Profibus DP fieldbus
- Modbus Plus network

CANopen machine bus



The CANopen machine bus is a fieldbus based on CAN lower layers and components. It complies with standard ISO 11898. With its standard communication profiles, the CANopen bus provides openness and interoperability with various devices (drives, motor starters, smart sensors, etc).

The CANopen bus is a multi-master bus, which provides secure, deterministic access to realtime automation device data. The CSMA/CA type protocol is based on broadcast exchanges, transmitted cyclically or on event, which ensure optimum use of the bandwidth. A messaging channel is also used to set the parameters of the slave devices.

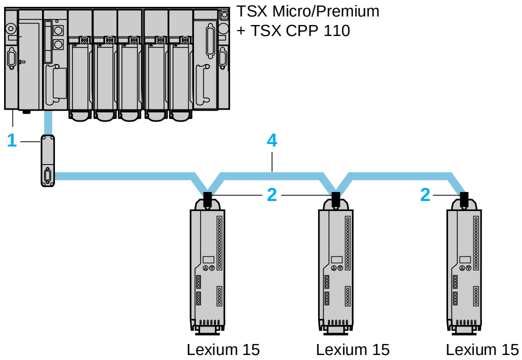
The Lexium 15 servo drive is equipped with a CANopen bus compatible interface as standard.
The **AM0 2CA 001V000** adaptor provides a hardware interface which **complies strictly with the CANopen standard**. This adaptor (occupying the slot for the option card) also has a 9-way male SUB-D connector for connecting a PC terminal.

(1) See characteristics page 27.
(2) Please consult our "Automation platform Modicon Premium and Unity - PL7 software" specialist catalogue.

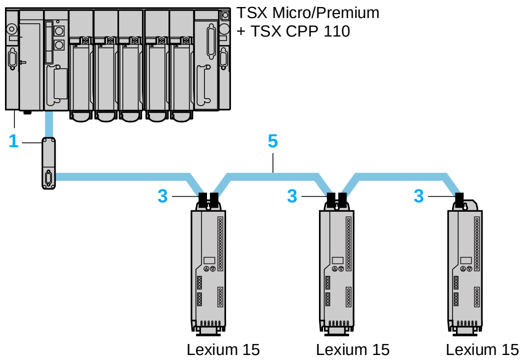
Characteristics:
page 27

Lexium 15 motion control

Communication buses and networks



Example of connection to CANopen bus



Example of connection to CANopen bus via adaptor AM0 2CA 001V000 3

AM0 2CA 001V000

CANopen machine bus connection components *(1)*

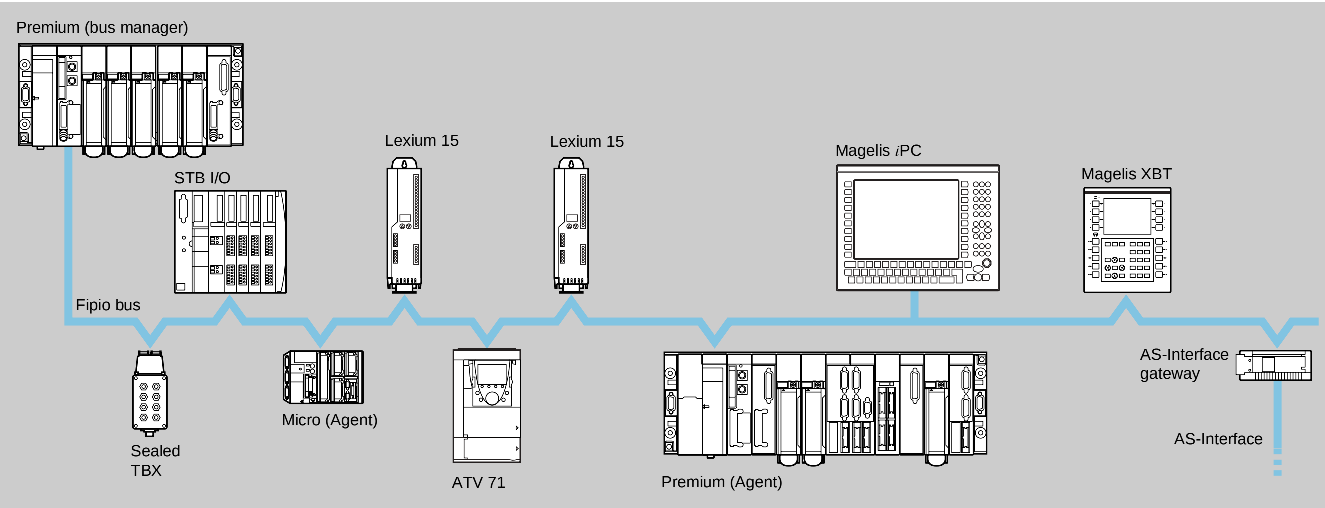
Description	Item no.	Length m	Reference	Weight kg
Connection accessories				
CANopen PCMCIA card Type III, supplied with cable and junction box with 9-way male SUB-D connector	1	0.5	**TSX CPP 110**	0.230
9-way female SUB-D connector not supplied. Provide a 120 Ω - 1/4 W line terminator	2	–	–	–
CANopen bus adaptor for Lexium 15 Hardware interface conforming to the CANopen standard + one 9-way male SUB-D connector for connecting PC Includes line terminator	3	–	**AM0 2CA 001V000**	0.110
Cables				
CANopen cables *(1)* Standard cables, CE marking Low smoke emission, halogen-free Flame retardant (IEC 60332-1)	4	50	**TSX CAN CA 50**	4.930
		100	**TSX CAN CA 100**	8.800
		300	**TSX CAN CA 300**	24.560
CANopen cables *(1)* UL certification, CE marking Flame retardant (IEC 60332-2)	4	50	**TSX CAN CB 50**	3.580
		100	**TSX CAN CB 100**	7.840
		300	**TSX CAN CB 300**	21.870
CANopen cables *(1)* Cable for harsh environments *(2)* or mobile installations, CE marking Low smoke emission, halogen-free Flame retardant (IEC 60332-1)	4	50	**TSX CAN CD 50**	3.510
		100	**TSX CAN CD 100**	7.770
		300	**TSX CAN CD 300**	21.700
CANopen cables equipped with two 9-way female SUB-D connectors Standard cable, CE marking Low smoke emission, halogen-free Flame retardant (IEC 60332-1)	5	0.3	**TSX CAN CADD 03**	0.091
		1	**TSX CAN CADD 1**	0.143
		3	**TSX CAN CADD 3**	0.295
		5	**TSX CAN CADD 5**	0.440
CANopen cables equipped with two 9-way female SUB-D connectors UL certification, CE marking Flame retardant (IEC 60332-2)	5	0.3	**TSX CAN CBDD 03**	0.086
		1	**TSX CAN CBDD 1**	0.131
		3	**TSX CAN CBDD 3**	0.268
		5	**TSX CAN CBDD 5**	0.400

(1) To order other components for connection to the CANopen bus, please consult our "Automation platform Modicon Premium and Unity - PL7 software", "Automation platform Modicon TSX Micro and PL7 software" and "Machines & installations with CANopen" specialist catalogues.
(2) Harsh environment:
- *Resistance to hydrocarbons, industrial oils, detergents, solder splashes*
- *Relative humidity up to 100%*
- *Saline atmosphere*
- *Significant temperature variations*
- *Operating temperature between - 10°C and + 70°C*

Characteristics:
page 27

Lexium 15 motion control
Communication buses and networks

Fipio bus
Presentation



The Fipio fieldbus is a standard means of communication between control system components, and conforms to the World FIP standard.
A Premium PLC (bus manager) can control 127 devices (agents) over a distance of 15 km.
The Fipio bus manager is integrated in the PLC processor.

The Lexium 15 servo drive is connected to the Fipio bus via the AM0 FIP 001V000 communication card.

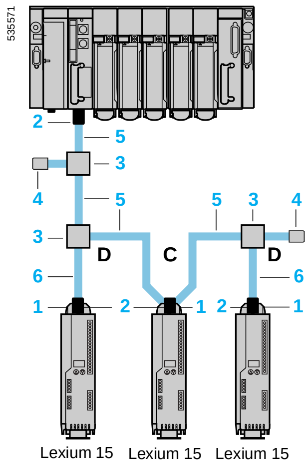
Other devices can be connected to the Fipio bus such as TSX Micro *(1)* and Premium *(2)* PLCs, Magelis XBT terminals *(3)*, Magelis *i*PC industrial PCs *(3)*, Altivar variable speed drives *(4)* and partner products in the Collaborative Automation program.

Characteristics of the AM0 FIP 001V000 Fipio card

Structure	Connector	One 9-way male SUB-D connector
	Transmission speed	1 Mbps
	Address	1 to 62, configurable via the terminal or the Unilink software
Services	X-Way and Uni-Te services	Read/write access to all Lexium 15 servo drive parameters: ■ Operating mode and fault management status data ■ Operating mode data ■ "Motion Task" movement data (realtime modification of the acceleration, position and speed) ■ External position, speed and torque setpoints ■ Path status data ■ Uploading and downloading of servo drive parameters (128 bytes of data maximum)
	Setup service via Unity Pro or PL7 Junior/Pro software	□ Integrated setup screens (presymbolization of objects, handling of double length words, debugging and diagnostics screens) □ "FDR" (Faulty Device Replacement) service. Restoring the operating context if a drive is replaced.
Diagnostics	Using LEDs	2 LEDs on the card: "ERR" (fault), "COM" (data exchange)

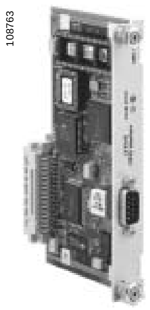
(1) Please consult our "Automation platform Modicon TSX Micro and PL7 software" specialist catalogue.
(2) Please consult our "Automation platform Modicon Premium and Unity - PL7 software" specialist catalogue.
(3) Please consult our "Human-Machine interfaces" specialist catalogue.
(4) Please consult our "Soft starters and variable speed drives" specialist catalogue.

Note: *See also our "Distributed I/O Advantys STB" and "Momentum automation platform" specialist catalogues.*



D: tap junction connection
C: daisy chain connection

Example of connection to the Fipio bus



AM0 FIP 001V000

TSX FP ACC3

Fipio bus connection components with Premium PLC *(1)*

Description	Use	Item no.	Reference	Weight kg
Card				
Fipio card	For Lexium 15, all ratings	1	**AM0 FIP 001V000**	0.140
Connection accessories				
9-way female SUB-D connector (zamak)	Connection by daisy chain or tap junction, for Premium PLC Connection of a number of Lexium 15 by daisy chain	2	**TSX FP ACC2**	0.080
9-way female SUB-D connector (polycarbonate, IP 20)	Connection by daisy-chain or tap junction, for Premium PLC Connection of a number of Lexium 15 by daisy chain	2	**TSX FP ACC12**	0.040
Junction box (polycarbonate, IP 20) Equipped with two 9-way female SUB-D connectors	Trunk cable tap link Also used to connect 2 devices via 9-way female SUB-D connectors	3	**TSX FP ACC3**	0.090
Junction box (zamak, IP 65) Equipped with one 9-way female SUB-D connector	Trunk cable tap link Also used to connect 1 device via a 9-way female SUB-D connector	3	**TSX FP ACC4**	0.660
Junction box (polycarbonate, IP 20)	Trunk cable tap link	3	**TSX FP ACC14**	0.120
Fipio line terminators (sold in lots of 2)	Fit at the end of each segment	4	**TSX FP ACC7**	0.020

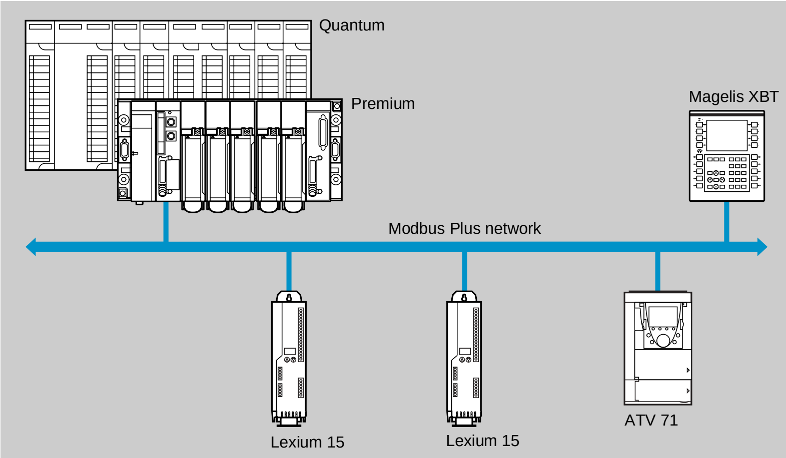
Cables

Description	Use From	To	Item no.	Length m	Reference	Weight kg
Trunk cables 8 mm, 1 shielded twisted pair 150 Ω In standard environment *(2)* and indoors	Connectors TSX FP ACC2/ ACC12 Junction boxes TSX FP ACC3/ ACC4/ACC14	Connectors TSX FP ACC2/ ACC12 Junction boxes TSX FP ACC3/ ACC4/ACC14	5	100	**TSX FP CA100**	5.680
				200	**TSX FP CA200**	10.920
				500	**TSX FP CA500**	30.000
Trunk cables 9.5 mm, 1 shielded twisted pair 150 Ω In harsh environments *(3)*, outdoors, or in mobile installations *(4)*	Connectors TSX FP ACC2/ ACC12 Junction boxes TSX FP ACC3/ ACC4/ACC14	Connectors TSX FP ACC2/ ACC12 Junction boxes TSX FP ACC3/ ACC4/ACC14	5	100	**TSX FP CR100**	7.680
				200	**TSX FP CR200**	14.920
				500	**TSX FP CR500**	40.000
Drop cables 8 mm, 2 shielded twisted pairs 150 Ω In standard environment *(2)* and indoors	Connectors TSX FP ACC2/ ACC12	Junction boxes TSX FP ACC3/ ACC4/ACC14	6	100	**TSX FP CC100**	5.680
				200	**TSX FP CC200**	10.920
				500	**TSX FP CC500**	30.000

(1) To order other components for connection to the Fipio bus, please consult our “Automation platform Modicon Premium and Unity - PL7 software” and “Automation platform Modicon TSX Micro and PL7 software” specialist catalogues.
(2) Standard environment:
- No particular environmental restrictions
- Operating temperature between + 5°C and + 60°C
- Fixed installation
(3) Harsh environment:
- Resistance to hydrocarbons, industrial oils, detergents, solder splashes
- Relative humidity up to 100%
- Saline atmosphere
- Significant temperature variations
- Operating temperature between - 10°C and + 70°C
(4) Mobile installation: cables in accordance with VDE 472 part 603/H:
- Use on a cable-carrier mechanism (cable with minimum 75mm radius of curvature)
- Use on a gantry, provided that operating conditions such as acceleration, speed, length, etc. are adhered to: Please consult your Regional Sales Office.
- Use on robots or multi-axis applications not authorized

Modbus Plus network

Presentation



The Modbus Plus network is a high-performance industrial local area network which meets the needs of client/server type extended architectures, combining a high data rate (1 Mbps), simple, low cost transmission media and numerous messaging services.

The Lexium 15 servo drive is connected to the Modbus Plus network via the AM0 MBP 001V000 communication card.

Other devices can be connected to the Modbus Plus network such as Quantum *(1)* and Premium *(2)* PLCs, Magelis XBT terminals *(3)*, Altivar variable speed drives *(4)*, etc.

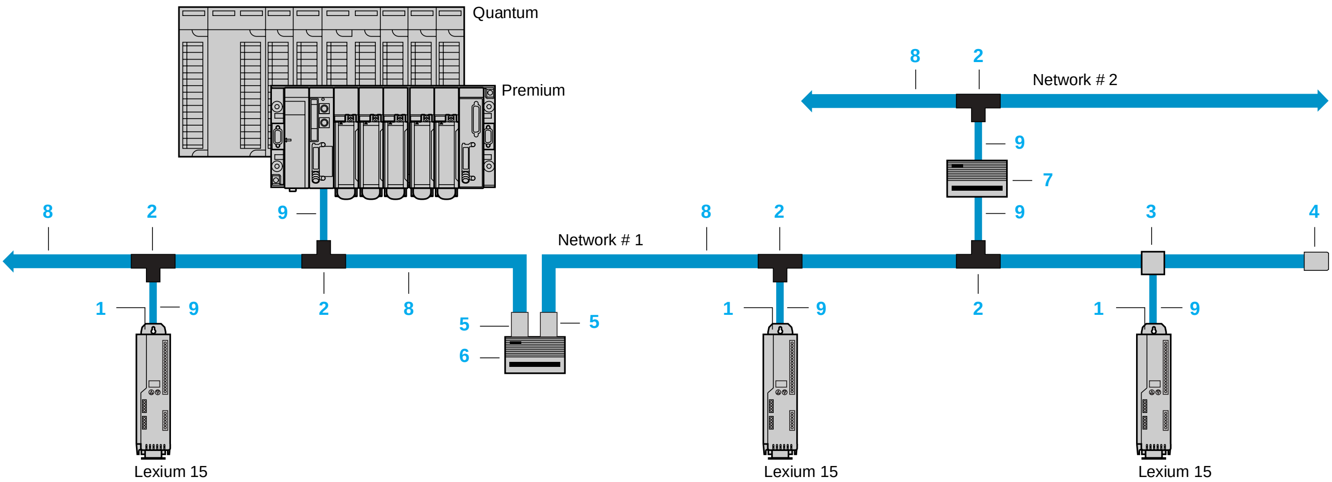
Characteristics of the AM0 MBP 001V000 Modbus Plus card

Structure	Connector	One 9-way female SUB-D connector
	Transmission speed	500…1000 kbps
	Address	1 to 63, configurable via the terminal or the Unilink software
Services	Messaging	Yes, Modbus; point-to-point requests with confirmation: 200 bytes maximum, compatible with all Modbus subscribers
	Periodic variables	“Peer Cop”: 9 registers “Global data”: 18 registers
	Communication monitoring	“Time out” adjustable from 0.01…60 s via the Unilink software
Diagnostics	Using LEDs	1 LED on the “COM” card (status)

(1) Please consult our “Automation platform Modicon Quantum and Unity” specialist catalogue.
(2) Please consult our “Automation platform Modicon Premium and Unity - PL7 software” specialist catalogue.
(3) Please consult our “Human-Machine interfaces” specialist catalogue.
(4) Please consult our “Soft starters and variable speed drives” specialist catalogue.

Lexium 15 motion control
Communication buses and networks

Modbus Plus wiring system



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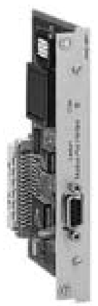


AM0 MBP 001V000

Modbus Plus network connection components *(1)*

Description	Use	Item no.	Reference	Weight kg
Card				
Modbus Plus card	For Lexium 15, all ratings	1	**AM0 MBP 001V000**	0.140
Connection accessories				
Modbus Plus tap (IP 20)	Connection by tap junction Provides impedance matching when it is installed at the end of the line (requires wiring tool 043 509 383)	2	**990 NAD 230 00**	0.230
Modbus Plus junction box (zamak, IP 65)	Connection via tap (screw terminals) Equipped with an RJ45 connector for connecting a programming or maintenance terminal. Installed at the end of the line, it requires 990 NAD 230 11 line terminators	3	**990 NAD 230 10**	0.650
Line terminators (Sold in lots of 2)	Set of 2 line terminators for 990 NAD 230 10 junction box	4	**990 NAD 230 11**	–
Connectors with Modbus Plus terminator (sold in lots of 2)	Set of 2 connectors for bridge and repeater	5	**AS MBKT 185**	0.260
Modbus Plus electrical repeater	Extension beyond 450 m or up to 64 subscribers	6	**NW RR85 001**	2.677
Modbus Plus bridge with 4 ports	Connection of 4 networks maximum	7	**NW BP85 002**	2.813
Wiring tool	Inserting trunk and drop cables in 990 NAD 230 00 tap	–	**043 509 383**	3.000

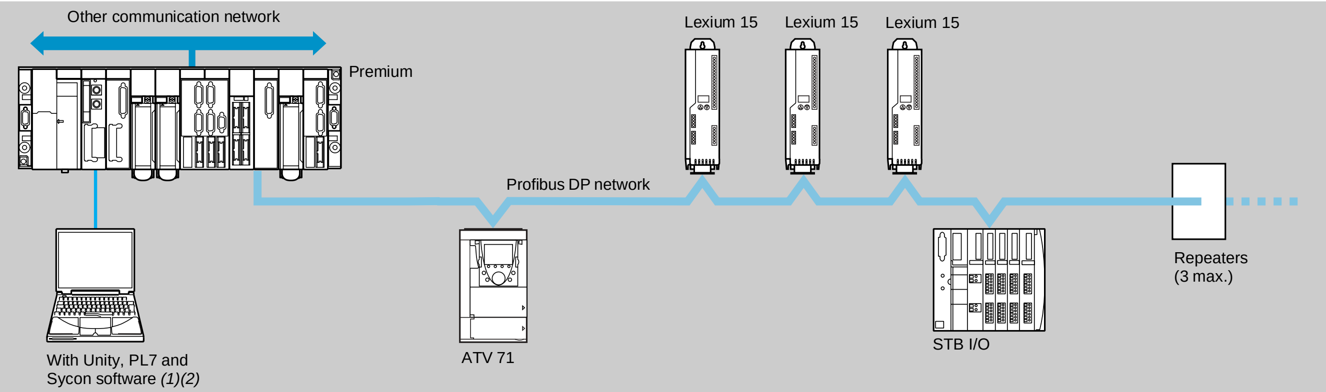
Cables

Description	Use From	To	Item no.	Length m	Reference	Weight kg
Modbus Plus trunk cables Shielded twisted pair with shielding drain	Modbus Plus tap 990 NAD 230 00, Modbus Plus junction box 990 NAD 230 10	Modbus Plus 990 NAD 230 00 tap, connector with Modbus Plus terminator AS MBKT 185, Modbus Plus junction box 990 NAD 230 10	8	30.5	**490 NAA 271 01**	1.833
				152.5	**490 NAA 271 02**	10.135
				305	**490 NAA 271 03**	18.940
				457	**490 NAA 271 04**	30.000
				1525	**490 NAA 271 06**	112.950
Drop cables One 9-way male SUB-D connector and one stripped end	Premium and Quantum PLCs, Modbus Plus bridge with 4 ports NW BP85 002, Lexium 15 servo drive	Modbus Plus 990 NAD 230 00 tap	9	2.4	**990 NAD 211 10**	0.169
				6	**990 NAD 211 30**	0.459

(1) To order other components for connection to the Modbus Plus network, please consult our “Automation platform Modicon Premium and Unity - PL7 software” and “Automation platform Modicon Quantum and Unity” specialist catalogues.

Lexium 15 motion control
Communication buses and networks

Profibus DP fieldbus
Presentation



Profibus DP is a fieldbus for industrial communication.
Profibus DP has a linear bus topology with a master/slave type centralized access procedure.
The physical link is a single shielded twisted pair, but optical interfaces are available for establishing star and ring tree structures.

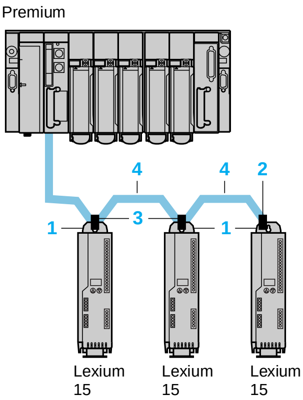
The Lexium 15 servo drive is connected to the Profibus DP fieldbus via the VW3 M3 306 communication card.

Other devices can be connected to the Profibus DP bus such as Premium *(1)* and Quantum *(2)* PLCs, STB I/O *(3)*, Altivar variable speed drives *(4)*, etc.

Characteristics of the VW3 M3 306 Profibus DP card

Structure	Connectors	Two 9-way female SUB-D connectors
	Transmission speed	9.6 kbps: 1200 m (4800 m with 3 repeaters) to 12 Mbps: 100 m (400 m with 3 repeaters)
	Address	1 to 62 (32 Lexium 15 servo drives max., without repeater)
Services	Periodic variables	Type 2 PPO: ■ Access to all the movement parameters and diagnostics parameters (4 PKW words) ■ Control and status words ■ Access to the various “Motion Task” control words ■ External position, speed and torque setpoints
Description file		A single gsd file for the whole range is supplied on the documentation CD-ROM or can be downloaded from the “www.telemecanique.com” website. This file does not contain descriptions of the servo drive parameters.

(1) Please consult our “Automation platform Modicon Premium and Unity - PL7 software” specialist catalogue.
(2) Please consult our “Automation platform Modicon Quantum and Unity” specialist catalogue.
(3) Please consult our “Distributed I/O Advantys STB” specialist catalogue.
(4) Please consult our “Soft starters and variable speed drives” specialist catalogue.



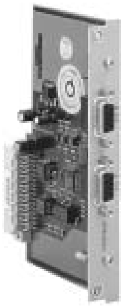
Profibus DP network connection components *(1)*

Description	Use	Item no.	Reference	Weight kg
Card				
Profibus DP card	For Lexium 15, all ratings	1	**VW3 M3 306**	0.140
Connection accessories				
Profibus connector One 9-way male SUB-D with line terminator output at 90°	Line terminator connection	2	**490 NAD 911 03**	–
Profibus connector One 9-way male SUB-D output at 90°	Intermediate connection	3	**490 NAD 911 04**	–
Profibus connector One 9-way male SUB-D and one 9-way female SUB-D, output at 90°	Intermediate connection with possibility of connecting a programming terminal on the 9-way female SUB-D connector	3	**490 NAD 911 05**	–

Cables

Description	Use From	Use To	Item no.	Length m	Reference	Weight kg
Profibus DP trunk cables	Profibus DP connectors 490 NAD 911 04/05	Profibus DP connectors 490 NAD 911 03/04/05	4	100	**TSX PBS CA 100**	–
				400	**TSX PBS CA 400**	–

(1) To order other components for connection to the Profibus DP network, please consult our "Automation platform Modicon Premium and Unity - PL7 software" and "Automation platform Modicon Quantum and Unity" specialist catalogues.



VW3 M3 306

490 NAD 911 03

Lexium 15 motion control

Option: SERCOS card

Presentation

108762

AM0 SER 001V000

SERCOS (SERial COmmunication System) is a communication standard which defines both an exchange protocol between a motion control module and a number of servo drives and the connection media. This standard is defined in European standard IEC/EN 61491.

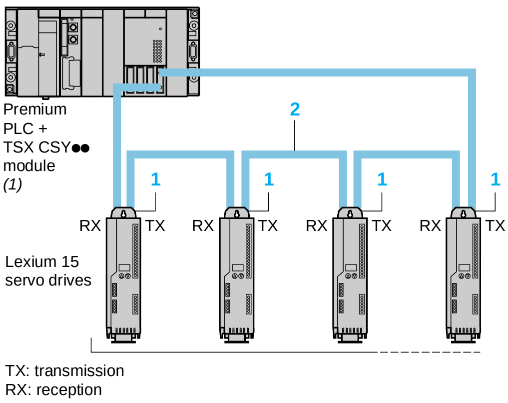
The SERCOS architecture is totally dedicated to the synchronization requirements of complex motion control applications. The ring topology of the SERCOS network is created using optical fibers that provide a very high speed (4 Mbps) and total immunity in disturbed industrial environments.

This bus also allows application I/O (position encoder, emergency stop, etc.) to be connected directly to the servo drives, thus reducing connection costs.

Characteristics *(1)*

Topology	Industrial bus complying with standard EN 61491 Ring connection of servo drives
Rate	4 Mbps by default
Medium	Fiber optic cable
Cycle time	2…4 ms depending on the number of axes, see page 76
Maximum number of segments	9…17 depending on the motion control module used, see page 76
Segment length	38 m maximum with plastic fiber optic cable 150 m maximum with glass fiber optic cable

References



SERCOS network ring

Card

Description	Use for	Item no.	Reference	Weight kg
SERCOS card	Lexium 15, all ratings	1	**AM0 SER 001V000**	0.150

Cables

Description	Use	Item no.	Length m	Reference	Weight kg
Plastic fiber optic cables fitted with SMA connectors (radius of curvature: 25 mm min.)	Connecting Lexium 15 servo drives equipped with card AM0 SER 001V000	2	0.3	**990 MCO 000 01**	0.150
			0.9	**990 MCO 000 03**	0.180
			1.5	**990 MCO 000 05**	0.260
			4.5	**990 MCO 000 15**	0.770
			16.5	**990 MCO 000 55**	2.830
			22.5	**990 MCO 000 75**	4.070
			37.5	**990 MCO 001 25**	5.940

(1) Motion control module, see page 81.

Lexium 15 motion control

Option: I/O extension card

Presentation

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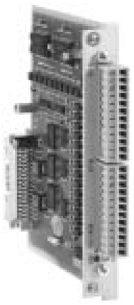


AM0 INE 001V000

Lexium 15 servo drives can be adapted for applications that require the possibility of control via extended logic I/O by installing an I/O extension card.

This card has 14 logic inputs that can be used for:
- Activating a motion task. The number of this task is coded on 8 bits (X11A-1…X11A-8). Each input represents one bit.
- Connecting a home position referencing sensor (X11A-9)
- Resetting errors to zero (X11A-10)
- Sequencing the next motion task (X11A-11)
- Activation of manual mode (X11A-12)
- Resumption of a previously interrupted motion task (X11B-1)
- Launching the motion task coded on the first 8 inputs (X11B-2).

It also has 8 logic outputs that can be used for:
- Sending the “In position” signal (X11B-3)
- Capturing 6 position registers (X11B-4, X11B-6…X11B10)
- Monitoring the following error (X11B-5)

Electrical characteristics

24 V ⎓ external power supply *(1)*	Voltage	**V**	18…36
	Current	**A**	4
Logic inputs			
Type			Logic inputs conforming to standard IEC 61131-2 type 1
Number			14 (X11A-1…X11A-12, X11B-1, X11B-2)
Power supply			24 V ⎓, 7 mA
Sampling period		**ms**	4
Response time		**ms**	2
Logic state		**A**	State 0 if < 7 V or input not wired State 1 if > 12 V
Logic outputs			
Type			24 V ⎓ logic outputs conforming to standard IEC 61131-2 type 1
Number			8 (X11B-3…X11B-10)
Output voltage		**V**	24
Response time		**ms**	10
Max. breaking current		**mA**	500

Connection characteristics

Type of terminal		Power supply	Logic I/O
Maximum wire size		1 mm^2 (AWG 17)	0.5 mm^2 (AWG 20)

References

Description	Reference	Weight kg
I/O extension card	**AM0 INE 001V000**	0.180

(1) Please consult our “Interfaces, I/O splitter boxes and power supplies” specialist catalogue.

Lexium 15 motion control
Lexium 15 servo drives
Option: Braking resistors

Presentation

Internal braking resistor

A braking resistor is integrated in Lexium 15 servo drives, except LXM 15HC●●N4X servo drives, to absorb the braking energy. If the DC bus voltage in the servo drive exceeds a specified value, this braking resistor is activated. The restored energy is converted into heat by the braking resistor.

External braking resistor

For LXM 15HC●●N4X servo drives or for applications requiring the servo motor to perform frequent braking operations, it may be necessary to add an external braking resistor.

If an external braking resistor is used, the internal braking resistor must be deactivated. To do this, the shunt between terminals PBe and PBi must be removed and the external braking resistor connected between terminals PA/+ and PBe.

Two or more external braking resistors can be connected in parallel. The servo drive monitors the power dissipated in the braking resistor.

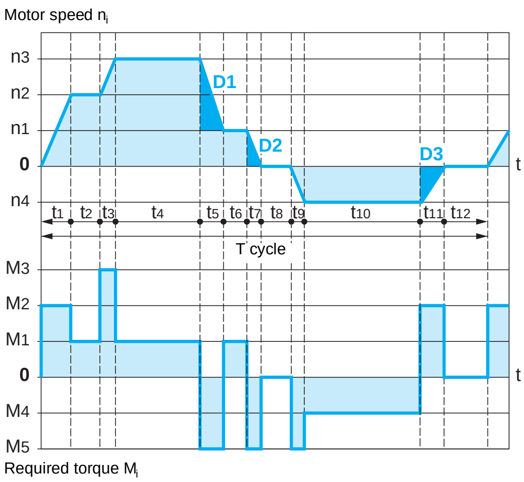
Sizing the braking resistor

During braking or deceleration requested by the servo drive, the kinetic energy of the moving load must be absorbed by the servo drive. The energy generated by deceleration charges the capacitors integrated in the servo drive.

When the voltage at the capacitor terminals exceeds the permitted threshold, the braking resistor (internal or external) will be activated automatically in order to dissipate this energy. In order to calculate the power to be dissipated by the braking resistor, the user needs a knowledge of the timing diagram giving the motor torques and speeds according to the time in order to identify the curve segments in which the servo drive decelerates the load.

Motor cycle timing diagram

These curves are those used in pages 146 and 192 for selecting the size of the servo motor. The curve segments to be taken into account, when the servo drive is decelerating, are marked in blue by D_i.



Characteristics:
pages 42 and 43

References:
page 43

Dimensions:
page 49

Sizing the braking resistor (continued)

Calculation of the constant deceleration energy

To do this, the user must know the total inertia, defined as follows:
J_t: total inertia
where:
J_t = Jm (motor inertia) + Jc (load inertia). For Jm, see pages 84 to 127 and 150 to 175.
The energy E_i of each segment is defined as follows:

$$E_i = \frac{1}{2}J_t \cdot \omega_i^2 = \frac{1}{2}J_t \cdot \left(\frac{2\pi n_i}{60}\right)^2$$

Which gives the following for the various segments:

$$E_1 = \frac{1}{2}J_t \cdot \left(\frac{2\pi[n_3 - n_1]}{60}\right)^2$$

$$E_2 = \frac{1}{2}J_t \cdot \left(\frac{2\pi n_1}{60}\right)^2$$

$$E_3 = \frac{1}{2}J_t \cdot \left(\frac{2\pi n_4}{60}\right)^2$$

where E_i is in joules, J_t in kgm^2, ω in radians and n_i in rpm.

Energy absorbed by the internal capacitor

The energy absorption capacity Edrive (without using an internal or external braking resistor) is given for each servo drive on page 42.
In the calculation, only take account of segments D_i for which the energy E_i is greater than the absorption capacities given in the table opposite.
This additional energy E_{Di} must be dissipated in the resistor (internal or external):
E_{Di} = E_i - Edrive (in joules).

Calculation of the continuous power

The continuous power Pc is calculated for each machine cycle:

$$Pc = \frac{\Sigma E_{Di}}{T\ cycle}$$

where Pc is in W, E_{Di} in joules and **T cycle** in s.

Selecting the braking resistor (internal or external)

Note: *This is a simplified selection method. In extreme applications, for example with vertical axes, this method is inadequate. In this case, please consult your Regional Sales Office.*

The selection is carried out in two steps:

1 The maximum energy during a braking procedure must be less than the peak energy that can be absorbed by the internal braking resistor: E_{Di} < EPk and the internal braking resistor's continuous power must in turn not exceed: Pc < PPr. If these conditions are met, the internal braking resistor is adequate.

2 If one of the above conditions is not met, an external braking resistor must be used to satisfy these conditions.
The value of the external braking resistor must be between the minimum and maximum values given in the table. Otherwise the servo drive may be subject to disturbance and the load can no longer be braked safely.

Presentation: page 40
Characteristics: pages 42 and 43
References: page 43
Dimensions: page 49

Lexium 15 motion control

Lexium 15 servo drives
Option: Braking resistors

Characteristics

Braking resistors used with Lexium 15 LP servo drives

Type of servo drive		LXM 15		LD13M3	LD21M3	LD28M3	LD13M3	LD21M3	LD28M3
Supply voltage			V	230					
Number of phases				Single phase			Three phase		
Load threshold			V ⎓	400					
Energy absorption of the internal capacitors		Edrive	Joule (Ws)	6.2					
Internal resistor	Resistance		Ω	66					
	Continuous power	PPr	W	20	50		20	50	
	Peak energy	EPk	Joule (Ws)	3000					
External resistor	Minimum resistance		Ω	47	31	19	47	31	19
	Maximum resistance *(1)*		Ω	190	95	57	190	95	57
	Degree of protection			IP 65					

Type of servo drive		LXM 15		LU60N4			LD10N4			LD17N4		
Supply voltage			V	230	400	480	230	400	480	230	400	480
Number of phases				Three phase								
Load threshold			V ⎓	400	720	840	400	720	840	400	720	840
Energy absorption of the internal capacitors		Edrive	Joule (Ws)	24.8	88.1	127.3	24.8	88.1	127.3	24.8	88.1	127.3
Internal resistor	Resistance		Ω	91								
	Continuous power	PPr	W	20			50					
	Peak energy	EPk	Joule (Ws)	2100	7000	9000	2100	7000	9000	2100	7000	9000
External resistor	Minimum resistance		Ω	47	85	99	38	68	79	31	56	66
	Maximum resistance *(1)*		Ω	285	768	803	114	265	401	95	177	201
	Degree of protection			IP 65								

Braking resistors used with Lexium 15 MP servo drives

Type of servo drive		LXM 15		MD28N4			MD40N4			MD56N4		
Supply voltage			V	230	400	480	230	400	480	230	400	480
Number of phases				Three phase								
Load threshold			V ⎓	400	720	840	400	720	840	400	720	840
Energy absorption of the internal capacitors		Edrive	Joule (Ws)	6	23	28	12	46	57	12	46	57
Internal resistor	Resistance		Ω	33								
	Continuous power	PPr	W	200								
	Peak energy	EPk	Joule (Ws)	5000	16,000	21,000	5000	16,000	21,000	5000	16,000	21,000
External resistor	Minimum resistance		Ω	16	28	33	12	21	25	8	14	16
	Maximum resistance *(1)*		Ω	57	106	120	41	76	86	28	53	60
	Degree of protection			IP 65								

Braking resistors used with Lexium 15 HP servo drives

Type of servo drive		LXM 15		HC11N4X			HC20N4X		
Supply voltage			V	230	400	480	230	400	480
Number of phases				Three phase					
Load threshold			V ⎓	400	720	840	400	720	840
Energy absorption of the internal capacitors		Edrive	Joule (Ws)	60	150	180	120	300	360
External resistor	Minimum resistance		Ω	3	6	7	2	3	4
	Maximum resistance *(1)*		Ω	14	27	30	7	13	17
	Degree of protection			IP 20					

(1) Values given for braking at nominal motor torque (M_0)

Presentation: page 40
References: page 43
Dimensions: page 49

Lexium 15 motion control

Lexium 15 servo drives

Option: Braking resistors

General characteristics

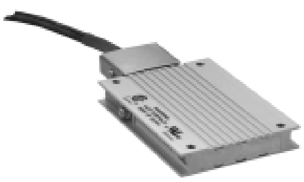
Type of braking resistor			VW3 A7 601 R●●...608 R●●	VW3 A7 705, 707
Ambient air temperature around the device	Operation	°C	0...+ 50	
	Storage	°C	- 25...+ 85	- 25...+ 70
Degree of protection of the casing			IP 65	IP 20
Thermal protection			Via the servo drive *(1)*	Via temperature-controlled switch *(2)* or via the servo drive *(1)*
Temperature-controlled switch	Activation temperature	°C	–	120
	Max. voltage - max. current		–	250 V ∼ - 1 A
	Min. voltage - min. current		–	24 V ⎓ - 0.1 A
	Maximum switch resistance	mΩ	–	60

Connection characteristics

Type of terminal			For servo drive	For temperature-controlled switch
Maximum wire size	VW3 A7 601 R●●...608 R●●		Supplied with connection cable	–
	VW3 A7 705, 707		Connected on a bar, M6	2.5 mm² (AWG 14)

External braking resistors

106005



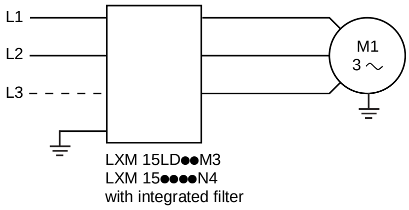
VW3 A7 602 R●●

Value	Continuous power PPr	Peak energy EPk 230 V	Peak energy EPk 400 V	Peak energy EPk 480 V	Length of connection cable	Reference	Weight
Ω	W	Ws	Ws	Ws	m		kg
5	1000	45,000	45,000	45,000	–	**VW3 A7 707**	11.000
10	400	13,000	8600	7700	0.75	**VW3 A7 601 R07**	1.420
					2	**VW3 A7 601 R20**	1.470
					3	**VW3 A7 601 R30**	1.620
	1000	45,000	45,000	45,000	–	**VW3 A7 705**	11.000
27	100	3000	1900	1700	0.75	**VW3 A7 602 R07**	0.630
					2	**VW3 A7 602 R20**	0.780
					3	**VW3 A7 602 R30**	0.900
	200	7500	4800	4300	0.75	**VW3 A7 603 R07**	0.930
					2	**VW3 A7 603 R20**	1.080
					3	**VW3 A7 603 R30**	1.200
	400	26,000	17,500	15,500	0.75	**VW3 A7 604 R07**	1.420
					2	**VW3 A7 604 R20**	1.470
					3	**VW3 A7 604 R30**	1.620
72	100	4500	3000	2700	0.75	**VW3 A7 605 R07**	0.620
					2	**VW3 A7 605 R20**	0.750
					3	**VW3 A7 605 R30**	0.850
	200	10,300	6800	6000	0.75	**VW3 A7 606 R07**	0.930
					2	**VW3 A7 606 R20**	1.080
					3	**VW3 A7 606 R30**	1.200
	400	26,500	17,500	15,500	0.75	**VW3 A7 607 R07**	1.420
					2	**VW3 A7 607 R20**	1.470
					3	**VW3 A7 607 R30**	1.620
100	100	4500	3000	2700	0.75	**VW3 A7 608 R07**	0.410
					2	**VW3 A7 608 R20**	0.560
					3	**VW3 A7 608 R30**	0.760

(1) Thermal protection is provided by internal limitation of the servo drive braking power.
(2) The switch should be connected in sequence (used for signalling or controlling the line contactor).

Presentation: page 40
Dimensions: page 49

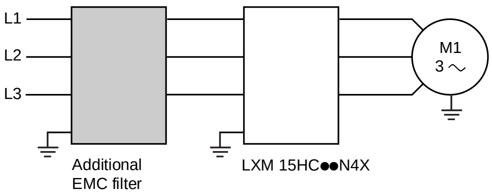
Lexium 15 motion control
Lexium 15 servo drives
Option: Additional EMC input filters



Integrated EMC filter
Function

LXM 15L●●●M3 and LXM 15●●●●N4 servo drives have built-in radio interference input filters to meet the EMC standard for variable speed electrical power drive "products" IEC/EN 61800-3, edition 2, category C2 or C3 in environment 1 or 2 and to comply with the European directive on EMC (electromagnetic compatibility).

For servo drive	Maximum motor cable length conforming to	
	EN 55011, class A, Gr1 IEC/EN 61800-3 category C2	EN 55011, class A, Gr2 IEC/EN 61800-3 category C3
	m	m
Single phase supply voltage: 200…240 V ∼ 50/60 Hz		
LXM 15LD●●M3	10	25, 50 with motor choke
Three phase supply voltage: 200…240 V ∼ 50/60 Hz		
LXM 15LD●●M3	10	25, 50 with motor choke
Three phase supply voltage: 208…480 V ∼ 50/60 Hz		
LXM 15L●●●N4	10	25, 50 with motor choke
LXM 15MD●●N4	10	25, 100 with motor choke



Additional EMC input filters
Applications

An additional EMC filter must be provided for LXM 15HC●●N4X servo drives.

This additional input filter is used to meet the requirements of standard IEC 61800-3, edition 2, category C3 in environment 2.

Use according to the type of line supply

Use of these built-in or additional filters is only possible on TN (neutral connection) and TT (neutral to earth) type networks.

The filters must not be used on IT (impedance or isolated neutral) type networks. For a servo drive with integrated filter (LXM 15LD●●M3, LXM 15●●●●N4), the filter must be connected to an LV/LV transformer in order to recreate, on the secondary side, a TT system (see page 61).

Standard IEC 61800-3, appendix D2.1, states that on IT (isolated or impedance earthed neutral) type networks, filters can adversely affect the operation of the insulation monitors. In addition, the effectiveness of additional filters on this type of line supply depends on the type of impedance between neutral and earth, and therefore cannot be predicted.

Dimensions:
page 49

Lexium 15 motion control

Lexium 15 servo drives

Option: Additional EMC input filters

Characteristics of drive/additional EMC input filter mounting

Filter type			VW3 M4 101	VW3 M4 102
Conformity to standards			UL 1283	
Degree of protection			IP 20	
Losses		W	30	50
Maximum nominal voltage	3-phase 50/60 Hz	V	480 + 10%	
Max. nominal current		A	42	75

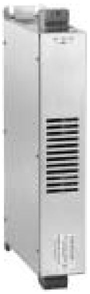
Application, category: EN 61800-3: 2001-02; IEC 61800-3, Ed. 2		Description
Category C3 in environment 2		Use in industrial premises

Connection characteristics

Maximum wire size		25 mm² (AWG 2)

References

105816



VW3 M4 101

For servo drive	Maximum motor cable length conforming to IEC/EN 61800-3, category C3	Reference	Weight
	m		kg
Three phase supply voltage: 208…480 V ∼ 50/60 Hz			
LXM 15HC11N4X	100	**VW3 M4 101**	0.600
LXM 15HC20N4X	100	**VW3 M4 102**	0.550

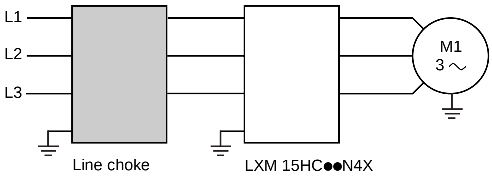
Dimensions:
page 49

Lexium 15 motion control

Lexium 15 servo drives

Option: Line chokes

Line chokes



A line choke can be used to provide improved protection against overvoltages on the line supply and to reduce harmonic distortion of the current produced by the servo drive.

The recommended chokes limit the line current. They have been developed in accordance with standards UL 506 and EN 61558-2-20 (VDE 0570).

The inductance values are defined for a voltage drop between 3% and 5% of the nominal line voltage. Values higher than this will cause loss of torque.

These chokes should be installed upstream of the servo drive.

Applications

In the context of a TT or TN supply system, it is compulsory to use a line choke with LXM 15HC●●N4X servo drives.

***Nota :** Do not order if an isolation transformer is used with an IT system.*

General characteristics

Type of line choke			VW3 M4 301	VW3 M4 302
Conformity to standards			UL 506, EN 61558-2-20 (VDE 0570)	
Voltage drop			Between 3% and 5% of the nominal supply voltage. Values higher than this will cause loss of torque.	
Degree of protection	Choke		IP 00	
	Terminals		IP 20	
Inductance value		**mH**	0.5	0.4
Nominal current		**A**	60	75
Losses		**W**	145	150

Connection characteristics

Maximum wire size	VW3 M4 301, 302		25 mm² (AWG 2)

References

109002

VW3 M4 301

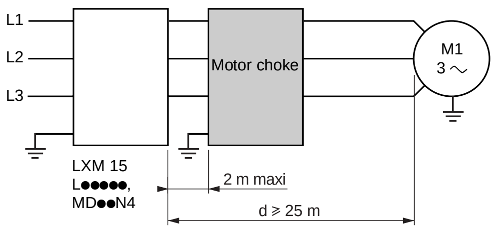
For servo drives	Line current without choke		Line current with choke		Reference	Weight
	208 V	480 V	208 V	480 V		
	A	A	A	A		kg
Three phase supply voltage: 208…480 V ∿ 50/60 Hz						
LXM 15HC11N4X	44	52	35	36.6	**VW3 M4 301**	9.000
LXM 15HC20N4X	84.4	83.5	60.6	60.9	**VW3 M4 302**	10.000

Dimensions:
page 49

Lexium 15 motion control

Lexium 15 servo drives
Option: Motor chokes

Motor chokes



The motor choke is used to reduce current ripple generated along the power cable. It enables the servo motor to be operated for motor cable lengths greater than 25 m (limited to 50 or 100 m depending on the rating).
LXM 15HC●●N4X servo drives are designed to allow the use of motor cables up to 100 metres long without the addition of a motor choke.

The motor choke is also used to:
- Protect the servo drive power stage against overvoltages
- Limit ripple to 5% of the nominal current

Nota : *The servo drive/motor choke connection cable MUST be less than 2 metres long.*
Increasing the current absorption of the motor power circuit reduces the maximum rotation frequency, thus limiting the maximum rotation speed of the servo motor:
- *For a 6-pole servo motor, it is limited to 3000 rpm*
- *For an 8-pole servo motor, it is limited to 2250 rpm*
- *For a 10-pole servo motor, it is limited to 1800 rpm*

In addition, the increase in the leakage current caused by the increase in the length of the cables makes it necessary to limit the output current to 1 A. It is advisable to use servo motors with a nominal current greater than 2 A.

General characteristics

Type of motor choke			**VW3 M5 301**	**VW3 M5 302**	**VW3 M5 303**	**VW3 M5 304**
Degree of protection	Choke		IP 00			
	Terminals		IP 20			
Inductance value		**mH**	0.9			0.45
Maximum current		**A**	1.5 x nominal current for 60 s			
Dielectric strength		**V**	Between earth and power terminals: 2700 V ⎓			
Losses		**W**	40			

Connection characteristics

Maximum wire size	VW3 M5 301…303		4 mm^2 (AWG 10)
	VW3 M5 304		6 mm^2 (AWG 8)

References

535556

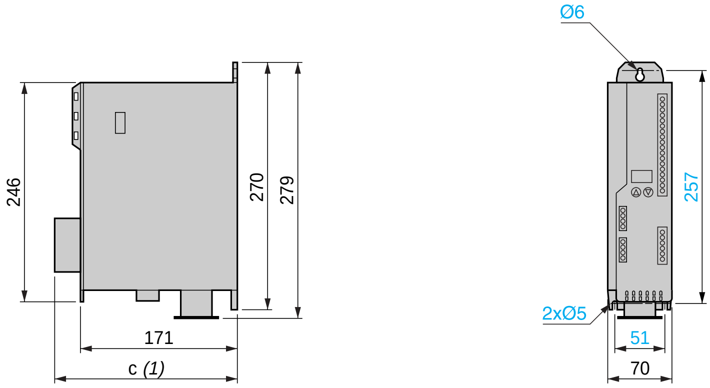
VW3 M5 304

For servo drive	**Length of motor cable**	**Nominal current**	**Reference**	**Weight**
	m	**A**		**kg**
LXM 15LD13M3, LD21M3 **LXM 15L●●●N4**	25…50	6	**VW3 M5 301**	4.500
LXM 15LD28M3	25…50	10	**VW3 M5 302**	5.500
LXM 15MD28N4	25…100	10	**VW3 M5 302**	5.500
LXM 15MD40N4	25…100	14	**VW3 M5 303**	10.000
LXM 15MD56N4	25…100	20	**VW3 M5 304**	10.000

Dimensions:
page 49

Lexium 15 motion control
Lexium 15 LP, 15 MP and 15 HP servo drives

LXM 15LD13M3…LD28M3, LU60N4…LD17N4 servo drives

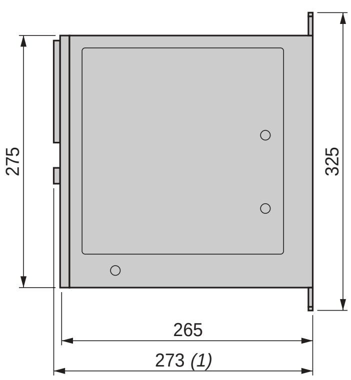


LXM 15	c
LD13M3…LD28M3	200
LU60N4…LD17N4	230

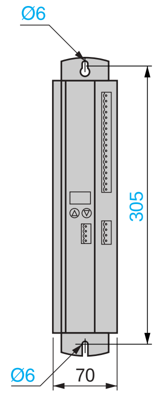
(1) With connectors

LXM 15MD28N4…MD56N4 servo drives

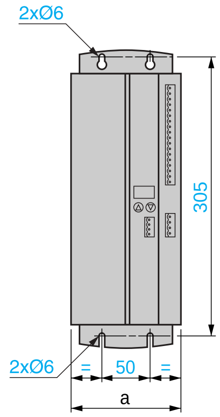
Common side view



LXM 15MD28N4



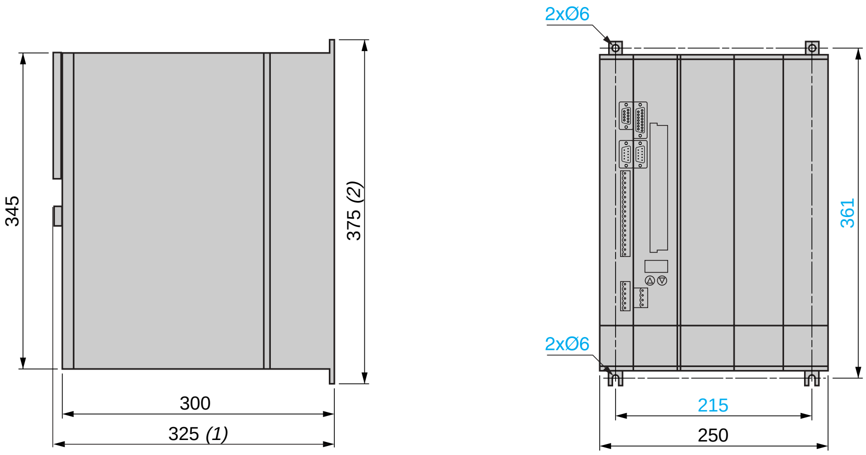
LXM 15MD40N4, MD56N4



LXM 15	a
MD40N4	100
MD56N4	120

(1) With connectors

LXM 15HC11N4X, HC20N4X servo drives

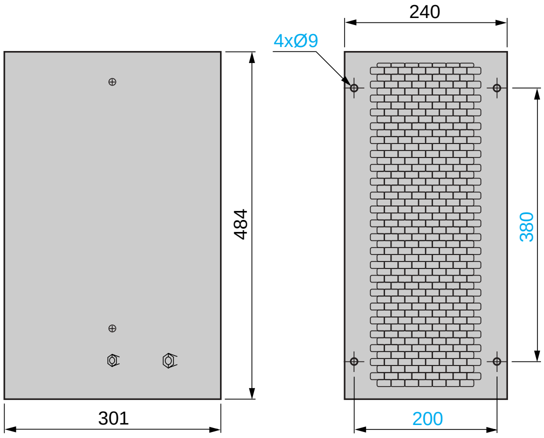


(1) With connectors
(2) 495, with earthing part

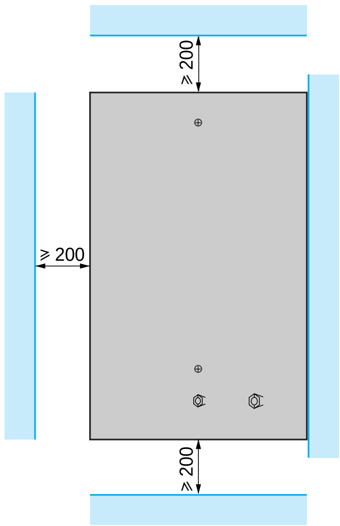
Presentation: pages 8 and 9
Functions: pages 14 to 23
Characteristics: pages 24 to 27
References: pages 28 and 29
Schemes: pages 50 to 61

Options

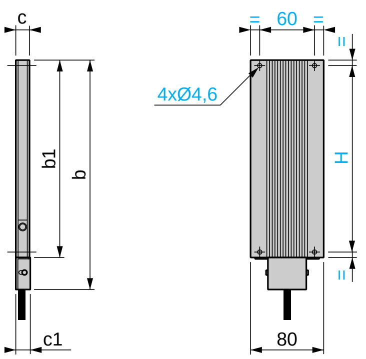
Braking resistors VW3 A7 705, 707



Mounting recommendations

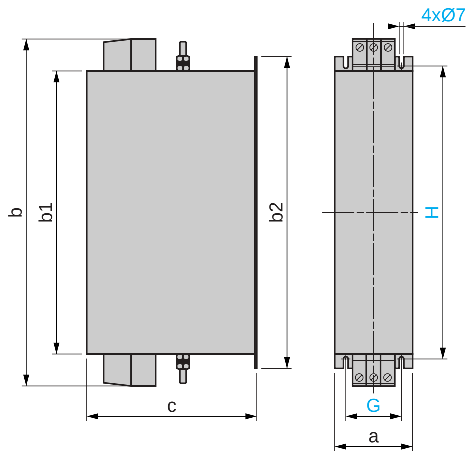


Braking resistors VW3 A7 601R●●...608R●●



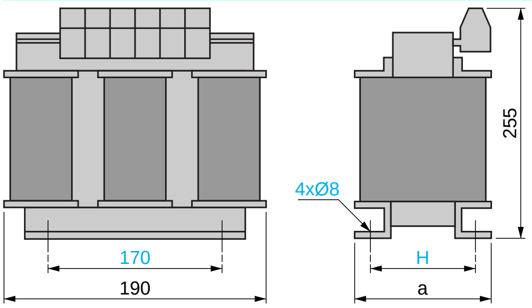
VW3	b	b1	c	c1	H
A7 602, 605, 608	145	110	15	15.5	98
A7 603, 606	251	216	15	15.5	204
A7 601, 604, 607	257	216	30	–	204

Additional EMC input filters VW3 M4 101, 102



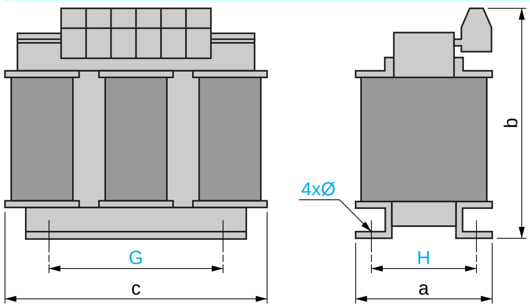
VW3	a	b	b1	b2	c	G	H
M4 101	60	355	305	335	150	35	320
M4 102	80	380	300	330	185	55	314

Line chokes VW3 M4 301, 302



VW3	a	H
M4 301	110	58
M4 302	120	68

Motor chokes VW3 M5 301...304



VW3	a	b	c	G	H	Ø
M5 301	70	190	155	130	55	5.5x8
M5 302	85	190	155	130	70	5.5x8
M5 303	115	220	190	170	75	6.5x10
M5 304	115	230	190	170	75	6.5x10

Presentation: pages 40, 44, 46 and 47
Characteristics: pages 42, 45, 46 and 47
References: pages 43, 45, 46 and 47
Schemes: pages 50 to 61

Lexium 15 motion control

Lexium 15 servo drives

Advice on use in accordance with the machinery safety directive

Categories relating to safety according to EN 954-1

The 5 categories of standard EN 954-1 are used to define the necessary system performance to meet safety requirements.

Categories	Basic safety principle	Control system requirements	Behaviour in the event of a fault
B	Selection of components that comply with the relevant standards	Control according to good engineering practice	Possible loss of the safety function
1	Selection of components and safety principles	Use of tried and tested components and proven safety principles	Possible loss of the safety function with a lower probability than in **B**
2	Selection of components and safety principles	Test per cycle. The intervals between tests must be appropriate to both the machine and its application	Fault detected on each test
3	Structure of the safety circuits	A single fault must not result in loss of the safety function. The fault must be detected if this is reasonably possible	Safety function ensured, except in the event of an accumulation of faults
4	Structure of the safety circuits	A single fault must not result in loss of the safety function. The fault must be detected when or before the safety function is next invoked. An accumulation of faults must not result in loss of the safety function.	Safety function always assured

⚠ **The machine manufacturer is responsible for selecting the safety category. The category depends on the level of risk factors given in standard EN 954-1.**

Lexium 15 servo drives and standard EN 954-1

The table below shows the safety level obtained according to the type of servo drive, with the integrated "Power Removal" safety function and associated equipment (Preventa monitoring module, contactor, etc)

Safety level	Devices required	For Lexium 15 servo drives	Equipment to be added	Recommended wiring diagram, see page
Category B	–	All ratings	–	–
Category 1	1 breaking	All ratings	–	52 and 56
Category 2	1 breaking and 1 monitoring	All ratings	1 breaking device per PWR function with 1 Preventa monitoring module *(1)*	53 and 57
Category 3	2 breaking *(2)*	All ratings	1 breaking device per PWR function, 1 breaking device per contactor and 1 Preventa monitoring module *(1)*	54 and 58
Category 4	2 breaking and 1 monitoring *(2)*	All ratings	1 breaking device per PWR function, 1 breaking device per contactor and 1 Preventa monitoring module *(1)*	55 and 59

"Power Removal" safety function

The "Power Removal" (PWR) safety function makes it easier to achieve the safety levels defined above.

The "Power Removal" safety function integrated in Lexium 15 LP servo drives consists of a PWR logic input, accessed on the X4 connector. Deactivation of this input in particular initiates locking of the power stage of the servo drive supplying the servo motor, thus depriving the servo motor of energy *(3)*.

The "Power Removal" safety function integrated in Lexium 15 MP and Lexium 15 HP servo drives consists principally of an auxiliary relay that is accessed on the PWRI+ and PWRI- terminals of the X10 connector. When the relay coil is activated by the control system, this locks the servo drive power stage that supplies power to the servo motor, thus depriving the servo motor of energy *(3)*.
The anti-start relay contact, accessed on the PWRO1 and PWRO2 terminals on the X10 connector, enables the application to check the locking command. The state of the relay contact is monitored constantly by the control system, to check that the system is working correctly and ensure strict compliance with the machine stop and locking procedures.

This function is used primarily when the servo motor has to be kept stationary, for example when personnel need to have frequent access to protected areas in which machinery is running, for brief periods of time.

Note: *The use of Lexium 15 servo drives with the integral "Power Removal" safety function simplifies the connection diagrams required to comply with standard EN 954-1.*

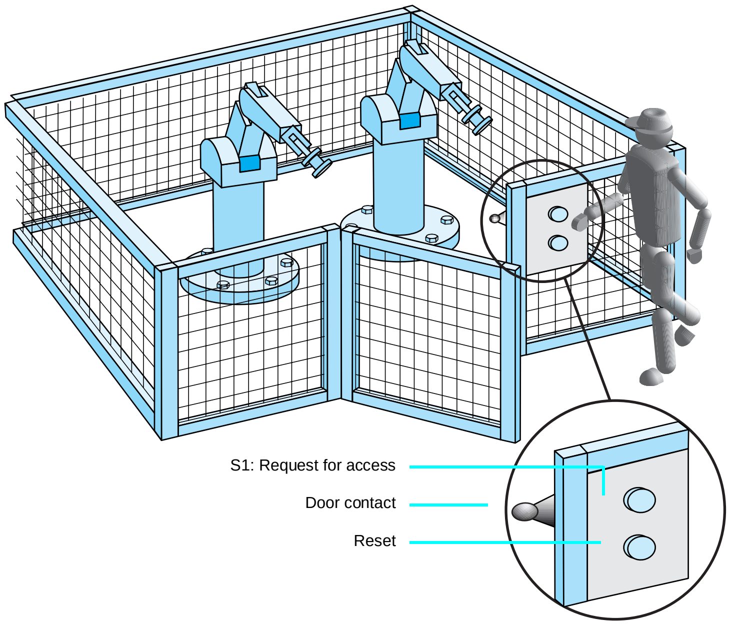
(1) The category of the Preventa safety module must be ⩾ the required safety category.
(2) Where there are 2 breaking devices, see also the sections relating to Categories 3 and 4 on pages 54, 55, 58 and 59.
(3) Vertical axis immobilization can only be obtained by installing a mechanical locking system (holding brake) on the axes.

Lexium 15 motion control

Lexium 15 servo drives

Recommended wiring diagrams complying with standard EN 954-1

Application with requirement for access to a hazardous area



Presentation

The recommended wiring diagrams on pages 52 to 59 give an example of an application where access to a hazardous area needs to be protected (space inside and/or around a machine in which an operator is exposed to a hazard).
These diagrams apply to Lexium 15 LP, 15 MP and 15 HP servo drives with integrated "Power Removal" safety function.

Description of the application

Pressing the "Request for access to protected area" spring return pushbutton **S1** causes the axes to slow down and stop, and also opens the access door to the protected area (activation of the latch electromagnet).
Depending on the safety level, if all the safety conditions are not met:
- Either the line contactor drops out
- Or the access door to the area remains locked

After operator intervention, the door closes and pressing the "Reset" spring return pushbutton enables the axes to operate again.

Selection criteria for the positions of the breaking contactors

Note: *A contactor can be used to break the power either upstream or downstream of the Lexium 15 servo drive, without compromising safety. Mixed breaking, upstream and downstream, is also possible.*

The positions of the contactors should be selected according to how often access to the hazardous area is required.

Occasional access requests
Breaking via a contactor upstream of the servo drive is recommended.
This type of breaking eliminates any risk of disconnection of the servo drive/servo motor assembly, which can cause overvoltages (only in the event of malfunction of the "Enable control system" input).

Frequent access requests
Breaking via a contactor downstream of the servo drive is preferable.
This type of breaking allows the servo drive input power bridge to remain energized, which enhances the longevity of the servo drive rectifier-filtering stage.

The recommended wiring diagrams on the following pages illustrate the most severe case corresponding to **frequent access requests**.

Note: *As a general rule, the breaking command for upstream KM contactors is instantaneous. The command for downstream KM contactors is delayed to allow the axis to come to a controlled stop (in accordance with parameter "StopMode = 1").*

Categories 3 and 4

The diagrams for categories 3 and 4 on pages 54, 55, 58 and 59 take account of the widest requirements and thus incorporate **double breaking** of the control circuit **and the power circuit**.

Note: *Following specific analysis of machine risks, this redundancy can be limited to the control circuit alone, and thus can be restricted to simply breaking the power circuit.*

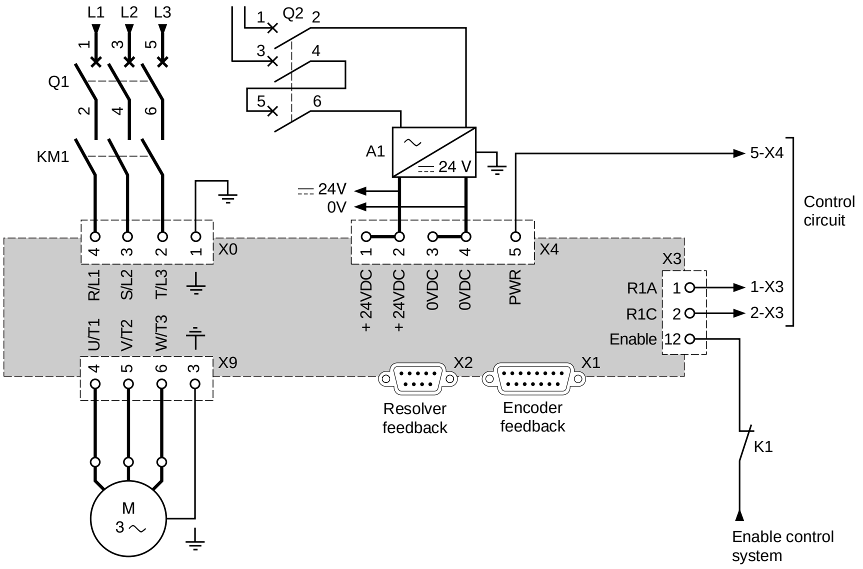
Lexium 15 motion control

Lexium 15 LP servo drives

Recommended wiring diagrams complying with standard EN 954-1

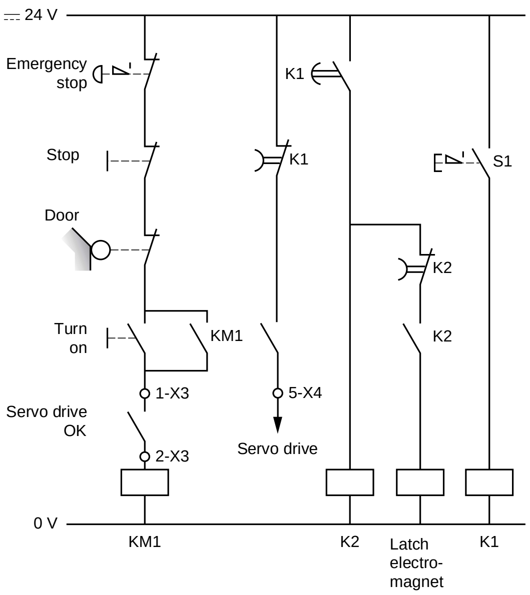
Category 1 safety level in accordance with EN 954-1

Power circuit of LXM 15L●●●●● servo drives

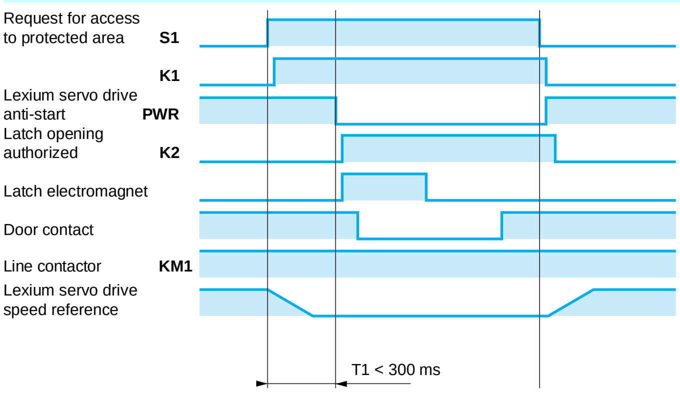


Q1: magnetic circuit breaker, see page 62
KM1: contactor, see page 62

Control circuit of LXM 15L●●●●● servo drives



Timing diagram



Comments

- Time delay T1 on the K1 relay must be long enough for the axis to come to a controlled stop.
- Lexium 15 LP servo drive parameters:
  - StopMode = 0: Axis performs a freewheel stop
  - StopMode = 1: Axis comes to a controlled stop according to the emergency deceleration ramp

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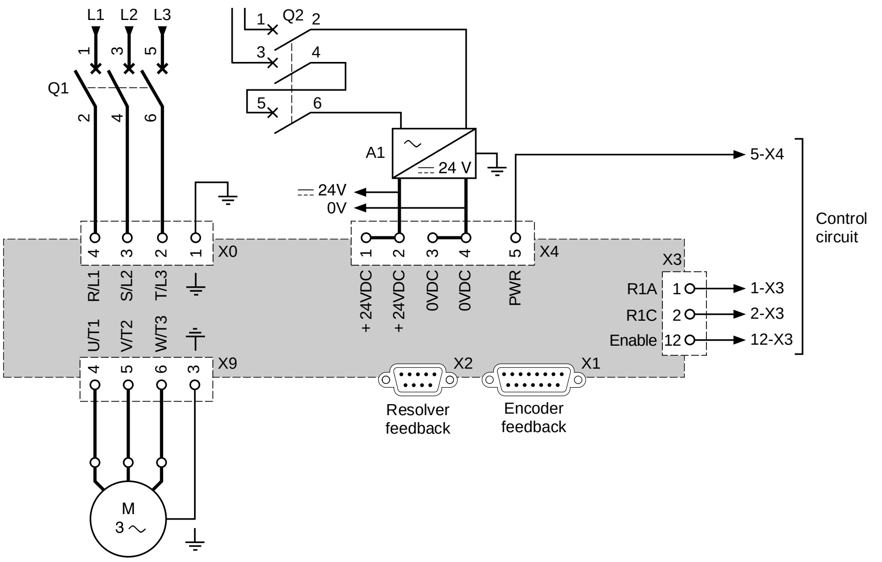
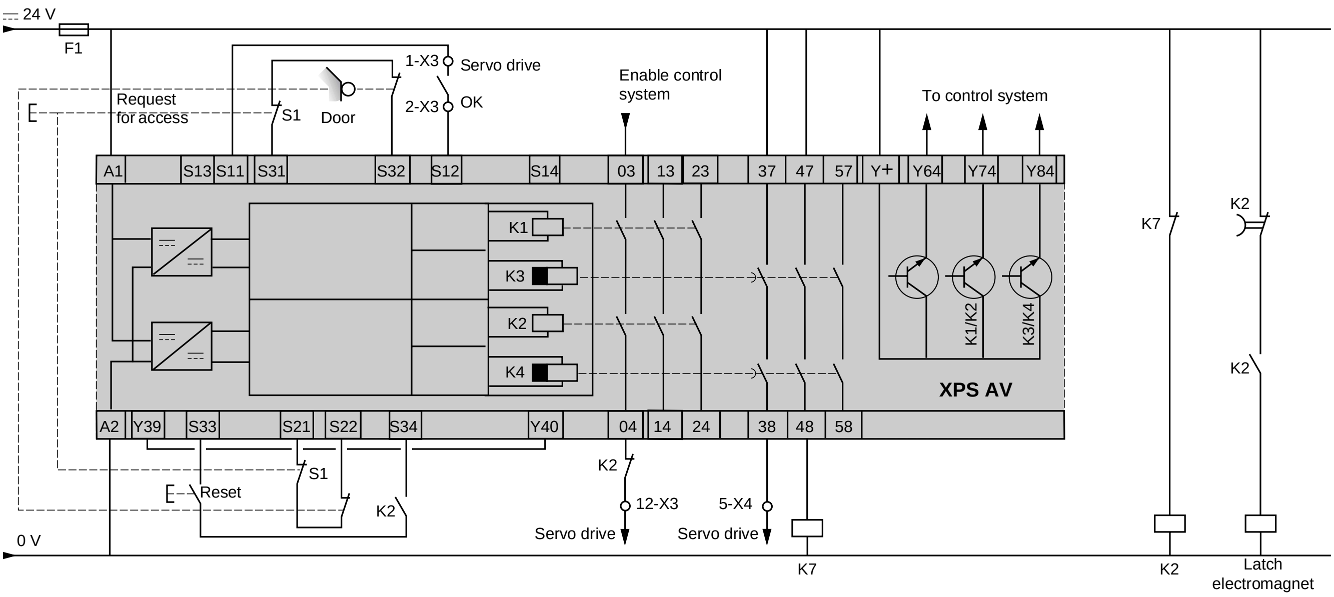
Category 2 safety level in accordance with EN 954-1

Power circuit of LXM 15L●●●●● servo drives



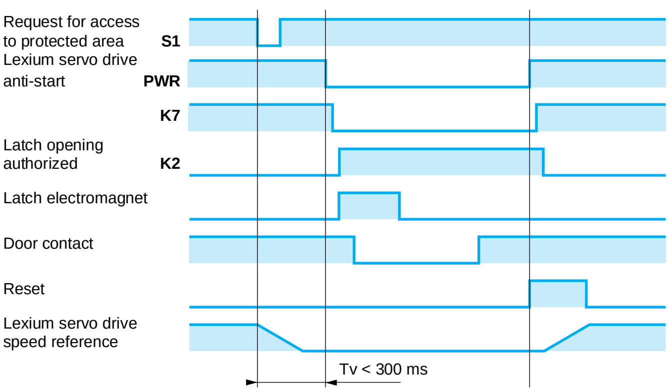
Q1: magnetic circuit breaker, see page 62

Control circuit of LXM 15L●●●●● servo drives



XPS AV: Preventa safety module, please consult our “Safety solutions using Preventa” specialist catalogue

Timing diagram



Comments

- Time delay Tv on the XPS AV monitoring module must be long enough for the axis to come to a controlled stop.
- Lexium 15 LP servo drive parameters:
  - StopMode = 0: Axis performs a freewheel stop
  - StopMode = 1: Axis comes to a controlled stop according to the emergency deceleration ramp

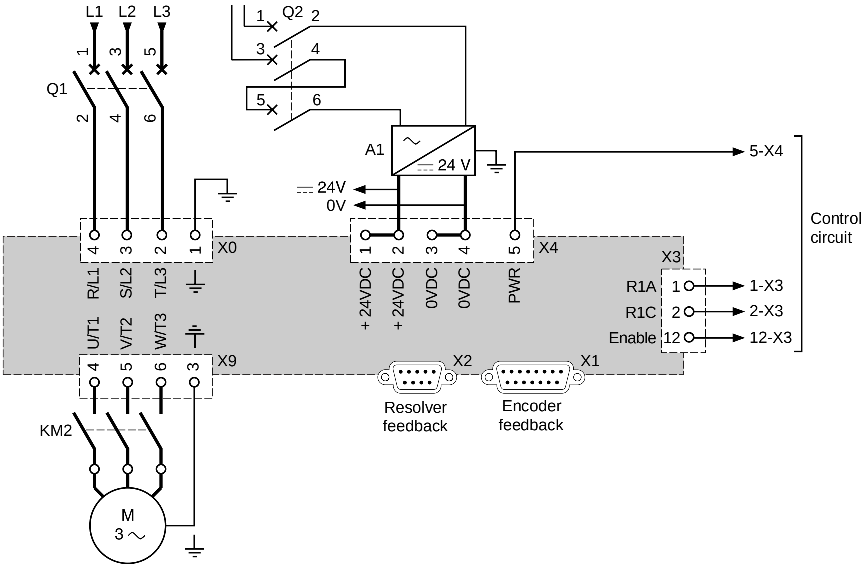
Lexium 15 motion control

Lexium 15 LP servo drives

Recommended wiring diagrams complying with standard EN 954-1

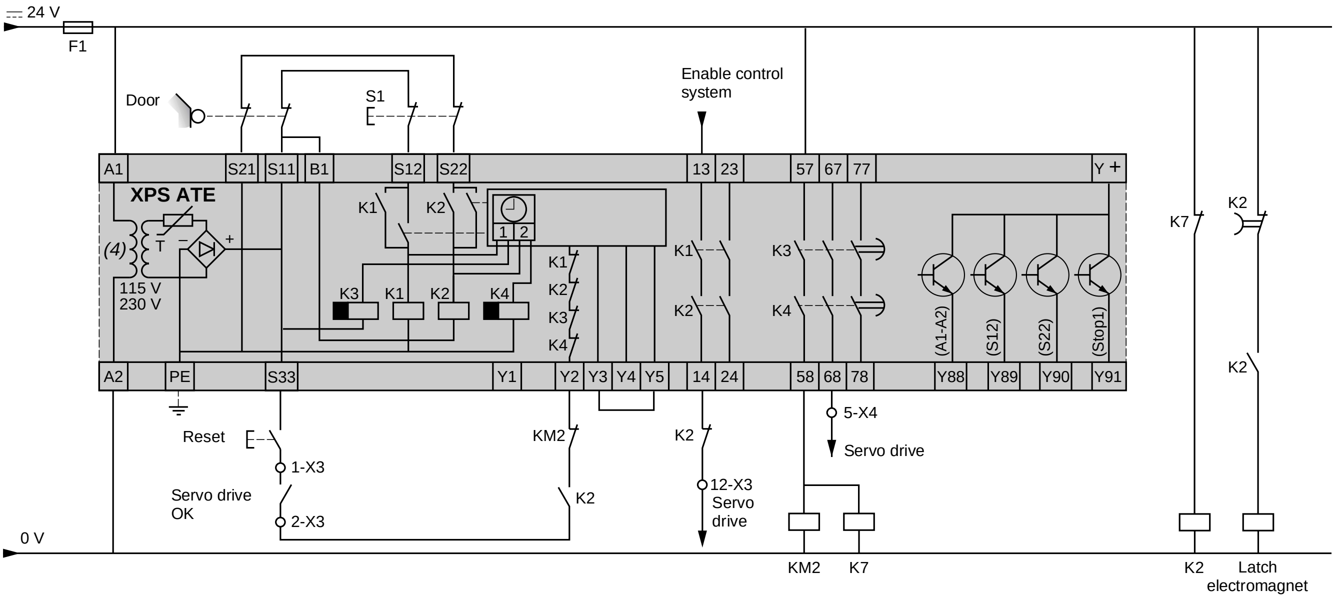
Category 3 safety level in accordance with EN 954-1

Power circuit of LXM 15L●●●●● servo drives



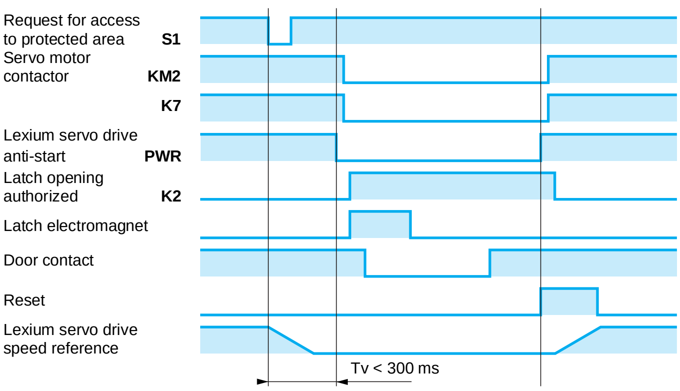
Q1: magnetic circuit breaker, see page 62

Control circuit of LXM 15L●●●●● servo drives



XPS ATE: Preventa safety module, please consult our “Safety solutions using Preventa” specialist catalogue

Timing diagram



Comments

■ Time delay Tv on the XPS ATE monitoring module must be long enough for the axis to come to a controlled stop.

■ Lexium 15 LP servo drive parameters:

□ StopMode = 0: Axis performs a freewheel stop

□ StopMode = 1: Axis comes to a controlled stop according to the emergency deceleration ramp

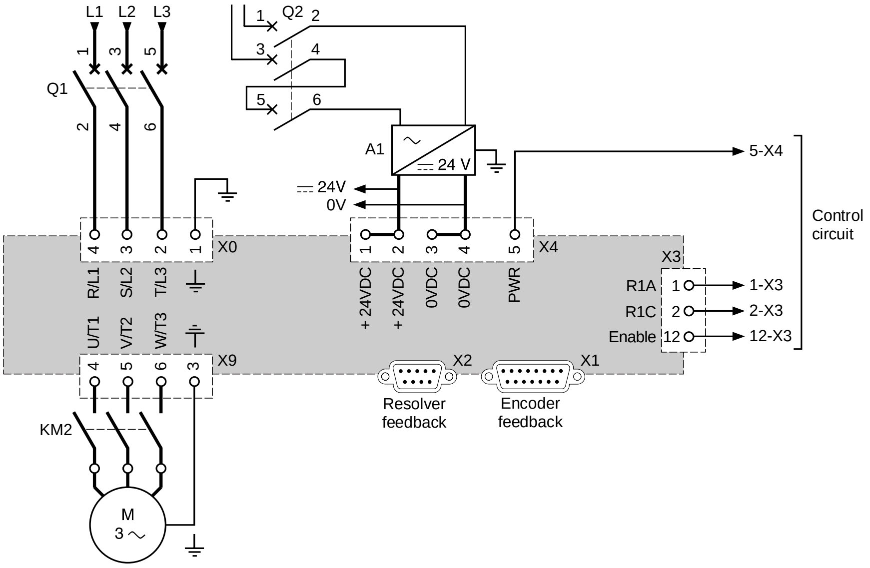
Lexium 15 motion control

Lexium 15 LP servo drives

Recommended wiring diagrams complying with standard EN 954-1

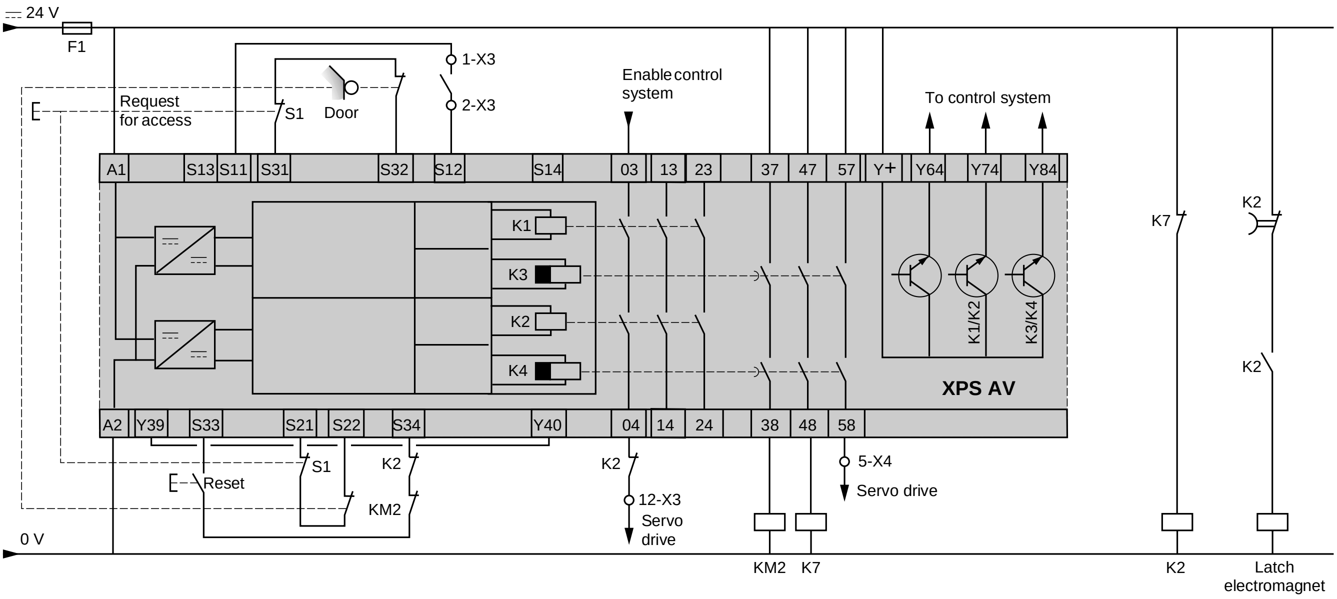
Category 4 safety level in accordance with EN 954-1

Power circuit of LXM 15L●●●●● servo drives



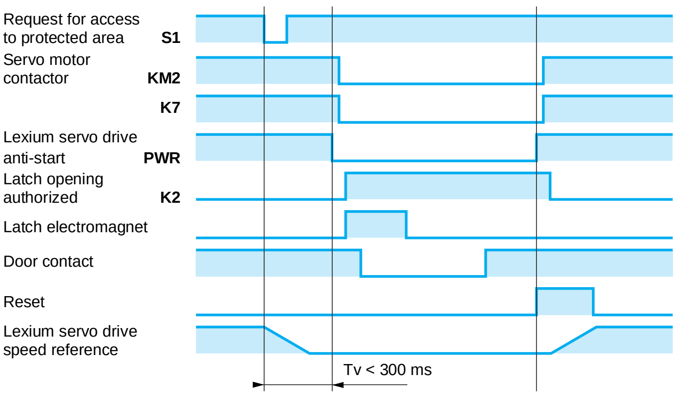
Q1: magnetic circuit breaker, see page 62

Control circuit of LXM 15L●●●●● servo drives



XPS AV: Preventa safety module, please consult our “Safety solutions using Preventa” specialist catalogue

Timing diagram



Comments

- Time delay Tv on the XPS AV monitoring module must be long enough for the axis to come to a controlled stop.
- Lexium 15 LP servo drive parameters:
  - StopMode = 0: Axis performs a freewheel stop
  - StopMode = 1: Axis comes to a controlled stop according to the emergency deceleration ramp

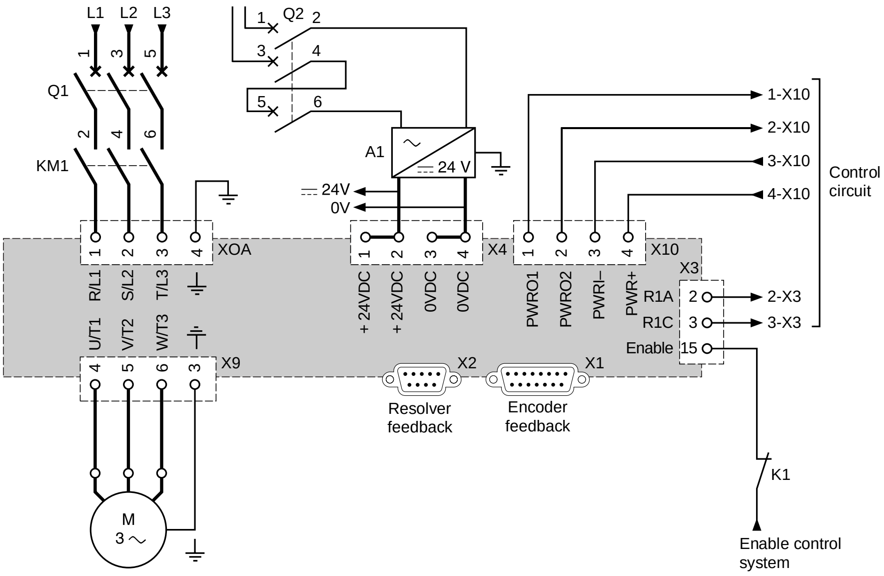
Lexium 15 motion control

Lexium 15 MP and 15 HP servo drives

Recommended wiring diagrams complying with standard EN 954-1

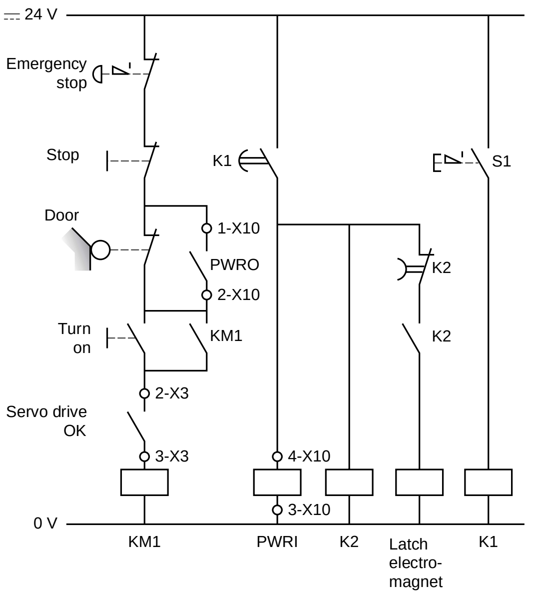
Category 1 safety level in accordance with EN 954-1

Power circuit of LXM 15MD●●N4, LXM 15HC●●N4X servo drives

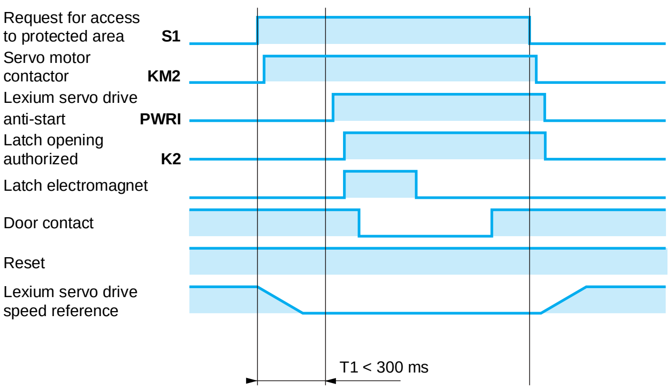


Q1: magnetic circuit breaker, see page 62
KM1: contactor, see page 62

Control circuit of LXM 15MD●●N4, LXM 15HC●●N4X servo drives



Timing diagram



Comments

- Time delay T1 on the K1 relay must be long enough for the axis to come to a controlled stop.
- Lexium 15 MP and 15 HP servo drive parameters:
  - StopMode = 0: Axis performs a freewheel stop
  - StopMode = 1: Axis comes to a controlled stop according to the emergency deceleration ramp

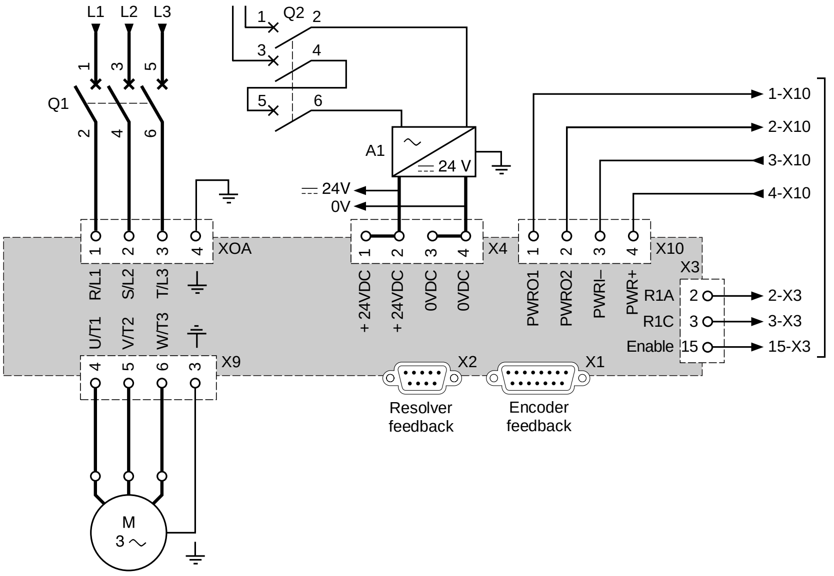
Lexium 15 motion control

Lexium 15 MP and 15 HP servo drives

Recommended wiring diagrams complying with standard EN 954-1

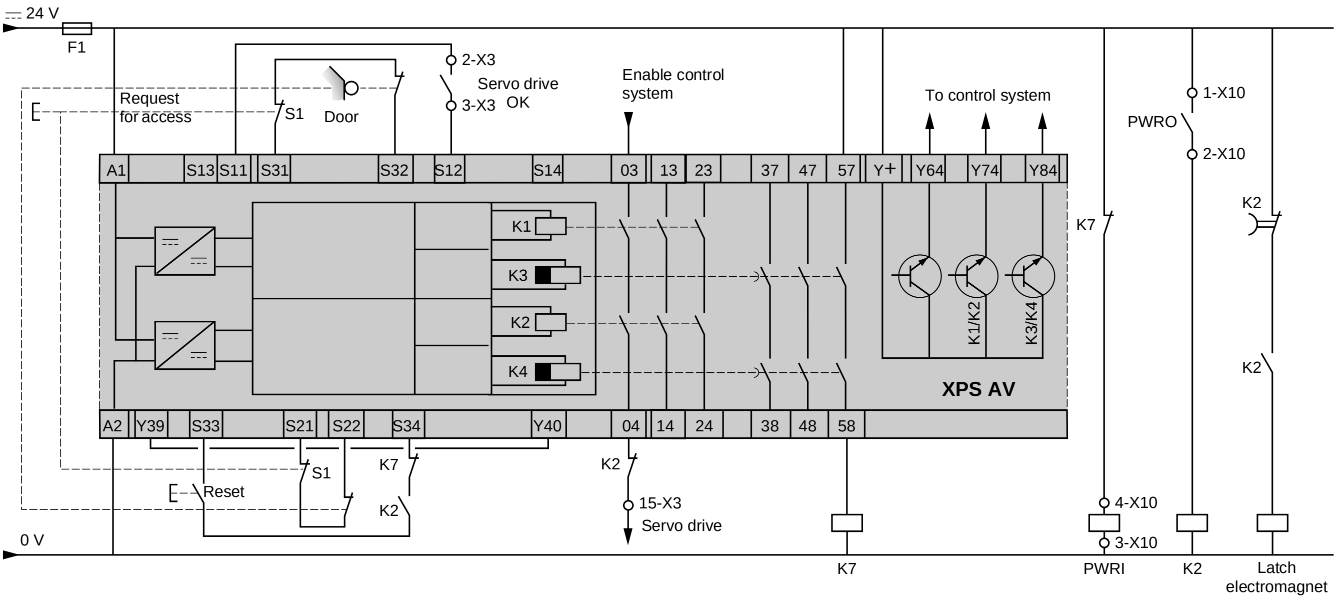
Category 2 safety level in accordance with EN 954-1

Power circuit of LXM 15MD●●N4, LXM 15HC●●N4X servo drives



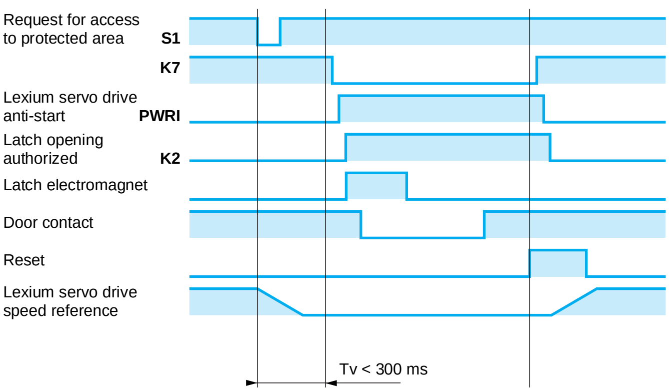
Q1: magnetic circuit breaker, see page 62

Control circuit of LXM 15MD●●N4, LXM 15HC●●N4X servo drives



XPS AV: Preventa safety module, please consult our “Safety solutions using Preventa” specialist catalogue

Timing diagram

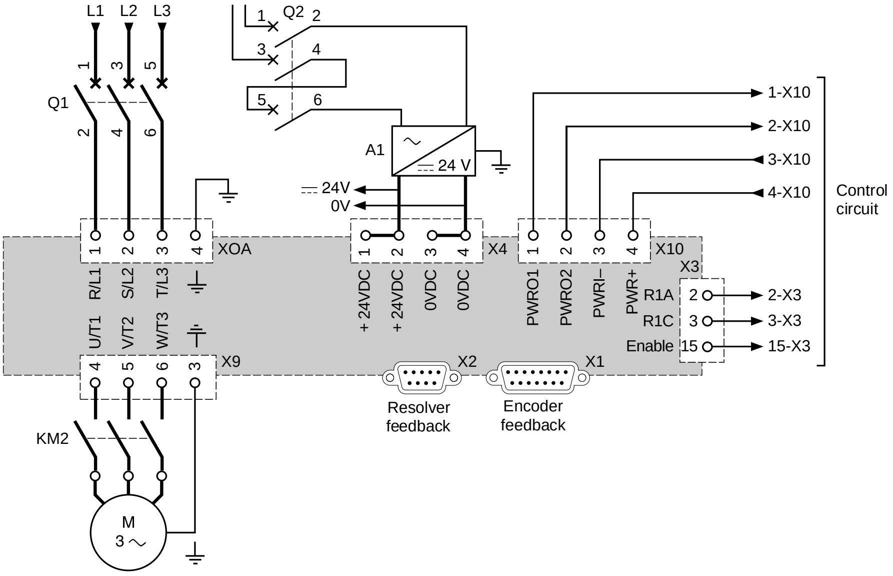


Comments

- Time delay Tv on the XPS AV monitoring module must be long enough for the axis to come to a controlled stop.
- Lexium 15 MP and 15 HP servo drive parameters:
  - StopMode = 0: Axis performs a freewheel stop
  - StopMode = 1: Axis comes to a controlled stop according to the emergency deceleration ramp

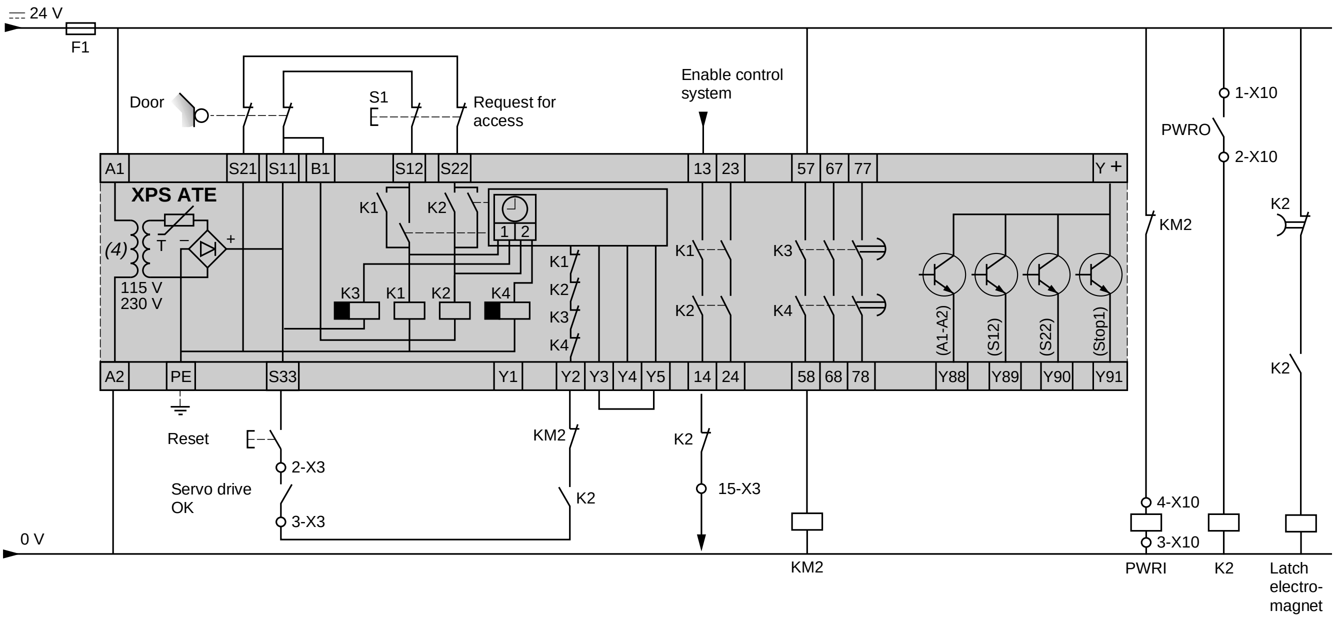
Category 3 safety level in accordance with EN 954-1

Power circuit of LXM 15MD●●N4, LXM 15HC●●N4X servo drives



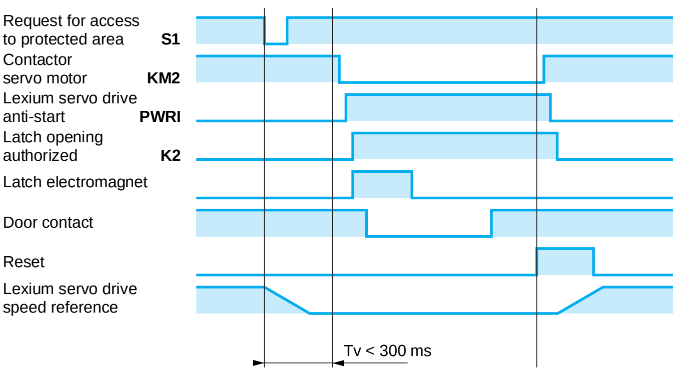
Q1: magnetic circuit breaker, see page 62

Control circuit of LXM 15MD●●N4, LXM 15HC●●N4X servo drives



XPS ATE: Preventa safety module, please consult our “Safety solutions using Preventa” specialist catalogue

Timing diagram



Comments

- Time delay Tv on the XPS ATE monitoring module must be long enough for the axis to come to a controlled stop.
- Lexium 15 MP and 15 HP servo drive parameters:
  - StopMode = 0: Axis performs a freewheel stop
  - StopMode = 1: Axis comes to a controlled stop according to the emergency deceleration ramp

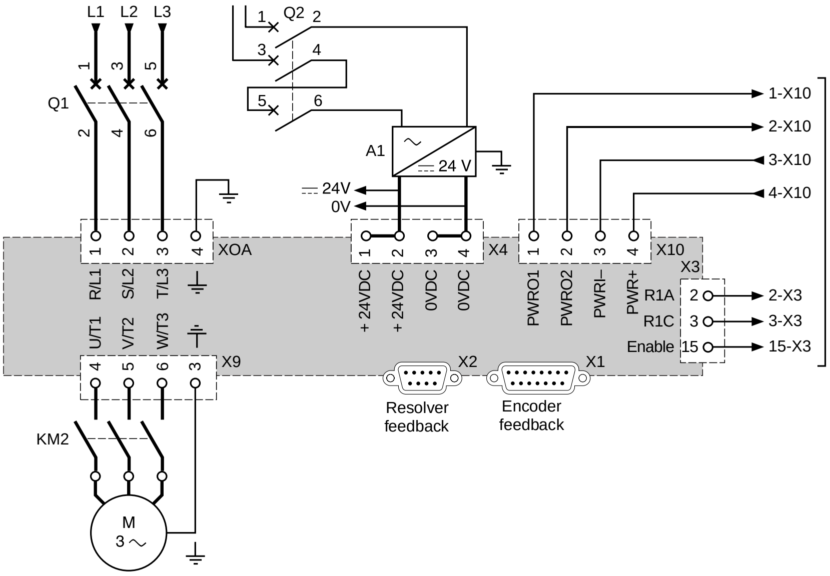
Lexium 15 motion control

Lexium 15 MP and 15 HP servo drives

Recommended wiring diagrams complying with standard EN 954-1

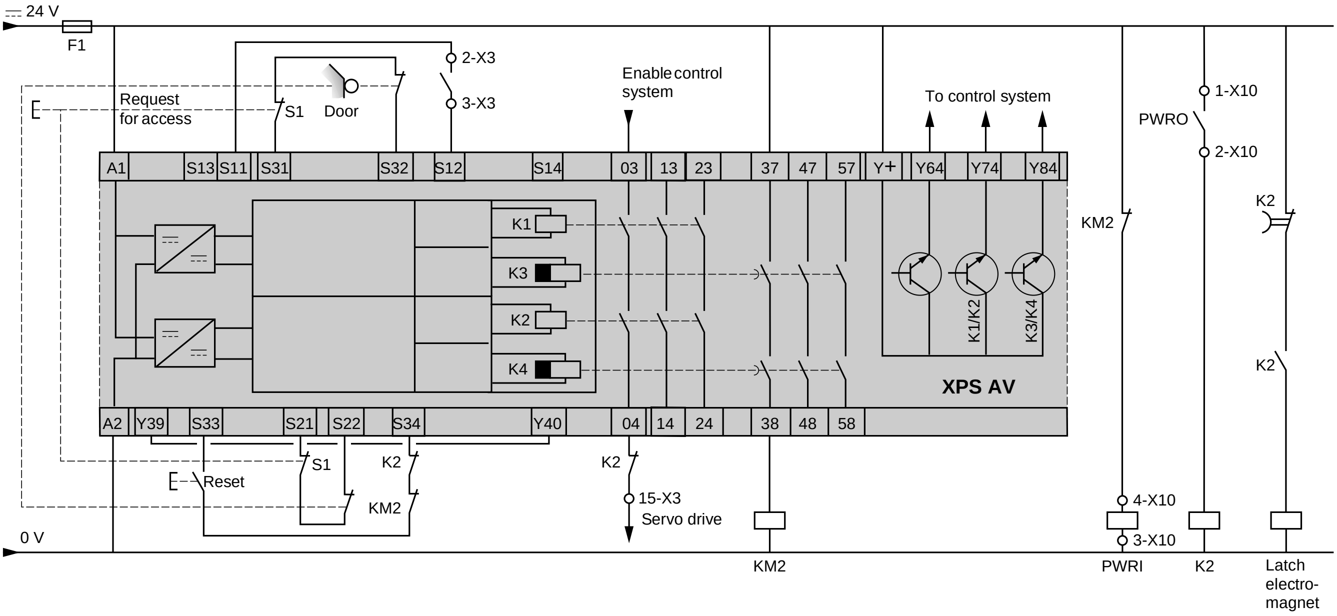
Category 4 safety level in accordance with EN 954-1

Power circuit of LXM 15MD●●N4, LXM 15HC●●N4X servo drives



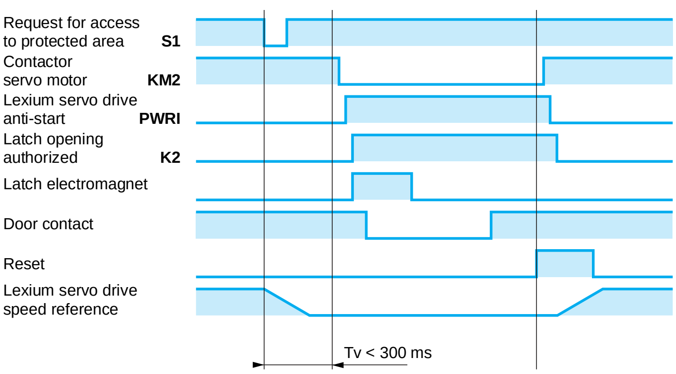
Q1: magnetic circuit breaker, see page 62

Control circuit of LXM 15MD●●N4, LXM 15HC●●N4X servo drives



XPS AV: Preventa safety module, please consult our "Safety solutions using Preventa" specialist catalogue

Timing diagram



Comments

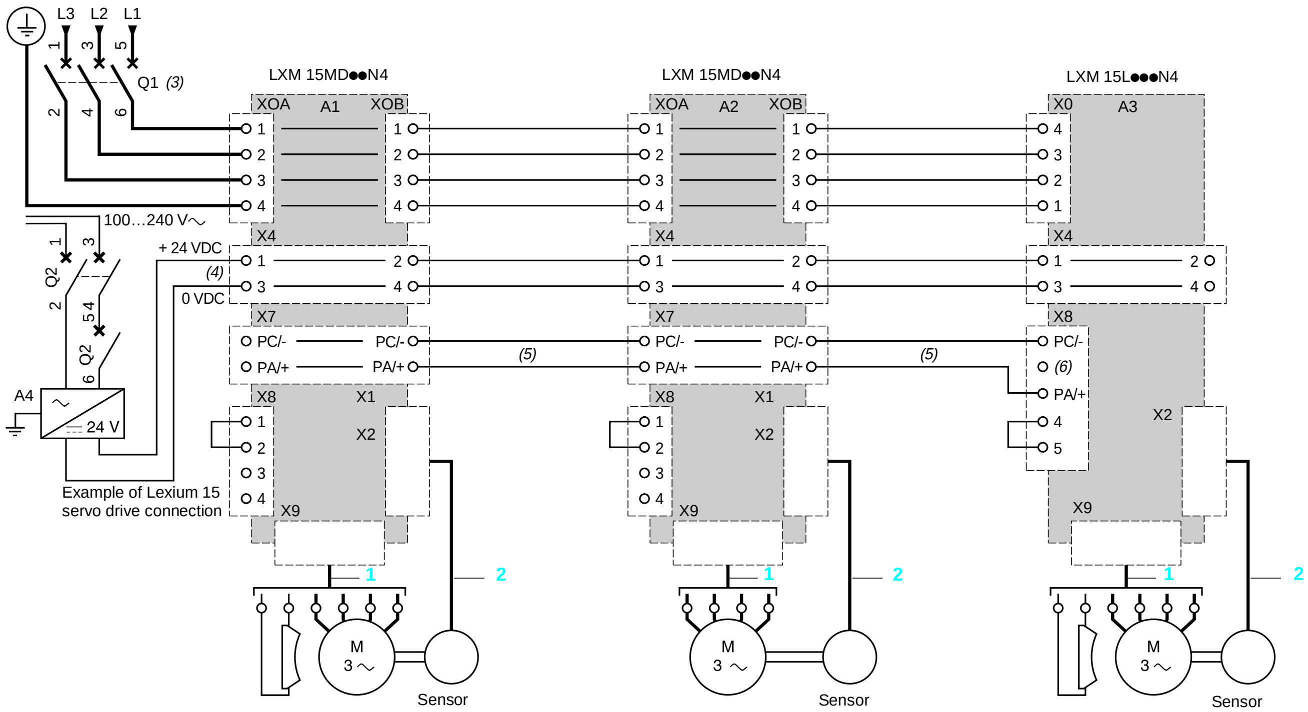
■ Time delay Tv on the XPS AV monitoring module must be long enough for the axis to come to a controlled stop.

■ Lexium 15 MP and 15 HP servo drive parameters:

□ StopMode = 0: Axis performs a freewheel stop

□ StopMode = 1: Axis comes to a controlled stop according to the emergency deceleration ramp

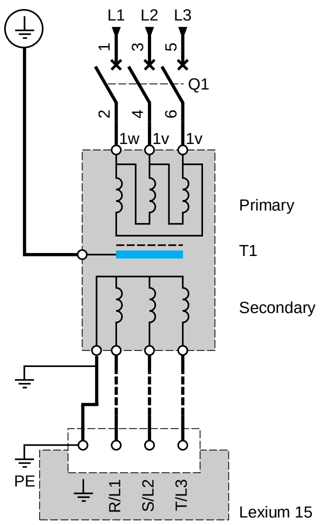
Example of connection of a set of two Lexium 15 MP servo drives and one Lexium 15 LP servo drive with distribution of braking energy *(1) (2)*



Additional components required (for the complete references, please consult our “Motor starter solutions - Control and protection components” specialist catalogue).	
Item no.	**Designation**
A1, A2, A3	Lexium 15 servo drives, see page 28. For different power ratings, power A1 ⩾ power A2 ⩾ power A3
A4	Phaseo power supply, please consult our “Interfaces, I/O splitter boxes and power supplies” specialist catalogue.
Q1 *(3)*	Circuit breaker
Q2	GV2-L circuit breaker rated at twice the nominal current of supply A1
1	Servo motor/servo drive power connection cable, see pages 132 and 180
2	Servo motor/servo drive control connection cable, see pages 133 and 181

(1) The same connection principle is possible for connecting Lexium 15 HP servo drive DC buses in parallel. Please consult your Regional Sales Office.
(2) Only servo drives that have the same supply voltage can be connected on the same DC bus.
(3) Circuit breaker Q1 and the power supply cables must be of sufficient size to provide protection against overloads and short-circuits on each servo drive. Connectors X0, XOA, XOB limit the line current to 20 A rms. For line currents > 20 A rms, use separate power supplies and protection devices for the servo drives.
(4) On the X4 connector on the main servo drive (A1), check that the sum of the 24 V ⎓ power supply currents on the servo drives and the holding brakes (optional) is ⩽ 10 A.
(5) Connectors X7 and X8 limit the DC bus current to 20 A.
(6) Not connected

Connection of Lexium 15 servo drives to installation with IT netural system
(isolated or impedance earthed neutral)



Connection of a servo drive to an installation with an IT neutral system

In this type of installation, a 3-phase LV/LV transformer must be inserted in the supply circuit for the servo drives, which thus allows a TT load system to be recreated on the secondary side. This diagram, with a secondary star transformer, thus meets the following requirements:
- Protection of personnel
- Adaptation of the supply voltage

If a Lexium 15 HP servo drive is connected, inserting an isolation transformer eliminates the need for a line choke (VW3 M4 3●●).

Merlin Gerin or Square D 3-phase T1 transformer to be used
The size of the transformers is defined using the following formulae:

- **Lexium servo drives with independent power supply** (one transformer per servo drive):

$$Pu = (\sqrt{3} \times Un \times In \times K) \times 1,5$$

where Pu: unit power (kVA), Un: nominal input voltage (V), In: continuous current (A), K = 0.9: reduction factor for the servo drive, and factor 1.5: factor taking account of the inrush and peak currents of the servo drives.

- **Lexium servo drives with common power supply** (one transformer per n servo drives):

$$Pm = (\Sigma Pu)/2$$

If Pm < Pu of the largest servo drive, take Pm = Pu of the largest servo drive. Where Pm: usable power (kVA), and Pu: servo drive unit power (kVA). Formula not applicable for continuous operation (S1 mode).

Selection of Merlin Gerin transformer with 3 x 400 V rms primary voltage

Lexium 15 servo drives with independent power supply		LXM 15		LU60N4	LD10N4	LD17N4	MD28N4	MD40N4	MD56N4	HC11N4X	HC20N4X	
Required power Pu		400 V rms *(1)*	**kVA**	1.4	2.8	5.6	9.4	13.1	19	38	66	
Merlin Gerin 3-phase LV/LV T1 transformer to be used	Nominal transformer power	400 V rms *(1)*	**kVA**	2.5	4	6.3	10	16	20	40	80	
	Reference	400/400 V rms		**84030**	**84032**	**84033**	**84035**	**84037**	**84038**	**84041**	**84044**	
Lexium 15 servo drives with common power supply			**kVA**	**2.5**	**4**	**6.3**	**10**	**16**	**20**	**40**	**80**	**160**
Power required Pm	**Reference**	400/400 V rms		**84030**	**84032**	**84033**	**84035**	**84037**	**84038**	**84041**	**84044**	**84047**

Selection of Square D transformer with 3 x 460 V rms primary voltage

Lexium 15 servo drives with independent power supply		LXM 15		LU60N4	LD10N4	LD17N4	MD28N4	MD40N4	MD56N4	HC11N4X	HC20N4X	
Required power Pu		460 V rms *(1)*	**kVA**	1.4	2.8	5.6	9.4	13.1	19	38	66	
Square D 3-phase LV/LV T1 transformer to be used	Nominal transformer power	460 V rms *(1)*	**kVA**	–	–	7.5	11	15	20	40	75	
	Reference	460/460 V rms		**–**	**–**	**7T145 HDIT**	**11T145 HDIT**	**15T145 HDIT**	**20T145 HDIT**	**40T145 HDIT**	**75T145 HDIT**	
Lexium 15 servo drives with common power supply			**kVA**	**2.5**	**4**	**7.5**	**11**	**15**	**20**	**40**	**75**	**145**
Power required Pm	**Reference**	460/460 V rms		*(2)*	*(2)*	**7T145 HDIT**	**11T145 HDIT**	**15T145 HDIT**	**20T145 HDIT**	**40T145 HDIT**	**75T145 HDIT**	**145T145 HDIT**

(1) 3-phase secondary voltage
(2) Please consult your Regional Sales Office.

Note: *Unit equivalent: 1 kW = 0.746 HP*

Lexium 15 motion control

Motor starters

Protection by circuit breaker

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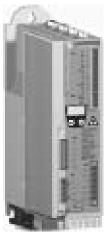
105808



GV2 L14
+
LC1 D09●●
+
LXM 15LD21M3

Applications

The combinations listed below can be used to create a complete motor starter unit comprising a circuit breaker, a contactor and a Lexium 15 servo drive.
The circuit breaker provides protection against accidental short-circuits, disconnection and, if necessary, isolation.
The contactor turns on and manages any safety features, as well as isolating the servo motor on stopping.
The servo drive controls the servo motor, provides protection against short-circuits between the servo drive and the servo motor and protects the motor cable against overloads. The overload protection is provided by the motor thermal protection of the servo drive.

Motor starters for Lexium 15 LP servo drives

Servo drive		Circuit breaker		Contactor
Reference	Nominal power	Reference	Rating	Reference *(1) (2)*
	kW		A	
Single phase supply voltage: 200…240 V ~ 50/60 Hz				
LXM 15LD13M3	0.9	**GV2 L14**	10	**LC1 K0610●●**
LXM 15LD21M3	1.2	**GV2 L14**	10	**LC1 K0610●●**
LXM 15LD28M3	1.2	**GV2 L14**	10	**LC1 K0610●●**
Three phase supply voltage: 200…240 V ~ 50/60 Hz				
LXM 15LD13M3	1	**GV2 L10**	6.3	**LC1 K0610●●**
LXM 15LD21M3	2.1	**GV2 L14**	10	**LC1 D09●●**
LXM 15LD28M3	3.4	**GV2 L16**	14	**LC1 D12●●**
Three phase supply voltage: 208…480 V ~ 50/60 Hz				
LXM 15LU60N4	1.1	**GV2 L10**	6.3	**LC1 K0610●●**
LXM 15LD10N4	2.1	**GV2 L10**	6.3	**LC1 K0610●●**
LXM 15LD17N4	4.3	**GV2 L14**	10	**LC1 D09●●**

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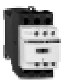

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GV2 L22
+
LC1 D32●●
+
LXM 15MD56N4

Motor starters for Lexium 15 MP servo drives

Servo drive		Circuit breaker		Contactor
Reference	Nominal power	Reference	Rating	Reference *(1) (2)*
	kW		A	
Three phase supply voltage: 208…480 V ~ 50/60 Hz				
LXM 15MD28N4	5.7	**GV2 L16**	14	**LC1 D12●●**
LXM 15MD40N4	7.9	**GV2 L22**	25	**LC1 D18●●**
LXM 15MD56N4	4.3	**GV2 L22**	25	**LC1 D32●●**

Motor starters for Lexium 15 HP servo drives

Servo drive		Circuit breaker		Contactor
Reference	Nominal power	Reference *(3)*	Rating	Reference *(1) (2)*
	kW		A	
Three phase supply voltage: 208…480 V ~ 50/60 Hz				
LXM 15HC11N4X	22.3	**NS100HMA50**	50	**LC1 D50●●**
LXM 15HC20N4X	42.5	**NS100LMA100**	100	**LC1 D80●●**

(1) Composition of contactors:
LC1 K06: 3 poles + 1 N/O auxiliary contact
LC1 D●●: 3 poles + 1 N/O auxiliary contact + 1 N/C auxiliary contact
(2) Replace ●● with the control circuit voltage reference given in the table below:

AC control circuit

	Volts ~	**24**	**48**	**110**	**220**	**230**	**240**
LC1 K	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
	Volts ~	**24**	**48**	**110**	**220/230**	**230**	**230/240**
LC1 D	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	–	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**

For other voltages between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.
(3) NS100●MA: Products sold under the Merlin Gerin brand.

Lexium 15 motion control

Motor starters

Protection using fuses

Protection of Lexium 15 LP servo drives using fuses

Servo drive		Fuse to be fitted upstream	
Reference	Nominal power	Type	Current
	kW		A
Single phase supply voltage: 200…240 V ~ 50/60 Hz			
LXM 15LD13M3	0.9	aT	10
LXM 15LD21M3	1.2	aT	10
LXM 15LD28M3	1.2	aT	10
Three phase supply voltage: 200…240 V ~ 50/60 Hz			
LXM 15LD13M3	1	aT	6
LXM 15LD21M3	2.1	aT	10
LXM 15LD28M3	3.4	aT	16
Three phase supply voltage: 208…480 V ~ 50/60 Hz			
LXM 15LU60N4	1.1	aT	6
LXM 15LD10N4	2.1	aT	6
LXM 15LD17N4	4.3	aT	10

Protection of Lexium 15 MP servo drives using fuses

Servo drive		Fuse to be fitted upstream	
Reference	Nominal power	Type	Current
	kW		A
Three phase supply voltage: 208…480 V ~ 50/60 Hz			
LXM 15MD28N4	5.7	aM	16
LXM 15MD40N4	7.9	aM	20
LXM 15MD56N4	11.4	aM	25

Protection of Lexium 15 HP servo drives using fuses

Servo drive		Fuse to be fitted upstream	
Reference	Nominal power	Type	Current
	kW		A
Three phase supply voltage: 208…480 V ~ 50/60 Hz			
LXM 15HC11N4X	22.3	aM	40
LXM 15HC20N4X	42.5	aM	63

Presentation: pages 8 and 9
Characteristics: pages 24 to 27
References: pages 28 and 29
Dimensions: pages 48 and 49
Schemes: pages 50 to 61

Mounting recommendations

LXM 15LD13M3 and LXM 15LU60N4 servo drives are cooled by natural convection.
The other servo drives, LXM 15LD21M3, LD28M3, LXM 15●D●●N4 and LXM 15HC●●N4X, have an integrated fan.

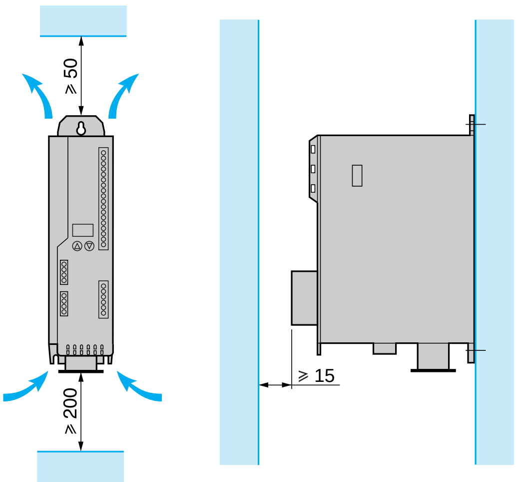
When the servo drive is installed in an enclosure, the following instructions should be followed with regard to the temperature and protection index:

- Provide sufficient cooling of the servo drive by complying with the minimum mounting distances
- Do not mount the servo drive near heat sources
- Do not mount the servo drive on flammable materials
- Do not heat the servo drive cooling air by currents of hot air from other equipment and components, for example from an external braking resistor
- If the servo drive is used above its thermal limits, the control stops due to overtemperature
- Mount the servo drive vertically (± 10%).

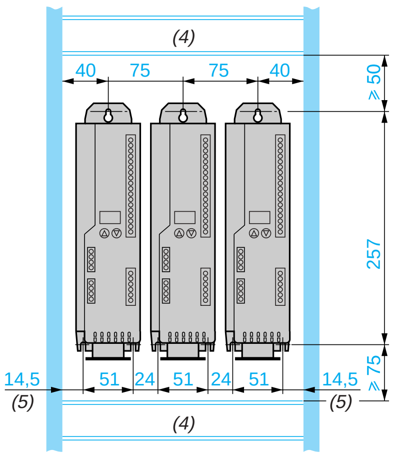
Note: *Do not use insulated enclosures, as they have a poor level of conductivity.*

Mounting

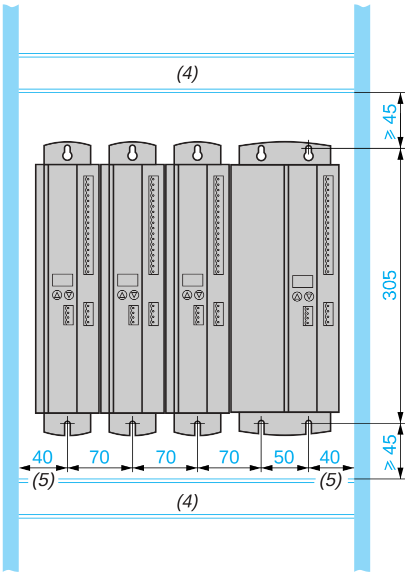
Cooling principle



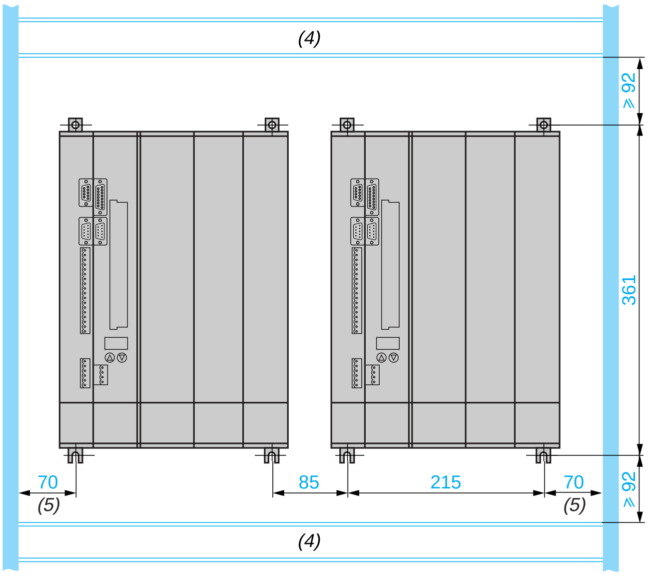
LXM 15L●●●●● servo drives *(1)*



LXM 15MD●●N4 servo drives *(2) (3)*

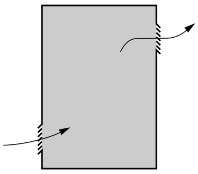


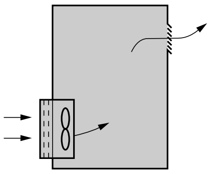
LXM 15HC●●N4X servo drives *(2) (3)*



(1) Ambient air temperature: 0…+ 40°C without derating. From + 40…+ 55°C with derating of the motor output current by 2.5% per additional °C.
(2) Ambient air temperature: 0…+ 45°C without derating. From + 45…+ 55°C with derating of the motor output current by 2.5% per additional °C.
(3) For easier connection of the power cables, leave a free space ⩾200 mm beneath the servo drive.
(4) Cable clip or ducting
(5) Minimum distance between the inside panel of the enclosure and the side of the servo drive.

Presentation: pages 8 and 9
Functions: pages 14 to 23
Characteristics: pages 24 to 27
References: pages 28 and 29
Dimensions: pages 48 and 49


Natural convection


Forced cooling

Recommendations for mounting in an enclosure

To ensure good air circulation in the servo drive:
- Fit ventilation grilles on the enclosure.
- Ensure that ventilation is adequate: if not install a forced ventilation unit with a filter.
- Any apertures and/or fans must provide a flow rate at least equal to that of the servo drive fans (see below).
- Use special filters with IP 54 protection.

Servo drive	Dissipated power W	Ventilation	Flow rate m^3/hour
LXM 15LD13M3	35	Natural convection	–
LXM 15LD21M3	60	Integrated fan	60
LXM 15LD28M3	90	Integrated fan	60
LXM 15LU60N4	40	Natural convection	–
LXM 15LD10N4	60	Integrated fan	60
LXM 15LD17N4	90	Integrated fan	60
LXM 15MD28N4	90	Integrated fan	60
LXM 15MD40N4	160	Integrated fan	110
LXM 15MD56N4	200	Integrated fan	160
LXM 15HC11N4X	400	Integrated fan	340
LXM 15HC20N4X	700	Integrated fan	470

Sealed metal enclosure (IP 54 degree of protection)

The servo drive must be mounted in a dust and damp proof enclosure in certain environmental conditions, such as dust, corrosive gases, high humidity with risk of condensation and dripping water, splashing liquid, etc.
In these cases, Lexium 15 servo drives can be installed in an enclosure where the internal temperature must not exceed 40°C.

Calculating the dimensions of the enclosure

Maximum thermal resistance Rth (°C/W)

The thermal resistance is defined by the following formula:

$$R_{th} = \frac{\theta° - \theta e}{P}$$

θ = maximum temperature inside enclosure in °C
θe = maximum external temperature in °C
P = total power dissipated in the enclosure in W

Power dissipated by the servo drive: see table above.
Add the power dissipated by the other equipment components.

Useful heat exchange area of enclosure S (m^2)

For an enclosure fixed to the wall, the useful heat exchange area is defined as the sum of the areas of the 2 sides + top + front panel

$$S = \frac{k}{R_{th}}$$

k = thermal resistance per m^2 of the enclosure

For a metal enclosure:
- k = 0.12 with internal fan
- k = 0.15 without fan

Note: *Do not use insulated enclosures, as they have a poor level of conductivity.*

Lexium 15 motion control
Modicon Premium motion control modules

Application type	**Master/slave (cam profile, cut on the fly)**		
			
Number of axes	2/4 axes	2/4 axes	3 axes
Frequency per axis	Counting: 500 kHz with an incremental encoder	Acquisition: 200 kHz with a SSI series absolute encoder or an absolute encoder with parallel outputs	
Counter inputs	Per axis: - incremental encoder 5 V⎓, RS 422/RS 485 or Totem pole - SSI serial absolute encoder 16 to 25 bits,10…30 V⎓ - Parallel output absolute encoder 16 to 24 bits, 5/10/30 V⎓ with Advantys Telefast (ABE 7CPA11) conversion sub-base		
Command outputs	Per axis: - 1 analog output ± 10 V, 13 bits + sign, servo drive reference		
Auxiliary I/O	Per axis: - 4 "discrete" inputs 24 V⎓ (homing cam, event, recalibration, emergency stop) - 1 input/1 output for servo drive control - 1 reflex output 24 V⎓		
Functions	Servo control on independent linear axis	Servo control on independent infinite axis Follower axis (dynamic ratio) Realtime correction of servo drive offset	Servo control on independent linear or independent infinite axis Linear interpolation on 2 or 3 axes Realtime correction of servo drive offset
Processing	Positioning of a moving part on an axis following the motion control functions supplied by the Premium PLC processor Parameter setting, adjustment and debugging of axes by Unity Pro and PL7 Junior/Pro software		
Events	User-definable activation of the event-triggered task		
Connections	9 and 15-way SUB-D type connectors for encoder input (direct or TSX TAP S15●● accessories), speed reference HE 10 connector for auxiliary inputs Advantys Telefast prewiring system (ABE 7CPA01, ABE 7H16R20, ABE 7CPA11) Specific accessories (TSX TAP MAS)		
Module type	**TSX CAY ●1** *(1)*	**TSX CAY ●2** *(1)*	**TSX CAY 33**
Pages	71		

(1) ***TSX CAY ●1/●2****: substitute* ***2*** *for* ***2*** *axe module,* ***4*** *for* ***4*** *axe module.*

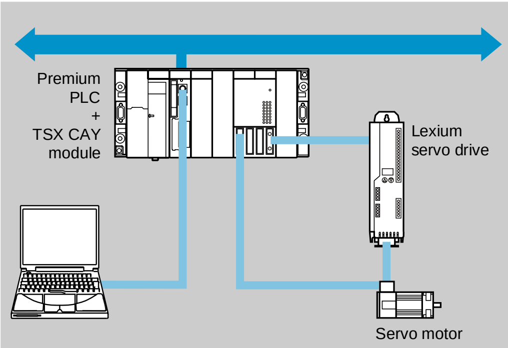
Synchronized multiaxis

		
8 axes	16 axes	8 axes
SERCOS network ring: 4 Mbps		
Per SERCOS digital link		
Per SERCOS digital link		
Per SERCOS digital link		
Independent linear or infinite axes Follower axes (6 slaves) by gearing or camming Manual mode (JOG and INC) Special functions, see page 76 4 groups of axes with simple 2 to 8 axes linear interpolation		
–		Path functions: 2 groups of 3 axes or 3 groups of 2 axes. With linear and circular interpolation with links via polynomial interpolation
Axis parameter setting, adjustment and debugging using Unity Pro and PL7 Junior/Pro software		
User-definable activation of the event-triggered task		
By 2 SMA type connectors for plastic (or glass) fibre optic cable		
TSX CSY 84	**TSX CSY 164**	**TSX CSY 85**
81		

Lexium 15 motion control

TSX CAY motion control modules for servo motors

Presentation



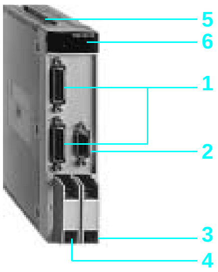
The servo-controlled TSX CAY●● positioning axis control offer is designed for machines requiring both high performance servo motion control in conjunction with PLC sequential control.

Depending on the model, the TSX CAY ●● modules make it possible to:
- Control 2 independent axes (TSX CAY 21/22)
- Control up to 4 independent axes (TSX CAY 41/42)
- Control 3 linearly interpolated axes (TSX CAY 33)

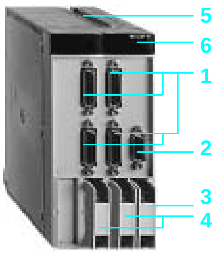
They accept servo drives with ±10 V analog inputs including Lexium 05, Lexium 15, Lexium 17D and Twin Line TLD 13 servo drives.

TSX CAY ●● modules can be inserted, like all application-specific modules, in all Premium PLC or Slot PLC Atrium slots.

Description



TSX CAY 21/22



TSX CAY 41/42

On the front panel of the TSX CAY ●● axis control modules there is:

1 A 15-way SUB-D connector per axis for connection of an incremental or absolute encoder

2 A 9-way SUB-D connector for all axes for connection of an analog output "speed reference" for each axis

3 An HE 10 to 20-way connector for all axes for connection:
- of auxiliary servo drive control inputs
- of external power supply of servo drive inputs/outputs

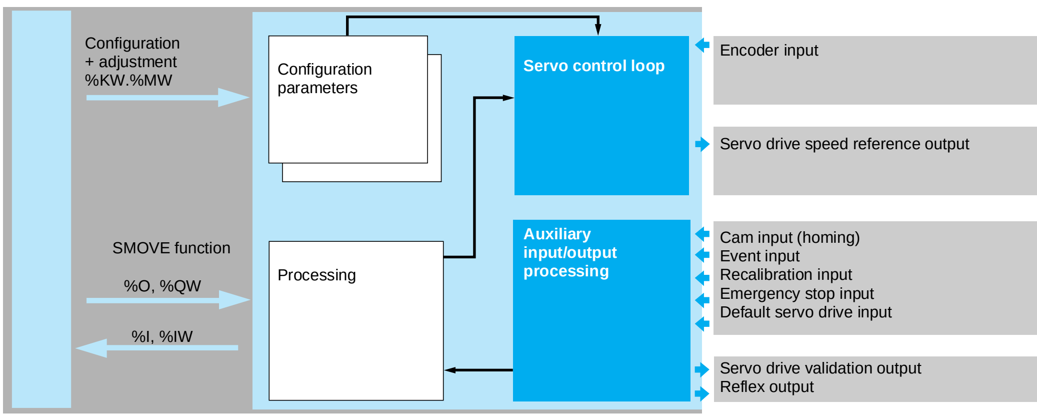
4 An HE 10 to 20-way connector for two axes (0/1 or 2/3) for connection:
- of auxiliary inputs: homing cam, emergency stop, event, recalibration,
- of reflex outputs
- external sensor and preactuator power supplies

5 rigid casing that performs the functions of:
- supporting electronic cards
- attaching and locking the module in its slot

6 LEDs for module diagnostics:
- diagnostics at module level:
  - Green RUN LED: module in operation
  - Red ERR LED: internal fault, module out of service
  - red I/O LED: external fault
- diagnostics at axis level:
  - Green CH● LED: axis diagnostics present

Operation

Diagram of an axis



Axis control modules are set up using Unity Pro or PL7 Junior/Pro software.
Premium TSX P57 ●●3M/4M and Atrium TPCX57●●3M or TSX PCI 57●●4M slot PLCs are required for TSX CAY 22/42/33 modules.

Characteristics: pages 69 and 70
References: pages 71 and 72
Connections: page 73

Lexium 15 motion control

TSX CAY motion control modules for servo motors

Functional characteristics

Module type			TSX CAY 21/22	TSX CAY 41/42	TSX CAY 33
Servo control loop			Proportional to overshoot compensation and gain switching		
	Period	ms	2	4	
Paths	Speed profile		Trapezoid or parabolic		
Resolution	Minimum		0.5 position units per point		
	Maximum		1000 position units per point		
Length of axis	Minimum		**TSX CAY 21**: 32,000 points	**TSX CAY 41**: 32,000 points	**TSX CAY 33**: 256 points
			TSX CAY 22: 256 points	**TSX CAY 42**: 256 points	
	Maximum		32,000,000 points		
Speed	Minimum		54,000 points/min		
	Maximum		270,000 points/min		
Acceleration (Change from 0 to VMAX)	Minimum	s	10		
	Maximum	ms	8	16	
Operating modes	OFF		Measuring mode, disabling of the servo control loop		
			The module operates by acquiring the position and current speed		
	DIR DRIVE		Servo control is switched off, disabling of the servo control loop		
			The module operates only in analog output		
	MAN		Motion control by an operator: - movement by viewing - incremental movement		
	AUTO		Sequence of movements controlled by a PLC program. The movements are described by a syntax similar to ISO language. The movements can be expressed absolutely or relatively (in relation to the current position or the captured position). Possibility of "step by step" execution, suspension/resumption of movement, changes in speed		
	FOLLOWER		Axis n of the module is servo controlled: - either at the 0 axis of the same module - or at a control profile transmitted by application program		–
	Environment		Encoder coupling, servo drive present, emergency stop		
	Movements		Control of the proper execution of movements (following difference, operational window, software stops)		
	Control		Control consistency check		
	Parameters		Parameter validity check		

Functionalities

Module type		TSX CAY 21	TSX CAY 22	TSX CAY 41	TSX CAY 42	TSX CAY 33
2/3 axes linear interpolation		–				Yes
Limited axes		Yes				
Infinite axes		–	Yes	–	Yes	
Following axes	Static ratio	Yes	–	Yes	–	
	Dynamic ratio	–	Yes	–	Yes	–
Servo drive offset correction		–	Yes	–	Yes	
Cut on the fly	On position or on event with infinite master axis and linearly-limited slave axis	–	Yes *(1)*	–		

(1) The TSX CAY 22 module's cut on the fly function requires Unity Pro software version ⩾ 2.2 or PL7 Junior/Pro software version u 4.1.

Presentation: page 68
References: pages 71 and 72
Connections: page 73

Lexium 15 motion control

TSX CAY motion control modules for servo motors

Electrical characteristics

Module type				TSX CAY 21	TSX CAY 22	TSX CAY 41	TSX CAY 42	TSX CAY 33
Modularity				2 axes		4 axes		3 axes
Maximum frequency on the counter inputs	SSI absolute encoder			16 to 25 bits	12 to 25 bits	16 to 25 bits	12 to 25 bits	
	CLK frequency	transmission	**kHz**	200				
	Incremental encoder	x 1	**kHz**	500				
		x 4	**kHz**	250 kHz in input or 1 MHz in counting				
Consumption		5 V⎓	**mA**	1100		1500		
		24 V⎓	**mA**	15		30		
Current consumed by module on the 10/30 V encoder at 24V (24 V absolute encoder)		Typical	**mA**	11 (20 max)		22 (40 max)		
Power dissipated inside the module		Typical	**W**	7.2 (11.5 max)		10 (17 max)		
Control of sensor power supplies				Yes				

Input characteristics

Type of input				Counter inputs 5 V⎓ (IA/IB/IZ)	Servo drive control inputs (1 per axis)	Auxiliary inputs (homing, event, recalibration, emergency stop)
Logic				Positive		
Nominal values	Voltage		**V**	5	24	
	Current		**mA**	18	8	
Value limits	Voltage		**V**	⩽ 5.5	19...30 (possible up to 34 V, limited 1 hr per 24 hr)	
	At state 1	Voltage	**V**	⩾ 2.4	⩾ 11 (OK state)	⩾ 11
		Current	**mA**	> 3.7 (for U = 2.4 V)	> 3.5 (for U = 11 V)	> 6 (for U = 11 V)
	At state 0	Voltage	**V**	⩽ 1.2	⩽ 5 (default state)	⩽ 5
		Current	**mA**	< 1 (for U = 1.2 V)	< 1.5 (for U = 5 V)	< 2 (for U = 5 V)
Control of voltage/sensor feedback				Presence check	–	
Input impedance for nominal U			**Ω**	270	3000	
Type of input				Resistive		Current sinks
Conforming to IEC 1131				–	Type 1	Type 2
2-wire compatibility detector:				–		Yes (all 24 V detectors)
3-wire compatibility detector				–		Yes (all 24 V detectors)

Output characteristics

Type of output		Analog outputs (1 per axis)	Servo drive validation (1 relay output per axis)	Reflex outputs (1 per axis)
Range	**V**	± 10, 24	–	
Resolution		13 bits + sign	–	
LSB value	**mV**	1.25	–	
Nominal voltage	**V**	–	⎓ 24	
Voltage limit	**V**	–	5…30	19...30 (possible up to 34 V, limited 1 hr per 24 hr)
Current	**mA**	–		500 nominal
Maximum current	**mA**	1.5	200 (resistive charge under 30 V)	625 (for U = 30 or 34 V)
Minimum permitted load		–	1 V/1mA	–
Max voltage drop ON	**V**	–		< 1
Leakage current	**mA**	–		< 0.3
Switching time		–	<5 ms	< 500 µs
Compatibility with d.c. inputs		–		All positive logic inputs for which the input resistance is < 15 kΩ
Conforming to IEC 1131		–		Yes
Short-circuit and overload protection		–		By current limiter and thermal release
Channel overvoltage protection		–		Zener diodes between the inputs and the + 24 V
Protection against reverse polarity		–		By diode in the opposite direction to the power supply

Presentation: page 68 References: pages 71 and 72 Connections: page 73

Lexium 15 motion control
TSX CAY motion control modules for servo motors

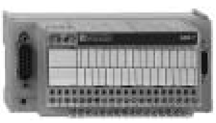

TSX CAY 2●

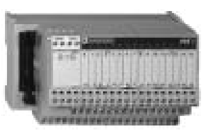

TSX CAY 33


TSX CAY 4●


TSX TAP S15 05


TSX TAP MAS


ABE 7CPA01


ABE 7H16R20

Motion control modules for servo motors *(1)*

Type of input	Characteristics	Function	No. of axes *(2)*	Reference *(3)*	Weight kg
Incremental encoders 5 V⎓ RS 422, 10…30 V⎓ Totem pole *(4)* **Absolute encoders** RS 485 serial or parallel *(5)*	500 kHz counter with incremental encoder 200 kHz acquisition with absolute serial encoder	Servo control on independent linear axis	2	**TSX CAY 21**	0.480
			4	**TSX CAY 41**	0.610
		Servo control on independent linear or independent infinite axis Following axes Servo drive realtime offset correction Cut on the fly *(6)*	2	**TSX CAY 22**	0.480
			4	**TSX CAY 42**	0.610
		Servo control on linear or infinite axis Linear interpolation on 2 or 3 axes Servo drive realtime offset correction	3	**TSX CAY 33**	0.610

Connection elements

Connection accessories

Description	Connection	Type of connector on module TSX CAY ●●	Item no. *(7)*	Reference	Weight kg
SUB-D connectors (sold in lots of 2)	SSI absolute/ incremental encoder	15-way SUB-D (1 per axis)	–	**TSX CAP S15**	0.050
	Speed references	9-way SUB-D (1 per TSX CAY module)	–	**TSX CAP S9**	0.050
Connection interface for incremental encoder	Incremental encoder 5 V⎓ RS 422/RS 485	15-way SUB-D (1 per axis)	3	**TSX TAP S15 05**	0.260
Splitter unit	Speed references towards servo drives	9-way SUB-D (1 per TSX CAY module)	–	**TSX TAP MAS**	0.590
Telefast 2 connection bases	Speed references	9-way SUB-D (1 per TSX CAY module)	–	**ABE 7CPA01**	0.300
	Auxiliary inputs, reflex outputs, I/O power supply 24 V⎓, encoder power supplies 5/24 V⎓	10, 20-way HE (1 for 2 axes)	–	**ABE 7H16R20**	0.300
	Servo drive control signals, I/O power supply 24 V⎓	10, 20-way HE (1 per TSX CAY module)	–	**ABE 7H16R20**	0.300
Adaptor base	Absolute encoders with parallel outputs (16 to 24 bit) 5 V⎓, 10…30 V⎓	15-way SUB-D	–	**ABE 7CPA11**	0.300

(1) To order other accessories please consult our “Automation platform Modicon Premium and Unity - PL7 software” specialist catalogue.
(2) Double format TSX CAY 41/42/33 modules.
(3) Supplied with a multilingual quick reference guide: in English and French.
(4) Totem pole encoder with supplementary Push/Pull outputs.
(5) Parallel output absolute encoders with ABE 7CPA11 adaptor interface.
(6) Cut on the fly function available with TSX CAY 22 module. Requires Unity Pro software version ≥ 2.2 or PL7 Junior/Pro software version u 4.1
(7) Item no. see page 73.

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Characteristics::
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Connections:
page 73

Lexium 15 motion control

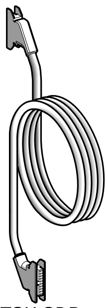
TSX CAY motion control modules for servo motors

Connection elements (continued)

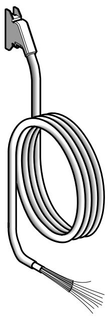
Cables

Description	Use From	Use To	Item no. (1)	Length m	Reference	Weight kg
Cables fitted with SUB-D connectors	TSX CAY●● module, 15-way SUB-D connector	TSX TAP S15 05 interface or ABE 7CPA11 adaptor base (15-way SUB-D connector)	2	0.5	**TSX CCP S15 050**	0.110
				1	**TSX CCP S15 100**	0.160
				2.5	**TSX CCP S15**	0.220
	TSX CAY●● module, 9-way SUB-D connector (speed reference)	ABE 7CPA01 sub-base or TSX TAP MAS splitter unit (15-way SUB-D connector)	4	2.5	**TSX CXP 213**	0.270
				6	**TSX CXP 613**	0.580
Sectors equipped with a SUB-D connector and a free end (servo drive side)	TSX CAY ●● module, or TSX TAP MAS unit	Lexium 05/15/17D servo drive speed reference, Twin Line TLD 13 or other drives (section 0.205 mm²)	5	6	**TSX CDP 611**	0.790
Connection cables fitted with HE 10 connectors	TSX CAY ●● module, (cast mould 20-way HE 10 connector)	ABE 7H16R20 sub-base (10, 20-way HE connector) 500 mA max cable	6	0.5	**TSX CDP 053**	0.085
				1	**TSX CDP 103**	0.150
				2	**TSX CDP 203**	0.280
				3	**TSX CDP 303**	0.410
				5	**TSX CDP 503**	0.670
Sectors equipped with an HE 10 connector and a free end (servo drive side)	TSX CAY ●● module, (cast mould 20-way HE 10 connector)	Auxiliary inputs, reflex output, control signals, power supplies (free end) 20 wire 500 mA max sectors	7	3	**TSX CDP 301**	0.400
				5	**TSX CDP 501**	0.660
Cables equipped for Lexium 15 servo drives	TSX CAY ●● module, 15-way SUB-D connector (encoder input)	Simulated incremental encoder feedback (9-way SUB-D connector)	8	2	**TSX CXP 235**	0.210
				6	**TSX CXP 635**	0.470
		Simulated absolute encoder feedback (9-way SUB-D connector)	9	2	**TSX CXP 245**	0.210
				6	**TSX CXP 645**	0.470

(1) Item no. see page 73.



TSX CDP ●●3



TSX CDP ●01

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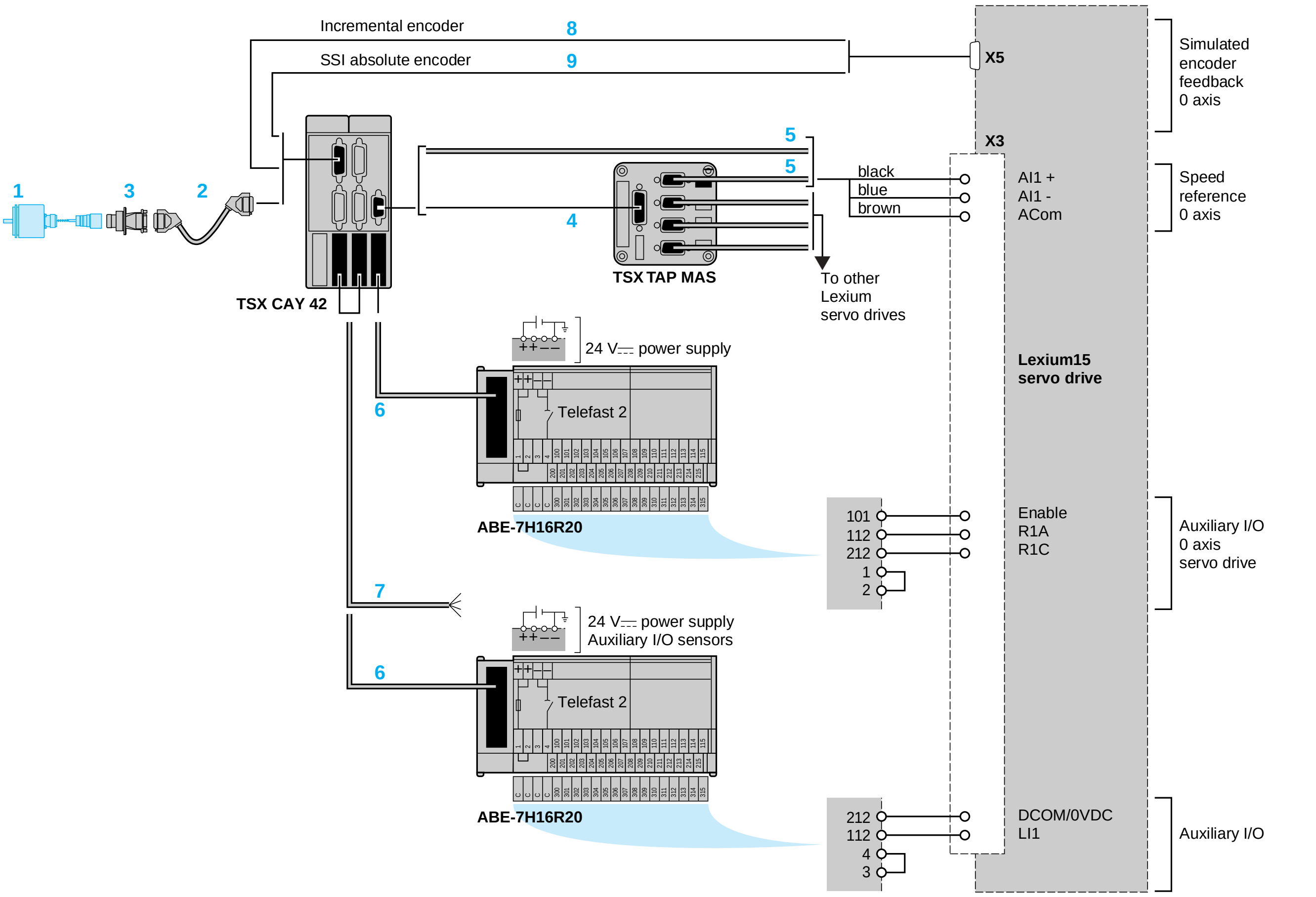
Lexium 15 motion control
TSX CAY motion control modules for servo motors

Example of Lexium 15 servo drive connection for BDH/BSH servo motor



1 Absolute/incremental encoder
2 TSX CCP S15●●● fitted cable (encoder feedback)
3 TSX TAP S15 05 connector
4 TSX CXP 213/613 fitted cable
5 TSX CDP 611 fitted sector
6 TSX CDP●●3 fitted cable
7 TSX CDP●01 fitted sector
8 TSX CXP 235/635 fitted cable (simulated incremental encoder feedback)
9 TSX CXP 245/645 fitted cable (simulated SSI absolute encoder feedback)

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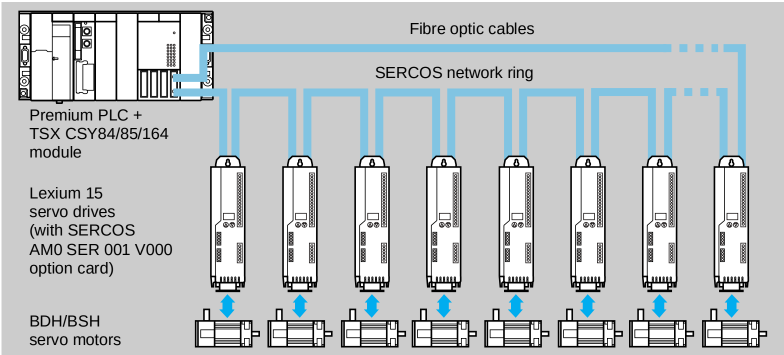
Characteristics:: pages 69 and 70
References: pages 71 and 72

Lexium 15 motion control
SERCOS TSX CSY 84/85/164
motion control modules

Presentation



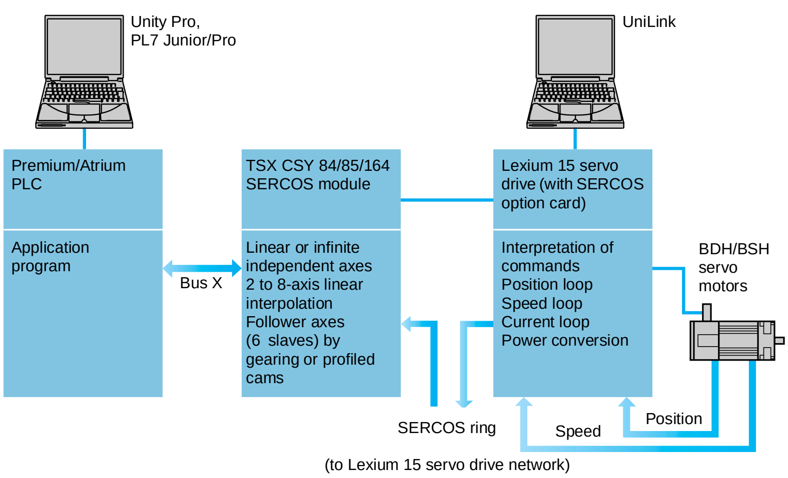
SERCOS (SERial COmmunication System) is a communication standard which defines the digital link (exchange protocol and medium) between a motion control module and servo drives. This is defined in European standard EN 61491.
The use of SERCOS distributed architecture allows application I/O (position encoder, emergency stop, etc.) to be connected directly to the servo drives, thus reducing connection costs. The fibre optic digital link permits high speed exchanges (2 or 4 Mbps) while ensuring a high level of immunity in disturbed industrial environments.

The SERCOS range in the Premium automation platform consists of:
■ TSX CSY 84/85/164 axis control modules *(1)* which can each control up to 8 servo drives (TSX CSY 84/85) and 16 servo drives (TSX CSY 164) via a SERCOS ring. The module calculates the path and the interpolation for several axes (position mode). Access to the other modes (speed and torque) is possible with the assistance of Schneider Electric application services.
■ 1.5 A to 70 A permanent Lexium 15 servo drives (fitted with SERCOS option card). The servo drives manage the position loop, speed loop and torque loop, and ensure power conversion to control the servo motor. The sensor feedback information is sent to the servo drive (current position, current speed).
■ BDH and BSH servo motors. The motors feature permanent magnets delivering a high power-to-weight ratio, resulting in excellent dynamic speed response in a compact unit.
The Lexium 15 range offers all the accessories required (line chokes, braking resistors, etc.) as well as a full set of connectors.

(1) The TSX CSY 85 module also supports path functions using the TjE path editor software.

System overview

The system overview shows the various functions performed by the different parts of the multi-axis control system.



Characteristics: pages 76 and 77
Functions: pages 78 to 80
References: page 81
Connections: page 81

Lexium 15 motion control

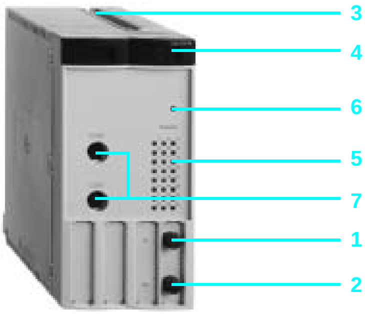
SERCOS TSX CSY 84/85/164
motion control modules

System overview (continued)

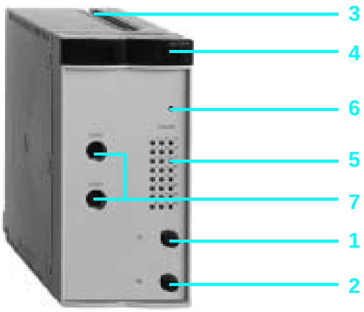
PL7 Junior/Pro or Unity Pro software via the Premium platform terminal port can be used to:
■ Declare SERCOS TSX CSY 84/85/164 modules in the PLC configuration.
■ Configure the functions and define the parameters for the axes used.
■ Program the movements in the PLC application.
■ Adjust the parameters via the operating codes (parameters, TSX CSY module and Lexium 15 servo drive with SERCOS option card).
■ Test and debug the application.

Unilink software, via the Lexium 15 servo drive's RS 232 terminal port (with SERCOS option card) can be used to:
■ Define types of Lexium 15 servo drive (with SERCOS option card) and BDH/BSH servo motor.
■ Adjust the parameters for Lexium 15 servo drives (with SERCOS option card), back them up in the servo drive EEprom memory and save them on a compatible PC.

Description



TSX CSY 84/164



TSX CSY 85

The SERCOS TSX CSY 84/85/164 axis control modules comprise:
1 An SMA-type connector, marked TX, for connecting the servo drives using the SERCOS ring fibre optic transmission cable.
2 An SMA-type connector, marked RX, for connecting the servo drives using the SERCOS ring fibre optic reception cable.
3 Double format rigid casing, in order to:
□ Support electronic cards.
□ Attach and lock the module in its slot.
4 Module diagnostics LEDs:
□ RUN LED (green): LED ON indicates module operating correctly.
□ SER LED (yellow): flashing LED indicates data transmission and reception on the SERCOS network.
□ ERR LED (red):
- LED ON indicates internal module fault.
- flashing LED on module start up indicates communication fault, incompatible configuration or application missing.
□ I/O LED (red): LED ON indicates external fault or application fault.
□ INI LED (yellow): flashing LED indicates module reinitializing.
5 Channel diagnostic LEDs (green): LED ON indicates axis operating normally; OFF: configuration fault; flashing: serious error on axis:
□ 1 to 8: display of 8 real axes *(1)*.
□ 9 to 12: display of 4 imaginary axes *(1)*.
□ 13 to 16: display of 4 remote axes *(1)*.
□ 17 to 20: display of 4 coordinated sets.
□ 21 to 24: display of 4 follower sets.
6 A pencil point button to reinitialize the module.
7 Two mini DIN type 8-way connectors for Schneider Electric use.

*(1) 1 to 16: display of 16 axes (real, imaginary or remote) with module **TSX CSY 164**.*

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Lexium 15 motion control

SERCOS TSX CSY 84/85/164 motion control modules

Electrical characteristics

Module type			TSX CSY 84	TSX CSY 85		TSX CSY 164		
SERCOS network:	Type		Industrial support complying with standard EN 61491					
	Topology		Ring					
	Medium		Fibre optic cable					
	Rate		4 Mbps by default					
	Cycle time *(1)* (independent axes)	**ms**	2 axes	4 axes	8 axes	2/4/8 axes	12 axes	16 axes
			2	2	4	2	3	4
	Max. number of segments		9			17		
	Length of segment	**m**	38 max. with plastic fibre optic cable, 150 max. with glass fibre optic cable					
Bus X	Distance	**m**	100 max. *(2)* between TSX CSY 84/85/164 axis control module and Premium processor					
SERCOS certification			TSX CSY 84/164 modules comply with SERCOS IEC/EN 61491 certification and with the tests defined by IGS (SERCOS Interest Group). Certification no. Z00030					
Power consumption for 5 V⎓ voltage		**A**	1.8					
Power dissipated in the module		**W**	9 (typical)					

Operating characteristics

Module type			TSX CSY 84	TSX CSY 85	TSX CSY 164
Number of channels			32 configurable channels (0 to 31), channel 0 used for SERCOS ring configuration		
Type of axes	Real axes (connected to a servo drive)		8 (channels 1 to 8)		16 (channels 1 to 16) may be dynamically configured as real axes, imaginary axes or external encoders
	Imaginary axes		4 (channels 9 to 12)		
	Remote axes *(3)*		4 (channels 13 to 16)		
Set of axes			4 coordinated (channels 17 to 20) Each set allows simple linear interpolation of 2 to 8 axes		
			4 followers (channels 21 to 24) Each set can have up to 7 axes: 1 master/6 slaves in gearing or camming mode		
Cam profile			7 (channels 25 to 31). Used to create the electronic cams with linear or cubic interpolation between profile points		
Path functions			Simple linear paths, following of auxiliary axes	Linear paths: - with 3° or 5° polynomial links. - with circular link on 2 axes. Circular path TjE path editor software for sets of 2 or 3 axes	Simple linear paths, following of auxiliary axes

(1) 4 ms default value. Values may be programmed according to the number of axes.
*(2) Without use of the **TSX REY 200** bus X remote module.*
(3) Determine external position using an encoder connected to the servo drive position input.

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Lexium 15 motion control
SERCOS TSX CSY 84/85/164 motion control modules

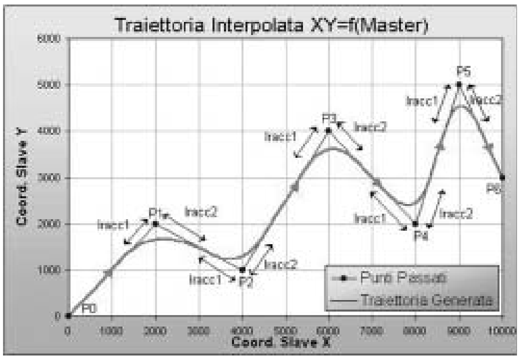
Main functions of TSX CSY 84/85/164 modules

Programming	Movements	Homing, absolute, relative or continuous Immediate movement, or queued, to a given position Speed override possible Acceleration and deceleration parameters may be set for each axis motion control Synchronization on start or desynchronization on stop for a slave axis on a master axis in a given position Rollover counter
	Special functions	Position capture and distance measurement between two edges on one or two logic inputs on the servo drive. This can be applied to the real or remote axis (position measurement via external sensor) Count probe: counts the edges on a logic input on the servo drive over a period of time Fast index: starts a movement on an event Registration move: position capture on an edge of the logic input on the servo drive Rotary knife: cuts using a rotary knife. Synchronizes a circular axis on a linear axis and controls a logic output on the servo drive
	Other special functions	It is possible to develop all other special functions with the assistance of our application services. Please consult our Regional Sales Offices.
	Stop/start functions	Fast stop, stop on configured deceleration profile Temporary stop Restart of stopped movement Choice of stop method: ■ on faulty slave: master is not stopped. Master stops normally according to pre-determined deceleration ramp or servo-driven master emergency stop ■ on faulty master: slave stops normally according to pre-determined deceleration ramp or servo-driven slave emergency stop On Emergency Stop: calculation of slave axis deceleration ramp alignment with master axis to obtain synchronized stopping of all axes in the set On Emergency Stop: axes may be allowed to "freewheel" or may be stopped according to a pre-determined ramp
Configuration and adjustment	SERCOS ring	Bus cycle time, traffic on the bus, optical power on the fibre, SERCOS loop diagnostics
	Acceleration/deceleration	Ramp values, ramp type (rectangular, triangular and trapezoid), choice of units, maximum acceleration adjustment
	Speed	Speed units, default speed, maximum speed, speed override
	Other settings	Target window, rollover, software limits
	Set of follower axes	Following of master axis by gearing or camming (cam profile), threshold position of master triggers the following, bias value when synchronizing an axis, monitoring of master/slave positions, master offset for follower axis
	Set of coordinated axes	Type of interpolation: linear
	Cam profile	Values of an existing point of a cam profile, number of points (5000 max.), type of interpolation, table addresses
	State of a movement or axis	Moving, accelerating, decelerating, homing, in position, faulty, etc.
	Diagnostics	Servo drive fault, axis currently reading data, following error, overvoltage, undervoltage, overcurrent, power supply fault Availability of follower axis fault information for a given axis set Multi-axis motion path control according to a common tolerance for all axes in the motion, with alarm feature. Only available with the TSX CSY 164 module

Presentation: page 74 | Functions: pages 78 to 80 | References: page 81 | Connections: page 81

Functions specific to the TSX CSY 85 module

Path creation using TjE editor



All paths, whether simple or complex, are divided into linear or circular segments linked by interpolation laws of 6 possible types. Each segment is characterized by:

- ■ The X and Y coordinates of the point to be reached (in the example on the left, P6) or "tangented" (P1, P2,....P5)
- ■ The movement speed, maximum or limited according to setpoint (parameter "ParF0", see screens below):
- □ The type of interpolation (parameter "ParW0", see screens below)
- □ The number of points in the linear segment (min. 1 point)
- □ The number of points in the cubic interpolation part of the segment
- □ Various other parameters depending on the type of interpolation

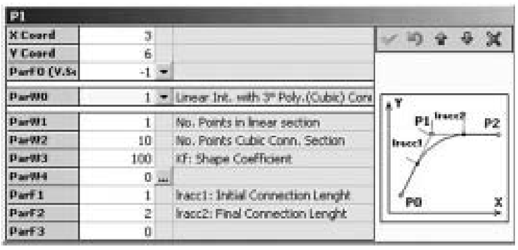
Linear interpolation

This type of interpolation is used to create a rectilinear path between the preceding point P_{i-1} and point P_i defining the segment. The various parameters below are used as follows:

- ■ "ParW1" indicates the number of points in the linear segment. The number of points represents the number of intermediate points that the TSX CSY 85 motion control module must calculate to define the path on the segment (minimum 1).
- ■ "ParW4" is used to indicate that the movement of a third axis will follow the path (here, a linear segment) using the tangential mode: positioning according to a constant angle with the path *(1)*.

(1) Available in the future version of the TjE software.

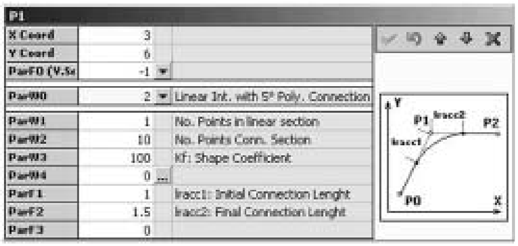
Linear interpolation with 3° polynomial interpolation connection



This type of interpolation is used to create a curve between two linear segments in accordance with a 3° interpolation in order to smooth the transitions. The path no longer passes through the defined point P_i (in the example on the left, P1) but follows a curve defined by the following parameters:

- ■ "ParW2" indicates the number of points in the cubic interpolation part (curve)
- ■ "ParW3" defines the shape coefficient of the cubic interpolation enabling the curve to move closer to or further from the defined point P_i
- ■ "Iracc1" and "Iracc2" correspond to the initial and final connection lengths. If these lengths are too great, maximum lengths are calculated by the TSX CSY 85 motion control module as a function of the previous section for Iracc1 and of the following section for Iracc2.

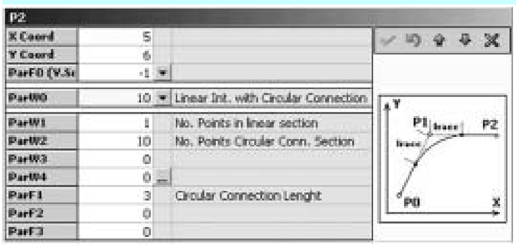
Linear interpolation with 5° polynomial interpolation connection



This type of 5° polynomial interpolation is used to define a path in the same way as that using 3° polynomial interpolation.

Nonetheless, compared to a 3° interpolation, 5° interpolation ensures more flexible movement.
If the acceleration limit in the segment in question is reached, however, the speed on the segment can be reduced for this type of connection.

Linear interpolation with circular interpolation connection



This type of interpolation is used to link segments via a circular path (circle arcs or full circles). The specific parameters defining this type of path are:

- ■ "ParW2" indicates the number of points in the circular interpolation part
- ■ "ParW4" defines whether the arc is greater or less than 180° (defining the arc direction)
- ■ "ParF1" corresponds to the length of the circular interpolation segment

Circular interpolation is only possible for a movement in a plane involving only 2 axes.

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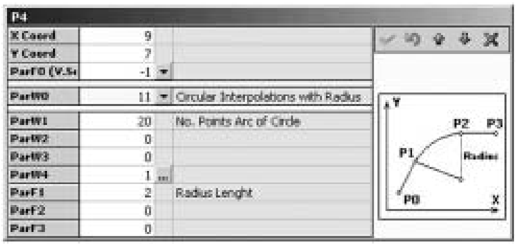
Characteristics: pages 76 and 77
References: page 81
Connections: page 81

Functions specific to the TSX CSY 85 module (continued)

Circular interpolation according to radius



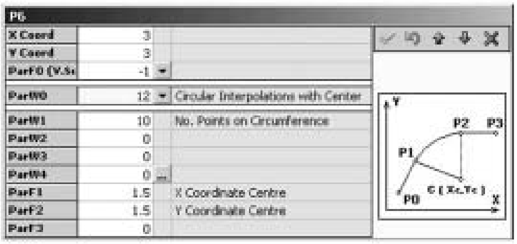
This type of interpolation is used to connect segments via a circular path (circle arcs) by specifying the start and end points, the circle radius and the path direction (clockwise or counter-clockwise). The specific parameters defining this type of path are:

- "ParW1" indicates the number of points in the circle arc
- "ParW4" defines the path direction (clockwise or counter-clockwise)
- "ParF1" corresponds to the radius of the circle arc

Circular interpolation according to radius:

- Is only possible for a movement in a single plane (2 axes only)
- Cannot be used to create paths in a full circle (to do this, use linear interpolation with connection according to circular interpolation)

Circular interpolation according to centre

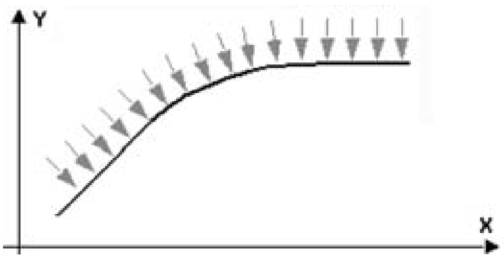


This type of interpolation is also used to connect segments by a circular path (circle arcs or full circles) by specifying the start and end points, the circle centre coordinates and the path direction (clockwise or counter-clockwise). The specific parameters defining this type of path are:

- "ParW1" indicates the number of points in the circle arc
- "ParW4" defines the path direction (clockwise or counter-clockwise)
- "ParF1" indicates the abscissa of the centre of the circle (X)
- "ParF2" indicates the ordinate of the centre of the circle (Y)

Full circular movement is defined as the end point being the same as the start point.
Circular interpolation is only possible for a movement in a single plane (2 axes only).

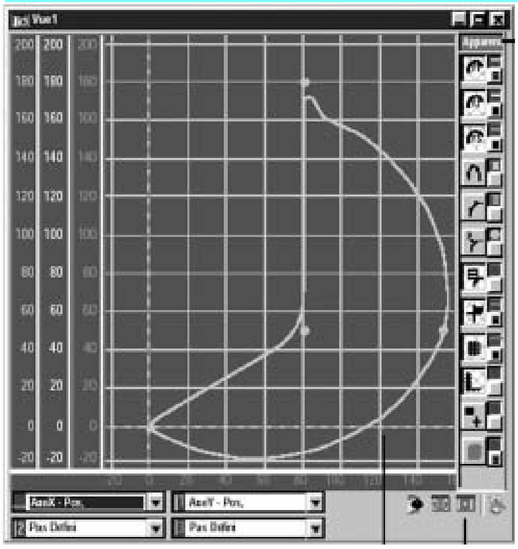
Tangential axis interpolation



Tangential axis interpolation applied to a third angular axis is used to enable it to follow the path defined by the first two axes according to a constant and controlled angle.
Tangential mode will be fully available in a future version.

This version V1.0 of the TSX CSY 85 module, however, offers functions for creating tangential mode using the PL7 application.

TjE path editor software



The TjE path editor software supplied with the SERCOS TSX CSY 85 motion control module is used in offline mode to:

- Create master/slave axes and axis sets for use in the paths with a maximum of 3 sets of 2 real axes or 2 sets of 3 axes.
- Each slave axis requires a cam profile selected from the 7 profiles available in the TSX CSY 85 module (with a limit of 10,000 cam points for all the profiles).
- Define paths by setting the parameters for each segment which are linked to the various possible interpolations described in pages 78 and 79.

The TjE software validates all the parameters and calculates the paths for each set of axes.

Path display

The TjE software integrates different graphic tools for displaying the previously created paths and the relevant data linked to the axes (making up the paths) with their positions, speeds and accelerations. The paths can be displayed with:

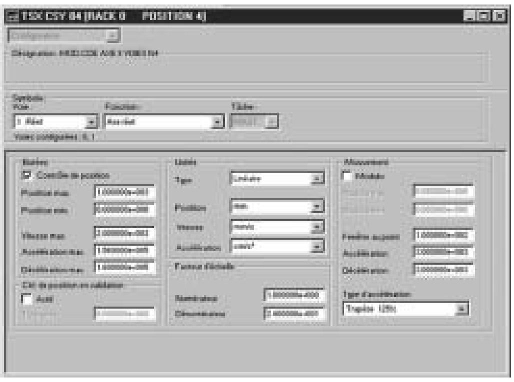
- A choice of curves, colours and scaling
- A choice of scales and offsets
- Display of segment reference points
- Display of points of the master, and calculated points of cam profiles

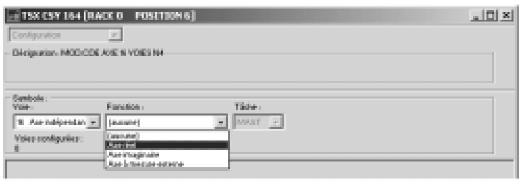
This display enables the user to validate the paths before transferring all the data thus generated to the PL7 Junior/Pro application managing the SERCOS TSX CSY 85 motion control module(s).

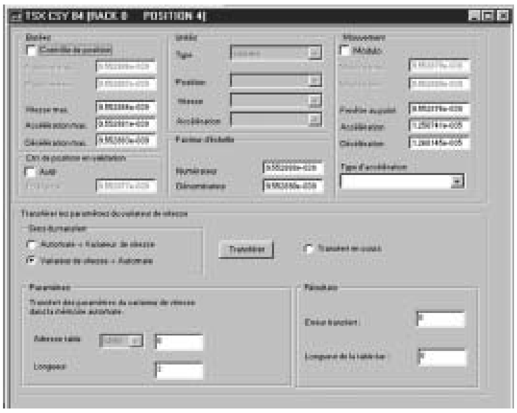
(1) *Maximum 8 real axes per **TSX CSY 85** module.*

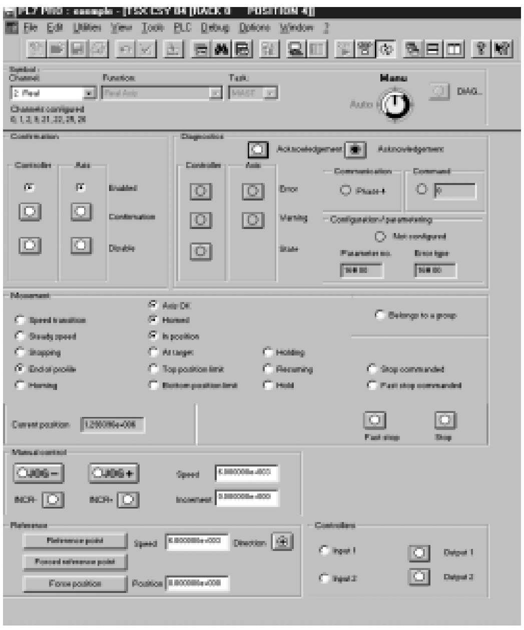
Lexium 15 motion control
SERCOS TSX CSY 84/85/164 motion control modules

Software setup of TSX CSY 84/85/164 modules


Module configuration


Declaring the axes of the TSX CSY 164 module


Setting the axis parameters


Debugging in PL7 Pro software

When setting up application-specific functions, screens specific to SERCOS motion control functions can be accessed via Unity Pro or PL7 Junior/Pro software, for configuration, adjustment, debugging and documentation of applications. These services are performed by editors which can be directly accessed from the basic screen using icons in the toolbars. Windows relating to the editors can be simultaneously displayed on one screen (example: it is possible to program using the program editor and to simultaneously define the symbols in the variables editor).

Declaring the SERCOS motion control modules
Parameter entry for application-specific functions is accessed via the configuration screen, by clicking on the slot occupied by the module.

Configuring the module
The configuration editor provides assistance with entering and modifying the values of the various axis configuration parameters. These parameters enable the operation of the axis control module to be adapted to the machine which is to be controlled. The axes configuration parameters are:
- Units of measurement
- Resolution
- Maximum and minimum limit positions
- Maximum speed
- Accelerating/decelerating

This data relates to the machine and cannot be modified by the program.

The configuration screen as shown here can be used to declare the 16 axes as real, imaginary or remote measurement axes in the TSX CSY 164 module.

Adjusting the modules
These parameters are associated with operation of the axes. They generally require the operations on and movements of the moving part to be known. These parameters are adjusted in online mode (they are initialized during configuration, in offline mode). They include:
- Maximum speed
- Resolution
- Servo control parameters
- Accelerating/decelerating

Debugging the modules
In online mode, the debugging tool provides the user with a control panel screen, giving a quick display which can be used to control and observe the behaviour of the axis.

The TSX CSY 84/85/164 modules associated with the Unity Pro or PL7 Junior/Pro software provides manual mode for running continual (JOG) or incremental (INC) motion commands without prior programming.

Presentation: page 74 | Characteristics: pages 76 and 77 | References: page 81 | Connections: page 81

Lexium 15 motion control

SERCOS TSX CSY 84/85/164 motion control modules

References *(1)*

TSX CSY 84/85/164 multi-axis control modules have 32 application-specific channels which are only counted they are configured in the Premium PLC application (using PL7 Junior/Pro or Unity Pro software). The maximum number of application-specific channels allowed depends on the type of processor:

Type of processor or slot PLC	TSX 57 1●	TSX 57 2● PCX 57 20 PCI 57 20	TSX 57 3● PCX 57 35 PCI 57 35	TSX 57 4●	TSX 57 5●
Max. number of application-specific channels	8	24	32	64	64

TSX CSY 84/164

TSX CSY 85

Motion control modules

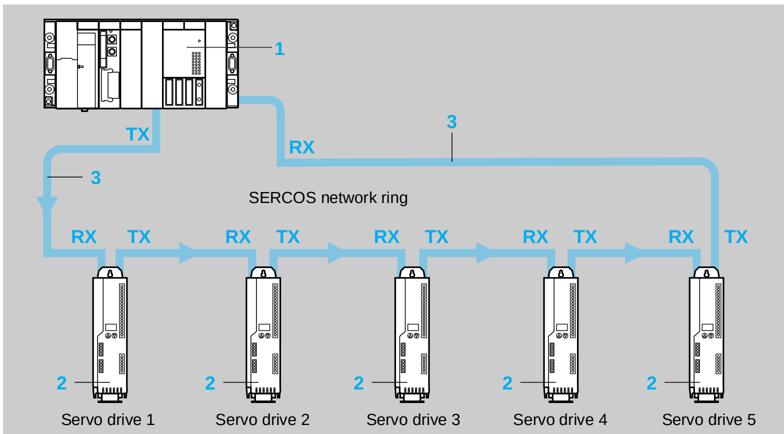
Description	Functions	Number of axes	Reference	Weight kg
Multi-axis control modules	SERCOS digital servo drives control	8 real axes 4 imaginary axes 4 remote axes	**TSX CSY 84**	0.520
		8 real axes 4 imaginary axes 4 remote axes TjE path creation function	**TSX CSY 85**	0.520
		16 axes (real, imaginary or remote)	**TSX CSY 164**	0.520

Fibre optic connection cables

Description	Connection	Length	Reference	Weight kg
Plastic fibre optic cables fitted with SMA-type connectors (curvature radius: 25 mm min.)	Lexium 15 servo drive (with SERCOS option card)	0.3 m	**990 MCO 000 01**	0.050
		0.9 m	**990 MCO 000 03**	0.180
		1.5 m	**990 MCO 000 05**	0.260
		4.5 m	**990 MCO 000 15**	0.770
		16.5 m	**990 MCO 000 55**	2.830
		22.5 m	**990 MCO 000 75**	4.070
		37.5 m	**990 MCO 001 25**	5.940

Connections

SERCOS ring with five Lexium 15 servo drives (example)



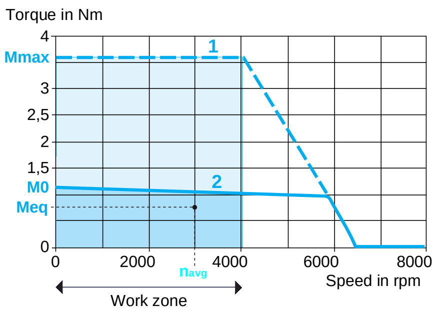
1 **TSX CSY 84/85/164**: multi-axis motion control module for Premium PLC.
2 **LXM 15●●●M3/N4/N4X**: Lexium 15 servo drives fitted with the SERCOS AM SER 001V000 option card, see page 38.
3 **990 MCO 000 ●●**: plastic fibre optic cables fitted with SMA-type connectors.
TX Transmission
RX Reception

(1) To order other accessories please consult our "Automation platform Modicon Premium and Unity - PL7 software" specialist catalogue

Lexium 15 motion control
BDH servo motors

105999

BDH servo motor



Presentation

Thanks to the advanced technology incorporated into their design, BDH servo motors represent a compact and high-performance solution for your machines, offering one of the best torque/size ratios available on the market.
7 flange sizes and multiple winding possibilities mean that these servo motors can be sized to match the requirements of each application. This product offer covers a torque range of between 0.18 Nm to 53 Nm for speeds from 10,000 to 8000 rpm.

The BDH servo motors come in 7 flange sizes available in IEC or NEMA mounting: 40, 58, 70, 88, 108, 138 and 188 mm. They are fitted as standard with angled connectors, with the exception of the 40 mm flange size which is supplied with remote straight connectors. Thermal protection is provided by a PTC probe integrated into the servo motor.
They are certified as "Recognized" ® by the Underwriters Laboratories and conform to UL 1004 standards as well as to European directives (CE marking).

BDH servo motors are available with the following variants:
- IP 54 or IP 67 degree of protection
- with or without holding brake
- resolver, SinCos Hiperface® single turn or multiturn encoder
- untapped or keyed shaft end
- IEC or NEMA mounting

Torque/speed characteristics

The BDH servo motors provide torque/speed curve profiles similar to the example shown on the left with:
1 Peak torque, depending on the servo drive model
2 Continuous torque, depending on the servo drive model
where:
- 8000 (in rpm) corresponds to the servo motor's maximum mechanical speed
- M_{max} (in Nm) represents the peak stall torque value
- M_{max} (in Nm) represents the continuous stall torque value

Principle for determining servo motor size according to the application

The torque/speed curves can be used to determine the correct servo motor size. For example, for a power supply voltage of 230 V single phase, the curves used are curves 1 and 2. Then:
1 Position the work zone of the application in relation to speed
2 Verify, using the motor cycle diagram, that the torques required by the application during the different cycle phases are located within the area bound by curve 1 in the work zone
3 Calculate the average speed n_{avg} and the equivalent thermal torque M_{eq} (see page 146)
4 The point defined by n_{avg} and M_{eq} must be located below curve 2 in the work zone

***Note:** Sizing of servo motors, see page 146*

Functions

General functions

BDH servo motors have been developed to meet the following requirements:
- Functional characteristics, robustness, safety, ... in compliance with IEC/EN 60034-1
- Ambient operating temperature: 5...40°C in compliance with EN 50178 climatic class 3K3. Maximum 50°C with derating from 40°C of 1 % per additional °C
- Relative humidity: 95% without condensation in compliance with EN 50178 climatic class 3K3
- Altitude: 1000m without derating, 2000m with k = 0.94 *(1)*, 3000m with k = 0.83
- Storage and transport temperature: - 25...55°C in compliance with EN 50178 climatic class 1K4
- Winding insulation class: F (threshold temperature for windings 155°C) in compliance with DIN 57530
- Power and sensor connection using angled connectors (with the exception of the 40 mm flange size supplied with remote straight connectors)
- Thermal protection by built-in PTC thermistor probe, controlled by the Lexium 15 servo drive

(1) k: derating factor

Characteristics: pages 84 to 129
References: pages 130 to 133
Dimensions: pages 134 to 137

Functions (continued)

General functions (continued)

■ Out-of-round, concentricity and perpendicularity between flange and shaft in accordance with DIN 42955, class N
■ Flange compliant with standard DIN 42948
■ Authorized mounting positions: no mounting restriction IMB5, IMV1 and IMV4 in accordance with DIN 42950
■ Opaque black lacquer paint RAL 9005
■ Degree of protection:
□ of the frame: IP 65 in accordance with IEC/EN 60529
□ of the shaft end: IP 54 or IP 67 in accordance with IEC/EN 60529
■ Integrated sensor: resolver, SinCos Hiperface® high resolution single turn or multiturn encoder
■ Untapped or keyed shaft end in standard sizes (according to DIN 748)

Holding brake (depending on model)

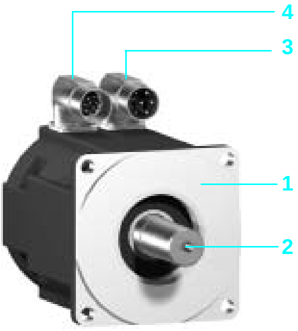
The integrated brake fitted to the BDH servo motors (depending on the model) is a failsafe electro-magnetic holding brake.

⚠ **Do not use the holding brake as a dynamic brake for deceleration, as this will rapidly damage the brake.**

Built-in position sensor

The servo drive is fitted, depending on the model, with a position sensor which can be:
■ A 2-pole resolver providing angular precision of the shaft position, accurate to less than ±30 arc minutes.
■ A SinCos Hiperface® high resolution single turn (4096 points) or multiturn (4096 points x 4096 turns) absolute encoder providing angular precision of the shaft position, accurate to less than ±1.3 arc minutes.

These sensors perform the following functions:
■ Give the angular position of the rotor in such a way that flows can be synchronized
■ Measure the motor speed via the associated Lexium servo drive. This information is used by the speed controller of the Lexium servo drive
■ Measure the position information for the Lexium servo drive position controller, if necessary
■ Measure and transmit position information in incremental or absolute format for the position return of a motion control module (Encoder emulation output of the Lexium servo drive).



Description

BDH servo drives with a 3-phase stator and a 6- to 10-pole rotor (depending on model) with Neodymium Iron Borium (NdFeB) magnets consist of:
1 An axial flange with 4 fixing points in accordance with standard DIN 42948
2 Standard shaft end according to DIN 748, untapped or keyed (depending on the model)
3 An angled dust and damp-proof male screw connector for connecting the power cable (with the exception of the 40 mm flange size supplied with remote straight connectors)
4 An angled dust and damp-proof male screw connector for connecting the control (sensor) cable (with the exception of the 40 mm flange size supplied with remote straight connectors)

Connecting cables must be ordered separately, see pages 132 and 133.

Schneider Electric has taken particular care to ensure compatibility between BDH servo motors and Lexium 15 servo drives. This compatibility can only be assured by using cables and connectors sold by Schneider Electric (see pages 132 and 133).

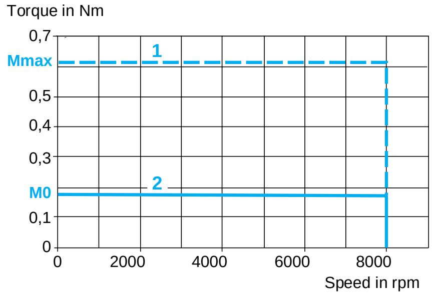
Characteristics of BDH 0401B/0402C servo motors

Type of servo motor				**BDH 0401B**		**BDH 0402C**	
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD13M3**	
Line supply voltage			**V**	230 single phase	230 3-phase	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	0.18		0.31	
	Peak stall	M_{max}	**Nm**	0.609		1.08	
Nominal operating point	Nominal torque		**Nm**	0.17		0.28	
	Nominal speed		**rpm**	8000			
Maximum current			**A rms**	0.82		1.06	
Servo motor characteristics							
Maximum mechanical speed			**rpm**	8000			
Constants (at 120°C)	Torque		**Nm/A rms**	0.16		0.21	
	Back emf		**V_{rms}/krpm**	10.2		13.3	
Rotor	Number of poles			6			
	Inertia – Without brake	J_m	**kgcm²**	0.017		0.031	
	Inertia – With brake	J_m	**kgcm²**	–			
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	20.2		12,4	
	Inductance (phase/phase)		**mH**	12,5		9.10	
	Electrical time constant		**ms**	0.62		0.73	
Holding brake (according to model)				See page 138			

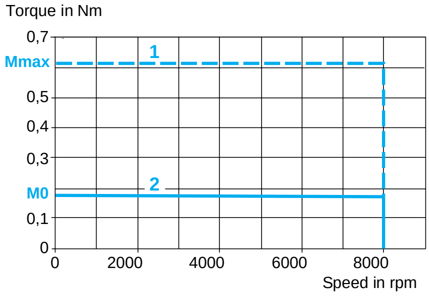
Torque/speed curves

BDH 0401B servo motor

With LXM 15LD13M3 servo drive
230 V single phase

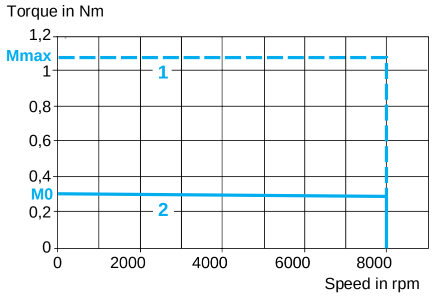


With LXM 15LD13M3 servo drive
230 V 3-phase

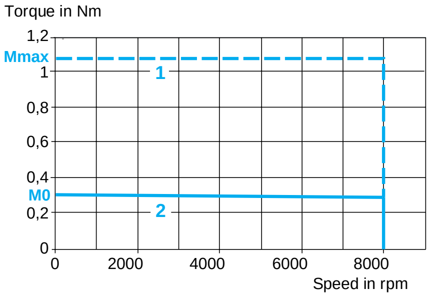


BDH 0402C servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 0403C servo motors

Type of servo motor			**BDH 0403C**	
Associated with Lexium 15 servo drive			**LXM 15LD13M3**	
Line supply voltage		**V**	230 single phase	230 3-phase
Torque	Continuous stall M_0	**Nm**	0.41	
	Peak stall M_{max}	**Nm**	1.46	
Nominal operating point	Nominal torque	**Nm**	0.36	
	Nominal speed	**rpm**	8000	
Maximum current		**A rms**	1.04	

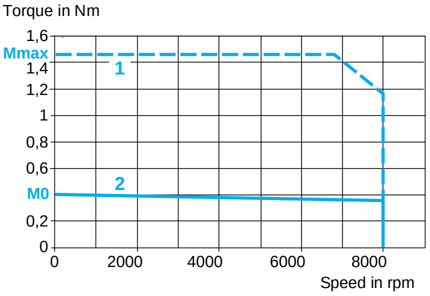
Servo motor characteristics

Maximum mechanical speed		**rpm**	8000
Constants (at 120°C)	Torque	**Nm/A rms**	0.28
	Back emf	**V_{rms}/krpm**	17.9
Rotor	Number of poles		6
	Inertia, Without brake J_m	**kgcm²**	0.045
	Inertia, With brake J_m	**kgcm²**	–
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	13.5
	Inductance (phase/phase)	**mH**	10.3
	Electrical time constant	**ms**	0.76
Holding brake (according to model)			See page 138

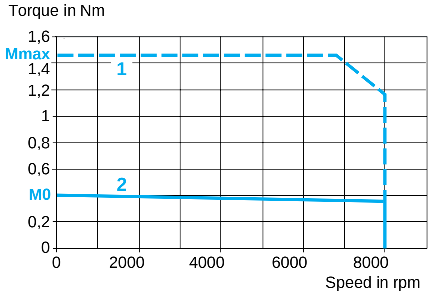
Torque/speed curves

BDH 0403C servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 82 and 83 | References: pages 130 to 133 | Dimensions: pages 134 to 137

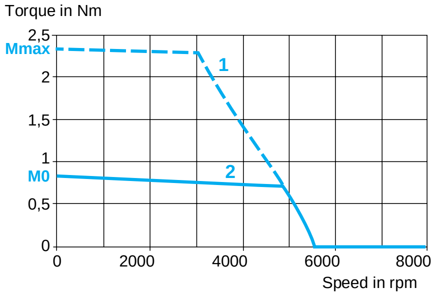
Characteristics of BDH 0582C/0582E servo motors

Type of servo motor				**BDH 0582C**			**BDH 0582E**	
Associated with Lexium 15 servo drive				**LXM 15LU60N4**			**LXM 15LD13M3**	
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	0.84			0.87	
	Peak stall	M_{max}	**Nm**	2.34			2.42	
Nominal operating point	Nominal torque		**Nm**	0.78	0.72	0.69	0.71	
	Nominal speed		**rpm**	3120	6240	7680	6880	
Maximum current			**A rms**	3.95			7.7	
Servo motor characteristics								
Maximum mechanical speed			**rpm**	8000				
Constants (at 120°C)	Torque		**Nm/A rms**	0.61			0.32	
	Back emf		**V_{rms}/krpm**	39			20.4	
Rotor	Number of poles			6				
	Inertia – Without brake	J_m	**kgcm²**	0.16				
	Inertia – With brake	J_m	**kgcm²**	0.171				
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	19.4			5.09	
	Inductance (phase/phase)		**mH**	35.5			9.7	
	Electrical time constant		**ms**	1.83			1.91	
Holding brake (according to model)				See page 138				

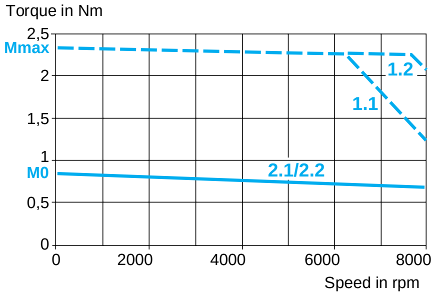
Torque/speed curves

BDH 0582C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase

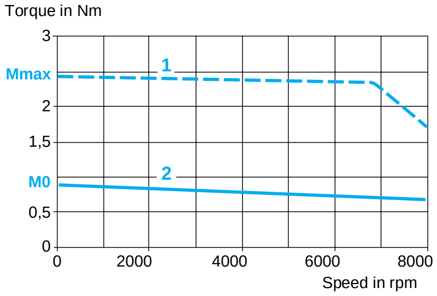


With LXM 15LU60N4 servo drive
400/480 V 3-phase

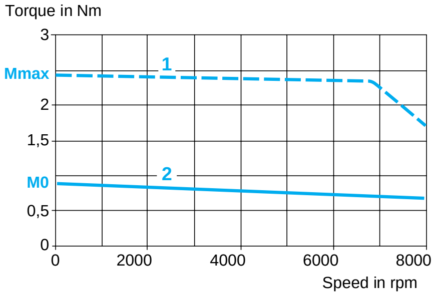


BDH 0582E servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83
References:
pages 130 to 133
Dimensions:
pages 134 to 137

Telemecanique

Characteristics of BDH 0583C servo motors

Type of servo motor				**BDH 0583C**		
Associated with Lexium 15 servo drive				**LXM 15LU60N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.13		
	Peak stall	M_{max}	**Nm**	3.2		
Nominal operating point	Nominal torque		**Nm**	1	0.87	0.82
	Nominal speed		**rpm**	2400	4880	6000
Maximum current			**A rms**	3.95		

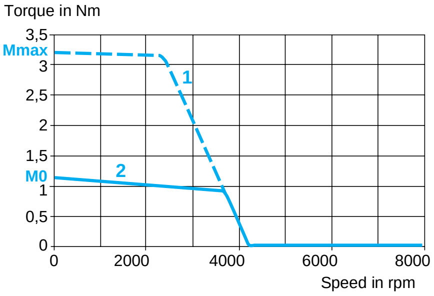
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	0.8
	Back emf			**V_{rms}/krpm**	51.8
Rotor	Number of poles				6
	Inertia	Without brake	J_m	**kgcm²**	0.22
		With brake	J_m	**kgcm²**	0.231
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	20.3
	Inductance (phase/phase)			**mH**	40.7
	Electrical time constant			**ms**	2
Holding brake (according to model)					See page 138

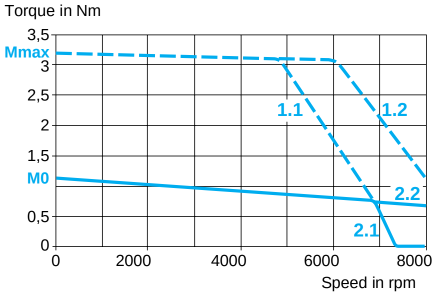
Torque/speed curves

BDH 0583C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

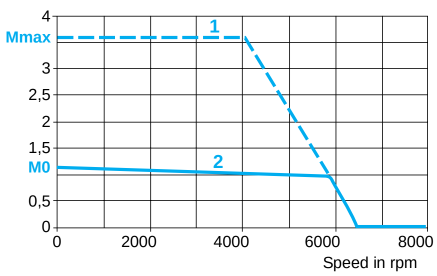
Characteristics of BDH 0583D servo motors

Type of servo motor				BDH 0583D				
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.16				
	Peak stall	M_{max}	**Nm**	3.58				
Nominal operating point	Nominal torque		**Nm**	1.06	1.05	1.06	0.94	
	Nominal speed		**rpm**	4080			7680	8000
Maximum current			**A rms**	6.22				
Servo motor characteristics								
Maximum mechanical speed			**rpm**	8000				
Constants (at 120°C)	Torque		**Nm/A rms**	0.52				
	Back emf		**V_{rms}/krpm**	33.8				
Rotor	Number of poles			6				
	Inertia – Without brake	J_m	**kgcm²**	0.22				
	Inertia – With brake	J_m	**kgcm²**	0.231				
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	8.36				
	Inductance (phase/phase)		**mH**	17.3				
	Electrical time constant		**ms**	2.07				
Holding brake (according to model)				See page 138				

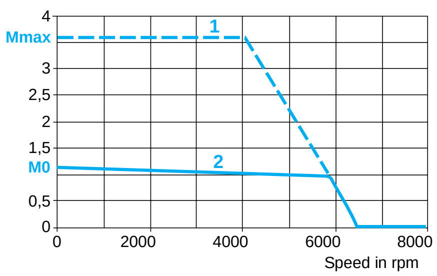
Torque/speed curves

BDH 0583D servo motor

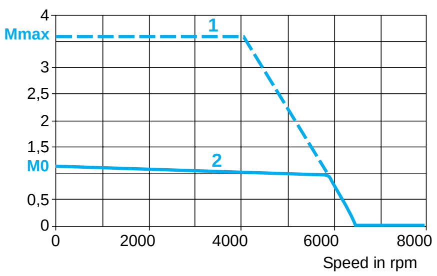
With LXM 15LD13M3 servo drive
230 V single phase



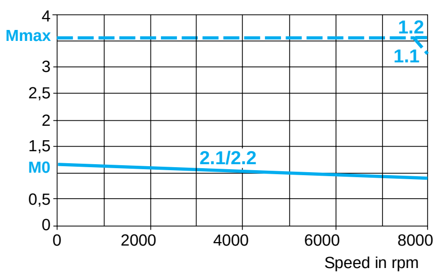
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

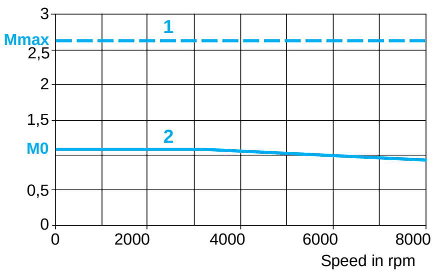
Characteristics of BDH 0583F/0584C servo motors

Type of servo motor				**BDH 0583F**		**BDH 0584C**		
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LU60N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.08	1.18	1.38		
	Peak stall	M_{max}	**Nm**	2.62	3.52	3.94		
Nominal operating point	Nominal torque		**Nm**	0.92		1.28	1.18	1.13
	Nominal speed		**rpm**	8000		2000	4080	5120
Maximum current			**A rms**	12.16		4.03		
Servo motor characteristics								
Maximum mechanical speed			**rpm**	8000				
Constants (at 120°C)	Torque		**Nm/A rms**	0.27		0.97		
	Back emf		**V_{rms}/krpm**	17.6		62.4		
Rotor	Number of poles			6				
	Inertia – Without brake	J_m	**kgcm²**	0.22		0.27		
	Inertia – With brake	J_m	**kgcm²**	0.231		0.281		
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	2.23		20.4		
	Inductance (phase/phase)		**mH**	4.68		43.8		
	Electrical time constant		**ms**	2.10		2.15		
Holding brake (according to model)				See page 138				

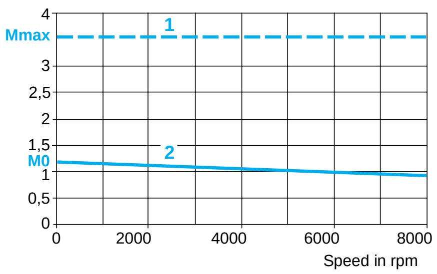
Torque/speed curves

BDH 0583F servo motor

With LXM 15LD21M3 servo drive
230 V single phase

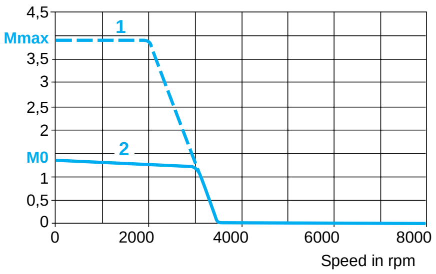


With LXM 15LD21M3 servo drive
230 V 3-phase

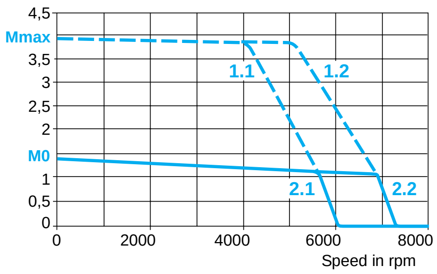


BDH 0584C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BDH 0584D servo motors

Type of servo motor				**BDH 0584D**				
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.41				
	Peak stall	M_{max}	**Nm**	4.4				
Nominal operating point	Nominal torque		**Nm**	1.18			1	0.92
	Nominal speed		**rpm**	3520			6640	8000
Maximum current			**A rms**	6.22				

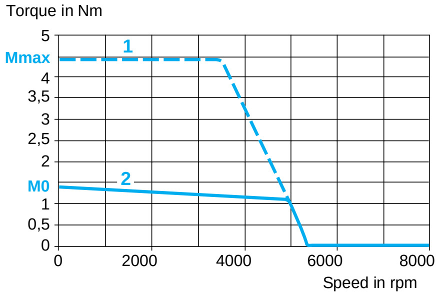
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	0.63
	Back emf			**V_{rms}/krpm**	40.8
Rotor	Number of poles				6
	Inertia	Without brake	J_m	**kgcm²**	0.27
		With brake	J_m	**kgcm²**	0.281
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	8.4
	Inductance (phase/phase)			**mH**	18.7
	Electrical time constant			**ms**	2.23
Holding brake (according to model)					See page 138

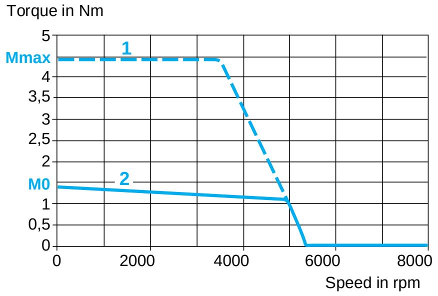
Torque/speed curves

BDH 0584D servo motor

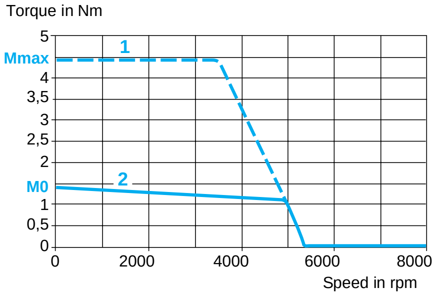
With LXM 15LD13M3 servo drive
230 V single phase



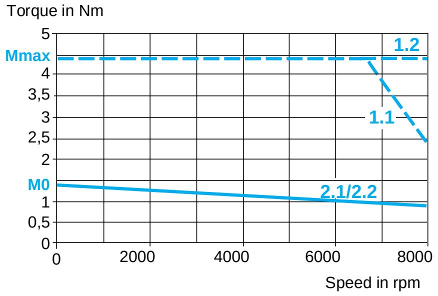
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BDH 0584F servo motors

Type of servo motor				**BDH 0584F**	
Associated with Lexium 15 servo drive				**LXM 15LD21M3**	
Line supply voltage			**V**	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	1.42	
	Peak stall	M_{max}	**Nm**	3.57	4.46
Nominal operating point	Nominal torque		**Nm**	1.06	1.03
	Nominal speed		**rpm**	6000	6560
Maximum current			**A rms**	11.03	

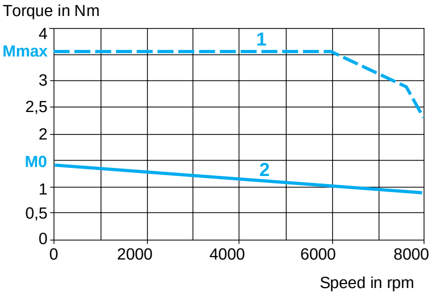
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	0.36
	Back emf			**V_{rms}/krpm**	23.4
Rotor	Number of poles				6
	Inertia	Without brake	J_m	**kgcm²**	0.27
		With brake	J_m	**kgcm²**	0.281
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	2.77
	Inductance (phase/phase)			**mH**	6.16
	Electrical time constant			**ms**	2.22
Holding brake (according to model)					See page 138

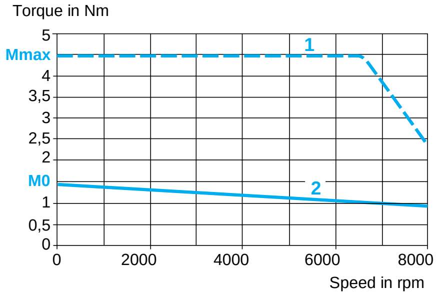
Torque/speed curves

BDH 0584F servo motor

With LXM 15LD21M3 servo drive
230 V single phase



With LXM 15LD21M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0701C/0701E servo motors

Type of servo motor				**BDH 0701C**			**BDH 0701E**	
Associated with Lexium 15 servo drive				**LXM 15LU60N4**			**LXM 15LD13M3**	
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	1.15			1.2	
	Peak stall	M_{max}	**Nm**	3.34			3.24	
Nominal operating point	Nominal torque		**Nm**	1.09	1.04	1	1.2	
	Nominal speed		**rpm**	2080	4320	5360		
Maximum current			**A rms**	3.89			8.48	

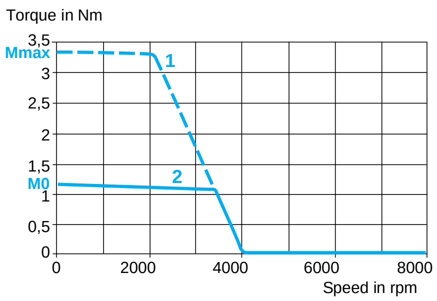
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000	
Constants (at 120°C)	Torque		**Nm/A rms**	0.85	0.41
	Back emf		**V_{rms}/krpm**	54.5	26.1
Rotor	Number of poles			8	
	Inertia – Without brake	J_m	**kgcm²**	0.33	
	Inertia – With brake	J_m	**kgcm²**	0.341	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	21.4	4.58
	Inductance (phase/phase)		**mH**	37.5	8.6
	Electrical time constant		**ms**	1.75	1.88
Holding brake (according to model)				See page 138	

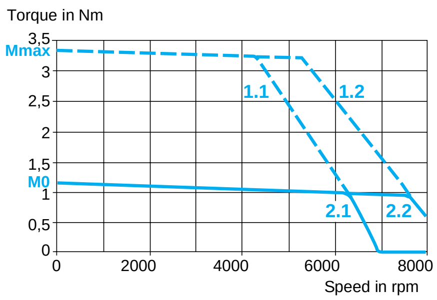
Torque/speed curves

BDH 0701C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase

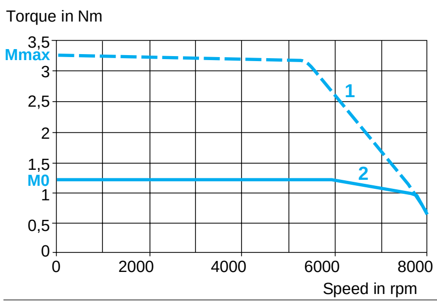


With LXM 15LU60N4 servo drive
400/480 V 3-phase

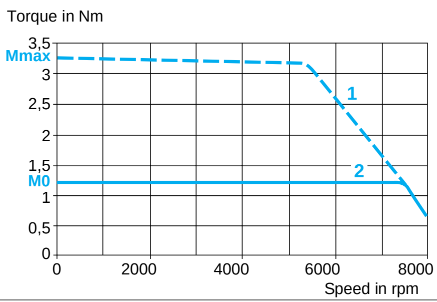


BDH 0701E servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0702C servo motors

Type of servo motor				**BDH 0702C**		
Associated with Lexium 15 servo drive				**LXM 15LU60N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	2		
	Peak stall	M_{max}	**Nm**	5.74		
Nominal operating point	Nominal torque		**Nm**	1.85	1.7	1.64
	Nominal speed		**rpm**	1280	2800	3440
Maximum current			**A rms**	4.03		

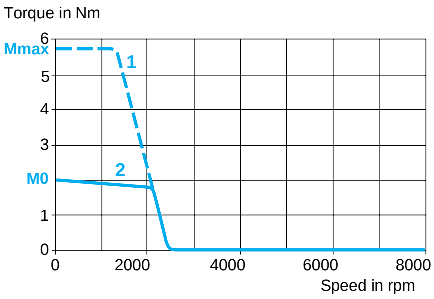
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	1.4
	Back emf			**V_{rms}/krpm**	89.8
Rotor	Number of poles				8
	Inertia	Without brake	J_m	**kgcm²**	0.59
		With brake	J_m	**kgcm²**	0.601
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	23
	Inductance (phase/phase)			**mH**	46.5
	Electrical time constant			**ms**	2.02
Holding brake (according to model)					See page 138

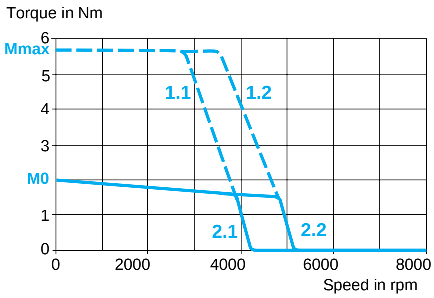
Torque/speed curves

BDH 0702C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BDH 0702D servo motors

Type of servo motor				**BDH 0702D**				
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	2.04				
	Peak stall	M_{max}	**Nm**	6.51				
Nominal operating point	Nominal torque		**Nm**	1.82			1.6	1.51
	Nominal speed		**rpm**	2320			4480	5520
Maximum current			**A rms**	6.29				

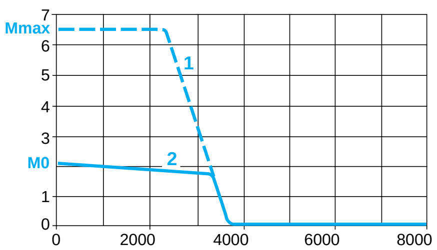
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	0.92
	Back emf		**V_{rms}/krpm**	59
Rotor	Number of poles			8
	Inertia, Without brake	J_m	**kgcm²**	0.59
	Inertia, With brake	J_m	**kgcm²**	0.601
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	9.57
	Inductance (phase/phase)		**mH**	20.1
	Electrical time constant		**ms**	2.10
Holding brake (according to model)				See page 138

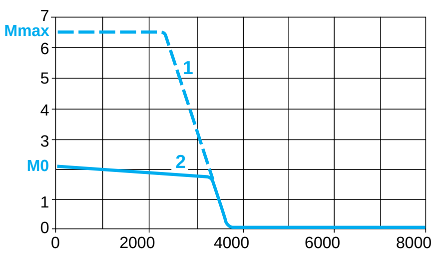
Torque/speed curves

BDH 0702D servo motor

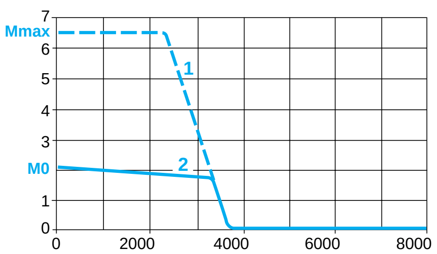
With LXM 15LD13M3 servo drive
230 V single phase



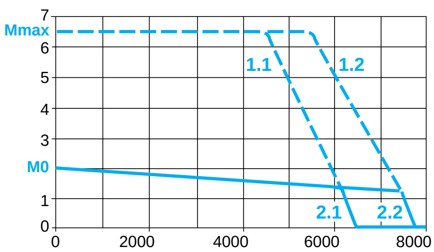
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BDH 0702H servo motors

Type of servo motor				**BDH 0702H**	
Associated with Lexium 15 servo drive				**LXM 15LD21M3**	
Line supply voltage			**V**	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	2.1	
	Peak stall	M_{max}	**Nm**	5.36	
Nominal operating point	Nominal torque		**Nm**	1.56	1.3
	Nominal speed		**rpm**	4320	6560
Maximum current			**A rms**	15.56	

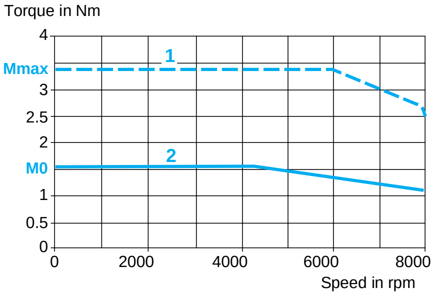
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	0.39
	Back emf			**V_{rms}/krpm**	24.8
Rotor	Number of poles				8
	Inertia	Without brake	J_m	**kgcm²**	0.59
		With brake	J_m	**kgcm²**	0.601
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	1.64
	Inductance (phase/phase)			**mH**	3.55
	Electrical time constant			**ms**	2.16
Holding brake (according to model)					See page 138

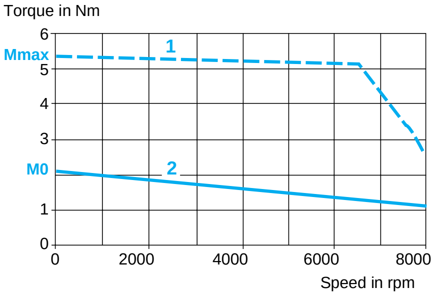
Torque/speed curves

BDH 0702H servo motor

With LXM 15LD21M3 servo drive
230 V single phase



With LXM 15LD21M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 0703C servo motors

Type of servo motor				**BDH 0703C**		
Associated with Lexium 15 servo drive				**LXM 15LU60N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	2.71		
	Peak stall	M_{max}	**Nm**	7.83		
Nominal operating point	Nominal torque		**Nm**	2.6	2.55	2.51
	Nominal speed		**rpm**	880	2080	2560
Maximum current			**A rms**	4.17		

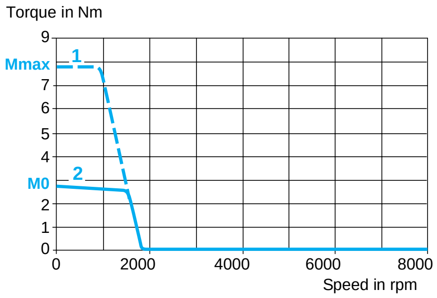
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	1.86
	Back emf		**V_{rms}/krpm**	120
Rotor	Number of poles			8
	Inertia – Without brake	J_m	**kgcm²**	0.85
	Inertia – With brake	J_m	**kgcm²**	0.861
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	25.4
	Inductance (phase/phase)		**mH**	53.6
	Electrical time constant		**ms**	2.11
Holding brake (according to model)				See page 138

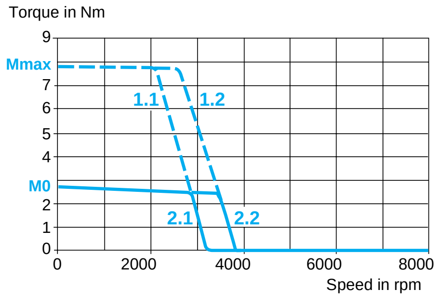
Torque/speed curves

BDH 0703C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83
References:
pages 130 to 133
Dimensions:
pages 134 to 137

Characteristics of BDH 0703E servo motors

Type of servo motor				**BDH 0703E**				
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	2.79				
	Peak stall	M_{max}	**Nm**	8.55				
Nominal operating point	Nominal torque		**Nm**	2.55			2.4	2.3
	Nominal speed		**rpm**	2000			3920	4800
Maximum current			**A rms**	7.28				

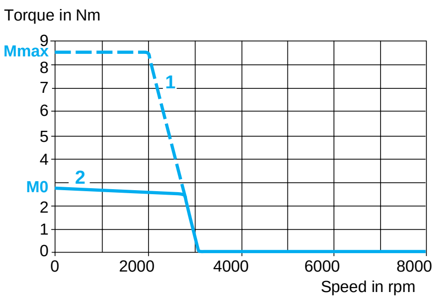
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	1.1
	Back emf			**V_{rms}/krpm**	70.6
Rotor	Number of poles				8
	Inertia	Without brake	J_m	**kgcm²**	0.85
		With brake	J_m	**kgcm²**	0.861
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	8.36
	Inductance (phase/phase)			**mH**	18.5
	Electrical time constant			**ms**	2.21
Holding brake (according to model)					See page 138

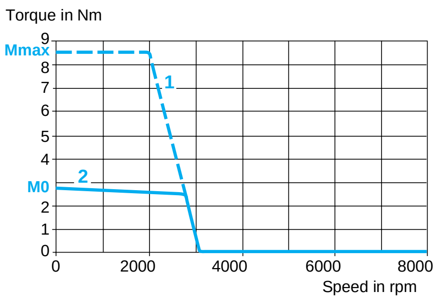
Torque/speed curves

BDH 0703E servo motor

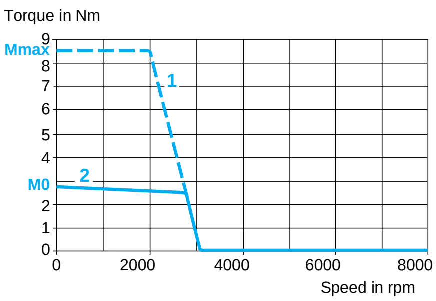
With LXM 15LD13M3 servo drive
230 V single phase



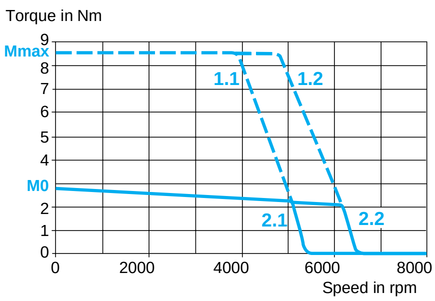
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0703H servo motors

Type of servo motor				**BDH 0703H**	
Associated with Lexium 15 servo drive				**LXM 15LD21M3**	
Line supply voltage			**V**	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	2.08	2.88
	Peak stall	M_{max}	**Nm**	4.52	7.35
Nominal operating point	Nominal torque		**Nm**	2.08	1.64
	Nominal speed		**rpm**	4400	4960
Maximum current			**A rms**	15.91	

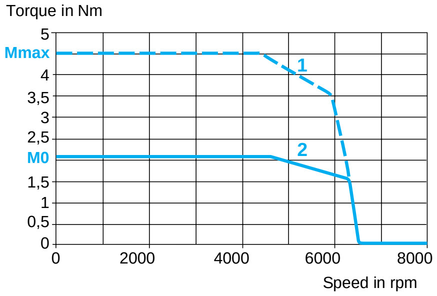
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	0.52
	Back emf		**V_{rms}/krpm**	33.4
Rotor	Number of poles			8
	Inertia	Without brake J_m	**kgcm²**	0.85
		With brake J_m	**kgcm²**	0.861
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.82
	Inductance (phase/phase)		**mH**	4.1
	Electrical time constant		**ms**	2.25
Holding brake (according to model)				See page 138

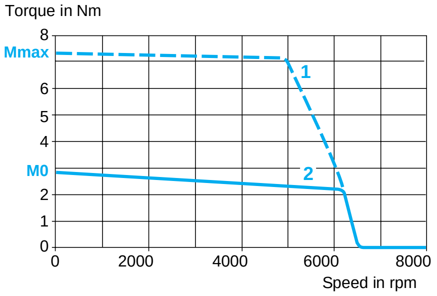
Torque/speed curves

BDH 0703H servo motor

With LXM 15LD21M3 servo drive
230 V single phase



With LXM 15LD21M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Characteristics of BDH 0841C servo motors

Type of servo motor				**BDH 0841C**		
Associated with Lexium 15 servo drive				**LXM 15LU60N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.95		
	Peak stall	M_{max}	**Nm**	5.12		
Nominal operating point	Nominal torque		**Nm**	1.88	1.83	1.8
	Nominal speed		**rpm**	1140	2280	2820
Maximum current			**A rms**	4.1		

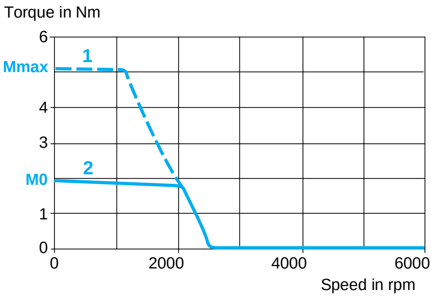
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	1.34
	Back emf			**V_{rms}/krpm**	86.3
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	0.81
		With brake	J_m	**kgcm²**	0.878
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	21.7
	Inductance (phase/phase)			**mH**	66.1
	Electrical time constant			**ms**	3.05
Holding brake (according to model)					See page 138

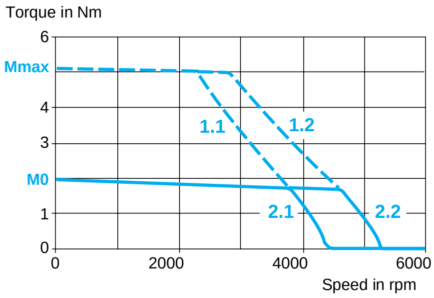
Torque/speed curves

Characteristics of BDH 0841C servo motors

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BDH 0841E servo motors

Type of servo motor				**BDH 0841E**				
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	2.02				
	Peak stall	M_{max}	**Nm**	5.33		5.13		
Nominal operating point	Nominal torque		**Nm**	1.84			1.67	1.62
	Nominal speed		**rpm**	2460		2520	4620	5640
Maximum current			**A rms**	8.06				

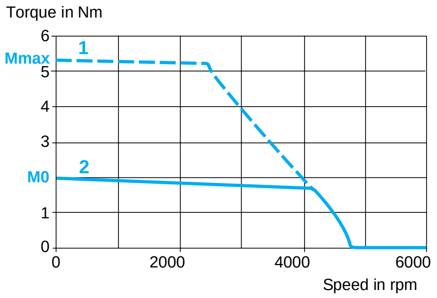
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	0.71
	Back emf			**V_{rms}/krpm**	45.6
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	0.81
		With brake	J_m	**kgcm²**	0.878
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	5.7
	Inductance (phase/phase)			**mH**	18.4
	Electrical time constant			**ms**	3.23
Holding brake (according to model)					See page 138

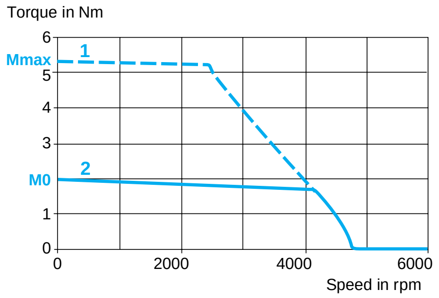
Torque/speed curves

BDH 0841E servo motor

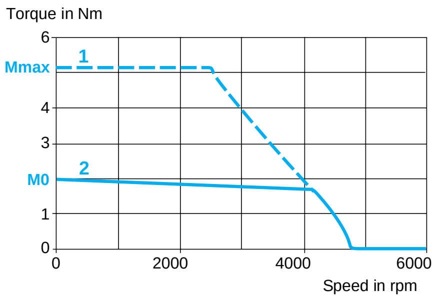
With LXM 15LD13M3 servo drive
230 V single phase



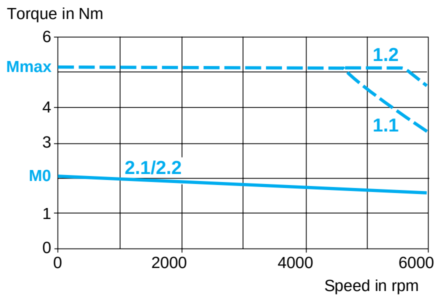
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

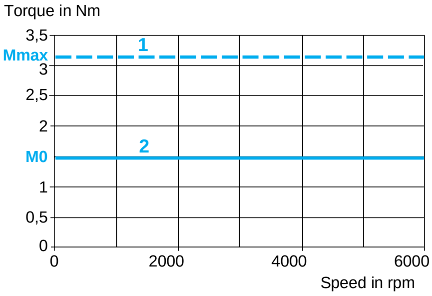
Characteristics of BDH 0841H/0842C servo motors

Type of servo motor			**BDH 0841H**		**BDH 0842C**		
Associated with Lexium 15 servo drive			**LXM 15LD21M3**		**LXM 15LU60N4**		
Line supply voltage		**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall M_0	**Nm**	1.5	2.06	3.35		
	Peak stall M_{max}	**Nm**	3.14	4.78	9.37		
Nominal operating point	Nominal torque	**Nm**	1.48	1.68	3.25	3.1	3
	Nominal speed	**rpm**	6000	5340	600	1320	1680
Maximum current		**A rms**	15.84		3.97		
Servo motor characteristics							
Maximum mechanical speed		**rpm**	6000				
Constants (at 120°C)	Torque	**Nm/A rms**	0.37		2.4		
	Back emf	**V_{rms}/krpm**	23.7		154		
Rotor	Number of poles		10				
	Inertia – Without brake J_m	**kgcm²**	0.81		1.5		
	Inertia – With brake J_m	**kgcm²**	0.878		1.568		
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	1.51		27.5		
	Inductance (phase/phase)	**mH**	5		97.4		
	Electrical time constant	**ms**	3.31		3.54		
Holding brake (according to model)			See page 138				

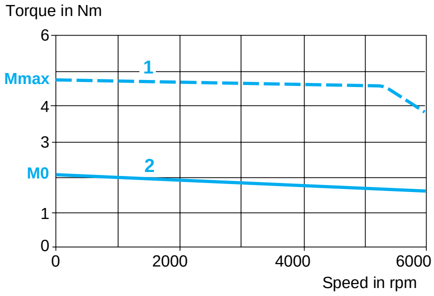
Torque/speed curves

BDH 0841H servo motor

With LXM 15LD21M3 servo drive
230 V single phase

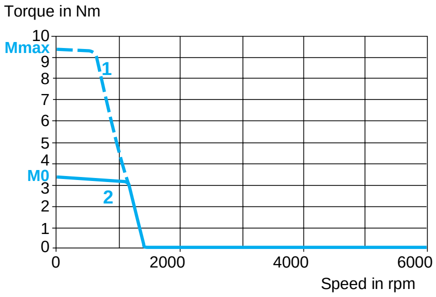


With LXM 15LD21M3 servo drive
230 V 3-phase

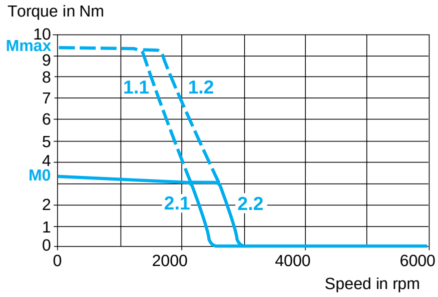


BDH 0842C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 0842E servo motors

Type of servo motor				**BDH 0842E**				
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	3.42				
	Peak stall	M_{max}	**Nm**	9.72		9.41		
Nominal operating point	Nominal torque		**Nm**	3.15			2.9	2.8
	Nominal speed		**rpm**	1500			2820	3480
Maximum current			**A rms**	7.78				

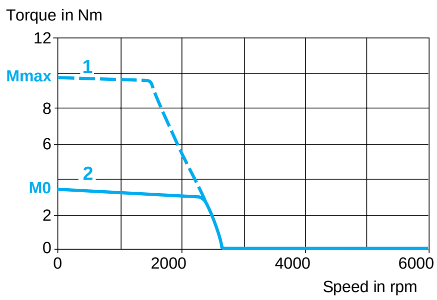
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	1.26
	Back emf			**V_{rms}/krpm**	80.9
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	1.5
		With brake	J_m	**kgcm²**	1.568
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	7.22
	Inductance (phase/phase)			**mH**	26.8
	Electrical time constant			**ms**	3.71
Holding brake (according to model)					See page 138

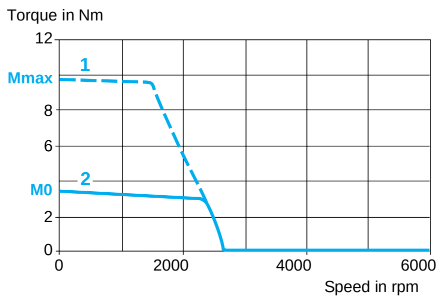
Torque/speed curves

BDH 0842E servo motor

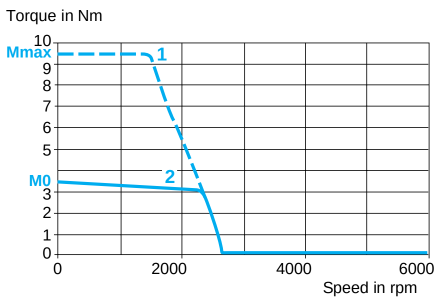
With LXM 15LD13M3 servo drive
230 V single phase



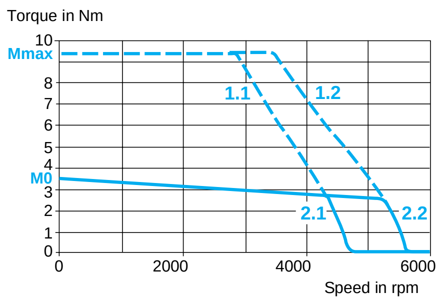
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0842G servo motors

Type of servo motor				BDH 0842G				
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	2.96	3.53			
	Peak stall	M_{max}	**Nm**	6.54	9.56	8.66		
Nominal operating point	Nominal torque		**Nm**	2.94	2.96		2.5	2.35
	Nominal speed		**rpm**	3000	2760	2880	5280	6000
Maximum current			**A rms**	13.58				

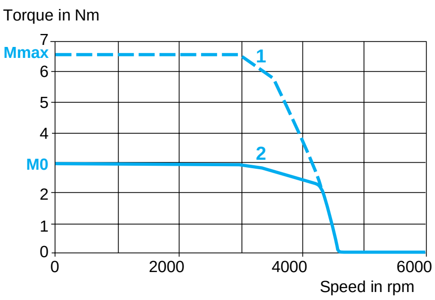
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	0.74
	Back emf			**V_{rms}/krpm**	47.5
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	1.5
		With brake	J_m	**kgcm²**	1.568
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	2.38
	Inductance (phase/phase)			**mH**	9.2
	Electrical time constant			**ms**	3.87
Holding brake (according to model)					See page 138

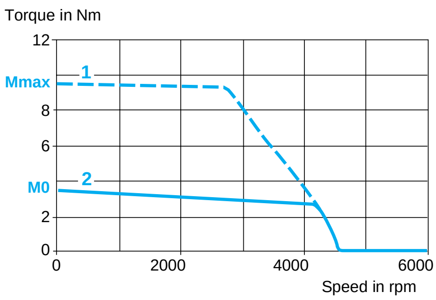
Torque/speed curves

BDH 0842G servo motor

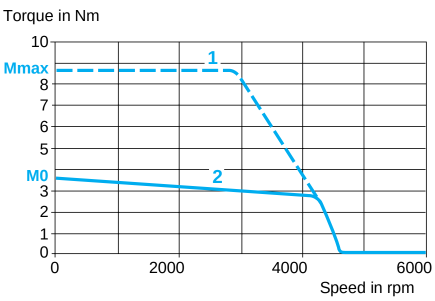
With LXM 15LD21M3 servo drive
230 V single phase



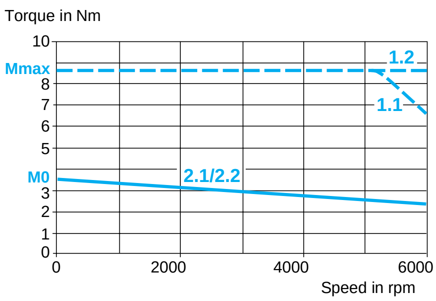
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

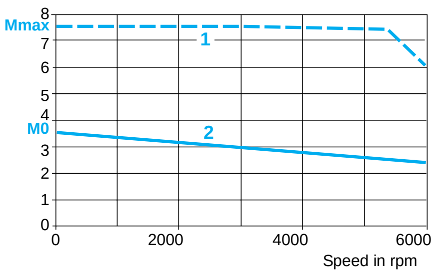
Characteristics of BDH 0842J/0843E servo motors

Type of servo motor				BDH 0842J		BDH 0843E		
Associated with Lexium 15 servo drive				**LXM 15LD28M3**	**LXM 15MD28N4**	**LXM 15LD10N4**		
Line supply voltage			**V**	230 3-phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	3.56		4.7		
	Peak stall	M_{max}	**Nm**	7.56		11.7		
Nominal operating point	Nominal torque		**Nm**	2.5		4.35	4	3.85
	Nominal speed		**rpm**	5400		1140	2220	2700
Maximum current			**A rms**	23.83		7.78		
Servo motor characteristics								
Maximum mechanical speed			**rpm**	6000				
Constants (at 120°C)	Torque		**Nm/A rms**	0.43		1.72		
	Back emf		**V_{rms}/krpm**	27.5		111		
Rotor	Number of poles			10				
	Inertia – Without brake	J_m	**kgcm²**	1.5		2.1		
	Inertia – With brake	J_m	**kgcm²**	1.568		2.168		
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.8		8.04		
	Inductance (phase/phase)		**mH**	3.1		32.6		
	Electrical time constant		**ms**	3.88		4.05		
Holding brake (according to model)				See page 138				

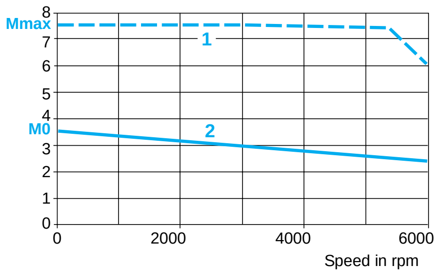
Torque/speed curves

BDH 0842J servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase

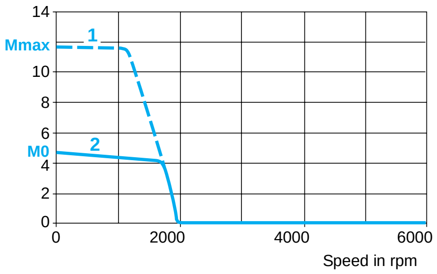


With LXM 15MD28N4 servo drive
230 V 3-phase

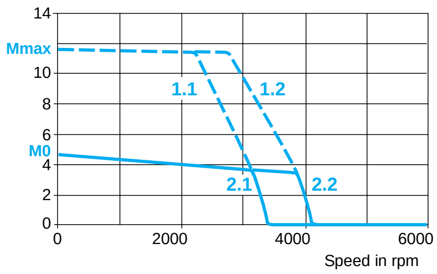


BDH 0843E servo motor

With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 0843G servo motors

Type of servo motor				**BDH 0843G**				
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	3.96	4.8			
	Peak stall	M_{max}	**Nm**	8.8	13.2	11.68		
Nominal operating point	Nominal torque		**Nm**	3.96	4	3.9	3.25	2.95
	Nominal speed		**rpm**	2220	2160	2280	4140	4980
Maximum current			**A rms**	13.79				

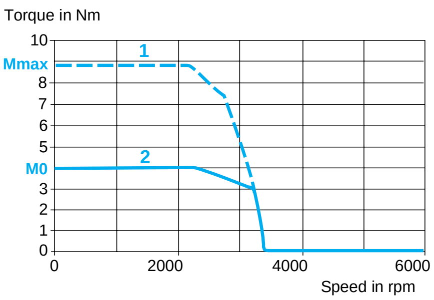
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	0.99
	Back emf			**V_{rms}/krpm**	63.9
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	2.1
		With brake	J_m	**kgcm²**	2.168
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	2.61
	Inductance (phase/phase)			**mH**	10.8
	Electrical time constant			**ms**	4.14
Holding brake (according to model)					See page 138

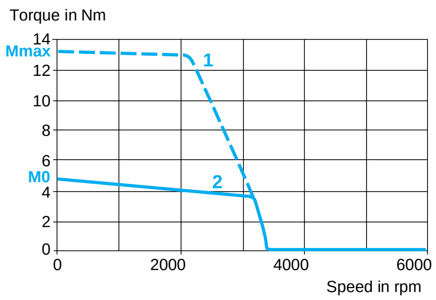
Torque/speed curves

BDH 0843G servo motor

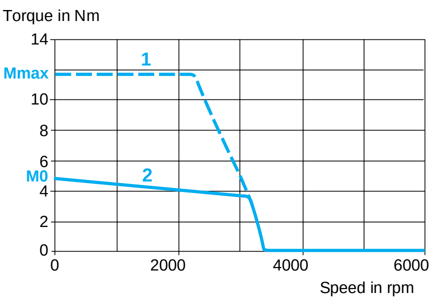
With LXM 15LD21M3 servo drive
230 V single phase



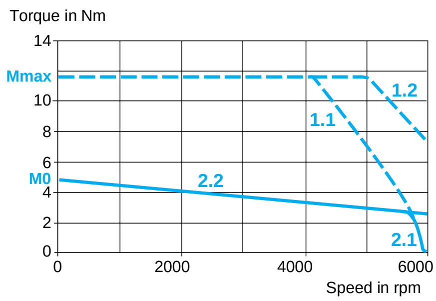
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

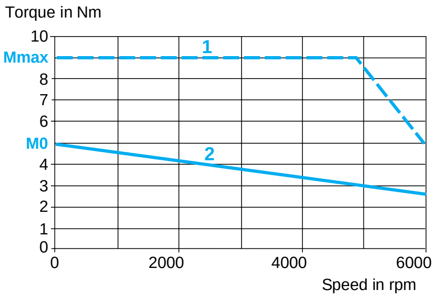
Characteristics of BDH 0843K/0844E servo motors

Type of servo motor				BDH 0843K		BDH 0844E		
Associated with Lexium 15 servo drive				**LXM 15LD28M3**	**LXM 15MD28N4**	**LXM 15LD10N4**		
Line supply voltage			**V**	230 3-phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	4.9		5.76		
	Peak stall	M_{max}	**Nm**	9.02		14.1		
Nominal operating point	Nominal torque		**Nm**	3		5.25	4.85	4.6
	Nominal speed		**rpm**	4920		1020	1920	2400
Maximum current			**A rms**	27.08		8.06		
Servo motor characteristics								
Maximum mechanical speed			**rpm**	6000				
Constants (at 120°C)	Torque		**Nm/A rms**	0.52		2.04		
	Back emf		**V_{rms}/krpm**	33.2		132		
Rotor	Number of poles			10				
	Inertia Without brake	J_m	**kgcm²**	2.1		2.7		
	Inertia With brake	J_m	**kgcm²**	2.168		2.768		
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.7		8.08		
	Inductance (phase/phase)		**mH**	2.9		33.9		
	Electrical time constant		**ms**	4.14		4.20		
Holding brake (according to model)				See page 138				

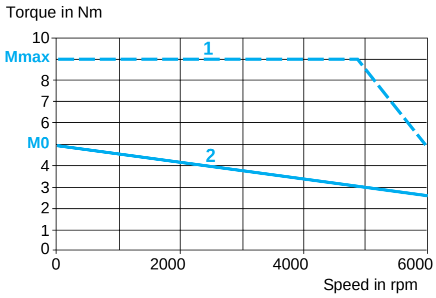
Torque/speed curves

BDH 0843K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase

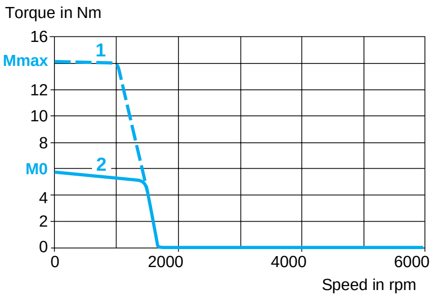


With LXM 15MD28N4 servo drive
230 V 3-phase

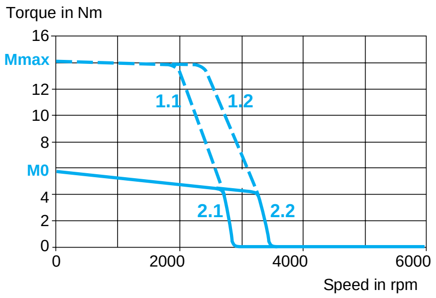


BDH 0844E servo motor

With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0844G servo motors

Type of servo motor				**BDH 0844G**				
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	4.76	5.88			
	Peak stall	M_{max}	**Nm**	10.55	16.1	13.97		
Nominal operating point	Nominal torque		**Nm**	4.76	4.9	4.85	3.95	3.5
	Nominal speed		**rpm**	1860		1960	3600	4380
Maximum current			**A rms**	14.14				

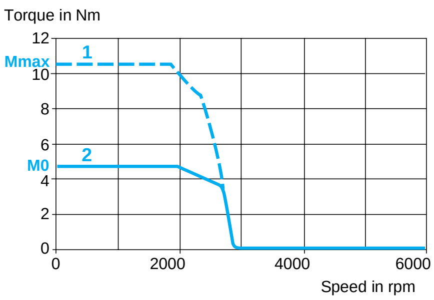
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	1.19
	Back emf			**V_{rms}/krpm**	76.6
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	2.7
		With brake	J_m	**kgcm²**	2.768
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	2.65
	Inductance (phase/phase)			**mH**	11.5
	Electrical time constant			**ms**	4.34
Holding brake (according to model)					See page 138

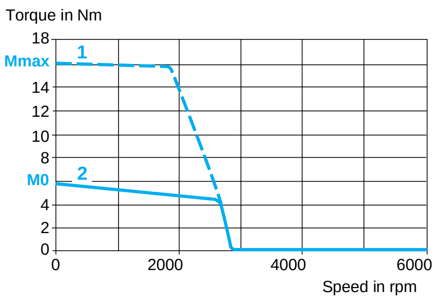
Torque/speed curves

BDH 0844G servo motor

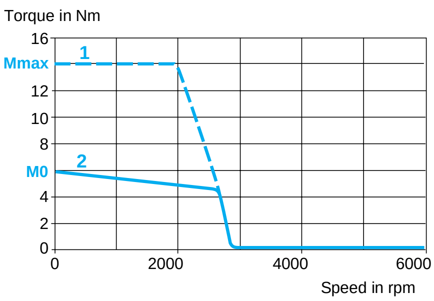
With LXM 15LD21M3 servo drive
230 V single phase



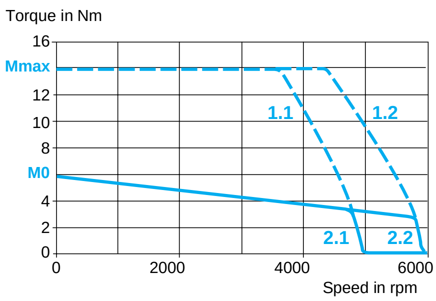
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BDH 0844J servo motors

Type of servo motor				**BDH 0844J**	
Associated with Lexium 15 servo drive				**LXM 15LD28M3**	**LXM 15MD28N4**
Line supply voltage			**V**	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	6	
	Peak stall	M_{max}	**Nm**	12.18	
Nominal operating point	Nominal torque		**Nm**	4	
	Nominal speed		**rpm**	3660	
Maximum current			**A rms**	24.89	

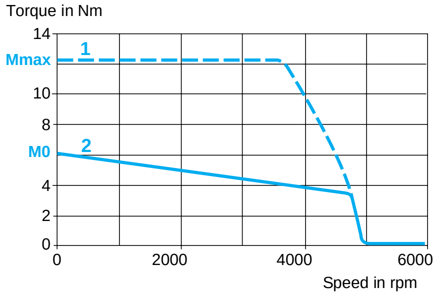
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	0.69
	Back emf			**V_{rms}/krpm**	44.2
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	2.7
		With brake	J_m	**kgcm²**	2.768
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	0.88
	Inductance (phase/phase)			**mH**	3.8
	Electrical time constant			**ms**	4.32
Holding brake (according to model)					See page 138

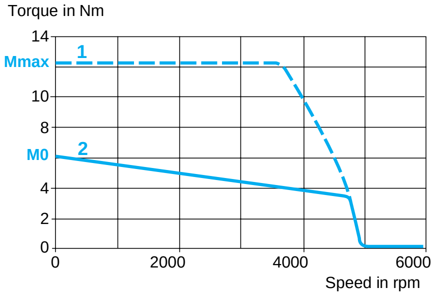
Speed/torque curves

BDH 0844J servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

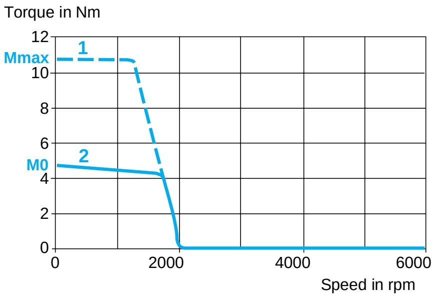
Characteristics of BDH 1081E servo motors

Type of servo motor					**BDH 1081E**		
Associated with Lexium 15 servo drive					**LXM 15LD10N4**		
Line supply voltage				**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall		M_0	**Nm**	4.7		
	Peak stall		M_{max}	**Nm**	10.71		
Nominal operating point	Nominal torque			**Nm**	4.35	4	3.85
	Nominal speed			**rpm**	1260	2340	2880
Maximum current				**A rms**	5.83		
Servo motor characteristics							
Maximum mechanical speed				**rpm**	6000		
Constants (at 120°C)	Torque			**Nm/A rms**	1.72		
	Back emf			**V_{rms}/krpm**	110		
Rotor	Number of poles				10		
	Inertia	Without brake	J_m	**kgcm²**	3.4		
		With brake	J_m	**kgcm²**	3.573		
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	8.47		
	Inductance (phase/phase)			**mH**	36.6		
	Electrical time constant			**ms**	4.32		
Holding brake (according to model)					See page 138		

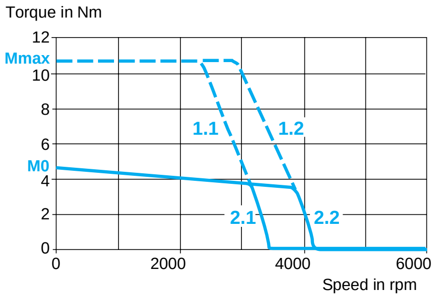
Torque/speed curves

BDH 1081E servo motor

With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
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Characteristics of BDH 1081G servo motors

Type of servo motor				BDH 1081G				
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	3.96	4.75			
	Peak stall	M_{max}	**Nm**	9.41	10.82			
Nominal operating point	Nominal torque		**Nm**	3.96	3.65		2.75	2.35
	Nominal speed		**rpm**	1680	2340		4260	5160
Maximum current			**A rms**	10.25				

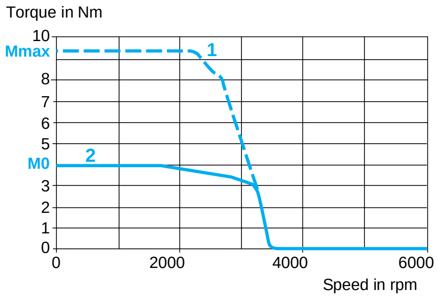
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000
Constants (at 120°C)	Torque		**Nm/A rms**	0.99
	Back emf		**V_{rms}/krpm**	63.6
Rotor	Number of poles			10
	Inertia Without brake	J_m	**kgcm²**	3.4
	Inertia With brake	J_m	**kgcm²**	3.573
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	2.75
	Inductance (phase/phase)		**mH**	12.1
	Electrical time constant		**ms**	4.4
Holding brake (according to model)				See page 138

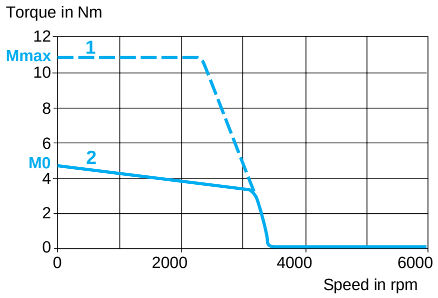
Torque/speed curves

BDH 1081G servo motor

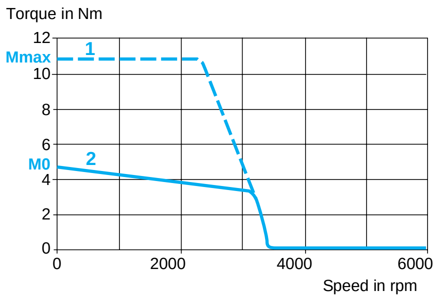
With LXM 15LD21M3 servo drive
230 V single phase



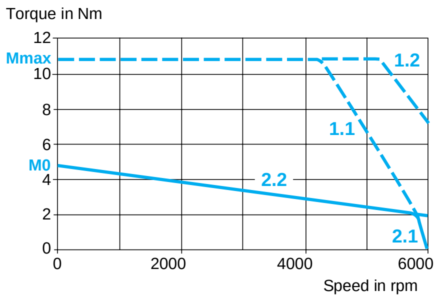
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

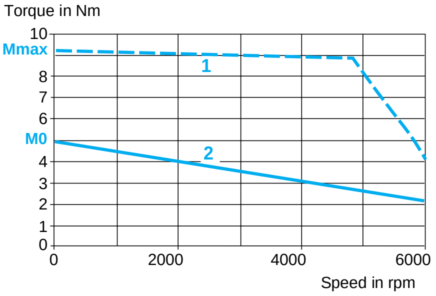
Characteristics of BDH 1081K/1082E servo motors

Type of servo motor			BDH 1081K		BDH 1082E		
Associated with Lexium 15 servo drive			**LXM 15LD28M3**	**LXM 15MD28N4**	**LXM 15LD10N4**		
Line supply voltage		**V**	230 3-phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall M_0	**Nm**	4.9		8.34		
	Peak stall M_{max}	**Nm**	9.22		18.08		
Nominal operating point	Nominal torque	**Nm**	2.65		7.9	7.5	7.3
	Nominal speed	**rpm**	4800		780	1500	1860
Maximum current		**A rms**	20.01		6.36		
Servo motor characteristics							
Maximum mechanical speed		**rpm**	6000				
Constants (at 120°C)	Torque	**Nm/A rms**	0.52		2.79		
	Back emf	**V_{rms}/krpm**	33.5		179		
Rotor	Number of poles		10				
	Inertia Without brake J_m	**kgcm²**	3.4		6.2		
	Inertia With brake J_m	**kgcm²**	3.573		6.373		
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	0.75		8.59		
	Inductance (phase/phase)	**mH**	3.4		44.7		
	Electrical time constant	**ms**	4.53		5.2		
Holding brake (according to model)			See page 138				

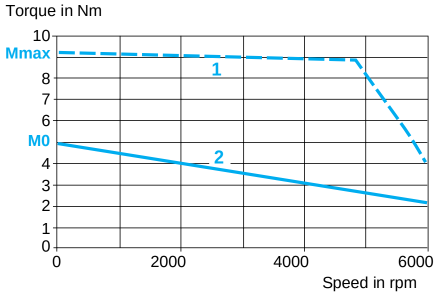
Torque/speed curves

BDH 1081K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase

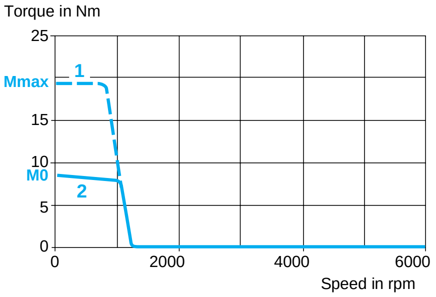


With LXM 15MD28N4 servo drive
230 V 3-phase

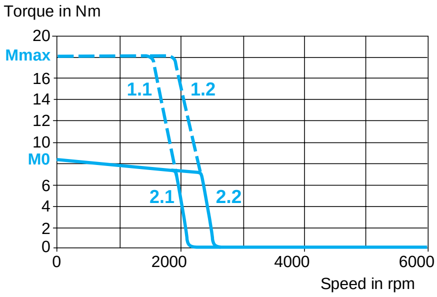


BDH 1082E servo motor

With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

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Characteristics of BDH 1082G servo motors

Type of servo motor				**BDH 1082G**				
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	7.16	8.43			
	Peak stall	M_{max}	**Nm**	17.31	19.51			
Nominal operating point	Nominal torque		**Nm**	7.16	7.65		7	6.66
	Nominal speed		**rpm**	1140	1320		2460	3000
Maximum current			**A rms**	10.04				

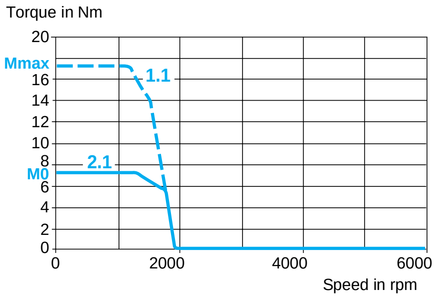
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	1.79
	Back emf			**V_{rms}/krpm**	115
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	6.2
		With brake	J_m	**kgcm²**	6.373
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	3.47
	Inductance (phase/phase)			**mH**	18.5
	Electrical time constant			**ms**	5.33
Holding brake (according to model)					See page 138

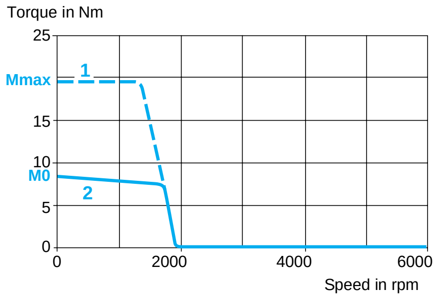
Torque/speed curves

BDH 1082G servo motor

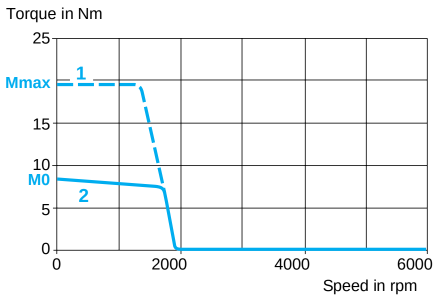
With LXM 15LD21M3 servo drive
230 V single phase



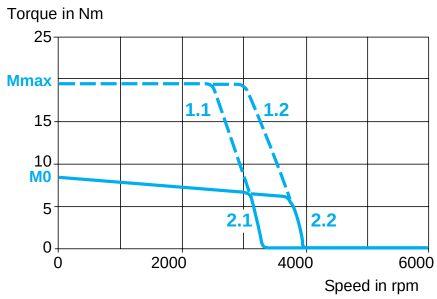
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
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pages 130 to 133

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pages 134 to 137

Characteristics of BDH 1082K/1082M/1083G servo motors

Type of servo motor			BDH 1082K		BDH 1082M	BDH 1083G		
Associated with Lexium 15 servo drive			**LXM 15LD28M3**	**LXM 15MD28N4**	**LXM 15MD40N4**	**LXM 15LD17N4**		
Line supply voltage		**V**	230 3-phase	230 3-phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall M_0	**Nm**	8.6			11.4		
	Peak stall M_{max}	**Nm**	16.9		16.7	25.83		
Nominal operating point	Nominal torque	**Nm**	6		5.5	10.6	9.8	9.5
	Nominal speed	**rpm**	2820		4080	1020	1920	2340
Maximum current		**A rms**	19.66		27.86	10.11		

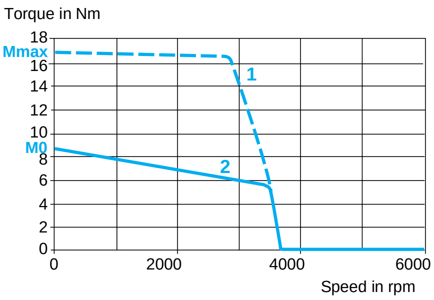
Servo motor characteristics

Maximum mechanical speed		**rpm**	6000					
Constants (at 120°C)	Torque	**Nm/A rms**	0.93		0.66	2.39		
	Back emf	**V_{rms}/krpm**	60.1		42.4	154		
Rotor	Number of poles		10					
	Inertia – Without brake J_m	**kgcm²**	6.2			9.273		
	Inertia – With brake J_m	**kgcm²**	6.373					
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	0.93		0.48	3.75		
	Inductance (phase/phase)	**mH**	5		2.5	21.3		
	Electrical time constant	**ms**	5.38		5.21	5.68		
Holding brake (according to model)			See page 138					

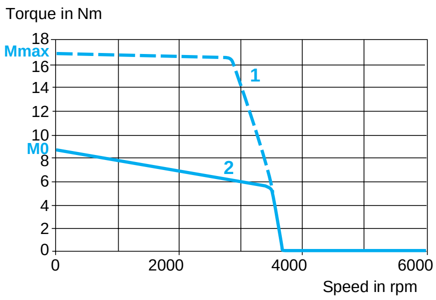
Torque/speed curves

BDH 1082K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase

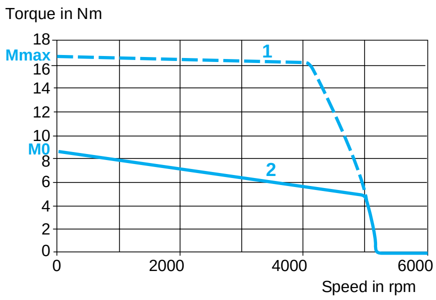


With LXM 15MD28N4 servo drive
230 V 3-phase



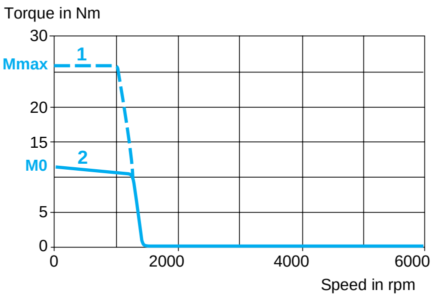
BDH 1082M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase

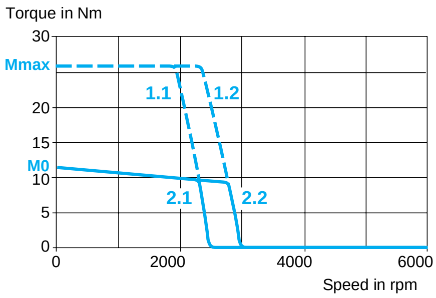


BDH 1083G servo motor

With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

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References: pages 130 to 133
Dimensions: pages 134 to 137

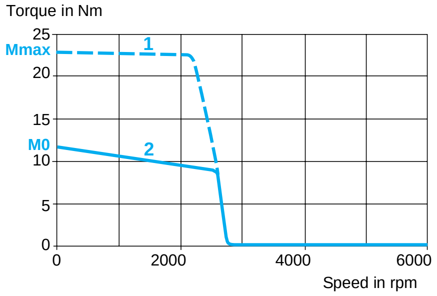
Characteristics of BDH 1083K/1083M/1083P servo motors

Type of servo motor				**BDH 1083K**		**BDH 1083M**	**BDH 1083P**
Associated with Lexium 15 servo drive				**LXM 15LD28M3**	**LXM 15MD28N4**	**LXM 15MD40N4**	**LXM 15MD56N4**
Line supply voltage			**V**	230 3-phase	230 3-phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	11.6		11.4	
	Peak stall	M_{max}	**Nm**	22.9		22.1	22.2
Nominal operating point	Nominal torque		**Nm**	9.4		8.5	6.2
	Nominal speed		**rpm**	2100		3180	4740
Maximum current			**A rms**	19.87		28.5	40.59
Servo motor characteristics							
Maximum mechanical speed			**rpm**	6000			
Constants (at 120°C)	Torque		**Nm/A rms**	1.24		0.85	0.6
	Back emf		**V_{rms}/krpm**	79.8		54.7	38.4
Rotor	Number of poles			10			
	Inertia – Without brake	J_m	**kgcm²**	9.1			
	Inertia – With brake	J_m	**kgcm²**	9.273			
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1		0.51	0.27
	Inductance (phase/phase)		**mH**	5.7		2.7	1.3
	Electrical time constant		**ms**	5.7		5.29	4.81
Holding brake (according to model)				See page 138			

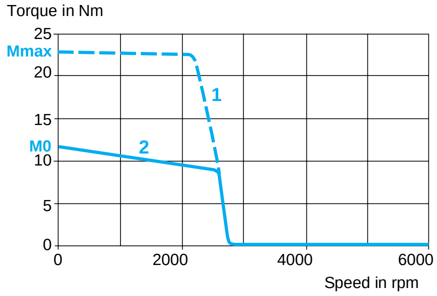
Torque/speed curves

BDH 1083K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase

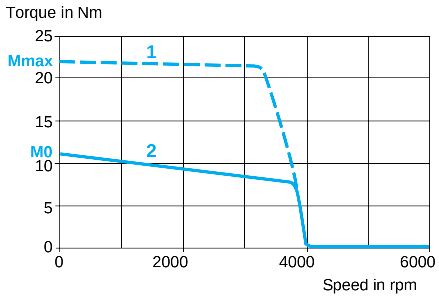


With LXM 15MD28N4 servo drive
230 V 3-phase



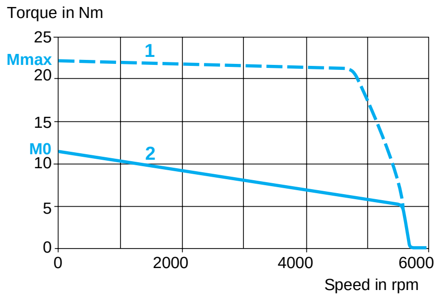
BDH 1083M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



BDH 1083P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

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pages 82 and 83

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pages 130 to 133

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pages 134 to 137

Characteristics of BDH 1084G/1084K servo motors

Type of servo motor				BDH 1084G			BDH 1084K	
Associated with Lexium 15 servo drive				**LXM 15LD17N4**			**LXM 15LD28M3**	**LXM 15MD28N4**
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	14.3			14.4	
	Peak stall	M_{max}	**Nm**	31.7			28.1	
Nominal operating point	Nominal torque		**Nm**	13.4	12.7	12.3	12.1	
	Nominal speed		**rpm**	840	1620	1980	1800	
Maximum current			**A rms**	10.54			20.65	

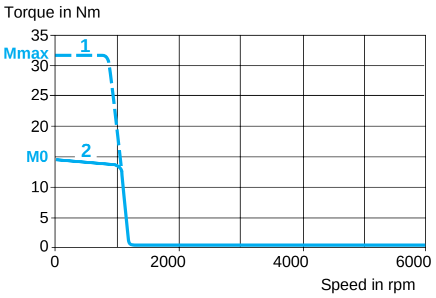
Servo motor characteristics

				BDH 1084G	BDH 1084K
Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	2.88	1.5
	Back emf		**V_{rms}/krpm**	185	96.6
Rotor	Number of poles			10	
	Inertia – Without brake	J_m	**kgcm²**	12	
	Inertia – With brake	J_m	**kgcm²**	12.173	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	3.8	1.02
	Inductance (phase/phase)		**mH**	22.9	6.2
	Electrical time constant		**ms**	6.03	6.08
Holding brake (according to model)				See page 138	

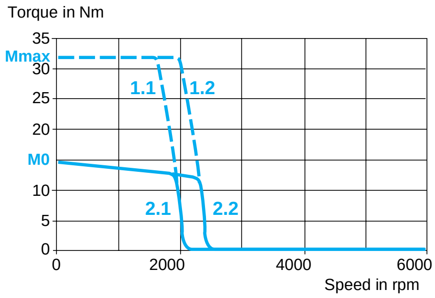
Torque/speed curves

BDH 1084G servo motor

With LXM 15LD17N4 servo drive
230 V 3-phase

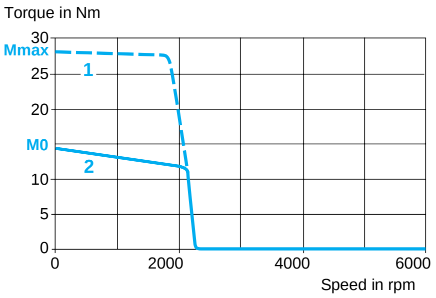


With LXM 15LD17N4 servo drive
400/480 V 3-phase

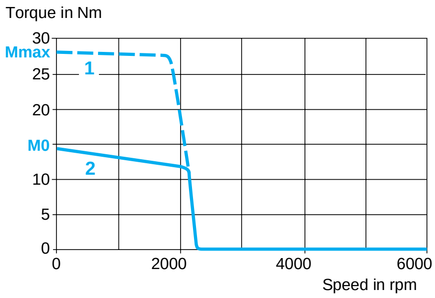


BDH 1084K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

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pages 82 and 83

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Characteristics of BDH 1084L/1084N servo motors

Type of servo motor				BDH 1084L		BDH 1084N
Associated with Lexium 15 servo drive				**LXM 15MD40N4**		**LXM 15MD56N4**
Line supply voltage			**V**	230 3-phase	400 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	14.1		
	Peak stall	M_{max}	**Nm**	27.28		25.5
Nominal operating point	Nominal torque		**Nm**	11.2	9	9.1
	Nominal speed		**rpm**	2400	4260	3780
Maximum current			**A rms**	37.76		26.52

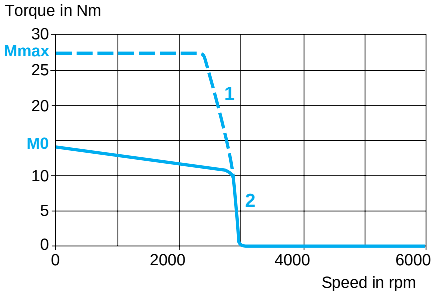
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	0.8	1.13
	Back emf		**V_{rms}/krpm**	51.3	72.9
Rotor	Number of poles			10	
	Inertia: Without brake	J_m	**kgcm²**	12	
	Inertia: With brake	J_m	**kgcm²**	12.173	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.33	0.63
	Inductance (phase/phase)		**mH**	1.8	3.5
	Electrical time constant		**ms**	5.45	5.56
Holding brake (according to model)				See page 138	

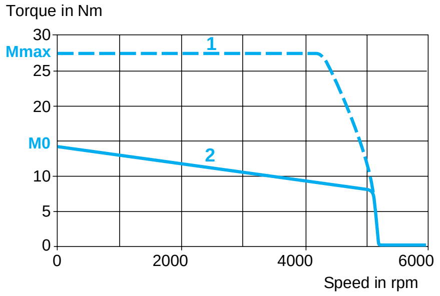
Torque/speed curves

BDH 1084L servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase

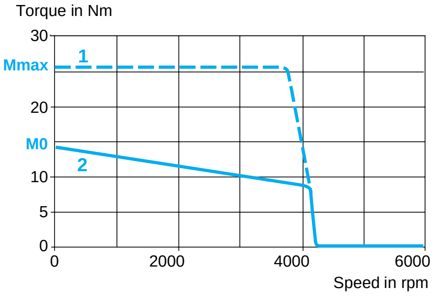


With LXM 15MD40N4 servo drive
400 V 3-phase



BDH 1084N servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
pages 82 and 83

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Dimensions:
pages 134 to 137

Lexium 15 motion control
BDH servo motors

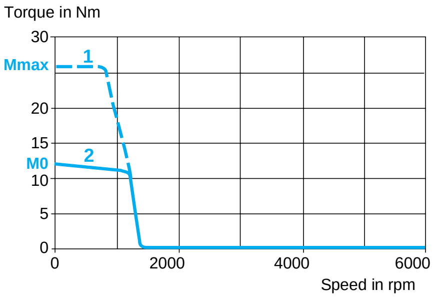
Characteristics of BDH 1382G/1382K servo motors

Type of servo motor				BDH 1382G			BDH 1382K	
Associated with Lexium 15 servo drive				**LXM 15LD17N4**			**LXM 15LD28M3**	**LXM 15MD28N4**
Line supply voltage			V	230 3-phase	400 3-phase	480 3-phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	Nm	11.9			12.2	
	Peak stall	M_{max}	Nm	25.6			22.7	
Nominal operating point	Nominal torque		Nm	11.3	10.6	10.4		
	Nominal speed		rpm	780	1500	1800	1860	
Maximum current			A rms	10.32			20.29	
Servo motor characteristics								
Maximum mechanical speed			rpm	6000				
Constants (at 120°C)	Torque		Nm/A rms	2.47			1.28	
	Back emf		V_{rms}/krpm	159			82.1	
Rotor	Number of poles			10				
	Inertia Without brake	J_m	kgcm²	17				
	Inertia With brake	J_m	kgcm²	17.61				
Stator (at 20°C)	Resistance (phase/phase)		Ω	3.94			1.05	
	Inductance (phase/phase)		mH	31.7			8.5	
	Electrical time constant		ms	8.05			8.10	
Holding brake (according to model)				See page 138				

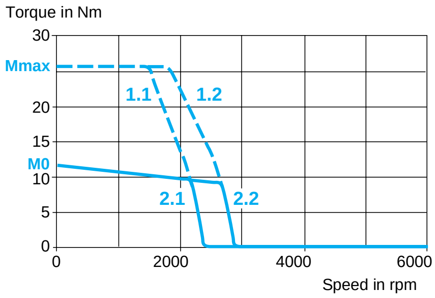
Torque/speed curves

BDH 1382G servo motor

With LXM 15LD17N4 servo drive
230 V 3-phase

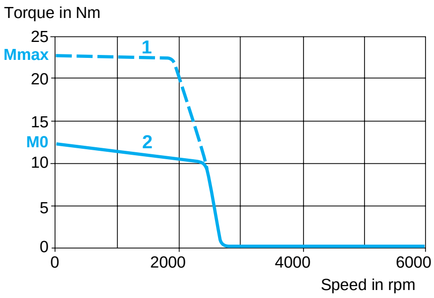


With LXM 15LD17N4 servo drive
400/480 V 3-phase

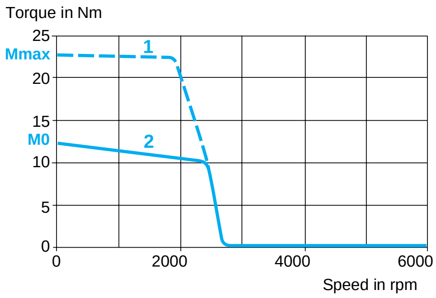


BDH 1382K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

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References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 1382M/1382P servo motors

Type of servo motor				**BDH 1382M**			**BDH 1382P**
Associated with Lexium 15 servo drive				**LXM 15MD40N4**			**LXM 15MD56N4**
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	12.2			12.3
	Peak stall	M_{max}	**Nm**	22.8			23.2
Nominal operating point	Nominal torque		**Nm**	9.3	7	5.9	8.7
	Nominal speed		**rpm**	2640	4800	5820	3840
Maximum current			**A rms**	28.5			39.95

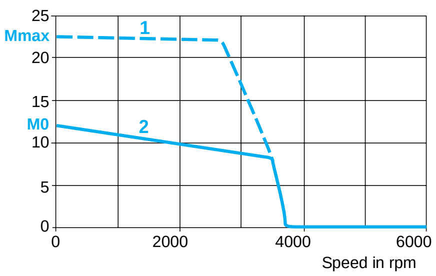
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000	
Constants (at 120°C)	Torque			**Nm/A rms**	0.91	0.66
	Back emf			**V_{rms}/krpm**	58.8	42.2
Rotor	Number of poles				10	
	Inertia	Without brake	J_m	**kgcm²**	17	
		With brake	J_m	**kgcm²**	17.61	
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	0.55	0.3
	Inductance (phase/phase)			**mH**	4.4	2.2
	Electrical time constant			**ms**	8	7.33
Holding brake (according to model)					See page 138	

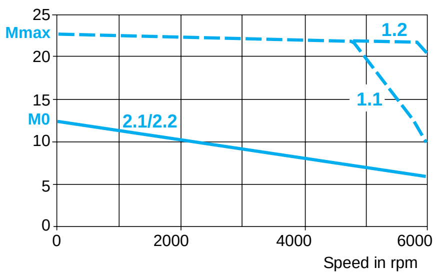
Torque/speed curves

BDH 1382M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase

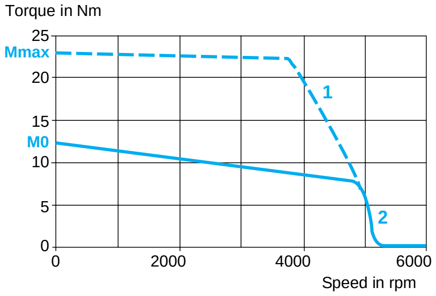


With LXM 15MD40N4 servo drive
400/480 V 3-phase



BDH 1382P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 1383G/1383K servo motors

Type of servo motor		Unit	BDH 1383G			BDH 1383K	
Associated with Lexium 15 servo drive			**LXM 15LD17N4**			**LXM 15LD28M3**	**LXM 15MD28N4**
Line supply voltage		V	230 3-phase	400 3-phase	480 3-phase	230 3-phase	230 3-phase
Torque	Continuous stall M_0	Nm	16.5			16.8	
	Peak stall M_{max}	Nm	38.4			31	
Nominal operating point	Nominal torque	Nm	15.7	15	14.6	14.8	
	Nominal speed	rpm	600	1140	1440	1500	
Maximum current		A rms	9.48			21	

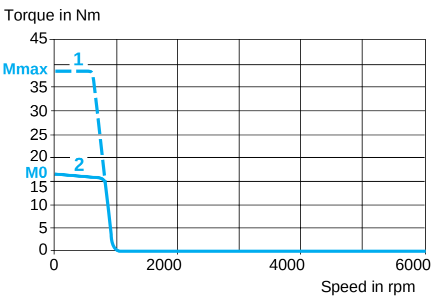
Servo motor characteristics

		Unit	BDH 1383G			BDH 1383K	
Maximum mechanical speed		rpm	6000				
Constants (at 120°C)	Torque	Nm/A rms	3.7			1.71	
	Back emf	V_{rms}/krpm	238			110	
Rotor	Number of poles		10				
	Inertia Without brake J_m	kgcm²	24				
	Inertia With brake J_m	kgcm²	24.61				
Stator (at 20°C)	Resistance (phase/phase)	Ω	5.16			1.09	
	Inductance (phase/phase)	mH	43.5			9.3	
	Electrical time constant	ms	8.43			8.53	
Holding brake (according to model)			See page 138				

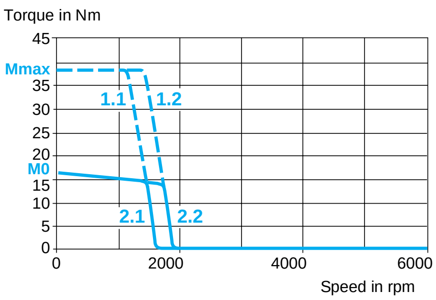
Torque/speed curves

BDH 1383G servo motor

With LXM 15LD17N4 servo drive
230 V 3-phase

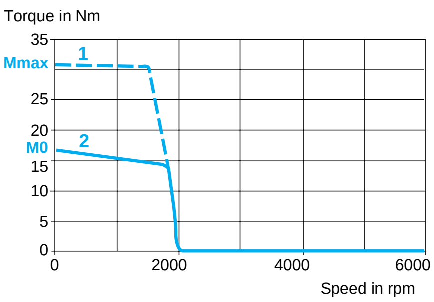


With LXM 15LD17N4 servo drive
400/480 V 3-phase

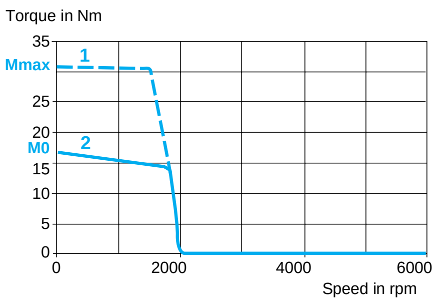


BDH 1383K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83
References:
pages 130 to 133
Dimensions:
pages 134 to 137

Characteristics of BDH 1383M/1383N servo motors

Type of servo motor				**BDH 1383M**			**BDH 1383N**		
Associated with Lexium 15 servo drive				**LXM 15MD40N4**			**LXM 15MD56N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	17					
	Peak stall	M_{max}	**Nm**	31.4			34.8		
Nominal operating point	Nominal torque		**Nm**	14	11.7	10.5	12.7	9.4	7.6
	Nominal speed		**rpm**	2100	3720	4500	2580	4620	5580
Maximum current			**A rms**	29.27			36.91		

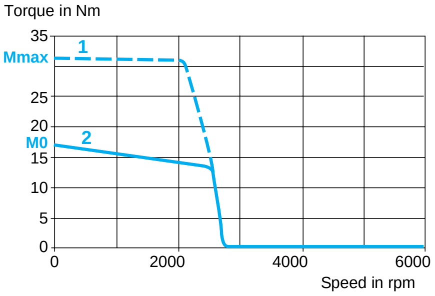
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000	
Constants (at 120°C)	Torque			**Nm/A rms**	1.24	0.98
	Back emf			**V_{rms}/krpm**	79.9	63.3
Rotor	Number of poles				10	
	Inertia	Without brake	J_m	**kgcm²**	24	
		With brake	J_m	**kgcm²**	24.61	
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	0.58	0.38
	Inductance (phase/phase)			**mH**	4.9	3.1
	Electrical time constant			**ms**	8.45	8.16
Holding brake (according to model)					See page 138	

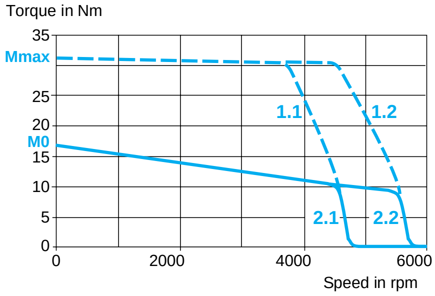
Torque/speed curves

BDH 1383M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase

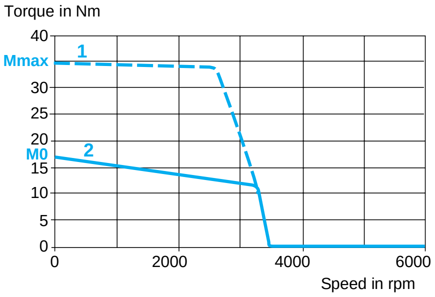


With LXM 15MD40N4 servo drive
400/480 V 3-phase

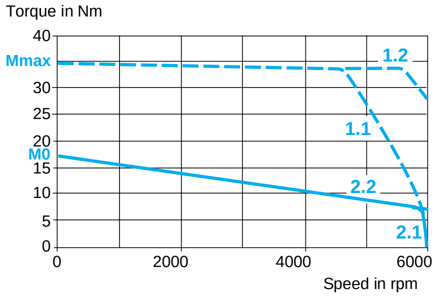


BDH 1383N servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83
References:
pages 130 to 133
Dimensions:
pages 134 to 137

Lexium 15 motion control

BDH servo motors

Characteristics of BDH 1384K/1384L servo motors

Type of servo motor				BDH 1384K			BDH 1384L		
Associated with Lexium 15 servo drive				LXM 15MD28N4			LXM 15MD40N4		
Line supply voltage			V	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	20.8			21		
	Peak stall	M_{max}	Nm	41.2			41.9		
Nominal operating point	Nominal torque		Nm	18.8	17	16.5	18	15.6	14.6
	Nominal speed		rpm	1080	2040	2460	1560	2820	3420
Maximum current			A rms	19.45			27.15		

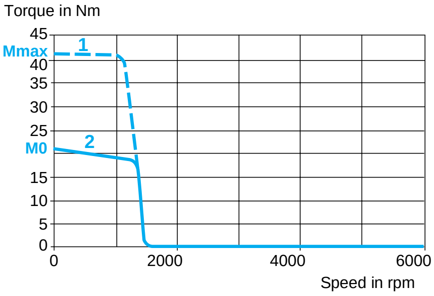
Servo motor characteristics

Maximum mechanical speed				rpm	6000		
Constants (at 120°C)	Torque			Nm/A rms	2.28		1.66
	Back emf			V_{rms}/krpm	147		107
Rotor	Number of poles				10		
	Inertia	Without brake	J_m	kgcm²	32		
		With brake	J_m	kgcm²	32.61		
Stator (at 20°C)	Resistance (phase/phase)			Ω	1.34		0.71
	Inductance (phase/phase)			mH	11.8		6.2
	Electrical time constant			ms	8.81		8.86
Holding brake (according to model)					See page 138		

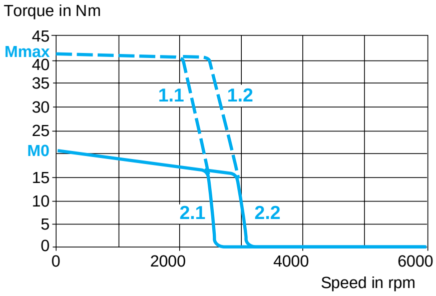
Torque/speed curves

BDH 1384K servo motor

With LXM 15MD28N4 servo drive
230 V 3-phase

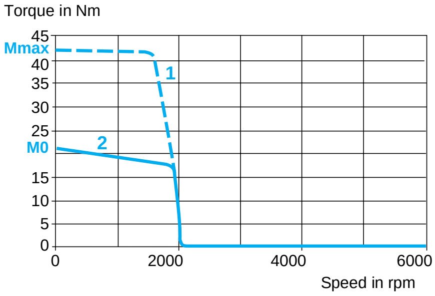


With LXM 15MD28N4 servo drive
400/480 V 3-phase

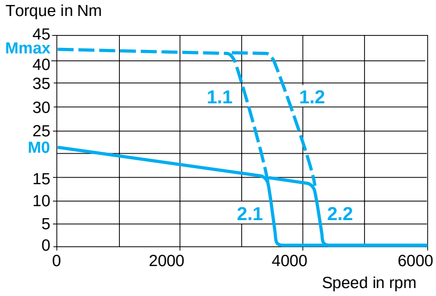


BDH 1384L servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BDH 1384P/1385K servo motors

Type of servo motor				**BDH 1384P**			**BDH 1385K**		
Associated with Lexium 15 servo drive				**LXM 15MD56N4**			**LXM 15MD28N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	20.4			24.8		
	Peak stall	M_{max}	**Nm**	40.2			46.8		
Nominal operating point	Nominal torque		**Nm**	15.3	11.3	9.4	19.4	20.5	22.5
	Nominal speed		**rpm**	2460	4380	5280	1020	1860	2280
Maximum current			**A rms**	39.53			20.79		

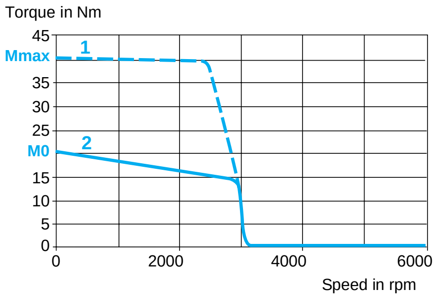
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000	
Constants (at 120°C)	Torque			**Nm/A rms**	1.1	2.54
	Back emf			**V_{rms}/krpm**	71	164
Rotor	Number of poles				10	
	Inertia	Without brake	J_m	**kgcm²**	32	40
		With brake	J_m	**kgcm²**	32.61	40.61
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	0.36	1.27
	Inductance (phase/phase)			**mH**	2.8	11.4
	Electrical time constant			**ms**	7.78	8.98
Holding brake (according to model)					See page 138	

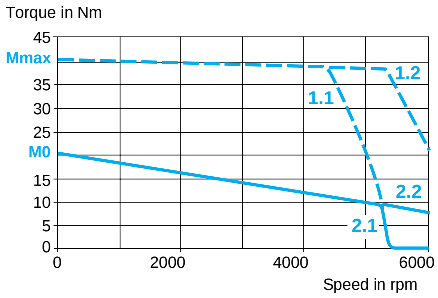
Torque/speed curves

BDH 1384P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase

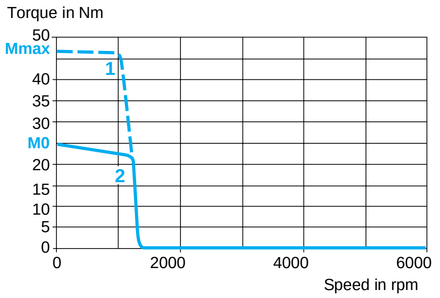


With LXM 15MD56N4 servo drive
400/480 V 3-phase

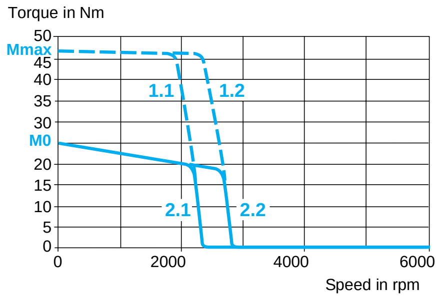


BDH 1385K servo motor

With LXM 15MD28N4 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 1385M/1385N servo motors

Type of servo motor				BDH 1385M			BDH 1385N		
Associated with Lexium 15 servo drive				LXM 15MD40N4			LXM 15MD56N4		
Line supply voltage			V	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	25			24.3		
	Peak stall	M_{max}	Nm	47.6			50.2		
Nominal operating point	Nominal torque		Nm	21.7	19	17.55	19.4	16	14
	Nominal speed		rpm	1440	2640	3180	1980	3540	4260
Maximum current			A rms	28.92			37.69		

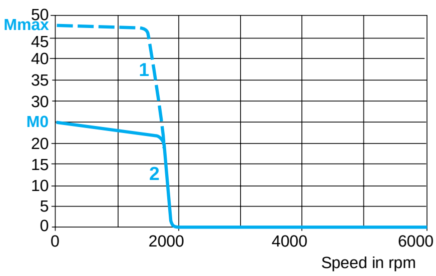
Servo motor characteristics

Maximum mechanical speed			rpm	6000	
Constants (at 120°C)	Torque		Nm/A rms	1.85	1.38
	Back emf		V_{rms}/krpm	119	88.8
Rotor	Number of poles			10	
	Inertia	Without brake J_m	kgcm²	40	
		With brake J_m	kgcm²	40.61	
Stator (at 20°C)	Resistance (phase/phase)		Ω	0.68	0.42
	Inductance (phase/phase)		mH	6.1	3.4
	Electrical time constant		ms	8.97	8.10
Holding brake (according to model)				See page 138	

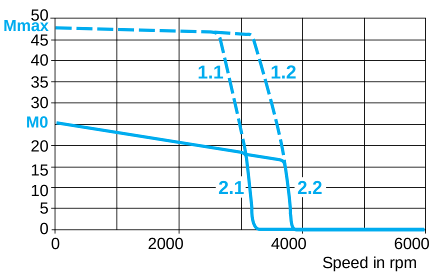
Torque/speed curves

BDH 1385M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase

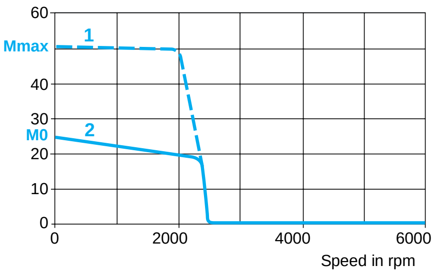


With LXM 15MD40N4 servo drive
400/480 V 3-phase

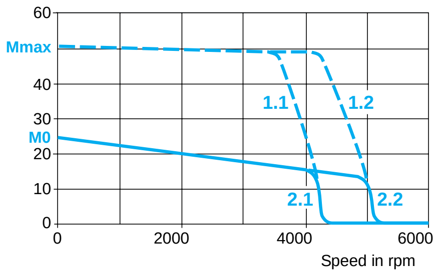


BDH 1385N servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 1882K/1882M servo motors

Type of servo motor				BDH 1882K			BDH 1882M		
Associated with Lexium 15 servo drive				**LXM 15MD28N4**			**LXM 15MD40N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	29.7			30		
	Peak stall	M_{max}	**Nm**	59.4			59.8		
Nominal operating point	Nominal torque		**Nm**	27.5	25.7	24.5	27	24	23
	Nominal speed		**rpm**	720	1320	1620	1020	1860	2220
Maximum current			**A rms**	19.66			27.51		

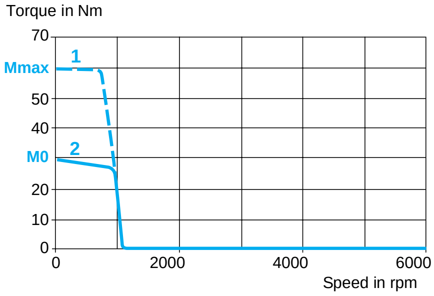
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	3.23	2.33
	Back emf		**V_{rms}/krpm**	208	150
Rotor	Number of poles			10	
	Inertia – Without brake	J_m	**kgcm²**	65	
	Inertia – With brake	J_m	**kgcm²**	66.64	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.22	0.64
	Inductance (phase/phase)		**mH**	20.7	10.8
	Electrical time constant		**ms**	16.97	16.88
Holding brake (according to model)				See page 138	

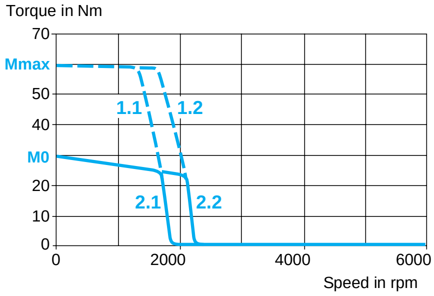
Torque/speed curves

BDH 1882K servo motor

With LXM 15MD28N4 servo drive
230 V 3-phase

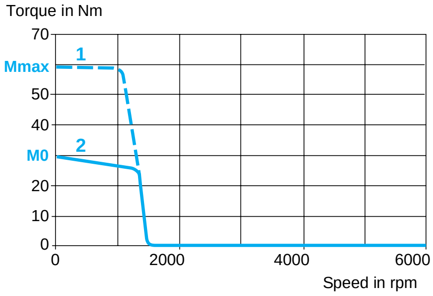


With LXM 15MD28N4 servo drive
400/480 V 3-phase

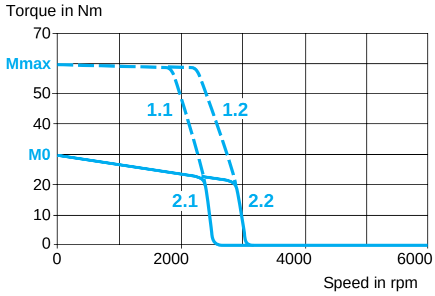


BDH 1882M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83
References:
pages 130 to 133
Dimensions:
pages 134 to 137

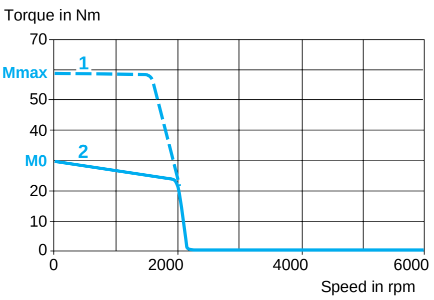
Characteristics of BDH 1882P/1883M servo motors

Type of servo motor				BDH 1882P			BDH 1883M		
Associated with Lexium 15 servo drive				**LXM 15MD56N4**			**LXM 15MD40N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	29.4			42		
	Peak stall	M_{max}	**Nm**	58.4			80.7		
Nominal operating point	Nominal torque		**Nm**	24.5	20.5	18.5	37.5	34	32.5
	Nominal speed		**rpm**	1560	2820	3360	780	1440	1740
Maximum current			**A rms**	39.67			28.85		
Servo motor characteristics									
Maximum mechanical speed			**rpm**	6000					
Constants (at 120°C)	Torque		**Nm/A rms**	1.58			3.1		
	Back emf		**V_{rms}/krpm**	102			200		
Rotor	Number of poles			10					
	Inertia, Without brake	J_m	**kgcm²**	65			92		
	Inertia, With brake	J_m	**kgcm²**	66.64			93.64		
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.33			0.68		
	Inductance (phase/phase)		**mH**	5			12.4		
	Electrical time constant		**ms**	15.15			18.24		
Holding brake (according to model)				See page 138					

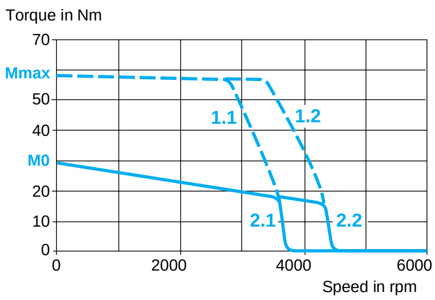
Torque/speed curves

BDH 1882P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase

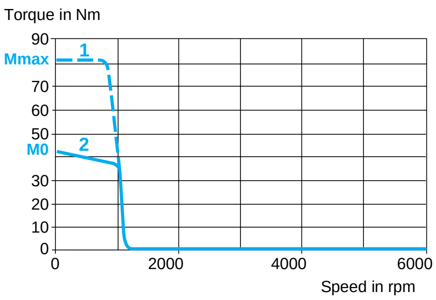


With LXM 15MD56N4 servo drive
400/480 V 3-phase

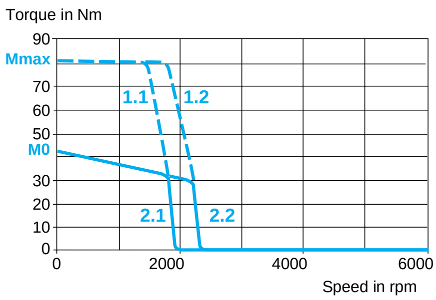


BDH 1883M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 1883P/1884L servo motors

Type of servo motor				**BDH 1883P**			**BDH 1884L**		
Associated with Lexium 15 servo drive				**LXM 15MD56N4**			**LXM 15MD40N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	41.6			53		
	Peak stall	M_{max}	**Nm**	79.4			108		
Nominal operating point	Nominal torque		**Nm**	35	29.5	27.5	48	44	42
	Nominal speed		**rpm**	1200	2160	2580	600	1080	1320
Maximum current			**A rms**	41.44			27.37		

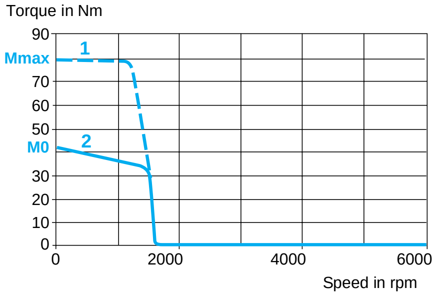
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	2.13	4.14
	Back emf		**V_{rms}/krpm**	137	266
Rotor	Number of poles			10	
	Inertia Without brake	J_m	**kgcm²**	92	120
	Inertia With brake	J_m	**kgcm²**	93.64	121.64
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.35	0.85
	Inductance (phase/phase)		**mH**	5.9	16.4
	Electrical time constant		**ms**	16.86	19.29
Holding brake (according to model)				See page 138	

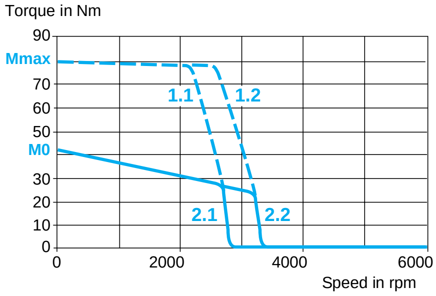
Torque/speed curves

BDH 1883P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase

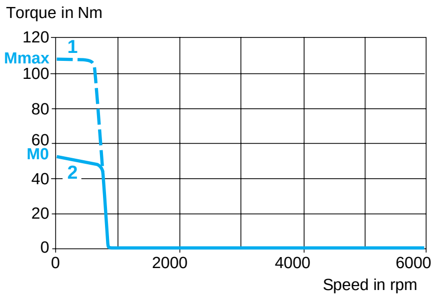


With LXM 15MD56N4 servo drive
400/480 V 3-phase

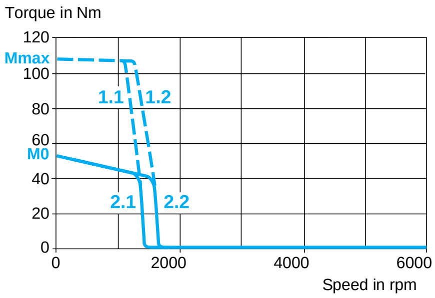


BDH 1884L servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83
References:
pages 130 to 133
Dimensions:
pages 134 to 137

Lexium 15 motion control
BDH servo motors

Characteristics of BDH 1884P servo motors

Type of servo motor			**BDH 1884P**		
Associated with Lexium 15 servo drive			**LXM 15MD56N4**		
Line supply voltage		**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall M_0	**Nm**	52.5		
	Peak stall M_{max}	**Nm**	106		
Nominal operating point	Nominal torque	**Nm**	45	39	36
	Nominal speed	**rpm**	900	1620	1980
Maximum current		**A rms**	39.24		

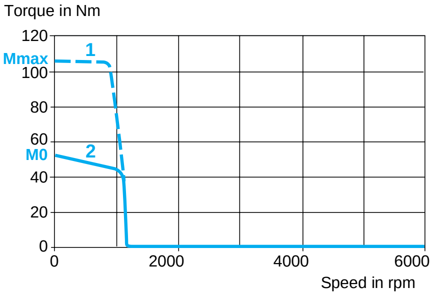
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	2.84
	Back emf			**V_{rms}/krpm**	183
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	120
		With brake	J_m	**kgcm²**	121.64
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	0.43
	Inductance (phase/phase)			**mH**	7.7
	Electrical time constant			**ms**	17.91
Holding brake (according to model)					See page 138

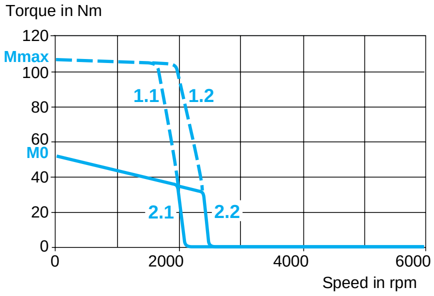
Torque/speed curves

BDH 1884P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase

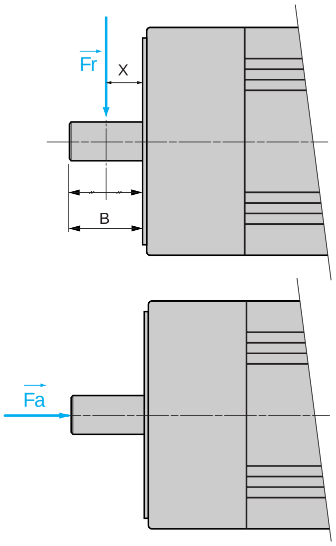


1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83
References:
pages 130 to 133
Dimensions:
pages 134 to 137



Radial and axial forces permitted on the motor shaft

Even when the servo motors are used under optimum conditions, their service life is limited by that of the bearings.

Conditions	
Nominal service life of bearings *(1)*	L_{10h} = 20,000 hours
Ambient temperature (temperature of bearings ~ 100°C)	40°C
Force application point	Fr applied at the middle point of the shaft end X = B/2 (dimension B, see pages 134 to 137)

(1) Hours of service with a failure probability of 10%

The following conditions must be adhered to:
- Radial and axial forces must not be applied simultaneously
- Shaft end with IP 54 or IP 67 degree of protection
- The bearings cannot be changed by the user as the built-in position sensor must be realigned if the unit is dismantled.

			Maximum radial force Fr							
Mechanical speed		**rpm**	**1000**	**2000**	**3000**	**4000**	**5000**	**6000**	**7000**	**8000**
Servo motor	BDH 040	**N**	46	43	40	37	33	30	27	23
	BDH 058	**N**	138	137	135	133	132	130	128	127
	BDH 070	**N**	300	240	200	180	165	150	–	–
	BDH 084	**N**	460	430	400	370	340	310	–	–
	BDH 108	**N**	425	400	375	350	325	300	–	–
	BDH 138	**N**	1200	900	775	700	650	600	–	–
	BDH 188	**N**	1400	1100	800	–	–	–	–	–
			Maximum axial force: Fa = $\frac{Fr}{3}$							

Presentation:
pages 82 and 83
References:
pages 130 to 133
Dimensions:
pages 134 to 137

Characteristics of servo motor/servo drive power connection cables

Cables fitted with a connector on servo motor side

Cable type		VW3 M5 101 R●●●
External sleeve, insulation		PUR orange coloured RAL 2003, TPM or PP/PE
Capacity	pF/m	< 70 (conductors/shielding)
Number of conductors (shielded)		[(4 x 1.5 mm²) + (2 x 1 mm²)]
Connector type		1 industrial connector (BDH servo motor side) and 1 free wire end (Lexium 15 LP servo drive side)
External diameter	mm	12 ± 0.2
Curvature radius	mm	90, suitable for daisy-chaining, cable carrier system
Working voltage	V	600
Maximum usable length	m	50, for connection with a Lexium 15 LP servo drive
Operating temperature	°C	- 40...+ 90 (fixed), - 20…+ 80 (mobile)
Certification		UL, CSA, VDE, CE, DESINA

Cables fitted with a connector on both the servo motor and servo drive sides

Cable type		VW3 M5 201 R●●●	VW3 M5 202 R●●●	VW3 M5 203 R●●●
External sleeve, insulation		PUR orange coloured RAL 2003, TPM or PP/PE		
Capacity	pF/m	< 70 (conductors/shielding)		
Number of conductors (shielded)		[(4 x 1.5 mm²) + (2 x 1 mm²)]	[(4 x 2.5 mm²) + (2 x 1 mm²)]	[(4 x 4 mm²) + (2 x 1 mm²)]
Connector type		1 industrial connector (BDH servo motor side) and 1 removable 6-way connector (Lexium 15 MP servo drives side)		
External diameter	mm	12 ± 0.2	14.3 ± 0.3	16.3 ± 0.3
Curvature radius	mm	90, suitable for daisy-chaining, cable carrier system	110, suitable for daisy-chaining, cable carrier system	125, suitable for daisy-chaining, cable carrier system
Working voltage	V	600		
Maximum usable length	m	100, for connection with a Lexium 15 MP servo drive		
Operating temperature	°C	- 40...+ 90 (fixed), - 20…+ 80 (mobile)		
Certification		UL, CSA, VDE, CE, DESINA		

Characteristics of the servo motor/servo drive control connection cables

Cable type		VW3 M8 301 R●●●	VW3 M8 401 R●●●
Sensor		SinCos Hiperface® encoder	Resolver
External sleeve, insulation		PUR green coloured RAL 6018, polyester	
Number of conductors (shielded)		5 x (2 x 0.25 mm²) + (2 x 0.5 mm²)	
External diameter	mm	8.8 ± 0.2	
Connector type		1 industrial connector (servo motor side) and 1 x 15-way SUB-D male connector (servo drive side)	1 industrial connector (servo motor side) and 1 x 9-way SUB-D male connector (servo drive side)
Min. curvature radius	mm	68, suitable for daisy-chaining, cable carrier system	
Working voltage	V	350 (0.25 mm²), 500 (0.5 mm²)	
Operating temperature	°C	- 50…+ 90 (fixed), - 40...+ 80 (mobile)	
Certification		UL, CSA, VDE, CE, DESINA	

Presentation:
pages 82 and 83
References:
pages 132 and 133
Dimensions:
pages 134 to 137

Lexium 15 motion control

BDH servo motors

BDH servo motors

The BDH servo motors shown below are supplied without a gearbox. For GBX gearboxes see page 143.

105995

BDH 0401●

105997

BDH 0701●

105999

BDH 1081●

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 15	Maximum nominal speed (1)	Reference (2)	Weight (3)
Nm	Nm	rpm		rpm		kg
0.18	0.61	8000	LD13M3	8000	**BDH 0401B ●5A2●**	0.350
0.31	1.08	8000	LD13M3	8000	**BDH 0402C ●5A2●**	0.490
0.41	1.46	8000	LD13M3	8000	**BDH 0403C ●5A2●**	0.630
0.84	2.34	8000	LU60N4	7680	**BDH 0582C ●●●2●**	1.100
0.87	2.42	8000	LD13M3	6880	**BDH 0582E ●●●2●**	1.100
1.08	2.62	8000	LD21M3	8000	**BDH 0583F ●●●2●**	1.380
1.13	3.2	8000	LU60N4	6000	**BDH 0583C ●●●2●**	1.380
1.15	3.34	8000	LU60N4	5360	**BDH 0701C ●●●2A**	1.550
1.16	3.58	8000	LD13M3	4080	**BDH 0583D ●●●2●**	1.380
			LD10N4	8000		
1.18	3.52	8000	LD21M3	8000	**BDH 0583F ●●●2●**	1.380
1.2	3.24	8000	LD13M3	5360	**BDH 0701E ●●●2A**	1.550
1.38	3.94	8000	LU60N4	5120	**BDH 0584C ●●●2●**	1.660
1.41	4.4	8000	LD13M3	3520	**BDH 0584D ●●●2●**	1.660
			LD10N4	8000		
1.42	3.57	8000	LD21M3	6000	**BDH 0584F ●●●2●**	1.660
	4.46	8000	LD21M3	6560		
1.5	3.14	6000	LD21M3	6000	**BDH 0841H ●●●2●**	2.440
1.95	5.12	6000	LU60N4	2820	**BDH 0841C ●●●2●**	2.440
2	5.74	8000	LU60N4	3440	**BDH 0702C ●●●2A**	2.230
2.02	5.13	6000	LD13M3	5640	**BDH 0841E ●●●2●**	2.440
	5.33	6000	LD10N4	2460		
2.04	6.51	8000	LD13M3	2320	**BDH 0702D ●●●2A**	2.230
			LD10N4	5520		
2.06	4.78	6000	LD21M3	5340	**BDH 0841H ●●●2●**	2.440
2.08	4.52	8000	LD21M3	4400	**BDH 0703H●●●2A**	2.900
2.1	5.36	8000	LD21M3	6560	**BDH 0702H ●●●2A**	2.230
2.71	7.83	8000	LU60N4	2560	**BDH 0703C ●●●2A**	2.900
2.79	8.55	8000	LD13M3	2000	**BDH 0703E ●●●2A**	2.900
			LD10N4	4800		
2.88	7.35	8000	LD21M3	4960	**BDH 0703H ●●●2A**	2.900
2.96	6.54	6000	LD21M3	3000	**BDH 0842G ●●●2●**	3.390
3.35	9.37	6000	LU60N4	1680	**BDH 0842C ●●●2●**	3.390
3.42	9.41	6000	LD10N4	3480	**BDH 0842E ●●●2●**	3.390
	9.72	6000	LD13M3	1500		
3.53	8.66	6000	LD17N4	6000	**BDH 0842G ●●●2●**	3.390
	9.56	6000	LD21M3	2760		
3.56	7.56	6000	LD28M3	5400	**BDH 0842J ●●●2●**	3.390
			MD28N4	5400		
3.96	8.8	6000	LD21M3	2220	**BDH 0843G ●●●2●**	4.350
	9.41	6000	LD21M3	1680	**BDH 1081G ●●●2●**	4.200
4.7	10.71	6000	LD10N4	2880	**BDH 1081E ●●●2●**	4.200
	11.7	6000	LD10N4	2700	**BDH 0843E ●●●2●**	4.350
4.75	10.82	6000	LD21M3	2340	**BDH 1081G ●●●2●**	4.200
			LD17N4	5160		
4.76	10.55	6000	LD21M3	1860	**BDH 0844G ●●●2●**	5.300
4.8	11.68	6000	LD17N4	4980	**BDH 0843G ●●●2●**	4.350
	13.2	6000	LD21M3	2160		
4.9	9.02	6000	LD28M3	4920	**BDH 0843K ●●●2●**	4.350
			MD28N4	4920		
	9.22	6000	LD28M3	4800	**BDH 1081K ●●●2●**	4.200
			MD28N4	4800		
5.76	14.1	6000	LD10N4	2400	**BDH 0844E ●●●2●**	5.300
5.88	13.97	6000	LD17N4	4380	**BDH 0844G ●●●2●**	5.300
	16.1	6000	LD21M3	1860		
6	12.8	6000	LD28M3	3660	**BDH 0844J ●●●2●**	5.300
			MD28N4	3660		
7.16	17.31	6000	LD21M3	1140	**BDH 1082G ●●●2●**	5.800

(1) Derating possible according to the power supply voltage, see characteristics pages 84 to 127.
(2) Complete each reference based on the available options, see table page 131.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 138.

BDH servo motors (continued)

106001

BDH 1882●

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 15	Maximum nominal speed (1)	Reference (2)	Weight (3)
Nm	Nm	rpm		rpm		kg
8.34	18.08	6000	LD10N4	1860	**BDH 1082E ●●●2●**	5.800
8.43	19.51	6000	LD21M3	1320	**BDH 1082G ●●●2●**	5.800
			LD17N4	3000		
8.6	16.7	6000	LD17N4	4080	**BDH 1082M ●●●2●**	5.800
	16.9	6000	LD28M3	2820	**BDH 1082K ●●●2●**	5.800
			MD28N4	2820		
11.4	22.1	6000	MD40N4	3180	**BDH 1083M ●●●2●**	7.400
	22.2	6000	MD56N4	4740	**BDH 1083P ●●●2●**	7.400
	25.83	6000	LD17N4	2340	**BDH 1083G ●●●2●**	7.400
11.6	22.9	6000	LD28M3	2100	**BDH 1083K ●●●2●**	7.400
			MD28N4	2100		
11.9	25.6	6000	LD17N4	1800	**BDH 1382G ●●●2●**	8.900
12.2	22.7	6000	LD28M3	1860	**BDH 1382K ●●●2●**	8.900
			MD28N4	1860		
	22.8	6000	MD40N4	5820	**BDH 1382M ●●●2●**	8.900
12.3	23.2	6000	MD56N4	3840	**BDH 1382P ●●●2●**	8.900
14.1	25.5	6000	MD56N4	3780	**BDH 1084N ●●●2●**	9.000
	27.28	6000	MD40N4	4260	**BDH 1084L ●●●2●**	9.000
14.3	31.7	6000	LD17N4	1980	**BDH 1084G ●●●2●**	9.000
14.4	28.1	6000	LD28M3	1800	**BDH 1084K ●●●2●**	9.000
16.5	38.4	6000	LD17N4	1440	**BDH 1383G ●●●2●**	11.100
16.8	31	6000	LD28M3	1500	**BDH 1383K ●●●2●**	11.100
			MD28N4	1500		
17	31.4	6000	MD40N4	4500	**BDH 1383M ●●●2●**	11.100
	34.8	6000	MD56N4	5580	**BDH 1383N ●●●2●**	11.100
20.4	40.2	6000	MD56N4	5280	**BDH 1384P ●●●2●**	13.300
20.8	41.2	6000	MD28N4	2460	**BDH 1384K ●●●2●**	13.300
21	41.9	6000	MD40N4	3420	**BDH 1384L ●●●2●**	13.300
24.3	50.2	6000	MD56N4	4260	**BDH 1385N ●●●2●**	15.400
24.8	46.8	6000	MD28N4	2280	**BDH 1385K ●●●2●**	15.400
25	47.6	6000	MD40N4	3180	**BDH 1385M ●●●2●**	15.400
29.4	58.4	6000	MD56N4	3360	**BDH 1882P ●●●2●**	19.700
29.7	59.4	6000	MD28N4	1620	**BDH 1882K ●●●2●**	19.700
30	59.8	6000	MD40N4	2220	**BDH 1882M ●●●2●**	19.700
41.6	79.4	6000	MD56N4	2580	**BDH 1883P ●●●2●**	26.700
42	80.7	6000	MD40N4	1740	**BDH 1883M ●●●2●**	26.700
52.5	106	6000	MD56N4	1980	**BDH 1884P ●●●2●**	33.600
53	108	6000	MD40N4	1320	**BDH 1884L ●●●2●**	33.600

To order a BDH servo motor complete each reference with:

		BDH 0583D	●	●	●	2	●
Shaft end	IP 54	Untapped *(4)*	**0**				
		Keyed *(6) (7)*	**1**				
	IP 67	Untapped *(4)*	**2**				
		Keyed *(6) (7)*	**3**				
Integrated sensor	Single turn, SinCos Hiperface® 4096 points/turn *(5)*			**1**			
	Multiturn, SinCos Hiperface® 4096 points/turn, 4096 turns *(5)*			**2**			
	2-pole resolver			**5**			
Holding brake	None				**A**		
	With *(5)*				**F**		
Connection	Angled connectors that can be rotated through 90°					**2**	
Flange	International IEC standard *(7)*						**A**
	NEMA *(6) (7) (8)*						**B**

Note: *The example above is for a* **BDH 0583D** *servo motor. Replace* **BDH 0583D** *with the relevant reference for other servo motors.*

(1) Derating possible according to the power supply voltage, see characteristics pages 84 to 127.
(2) To complete each reference see the above table.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 138.
(4) Not available in NEMA mounting for BDH 084●●, BDH 108●●, BDH 138●● and BDH 188●● servo motors.
(5) Not available for BDH 040●● servo motors.
(6) Not available in NEMA mounting for BDH 040●● servo motors and BDH 058●●.
(7) The type of key differs according to the type of mounting (IEC or NEMA) and the servo motor rating, see pages 134 to 137:
- *EMC mounting: BDH 040●●, open shaft key; other BDH servo motors, closed shaft key.*
- *NEMA mounting: BDH 084●●, BDH 108●●, BDH 138●● and BDH 188●●, open shaft key. Shaft key option not available for BDH 040●● and BDH 058●●.*

(8) Not available for BDH 070●● servo motors.

Presentation:
pages 82 and 83
Characteristics:
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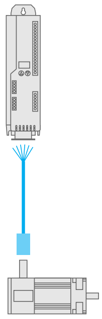
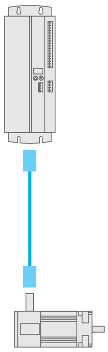
Dimensions:
pages 134 to 137

Power supply connection cables



VW3 M5 101 R●●●



VW3 M5 201/202/203 R●●●

Description	From servo motor	To servo drive	Composition	Length m	Reference	Weight kg
Cables fitted with a connector on servo motor side	BDH 040●● BDH 058●● BDH 070●● BDH 084●● BDH 108●E BDH 108●G BDH 108●K BDH 138●G BDH 138●K	LXM 15L●●●●●	[(4 x 1.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 101 R30**	0.810
				5	**VW3 M5 101 R50**	2.290
				10	**VW3 M5 101 R100**	2.290
				15	**VW3 M5 101 R150**	3.400
				20	**VW3 M5 101 R200**	4.510
				25 *(1)*	**VW3 M5 101 R250**	6.200
				50 *(1)*	**VW3 M5 101 R500**	12.325
Cables fitted with two connectors	BDH 084●● BDH 108●K BDH 138●K BDH 188●K	LXM 15MD●●N4	[(4 x 1.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 201 R30**	0.885
				5	**VW3 M5 201 R50**	1.375
				10	**VW3 M5 201 R100**	2.600
				15	**VW3 M5 201 R150**	3.825
				20	**VW3 M5 201 R200**	5.050
				25 *(1)*	**VW3 M5 201 R250**	6.275
				50 *(1)*	**VW3 M5 201 R500**	12.400
				75 *(1)*	**VW3 M5 201 R750**	18.525
	BDH 108●L BDH 108●M BDH 138●L BDH 138●M BDH 188●L BDH 188●M	LXM 15MD●●N4	[(4 x 2.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 202 R30**	1.137
				5	**VW3 M5 202 R50**	1.795
				10	**VW3 M5 202 R100**	3.430
				15	**VW3 M5 202 R150**	5.085
				20	**VW3 M5 202 R200**	6.730
				25 *(1)*	**VW3 M5 202 R250**	8.375
				50 *(1)*	**VW3 M5 202 R500**	16.600
				75 *(1)*	**VW3 M5 202 R750**	24.825
	BDH 108●N BDH 108●P BDH 138●N BDH 138●P BDH 188●P	LXM 15MD●●N4	[(4 x 4 mm²) + (2 x 1 mm²)]	3	**VW3 M5 203 R30**	1.536
				5	**VW3 M5 203 R50**	2.460
				10	**VW3 M5 203 R100**	4.770
				15	**VW3 M5 203 R150**	7.080
				20	**VW3 M5 203 R200**	9.390
				25 *(1)*	**VW3 M5 203 R250**	11.700
				50 *(1)*	**VW3 M5 203 R500**	23.250
				75 *(1)*	**VW3 M5 203 R750**	34.800

(1) For cables longer than 20m, a motor choke is compulsory, see page 47.

Presentation:
pages 82 and 83

Characteristics:
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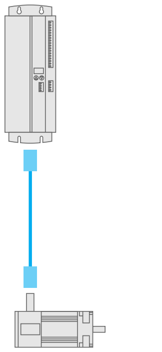
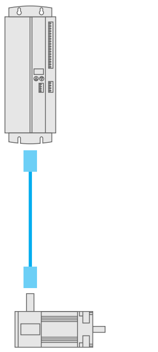
Control connecting cables



VW3 M8 301 R●●●

Description	From servo motor	To servo drive	Composition	Length m	Reference	Weight kg
SinCos Hiperface® encoder cables fitted with two connectors	BDH, all ratings	LXM 15, all ratings	5x(2 x 0.25 mm²) + (2 x 0.5 mm²)	3	**VW3 M8 301 R30**	–
				5	**VW3 M8 301 R50**	–
				10	**VW3 M8 301 R100**	–
				15	**VW3 M8 301 R150**	–
				20	**VW3 M8 301 R200**	–
				25	**VW3 M8 301 R250**	–
				50	**VW3 M8 301 R500**	–
				75	**VW3 M8 301 R750**	–
Resolver cables fitted with two connectors	BDH, all ratings	LXM 15, all ratings	5x(2 x 0.25 mm²) + (2 x 0.5 mm²)	3	**VW3 M8 401 R30**	–
				5	**VW3 M8 401 R50**	–
				10	**VW3 M8 401 R100**	–
				15	**VW3 M8 401 R150**	–
				20	**VW3 M8 401 R200**	–
				25	**VW3 M8 401 R250**	–
				50	**VW3 M8 401 R500**	–
				75	**VW3 M8 401 R750**	–



VW3 M8 401 R●●●

Presentation:
pages 82 and 83

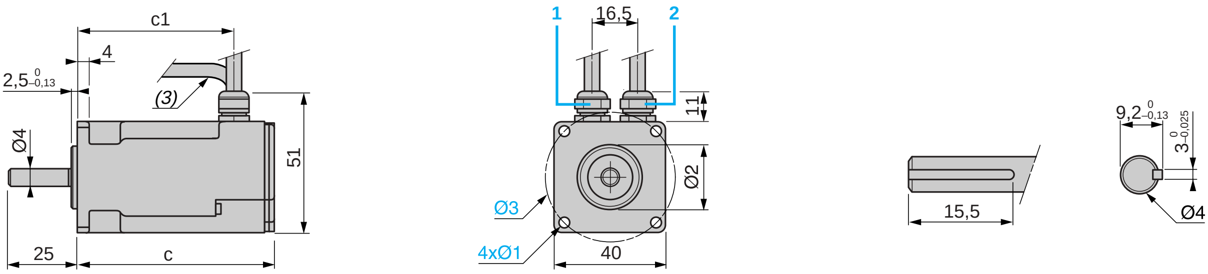
Characteristics:
page 129

Lexium 15 motion control

BDH servo motors

BDH 040 (straight remote connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*

Keyed shaft end (optional) *(2)*

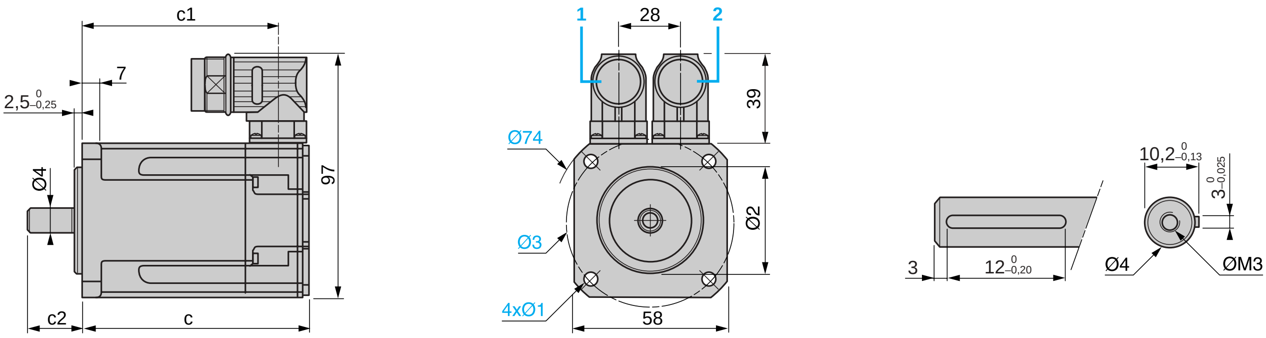


	With resolver		IEC mounting				NEMA mounting			
	c	**c1**	**Ø1**	**Ø2**	**Ø3**	**Ø4**	**Ø1**	**Ø2**	**Ø3**	**Ø4**
BDH 0401	69.6	56.1	4.3	30 h7	46	8 h7	3.56	$20.015^{+0.025}_{-0.025}$	46.69	$6.35^{0}_{-0.012}$
BDH 0402	88.6	75.1	4.3	30 h7	46	8 h7	3.56	$20.015^{+0.025}_{-0.025}$	46.69	$6.35^{0}_{-0.012}$
BDH 0403	107.6	94.1	4.3	30 h7	46	8 h7	3.56	$20.015^{+0.025}_{-0.025}$	46.69	$6.35^{0}_{-0.012}$

(1) SinCos Hiperface® encoder options and holding brake not available.
(2) Not available in NEMA mounting.
(3) Supplied with remote connectors, connection length: 500 mm

BDH 058 (angled connectors: power supply for servo motor/brake 2 and sensor 1)

Keyed shaft end (optional) *(1)*

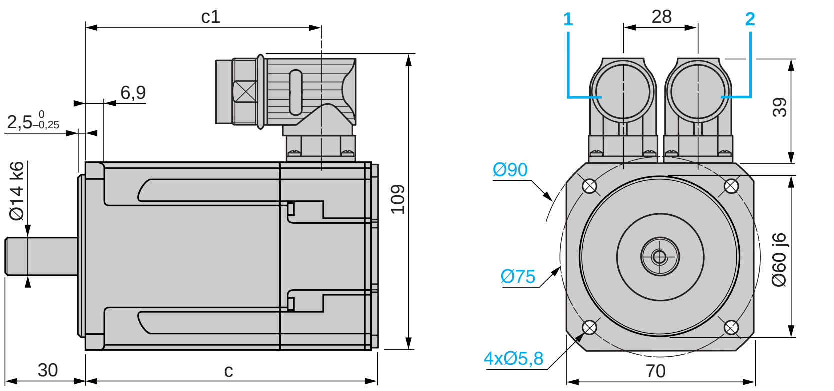


	With resolver		With SinCos encoder			IEC mounting					NEMA mounting				
	c (without brake)	**c** (with brake)	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**
BDH 0582	105.2	148.5	114.4	148.5	93.6	20	4.8	40 j6	63	9 k6	$31.75^{+0.79}_{-0.79}$	5.1	$38.1^{0}_{-0.005}$	66.68	$9.525^{0}_{-0.013}$
BDH 0583	124.2	167.5	133.4	167.5	112.6	20	4.8	40 j6	63	9 k6	$31.75^{+0.79}_{-0.79}$	5.1	$38.1^{0}_{-0.005}$	66.68	$9.525^{0}_{-0.013}$
BDH 0584	143.2	186.5	152.4	186.5	131.6	20	4.8	40 j6	63	9 k6	$31.75^{+0.79}_{-0.79}$	5.1	$38.1^{0}_{-0.005}$	66.68	$9.525^{0}_{-0.013}$

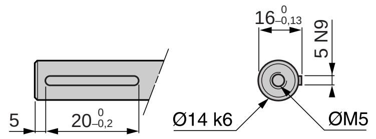
(1) Not available in NEMA mounting.

Presentation:
pages 82 and 83
Characteristics:
pages 84 to 129
References:
pages 130 to 133

BDH 070 (angled connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*



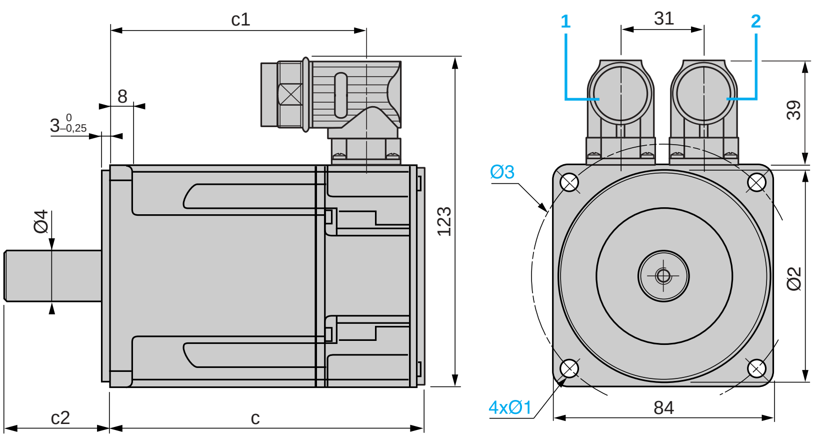
Keyed shaft end (optional)



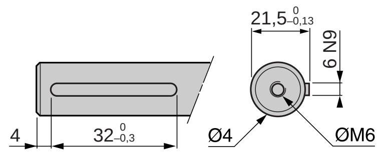
	With resolver or SinCos encoder		
	c (without brake)	**c** (with brake)	**c1**
BDH 0701	109.8	140.3	87.9
BDH 0702	140.8	171.3	118.9
BDH 0703	171.8	202.3	149.9

(1) Not available in NEMA mounting.

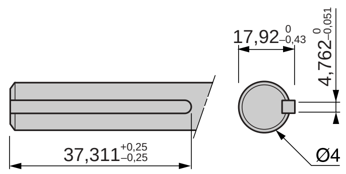
BDH 084 (angled connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*



Keyed shaft end, IEC mounting (optional)



Keyed shaft end, NEMA mounting *(1)*



	With resolver or SinCos encoder			IEC mounting					NEMA mounting				
	c (without brake)	**c** (with brake)	**c1**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**
BDH 0841	118.8	152.3	96.4	40	7	80 j6	100	19 k6	$52.4^{+0.79}_{-0.79}$	5.54	$73.025^{0}_{-0.051}$	98.43	$15.875^{0}_{-0.013}$
BDH 0842	147.8	181.3	125.5	40	7	80 j6	100	19 k6	$52.4^{+0.79}_{-0.79}$	5.54	$73.025^{0}_{-0.051}$	98.43	$15.875^{0}_{-0.013}$
BDH 0843	176.8	210.3	154.4	40	7	80 j6	100	19 k6	$52.4^{+0.79}_{-0.79}$	5.54	$73.025^{0}_{-0.051}$	98.43	$15.875^{0}_{-0.013}$
BDH 0844	205.8	239.3	183.4	40	7	80 j6	100	19 k6	$52.4^{+0.79}_{-0.79}$	5.54	$73.025^{0}_{-0.051}$	98.43	$15.875^{0}_{-0.013}$

(1) The untapped shaft end option is not available in NEMA mounting.

Presentation:
pages 82 and 83

Characteristics:
pages 84 to 129

References:
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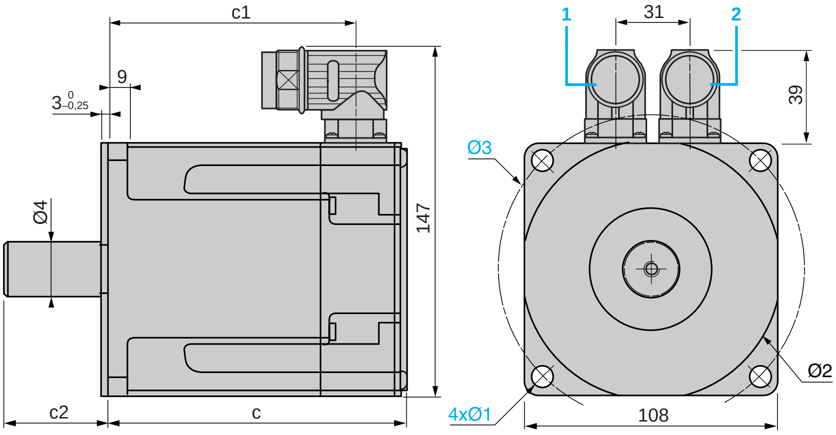
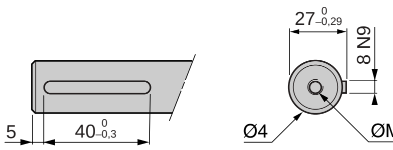
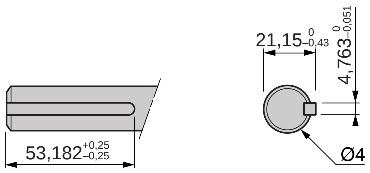
BDH 108 (angled connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*



Keyed shaft end, IEC mounting (optional)



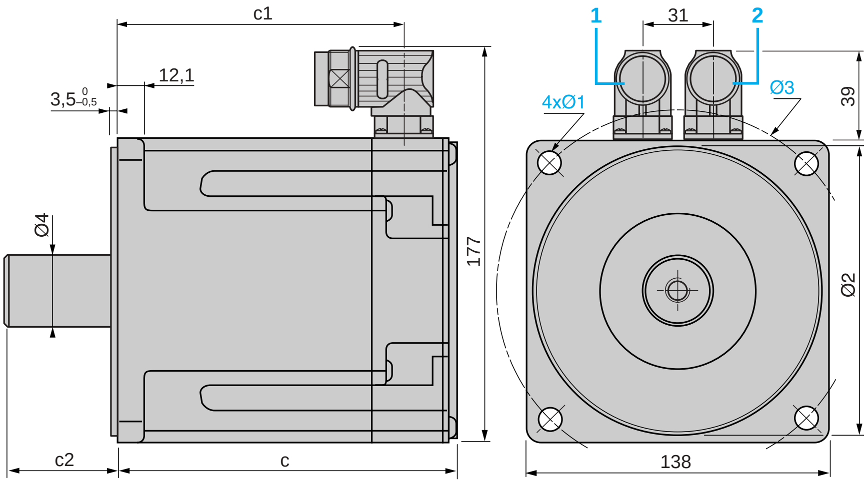
Keyed shaft end, NEMA mounting *(1)*



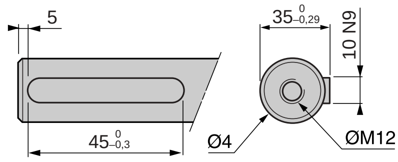
	With resolver		With SinCos encoder			IEC mounting					NEMA mounting				
	c (without brake)	**c** (with brake)	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**
BDH 1081	127.5	172.5	146	189	105.3	50	9	110 j6	130	24 k6	$57.15_{-0.79}^{+0.79}$	8.33	$55.563_{-0.051}^{0}$	125.73	$19.05_{-0.013}^{0}$
BDH 1082	158.5	203.5	177	220	136.3	50	9	110 j6	130	24 k6	$57.15_{-0.79}^{+0.79}$	8.33	$55.563_{-0.051}^{0}$	125.73	$19.05_{-0.013}^{0}$
BDH 1083	189.5	234.5	208	251	167.3	50	9	110 j6	130	24 k6	$57.15_{-0.79}^{+0.79}$	8.33	$55.563_{-0.051}^{0}$	125.73	$19.05_{-0.013}^{0}$
BDH 1084	220.5	265.5	239	282	196.3	50	9	110 j6	130	24 k6	$57.15_{-0.79}^{+0.79}$	8.33	$55.563_{-0.051}^{0}$	125.73	$19.05_{-0.013}^{0}$

(1) The untapped shaft end option is not available in NEMA mounting.

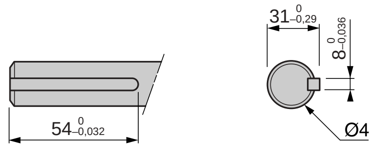
BDH 138 (angled connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*



Keyed shaft end, IEC mounting (optional)



Keyed shaft end, NEMA mounting *(1)*



	With resolver		With SinCos encoder			IEC mounting					NEMA mounting				
	c (without brake)	**c** (with brake)	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**
BDH 1382	153.7	200.7	172.2	218.7	130.5	58	$11_{0}^{+0.36}$	130 j6	165	32 k6	60	$9_{0}^{+0.36}$	110 h7	145	28 h6
BDH 1383	178.7	225.7	197.2	224.7	155.5	58	$11_{0}^{+0.36}$	130 j6	165	32 k6	60	$9_{0}^{+0.36}$	110 h7	145	28 h6
BDH 1384	203.7	250.7	222.2	268.7	180.5	58	$11_{0}^{+0.36}$	130 j6	165	32 k6	60	$9_{0}^{+0.36}$	110 h7	145	28 h6
BDH 1385	228.7	275.7	247.2	294.7	205.5	58	$11_{0}^{+0.36}$	130 j6	165	32 k6	60	$9_{0}^{+0.36}$	110 h7	145	28 h6

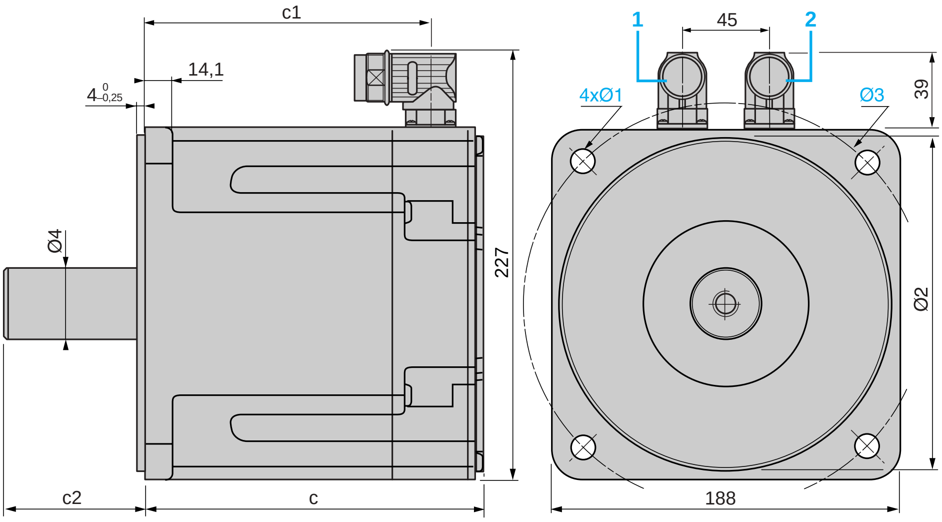
(1) The untapped shaft end option is not available in NEMA mounting.

Presentation:
pages 82 and 83

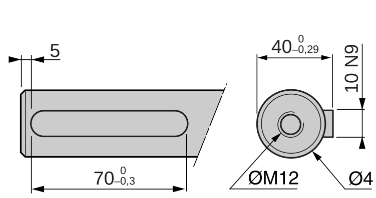
Characteristics:
pages 84 to 129

References:
pages 130 to 133

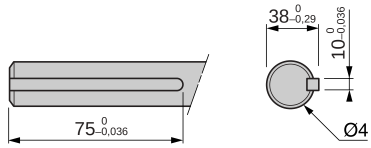
BDH 188 (angled connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*



Keyed shaft end, IEC mounting (optional)



Keyed shaft end, NEMA mounting *(1)*



	With resolver		With SinCos encoder			IEC mounting					NEMA mounting				
	c (without brake)	**c** (with brake)	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**
BDH 1882	192.5	234.5	201.7	253.3	164.5	80	$13.5^{+0.43}_{0}$	180 j6	215	38 k6	79	$13.5^{+0.43}_{0}$	$114.3^{0}_{-0.025}$	200	35 h6
BDH 1883	226.5	268.5	235.7	287.3	198.5	80	$13.5^{+0.43}_{0}$	180 j6	215	38 k6	79	$13.5^{+0.43}_{0}$	$114.3^{0}_{-0.025}$	200	35 h6
BDH 1884	260.5	302.5	269.7	321.3	232.5	80	$13.5^{+0.43}_{0}$	180 j6	215	38 k6	79	$13.5^{+0.43}_{0}$	$114.3^{0}_{-0.025}$	200	35 h6

(1) The untapped shaft end option is not available in NEMA mounting.

Presentation:
pages 82 and 83

Characteristics:
pages 84 to 129

References:
pages 130 to 133

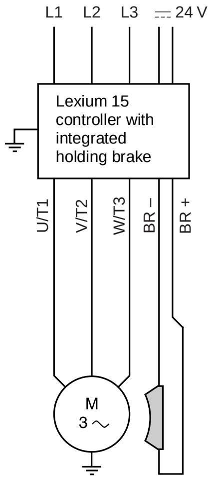
Lexium 15 motion control

BDH servo motors

Option: integrated holding brake

Holding brake *(1)*

Presentation



Holding brake

The holding brake integrated into the BDH servo motor, depending on the model, is an electromagnetic pressure spring brake with that blocks the servo motor axis once the output current has been switched off. In the event of an emergency, such as a power outage or an emergency stop, the drive is immobilized, significantly increasing safety.
Blocking the servo motor axis is also necessary in cases of torque overload, such as in the event of vertical axis movement.

Activation of the holding brake is directly controlled by the Lexium 15 servo drive.

Characteristics

Type of servo motor	BDH	058	070	084	108	138	188
Holding torque M_{Br}	**Nm**	1.42	2.5	6	14.5	25	53
Inertia of rotor (brake only) J_{Br}	**kgcm²**	0.011	0.011	0.068	0.173	0.61	1.64
Electrical clamping power P_{Br}	**W**	8.4	10.1	12.8	19.5	25.7	35.6
Supply voltage		24 V⎓ -10…+10 %					
Opening time	**ms**	20	27	35	80	105	110
Closing time	**ms**	18	10	15	15	20	35
Weight	**kg**	0.270	0.350	0.610	1.100	2.000	2.100

References

105998


BDH servo motor

Selection of BDH servo motor with **F** *(1)* or without **A** holding brake, see references page 131.

(1) Not available for BDH 040●● servo motors.

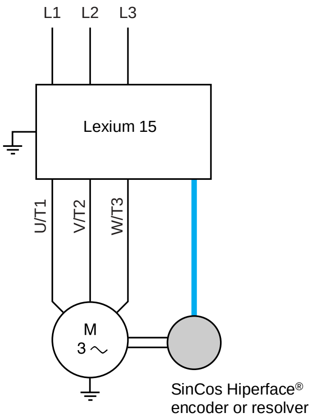
Dimensions:
pages 134 to 137

Lexium 15 motion control

BDH servo motors
Option: integrated sensor

Sensor integrated into BDH servo motors

Presentation



BDH servo motors can be fitted with 2 types of sensor:
- 2-pole resolver
- SinCos high resolution Hiperface® *(1)* encoder:
  - single turn
  - multiturn

These measurement devices are perfectly adapted to the Lexium 15 range of servo drives.

The use of a resolver allows (at low cost):
- The angular position of the rotor to be identified
- The servo motor speed to be measured

The use of a SinCos Hiperface® *(1)* encoder also allows:
- The BDH servo motor data to be automatically identified by the servo drive
- The servo drive's control loops to be automatically initialized. These functions therefore simplify the installation of the motion control device.

Characteristics

Type of sensor		**Resolver**	**Single turn SinCos** *(1)*	**Multiturn SinCos** *(1)*
Sinus periods per turn		1	128	128
Number of points		–	4096	4096 x 4096 turns
Encoder precision		± 30 arc minutes	± 1.3 arc minutes	
Measurement method		Electromagnetic demodulation	Optical high resolution	
Interface		–	Hiperface®	
Operating temperature	**°C**	+55…+155	+5…+110	

References

105998

BDH servo motor

Selection of resolver sensor **5**, type of SinCos Hiperface® encoder *(1)* integrated into the BDH servo motor (single turn **1** or multiturn **2**), see references page 131.

(1) Not available for BDH 040●● servo motors.

Dimensions:
pages 134 to 137

Lexium 15 motion control

BDH servo motors

Option: GBX planetary gearboxes

Presentation

535526

GBX planetary gearboxes

In many cases, motion control requires the use of planetary gearboxes to adapt speeds and torques, while ensuring the precision demanded by the application.

Schneider Electric has selected GBX gearboxes made by Neugart to be used in association with the BDH servo motor range. These gearboxes are lubricated for life and are designed for applications not requiring very low backlash. As their association with BDH servo motors has been fully qualified and they are very easy to mount, the gearboxes are simple to put into operation and risk free.

Available in 5 sizes (GBX 40... GBX 160), the planetary gearboxes are offered in 12 gear ratios (3:1...40:1), see table below.

Continuous stall torques and peak stall torques available from the gearbox are obtained by multiplying the characteristic values of the servo motor by the reduction ratio and gearbox efficiency (0.96 or 0.94 depending on the speed reduction ratio).

The table below shows the most suitable servo motor/gearbox combinations. For other combinations, see the servo motor data sheets.

BDH servo motor/GBX gearbox associations

Type of servo motor	Speed reduction ratio											
	3:1	4:1	5:1	8:1	9:1	12:1	15:1	16:1	20:1	25:1	32:1	40:1
BDH 0401B	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 60
BDH 0402C	GBX 40	GBX 40	GBX 40	GBX 60	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60
BDH 0403C	GBX 40	GBX 40	GBX 40	GBX 60	GBX 40	GBX 40	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60	_GBX 60*_
BDH 0582C	GBX 60	GBX 60	GBX 60	_GBX 60*_	GBX 40	GBX 60	GBX 60	GBX 60	GBX 60	_GBX 60*_	_GBX 60*_	_GBX 60*_
BDH 0582E	GBX 60	GBX 60	GBX 60	_GBX 60*_	GBX 40	GBX 60	GBX 60	GBX 60	GBX 60	_GBX 60*_	_GBX 60*_	_GBX 60*_
BDH 0583C	GBX 60	GBX 60	GBX 60	_GBX 60*_	GBX 60	GBX 60	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_
BDH 0583D	GBX 60	GBX 60	GBX 60	_GBX 60*_	GBX 60	GBX 60	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_
BDH 0583F	GBX 60	GBX 60	GBX 60	_GBX 60*_	GBX 60	GBX 60	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_
BDH 0584C	GBX 60	GBX 60	_GBX 60*_	_GBX 60*_	GBX 60	GBX 60	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_
BDH 0584D	GBX 60	GBX 60	_GBX 60*_	_GBX 60*_	GBX 60	GBX 60	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_
BDH 0584F	GBX 60	GBX 60	_GBX 60*_	_GBX 60*_	GBX 60	GBX 60	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_	_GBX 60*_
BDH 0701C	GBX 60	GBX 60	GBX 60	GBX 80	GBX 60	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120
BDH 0701E	GBX 60	GBX 60	GBX 60	GBX 80	GBX 60	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120
BDH 0702C	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0702D	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0702H	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0703C	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	_GBX 120*_
BDH 0703E	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	_GBX 120*_
BDH 0703H	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	_GBX 120*_
BDH 0841C	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0841E	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0841H	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0842C	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160
BDH 0842E	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160
BDH 0842G	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160
BDH 0842J	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160
BDH 0843E	GBX 80	GBX 80	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 0843G	GBX 80	GBX 80	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 0843K	GBX 80	GBX 80	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 0844E	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160
BDH 0844G	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160
BDH 0844J	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160

GBX 60* *For associations in italics and marked with an asterisk, you must check that the application does not exceed the maximum continuous output torque of the gearbox, see values page 142.*

Characteristics:
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References:
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Lexium 15 motion control

BDH servo motors

Option: GBX planetary gearboxes

BDH servo motor/GBX gearbox associations (continued)

Type of servo motor	Speed reduction ratio											
	3:1	4:1	5:1	8:1	9:1	12:1	15:1	16:1	20:1	25:1	32:1	40:1
BDH 1081E	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 1081G	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 1081K	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 1082E	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*
BDH 1082G	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*
BDH 1082K	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*
BDH 1082M	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*
BDH 1083G	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1083K	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1083M	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1083P	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1084G	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1084K	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1084L	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1084N	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1382G	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1382K	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1382M	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1382P	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1383G	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1383K	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1383M	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1383N	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1384K	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1384L	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1384P	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1385K	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1385M	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1385N	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*

GBX 160* — *For associations in italics and marked with an asterisk, you must check that the application does not exceed the maximum continuous output torque of the gearbox, see values page 142.*

Lexium 15 motion control

BDH servo motors

Option: GBX planetary gearboxes

Characteristics of GBX gearboxes

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Type of gearbox			Planetary gearbox with straight teeth, single reduction stage				
Backlash	**3:1...8:1**	**arc min**	< 30	< 20	< 12	< 8	< 6
	9:1...40:1		< 35	< 25	< 17	< 12	< 10
Torsion rigidity	**3:1...8:1**	**Nm/arc min**	1.0	2.3	6	12	38
	9:1...40:1		1.1	2.5	6.5	13	41
Noise level		**dB (A)**	55	58	60	65	70
Junction box			Black anodized aluminum				
Shaft material			C 45				
Shaft output dust and damp protection			IP 54				
Lubrification			Lubricated for life				
Average service life *(1)*		**hr**	30,000				
Mounting position			All positions				
Operating temperature		**°C**	- 25...+ 90				

Characteristics of BDH servo motor/GBX gearbox associations

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Efficiency	**3:1...8:1**		0.96				
	9:1...40:1		0.94				
Maximum permitted radial force *(1) (2)*	L_{10h} = 10,000 hours	**N**	200	500	950	2000	6000
	L_{10h} = 30,000 hours		160	340	650	1500	4200
Maximum permitted axial force *(1)*	L_{10h} = 10,000 hours	**N**	200	600	1200	2800	8000
	L_{10h} = 30,000 hours		160	450	900	2100	6000
Inertia of gearbox	**3:1**	**$kgcm^2$**	0.031	0.135	0.77	2.63	12.14
	4:1	**$kgcm^2$**	0.022	0.093	0.52	1.79	7.78
	5:1	**$kgcm^2$**	0.019	0.078	0.45	1.53	6.07
	8:1	**$kgcm^2$**	0.017	0.065	0.39	1.32	4.63
	9:1	**$kgcm^2$**	0.030	0.131	0.74	2.62	–
	12:1	**$kgcm^2$**	0.029	0.127	0.72	2.56	12.37
	15:1	**$kgcm^2$**	0.023	0.077	0.71	2.53	12.35
	16:1	**$kgcm^2$**	0.022	0.088	0.50	1.75	7.47
	20:1	**$kgcm^2$**	0.019	0.075	0.44	1.50	6.64
	25:1	**$kgcm^2$**	0.019	0.075	0.44	1.49	5.81
	32:1	**$kgcm^2$**	0.017	0.064	0.39	1.30	6.36
	40:1	**$kgcm^2$**	0.016	0.064	0.39	1.30	5.28
Continuous output torque *(1)* M_{2N}	**3:1**	**Nm**	4.5	12	40	80	400
	4:1	**Nm**	6	16	50	100	450
	5:1	**Nm**	6	16	50	110	450
	8:1	**Nm**	5	15	50	120	450
	9:1	**Nm**	16.5	44	130	210	–
	12:1	**Nm**	20	44	120	260	800
	15:1	**Nm**	18	44	110	230	700
	16:1	**Nm**	20	44	120	260	800
	20:1	**Nm**	20	44	120	260	800
	25:1	**Nm**	18	40	110	230	700
	32:1	**Nm**	20	44	120	260	800
	40:1	**Nm**	18	40	110	230	700

(1) Values refer to an output shaft speed of 100 rpm in S1 mode (cyclic ratio = 1) on electrical machines and an ambient temperature of 30°C.
(2) Force applied at mid-distance from the output shaft.

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pages 140 and 141
References:
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Lexium 15 motion control

BDH servo motors
Option: GBX planetary gearboxes

References

535526

GBX●●●

Size	Speed reduction ratio	Reference (1)	Weight kg
GBX 40	3:1, 4:1, 5:1 and 8:1	**GBX 040 ●●● ●●● ●D**	0.350
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 040 ●●● ●●● ●D**	0.450
GBX 60	3:1, 4:1, 5:1 and 8:1	**GBX 060 ●●● ●●● ●D**	0.900
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 060 ●●● ●●● ●D**	1.100
GBX 80	3:1, 4:1, 5:1 and 8:1	**GBX 080 ●●● ●●● ●D**	2.100
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 080 ●●● ●●● ●D**	2.600
GBX 120	3:1, 4:1, 5:1 and 8:1	**GBX 120 ●●● ●●● ●D**	6.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 120 ●●● ●●● ●D**	8.000
GBX 160	3:1, 4:1, 5:1 and 8:1	**GBX 160 ●●● ●●● ●D**	18.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 160 ●●● ●●● ●D**	22.000

To order a GBX planetary gearbox, complete each reference with:

		GBX	●●●	●●●	●●●	●	B
Size	Junction box diameter (see associations table with BDH servo motor, pages 140 and 141)	40 mm	**040**				
		60 mm	**060**				
		80 mm	**080**				
		115 mm	**120**				
		160 mm	**160**				
Speed reduction ratio		3:1		**003**			
		4:1		**004**			
		5:1		**005**			
		8:1		**008**			
		9:1		**009**			
		12:1		**012**			
		15:1		**015**			
		16:1		**016**			
		20:1		**020**			
		25:1		**025**			
		32:1		**032**			
		40:1		**040**			
Associated BDH servo motor	Type	BDH 040			**040**		
		BDH 058			**058**		
		BDH 070			**070**		
		BDH 084			**084**		
		BDH 108			**108**		
		BDH 138			**138**		
	Model	BDH ●●●1				**1**	
		BDH ●●●2				**2**	
		BDH ●●●3				**3**	
		BDH ●●●4				**4**	
		BDH ●●●5				**5**	
BDH servo motor adaptation							**D**

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Characteristics: page 142
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Lexium 15 motion control

BDH servo motors

Option: GBX planetary gearboxes

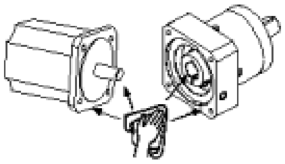
Mounting

No specialized tool is required to install the GBX planetary gearbox on the BDH servo motor. The general usage rules for mechanical mounting must be observed:

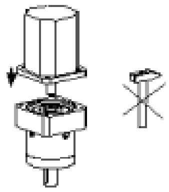
1 Clean support areas and joints.
2 Align the shafts to be linked and assemble in vertical position.
3 Join the servo motor flange to the gearbox flange in uniform manner, with cross tightening of the screws.
4 Using a torque wrench, tighten the TA ring following tightening torque (2...40 Nm according to the gearbox model).

For more information, consult the user instructions supplied with the products).

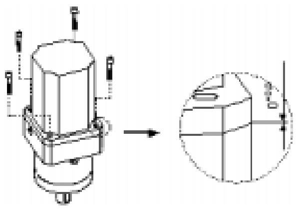
1



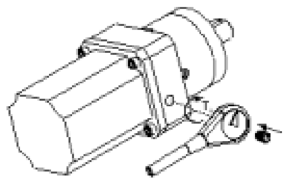
2



3

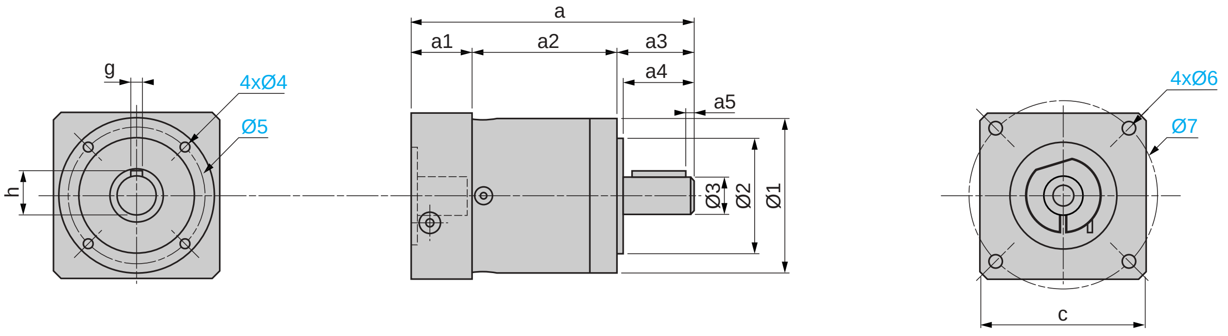


4



Dimensions

Servo motor assembly



GBX	c	a	a1	a2	a3	a4	a5	h	g	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7
040 003...008	40	93.5	28.5	39	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
040 009...032	40	106.5	28.5	52	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
060 003...008	60	106.5	24.5	47	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
060 009...040	60	118.5	24.5	59	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
080 003...008	90	134	33.5	60.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
080 009...032	90	151	33.5	77.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
120 003...008	115	176.5	47.5	74	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
120 009...040	115	203.5	47.5	101	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
160 003...008	140	255.5	64.5	104	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165
160 009...040	140	305	64.5	153.5	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165

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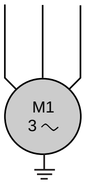
Lexium 15 motion control

BDH servo motors

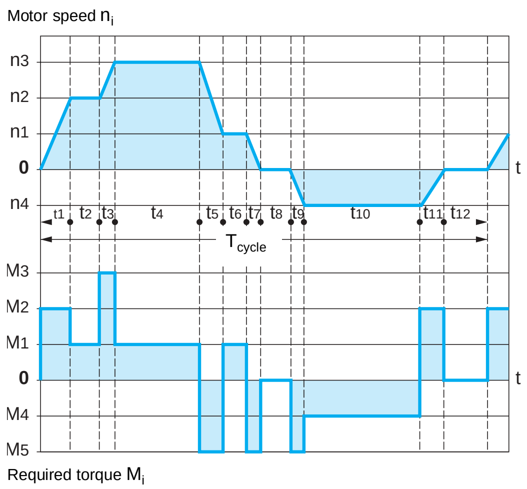


Sizing of BDH servo motors

To assist you in sizing your servo motor, the "**Lexium Sizer**" software tool is available on the website www.telemecanique.com

These 2 pages are to help you understand the method used for calculation.

To size the servo motor you need to know the equivalent thermal torque and the average speed required by the mechanics to be used with the servo motor.
Both values are calculated using the motor cycle trend diagram and can be compared with the speed/torque curves given for each servo motor (see BDH servo motor curves, pages 84 to 127).



Motor cycle trend diagram

The motor cycle is made up of various sub-cycles for which the duration of each is known.
Each sub-cycle is broken down into phases which correspond to the periods of time during which the motor torque is constant (1 to 3 phases maximum per sub-cycle).
This breakdown makes it possible to find out for each phase:

- The duration (t_j)
- The speed (n_i)
- The required torque value (M_i)

The curves on the left show the 4 phase types:

- Constant acceleration during t_1, t_3 and t_9
- At work during t_2, t_4, t_6 and t_{10}
- Constant deceleration during t_5, t_7 and t_{11}
- Motor stopped during t_8 and t_{12}

The total cycle duration is:

$T_{cycle} = t_1 + t_2 + t_3 + t_4 + t_5 + t_6 + t_7 + t_8 + t_9 + t_{10} + t_{11} + t_{12}$

Calculating the average speed n_{avg}

The average speed is calculated using the formula opposite with: $n_{avg} = \dfrac{\sum |ni| \cdot t_j}{\sum t_j}$

- n_i corresponds to the various work speeds.
- $\dfrac{ni}{2}$ corresponds to the average speeds during constant acceleration and deceleration phases.

In the above example:

Duration t_j	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}	t_{12}
Speed $\|ni\|$	$\frac{\|n2\|}{2}$	$\|n2\|$	$\frac{\|n3\|+\|n2\|}{2}$	$\|n3\|$	$\frac{\|n3\|+\|n1\|}{2}$	$\|n1\|$	$\frac{\|n1\|}{2}$	0	$\frac{\|n4\|}{2}$	$\|n4\|$	$\frac{\|n4\|}{2}$	0

The average speed is calculated as follows:

$$n_{moy} = \frac{\frac{n2}{2} \cdot t1 + n2 \cdot t2 + \frac{n3+n2}{2} \cdot t3 + n3 \cdot t4 + \frac{n3+n1}{2} \cdot t5 + n1 \cdot t6 + \frac{n1}{2} \cdot t7 + \frac{n4}{2} \cdot t9 + n4 \cdot t10 + \frac{n4}{2} \cdot t11}{Tcycle}$$

Calculating the equivalent thermal torque M_{eq}

The equivalent thermal torque is calculated using the following formula:

$$M_{eq} = \sqrt{\frac{\sum Mi^2 \cdot t_j}{Tcycle}}$$

In the above example, this formula gives the following calculation:

$$M_{eq} = \sqrt{\frac{M2^2 \cdot t1 + M1^2 \cdot t2 + M3^2 \cdot t3 + M1^2 \cdot t4 + M5^2 \cdot t5 + M1^2 \cdot t6 + M5^2 \cdot t7 + M5^2 \cdot t9 + M4^2 \cdot t10 + M2^2 \cdot t11}{Tcycle}}$$

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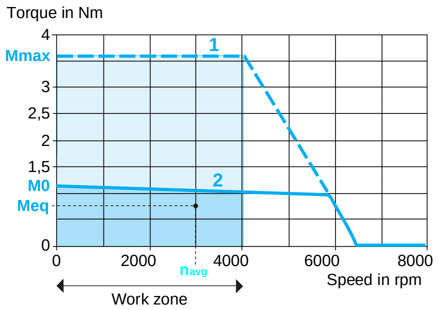
Dimensions:
pages 134 to 137



Sizing of BDH servo motors (continued)

Determining the size of the servo motor

The point defined by the 2 preceding calculations (average speed and equivalent thermal torque) where:

- the horizontal axis represents the average speed n_{avg}
- the vertical axis represents the thermal torque M_{eq}

must be within the area bound by curve 2 and the work zone.

The motor cycle trend diagram must also be used to ensure that all torques M_i required for the different speeds n_i during the various cycle phases are within the area bound by curve 1 and the work zone.

1 Peak torque
2 Continuous torque

Lexium 15 motion control

BSH servo motors

BSH servo motor with straight connectors

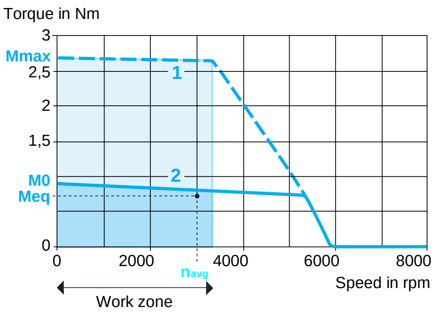
BSH servo motor with angled connectors

Presentation

BSH servo motors offer an excellent solution for dynamics and precision requirements. With five flange sizes and available in a variety of lengths, they are perfectly suited to most applications, covering a torque range of between 0.5 Nm to 90 Nm and speeds from 1250 to 8000 rpm.
Incorporating the latest technology in their windings, based on salient poles, BSH servo motors are far more compact than conventional servo motors.

BSH servo motors are available in five flange sizes: 55, 70, 100, 140 and 205 mm. Thermal protection is provided by a temperature probe integrated into the servo motor. They are certified as "Recognized" UR by the Underwriters Laboratories and conform to UL 1004 standards as well as to European directives (CE marking).

BSH servo motors are available with the following variants:
- IP 40 or IP 65 degree of protection
- with or without holding brake
- straight or angled connectors *(1)*
- SinCos Hiperface® single turn or multiturn encoders
- untapped or keyed shaft end



Torque/speed characteristics

BSH servo motors provide torque/speed curve profiles similar to the example shown on the left with:
1 Peak torque, depending on the servo drive model
2 Continuous torque, depending on the servo drive model
where:
- 8000 (in rpm) corresponds to the servo motor's maximum mechanical speed,
- M_{max} (in Nm) represents the peak stall torque value
- M_0 (in Nm) represents the continuous stall torque value

Principle for determining motor size according to the application

The torque/speed curves can be used to determine the correct servo motor size.
For example, for a power supply voltage of 230 V single phase, the curves used are curves 1 and 2. Then:
1 Position the work zone of the application in relation to speed.
2 Verify, using the motor cycle trend diagram, that the torques required by the application during the different cycle phases are located within the area bound by curve 1 in the work zone.
3 Calculate the average speed n_{avg} and the equivalent thermal torque M_{eq} (see page 192).
4 The point defined by n_{avg} and M_{eq} must be located below curve 2 in the work zone.

Note: *Sizing of servo motors, see page 192*

Functions

General functions

BSH servo motors were developed to meet the following requirements:
- Functional characteristics, robustness, safety, ... in compliance with IEC/EN 60034-1
- Ambient operating temperature: - 20...40°C according to DIN 50019R14. Maximum 55°C with derating from 40°C of 1% per additional °C
- Relative humidity: Class F according to DIN 400
- Altitude: 1000 m without derating, 2000 m with k = 0.86 *(2)*, 3000 m with k = 0.8
- Storage and transport temperature: - 25...70°C
- Winding insulation class: F (threshold temperature for windings 155°C) in compliance with DIN VDE 0530
- Power and sensor connection using straight or angled connectors *(1)*
- Thermal protection via built-in PTC thermistor probes, controlled by the Lexium 15 servo drive

(1) BSH 2052 ● and BSH 2053● servo motors are supplied with a power connection terminal and an angled connector for sensor connection
(2) k: derating factor

Characteristics: pages 150 to 177
References: pages 178 to 181
Dimensions: pages 182 to 185

Functions (continued)

General functions (continued)

■ Out-of-round, concentricity and perpendicularity between flange and shaft in accordance with DIN 42955, class N
■ Flange compliant with standard DIN 42948
■ Authorized mounting positions: no mounting restriction IMB5, IMV1 and IMV4 in accordance with DIN 42950
■ Polyester resin-based paint: Opaque black paint RAL 9005
■ Degree of protection:
□ of the frame: IP 65 in accordance with IEC/EN 60529
□ of the shaft end: IP 40 or IP 65 in accordance with IEC/EN 60529*(1)*
■ Integrated sensor: SinCos Hiperface® high resolution single turn or multiturn encoder
■ Standard sized untapped or keyed shaft end (according to DIN 42948)

Holding brake (depending on model)

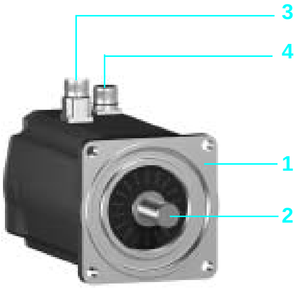
The integrated brake fitted to the BSH servo motors (depending on the model) is a failsafe electro-magnetic holding brake.

⚠ **Do not use the holding brake as a dynamic brake for deceleration, as this will rapidly damage the brake.**

Built-in sensor

The servo motor is fitted with a SinCos Hiperface® high resolution single turn (4096 points) or multiturn (4096 points x 4096 turns) absolute encoder providing angular precision of the shaft position, accurate to less than ±1.3 arc minutes.

This sensor performs the following functions:
■ Gives the angular position of the rotor in such a way that flows can be synchronized
■ Measures the servo motor speed via the associated Lexium servo drive. This information is used by the speed controller of the Lexium servo drive
■ Measures the position information for the Lexium servo drive position controller
■ Measures and transmits position information in incremental format for the position return of a motion control module (Encoder emulation output of the Lexium servo drive)



Description

BSH servo motors with a 3-phase stator and a 6- to 10-pole rotor (depending on model) with Neodymium Iron Borium (NdFeB) magnets consist of:
1 An axial flange with 4 fixing points in accordance with standard DIN 42948.
2 Standard shaft end according to DIN 42948, untapped or keyed (depending on model).
3 A straight dust and damp-proof male screw connector for connecting the power cable *(2)*.
4 A straight dust and damp-proof male screw connector for connecting the control (sensor) cable *(2)*.

Connecting cables must be ordered separately; for connection to Lexium 15 servo drives, see pages 180 and 181.

Schneider Electric has taken particular care to ensure compatibility between BSH servo motors and Lexium 15 servo drives. This compatibility can only be assured by using cables and connectors sold by Schneider Electric (see pages 180 and 181).

(1) IP 40 when motor is mounted in position IMV3 (vertical mounting, upper shaft end).
(2) Available in angled version for BSH 055●●, BSH 070●●, BSH 100●●, BSH 140●● and BSH 2051● servo motors. The BSH 2052 ● and BSH 2053● servo motors are supplied with a power connection terminal and an angled connector for the sensor connection.

Characteristics of BSH 0551P/0551T servo motors

Type of servo motor				BSH 0551P		BSH 0551T
Associated with Lexium 15 servo drive				**LXM 15LD13M3**	**LXM 15LU60N4**	**LXM 15LD13M3**
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	0.5		
	Peak stall	M_{max}	**Nm**	1.4		
Nominal operating point	Nominal torque		**Nm**	0.46		0.41
	Nominal speed		**rpm**	3200		7040
Maximum current			**A rms**	3.5		6.2

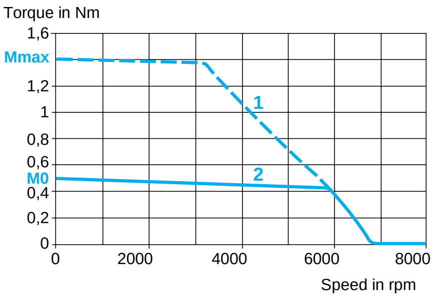
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000	
Constants (at 120°C)	Torque			**Nm/A rms**	0.5	0.28
	Back emf			**V_{rms}/krpm**	32	18
Rotor	Number of poles				6	
	Inertia	Without brake	J_m	**kgcm²**	0.09	
		With brake	J_m	**kgcm²**	0.1113	
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	33.8	11
	Inductance (phase/phase)			**mH**	37	12
	Electrical time constant			**ms**	1.09	
Holding brake (according to model)					See page 186	

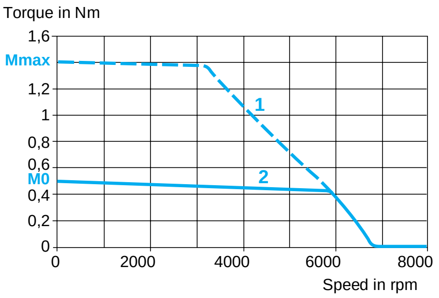
Torque/speed curves

BSH 0551P servo motor

With LXM 15LD13M3 servo drive
230 V single phase

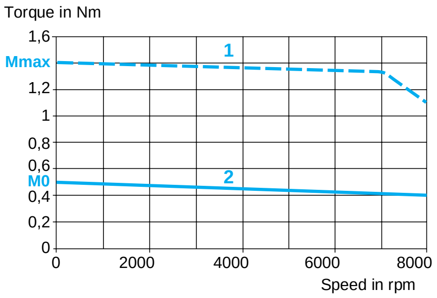


With LXM 15LU60N4 servo drive
230 V 3-phase



BSH 0551T servo motor

With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

Characteristics of BSH 0552M/0552P servo motors

Type of servo motor					BSH 0552M		BSH 0552P		
Associated with Lexium 15 servo drive					LXM 15LU60N4		LXM 15LD13M3		LXM 15LU60N4
Line supply voltage				V	400 3-phase	480 3-phase	230 single phase	230 3-phase	230 3-phase
Torque	Continuous stall		M_0	Nm	0.9		0.9		
	Peak stall		M_{max}	Nm	2.25		2.7		2.26
Nominal operating point	Nominal torque			Nm	0.8	0.77	0.8		0.78
	Nominal speed			rpm	3200	4080	3360		3760
Maximum current				A rms	2.4		5.9		

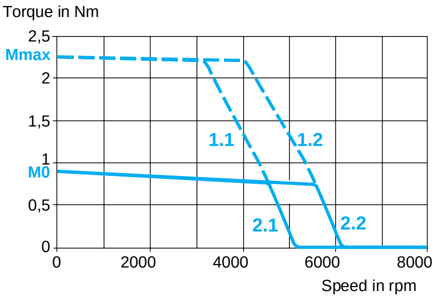
Servo motor characteristics

					BSH 0552M	BSH 0552P
Maximum mechanical speed				rpm	8000	
Constants (at 120°C)	Torque			Nm/A rms	1.125	0.56
	Back emf			V_{rms}/krpm	74	37
Rotor	Number of poles				6	
	Inertia	Without brake	J_m	kgcm²	0.14	
		With brake	J_m	kgcm²	0.1613	0.1113
Stator (at 20°C)	Resistance (phase/phase)			Ω	62.0	15.5
	Inductance (phase/phase)			mH	76.8	19.2
	Electrical time constant			ms	1.24	
Holding brake (according to model)					See page 186	

Torque/speed curves

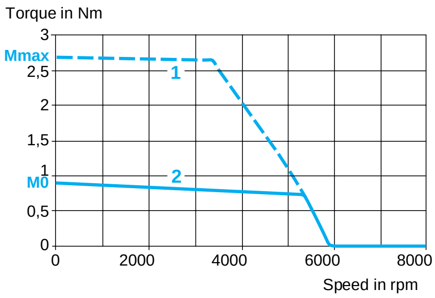
BSH 0552M servo motor

With LXM 15LU60N4 servo drive
400/480 V 3-phase

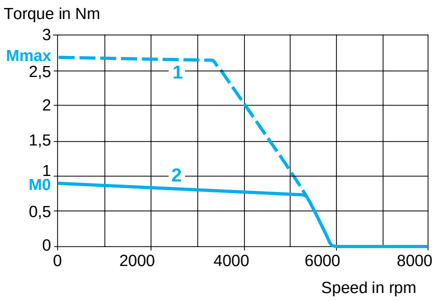


BSH 0552P servo motor

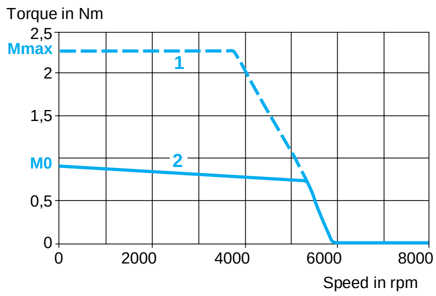
With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 0552T servo motors

Type of servo motor				**BSH 0552T**	
Associated with Lexium 15 servo drive				**LXM 15LD13M3**	
Line supply voltage			**V**	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	0.9	
	Peak stall	M_{max}	**Nm**	2.54	
Nominal operating point	Nominal torque		**Nm**	0.72	0.68
	Nominal speed		**rpm**	5920	7120
Maximum current			**A rms**	10.3	

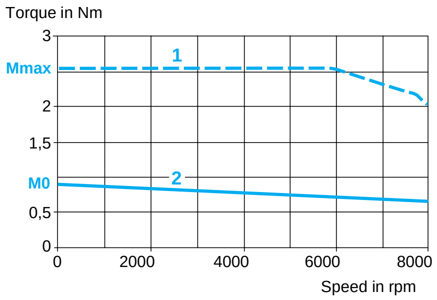
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	0.32
	Back emf		**V_{rms}/krpm**	21
Rotor	Number of poles			6
	Inertia – Without brake	J_m	**kgcm²**	0.14
	Inertia – With brake	J_m	**kgcm²**	0.1613
Stator (at 20°C)	Resistance (phase/phase)		Ω	5
	Inductance (phase/phase)		**mH**	6.2
	Electrical time constant		**ms**	1.24
Holding brake (according to model)				See page 186

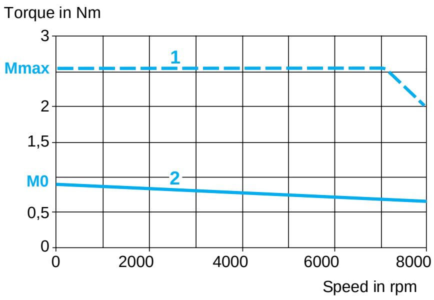
Torque/speed curves

BSH 0552T servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
pages 148 and 149
References:
pages 178 to 181
Dimensions:
pages 182 to 185

Characteristics of BSH 0553M/0553P servo motors

Type of servo motor				BSH 0553M		BSH 0553P		
Associated with Lexium 15 servo drive				LXM 15LU60N4		LXM 15LD13M3		LXM 15LD10N4
Line supply voltage			V	400 3-phase	480 3-phase	230 single phase	230 3-phase	400 3-phase
Torque	Continuous stall	M_0	Nm	1.3				
	Peak stall	M_{max}	Nm	3.5		4.2		3.87
Nominal operating point	Nominal torque		Nm	1.07	1.01	1.08	1.05	0.8
	Nominal speed		rpm	3360	4240	3200	3600	7280
Maximum current			A rms	3.6		8.7		

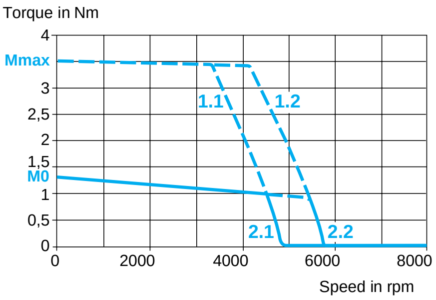
Servo motor characteristics

					BSH 0553M	BSH 0553P
Maximum mechanical speed				rpm	8000	
Constants (at 120°C)	Torque			Nm/A rms	1.18	0.59
	Back emf			V_{rms}/krpm	78	39
Rotor	Number of poles				6	
	Inertia	Without brake	J_m	kgcm²	0.19	
		With brake	J_m	kgcm²	0.2113	
Stator (at 20°C)	Resistance (phase/phase)			Ω	32	8
	Inductance (phase/phase)			mH	48	12
	Electrical time constant			ms	1.5	
Holding brake (according to model)					See page 186	

Torque/speed curves

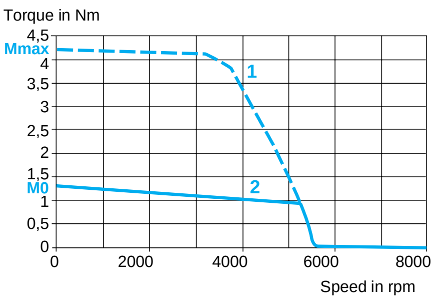
BSH 0553M servo motor

With LXM 15LU60N4 servo drive
400/480 V 3-phase

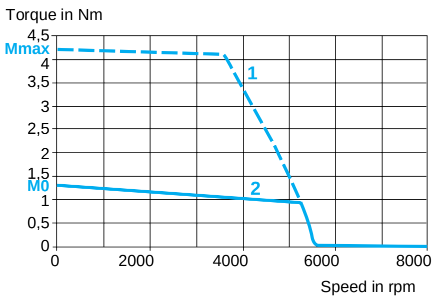


BSH 0553P servo motor

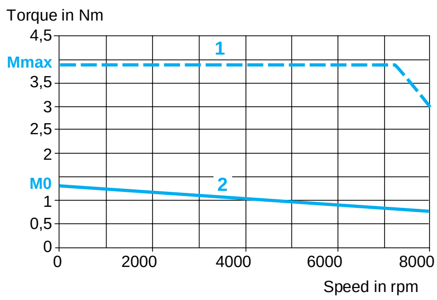
With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149
References:
pages 178 to 181
Dimensions:
pages 182 to 185

Characteristics of BSH 0701T servo motors

Type of servo motor			**BSH 0701T**					
Associated with Lexium 15 servo drive			**LXM 15LD13M3**		**LXM 15LD21M3**	**LXM 15LD10N4**		
Line supply voltage		**V**	230 single phase	230 3-phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall M_0	**Nm**	1.4					
	Peak stall M_{max}	**Nm**	3.19			2.91		
Nominal operating point	Nominal torque	**Nm**	1.25				1.23	
	Nominal speed	**rpm**	5040			5200	6000	
Maximum current		**A rms**	9.9					

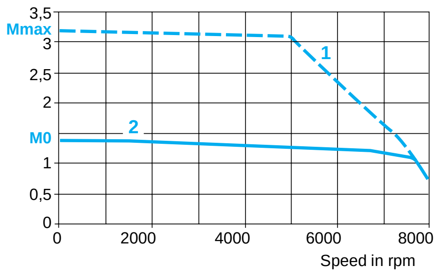
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	0.45
	Back emf		**V_{rms}/krpm**	26
Rotor	Number of poles			6
	Inertia	Without brake J_m	**kgcm²**	0.25
		With brake J_m	**kgcm²**	0.322
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	3.4
	Inductance (phase/phase)		**mH**	14.1
	Electrical time constant		**ms**	4.15
Holding brake (according to model)				See page 186

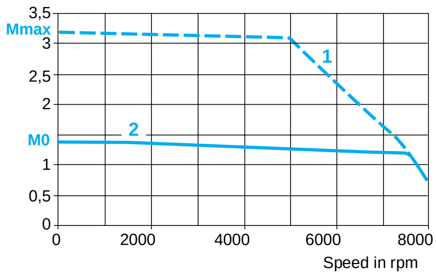
Torque/speed curves

BSH 0701T servo motor

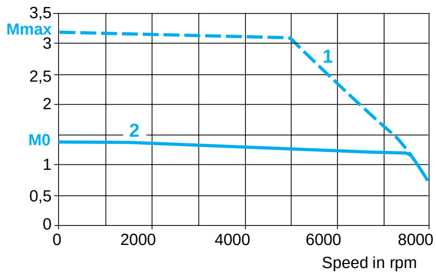
With LXM 15LD13M3 servo drive
230 V single phase



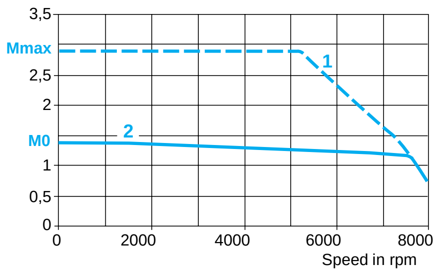
With LXM 15LD13M3 servo drive
230 V 3-phase



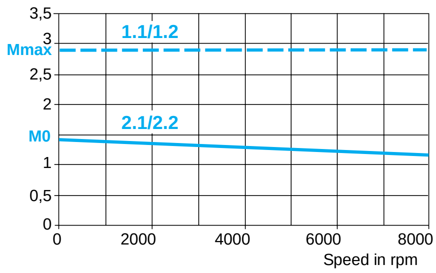
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149
References:
pages 178 to 181
Dimensions:
pages 182 to 185

Characteristics of BSH 0701P servo motors

Type of servo motor				BSH 0701P	
Associated with Lexium 15 servo drive				**LXM 15LD13M3**	**LXM 15LU60N4**
Line supply voltage			V	230 single phase	230 3-phase
Torque	Continuous stall	M_0	Nm	1.41	
	Peak stall	M_{max}	Nm	2.66	
Nominal operating point	Nominal torque		Nm	1.31	1.32
	Nominal speed		rpm	2960	3040
Maximum current			A rms	5.3	

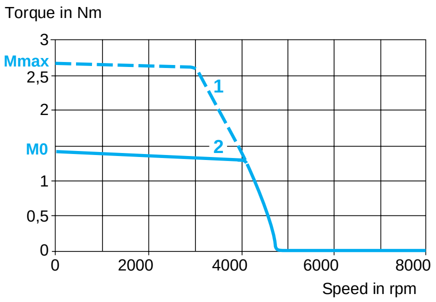
Servo motor characteristics

Maximum mechanical speed			rpm	8000
Constants (at 120°C)	Torque		Nm/A rms	0.78
	Back emf		V_{rms}/krpm	46
Rotor	Number of poles			6
	Inertia – Without brake	J_m	kgcm²	0.25
	Inertia – With brake	J_m	kgcm²	0.322
Stator (at 20°C)	Resistance (phase/phase)		Ω	10.4
	Inductance (phase/phase)		mH	42.6
	Electrical time constant		ms	4.1
Holding brake (according to model)				See page 186

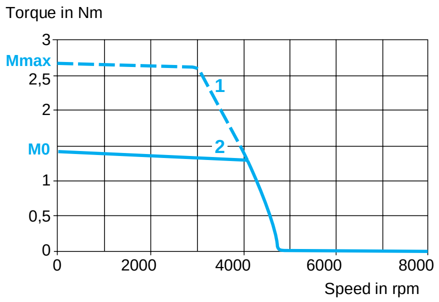
Torque/speed curves

BSH 0701P servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LU60N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

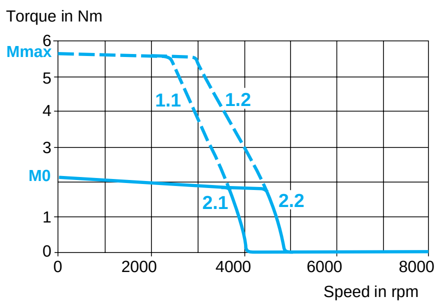
Characteristics of BSH 0702M/0702P servo motors

Type of servo motor				BSH 0702M		BSH 0702P			
Associated with Lexium 15 servo drive				LXM 15LU60N4		LXM 15LD13M3	LXM 15LD10N4		
Line supply voltage			V	400 3-phase	480 3-phase	230 single phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	2.12		2.2			
	Peak stall	M_{max}	Nm	5.63			4.85		
Nominal operating point	Nominal torque		Nm	1.93	1.89	1.9	1.88	1.68	1.59
	Nominal speed		rpm	2400	2960	2880	3120	5680	6880
Maximum current			A rms	5.9		11.8			
Servo motor characteristics									
Maximum mechanical speed			rpm	8000					
Constants (at 120°C)	Torque		Nm/A rms	1.46		0.77			
	Back emf		V_{rms}/krpm	93		48			
Rotor	Number of poles			6					
	Inertia – Without brake	J_m	$kgcm^2$	0.41					
	Inertia – With brake	J_m	$kgcm^2$	0.482					
Stator (at 20°C)	Resistance (phase/phase)		Ω	17.3		4.2			
	Inductance (phase/phase)		mH	84.4		19			
	Electrical time constant		ms	4.88		4.52			
Holding brake (according to model)				See page 186					

Torque/speed curves

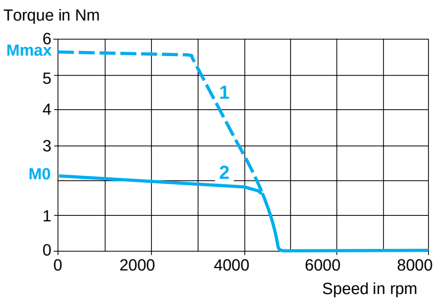
BSH 0702M servo motor

With LXM 15LU60N4 servo drive
400/480 V 3-phase

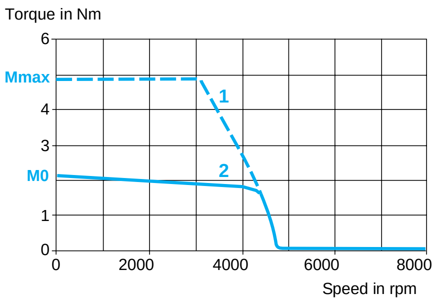


BSH 0702P servo motor

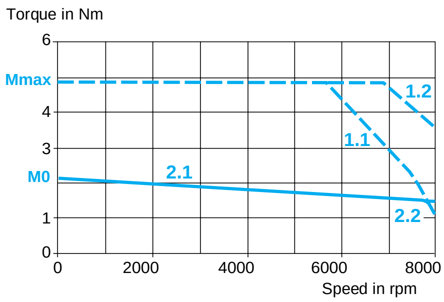
With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

Characteristics of BSH 0702T servo motors

Type of servo motor				BSH 0702T	
Associated with Lexium 15 servo drive				LXM 15LD21M3	LXM 15LD17N4
Line supply voltage			V	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	Nm	2.12	
	Peak stall	M_{max}	Nm	5.45	4.47
Nominal operating point	Nominal torque		Nm	1.71	1.66
	Nominal speed		rpm	5280	5920
Maximum current			A rms	20.6	

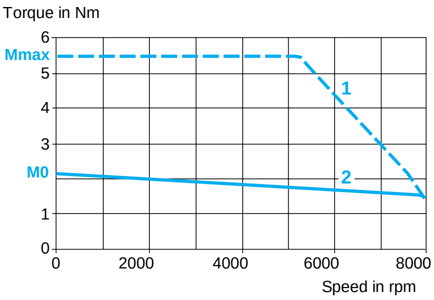
Servo motor characteristics

Maximum mechanical speed			rpm	8000
Constants (at 120°C)	Torque		Nm/A rms	0.42
	Back emf		V_{rms}/krpm	28
Rotor	Number of poles			6
	Inertia	Without brake J_m	kgcm²	0.41
		With brake J_m	kgcm²	0.482
Stator (at 20°C)	Resistance (phase/phase)		Ω	1.5
	Inductance (phase/phase)		mH	6.6
	Electrical time constant		ms	4.5
Holding brake (according to model)				See page 186

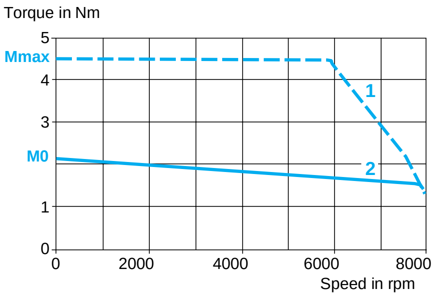
Torque/speed curves

BSH 0702T servo motor

With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 0703P/0703T servo motors

Type of servo motor				BSH 0703P					BSH 0703T
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**			**LXM 15LD28M3**
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	2.83					
	Peak stall	M_{max}	**Nm**	5.99	9.28	7.71			7.38
Nominal operating point	Nominal torque		**Nm**	2.4	2.48	2.41	2.11	1.96	2.08
	Nominal speed		**rpm**	2960	2560	2960	5360	6480	5520
Maximum current			**A rms**	15.2					30.9

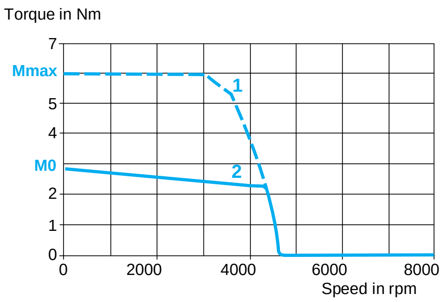
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000	
Constants (at 120°C)	Torque		**Nm/A rms**	0.78	0.42
	Back emf		**V_{rms}/krpm**	49	29
Rotor	Number of poles			6	
	Inertia Without brake	J_m	**$kgcm^2$**	0.58	
	Inertia With brake	J_m	**$kgcm^2$**	0.81	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	2.7	0.9
	Inductance (phase/phase)		**mH**	14.6	5
	Electrical time constant		**ms**	5.41	5.55
Holding brake (according to model)				See page 186	

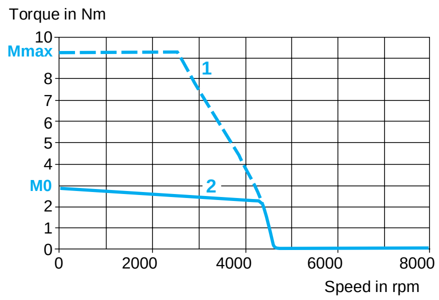
Torque/speed curves

BSH 0703P servo motor

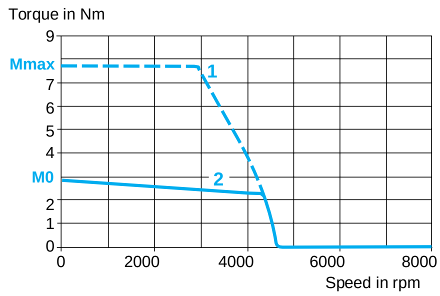
With LXM 15LD21M3 servo drive
230 V single phase



With LXM 15LD21M3 servo drive
230 V 3-phase

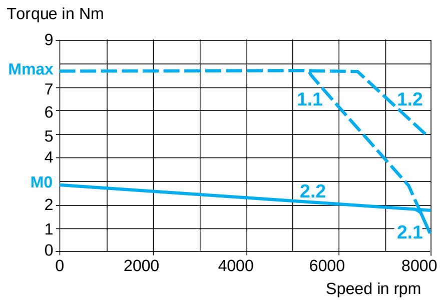


With LXM 15LD17N4 servo drive
230 V 3-phase



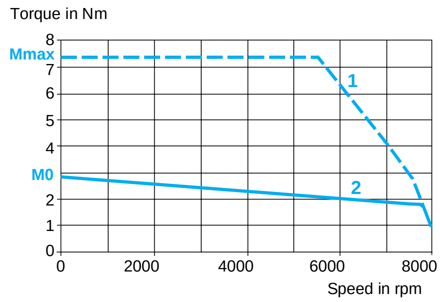
BSH 0703P servo motor

With LXM 15LD17N4 servo drive
400/480 V 3-phase



BSH 0703T servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 1001P/1001T servo motors

Type of servo motor				BSH 1001P			BSH 1001T
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD10N4**	**LXM 15LD28M3**
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	3.39			
	Peak stall	M_{max}	**Nm**	7.08		6.19	8.5
Nominal operating point	Nominal torque		**Nm**	3.01		2.99	2.77
	Nominal speed		**rpm**	2400		2580	3960
Maximum current			**A rms**	12			23

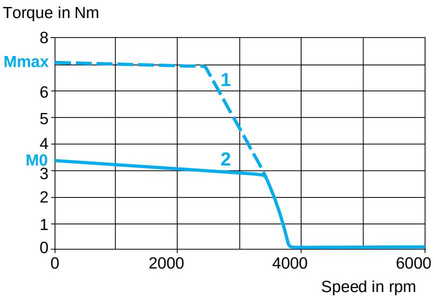
Servo motor characteristics

						BSH 1001P	BSH 1001T
Maximum mechanical speed					**rpm**	6000	
Constants (at 120°C)	Torque				**Nm/A rms**	0.89	0.51
	Back emf				**V_{rms}/krpm**	60	28
Rotor	Number of poles					8	
	Inertia	Without brake		J_m	**kgcm²**	1.4	
		With brake		J_m	**kgcm²**	2.018	
Stator (at 20°C)	Resistance (phase/phase)				**Ω**	3.8	0.9
	Inductance (phase/phase)				**mH**	19	4.3
	Electrical time constant				**ms**	5	4.78
Holding brake (according to model)						See page 186	

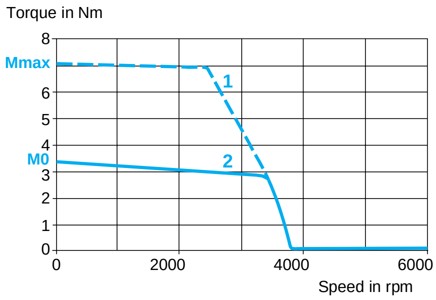
Torque/speed curves

BSH 1001P servo motor

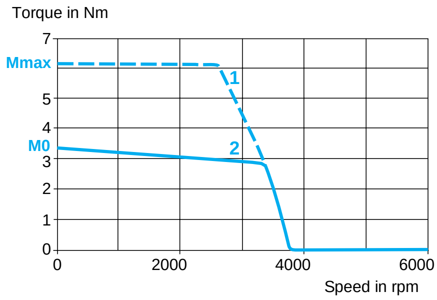
With LXM 15LD21M3 servo drive
230 V single phase



With LXM 15LD21M3 servo drive
230 V 3-phase

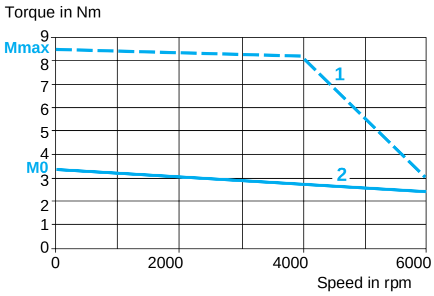


With LXM 15LD10N4 servo drive
230 V 3-phase



BSH 1001T servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 1002P/1002T servo motors

Type of servo motor			BSH 1002P			BSH 1002T
Associated with Lexium 15 servo drive			**LXM 15LD21M3**	**LXM 15LD17N4**		**LXM 15LD28M3**
Line supply voltage		**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase
Torque	Continuous stall M_0	**Nm**	5.8			5.5
	Peak stall M_{max}	**Nm**	14.79	12.13		11.59
Nominal operating point	Nominal torque	**Nm**	4.8	4.06	3.75	4
	Nominal speed	**rpm**	1920	3900	4740	4080
Maximum current		**A rms**	17.1			31.2

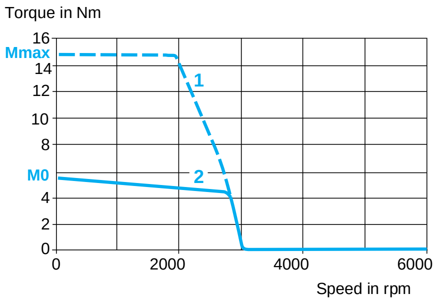
Servo motor characteristics

				Unit	BSH 1002P	BSH 1002T
Maximum mechanical speed				**rpm**	6000	
Constants (at 120°C)	Torque			**Nm/A rms**	1.21	0.64
	Back emf			**V_{rms}/krpm**	77	33
Rotor	Number of poles				8	
	Inertia	Without brake	J_m	**kgcm²**	2.31	
		With brake	J_m	**kgcm²**	2.928	
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	2.4	0.6
	Inductance (phase/phase)			**mH**	13.5	2.9
	Electrical time constant			**ms**	5.63	4.83
Holding brake (according to model)					See page 186	

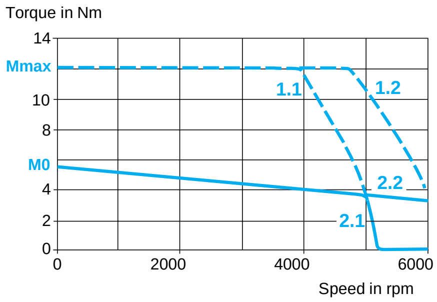
Torque/speed curves

BSH 1002P servo motor

With LXM 15LD21M3 servo drive
230 V 3-phase

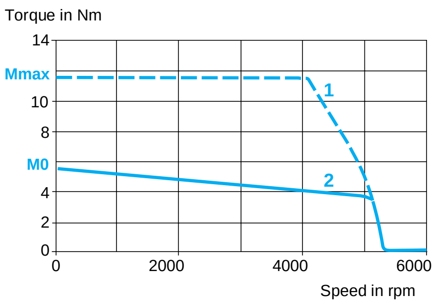


With LXM 15LD17N4 servo drive
400/480 V 3-phase



BSH 1002T servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

Characteristics of BSH 1003M servo motors

Type of servo motor				BSH 1003M		
Associated with Lexium 15 servo drive				LXM 15LD10N4	LXM 15LD17N4	
Line supply voltage			V	400 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	7.76		
	Peak stall	M_{max}	Nm	15.19	22.95	
Nominal operating point	Nominal torque		Nm	6.36	6.65	6.36
	Nominal speed		rpm	2040	1620	2040
Maximum current			A rms	15.6		

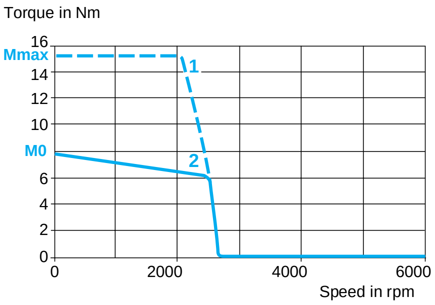
Servo motor characteristics

Maximum mechanical speed				rpm	6000
Constants (at 120°C)	Torque			Nm/A rms	2.22
	Back emf			V_{rms}/krpm	144
Rotor	Number of poles				8
	Inertia	Without brake	J_m	kgcm²	3.22
		With brake	J_m	kgcm²	3.838
Stator (at 20°C)	Resistance (phase/phase)			Ω	5.3
	Inductance (phase/phase)			mH	33.7
	Electrical time constant			ms	6.36
Holding brake (according to model)					See page 186

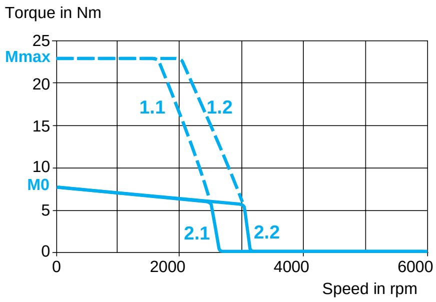
Torque/speed curves

BSH 1003M servo motor

With LXM 15LD10N4 servo drive
400 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 1003P servo motors

Type of servo motor				BSH 1003P				
Associated with Lexium 15 servo drive				**LXM 15LD28M3**	**LXM 15MD28N4**		**LXM 15MD40N4**	
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	7.8				
	Peak stall	M_{max}	**Nm**	19.69			23.17	
Nominal operating point	Nominal torque		**Nm**	6.32	5.13	4.6	5.34	4.8
	Nominal speed		**rpm**	2100	3840	4620	3540	4320
Maximum current			**A rms**	28.3				

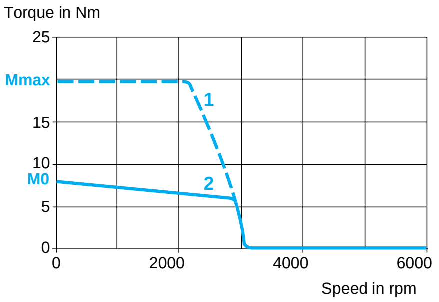
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000
Constants (at 120°C)	Torque		**Nm/A rms**	1.22
	Back emf		**V_{rms}/krpm**	77
Rotor	Number of poles			8
	Inertia Without brake	J_m	**kgcm²**	3.22
	With brake	J_m	**kgcm²**	3.838
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.43
	Inductance (phase/phase)		**mH**	9.4
	Electrical time constant		**ms**	6.57
Holding brake (according to model)				See page 186

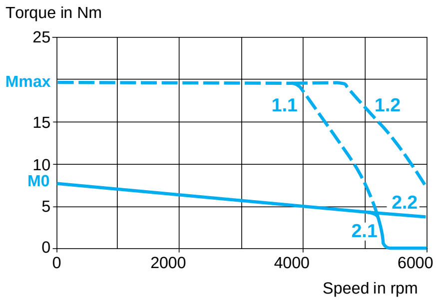
Torque/speed curves

BSH 1003P servo motor

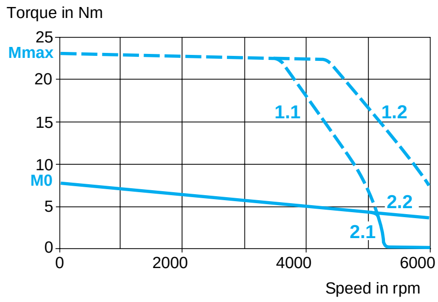
With LXM 15LD28M3 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
400/480 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149
References:
pages 178 to 181
Dimensions:
pages 182 to 185

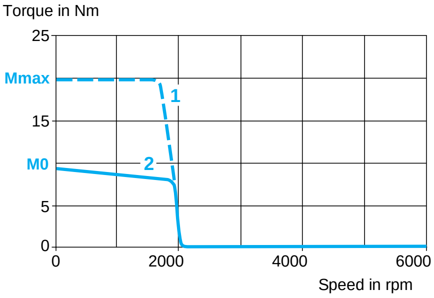
Characteristics of BSH 1004M servo motors

Type of servo motor				**BSH 1004M**				
Associated with Lexium 15 servo drive				**LXM 15LD10N4**	**LXM 15LD17N4**		**LXM 15MD40N4**	
Line supply voltage			**V**	400 3-phase	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	9.31				
	Peak stall	M_{max}	**Nm**	19.8	29.87		34.17	
Nominal operating point	Nominal torque		**Nm**	8.13	8.31	8.05	8.35	8.13
	Nominal speed		**rpm**	1620	1380	1740	1320	1620
Maximum current			**A rms**	17.4				
Servo motor characteristics								
Maximum mechanical speed			**rpm**	6000				
Constants (at 120°C)	Torque		**Nm/A rms**	3				
	Back emf		**V_{rms}/krpm**	195				
Rotor	Number of poles			8				
	Inertia – Without brake	J_m	**kgcm²**	4.22				
	Inertia – With brake	J_m	**kgcm²**	5.245				
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	7.1				
	Inductance (phase/phase)		**mH**	43.9				
	Electrical time constant		**ms**	6.18				
Holding brake (according to model)				See page 186				

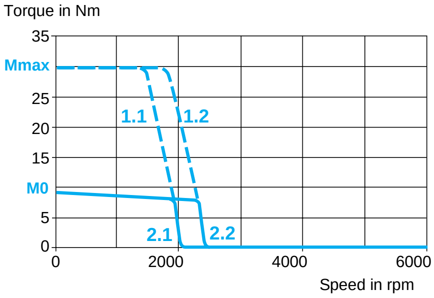
Torque/speed curves

BSH 1004M servo motor

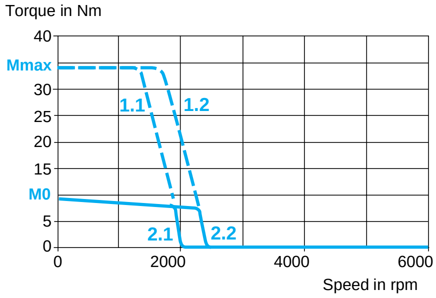
With LXM 15LD10N4 servo drive
400 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149
References:
pages 178 to 181
Dimensions:
pages 182 to 185

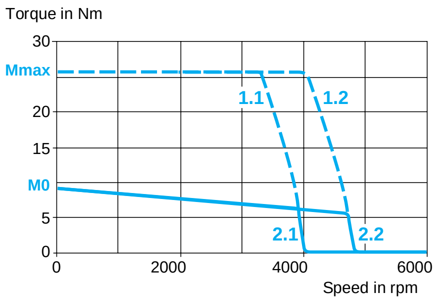
Characteristics of BSH 1004P/1004T servo motors

Type of servo motor			BSH 1004P					BSH 1004T
Associated with Lexium 15 servo drive			LXM 15MD28N4		LXM 15MD40N4			LXM 15MD40N4
Line supply voltage		V	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase	230 3-phase
Torque	Continuous stall M_0	Nm	9.31					
	Peak stall M_{max}	Nm	25.7		33.83			21.04
Nominal operating point	Nominal torque	Nm	6.91	6.5	8.18	7.17	6.69	6.8
	Nominal speed	rpm	3300	4020	1560	2940	3600	3480
Maximum current		A rms	34.8					61
Servo motor characteristics								
Maximum mechanical speed		rpm	6000					
Constants (at 120°C)	Torque	Nm/A rms	1.62					0.86
	Back emf	V_{rms}/krpm	103					50
Rotor	Number of poles		8					
	Inertia Without brake J_m	kgcm²	4.22					
	With brake J_m	kgcm²	5.245					
Stator (at 20°C)	Resistance (phase/phase)	Ω	1.81					0.45
	Inductance (phase/phase)	mH	13					2.9
	Electrical time constant	ms	7.18					6.44
Holding brake (according to model)			See page 186					

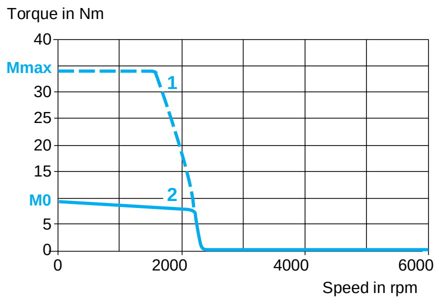
Torque/speed curves

BSH 1004P servo motor

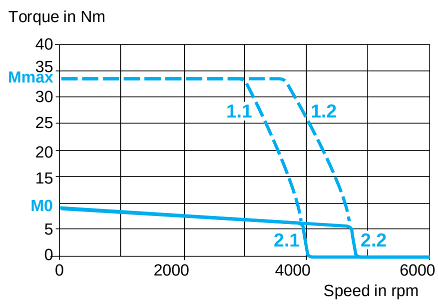
With LXM 15MD28N4 servo drive
400/480 V 3-phase



With LXM 15MD40N4 servo drive
230 V 3-phase

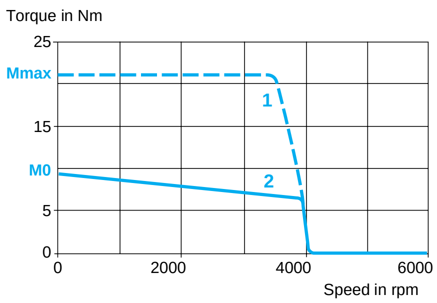


With LXM 15MD40N4 servo drive
400/480 V 3-phase



BSH 1004T servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149
References:
pages 178 to 181
Dimensions:
pages 182 to 185

Characteristics of BSH 1401M/1401P servo motors

Type of servo motor				BSH 1401M		BSH 1401P			
Associated with Lexium 15 servo drive				**LXM 15MD28N4**		**LXM 15MD28N4**		**LXM 15MD40N4**	
Line supply voltage			**V**	400 3-phase	480 3-phase	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	11.1					
	Peak stall	M_{max}	**Nm**	26		23.33			
Nominal operating point	Nominal torque		**Nm**	10.4	10.1	7.63	6.8	7.63	6.8
	Nominal speed		**rpm**	1080	1320	2520	3080	2520	3080
Maximum current			**A rms**	10.8		20.8			

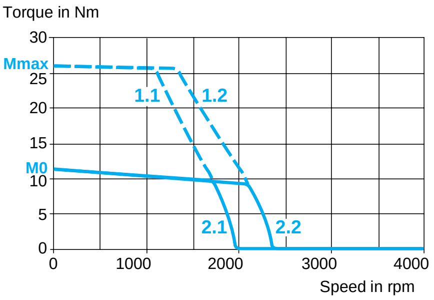
Servo motor characteristics

Maximum mechanical speed			**rpm**	4000	
Constants (at 120°C)	Torque		**Nm/A rms**	2.78	1.43
	Back emf		**V_{rms}/krpm**	194	100
Rotor	Number of poles			10	
	Inertia — Without brake	J_m	**kgcm²**	7.41	
	With brake	J_m	**kgcm²**	8.56	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	5.3	1.41
	Inductance (phase/phase)		**mH**	60.85	16.34
	Electrical time constant		**ms**	11.59	
Holding brake (according to model)				See page 186	

Torque/speed curves

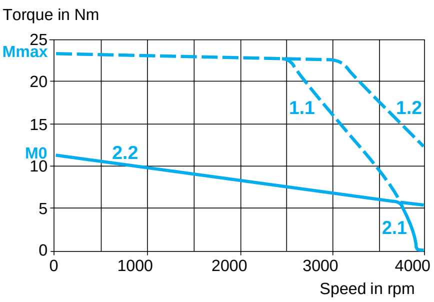
BSH 1401M servo motor

With LXM 15MD28N4 servo drive
400/480 V 3-phase

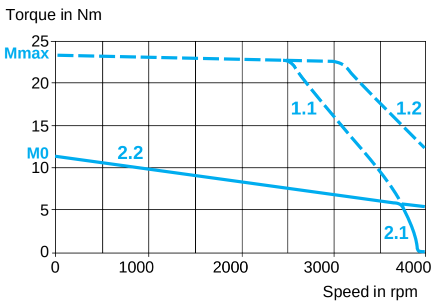


BSH 1401P servo motor

With LXM 15MD28N4 servo drive
400/480 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 1401T servo motors

Type of servo motor			**BSH 1401T**
Associated with Lexium 15 servo drive			**LXM 15MD56N4**
Line supply voltage		**V**	230 3-phase
Torque	Continuous stall M_0	**Nm**	11.1
	Peak stall M_{max}	**Nm**	23.33
Nominal operating point	Nominal torque	**Nm**	7.63
	Nominal speed	**rpm**	2520
Maximum current		**A rms**	37.1

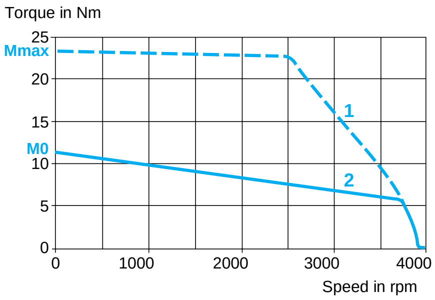
Servo motor characteristics

Maximum mechanical speed		**rpm**	4000
Constants (at 120°C)	Torque	**Nm/A rms**	0.83
	Back emf	**V_{rms}/krpm**	56
Rotor	Number of poles		10
	Inertia – Without brake J_m	**kgcm²**	7.41
	Inertia – With brake J_m	**kgcm²**	8.56
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	0.4
	Inductance (phase/phase)	**mH**	5.15
	Electrical time constant	**ms**	12.88
Holding brake (according to model)			See page 186

Speed/torque curves

BSH 1401T servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

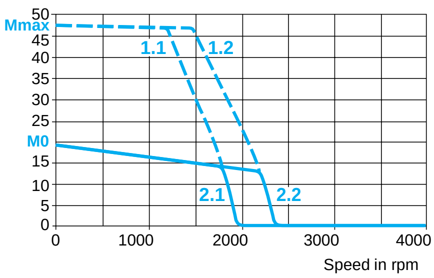
Characteristics of BSH 1402M/1402P servo motors

Type of servo motor				BSH 1402M		BSH 1402P			
Associated with Lexium 15 servo drive				LXM 15MD40N4		LXM 15MD40N4		LXM 15MD56N4	
Line supply voltage			V	400 3-phase	480 3-phase	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	19.5					
	Peak stall	M_{max}	Nm	47.5		39.33		47.5	
Nominal operating point	Nominal torque		Nm	15.9	15	11.47	9.9	12.14	10.68
	Nominal speed		rpm	1200	1480	2760	3320	2520	3040
Maximum current			A rms	22.4		44.1			
Servo motor characteristics									
Maximum mechanical speed			rpm	4000					
Constants (at 120°C)	Torque		Nm/A rms	2.91		1.47			
	Back emf		V_{rms}/krpm	199		101			
Rotor	Number of poles			10					
	Inertia — Without brake	J_m	kgcm²	12.68					
	Inertia — With brake	J_m	kgcm²	13.83					
Stator (at 20°C)	Resistance (phase/phase)		Ω	2.3		0.6			
	Inductance (phase/phase)		mH	29.79		7.71			
	Electrical time constant		ms	12.85					
Holding brake (according to model)				See page 186					

Torque/speed curves

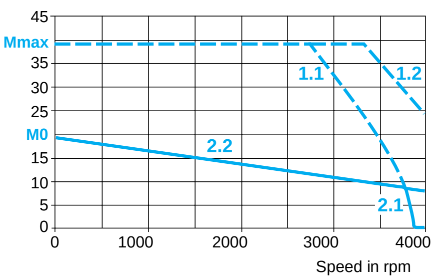
BSH 1402M servo motor

With LXM 15MD40N4 servo drive
400/480 V 3-phase

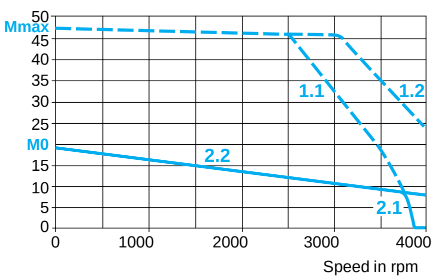


BSH 1402P servo motor

With LXM 15MD40N4 servo drive
400/480 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BSH 1403M/1403P servo motors

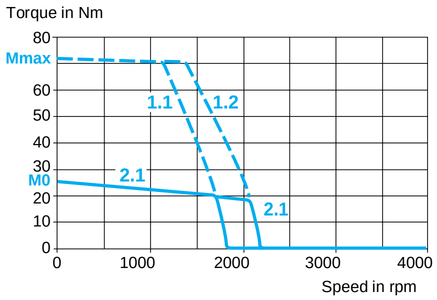
Type of servo motor				BSH 1403M		BSH 1403P	
Associated with Lexium 15 servo drive				LXM 15MD40N4		LXM 15MD56N4	
Line supply voltage			V	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	27.8			
	Peak stall	M_{max}	Nm	71.76		57.32	
Nominal operating point	Nominal torque		Nm	21.48	20.67	13.81	11.39
	Nominal speed		rpm	1160	1400	2680	3240
Maximum current			A rms	31.3		61	

Servo motor characteristics						
Maximum mechanical speed				rpm	4000	
Constants (at 120°C)	Torque			Nm/A rms	3.09	1.59
	Back emf			V_{rms}/krpm	205	105
Rotor	Number of poles				10	
	Inertia	Without brake	J_m	kgcm²	17.94	
		With brake	J_m	kgcm²	23.44	
Stator (at 20°C)	Resistance (phase/phase)			Ω	1.52	0.4
	Inductance (phase/phase)			mH	20.3	5.32
	Electrical time constant			ms	13.31	13.3
Holding brake (according to model)					See page 186	

Torque/speed curves

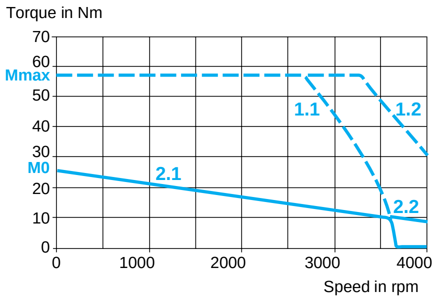
BSH 1403M servo motor

With LXM 15MD40N4 servo drive
400/480 V 3-phase



BSH 1403P servo motor

With LXM 15MD56N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 1404M servo motors

Type of servo motor				BSH 1404M			
Associated with Lexium 15 servo drive				**LXM 15MD40N4**		**LXM 15MD56N4**	
Line supply voltage			V	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	33.4			
	Peak stall	M_{max}	Nm	82.32		95	
Nominal operating point	Nominal torque		Nm	26.5	25.4	26.92	25.5
	Nominal speed		rpm	1160	1400	1080	1320
Maximum current			A rms	47.8			

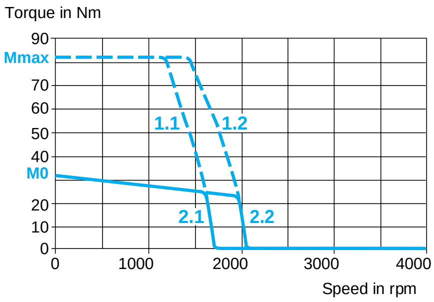
Servo motor characteristics

Maximum mechanical speed				rpm	4000
Constants (at 120°C)	Torque			Nm/A rms	3.12
	Back emf			V_{rms}/krpm	208
Rotor	Number of poles				10
	Inertia	Without brake	J_m	kgcm²	23.7
		With brake	J_m	kgcm²	29.2
Stator (at 20°C)	Resistance (phase/phase)			Ω	1.12
	Inductance (phase/phase)			mH	16.28
	Electrical time constant			ms	14.54
Holding brake (according to model)					See page 186

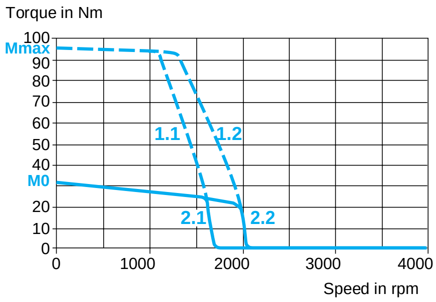
Torque/speed curves

BSH 1404M servo motor

With LXM 15MD40N4 servo drive
400/480 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BSH 2051M servo motors

Type of servo motor				BSH 2051M					
Associated with Lexium 15 servo drive				LXM 15MD40N4		LXM 15MD56N4		LXM 15HC11N4X	
Line supply voltage			V	400 3-phase	480 3-phase	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	36					
	Peak stall	M_{max}	Nm	68.33					
Nominal operating point	Nominal torque		Nm	32	31.2	32	31.2	32.3	31.3
	Nominal speed		rpm	1500	1700	1500	1700	1500	1700
Maximum current			A rms	40.4					

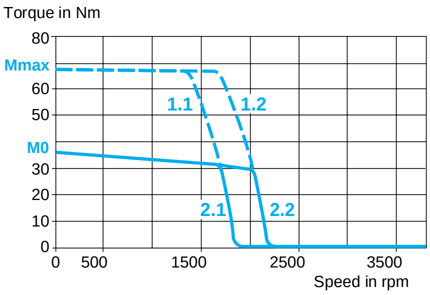
Servo motor characteristics

Maximum mechanical speed			rpm	3800
Constants (at 120°C)	Torque		Nm/A rms	3.1
	Back emf		V_{rms}/krpm	208
Rotor	Number of poles			10
	Inertia – Without brake	J_m	kgcm²	77
	Inertia – With brake	J_m	kgcm²	93
Stator (at 20°C)	Resistance (phase/phase)		Ω	1.1
	Inductance (phase/phase)		mH	21.3
	Electrical time constant		ms	19.4
Holding brake (according to model)				See page 186

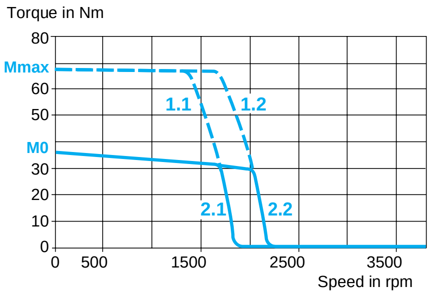
Torque/speed curves

BSH 2051M servo motor

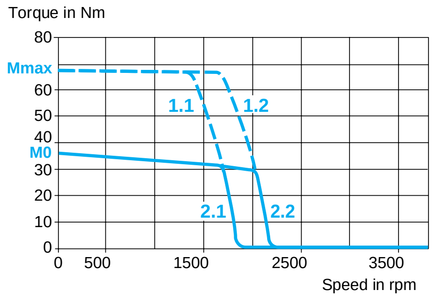
With LXM 15MD40N4 servo drive
400/480 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



With LXM 15HC11N4X servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149
References:
pages 178 to 181
Dimensions:
pages 182 to 185

Characteristics of BSH 2051P servo motors

Type of servo motor				BSH 2051P		
Associated with Lexium 15 servo drive				LXM 15HC11N4X		
Line supply voltage			V	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	36		
	Peak stall	M_{max}	Nm	82		
Nominal operating point	Nominal torque		Nm	31.9	28.2	27
	Nominal speed		rpm	1444	2622	3192
Maximum current			A rms	78.1		

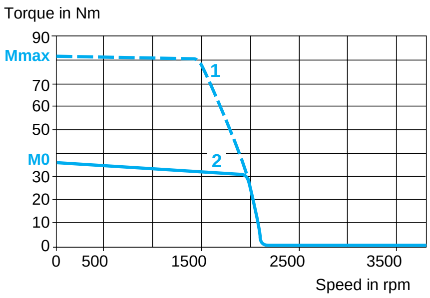
Servo motor characteristics

Maximum mechanical speed				rpm	3800
Constants (at 120°C)	Torque			Nm/A rms	1.6
	Back emf			V_{rms}/krpm	104
Rotor	Number of poles				10
	Inertia	Without brake	J_m	kgcm²	77
		With brake	J_m	kgcm²	93
Stator (at 20°C)	Resistance (phase/phase)			Ω	0.3
	Inductance (phase/phase)			mH	5.7
	Electrical time constant			ms	19
Holding brake (according to model)					See page 186

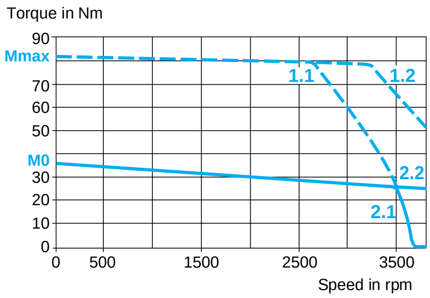
Torque/speed curves

BSH 2051P servo motor

With LXM 15HC11N4X servo drive
230 V 3-phase



With LXM 15HC11N4X servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

Characteristics of BSH 2052M servo motors

Type of servo motor				**BSH 2052M**					
Associated with Lexium 15 servo drive				**LXM 15HC11N4X**			**LXM 15HC20N4X**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	65					
	Peak stall	M_{max}	**Nm**	200					
Nominal operating point	Nominal torque		**Nm**	56.5	49	45.6	56.5	49	45.6
	Nominal speed		**rpm**	500	1000	1300	500	1000	1300
Maximum current			**A rms**	49.6					

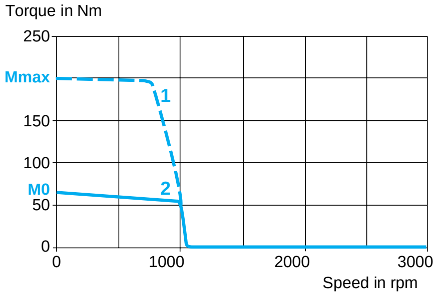
Servo motor characteristics

Maximum mechanical speed				**rpm**	3800
Constants (at 120°C)	Torque			**Nm/A rms**	5.04
	Back emf			**V_{rms}/krpm**	314
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	129
		With brake	J_m	**kgcm²**	145
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	1.1
	Inductance (phase/phase)			**mH**	20.6
	Electrical time constant			**ms**	18.72
Holding brake (according to model)					See page 186

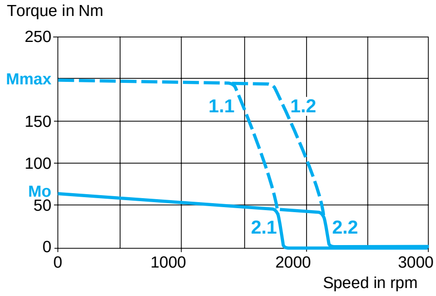
Torque/speed curves

BSH 2052M servo motor

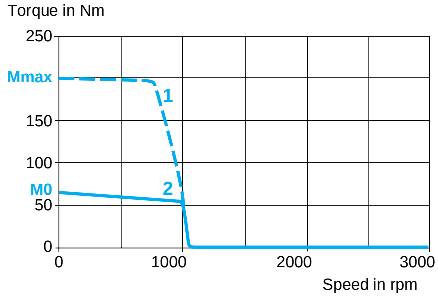
With LXM 15HC11N4X servo drive
230 V 3-phase



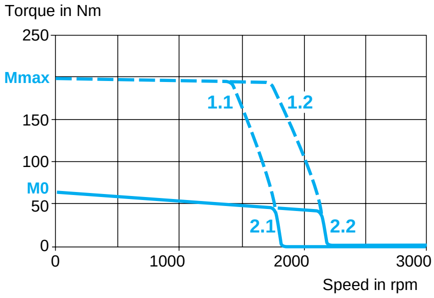
With LXM 15HC11N4X servo drive
400/480 V 3-phase



With LXM 15HC20N4X servo drive
230 V 3-phase



With LXM 15HC20N4X servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

Characteristics of BSH 2052P servo motors

Type of servo motor					**BSH 2052P**					
Associated with Lexium 15 servo drive					**LXM 15HC11N4X**			**LXM 15HC20N4X**		
Line supply voltage				**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall		M_0	**Nm**	65					
	Peak stall		M_{max}	**Nm**	118.54			193.45		
Nominal operating point	Nominal torque			**Nm**	55	49		56	49.32	49
	Nominal speed			**rpm**	1000	2000		1000	2000	3000
Maximum current				**A rms**	96.8					

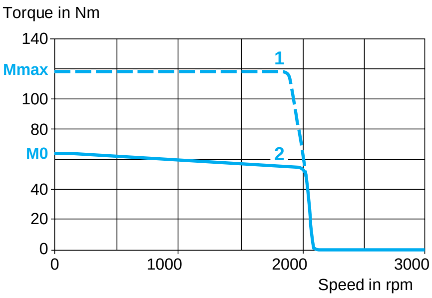
Servo motor characteristics

Maximum mechanical speed				**rpm**	3800
Constants (at 120°C)	Torque			**Nm/A rms**	2.58
	Back emf			**V_{rms}/krpm**	161
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	129
		With brake	J_m	**kgcm²**	145
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	0.3
	Inductance (phase/phase)			**mH**	5.4
	Electrical time constant			**ms**	18
Holding brake (according to model)					See page 186

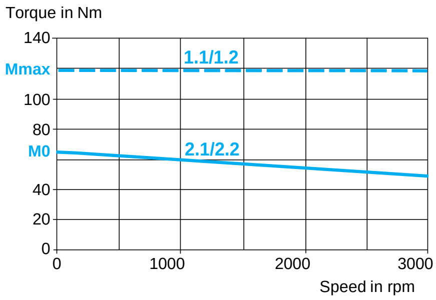
Torque/speed curves

BSH 2052P servo motor

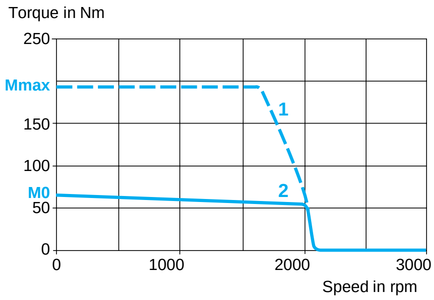
With LXM 15HC11N4X servo drive
230 V 3-phase



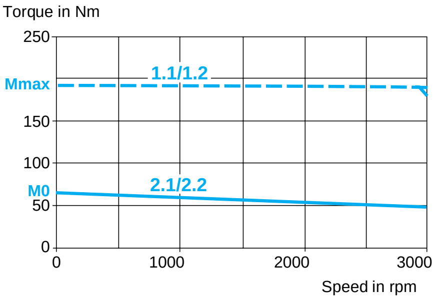
With LXM 15HC11N4X servo drive
400/480 V 3-phase



With LXM 15HC20N4X servo drive
230 V 3-phase



With LXM 15HC20N4X servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149
References:
pages 178 to 181
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pages 182 to 185

Lexium 15 motion control

BSH servo motors

Characteristics of BSH 2053M servo motors

Type of servo motor				BSH 2053M					
Associated with Lexium 15 servo drive				LXM 15HC11N4X			LXM 15HC20N4X		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	90					
	Peak stall	M_{max}	**Nm**	227.18			300		
Nominal operating point	Nominal torque		**Nm**	80.2	70.45	64.6	80.2	70.45	64.6
	Nominal speed		**rpm**	500	1000	1300	500	1000	1300
Maximum current			**A rms**	68					

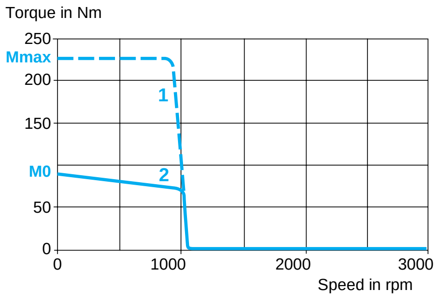
Servo motor characteristics

Maximum mechanical speed			**rpm**	3800
Constants (at 120°C)	Torque		**Nm/A rms**	5.5
	Back emf		V_{rms}**/krpm**	344
Rotor	Number of poles			10
	Inertia – Without brake	J_m	**kgcm²**	182
	Inertia – With brake	J_m	**kgcm²**	196
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.8
	Inductance (phase/phase)		**mH**	16.8
	Electrical time constant		**ms**	20
Holding brake (according to model)				See page 186

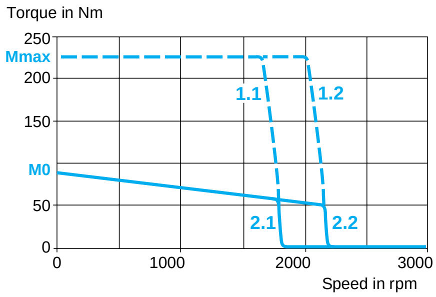
Torque/speed curves

BSH 2053M servo motor

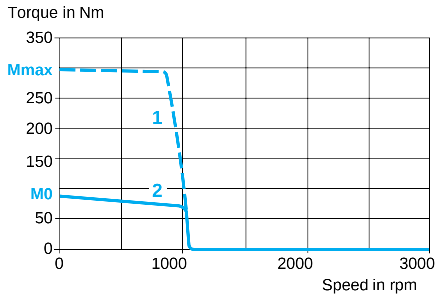
With LXM 15HC11N4X servo drive
230 V 3-phase



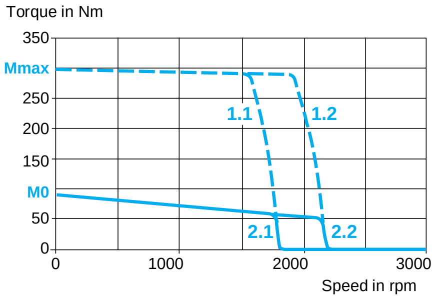
With LXM 15HC11N4X servo drive
400/480 V 3-phase



With LXM 15HC20N4X servo drive
230 V 3-phase



With LXM 15HC20N4X servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

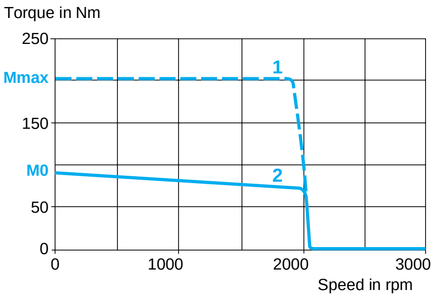
Characteristics of BSH 2053P servo motors

Type of servo motor					**BSH 2053P**		
Associated with Lexium 15 servo drive					**LXM 15HC20N4X**		
Line supply voltage				**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall		M_0	**Nm**	90		
	Peak stall		M_{max}	**Nm**	202.96		
Nominal operating point	Nominal torque			**Nm**	70.45	37.37	
	Nominal speed			**rpm**	1000	2000	
Maximum current				**A rms**	136.1		
Servo motor characteristics							
Maximum mechanical speed				**rpm**	3800		
Constants (at 120°C)	Torque			**Nm/A rms**	2.76		
	Back emf			**V_{rms}/krpm**	172		
Rotor	Number of poles				10		
	Inertia	Without brake	J_m	**kgcm²**	182		
		With brake	J_m	**kgcm²**	196		
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	0.2		
	Inductance (phase/phase)			**mH**	4.2		
	Electrical time constant			**ms**	21		
Holding brake (according to model)					See page 186		

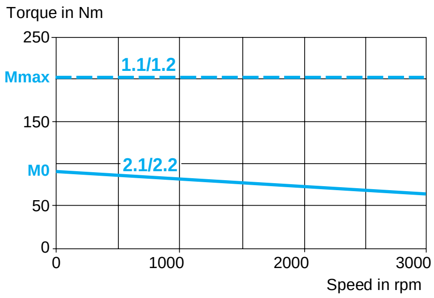
Torque/speed curves

BSH 2053P servo motor

With LXM 15HC20N4X servo drive
230 V 3-phase



With LXM 15HC20N4X servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

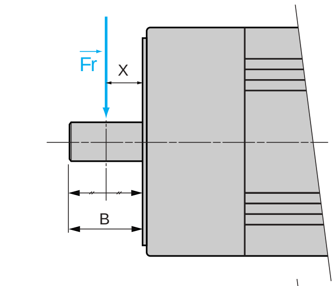
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

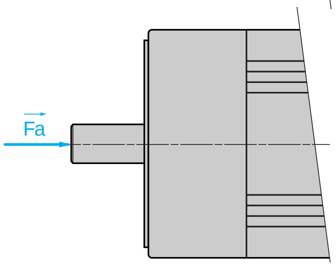
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185





Radial and axial forces permitted on the motor shaft

Even when the servo motors are used under optimum conditions, their service life is limited by that of the bearings.

Conditions	
Nominal service life of bearings *(1)*	L_{10h} = 20,000 hours
Ambiant temperature (temperature of bearings ~ 100°C)	40°C
Force application point	Fr applied at the middle point of the shaft end X = B/2 (dimension B, see pages 182 to 185)

(1) Hours of use with a failure probability of 10%

⚠ The following conditions must be adhered to:

- Radial and axial forces must not be applied simultaneously
- Shaft end with IP 40 or IP 65 degree of protection
- The bearings cannot be changed by the user as the built-in position sensor must be realigned if the unit is dismantled.

			Maximum radial force Fr							
Mechanical speed		**rpm**	**1000**	**2000**	**3000**	**4000**	**5000**	**6000**	**7000**	**8000**
Servo motor	BSH 0551	**N**	340	270	240	220	200	190	180	170
	BSH 0552	**N**	370	290	260	230	220	200	190	190
	BSH 0553	**N**	390	310	270	240	230	210	200	190
	BSH 0701	**N**	660	520	460	410	380	360	–	–
	BSH 0702	**N**	710	560	490	450	410	390	–	–
	BSH 0703	**N**	730	580	510	460	430	400	–	–
	BSH 1001	**N**	900	720	630	570	530	–	–	–
	BSH 1002	**N**	990	790	690	620	–	–	–	–
	BSH 1003	**N**	1050	830	730	660	–	–	–	–
	BSH 1004	**N**	1070	850	740	–	–	–	–	–
	BSH 1401	**N**	2210	1760	1530	–	–	–	–	–
	BSH 1402	**N**	2430	1930	1680	–	–	–	–	–
	BSH 1403	**N**	2560	2030	1780	–	–	–	–	–
	BSH 1404	**N**	2660	2110	1840	–	–	–	–	–
	BSH 2051	**N**	3730	2960	2580	–	–	–	–	–
	BSH 2052	**N**	4200	3330	2910	–	–	–	–	–
	BSH 2053	**N**	4500	3570	3120	–	–	–	–	–
			Maximum axial force: Fa = 0.2 x Fr							

Characteristics of servo motor/servo drive power connection cables

Cables fitted with a connector on servo motor side

Cable type		**VW3 M5 101 R●●●**	**VW3 M5 103 R●●●**
External sleeve, insulation		PUR orange coloured RAL 2003, TPM or PP/PE	
Capacity	**pF/m**	< 70 (conductors/shielding)	
Number of conductors (shielded)		[(4 x 1.5 mm²) + (2 x 1 mm²)]	[(4 x 4 mm²) + (2 x 1 mm²)]
Connector type		1 industrial connector (on BSH servo motor side) and 1 free wire end (on Lexium 15 LP and 15 HP servo drive side)	
External diameter	**mm**	12 ± 0.2	16.3 ± 0.3
Curvature radius	**mm**	90, suitable for daisy-chaining, cable carrier system	125, suitable for daisy-chaining, cable carrier system
Working voltage	**V**	600	
Maximum usable length	**m**	50, for connection with a Lexium 15 LP servo drive 100, for connection with a Lexium 15 HP servo drive	
Operating temperature	**°C**	- 40...+ 90 (fixed), - 20…+ 80 (mobile)	
Certification		UL, CSA, VDE, CE, DESINA	

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

Characteristics of servo motor/servo drive power connection cables (continued)

Cables fitted with a connector on both the servo motor and servo drive sides

Cable type		VW3 M5 201 R●●●	VW3 M5 202 R●●●	VW3 M5 203 R●●●
External sleeve, insulation		PUR orange coloured RAL 2003, TPM or PP/PE		
Capacity	pF/m	< 70 (conductors/shielding)		
Number of conductors (shielded)		[(4 x 1.5 mm²) + (2 x 1 mm²)]	[(4 x 2.5 mm²) + (2 x 1 mm²)]	[(4 x 4 mm²) + (2 x 1 mm²)]
Connector type		1 industrial connector (BSH servo motor side) and 1 removable 6-way connecteur (Lexium 15 MP servo drives side)		
External diameter	mm	12 ± 0.2	14.3 ± 0.3	16.3 ± 0.3
Curvature radius	mm	90, suitable for daisy-chaining, cable-carrier system	110, suitable for daisy-chaining, cable-carrier system	125, suitable for daisy-chaining, cable-carrier system
Working voltage	V	600		
Maximum usable length	m	100, for connection with a Lexium 15 MP servo drive		
Operating temperature	°C	- 40...+ 90 (fixed), - 20…+ 80 (mobile)		
Certification		UL, CSA, VDE, CE, DESINA		

Cables

Cable type		VW3 M5 304 R●●●●
External sleeve, insulation		PUR orange coloured RAL 2003, TPM or PP/PE
Capacity	pF/m	< 70 (conductors/shielding)
Number of conductors (shielded)		[(4 x 10 mm²) + (2 x 1 mm²)]
Connector type		Without connectors; cable for connection of BSH 2052 and BSH 2053 servo motors (terminal) with Lexium 15 HP servo drive (terminal)
External diameter	mm	18 ± 0.3
Curvature radius	mm	135, suitable for daisy-chaining, cable-carrier system
Working voltage	V	600
Maximum usable length	m	100
Operating temperature	°C	- 40...+ 90 (fixed), - 20…+ 80 (mobile)
Certification		UL, CSA, VDE, CE, DESINA

Characteristics of the servo motor/servo drive control connection cables

Cable type		VW3 M8 301 R●●●
Sensor		SinCos Hiperface® encoder
External sleeve, insulation		PUR green coloured RAL 6018, polyester
Number of conductors (shielded)		5 x (2 x 0.25 mm²) + (2 x 0.5 mm²)
External diameter	mm	8.8 ± 0.2
Connector type		1 industrial connector (servo motor side) and 1 x 15-way SUB-D male connector (servo drive side)
Min. curvature radius	mm	68, suitable for daisy-chaining, cable-carrier system
Working voltage	V	350 (0.25 mm²), 500 (0.5 mm²)
Operating temperature	°C	- 50…+ 90 (fixed), - 40...+ 80 (mobile)
Certification		UL, CSA, VDE, CE, DESINA

Presentation:
pages 148 and 149

References:
pages 180 and 181

Dimensions:
pages 182 to 185

Lexium 15 motion control
BSH servo motors

105990

BSH 055●●

105991

BSH 070●●

105992

BSH 100●●

BSH servo motors

The BSH servo motors shown below are not equipped with gearboxes.
For GBX gearboxes see page 190.

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 15	Maximum nominal speed *(1)*	Reference *(2)*	Weight *(3)*
Nm	Nm	rpm		rpm		kg
0.5	1.4	8000	LD13M3	3200	**BSH 0551P ●●●●A**	0.800
			LU60N4	3200		
			LD13M3	7040	**BSH 0551T ●●●●A**	0.800
0.9	2.25	8000	LU60N4	4080	**BSH 0552M ●●●●A**	1.100
	2.26	8000	LU60N4	3760	**BSH 0552P ●●●●A**	1.100
	2.54	8000	LD13M3	7120	**BSH 0552T ●●●●A**	1.100
	2.7	8000	LD13M3	3360	**BSH 0552P ●●●●A**	1.100
1.3	3.5	8000	LU60N4	4240	**BSH 0553M ●●●●A**	1.400
	3.87	8000	LD10N4	7280	**BSH 0553P ●●●●A**	1.400
	4.2	8000	LD13M3	3600		
1.4	2.91	8000	LD10N4	6000	**BSH 0701T ●●●●A**	2.100
	3.19	8000	LD13M3	5040		
			LD21M3	5040		
1.41	2.66	8000	LD13M3	2960	**BSH 0701P ●●●●A**	2.100
			LU60N4	3040		
2.12	4.47	8000	LD17N4	5920	**BSH 0702T ●●●●A**	2.800
	5.45	8000	LD21M3	5280		
	5.63	8000	LU60N4	2960	**BSH 0702M ●●●●A**	2.800
2.2	4.85	8000	LD10N4	6880	**BSH 0702P ●●●●A**	2.800
	5.63	8000	LD13M3	2880		
2.83	5.99	8000	LD21M3	2960	**BSH 0703P ●●●●A**	3.600
	7.38	8000	LD28M3	5520	**BSH 0703T ●●●●A**	3.600
	7.71	8000	LD17N4	6480	**BSH 0703P ●●●●A**	3.600
	9.28	8000	LD21M3	2560		
3.39	6.19	6000	LD10N4	2580	**BSH 1001P ●●●●A**	4.300
	7.08	6000	LD21M3	2400		
	8.5	6000	LD28M3	3960	**BSH 1001T ●●●●A**	4.300
5.5	11.59	6000	LD28M3	4080	**BSH 1002T ●●●●A**	5.800
5.8	12.13	6000	LD17N4	4740	**BSH 1002P ●●●●A**	5.800
	14.79	6000	LD21M3	1920		
7.76	15.19	6000	LD10N4	2040	**BSH 1003M ●●●●A**	7.500
	22.95	6000	LD17N4	2040		
7.8	19.69	6000	LD28M3	2100	**BSH 1003P ●●●●A**	7.500
			MD28N4	4620		
	23.17	6000	MD40N4	4320		
9.31	19.8	6000	LD10N4	1620	**BSH 1004M ●●●●A**	9.200
	21.04	6000	MD40N4	3480	**BSH 1004T ●●●●A**	9.200
	25.7	6000	MD28N4	4020	**BSH 1004P ●●●●A**	9.200
	29.87	6000	LD17N4	1740	**BSH 1004M ●●●●A**	9.200
	33.83	6000	MD40N4	3600	**BSH 1004P ●●●●A**	9.200
	34.17	6000	MD40N4	1620	**BSH 1004M ●●●●A**	9.200

(1) Derating possible according to the power supply voltage, see characteristics pages 150 to 175.
(2) To complete each reference see the table on page 179.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 186.

BSH servo motors (continued)

105994

BSH 2051●

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 15	Maximum nominal power *(1)*	Reference *(2)*	Weight *(3)*
Nm	Nm	rpm		rpm		kg
11.1	23.33	4000	MD56N4	2520	**BSH 1401T ●●●●A**	11.900
			MD28N4	3080	**BSH 1401P ●●●●A**	11.900
			MD40N4	3080		
	26	4000	MD28N4	1320	**BSH 1401M ●●●●A**	11.900
19.5	39.33	4000	MD40N4	3320	**BSH 1402P ●●●●A**	16.600
	47.5	4000	MD40N4	1480	**BSH 1402M ●●●●A**	16.600
			MD56N4	3040	**BSH 1402P ●●●●A**	16.600
27.8	57.32	4000	MD56N4	3240	**BSH 1403P ●●●●A**	21.300
	71.76	4000	MD40N4	1400	**BSH 1403M ●●●●A**	21.300
33.4	82.32	4000	MD40N4	1400	**BSH 1404M ●●●●A**	26.000
	95	4000	MD56N4	1320		
36	68.33	3800	MD40N4	1672	**BSH 2051M ●●●●A**	33.000
			MD56N4	1672		
			HC11N4X	1672		
	82	3800	HC11N4X	3190	**BSH 2051P ●●●●A**	33.000
65	118.54	3800	HC11N4X	3000	**BSH 2052P ●●●3A** *(4)*	44.000
	193.45	3800	HC20N4X	3000		
	200	3800	HC11N4X	1710	**BSH 2052M ●●●3A** *(4)*	44.000
		3800	HC20N4X	1710		
90	202.96	3800	HC20N4X	3000	**BSH 2053P ●●●3A** *(4)*	56.000
	227.18	3800	HC11N4X	1980	**BSH 2053M ●●●3A** *(4)*	56.000
	300	3800	HC20N4X	1890		

To order a BSH servo motor complete each reference with:

		BSH 0701P	●	●	●	●	**A**
Shaft end	IP 40	Untapped	**0**				
		Keyed	**1**				
	IP 65	Untapped	**2**				
		Keyed	**3**				
Integrated sensor	Single turn, SinCos Hiperface® 4096 points/turn			**1**			
	Multiturn, SinCos Hiperface® 4096 points/turn, 4096 turns			**2**			
Holding brake	None				**A**		
	With				**F**		
Connection *(4)*	Straight connectors					**1**	
	Rotatable right-angled connectors					**2**	
Flange	International standard						**A**

Note: *The example above is for a **BSH 0701P** servo motor. Replace **BSH 0701P** by the relevant reference for other servo motors.*

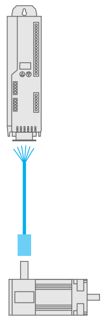
(1) Derating possible according to the power supply voltage, see characteristics pages 150 to 175.
(2) To complete each reference see the table above.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 186.
(4) The BSH 2052 ● and BSH 2053● servo motors are supplied with a power connection terminal and an angled connector for the control connection (sensor), see page 185. The product reference is BSH 205●● ●●●3A.

Presentation:
pages 148 and 149

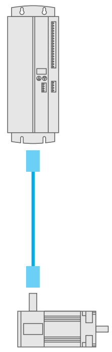
Characteristics:
pages 150 to 175

Dimensions:
pages 182 to 185

Power connection cables



VW3 M5 101/103 R●●●

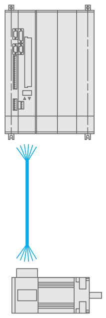


VW3 M5 201/202/203 R●●●

Description	From servo motor	To servo drive	Composition	Length m	Reference	Weight kg
Cables fitted with a connector on servo motor side	BSH 055●● BSH 070●● BSH 100●●	LXM 15L●●●●●	[(4 x 1.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 101 R30**	0.810
				5	**VW3 M5 101 R50**	1.210
				10	**VW3 M5 101 R100**	2.290
				15	**VW3 M5 101 R150**	3.400
				20	**VW3 M5 101 R200**	4.510
				25 *(1)*	**VW3 M5 101 R250**	6.200
				50 *(1)*	**VW3 M5 101 R500**	12.325
	BSH 2051M BSH 2051P	LXM 15HC●●N4X	[(4 x 4 mm²) + (2 x 1 mm²)]	3	**VW3 M5 103 R30**	1.330
				5	**VW3 M5 103 R50**	2.130
				10	**VW3 M5 103 R100**	4.130
				15	**VW3 M5 103 R150**	6.120
				20	**VW3 M5 103 R200**	8.090
				25	**VW3 M5 103 R250**	11.625
				50	**VW3 M5 103 R500**	23.175
				75	**VW3 M5 103 R750**	34.725
Cables fitted with two connectors	BSH 1003P BSH 1004● BSH 1401M BSH 1401P BSH 1402M BSH 1402P BSH 1403M BSH 1404M	LXM 15MD●●N4	[(4 x 1.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 201 R30**	0.885
				5	**VW3 M5 201 R50**	1.375
				10	**VW3 M5 201 R100**	2.600
				15	**VW3 M5 201 R150**	3.825
				20	**VW3 M5 201 R200**	5.050
				25 *(1)*	**VW3 M5 201 R250**	6.275
				50 *(1)*	**VW3 M5 201 R500**	12.400
				75 *(1)*	**VW3 M5 201 R750**	18.525
	BSH 1401T BSH 1402T BSH 1403P BSH 1404P	LXM 15MD●●N4	[(4 x 2.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 202 R30**	1.137
				5	**VW3 M5 202 R50**	1.795
				10	**VW3 M5 202 R100**	3.430
				15	**VW3 M5 202 R150**	5.085
				20	**VW3 M5 202 R200**	6.730
				25 *(1)*	**VW3 M5 202 R250**	8.375
				50 *(1)*	**VW3 M5 202 R500**	16.600
				75 *(1)*	**VW3 M5 202 R750**	24.825
	BSH 2051M	LXM 15MD●●N4	[(4 x 4 mm²) + (2 x 1 mm²)]	3	**VW3 M5 203 R30**	1.536
				5	**VW3 M5 203 R50**	2.460
				10	**VW3 M5 203 R100**	4.770
				15	**VW3 M5 203 R150**	7.080
				20	**VW3 M5 203 R200**	9.390
				25 *(1)*	**VW3 M5 203 R250**	11.700
				50 *(1)*	**VW3 M5 203 R500**	23.250
				75 *(1)*	**VW3 M5 203 R750**	34.800

(1) For cables longer than 20 m, a motor choke is compulsory, see page 47.

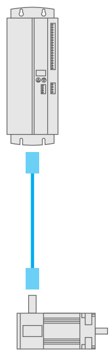
Power connection cables (continued)



VW3 M5 304 R●●●●

Description	From servo motor	To servo drive	Composition	Length m	Reference	Weight kg
Cable	BSH 2052M BSH 2052P BSH 2053M BSH 2053P	LXM 15HC●●N4X	[(4 x 10 mm²) + (2 x 1 mm²)]	10	**VW3 M5 304 R100**	8.530
				25	**VW3 M5 304 R250**	21.325
				50	**VW3 M5 304 R500**	42.650
				100	**VW3 M5 304 R1000**	85.300

Control connecting cables



VW3 M8 301 R●●●

Description	From servo motor	To servo drive	Composition	Length m	Reference	Weight kg
SinCos Hiperface® encoder cables fitted with two connectors	BSH, all ratings	LXM 15, all ratings	5x(2 x 0.25 mm²) + (2 x 0.5 mm²)	3	**VW3 M8 301 R30**	–
				5	**VW3 M8 301 R50**	–
				10	**VW3 M8 301 R100**	–
				15	**VW3 M8 301 R150**	–
				20	**VW3 M8 301 R200**	–
				25	**VW3 M8 301 R250**	–
				50	**VW3 M8 301 R500**	–
				75	**VW3 M8 301 R750**	–

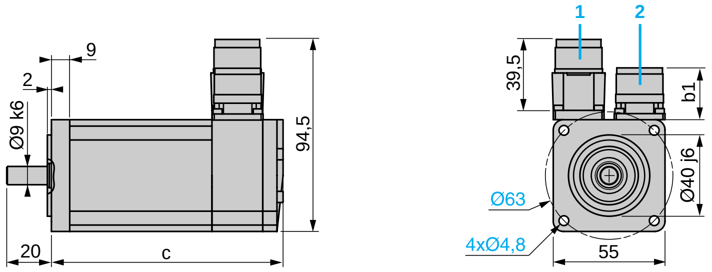
Presentation:
pages 148 and 149

Characteristics:
pages 176 and 177

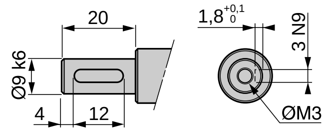
Lexium 15 motion control

BSH servo motors

BSH 055 (example with straight connectors: power supply for servo motor/brake 1 and encoder 2)

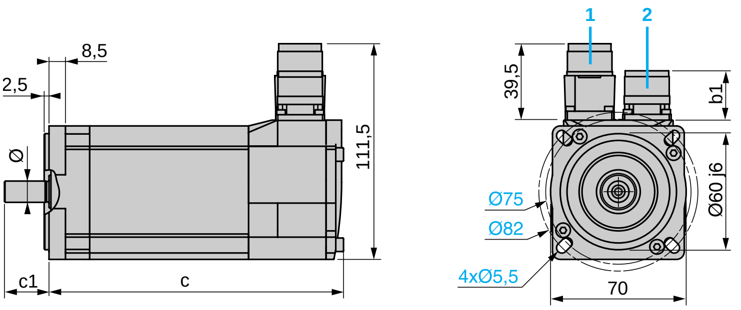


Shaft end, keyed slot (optional)

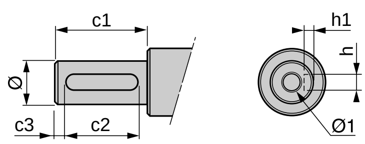


	Straight connectors	Rotary angled connectors		
	b1	**b1**	**c** (without brake)	**c** (with brake)
BSH 0551	25.5	39.5	132.5	159
BSH 0552	25.5	39.5	154.5	181
BSH 0553	25.5	39.5	176.5	203

BSH 070 (example with straight connectors: power supply for servo motor/brake 1 and encoder 2)



Shaft end, keyed slot (optional)



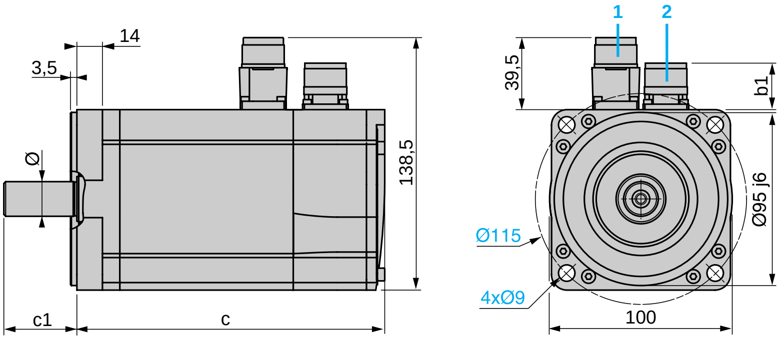
	Straight connectors	Rotary angled connectors									
	b1	**b1**	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**c3**	**h**	**h1**	**Ø**	**Ø1**
BSH 0701	25.5	39.5	154	180	23	18	2.5	4 N9	$2.5^{+0.1}_{0}$	11 k6	M4
BSH 0702	25.5	39.5	187	213	23	18	2.5	4 N9	$2.5^{+0.1}_{0}$	11 k6	M4
BSH 0703	25.5	39.5	220	256	30	20	5	5 N9	$3^{+0.1}_{0}$	14 k6	M5

Presentation:
pages 148 and 149

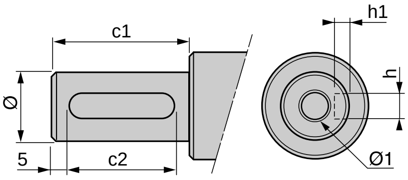
Characteristics:
pages 150 to 177

References:
pages 178 to 181

BSH 100 (example with straight connectors: power supply for servo motor/brake 1 and encoder 2)

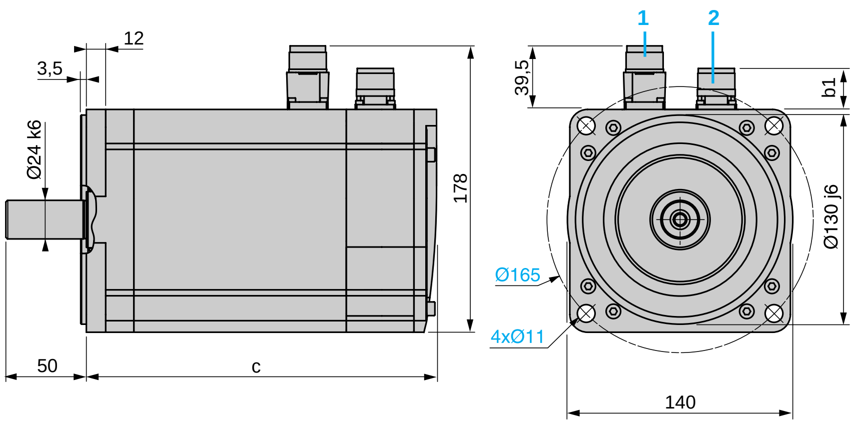


Shaft end, keyed slot (optional)

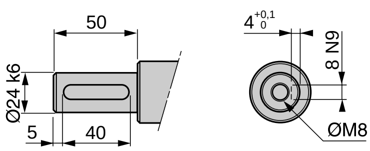


	Straight connectors b1	Rotary angled connectors b1	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**h**	**h1**	**Ø**	**Ø1**
BSH 1001	25.5	39.5	169	200	40	30	6 N9	$3.5^{+0.1}_{0}$	19 k6	M6
BSH 1002	25.5	39.5	205	236	40	30	6 N9	$3.5^{+0.1}_{0}$	19 k6	M6
BSH 1003	25.5	39.5	241	272	40	30	6 N9	$3.5^{+0.1}_{0}$	19 k6	M6
BSH 1004	25.5	39.5	277	308	50	40	8 N9	$4^{+0.1}_{0}$	24 k6	M8

BSH 140 (example with straight connectors: power supply for servo motor/brake 1 and encoder 2)



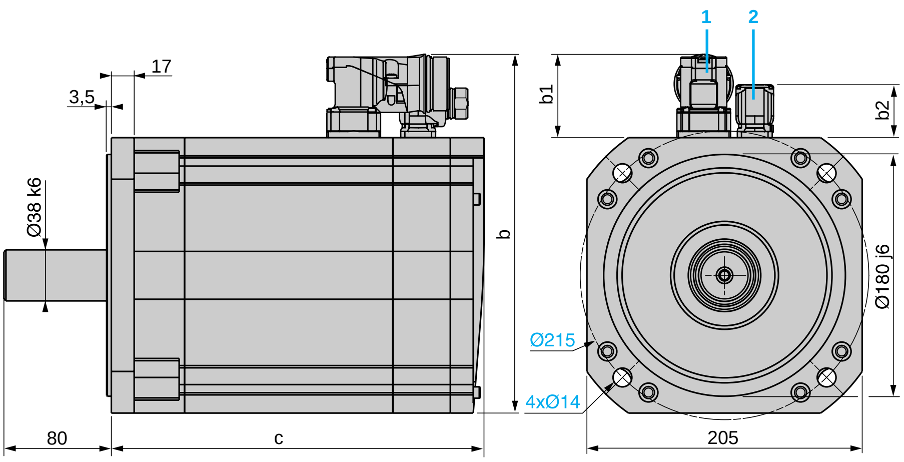
Shaft end, keyed slot (optional)



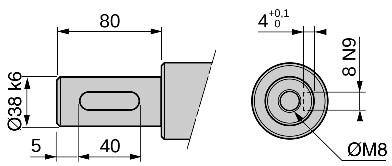
	Straight connectors b1	Rotary angled connectors b1	**c** (without brake)	**c** (with brake)
BSH 1401	25.5	39.5	218	256
BSH 1402	25.5	39.5	273	311
BSH 1403	25.5	39.5	328	366
BSH 1404	25.5	39.5	383	421

Presentation:
pages 148 and 149
Characteristics:
pages 150 to 177
References:
pages 178 to 181

BSH 2051 (example with rotary angled connectors: power supply for servo motor/brake 1 and encoder 2)



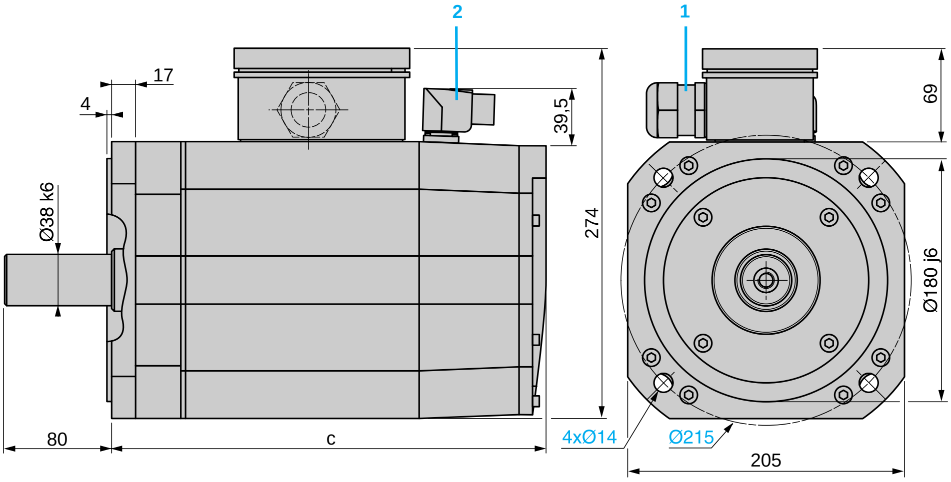
Shaft end, keyed slot (optional)



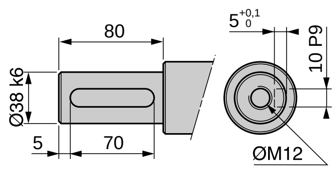
	Straight connectors			Rotary angled connectors				
	b	**b1**	**b2**	**b**	**b1**	**b2**	**c** (without brake)	**c** (with brake)
BSH 2051	259	54	25.5	267	70	39.5	321	370.5

Lexium 15 motion control
BSH servo motors

BSH 2052 and 2053 (example with angled connectors: power supply for servo motor/brake 1 and encoder 2) ***(1)***



Shaft end, keyed slot (optional)



	c (without brake)	**c** (with brake)
BSH 2052	405	454.5
BSH 2053	489	538.5

(1) Not available with straight connectors. The power supply cable for servo motor/brake 1 is connected via a terminal.

Presentation:
pages 148 and 149
Characteristics:
pages 150 to 177
References:
pages 178 to 181

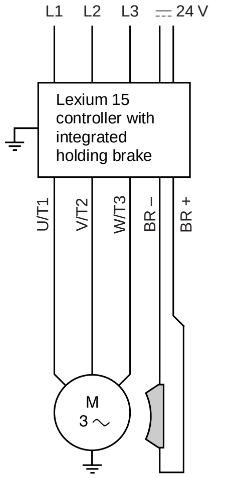
Lexium 15 motion control

BSH servo motors

Option: integrated holding brake

Holding brake

Presentation



The holding brake integrated into the BSH servo motor, depending on the model, is an electromagnetic pressure spring brake that blocks the servo motor axis once the output current has been switched off. In the event of an emergency, such as a power outage or an emergency stop, the drive is immobilized, significantly increasing safety.
Blocking the servo motor axis is also necessary in cases of torque overload, such as in the event of vertical axis movement.

Activation of the holding brake is directly controlled by the Lexium 15 servo drive.

Characteristics

Type of servo motor	BSH	0551 0552 0553	0701 0702	0703	1001 1002 1003	1004	1401 1402	1403 1404	2051 2052 2053
Holding torque M_{Br}	**Nm**	0.8	2	3	9	12	23	36	80
Inertia of rotor (brake only) J_{Br}	**kgcm²**	0.0213	0.072	0.23	0.613	1.025	1.15	5.5	16
Electrical clamping power P_{Br}	**W**	10	11	12	18	20	24	26	40
Supply voltage		24 V⎓ -10…+6 %							
Opening time	**ms**	12	25	35	40	45	50	100	200
Closing time	**ms**	6	8	15	18	20	25	30	50
Weight (brake only)	**kg**	0.080	0.450	0.320	0.450	0.690	1.100	1.790	3.600

References

105992

BSH servo motor

Selection of BSH servo motor with **F** or without **A** holding brake , see references page 179.

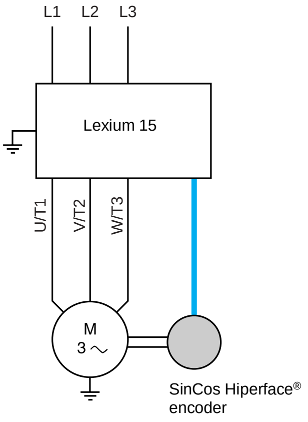
Dimensions:
pages 182 to 185

Lexium 15 motion control

BSH servo motors
Option: integrated sensor

Sensor integrated into BSH servo motors

Presentation



The standard measurement device is the SinCos Hiperface® single turn or multiturn encoder integrated into the BSH servo motors. This measurement device is perfectly adapted to the Lexium 15 range of servo drives.

Use of this encoder allows:
- The BSH servo motor data to be automatically identified by the servo drive
- The servo drive's control loops to be automatically initialized. These functions therefore simplify the installation of the motion control device.

Characteristics

Type of sensor		Single turn SinCos	Multiturn SinCos
Sinus periods per turn		128	128
Number of points		4096	4096 x 4096 turns
Encoder precision		± 1.3 arc minutes	
Measurement method		Optical high resolution	
Interface		Hiperface®	
Operating temperature	**°C**	+5...+110	

References

105992

BSH servo motor

Selection of SinCos Hiperface® single turn **1** or multiturn **2** encoder integrated into the BSH servo motor, see references page 179.

Dimensions:
pages 182 to 185

Lexium 15 motion control

BSH servo motors

Option: GBX planetary gearboxes

Presentation

GBX planetary gearbox

In many cases, motion control requires the use of planetary gearboxes to adapt speeds and torques, while ensuring the precision demanded by the application.

Schneider Electric has selected GBX gearboxes made by Neugart to be used in association with the BSH servo motor range. These gearboxes are lubricated for life and are designed for applications not requiring very low backlash. As their association with BSH servo motors has been thoroughly qualified and they are very easy to mount, the gearboxes are simple to put into operation and risk free.

Available in 5 sizes (GBX 40... GBX 160), the planetary gearboxes are offered in 12 speed reduction ratios (3:1...40:1), see table below.

Continuous stall torques and peak stall torques available from the gearbox are obtained by multiplying the characteristic values of the servo motor by the reduction ratio and gearbox efficiency (0.96 or 0.94 depending on the speed reduction ratio).

The table below shows the most suitable servo motor/gearbox combinations. For other associations consult the servo motor data sheets.

BSH servo motor/GBX gearbox associations

Type of servo motor	Speed reduction ratio											
	3:1	4:1	5:1	8:1	9:1	12:1	15:1	16:1	20:1	25:1	32:1	40:1
BSH 0551	GBX 40	GBX 40	GBX 40	GBX 60	GBX 40	GBX 40	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60	*GBX 60**
BSH 0552	GBX 60	GBX 60	GBX 60	GBX 60	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60	*GBX 60**	*GBX 60**	*GBX 60**
BSH 0553	GBX 60	GBX 60	GBX 60	*GBX 60**	GBX 40	GBX 60	GBX 60	GBX 60	GBX 60	*GBX 60**	*GBX 60**	*GBX 60**
BSH 0701	GBX 60	GBX 60	GBX 80	GBX 80	GBX 60	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120
BSH 0702	GBX 80	GBX 80	GBX 80	GBX 80	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120
BSH 0703	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BSH 1001	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 160
BSH 1002	GBX 80	GBX 80	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BSH 1003	GBX 80	GBX 120	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BSH 1004	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BSH 1401	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BSH 1402	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BSH 1403	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BSH 1404	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BSH 2051	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**	–	–	–	–	–	–	–	–
BSH 2052	–	–	–	–	–	–	–	–	–	–	–	–
BSH 2053	–	–	–	–	–	–	–	–	–	–	–	–

GBX 60* *For associations in italics and marked with an asterisk, you must check that the application does not exceed the maximum continuous output torque of the gearbox, see values page 189.*

Characteristics:
page 189

References:
page 190

Dimensions:
page 191

Lexium 15 motion control
BSH servo motors
Option: GBX planetary gearboxes

Characteristics of GBX gearboxes

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Type of gearbox			Planetary gearbox with straight teeth, single reduction stage				
Backlash	3:1...8:1	**arc min**	< 30	< 20	< 12	< 8	< 6
	9:1...40:1		< 35	< 25	< 17	< 12	< 10
Torsion rigidity	3:1...8:1	**Nm/arc min**	1.0	2.3	6	12	38
	9:1...40:1		1.1	2.5	6.5	13	41
Noise level		**dB (A)**	55	58	60	65	70
Junction box			Black anodized aluminum				
Shaft material			C 45				
Shaft output dust and damp protection			IP 54				
Lubrification			Lubricated for life				
Average service life *(1)*		**hr**	30,000				
Mounting position			All positions				
Operating temperature		**°C**	- 25...+ 90				

Characteristics of BSH servo motor/GBX gearbox associations

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Efficiency	3:1...8:1		0.96				
	9:1...40:1		0.94				
Maximum permitted radial force *(1) (2)*	L_{10h} = 10,000 hours	**N**	200	500	950	2000	6000
	L_{10h} = 30,000 hours		160	340	650	1500	4200
Maximum permitted axial force *(1)*	L_{10h} = 10,000 hours	**N**	200	600	1200	2800	8000
	L_{10h} = 30,000 hours		160	450	900	2100	6000
Moment of gearbox inertia	3:1	**kgcm²**	0.031	0.135	0.77	2.63	12.14
	4:1	**kgcm²**	0.022	0.093	0.52	1.79	7.78
	5:1	**kgcm²**	0.019	0.078	0.45	1.53	6.07
	8:1	**kgcm²**	0.017	0.065	0.39	1.32	4.63
	9:1	**kgcm²**	0.03	0.131	0.74	2.62	–
	12:1	**kgcm²**	0.029	0.127	0.72	2.56	12.37
	15:1	**kgcm²**	0.023	0.077	0.71	2.53	12.35
	16:1	**kgcm²**	0.022	0.088	0.5	1.75	7.47
	20:1	**kgcm²**	0.019	0.075	0.44	1.5	6.64
	25:1	**kgcm²**	0.019	0.075	0.44	1.49	5.81
	32:1	**kgcm²**	0.017	0.064	0.39	1.3	6.36
	40:1	**kgcm²**	0.016	0.064	0.39	1.3	5.28
Continuous output torque *(1)* M_{2N}	3:1	**Nm**	4.5	12	40	80	400
	4:1	**Nm**	6	16	50	100	450
	5:1	**Nm**	6	16	50	110	450
	8:1	**Nm**	5	15	50	120	450
	9:1	**Nm**	16.5	44	130	210	–
	12:1	**Nm**	20	44	120	260	800
	15:1	**Nm**	18	44	110	230	700
	16:1	**Nm**	20	44	120	260	800
	20:1	**Nm**	20	44	120	260	800
	25:1	**Nm**	18	40	110	230	700
	32:1	**Nm**	20	44	120	260	800
	40:1	**Nm**	18	40	110	230	700

(1) Values refer to an output shaft speed of 100 rpm in S1 mode (cyclical ratio = 1) on electrical machines for an ambient temperature of 30°C.
(2) Force applied at mid-distance from the output shaft.

Presentation: page 188
References: page 190
Dimensions: page 191

Lexium 15 motion control
BSH servo motors
Option: GBX planetary gearboxes

References

GBX ●●●

Size	Speed reduction ratio	Reference (1)	Weight kg
GBX 40	3:1, 4:1, 5:1 and 8:1	**GBX 040 ●●● ●●● ●F**	0.350
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 040 ●●● ●●● ●F**	0.450
GBX 60	3:1, 4:1, 5:1 and 8:1	**GBX 060 ●●● ●●● ●F**	0.900
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 060 ●●● ●●● ●F**	1.100
GBX 80	3:1, 4:1, 5:1 and 8:1	**GBX 080 ●●● ●●● ●F**	2.100
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 080 ●●● ●●● ●F**	2.600
GBX 120	3:1, 4:1, 5:1 and 8:1	**GBX 120 ●●● ●●● ●F**	6.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 120 ●●● ●●● ●F**	8.000
GBX 160	3:1, 4:1, 5:1 and 8:1	**GBX 160 ●●● ●●● ●F**	18.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 160 ●●● ●●● ●F**	22.000

To order a GBX planetary gearbox, complete each reference with:

			GBX ●●●	●●●	●●●	●	F
Size	Junction box diameter (see associations table with BSH servo motor, page 188)	40 mm	**040**				
		60 mm	**060**				
		80 mm	**080**				
		115 mm	**120**				
		160 mm	**160**				
Speed reduction ratio		3:1		**003**			
		4:1		**004**			
		5:1		**005**			
		8:1		**008**			
		9:1		**009**			
		12:1		**012**			
		15:1		**015**			
		16:1		**016**			
		20:1		**020**			
		25:1		**025**			
		32:1		**032**			
		40:1		**040**			
Associated BSH servo motor	Type	BSH 055			**055**		
		BSH 070			**070**		
		BSH 100			**100**		
		BSH 140			**140**		
		BSH 205			**205**		
	Model	BSH ●●●1				**1**	
		BSH ●●●2				**2**	
		BSH ●●●3				**3**	
		BSH ●●●4				**4**	
BSH servo motor adaptation							**F**

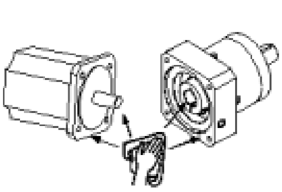
Mounting

No specialized tool is required to mount the GBX planetary gearbox on the BSH servo motor. The general usage rules for mechanical mounting must be observed:

1 Clean support areas and joints.
2 Align shafts to be linked and assemble in vertical position.
3 Join the servo motor flange to the gearbox flange in uniform manner, with cross tightening of the screws.
4 Using a torque wrench, tighten the TA ring following tightening torque (2...40 Nm according to the gearbox model).

For more information, consult the user instructions supplied with the products).

1



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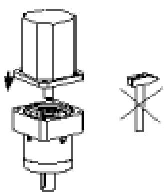

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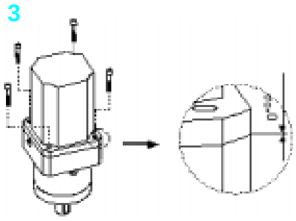

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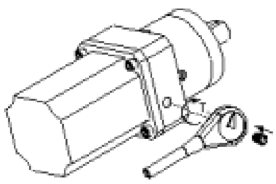
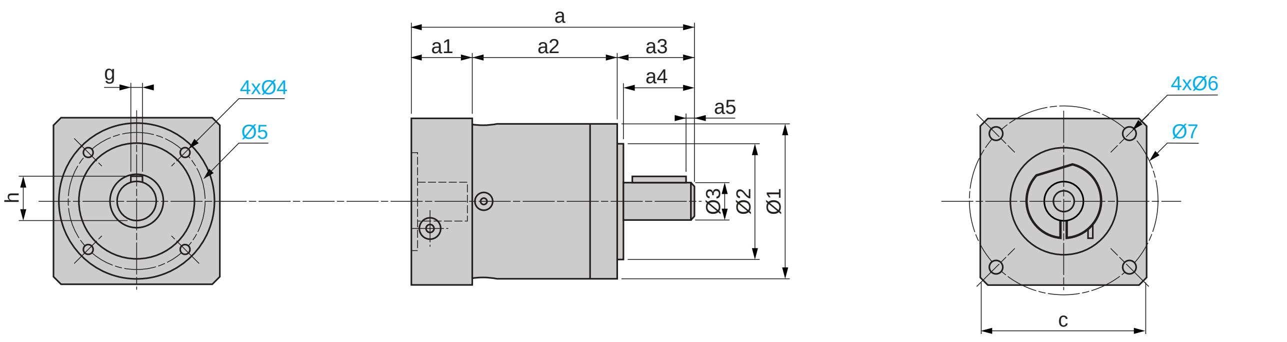


Lexium 15 motion control
BSH servo motors
Option: GBX planetary gearboxes

Dimensions

Servo motor assembly



GBX	c	a	a1	a2	a3	a4	a5	h	g	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7
040 003...008	40	93.5	28.5	39	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
040 009...016	40	106.5	28.5	52	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
060 003...008	60	106.5	24.5	47	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
060 009...040	60	118.5	24.5	59	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
080 003...008	90	134	33.5	60.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
080 009...032	90	151	33.5	77.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
120 003...008	115	176.5	47.5	74	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
120 009...040	115	203.5	47.5	101	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
160 003...008	140	255.5	64.5	104	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165
160 009...040	140	305	64.5	153.5	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165

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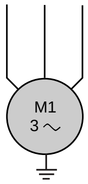
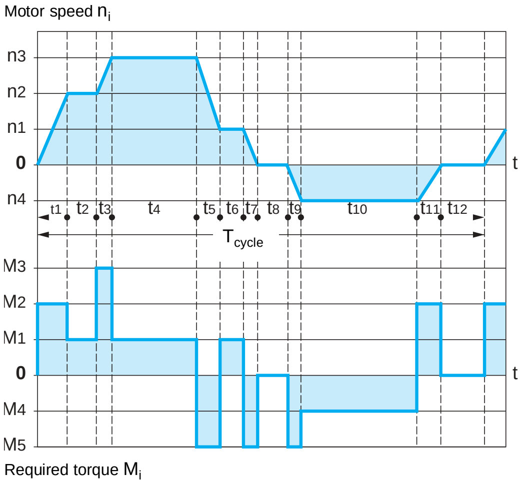


Sizing of BSH servo motor

To assist you in sizing the servo motor, the "**Lexium Sizer**" software tool is available on the website www.telemecanique.com

These 2 pages are to help you understand the method used for calculation.

To size the servo motor you need to know the equivalent thermal torque and the average speed required by the mechanics to be associated with the servo motor. Both values are calculated using the motor cycle trend diagram and should be compared with the speed/torque curves given for each servo motor (see BSH servo motor curves, pages 150 to 175).



Motor cycle trend diagram

The motor cycle is made up of several sub-cycles for which the duration of each is known.
Each sub-cycle is broken down into phases which correspond to the periods of time during which the motor torque is constant (1 to 3 phases maximum per sub-cycle).
This breakdown can be used to calculate, for each phase:
- the duration (t_j)
- the speed (n_i)
- the required torque value (M_i)

The curves on the left show the 4 phase types:
- constant acceleration during t_1, t_3 and t_9
- at work during t_2, t_4, t_6 and t_{10}
- constant deceleration during t_5, t_7 and t_{11}
- motor stopped during t_8 and t_{12}

The total cycle duration is:
$T_{cycle} = t_1 + t_2 + t_3 + t_4 + t_5 + t_6 + t_7 + t_8 + t_9 + t_{10} + t_{11} + t_{12}$

Calculating the average speed n_{avg}

The average speed is calculated using the formula opposite where: $n_{avg} = \dfrac{\sum |ni| \cdot t_j}{\sum t_j}$

- n_i corresponds to the different work speeds.
- $\dfrac{ni}{2}$ corresponds to the average speeds during constant acceleration and deceleration phases.

In the above example:

Duration t_j	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}	t_{12}
Speed $\|ni\|$	$\frac{\|n2\|}{2}$	$\|n2\|$	$\frac{\|n3\|+\|n2\|}{2}$	$\|n3\|$	$\frac{\|n3\|+\|n1\|}{2}$	$\|n1\|$	$\frac{\|n1\|}{2}$	0	$\frac{\|n4\|}{2}$	$\|n4\|$	$\frac{\|n4\|}{2}$	0

The average speed is calculated as follows:

$$n_{avg} = \frac{\frac{n2}{2} \cdot t1 + n2 \cdot t2 + \frac{n3+n2}{2} \cdot t3 + n3 \cdot t4 + \frac{n3+n1}{2} \cdot t5 + n1 \cdot t6 + \frac{n1}{2} \cdot t7 + \frac{n4}{2} \cdot t9 + n4 \cdot t10 + \frac{n4}{2} \cdot t11}{Tcycle}$$

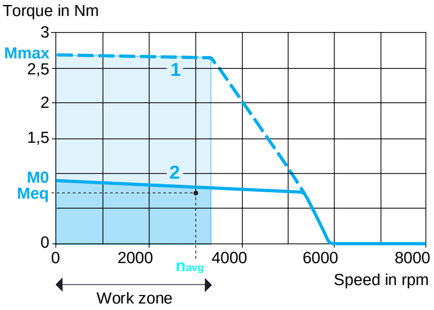
Calculating the equivalent thermal torque M_{eq}

The equivalent thermal torque is calculated using the following formula:

$$M_{eq} = \sqrt{\frac{\sum Mi^2 \cdot t_j}{Tcycle}}$$

In the above example, this formula gives the following calculation:

$$M_{eq} = \sqrt{\frac{M2^2 \cdot t1 + M1^2 \cdot t2 + M3^2 \cdot t3 + M1^2 \cdot t4 + M5^2 \cdot t5 + M1^2 \cdot t6 + M5^2 \cdot t7 + M5^2 \cdot t9 + M4^2 \cdot t10 + M2^2 \cdot t11}{Tcycle}}$$



Sizing of BSH servo motor (continued)

Determining the size of the servo motor

The point defined by the 2 preceding calculations (average speed and equivalent thermal torque) where the:

- horizontal axis represents the average speed n_{avg}
- vertical axis represents the thermal torque M_{eq}

must be within the area bound by the curve 2 and the work zone.

The motor cycle trend diagram should also be used to ensure that all torques M_i required for the different speeds n_i during the various cycle phases are within the area bound by the curve 1 and the work zone.

1 Peak torque
2 Continuous torque

Product reference index

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Lexium 05: 4 to 25 A eff
BSH motors: 0.5 to 36 Nm

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BERGER LAHR

Catalogue

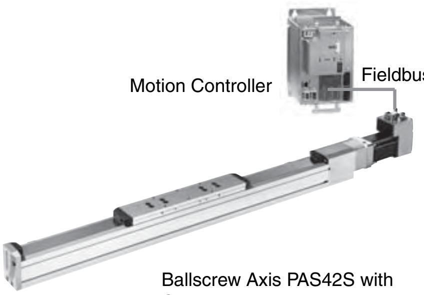
Portal Axes PAS

a company of Schneider Electric

Toothed Belt Axis PAS42B

Toothed Belt Axis PAS42SB with motor

Ballscrew Axis PAS42S



Ballscrew Axis PAS42S with
Compact Drive IclA

Product Description

Berger Lahr has added the PAS portal axes to the well-known linear range. PAS portal axes are available in ballscrew and toothed-belt models to meet different requirements.

The portal axes are designed to be extremely user-friendly and can be supplied with various Berger Lahr drives and controllers. The maximum power of the axis can be reached only if axis, motor and electronics are optimally matched. Our field sales representatives will be pleased to advise you.

Flexible drive interface

The coupling modules make it easy to attach motors and gearing.

The drive and end blocks are identical on the toothed-belt axes. Additional drive and output components can be attached with one coupling or a shaft journal at both ends.

Consistency

The sizes of the axes are optimally matched to customer requirements. Axes of the same size are compatible regardless of axis type (ballscrew or toothed belt). All carriages are fitted with lubrication adapters on both sides for optimum lubrication.

Flexible adapters

There are side and bottom ITEM-compatible T-slots for flexible attachment of the axis on the axial sections. The limit stop sensors can be moved along a T-slot. The carriage holes are prepared to accept the centring rings.

Wide variety of options

Axes are available with a metal cover strip to protect the interior against dirt. All axes can be fitted with up to three carriages and any desired carriage separation. Toothed-belt axes are available as ball guide or roller guide version, ballscrew axes as ball guide version. Corrosion-resistant and antistatic versions of the toothed-belt axes are also available.

Applications

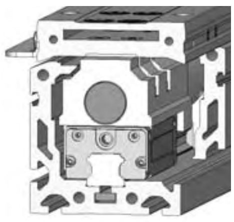
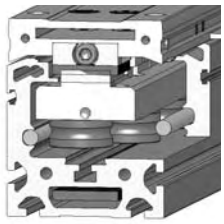
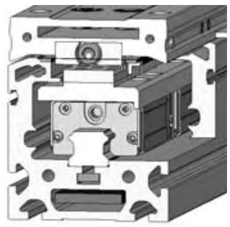
Ballscrew axes are recommended for precise positioning of loads at low speeds and high feed forces. Toothed-belt axes are preferred when dynamic response, high positioning speed and long strokes are required. The following table shows a comparison of the most important technical data of the two types of axis.

Product offer

Portal axes		Ballscrew axes			Toothed-belt axes					
										
Size		**2**	**3**	**4**	**1**	**2**		**3**		**4**
Type designation		**PAS42SB**	**PAS43SB**	**PAS44SB**	**PAS41BR**	**PAS42BR**	**PAS42BB**	**PAS43BR**	**PAS43BB**	**PAS44BB**
Type of guides		Ball guide			Roller	Roller	Ball guide	Roller	Ball guide	Ball guide
Typical payload [1)]	kg	24	60	100	6	12	24	30	60	100
Max. feed force	N	2070	2360	3950	300	800	800	1100	1100	2600
Max. speed	m/s	0.80	1.00	1.25	8	8	5	8	5	5
Max. acceleration	m/s^2	10	10	10	20	20	20	20	20	20
Max. stroke length	mm	1500	3000	3000	3000	5500	5500	5500	5500	5500
Repeat accuracy	mm	±0.02	±0.02	±0.02	±0.05	±0.05	±0.05	±0.05	±0.05	±0.05
Section cross-section	mm x mm	60 x 60	80 x 80	110 x 110	40 x 40	60 x 60	60 x 60	80 x 80	80 x 80	110 x 110

[1)] The typical payload is the load for which the axis is normally used. This payload may be considerably exceeded if the corresponding prerequisites are given or considered. Refer to the influence of the forces and torques on the service life of the axis in km in the section Technical data, Calculations, Calculation of service life.

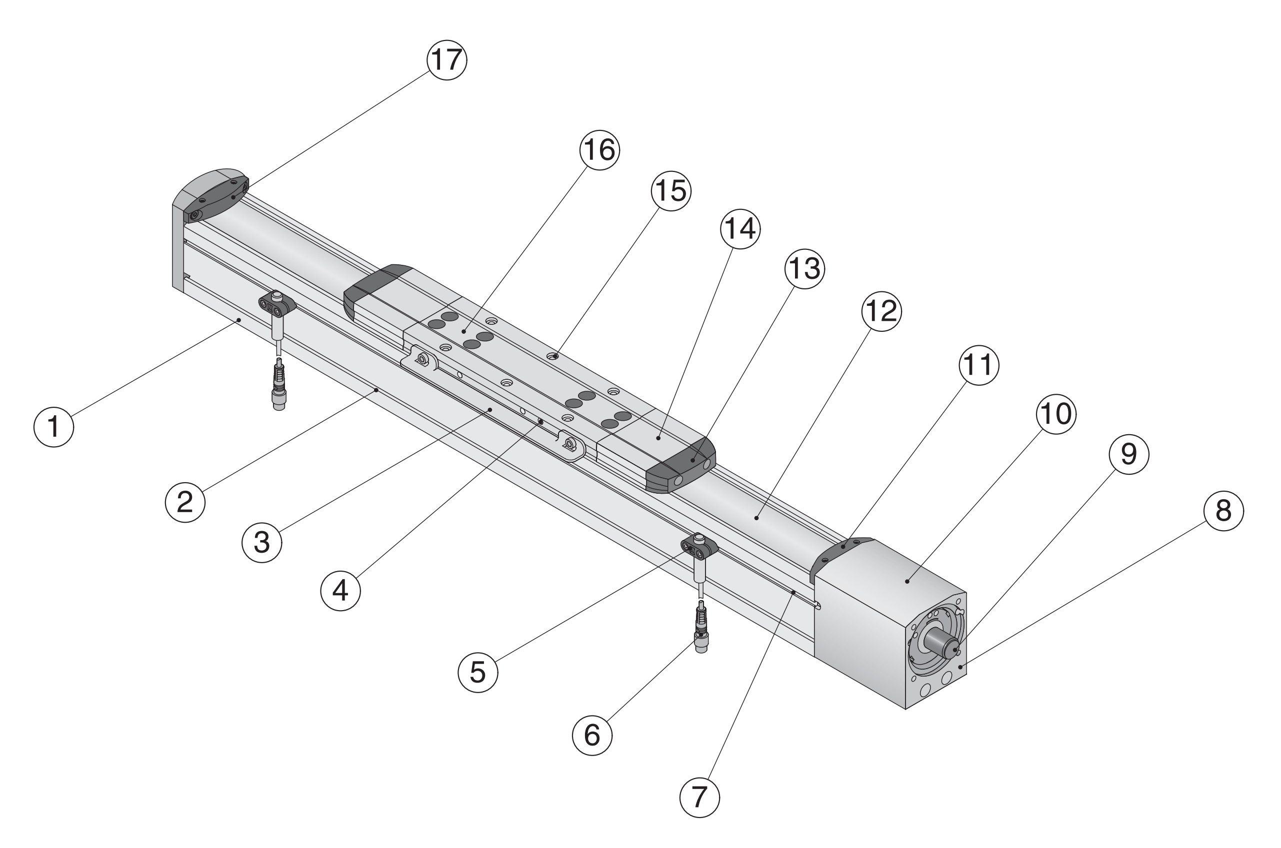
Guide types

Ballscrew axis with ball guide	Toothed-belt axis with roller guide	Toothed-belt axis with ball guide
		

Ballscrew axes

Product Description

Structure



Components of a ballscrew axis

(1) Axis body
(2) T-slot fastening
(3) Sensor damper plate
(4) Lubrication nipple
(5) Sensor retainer
(6) Sensor with connector cable
(7) T-slot for fastening the sensor retainer
(8) Flange for drive mount
(9) Drive shaft
(10) Drive block
(11) Metal cover strip fastening
(12) Metal cover strip
(13) Buffer
(14) Metal cover strip deflector
(15) Threaded holes for mounting the load
(16) Carriage
(17) End block with ballscrew bearing

Introduction

The ballscrew axes are based on specially developed and particularly distortion-resistant aluminium sections. A special feature is their ability to position heavy loads with a ballscrew drive and ball guides accurately and repeatedly with high feed force.

The ballscrew axes can be fitted with up to three carriages for moving large loads and higher torques. A support axis running parallel can also be installed by the customer.

Features and options

- High positioning accuracy
- High feed force
- High stiffness
- User-friendly structure
  - Easy system integration with section technology (ITEM-compatible T-section slots)
  - Carriage with holes and locating dowels for easy load mounting
  - Lubrication at lubrication nipples on both carriage sides
  - Easy motor attachment with quick-coupling system
  - Stroke length available with millimetre accuracy
  - Sensors can be moved anywhere in T-section slots
- Many options:
  - Various ballscrew pitches
  - Cover strip
  - Sensor limit switches in various designs
  - Carriage (type, number, distance)
  - Ballscrew support running parallel (ballscrew stabilisation at high speeds and strokes)

Property-related application examples

- Accurate and backlash-free advance movements, even under variable loads and torques, for cutting, separating, labelling and precise positioning of loads in workstations
- High feed forces for joining, cutting and machining processes
- Exact and repeatable positioning of parts, vision and measurement systems

Product offer

Size		**2**	**3**	**4**
Type designation		**PAS42SB**	**PAS43SB**	**PAS44SB**
Type of guide		Ball guide		
Typical payload [1]	kg	24	60	100
Max. feed force	N	2070	2360	3950
Max. speed	m/s	0.80	1.00	1.25
Max. acceleration	m/s^2	10	10	10
Max. stroke length	mm	1500	3000	3000
Repeat accuracy	mm	±0.02	±0.02	±0.02
Section cross-section	mm x mm	60 x 60	80 x 80	110 x 110
Ballscrew diameter	mm	16	20	25
Ballscrew pitch	mm/rev	5 / 10 / 16	5 / 10 / 20	5 / 10 / 25

[1] The typical payload is the load for which the axis is normally used. This payload may be considerably exceeded if the corresponding prerequisites are given or considered. Refer to the influence of the forces and torques on the service life of the axis in km in the section Technical data, Calculations, Calculation of service life.

Motors and drives

We offer complete solutions from our comprehensive range of products comprising: axis, motor, gearing, drive and motion controller.
Depending on the requirements for forces, torques and dynamic response for the application, the ballscrew axes are fitted with Berger Lahr three-phase stepper motors, AC servomotors or compact drives. Other motors are also available as specified by the customer.

The following table shows the standard motorisation recommended by Berger Lahr.

Recommended motors and drives			**Ballscrew axes**		
Type	**Size**	**Max. torque (Nm)**	**PAS42SB**	**PAS43SB**	**PAS44SB**
VRDM three-phase stepper motors	VRDM 366	0.9	x		
	VRDM 368	1.5	x		
	VRDM 397	2	x	x	x
	VRDM 3910	4	x	x	x
	VRDM 3913	6	x	x	x
	VRDM 31117	12	x	x	x
	VRDM 31122	16.5	x	x	x
Intelligent compact drives IclA IFS/IDS with stepper motors	I•S 62	0.9	x		
	I•S 63	1.5	x		
	I•S 91	2	x	x	x
	I•S 92	4	x	x	x
	I•S 93	6	x	x	x
Intelligent compact drives IclA IFE with brushless DC motors (with gearing)	IFE71 V-018	3.5	x		
	IFE71 V-038	6	x		
	IFE71 V-054	10	x		
	IFE71 V-115	14	x		
SER servomotors	SER 3610	3.6	x		
	SER 397	4	x	x	
	SER 3910	8	x	x	
	SER 3913	11.5	x	x	x
	SER 3916	14.5	x	x	x
	SER 31112	16.8		x	x
	SER 31117	25		x	x
	SER 31122	38		x	x
	SER 31127	48		x	x
RIG servomotors I = 4:1	RIG 379	15.5	x	x	x
	RIG 3910	22	x	x	x
	RIG 3913	22	x	x	x
	RIG 31112	70			x
	RIG 31117	76			x
	RIG 31122	76			x
BSH servomotors	BSH 0701	3.5	x		
	BSH 0702	7.6	x		
	BSH 0703	11.3	x		
	BSH 1001	9.6	x	x	x
	BSH 1002	18.3	x	x	x
	BSH 1003	28.3	x	x	x
	BSH 1004	40.5		x	x
Planetary gears, single-stage (Neugart)	PLE 40 / WPLE 40	5	x		
	PLE 60 / WPLE 60	15	x	x	x
	PLE 80 / WPLE 80	50		x	x
	PLS 70	110	x	x	x
	PLS 90	220		x	x

Motors and gearings

Depending on the requirements, different gearings can be attached to the Berger Lahr motors.

The following table shows the standard motor-gearing combinations recommended by Berger Lahr:

Recommended motors and gearings							
Type	**Size**	**PLE 40 / WPLE 40**	**PLE 60 / WPLE 60**	**PLE 80 / WPLE 80**	**PLE 120 / WPLE 120**	**PLE 70**	**PLE 90**
VRDM three-phase stepper motors	VRDM 366	x	x			x	
	VRDM 368	x	x			x	
	VRDM 397			x			x
	VRDM 3910			x			x
	VRDM 3913			x			x
	VRDM 31117			x	x		x
	VRDM 31122			x	x		x
Intelligent compact drives IclA IFS/IDS with stepper motors	I•S 62	x	x			x	
	I•S 63	x	x			x	
	I•S 91			x			x
	I•S 92			x			x
	I•S 93			x			x
SER servomotors	SER 3610	x	x	x		x	
	SER 397	x	x	x		x	
	SER 3910		x	x		x	x
	SER 3913		x	x		x	x
	SER 3916		x	x		x	x
	SER 31112			x	x		x
	SER 31117			x	x		x
	SER 31122			x	x		x
	SER 31127			x	x		x
BSH servomotors	BSH 070•		x	x	x		
	BSH 100•			x	x		

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

For detailed information on the various motors and drives see the catalogues below:

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

PAS42S

Technical Data

Ballscrew pitch	mm	5	10	16
Type designation		PAS42SB		
Guide type		Ball guide SHS 15		
Typical payload	kg	24		
Max. stroke length [1] [2]	mm	1500		
Min. stroke length [3]	mm	9		
Max. speed [4]	m/s	0.25	0.50	0.80
Max. acceleration[4]	m/s^2	10		
Max. drive force Fx [5]	N	2070	1365	1775
Max. force Fy_{dynmax}[5]	N	3535		
Max. force Fz_{dynmax}[5]	N	3535		
Load ratings guide system C_0/C_{dyn}	N	24200 / 14200		
Max. torque Mx_{dynmax}[5]	Nm	24		
Max. initialising driving torque M_{max}[5]	Nm	2.20	2.80	4.90
No-load torque 0-stroke axis (without carriage) [6]	Nm	0.40		
Moment of inertia 0-stroke axis (without carriage)	$kgcm^2$	1.05		
Moment of inertia per m stroke	$kgcm^2/m$	0.35	0.45	0.50
Moment of inertia per kg payload	$kgcm^2/kg$	0.006	0.025	0.065
Moment of inertia of motor attachment	$kgcm^2$	0.3		
Mass 0-stroke axis (without carriage)	kg	1.80		
Mass of stroke per m stroke (incl. ballscrew and profile)	kg/m	6.9		
Mass of motor attachment	kg	0.55		
Repeat accuracy[4]	mm	±0.02		
Internal diameter of clutch	mm	6 ... 20		
External diameter of driveshaft	mm	16 g6		
Profile cross section (W x H)	mm	60 x 60		
Axial planar moment of inertia ly/lz	mm^4	461963 / 598338		
Elasticity module (aluminium)	N/mm^2	0.72×10^5		
Max. ambient temperature	°C	0 ... 50		
Ballscrew				
Ballscrew diameter	mm	16		
Ballscrew accuracy		P7 in accordance with DIN 69051 Part 3		
Max. ballscrew speed	1/min	3000		
Ballscrew axial play	mm	0.04		

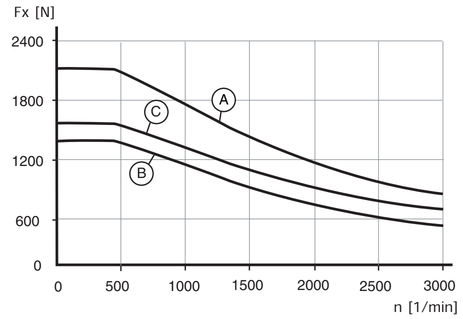
Carriage		**Type 1**			**Type 4**		
Ballscrew pitch		**5**	**10**	**16**	**5**	**10**	**16**
Max. torque of carriage My_{dynmax}[5]	Nm	265			585		
Max. torque of carriage Mz_{dynmax}[5]	Nm	265			585		
No-load torque of carriage[6]	Nm	0.01	0.02	0.04	0.01	0.02	0.04
Moment of inertia of carriage with/without strip redirection (incl. ballscrew component)	$kgcm^2$	0.15 / 0,10	0.20 / 0.15	0.25 / 0.20	0.25 / 0,20	0.30 / 0.25	0.35 / 0.30
Mass of carriage with/without stripstrip redirection (incl. ballscrew and profile component)	kg	3.7 / 3,0			5.4 / 4.7		
Moving mass of carriage with/without strip redirection	kg	1.4 / 1.3			1.9 / 1.8		
Max. stroke length with/without cover stripstrip [7]	mm	1785 / 1880			1605 / 1700		

1) Greater stroke length on request
2) Carriage-dependent
3) Guaranteed lubrication of guide and drive elements, shorter stroke length on request
4) Load and stroke-dependent
5) The maximum permissible dynamic forces and torques decrease with increasing speed, see characteristic curves on the next page
6) Measured at 0.1 m/s
7) Stroke greater than 1500 mm with reduced ballscrew speed is available on request

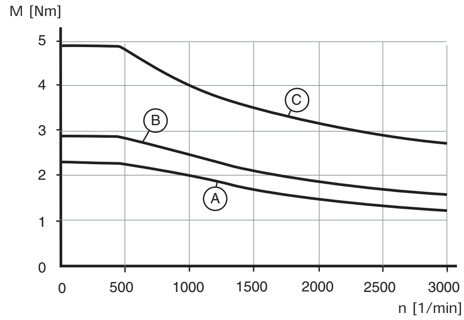
Note: The listed torques and forces are based on an operational life of 15000 km.

Characteristic curves

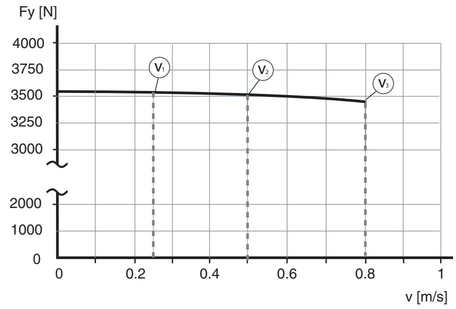
Max. feed force Fx



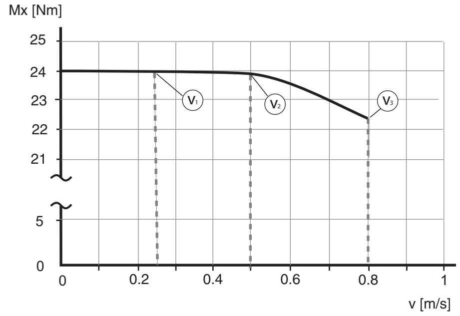
Max. driving torque M_{max}



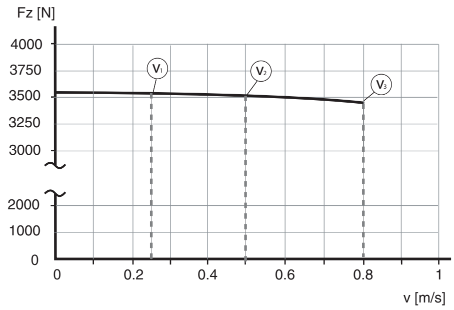
Max. force Fy_{dynmax}



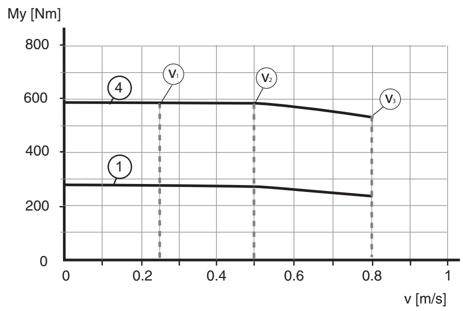
Max. torque Mx_{dynmax}



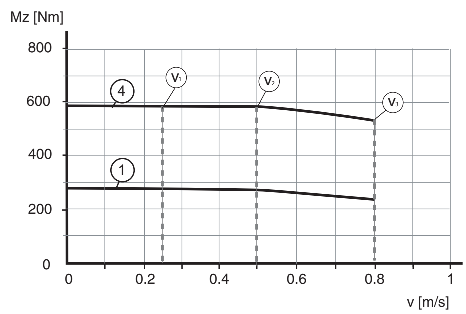
Max. force Fz_{dynmax}



Max. torque My_{dynmax}

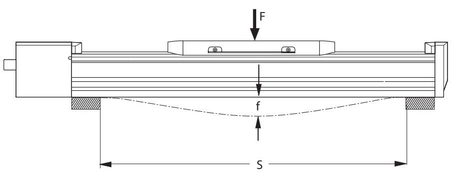


Max. torque Mz_{dynmax}



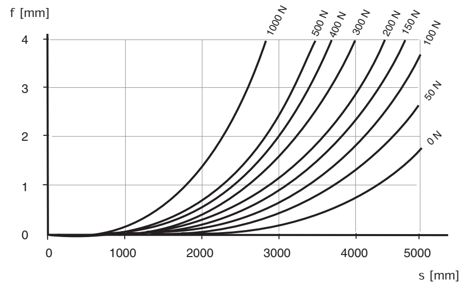
(1)	Carriage type 1
(4)	Carriage type 4
(A)	Ballscrew pitch 5 mm
(B)	Ballscrew pitch 10 mm
(C)	Ballscrew pitch 16 mm

(v_1)	Max. speed for ballscrew pitch 5 mm
(v_2)	Max. speed for ballscrew pitch 10 mm
(v_3)	Max. speed for ballscrew pitch 16 mm



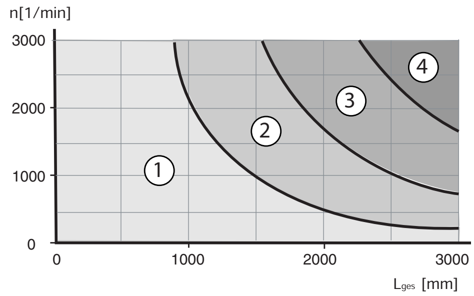
Deflection

In order to limit deflection of the linear axis with long strokes, the axis must have additional support.
The diagram below shows the deflection f (mm) of the linear axis with respect to the support distance S (mm) and the acting force F (N). The maximum deflection of f = 4 mm should not be exceeded. Excessive deflection reduces the service life of the linear axis.



Ballscrew critical speed

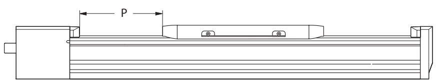
Up to two optional, sliding ballscrew supports can be integrated in PAS ballscrew axes. This allows for high ballscrew speeds even with large strokes.
The diagram shows the permissible working strokes with respect to the total axis length and the ballscrew speed with and without sliding ballscrew supports.

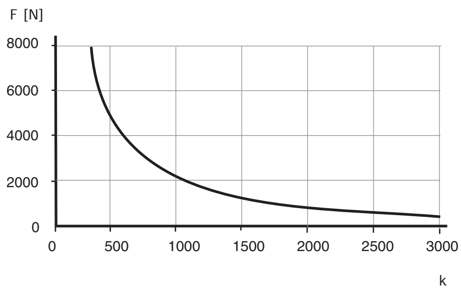


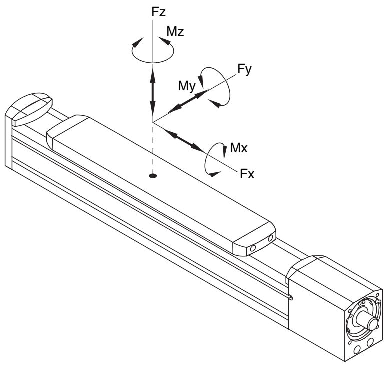
(1) without ballscrew support
(2) one ballscrew support
(3) two ballscrew supports
(4) working stroke not permissible

Buckling load

Another limiting factor to be considered in ballscrew axis applications is the buckling load of the ballscrew to pressure loads.
The diagram shows the permissible buckling load F (N) with respect to the carriage position P (mm).







Calculations

Calculation of service life

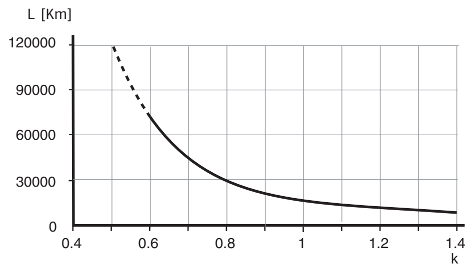
The service life of the linear axes is a function of the mean forces and torques that act in the system. If multiple forces and torques act simultaneously, use the following formula to calculate the load factor k.

$$\frac{Fy}{Fy_{dynmax}} + \frac{Fz}{Fz_{dynmax}} + \frac{Mx}{Mx_{dynmax}} + \frac{My}{My_{dynmax}} + \frac{Mz}{Mz_{dynmax}} = k = Loadfactor$$

The service life of the axis (in km) can be approximated using the load factor and the service life - load characteristic curve.

Please note that the maximum permissible dynamic forces and torques (in the denominator) decrease with increasing speed. Refer to the characteristic curves on the previous page.
The application-specific load values appear in the numerator.

Service life load curve PAS••SB (ball guide)



No-load torque of ballscrew axis [Nm]

	No-load torque 0-stroke axis (without carriage)		0.40
+	No-load torque per carriage x number of carriages		
=	**No-load torque of ballscrew axis**		

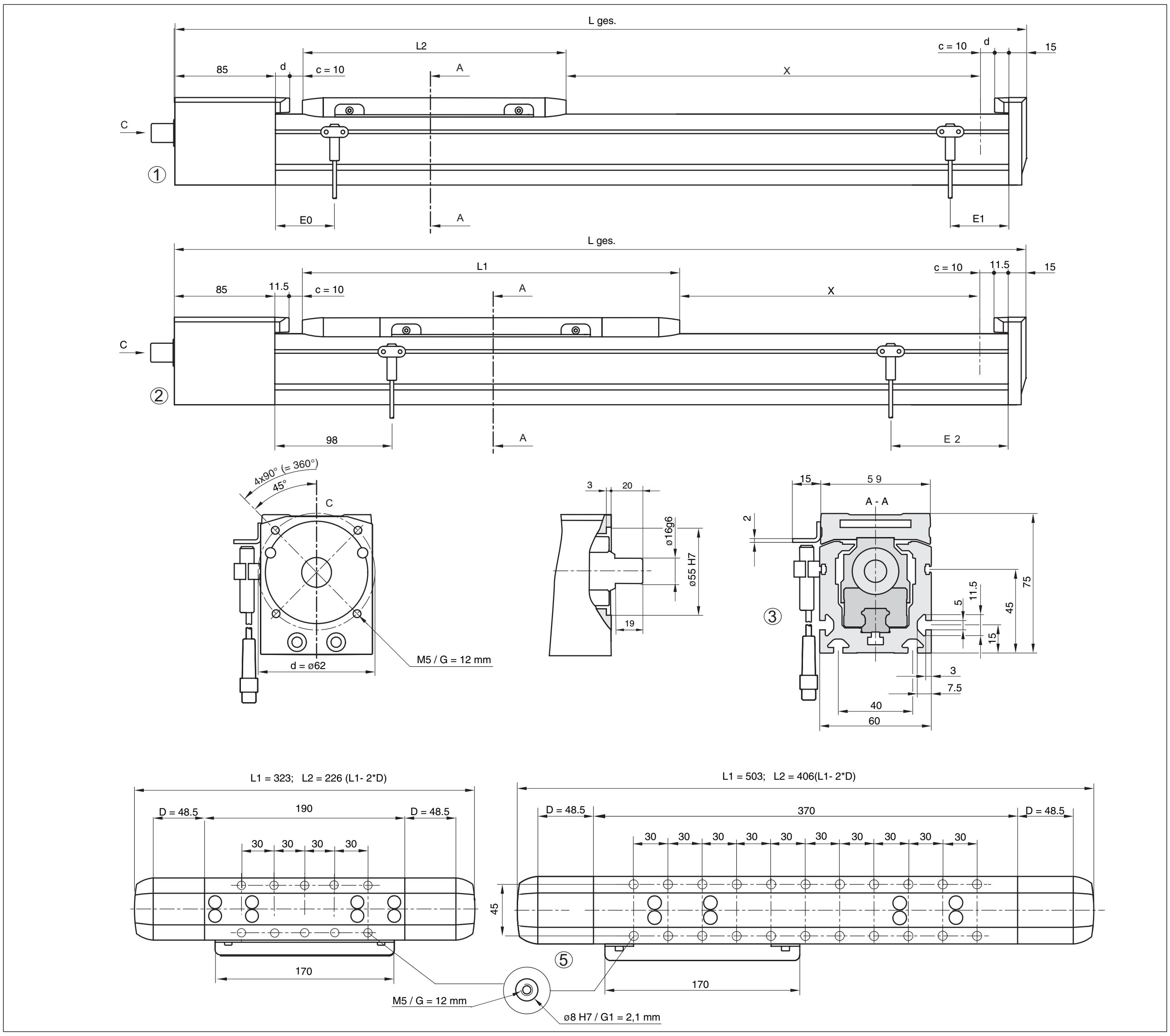
Total moment of inertia of ballscrew axis without drive [$kgcm^2$]

	Moment of inertia of 0-stroke axis		1.05
+	Moment of inertia m stroke x m stroke		
+	Moment of inertia per kg payload x kg payload		
+	Moment of inertia motor attachment		0.3
+	Moment of inertia per carriage with/without cover strip x number of carriages		
=	**Total moment of inertia of ballscrew axis without drive**		

Total mass of ballscrew axis [kg]

	Mass of 0-stroke axis		1.80
+	Mass per m stroke x m stroke	(6.90 kg/m)	
+	Mass motor attachment		0.55
+	Mass per carriage (with/without strip diverter) x number of carriages		
+	Mass of motor/gearing (see motor catalogue)		
+	Mass of payload		
=	**Total mass of ballscrew axis**		

Dimensional drawings

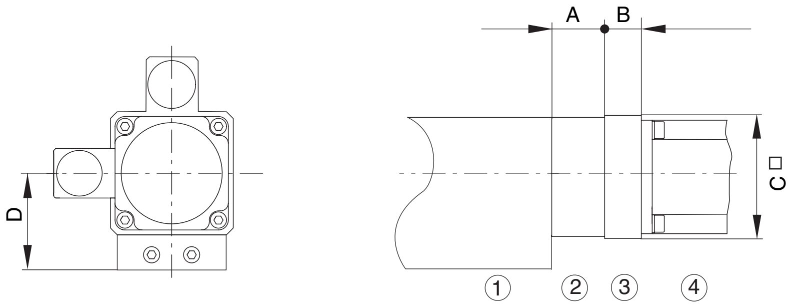


Dimensional drawing PAS 42S

(1) Axis without cover strip	Lges	Without cover strip	without ballscrew support = 143 + L2 + X (add L2 + m for each additional carriage)		
(2) Axis with cover strip			one ballscrew support = 173 + L2 + X (add L2 + m for each additional carriage)		
(3) Cross section			two ballscrew supports = 203 + L2 + X (add L2 + m for each additional carriage)		
(4) Carriage type 1		With cover strip	0,1,2 ballscrew supports =143 + L1 + X (add L1 + m for each additional carriage)		
(5) Carriage type 4	L1	Carriage length with cover strip			
	L2	Carriage length without cover strip			
	X	Working stroke			
	m [1]	Minimum distance between two carriages:		without cover strip 35 mm	with cover strip 90 mm
	C	Limit switch safety distance to mechanical stop. CAUTION: Depending on the payload, the acceleration and the positioning velocity, a greater distance is required. This is obtained by moving the limit switch position. The total axis length changes by this value.			
	D	Cover strip turning block			
	d		without cover strip 11.5 mm	one ballscrew support 26.5 mm	two ballscrew supports 41.5 mm
	E0	Carriage type 1/4:	without ballscrew support 50 mm	one ballscrew support 65 mm	two ballscrew supports 80 mm
	E1	Carriage type 1: Carriage type 4:	without ballscrew support 50 mm without ballscrew support 230 mm	one ballscrew support 65.0 mm one ballscrew support 245.0 mm	two ballscrew supports 80 mm two ballscrew supports 260 mm
(G) Thread depth (G1) Countersink depth	E2	Carriage type 1: Carriage type 4:	support-independent 98 mm support-independent 278 mm		

[1] Maximum of two carriages of the same type on request

Motor attachment dimensions



(1) Axial section
(2) Coupling
(3) Motor adapter plate
(4) Motor or gearing

Note: The motor adapter plate or the motor may protrude over the axial section and may act as an obstruction if elements are above the carriage.

Drive type	Size	Shaft diameter	Length			
			A	B	C	D
		mm	mm	mm	mm	mm
VRDM stepper motors	VRDM 366	8	36	19	62	44
	VRDM 368					
	VRDM 397	12		26	85	
	VRDM 3910					
	VRDM 3913	14				
	VRDM 31117	19		38	110	
	VRDM 31122					
Intelligent compact drives IclA IDS/IFS with stepper motor	I•S 62	6.35		19	62	
	I•S 63	8				
	I•S 91	12		26	85	
	I•S 92					
	I•S 93	14				
Intelligent compact drives IclA IFE with brushless DC motors (with gearing)	IFE71 V-018	10		21	76/66	
	IFE71 V-038					
	IFE71 V-054					
	IFE71 V-115					
SER servomotors	SER 3610	9		19	62	
	SER 397	14		26	85	
	SER 3910					
	SER 3913					
	SER 3916					
RIG servomotorsI =4:1	RIG 397	20		38		
	RIG 3910					
	RIG 3913					
BSH servomotors	BSH 0701	11		19	62	
	BSH 0702					
	BSH 0703	14				
	BSH 1001	19		38	110	
	BSH 1002					
	BSH 1003					
Planetary gears, single-stage (Neugart)	PLE 40 / WPLE 40	10		29.5	62	
	PLE 60 / WPLE 60	14		30.5		
	PLS 70	19		29	70	

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

For dimensional drawings of the motors and drives see the catalogues below.

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

PAS43S

Technical Data

Ballscrew pitch	**mm**	**5**	**10**	**20**
Type designation		PAS43SB		
Guide type		Ball guide SHS 20		
Typical payload	kg	60		
Max. stroke length [1,2]	mm	3000		
Min. stroke length [3]	mm	11		
Max. speed [4]	m/s	0.25	0.50	1.00
Max. acceleration[4]	m/s^2	10		
Max. drive force Fx [5]	N	2360	2360	1895
Max. force Fy_{dynmax} [5]	N	5550		
Max. force Fz_{dynmax} [5]	N	5550		
Load ratings guide system C_0/C_{dyn}	N	38400 / 22300		
Max. torque Mx_{dynmax} [5]	Nm	52		
Max. initialising driving torque M_{max} [5]	Nm	2.7	4.6	7.3
No-load torque 0-stroke axis (without carriage) [6]	Nm	0.60		
Moment of inertia 0-stroke axis (without carriage)	$kgcm^2$	2.30		
Moment of inertia per m stroke	$kgcm^2/m$	0.95	1.10	1.15
Moment of inertia per kg payload	$kgcm^2/kg$	0.006	0.025	0.101
Moment of inertia of motor attachment	$kgcm^2$	1.15		
Mass 0-stroke axis (without carriage)	kg	3.35		
Mass of stroke per m stroke (incl. ballscrew and profile)	kg/m	11.7		
Mass of motor attachment	kg	1.10		
Repeat accuracy[4]	mm	±0.02		
Internal diameter of clutch	mm	9 ... 30		
External diameter of driveshaft	mm	20 g6		
Profile cross section (W x H)	mm	80 x 80		
Axial planar moment of inertia ly/lz	mm^4	1480068 / 1851166		
Elasticity module (aluminium)	N/mm^2	0.72×10^5		
Max. ambient temperature	°C	0 ... 50		
Ballscrew				
Ballscrew diameter	mm	20		
Ballscrew accuracy		P7 in accordance with DIN 69051 Part 3		
Max. ballscrew speed	1/min	3000		
Ballscrew axial play	mm	0.04		

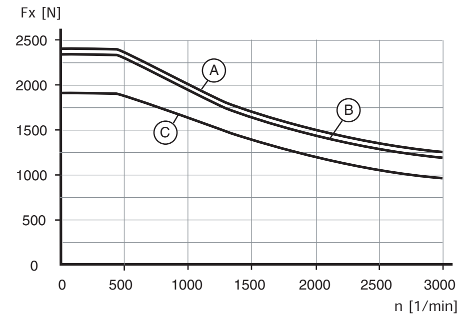
Carriage		**Type 1**			**Type 4**		
Ballscrew pitch		**5**	**10**	**20**	**5**	**10**	**20**
Max. torque of carriage My_{dynmax} [5]	Nm	485			1070		
Max. torque of carriage Mz_{dynmax} [5]	Nm	485			1070		
No-load torque of carriage[6]	Nm	0.01	0.05	0.10	0.01	0.05	0.10
Moment of inertia of carriage with/without strip redirection (incl. ballscrew component)	$kgcm^2$	0.50 / 0.35	0.5 / 0.40	0.75 / 0.55	0.7 / 0.6	0.8 / 0.65	1.10 / 0.90
Mass of carriage with/without strip redirection (incl. ballscrew and profile component)	kg	7.5 / 6.1			11 / 10		
Moving mass of carriage with/without strip redirection	kg	3 / 2.6			3.75 / 3.50		
Max. total stroke with/without cover strip [7]	mm	3070 / 3190			2860 / 2980		

1) Greater stroke length on request
2) Carriage-dependent
3) Guaranteed lubrication of guide and drive elements, shorter stroke length on request
4) Load and stroke-dependent
5) The maximum permissible dynamic forces and torques decrease with increasing speed, see characteristic curves on the next page
6) Measured at 0.1 m/s
7) Stroke greater than 3000 mm with reduced ballscrew speed is available on request

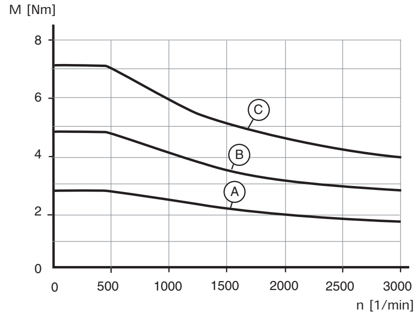
Note: The listed torques and forces are based on an operational life of 15000 km.

Characteristic curves

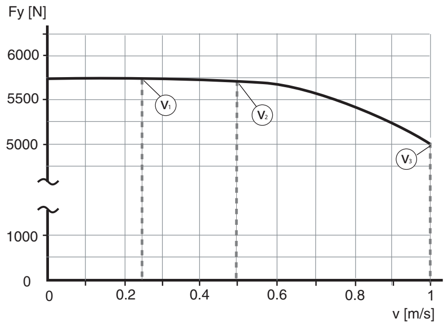
Max. feed force Fx



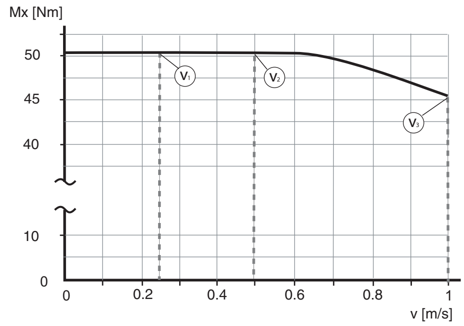
Max. driving torque M_{max}



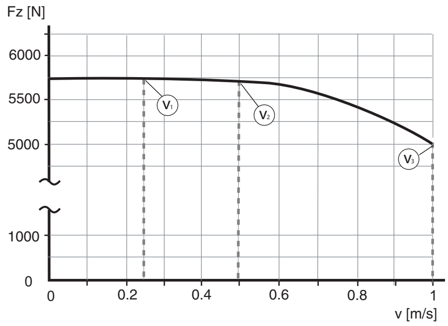
Max. force Fy_{dynmax}



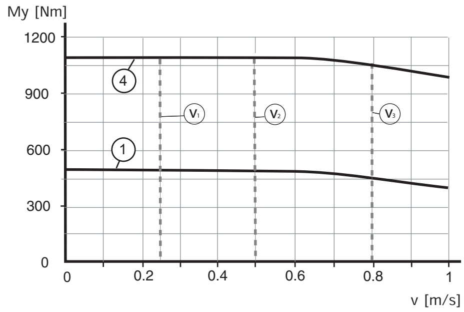
Max. torque Mx_{dynmax}



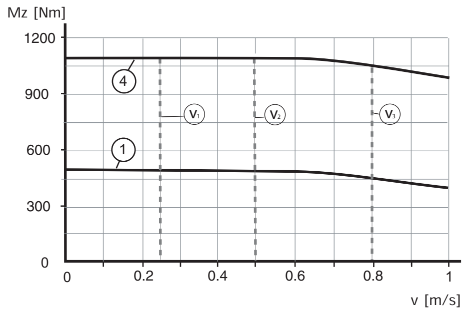
Max. force Fz_{dynmax}



Max. torque My_{dynmax}



Max. torque Mz_{dynmax}

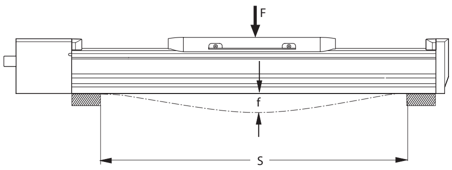


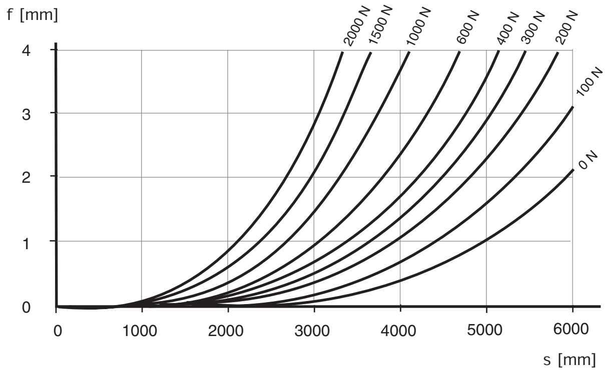
(1) Carriage type 1
(4) Carriage type 4
(A) Ballscrew pitch 5 mm
(B) Ballscrew pitch 10 mm
(C) Ballscrew pitch 20 mm

(v_1) Max. speed for ballscrew pitch 5 mm
(v_2) Max. speed for ballscrew pitch 10 mm
(v_3) Max. speed for ballscrew pitch 20 mm

Deflection

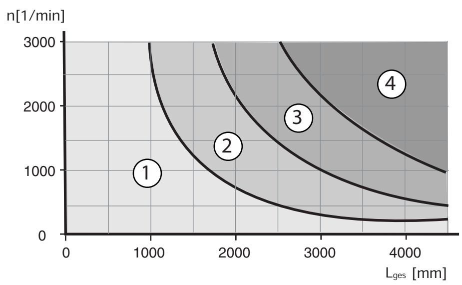
In order to limit deflection of the linear axis with long strokes, the axis must have additional support.
The diagram below shows the deflection f (mm) of the linear axis with respect to the support distance S (mm) and the acting force F (N). The maximum deflection of f = 4 mm should not be exceeded. Excessive deflection reduces the service life of the linear axis.





Ballscrew critical speed

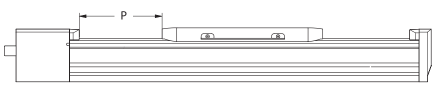
Up to two optional, sliding ballscrew supports can be integrated in PAS ballscrew axes. This allows for high ballscrew speeds even with large strokes.
The diagram shows the permissible work strokes with respect to the total axis length and the ballscrew speed with and without sliding ballscrew supports.

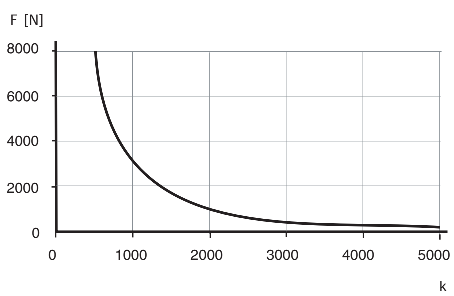


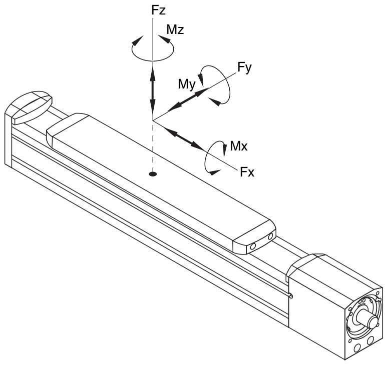
(1) without ballscrew support
(2) one ballscrew support
(3) two ballscrew supports
(4) working stroke not permissible

Buckling load

Another limiting factor to be considered in ballscrew axis applications is the Buckling load of the ballscrew to pressure loads.
The diagram shows the permissible buckling load F (N) with respect to the carriage position P (mm).







Calculations

Calculation of service life

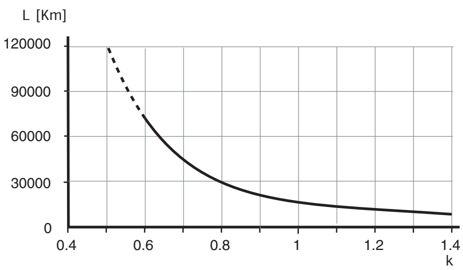
The service life of the linear axes is a function of the mean forces and torques that act in the system. If multiple forces and torques act simultaneously, use the following formula to calculate the load factor k.

$$\frac{Fy}{Fy_{dynmax}} + \frac{Fz}{Fz_{dynmax}} + \frac{Mx}{Mx_{dynmax}} + \frac{My}{My_{dynmax}} + \frac{Mz}{Mz_{dynmax}} = k = Loadfactor$$

The service life of the axis (in km) can be approximated using the load factor and the service life - load characteristic curve.

Please note that the maximum permissible dynamic forces and torques (in the denominator) decrease with increasing speed. Refer to the characteristic curves on the previous page.
The application-specific load values appear in the numerator.

Service life load curve PAS••SB (ball guide)



No-load torque of ballscrew axis [Nm]

	No-load torque 0-stroke axis (without carriage)	0.60
+	No-load torque per carriage x number of carriages	
=	**No-load torque of ballscrew axis**	

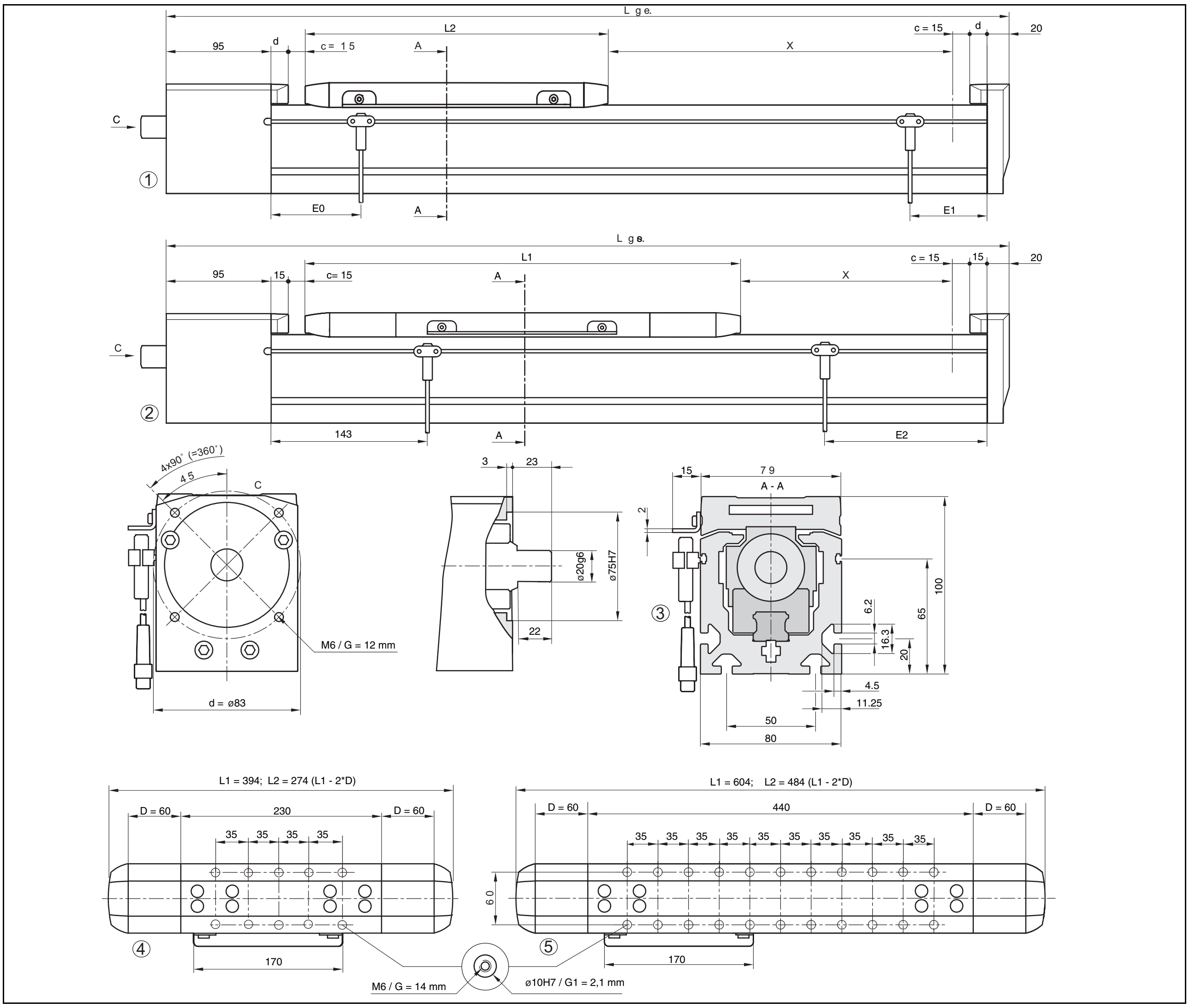
Total moment of inertia of ballscrew axis without drive [kgcm^2]

	Moment of inertia of 0-stroke axis (without carriage)	2.30
+	Moment of inertia m stroke x m stroke	
+	Moment of inertia per kg payload x kg payload	
+	Moment of inertia motor attachment	1.15
+	Moment of inertia per carriage (with/without strip diversion) x number of carriages	
=	**Total moment of inertia of ballscrew axis without drive**	

Total mass of ballscrew axis [kg]

	Mass of 0-stroke axis		3.35
+	Mass per m stroke x m stroke	(11.7 kg/m)	
+	Mass motor attachment		1.10
+	Mass per carriage (with/without strip diversion) x number of carriages		
+	Mass of motor/gearing (see motor catalogue)		
+	Mass of payload		
=	**Total mass of ballscrew axis**		

Dimensional drawings

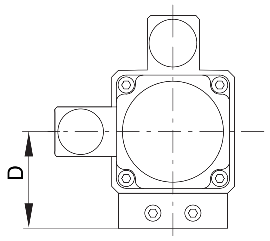


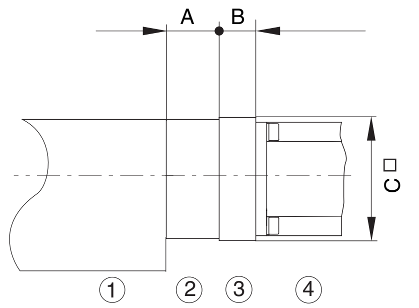
Dimensional drawing PAS 43 S

(1) Axis without cover strip	Lges	Without cover strip	without ballscrew support	= 175 + L2 + X (add L2 + m for each additional carriage)
(2) Axis with cover strip			one ballscrew support	= 205 + L2 + X (add L2 + m for each additional carriage)
(3) Cross section			two ballscrew supports	= 245 + L2 + X (add L2 + m for each additional carriage)
(4) Carriage type 1		With cover strip	0, 1, 2 two ballscrew supports	= 175 + L1 + X (add L1 + m for each additional carriage)
(5) Carriage type 4	L1	Carriage length with cover strip		
	L2	Carriage length without cover strip		
	X	Working stroke		
	m [1]	Minimum distance between two carriages:	without cover strip 35 mm	with cover strip 90 mm
	C	Limit switch safety distance to mechanical stop. CAUTION: Depending on the payload, the acceleration and the positioning velocity, a greater distance is required. This is obtained by moving the limit switch position. The total axis length changes by this value.		
	D	Cover strip turning block		
	d		without ballscrew support 15 mm	one ballscrew support 35 mm; two ballscrew supports 55 mm
	E0	Carriage type 1/4:	without ballscrew support 83 mm	one ballscrew support 103 mm; two ballscrew supports 123 mm
	E1	Carriage type 1:	without ballscrew support 83 mm	one ballscrew support 103 mm; two ballscrew supports 123 mm
		Carriage type 4:	without ballscrew support 293 mm	one ballscrew support 313 mm; two ballscrew supports 330 mm
(G) Thread depth	E2	Carriage type 1:	support-independent 143 mm	
(G1) Countersink depth		Carriage type 4:	support-independent 353 mm	

[1] Maximum of two carriages of the same type on request

Motor attachment dimensions





(1) Axial section
(2) Coupling
(3) Motor adapter plate
(4) Motor or gearing

Note: Depending on C, the motor adapter plate or the motor may protrude over the axial section and may act as an obstruction if elements are above the carriage.

Drive type	Size	Shaft diameter	Length			
			A	B	C	D
		mm	mm	mm	mm	mm
VRDM stepper motors	VRDM 397	12	42.5	21	85	60
	VRDM 3910					
	VRDM 3913	14				
	VRDM 31117	19		26	110	
	VRDM 31122					
Intelligent compact drives IclA IDS/IFS with stepper motor	I•S 91	12		21	85	
	I•S 92					
	I•S 93	14				
SER servomotors	SER 397					
	SER 3910					
	SER 3913					
	SER 3916					
	SER 31112	19		26	110	
	SER 31117					
	SER 31122					
	SER 31127					
RIG servomotors I = 4:1	RIG 397	20		31	85	
	RIG 3910					
	RIG 3913					
BSH servomotors	BSH 1001	19		26	110	
	BSH 1002					
	BSH 1003					
	BSH 1004	24		40		
Planetary gears, single-stage (Neugart)	PLE 60 / WPLE 60	14		30.5	85	
	PLE 80 / WPLE 80	20		33		
	PLS 70	19		21		
	PLS 90	22		31		

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

For dimensional drawings of the motors and drives see the catalogues below.

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

PAS44S

Technical Data

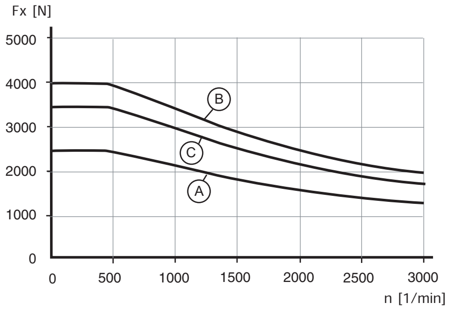
Ballscrew pitch	**mm**	**5**			**10**		**25**
Type designation		PAS44SB					
Guide type		Ball guide SHS 25					
Typical payload	kg	100					
Max. stroke length [1) 2)]	mm	3000					
Min. stroke length [3)]	mm	13					
Max. speed [4)]	m/s	0.25			0.50		1.25
Max. acceleration	m/s^2	10					
Max. drive force Fx [5)]	N	2565			3950		3560
Max. force Fy_{dynmax} [5)]	N	7890					
Max. force Fz_{dynmax} [5)]	N	7890					
Load ratings guide system C_0/C_{dyn}	N	52400 / 31700					
Max. torque Mx_{dynmax} [5)]	Nm	85					
Max. initialising driving torque M_{max}	Nm	3.1			7.8		16.5
No-load torque 0-stroke axis (without carriage) [6)]	Nm	0.80					
Moment of inertia 0-stroke axis (without carriage)	$kgcm^2$	5.65					
Moment of inertia per m stroke	$kgcm^2/m$	2.00			2.30		2.40
Moment of inertia per kg payload	$kgcm^2/kg$	0.006			0.025		0.158
Moment of inertia of motor attachment	$kgcm^2$	2.44					
Mass 0-stroke axis (without carriage)	kg	7.40					
Mass of stroke per m stroke (incl. ballscrew and profile)	kg/m	19					
Mass of motor attachment	kg	2.50					
Repeat accuracy[4)]	mm	±0.02					
Internal diameter of clutch	mm	12 ... 25					
External diameter of driveshaft	mm	25 g6					
Profile cross section (W x H)	mm	110 x 110					
Axial planar moment of inertia ly/lz	mm^4	5024548 / 6354771					
Elasticity module (aluminium)	N/mm^2	0.72×10^5					
Max. ambient temperature	°C	0 ... 50					
Ballscrew							
Ballscrew diameter	mm	24					
Ballscrew accuracy		P7 in accordance with DIN 69051 Part 3					
Max. ballscrew speed	1/min	3000					
Ballscrew axial play	mm	0.04					
Carriage-dependent values		**Type 1**			**Type 4**		
Ballscrew pitch		**5**	**10**	**25**	**5**	**10**	**25**
Max. torque of carriage My_{dynmax} [5)]	Nm	820			1885		
Max. torque of carriage Mz_{dynmax} [5)]	Nm	820			1885		
No-load torque of carriage[6)]	Nm	0.03	0.06	0.14	0.03	0.06	0.14
Moment of inertia of carriage with/without strip redirection (incl. ballscrew component)	$kgcm^2$	1.2 / 0.8	1.2 / 0.9	2.1 / 1.6	1.9 / 1.5	2 / 1.6	2 / 2.5
Mass of carriage with/without strip redirection (incl. ballscrew and profile component)	kg	15 / 12			22 / 19		
Moving mass of carriage with/without strip redirection	kg	5.7 / 5,0			7.8 / 7,0		
Max. total stroke with/without cover strip [7)]	mm	2950 / 3110			2680 / 2840		

1) Greater stroke length on request
2) Carriage-dependent
3) Guaranteed lubrication of guide and drive elements, shorter stroke length on request
4) Load and stroke-dependent
5) The maximum permissible dynamic forces and torques decrease with increasing speed, see characteristic curves on the next page
6) Measured at 0.1 m/s
7) Stroke greater than 3000 mm with reduced ballscrew speed is available on request

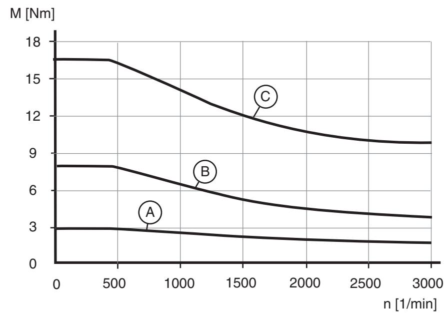
Note: The listed torques and forces are based on an operational life of 15000 km.

Characteristic curves

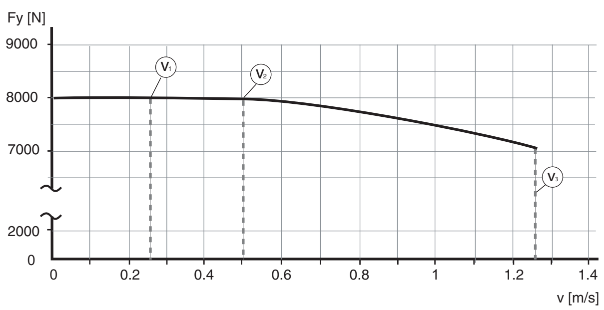
Max. feed force Fx



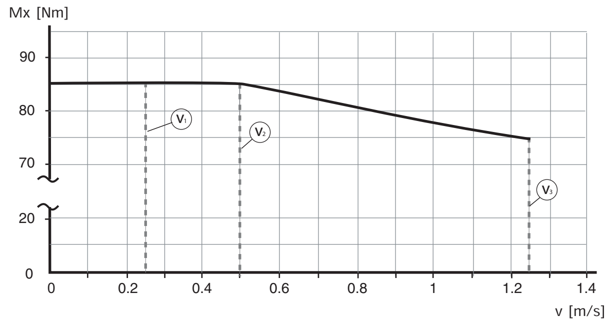
Max. driving torque M_{max}



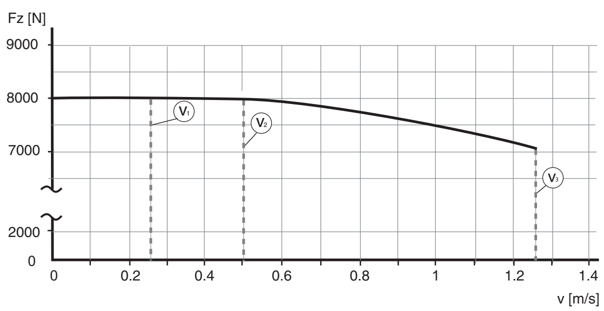
Max. force Fy_{dynmax}



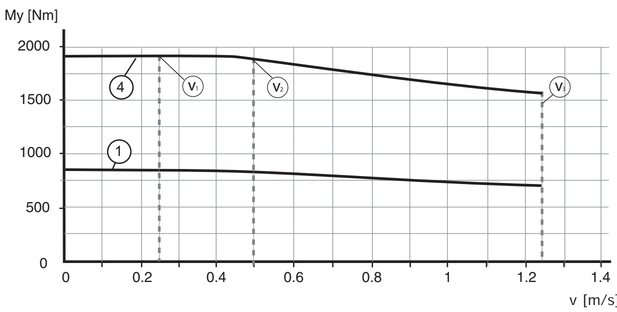
Max. torque Mx_{dynmax}



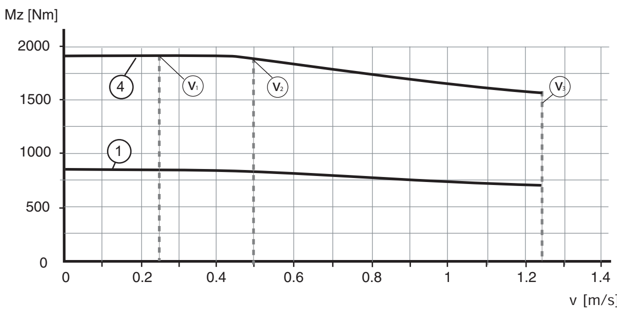
Max. force Fz_{dynmax}



Max. torque My_{dynmax}



Max. torque Mz_{dynmax}

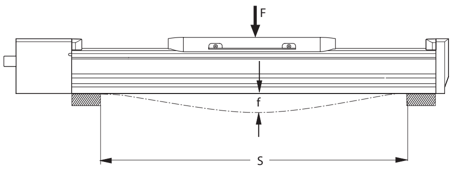


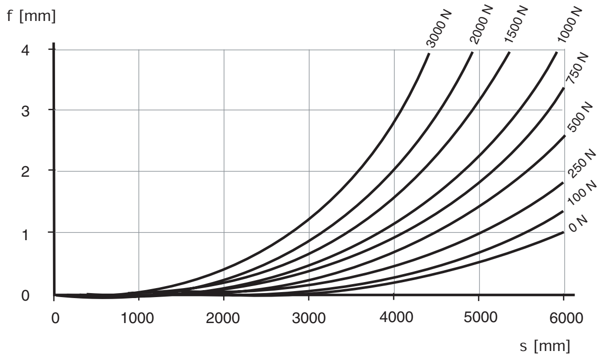
(1) Carriage type 1
(4) Carriage type 4
(A) Ballscrew pitch 5 mm
(B) Ballscrew pitch 10 mm
(C) Ballscrew pitch 25 mm

(v_1) Max. speed for ballscrew pitch 5 mm
(v_2) Max. speed for ballscrew pitch 10 mm
(v_3) Max. speed for ballscrew pitch 25 mm

Deflection

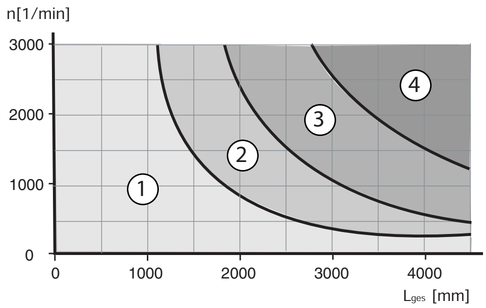
In order to limit deflection of the linear axis with long strokes, the axis must have additional support.
The diagram below shows the deflection f (mm) of the linear axis with respect to the support distance S (mm) and the acting force F (N). The maximum deflection of f = 4 mm should not be exceeded. Excessive deflection reduces the service life of the linear axis.





Ballscrew critical speed

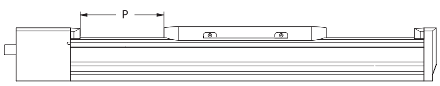
Up to two optional, sliding ballscrew supports can be integrated in PAS ballscrew axes. This allows for high ballscrew speeds even with large strokes.
The diagram shows the permissible working strokes with respect to the total axis length and the ballscrew speed with and without sliding ballscrew supports.

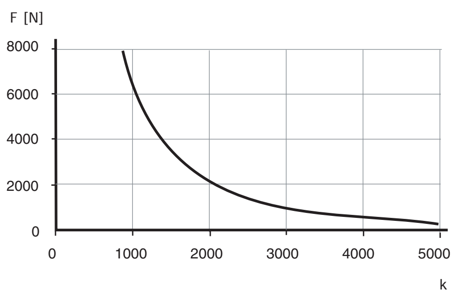


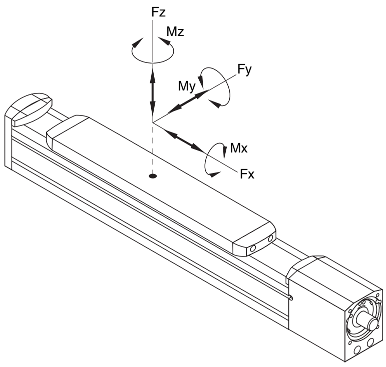
(1) without ballscrew support
(2) one ballscrew support
(3) two ballscrew supports
(4) working stroke not permissible

Buckling load

Another limiting factor to be considered in ballscrew axis applications is the buckling load of the ballscrew to pressure loads.
The diagram shows the permissible buckling load F (N) with respect to the carriage position P (mm).







Calculations

Calculation of service life

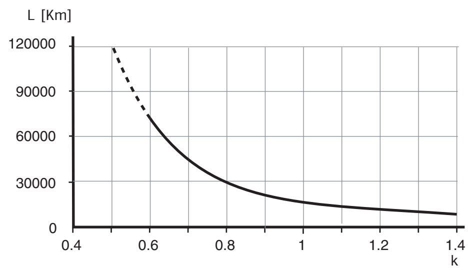
The service life of the linear axes is a function of the mean forces and torques that act in the system. If multiple forces and torques act simultaneously, use the following formula to calculate the load factor k.

$$\frac{Fy}{Fy_{dynmax}} + \frac{Fz}{Fz_{dynmax}} + \frac{Mx}{Mx_{dynmax}} + \frac{My}{My_{dynmax}} + \frac{Mz}{Mz_{dynmax}} = k = Loadfactor$$

The service life of the axis (in km) can be approximated using the load factor and the service life - load characteristic curve.

Please note that the maximum permissible dynamic forces and torques (in the denominator) decrease with increasing speed. Refer to the characteristic curves on the previous page.
The application-specific load values appear in the numerator.

Service life load curve PAS••SB (ball guide)



No-load torque of ballscrew axis [Nm]

	No-load torque 0-stroke axis (without carriage)	0.80
+	No-load torque per carriage x number of carriages	
=	**No-load torque of ballscrew axis**	

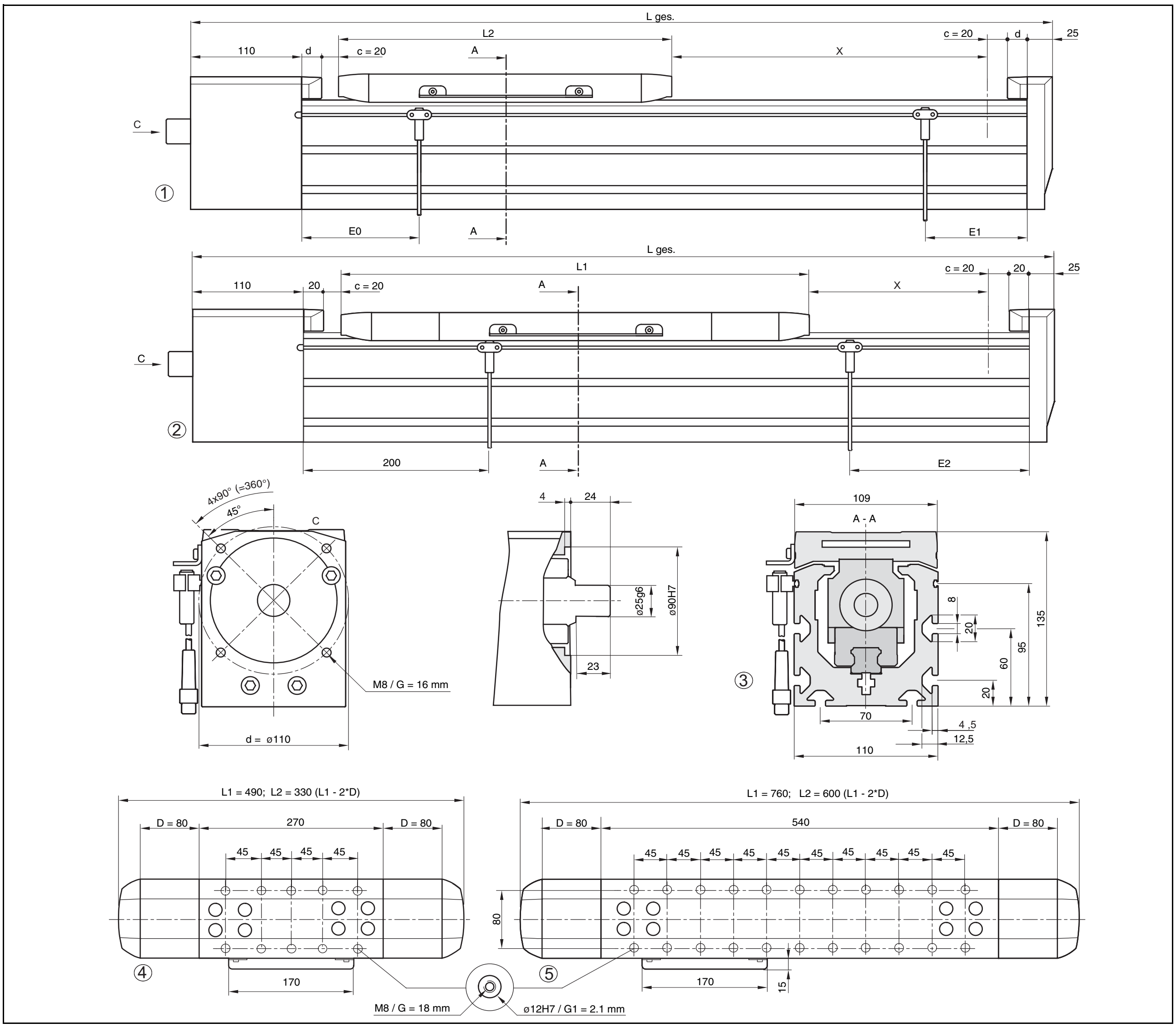
Total moment of inertia of ballscrew axis without drive [kgcm2]

	Moment of inertia of 0-stroke axis (without carriage)	5.65
+	Moment of inertia m stroke x m stroke	
+	Moment of inertia per kg payload x kg payload	
+	Moment of inertia motor attachment	2.44
+	Moment of inertia per carriage (with/without strip diversion x) number of carriages	
=	**Total moment of inertia of ballscrew axis without drive**	

Total mass of ballscrew axis [kg]

	Mass of 0-stroke axis	7.40
+	Mass per m stroke x m stroke (19 kg/m)	
+	Mass motor attachment	2.50
+	Mass per carriage (with/without strip diversion) x number of carriages	
+	Mass of motor/gearing (see motor catalogue)	
+	Mass of payload	
=	**Total mass of ballscrew axis**	

Dimensional drawings

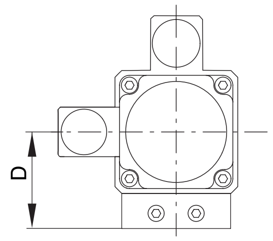


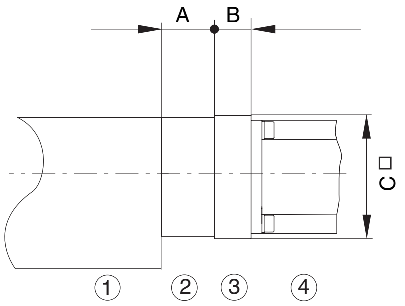
Dimensional drawing PAS44S

(1) Axis without cover strip	Lges	Without cover strip	without ballscrew support	= 215 + L2 + X (add L2 + m for each additional carriage)	
(2) Axis with cover strip			one ballscrew support	= 265 + L2 + X (add L2 + m for each additional carriage)	
(3) Cross section			two ballscrew supports	= 315 + L2 + X (add L2 + m for each additional carriage)	
(4) Carriage type 1		With cover strip	0, 1, 2 two ballscrew supports	= 215 + L1 + X (add L1 + m for each additional carriage)	
(5) Carriage type 4	L1	Carriage length with cover strip			
	L2	Carriage length without cover strip			
	X	Working stroke			
	m [1]	Minimum distance between two carriages:		without cover strip 35 mm	with cover strip 90 mm
	C	Limit switch safety distance to mechanical stop. CAUTION: Depending on the payload, the acceleration and the positioning velocity, a greater distance is required. This is obtained by moving the limit switch position. The total axis length changes by this value.			
	D	Cover strip turning block			
	d		without ballscrew support 20 mm	one ballscrew support 45 mm	two ballscrew supports 70 mm
	E0	Carriage type 1/4:	without ballscrew support 120 mm	one ballscrew support 145 mm	two ballscrew supports 170 mm
	E1	Carriage type 1: Carriage type 4:	without ballscrew support 120 mm without ballscrew support 390 mm	one ballscrew support 145 mm one ballscrew support 415 mm	two ballscrew supports 170 mm two ballscrew supports 440 mm
(G) Thread depth (G1) Countersink depth	E2	Carriage type 1: Carriage type 4:	support-independent 200 mm support-independent 470 mm		

[1] Maximum of two carriages of the same type on request

Motor attachment dimensions





(1) Axial section
(2) Coupling
(3) Motor adapter plate
(4) Motor or gearing

Note: Depending on C, the motor adapter plate or the motor may protrude over the axial section and may act as an obstruction if elements are above the carriage.

Drive type	Size	Shaft diameter	Length A	Length B	Length C	Length D
		mm	mm	mm	mm	mm
VRDM stepper motors	VRDM 397	12	46	24	110	78.5
	VRDM 3910					
	VRDM 3913	14				
	VRDM 31117	19				
	VRDM 31122					
Intelligent compact drives	I•S 91	12				
IclA IDS/IFS with stepper motor	I•S 92					
	I•S 93	14				
SER servomotors	SER 3913			24		
	SER 3916					
	SER 31112	19		32		
	SER 31117					
	SER 31122					
	SER 31127					
RIG servomotors I = 4:1	RIG 397	20		24		
	RIG 3910					
	RIG 3913					
	RIG 31112	25		32		
	RIG 31117					
	RIG 31122					
BSH servomotors	BSH 1001	19				
	BSH 1002					
	BSH 1003					
	BSH 1004	24				
Planetary gears, single-stage (Neugart)	PLE 60 / WPLE 60	14		33.5		
	PLE 80 / WPLE 80	20		36		
	PLS 70	19		28		
	PLS 90	22		24		

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

For dimensional drawings of the motors and drives see the catalogues below.

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

Type code

Example (continued next page):	PAS	4	2	S	B	D	1200	C	1	B	A	xxx	S	N	/	I6
Product PAS = portal axis	**PAS**	4	2	S	B	D	1200	C	1	B	A	xxx	S	N	/	I6
Product family 4 = basic line	PAS	**4**	2	S	B	D	1200	C	1	B	A	xxx	S	N	/	I6
Size (cross-section of section) 2 = 60; (60 x 60 mm) 3 = 80; (80 x 80 mm) 4 = 110; (110 x 110 mm)	PAS	4	**2**	S	B	D	1200	C	1	B	A	xxx	S	N	/	I6
Carriage drive element S = ballscrew A = support axis (without ballscrew, guide element only)	PAS	4	2	**S**	B	D	1200	C	1	B	A	xxx	S	N	/	I6
Type of guide B = Ball guide	PAS	4	2	S	**B**	D	1200	C	1	B	A	xxx	S	N	/	I6
Feed per revolution B = 5 mm (sizes 60, 80 and 110) D = 10 mm (sizes 60, 80 and 110) F = 16 mm (size 60) G = 20 mm (size 80) H = 25 mm (size 110) N = support axis	PAS	4	2	S	B	**D**	1200	C	1	B	A	xxx	S	N	/	I6
Stroke length XXXX = in mm	PAS	4	2	S	B	D	**1200**	C	1	B	A	xxx	S	N	/	I6
Limit switch [1)] A = 2 x PNP sensors as normally closed contacts, not wired [1)] B = 2 x PNP sensors as normally closed contacts, plugged into IclA C = 2 x PNP sensors as normally open contacts, not wired [1)] D = 2 x PNP sensors as normally open contacts, plugged into IclA E = 2 x NPN sensors as normally closed contacts, not wired [1)] F = 2 x NPN sensors as normally closed contacts, plugged into IclA G = 2 x NPN sensors as normally open contacts, not wired [1)] H = 2 x NPN sensors as normally open contacts, plugged into IclA N = no sensors	PAS	4	2	S	B	D	1200	**C**	1	B	A	xxx	S	N	/	I6
Carriage 1 = type 1 4 = type 4	PAS	4	2	S	B	D	1200	C	**1**	B	A	xxx	S	N	/	I6
Options [2)] B = with cover strip / without ballscrew support N = without cover strip / without ballscrew support C = with cover strip / one ballscrew support D = without cover strip / one ballscrew support E = with cover strip / two ballscrew supports F = without cover strip / two ballscrew supports	PAS	4	2	S	B	D	1200	C	1	**B**	A	xxx	S	N	/	I6
Number of carriages [3)] A = one B = two (on request) C = three (on request)	PAS	4	2	S	B	D	1200	C	1	B	**A**	xxx	S	N	/	I6
Distance between carriages [4)] 1 .. 999 = distance in mm xxx = with only one carriage	PAS	4	2	S	B	D	1200	C	1	B	A	**xxx**	S	N	/	I6
Axis drive interface S = with motor or motor adapter attachment D = with shaft journal	PAS	4	2	S	B	D	1200	C	1	B	A	xxx	**S**	N	/	I6
Toothed-belt drive gear N = without toothed-belt drive gear	PAS	4	2	S	B	D	1200	C	1	B	A	xxx	S	**N**	/	I6

1) With 100 mm cable with plug wired at one end, additional versions as accessories,extension cable as accessories

2) See dimensional drawings and the dependence on "total axis length"

3) Only carriages of the same type are possible. The carriage closest to the motor is driven.

4) Minimum distance between two carriages: see dimensional drawings

Example (continued from previous page):	PAS	4	2	S	B	D	1200	C	1	B	A	xxx	S	N	/	I6
Motor/gearing interface [1)] V6 = stepper motors VRDM 364 / VRDM 366 V8 = stepper motors VRDM 368 V9 = stepper motors VRDM 397 / VRDM 3910 V0 = stepper motors VRDM 3913 V1 = stepper motors VRDM 311• I6 = IclA IFS/IDS 61 / IFS/IDS 62 with stepper motor I7 = IclA IFS/IDS 63 with stepper motor I9 = IFS/IDS 91 / IFS/IDS 92 with stepper motor I8 = IclA IFS/IDS 93 with stepper motor S6 = servomotors SER 36• S9 = servomotors SER 39• S1 = servomotors SER 311• A6 = IclA IFA 6• with servomotor G9 = servomotors RIG 39• G1 = servomotors RIG 311•• H5 = servomotors BSH 055• H7 = servomotors BSH 0701 / BSH 0702 H8 = servomotors BSH 0703 H1 = servomotors BSH 1001 / BSH 1002 / BSH 1003 H4 = servomotors BSH 1004 XX = third-party motor / third-party gearing without attachment by Berger Lahr (drawing required) XY = third-party motor / third-party gearing with attachment by Berger Lahr (drawing required; provide motor/gearing)	PAS	4	2	S	B	D	1200	C	1	N	B	xxx	S	N	/	**I6**

1) Attachment of motor coupling assembly and motor adapter plate:
In case of selection V6 to XX, the corresponding motor coupling with coupling housing as well as the motor plate without motor are attached to the axis.
Motor attachment:
If the axis is to be delivered with attached motor, specify the complete motor identification (see type codes in the motor catalogues) instead of the motor/gearing interface or select XY.

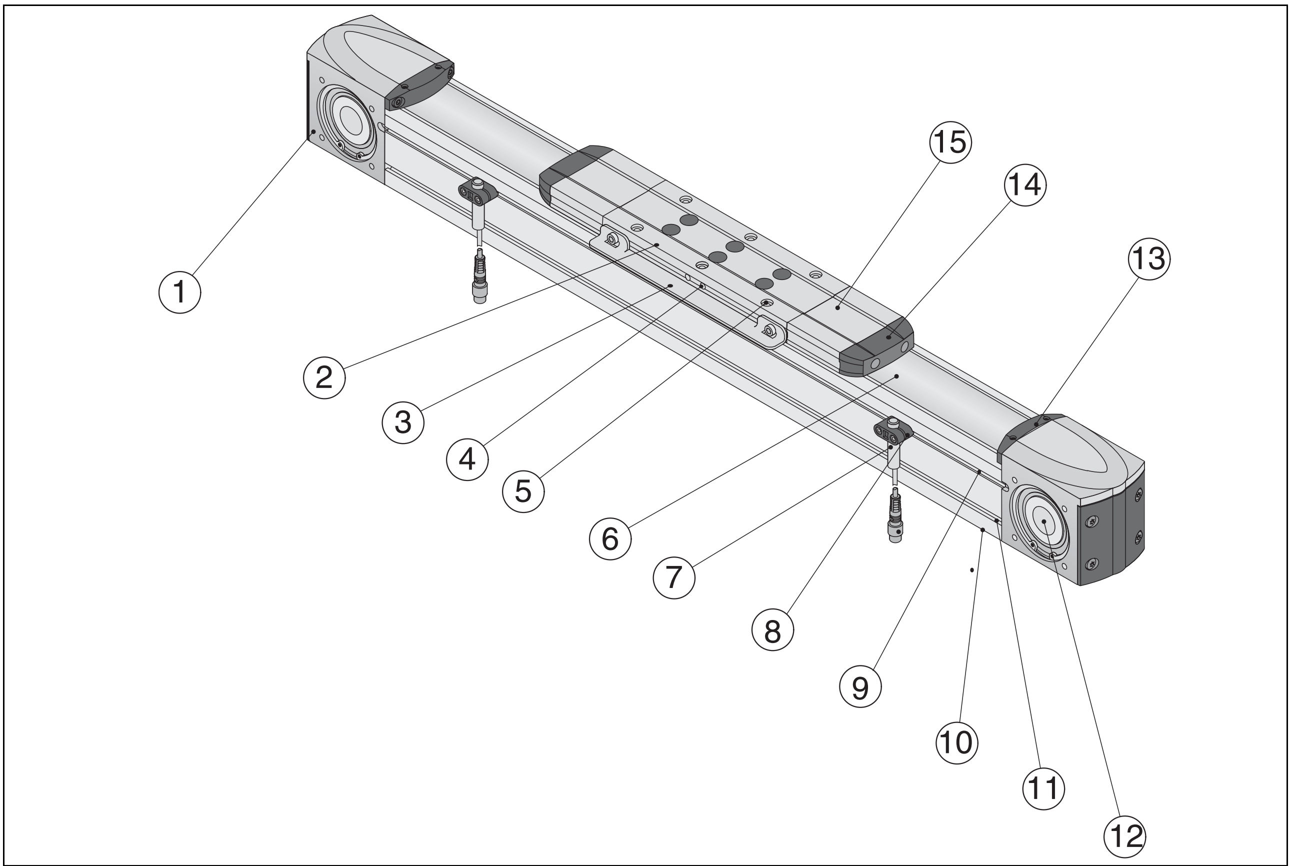
The type codes for the motors are in the following catalogues.

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

Toothed-belt axes

Product Description

Structure



Components of a toothed-belt axis

(1) End block
(2) Carriage
(3) Sensor damper plate
(4) Lubrication nipple
(5) Threaded holes for mounting the load
(6) Metal cover strip
(7) Sensor with connector cable
(8) Sensor retainer
(9) T-slot for fastening the sensor retainer
(10) Axis body
(11) T-slot fastening
(12) Hollow shaft for motor coupling or shaft journal
(13) Metal cover strip fastening
(14) Buffer
(15) Coverstrip deflector

Introduction

The new toothed-belt portal axes are available with roller guides and ball guides for positioning heavy loads. Toothed-belt axes are characterised by long strokes, high dynamic response and high positioning speed. The toothed-belt axes can be fitted with up to three carriages for moving large loads and higher torques. A support axis running parallel can also be used.

Special features and options

- High positioning speed
- High dynamic response
- Large stroke lengths
  – User-friendly structure:
  – Easy system integration with section technology (ITEM-compatible T-section slots)
  – Carriage with holes and locating dowels for easy support of the load
  – Lubrication at lubrication nipples on both carriage sides
  – Easy motor attachment with quick-coupling system
  – Stroke length available to millimetre accuracy
  – Sensors can be moved anywhere in T-section slots
- Many options:
  – Roller or ball guidance
  – Corrosion-resistant
  – Cover strip
  – Sensors in various designs
  – Carriage (type, number, distance)
  – Antistatic toothed belts

Property-related application examples

- Positioning over long distances, e.g. pick&place applications
- Positioning of parts, vision and measurement systems with high speed

Product offer

Size		**1**	**2**		**3**		**4**
Type designation		**PAS41BR**	**PAS42BR**	**PAS42BB**	**PAS43BR**	**PAS43BB**	**PAS44BB**
Type of guide		Roller	Roller	Ball guide	Roller	Ball guide	Ball guide
Typical payload [1]	kg	6	12	24	30	60	100
Max. feed force	N	300	800	800	1100	1100	2600
Max. speed	m/s	8	8	5	8	5	5
Max. acceleration	m/s^2	20	20	20	20	20	20
Max. stroke length	mm	3000	5500	5500	5500	5500	5500
Repeat accuracy	mm	±0.05	±0.05	±0.05	±0.05	±0.05	±0.05
Section cross-section	mm x mm	40 x 40	60 x 60	60 x 60	80 x 80	80 x 80	110 x 110

[1] The typical payload is the load for which the axis is normally used. This payload may be considerably exceeded if the corresponding prerequisites are given or considered. Refer to the influence of the forces and torques on the service life of the axis in km in the section Technical data, Calculations, Calculation of service life.

Motors and gearings

We offer complete solutions from our comprehensive range of products including: axis, motor, drive amplifier and motion controller.
Depending on the requirements for forces, torques and dynamic response for the application, the toothed-belt axes are fitted with Berger Lahr three-phase stepper motors, AC servomotors or compact drives. Other motors are also available as specified by the customer.

A selection of motors and drives recommended by Berger Lahr is listed below:

Recommended motors and drives			**Toothed-belt axis**			
Type	**Size**	**Max. torque (Nm)**	**PAS41B**	**PAS42B**	**PAS43B**	**PAS44B**
VRDM three-phase stepper motors	VRDM 366	0.9	x			
	VRDM 368	1.5	x			
	VRDM 397	2	x	x		
	VRDM 3910	4	x	x	x	
	VRDM 3913	6	x	x	x	
	VRDM 31117	12		x	x	x
	VRDM 31122	16.5		x	x	x
IclA IFS/IDS intelligent compact drives with stepper motors	I•S 62	0.9	x			
	I•S 63	1.5	x			
	I•S 91	2	x	x		
	I•S 92	4	x	x	x	
	I•S 93	6	x	x	x	
IclA IFE intelligent compact drives with brushless DC motors and spur wheel gear	IFE V-018	3.5	x	x		
	IFE V-038	6	x	x		
	IFE V-054	10	x	x		
	IFE V-115	14	x	x		
SER servomotors	SER 368	3	x			
	SER 3610	3.6	x			
	SER 397	4	x			
	SER 3910	8	x	x		
	SER 3913	11.5	x	x		
	SER 3916	14.5	x	x		
	SER 31112	16.8		x	x	
	SER 31117	25		x	x	
	SER 31122	38		x	x	
	SER 31127	48		x		
RIG servomotors with integrated gearing I = 4:1	RIG 397	15.5		x	x	x
	RIG 3910	22		x	x	x
	RIG 3913	22		x	x	x
	RIG 31112	70			x	x
	RIG 31117	76			x	x
	RIG 31122	76			x	x
BSH servomotors	BSH 0701	3.5	x			
	BSH 0702	7.6	x			
	BSH 0703	12.3	x			
	BSH 1001	9.6		x		
	BSH 1002	18.3		x		
	BSH 1003	28.3		x		
	BSH 1004	40.5				
Planetary gears, single-stage (Neugart)	PLE 40 / WPLE 40	5	x	x		
	PLE 60 / WPLE 60	15	x	x	x	
	PLE 80 / WPLE 80	50		x	x	x
	PLE 120 / WPLE 120	120			x	x
	PLS 70	110		x	x	x
	PLS 90	220			x	x

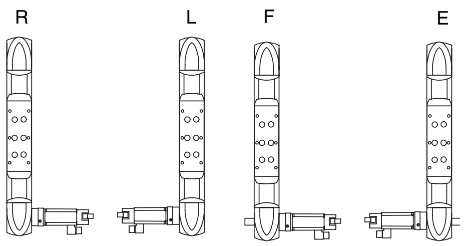
Recommended motors and gearings							
Type	**Size**	**PLE 40 / WPLE 40**	**PLE 60 / WPLE 60**	**PLE 80 / WPLE 80**	**PLE 120 / WPLE 120**	**PLE 70**	**PLE 90**
VRDM three-phase stepper motors	VRDM 366	x	x			x	
	VRDM 368	x	x			x	
	VRDM 397			x			x
	VRDM 3910			x			x
	VRDM 3913			x			x
	VRDM 31117			x	x		x
	VRDM 31122			x	x		x
Intelligent compact drives IclA IFS/IDS with stepper motors	I•S 62	x	x			x	
	I•S 63	x	x			x	
	I•S 91			x			x
	I•S 92			x			x
	I•S 93			x			x
SER servomotors	SER 3610	x	x	x		x	
	SER 397	x	x	x		x	x
	SER 3910		x	x		x	x
	SER 3913		x	x		x	x
	SER 3916		x	x		x	x
	SER 31112			x	x		x
	SER 31117			x	x		x
	SER 31122			x	x		x
	SER 31127			x	x		x
BSH servomotors	BSH 070•		x	x	x		
	BSH 100•			x	x		

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

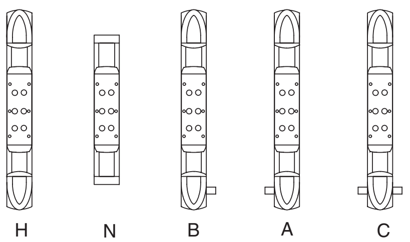
For detailed information on the various motors and drives see the catalogues below:

Catalogue	**Order number**
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

Motor attachment types



(R) Motor right
(L) Motor left
(F) Motor right, shaft journal left
(E) Motor left, shaft journal right



(H) Hollow shaft with bearings at both ends. Prepared for flexible layout of drive and output components
(N) Support axis without drive interface
(B) Shaft journal right
(A) Shaft journal left
(C) Shaft journal left and right

PAS41B

Technical Data

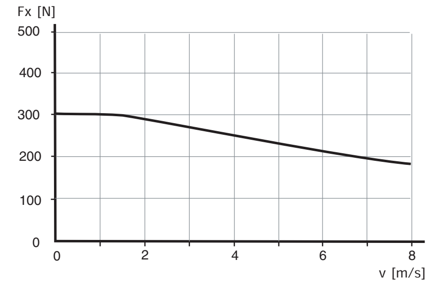
Type designation		PAS41BR	
Guide type		Roller W06	
Typical payload	kg	6	
Max. stroke length 1) 2)	mm	3000	
Min. stroke length 3)	mm	125	
Max. speed 4)	m/s	8	
Max. acceleration4)	m/s^2	20	
Max. drive force Fx 5)	N	300	
Max. force Fy_{dynmax} 5)	N	810	
Max. force Fz_{dynmax} 5)	N	520	
Max. torque Mx_{dynmax} 5)	Nm	6	
Load ratings guide system C_0/C_{dyn}	N	2230 / 3950	
Max. driving torque M_{max} 5)	Nm	4	
No-load torque 0-stroke axis (without carriage) 6)	Nm	0.1	
Moment of inertia 0-stroke axis (without carriage)	$kgcm^2$	0.12	
Moment of inertia per m stroke	$kgcm^2/m$	0.11	
Moment of inertia per kg payload	$kgcm^2/kg$	1.79	
Moment of inertia of motor attachment	$kgcm^2$	0.03	
Moment of inertia of shaft extension	$kgcm^2$	0.002	
Mass of 0-stroke axis (without motor, without carriage)	kg	0.55	
Mass stroke per m stroke	kg/m	2.25	
Mass of motor attachment	kg	0.2	
Mass of shaft extension	kg	0.013	
Repeat accuracy4)	mm	±0.05	
Internal diameter of clutch	mm	4 ... 14	
Profile cross section (W x H)	mm	40 x 40	
Diameter of shaft extension	mm	12 h7	
Axial planar moment of inertia Iy/Iz	mm^4	76647 / 108936	
Elasticity module (aluminium)	N/mm^2	0.72×10^5	
Max. ambient temperature	°C	0 ... +50	
Toothed belt / toothed belt pulley			
Drive constant	mm/rotat.	84	
Toothed belt width/pitch		15 / HTD3	
Effective diameter toothed belt wheel (both sides equal)	mm	26.738	
Width toothed belt wheel	mm	35	
Material density toothed belt wheel	kg/cm^3	0.003	
Moment of inertia toothed belt wheel	$kgcm^2$	0.02	
Carriage		**Type 2**	**Type 4**
Max. torque of carriage My_{dynmax} 5)	Nm	15	35
Max. torque of carriage Mz_{dynmax} 5)	Nm	20	55
No-load torque of carriage6)	Nm	0.05	0.05
Moment of inertia of carriage (with/without strip redirection)	$kgcm^2$	0.95 / 0.80	1.20 / 1.00
Mass of carriage with/without strip turning block (incl. toothed belt and profile section)	kg	1.2 / 1.00	1.50 / 1.30
Moving mass of carriage with/without strip redirection	kg	0.53 / 0.45	0.65 / 0.60
Max. total stroke with/without cover strip	mm	2910 / 3000	2830 / 2920

1) Greater stroke length on request
2) Carriage-dependent
3) Guaranteed lubrication of guide elements, shorter stroke length on request
4) Load and stroke-dependent
5) The maximum permissible dynamic forces and torques decrease with increasing speed, see characteristic curves on the next page
6) Measured at 0.1 m/s

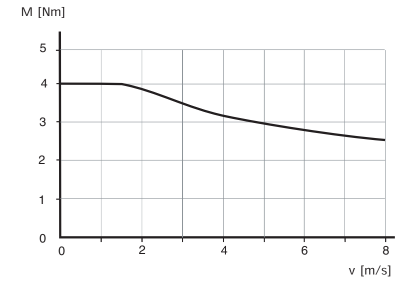
Note: The listed torques and forces refer to a service life of 20000 km.

PAS41BR characteristic curves (Ball guides)

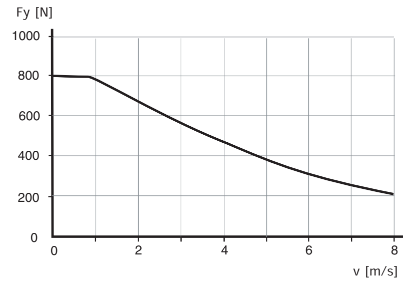
Max. feed force Fx



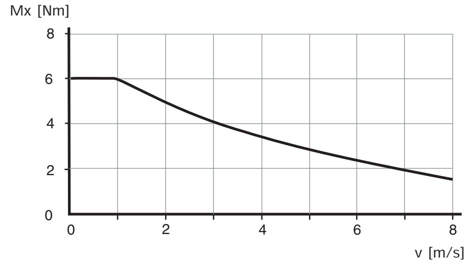
Max. driving torque M_{max}



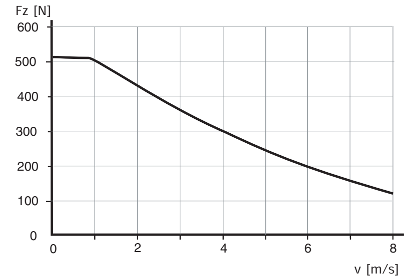
Max. force Fy_{dynmax}



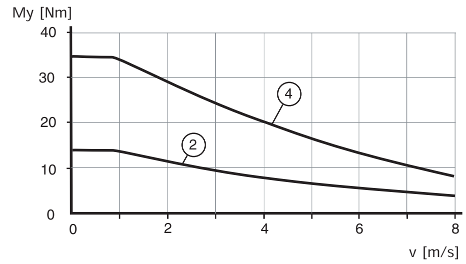
Max. torque of carriage Mx_{dynmax}



Max. force Fz_{dynmax}



Max. torque of carriage My_{dynmax}

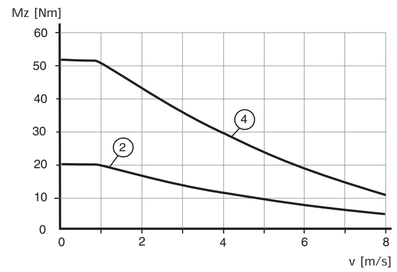


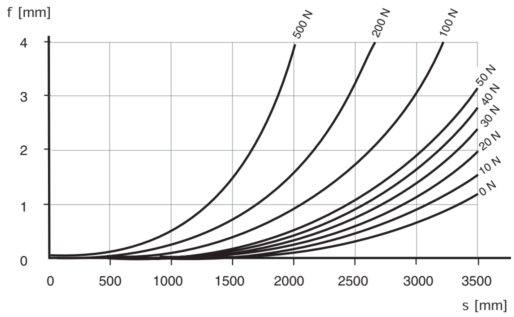
Deflection

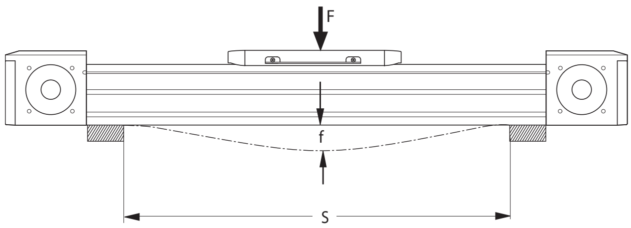
In order to limit deflection of the linear axis in case of long strokes, the axis must have additional support.

The diagram below shows the deflection f (mm) of the linear axis with respect to the support distance S (mm) and the acting force F (N). The maximum deflection of f = 4 mm should not be exceeded. Excessive deflection reduces the service life of the linear axis.

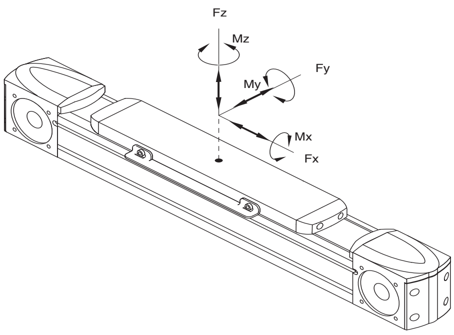
Max. torque of carriage Mz_{dynmax}







(2) Carriage type 2
(4) Carriage type 4



Calculations

Calculation of service life

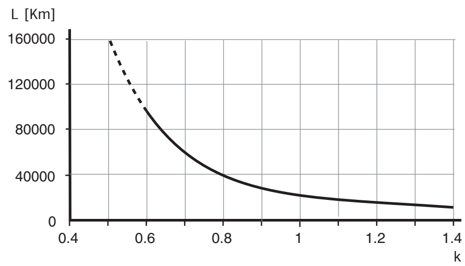
The service life of the linear axes is a function of the mean forces and torques that act in the system. If multiple forces and torques act simultaneously, use the following formula to calculate the load factor k.

$$\frac{Fy}{Fy_{dynmax}} + \frac{Fz}{Fz_{dynmax}} + \frac{Mx}{Mx_{dynmax}} + \frac{My}{My_{dynmax}} + \frac{Mz}{Mz_{dynmax}} = k = Loadfactor$$

The service life of the axis (in km) can be approximated using the load factor and the service life - load characteristic curve.

Please note that the maximum permissible dynamic forces and torques (in the denominator) decrease with increasing speeds. Refer to the characteristic curves on the previous page.
The application-specific load values appear in the numerator.

Service life load curve PAS••BR (roller guides)



No-load torque of toothed belt axis [Nm]

	No-load torque 0-stroke axis (without carriage)		0.1
+	No-load torque per carriage x number of carriages		
=	**No-load torque of toothed belt axis**		

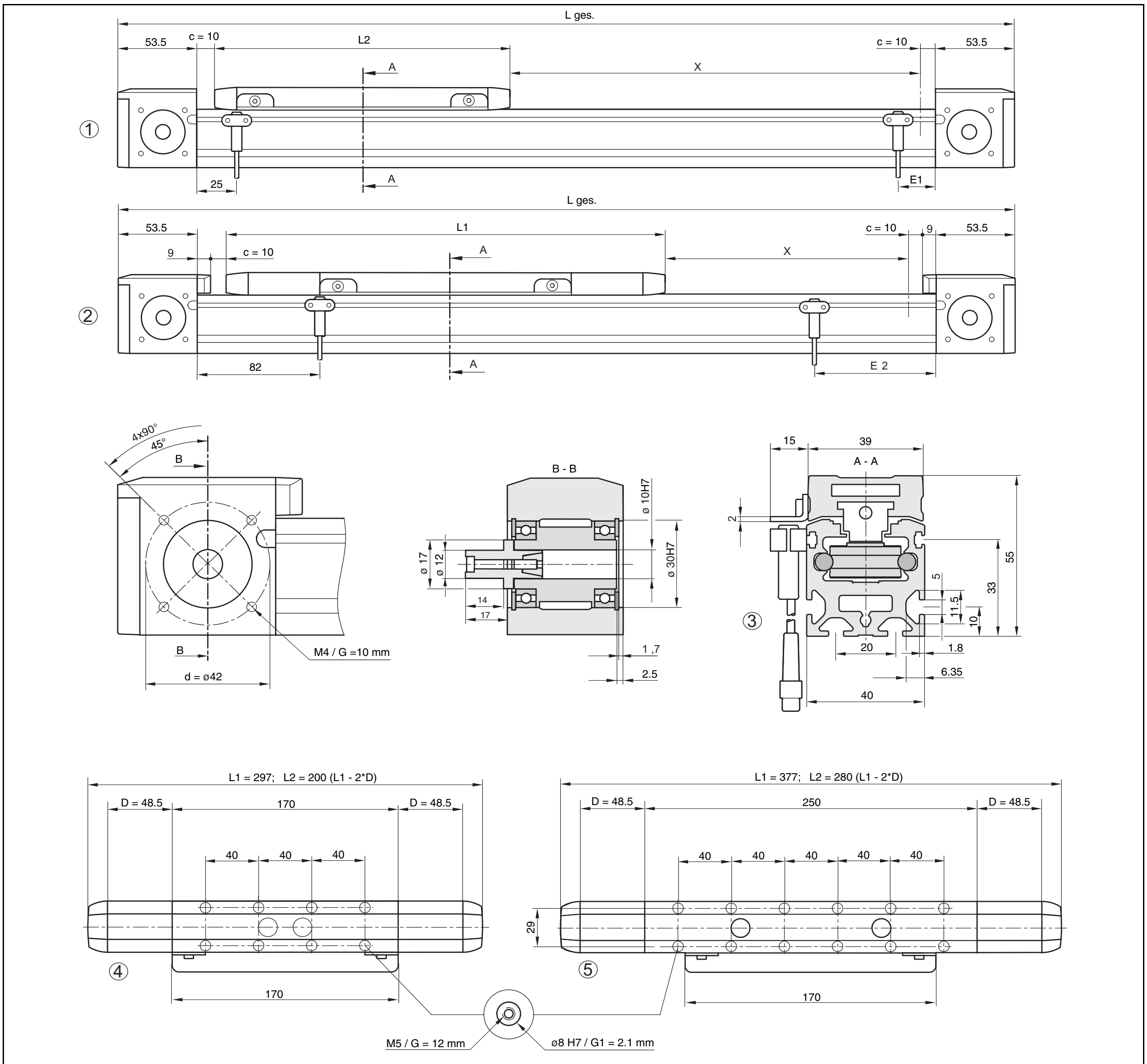
Total moment of inertia of toothed belt axis without drive [kgcm^2]

	Moment of inertia of 0-stroke axis (without carriage)		
+	Moment of inertia per m stroke x m stroke	(0.11) kgcm^2/m)	
+	Moment of inertia per kg payload x kg payload	(1.79 kgcm^2/kg)	
+	Moment of inertia motor attachment		0.03
+	Moment of inertia per carriage (with/without strip diversion) x number of carriages		
=	**Total moment of inertia of toothed belt axis without drive**		

Total mass of toothed belt axis [kg]

	Mass of 0-stroke axis		0.55
+	Mass per m stroke x m stroke	(2.25 kg/m)	
+	Mass motor attachment		0.2
+	Mass shaft journal		0.013
+	Mass per carriage (with/without strip diversion) x number of carriages		
+	Mass of motor/gearing (see motor catalogue)		
+	Mass of payload		
=	**Total mass of toothed belt axis**		

Dimensional drawings



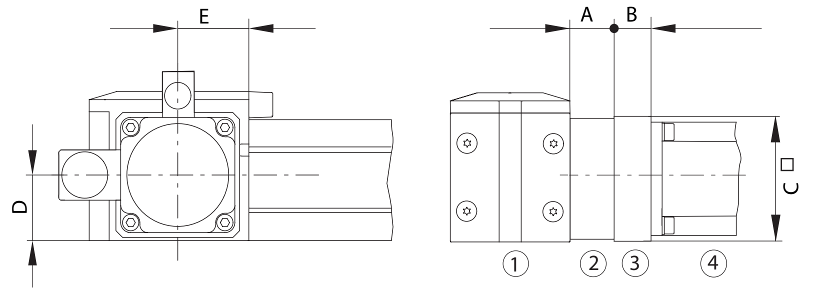
Dimensional drawings PAS41B

(1) = axis without cover strip	Lges	Total length without cover strip = 127 + L2 + X (add L2 + m for each additional carriage)
(2) = axis with cover strip		Total length with cover strip = 145 + L1 + X (add L1 + m for each additional carriage)
(3) = cross section		
(4) = carriage type 2	L1	Carriage length with cover strip
(5) = carriage type 4	L2	Carriage length without cover strip
(B-B) shaft journal as option	X	Working stroke
	m [1]	Minimum distance between two carriages: with cover strip 90 mm, without cover strip 35 mm
	C	Limit switch safety distance to mechanical stop. CAUTION: Depending on the payload, the acceleration and the positioning velocity, a greater distance is required. This is obtained by moving the limit switch position. The total axis length changes by this value.
	D	Cover strip turning block
G = thread depth	E1 [2]	Carriage: type 2 = 25 mm; type 4 = 105 mm
G1 = countertsink depth	E2 [2]	Carriage: type 2 = 82 mm; type 4 = 162 mm

[1] Maximum of two carriages of the same type on request

[2] E1/E2: limit switch position opposite drive side

Motor attachment dimensions



(1) Axial section
(2) Coupling
(3) Motor adapter plate
(4) Motor or gearing

Note: Depending on C, the motor adapter plate or the motor may protrude over the axial section and may act as an obstruction if elements are above the carriage.

Drive type	Size	Shaft diameter	Length				
			A	B	C	D	E
		mm	mm	mm	mm	mm	mm
VRDM stepper motors	VRDM 366	6.35	16	13	60	24.5	23
	VRDM 368	8					
	VRDM 397	12		28.5	85		
	VRDM 3910						
	VRDM 3913	14					
Intelligent compact drives IclA IDS/IFS with stepper motor	I•S 62	6.35		13	60		
	I•S 63	8					
	I•S 91	12		28.5	85		
	I•S 92						
	I•S 93	14					
Intelligent compact drives IclA IFE with brushless DC motors (with gearing)	IFE 71 V-018	10		23.5	77/68		
	IFE 71 V-038						
	IFE 71 V-054						
	IFE 71 V-115						
BSH servomotors	BSH 701	11		22	62		
	BSH 702						
	BSH 703	14		28.5			
SER servomotors	SER 368	9		13			
	SER 3610						
	SER 397	14		28.5	85		
	SER 3910						
	SER 3913						
	SER 3916						
Planetary gears, single-stage (Neugart)	PLE 40	10		23.5	60		
	PLE 60	14		33.5	62		

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

For dimensional drawings of the motors and drives see the catalogues below.

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

PAS42B
Technical Data

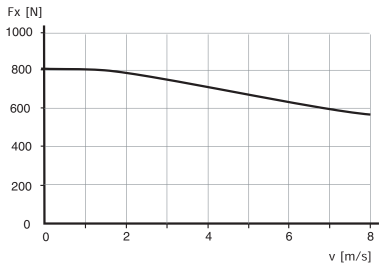
Type designation		PAS42BR		PAS42BB	
Guide type		Roller W06		Ball guide SHS 15	
Typical payload	kg	12		24	
Max. stroke length 1) 2)	mm	5500		5500	
Min. stroke length 3)	mm	130		9	
Max. speed 4)	m/s	8		5	
Max. acceleration 4)	m/s^2	20		20	
Max. drive force Fx 5)	N	800		800	
Max. force Fy_{dynmax} 5)	N	810		2805	
Max. force Fz_{dynmax} 5)	N	520		2805	
Max. torque Mx_{dynmax} 5)	Nm	11		19	
Load ratings guide system C_0/C_{dyn}	N	2230 / 3950		24200 / 14200	
Max. driving torque M_{max} 5)	Nm	20		20	
No-load torque 0-stroke axis (without carriage) 6)	Nm	0.64		0.64	
Moment of inertia 0-stroke axis (without carriage)	$kgcm^2$	1.90		1.90	
Moment of inertia per m stroke	$kgcm^2/m$	1.20		1.20	
Moment of inertia per kg payload	$kgcm^2/kg$	6.10		6.10	
Moment of inertia of motor attachment	$kgcm^2$	0.24		0.24	
Moment of inertia of shaft extension	$kgcm^2$	0.05		0.05	
Mass of 0-stroke axis (without motor, without carriage)	kg	1.70		1.75	
Mass stroke per m stroke	kg/m	4.55		5.60	
Mass of motor attachment	kg	0.50		0.50	
Mass of shaft extension	kg	0.075		0.075	
Repeat accuracy 4)	mm	±0.05		±0.05	
Internal diameter of clutch	mm	6.35 ... 20		6.35 ... 20	
Profile cross section (W x H)	mm	60 x 60		60 x 60	
Diameter of shaft extension	mm	20 h7		20 h7	
Elasticity module (aluminium)	N/mm^2	0.72×10^5		0.72×10^5	
Axial planar moment of inertia Iy/Iz	mm^4	435394 / 651612		435394 / 651612	
Max. ambient temperature	°C	0 ... +50		0 ... +50	
Toothed belt / toothed belt pulley					
Drive constant	mm/rotat.	155		155	
Toothed belt width/pitch		25 / HTD5		25 / HTD5	
Effective diameter toothed belt wheel (both sides equal)	mm	49.338		49.338	
Width toothed belt wheel	mm	52		52	
Material density toothed belt wheel	kg/cm^3	0.003		0.003	
Moment of inertia toothed belt wheel	$kgcm^2$	0.50		0.50	
Carriage		**Type 1**	**Type 4**	**Type 1**	**Type 4**
Max. torque of carriage My_{dynmax} 5)	Nm	23	70	75	365
Max. torque of carriage Mz_{dynmax} 5)	Nm	35	110	75	365
No-load torque of carriage 6)	Nm	0.08	0.08	0.35	0.35
Moment of inertia of carriage (with/without strip redirection)	$kgcm^2$	6.10 / 5.50	10.15 / 9.60	6.90 / 6.30	10.20 / 9.55
Mass of carriage with/without strip redirection (incl. toothed belt and profile component)	kg	2.40 / 1.90	3.90 / 3.40	2.8 / 2.30	4.35 / 3.80
Moving mass of carriage with/without strip redirection	kg	1.0 / 0.9	1.7 / 1.6	1.2 / 1.0	1.7 / 1.6
Max. total stroke with/without cover strip	mm	5380 / 5500	5200 / 5320	5380 / 5500	5200 / 5320

1) Greater stroke length on request
2) Carriage-dependent
3) Guaranteed lubrication of guide elements, shorter stroke length on request
4) Load and stroke-dependent
5) The maximum permissible dynamic forces and torques decrease with increasing speed, see characteristic curves on the next page
6) Measured at 0.1 m/s

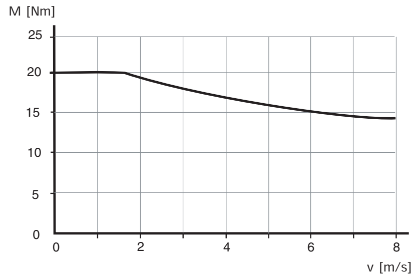
Note: the listed forces and torques refer to a service life of 20000 km with ball guide guides and 30000 km with roller guides

PAS42BR characteristic curves (Ball guides)

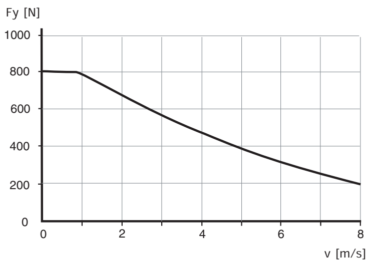
Max. feed force Fx



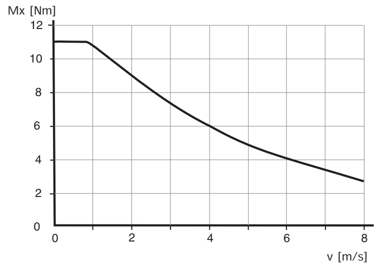
Max. driving torque M_{max}



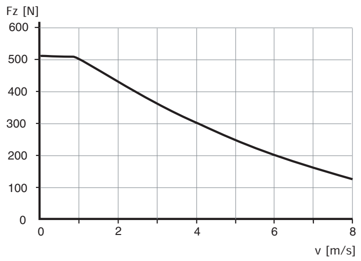
Max. force Fy_{dynmax}



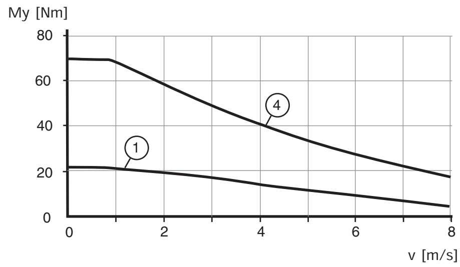
Max. torque of carriage Mx_{dynmax}



Max. force Fz_{dynmax}



Max. torque of carriage My_{dynmax}

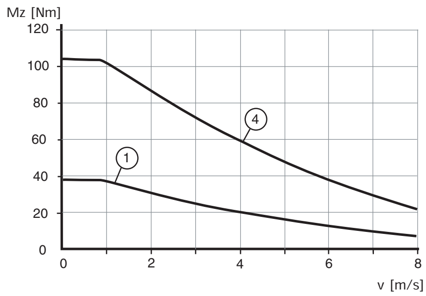


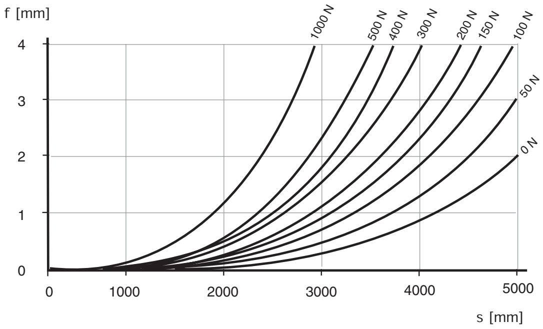
Deflection PAS42BR and PAS42BB

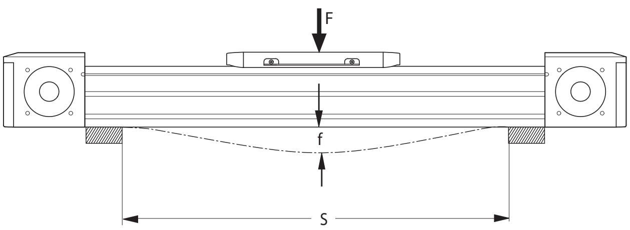
In order to limit the deflection of the linear axis in case of long strokes, the axis must have additional support.

The diagram below shows the deflection f (mm) of the linear axis with respect to the support distance S (mm) and the acting force F (N). The maximum deflection of f = 4 mm should not be exceeded. Excessive deflection reduces the service life of the linear axis.

Max. torque of carriage Mz_{dynmax}



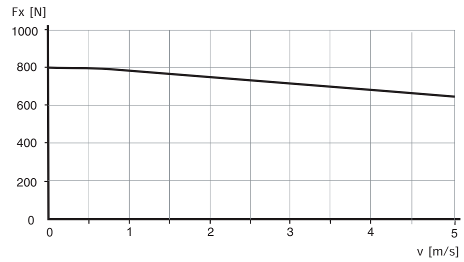




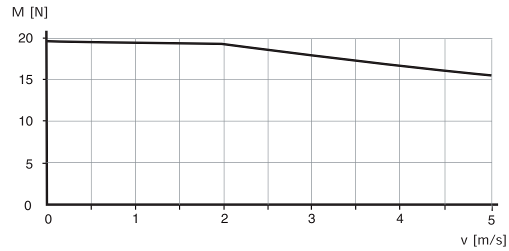
(1) Carriage type 1
(4) Carriage type 4

PAS42BB characteristic curves (Ball guides)

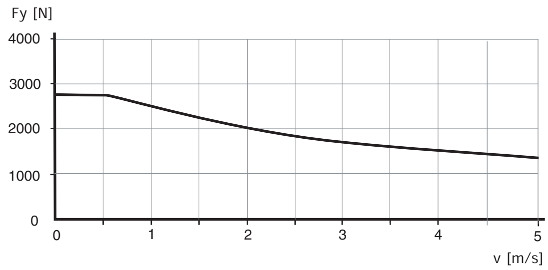
Max. feed force Fx



Max. driving torque M_{max}

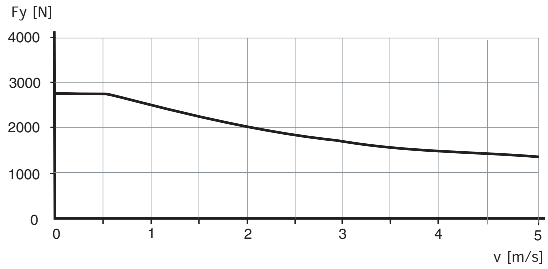


Max. force Fy_{dynmax}

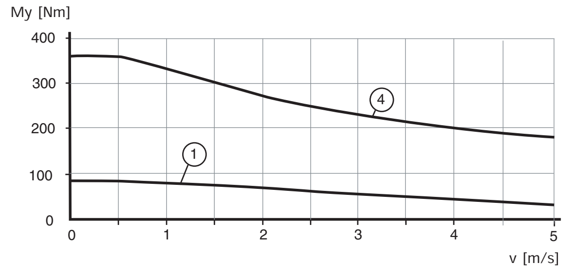


Max. torque of carriage Mx_{dynmax}

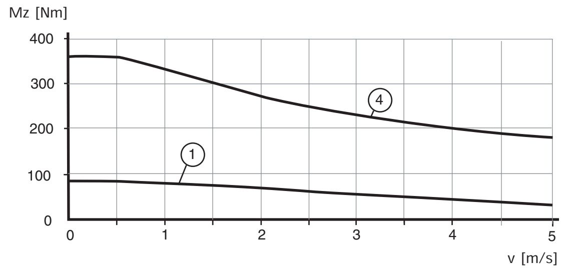
Max. force Fz_{dynmax}



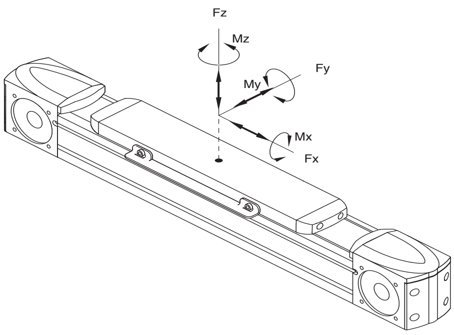
Max. torque of carriage My_{dynmax}



Max. torque of carriage Mz_{dynmax}



(1) Carriage type 1
(4) Carriage type 4



Calculations

Calculation of service life

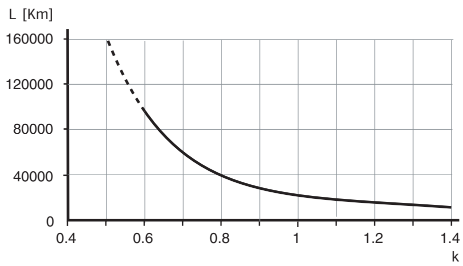
The service life of the linear axes is a function of the mean forces and torques that act in the system. If multiple forces and torques act simultaneously, use the following formula to calculate the load factor k.

$$\frac{Fy}{Fy_{dynmax}} + \frac{Fz}{Fz_{dynmax}} + \frac{Mx}{Mx_{dynmax}} + \frac{My}{My_{dynmax}} + \frac{Mz}{Mz_{dynmax}} = k = Loadfactor$$

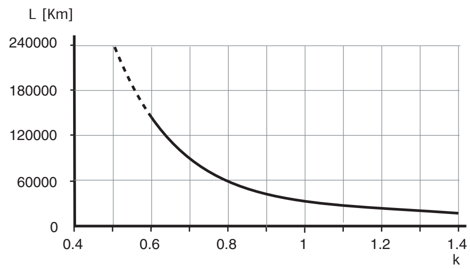
The service life of the axis (in km) can be approximated using the load factor and the service life - load characteristic curve.

Please note that the maximum permissible dynamic forces and torques (in the denominator) decrease with increasing speeds. Refer to the characteristic curves on the previous page.
The application-specific load values appear in the numerator.

Service life load curve PAS••BR (roller guides)



Service life load curve PAS••BB (ball guide)



No-load torque of toothed belt axis [Nm]

	No-load torque 0-stroke axis (without carriage)		0.64
+	No-load torque per carriage x number of carriages		
=	**No-load torque of toothed belt axis**		

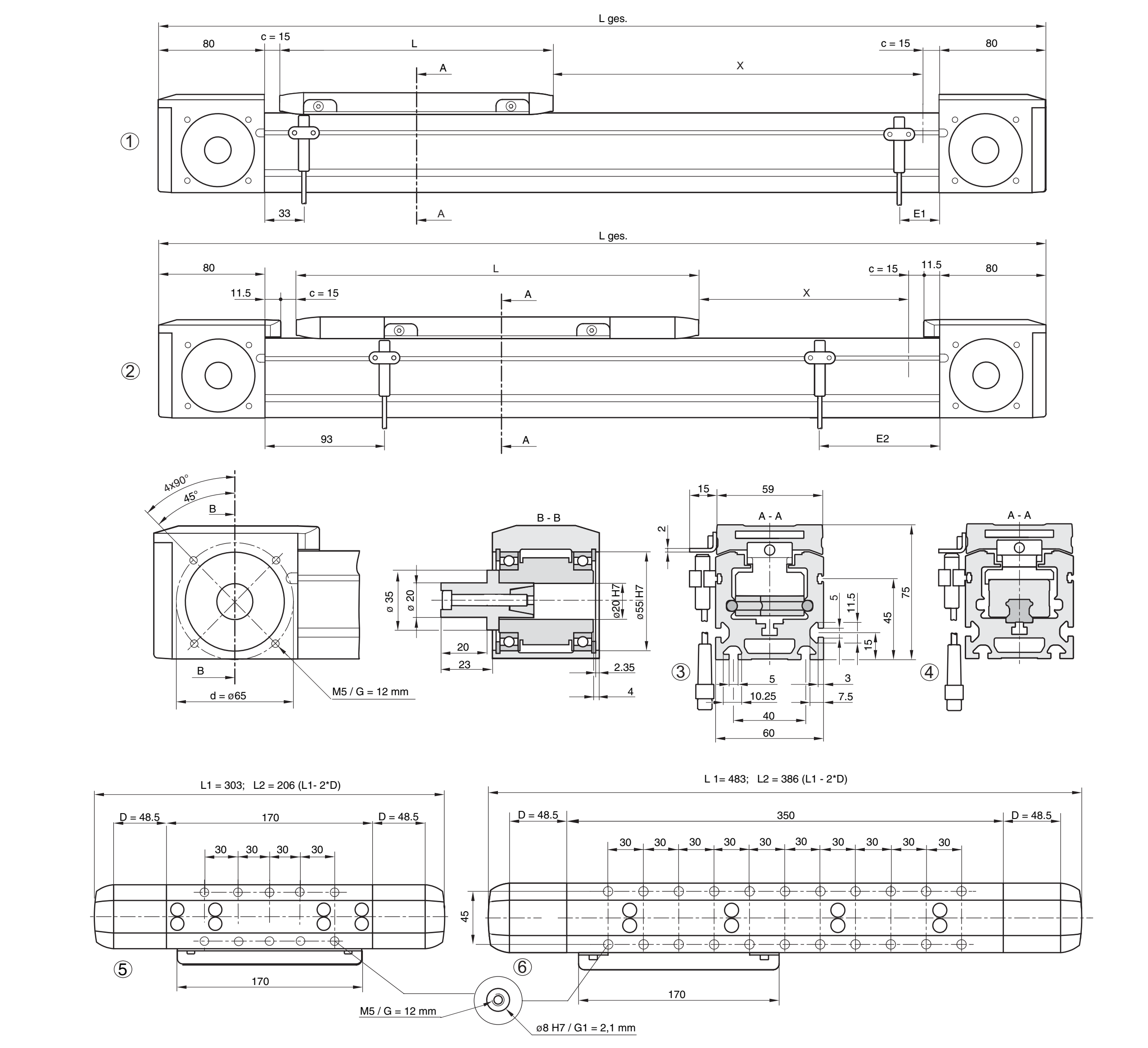
Total moment of inertia of toothed belt axis without drive [kgcm^2]

	Moment of inertia of 0-stroke axis (without carriage)		
+	Moment of inertia per m stroke x m stroke	(1.20 kgcm^2/m)	
+	Moment of inertia per kg payload x kg payload	(6.10 kgcm^2/kg)	
+	Moment of inertia motor attachment		0.24
+	Moment of inertia per carriage (with/without strip diversion) x number of carriages		
=	**Total moment of inertia of toothed belt axis without drive**		

Total mass of toothed belt axis [kg]

	Mass of 0-stroke axis	
+	Mass per m stroke x m stroke	
+	Mass motor attachment	0.5
+	Mass shaft journal	0.24
+	Mass per carriage (with/without strip diversion) x number of carriages	
+	Mass of motor/gearing (see motor catalogue)	
+	Mass of payload	
=	**Total mass of toothed belt axis**	

Dimensional drawings



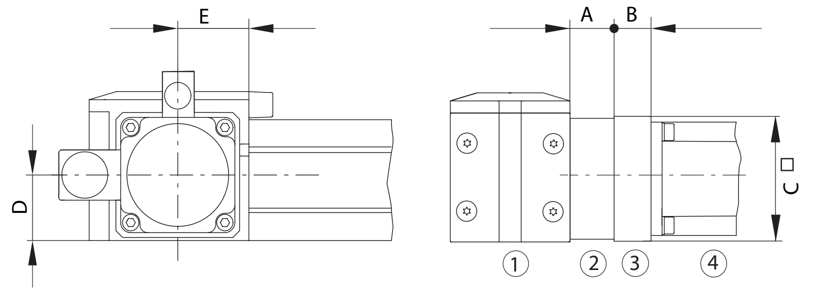
Dimensional drawings PAS42B

(1) = axis without cover strip	Lges	Total length without cover strip = 190 + L2 + X (add L2 + m for each additional carriage)
(2) = axis with cover strip		Total length with cover strip = 213 + L1 + X (add L1 + m for each additional carriage)
(3) = cross section with roller guide		
(4) = cross section with ball guide	L1	Carriage length with cover strip
(5) = carriage type 1	L2	Carriage length without cover strip
(6) = carriage type 4	X	Working stroke
(B-B) = shaft journal as option	m [1]	Minimum distance between two carriages: with cover strip: 90 mm, without cover strip: 40 mm
	C	Limit switch safety distance to mechanical stop. CAUTION: Depending on the payload, the acceleration and the positioning velocity, a greater distance is required. This is obtained by moving the limit switch position. The total axis length changes by this value.
	D	Cover strip turning block
G = thread depth	E1 [2]	Carriage: type 1 = 33 mm; type 4 = 213 mm
G1 = countersink depth	E2	Carriage: type 1 = 93 mm; type 4 = 273 mm

[1] Maximum of two carriages of the same type on request

[2] E1/E2: limit switch position opposite drive side

Motor attachment dimensions



(1) Axial section
(2) Coupling
(3) Motor adapter plate
(4) Motor or gearing

Note: Depending on C, the motor adapter plate or the motor may protrude over the axial section and may act as an obstruction if elements are above the carriage.

Drive type	Size	Shaft diameter	Length				
			A	B	C	D	E
		mm	mm	mm	mm	mm	mm
VRDM stepper motors	VRDM 397	12	22	26	85	32	35
	VRDM 3910						
	VRDM 3913	14					
	VRDM 31117	19		38	110		
	VRDM 31122						
Intelligent compact drives	I•S 91	12		26	85		
IclA IDS/IFS with stepper motor	I•S 92						
	I•S 93	14					
Intelligent compact drives IclA IFE with brushless DC motors (with gearing)	IFE 71 V-018	10		21	76/66		
	IFE 71 V-038						
	IFE 71 V-054						
	IFE 71 V-115						
SER servomotors	SER 3910	14		26	85		
	SER 3913						
	SER 3916						
	SER 31112	19		38	110		
	SER 31117						
	SER 31122						
	SER 31127						
RIG servomotors I = 4:1	RIG 397	20			85		
	RIG 3910						
	RIG 3913						
BSH servomotors	BSH 1001	19			110		
	BSH 1002						
	BSH 1003						
Planetary gears, single-stage (Neugart)	PLE 40 / WPLE 40	10		29.5	62		
	PLE 60 / WPLE 60	14		30.5			
	PLE 80 / WPLE 80	20		38	85		
	PLS 70	19		29	70		

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

For dimensional drawings of the motors and drives see the catalogues below.

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

PAS43B

Technical Data

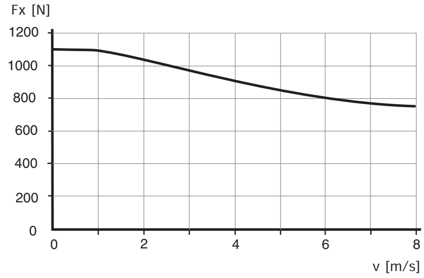
Type designation		PAS43BR		PAS43BB	
Guide type		Roller W10		Ball guide SHS20	
Typical payload	kg	30		60	
Max. stroke length [1,2]	mm	5500		5500	
Min. stroke length [3]	mm	175		11	
Max. speed [4]	m/s	8		5	
Max. acceleration[4]	m/s^2	20		20	
Max. drive force Fx [5]	N	1100		1100	
Max. force Fy_{dynmax}[5]	N	2130		4410	
Max. force Fz_{dynmax}[5]	N	1255		4410	
Load ratings guide system C_0/C_{dyn}	N	4850 / 8500		38400 / 22300	
Max. torque Mx_{dynmax}[5]	Nm	36		42	
Max. driving torque M_{max}[5]	Nm	36		36	
No-load torque 0-stroke axis (without carriage) [6]	Nm	0.75		0.75	
Moment of inertia 0-stroke axis (without carriage)	$kgcm^2$	8.10		8.10	
Moment of inertia per m stroke	$kgcm^2/m$	2.50		2.50	
Moment of inertia per kg payload	$kgcm^2/kg$	10.65		10.65	
Moment of inertia of motor attachment	$kgcm^2$	0.90		0.90	
Moment of inertia of shaft extension	$kgcm^2$	0.16		0.16	
Mass of 0-stroke axis (without motor, without carriage)	kg	4.40		4.50	
Mass stroke per m stroke	kg/m	8.00		9.50	
Mass of motor attachment	kg	1.0		1.0	
Mass of shaft extension	kg	0.154		0.154	
Repeat accuracy[4]	mm	±0.05		±0.05	
Internal diameter of clutch	mm	12 ... 25		9 ... 32	
Profile cross section (W x H)	mm	80 x 80		80 x 80	
Diameter of shaft extension	mm	25 h7		25 h7	
Axial planar moment of inertia Iy/Iz	mm^4	1285262 / 1867213		1285262 / 1867213	
Elasticity module (aluminium)	N/mm^2	0.72×10^5		0.72×10^5	
Max. ambient temperature	°C	0 ... +50		0 ... +50	
Toothed belt / toothed belt pulley					
Drive constant	mm/rotat.	205		205	
Toothed belt width/pitch		30 / HTD5		30 / HTD5	
Effective diameter toothed belt wheel (both sides equal)	mm	65.254		65.254	
Width toothed belt wheel	mm	71		71	
Material density toothed belt wheel	kg/cm^3	0.003		0.003	
Moment of inertia toothed belt wheel	$kgcm^2$	2.04		2	
Carriage		**Type 1**	**Type 4**	**Type 1**	**Type 4**
Max. torque of carriage My_{dynmax}[5]	Nm	62	195	165	690
Max. torque of carriage Mz_{dynmax}[5]	Nm	105	330	165	690
No-load torque of carriage[6]	Nm	0.25	0.25	0.82	0.82
Moment of inertia of carriage (with/without strip redirection)	$kgcm^2$	23.20 / 20.00	38.00 / 34.50	25.00 / 21.80	37.35 / 34.20
Mass of carriage with/without strip redirection (incl. toothed belt and profile component)	kg	5.10 / 4.10	8.20 / 7.10	5.80 / 4.65	8.90 / 7.80
Moving mass of carriage with/without strip redirection	kg	2.20 / 1.90	3.55 / 3.30	2.50 / 2.10	3.55 / 3.30
Max. total stroke with/without cover strip	mm	5350 / 5500	5140 / 5290	5350 / 5500	5140 / 5290

1) Greater stroke length on request
2) Carriage-dependent
3) Guaranteed lubrication of guide elements, shorter stroke length on request
4) Load and stroke-dependent
5) The maximum permissible dynamic forces and torques decrease with increasing speed, see characteristic curves on the next page
6) Measured at 0.1 m/s

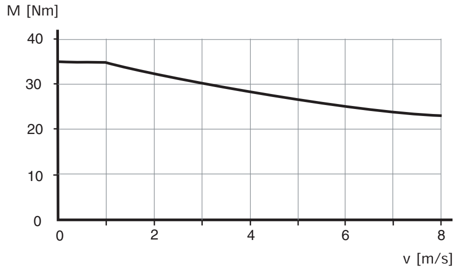
Note: the listed forces and torques refer to a service life of 20000 km with ball guide guides and 30000 km with roller guides

PAS43BR characteristic curves (Ball guides)

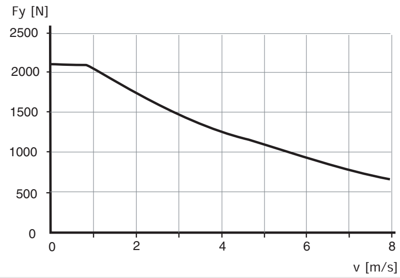
Max. feed force Fx



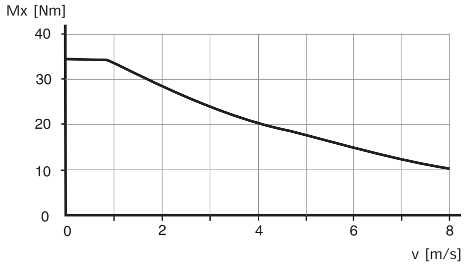
Max. driving torque M_{max}



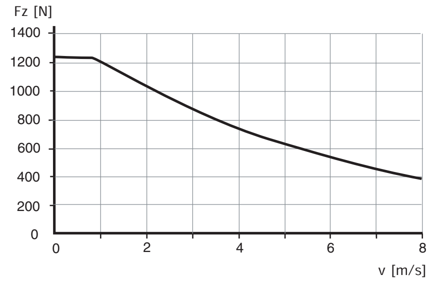
Max. force Fy



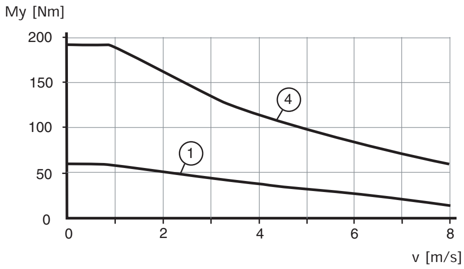
Max. torque of carriage Mx_{dynmax}



Max. force Fz_{dynmax}



Max. torque of carriage My_{dynmax}

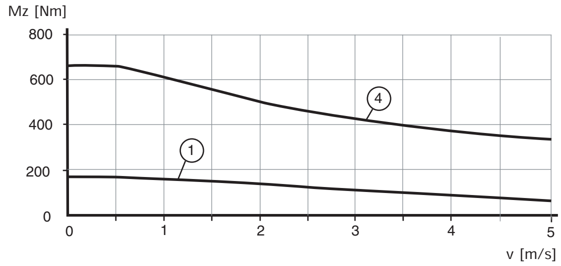


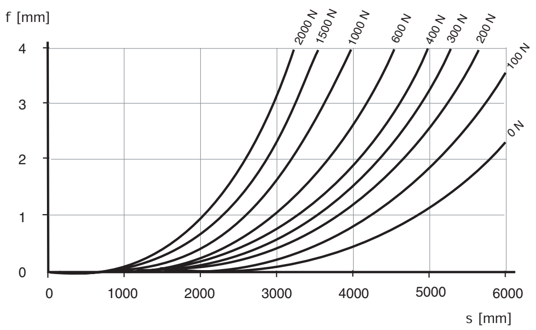
Deflection PAS43BR and PAS43BB

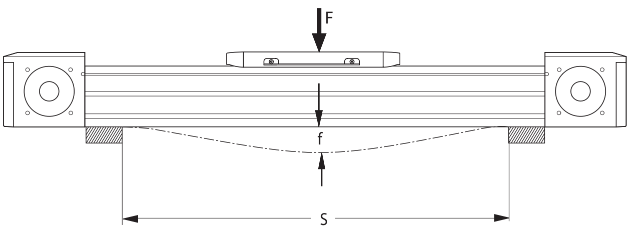
In order to limit deflection of the linear axis in case of long strokes, the axis must have additional support.

The diagram below shows the deflection f (mm) of the linear axis with respect to the support distance S (mm) and the acting force F (N). The maximum deflection of f = 4 mm should not be exceeded. Excessive deflection reduces the service life of the linear axis.

Max. torque of carriage Mz_{dynmax}





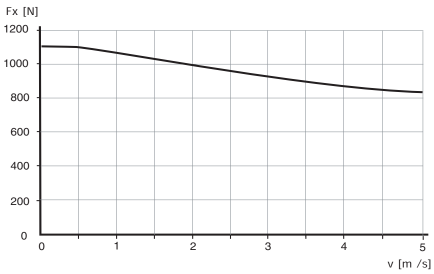


(1) Carriage type 1

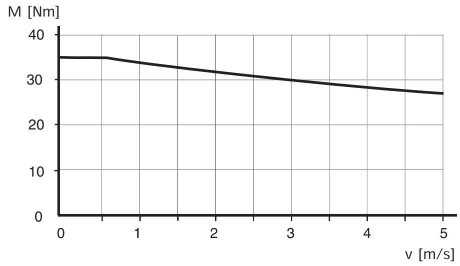
(4) Carriage type 4

PAS43BB characteristic curves (Ball guides)

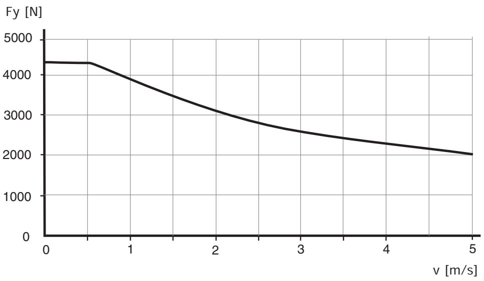
Max. feed force Fx



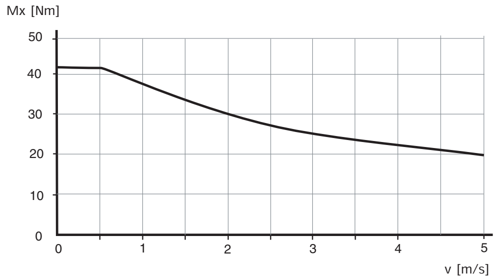
Max. driving torque M_{max}



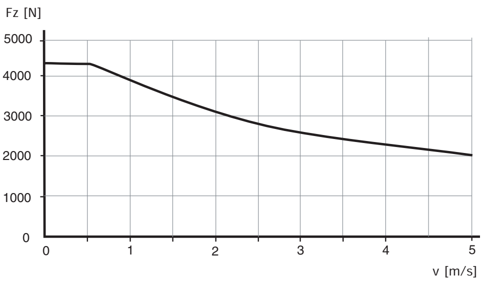
Max. force Fy_{dynmax}



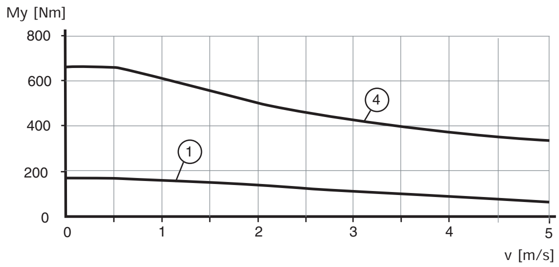
Max. torque of carriage Mx_{dynmax}



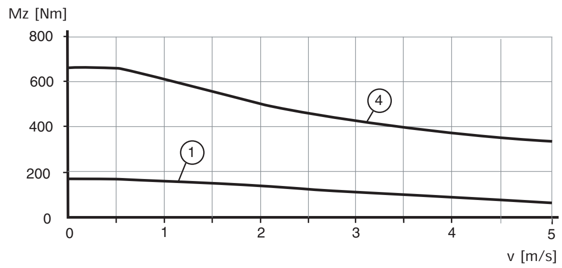
Max. force Fz_{dynmax}



Max. torque of carriage My_{dynmax}

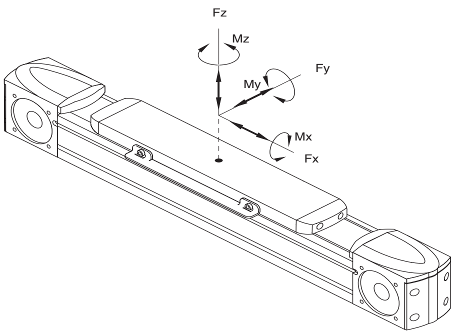


Max. torque of carriage Mz_{dynmax}



(1) Carriage type 1
(4) Carriage type 4

Calculations



Calculation of service life

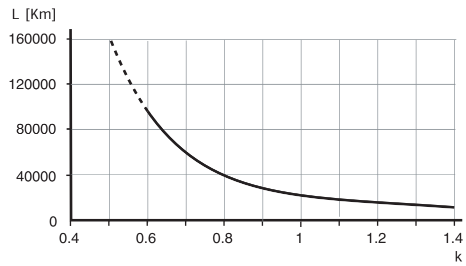
The service life of the linear axes is a function of the mean forces and torques that act in the system. If multiple forces and torques act simultaneously, use the following formula to calculate the load factor k.

$$\frac{Fy}{Fy_{dynmax}} + \frac{Fz}{Fz_{dynmax}} + \frac{Mx}{Mx_{dynmax}} + \frac{My}{My_{dynmax}} + \frac{Mz}{Mz_{dynmax}} = k = Loadfactor$$

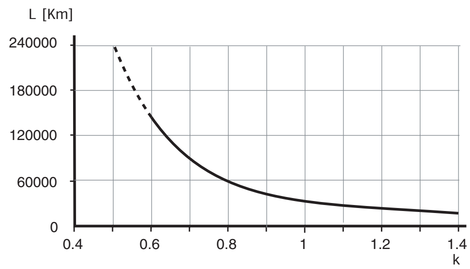
The service life of the axis (in km) can be approximated using the load factor and the service life - load characteristic curve.

Please note that the maximum permissible dynamic forces and torques (in the denominator) decrease with increasing speeds. Refer to the characteristic curves on the previous page.
The application-specific load values appear in the numerator.

Service life load curve PAS••BR (roller guides)



Service life load curve PAS••BB (ball guide)



No-load torque of toothed belt axis [Nm]

	No-load torque 0-stroke axis (without carriage)		0.75
+	No-load torque per carriage x number of carriages		
=	**No-load torque of toothed belt axis**		

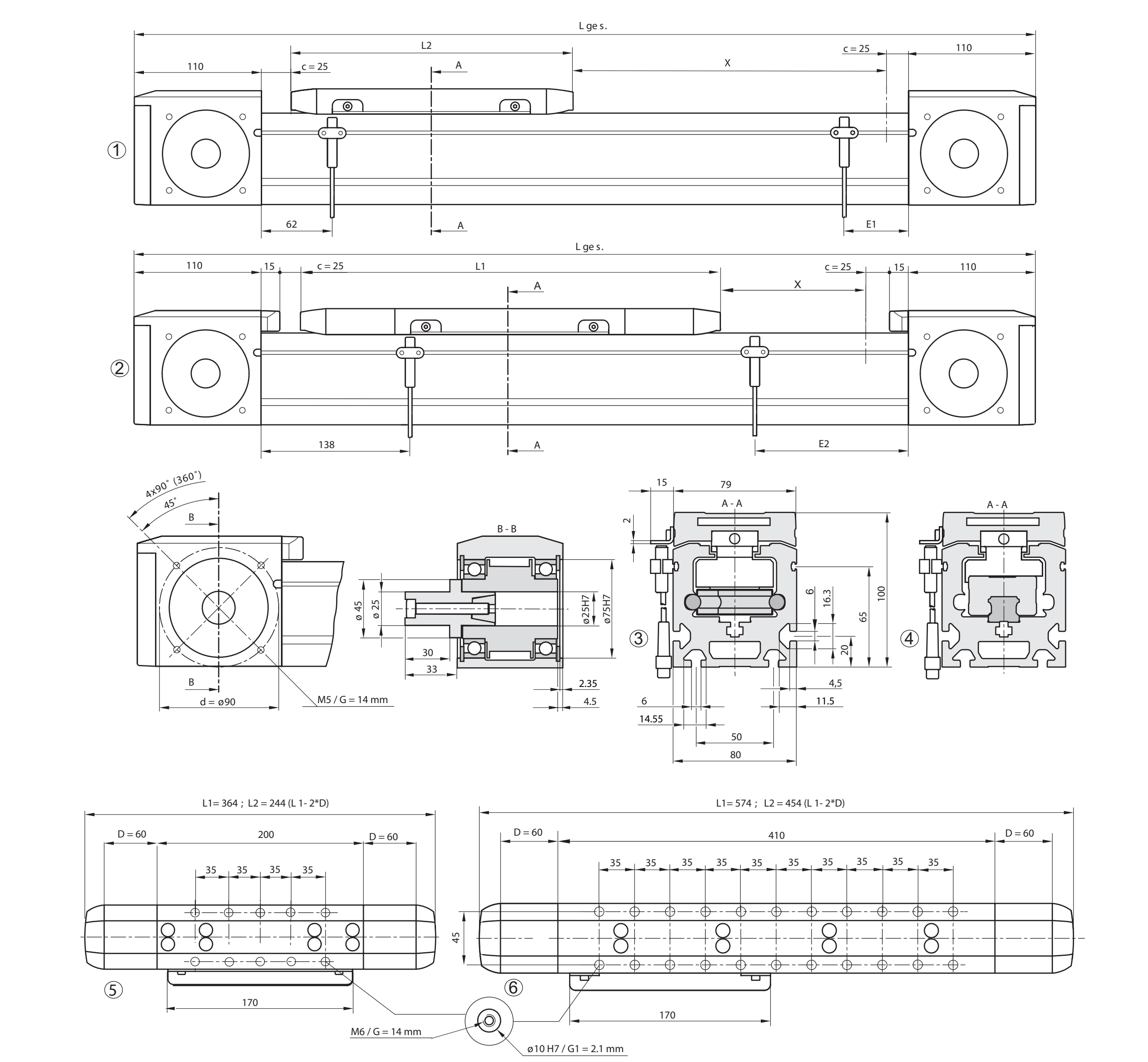
Total moment of inertia of toothed belt axis without drive [kgcm^2]

	Moment of inertia of 0-stroke axis (without carriage)		
+	Moment of inertia per m stroke x m stroke	(2.50 kgcm^2/m)	
+	Moment of inertia per kg payload x kg payload	(10.65 kgcm^2/kg)	
+	Moment of inertia motor attachment		0.90
+	Moment of inertia per carriage (with/without strip diversion) x number of carriages		
=	**Total moment of inertia of toothed belt axis without drive**		

Total mass of toothed belt axis [kg]

	Mass of 0-stroke axis	4.40
+	Mass per m stroke x m stroke	
+	Mass motor attachment	1.0
+	Mass shaft journal	0.154
+	Mass per carriage (with/without strip diversion) x number of carriages	
+	Mass of motor/gearing (see motor catalogue)	
+	Mass of payload	
=	**Total mass of toothed belt axis**	

Dimensional drawings

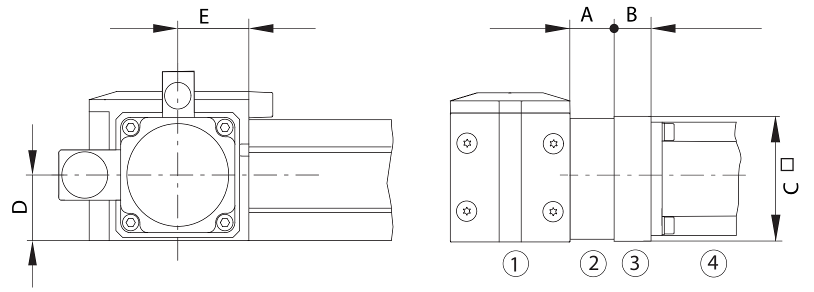


Dimensional drawings PAS43B

(1) = axis without cover strip	Lges	Total length without cover strip = 270 + L2 + X (add L2 + m for each additional carriage)
(2) = axis with cover strip		Total length with cover strip: = 300 + L1 + X (add L1 + m for each additional carriage)
(3) = cross section with roller guide		
(4) = cross section with ball guide	L1	Carriage length with cover strip
(5) = carriage type 1	L2	D Carriage length without cover strip
(6) = carriage type 4	X	Working stroke
(B-B) = shaft journal as option	m [1]	Minimum distance between two carriages: with cover strip: 110 mm, without cover strip: 45 mm)
	C	Limit switch safety distance to mechanical stop. CAUTION: Depending on the payload, the acceleration and the positioning velocity, a greater distance is required. This is obtained by moving the limit switch position. The total axis length changes by this value.
	D	Cover strip turning block
G = thread depth	E1 [2]	Carriage: type 1 = 62 mm; type 4 = 272 mm
G1 = countersink depth	E2 [2]	Carriage: type 1 = 138 mm; type 4 = 348 mm

[1] Maximum of two carriages of the same type on request
[2] E1/E2: limit switch position opposite drive side

Motor attachment dimensions



(1) Axial section
(2) Coupling
(3) Motor adapter plate
(4) Motor or gearing

Note: Depending on C, the motor adapter plate or the motor may protrude over the axial section and may act as an obstruction if elements are above the carriage.

Drive type	Size	Shaft diameter	Length A	B	C	D	E
		mm	mm	mm	mm	mm	mm
VRDM stepper motors	VRDM 3910	12	25	21	85	44.5	48
	VRDM 3913	14					
	VRDM 31117	19		26	110		
	VRDM 31122						
Intelligent compact drives IclA IDS/IFS with stepper motor	I•S 92	12		21	85		
	I•S 93						
SER servomotors	SER 31112	19		26	110		
	SER 31117						
	SER 31122						
	SER 31127						
RIG servomotors	RIG 397	20		31	85		
	RIG 3910						
	RIG 3913						
	RIG 31112	25		40	110		
	RIG 31117						
	RIG 31122						
Planetary gears, single-stage (Neugart)	PLE 60 / WPLE 60	14		30.5	85		
	PLE 80 / WPLE 80	20		33			
	PLE120/WPLE 120	25		45	115		
	PLS 70	19		21	85		
	PLS 90	22		31			

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

For dimensional drawings of the motors and drives see the catalogues below.

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

PAS44B

Technical Data

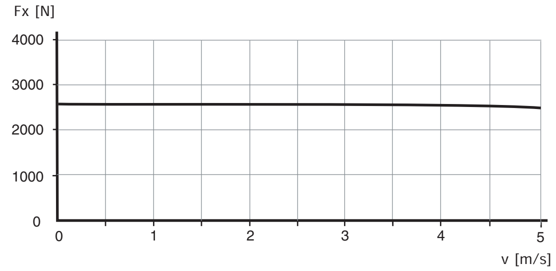
Type designation		PAS44BB	
Guide type		Ball guide SHS25	
Typical payload	kg	100	
Max. stroke length 1) 2)	mm	5500	
Min. stroke length 3)	mm	13	
Max. speed 4)	m/s	5	
Max. acceleration	m/s^2	20	
Max. drive force Fx 5)	N	2600	
Max. force Fy_{dynmax} 5)	N	6250	
Max. force Fz_{dynmax} 5)	N	6250	
Max. torque Mx_{dynmax} 5)	Nm	67	
Load ratings guide system C_0/C_{dyn}	N	52400 / 31700	
Max. driving torque M_{max} 5)	Nm	110	
No-load torque 0-stroke axis (without carriage) 6)	Nm	2.50	
Moment of inertia 0-stroke axis (without carriage)	$kgcm^2$	28.00 / 25.85	
Moment of inertia per m stroke	$kgcm^2/m$	11.00	
Moment of inertia per kg payload	$kgcm^2/kg$	17.70	
Moment of inertia of motor attachment	$kgcm^2$	2.10	
Moment of inertia of shaft extension	$kgcm^2$	0.54	
Mass of 0-stroke axis (without motor, without carriage)	kg	10.5	
Mass stroke per m stroke	kg/m	16.85	
Mass of motor attachment	kg	2.0	
Mass of shaft extension	kg	0.323	
Repeat accuracy 4)	mm	±0.05	
Internal diameter of clutch	mm	10 ... 32	
Profile cross section (W x H)	mm	110 x 110	
Diameter of shaft extension	mm	32 h7	
Axial planar moment of inertia Iy/Iz	mm^4	4713499 / 6624690	
Elasticity module (aluminium)	N/mm^2	0.72×10^5	
Max. ambient temperature	°C	0 ... +50	
Toothed belt / toothed belt pulley			
Drive constant	mm/rotat.	264	
Toothed belt width/pitch		50 / HTD8	
Effective diameter toothed belt wheel (both sides equal)	mm	84.034	
Width toothed belt wheel	mm	98	
Material density toothed belt wheel	kg/cm^3	0.003	
Moment of inertia toothed belt wheel	$kgcm^2$	7.03	
Carriage		**Type 1**	**Type 4**
Max. torque of carriage My_{dynmax} 5)	Nm	260	1210
Max. torque of carriage Mz_{dynmax} 5)	Nm	260	1210
No-load torque of carriage 6)	Nm	1.35	1.35
Moment of inertia of carriage (with/without strip redirection)	$kgcm^2$	84.90 / 72.90	133.00 / 121.00
Mass of carriage with/without strip redirection (incl. toothed belt and profile component)	kg	12.7 / 10.0	20.0 / 17.0
Moving mass of carriage with/without strip redirection	kg	5.0 / 4.2	7.5 / 7.0
Max. total stroke with/without cover strip	mm	5300 / 5500	5030 / 5230

1) Greater stroke length on request
2) Carriage-dependent
3) Guaranteed lubrication of guide elements, shorter stroke length on request
4) Load and stroke-dependent
5) The maximum permissible dynamic forces and torques decrease with increasing speed, see characteristic curves on the next page
6) Measured at 0.1 m/s

Note: The listed torques and forces refer to a service life of 20000 km.

PAS44BB characteristic curves (Ball guides)

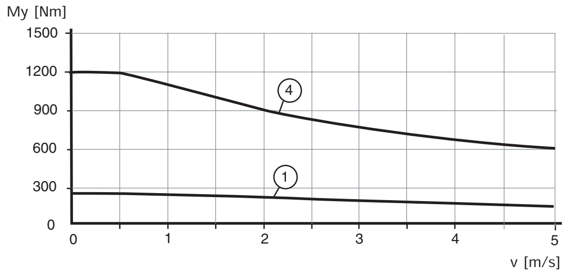
Max. feed force Fx_{dynmax}



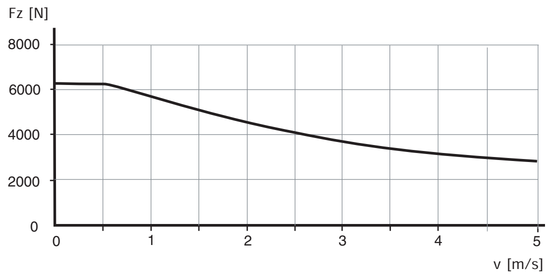
Max. torque Mx_{dynmax}

Max. force Fy_{dynmax}

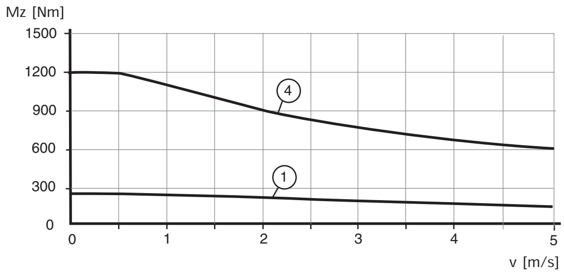
Max. torque of carriage My_{dynmax}



Max. force Fz_{dynmax}



Max. torque of carriage Mz_{dynmax}

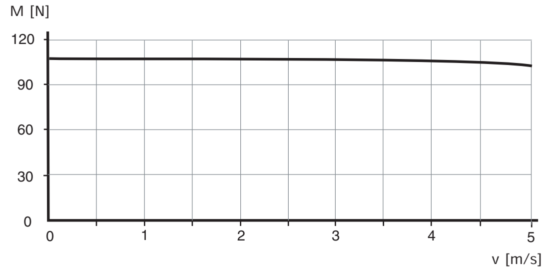


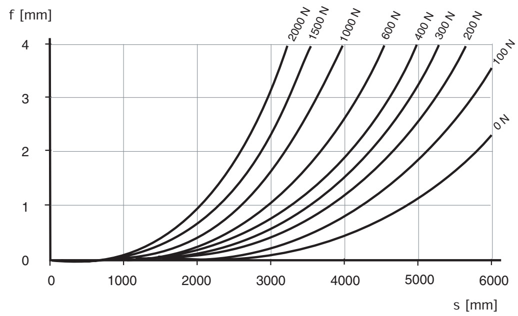
Deflection PAS44BB

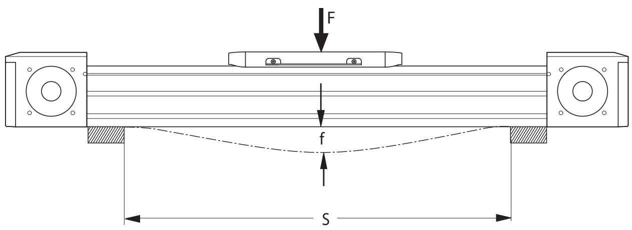
In order to limit deflection of the linear axis in case of long strokes, the axis must have additional support.

The diagram below shows the deflection f (mm) of the linear axis with respect to the support distance S (mm) and the acting force F (N). The maximum deflection of f = 4 mm should not be exceeded. Excessive deflection reduces the service life of the linear axis.

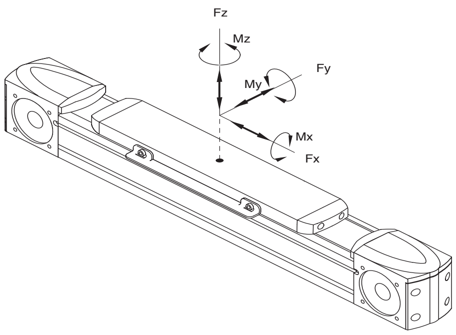
Max. torque of carriage Mz_{dynmax}







(1) Carriage type 1
(4) Carriage type 4



Calculations

Calculation of service life

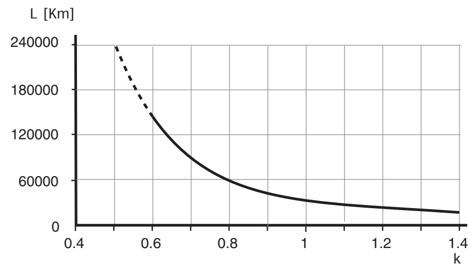
The service life of the linear axes is a function of the mean forces and torques that act in the system. If multiple forces and torques act simultaneously, use the following formula to calculate the load factor k.

$$\frac{Fy}{Fy_{dynmax}} + \frac{Fz}{Fz_{dynmax}} + \frac{Mx}{Mx_{dynmax}} + \frac{My}{My_{dynmax}} + \frac{Mz}{Mz_{dynmax}} = k = Loadfactor$$

The service life of the axis (in km) can be approximated using the load factor and the service life - load characteristic curve.

Please note that the maximum permissible dynamic forces and torques (in the denominator) decrease with increasing speeds. Refer to the characteristic curves on the previous page.
The application-specific load values appear in the numerator.

Service life load curve PAS••BB (ball guide)



No-load torque of toothed belt axis [Nm]

	No-load torque 0-stroke axis (without carriage)		2.50
+	No-load torque per carriage x number of carriages		
=	**No-load torque of toothed belt axis**		

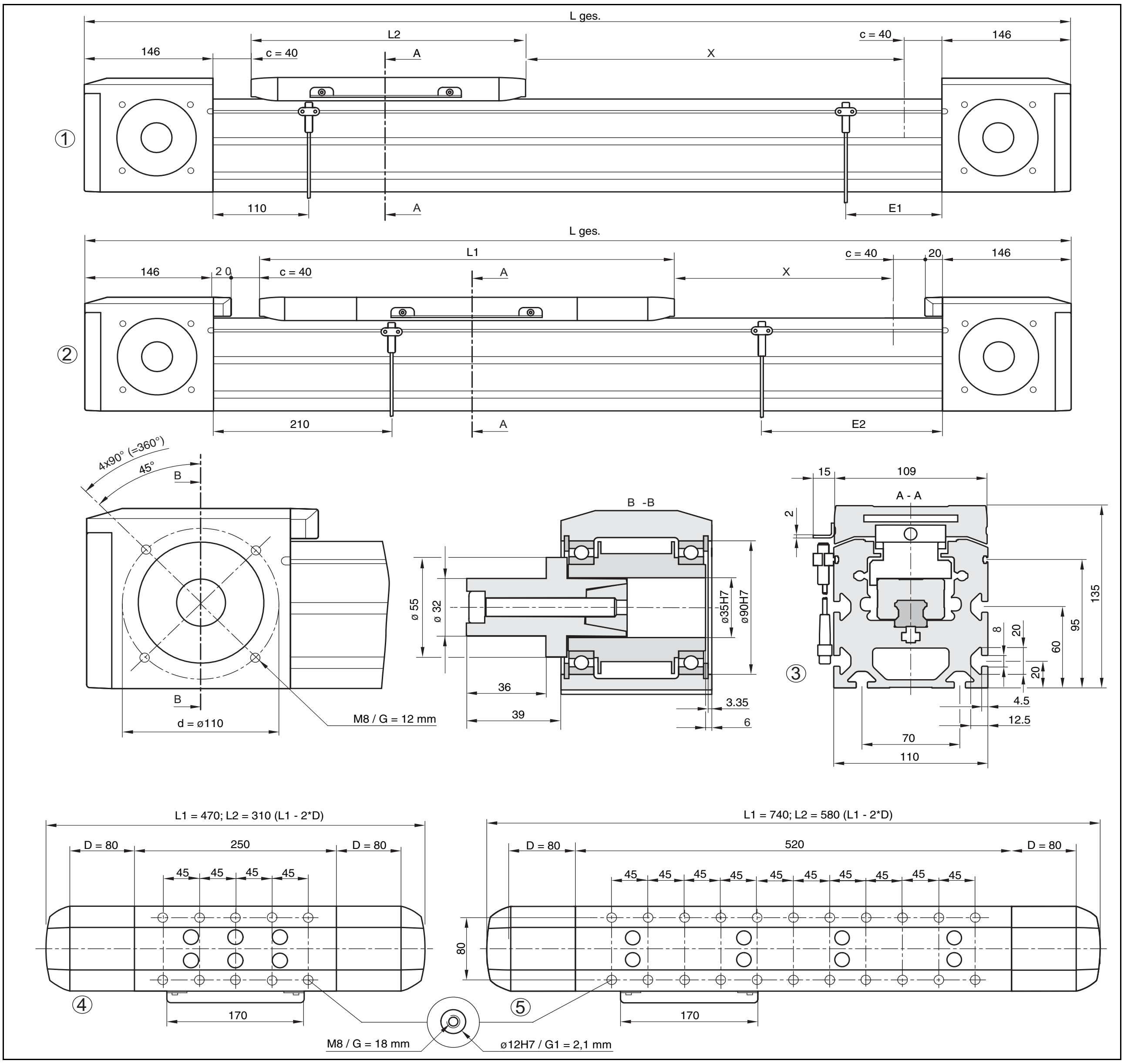
Total moment of inertia of toothed belt axis without drive [kgcm^2]

	Moment of inertia of 0-stroke axis (without carriage)		
+	Moment of inertia per m stroke x m stroke	(11.00 kgcm^2/m)	
+	Moment of inertia per kg payload x kg payload	(17.70 kgcm^2/kg)	
+	Moment of inertia motor attachment		2.10
+	Moment of inertia per carriage (with/without strip diversion) x number of carriages		
=	**Total moment of inertia of toothed belt axis without drive**		

Total mass of toothed belt axis [kg]

	Mass of 0-stroke axis	10.50
+	Mass per m stroke x m stroke	16.85
+	Mass motor attachment	2.0
+	Mass shaft journal	0.325
+	Mass per carriage (with/without strip diversion) x number of carriages	
+	Mass of motor/gearing (see motor catalogue)	
+	Mass of payload	
=	**Total mass of toothed belt axis**	

Dimensional drawings



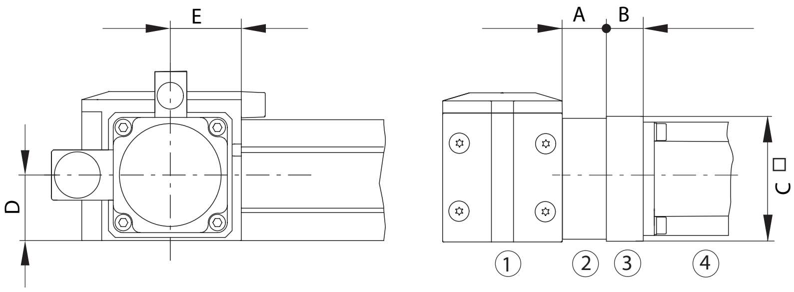
Dimensional drawings PAS44B

(1) = axis without cover strip	Lges	Total length without cover strip = 372 + L2 + X (add L2 + m for each additional carriage)
(2) = axis with cover strip		Total length with cover strip = 412 + L1 + X (add L1 + m for each additional carriage)
(3) = cross section with ball guide		
(4) = carriage type 1	L1	Carriage length with cover strip
(5) = carriage type 4	L2	Carriage length without cover strip
(B-B) = shaft journal as option	X	Working stroke
	m [1]	Minimum distance between two carriages: with cover strip: 135 mm, without cover strip: 55 mm)
	C	Limit switch safety distance to mechanical stop. CAUTION: Depending on the payload, the acceleration and the positioning velocity, a greater distance is required. This is obtained by moving the limit switch position. The total axis length changes by this value.
	D	Cover strip turning block
G = thread depth	E1 [2]	Carriage: type 1 = 110 mm; type 4 = 380 mm
G1 = countersink depth	E2 [2])	Carriage: type 1 = 210 mm; type 4 = 480 mm

[1] Maximum of two carriages of the same type on request

[2] E1/E2: limit switch position opposite drive side

Motor attachment dimensions



(1) Axial section
(2) Coupling
(3) Motor adapter plate
(4) Motor or gearing

Note: Depending on C, the motor adapter plate or the motor may protrude over the axial section and may act as an obstruction if elements are above the carriage.

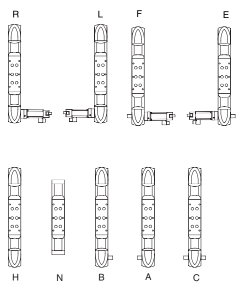
Drive type	Size	Shaft diameter	Length				
			A	B	C	D	E
		mm	mm	mm	mm	mm	mm
VRDM stepper motors	VRDM 31117	19	26	24	110	64	64
	VRDM 31122						
RIG servomotors	RIG 397	20		24			
	RIG 3910						
	RIG 3913						
	RIG 31112	25		32			
	RIG 31117						
	RIG 31122						
Planetary gears, single-stage (Neugart)	PLE 80 / WPLE 80	20		36			
	PLE120/WPLE 120	25		51	115		
	PLS 70	19		28	110		
	PLS 90	22		24			

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

For detailed information on the various motors and drives see the catalogues below:

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

Type code

Example (continued next page):	PAS	4	2	B	R	M	1200	C	1	N	B	100	R	N	/	V9
Product PAS = portal axis	**PAS**	4	2	B	R	M	1200	C	1	N	B	100	R	N	/	V9
Product family 4 = basic line	PAS	**4**	2	B	R	M	1200	C	1	N	B	100	R	N	/	V9
Size(cross-section of section) 1 = 40; (40 x 40 mm) 2 = 60; (60 x 60 mm) 3 = 80; (80 x 80 mm) 4 = 110; (110 x 110 mm)	PAS	4	**2**	B	R	M	1200	C	1	N	B	100	R	N	/	V9
Carriage drive B = toothed belt H = support axis (without drive, guide element only)	PAS	4	2	**B**	R	M	1200	C	1	N	B	100	R	N	/	V9
Guide type R = roller guide B = ball guide	PAS	4	2	B	**R**	M	1200	C	1	N	B	100	R	N	/	V9
Feed per revolution M = 84 mm with size 40; 155 mm with size 60; 205 mm with size 80; 264 mm with size 110 N = support axis	PAS	4	2	B	R	**M**	1200	C	1	N	B	100	R	N	/	V9
Stroke length XXXX = in mm	PAS	4	2	B	R	M	**1200**	C	1	N	B	100	R	N	/	V9
Limit switch 1) A = 2 x PNP sensors as normally closed contacts, not wired 1) B = 2 x PNP sensors as normally closed contacts, plugged into IclA C = 2 x PNP sensors as normally open contacts, not wired 1) D = 2 x PNP sensors as normally open contacts, plugged into IclA E = 2 x NPN sensors as normally closed contacts, not wired 1) F = 2 x NPN sensors as normally closed contacts, plugged into IclA G = 2 x NPN sensors as normally open contacts, not wired 1) H = 2 x NPN sensors as normally open contacts, plugged into IclA N = no sensors	PAS	4	2	B	R	M	1200	**C**	1	N	B	100	R	N	/	V9
Carriage (all carriages driven) 1 = type 1 (size 60, 80, 110) 2 = type 2 (size 40) 4 = type 4 (size 40, 60, 80, 110)	PAS	4	2	B	R	M	1200	C	**1**	N	B	100	R	N	/	V9
Options N = without options B = with cover strip C = corrosion-resistant, without cover strip A = antistatic toothed belt, without cover strip E = corrosion-resistant, antistatic toothed belt, without cover strip L = antistatic toothed belt, with cover strip	PAS	4	2	B	R	M	1200	C	1	**N**	B	100	R	N	/	V9
Number of carriages 2) A = one B = two C = three	PAS	4	2	B	R	M	1200	C	1	N	**B**	100	R	N	/	V9
Distance between carriages 3) 1 ... 999 = distance in mm xxx with only one carriage	PAS	4	2	B	R	M	1200	C	1	N	B	**100**	R	N	/	V9
Axis drive interface H = without (hollow shaft both sides) L = with motor, attachment left R = with motor, attachment right A = with shaft journal, attachment left B = with shaft journal, attachment right C = with shaft journal, attachment both sides E = with motor, attachment left; shaft journal, attachment right F = with motor, attachment right; shaft journal, attachment left N = support axis 	PAS	4	2	B	R	M	1200	C	1	N	B	100	**R**	N	/	V9
Toothed belt drive gear N = without	PAS	4	2	B	R	M	1200	C	1	N	B	100	R	**N**	/	V9

1) With 100 mm cable with plug wired at one end, additional versions as accessories,extension cable as accessories

2) Only carriages of the same type can be used, all carriages are driven.

3) Minimum distance between two carriages: see dimensional drawings

Example (continued from previous page):	PAS	4	2	B	R	M	1200	C	1	N	B	100	R	N	/	XX
Motor/gearing interface 1) V6 = stepper motors VRDM 364 / VRDM 366 V8 = stepper motors VRDM 368 V9 = stepper motors VRDM 397 / VRDM 3910 V0 = stepper motors VRDM 3913 V1 = stepper motors VRDM 311• I6 = IclA IFS/IDS 61 / IFS/IDS 62 with stepper motor I7 = IclA IFS/IDS 63 with stepper motor I9 = IFS/IDS 91 / IFS/IDS 92 with stepper motor I8 = IclA IFS/IDS 93 with stepper motor S6 = servomotors SER 36• S9 = servomotors SER 39• S1 = servomotors SER 311• A6 = IclA IFA 6• with servomotor G9 = servomotors RIG 39• G1 = servomotors RIG 311•• H5 = servomotors BSH 055• H7 = servomotors BSH 0701 / BSH 0702 H8 = servomotors BSH 0703 H1 = servomotors BSH 1001 / BSH 1002 / BSH 1003 H4 = servomotors BSH 1004 0G = planetary gear (Neugart) - PLE 40 1G = planetary gear (Neugart) - PLE/WPLE 60 3G = planetary gear (Neugart) - PLE/WPLE 80 5G = planetary gear (Neugart) - PLE/WPLE 120 7G = planetary gear (Neugart) - PLS 70 8G = planetary gear (Neugart) - PLS 90 XX = third-party motor / third-party gearing without attachment by Berger Lahr (drawing required) XY = third-party motor / third-party gearing with attachment by Berger Lahr (drawing required; provide motor/gearing)	PAS	4	2	B	R	M	1200	C	1	N	B	100	R	N	/	V9

1) Attachment of motor coupling assembly and motor adapter plate:In case of selection V6 to XX, the corresponding motor coupling with coupling housing as well as the motor adapter are attached to the axis. Not the motor.Motor attachment:If the axis is to be delivered with attached motor, specify the complete motor identification (see type codes in the motor catalogues) instead of the motor/gearing interface or select XY.

The type codes for the motors are in the following catalogues.

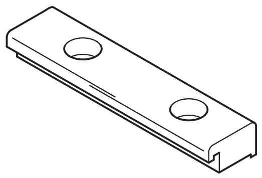
Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

Accessories

Accessories

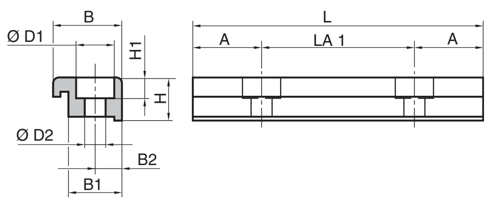
Clamping claws for linear axes

Order data



Description	Order number
For mounting the linear axes on a fastening base. Contents: 10 units	
For linear axis ...	
PAS41	**MNA3MF10/5/11**
PAS42	**MNA3MF10/5/12**
PAS43	**MNA3MF10/6/13**
PAS44	**MNA3MF10/8/14**

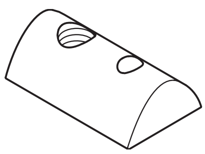
Dimensional drawings



For linear axis ...	A	B	B1	B2	D1	D2	H	H1	L	LA1
PAS41	18	18	14	7	10	5.5	11.2	5.4	76	40
PAS42		19	14	7	10	5.5	16.2	5.4		
PAS43		24	16	8	11	6.6	21.5	6.4		
PAS44		28	20	10	15	9	22	12		

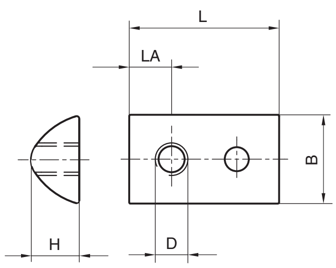
T-slot nuts

Order data



Description	T-slot nut type	Order number
The T-slot nuts are swivelled into the T-slots of the axial section to fasten the axis or parts of the axis. Contents: 10 units		
For linear axis...		
PAS41 / PAS42	5 x M5	**MNA3MF010T5N5**
PAS43	6 x M6	**MNA3MF010T6N6**
PAS44	8 x M6	**MNA3MF010T8N6**
	8 x M8	**MNA3MF010T8N8**

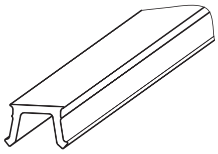
Dimensional drawings



Linear axis ...	T-slot nut type	B	D	H	L	LA
PAS41 / PAS42	5 x M5	8	5	4	11.5	4
PAS43	6 x M6	10.6	6	6.4	17	5.5
PAS44	8 x M6	13.8	8	7.3	23	6.5
	8 x M8	13.8	8	7.3	23	7.5

T-slot covers

Order data



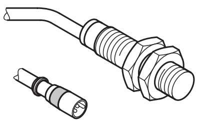
Description	For linear axis ...	T-slot size	Order number
length 2 m Contents: 5 units	PAS41	5	**MNA3MC05A05**
	PAS42	5	**MNA3MC05B05**
	PAS43	6	**MNA3MC05A06**
	PAS44	8	**MNA3MC05A08**

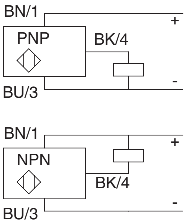
Sensors

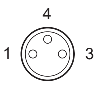
Order data

Designation	Description			Order number
Sensor	With signal display, 100 mm cable and 3-pin M8 circular plug-in connector; fits all linear axes	PNP, normally closed contact	1 units	**XS508B1PBP01M8**
		PNP, normally open contact	1 units	**XS508B1PAP01M8**
		NPN, normally closed contact	1 units	**XS508B1NBP01M8**
		NPN, normally open contact	1 units	**XS508B1NAP01M8**
Sensor extension cable	Fits trailing cable; sensor side with 3-pin M8 circular plug-in connector socket, second cable end open Contents: 1 units		5 m	**MNA2SBCBGA050**
			10 m	**MNA2SBCBGA100**
			20 m	**MNA2SBCBGA200**
Sensor retainer	To take a standard limit switch with 8 mm diameter; movable; fits all linear axes		10 units	**MNA3MF010M8**
Sensor damper plate	For attachment to the carriage of the PAS axes. Contents: Sensor damper plate and screw kit		1 units	**MNA3MASP1**

Sensor:

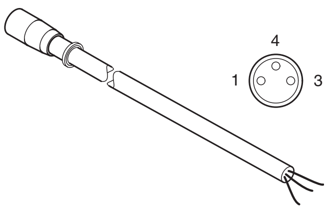




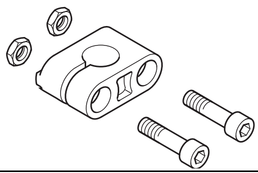


BK = Black
BN = Brown
BU = Blue

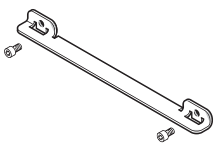
Sensor extension cable:



Sensor retainer:

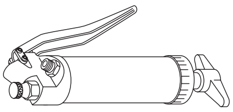
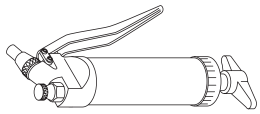
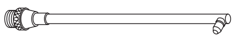


Sensor damper plate:



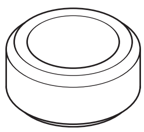
Grease guns

Order data

Designation	Description	Order number
Single-hand high-pressure oil gun 	With nozzle for the lubrication of the linear axes with roller guides. This takes type D nozzles. Volume: 120 cm³; delivery: 0.5 cm³/stroke	**MNA3MAP01**
Single-hand high-pressure grease gun 	With nozzle for the lubrication of the linear axes with guide. This takes type D nozzles. Volume: 120 cm³; delivery: 0.5 cm³/stroke	**MNA3MAP02**
Nozzle type D6 90° 	For type D6 lubrication nipple; nipple 90°, Ø 6 mm; length 20 mm; with M4 pointed end 90° to side	**MNA3MAT01**
Nozzle type D6 20° 	For type D6 lubrication nipple; nipple 20°, Ø 6 mm; length 20 mm; with M4 pointed end 20° angled	**MNA3MAT02**

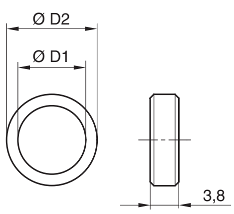
Locating dowels

Order data



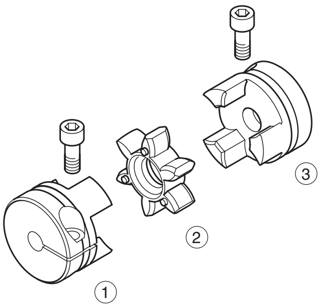
Description	Order number
For exact and reproducible load bearing the locating dowels are inserted into the holes provided in the carriages. Contents: 20 units	
For carriages of linear axes ...	
PAS41 / PAS42	**MNA3MF020LD01**
PAS43	**MNA3MF020LD02**
PAS44	**MNA3MF020LD03**

Dimensional drawings

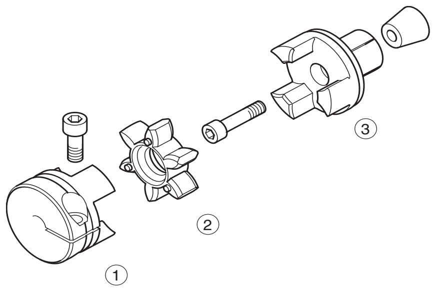


For carriages of linear axis ...	D1	D2
PAS41 / PAS42	5.5	8 h6
PAS43	6.6	10 h6
PAS44	9	12 h6

Coupling modules



Coupling module for ballscrew axes
(1) Clamping hub
(2) Ring gear
(3) Clamping hub



Coupling module for toothed-belt axes
(1) Clamping hub
(2) Ring gear
(3) Expanding hub

Coupling modules are required to attach motors.

A coupling module for ballscrew axes has the following components:

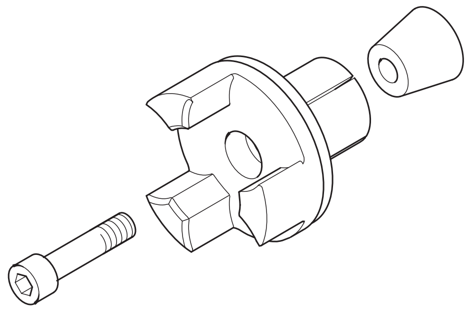
- 2 clamping hubs, one each for ballscrew end and motor end
- 1 ring gear, as a decoupling component between the hubs
- 2 screws

A coupling module for toothed-belt axes has the following components:

- 1 expanding hub for the axis end
- 1 clamping hub for the motor end
- 1 ring gear, as a decoupling component between the hubs
- 2 screws

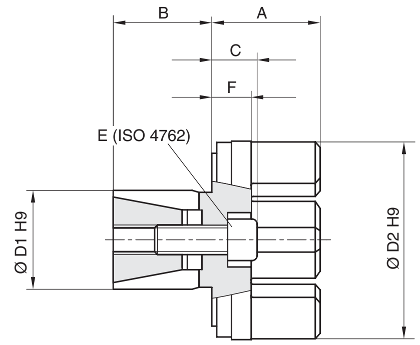
Expanding hubs

Order data



Description	Order number
Coupling components for mounting the coupling module to the toothed-belt axis. Contents: 1 unit	
For toothed-belt axis...	
PAS41B•	**MNA3MFSC10A14**
PAS42B•	**MNA3MFSC20A20**
PAS43B•	**MNA3MFSC25A30**
PAS44B•	**MNA3MFSC35A36**

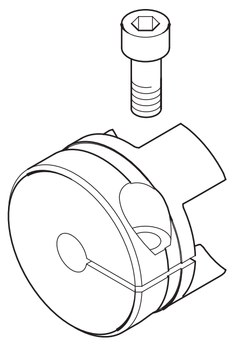
Dimensional drawings



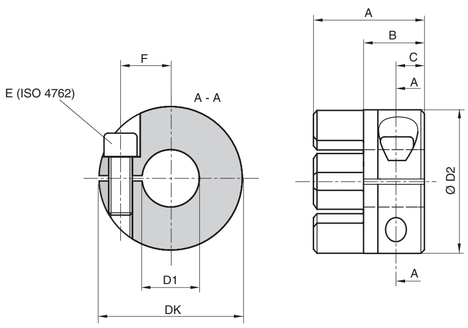
For toothed belt axis ...	Rotationmoment of inertia	Retainingscrew	Wrench size	Tightening torque						
	J	**E**			**A**	**B**	**C**	**D1**	**D2**	**F**
	kgcm²		mm	Nm	mm					
PAS41B•	0.009	M4	3	2.9	16	14	7	10	25	5
PAS42B•	0.09	M6	5	10	22	20	8	20	40	8
PAS43B•	0.32	M8	6	25	24	30	12	25	55	8
PAS44B•	0.77	M10	8	49	25.5	36	13	35	65	8

Clamping hubs

Order data



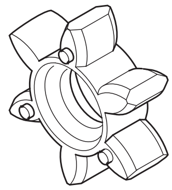
Description			Order number
Motor end clamping hub for toothed-belt axes, axis and motor end clamping hub for ballscrew axes. Contents: 1 unit			
For axis...	**D1 (mm)** Additional diameters on enquiry	**M_{Rmax} (Nm)** Max. transferable torque	
PAS41	6.35	6.8	**MNA3MFCC06A06**
	8	7.4	**MNA3MFCC08A06**
	9	7.8	**MNA3MFCC09A06**
	10	9.7	**MNA3MFCC10A06**
	11	10.7	**MNA3MFCC11A06**
	12	11.6	**MNA3MFCC12A06**
	14	12.2	**MNA3MFCC14A06**
PAS42	6.35	32.5	**MNA3MFCC06A07**
	8	35	**MNA3MFCC08A07**
	9	36	**MNA3MFCC09A07**
	10	41	**MNA3MFCC10A07**
	11	45	**MNA3MFCC11A07**
	12	50	**MNA3MFCC12A07**
	14	53	**MNA3MFCC14A07**
	16	55	**MNA3MFCC16A07**
	19	58	**MNA3MFCC19A07**
	20	60	**MNA3MFCC20A07**
PAS43	12	49	**MNA3MFCC12A08**
	14	54	**MNA3MFCC14A08**
	19	75	**MNA3MFCC19A08**
	20	76	**MNA3MFCC20A08**
	22	78	**MNA3MFCC22A08**
	24	85	**MNA3MFCC24A08**
	25	98	**MNA3MFCC25A08**
PAS44	12	108	**MNA3MFCC12A09**
	14	111	**MNA3MFCC14A09**
	19	128	**MNA3MFCC19A09**
	20	138	**MNA3MFCC20A09**
	22	154	**MNA3MFCC22A09**
	24	158	**MNA3MFCC24A09**
	25	160	**MNA3MFCC25A09**



	Rotationmoment of inertia	Retainingscrew	Wrench size	Tightening torque	Centre distance	Hub length	Fit length		Inside diameter		External diameter
	J	**E**			**B**	**A**	**C**	**F**	**D1**	**D2**	**Dk**
For linear axis ...	kgcm²		mm	Nm	mm						
PAS41	0.015	M3	2.5	1.9	8.1	12	5.5	14	see order data	25	25.8
PAS42	0.15	M6	5	14	14	27	7	20		40	45
PAS43	0.55	M6	5	14	20	32	7.5	30		55	57.5
PAS44	1.22	M8	6	35	25	37	9	36		65	73

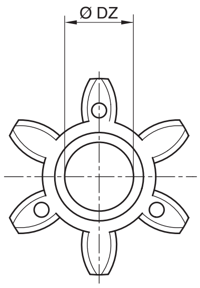
Ring gear

Order data



Description	Order number
The elastomer ring gear is a decoupling component between the hubs of a coupling module. Contents: 1 unit	
For axis...	
PAS41	**MNA3MFR09A018**
PAS42	**MNA3MFR14A034**
PAS43	**MNA3MFR20A120**
PAS44	**MNA3MFR25A320**

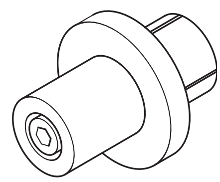
Dimensional drawings



	Shore hardness	Max. torque	Nominal torque	Rotationmoment of inertia	Diameter
		M_{max}	M_N	J	DZ
For axis ...		Nm	Nm	kgcm²	mm
PAS41	98 Sh A	18	7	0.001	9
PAS42	98 Sh A	34	17	0.013	14
PAS43	98 Sh A	120	60	0.067	20
PAS44	98 Sh A	320	160	0.150	25

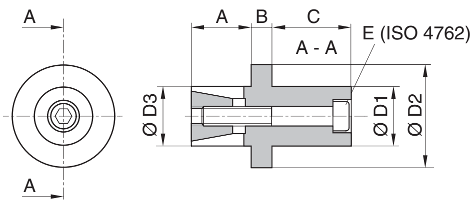
Shaft journal

Order data



Description	Order number
The shaft journal can be mounted at both ends of the toothed-belt axis end blocks. Contents: 1 unit	
For toothed-belt axis ...	
PAS41B•	**MNA3MF1S12A12**
PAS42B•	**MNA3MF1S27A20**
PAS43B•	**MNA3MF1S32A25**
PAS44B•	**MNA3MF1S37A32**

Dimensional drawings



	Max. radial force	Rotationmoment of inertia	Retainingscrew	Wrench size	Tightening torque	Fit length	Joining length	Installed length	Journal diameter	Diameter	Expanding hub
	F_R	J	E			A	B	C	D1	D2	D3
For toothed-belt axis ...	N	kgcm²		mm	Nm	mm					
PAS41B•	230	0.002	M4	3	2.9	12	5.5	14	12	17	10
PAS42B•	400	0.05	M6	5	10	27	7	20	20	35	20
PAS43B•	700	0.16	M8	6	25	32	7.5	30	25	45	25
PAS44B•	1300	0.54	M10	8	49	37	9	36	32	55	35

Definitions and technical terms

Axial section The linear axis is based on a high-rigidity precision aluminium section.

Ballscrew drive The ballscrew drive converts a rotary movement into a linear movement. It consists of the ballscrew, the nut system with circulating ball components and the balls as roller components. The ballscrew drive has a very high efficiency. This enables it to execute precise and rigid advance movements and apply high feed forces with high positioning and repeat accuracy.

Bending-critical ballscrew speed If the bending-critical ballscrew speed is exceeded, ballscrew deviations will occur with resulting oscillations. This will seriously affect the service life of the ballscrew drive. ballscrew supports are installed with longer ballscrew axes to increase the bending-critical ballscrew speed and the output.

Drive constant The drive constant shows the path of the carriage that is covered by one revolution of the axis drive.

Dynamic load rating C_{dyn} The dynamic load rating C_{dyn} (in accordance with DIN ISO 281) is the constant equivalent dynamic load P at which a larger number of equivalent rolling bearings or roller guides have 90% probability of reaching the following calculated or nominal service life under standard operating conditions:

- 106 revolutions with deep-groove ball bearings, profile running blocks, ball-screw drives
- 50 km with profile rail guideways

If the load in operation is less than the dynamic load rating C_{dyn}, the nominal service life L10 is correspondingly greater. The service life for ball roller bodies can be calculated as follows:

- L10 = (C_{dyn}/P)3 x 106 revolutions for deep-groove ball bearings, profile running blocks, ball-screw drives
- L10 = (C_{dyn}/P)3 x 50 km profile rail guideways

The service life of rolling bearings or roller guides also depends on the ambient conditions as well as the equivalent dynamic load P. Shock loads, increased component temperatures (t > 100°C) and the penetration of dirt particles will reduce the calculated service life. The influence of ambient conditions can be taken into account with various factors when calculating the service life.

Limit switch safety distance The limit switch safety distance is the distance between the limit switches and the mechanical end stop.

Modulus of elasticity The modulus of elasticity is a material quantity that describes the connection between tension and extension during deformation. The higher the values the stiffer the material.

Mounting position The linear axes can be installed in any desired position. However, note that all forces and torques must be below the maximum values of the axes.

Positioning accuracy Positioning accuracy is the tolerance between a specified position and actual end position. The positioning accuracy is influenced by changes in temperature, load and speed and the accuracy of the switching point of the reference sensors.

Repeat accuracy The repeat accuracy is the capacity to reach a previously reached position again under the same conditions. The repeat accuracy is influenced by changes in temperature, load and speed and the accuracy of the switching point of the reference sensors.

Ball guide The axial section receives the forces and torques applied to the carriage via the ball guide. High forces and torques can be received with section rail guides.

Self-locking The axes are not self-locking. This means that motors with a holding brake, a separate holding brake or suitable weight compensation for the linear axis is required, particularly when axes are vertically mounted.

Sequence accuracy The aluminium sections are extruded sections that have deviations in straightness and torsion because of the manufacturing process. The tolerance of this variation is specified in EN 12020-2. The linear unit must be tensioned on an appropriately accurately machined base to achieve the desired guideway accuracy.

Sensors Inductive proximity switches are used as sensors for limit switches or reference switches. These switches are small safety limit switches as specified by EN60204-1.

Service life The service life is the path travelled by a linear axis before the first signs of material fatigue can be seen on the guideways, the drive components and the bearings. Service life specifications (kilometres covered) are based on the nominal values in the data sheet. If these nominal values are exceeded, the service life will be reduced according to the service life curve.

Ballscrew axial play Axial play between ballscrew nut and ballscrew.

Static load rating C_0 The static load rating of rolling bearings, rolling guides and ballscrew drives is the static load that causes a lasting deformation at the point of contact with the contact surface but which does not yet degrade the function. Practical experience has shown that the static load rating C0 (according to DIN ISO 76) may amount to a value that causes the roller diameter to deform by a factor of 0.0001. Greater loads cause increased noise and lead to premature failure.

Stiffness The stiffness shows information on the capacity of part that is to be positioned to move and stop at the correct position, even under load variations.

Stroke The stroke is the path covered by the carriage between the switching points of the limit switches.

Conversion tables

Rotor inertia

	lb·in²	lb·ft²	lb·in·s²	lb·ft·s² slug·ft²	kg·cm²	kg·cm·s²	g·cm²	g·cm·s²	oz·in²	oz·in·s²
lb·in²	–	6.94×10^{-3}	2.59×10^{-3}	2.15×10^{-4}	2.926	2.98×10^{-3}	2.92×10^{3}	2.984	16	4.14×10^{-2}
lb·ft²	144	–	0.3729	3.10×10^{-2}	421.40	0.4297	4.21×10^{5}	429.71	2304	5.967
lb·in·s²	386.08	2.681	–	8.33×10^{-2}	1.129×10^{3}	1.152	1.129×10^{6}	1.152×10^{3}	6.177×10^{3}	16
lb·ft·s² slug·ft²	4.63×10^{3}	32.17	12	–	1.35×10^{4}	13.825	1.355×10^{7}	1.38×10^{4}	7.41×10^{4}	192
kg·cm²	0.3417	2.37×10^{-3}	8.85×10^{-4}	7.37×10^{-6}	–	1.019×10^{-3}	1000	1.019	5.46	1.41×10^{-2}
kg·cm·s²	335.1	2.327	0.8679	7.23×10^{-2}	980.66	–	9.8×10^{5}	1000	5.36×10^{3}	13.887
g·cm²	3.417×10^{-4}	2.37×10^{-6}	8.85×10^{-7}	7.37×10^{-8}	1×10^{-3}	1.01×10^{-6}	–	1.01×10^{-3}	5.46×10^{-3}	1.41×10^{-6}
g·cm·s²	0.335	2.32×10^{-3}	8.67×10^{-4}	7.23×10^{-5}	0.9806	1×10^{-3}	980.6	–	5.36	1.38×10^{-2}
oz·in²	0.0625	4.3×10^{-4}	1.61×10^{-6}	1.34×10^{-6}	0.182	1.86×10^{-4}	182.9	0.186	–	2.59×10^{-3}
oz·in·s²	24.3	0.1675	6.25×10^{-2}	5.20×10^{-3}	70.615	7.20×10^{-2}	7.06×10^{4}	72	386.08	–

Torque

	lb·in	lb·ft	oz·in	Nm	kg·m	kg·cm	g·cm	dyne·cm
lb·in	–	8.333×10^{-2}	16	0.113	1.152×10^{-2}	1.152	1.152×10^{3}	1.129×10^{6}
lb·ft	12	–	192	1.355	0.138	13.825	1.382×10^{4}	1.355×10^{7}
oz·in	6.25×10^{-2}	5.208×10^{-3}	–	7.061×10^{-3}	7.200×10^{-4}	7.200×10^{-2}	72.007	7.061×10^{4}
Nm	8.850	0.737	141.612	–	0.102	10.197	1.019×10^{4}	1×10^{7}
kg·m	86.796	7.233	1.388×10^{3}	9.806	–	100	1×10^{5}	9.806×10^{7}
kg·cm	0.8679	7.233×10^{-2}	13.877	9.806×10^{-2}	10^{-2}	–	1000	9.806×10^{5}
g·cm	8.679×10^{-4}	7.233×10^{-5}	1.388×10^{-2}	9.806×10^{-5}	1×10^{-5}	1×10^{-3}	–	980.665
dyne·cm	8.850×10^{-7}	7.375×10^{-8}	1.416×10^{-5}	10^{-7}	1.019×10^{-8}	1.0197×10^{-6}	1.019×10^{-6}	–

Power

	H.P.	W
H.P.	–	745.7
W	1.31×10^{-3}	–

Speed

	1/min (rpm)	rad/sec	deg./sec
1/min (rpm)	–	0.105	6.0
rad/sec	9.55	–	57.30
deg./sec	0.167	1.745×10^{-2}	–

Temperature

	°F	°C
°F	–	$(\vartheta - 32) \times {}^{5}/_{9}$
°C	ϑ ¾ ${}^{9}/_{5} + 32$	–

Length

	in	ft	yd	m	cm	mm
in	–	0.0833	0.028	0.0254	2.54	25.4
ft	12	–	0.333	0.3048	30.48	304.8
yd	36	3	–	0.914	91.44	914.4
m	39.37	3.281	1.09	–	100	1000
cm	0.3937	0.03281	1.09×10^{-2}	0.01	–	10
mm	0.03937	0.00328	1.09×10^{-3}	0.001	0.1	–

Mass

	lb	oz	slug	kg	g
lb	–	16	0.0311	0.453592	453.592
oz	6.35×10^{-2}	–	1.93×10^{-3}	0.028349	28.35
slug	32.17	514.8	–	14.5939	1.459×10^{4}
kg	2.20462	35.274	0.0685218	–	1000
g	2.205×10^{-3}	3.527×10^{-3}	6.852×10^{-5}	0.001	–

Force

	lb	oz	gf	dyne	N
lb	–	16	453.592	4.448×10^{5}	4.4482
oz	0.0625	–	28.35	2.780×10^{4}	0.27801
gf	2.205×10^{-3}	0.03527	–	980.665	N.A.
dyne	2.248×10^{-6}	3.59×10^{-6}	1.02×10^{-3}	–	0.0001
N	0.22481	3.5967	N.A.	100,000	–

Example for conversion:
Conversion of 10 inches to metres. Search for "in" (inches) in the left column of the "length" table and "m" (metres) in the header row. The table cell at the intersection of column and row shows the conversion factor: "0.0254". Multiply 10 inches by 0.0254 and the answer is the value in metres: 10 in x 0.0254 = 0.254 m.

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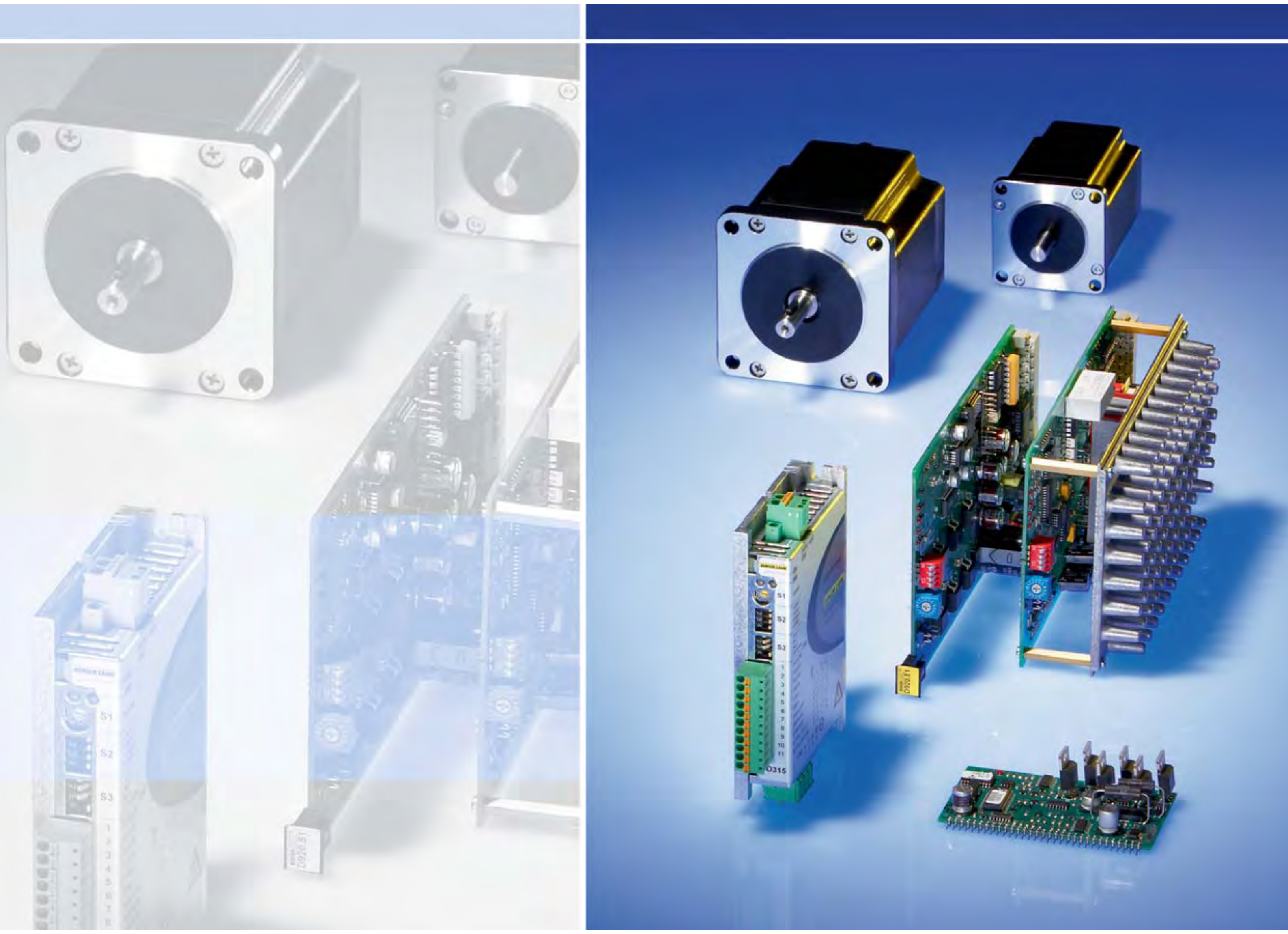
Catalogue

Stepper motor drives SD3 15, D9••



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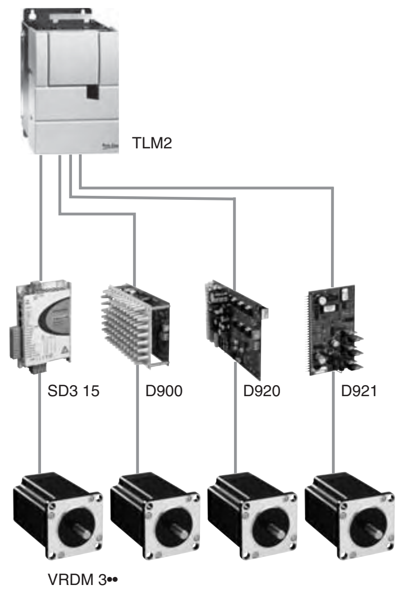


Product overview

The SD3 15 stepper motor drive and the D9•• stepper motor drive boards are suitable for all applications. Reference values are set as pulse/direction signals by a master PLC or a Berger Lahr Motion Controller (e.g. TLM2). This range of products can be used to control series VRDM 36• and VRDM 39• motors. The nominal torques of these motors range from 0.45 to 6 Nm.

Special features

Compactness
Due to their small size, the stepper motor drive boards require very little installation space.

Simplicity
Parameter switches allow for quick and easy commissioning. Commissioning software is not required.

Flexibility
Stepper motor drive boards are available as plug-in units for 19" rack mounting or a 3HU boards (D900, D920) for wall mounting or DIN rail mounting (SD3 15), as well as a power module (D921) for integration of customer-specific electronics.

Power is supplied via an external power supply unit e. g. 24 V_{DC} (D920, D921, SD3 15) or 130 V_{DC} (D900).

5 V or 24 V input signals are used to control the units.

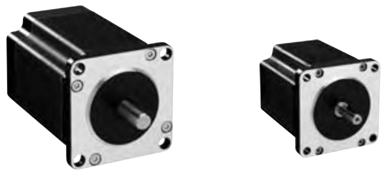
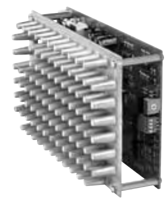
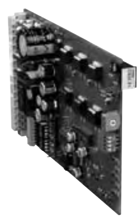
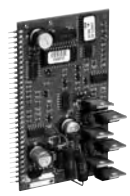
Application options

The Berger Lahr stepper motor drive have excellent constant velocity characteristics which are required for applications such as scanning or exposure.

Due to the high torque at low speeds, the stepper motor drive is particularly suited for short-distance positioning.

Another advantage is its high holding torque at standstill. This allows for the highly economic implementation of automation tasks such as "pick and place".

Assignment of stepper motors, stepper motor drives SD3 15 and D9••

3-phase stepper motors		SD3 15	D900	D920	D921
Power supply		24 … 48 V_{DC}, max. 10 A	80 … 140 V_{DC}, max. 4 A	18 … 40 V_{DC}, max. 6 A	18 … 40 V_{DC}, max. 5 A
					
Motors with H winding					
VRDM 364 / 50L H	Nm	0.51 / 0.45 [1)]		0.51/ 0.45	0.51/ 0.45
VRDM 366 / 50L H	Nm	1.02 / 0.90		1.02 / 0.90	1.02 / 0.90
VRDM 368 / 50L H	Nm	1.70 / 1.50		1.70 / 1.50	1.70 / 1.50
VRDM 397 / 50L H	Nm	2.26 / 2.00		1.92 / 1.70	1.92 / 1.70
VRDM 3910 / 50L H	Nm	4.80 / 4.00		4.18 / 3.70	4.18 / 3.70
VRDM 3913 / 50L H	Nm	6.50 / 5.75		5.65 / 5.00	
Motors with N winding					
VRDM 366 / 50L N	Nm		1.02 / 0.90		
VRDM 368 / 50L N	Nm		1.70 / 1.50		
VRDM 397 / 50L N	Nm		2.26 / 2.00		
VRDM 3910 / 50L N	Nm		4.52 / 4.00		
VRDM 3913 / 50L N	Nm		6.78 / 6.00		

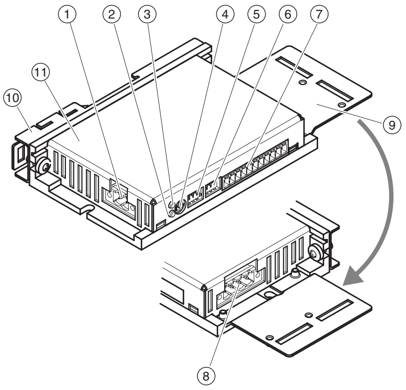
1) The 1st value is the holding torque M_H when the stepper motor is at a standstill, the 2nd value is the nominal torque M_N when the motor is in operation.

Stepper motor drive SD3 15

Product description

The SD3 15 stepper motor drive is used to control 3-phase stepper motors with H windings: VRDM36…LH and VRDM39…LH.

Device overview



(1) Power supply CN1
(2) LED1 (green)
(3) LED2 (red)
(4) Rotary switch S1 for adjustment of the current reduction
(5) Parameter switch S2
(6) Parameter switch S3
(7) Signal interface CN2
(8) Motor connection CN3
(9) EMC mounting plate (accessories)
(10) DIN rail adapter (accessories)
(11) Nameplate with quick reference

Power supply CN1

Power is supplied via connection CN1. The supply voltage VDC is at the same time the control voltage.

The control voltage supply unit at the drive system has no inrush current limitation. If the voltage is applied via contacts, these may be destroyed.

Signal interface CN2

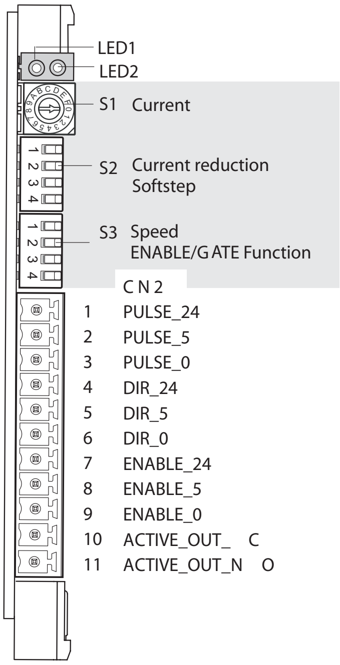
The reference position of the stepper motor is preset as a pulse signal by a controller via the CN2 signal interface. One pulse corresponds to one step of the motor.
In addition, the following functions can be activated via input signals:

- Enable/disable power amplifier or pulses
- Direction of rotation left/right
- Increase/decrease number of steps by a factor of 10
- Change motor current

An electronic relay contact reports operating readiness. All input signals can be supplied as 5 V or 24 V signals via optocouplers.

Motor connection CN3

Motor lines U, V and W and the shield connection are connected to motor connection CN3.

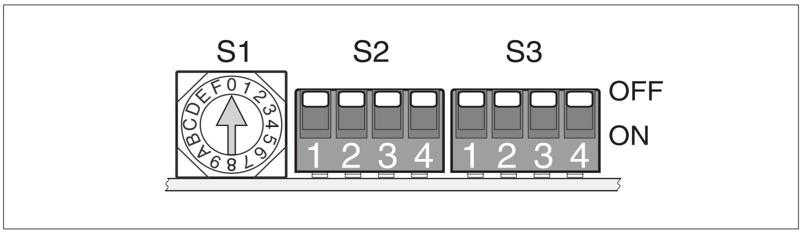


Functions

Parameterisation

The following functions can be activated via the parameter switch of the SD3 15:

- Motor phase current
- Steps per revolution
- Current reduction during standstill
- "Softstep"
- Type of release ("ENABLE" or "GATE")



Parameter switches

Setting motor phase current

The motor phase current is set with rotary switch S1. The set value should correspond to the nominal motor current I_N, see motor nameplate. A low motor phase current produces a low torque.

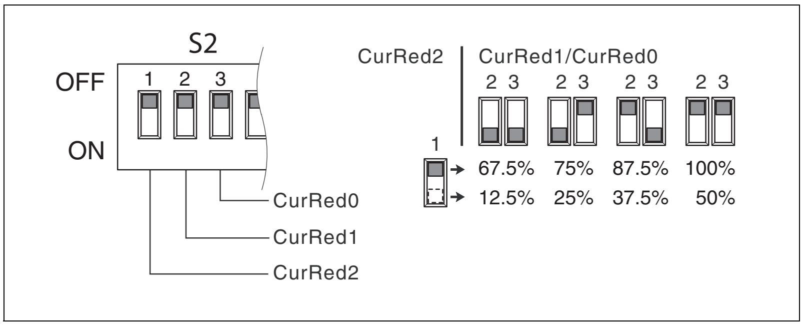
Adjustments with rotary switch S1

Switch setting S1	Motor phase current in A
0 (factory setting)	3
1	3.7
2	4.4
3	4.8
4	5.2
5	5.5
6	5.8
7	6.2
8	6.6
9	7
A	7.5
B	8
C	8.5
D	9
E	9.5
F	10

Setting current reduction

If the full holding torque is not required at standstill, the "current reduction" function can be used to reduce the holding torque. Motor and electronics heat up less and the efficiency is improved.
When the last pulse edge has been received, the motor phase current is reduced to the percentage value set with parameter switch S2.

Adjustments with parameter switch S2



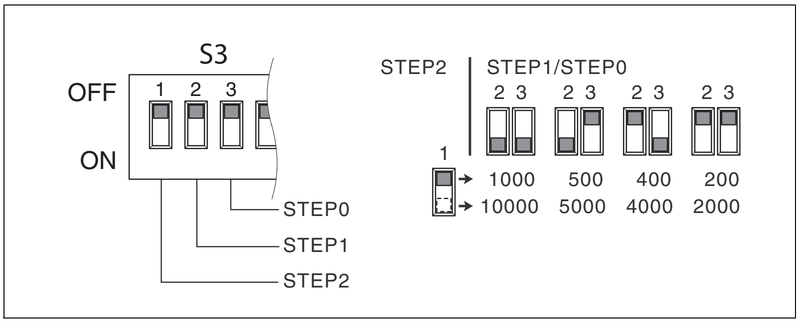
Setting current reduction

Setting steps per revolution

The resolution of the stepper motor drive is set via the number of steps.

Example:
At a number of steps of 1000 and at 1000 pulses, the stepper motor drive turns the motor exactly one complete revolution. At a pulse frequency of 1 kHz this results in a speed of 60 1/min.

Adjustments with parameter switch S3
Number of steps: 200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000 per revolution



Setting steps per revolution

Activating the "Softstep" function

If the "Softstep" function is activated, the reference value is internally set to a higher resolution. The motor then runs much more smoothly, in particular at low speeds or sudden changes in the reference value
The motor accelerates and decelerates virtually without jerking. The transitions are smoothed, i.e. the motor can follow the reference values much more easily with fast changes of frequency.

Adjustments with parameter switch S2.4
Activate/deactivate "Softstep" function

Setting release type

The release type can be set with parameter switch S3.4.

Switch setting S3.4	Description
OFF (factory setting)	"ENABLE" function Activating and deactivating the power amplifier
ON	"GATE" function Enable or disable reference values

Signal inputs and outputs

All signal inputs are available as a 5 V or 24 V optocoupler inputs.

ENABLE signal input

Signal input ENABLE activates or deactivates the power amplifier.
In addition, an error message is reset with a rising edge.

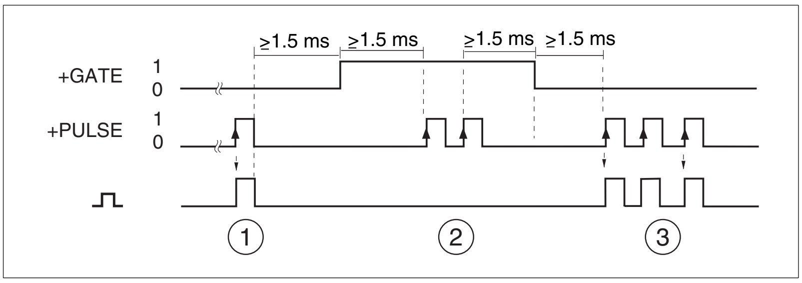
Signal value	Description
Rising edge	Activate power amplifier
Falling edge	Deactivate power amplifier and reset error message

If no error condition is present, signal output ACTIVE_OUT signals readiness for operation approx. 500 ms after activation of the power amplifier .

GATE signal input

Signal input GATE blocks the signals at the signal interface without disabling the operating readiness. In a multi-axis system, you can select individual axes via GATE.

Signal value	Description
Rising edge	Block signals
Falling edge	Enable signals



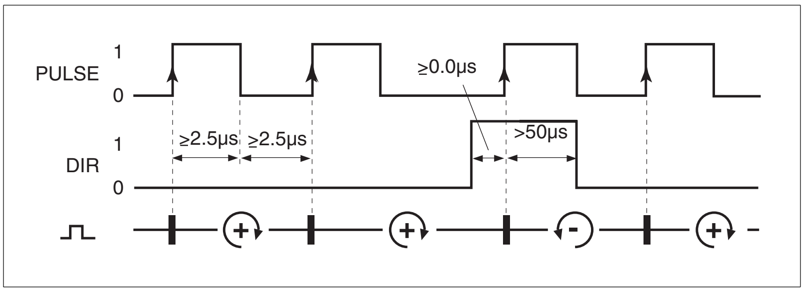
Signal sequences in case of activation via GATE

(1) Motor step
(2) No motor steps
(3) Motor steps

No pulse may be applied for 1.5 ms before and after the GATE signal changes to ensure that the drive can follow the preset pulse step by step.

PULSE/DIR signal input

The motor executes a motor step with the rising edge of the PULSE signal. The direction of rotation is controlled by the DIR signal.



"PULSE/DIR" interface mode

Signal	Signal value	Description
PULSE	Rising edge	Motor step
DIR	0 level 1 level	Positive rotation Negative rotation

The maximum frequency is 200 Hz.

ACTIVE_OUT signal output

The signal output ACTIVE_OUT indicates operating readiness.

Signal value	Description
Open	Power amplifier deactivated, motor without current
Closed	Power amplifier activated, motor has current

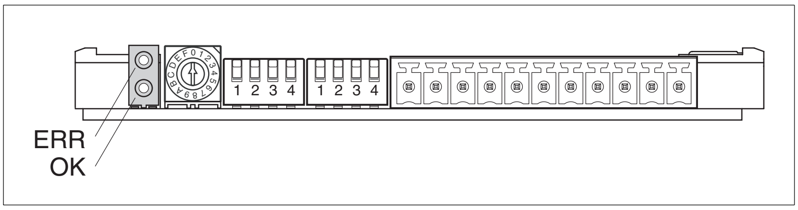
Monitoring functions

The monitoring functions are provided to protect the equipment. These monitoring functions are not designed to protect personnel.

The following errors and limit values can be monitored:

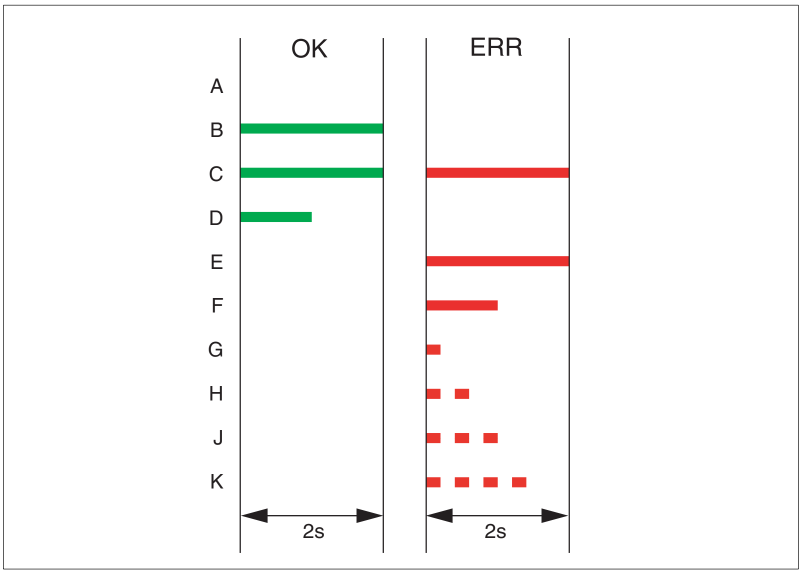
Monitoring	Task	Protective function
Overvoltage and undervoltage	Monitoring for overvoltage and undervoltage of the power supply	Functional safety and device protection
Overtemperature	Monitoring device for overtemperature	Device protection
Short circuit	Monitoring for short circuits between the motor phases	Device protection

Status display



Status display via LEDs

The LEDs display the current operating status.



Flash codes of LED OK and LED ERR

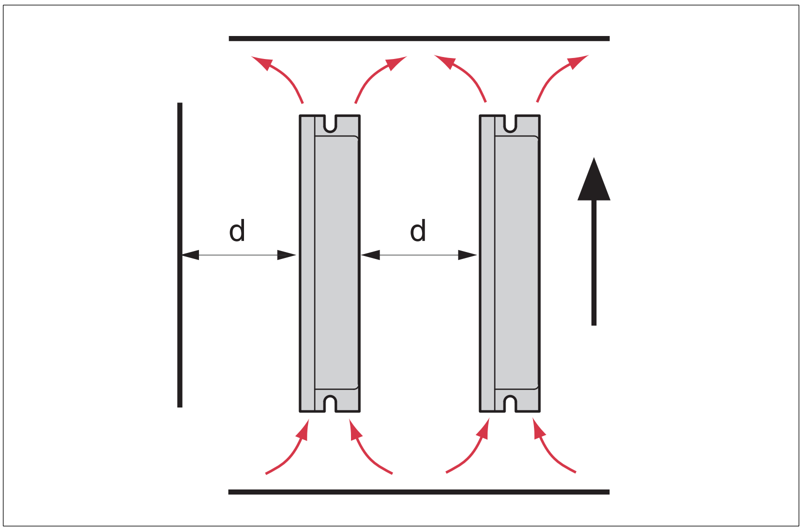
(A) No power supply.
(B) Power amplifier is activated.
(C) Reserved
(D) Power amplifier is deactivated.
(E) Reserved
(F) Power amplifier overtemperature
(G) Overvoltage, also in case of regeneration conditions.
(H) Undervoltage
(J) Reference signal frequency too high
(K) Short circuit between two motor phases.

Mounting and installation

Mounting distances and ventilation

When selecting the position of the device in the control cabinet, note the following instructions:

- Adequate cooling of the device must be ensured by complying with the minimum installation distances. Prevent heat accumulation.
- The device must not be installed close to heat sources or mounted on flammable materials.
- The warm airflow from other devices and components must not heat the air used for cooling the device.
- The drive will switch off as a result of overtemperature when operated above the thermal limits.



Installation distances and air circulation

The specified continuous current is applicable if the following distances are maintained and the device is installed vertically.

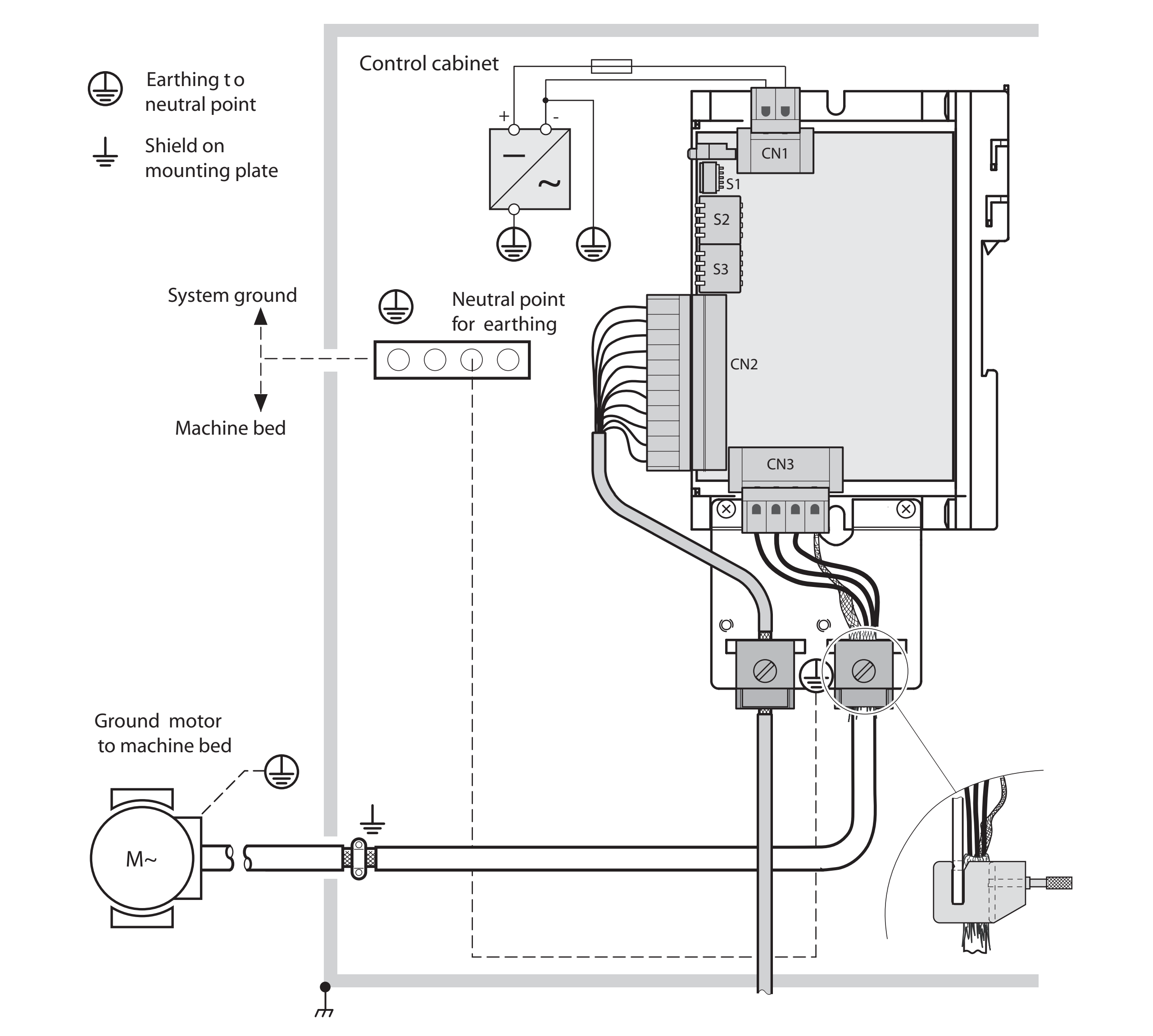
- At least 10mm of free space is required in front of the device.
- At least 50 mm of free space is required above the device.
- For "d" ist mindestens 30 mm Freiraum einzuhalten.
- At least 200mm of free space is required below the to ensure that cables can be routed without excessive bending.

If other components are installed in these areas, the possible continuous current is reduced.
The SD3 15 stepper motor drive meets the EMC requirements for the second environment as per IEC 61800-3.
An EMC-compliant design is required to maintain the specified limit values, see documentation.

EMC-compliant installation

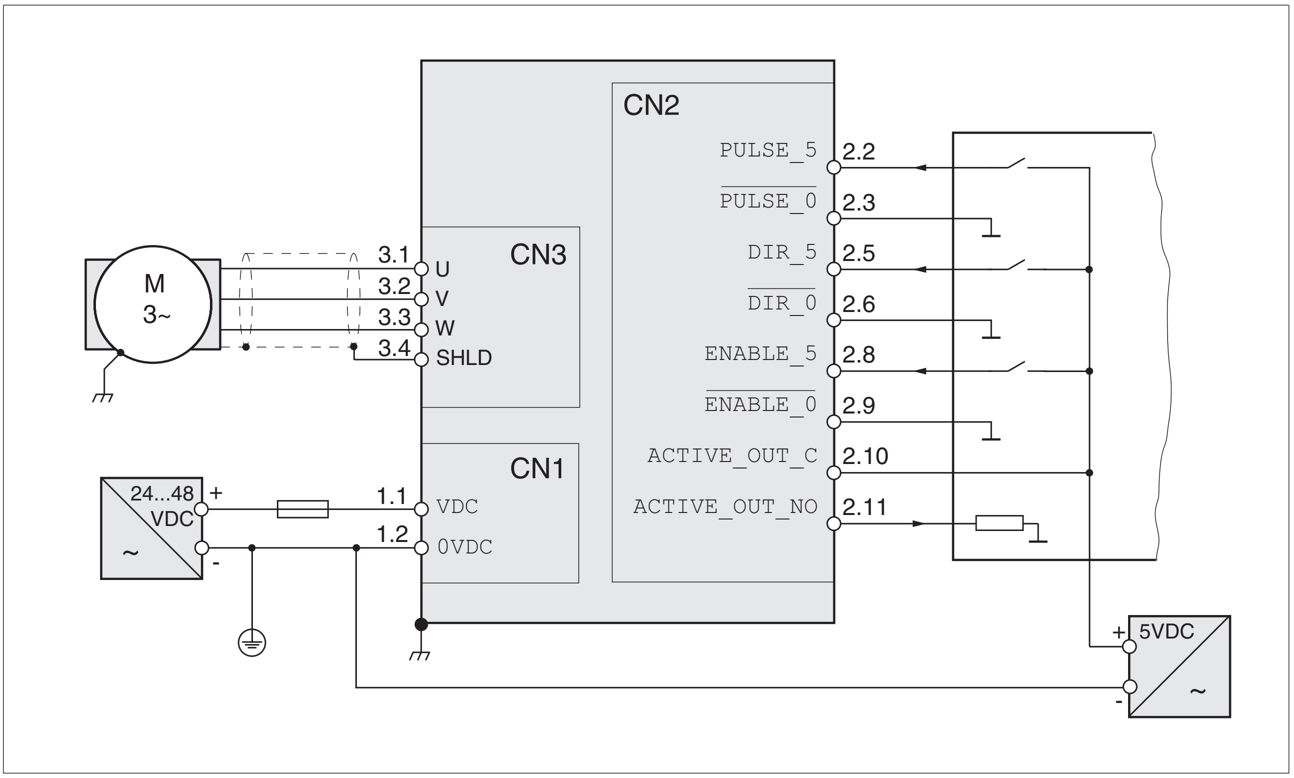
The SD3 15 stepper motor drive meets the EMC requirements for the second environment as per IEC 61800-3.
An EMC-compliant design is required to maintain the specified limit values, see documentation.

EMC measures for the SD3 15 stepper motor drive

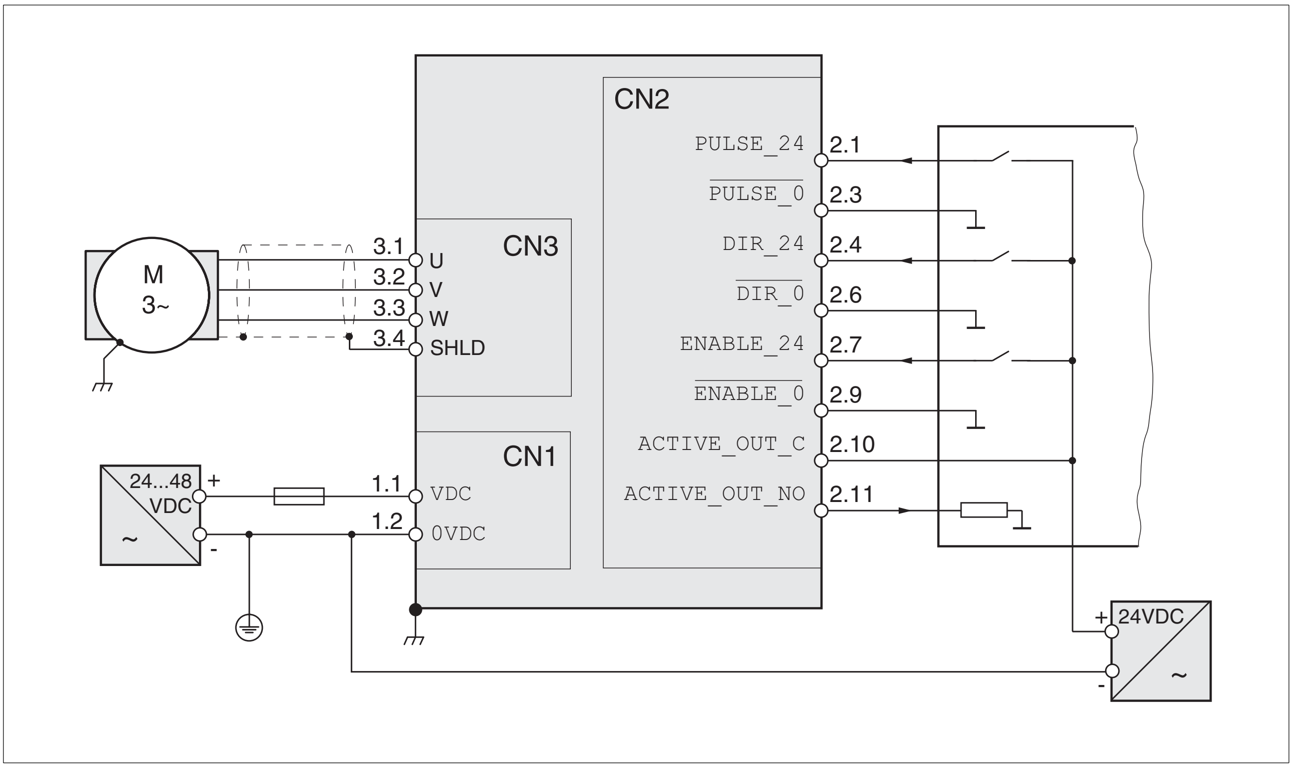


EMC measures

Wiring examples



Wiring example with 5 V



Wiring example with 24 V

Technical data

Mechanical data

		SD3 15
Dimensions (W x H x D)	mm	74.5 x 117 x 23.5
Weight	kg	0.25
Type of cooling		Free convection

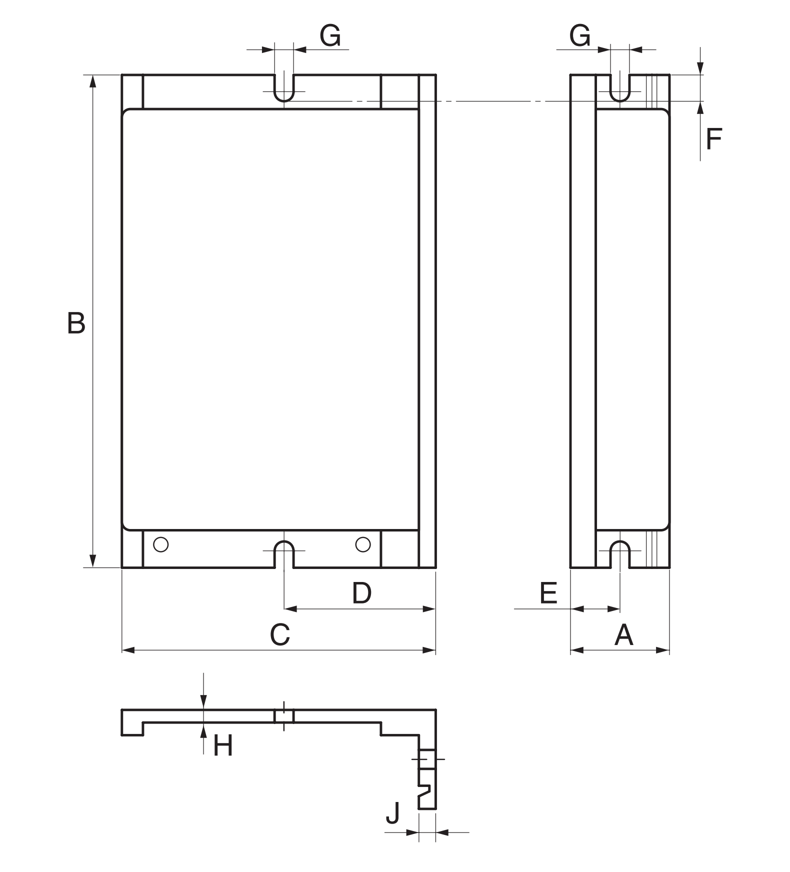
Electrical data

Power supply at CN1		**SD3 15**
Supply voltage	V_{DC}	24 … 48
Limit values	V_{DC}	19.2 … 60
Max. current consumption	A	7.5
Residual ripple	%	<5
Power loss	W	<7
Fuse, external	A	<10
Signal interface CN2		
5 V optocoupler input signals		
• Logic 1 (U_{high})	V	+2.5 ... +5.25
• Logic 0 (U_{low})	V	≤0.4
• Input current	mA	≤25
• Max. input frequency	kHz	≤200
24 V optocoupler input signals		
• Logic 1 (U_{high})	V	+15 ... +30
• Logic 0 (U_{low})	V	≤5
• Input current	mA	≤7
• Max. input frequency	kHz	≤200
Signal output "Readiness"		Electronic relay
• Max. switching voltage	V_{DC}	≤30
• Max. switching current	mA	≤200
• Voltage drop at 50 mA load	V	≤1
Motor connection at CN3		
Max. motor phase current	A_{pk}	14
	A_{rms}	10
Number of phases		3

Ambient conditions

Operating / ambient temperature	°C	0 ... +50%, no icing allowed
Transport and storage temperature	°C	-25 ... +70
Pollution degree		2
Relative humidity	%	5 ... 85%, no condensation allowed
Installation height above mean sea level for 100% power	m	< 1000
Installation height	m	<2000 at max. Ambient temperature 40 °C, set up with gap at side of >20 mm
Oscillation and vibration		As per IEC/EN 60068-2-6
	mm	1.5; sine 3 ... 13 Hz
	m/s^2	10; sine 13 ... 150 Hz
Shock loading		As per IEC/EN 60068-2-27
	m/s^2	150; half-sine 11 ms
Degree of protection		IP 20

Dimensional drawings

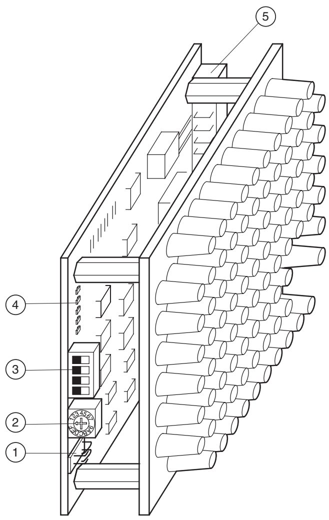


Dimensions SD3 15

A	mm	23.5
B	mm	117
C	mm	74.5
D	mm	36
E	mm	11.75
F	mm	6.25
G	mm	4.5
H	mm	3
J	mm	4

Order number

Type	Order number
SD3 15D N10 B4 00	**0062050003001**



D900 stepper motor drive board

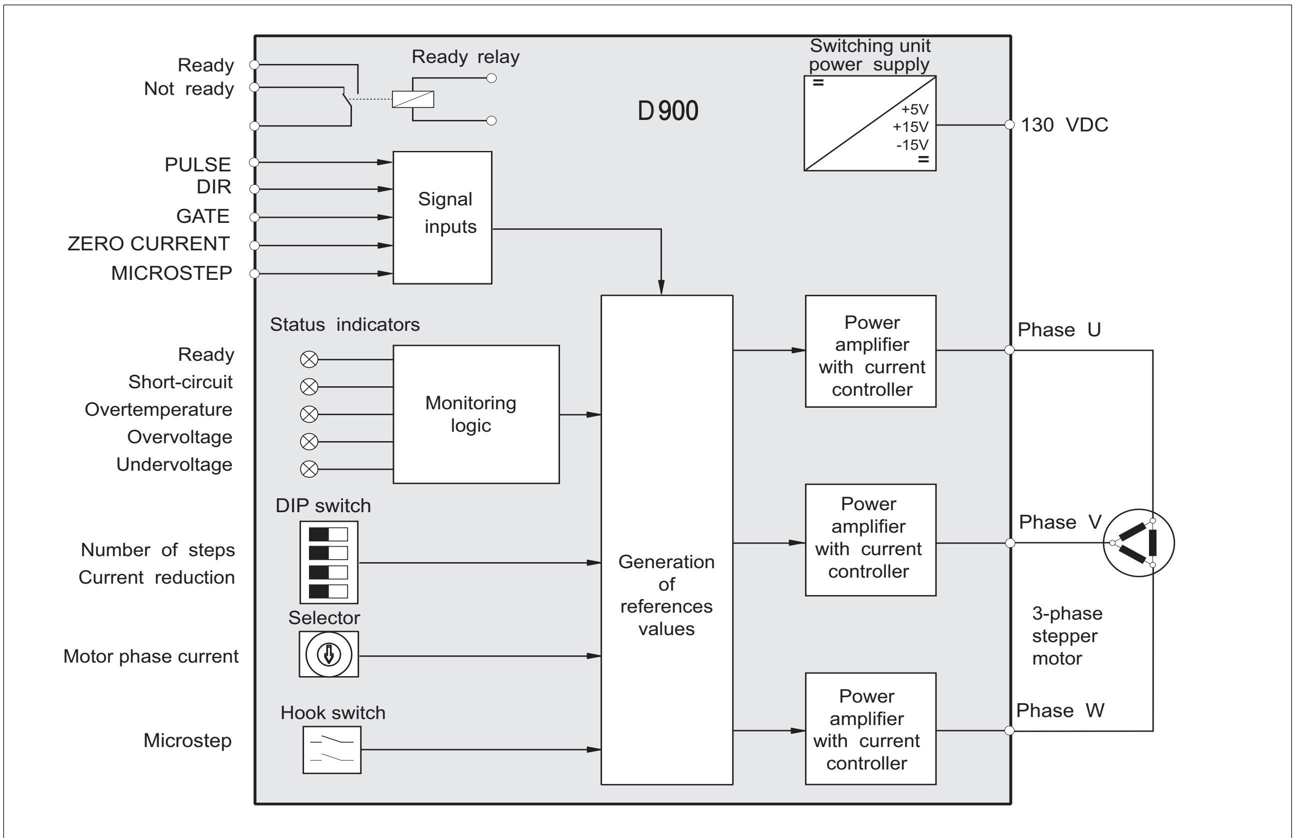
Product description

The D900 stepper motor drive board is used to control 3-phase stepper motors with N windings: VRDM 36...LN and VRDM 39...LN.

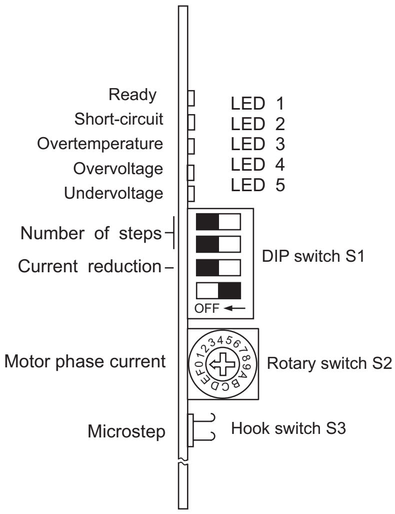
This board is available in two versions:
- D 900.50 (control with 24 V)
- D 900.51 (control with 5 V)

Device overview

(1) Hook switch for setting the "Microstep" function
(2) Parameter switch for setting the motor phase current
(3) Parameter switch for setting the number of steps and the current reduction
(4) 5 LEDs
(5) Plug-in unit 19" rack mounting housing (3HU)



Block diagram D900



Functions

Parameterisation

The following functions can be set via the parameter switches of the stepper motor drive board:

- Motor phase current
- Steps per revolution
- Current reduction during standstill
- "Microstep"

Setting motor phase current

The motor phase current is set with rotary switch S2. The set value should correspond to the nominal motor current I_N, see motor nameplate. A low motor phase current produces a low torque.

Adjustments with rotary switch S2

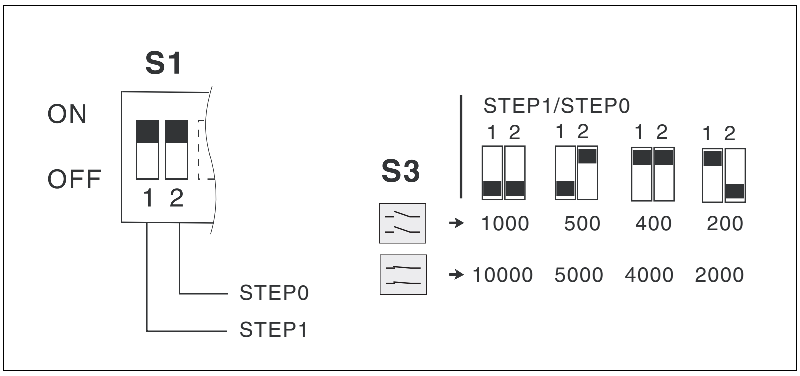
Switch position S2	Motor phase current in A
0 (factory setting)	1.35
1	1.65
2	1.90
3	2.20
4	2.45
5	2.75
6	3.00
7	3.30
8	3.60
9	3.90
A	4.15
B	4.40
C	4.70
D	5.00
E	5.20
F	5.50

Setting steps per revolution

The resolution of the stepper motor drive is set via the step number.

Example:
With a step number of 1000, the stepper motor drive performs exactly one revolution for 1000 pulses. With a pulse frequency of 1 kHz, the result is therefore a speed of rotation of 60 1/min.

Adjustments with parameter switches S1 and S3
Number of steps: 200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000 per revolution



Setting steps per revolution

The setting of hook switch S3 can be inverted via the input signal MICROSTEP. This increases or decreases the number of steps by a factor of 10.

Activating the current reduction

If the full holding torque is not required at standstill, the "current reduction" function can be used to reduce the holding torque. Motor and electronics heat up less and the efficiency is improved.
The motor phase current is reduced to approximately 60% of the set current value after the last pulse edge was received.

Adjustments with parameter switch S1.3
Activate/deactivate current reduction

Activating the "Microstep" function

The "Microstep" function can be activated in two ways. Mechanically via hook switch S3 and digitally via the input signal at the MICROSTEP signal input.

Activating the "Microstep" function increases the resolution and the number of motor steps by a factor of 10.

Adjustments with hook switch S3
Activate/deactivate "Microstep" function

Signal inputs and outputs

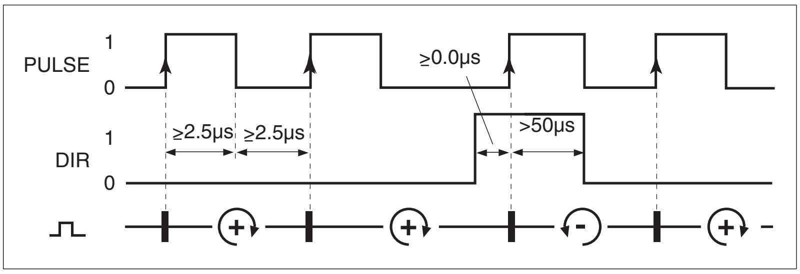
PULSE signal input

In order to generate a rotary movement of the motor shaft, square pulses must be supplied at the pulse input. Each positive pulse edge triggers one motor step when the gate input is without current.
The direction of rotation is controlled by the DIR input.

DIR signal input

When the DIR signal input is currentless, the motor turns clockwise, viewed from the front onto the motor shaft. If the signal input is live, the motor runs anticlockwise.
It is possible to invert the direction of rotation by changing two motor phases.

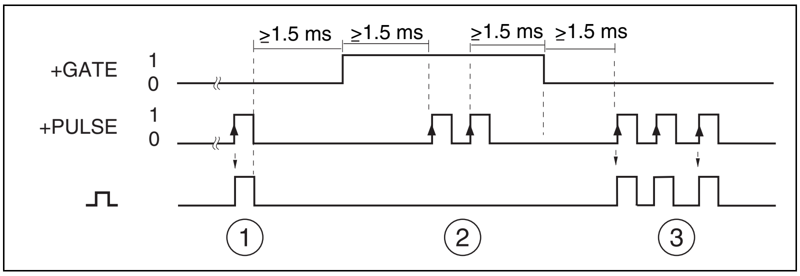
PULSE/DIR interface mode
The motor executes an angular step with the rising edge of the `PULSE` signal. The direction of rotation is controlled by the `DIR` signal. The pulse maximum frequency is 200 kHz.



PULSE/DIR interface mode

GATE signal input

The "GATE" function blocks the pulses at the reference value input without switching off the operating readiness. In a multi-axis system, individual axes can be selected with the "Gate" function.



Signal sequences in case of activation via the "GATE" function

(1) Motor step
(2) No motor steps
(3) Motor steps

MICROSTEP signal input

The "MICROSTEP" function is selected via the `MICROSTEP` signal input or with the hook switch S3. The time sequence of the `MICROSTEP` signal input and that of the `GATE` signal input are the same.

ZERO CURRENT signal input

When the signal input is live, the motor phase current is switched off. At a standstill, the motor has no holding torque.

Signal output

If the board is working correctly, the operating readiness contact is closed and the ready for operation LED lights up.

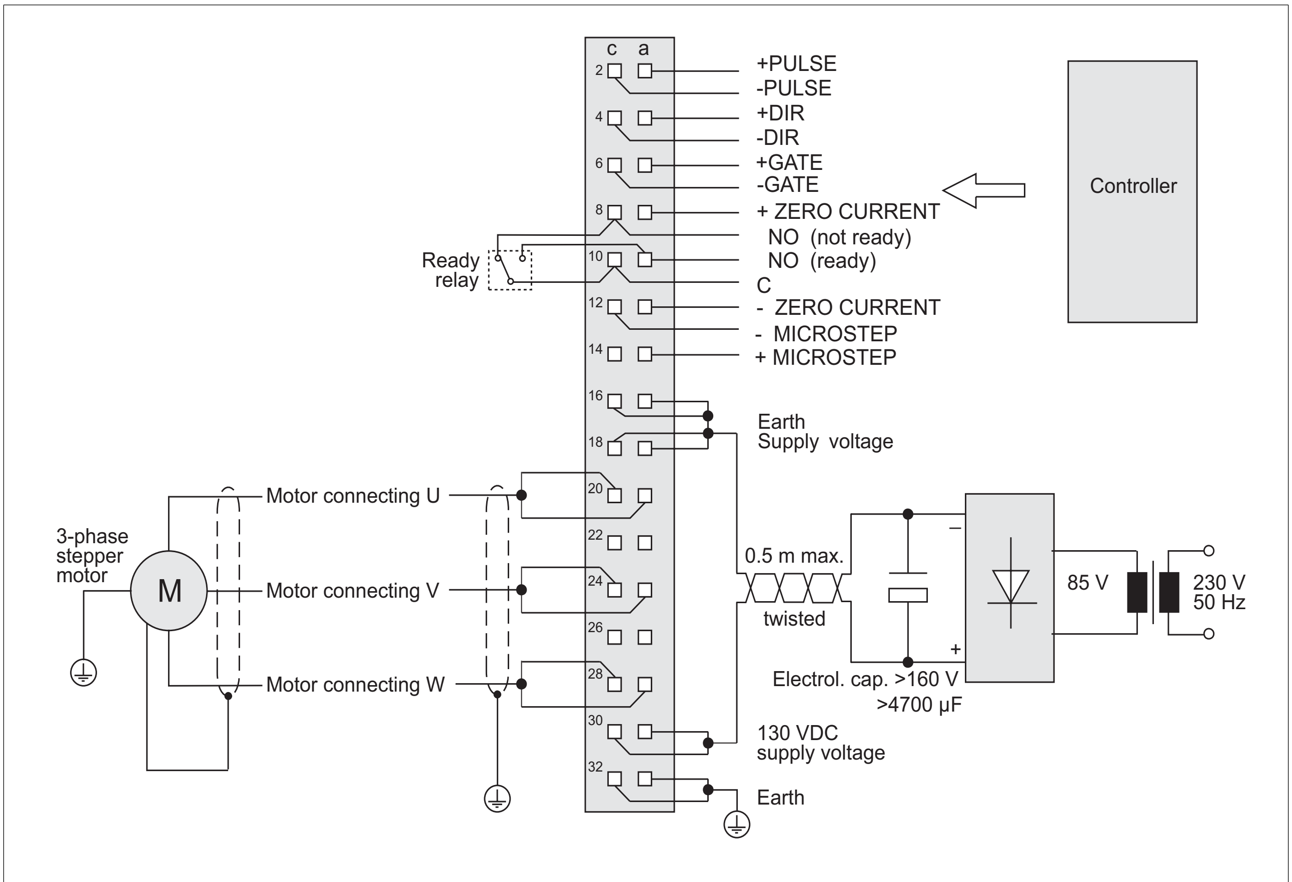
Status display LED

The five LEDs on the board show the operating status and any malfunctions.

LED 1: Readiness
LED 2: Short circuit
LED 3: Overtemperature
LED 4: Overvoltage
LED 5: Undervoltage

Mounting and installation

The board is mounted in a 19" rack mounting housing (3HU). When mounting the board, make sure to keep a distance of at least 5 cm between the board and the housing wall or the next board. The board can be ventilated longitudinally or transversely.



Wiring example D900

Technical data

Mechanical data

Dimensions (W x H x D)	mm	100 x 160 x 51
Weight	kg	0.5

Electrical data

Power supply			
Supply voltage	V_{DC}	80 … 140	
Max. current consumption	A	4	
Max. power loss	W	40	
Max. length supply cable, twisted	m	5	
Motor connection			
Motor phase current	A	1.35 … 5.5	
Motor voltage	V	3 x 130	
Motor cable as per EN 60204			
• Max. length	m	50	
• Cross section at cable length ≤ 30m	mm^2	0.75	
• Cross section at cable length > 30m	mm^2	≥1.5	
• Shield connection		at both ends	
Signal connection [1]		**D900.50**	**D900.51**
Voltage control			
• Logic 1 (U_{high})	V	2.5 ... +5.25 [2]	20 … 30
• Logic 0 (U_{low})	V	+0.4 … -5.25	-3 … +3
• Input current	mA	≤30	≤20
Current control			
• Logic 1 (I_{high})	mA	+7 ... +25	+7 ... +15
• Logic 0 (I_{low})	mA	+0.2 … -25	+0.2 ... -15
• Input voltage	V	≤5.25	≤30
Input resistance	Ω	150	2000
Max. input frequency	kHz	≤200	
`Readiness` signal output		Electronic relay (resistive load)	
• Max. switching voltage	V_{DC}	≤36	
• Switching current	mA	10 ... 200	

1) The PULSE, DIR, GATE, ZERO CURRENT, MICROSTEP signal inputs are optocoupled and protected against reverse polarity

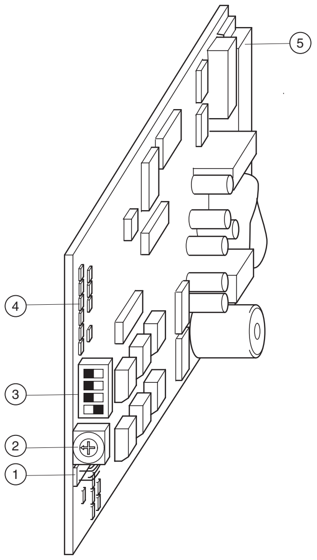
2) Pulse signal voltage 3.5 V to 5.25 V for pulse duration/pulse pause <10 µs

Ambient conditions

Operating / ambient temperature	°C	0 ... +50%, no icing allowed
Transport and storage temperature	°C	-25 ... +70
Pollution degree		2
Relative humidity	%	5 ... 85%, no condensation allowed
Installation height above mean sea level for 100% power	m	< 1000
Installation height	m	<2000 at max. ambient temperature 40 °C, set up with gap at side of >20 mm
Oscillation and vibration		As per IEC/EN 60068-2-6
	mm	1.5; sine 3 ... 13 Hz
	m/s^2	10; sine 13 ... 150 Hz
Shock loading		As per IEC/EN 60068-2-27
	m/s^2	150; half-sine 11 ms
Degree of protection		IP 00

Order numbers

Type	Order number
D900.50 (24 V signal voltage)	**0062010900503**
D900.51 (5 V signal voltage)	**0062010900513**



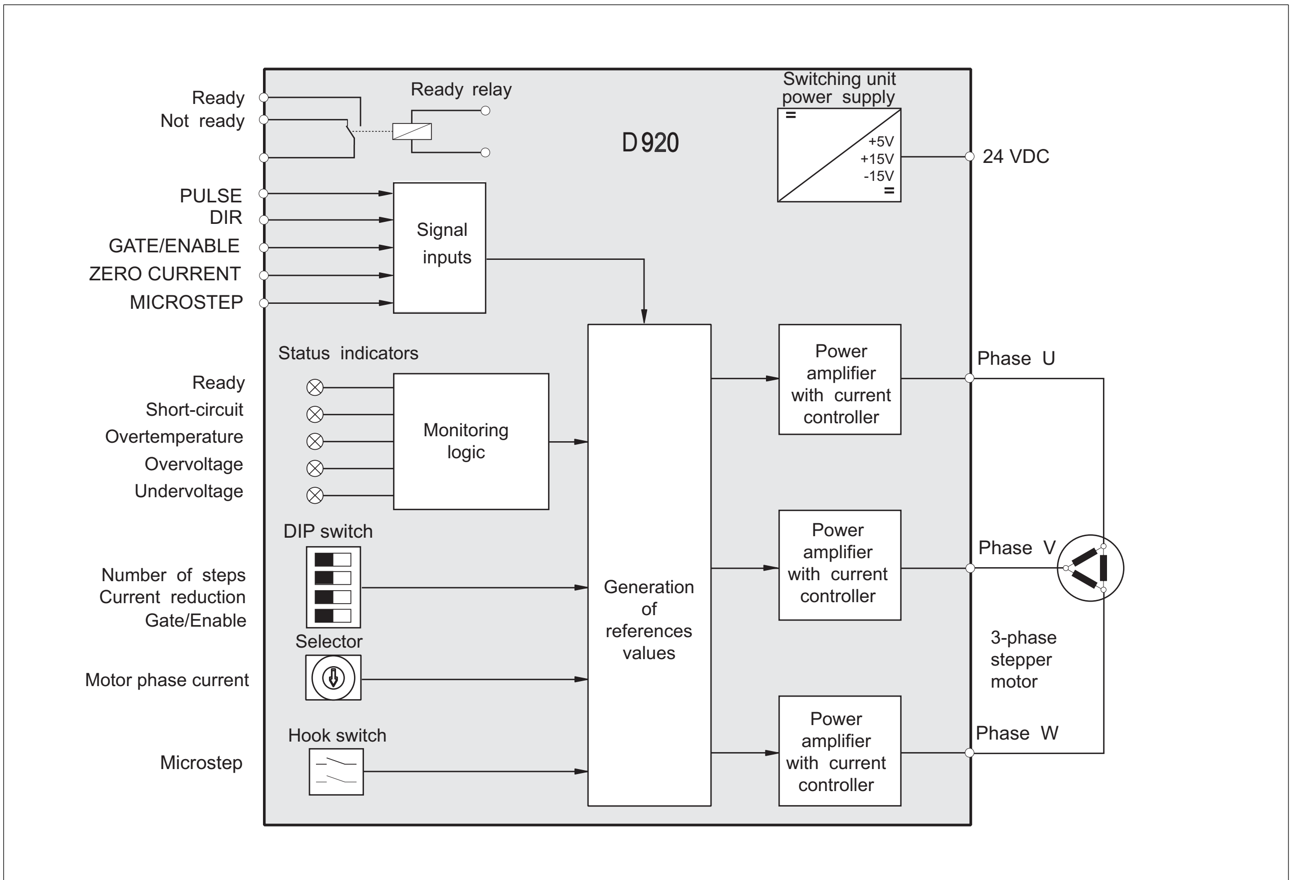
D920 stepper motor drive board

Product Description

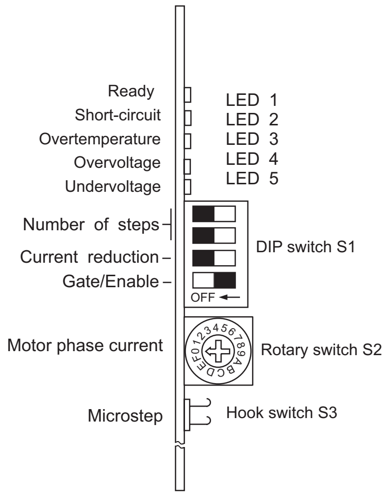
The D920 stepper motor drive board is used to control 3-phase stepper motors with H windings: VRDM 36...LH and VRDM 39...LH.

Device overview

(1) Hook switch for setting the Microstep
(2) Parameter switch for setting the motor phase current
(3) Parameter switch for setting the number of steps and the current reduction
(4) 5 LEDs
(5) Plug-in unit 19" rack mounting housing (3HU)



Block diagram D920



Functions

Parameterisation

The following functions can be set via the parameter switches of the stepper motor drive board:

- Motor phase current
- Steps per revolution
- Current reduction during standstill
- "Microstep"

Setting motor phase current

The motor phase current is set with rotary switch S2. The set value should correspond to the nominal motor current I_N, see motor nameplate. A low motor phase current produces a low torque.

Adjustments with rotary switch S2

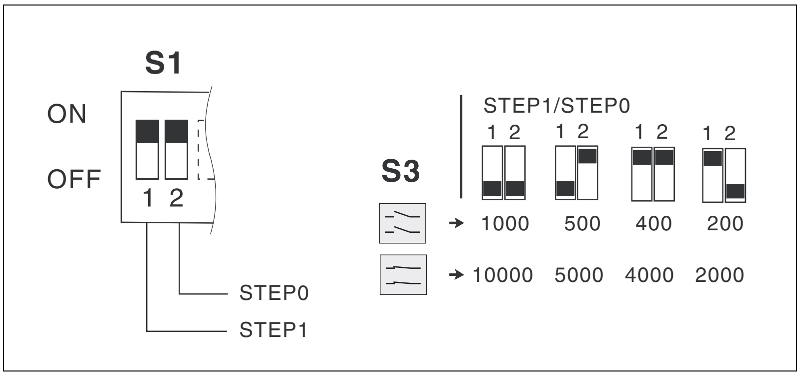
Switch position S2	Motor phase current in A
0 (factory setting)	1.45
1	1.75
2	2.05
3	2.30
4	2.60
5	2.90
6	3.20
7	3.50
8	3.75
9	4.05
A	4.35
B	4.60
C	4.90
D	5.20
E	5.50
F	5.80

Setting steps per revolution

The resolution of the stepper motor drive is set via the step number.

Example:
With a step number of 1000, the stepper motor drive performs exactly one revolution for 1000 pulses. With a pulse frequency of 1 kHz, the result is therefore a speed of rotation of 60 1/min.

Adjustments with parameter switches S1 and S3
Number of steps: 200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000 per revolution



Setting steps per revolution

The setting of hook switch S3 can be inverted via the input signal MICROSTEP. This increases or decreases the number of steps by a factor of 10.

Activating the current reduction

If the full holding torque is not required at standstill, the "current reduction" function can be used to reduce the holding torque. Motor and electronics heat up less and the efficiency is improved.
The motor phase current is reduced to approximately 60% of the set current value after the last pulse edge was received.

Adjustments with parameter switch S1.3
Activate/deactivate current reduction

Activating the "Microstep" function

The "Microstep" function can be activated in two ways. Mechanically via hook switch S3 and digitally via the input signal at the MICROSTEP signal input.

Activating the "Microstep" function increases the resolution and the number of motor steps by a factor of 10.

Adjustments with hook switch S3
Activate/deactivate "Microstep" function

Signal inputs and outputs

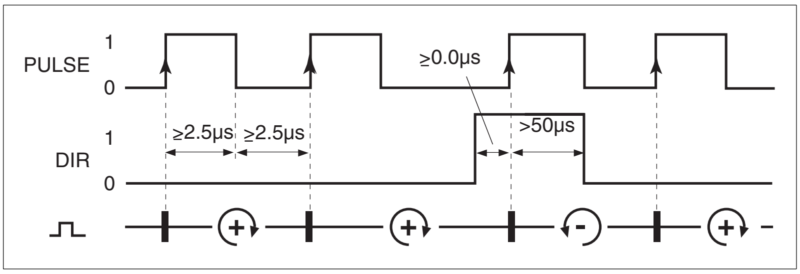
PULSE signal input

In order to generate a rotary movement of the motor shaft, square pulses must be supplied at the pulse input. Each positive pulse edge triggers one motor step when the gate input is without current.
The direction of rotation is controlled by the DIR input.

DIR signal input

When the DIR signal input is currentless, the motor turns clockwise, viewed from the front onto the motor shaft. If the signal input is live, the motor runs anticlockwise.
It is possible to invert the direction of rotation by changing two motor phases.

PULSE/DIR interface mode
The motor executes an angular step with the rising edge of the PULSE signal. The direction of rotation is controlled by the DIR signal. The pulse maximum frequency is 200 kHz.



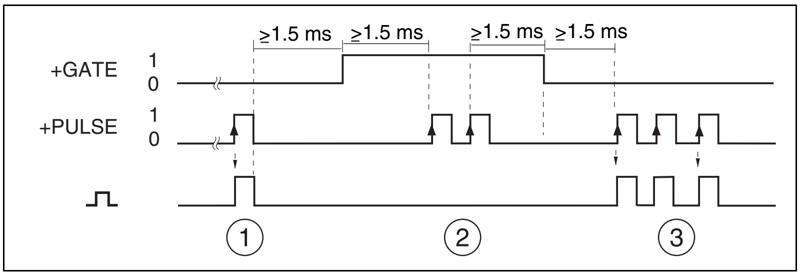
PULSE/DIR interface mode

ENABLE signal input

The ENABLE function enables the power amplifier to allow control of the motor.

GATE signal input

The "GATE" function blocks the pulses at the reference value input without switching off the operating readiness. In a multi-axis system, individual axes can be selected with the "Gate" function.



Signal sequences in case of activation via the "GATE" function

(1) Motor step
(2) No motor steps
(3) Motor steps

MICROSTEP signal input

The "MICROSTEP" function is selected via the MICROSTEP signal input or with the hook switch S3. The time sequence of the MICROSTEP signal input and that of the GATE signal input are the same.

ZERO CURRENT signal input

When the signal input is live, the motor phase current is switched off. At a standstill, the motor has no holding torque.

Signal output

If the board is working correctly, the operating readiness contact is closed and the ready for operation LED lights up.

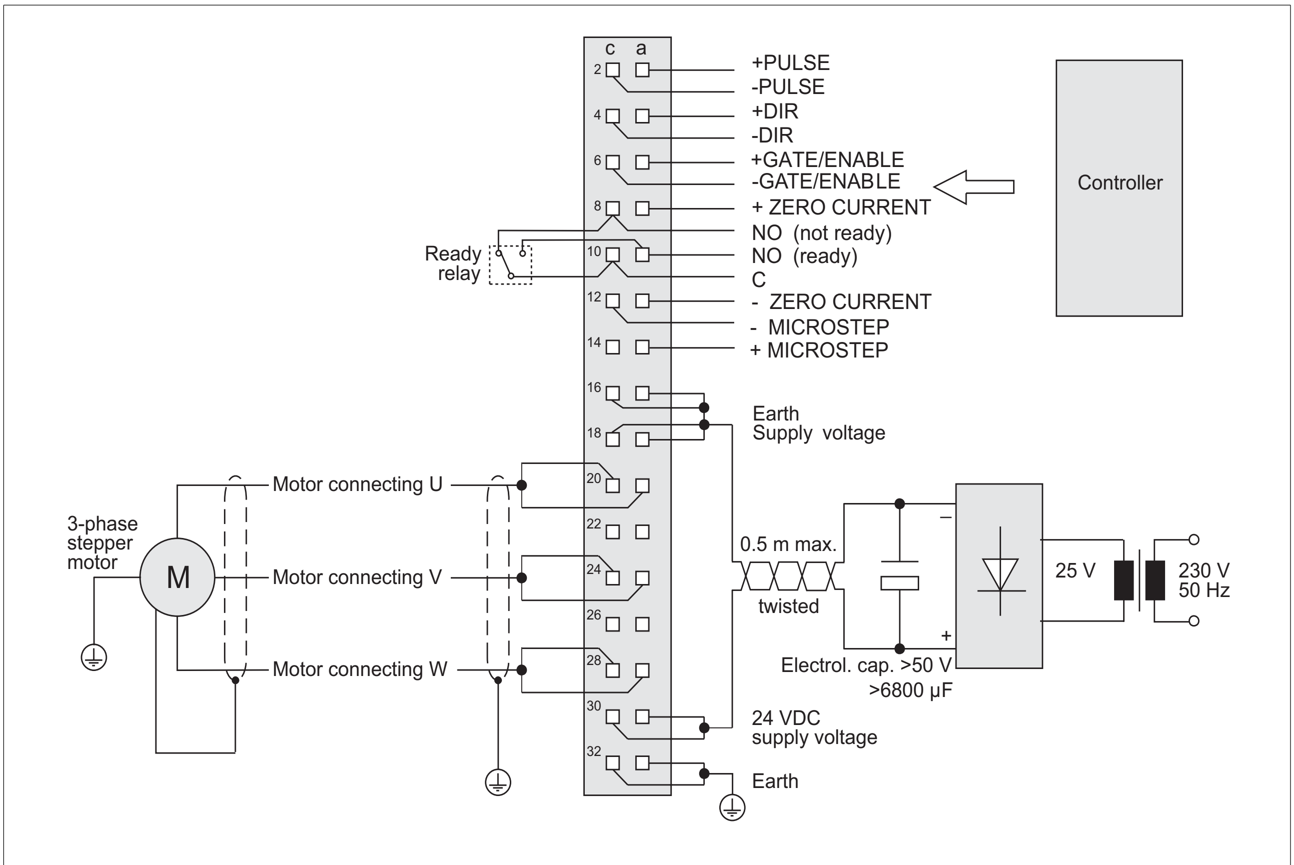
Status display LED

The five LEDs on the board show the operating status and any malfunctions.

LED 1: Readiness
LED 2: Short circuit
LED 3: Overtemperature
LED 4: Overvoltage
LED 5: Undervoltage

Mounting and installation

The board is mounted in a 19" rack mounting housing (3HU). When mounting the board, make sure to keep a distance of at least 5 cm between the board and the housing wall or the next board. The board can be ventilated longitudinally or transversely.



Wiring example

Technical data

Mechanical data

Dimensions (W x H x D)	mm	100 x 160 x 51
Weight	kg	0.15

Electrical data

Power supply			
Supply voltage	V_{DC}	18 … 40	
Max. current consumption	A	6	
Max. power loss	W	20	
Max. length supply cable, twisted	m	5	
Motor connection			
Motor phase current	A	1.45 … 5.8	
Motor voltage	V	3 x 24	
Motor cable as per EN 60204			
• Max. length	m	50	
• Cross section at cable length ≤ 30m	mm^2	1.5	
• Capacitance per 100 m	nF	10	
• Shield connection		at both ends	
Signal connection [1]		**D920.50**	**D920.51**
Voltage control			
• Logic 1 (U_{high})	V	2.5 ... +5.25 [2]	20 … 30
• Logic 0 (U_{low})	V	+0.4 … -5.25	-3 … +3
• Input current	mA	≤30	≤20
Current control			
• Logic 1 (I_{high})	mA	+7 ... +25	+7 ... +15
• Logic 0 (I_{low})	mA	+0.2 … -25	+0.2 … -15
• Input voltage	V	≤5.25	≤30
Input resistance	Ω	150	2000
Max. input frequency	kHz	≤200	
`Readiness` signal output		Electronic relay (resistive load)	
• Max. switching voltage	V_{DC}	≤36	
• Switching current	mA	10 ... 200	

[1] The PULSE, DIR, GATE, ZERO CURRENT, MICROSTEP signal inputs are optocoupled and protected against reverse polarity

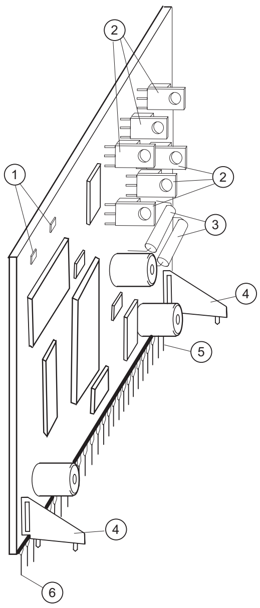
[2] Pulse signal voltage 3.5 V to 5.25 V for pulse duration/pulse pause <10 µs

Ambient conditions

Operating / ambient temperature	°C	0 ... +50%, no icing allowed
Transport and storage temperature	°C	-25 ... +70
Pollution degree		2
Relative humidity	%	5 ... 85%, no condensation allowed
Installation height above mean sea level for 100% power	m	< 1000
Installation height	m	<2000 at max. ambient temperature 40 °C, set up with gap at side of >20 mm
Oscillation and vibration		As per IEC/EN 60068-2-6
	mm	1.5; sine 3 ... 13 Hz
	m/s^2	10; sine 13 ... 150 Hz
Shock loading		As per IEC/EN 60068-2-27
	m/s^2	150; half-sine 11 ms
Degree of protection		IP 00

Order numbers

Type	Order number
D920.50 (24 V signal voltage)	**0062010920503**
D920.51 (5 V signal voltage)	**0062010920513**



D921 stepper motor drive board

Product description

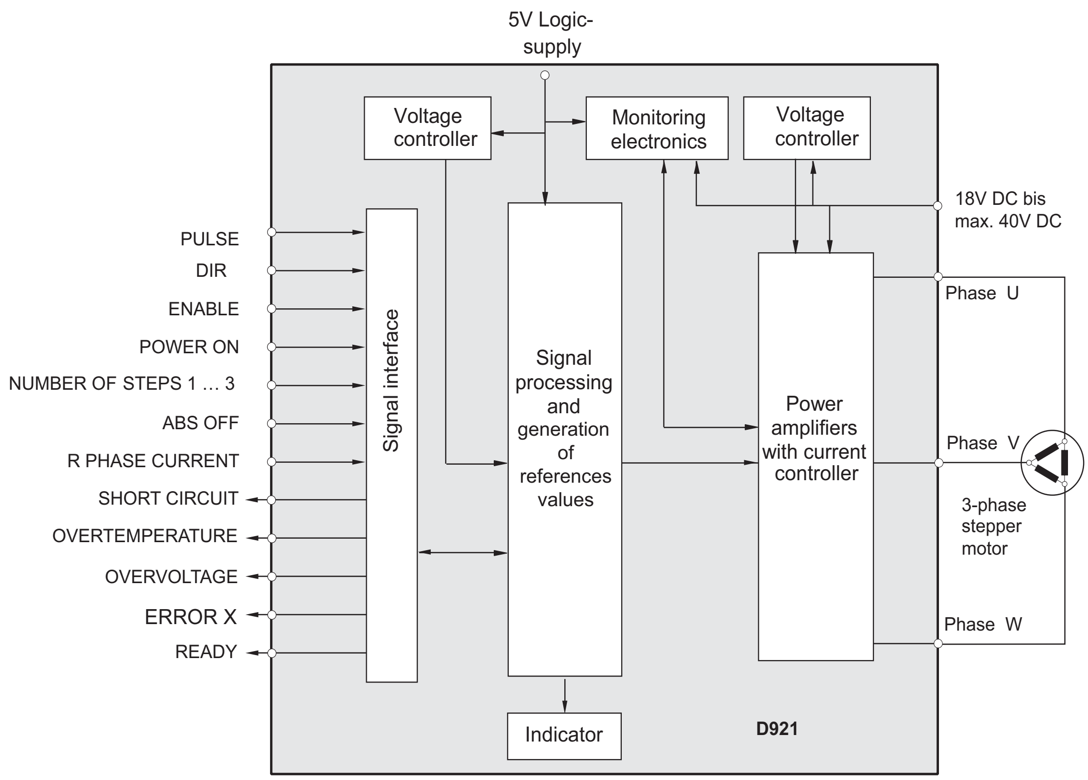
The D921 stepper motor drive board is used to control 3-phase stepper motors with H windings: VRDM 36…LH and VRDM 39…LH. It is installed in a customer-specific electronic system as a power module.

The D921 stepper motor drive board is available in two versions:

- with angled connecting pins, without fastening bracket
- with straight connecting pins and fastening bracket

Device overview

(1) LED
(2) Power transistors
(3) Power resistors
(4) Fastening brackets for solder mounting
(5) Pin 31
(6) Pin 1



Block diagram D921

Functions

Parameterisation

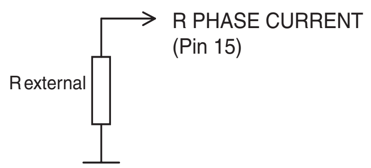
The following functions can be set via the inputs of the stepper motor drive board:

- Motor phase current
- Steps per revolution
- Automatic current reduction function

Setting motor phase current

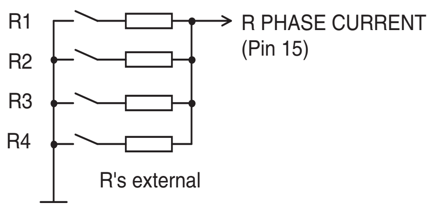
To set the motor phase current, a resistor must be earthed at the input R PHASE CURRENT. Alternatively, a resistor network consisting of 4 resistors can be used. This allows the nominal motor current to be adjusted in 16 steps. The set value should correspond to the nominal motor current I_N, see motor nameplate. A low motor phase current produces a low torque.

Wiring suggestion 1



Resistor circuit for 16 current settings:

External resistor in kΩ	Motor phase current in A
0	1.45
330	1.75
165	2.05
110	2.30
82.5	2.60
66	2.90
55	3.20
47	3.50
41.2	3.75
36.6	4.05
33	4.35
30	4.60
27.5	4.90
25.4	5.20
23.5	5.50
22	5.80



Wiring suggestion 2

Resistor circuit an external resistor network consisting of four resistors. With the selected resistors, the motor phase current can be set in 16 steps using a hexadecimal switch.

R1 (330 kΩ)	R2 (165 kΩ)	R3 (82.5 kΩ)	R4 (41.2 kΩ)	Motor phase current in A
0	0	0	0	1.45
1	0	0	0	1.75
0	1	0	0	2.05
1	1	0	0	2.30
0	0	1	0	2.60
1	0	1	0	2.90
0	1	1	0	3.20
1	1	1	0	3.50
0	0	0	1	3.75
1	0	0	1	4.05
0	1	0	1	4.35
1	1	0	1	4.60
0	0	1	1	4.90
1	0	1	1	5.20
0	1	1	1	5.50
1	1	1	1	5.80

Setting steps per revolution

The resolution of the stepper motor drive is set via the step number.

Example:
With a step number of 1000, the stepper motor drive performs exactly one revolution for 1000 pulses. With a pulse frequency of 1 kHz, the result is therefore a speed of rotation of 60 1/min.

Adjustments via the three signal inputs `NUMBER OF STEPS 1 … 3`
Number of steps: 200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000 per revolution

Resolution	NUMBER OF STEPS 1	NUMBER OF STEPS 2	NUMBER OF STEPS 3
200	0	0	0
400	1	0	0
500	0	1	0
1000	1	1	0
2000	0	0	1
4000	1	0	1
5000	0	1	1
10000	1	1	1

Activating motor phase current reduction at standstill

If the full holding torque is not required at standstill, the "current reduction" function can be used to reduce the holding torque. Motor and electronics heat up less and the efficiency is improved.
The motor phase current is reduced to approximately 60% of the set current value after the last pulse edge was received.

Adjustments with the signal input `ABS OFF`
Activate/deactivate current reduction

Signal inputs and outputs

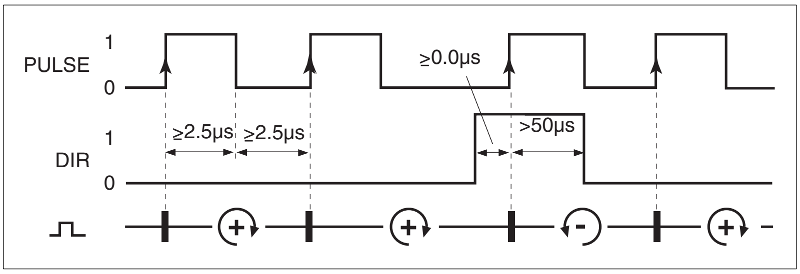
`PULSE` signal input

In order to generate a rotary movement of the motor shaft, square pulses must be supplied at the pulse input. Each positive pulse edge triggers one motor step when the gate input is without current.
The direction of rotation is controlled by the DIR input.

`DIR` signal input

When the DIR signal input is currentless, the motor turns clockwise, viewed from the front onto the motor shaft. If the signal input is live, the motor runs anticlockwise.
It is possible to invert the direction of rotation by changing two motor phases.

PULSE/DIR interface mode
The motor executes an angular step with the rising edge of the `PULSE` signal. The direction of rotation is controlled by the `DIR` signal. The pulse maximum frequency is 200 kHz.



PULSE/DIR interface mode

`ENABLE` signal input

The ENABLE function enables the power amplifier to allow control of the motor.

`POWER ON` signal input

The power amplifier is enabled (signal =1) or blocked (signal = 0) via the signal input `POWER ON`. When the power amplifier is blocked, the motor current is switched off. The motor no longer has a holding torque.
This status is not displayed. The stepper motor drive board remains ready for operation.

Signal outputs

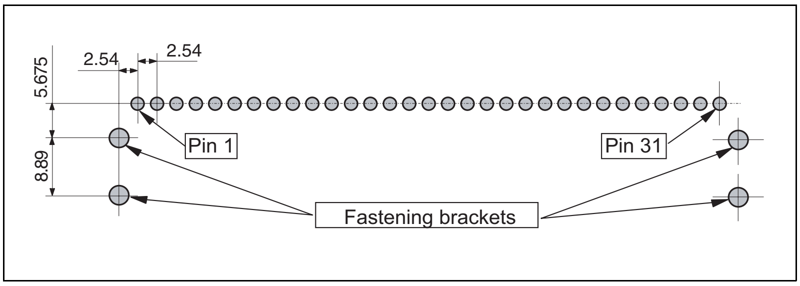
The signals for malfunctions and operating readiness are provided at the signal outputs `SHORT CIRCUIT`, `OVERTEMPERATURE`, `OVERVOLTAGE`, `ERROR X` and `READY`.

Mounting and installation

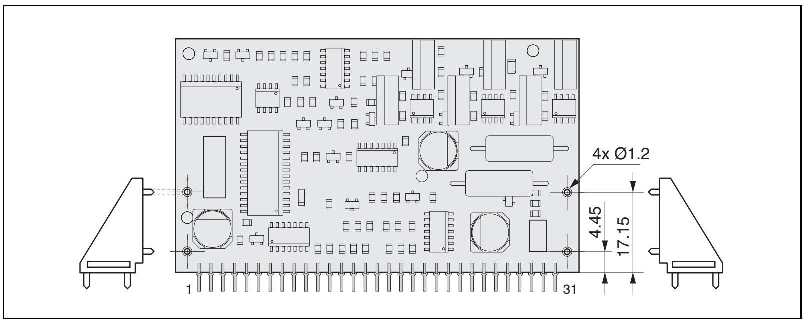
The D921 stepper motor drive board is available in two versions:
- with angled connecting pins, without fastening bracket
- with straight connecting pins, with fastening bracket

The two fastening brackets supplied are soldered onto the board. This supports the board laterally. Then the board is soldered onto the printed circuit board. The right angle (at Pin 31) serves as an additional heat sink and is connected to supply potential (18 ... 40 V).

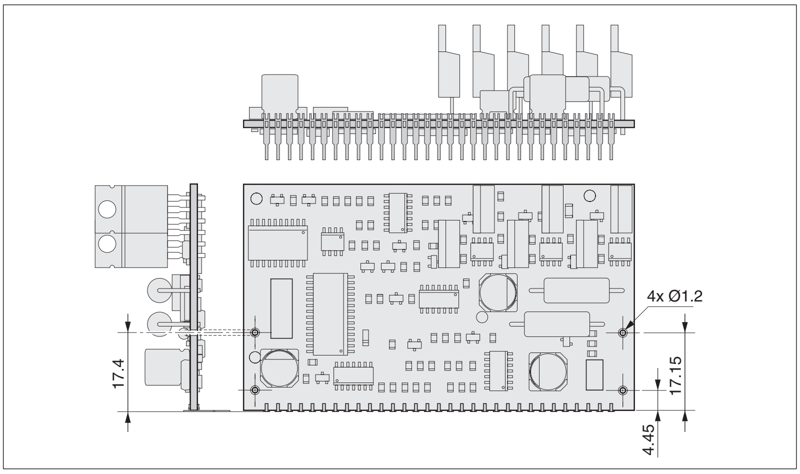
Soldered contacts		
Pin grid dimensions	mm	2.54
Contacts		31 pins
Diameter of holes for solder pins (31 holes)	mm	0.9 +0.15
Diameter of holes for bracket	mm	1.3 +0.15



D921 board with solder contacts

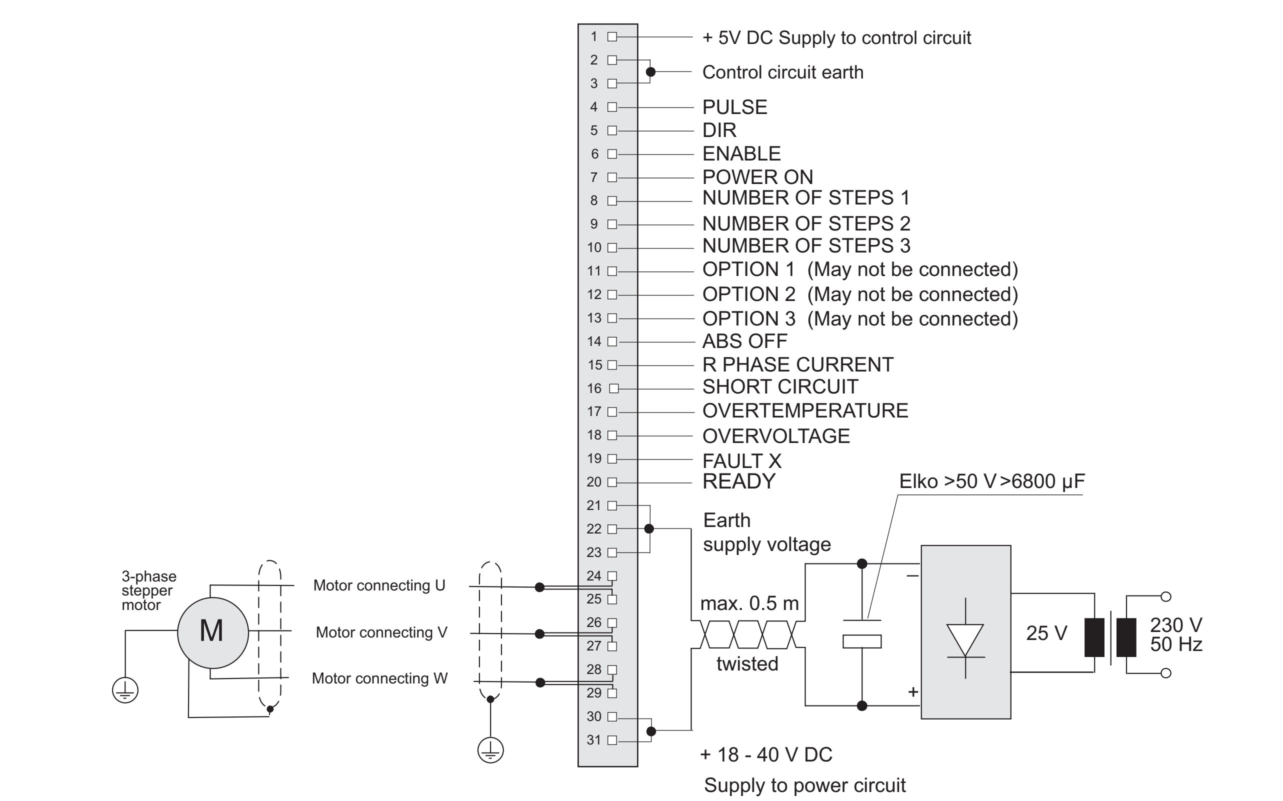


D921 with straight connecting pins (for mounting with fastening brackets)



D921 with angled connecting pins (for mounting without fastening brackets)

Wiring example



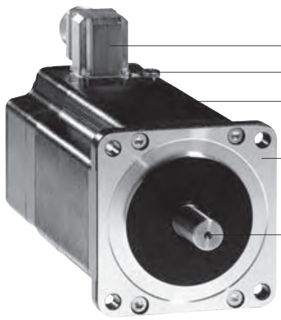
Wiring example D921

Technical data

Mechanical data		
Dimensions (W x H x D)	mm	86.5 x 52 x 23
Weight	g	45
Electrical data		
Power circuit		
Supply voltage	V_{DC}	18 … 40
Max. ripple	V_{SS}	3.6
Max. current consumption	A	5
Max. power loss	W	15
External fuse		10 A slow-blow
Control circuit		
Supply voltage	V	5 ± 5%
Residual ripple	mV_{SS}	20
Max. current consumption	A	0.1
CMOS inputs: `PULSE`, `DIR`, `ENABLE`, `POWER ON`, `STEP NUMBER` 1 ... 3		
Max. signal voltage	V	5.25
`PULSE`		
• $U_{high\ min.}$	V	2.1
• $U_{low\ max.}$	V	0.5
`DIR`, `ENABLE`, `POWER ON`, `STEP NUMBER 1 … 3`		
• $U_{high\ min.}$	V	2.0
• $U_{low\ max.}$	V	0.8
CMOS outputs: `SHORT CIRCUIT`, `OVERTEMPERATURE`, `OVERVOLTAGE`, `ERROR X`, `READY`		
Max. output current	A	±0.004
• $U_{high\ min.}$	V	3.5
• $U_{low\ max.}$	V	0.8
FET input: ABS OFF		
Max. signal voltage	V	10
• $U_{high\ min.}$	V	6.5
• $U_{low\ max.}$	V	0.8
OP input: R PHASE CURRENT		
Min. external resistance	kΩ	22
• $R_{min.}$	kΩ	6.5
• $R_{max.}$		as high as required
Motor connection		
Motor phase current (operation)	A	1.45 … 5.8
Motor phase current (standstill)	A_{DC}	≤8.2
Motor chopper voltage	V	≤40
Motor cable as per EN 60204		
Max. length	m	10
Cross section	mm^2	1.5
• Capacitance per 100 m	nF	10
Shield connection		at both ends
Ambient conditions		
Operating / ambient temperature	°C	0 ... +50%, no icing allowed
Transport and storage temperature	°C	-25 ... +70
Pollution degree		2
Relative humidity	%	5 ... 85%, no condensation allowed
Installation height above mean sea level for 100% power	m	< 1000
Installation height	m	<2000 at max. ambient temperature 40 °C, set up with gap at side of >20 mm
Oscillation and vibration		As per IEC/EN 60068-2-6
	mm	1.5; sine 3 ... 13 Hz
	m/s^2	10; sine 13 ... 150 Hz
Shock loading		As per IEC/EN 60068-2-27
	m/s^2	150; half-sine 11 ms
Degree of protection		IP 00

Order numbers

Type	Order number
D921.00 with straight connecting pins	**0062010921006**
D921.01 with angled connecting pins	**0062010921016**



Product offer

The 3-phase stepper motors from Berger Lahr are extremely robust, maintenance-free motors. They carry out precise step-by-step movements that are controlled by a stepper motor drive. A stepper motor drive system consists of a stepper motor and the matching stepper motor drive. Maximum performance can only be obtained if motor and electronics are perfectly tuned to each other.

The 3-phase stepper motors can be operated at very high resolutions depending on the stepper motor drive.

Options such as rotation monitoring and holding brake as well as robust, low-play planetary gears extend the application options.

Special features

Quiet
As a result of the sine commutation and the special mechanical design of the motors, the stepper motors are very quiet and run virtually without resonance.

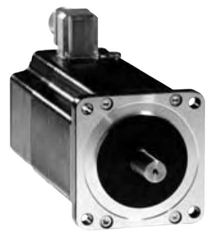
Strong
The optimised internal geometry of the motor ensures a high power density;

Flexible
With a flexible modular system and modern variant management, a wide variety of motor types can be manufactured and delivered in a very short time.

Structure

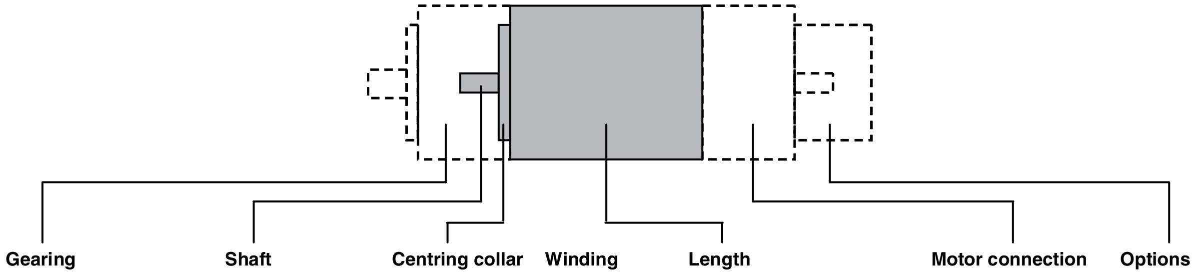
(1) Motor connection, here a version with an angular connector
(2) Additional terminal for protective conductor
(3) Housing, with black protective coating
(4) Axial flange with four mounting points as per DIN 42918
(5) Smooth shaft end as per DIN 42918

Product quotation

3-phase stepper motors		VRDM 36•	VRDM 39•
			
Size		6	9
Max. torque M_{max}	Nm	0.45...1.50	1.7...6.0
Holding torque M_H	Nm	0.51...1.70	1.92...6.78
Number of steps z [1)]		200 / 500 / 1000 / 2000 / 4000 / 5000 / 10000	
Step angle α [1)]	°	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036	

1) With suitable control

Motor types



Motortyp	Length (Without shaft)	Winding [1]	Shaft		Centring collar	Motor-connection [2]	Options [3]	Gearing [4]
VRDM 36•								
VRDM 364	4 (42 mm)	H	smooth	Ø 6.35 mm	Ø 38.1 mm	Wires, Connector, Terminal box	2th schaft end, Holding brake, Encoder	PLE 40, PLE 60, PLS 70
VRDM 366	6 (56 mm)	H, N						PLE 60, PLS 70
VRDM 368	8 (79 mm)			Ø 8 mm				
VRDM 39•								
VRDM 397	7 (68 mm)	H, N	smooth, Woodruff key	Ø 9.5 mm,	Ø 60 mm,	Wires, Connector,	2th schaft end, Holding brake, Encoder	PLE 80, PLS 90
VRDM 3910	10 (98 mm)			Ø 12 mm	Ø 73 mm	Terminal box		
VRDM 3913	13 (128 mm)			Ø 14 mm				

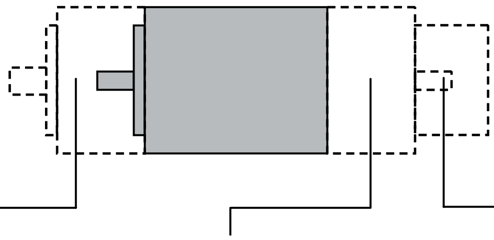
1) Winding type for nominal voltage : H = 24 / 35 V_{DC}; N = 130 V_{DC}

2) In case of motors with terminal box, the terminal block is located inside the motor; the cable gland is sealed and EMC-tested

3) Alternatively: 2nd shaft end or holding brake. Motors with encoder are only available in connector version; 2nd shaft end or holding brake are not possible with this version.

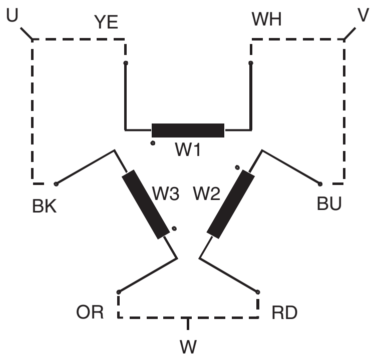
4) All PLE and PLS gearings are available with the gear ratios 3:1, 5:1 and 8:1.

Degree of protection



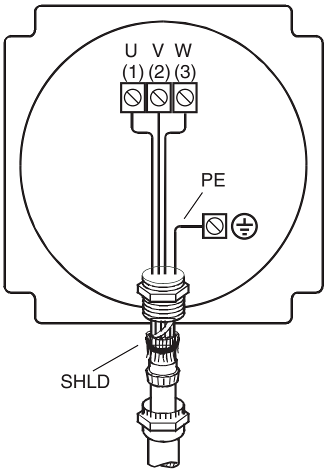
Front of motor			Motor connection		Rear of motor	
Gearing		**Shaft bushing**	**Wires**	**Terminal box Connector**	**2nd shaft end**	**Holding brake Encoders**
PL, PLE	**PLS**					
IP 54	IP 65	IP 41 IP 56 (optional with VRDM 39•)	IP 41	IP 56	IP 41	IP 56

Motor connection



Motor connection wire version

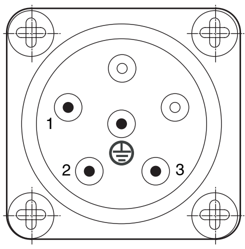
Designation	Motor wire colour as per DIN IEC 757	Motor wire colour
U	BK and YE	Black and yellow
V	WH and BU	White and blue
W	OR and RD	Orange and red



Motor connection in terminal box version

Designation	Pin	Wire colour as per DIN IEC 757	Wire colour [1]
U	1	BR	Brown
V	2	BU	Blue
W	3	BK	Black
PE		GN/YE	Green/yellow
SHLD	Shield		

[1] Berger Lahr motor cable



Motor connection in connector version

Designation	Pin
U	1
V	2
W	3
PE	4

VRDM 36•

Technical data

Motor type		VRDM 364	VRDM 366		VRDM 368	
Winding		**H**	**H**	**N**	**H**	**N**
Max. supply voltage U_{max}	V_{AC}	34	34	92	34	92
Max. voltage to PE	V_{AC}	42	42	125	42	125
Nominal voltage DC bus U_N	V_{DC}	24 / 36 / 48	24 / 36 / 48	130	24 / 36 / 48	130
Nominal torque M_N	Nm	0.45	0.90		1.50	
Holding torque M_H	Nm	0.51	1.02		1.70	
Rotor inertia J_R	kgcm²	0.1	0.22		0.38	
Number of steps z [1]		200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000				
Step angle α	°	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036				
Systematic angle tolerance $\Delta\alpha_s$ [2]	’	±6				
Max. starting frequency f_{Aom}	kHz	8.5	8.0	8.	6.0	8.5
Nominal motor current I_N	A_{rms}	5.2	5.8	1.6	5.8	1.9
Winding resistance R_W	Ω	0.42	0.5	5.3	0.7	4.8
Current rise time constant τ	ms	2.1	3.3		4.6	
Mass m [3]	kg	1.3	1.6		2.0	
Shaft load [4]						
• Max. radial force 1st shaft end [5]	N	24	24		50	
• Max. radial force 2nd shaft end (optional) [6]	N	25 / 40				
• Max. axial tensile force	N	100				
• Max. axial force pressure	N	8.4				
• Nominal bearing service life L_{10h} [7]	h	20000				

1) Depending on the control

2) Measured at 1000 steps/revolution, unit: angular minutes

3) Mass of the motor version with cable gland and connector

4) Conditions for shaft load: speed of rotation 600 min^{-1}, 100% duty cycle at nominal torque, ambient temperature 40 °C (bearing ≈ 80 °C)

5) Radial force acts at centre of shaft end

6) Radial force acts at centre of shaft end ; 1st value: motors with terminal box, connector or encoder; 2nd value: motors with wires

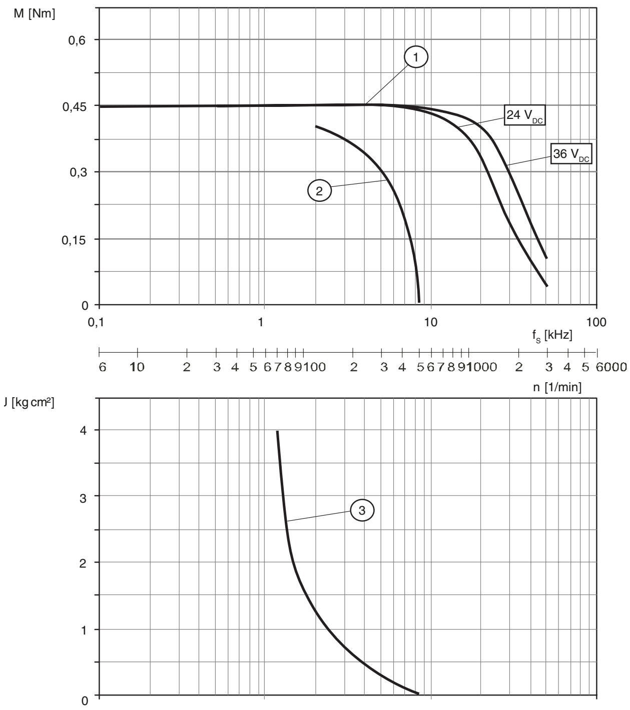
7) Operating hours at a probability of failure of 10%

Ambient conditions

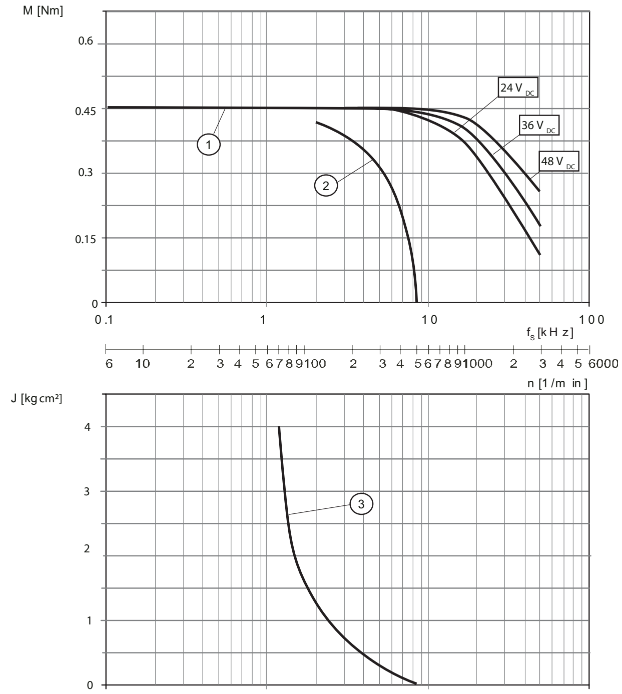
Ambient temperature	°C	-25 ... +40
Installation height without power reduction	m a. MSL	< 1000
Transport and storage temperature	°C	-25 ... +70
Relative humidity	%	75 (on annual average), 95 (in 30 days, no condensation)
Vibration grade in operation as per EN 60034-14		A
Continuous shocks as per DIN EN 60068-2-29		
• Number of shocks per direction		100
• Peak acceleration	m/s^2	20
Degree of protection as per EN 60034-5		
• Total except shaft bushing		IP 56
• Shaft bushing without shaft seal ring		IP 41
Therm class as per EN 60034-1		155 (F)
Shaft wobble and perpendicularity		As per EN 50 347 (IEC 60072-1)
Maximum rotary acceleration	rad/s^2	200000

Characteristic curves

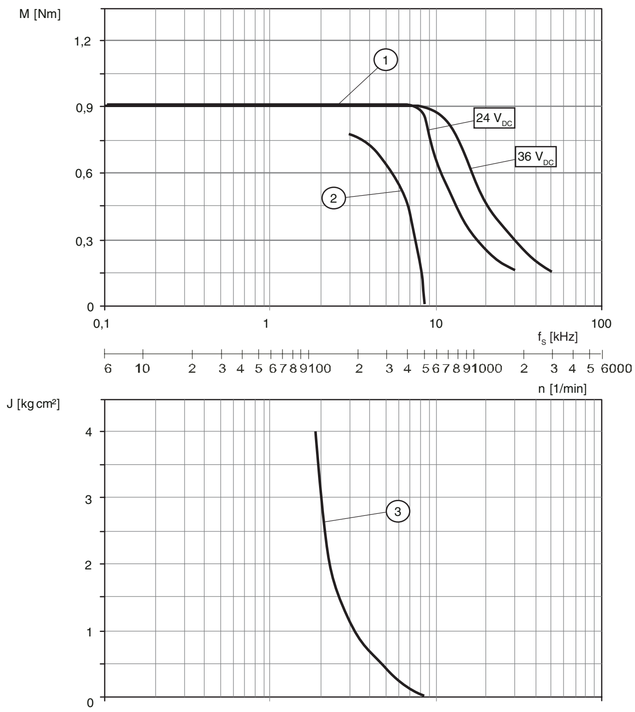
VRDM 364 / 50L H with D920 and D921



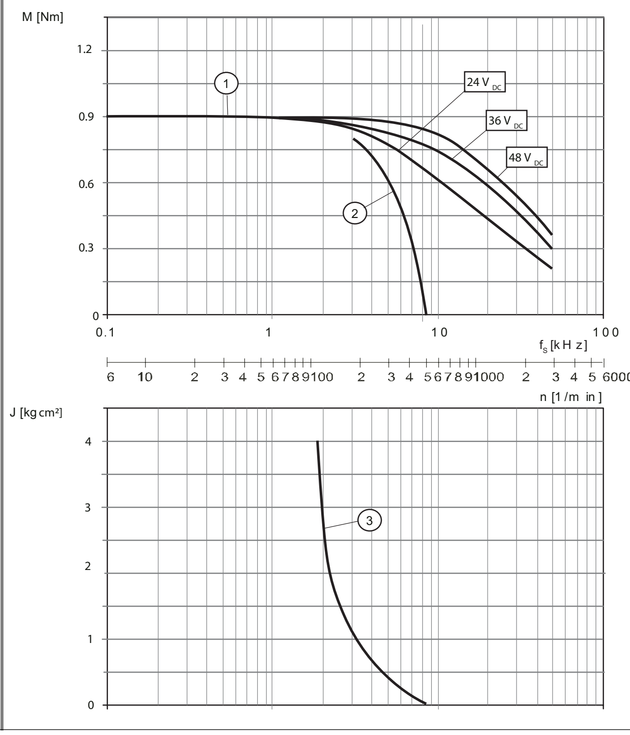
VRDM 364 / 50L H with SD3 15



VRDM 366 / 50L H with D920 and D921



VRDM 366 / 50L H with SD3 15



Measurement at 1000 steps/revolution, nominal voltage DC bus U_N and phase current I_N

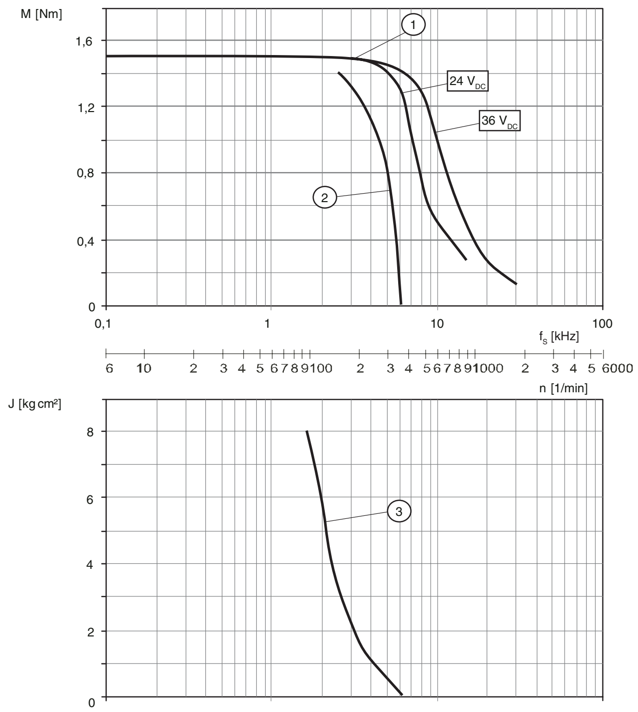
(1) Pull-out torque

(2) pull-in torque

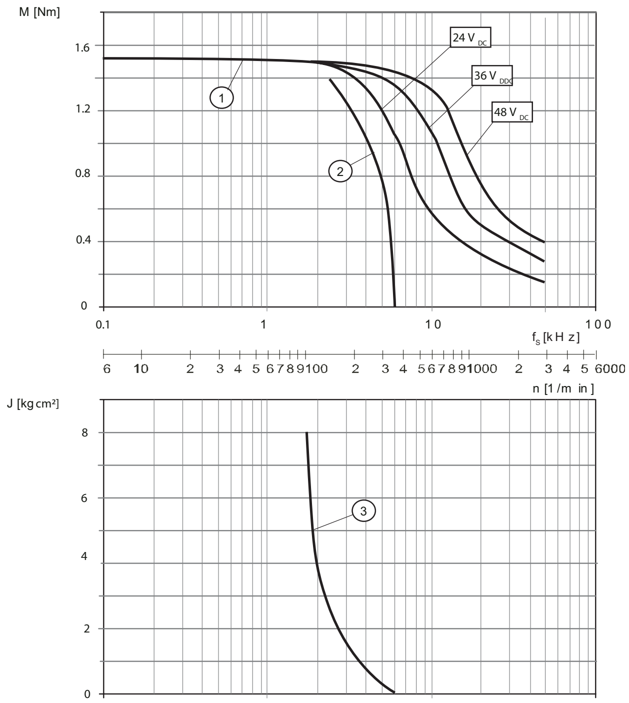
(3) Maximum load inertia

Characteristic curves

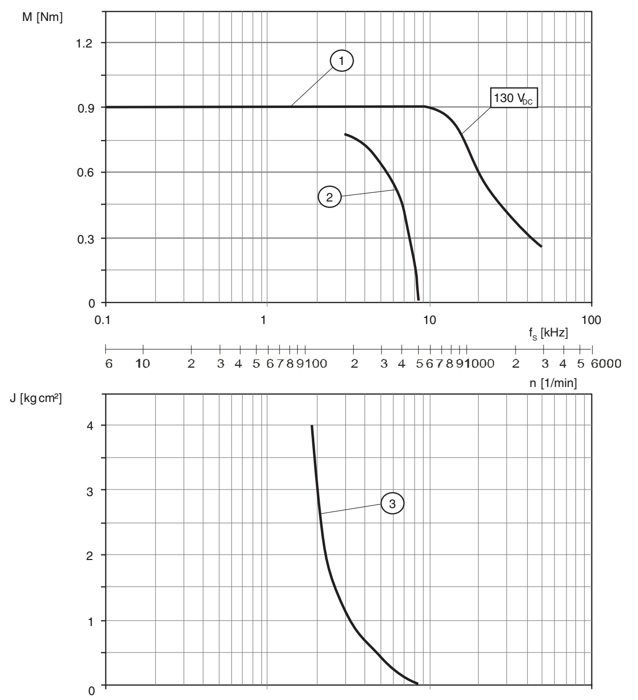
VRDM 368 / 50L H with D920 and D921



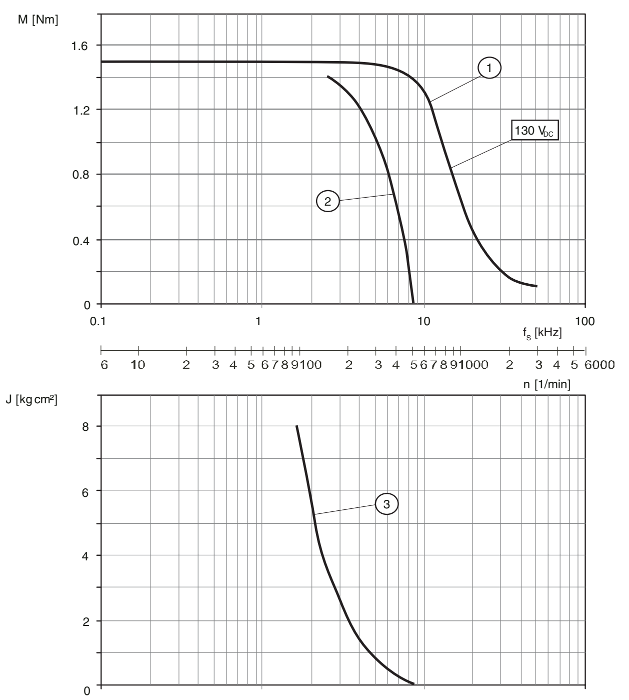
VRDM 368 / 50L H with SD3 15



VRDM 366 / 50L N with D900



VRDM 368 / 50L N with D900



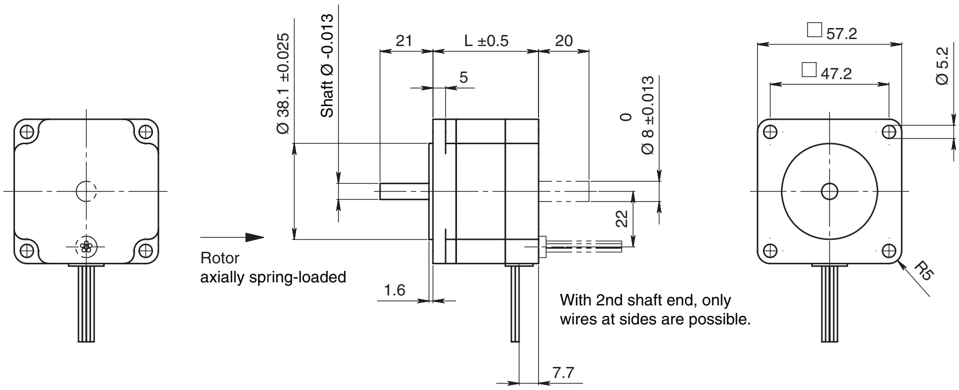
Measurement at 1000 steps/revolution, nominal voltage DC bus U_N and phase current I_N

(1) Pull-out torque

(2) Pull-in torque

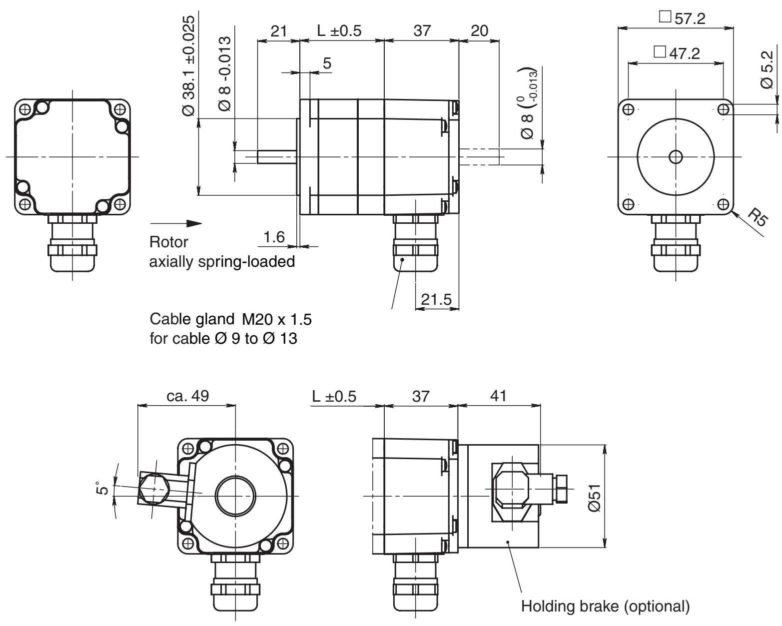
(3) Maximum load inertia

Dimensional drawings



	Length L	Shaft Ø
VRDM 364	42	6.35
VRDM 366	56	6.35
VRDM 368	79	8

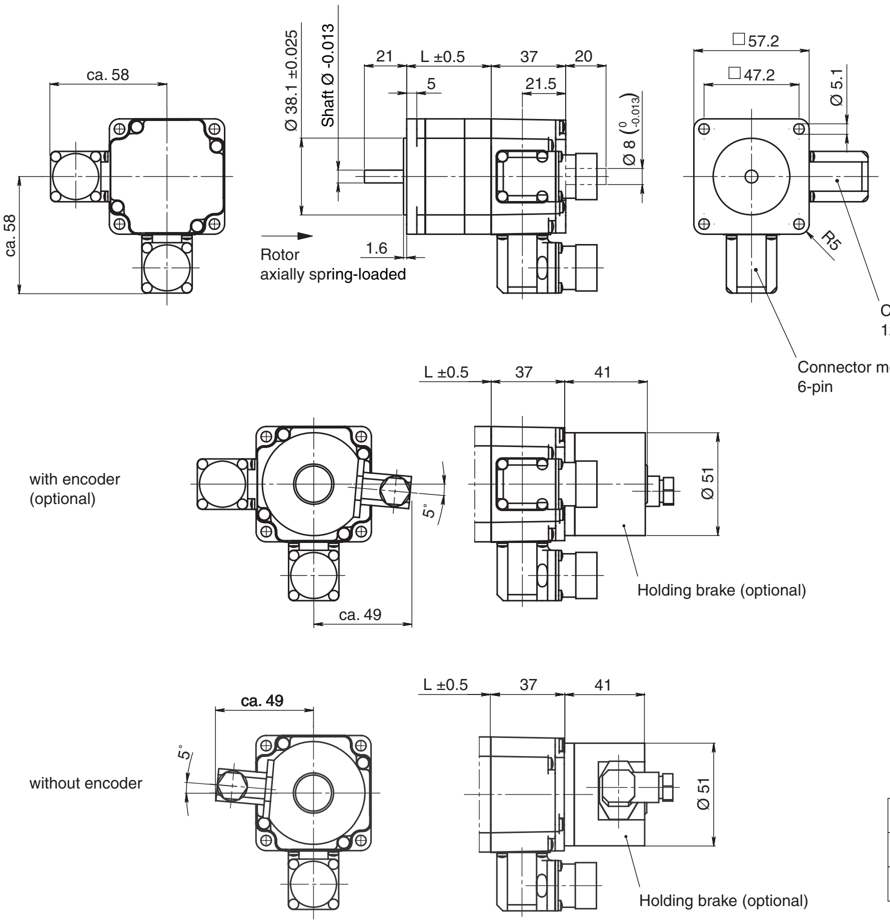
3-phase stepper motor VRDM 36• in wire version



	Length L	Shaft Ø
VRDM 364	42	6.35
VRDM 366	56	6.35
VRDM 368	79	8

3-phase stepper motor VRDM 36• in terminal box version

Dimensional drawings



	Length L	Shaft Ø
VRDM 364	42	6.35
VRDM 366	56	6.35
VRDM 368	79	8

3-phase stepper motor VRDM 36• in connector version

Type code

Example:	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	2	B	B	O	OOO
Number of phases 3	VRDM	**3**	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	2	B	B	O	OOO
Size (flange) 6 = 57.2 mm	VRDM	3	**6**	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	2	B	B	O	OOO
Length 4 = 42 mm 6 = 56 mm 8 = 79 mm	VRDM	3	6	**8**	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	2	B	B	O	OOO
Number of pole pairs 50	VRDM	3	6	8	/	**50**	L	H	C	E	O	IP41	1	5	DO	O	OO	2	B	B	B	OOO
Rotor L = laminated rotor plate	VRDM	3	6	8	/	50	**L**	H	C	E	O	IP41	1	5	DO	O	OO	2	B	B	O	OOO
Maximum voltage H = 34 V_{AC}(48 V_{DC}) N = 92 V_{AC}(130 V_{DC})	VRDM	3	6	8	/	50	L	**H**	C	E	O	IP41	1	5	DO	O	OO	2	B	B	B	OOO
Connection type A = Wires B = Terminal box C = Connector	VRDM	3	6	8	/	50	L	H	**C**	E	O	IP41	1	5	DO	O	OO	2	B	B	O	OOO
Position capture E = Encoder (1000 increments/revolution) O = Without encoder	VRDM	3	6	8	/	50	L	H	C	**E**	O	IP41	1	5	DO	O	OO	2	B	B	O	OOO
Holding brake B = Brake O = Without brake	VRDM	3	6	8	/	50	L	H	C	E	**O**	IP41	1	5	DO	O	OO	2	B	B	O	OOO
Degree of protection IP41 = IP41 at shaft bushing	VRDM	3	6	8	/	50	L	H	C	E	O	**IP41**	1	5	DO	O	OO	2	B	B	O	OOO
Gearing type O = Without gearing 1 = PLE 40 2 = PLE 60 A = PLS 70	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	**1**	5	DO	O	OO	2	B	B	O	OOO
Gear ratio O = Without gearing 3 = 3:1 5 = 5:1 8 = 8:1	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	**5**	DO	O	OO	2	B	B	O	OOO
Shaft diameter* D6 = 6.35 mm D8 = 8 mm DO = With gearing	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	**DO**	O	OO	2	B	B	O	OOO
Shaft design front O = Smooth shaft or gearing	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	**O**	OO	2	B	B	O	OOO
Centring collar 38 = 38.10 mm OO = with gearing	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	**OO**	2	B	B	O	OOO
Second shaft: O = without 2 = with	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	**2**	B	B	O	OOO
Connection direction motor plug [1)] O = Without, L = Left, R = Right B = Back, F = Front, S = Straight	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	2	**B**	B	O	OOO
Coonection direction encoder plug [1)] O = Without, L = Left, R = Right B = Back, F = Front, S = Straight	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	2	B	**B**	O	OOO
Wire output O = Without S = Side B = Back	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	2	B	B	**O**	OOO
Wire length OOO = None xxx = xxx mm (max. 400 mm)	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	2	B	B	O	**OOO**

[1)] Connection direction viewed from front at 1st shaft end, connector up.

* **Note**: Please note the description of the possible motor types on page 38.

VRDM 39•

Technical data

Motor type		VRDM 397		VRDM 3910		VRDM 3913	
Winding		**H**	**N**	**H**	**N**	**H**	**N**
Max. supply voltage U_{max}	V_{AC}	34	92	34	92	34	92
Max. voltage to PE	V_{AC}	42	125	42	125	42	125
Nominal voltage DC bus U_N	V_{DC}	24 / 36 / 48	130	24 / 36 / 48	130	24 / 36 / 48	130
Nominal torque M_N	Nm	2	2	4	4	5.75	6
Holding torque M_H	Nm	2.26	2.26	4.80	4.52	6.50	6.78
Rotor inertia J_R	kgcm²	1.1		2.2		3.3	
Number of steps z [1]		200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000					
Step angle α	°	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036					
Systematic angle tolerance $\Delta\alpha_s$ [2]	'	±6					
Max. starting frequency f_{Aom}	kHz	4.6	5.3	4.8	5.3	4.5	5.3
Nominal motor current I_N	A_{rms}	5.8	4.4	5.8	5	5.8	5
Winding resistance R_W	Ω	0.35	1	0.55	1.2	0.63	1.3
Current rise time constant τ	ms	~7		~9		~10	
Mass m [3]	kg	2.1		3.2		4.3	
Shaft load [4]							
• Max. radial force 1st shaft end [5]	N	100		100		110	
• Max. radial force 2nd shaft end (optional) [6]	N	50 / 75					
• Max. axial tensile force	N	175					
• Max. axial force pressure	N	30					
• Nominal bearing service life L_{10h} [7]	h	20000					

[1] Depending on the control

[2] Measured at 1000 steps/revolution, unit: angular minutes

[3] Mass of motor version with cable gland or connector

[4] Conditions for shaft load: speed of rotation 600 min^{-1}, 100% duty cycle at nominal torque, ambient temperature 40 °C (bearing temperature ≈ 80 °C)

[5] Radial force acts at centre of shaft end

[6] Radial force acts at centre of shaft end ; 1st value: motors with terminal box, connector or encoder; 2nd value: motors with wires

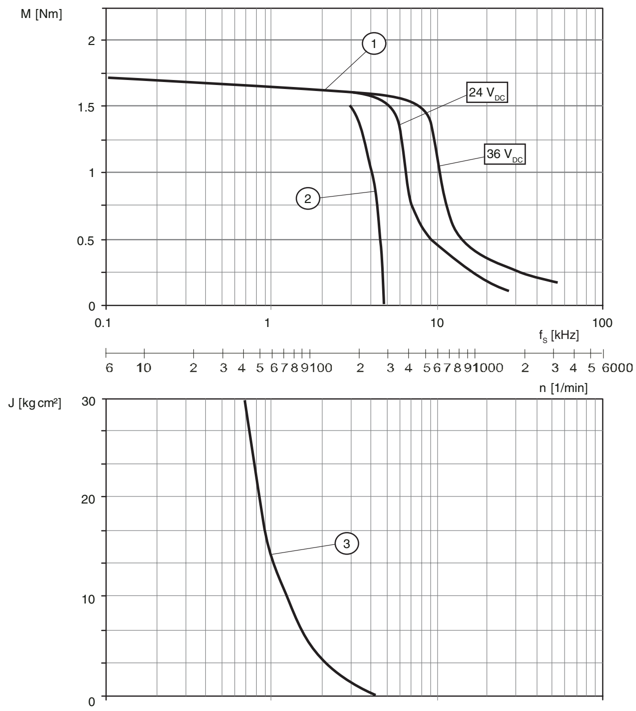
[7] Operating hours at a probability of failure of 10%

Ambient conditions

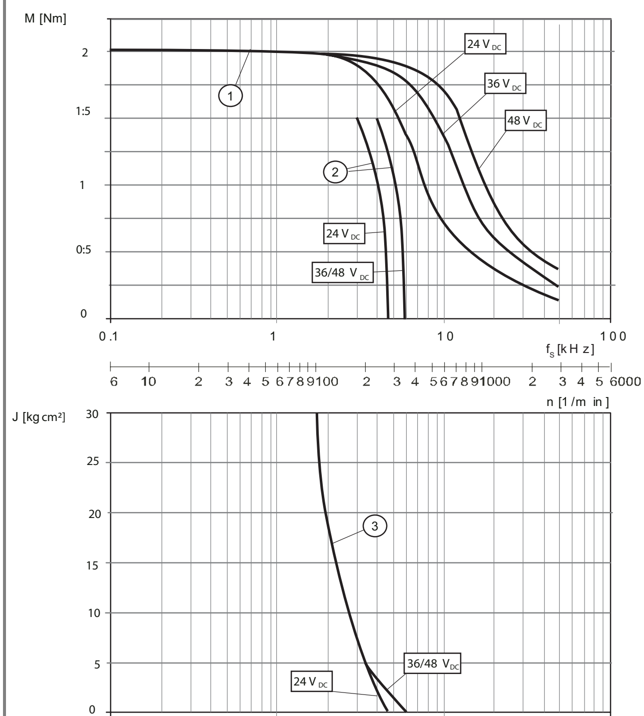
Ambient temperature	°C	-25 ... +40
Installation height without power reduction	m a. MSL	< 1000
Transport and storage temperature	°C	-25 ... +70
Relative humidity	%	75 (on annual average), 95 (in 30 days, no condensation)
Vibration grade in operation as per EN 60034-14		A
Continuous shocks as per DIN EN 60068-2-29		
• Number of shocks per direction		100
• Peak acceleration	m/s^2	20
Degree of protection as per EN 60034-5		
• Total except shaft bushing		IP 56
• Shaft bushing without shaft seal ring		IP 41
Therm class as per EN 60034-1		155 (F)
Shaft wobble and perpendicularity		As per EN 50 347 (IEC 60072-1)
Maximum rotary acceleration	rad/s^2	200000

Characteristic curves

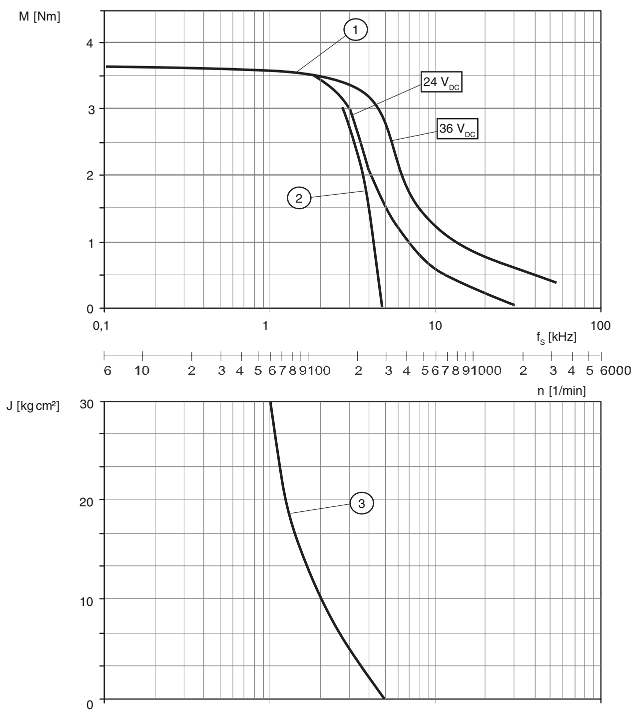
VRDM 397 / 50L H with D920 and D921



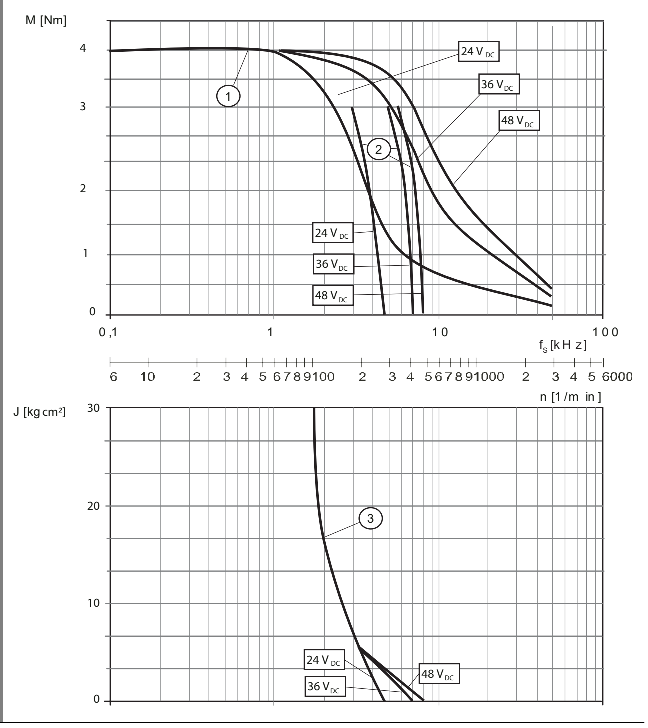
VRDM 397 / 50L H with SD3 15



VRDM 3910 / 50L H with D920 and D921



VRDM 3910 / 50L H with SD3 15



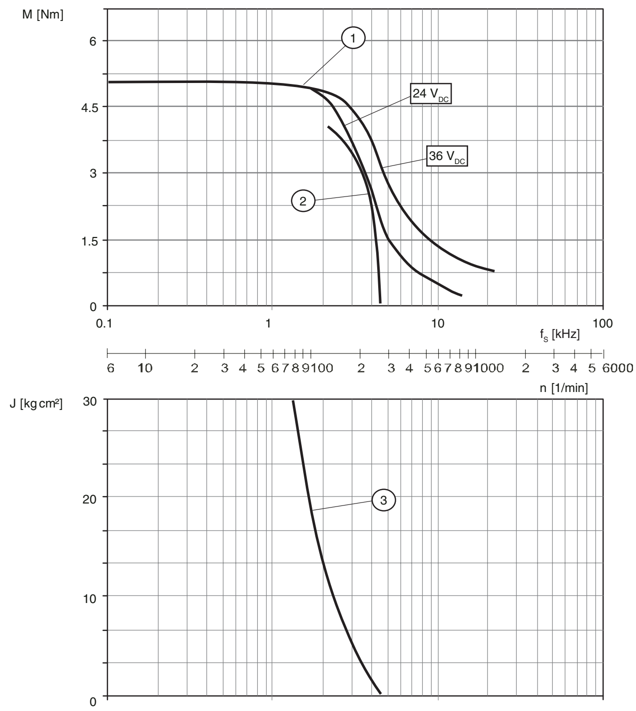
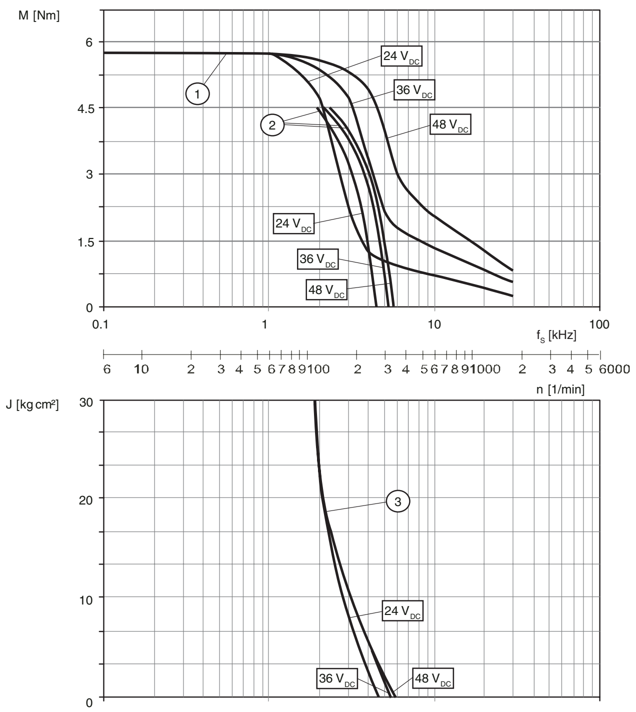
Measurement at 1000 steps/revolution, nominal voltage DC bus U_N and motor phase current I_N

(1) Pull-out torque

(2) Pull-in torque

(3) Maximum load inertia

Characteristic curves

VRDM 3913 / 50L H with D920	VRDM 3913 / 50L H with SD3 15
	

Measurement at 1000 steps/revolution, nominal voltage DC bus U_N and motor phase current I_N

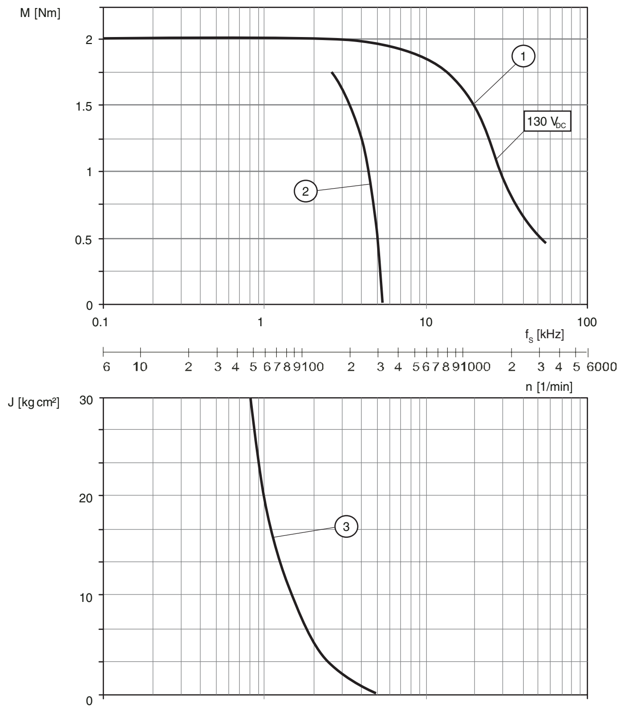
(1) Pull-out torque

(2) Pull-in torque

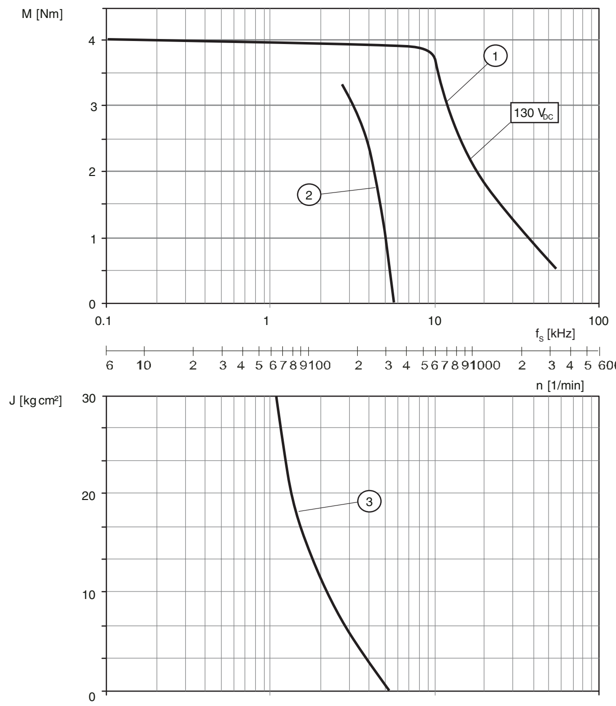
(3) Maximum load inertia

Characteristic curves

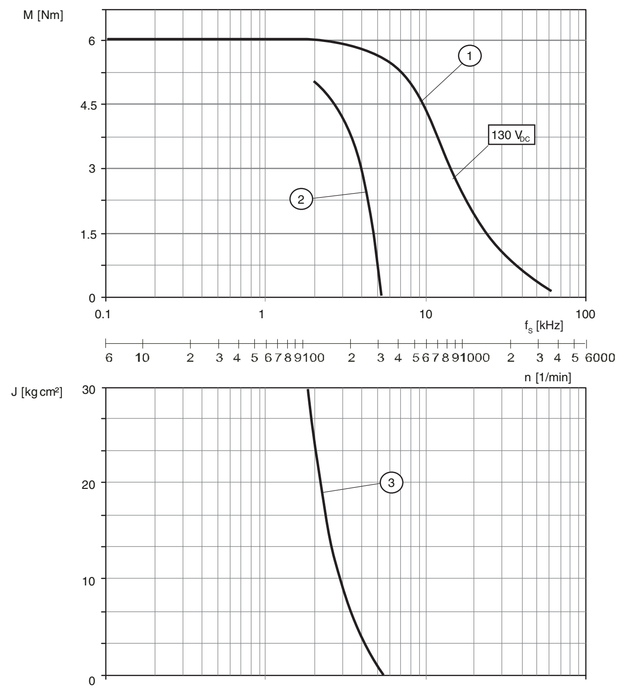
VRDM 397 / 50L N with D900



VRDM 3910 / 50L N with D900



VRDM 3913 / 50L N with D900



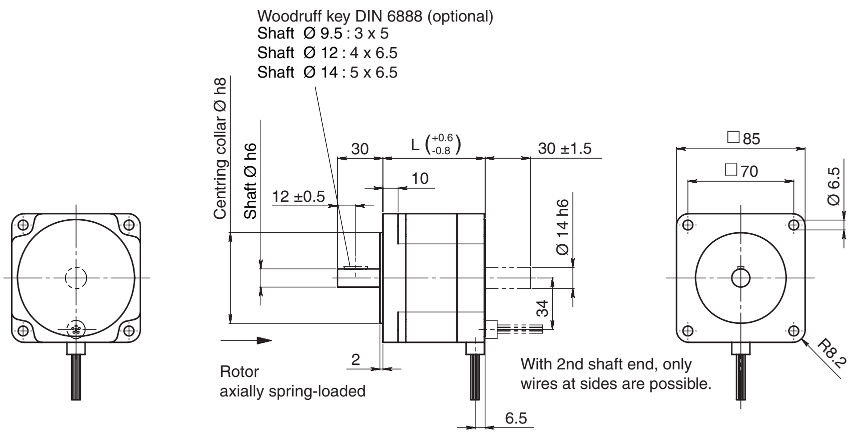
Measurement at 1000 steps/revolution, nominal voltage DC bus U_N and motor phase current I_N

(1) Pull-out torque

(2) Pull-in torque

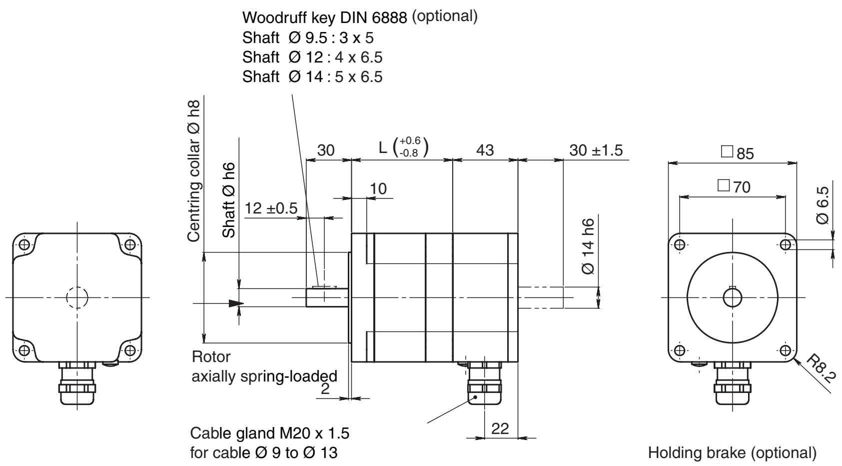
(3) Maximum load inertia

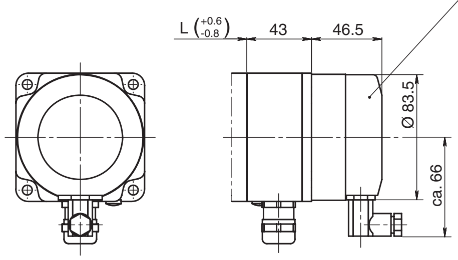
Dimensional drawings



	Length L	Shaft Ø		Centring collar Ø	
VRDM 397	67.5	9.5	12	60	73
VRDM 3910	97.5	9.5	12	60	73
VRDM 3913	127.5	14		60	73

3-phase stepper motor VRDM 39• in wire version

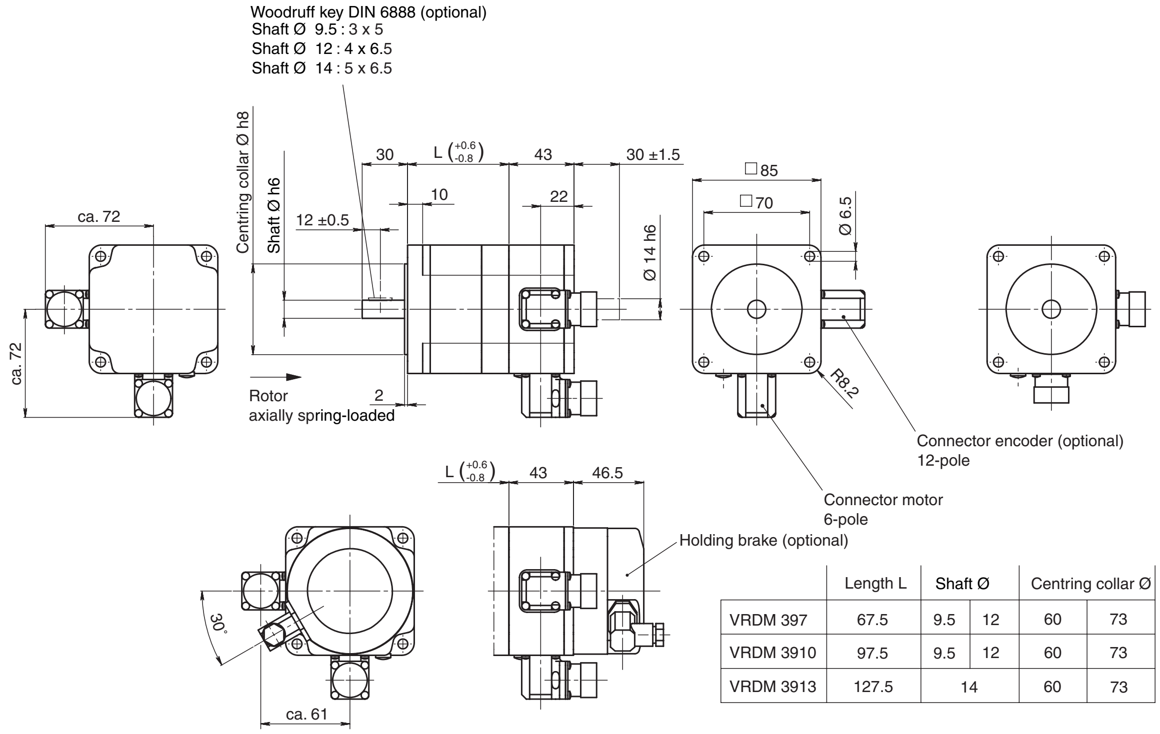




	Length L	Shaft Ø		Centring collar Ø	
VRDM 397	67.5	9.5	12	60	73
VRDM 3910	97.5	9.5	12	60	73
VRDM 3913	127.5	14		60	73

3-phase stepper motor VRDM 39• in terminal box version

Dimensional drawings



	Length L	Shaft Ø		Centring collar Ø	
VRDM 397	67.5	9.5	12	60	73
VRDM 3910	97.5	9.5	12	60	73
VRDM 3913	127.5	14		60	73

3-phase stepper motor VRDM 39• in connector version

Type code																						
Example:	**VRDM**	**3**	**9**	**10**	**/**	**50**	**L**	**H**	**C**	**E**	**O**	**IP41**	**3**	**5**	**DO**	**O**	**OO**	**2**	**B**	**B**	**O**	**OOO**
Number of phases 3	VRDM	**3**	9	10	/	50	L	H	C	E	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Size (flange) 9 = 85 mm	VRDM	3	**9**	10	/	50	L	H	C	E	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Motor length 7 = 68 mm 10 = 98 mm 13 = 128 mm	VRDM	3	9	**10**	/	50	L	H	C	E	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Number of pole pairs 50	VRDM	3	9	10	/	**50**	L	H	C	E	O	IP41	3	5	DO	O	OO	2	B	B	B	OOO
Rotor L = laminated rotor plate	VRDM	3	9	10	/	50	**L**	H	C	E	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Maximum voltage H = 34 V_{AC} (48 V_{DC}) N = 92 V_{AC}(130 V_{DC})	VRDM	3	9	10	/	50	L	**H**	C	E	O	IP41	3	5	DO	O	OO	2	B	B	B	OOO
Connection type A = Wires B = Terminal box C = Connector	VRDM	3	9	10	/	50	L	H	**C**	E	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Position capture E = Encoder (1000 increments/revolution) O = Without encoder	VRDM	3	9	10	/	50	L	H	C	**E**	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Holding brake B = Brake O = Without brake	VRDM	3	9	10	/	50	L	H	C	E	**O**	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Degree of protection IP41 = IP 41 at shaft bushing IP56 = IP 56 at front shaft bushing	VRDM	3	9	10	/	50	L	H	C	E	O	**IP41**	3	5	DO	O	OO	2	B	B	O	OOO
Gearing type O = Without gearing 3 = PLE 80 B = PLS 90	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	**3**	5	DO	O	OO	2	B	B	O	OOO
Gear ratio O = Without gearing 3 = 3:1 5 = 5:1 8 = 8:1	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	**5**	DO	O	OO	2	B	B	O	OOO
Shaft diameter* D9 = 9.5 mm D2 = 12 mm D4 = 14 mm DO = With gearing	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	5	**DO**	O	OO	2	B	B	O	OOO
Shaftdesignfront O = smooth shaft or gearing K = Woodruff key as per DIN 6888	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	5	DO	**O**	OO	2	B	B	O	OOO
Centring collar 60 = 60 mm 73 = 73 mm OO = Without gearing	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	5	DO	O	**OO**	2	B	B	O	OOO
Second shaft O = without 2 = with	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	5	DO	O	OO	**2**	B	B	O	OOO
Connection direction motor plug [1)] O = Without, L = Left, R = Right B = Back, F = Front, S = Straight	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	5	DO	O	OO	2	**B**	B	O	OOO
Coonection direction encoder plug [1)] O = Without, L = Left, R = Right B = Back, F = Front, S = Straight	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	5	DO	O	OO	2	B	**B**	O	OOO
Wire output S = side B = back O = without	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	5	DO	O	OO	2	B	B	**O**	OOO
Wire length OOO = without xxx = xxx mm (max. 400 mm)	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	5	DO	O	OO	2	B	B	O	**OOO**

1) Connection direction viewed from front at 1st shaft end, connector up.

***Note**: Please note the description of the possible motor types on page 38.

Options

Holding brake

The holding brake is an electromagnetic spring force brake and fixes the motor axis after switching off the motor current (e.g. in case of power failure or emergency stop). The shaft must be fixed with torque loads resulting from gravity, e.g. with Z-axes in handling technology.

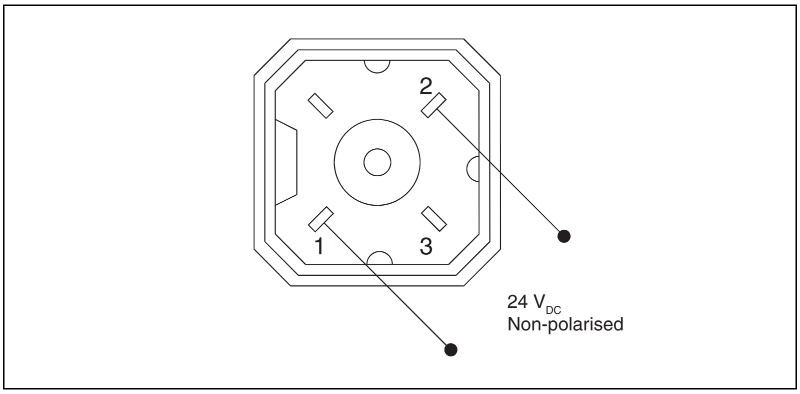
Technical data

Holding brake for motor type		VRDM 36•	VRDM 39•
Nominal voltage	V	24	24
Holding torque	Nm	1	6
Pull-in power	W	8	24
Moment of inertia	kgcm²	0.016	0.2
Energise time (release brake)	ms	58	40
Shutdown time (apply brake)	ms	14	20
Mass	kg	Approx. 0.5	Approx. 1.5

Note: In order to ensure the safe function of the holding brake for Z-axes, the static load torque must be no greater than 25% of the holding torque of the motor.

Wiring diagram

The connector is a part of the scope of supply.
Connector designation: Hirschmann Type G4 5M



Wiring diagram of the connector for the holding brake

Encoder

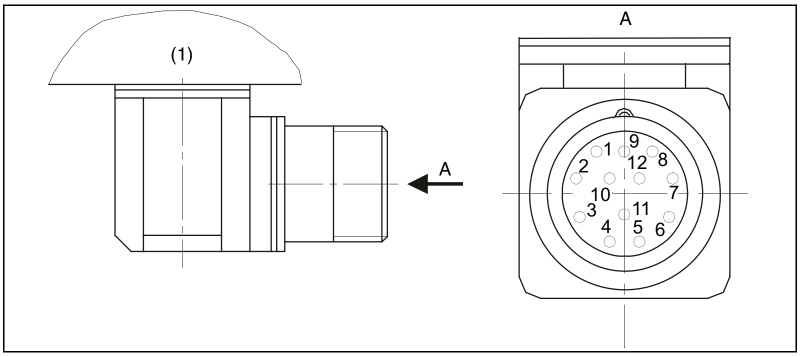
Three-phase stepper motors from Berger Lahr can be fitted with an encoder. If the stepper drive is fitted with rotation monitoring electronics, the encoder operates as a measurement system for reporting the actual position of the rotor.
The rotation monitoring compares the setpoint and actual position of the motor and reports errors if the actual position deviates from the setpoint position. For example, this enables detection of mechanical overload of the motor.

Note: an encoder can only be used with motors with connector. A temperature sensor is integrated to protect the encoder from high temperatures.

Technical data

Resolution	Inc/rev.	1000
Index plus	Inc/rev.	1
Output		RS 422
Signals		A; B; I
Signal shape		Rectangular
Supply voltage	V	5 ± 5%
Supply current	A	max.0.125

Wiring diagram



Wiring diagram of encoder plug on VRDM 3••

(1) Motor housing

Pin	Designation
1	A
2	A negated
3	B
4	B negated
5	C, I
6	C negated, negated
7	$5V_{GND}$
8	+ 5
9	-SENSE
10	+SENSE
11	Temperature sensor
12	not connected

Gearing

Stepper motors from Berger Lahr can also be fitted with integrated planetary gear. The PLE gearings are economical planetary gears that meet most requirements for accuracy. The PLS gear is a high-quality gearing with very low torsional play.
These gearings can be supplied with one of three gear ratios: 3:1, 5:1 and 8:1.
The output torque of the gearing is determined by multiplying the torque of the motor with the gear ratio and the efficiency of the gearing (0.96).
The following table shows the recommended gearings for the motors.

Motor type	Gearing type	
VRDM 364	PLE 40, PLE 60	PLS 70
VRDM 366	PLE 60	PLS 70
VRDM 368	PLE 60	PLS 70
VRDM 39•	PLE 80	PLS 90

Technical data PLE gearing

PLE-gearing general		
Gear stages		1
Bearing service life [1]	h	10000
Efficiency at full load	%	96
Housing material		aluminium
Surface		black anodised
Shaft material		C 45
Bearings		roller bearing
Operating temperature [2]	°C	-25 ... +90, shortly +120
Degree of protection [3]		IP 54
Lubrication		lifetime lubrication

1) Life time with an output speed at 100 1/min and T = 30 °C

2) Referring to the housing surface

3) With mounting position IM V3 (drive shaft vertical, shaft end upward) only degree of potection IP 41 is guaranteed

Size PLE		**40**	**60**	**80**	**120**
Max. radial force [1] [2]	N	200	500	950	2000
Max. axial force [1]	N	200	600	1200	2800
Torsional play	arcmin	<30	<20	<12	<8
Max. drive speed	1/min	18000	13000	7000	6500
Recommended drive speed	1/min	4500	4000	4000	3500
Torsional stiffness	Nm/arcmin	1.0	2.3	6	12
Weight	kg	0.35	0.9	2.1	6.0

1) The information refers to min. 20000 h bearing service life with an output speed of 100 1/min and application factor K = 100 min and S1-operating mode for electrical machines and T = 30 °C

2) Refers to the centre of the drive shaft and 50% duty cycle.

Attention: the actual output torque must be less than the nominal output torque of the gearing, otherwise the gearing may be destroyed.

Technical data PLS gearing

Size PLS		**70**	**90**
Max. radial force [1] [2]	N	3000	4000
Max. axial force [1]	N	6000	9000
Torsional play	arcmin	<3	<3
Max. drive speed	1/min	14000	10000
Recommended drive speed	1/min	5000	4500
Torsional stiffness	Nm/arcmin	6	9
Weight	kg	3.0	4.3

1) The values refer to a min. bearing service life of 20000 h at an output speed of 100 1/min and an application factor K = 100 min and S1 operating mode for electrical machines and T = 30 °C

2) Referring to centre of output shaft and 50% duty cycle

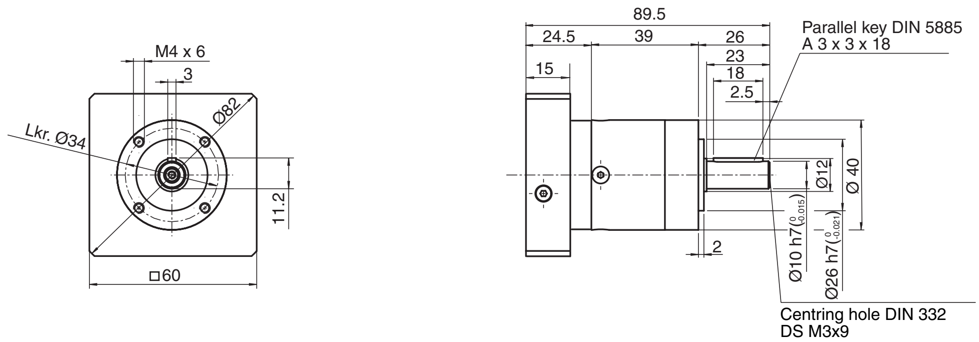
PLS gearing general		
Gear stages		1
Life time [1]	h	20000
Efficiency at full load	%	98
Housing material		aluminium
Surface		black anodised
Shaft material		C 45
Bearings		tapered roller bearings
Operating temperature [2]	°C	-25 ... +100, shortly +124
Degree of protection [3]		IP 65
Lubrication		lifetime lubrication

1) Life time with an output speed of 100 1/min and T = 30 °C

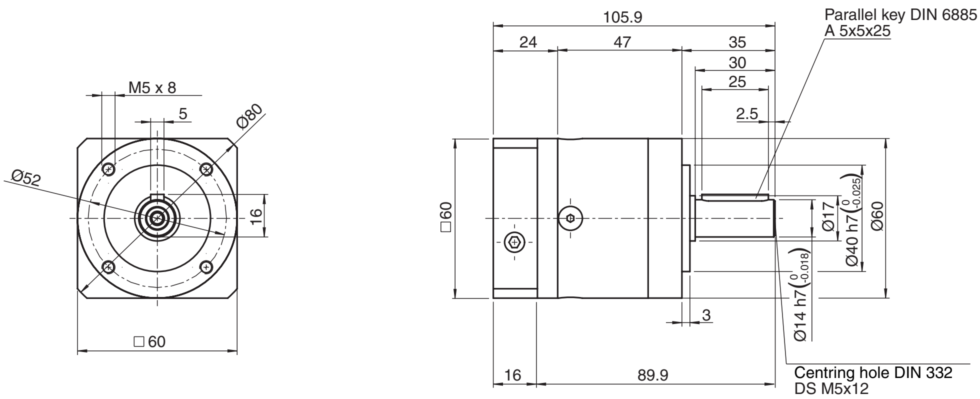
2) Referring to the housing surface

3) With mounting position IM V3 (drive shaft vertical, shaft end upward) only protection class IP 41 is guaranteed

Dimensional drawings

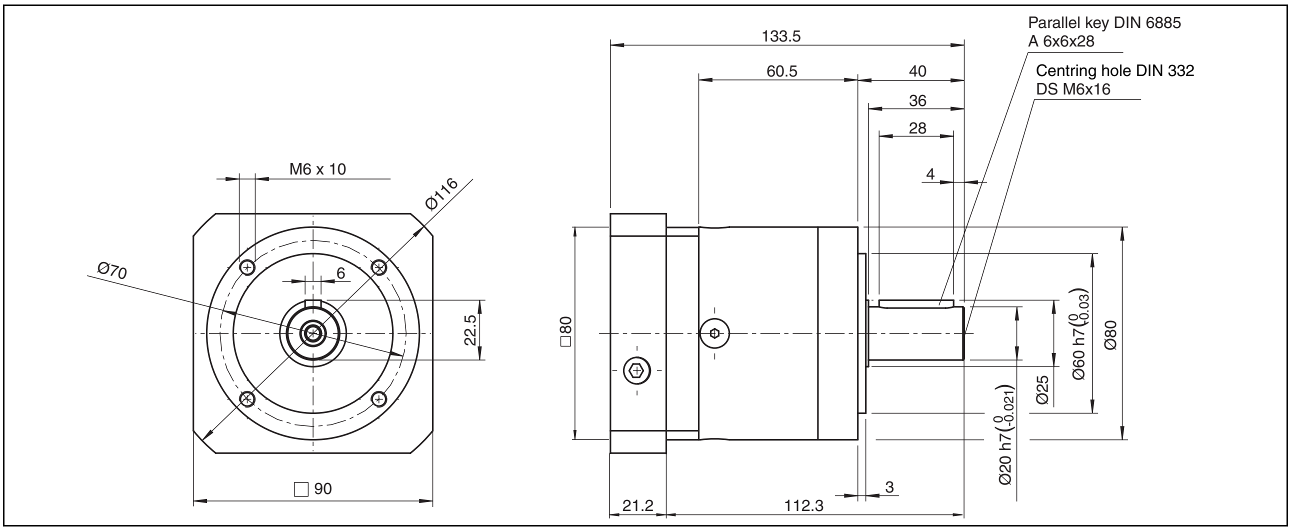


PLE 40 gearing, single-stage

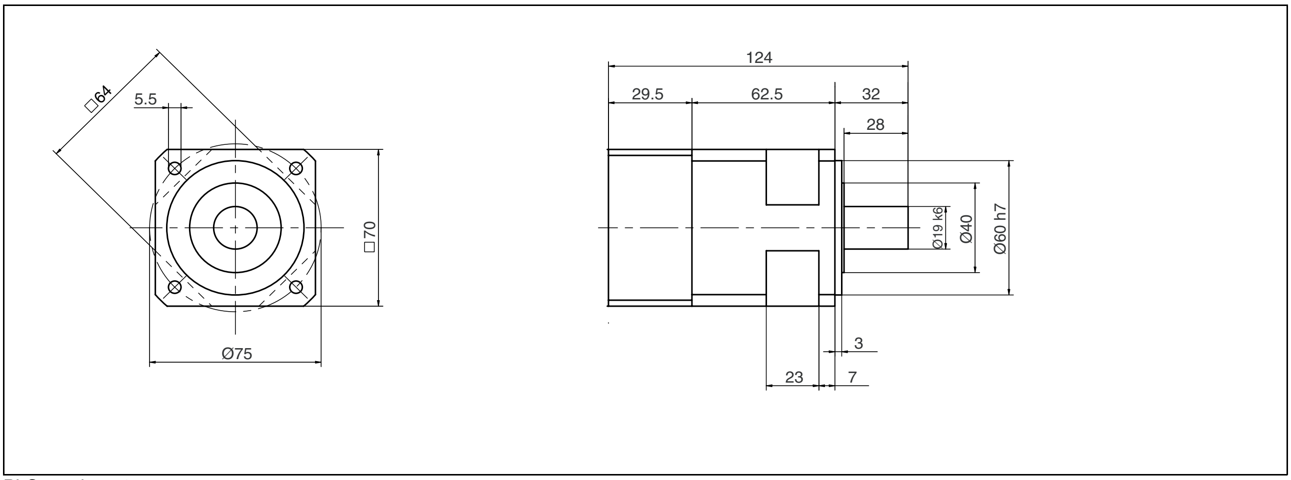


PLE 60 gearing, single-stage

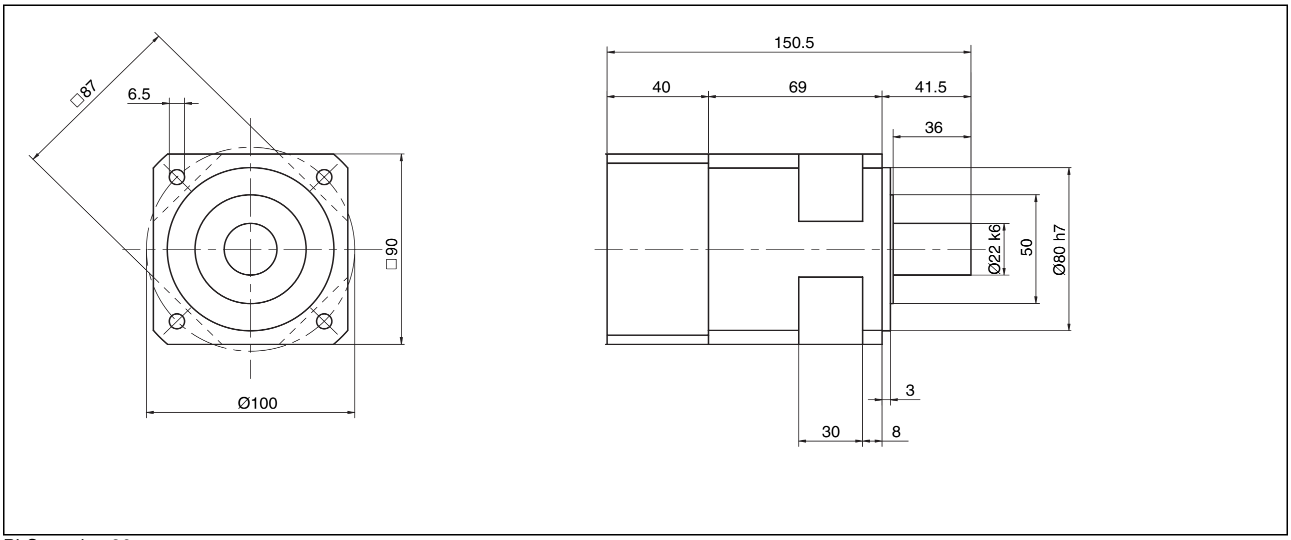
Dimensional drawings



PLE 80 gearing, single-stage



PLS gearing 70



PLS gearing 90

Accessories

Order data

Designation	Description		Order number
Motor cable			
Cable for 3-phase stepper motor	4 x 1.5 mm, shielded; Motor end with 6-pin circular plug; other cable end open	3m	**VW3S5101R30**
		5 m	**VW3S5101R50**
		10 m	**VW3S5101R100**
		15 m	**VW3S5101R150**
		20 m	**VW3S5101R200**
	4 x 1.5 mm, shielded; both cable ends open	3 m	**VW3S5102R30**
		5 m	**VW3S5102R50**
		10 m	**VW3S5102R100**
		15 m	**VW3S5102R150**
		20 m	**VW3S5102R200**
Adapter plate for SD3 15	For DIN rail mounting		**MNA3MFDINR1**
EMC kit for SD3 15	For shield connection of shielded cable		**MNA3CS013**
Spring clamp connector kit for SD3 15D	2 ,4 and 11 pins		**MNA3CS008**
Spring clamp connector kit for SD3 15O	2 ,4, 11 and 12 pins		**MNA3CS009**
Connector for D900 and D920	Signal, motor and supply connection		**0098050060238**

Conversion tables

Rotor inertia

	lb·in^2	lb·ft^2	lb·in·s^2	lb·ft·s^2 slug·ft^2	kg·cm^2	kg·cm·s^2	g·cm^2	g·cm·s^2	oz·in^2	oz·in·s^2
lb·in^2	–	6.94 x 10^{-3}	2.59 x 10^{-3}	2.15 x 10^{-4}	2.926	2.98 x 10^{-3}	2.92 x 103	2.984	16	4.14 x 10^{-2}
lb·ft^2	144	–	0.3729	3.10 x 10^{-2}	421.40	0.4297	4.21 x 10^5	429.71	2304	5.967
lb·in·s^2	386.08	2.681	–	8.33 x 10^{-2}	1.129 x 10^3	1.152	1.129 x 10^6	1.152 x 10^3	6.177 x 10^3	16
lb·ft·s^2 slug·ft^2	4.63 x 10^3	32.17	12	–	1.35 x 10^4	13.825	1.355 x 10^7	1.38 x 10^4	7.41 x 10^4	192
kg·cm^2	0.3417	2.37 x 10^{-3}	8.85 x 10^{-4}	7.37 x 10^{-6}	–	1.019 x 10^{-3}	1000	1.019	5.46	1.41 x 10^{-2}
kg·cm·s^2	335.1	2.327	0.8679	7.23 x 10^{-2}	980.66	–	9.8 x 10^5	1000	5.36 x 10^3	13.887
g·cm^2	3.417 x 10^{-4}	2.37 x 10^{-6}	8.85 x 10^{-7}	7.37 x 10^{-8}	1 x 10^{-3}	1.01 x 10^{-6}	–	1.01 x 10^{-3}	5.46 x 10^{-3}	1.41 x 10^{-6}
g·cm·s^2	0.335	2.32 x 10^{-3}	8.67 x 10^{-4}	7.23 x 10^{-5}	0.9806	1 x 10^{-3}	980.6	–	5.36	1.38 x 10^{-2}
oz·in^2	0.0625	4.3 x 10^{-4}	1.61 x 10^{-6}	1.34 x 10^{-6}	0.182	1.86 x 10^{-4}	182.9	0.186	–	2.59 x 10^{-3}
oz·in·s^2	24.3	0.1675	6.25 x 10^{-2}	5.20 x 10^{-3}	70.615	7.20 x 10^{-2}	7.06 x 10^4	72	386.08	–

Torque

	lb·in	lb·ft	oz·in	Nm	kg·m	kg·cm	g·cm	dyne·cm
lb·in	–	8.333 x 10^{-2}	16	0.113	1.152 x 10^{-2}	1.152	1.152 x 10^3	1.129 x 10^6
lb·ft	12	–	192	1.355	0.138	13.825	1.382 x 10^4	1.355 x 10^7
oz·in	6.25 x 10^{-2}	5.208 x 10^{-3}	–	7.061 x 10^{-3}	7.200 x 10^{-4}	7.200 x 10^{-2}	72.007	7.061 x 10^4
Nm	8.850	0.737	141.612	–	0.102	10.197	1.019 x 10^4	1 x 10^7
kg·m	86.796	7.233	1.388 x 10^3	9.806	–	100	1 x 10^5	9.806 x 10^7
kg·cm	0.8679	7.233 x 10^{-2}	13.877	9.806 x 10^{-2}	10^{-2}	–	1000	9.806 x 10^5
g·cm	8.679 x 10^{-4}	7.233 x 10^{-5}	1.388 x 10^{-2}	9.806 x 10^{-5}	1 x 10^{-5}	1 x 10^{-3}	–	980.665
dyne·cm	8.850 x 10^{-7}	7.375 x 10^{-8}	1.416 x 10^{-5}	10^{-7}	1.019 x 10^{-8}	1.0197 x 10^{-6}	1.019 x 10^{-6}	–

Power

	H.P.	W
H.P.	–	745.7
W	1.31 x 10^{-3}	–

Length

	in	ft	yd	m	cm	mm
in	–	0.0833	0.028	0.0254	2.54	25.4
ft	12	–	0.333	0.3048	30.48	304.8
yd	36	3	–	0.914	91.44	914.4
m	39.37	3.281	1.09	–	100	1000
cm	0.3937	0.03281	1.09 x 10^{-2}	0.01	–	10
mm	0.03937	0.00328	1.09 x 10^{-3}	0.001	0.1	–

Speed

	1/min (rpm)	rad/sec	deg./sec
1/min (rpm)	–	0.105	6.0
rad/sec	9.55	–	57.30
deg./sec	0.167	1.745 x 10^{-2}	–

Mass

	lb	oz	slug	kg	g
lb	–	16	0.0311	0.453592	453.592
oz	6.35 x 10^{-2}	–	1.93 x 10^{-3}	0.028349	28.35
slug	32.17	514.8	–	14.5939	1.459 x 10^4
kg	2.20462	35.274	0.0685218	–	1000
g	2.205 x 10^{-3}	3.527 x 10^{-3}	6.852 x 10^{-5}	0.001	–

Temperature

	°F	°C
°F	–	(ϑ - 32) x $^5/_9$
°C	ϑ ¾ $^9/_5$ + 32	–

Force

	lb	oz	gf	dyne	N
lb	–	16	453.592	4.448 x 10^5	4.4482
oz	0.0625	–	28.35	2.780 x 10^4	0.27801
gf	2.205 x 10^{-3}	0.03527	–	980.665	N.A.
dyne	2.248 x 10^{-6}	3.59 x 10^{-6}	1.02 x 10^{-3}	–	0.0001
N	0.22481	3.5967	N.A.	100,000	–

Example for conversion:
Conversion of 10 inches to metres. Search for "in" (inches) in the left column of the "length" table and "m" (metres) in the header row. The box at the intersection of column and row gives you the conversion factor: "0.0254". Multiply 10 inches by 0.0254, and you have the value in metres: 10 in x 0.0254 = 0.254 m.

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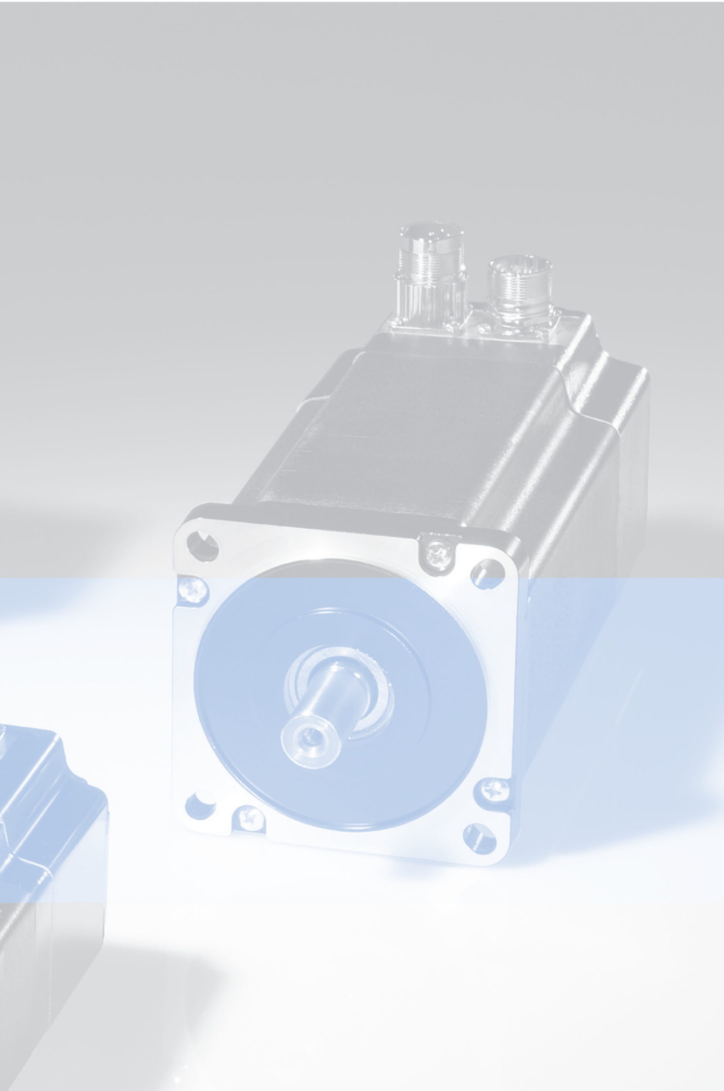
Catalogue

Servomotors



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SER servomotors

Options

Appendix

Product description

SER servomotors are AC synchronous servomotors and are fitted with permanent neodynium-iron-boron magnets (NdFeB). SER servomotors have a high power density and speed dynamics.

Thermal protection is provided by an integral probe in the motor. These motors support high overloads without risk of demagnetisation.

SER servomotors have been certified as "Recognised" (UR) by Underwriter Laboratories. They are compliant with the UL1004 standards and with European directives (CE mark).

Depending on the model, SER servomotors can be equipped with a holding brake and/or gearing.

The SER servomotors are compatible with the standard servo connection dimensions for flexible solutions for problems. The SER servomotors are fitted with the absolute sensor system as standard equipment. When using the HIPERFACE® interface between motor-sensor system and device the motor and current controller parameters are internally initialised. This greatly simplifies the commissioning procedure.

An AC synchronous servomotor module consists of the AC synchronous servomotor and the associated controller. Optimum power can only be reached when motor and controller are optimally matched.

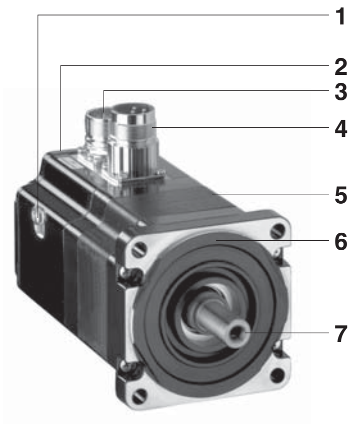
Special features

High power density
The use of the latest magnetic materials and optimised design results in motors with a shorter length for comparable torque.

High pulse torques
Up to four times the continuous standstill torque.

Economical
With a strong standard series we can offer a compact and powerful AC synchronous servomotor.

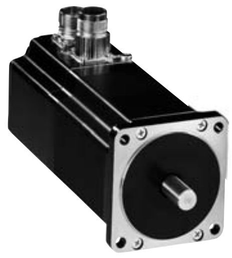
Structure



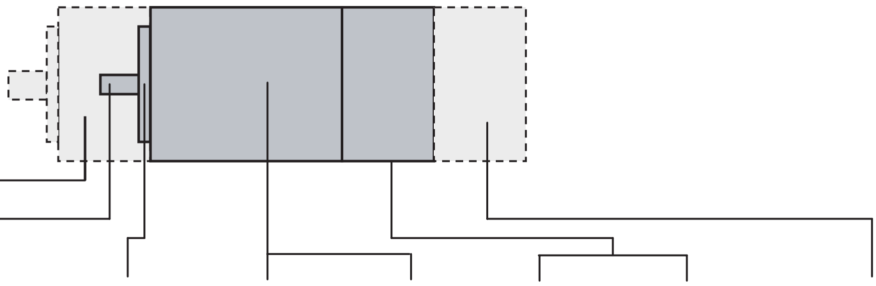
SER servomotors with a 3-phase stator and an 8-pole (SER 36•: 6-pole) rotor with permanent NdFeB magnets have the following structure :

(1) Additional terminal for protective conductor (not with SER 36•)
(2) Nameplate
(3) Screw connector for power cable connection
(4) Screw connector for encoder cable connection
(5) Housing with a square cross-section, with a black opaque polyester resin protective coating (RAL 2005).
(6) Axial flange with four mounting points as per DIN 42948
(7) Shaft end as per DIN 42948

Product overview

SER servomotors		SER 36•	SER 39•	SER 311•
				
Size (flange dimension)		6 (57.2 mm)	9 (85 mm)	11 (110 mm)
Nominal power P_N	kW	0.28 ... 0.62	0.30 ... 1.06	0.42 ... 2.09
Nominal speed n_N	1/min	3700 ... 12000	1200 ... 6000	1000 ... 6000
Nominal continuous torque M_N	Nm	0.26 ... 0.78	0.6 ... 2.8	1.5 ... 10.8
Continuous torque M_0	Nm	0.29 ... 0.90	1.1 ... 3.6	4.2 ... 13.4
Max. torque M_{max}	Nm	1.03 ... 3.74	3.43 ... 12.67	11.76 ... 40.20

Motor types



Gearing [1]	Shaft model		Centring collar	Size (Flange dimension)	Length (Dimension without shaft)	Winding [2]	Max. voltage	Options
SER 36•								
PLE 60	Smooth	Ø 9 mm	Ø 40 mm	6 (57.2 mm)	4 (126 mm)	3S	230 V_{AC} / 325 V_{DC}	Holding brake
PLS 70	with parallel key		Ø 50 mm		6 (145 mm)	5S		Position capture [3]
					8 (163 mm)	7S		Plug connector [4]
					10 (182 mm)			
SER 39•								
PLE 80	Smooth	Ø 14 mm	Ø 50 mm	9 (85 mm)	7 (141 mm)	3S	480 V_{AC} / 680 V_{DC}	Holding brake
PLE 120	with parallel key		Ø 73 mm		10 (171 mm)	5S		Position capture[3]
PLS 70			Ø 80 mm		13 (201 mm)	7S		Plug connector [4]
PLS 90					16 (231 mm)			
PLS 115								
SER 311•								
PLE 120	Smooth	Ø 19 mm	Ø 56 mm	11 (110 mm)	12 (132 mm)	3S	480 V_{AC} / 680 V_{DC}	Holding brake
PLE 160	with parallel key		Ø 95 mm		17 (180 mm)	5S		Position capture [3]
PLS 90			Ø 110 mm		22 (228 mm)	7S		Plug connector [4]
PLS 115					27 (276 mm)	5D		
PLS 142								

1) Planetary gear available in the gear ratios 3:1, 5:1 and 8:1

2) Winding types: S = star; D = delta

3) Types: Singleturn encoder SinCos (SRS), Multiturn encoder SinCos (SRM) or resolver

4) Type 1: straight; type 2: 90° angle and rotatable 310°

Note: For combination options see type code

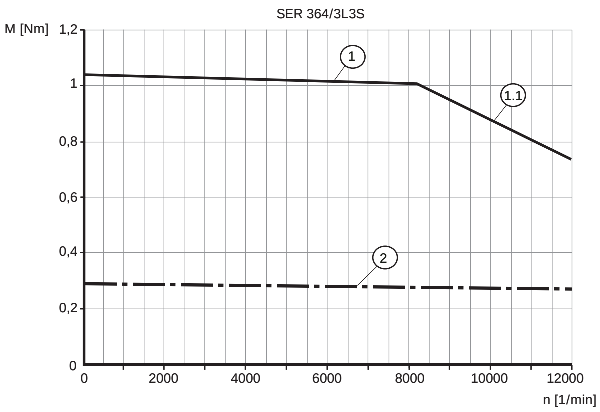
SER 36•
Technical Data

Motor type		SER 364			SER 366			SER 368			SER 3610		
Winding [1]		**3S**	**5S**	**7S**	**3S**	**5S**	**7S**	**3S**	**5S**	**7S**	**3S**	**5S**	**7S**
Nominal supply voltage U_N = 230 V_{AC}													
• Nominal continuous torque M_N	Nm	0.26	0.27	0.28	0.44	0.46	0.49	0.48	0.55	0.65	0.5	0.62	0.78
• Nominal continuous current I_N	A_{rms}	1.8	1.2	0.95	2.3	1.5	1.2	2.0	1.6	1.0	2.1	1.6	1.1
• Nominal speed n_N	1/min	12000	10000	8000	12000	9000	6000	12000	8500	4300	12000	8000	3700
• Nominal power P_N	kW	0.32	0.28	0.23	0.55	0.43	0.30	0.60	0.49	0.29	0.62	0.51	0.30
Continuous torque M_0 [2]	Nm	0.29			0.54			0.75			0.9		
Continuous current I_0	A_{rms}	2.0	1.3	1.0	2.75	1.8	1.25	3.05	2.1	1.15	3.53	2.3	1.2
Voltage constant k_{EU_V} [3]	V_{rms}	9.1	13.5	18.0	12.0	18.2	26.4	14.9	21.7	39.0	15.4	23.8	46.4
Winding resistance R_W	Ω	4.7	11.1	18.9	3.7	9.1	17.4	3.4	7.3	23.7	2.7	6.1	23.0
Winding inductance L_{qU_V}	mH	9.2	21.8	37.9	7.9	21.0	37.5	7.6	15.9	53.0	6.0	14.0	54.0
Winding inductance L_{dU_V}	mH	7.9	19.2	33.4	7.1	18.6	32.9	6.7	14.0	46.7	5.2	12.5	47.0
Maximum values													
Max. winding voltage U_{max}	V_{AC}	230			230			230			230		
	V_{DC}	325			325			325			325		
Max. voltage against PE	V_{AC}	300			300			300			300		
Max. current I_{max} [4]	A_{rms}	10.4	6.5	5.2	12.3	8.0	5.6	14.5	10.0	5.5	17.5	11.5	6.0
Max. torque M_{max}	Nm	1.04	1.07	1.03	1.90	1.82	1.90	2.80	2.80	2.80	3.74	3.69	3.65
Max. allowable speed of rotation n_{max}	1/min	12000			12000			12000			12000		
Max. continuous power P_{dmax}	kW	0.326			0.553			0.603			0.628		
Torque at max. continuous power M_{Pdmax}	Nm	0.28			0.44			0.48			0.5		
Speed of rotation at max. continuous power n_{Pdmax}	1/min	12000			12000			12000			12000		
Mechanical values													
Rotor moment of inertia J_R	$kgcm^2$	0.1			0.18			0.26			0.34		
Mass m [5]	kg	1.1			1.4			1.7			2.0		
Shaft load [6]													
• Max. radial force front F_R													
- 10% ED	N	231			275			302			320		
- 100% ED	N	89			107			117			124		
• Max. axial force tension/compression F_A													
- 10% ED	N	300			300			300			300		
- 100% ED	N	104			104			104			104		
• Nominal bearing lifetime L_{10h}	h	20000											

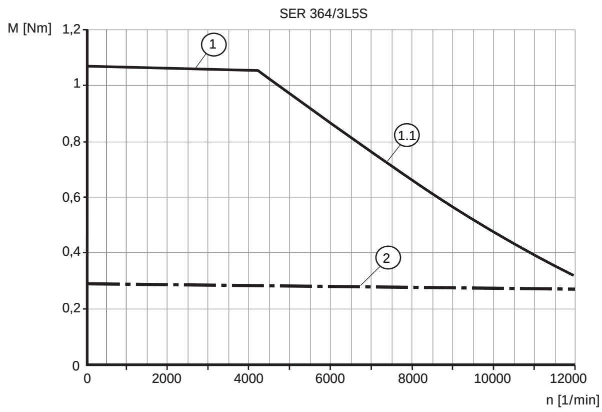
[1] Definition of winding see type code
[2] At 20 1/min; for n = 0 max. 89%
[3] RMS value at 1000 1/min
[4] Max. 2.5 s
[5] Without holding brake
[6] Axial and radial forces must not occur simultaneously

Characteristic curves

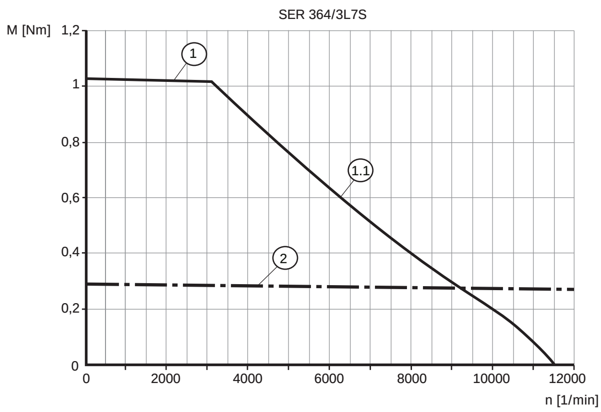
SER 364 / 3L 3S



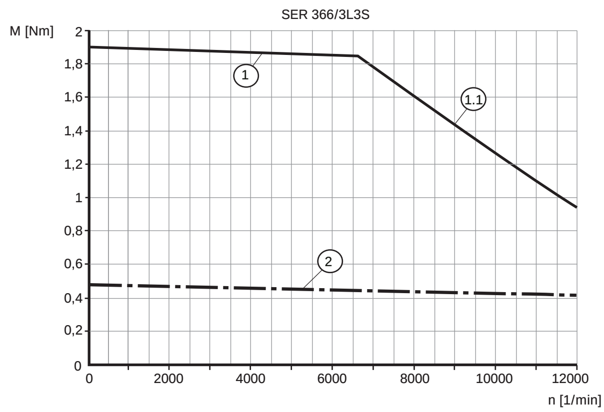
SER 364 / 3L 5S



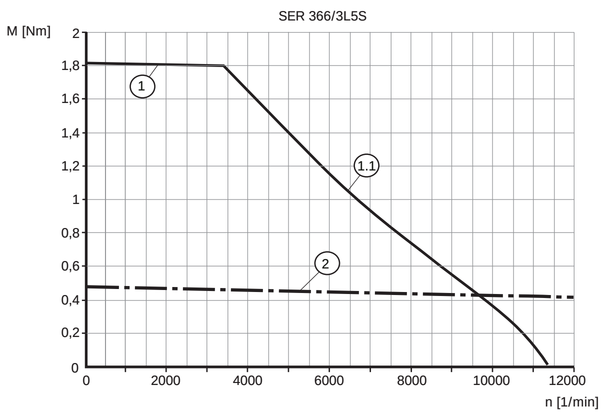
SER 364 / 3L 7S



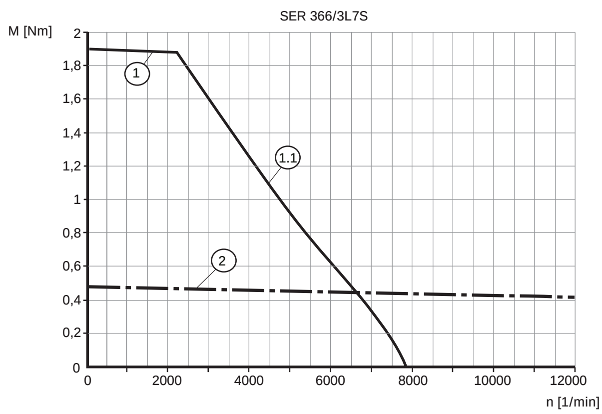
SER 366 / 3L 3S



SER 366 / 3L 5S



SER 366 / 3L 7S

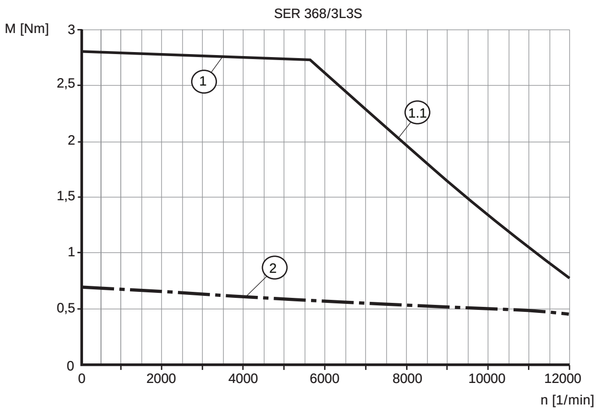


(1) Peak torque of motor
(1.1) Speed limit at 230 V_{eff}
(2) Continuous torque of motor

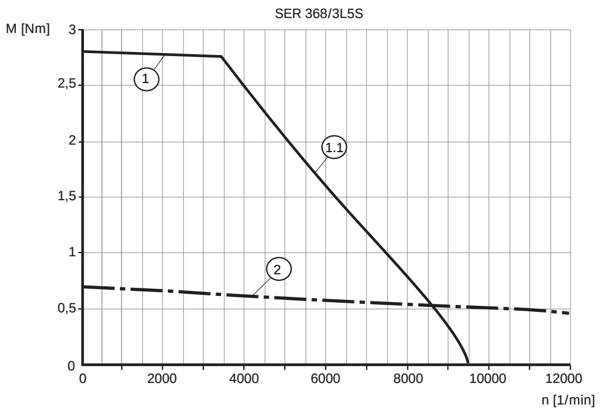
Note: The peak torque characteristics show the maximum values of the motors. The peak characteristics of the motors in combination with servo drive systems can be found at: www.berger-lahr.de > Downloads > Documentations > Motors.

Characteristic curves

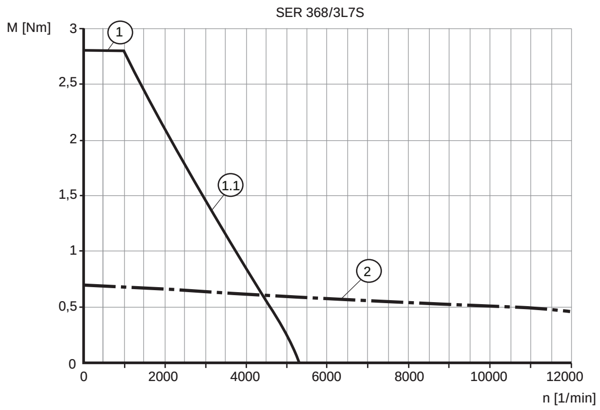
SER 368 / 3L 3S



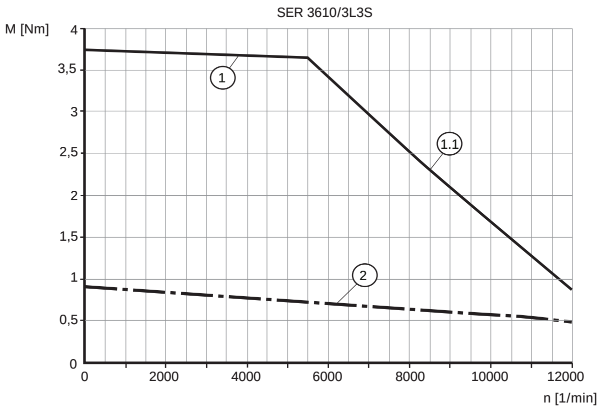
SER 368 / 3L 5S



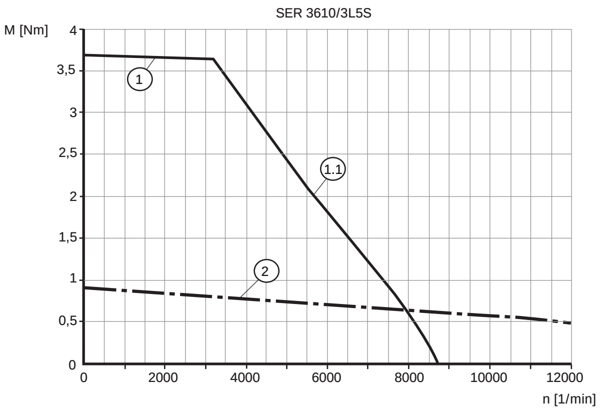
SER 368 / 3L 7S



SER 3610 / 3L 3S



SER 3610 / 3L 5S



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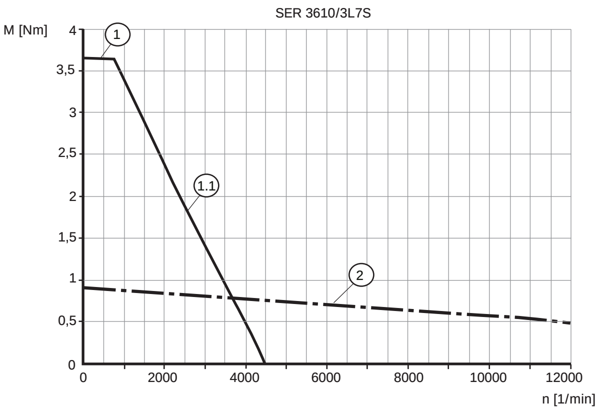


(1) Peak torque of motor
(1.1) Speed limit at 230 V_{eff}
(2) Continuous torque of motor

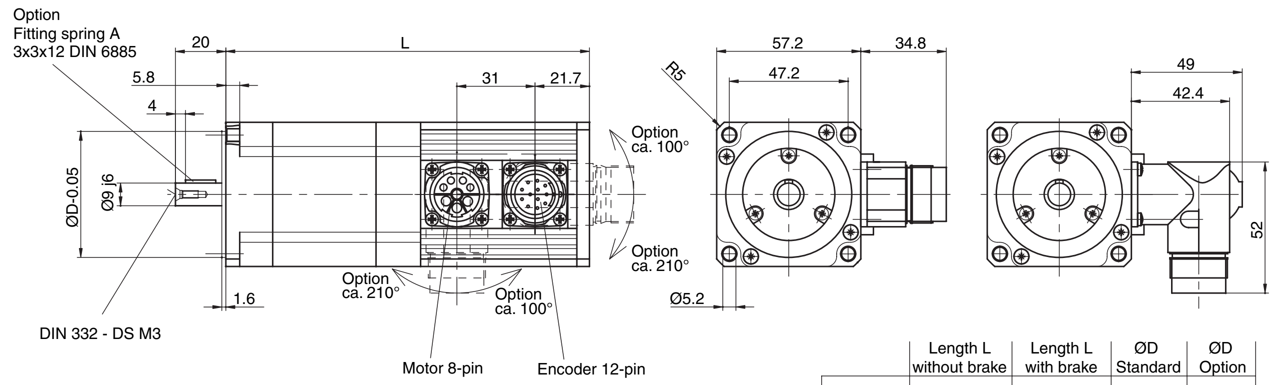
Note: The peak torque characteristics show the maximum values of the motors. The peak characteristics of the motors in combination with servo drive systems can be found at: www.berger-lahr.de > Downloads > Documentations > Motors.

Ambient conditions

Operating / ambient temperature without power reduction	°C	20 ... 40
Installation height without power reduction	m above MSL	1000
Transport and storage temperature	°C	-25 ... +70
Relative humidity	%	15 … 85 (non-condensing)
Vibration magnitude in operation as per DIN EN 60034-14		A
Vibration strain as per DIN EN 60068-2-6		
• Acceleration amplitude	m/s²	20
• Frequency range	Hz	10 ... 500
• Number of cycles		10
Degree of protection as per DIN EN 60034-5		
• Shaft exit front without shaft seal ring		IP 41
• Shaft exit front with shaft seal ring		IP 56 [1)
• Motor housing		IP 56
Thermal class as per DIN EN 60034-1		155 (F)
Shaft wobble and run-out accuracy		as per DIN 42955 N (IEC 60072-1)
Max. rotary acceleration	rad/s^2	200000

1) Speed restriction by shaft seal ring at 6000 1/min; with mounting position IM V3 (drive shaft vertical, shaft end up) only degree of protection IP 41 is guaranteed.

Dimensional drawings



	Length L without brake	Length L with brake	ØD Standard	ØD Option
SER 364	125.8	165.3	50	40
SER 366	144.3	183.8	50	40
SER 368	162.8	202.3	50	40
SER 3610	181.3	220.8	50	40

Dimensional drawing SER 36•

Type code

Example:	SER	3	6	4	/	3	L	3	S	M	O	T	O	IP41	2	3	K	50	PTC
Number of phases 3	SER	**3**	6	4	/	3	L	3	S	M	O	T	O	IP41	2	3	K	50	PTC
Size (flange) 6 = 57.2 mm	SER	3	**6**	4	/	3	L	3	S	M	O	T	O	IP41	2	3	K	50	PTC
Length 4 = 126 mm 6 = 145 mm 8 = 163 mm 10 = 182 mm	SER	3	6	**4**	/	3	L	3	S	M	O	T	O	IP41	2	3	K	50	PTC
Number of pole pairs 3	SER	3	6	4	/	**3**	L	3	S	M	O	T	O	IP41	2	3	K	50	PTC
Rotor inertia L = low moment of inertia	SER	3	6	4	/	3	**L**	3	S	M	O	T	O	IP41	2	3	K	50	PTC
Winding label 3; 5; 7	SER	3	6	4	/	3	L	**3**	S	M	O	T	O	IP41	2	3	K	50	PTC
Winding circuit S = star	SER	3	6	4	/	3	L	3	**S**	M	O	T	O	IP41	2	3	K	50	PTC
Sensor system S = SinCos Singleturn M = SinCos Multiturn R = resolver	SER	3	6	4	/	3	L	3	S	**M**	O	T	O	IP41	2	3	K	50	PTC
Sensor system resolution 0 for sensor systems S, M, R	SER	3	6	4	/	3	L	3	S	M	**O**	T	O	IP41	2	3	K	50	PTC
Plug connector C = straight T = 90° angled	SER	3	6	4	/	3	L	3	S	M	O	**T**	O	IP41	2	3	K	50	PTC
Holding brake O = without brake B = with brake	SER	3	6	4	/	3	L	3	S	M	O	T	**O**	IP41	2	3	K	50	PTC
Degree of protection IP41 = without shaft seal ring IP56 = with shaft seal ring [1]	SER	3	6	4	/	3	L	3	S	M	O	T	O	**IP41**	2	3	K	50	PTC
Gearbox type [2] 2 = PLE 60 A = PLS 70	SER	3	6	4	/	3	L	3	S	M	O	T	O	IP41	**2**	3	K	50	PTC
Gear ratio 3 = 3:1 5 = 5:1 8 = 8:1	SER	3	6	4	/	3	L	3	S	M	O	T	O	IP41	2	**3**	K	50	PTC
Motor shaft model K = parallel key DIN 6885 O = without parallel key / without gearing	SER	3	6	4	/	3	L	3	S	M	O	T	O	IP41	2	3	**K**	50	PTC
Centring collar 50 = 50 mm 40 = 40 mm 00 = with gearing	SER	3	6	4	/	3	L	3	S	M	O	T	O	IP41	2	3	K	**50**	PTC
Temperature sensor PTC = PTC	SER	3	6	4	/	3	L	3	S	M	O	T	O	IP41	2	3	K	50	**PTC**

1) With mounting position IM V3 (drive shaft vertical, shaft end upward) only degree of protection IP 41 is guaranteed.
2) Possible motor-gearing combinations see page 35f

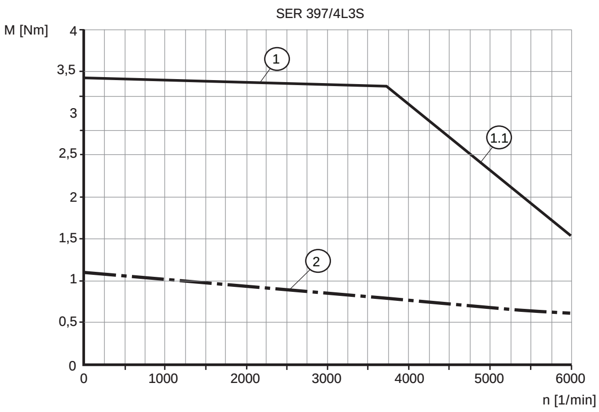
SER 39•
Technical data

Motor type		SER 397		SER 3910		SER 3913			SER 3916		
Winding [1]		**3S**	**7S**	**3S**	**7S**	**3S**	**5S**	**7S**	**3S**	**5S**	**7S**
Nominal supply voltage U_N = 230 V_{AC}											
• Nominal continuous torque M_N	Nm	0.6	0.8	1.6	1.8	2.1	2.5	2.6	1.9	2.3	2.8
• Nominal continuous current I_N	A_{rms}	1.5	1.0	2.1	1.4	2.9	2.1	1.2	2.5	2.3	1.8
• Nominal speed n_N	1/min	6000	3600	4000	2200	3800	2500	1200	4000	3000	1800
• Nominal power P_N	kW	0.38	0.30	0.67	0.42	0.84	0.65	0.33	0.80	0.72	0.53
Nominal supply voltage U_N = 400 V_{AC}											
• Nominal continuous torque M_N	Nm	0.6	0.6	1.1	1.5	1.7	2.0	2.5	1.1	1.6	2.2
• Nominal continuous current I_N	A_{rms}	1.5	0.7	1.8	1.2	2.5	1.8	1.1	1.7	1.9	1.5
• Nominal speed n_N	1/min	6000	6000	6000	4000	6000	4500	2300	6000	5000	3300
• Nominal power P_N	kW	0.38	0.38	0.69	0.63	1.06	0.94	0.60	0.69	0.84	0.76
Nominal supply voltage U_N = 480 V_{AC}											
• Nominal continuous torque M_N	Nm	0.6	0.6	1.1	1.3	1.7	1.8	2.4	1.1	1.1	2
• Nominal continuous current I_N	A_{rms}	1.5	0.7	1.8	1.1	2.5	1.6	1.1	1.7	1.1	1.2
• Nominal speed n_N	1/min	6000	6000	6000	4700	6000	5500	2600	6000	6000	3800
• Nominal power P_N	kW	0.38	0.38	0.69	0.64	1.06	1.04	0.65	0.69	0.69	0.80
Continuous torque M_0 [2]	Nm	1.1		2.2		2.9			3.6		
Continuous current I_0	A_{rms}	2.6	1.3	3.0	1.7	3.7	2.5	1.3	4.4	3.5	2.1
Voltage constant k_{EU_V} [3]	V_{rms}	27.5	50.7	47.2	83.2	49.5	72.3	141.6	51.5	65.0	103.6
Winding resistance R_W	Ω	3.7	13	5.4	13.7	3.3	7.5	27.5	2.65	4.2	10.4
Winding inductance L_{qU_V}	mH	13.6	47.9	20.3	60.7	14.1	30.3	115	10.2	18.6	51.8
Winding inductance L_{dU_V}	mH	11.7	40.9	17.6	51.5	12.2	26.1	98.6	8.4	15.8	41.4
Maximum values											
Max. winding voltage U_{max}	V_{AC}	480		480		480			480		
	V_{DC}	680		680		680			680		
Max. voltage against PE	V_{AC}	300		300		300			300		
Max. current I_{max} [4]	A_{rms}	10.4	5.2	12.0	6.8	14.8	10.0	5.2	17.6	14.0	8.4
Max. torque M_{max}	Nm	3.43	3.56	6.69	6.78	9.51	9.51	9.51	12.67	11.81	12.38
Max. allowable speed of rotation n_{max}	1/min	6000		6000		6000			6000		
Max. continuous power P_{dmax}	kW	0.38		0.69		1.06			0.85		
Torque at max. continuous power M_{Pdmax}	Nm	0.6		1.1		1.7			1.8		
Speed of rotation at max. continuous power n_{Pdmax}	1/min	6000		6000		6000			4500		
Mechanical values											
Rotor moment of inertia J_R	$kgcm^2$	0.85		1.6		2.4			3.2		
Mass m [5]	kg	2.2		3.3		4.4			6.1		
Shaft load [6]											
• Max. radial force front F_R											
- 10% ED	N	600		520		500			500		
- 100% ED	N	340		450		430			450		
• Max. axial force tension/compression F_A											
- 10% ED	N	520		520		520			520		
- 100% ED	N	450		450		450			450		
• Nominal bearing lifetime L_{10h}	h	20000		20000		20000			20000		

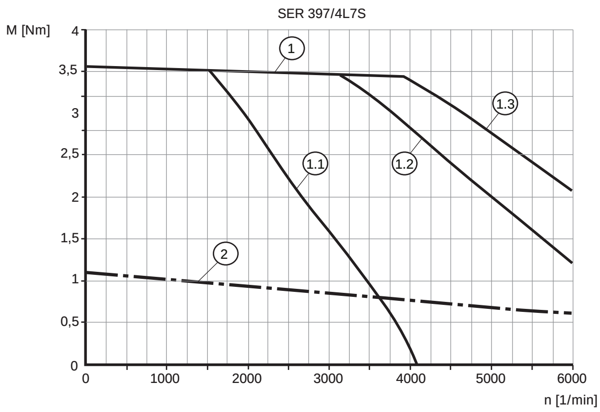
1) Definition of winding see type code
2) At 20 1/min; for n = 0 max. 89%
3) RMS value at 1000 1/min
4) Max. 2.5 s
5) Without holding brake
6) Axial and radial forces must not occur simultaneously

Characteristic curves

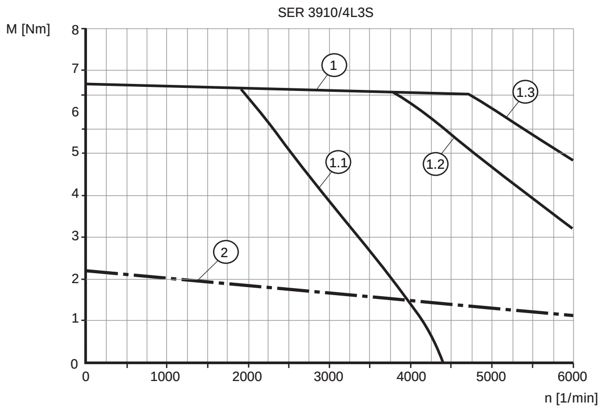
SER 397 / 4L 3S



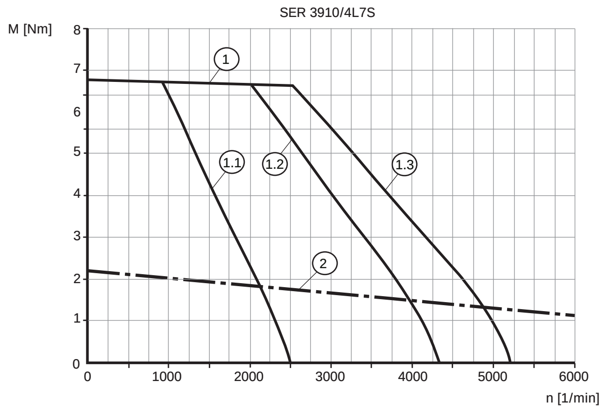
SER 397 / 4L 7S



SER 3910 / 4L 3S



SER 3910 / 4L 7S

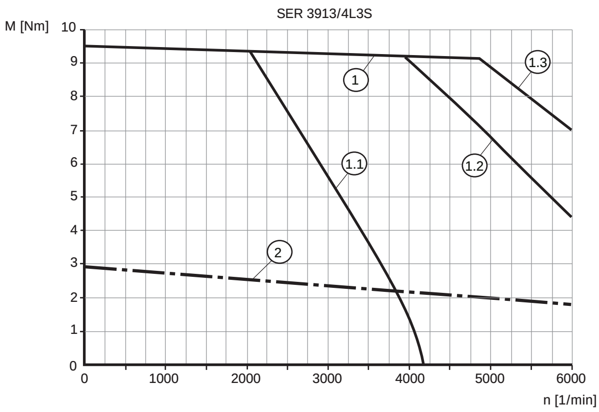


(1) Peak torque of motor
(1.1) Speed limit at 230 V_{eff}
(1.2) Speed limit at 400 V_{eff}
(1.3) Speed limit at 480 V_{eff}
(2) Continuous torque of motor

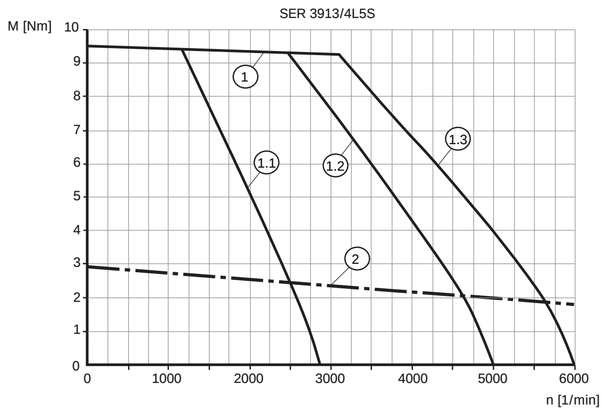
Note: The peak torque characteristics show the maximum values of the motors. The peak characteristics of the motors in combination with servo drive systems can be found at: www.berger-lahr.de > Downloads > Documentations > Motors.

Characteristic curves

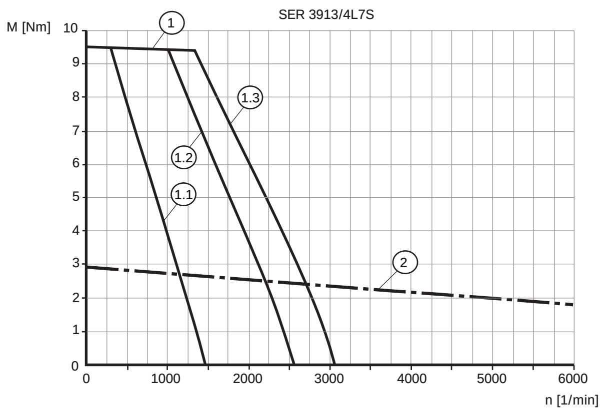
SER 3913 / 4L 3S



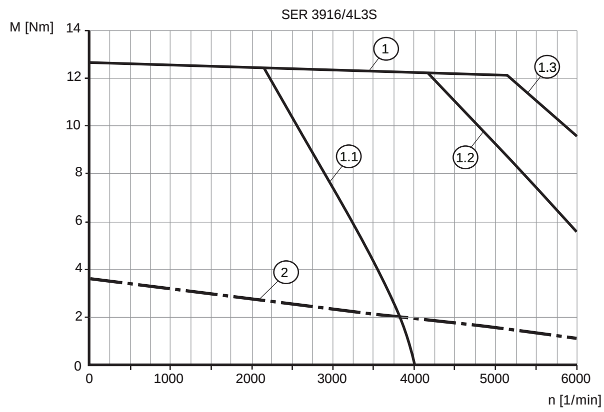
SER 3913 / 4L 5S



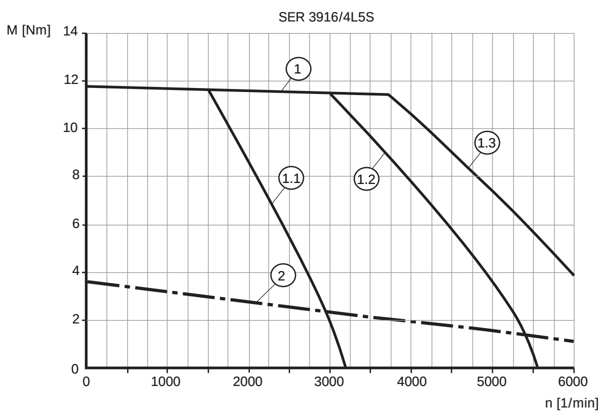
SER 3913 / 4L 7S



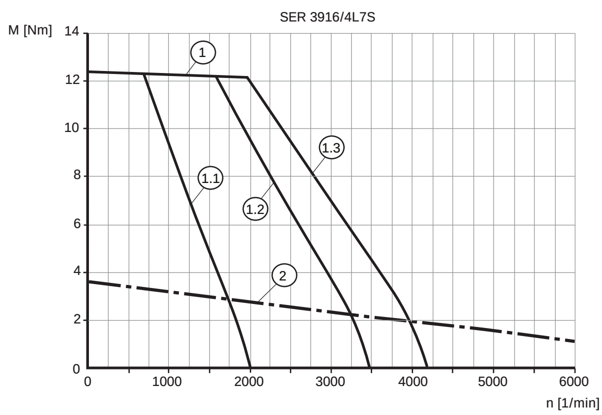
SER 3916 / 4L 3S



SER 3916 / 4L 5S



SER 3916 / 4L 7S



(1) Peak torque of motor
(1.1) Speed limit at 230 V_{eff}
(1.2) Speed limit at 400 V_{eff}
(1.3) Speed limit at 480 V_{eff}
(2) Continuous torque of motor

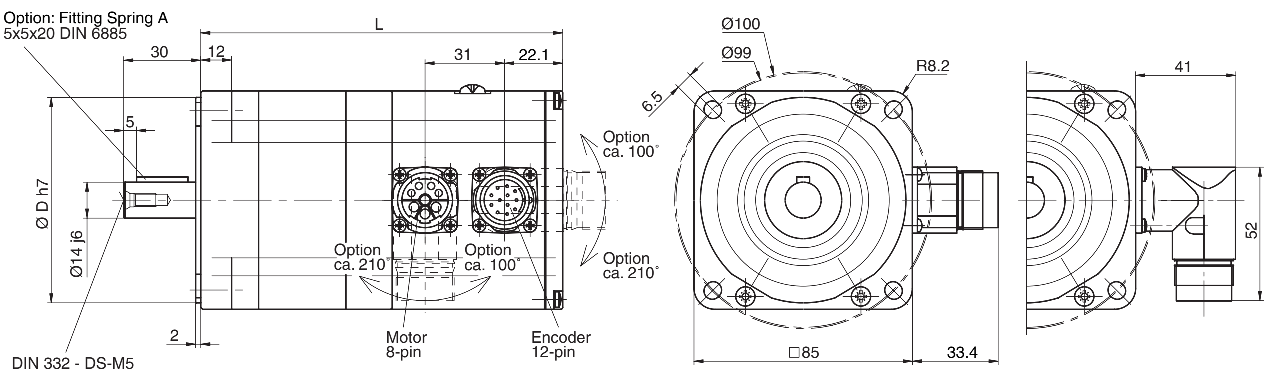
Note: The peak torque characteristics show the maximum values of the motors. The peak characteristics of the motors in combination with servo drive systems can be found at: www.berger-lahr.de > Downloads > Documentations > Motors.

Ambient conditions

Operating / ambient temperature without power reduction	°C	20 ... 40
Installation height without power reduction	m above MSL	1000
Transport and storage temperature	°C	-25 ... +70
Relative humidity	%	15 … 85 (non-condensing)
Vibration magnitude in operation as per DIN EN 60034-14		A
Vibration strain as per DIN EN 60068-2-6		
• Acceleration amplitude	m/s²	20
• Frequency range	Hz	10 ... 500
• Number of cycles		10
Degree of protection as per DIN EN 60034-5		
• Shaft exit front without shaft seal ring		IP 41
• Shaft exit front with shaft seal ring		IP 56 [1)
• Motor housing		IP 56
Thermal class as per DIN EN 60034-1		155 (F)
Shaft wobble and run-out accuracy		as per DIN 42955 N (IEC 60072-1)
Max. rotary acceleration	rad/s^2	200000

1) With mounting position IM V3 (drive shaft vertical, shaft end upward) only degree of protection IP 41 is guaranteed.

Dimensional drawings



	Length L without brake	Length L with brake	ØD Standard	ØD Option	ØD Option
SER 397	140.4	186.3	80	73	50
SER 3910	170.4	216.3	80	73	50
SER 3913	200.4	246.3	80	73	50
SER 3916	230.4	276.3	80	73	50

Dimensional drawing of SER 39•

Type code

Example:	SER	3	9	7	/	4	L	3	S	M	O	T	O	IP41	3	3	K	80	PTC
Number of phases 3	SER	**3**	9	7	/	4	L	3	S	M	O	T	O	IP41	3	3	K	80	PTC
Size (flange) 9 = 85 mm	SER	3	**9**	7	/	4	L	3	S	M	O	T	O	IP41	3	3	K	80	PTC
Length 7 = 141 mm 10 = 171 mm 13 = 201 mm 16 = 231 mm	SER	3	9	**7**	/	4	L	3	S	M	O	T	O	IP41	3	3	K	80	PTC
Number of pole pairs 4	SER	3	9	7	/	**4**	L	3	S	M	O	T	O	IP41	3	3	K	80	PTC
Rotor inertia L = low moment of inertia	SER	3	9	7	/	4	**L**	3	S	M	O	T	O	IP41	3	3	K	80	PTC
Winding label 3; 5; 7	SER	3	9	7	/	4	L	**3**	S	M	O	T	O	IP41	3	3	K	80	PTC
Winding circuit S = star	SER	3	9	7	/	4	L	3	**S**	M	O	T	O	IP41	3	3	K	80	PTC
Sensor system S = SinCos Singleturn M = SinCos Multiturn R = resolver	SER	3	9	7	/	4	L	3	S	**M**	O	T	O	IP41	3	3	K	80	PTC
Sensor system resolution O for sensor systems S, M, R	SER	3	9	7	/	4	L	3	S	M	**O**	T	O	IP41	3	3	K	80	PTC
Plug connector C = straight T = 90° angled	SER	3	9	7	/	4	L	3	S	M	O	**T**	O	IP41	3	3	K	80	PTC
Holding brake O = without brake B = with brake	SER	3	9	7	/	4	L	3	S	M	O	T	**O**	IP41	3	3	K	80	PTC
Degree of protection IP41 = without shaft seal ring IP56 = with shaft seal ring [1]	SER	3	9	7	/	4	L	3	S	M	O	T	O	**IP41**	3	3	K	80	PTC
Gearbox type [2] 3 = PLE 80 4 = PLE 120 A = PLS 70 B = PLS 90 C = PLS 115	SER	3	9	7	/	4	L	3	S	M	O	T	O	IP41	**3**	3	K	80	PTC
Gear ratio 3 = 3:1 5 = 5:1 8 = 8:1	SER	3	9	7	/	4	L	3	S	M	O	T	O	IP41	3	**3**	K	80	PTC
Motor shaft model K = parallel key DIN 6885 O = without parallel key / without gearing	SER	3	9	7	/	4	L	3	S	M	O	T	O	IP41	3	3	**K**	80	PTC
Centring collar OO = with gearing 50 = 50 mm 73 = 73 mm 80 = 80 mm	SER	3	9	7	/	4	L	3	S	M	O	T	O	IP41	3	3	K	**80**	PTC
Temperature sensor PTC = PTC	SER	3	9	7	/	4	L	3	S	M	O	T	O	IP41	3	3	K	80	**PTC**

[1] With mounting position IM V3 (drive shaft vertical, shaft end upward) only degree of protection IP 41 is guaranteed.
[2] Possible motor-gearing combinations see page 35f

SER 311•

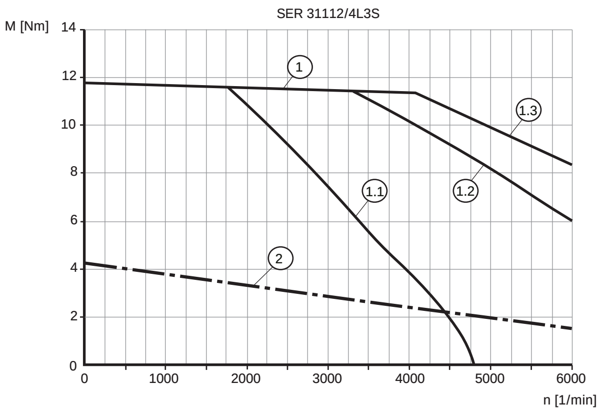
Technical data

Motor type		SER 31112			SER 31117			SER 31122		SER 31127	
Winding [1]		**3S**	**5S**	**7S**	**3S**	**5S**	**7S**	**5S**	**7S**	**5D**	**7S**
Nominal supply voltage U_N = 230 V_{AC}											
• Nominal continuous torque M_N	Nm	2.5	3.3	4.0	3.6	4.2	5.5	4.5	8.2	8.5	10.8
• Nominal continuous current I_N	A_{rms}	3.5	2.8	1.7	3.8	3.3	2.3	3.0	3.0	6.0	4.2
• Nominal speed n_N	1/min	4000	2200	1000	3300	2400	1250	2250	1000	2200	1100
• Nominal power P_N	kW	1.05	0.76	0.42	1.24	1.06	0.72	1.06	0.86	1.96	1.25
Nominal supply voltage U_N = 400 V_{AC}											
• Nominal continuous torque M_N	Nm	1.5	2.5	3.4	1.5	3.3	4.6	5.0	7.5	4.5	9.0
• Nominal continuous current I_N	A_{rms}	2.1	2.1	1.5	1.7	2.6	2.0	3.5	2.8	3.2	3.7
• Nominal speed n_N	1/min	6000	4000	2000	6000	4000	2250	4000	2000	4000	2000
• Nominal power P_N	kW	0.94	1.05	0.71	0.94	1.38	1.05	2.09	1.57	1.88	1.88
Nominal supply voltage U_N = 480 V_{AC}											
• Nominal continuous torque M_N	Nm	1.5	2.0	3.2	1.5	2.6	4.5	4.6	7.2	3.4	7.8
• Nominal continuous current I_N	A_{rms}	2.1	1.7	1.4	1.7	2.1	1.9	3.3	2.6	2.3	3.1
• Nominal speed n_N	1/min	6000	5000	2400	6000	4900	2500	4300	2250	4500	2500
• Nominal power P_N	kW	0.94	1.05	0.80	0.94	1.33	1.18	2.07	1.70	1.60	2.04
Continuous torque M_0 [2]	Nm	4.2			6.6			10		13.4	
Continuous current I_0	A_{rms}	6.0	3.6	1.8	6.6	5.0	2.7	7.0	3.6	9.2	5.1
Voltage constant k_{EU_V} [3]	V_{rms}	43.3	70.7	140.0	58.4	82.0	148.4	90.9	176	88.2	160
Winding resistance R_W	Ω	1.5	4	18.1	1.2	2.3	7.4	1.7	5.7	1.3	3.75
Winding inductance L_{qU_V}	mH	12.6	34.1	141	11.3	21.2	70.2	17.2	62.5	14.5	41.5
Winding inductance L_{dU_V}	mH	9.7	26.6	107	8.3	15.4	51.8	12.4	45.7	10.9	29.9
Maximum values											
Max. winding voltage U_{max}	V_{AC}	480			480			480		480	
	V_{DC}	680			680			680		680	
Max. voltage against PE	V_{AC}	300			300			300		300	
Max. current I_{max} [4]	A_{rms}	24.0	14.4	7.2	26.4	20.0	10.8	28.0	14.4	36.8	20.4
Max. torque M_{max}	Nm	11.76	11.93	11.93	20.86	20.06	20.33	30.00	30.00	39.13	40.20
Max. allowable speed of rotation n_{max}	1/min	6000			6000			4500		4500	
Max. continuous power P_{dmax}	kW	1.03			1.38			2.09		2.25	
Torque at max. continuous power M_{Pdmax}	Nm	2.1			3.3			5.0		6.7	
Speed of rotation at max. continuous power n_{Pdmax}	1/min	4700			4000			4000		3200	
Mechanical data											
Rotor moment of inertia J_R	$kgcm^2$	4			8			11.6		15.5	
Mass m	kg	5.0			8.0			11.0		13.0	
Shaft load [5]											
• Max. radial force front F_R											
- 10% ED	N	1480			1550			1530		760	
- 100% ED	N	690			800			800		760	
• Max. axial force tension/compression F_A											
- 10% ED	N	900			900			900		900	
- 100% ED	N	600			600			600		600	
• Nominal bearing lifetime L_{10h}	h	20000			20000			20000		20000	

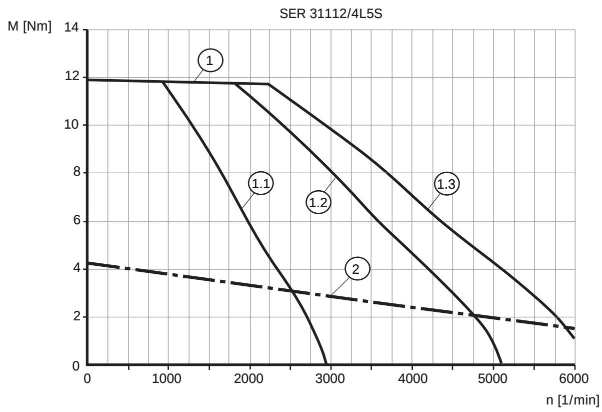
[1] Definition of winding see type code
[2] At 20 1/min; for n = 0 max. 89%
[3] RMS value at 1000 1/min
[4] Max. 2.5 s
[5] Axial and radial forces must not occur simultaneously

Characteristic curves

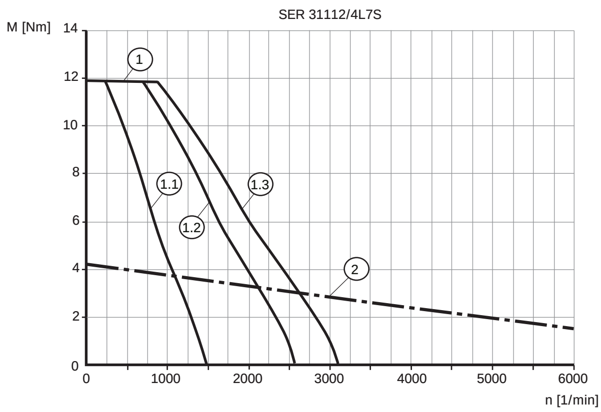
SER 31112 / 4L 3S



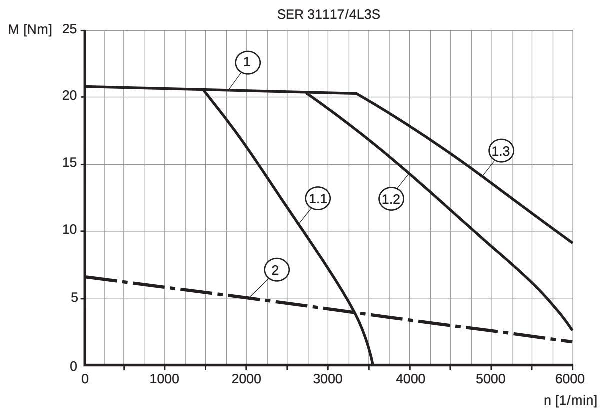
SER 31112 / 4L 5S



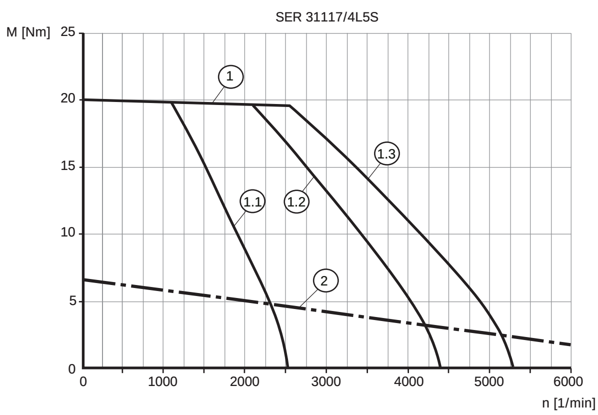
SER 31112 / 4L 7S



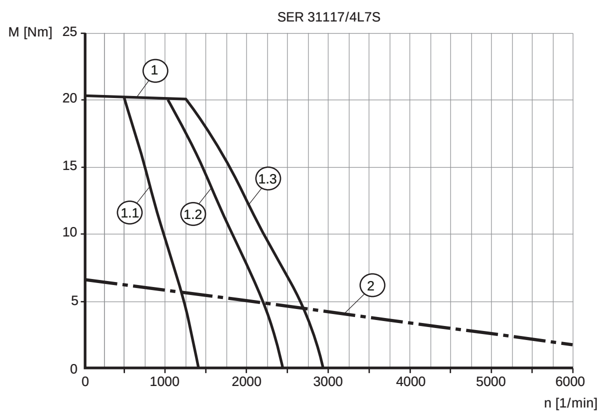
SER 31117 / 4L 3S



SER 31117 / 4L 5S



SER 31117 / 4L 7S

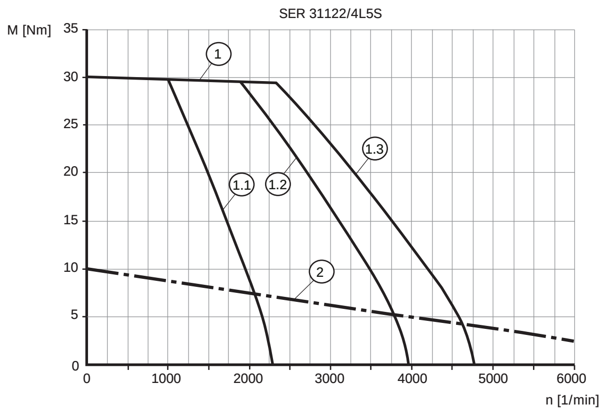


(1) Peak torque of motor
(1.1) Speed limit at 230 V_{eff}
(1.2) Speed limit at 400 V_{eff}
(1.3) Speed limit at 480 V_{eff}
(2) Continuous torque of motor

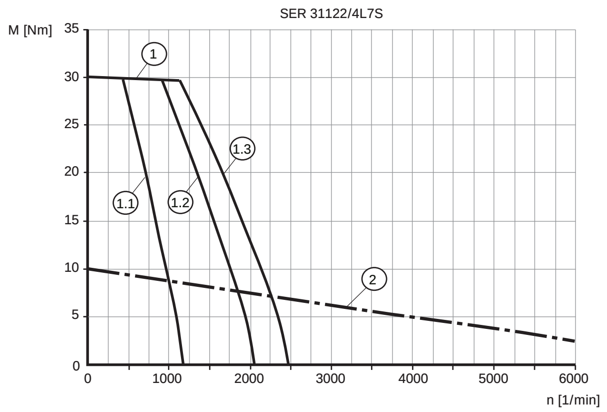
Note: The peak torque characteristics show the maximum values of the motors. The peak characteristics of the motors in combination with servo drive systems can be found at: www.berger-lahr.de > Downloads > Documentations > Motors.

Characteristic curves

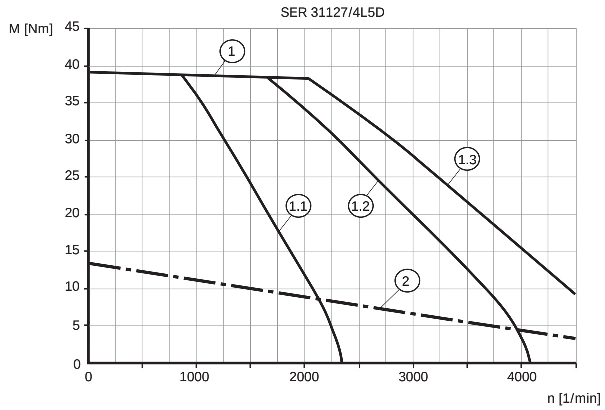
SER 31122 / 4L 5S



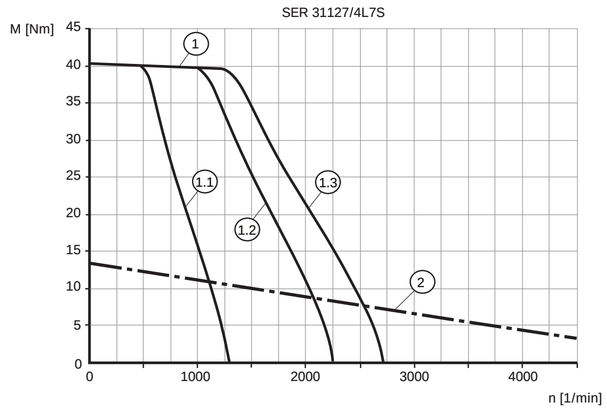
SER 31122 / 4L 7S



SER 31127 / 4L 5D



SER 31127 / 4L 7S



(1) Peak torque of motor
(1.1) Speed limit at 230 V_{eff}
(1.2) Speed limit at 400 V_{eff}
(1.3) Speed limit at 480 V_{eff}
(2) Continuous torque of motor

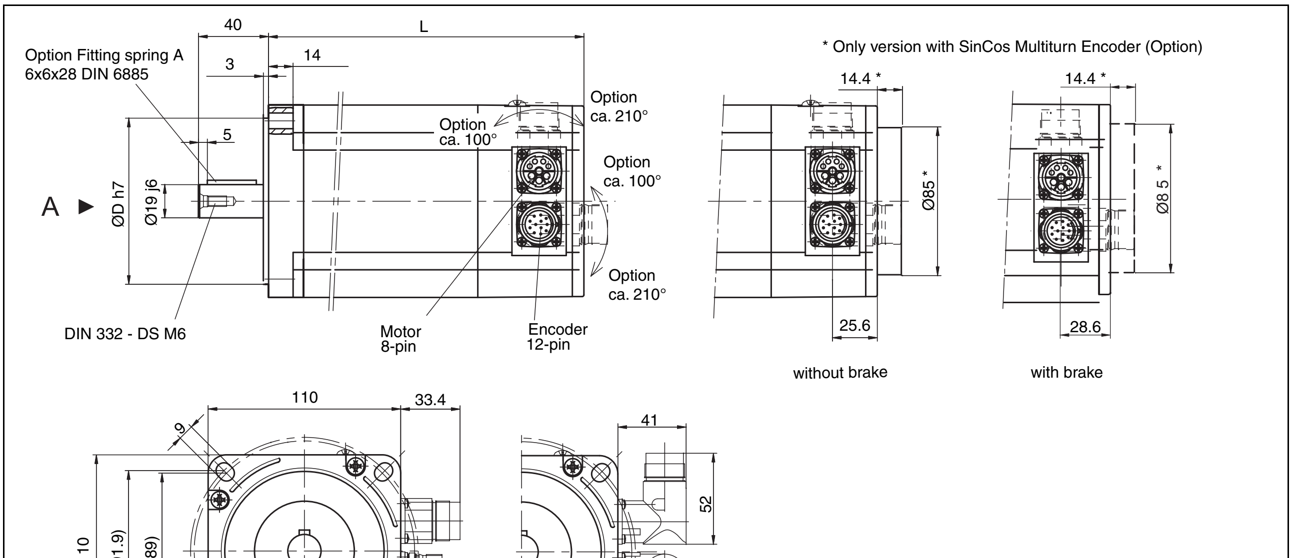
Note: The peak torque characteristics show the maximum values of the motors. The peak characteristics of the motors in combination with servo drive systems can be found at: www.berger-lahr.de > Downloads > Documentations > Motors.

Ambient conditions

Operating / ambient temperature without power reduction	°C	20 ... 40
Installation height without power reduction	m above MSL	1000
Transport and storage temperature	°C	-25 ... +70
Relative humidity	%	15 … 85 (non-condensing)
Vibration magnitude in operation as per DIN EN 60034-14		A
Vibration strain as per DIN EN 60068-2-6		
• Acceleration amplitude	m/s²	20
• Frequency range	Hz	10 ... 500
• Number of cycles		10
Degree of protection as per DIN EN 60034-5		
• Shaft exit front without shaft seal ring		IP 41
• Shaft exit front with shaft seal ring		IP 56 [1]
• Motor housing		IP 56
Thermal class as per DIN EN 60034-1		155 (F)
Shaft wobble and run-out accuracy		as per DIN 42955 N (IEC 60072-1)
Max. rotary acceleration	rad/s^2	200000

[1] With mounting position IM V3 (drive shaft vertical, shaft end upward) only degree of protection IP 41 is guaranteed.

Dimensional drawings



	Length L without brake	Length L with brake	ØD Standard	ØD Option	ØD Option
SER 31112	132.1	198.1	95	110	56
SER 31117	180.1	246.1	95	110	56
SER 31122	228.1	294.1	95	110	56
SER 31127	276.1	342.1	95	110	56

Dimensional drawing of SER 311•

Type code

Example:	SER	3	11	12 /	4	L	3	S	M	O	T	O	IP41	3	3	K	95	PTC
Number of phases 3	SER	**3**	11	12 /	4	L	3	S	M	O	T	O	IP41	3	3	K	95	PTC
Size (flange) 11 = 110 mm	SER	3	**11**	12 /	4	L	3	S	M	O	T	O	IP41	3	3	K	95	PTC
Length 12 = 132 mm 17 = 180 mm 22 = 228 mm 27 = 276 mm	SER	3	11	**12** /	4	L	3	S	M	O	T	O	IP41	3	3	K	95	PTC
Number of pole pairs 4	SER	3	11	12 /	**4**	L	3	S	M	O	T	O	IP41	3	3	K	95	PTC
Rotor inertia L = low moment of inertia	SER	3	11	12 /	4	**L**	3	S	M	O	T	O	IP41	3	3	K	95	PTC
Winding label 3; 5; 7	SER	3	11	12 /	4	L	**3**	S	M	O	T	O	IP41	3	3	K	95	PTC
Winding circuit S = star	SER	3	11	12 /	4	L	3	**S**	M	O	T	O	IP41	3	3	K	95	PTC
Sensor system S = SinCos Singleturn M = SinCos Multiturn R = resolver	SER	3	11	12 /	4	L	3	S	**M**	O	T	O	IP41	3	3	K	95	PTC
Sensor system resolution O for sensor systems S, M, R	SER	3	11	12 /	4	L	3	S	M	**O**	T	O	IP41	3	3	K	95	PTC
Plug connector C = straight T = 90° angled	SER	3	11	12 /	4	L	3	S	M	O	**T**	O	IP41	3	3	K	95	PTC
Holding brake O = without brake B = with brake	SER	3	11	12 /	4	L	3	S	M	O	T	**O**	IP41	3	3	K	95	PTC
Degree of protection IP41 = without shaft seal ring IP56 = with shaft seal ring [1)]	SER	3	11	12 /	4	L	3	S	M	O	T	O	**IP41**	3	3	K	95	PTC
Gearbox type [2)] 3 = PLE 80 4 = PLE 120 B = PLS 90 C = PLS 115 D = PLS 142	SER	3	11	12 /	4	L	3	S	M	O	T	O	IP41	**3**	3	K	95	PTC
Gear ratio 3 = 3:1 5 = 5:1 8 = 8:1	SER	3	11	12 /	4	L	3	S	M	O	T	O	IP41	3	**3**	K	95	PTC
Motor shaft model K = parallel key DIN 6885 O = without parallel key / without gearing	SER	3	11	12 /	4	L	3	S	M	O	T	O	IP41	3	3	**K**	95	PTC
Centring collar OO = with gearing 11 = 110 mm 56 = 56 mm 95 = 95 mm	SER	3	11	12 /	4	L	3	S	M	O	T	O	IP41	3	3	K	**95**	PTC
Temperature sensor PTC = PTC	SER	3	11	12 /	4	L	3	S	M	O	T	O	IP41	3	3	K	95	**PTC**

1) With mounting position IM V3 (drive shaft vertical, shaft end upward) only degree of protection IP 41 is guaranteed.
2) Possible motor-gearing combinations see page 35f

Options

Holding brake

The holding brake is an electromagnetic sprung brake. It holds the motor axis after the motor current is switched off, including after power failure and emergency stop. A holding brake is required particularly for torque loads caused by weight forces, such as occur with vertical axes used in handling applications.

Control

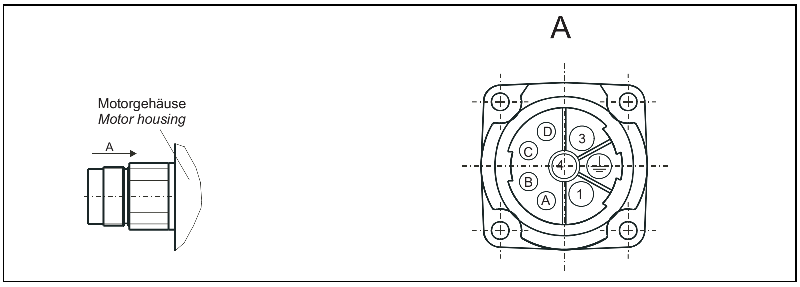
A motor with a holding brake requires appropriate control logic which releases the brake exactly at the start of a rotary movement and fixes the motor axis when the motor stops.

Control circuit
Use a suitable holding brake controller, such as the Berger Lahr TL HBC VW3M3103. The current of the brake voltage to must be reduced after about 100 ms, because otherwise the specified torque characteristics will not be guaranteed because of the additional heat build-up. The holding brake controller should have secure electrical isolation for the brake power supply and comply with the EMC Standard DIN EN 618008-3.

Technical Data

Motor		SER 36•	SER 39•	SER 311•
Nominal voltage	V_{DC}	24 ± 10%	24 ± 10%	24 ± 10%
Holding torque	Nm	1.2	6	16
Electrical pull-in power	W	10	24	28
Moment of inertia	$kgcm^2$	0.07	0.2	0.35
Energise time (release brake)	ms	14	40	60
De-energise time (apply brake)	ms	13	20	30
Mass	kg	Approx. 0.3	Approx. 1.8	Approx. 3.0

Motor connection



Motor connection

Manufacturer: Intercontec,
power plug connector 8-pin, BEGA089NN0000 0002 000

PIN	Assignments
1	U
2	PE
3	W
4	V
A	Holding brake +
B	Holding brake –
C	not connected
D	not connected

Position capture

SinCos encoder

SinCos (SRS50) Singleturn
The "SinCos (SRS50) Singleturn" sensor system measures an absolute value within one revolution after being switched on and continues to count incrementally from this point.

Technical Data		
Resolution		depends on controller
Measurement range absolute		1 revolution
Error limit of digital absolute value	arcmin	±1.5 (depending on controller)
Precision of the incremental position evaluation	arcmin	±0.75
Signal shape		sinus
Supply voltage	V	7 ... 12 (recommended 8 V)
Current consumption	mA	80 (without load)

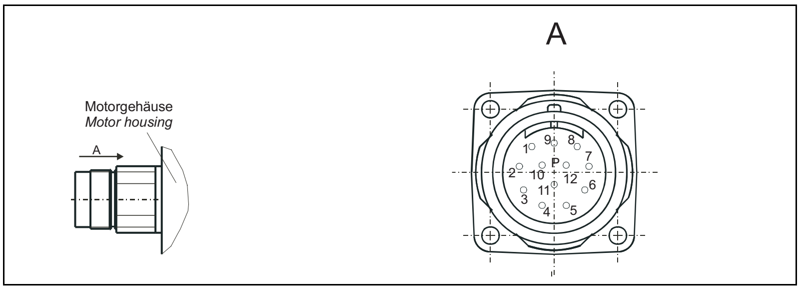
For more information see www.stegmann.de

SinCos (SRSM50) Multiturn
The "SinCos (SRM50) Multiturn" sensor system measures an absolute value within 4096 revolutions after being switched on and continues to count incrementally from this point.

Technical Data		
Resolution		depends on controller
Measurement range absolute		4096 revolution
Error limit of digital absolute value	arcmin	±1.5 (depending on controller)
Precision of the incremental position evaluation	arcmin	±0.75
Signal shape		sinus
Supply voltage	V	7 ... 12 (recommended 8 V)
Current consumption	mA	80 (without load)

For more information see www.stegmann.de

SinCos encoder sensor connection



SinCos Encoder sensor connector (Singleturn and Multiturn)

Manufacturer: Intercontec,
signal plug connector 12-pin, AEGA052NN0000 1250 000

PIN	Assignments
1	Temperature sensor PTC
2	Temperature sensor PTC
3	not connected
4	REF SIN
5	REF COS
6	Data+ RS 485
7	Data- RS 485
8	+ SIN
9	+ COS
10	U_S 7-12 V
11	GND
12	not connected

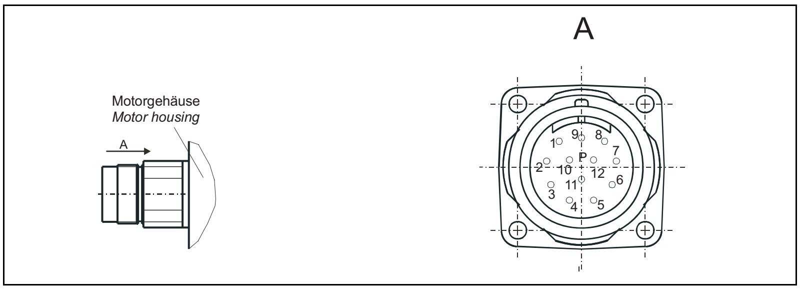
PTC: S+M, Model B59135-M155-A7

Resolver

The "resolver" sensor system is a very robust system. Absolute position capture is possible within one revolution.

Technical Data		
Resolution		depends on controller
Measurement range absolute		1 revolution
Precision of the incremental position evaluation	arcmin	±6
Input voltage	V_{eff}	7
Current consumption	mA	38

Resolver sensor connection



Sensor plug resolver

Manufacturer: Intercontec,
signal plug connector 12-pole, AEGA052NN0000 1250 000

PIN	Assignments
1	Temperature sensor PTC
2	Temperature sensor PTC
3	not connected
4	- SIN
5	- COS
6	REF +
7	REF -
8	+ SIN
9	+ COS
10	not connected
11	not connected
12	not connected

PTC: S+M, Model B59135-M155-A70

Gearing for SER servomotors

Stepper motors from Berger Lahr can also be fitted with integrated planetary gear. The PLE gearing comprises economical planetary gears that meet most requirements for accuracy. The PLS gearing is high-quality gearing with very low rotation play. This gearing can be supplied with one of three ratios: 3:1, 5:1 and 8:1.
The output torque of the gearing is determined by multiplying the torque of the motor with the gear ratio and the efficiency of the gearing.

PLE gearing

The following table shows the preferred motor-gearing combinations.

Motor type	**PLE gearing**		
Gear ratio	**3:1**	**5:1**	**8:1**
SER 364 / 366	PLE 60	PLE 60	PLE 60
SER 368 / 3610	PLE 60	PLE 60	PLE 60 [1)]
SER 397	PLE 80	PLE 80	PLE 80
SER 3910	PLE 80	PLE 80	PLE 120
SER 3913	PLE 80	PLE 80	PLE 120
SER 3916	PLE 120	PLE 120	PLE 120
SER 31112	PLE 120	PLE 120	PLE 120
SER 31117	PLE 120	PLE 120	PLE 160
SER 31122	PLE 160	PLE 160	PLE 160
SER 31127	PLE 160	PLE 160	PLE 160

1) The continuous gearing output torque must not be continuously exceeded. Twice the torque is possible for a short time, such as in an emergency stop situation. It may be necessary to limit the motor, otherwise the gearing may be destroyed at peak torques.

Technical Data		
PLE gearing general		
Gear stages		1
Life time [1)]	h	10000
Efficiency at full load	%	96
Housing material		aluminium
Surface		black anodised
Shaft material		C 45
Bearings		roller bearing
Operating temperature [2)]	°C	-25 ... +90, shortly +120
Degree of protection [3)]		IP 54
Lubrication		life lubrication

1) Life time with an output speed of 100 1/min and T = 30 °C
2) Referring to the housing surface
3) With mounting position IM V3 (drive shaft vertical, shaft end upward) only degree of protection IP 41 is guaranteed

Size of PLE		**60**	**80**	**120**	**160**
Max. radial force [1) 2)]	N	500	950	2000	6000
Max. axial force [1)]	N	600	1200	2800	8000
Torsional play	arcmin	< 20	< 12	<8	< 6
Max. drive speed	1/min	13000	7000	6500	6500
Recommended drive speed	1/min	4000	4000	3500	3000
Torsional stiffness	Nm/arcmin	2.3	6	12	38
Weight	kg	0.9	2.1	6.0	18

1) The information refers to min. 20000 h life time with an output speed of 100 1/min and application factor K = 100 min and S1 operating mode for electrical machines and T = 30 °C
2) Refers to the centre of the driven shaft and 50% ED

PLS gearing

The following table shows the recommended motor-gearing combinations.

Motor type	PLS gearing		
Gear ratio	**3:1**	**5:1**	**8:1**
SER 36•	PLS 70	PLS 70	PLS 70
SER 397	PLS 70	PLS 70	PLS 70
SER 3910	PLS 70	PLS 70	PLS 90
SER 3913	PLS 70	PLS 90	PLS 115
SER 3916	PLS 90	PLS 90	PLS 115
SER 31112	PLS 90	PLS 90	PLS 115
SER 31117	PLS 90	PLS 115	PLS 142
SER 31122	PLS 115	PLS 115	PLS 142
SER 31127	PLS 115	PLS 142	PLS 142

Technical Data

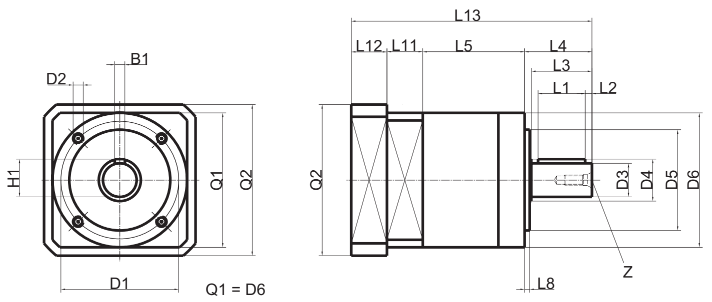
PLS gearing general		
Gear stages		1
Life time 1)	h	20000
Efficiency at full load	%	98
Housing material		aluminium
Surface		black anodised
Shaft material		C 45
Bearings		tapered roller bearings
Operating temperature 2)	°C	-25 ... +100, shortly +124
Degree of protection 3)		IP 65
Lubrication		life lubrication

1) Life time with an output speed of 100 1/min and T = 30 °C
2) Referring to the housing surface
3) With mounting position IM V3 (drive shaft vertical, shaft end upward) only protection class IP 41 is guaranteed

Size of PLS		70	90	115	142
Max. radial force 1) 2)	N	3000	4000	5000	9000
Max. axial force 1)	N	6000	9000	12000	15000
Torsional play	arcmin	<3	<3	<3	<3
Max. drive speed	1/min	14000	10000	8500	6500
Recommended drive speed	1/min	5000	4500	4000	3000
Torsional stiffness	Nm/arcmin	6	9	20	44
Weight	kg	3.0	4.3	9.0	15.4

1) The information refers to min. 20000 h life time with an output speed of 100 1/min and application factor K = 100 min and S1 operating mode for electrical machines and T = 30 °C
2) Refers to the centre of the driven shaft and 50% ED

Dimensional drawings of PLE gearing

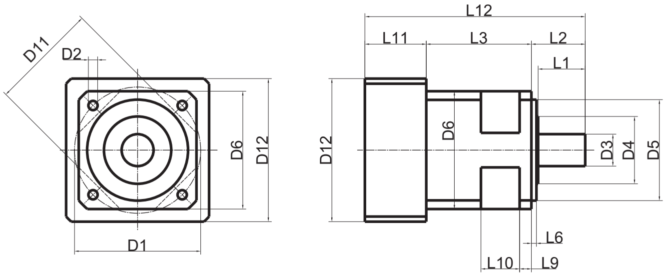


Size of PLE		60	80	120	160
Combination options		**SER 36•**	**SER 39•**	**SER 39• SER 311•**	**SER 311•**
Flange hole circle	D1	52	70	100	145
Screw-in thread	D2	M5*8	M6*10	M10*16	M12*20
Shaft diameter	D3	14	20	25	40
Shaft stub	D4	17	25	35	55
Centring	D5	40	60	80	130
Housing diameter	D6	60	80	115	160
Adapter flange cross section	Q2	60	90	115	140
Centre hole [1]	Z	M5*12	M6*16	M10*22	M16*36
Parallel key height [2]	H1	16	22.5	28	43
Parallel key width [2]	B1	5	6	8	12
Parallel key length [2]	L1	25	28	40	65
Distance from shaft end	L2	2,5	4	5	8
Shaft length to collar	L3	30	36	50	80
Output shaft length	L4	35	40	55	87
Case length	L5	47	60.5	74	104
Output centring collar	L8	3	3	4	5
Intermediate flange length	L11	8.2	12	25.5	-
Adapter flange length	L12	16	21.2	21.8	64.5
Total length	L13	106.2	133.7	176.3	255.5

1) Centre hole DIN 332, page 2, form DS

2) Parallel key DIN 6885 T1

Dimensional drawings of PLS gearing



Size of PLS		70	70	90	90	115	142
Combination options		**SER 36•**	**SER 39•**	**SER 39•**	**SER 311•**	**SER 39• SER 311•**	**SER 311•**
Flange hole circle	D1	75	75	100	100	130	165
Screw-in hole	D2	5.5	5.5	6.5	6.5	8.5	11
Shaft diameter	D3	19	19	22	22	32	40
Shaft stub	D4	40	40	50	50	55	65
Centring	D5	60	60	80	80	110	130
Gearing cross section	D6	70	70	90	90	115	140
Cut-out	D11	64	64	87	87	115	140
Motor flange cross section	D12	70	90	90	115	115	140
Shaft length to collar	L1	28	28	36	36	58	80
Output shaft length	L2	32	32	41.5	41.5	64.5	87
Case length	L3	62.5	62.5	69	69	77.5	102
Output centring collar	L6	3	3	3	3	4	5
Flange thickness	L9	7	7	8	8	14	20
Cut-out width	L10	23	23	30	30	34	52
Motor flange length	L11	29.5	36.5	40	50	46	64.5
Total length	L12	124	131	150.5	160.5	188	253.5

All information refers to a single-stage gearing.

Conversion tables

Rotor inertia

	$lb{\cdot}in^2$	$lb{\cdot}ft^2$	$lb{\cdot}in{\cdot}s^2$	$lb{\cdot}ft{\cdot}s^2$ $slug{\cdot}ft^2$	$kg{\cdot}cm^2$	$kg{\cdot}cm{\cdot}s^2$	$g{\cdot}cm^2$	$g{\cdot}cm{\cdot}s^2$	$oz{\cdot}in^2$	$oz{\cdot}in{\cdot}s^2$
$lb{\cdot}in^2$	–	6.94×10^{-3}	2.59×10^{-3}	2.15×10^{-4}	2.926	2.98×10^{-3}	2.92×10^{3}	2.984	16	4.14×10^{-2}
$lb{\cdot}ft^2$	144	–	0.3729	3.10×10^{-2}	421.40	0.4297	4.21×10^{5}	429.71	2304	5.967
$lb{\cdot}in{\cdot}s^2$	386.08	2.681	–	8.33×10^{-2}	1.129×10^{3}	1.152	1.129×10^{6}	1.152×10^{3}	6.177×10^{3}	16
$lb{\cdot}ft{\cdot}s^2$ $slug{\cdot}ft^2$	4.63×10^{3}	32.17	12	–	1.35×10^{4}	13.825	1.355×10^{7}	1.38×10^{4}	7.41×10^{4}	192
$kg{\cdot}cm^2$	0.3417	2.37×10^{-3}	8.85×10^{-4}	7.37×10^{-6}	–	1.019×10^{-3}	1000	1.019	5.46	1.41×10^{-2}
$kg{\cdot}cm{\cdot}s^2$	335.1	2.327	0.8679	7.23×10^{-2}	980.66	–	9.8×10^{5}	1000	5.36×10^{3}	13.887
$g{\cdot}cm^2$	3.417×10^{-4}	2.37×10^{-6}	8.85×10^{-7}	7.37×10^{-8}	1×10^{-3}	1.01×10^{-6}	–	1.01×10^{-3}	5.46×10^{-3}	1.41×10^{-6}
$g{\cdot}cm{\cdot}s^2$	0.335	2.32×10^{-3}	8.67×10^{-4}	7.23×10^{-5}	0.9806	1×10^{-3}	980.6	–	5.36	1.38×10^{-2}
$oz{\cdot}in^2$	0.0625	4.3×10^{-4}	1.61×10^{-6}	1.34×10^{-6}	0.182	1.86×10^{-4}	182.9	0.186	–	2.59×10^{-3}
$oz{\cdot}in{\cdot}s^2$	24.13	0.1675	6.25×10^{-2}	5.20×10^{-3}	70.615	7.20×10^{-2}	7.06×10^{4}	72	386.08	–

Torque

	lb·in	lb·ft	oz·in	Nm	kg·m	kg·cm	g·cm	dyne·cm
lb·in	–	8.333×10^{-2}	16	0.113	1.152×10^{-2}	1.152	1.152×10^{3}	1.129×10^{6}
lb·ft	12	–	192	1.355	0.138	13.825	1.382×10^{4}	1.355×10^{7}
oz·in	6.25×10^{-2}	5.208×10^{-3}	–	7.061×10^{-3}	7.200×10^{-4}	7.200×10^{-2}	72.007	7.061×10^{4}
Nm	8.850	0.737	141.612	–	0.102	10.197	1.019×10^{4}	1×10^{7}
kg·m	86.796	7.233	1.388×10^{3}	9.806	–	100	1×10^{5}	9.806×10^{7}
kg·cm	0.8679	7.233×10^{-2}	13.877	9.806×10^{-2}	1×10^{-2}	–	1000	9.806×10^{5}
g·cm	8.679×10^{-4}	7.233×10^{-5}	1.388×10^{-2}	9.806×10^{-5}	1×10^{-5}	1×10^{-3}	–	980.665
dyne·cm	8.850×10^{-7}	7.375×10^{-8}	1.416×10^{-5}	1×10^{-7}	1.019×10^{-8}	1.0197×10^{-6}	1.019×10^{-6}	–

Power

	H.P.	W
H.P.	–	745.7
W	1.31×10^{-3}	–

Length

	in	ft	yd	m	cm	mm
in	–	0.0833	0.028	0.0254	2.54	25.4
ft	12	–	0.333	0.3048	30.48	304.8
yd	36	3	–	0.914	91.44	914.4
m	39.37	3.281	1.09	–	100	1000
cm	0.3937	0.03281	1.09×10^{-2}	0.01	–	10
mm	0.03937	0.00328	1.09×10^{-3}	0.001	0.1	–

Rotation

	1/min (rpm)	rad/sec	deg./sec
1/min (rpm)	–	0.105	6.0
rad/sec	9.55	–	57.30
deg./sec	0.167	1.745×10^{-2}	–

Weight

	lb	oz	slug	kg	g
lb	–	16	0.0311	0.453592	453.592
oz	6.35×10^{-2}	–	1.93×10^{-3}	0.028349	28.35
slug	32.17	514.8	–	14.5939	1.459×10^{4}
kg	2.20462	35.274	0.0685218	–	1000
g	2.205×10^{-3}	3.527×10^{-3}	6.852×10^{-5}	0.001	–

Temperature

	°F	°C
°F	–	$(\vartheta - 32) \cdot {}^{5}/_{9}$
°C	ϑ #) $^{9}/_{5} + 32$	–

Force

	lb	oz	gf	dyne	N
lb	–	16	453.592	4.448×10^{5}	4.4482
oz	0.0625	–	28.35	2.780×10^{4}	0.27801
gf	2.205×10^{-3}	0.03527	–	980,665	N.A.
dyne	2.248×10^{-6}	3.59×10^{-6}	1.02×10^{-3}	–	0.0001
N	0.22481	3.5967	N.A.	100,000	–

Example for conversion:
Conversion of a 10 inch length measurement into metres. Look for the entry "in" (= inch) in the "Length" table in the left column and the entry "m" (= metre) in the header. The table cell at the point of intersection of the column and the row will show the conversion factor: "0.0254". Multiply 10 inches by 0.0254 and you will get the value in metres: 10 in x 0.0254 = 0.254 m.

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Catalogue

Stepper Motors VRDM, ExRDM

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Product description

The 3-phase stepper motors from Berger Lahr are extremely robust, maintenance-free motors. They carry out precise stepper movements that are controlled by a stepper drive. A stepper motor drive consists of a stepper motor and the matching stepper drive. The maximum power can be reached only if motor and electronics are optimally matched.

The 3-phase stepper motors can be operated at very high resolutions depending on the stepper motor controller.

Options such as rotation monitoring and holding brake with robust, low-play planetary gears extend the application options.
There are also 3-phase stepper motors by Berger Lahr in normal and explosion-proof types (explosion degree of protection EEx d IIC T4).

Stepper motor drive system

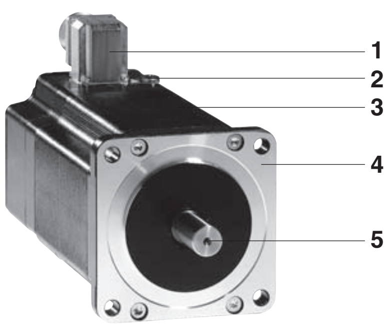
Special features

Quiet
Due to the sinus-commutation of the drive and the special mechanical construction of the motors, the result is a very quiet stepper motor that runs virtually resonance-free.

Strong
The optimised internal geometry of the motor offers a high power density; i.e. up to 50% greater torque compared to conventional stepper motors of comparable size.

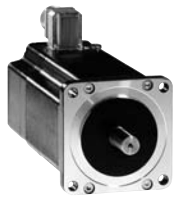
Flexible
It is possible to manufacture and supply a wide variety of motor types due to their flexible modular system and modern version management.

Design



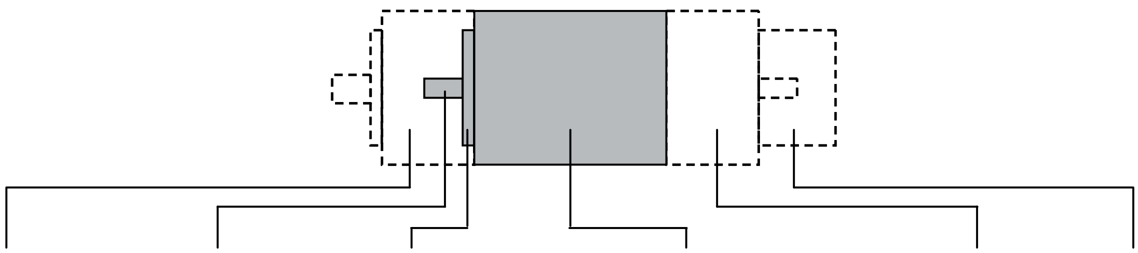
(1) Motor connection, here versions with an offset connector
(2) Additional terminal for protective conductor
(3) Housing, with black protective coating
(4) Axial flange with four mounting points as per DIN 42918
(5) Smooth shaft end as per DIN 42918

Product overview

3-phase stepper motors		VRDM 36•	VRDM 39•	VRDM 311•	ExRDM 39• (explosion-proof motors)
					
Size		6	9	11	9
Max. torque M_{max}	Nm	0.45 ... 1.50	1.7 ... 6.0	12.0 ... 16.5	4.0 ... 5.8
Holding torque M_H	Nm	0.51 ... 1.70	1.92 ... 6.78	13.5 ... 19.7	4.5 ... 6.55
Steps per revolution z [1]		200 / 500 / 1000 / 2000 / 4000 / 5000 / 10000			
Step angle α [1]	°	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036			

[1] Depending on controller

Motor types



Gear [1]	Shaft model		Centring collar	Size (Flange dimension)	Length (Dimension without shaft)	Winding [2]	Motor connection [3]	Options [4]
VRDM 36•								
PLE 40	smooth	Ø 6.35 mm	Ø 38.1 mm	6 (57.2 mm)	4 (42 mm)	H	Braided wires	2nd shaft end
PLE 60					6 (56 mm)	H	Terminal box	Holding brake
PLS 70						N	Plug	Encoder
					8 (79 mm)	H		
		Ø 8 mm				N		
						W		
VRDM 39•								
PLE 80	smooth	Ø 9.5 mm [5]	Ø 60 mm	9 (85 mm)	7 (68 mm)	H	Braided wires	2nd shaft end
PLS 90	with woodruff key	Ø 12 mm	Ø 73 mm		10 (98 mm)	N	Terminal box	Holding brake
		Ø 14 mm			13 (128 mm)	W	Plug	Encoder
VRDM 311•								
PLE 120	with parallel key	Ø 19 mm	Ø 56 mm	11 (110 mm)	17 (180 mm)	W	Terminal box	2nd shaft end
PLS 115					22 (228 mm)		Plug	Holding brake
								Encoders
ExRDM 39•								
PL 50/100/ATEX	with woodruff key	Ø 14 mm	Ø 60 mm	9 (85 mm)	10 (98 mm)	W	Terminal box	Holding brake
					13 (128 mm)			Encoder

[1] Planetary gears each available in the gear ratios 3:1, 5:1 and 8:1. The gear PL 50/100/ATEX is available in the gear ratios 3:1 and 5:1

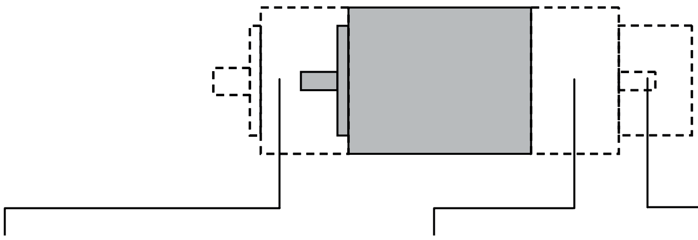
[2] Nominal voltage: H = 24 / 35 V_{DC}; N = 130 V_{DC}; W = 325 V_{DC}

[3] Motors with W-winding are not available with braids. For motors with terminal box there is a strip terminal within the motor; the screwed cable gland is sealed and EMC-tested.

[4] Alternative: 2nd shaft end or holding brake. Motors with encoder are only available with plug; 2nd shaft end or holding brake are not possible then.

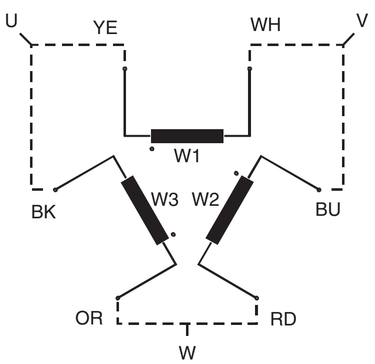
[5] Ø 9.5 mm and Ø 12 mm at VRDM 397 and VRDM 3910; Ø 14 mm at VRDM 3913

Degree of protection

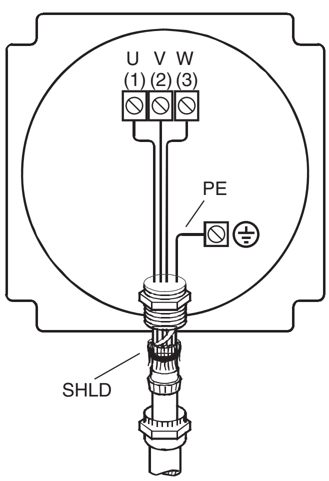


Front of motor			Motor connection		Rear of motor	
Gearbox		Shaft bushing	Braided wires	Terminal box	2nd shaft end	Holding brake
PL, PLE	PLS			Plug		Encoder
IP 54	IP 65	IP 41 IP 56 (optional with VRDM 39x and VRDM 311x) IP 44 for ExRDM 39x	IP 41	IP 56	IP 41	IP 56

Motor connection

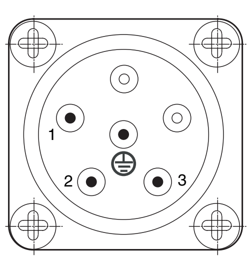


Motor connection in braided wire version		
Designation	**Motor braided wire colour as per DIN IEC 757**	**Motor braided wire colour**
U	BK and YE	black and yellow
V	WH and BU	white and blue
W	OR and RD	orange and red



Motor connection in terminal box version			
Designation	**Pin**	**Wire colour as per DIN IEC 757**	**Wire colour** [1)]
U	1	BR	brown
V	2	BU	blue
W	3	BK	black
PE		GN/YE	green/yellow
SHLD	Shield		

1) Berger Lahr motor cable

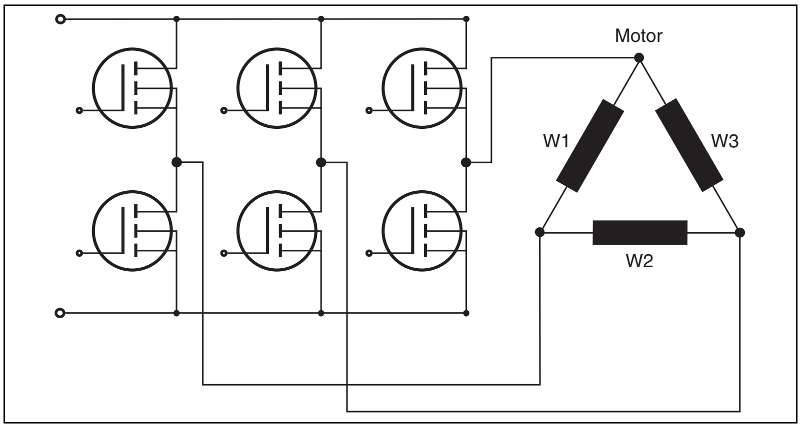


Motor connection in connector version	
Designation	**Pin**
U	1
V	2
W	3
PE	4

Control

3-phase stepper motors in triangle

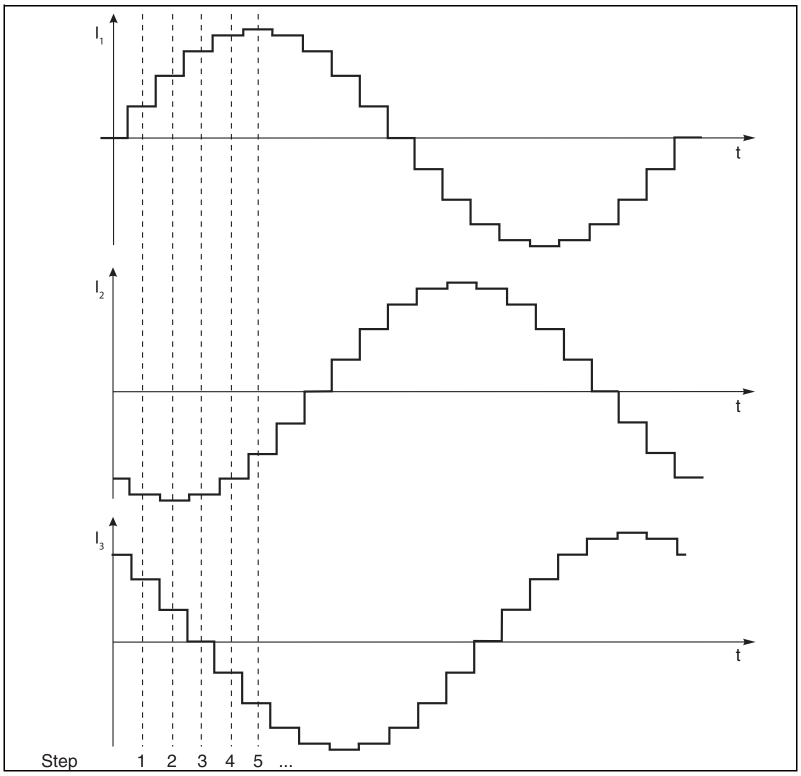
The windings of the 3-phase stepper motors are circuited internally to form a triangle. The control currents of the control electronics are impressed via three connections.



Control switch for 3-phase stepper motors

Micro-step procedure with sinusoidal control

The system consisting of a 3-phase stepper motor and control electronics works according to the bipolar delta connection (see control circuit). The current can be controlled via three half-bridges so that it can flow through each winding in both directions (bipolar).
This makes it possible to control the current according to a sinusoidal step function. Here each step corresponds to a motor step. The steps per revolution are determined by the number of the different current patterns per period and due to the number of pole pairs of the motor. Thus, any step count is possible. This procedure is known as the micro-step procedure.



Current pattern of the three motor connections at 1000 steps per revolution

Characteristic values of a stepper motor

In order to assess and select a stepper motor, certain characteristic values and characteristic curves are required. Each stepper motor with its control electronics has its own characteristics which are shown in characteristic curves. To better understand their content and statement, here the major characteristic values and the handling of the characteristic curves are explained. The terms used here correspond to DIN 42021.

Basic terms

Steps per revolution
Step count z is the number of the rotor-steps per revolution. The step count of the 3-phase stepper motor can be used on the control electronics.

Step angle
A step includes the procedure in which the motor shaft rotates around the step angle – due to a step angle α.
The step angle α is derived from the steps per revolution z as follows:
$\alpha = 360°/z$

Holding torque
In this step position, the rotor is held into place due to the electrical d.c. operation of the windings if its holding torque M_H is not exceeded on the motor shaft.

Systematic angular tolerance
The systematic angular tolerance per step $\Delta\alpha_s$ indicates by how many angular minutes a step can have a maximum deviation from the step angle.

Control and pulse rate
With a continuous sequence of control pulses with a control frequency f_S, the motor shaft will also run a sequence of steps with the (same) pulse rate f_z.

Speed
From a certain control frequency – depending on the motor type and the mechanical load – the step-by-step movement of the motor shaft switches to a continuous rotary movement. Then the speed of rotation n of the motor applies:

$$n = \frac{\alpha}{360°} \cdot f_S \cdot 60 min^{-1}$$

f_S in Hz

Torques
If the rotating motor shaft is loaded with a load torque M_L, the motor of the control frequency continuous to run synchronously as long as the load moment does not exceed a certain limit which exceeds the pull-out torque M_{BM}. In this case, the rotor can no longer follow the control frequency. This case does not occur when the motor and the control is correctly selected.

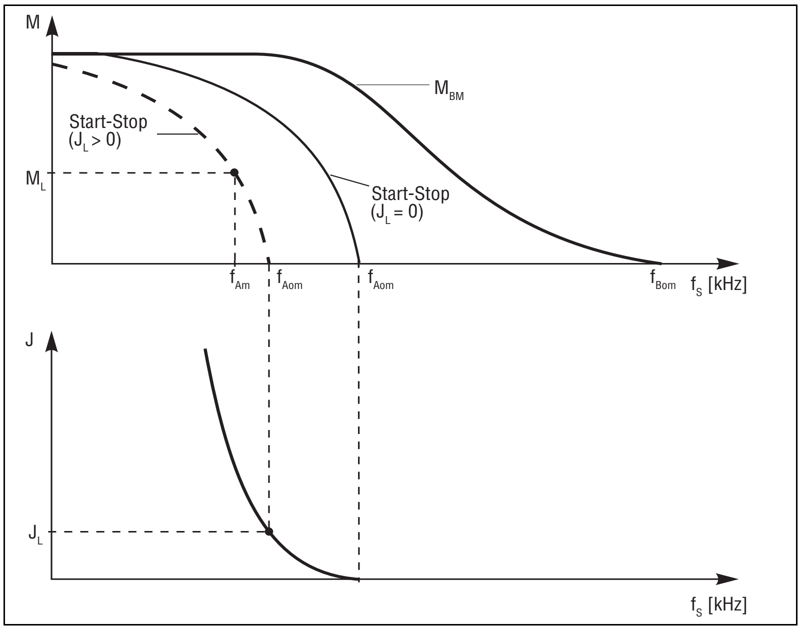
Torque characteristic curves

The pull-out torque M_{BM} of a stepper motor depends primarily on the pulse rate in addition to its size and the type of electrical control. This procedure is indicated as a characteristic curve for each stepper motor system.
The motor can produce the maximum pulse rate M_{BM} at low pulse rates, with an increasing pulse rate, the pull-out torque decreases.

The operating range of the motor created by the pull-out torque is subdivided into the starting area and the acceleration range. In the starting area, the motor can follow, without a step error, a control frequency used erratically or which is interrupted.
The starting area is limited by the characteristic curve of the starting limit frequency f_{AM} (start-stop characteristic curve). Without a load, the motor can start with the maximum starting frequency f_{A0M}, with a load, the starting frequency decreases.
The acceleration range is between the starting area of the start-stop characteristic curve and the pull-out torque curve. In the acceleration range, the control frequency can only be changed continuously (frequency ramp) so that the motor can follow the control frequency.

Mass moment of inertia of the load

The size of the starting area also depends on the load inertia which is in effect on the motor shaft J_L of the load. With an increasing J_L, the start-stop characteristic curve shifts to lower frequencies. The start-stop characteristic curve shows the dependency of the maximum starting frequency f_{A0M} on the load inertia J_L. If load inertia and load torque are present simultaneously, the starting limit frequency f_{AM} is determined by moving the stop-start characteristic curve in the torque graph parallel to the left until the maximum starting frequency f_{A0M} corresponds to the J_L-diagram (see Figure).



Stepper motor characteristic curve

M_{BM} Pull-out torque
M_L Load torque
M_H Holding torque
f_S Control frequency
f_{AM} Starting limit frequency
f_{A0M} Maximum starting frequency
f_{B0M} Maximum operating frequency
J_L Load inertia

VRDM 36•

Technical data

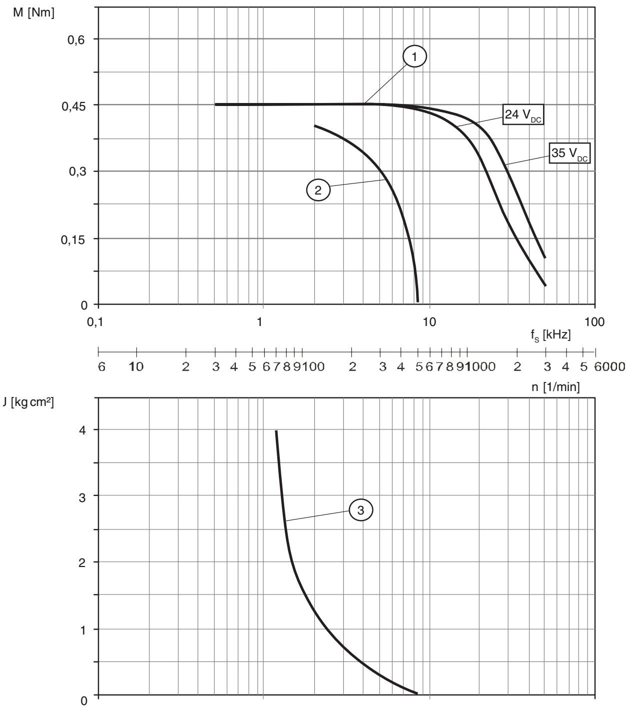
Motor type		VRDM 364	VRDM 366		VRDM 368		
Winding		**H**	**H**	**N**	**H**	**N**	**W**
Max. supply voltage U_{max}	V_{AC}	25	25	92	25	92	230
Nominal voltage DC bus U_N	V_{DC}	24 / 35	24 / 35	130	24 / 35	130	325
Nominal torque M_N	Nm	0.45	0.90		1.50		
Holding torque M_H	Nm	0.51	1.02		1.70		
Rotor inertia J_R	kgcm²	0.1	0.22		0.38		
Steps per revolution z [1]		200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000					
Step angle α	°	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036					
Systematic angular tolerance $\Delta\alpha_s$ [2]	'	±6					
Max. starting frequency f_{Aom}	kHz	8.5	8.0	8.0	6.0	8.5	8.5
Phase current I_N	A_{rms}	5.2	5.8	1.6	5.8	1.9	0.9
Winding resistance R_W	Ω	0.42	0.5	5.3	0.7	4.8	25
Rate-of-current rise time constant τ	ms	2.1	3.3		4.6		
Weight m [3]	kg	1.3	1.6		2.0		
Shaft load [4]							
• Max. radial force 1st shaft end [5]	N	24	24		50		
• Max. radial force 2nd shaft end (optional) [6]	N	25 / 40					
• Max. axial force pull	N	100					
• Max. axial force compression	N	8.4					
• Nominal bearing life L_{10h} [7]	h	20000					

1) Depending on controller
2) Measured at 1000 steps/revolution, unit: angular minutes
3) Weight of the motor version with cable retaining screws and connector
4) Conditions for shaft load: speed of rotation 600 1/min, 100% ED at nominal torque, ambient temperature 40 °C (storage temperature ≈ 80 °C)
5) Point of attack of radial force: in the middle of the shaft end
6) Point of attack of radial force: in the middle of the shaft end; 1st value: Motors with terminal boxes, connectors or encoder; 2nd value: Motors with braided wires
7) Operating hours at a failure probability of 10%

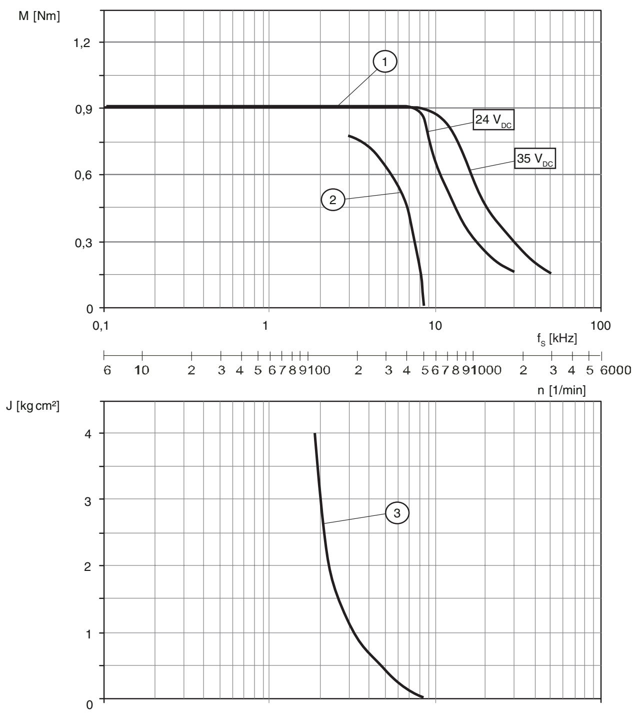
Environmental conditions		
Ambient temperature	°C	-25 ... +40
Installation height without power reduction	m a. MSL	< 1000
Transport and storage temperature	°C	-25 ... +70
Relative humidity	%	5 … 85; no condensation permissible
Vibration magnitude in operation as per EN 60034-14		A
Vibration strain as per DIN EN 60068-2-6	m/s²	20
Degree of protection as per EN 60034-5		
• Total except shaft bushing		IP 56
• Shaft bushing without shaft seal ring		IP 41
Heat class as per EN 60034-1		155 (F)
Shaft wobble and axial precision		As per EN 50 347 (IEC 60072-1)
Maximum rotary acceleration	Wheel/s²	200000

Characteristic curves

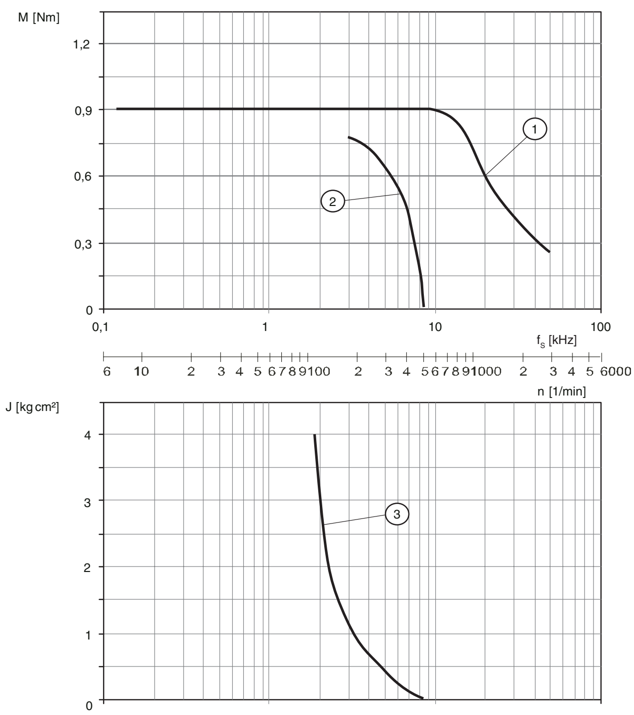
VRDM 364 / 50L H



VRDM 366 / 50L H



VRDM 366 / 50L N



Measurement at 1000 steps/revolution, nominal voltage DC bus U_N and phase current I_N

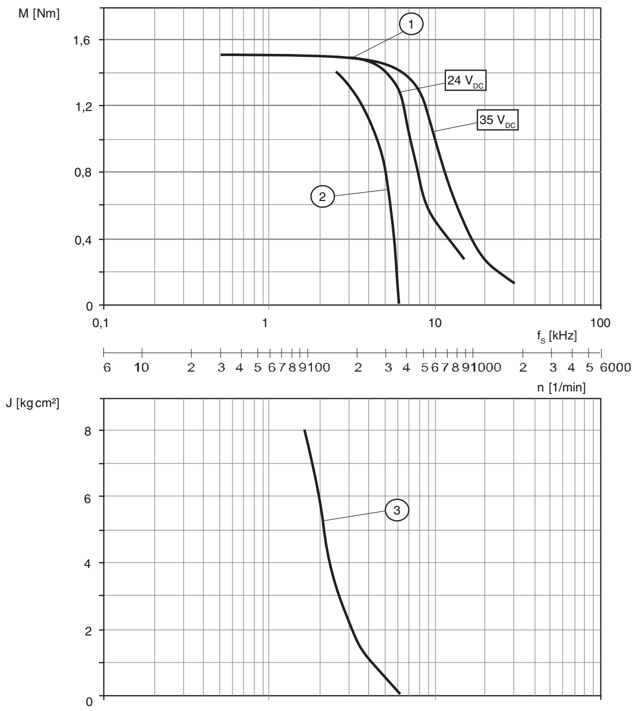
(1) Pull-out torque

(2) Start limit torque

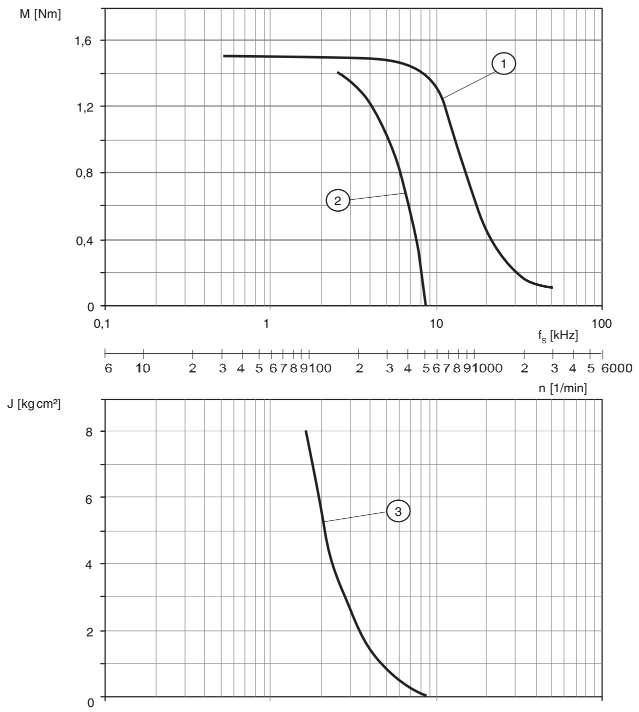
(3) Maximum load inertia

Characteristic curves

VRDM 368 / 50L H



VRDM 368 / 50L N + W



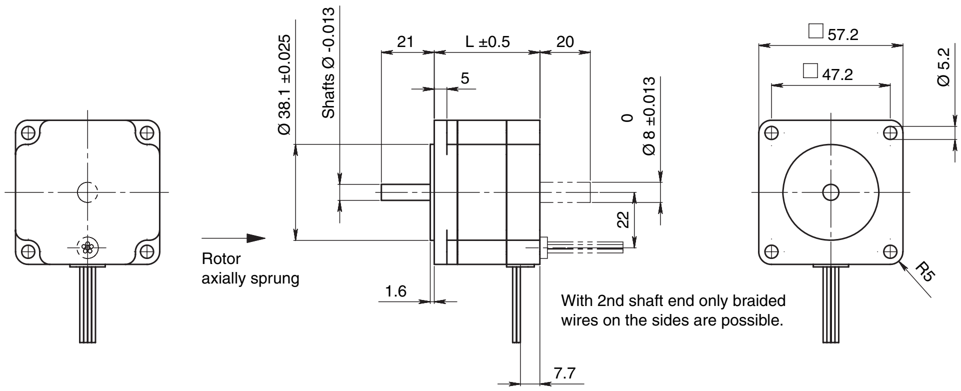
Measurement at 1000 steps/revolution, nominal voltage DC bus U_N and phase current I_N

(1) Pull-out torque

(2) Start limit torque

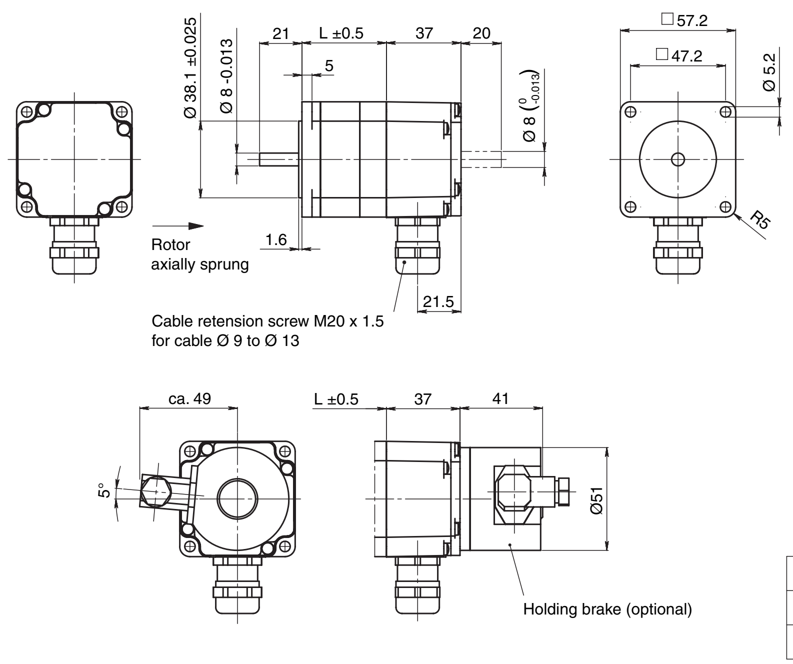
(3) Maximum load inertia

Dimensional drawings



	Length L	Shafts Ø
VRDM 364	42	6.35
VRDM 366	56	6.35
VRDM 368	79	8

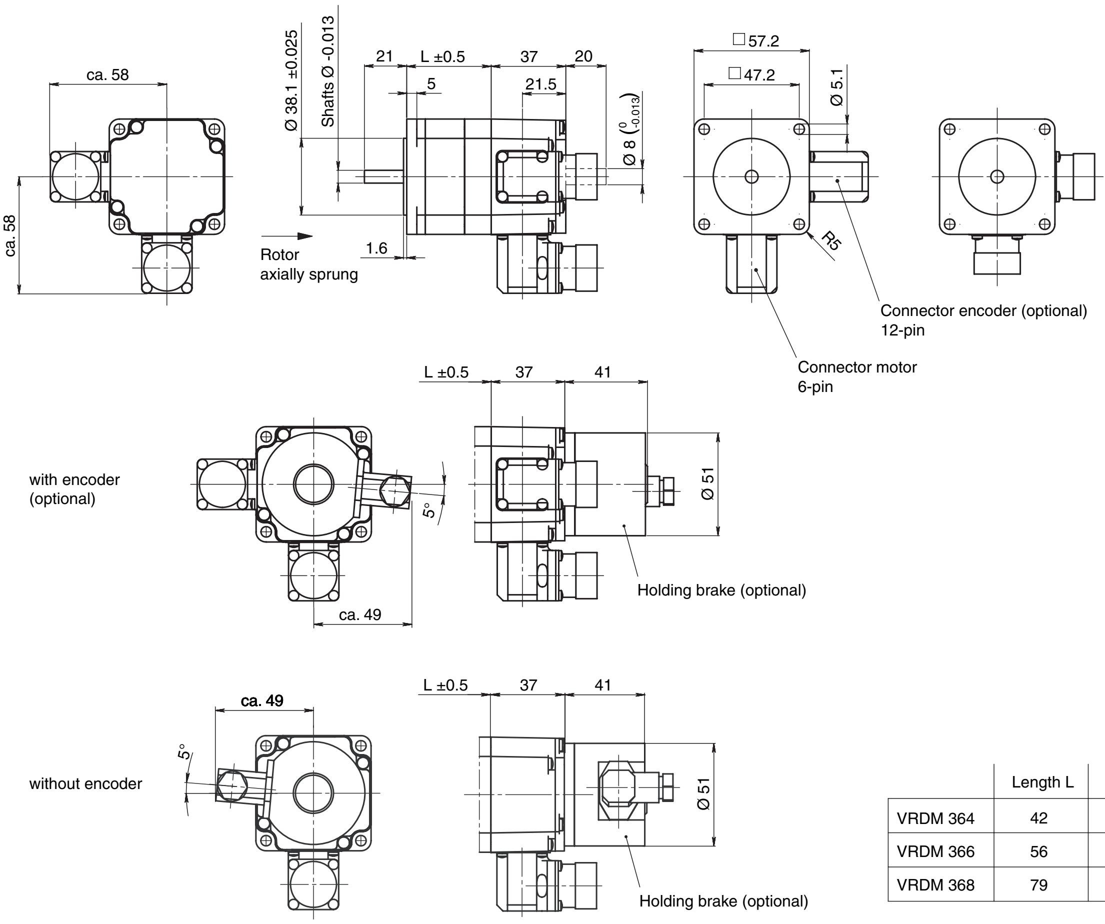
3-phase stepper motor VRDM 36• in braided wire version



	Length L	Shafts Ø
VRDM 364	42	6.35
VRDM 366	56	6.35
VRDM 368	79	8

3-phase stepper motor VRDM 36• in terminal box version

Dimensional drawings



	Length L	Shafts Ø
VRDM 364	42	6.35
VRDM 366	56	6.35
VRDM 368	79	8

3-phase stepper motor VRDM 36• in connector version

Type code

Example:	**VRDM**	**3**	**6**	**8**	**/**	**50**	**L**	**H**	**C**	**E**	**O**	**IP41**	**1**	**5**	**DO**	**O**	**OO**	**2**	**B**	**B**	**O**	**OOO**
Phase count 3	VRDM	**3**	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	2	B	B	O	OOO
Size (Flange) 6 = 57.2 mm	VRDM	3	**6**	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	2	B	B	O	OOO
Length 4 = 42 mm 6 = 56 mm 8 = 79 mm	VRDM	3	6	**8**	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	2	B	B	O	OOO
Number of pole pairs 50	VRDM	3	6	8	/	**50**	L	H	C	E	O	IP41	1	5	DO	O	OO	2	B	B	B	OOO
Rotor L = Laminated rotor plate	VRDM	3	6	8	/	50	**L**	H	C	E	O	IP41	1	5	DO	O	OO	2	B	B	O	OOO
Maximum voltage H = 25 V_{AC} (35 V_{DC}) N = 92 V_{AC} (130 V_{DC}) W = 230 V_{AC} (325 V_{DC})	VRDM	3	6	8	/	50	L	**H**	C	E	O	IP41	1	5	DO	O	OO	2	B	B	B	OOO
Connection type A = Braided wire B = Terminal box C = Connector	VRDM	3	6	8	/	50	L	H	**C**	E	O	IP41	1	5	DO	O	OO	2	B	B	O	OOO
Position capture E = Encoder (1000 increments/revolution) O = Without encoder	VRDM	3	6	8	/	50	L	H	C	**E**	O	IP41	1	5	DO	O	OO	2	B	B	O	OOO
Holding brake B = Brake O = Without brake	VRDM	3	6	8	/	50	L	H	C	E	**O**	IP41	1	5	DO	O	OO	2	B	B	O	OOO
Degree of protection IP41 = IP41 on shaft bushing	VRDM	3	6	8	/	50	L	H	C	E	O	**IP41**	1	5	DO	O	OO	2	B	B	O	OOO
Gearbox type O = Without gearbox 1 = PLE 40 2 = PLE 60 A = PLS 70	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	**1**	5	DO	O	OO	2	B	B	O	OOO
Gear ratio O = Without gearbox 3 = 3:1 5 = 5:1 8 = 8:1	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	**5**	DO	O	OO	2	B	B	O	OOO
Shaft diameter D6 = 6.35 mm D8 = 8 mm DO = With gearbox	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	**DO**	O	OO	2	B	B	O	OOO
Shaft model front O = Smooth shaft or gearbox	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	**O**	OO	2	B	B	O	OOO
Centring collar 38 = 38.10 mm OO = With gearbox	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	**OO**	2	B	B	O	OOO
Second shaft: O = Without 2 = With	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	**2**	B	B	O	OOO
Connection direction motor plug [1)] O = Without, L = Left, R = Right B = Back, F = Front, S = Straight	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	2	**B**	B	O	OOO
Coonection direction encoder plug [1)] O = Without, L = Left, R = Right B = Back, F = Front, S = Straight	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	2	B	**B**	O	OOO
Braided wire output O = Without S = Side B = Back	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	2	B	B	**O**	OOO
Braided wire length OOO = No xxx = xxx mm (max. 400 mm)	VRDM	3	6	8	/	50	L	H	C	E	O	IP41	1	5	DO	O	OO	2	B	B	O	**OOO**

1) Connection direction viewed from front at 1st shaft end, connector up.

Note:
Please note the description of the possible motor types on page 3.

VRDM 39•

Technical data

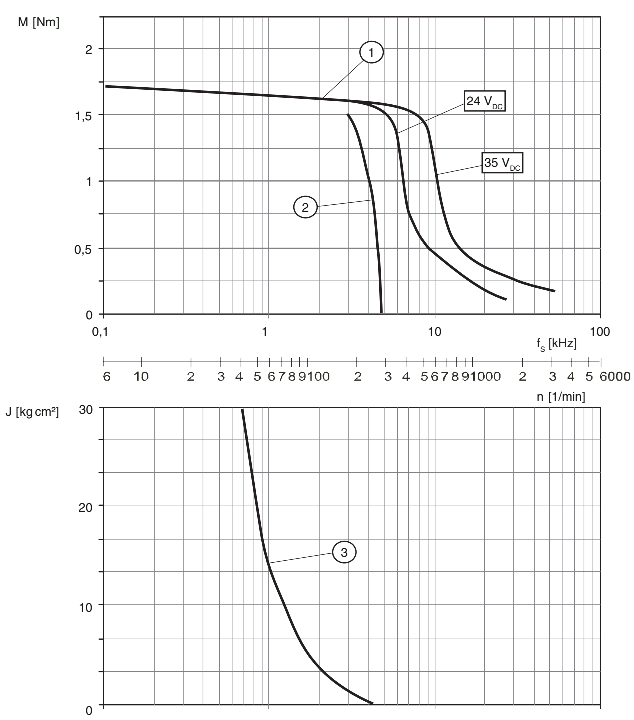
Motor type		VRDM 397			VRDM 3910			VRDM 3913		
Winding		**H**	**N**	**W**	**H**	**N**	**W**	**H**	**N**	**W**
Max. supply voltage U_{max}	V_{AC}	25	92	230	25	92	230	25	92	230
Nominal voltage DC bus U_N	V_{DC}	24 / 35	130	325	24 / 35	130	325	24 / 35	130	325
Nominal torque M_N	Nm	1.7	2	2	3.7	4	4	5	6	6
Holding torque M_H	Nm	1.92	2.26	2.26	4.18	4.52	4.52	5.65	6.78	6.78
Rotor inertia J_R	kgcm²	1.1			2.2			3.3		
Steps per revolution z [1]		200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000								
Step angle α	°	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036								
Systematic angular tolerance $\Delta\alpha_s$ [2]	'	±6								
Max. starting frequency f_{Aom}	kHz	4.6	5.3	5.3	4.8	5.3	5.3	4.5	5.3	5.3
Phase current I_N	A_{rms}	5.8	4.4	1.75	5.8	5	2	5.8	5	2.25
Winding resistance R_W	Ω	0.35	1	6.5	0.55	1.2	5.8	0.63	1.3	6.5
Rate-of-current rise time constant τ	ms	~7			~9			~10		
Weight m [3]	kg	2.1			3.2			4.3		
Shaft load [4]										
• Max. radial force 1st shaft end [5]	N	100			100			110		
• Max. radial force 2nd shaft end (optional) [6]	N	50 / 75								
• Max. axial force pull	N	175								
• Max. axial force compression	N	30								
• Nominal bearing life L_{10h} [7]	h	20000								

1) Depending on controller
2) Measured at 1000 steps/revolution, unit: angular minutes
3) Weight of the motor version with cable retaining screws or connector
4) Conditions for shaft load: speed of rotation 600 1/min, 100% ED at nominal torque, ambient temperature 40 °C (storage temperature ≈ 80 °C)
5) Point of attack of radial force: in the middle of the shaft end
6) Point of attack of radial force: in the middle of the shaft end; 1st value: Motors with terminal boxes, connectors or encoder; 2nd value: Motors with braided wires
7) Operating hours at a failure probability of 10%

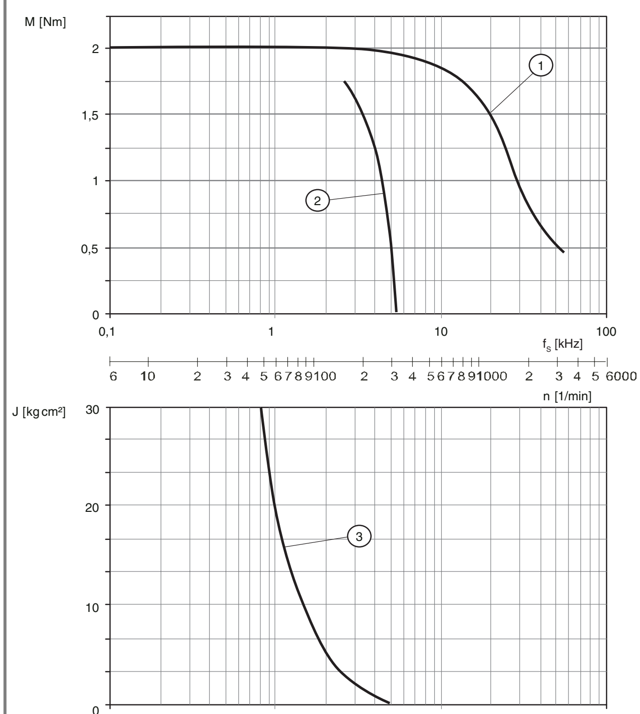
Environmental conditions		
Ambient temperature	°C	-25 ... +40
Installation height without power reduction	m a. MSL	< 1000
Transport and storage temperature	°C	-25 ... +70
Relative humidity	%	5 … 85; no condensation permissible
Vibration magnitude in operation as per EN 60034-14		A
Vibration strain as per DIN EN 60068-2-6	m/s²	20
Degree of protection as per EN 60034-5		
• Total except shaft bushing		IP 56
• Shaft bushing without shaft seal ring		IP 41
Heat class as per EN 60034-1		155 (F)
Shaft wobble and axial precision		As per EN 50 347 (IEC 60072-1)
Maximum rotary acceleration	Wheel/s²	200000

Characteristic curves

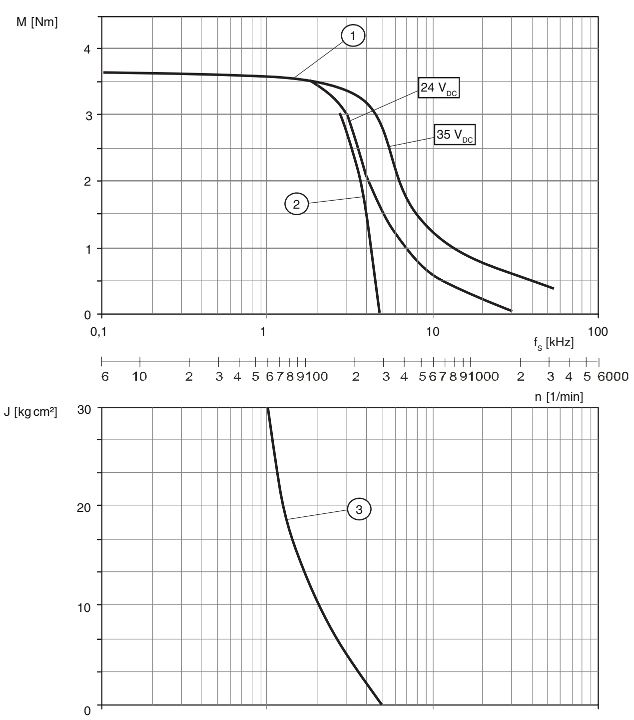
VRDM 397 / 50L H



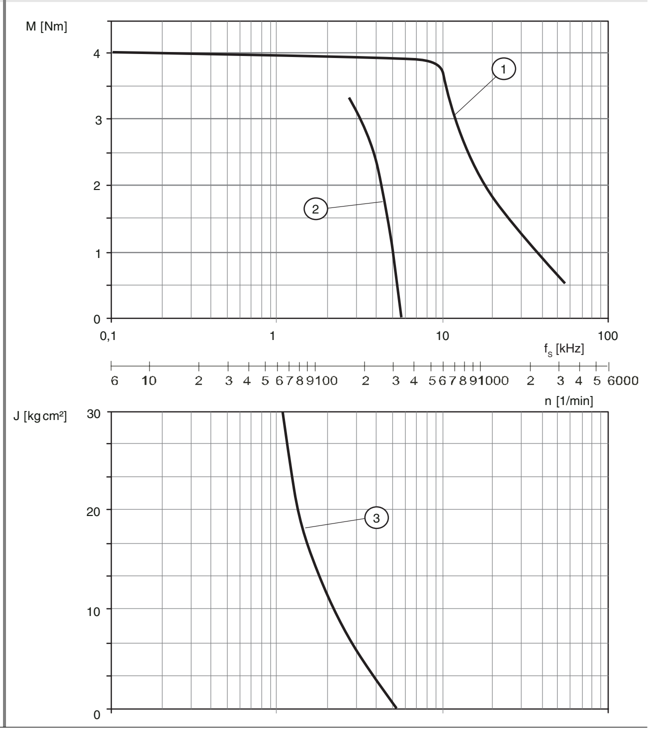
VRDM 397 / 50L N+ W



VRDM 3910 / 50L H



VRDM 3910 / 50L N + W



Measurement at 1000 steps/revolution, nominal voltage DC bus U_N and phase current I_N

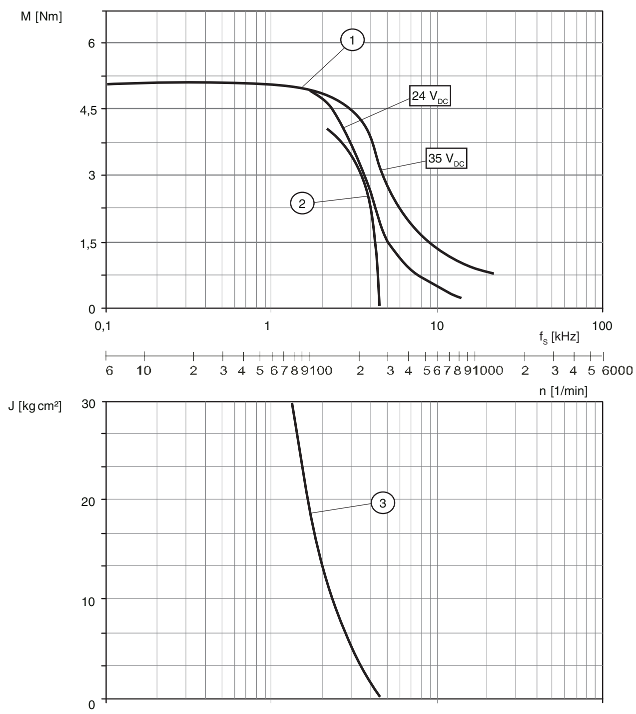
(1) Pull-out torque

(2) Start limit torque

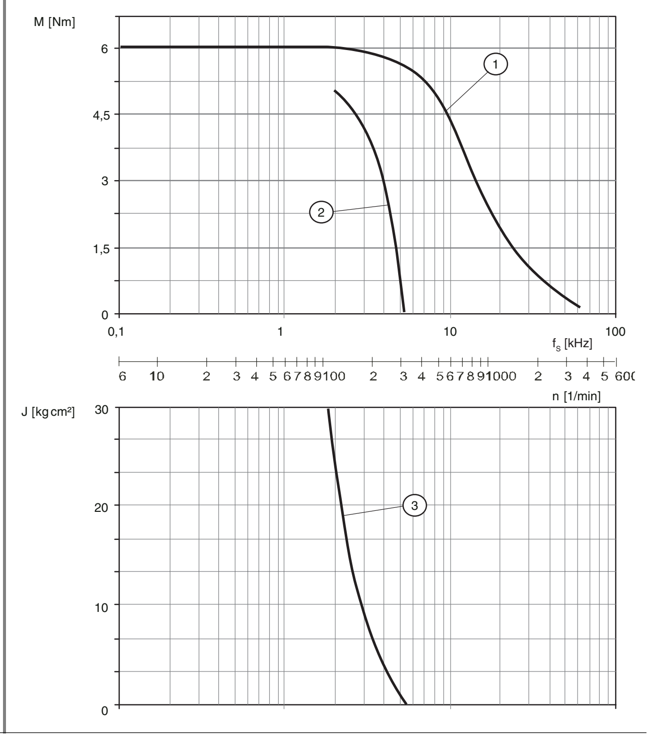
(3) Maximum load inertia

Characteristic curves

VRDM 3913 / 50L H



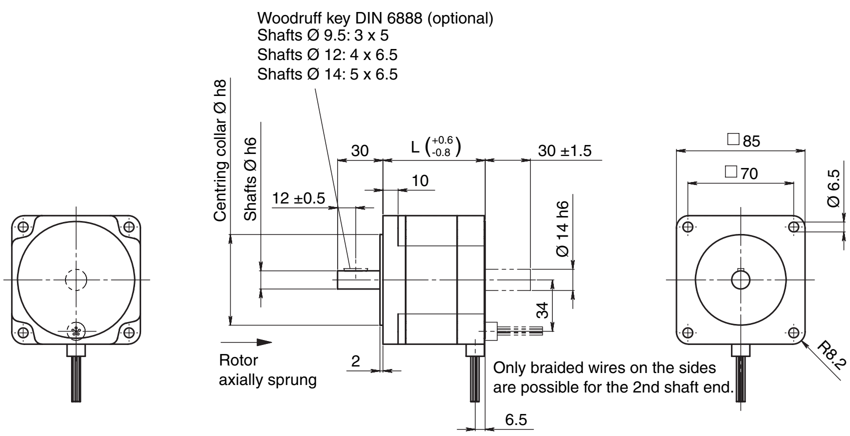
VRDM 3913 / 50L N + W



Measurement at 1000 steps/revolution, nominal voltage DC bus U_N and phase current I_N

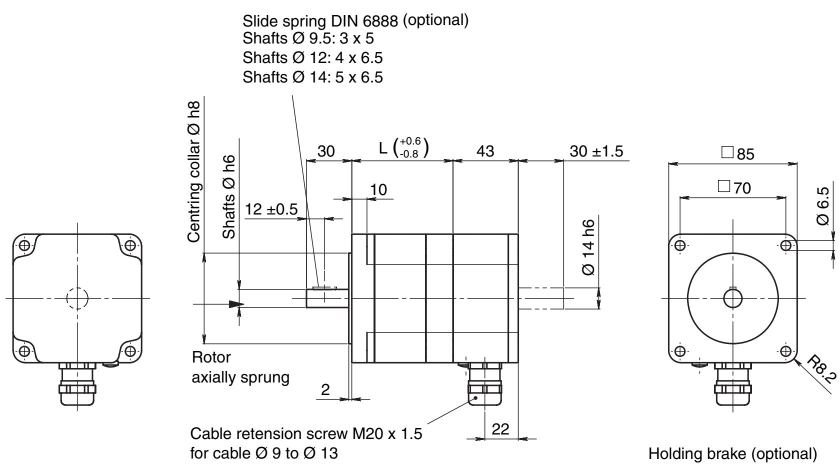
(1) Pull-out torque
(2) Start limit torque
(3) Maximum load inertia

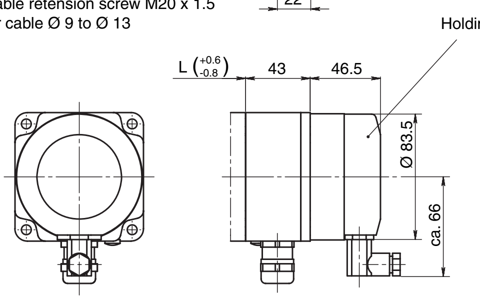
Dimensional drawings



	Length L	Shafts Ø		Centring collar Ø	
VRDM 397	67.5	9.5	12	60	73
VRDM 3910	97.5	9.5	12	60	73
VRDM 3913	127.5	14		60	73

3-phase stepper motor VRDM 39• in braided wire version

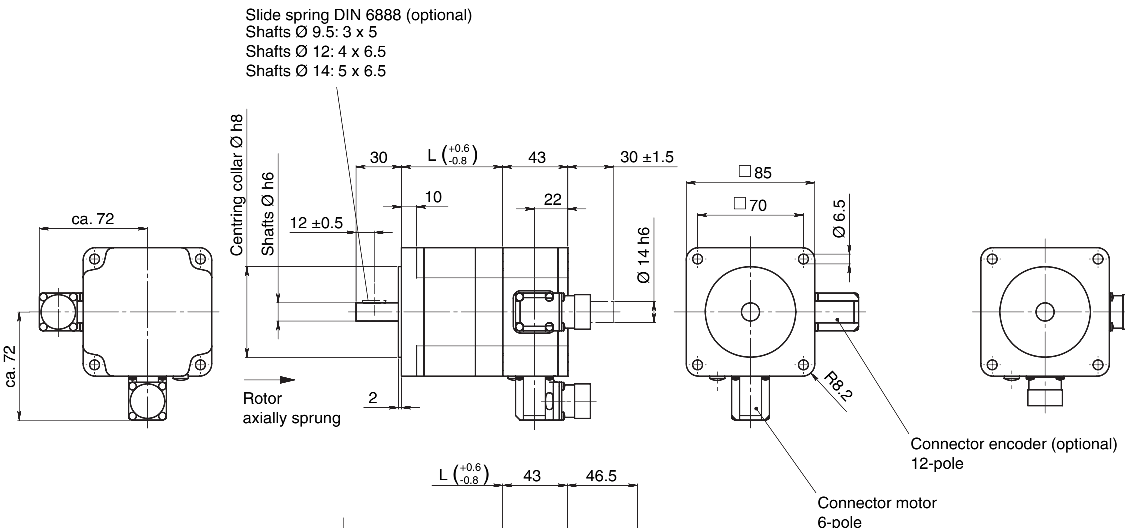


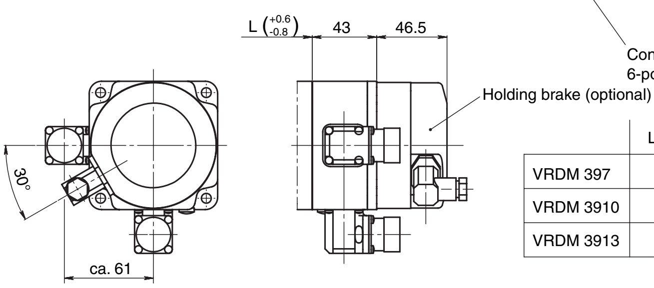


	Length L	Shafts Ø		Centring collar Ø	
VRDM 397	67.5	9.5	12	60	73
VRDM 3910	97.5	9.5	12	60	73
VRDM 3913	127.5	14		60	73

3-phase stepper motor VRDM 39• in terminal box version

Dimensional drawings





	Length L	Shafts Ø		Centring collar Ø	
VRDM 397	67.5	9.5	12	60	73
VRDM 3910	97.5	9.5	12	60	73
VRDM 3913	127.5	14		60	73

3-phase stepper motor VRDM 39• in connector version

Type code

Example:	**VRDM**	**3**	**9**	**10**	**/**	**50**	**L**	**H**	**C**	**E**	**O**	**IP41**	**3**	**5**	**DO**	**O**	**OO**	**2**	**B**	**B**	**O**	**OOO**
Phase count 3	VRDM	**3**	9	10	/	50	L	H	C	E	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Size (Flange) 9 = 85 mm	VRDM	3	**9**	10	/	50	L	H	C	E	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Motor length 7 = 68 mm 10 = 98 mm 13 = 128 mm	VRDM	3	9	**10**	/	50	L	H	C	E	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Number of pole pairs 50	VRDM	3	9	10	/	**50**	L	H	C	E	O	IP41	3	5	DO	O	OO	2	B	B	B	OOO
Rotor L = Laminated rotor plate	VRDM	3	9	10	/	50	**L**	H	C	E	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Maximum voltage H = 25 V_{AC} (35 V_{DC}) N = 92 V_{AC} (130 V_{DC}) W = 230 V_{AC} (325 V_{DC})	VRDM	3	9	10	/	50	L	**H**	C	E	O	IP41	3	5	DO	O	OO	2	B	B	B	OOO
Connection type A = Braided wire B = Terminal box C = Connector	VRDM	3	9	10	/	50	L	H	**C**	E	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Position capture E = Encoder (1000 increments/revolution) O = Without encoder	VRDM	3	9	10	/	50	L	H	C	**E**	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Holding brake B = Brake O = Without brake	VRDM	3	9	10	/	50	L	H	C	E	**O**	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Degree of protection IP41 = IP41 on shaft bushing IP56 = IP56 on shaft bushing front	VRDM	3	9	10	/	50	L	H	C	E	O	**IP41**	3	5	DO	O	OO	2	B	B	O	OOO
Gearbox type O = Without gearbox 3 = PLE 80 B = PLS 90	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	**3**	5	DO	O	OO	2	B	B	O	OOO
Gear ratio O = Without gearbox 3 = 3:1 5 = 5:1 8 = 8:1	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	**5**	DO	O	OO	2	B	B	O	OOO
Shaft diameter D9 = 9.5 mm D2 = 12 mm D4 = 14 mm DO = With gearbox	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	5	**DO**	O	OO	2	B	B	O	OOO
Shaft model front O = Smooth shaft or gearbox K = Woodruff key per DIN 6888	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	5	DO	**O**	OO	2	B	B	O	OOO
Centring collar 60 = 60 mm 73 = 73 mm OO = With gearbox	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	5	DO	O	**OO**	2	B	B	O	OOO
Second shaft O = Without 2 = With	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	5	DO	O	OO	**2**	B	B	O	OOO
Connection direction motor plug [1)] O = Without, L = Left, R = Right B = Back, F = Front, S = Straight	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	5	DO	O	OO	2	**B**	B	O	OOO
Coonection direction encoder plug [1)] O = Without, L = Left, R = Right B = Back, F = Front, S = Straight	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	5	DO	O	OO	2	B	**B**	O	OOO
Braided wire output S = Side B = Back O = Without	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	5	DO	O	OO	2	B	B	**O**	OOO
Braided wire length OOO = Without xxx = xxx mm (max. 400 mm)	VRDM	3	9	10	/	50	L	H	C	E	O	IP41	3	5	DO	O	OO	2	B	B	O	**OOO**

1) Connection direction viewed from front at 1st shaft end, connector up.

Note:
Please note the description of the possible motor types on page 3.

VRDM 311•

Technical data

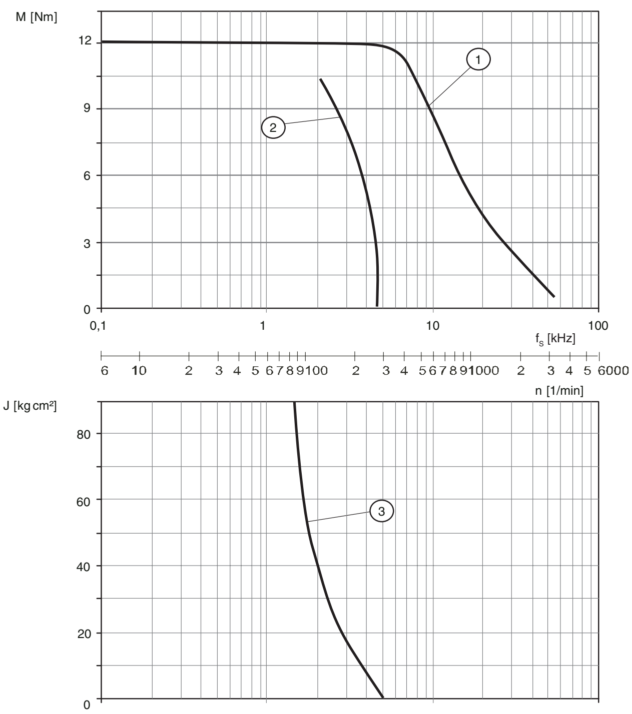
Motor type		VRDM 31117	VRDM 31122
Winding		**W**	**W**
Max. supply voltage U_{max}	V_{AC}	230	230
Nominal voltage DC bus U_N	VDC_{DC}	325	325
Nominal torque M_N	Nm	12	16.5
Holding torque M_H	Nm	13.5	19.7
Rotor inertia J_R	kgcm²	10.5	16
Steps per revolution z		200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000	
Step angle α [1]	°	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036	
Systematic angular tolerance $\Delta\alpha_s$ [2]	’	±6	
Max. starting frequency f_{Aom}	kHz	4.7	
Phase current I_N	A_{rms}	4.1	4.75
Winding resistance R_W	Ω	1.8	1.9
Rate-of-current rise time constant τ	ms	~22	~22
Weight m [3]	kg	8.2	11.2
Shaft load [4]			
• Max. radial force 1st shaft end [5]	N	300	
• Max. radial force 2nd shaft end (optional) [5]	N	150	
• Max. axial force pull	N	330	
• Max. axial force compression	N	60	
• Nominal bearing life L_{10h} [6]	h	20000	

1) Depending on the control
2) Measured at 1000 steps/revolution, unit: minutes of arc
3) Weight of the motor version with cable retaining screws or connector
4) Conditions for shaft load: speed of rotation 600 1/min, 100% ED at nominal torque, ambient temperature 40 °C (storage temperature ≈ 80 °C)
5) Point of attack of radial force: in the middle of the shaft end
6) Operating hours at a failure probability of 10%

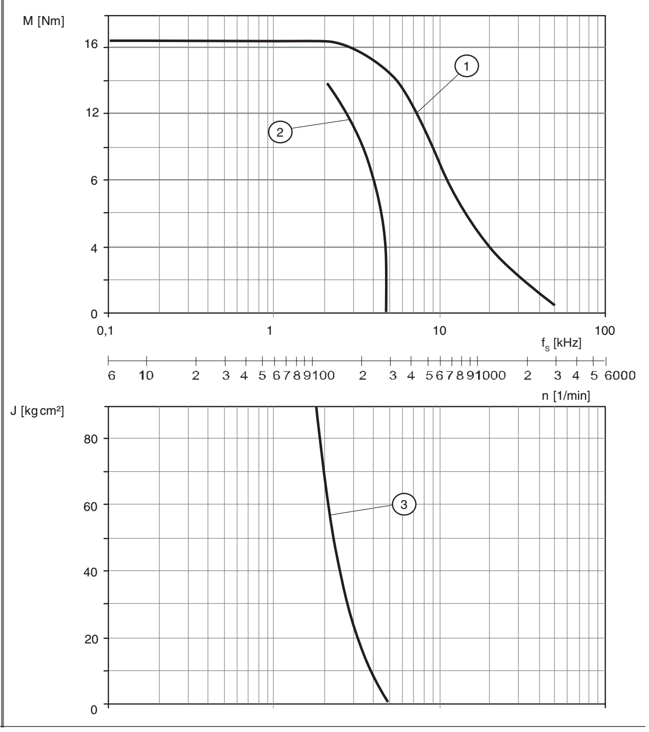
Environmental conditions		
Ambient temperature	°C	-25 ... +40
Installation height without power reduction	m a. MSL	< 1000
Transport and storage temperature	°C	-25 ... +70
Relative humidity	%	5 … 85; no condensation permissible
Vibration magnitude in operation as per EN 60034-14		A
Vibration strain as per DIN EN 60068-2-6	m/s²	20
Degree of protection as per EN 60034-5		
• Total except shaft bushing		IP 56
• Shaft bushing without shaft seal ring		IP 41
Heat class as per EN 60034-1		155 (F)
Shaft wobble and axial precision		As per EN 50 347 (IEC 60072-1)
Maximum rotary acceleration	Wheel/s^2	200000

Characteristic curves

VRDM 31117 / 50L W



VRDM 31122 / 50L W



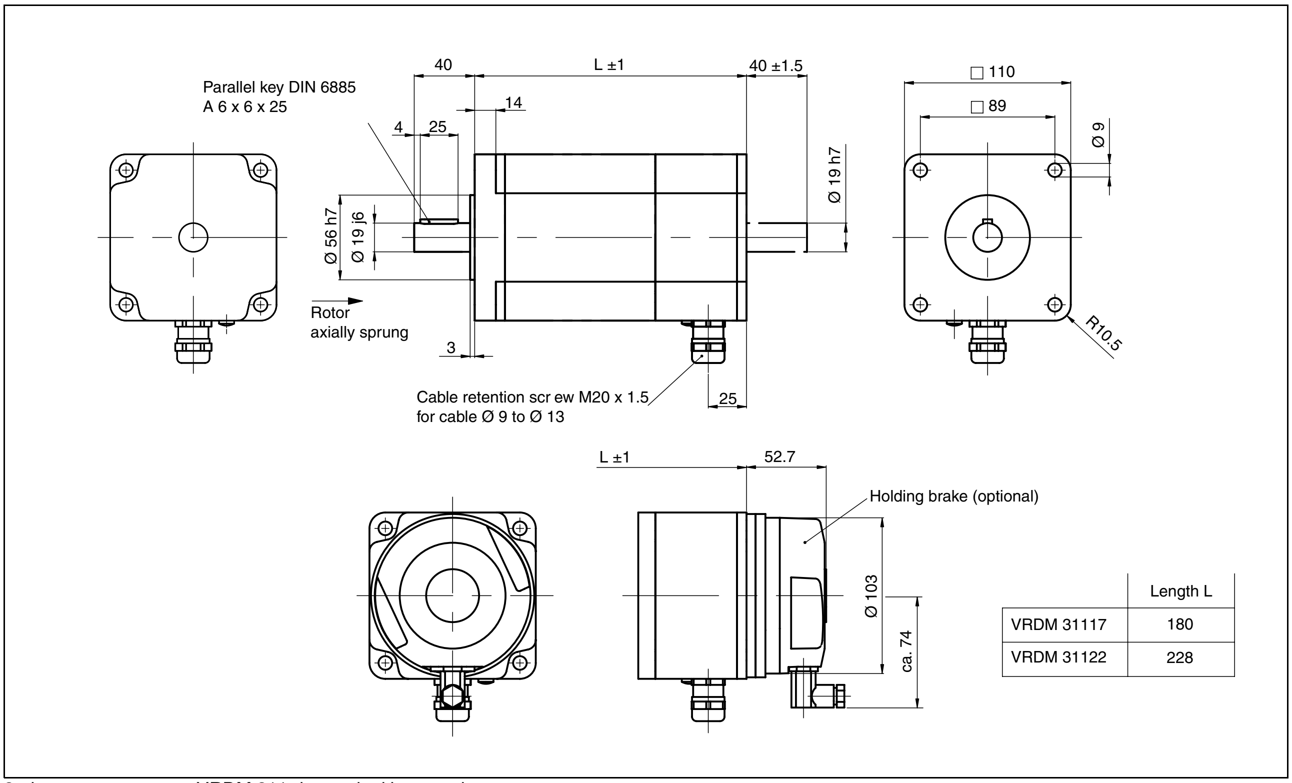
Measurement at 1000 steps/revolution, nominal voltage DC bus U_N and phase current I_N

(1) Pull-out torque

(2) Start limit torque

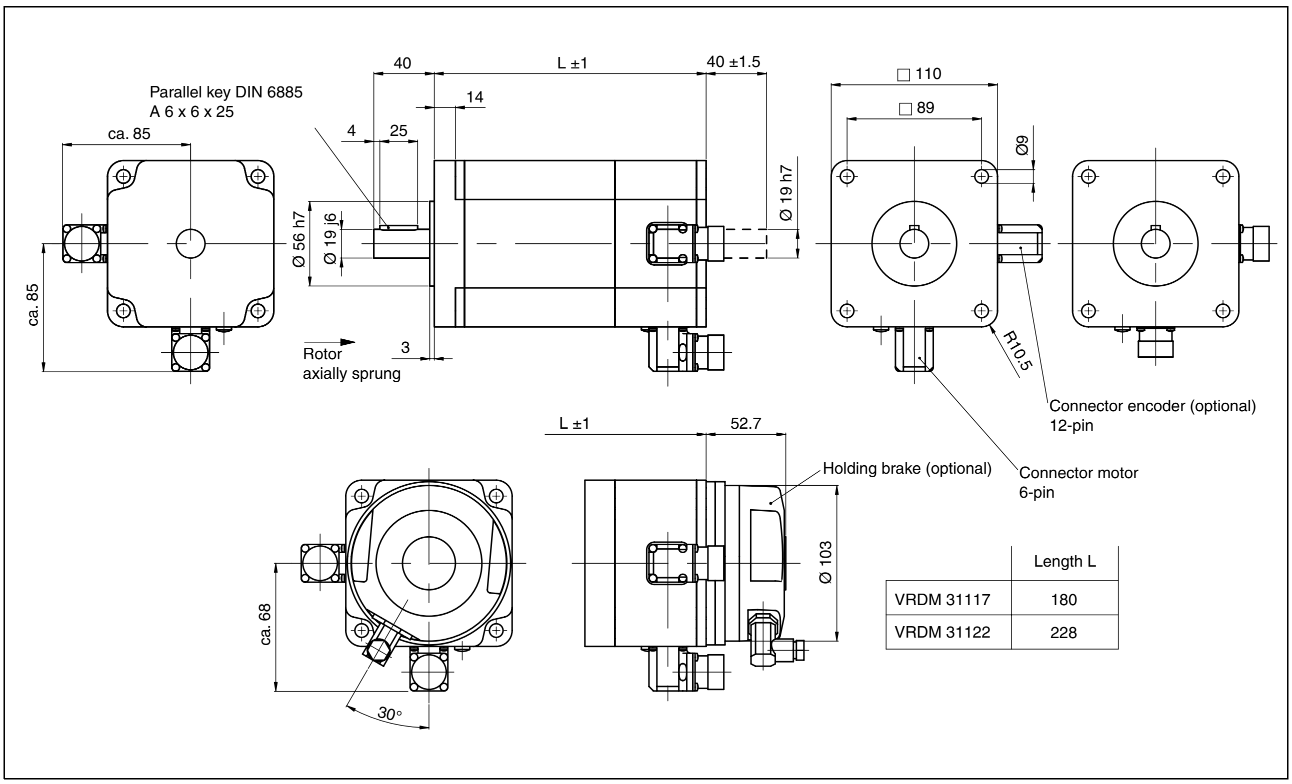
(3) Maximum load inertia

Dimensional drawings



	Length L
VRDM 31117	180
VRDM 31122	228

3-phase stepper motor VRDM 311• in terminal box version



	Length L
VRDM 31117	180
VRDM 31122	228

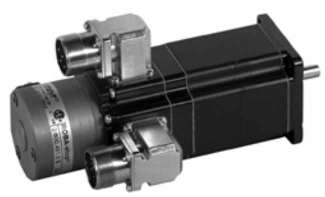
3-phase stepper motor VRDM 311• in connector version

Type code

Example:	**VRDM**	**3**	**11**	**17**	**/**	**50**	**L**	**W**	**C**	**E**	**O**	**IP41**	**4**	**5**	**DO**	**O**	**OO**	**2**	**B**	**B**	**O**	**OOO**
Phase count 3	VRDM	**3**	11	17	/	50	L	W	C	E	O	IP41	4	5	DO	O	OO	2	B	B	O	OOO
Size (Flange) 11 = 110 mm	VRDM	3	**11**	17	/	50	L	W	C	E	O	IP41	4	5	DO	O	OO	2	B	B	O	OOO
Length 17 = 180 mm 22 = 228 mm	VRDM	3	11	**17**	/	50	L	W	C	E	O	IP41	4	5	DO	O	OO	2	B	B	O	OOO
Number of pole pairs 50	VRDM	3	11	17	/	**50**	L	W	C	E	O	IP41	4	5	DO	O	OO	2	B	B	B	OOO
Rotor L = Laminated rotor plate	VRDM	3	11	17	/	50	**L**	W	C	E	O	IP41	4	5	DO	O	OO	2	B	B	O	OOO
Maximum voltage W = 230 V_{AC} (325 V_{DC})	VRDM	3	11	17	/	50	L	**W**	C	E	O	IP41	4	5	DO	O	OO	2	B	B	B	OOO
Connection type B = Terminal box C = Connector	VRDM	3	11	17	/	50	L	W	**C**	E	O	IP41	4	5	DO	O	OO	2	B	B	O	OOO
Recording of position E = Encoder (1000 increments/revolution) O = Without encoder	VRDM	3	11	17	/	50	L	W	C	**E**	O	IP41	4	5	DO	O	OO	2	B	B	O	OOO
Holding Brake B = Brake O = Without brake	VRDM	3	11	17	/	50	L	W	C	E	**O**	IP41	4	5	DO	O	OO	2	B	B	O	OOO
Degree of protection IP41 = IP41 on shaft bushing IP56 = IP56 on shaft bushing front	VRDM	3	11	17	/	50	L	W	C	E	O	**IP41**	4	5	DO	O	OO	2	B	B	O	OOO
Gearbox type O = Without gearbox 4 = PLE 120 C = PLS 115	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	**4**	5	DO	O	OO	2	B	B	O	OOO
Gear ratio O = Without gearbox 3 = 3:1 5 = 5:1 8 = 8:1	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	**5**	DO	O	OO	2	B	B	O	OOO
Shaft diameter D9 = 19 mm DO = With gearbox	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	5	**DO**	O	OO	2	B	B	O	OOO
Shaft model front O = With gearbox K = Parallel key as per DIN 6885	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	5	DO	**O**	OO	2	B	B	O	OOO
Centring collar 56 = 56 mm OO = With gearbox	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	5	DO	O	**OO**	2	B	B	O	OOO
Second shaft O = Without 2 = With	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	5	DO	O	OO	**2**	B	B	O	OOO
Connection direction motor plug [1)] O = Without, L = Left, R = Right B = Back, F = Front, S = Straight	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	5	DO	O	OO	2	**B**	B	O	OOO
Coonection direction encoder plug [1)] O = Without, L = Left, R = Right B = Back, F = Front, S = Straight	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	5	DO	O	OO	2	B	**B**	O	OOO
Braided wire output O = Without	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	5	DO	O	OO	2	B	B	**O**	OOO
Braided wire length OOO = Without xxx = xxx mm (max. 400 mm)	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	5	DO	O	OO	2	B	B	O	**OOO**

1) Connection direction viewed from front at 1st shaft end, connector up.

Note:
Please note the description of the possible motor types on page 3.



Options

Holding brake

The holding brake is an electromagnetic sprung brake and fixes the motor axis after switching off the motor current (e.g. in case of power failure or emergency stop). The shaft must be fixed with torque loads resulting from gravity, e.g. with Z-axes in handling technology.

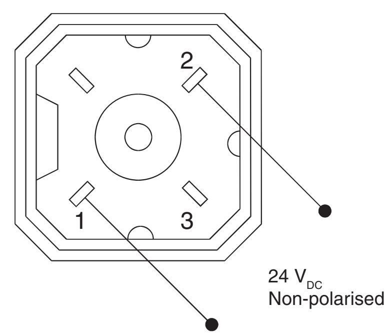
Technical Data

Holding brake for motor type		VRDM 36•	VRDM 39•	VRDM 311•
Nominal voltage	V	24	24	24
Holding torque	Nm	1	6	16
Pull-in power	W	8	24	28
Moment of inertia	kgcm²	0.016	0.2	0.35
Energise time (release brake)	ms	58	40	60
Shutdown time (apply brake)	ms	14	20	30
Mass	kg	Approx. 0.5	Approx. 1.5	Approx. 2.0

Note: In order to ensure the safe function of the holding brake for Z-axes, the static load torque must be no greater than 25% of the holding torque of the motor.

Wiring diagram

The connector is a part of the scope of supply.
Connector name: Hirschmann Type G4 5M



Wiring diagram of the connector for the holding brake

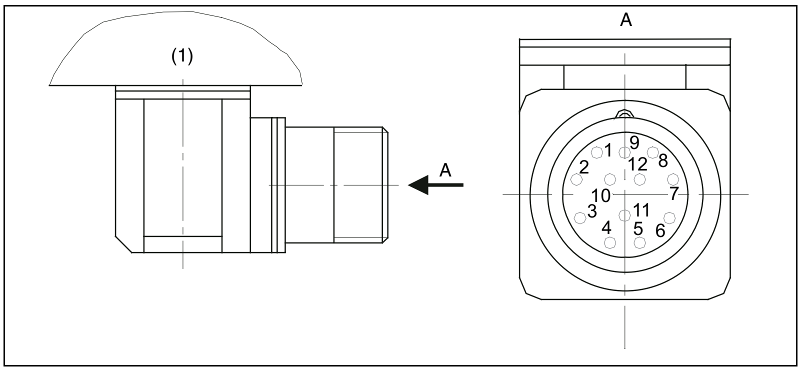
Encoder

The 3-phase stepper motors from Berger Lahr can be equipped with an encoder. If the control electronics are equipped with rotation monitoring electronics, the encoder is used as a measurement system to acknowledge the actual position of the rotor. Rotation monitoring compares the set point and actual position of the motor and reports errors if the actual position deviates from the setpoint position. For example, a mechanical overload of the motor can thereby be recorded.
Note: An encoder can only be used in motors with a connector. A temperature sensor is integrated, which protects the encoder from high temperatures.

Technical Data

Resolution	Pulse/rpm.	1000
Index plus	Pulse/rpm.	1
Output		RS 422
Signals		A; B; I
Signal shape		Rectangular
Supply voltage	V	5 ± 5%
Max. power consumption	A	0.125 (VRDM 36•) 0.15 (VRDM 39• and 311•)
Temperature sensor	°C	100...105 (VRDM 39• and 311•)

Wiring diagram



Wiring diagram encoder plug on VRDM 3xx

(1) Motor housing

Pin	Designation
1	A
2	A negated
3	B
4	B negated
5	C, I
6	C negated, negated
7	5 V_{GND}
8	+ 5
9	– SENSE
10	+ SENSE
11	Temperature sensor
12	not assigned

Gearboxes

Stepper motors from Berger Lahr can also be supplied with a built-in planetary gear. The PLE gears are cost-effective planetary gears, which are sufficient to meet most precision requirements. The PLS gears are high-quality gears with a very low torsional backlash.
These gears can be supplied with one of three gear ratios: 3:1, 5:1 and 8:1.
The output torque of the gearbox is determined by multiplying the torque of the motor with the gear ratio and efficiency of the gearbox (0.96).
The following table shows the preferred gearboxes for the motors.

Motor type	Gearbox type	
VRDM 364	PLE 40, PLE 60	PLS 70
VRDM 366	PLE 60	PLS 70
VRDM 368	PLE 60	PLS 70
VRDM 39x	PLE 80	PLS 90
VRDM 31117	PLE 120	PLS 115
VRDM 31122		PLS 115

Technical data PLE gearboxes

PLE-gearbox general		
Gear stages		1
Service life 1)	h	10000
Efficiency at full load	%	96
Housing material		aluminium
Surface		black anodised
Shaft material		C 45
Bearings		roller bearing
Operating temperature 2)	°C	-25 ... +90, shortly +120
Degree of protection 3)		IP 54
Lubrication		life lubrication

1) Life time with an output speed at 100 1/min and T = 30 °C
2) Referring to the housing surface
3) With mounting position IM V3 (drive shaft vertical, shaft end upward) only degree of potection IP 41 is guaranteed

Size of PLE		40	60	80	120
Max. radial force 1) 2)	N	200	500	950	2000
Max. axial force 1)	N	200	600	1200	2800
Torsional play	arcmin	<30	<20	<12	<8
Max. drive speed	1/min	18000	13000	7000	6500
Recommended drive speed	1/min	4500	4000	4000	3500
Torsional stiffness	Nm/arcmin	1.0	2.3	6	12
Weight	kg	0.35	0.9	2.1	6.0

1) The information refers to min. 20000 h service life with an output speed of 100 1/min and application factor K = 100 min and S1-operating mode for electrical machines and T = 30 °C
2) Refers to the centre of the drive shaft and 50% ED

Attention: the actual output torque must be less than the nominal output torque of the gearbox, otherwise the gearbox may be destroyed.

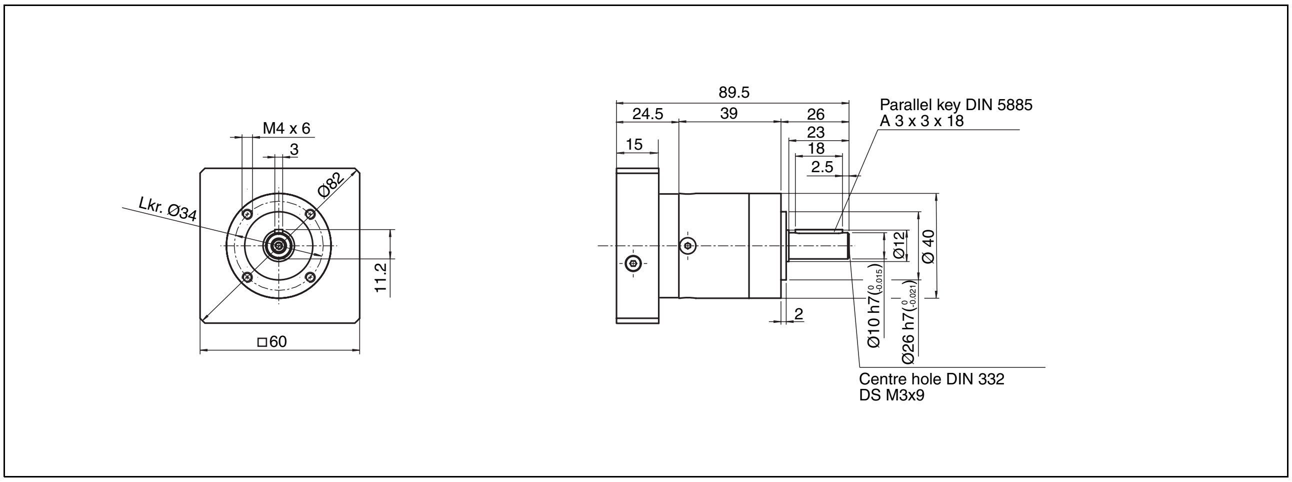
Technical data PLS gearboxes		
PLS gearbox general		
Gear ratios		1
Service life [1]	h	20000
Efficiency at full load	%	98
Case material		aluminium
Surface		black anodised
Shaft material		C 45
Bearings		tapered roller bearings
Operating temperature [2]	°C	-25 ... +100, shortly +124
Degree of protection [3]		IP 65
Lubrication		life lubrication

1) Service life with an output speed of 100 1/min and T = 30°C
2) Measured at the housing surface
3) At mounting position IM V3 (drive shaft vertical, shaft end up) only degree of protection IP 41 is guaranteed

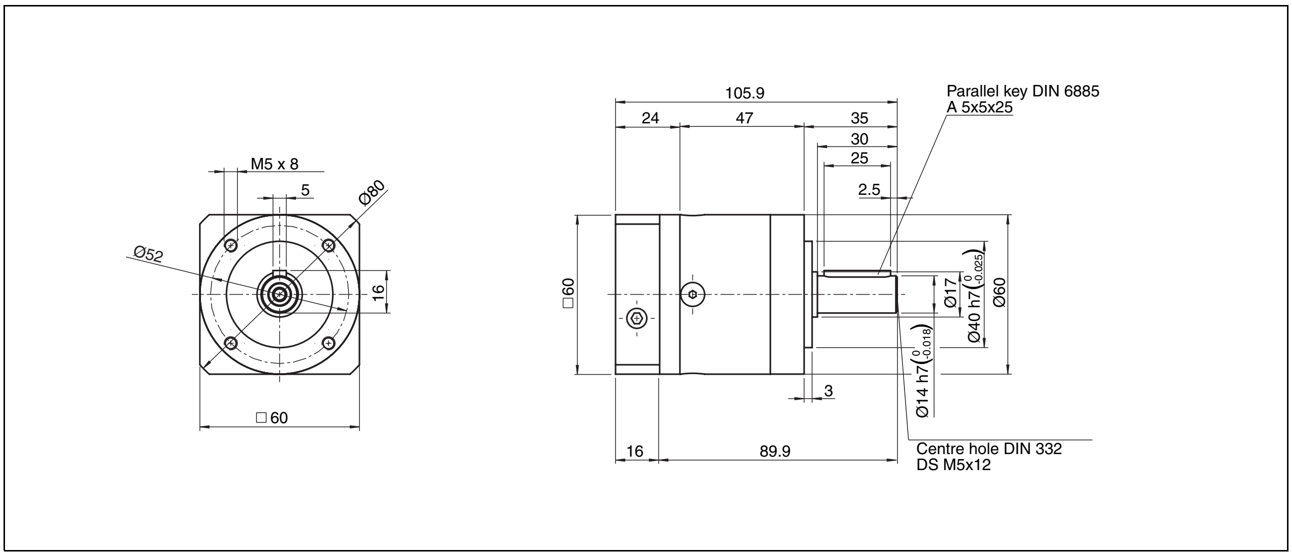
Size of PLS		70	90	115
Max. radial force [1] [2]	N	3300	4300	4800
Max. axial force [1]	N	4700	6400	8000
Torsional play	arcmin	<3	<3	<3
Max. drive speed	1/min	14000	10000	8500
Received drive speed	1/min	5000	4500	4000
Torsion rigidity	Nm/arcmin	6	9	20
Weight	kg	3.0	4.3	9.0

1) The details are based on min. 20000 h service life with an output speed of 100 1/min and application factor K = 100 min and S1-operating mode for electric machines and T = 30 °C
2) Refers to the centre of the device shaft and 50% ED

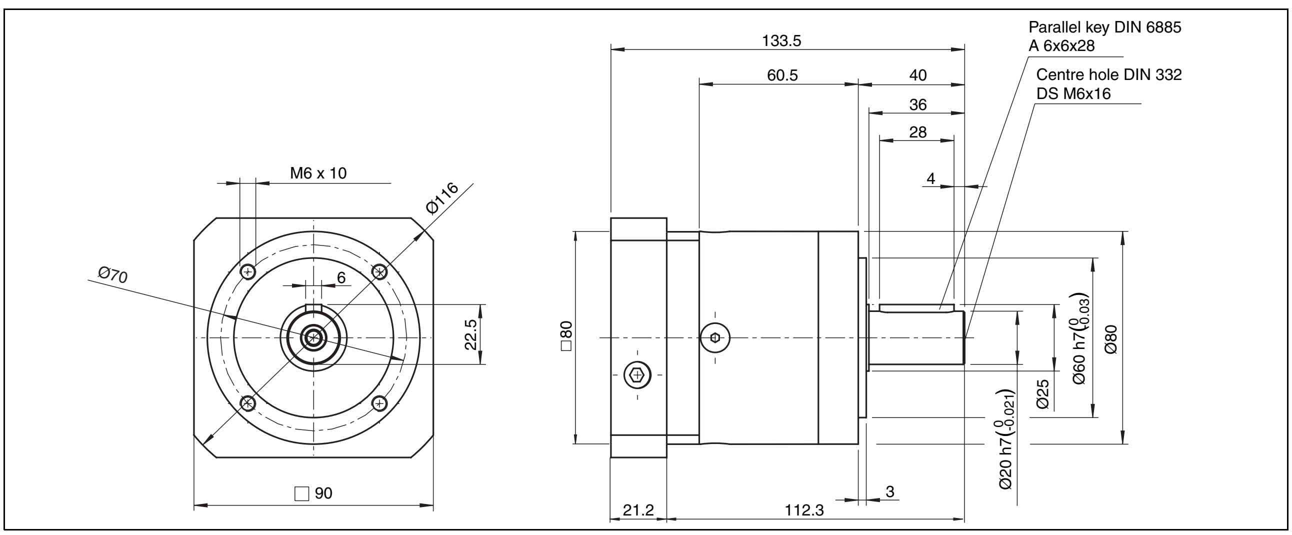
Dimensional drawings



PLE 40 gearbox, 1-stage

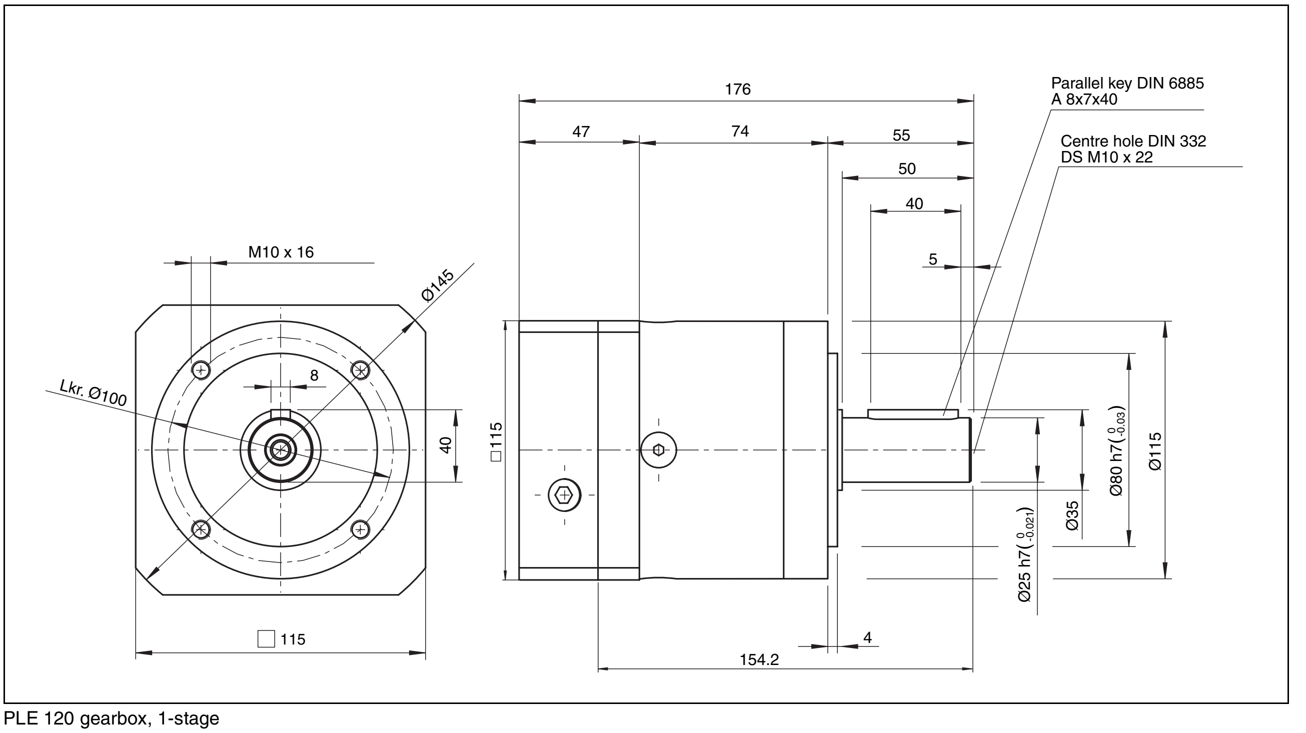


PLE 60 gearbox, 1-stage



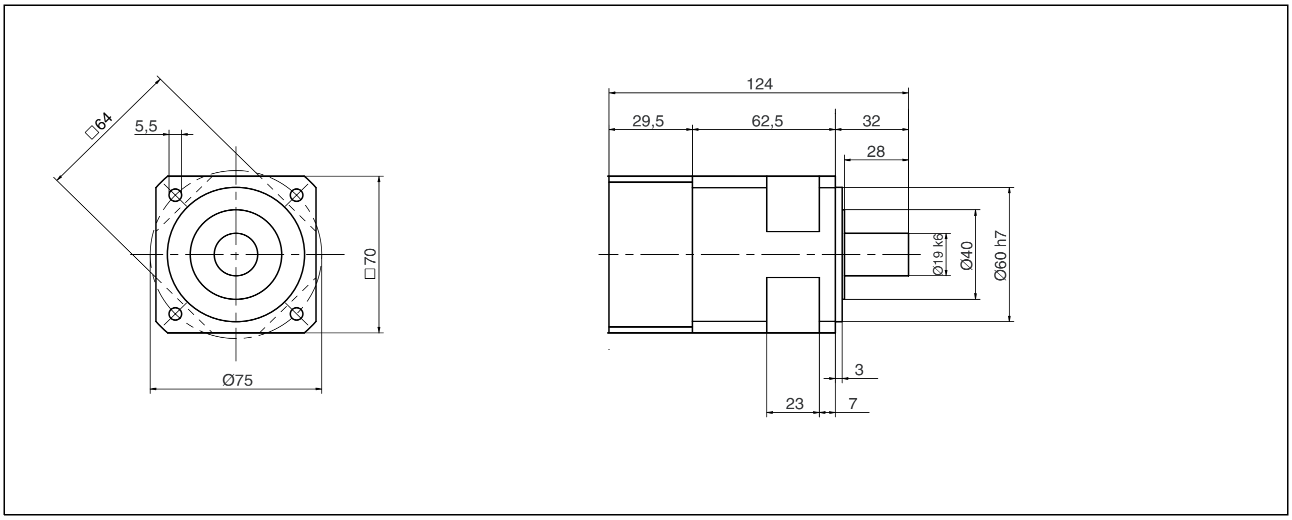
PLE 80 gearbox, 1-stage

Dimensional drawings

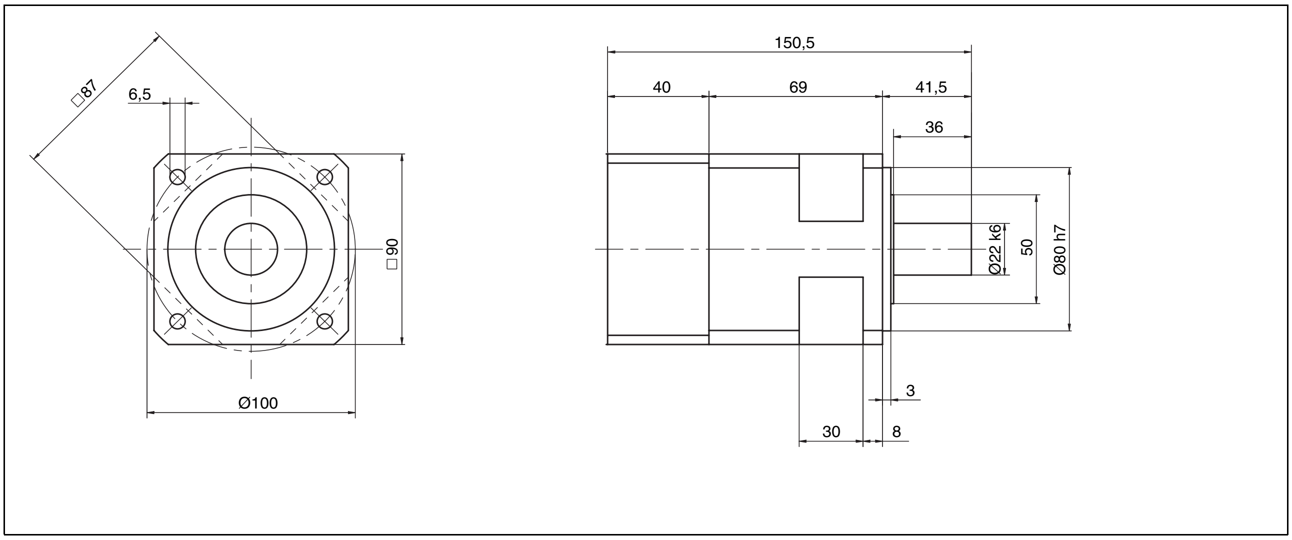


PLE 120 gearbox, 1-stage

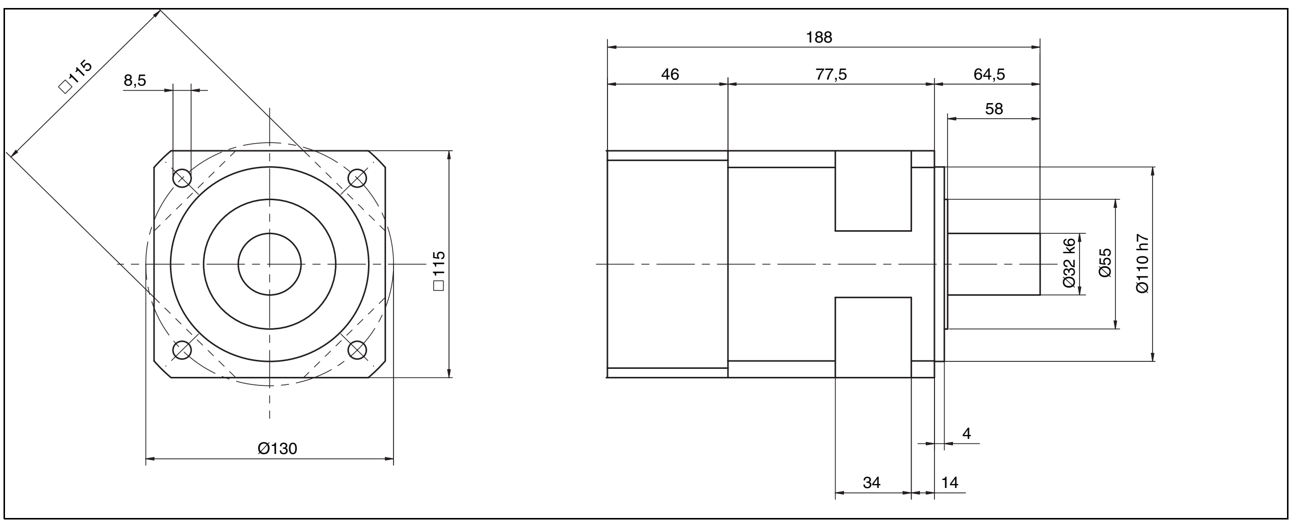
Dimensional drawings



PLS 70 gearbox



PLS 90 gearbox



PLS 115 gearbox

ExRDM 39•

Product description

For operation in potentially explosive areas, Berger Lahr offers the 3-phase stepper motors ExRDM 3910 and ExRDM 3913.
The explosion-proof 3-phase stepper motors have a robust design and a high torque in relation to their size.

Special features

The motors have protection type EEx d IIC T4. The result is the following characteristics and conditions:

- Ex-protection as per European standards EN 50014 and EN 50018
- Registration as per UL 2279 or ATEX 94/9/EG (EC-type test certification PTB 02 ATEX 1134)
- Device group II
- Explosion group C
- Type of protection pressure-resistant encapsulation "d"
- Temperature class "T4" (135°C)
- Use in potentially explosive atmospheres of zones 1 and 2, device category 2G
- Tested thermistor monitoring devices are required for temperature monitoring.

Product overview

Motor type		ExRDM 3910	ExRDM 3913
Nominal torque M_N	Nm	4.0	5.8
Holding torque M_H	Nm	4.5	6.55
Steps per revolution z [1)]		200 / 500 / 1000 / 2000 / 4000 / 5000 / 10000	
Step angle α[1)]	°	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036	

1) With appropriate control

Technical data

Motor type		ExRDM 3910N ExRDM 3910NEi	ExRDM 3913N ExRDM 3913NEi	ExRDM 3913NEa
Max. supply voltage U_{max}	V_{AC}	230	230	230
Nominal voltage DC bus U_N	V_{DC}	325	325	325
Max. voltage against PE	V_{AC}	250	250	250
Phase current in S1 operation I_N [1]	A_{eff}	1.6	1.6	1.6
Winding resistance R_W	Ω	7.5	9.3	9.3
Nominal torque M_N	Nm	4.0	5.8	5.8
Holding torque	Nm	4.5	6.55	6.55
Rotor inertia M_H	kgcm²	2.2	3.3	3.3
Steps per revolution z [2]	1/min	200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000		
Step angle α [2]	°	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036		
Systematic angular tolerance $\Delta\alpha_s$ [3]	’	±6	±6	±6
Max. starting frequency f_{Aom} [2]	kHz	5.3	5.3	5.3
Current rise time constant τ	ms	~9	~11	~11
Type of protection		EEx d IIC T4	EEx d IIC T4	EEx d IIC T4
Total length l	mm	194	224	250
Weigth m	kg	7.4	9.5	9.8
Shaft load				
• Max. radial force F_R (1st shaft end, 100% ED) [4]	N	110	110	110
• Max. axial force pull F_A	N	170	170	170
• Max. axial force pressure F_A	N	30	30	30
• Press-on force	N	80	80	80
• Nominal bearing life L_{10h}	h	20000	20000	20000

1) S1 operation, as per DIN VDE 0530: continuous operation
2) Depending on controller
3) Measured at 1000 steps/revolution, unit in angular minutes
4) Point of attack of radial force: in the middle of the shaft end

Environmental conditions

Ambient temperature	°C	-20 ... +50
Installation height without power reduction	m a. MSL	< 1000
Transport and storage temperature	°C	-25 ... +70
Relative humidity	%	5 … 85; no condensation permissible
Vibration severity in operation as per DIN EN 60034-14		A
Max. vibration load	m/s^2	20
Degree of protection as per DIN EN 60034-5		
• Gear		IP 54
• Shaft bushing front		IP 44
• Terminal box		IP 56
Heat class as per EN 60034-1		155 (F)
Shaft wobble and axial precision		DIN EN 50347 (IEC 60072-1)
Max. rotary acceleration	Wheel/s²	

Temperature monitoring

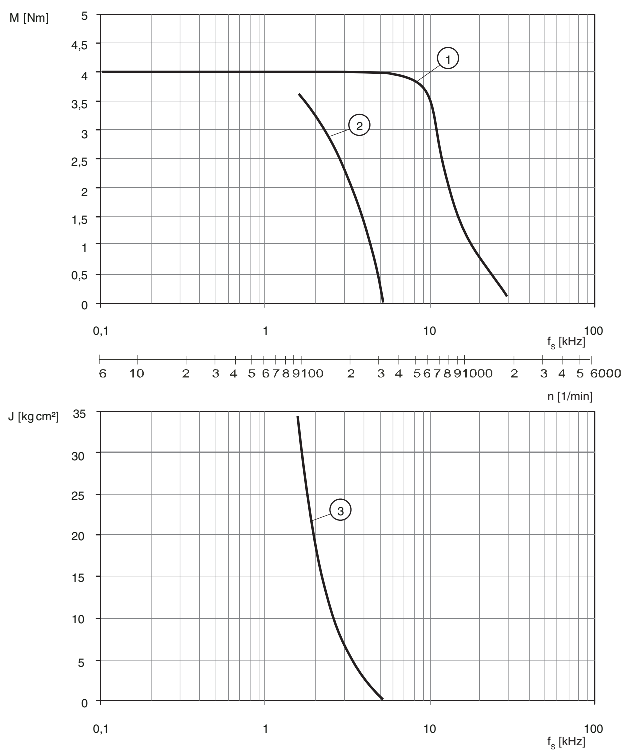
The explosion-proof motors ExRDM 3910 and ExRDM 3913 are operated with Berger Lahr stepper motor drives.
Tested thermistor monitoring devices are obligatory for temperature monitoring of the stepper motors ExRDM 3910 Nxx and ExRDM 3913 Nxx.
The devices are to be installed outside of the potentially explosive area.
The following devices are recommended:

- Dold MK 9003.12/11120 ATEX 230 V_{AC}
- Möller EMT 6 DBK

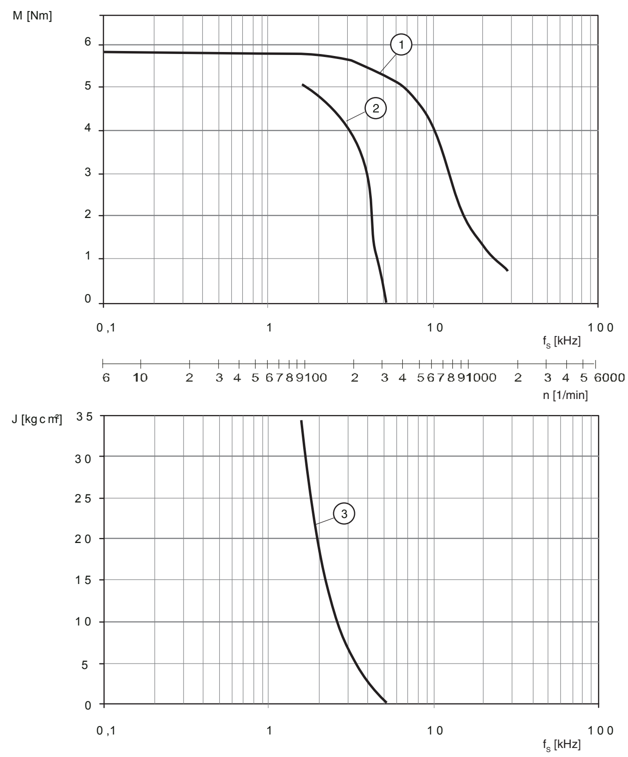
The devices can be purchased from their manufacturers.

Characteristic curves

ExRDM 3910



ExRDM 3913



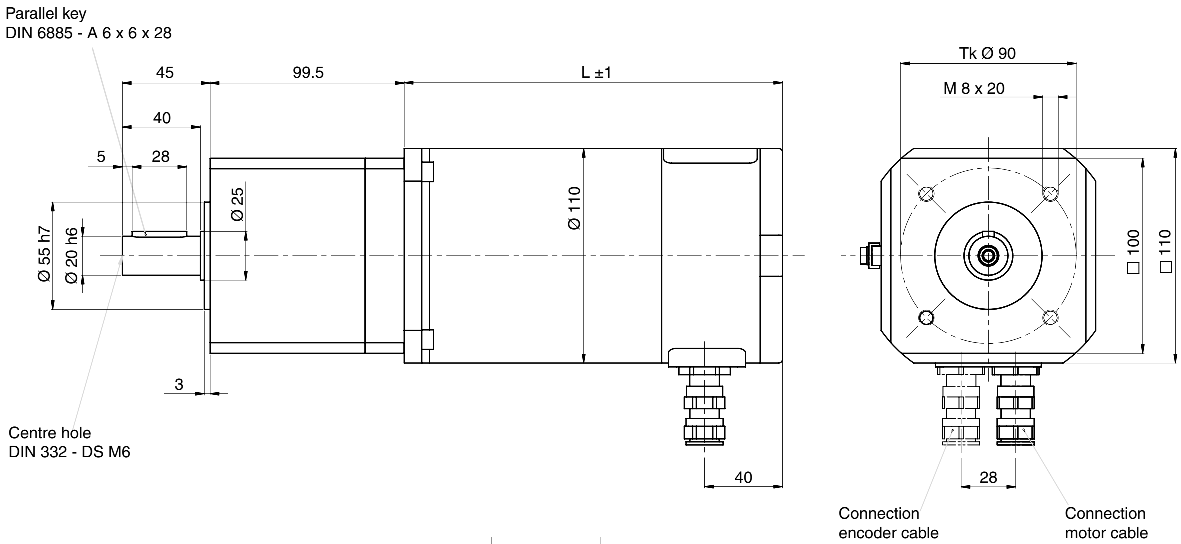
Measurement at 1000 steps/revolution, nominal voltage DC bus U_N and phase current I_N

(1) Pull-out torque

(2) Start limit torque

(3) Maximum load inertia

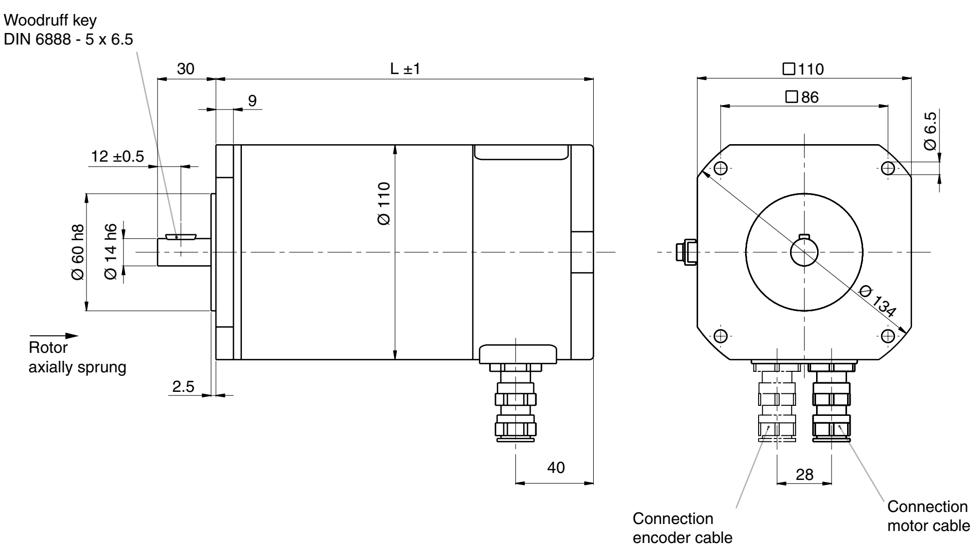
Dimensional drawings



	Length L
ExRDM 3910	194
ExRDM 3913	224

Cable retension screw
for clamping area 6.0 to 12.0 mm.

ExRDM 39•NE and ExRDM 39•NEi with gearbox

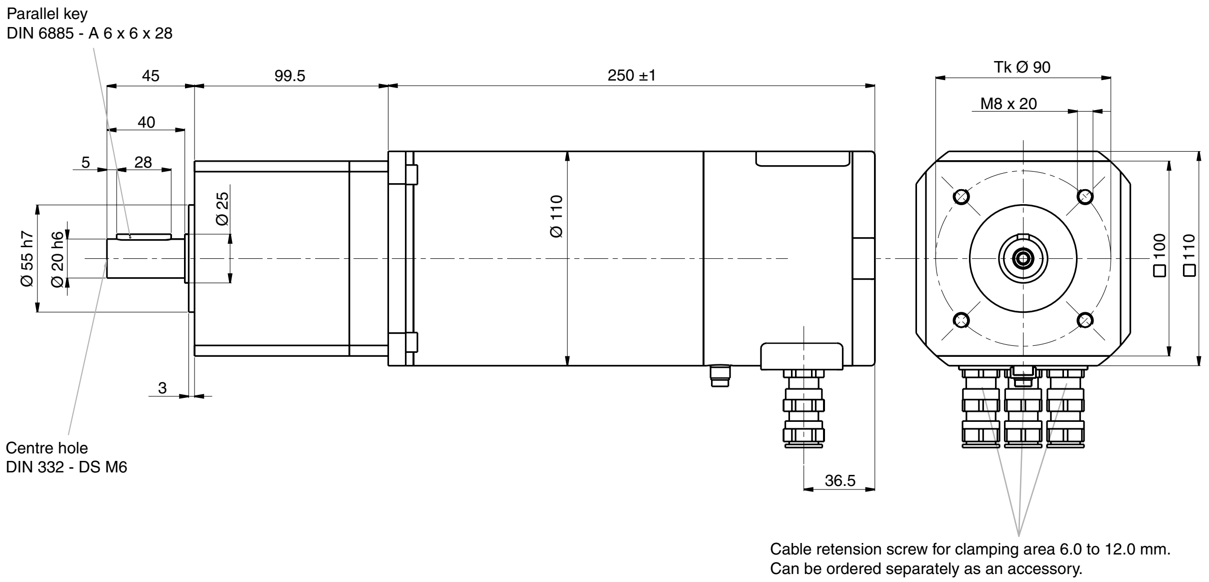


	Length L
ExRDM 3910	194
ExRDM 3913	224

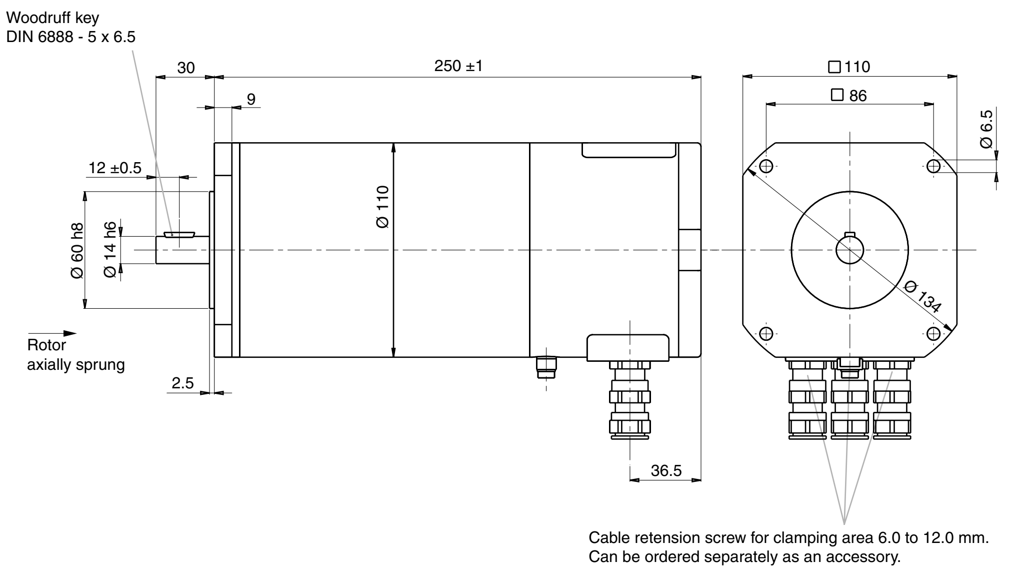
Cable retension screw
for clamping area 6.0 to 12.0 mm.

ExRDM 39•NE and ExRDM 39•NEi without gearbox

Dimensional drawings



ExRDM 39•NEa with gearbox



ExRDM 39•NEa without gearbox

Type code

Example:	**ExRDM**	**3**	**9**	**10**	**/**	**50**	**N**	**E**	**I**	**7**	**A**	**IP44**	**O**	**O**	**D4**	**K**	**60**
Product family ExRDM = Explosion-protected motor	**ExRDM**	**3**	9	10	/	50	N	E	I	7	A	IP44	O	O	D4	K	60
Phase count 3	ExRDM	**3**	**9**	10	/	50	N	E	I	7	A	IP44	O	O	D4	K	60
Motor size (Flange) 9 = 85 mm	ExRDM	3	**9**	**10**	/	50	N	E	I	7	A	IP44	O	O	D4	K	60
Motor length 10 = 194 mm 13 = 224 mm	ExRDM	3	9	**10**	**/**	50	N	E	I	7	A	IP44	O	O	D4	K	60
Number of pole pairs 50	ExRDM	3	9	10	/	**50**	N	E	I	7	A	IP44	O	O	D4	K	60
N = No meaning	ExRDM	3	9	10	/	50	**N**	E	I	7	A	IP44	O	O	D4	K	60
Encoders O = Without encoder E = With encoder	ExRDM	3	9	10	/	50	N	**E**	I	7	A	IP44	O	O	D4	K	60
Encoder type A = Absolute I = Incremental	ExRDM	3	9	10	/	50	N	E	**I**	7	A	IP44	O	5	D4	K	60
Winding (Motor voltage) 7 = 230 V_{AC} (325 V_{DC})	ExRDM	3	9	10	/	50	N	E	I	**7**	O	IP44	O	O	D4	K	60
Approval A = ATEX U = UL (only with length 13)	ExRDM	3	9	10	/	50	N	E	I	7	**A**	IP44	O	O	D4	K	60
Degree of protection IP44 = IP44 on shaft bushing	ExRDM	3	9	10	/	50	N	E	I	7	A	**IP44**	O	O	D4	K	60
Gearbox type O = Without gearbox U = Planetary gear PL 50/100 /ATEX	ExRDM	3	9	10	/	50	N	E	I	7	A	IP44	**O**	O	D4	K	60
Gear ratio O = Without gearbox 3 = 3:1 5= 5 :1	ExRDM	3	9	10	/	50	N	E	I	7	A	IP44	O	**O**	D4	K	60
Shaft diameter D4 = 14 mm DO = With gearbox	ExRDM	3	9	10	/	50	N	E	I	7	A	IP44	O	O	**D4**	K	60
Shaft model front K = Woodruff key as per DIN 6888 O = With gearbox	ExRDM	3	9	10	/	50	N	E	I	7	A	IP44	O	O	D4	**K**	60
Centring collar 60 = 60 mm OO = With gearbox	ExRDM	3	9	10	/	50	N	E	I	7	A	IP44	O	O	D4	K	**60**

Note:
Please note the description of the possible motor types on page 3.

Options

Encoder

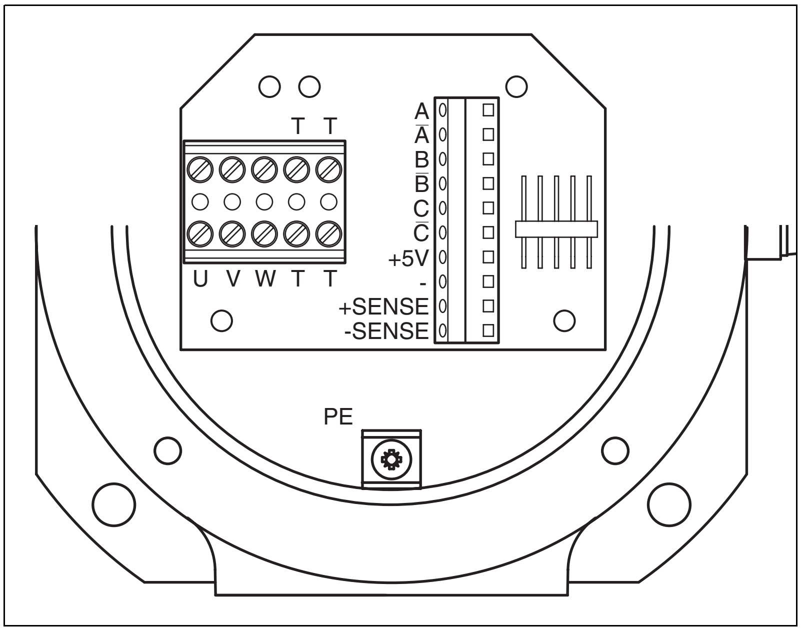
The 3-phase stepper motors from Berger Lahr can be equipped with an encoder. If the control electronics are equipped with rotation monitoring electronics, the encoder is used as a measurement system to acknowledge the actual position of the rotor. Rotation monitoring compares the set point and actual position of the motor and reports errors if the difference exceeds the tracking error limit. For example, a mechanical overload of the motor can thereby be recorded.

Incremental encoder for ExRDM 39•N- and ExRDM 39•NEi

Technical Data

Resolution	Incr./rpm	1000
Index pulse	Pulse/rpm.	1
Output		RS 422
Signals		A, B, I
Signal shape		Rectangular
Supply voltage	V	5 ± 5%
Supply current	A	max. 0.125

Wiring diagram



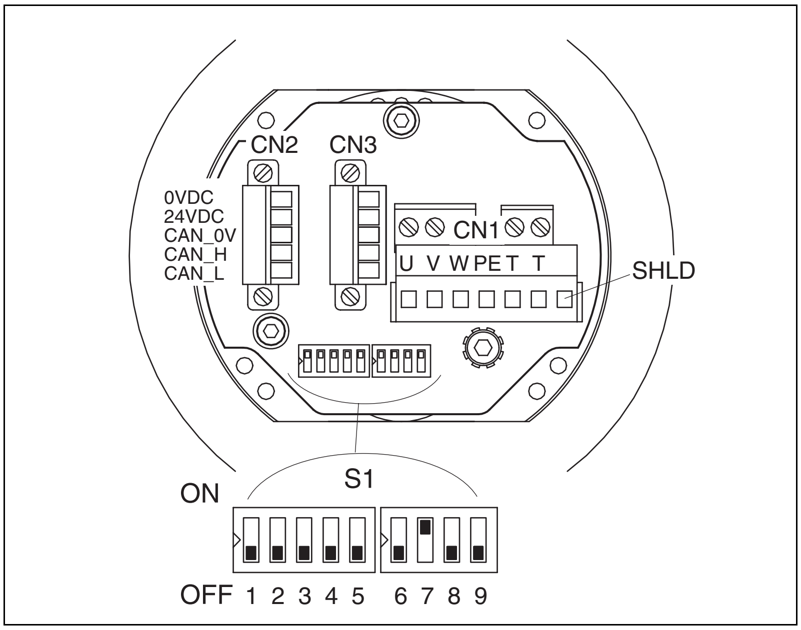
Wiring diagram ExRDM 39•N and ExRDM 39•NEi with incremental encoder

Absolute encoder for ExRDM 39•NEa

Unlike incremental encoders, the current position value is directly available for the absolute encoder. If this encoder is mechanically run in a shut-off state, the current position value can be read out directly after re-start of the power supply.

Technical Data		
Supply voltage	V_{DC}	18 ... 30
Max. power consumption	A	< 0.12 at 18 V_{DC}, < 0.07 at 30 V_{DC}
Resolution	Incr./rpm	max. 8192 (13 Bit)
Measurement range	rpm	max. 4096 (12 Bit)
Baud rate	kBaud	250, line length to 250 m
	kBaud	500, line length to 100 m
Encoder interface		CAN-field bus interface (opto-isolated)
• Data transmission		CAN bus driver (ISO/DIS 11898)
• Protocol		CANopen device profile for encoder CiA DS-406 V2.0A
• Output code		Binary
Max. allowable speed	1/min	12000

Wiring diagram



Wiring diagram for ExRDM 39•NEa with absolute encoder

S1 (DIP switch)	Description
1-5	Base ID
6	Memory function 0: All parameters are stored 1: No parameter is stored. After power Off/On, the old values apply again.
7	Baud rate 0: 250 kBaud 1: 500 kBaud
8	Count direction 0: Bus parameter Index 6000 is valid 1: Bus parameter Index 6000 has inverse effect
9	CAN bus termination (terminating resistor 120 Ω ± 5%) 0: powered off 1: connected

Gearbox

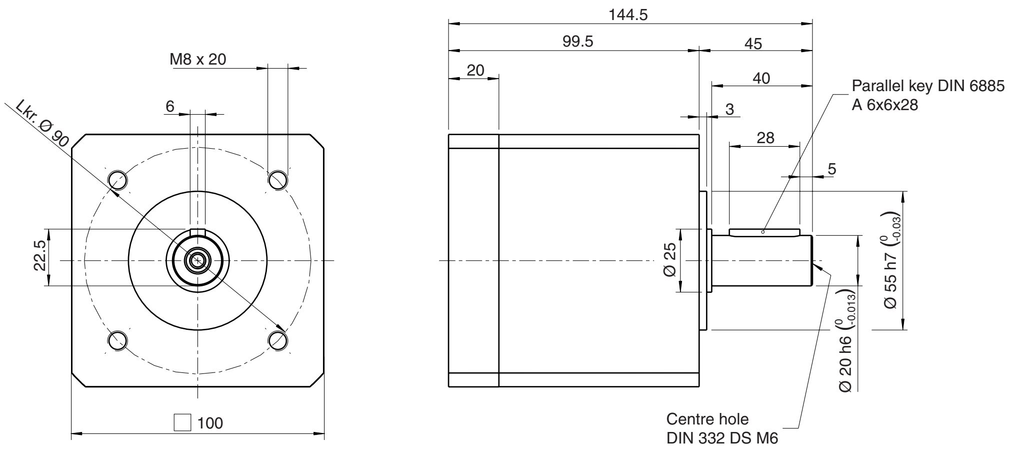
Explosion-proof stepper motors by Berger Lahr can also be supplied with a built-in planetary gear PL 50/100/ATEX.
These gearboxes are available in a choice of two gear ratios: 3:1 and 5:1.
The output torque of the gearbox is obtained by multiplying the characteristic values of the motor by the reduction ratio and the efficiency of the gearbox (0.96).

Technical data

Gearbox		**PL 50/100/ATEX**	
Planetary gear, spur-toothed, suitable for group II as per ATEX 94/9/EC, category 2D/2G/3D/3G; S1-operation			
Gear ratio		**3**	**5**
Torsional play	arcmin	12	
Torsional stiffness	Nm/arcmin	5.8	
Nominal output torque [1]	Nm	30	25
Moment of inertia	kgcm²	0.65	0.15
Max. radial force F_R [2]	N	700	
Max. axial force F_A [3]	N	700	
Max. allowable press-on force	N	1000	
Weight	kg	2.9	
Gear stages		1	
Max. drive speed	1/min	7000	
Recommended drive speed [4]	1/min	4,500	
Efficiency for nominal load	%	90	
Min. operating temperature	°C	-20	
Max. operating temperature	°C	+80	
Bearings		Deep-groove ball bearing	
Degree of protection		IP 65	
Lubrication		Grease lubrication	
Service life	h	10000	

1) The actual output torque is calculated from the motor torque x gear ratio x efficiency of the gearbox.
2) For N = 200 1/min, $F_A = 0$
3) For N = 200 1/min, $F_R = 0$
4) The recommended operating temperature may not be exceeded!

Dimensional drawing



PL 50/100/ATEX gearbox

VRDM 26•
Technical data

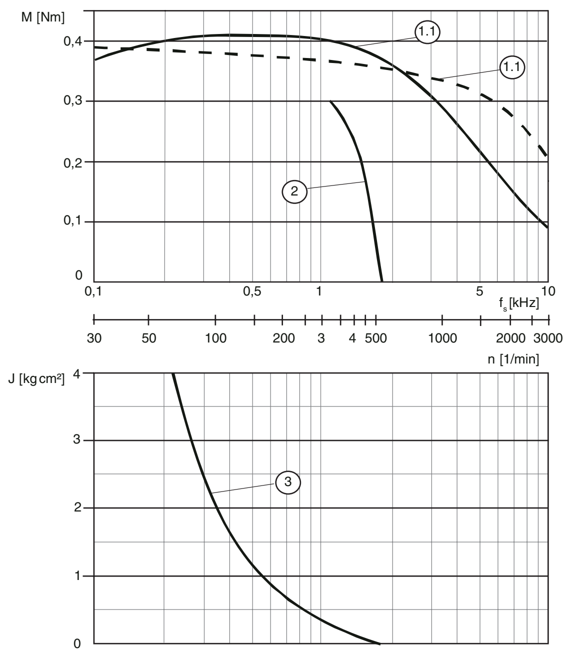
Motor type		VRDM 264 / 50L		VRDM 266 / 50L			VRDM 268 / 50L	
Winding		**5G4A**	**7G8A**	**7G8A**	**5G4A**	**3G8A**	**5G4A**	**3G8A**
Max. supply voltage U_{max}	V_{AC}	24						
Nominal voltage DC bus U_N	V_{DC}	35						
Nominal torque M_N	Nm	0.40	0.40	0.85	0.87	0.85	1.30	1.40
Holding torque M_H	Nm	0.45	0.45	1.00	1.00	1.00	1.50	1.60
Rotor inertia J_R	kgcm²	0.09	0.09	0.22	0.22	0.22	0.38	0.38
Steps per revolution z		200 / 400						
Step angle α	°	1.8 / 0.9						
Systematic angular tolerance $\Delta\alpha_s$ [1]	’	±3						
Max. starting frequency full step f_{Aom}	kHz	1.8	1.7	1.35	1.5	1.6	1.1	1.2
Max. starting frequency half step f_{Aom}	kHz	3.4	3.2	2.6	2.9	3	2.1	2.1
Phase current I_W	A_{rms}	2.1	1	1	2.1	3	2.1	3
Winding resistance R_W	Ω	1	4.75	6.7	1.4	0.8	2	1.1
Rate-of-current rise time constant τ	ms	3.2	3.2	5.0	5.0	5.0	5.5	5.5
Number of connection wires		4	8	8	4	8	4	8
Weight m [2]	kg	0.5	0.5	0.7	0.7	0.7	1.05	1.05
Shaft load [3]								
• Max. radial force 1st shaft end [4]	N	24					50	
• Max. radial force 2nd shaft end (optional) [5]	N	25 / 40						
• Max. axial force pull	N	100						
• Max. axial force compression	N	8.4						
• Nominal bearing life L_{10h} [6]	h	20000						

1) Measured at 200 / 400 steps/revolution, unit: minutes of arc
2) Weight of the motor version with braided wires
3) Conditions for shaft load: speed of rotation 600 1/min, 100% ED at nominal torque, ambient temperature 40 °C (storage temperature ≈ 80 °C)
4) Point of attack of radial force: in the middle of the shaft end
5) Point of attack of radial force: in the middle of the shaft end; 1st value: Motors with terminal boxes, connectors or encoder; 2nd value: Motors with braided wires
6) Operating hours at a failure probability of 10%

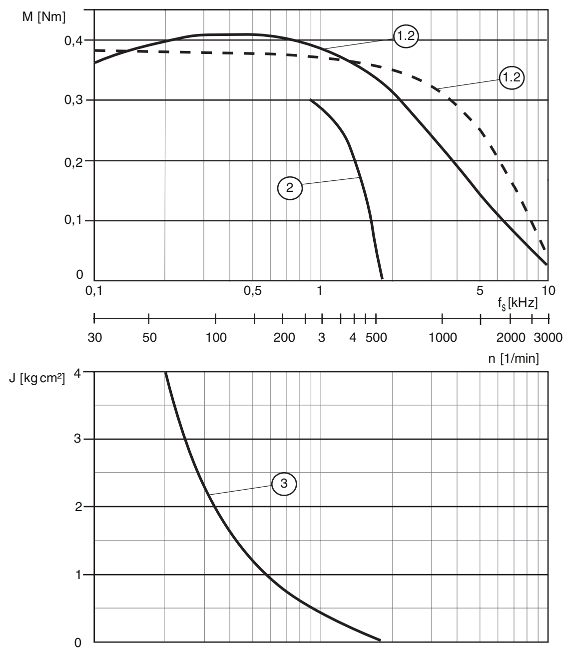
Environmental conditions		
Ambient temperature	°C	-25 ... +40
Installation height without power reduction	m a. MSL	1000
Transport and storage temperature	°C	-25 ... +70
Relative humidity	%	5 … 85; no condensation permissible
Vibration severity in operation as per DIN EN 60034-14		A
Max. vibration load	m/s^2	20
Degree of protection as per DIN EN 60034-5		
• Total except shaft bushing		IP 41
• Shaft bushing		IP 41
Heat class as per EN 60034-1		155 (F)
Shaft wobble and axial precision		DIN EN 50 347 (IEC 60072-1)
Max. rotary acceleration	$Wheel/s^2$	200000

Characteristic curves

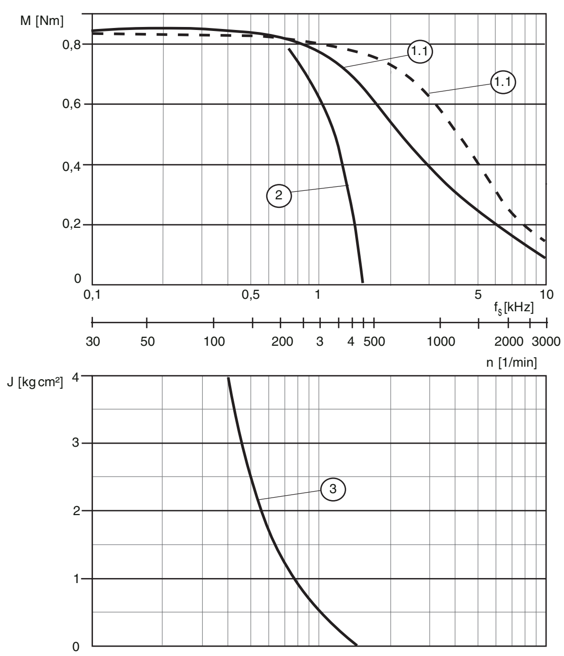
VRDM 264 / 50L 5G4A



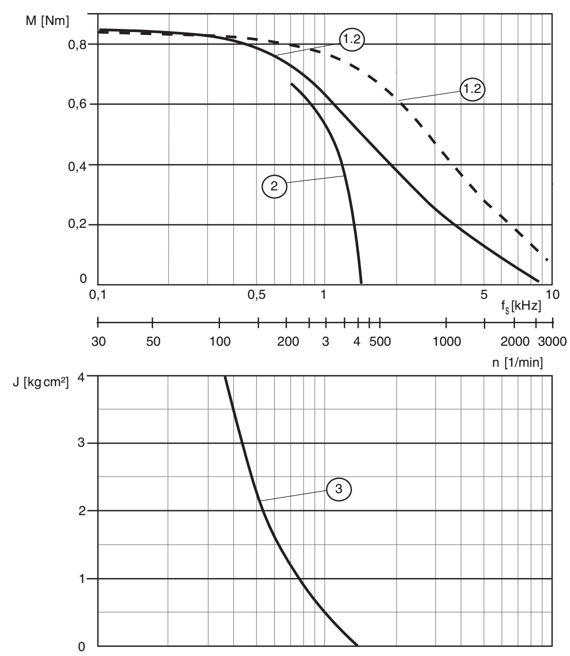
VRDM 264 / 50L 7G8A



VRDM 266 / 50L 5G4A



VRDM 266 / 50L 7G8A

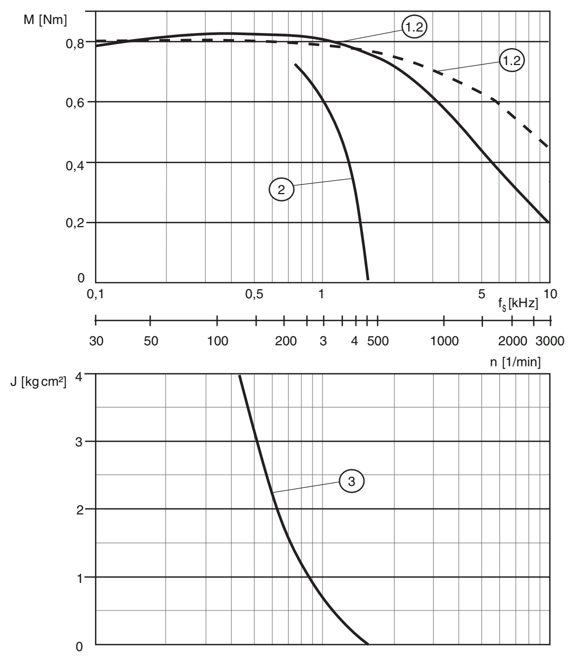


(1.1) Pull-out torque at U_N = 35 V_{DC} and I_W = 2.1 A
(1.2) Pull-out torque at U_N = 35 V_{DC} and I_W' = 1.4 A
(The characteristic curve was measured with a bipolar parallel connection and the calculated current: $I_W' = I_W \cdot \sqrt{2}$, I_W' - Current setting on controller)
(2) Start limit torque
(3) Maximum load inertia

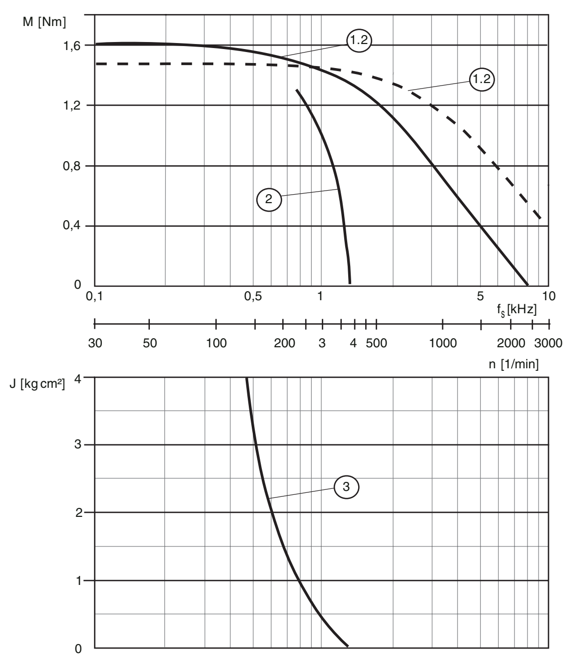
——: Measured at full step (200 steps per revolution)
– –: Measured at half step (400 steps per revolution)

Characteristic curves

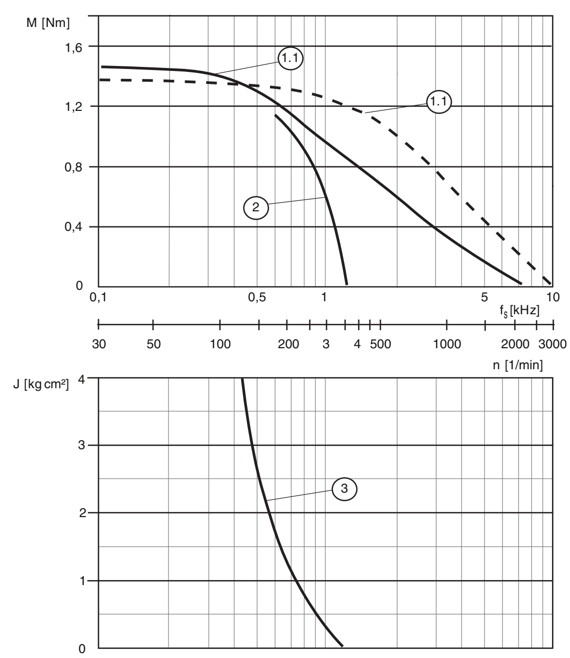
VRDM 266 / 50L 3G8A



VRDM 268 / 50L 3G8A



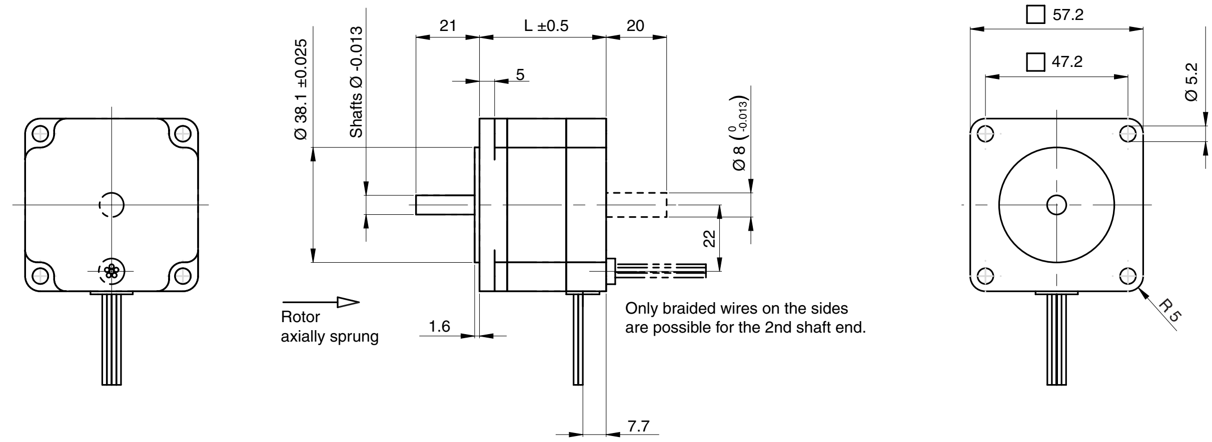
VRDM 268 / 50L 5G4A



(1.1) Pull-out torque at U_N = 35 V_{DC} and I_W = 2.1 A
(1.2) Pull-out torque at U_N = 35 V_{DC} and I_W' = 4.2 A
(The characteristic curve was measured with a bipolar parallel connection and the calculated current: $I_W' = I_W \cdot \sqrt{2}$, I_W' - Current setting on controller)
(2) Start limit torque
(3) Maximum load inertia

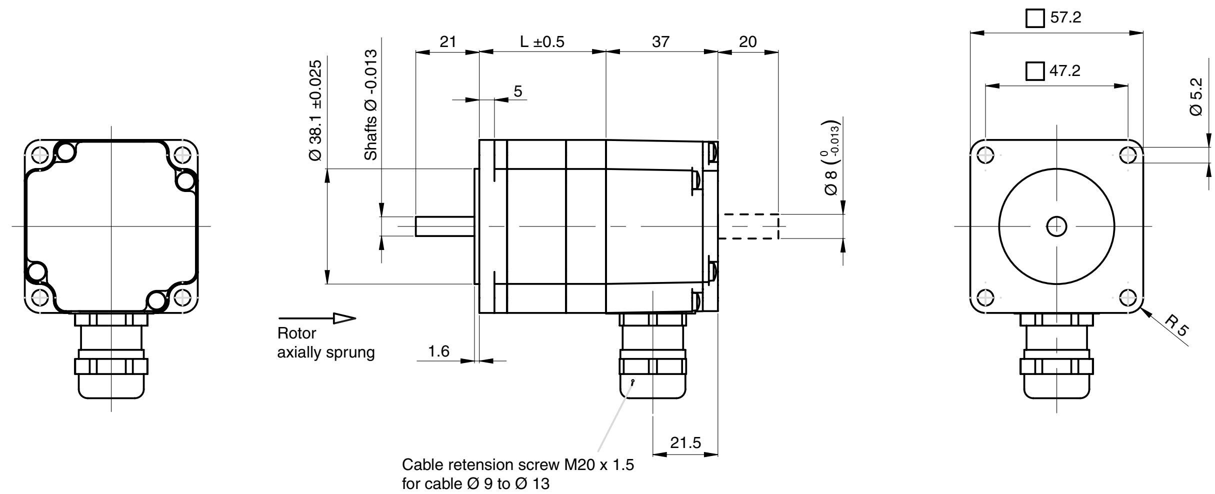
——: Measured at full step (200 steps per revolution)
——: Measured at half step (400 steps per revolution)

Dimensional drawings



	Length L	Shafts Ø
VRDM 264	42	6.35
VRDM 266	56	6.35
VRDM 268	79	8

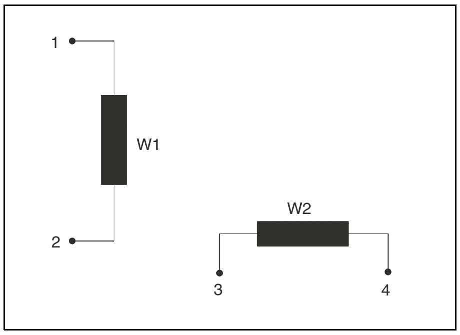
2-phase stepper motor VRDM 26• in braided wire version



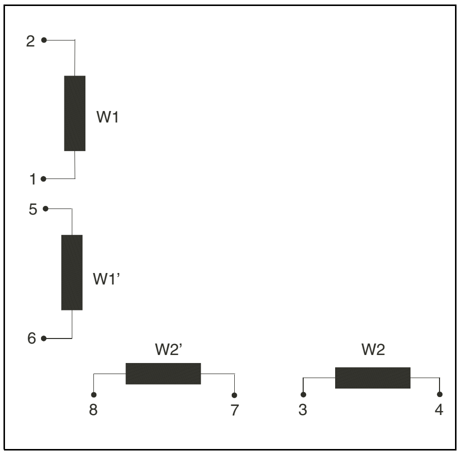
	Length L	Shafts Ø
VRDM 264	42	6.35
VRDM 266	56	6.35
VRDM 268	79	8

2-phase stepper motor VRDM 26• in terminal box version

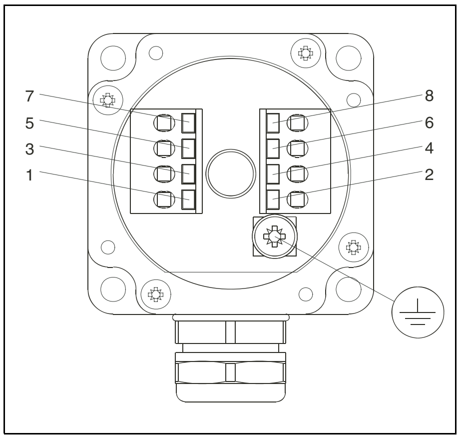
Motor connection



Motor connection in braided wire version with four connection wires		
Designation	**Motor wire colour as per DIN IEC 757**	**Motor wire colour**
1	BR	brown
2	BR/WH	brown and white
3	RD	red
4	RD/WH	red and white



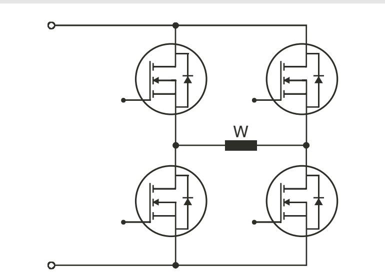
Motor connection in braided wire version with eight connection wires		
Designation	**Motor wire colour as per DIN IEC 757**	**Motor wire colour**
1	BR	brown
2	BR/WH	brown and white
3	RD	red
4	RD/WH	red and white
5	OR	orange
6	OR/WH	orange and white
7	YE	yellow
8	YE/WH	yellow and white



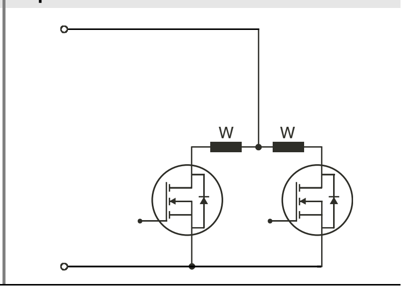
Motor connection in terminal box version		
Designation	**Wire colour as per DIN IEC 757**	**Wire colour**
1	BR	brown
2	BR/WH	brown and white
3	RD	red
4	RD/WH	red and white
5	OR	orange
6	OR/WH	orange and white
7	YE	yellow
8	YE/WH	yellow and white

Control

bipolar



unipolar



Type code

Example:	**VRDM**	**2**	**6**	**8**	**/**	**50**	**L**	**3**	**G**	**4**	**B**	**IP41**	**1**	**5**	**DO**	**O**	**OO**	**2**	**O**	**O**	**O**	**OOO**
Phase count 2	VRDM	**2**	6	8	/	50	L	3	G	4	B	IP41	1	5	DO	O	OO	2	O	O	O	OOO
Size (Flange) 6 (57.2mm)	VRDM	2	**6**	8	/	50	L	3	G	4	B	IP41	1	5	DO	O	OO	2	O	O	O	OOO
Length 4 = 42 mm 6 = 56 mm 8 = 79 mm	VRDM	2	6	**8**	/	50	L	3	G	4	B	IP41	1	5	DO	O	OO	2	O	O	O	OOO
Number of pole pairs 50	VRDM	2	6	8	/	**50**	L	3	G	4	B	IP41	1	5	DO	O	OO	2	O	O	O	OOO
Rotor L = Laminated rotor plate	VRDM	2	6	8	/	50	**L**	3	G	4	B	IP41	1	5	DO	O	OO	2	O	O	O	OOO
Winding variant 3; 5; 7	VRDM	2	6	8	/	50	L	**3**	G	4	B	IP41	1	5	DO	O	OO	2	O	O	O	OOO
Winding circuit G = General	VRDM	2	6	8	/	50	L	3	**G**	4	B	IP41	1	5	DO	O	OO	2	O	O	O	OOO
Connection type I 4 = 4 braided wires 8 = 8 braided wires	VRDM	2	6	8	/	50	L	3	G	**4**	B	IP41	1	5	DO	O	OO	2	O	O	O	OOO
Connection type II A = Braided wires B = Terminal box	VRDM	2	6	8	/	50	L	3	G	4	**B**	IP41	1	5	DO	O	OO	2	O	O	O	OOO
Degree of protection IP41 = IP41 on shaft bushing	VRDM	2	6	8	/	50	L	3	G	4	B	**IP41**	1	5	DO	O	OO	2	O	O	O	OOO
Gearbox type [1)] O = Without gearbox 1 = PLE 40 2 = PLE 60 A = PLS 70	VRDM	2	6	8	/	50	L	3	G	4	B	IP41	**1**	5	DO	O	OO	2	O	O	O	OOO
Gear ratio O = Without gearbox 3= 3 :1 5= 5 :1 8= 8 :1	VRDM	2	6	8	/	50	L	3	G	4	B	IP41	1	**5**	DO	O	OO	2	O	O	O	OOO
Shaft diameter D6 = 6.35 mm D8 = 8 mm DO = With gearbox	VRDM	2	6	8	/	50	L	3	G	4	B	IP41	1	5	**DO**	O	OO	2	O	O	O	OOO
Shaft model front O = Without processing or with gearbox	VRDM	2	6	8	/	50	L	3	G	4	B	IP41	1	5	DO	**O**	OO	2	O	O	O	OOO
Centring collar 38 = 38.10 mm OO = With gearbox	VRDM	2	6	8	/	50	L	3	G	4	B	IP41	1	5	DO	O	**OO**	2	O	O	O	OOO
Second shaft O = Without 2 = With	VRDM	2	6	8	/	50	L	3	G	4	B	IP41	1	5	DO	O	OO	**2**				OOO
O = Reserved	VRDM	2	6	8	/	50	L	3	G	4	B	IP41	1	5	DO	O	OO	2	**O**	O	O	OOO
O = Reserved	VRDM	2	6	8	/	50	L	3	G	4	B	IP41	1	5	DO	O	OO	2	O	**O**	O	OOO
Braided wire output O = Without S = Side B = Back	VRDM	2	6	8	/	50	L	3	G	4	B	IP41	1	5	DO	O	OO	2	O	O	**O**	OOO
Braided wire length OOO = Without xxx = xxx mm (max. 400 mm)	VRDM	2	6	8	/	50	L	3	G	4	B	IP41	1	5	DO	O	OO	2	O	O	O	**OOO**

1) Description of gearbox see options VRDM 36x, page 27

Possible motor types
VRDM 264 / 50L 5G4 ...
VRDM 264 / 50L 7G8 ...
VRDM 266 / 50L 3G8 ...
VRDM 266 / 50L 5G4 ...
VRDM 266 / 50L 7G8 ...
VRDM 268 / 50L 3G8 ...
VRDM 268 / 50L 5G4 ...

Conversion tables

Rotor inertia

	lb·in^2	lb·ft^2	lb·in·s^2	lb·ft·s^2 slug·ft^2	kg·cm^2	kg·cm·s^2	g·cm^2	g·cm·s^2	oz·in^2	oz·in·s^2
lb·in^2	–	6.94×10^{-3}	2.59×10^{-3}	2.15×10^{-4}	2.926	2.98×10^{-3}	2.92×10^{3}	2.984	16	4.14×10^{-2}
lb·ft^2	144	–	0.3729	3.10×10^{-2}	421.40	0.4297	4.21×10^{5}	429.71	2304	5.967
lb·in·s^2	386.08	2.681	–	8.33×10^{-2}	1.129×10^{3}	1.152	1.129×10^{6}	1.152×10^{3}	6.177×10^{3}	16
lb·ft·s^2 slug·ft^2	4.63×10^{3}	32.17	12	–	1.35×10^{4}	13.825	1.355×10^{7}	1.38×10^{4}	7.41×10^{4}	192
kg·cm^2	0.3417	2.37×10^{-3}	8.85×10^{-4}	7.37×10^{-6}	–	1.019×10^{-3}	1000	1.019	5.46	1.41×10^{-2}
kg·cm·s^2	335.1	2.327	0.8679	7.23×10^{-2}	980.66	–	9.8×10^{5}	1000	5.36×10^{3}	13.887
g·cm^2	3.417×10^{-4}	2.37×10^{-6}	8.85×10^{-7}	7.37×10^{-8}	1×10^{-3}	1.01×10^{-6}	–	1.01×10^{-3}	5.46×10^{-3}	1.41×10^{-6}
g·cm·s^2	0.335	2.32×10^{-3}	8.67×10^{-4}	7.23×10^{-5}	0.9806	1×10^{-3}	980.6	–	5.36	1.38×10^{-2}
oz·in^2	0.0625	4.3×10^{-4}	1.61×10^{-6}	1.34×10^{-6}	0.182	1.86×10^{-4}	182.9	0.186	–	2.59×10^{-3}
oz·in·s^2	24.13	0.1675	6.25×10^{-2}	5.20×10^{-3}	70.615	7.20×10^{-2}	7.06×10^{4}	72	386.08	–

Torque

	lb·in	lb·ft	oz·in	Nm	kg·m	kg·cm	g·cm	dyne·cm
lb·in	–	8.333×10^{-2}	16	0.113	1.152×10^{-2}	1.152	1.152×10^{3}	1.129×10^{6}
lb·ft	12	–	192	1.355	0.138	13.825	1.382×10^{4}	1.355×10^{7}
oz·in	6.25×10^{-2}	5.208×10^{-3}	–	7.061×10^{-3}	7.200×10^{-4}	7.200×10^{-2}	72.007	7.061×10^{4}
Nm	8.850	0.737	141.612	–	0.102	10.197	1.019×10^{4}	1×10^{7}
kg·m	86.796	7.233	1.388×10^{3}	9.806	–	100	1×10^{5}	9.806×10^{7}
kg·cm	0.8679	7.233×10^{-2}	13.877	9.806×10^{-2}	10^{-2}	–	1000	9.806×10^{5}
g·cm	8.679×10^{-4}	7.233×10^{-5}	1.388×10^{-2}	9.806×10^{-5}	1×10^{-5}	1×10^{-3}	–	980.665
dyne·cm	8.850×10^{-7}	7.375×10^{-8}	1.416×10^{-5}	10^{-7}	1.019×10^{-8}	1.0197×10^{-6}	1.019×10^{-6}	–

Power

	H.P.	W
H.P.	–	745.7
W	1.31×10^{-3}	–

Length

	in	ft	yd	m	cm	mm
in	–	0.0833	0.028	0.0254	2.54	25.4
ft	12	–	0.333	0.3048	30.48	304.8
yd	36	3	–	0.914	91.44	914.4
m	39.37	3.281	1.09	–	100	1000
cm	0.3937	0.03281	1.09 x 10-2	0.01	–	10
mm	0.03937	0.00328	1.09 x 10-3	0.001	0.1	–

Rotation

	1/min (rpm)	rad/sec	deg./sec
1/min (rpm)	–	0.105	6.0
rad/sec	9.55	–	57.30
deg./sec	0.167	1.745×10^{-2}	–

Weight

	lb	oz	slug	kg	g
lb	–	16	0.0311	0.453592	453.592
oz	6.35×10^{-2}	–	1.93×10^{-3}	0.028349	28.35
slug	32.17	514.8	–	14.5939	1.459×10^{4}
kg	2.20462	35.274	0.0685218	–	1000
g	2.205×10^{-3}	3.527×10^{-3}	6.852×10^{-5}	0.001	–

Temperature

	°F	°C
°F	–	$(\vartheta - 32) \cdot {}^{5}/_{9}$
°C	$\vartheta \cdot {}^{9}/_{5} + 32$	–

Force

	lb	oz	gf	dyne	N
lb	–	16	453.592	4.448×10^{5}	4.4482
oz	0.0625	–	28.35	2.780×10^{4}	0.27801
gf	2.205×10^{-3}	0.03527	–	980,665	N.A.
dyne	2.248×10^{-6}	3.59×10^{-6}	1.02×10^{-3}	–	0.0001
N	0.22481	3.5967	N.A.	100,000	–

Example for conversion:
Conversion of a 10 inch length measurement into metres. Look for the entry “in” (= inch) in the “Length” table in the left column and the entry “m” (= metre) in the header. The table cell at the point of intersection of the column and the row will show the conversion factor: “0.0254”. Multiply 10 inches by 0.0254 and you will get the value in metres: 10 in x 0.0254 = 0.254 m.

BERGER LAHR

Berger Lahr offers you the positioning and automation solutions you need, based on our technology and proven series of products. Our comprehensive engineering and consulting service is ready to support and advise you every step of the way.
Berger Lahr is a member company of the Schneider Electric Group. With its Merlin Gerlin, Square D and Telemecanique brands, Schneider Electric is one of the leading providers of electrical and automation-engineering solutions.

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BERGER LAHR

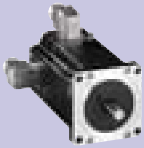
Catalogue of Twin Line Motors

Edition 11/2001

Twin Line

Motors

	3-phase stepping motors			AC synchronous servomotors (standard)		
Size	VRDM 368	VRDM 39X	VRDM 311X	SER 39X	SER 311X	

Power class	**3 A / 350 W / 1~** VRDM 368 VRDM 39X	**7 A / 750 W / 1~** VRDM 311X	**3 A / 750 W / 1~** SER 397 SER 3910 SER 3913 SER 3916	**3 A / 1,5 kW / 3~** SER 3913 SER 3916 SER 31112 SER 31117	**6 A / 3 kW / 3~** SER 31117 SER 31122 SER 31127

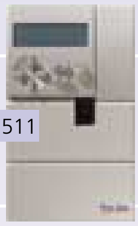
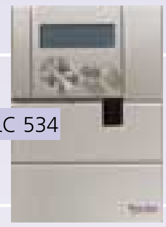
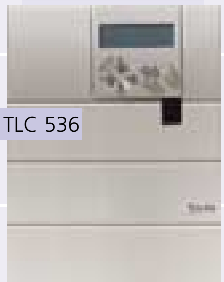
Power electronics

for single-axis systems	TLD 011	TLD 012	TLD 132	TLD 134	TLD 136

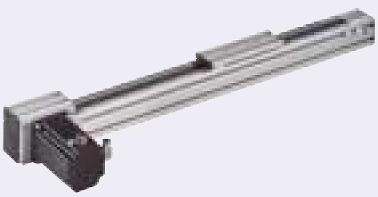
Positioning controllers

with data set processing	TLC 411	TLC 412	TLC 432	TLC 434	TLC 436
with field-bus interface	TLC 511	TLC 512	TLC 532	TLC 534	TLC 536
freely programmable according to IEC 1131-3	TLC 611	TLC 612	TLC 632	TLC 634	TLC 636

Robotics

Single-axis systems

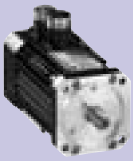

Portal axis


Cantilever axis


Telescope axis

AC synchronous servomotors (high performance)

DSM 4-05.X
DSM 4-07.X



DSM 4-09.X

DSM 4-11.X

DSM 4-14.X

DSM 4-19.X

3 A / 750 W / 1~
DSM 4-05.1-.4
DSM 4-07.1-.2
DSM 4-09.1-.2

3 A / 1,5 kW / 3~
DSM 4-07.1-.3
DSM 4-09.1-.3

6 A / 3 kW / 3~
DSM 4-07.1-.3
DSM 4-09.1-.4
DSM 4-11.1-.2

16 A / 8 kW / 3~
DSM 4-11.1-.4
DSM 4-14.1-.4
DSM 4-19.1-.2

Catalogue includes

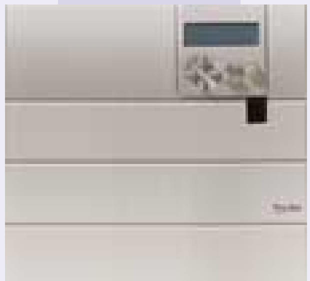
- General information
- 3-phase stepping motors
- AC synchronous servomotors (standard)
- AC synchronous servomotors (high performance)
- Accessories

TLD 132

TLD 134

TLD 136

TLD 138



Catalogue of
Power electronics

TLC 432

TLC 532

TLC 632

TLC 434

TLC 534

TLC 634

TLC 436

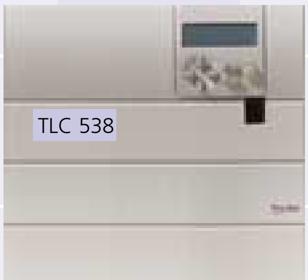
TLC 536

TLC 636

TLC 438

TLC 538

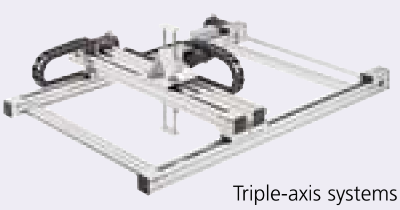
TLC 638



Catalogue of
Positioning Controllers

Multi-axis systems

Double-axis systems



Triple-axis systems

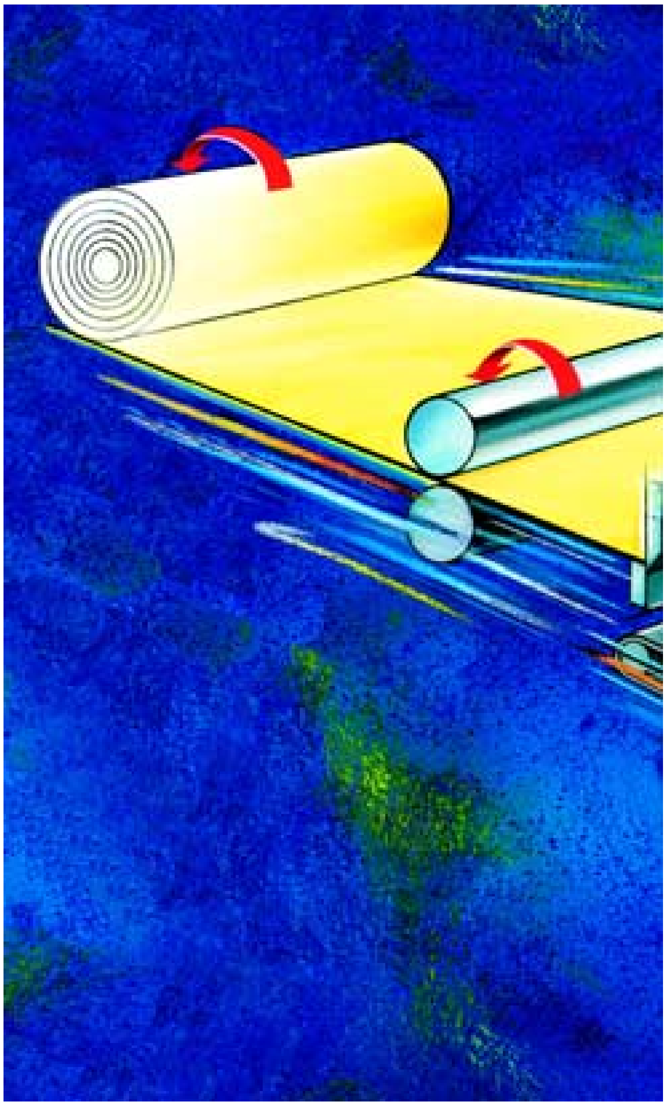
Low-mass systems

Catalogue of
Robotics

Positioning drives

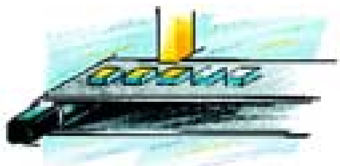
Positioning drives enable the execution of accurate, precisely defined movements. The distances travelled may vary from a few µm to several metres. The digital positioning drives from Berger Lahr are especially well-suited to positioning tasks. They are maintenance-free, simple to control and the movement procedures are easy to program. They can be used to solve almost any task in production automation requiring up to 8 kW of power: from simple point-to-point movements all the way to multi-axis systems with varying travel patterns. Positioning drives from Berger Lahr may be

– operated as autonomous solutions
– controlled by a PLC
– integrated into various networks and standard field-bus systems

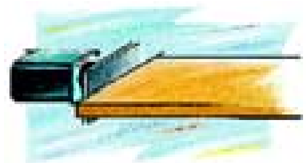


What would you like to position?

Below are some examples of possible positioning tasks. Many other applications are also conceivable.

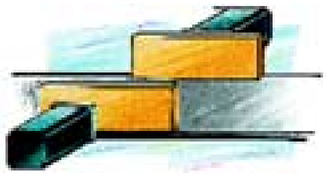


Positioning parts



Positioning limit stops

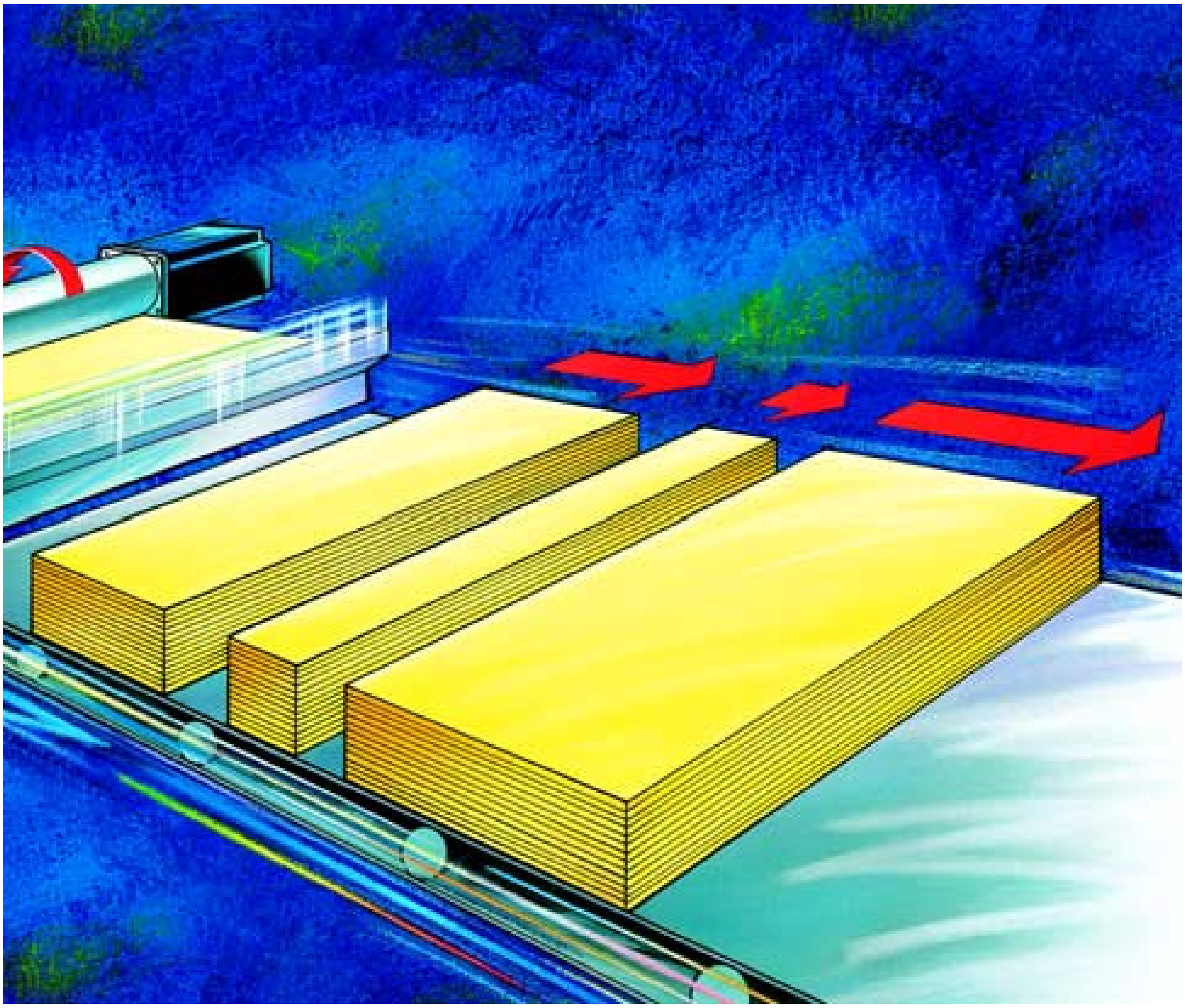
Feed movements

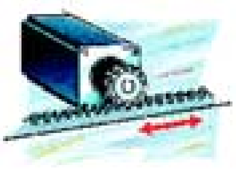


Format setting/adjustment

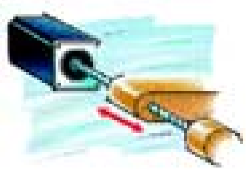
Metering

Cutting to length

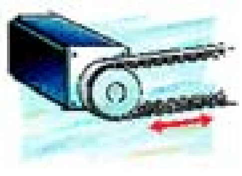




Toothed rod



Spindle



Toothed belt

Gearing

Chain

The mobility you need

Mechanical components precisely adjust the motor's rotary motion to the movement type for the positioning task required.

Berger Lahr positioning drives

Berger Lahr positioning drives

General information

The selection of positioning drives was previously limited to either a servomotor drive or a stepping-motor drive. Both of these distinct drive technologies have been combined in the Twin Line product family, enabling you to match the advantages of each system to your particular application.

Three different motor series are available for the Twin Line positioning drives:

3-phase stepping motors

Exceptionally robust, maintenance-free drives. They execute precise, step-by-step movements specified by a positioning controller.

The 3-phase stepping motors can be operated in conjunction with Twin Line power electronics (Power range from 350 W to 750 W) at resolutions from 200 to 1000 steps per revolution or, in micro-step mode, from 2000 to 10000 steps per revolution.

Options such as rotation monitoring, holding brake and rugged, low-backlash planetary gears expand the application possibilities.

AC synchronous servomotors - standard

Provide a very high power intensity, enabling highly dynamic positioning drives offering exceptional performance at a low price.

Power range from 750 W to 3 kW.

AC synchronous servomotors - high performance

Offer high impulse torques and a large power bandwidth, making them easy to adapt to your application.

Power range from 750 W to 8 kW.

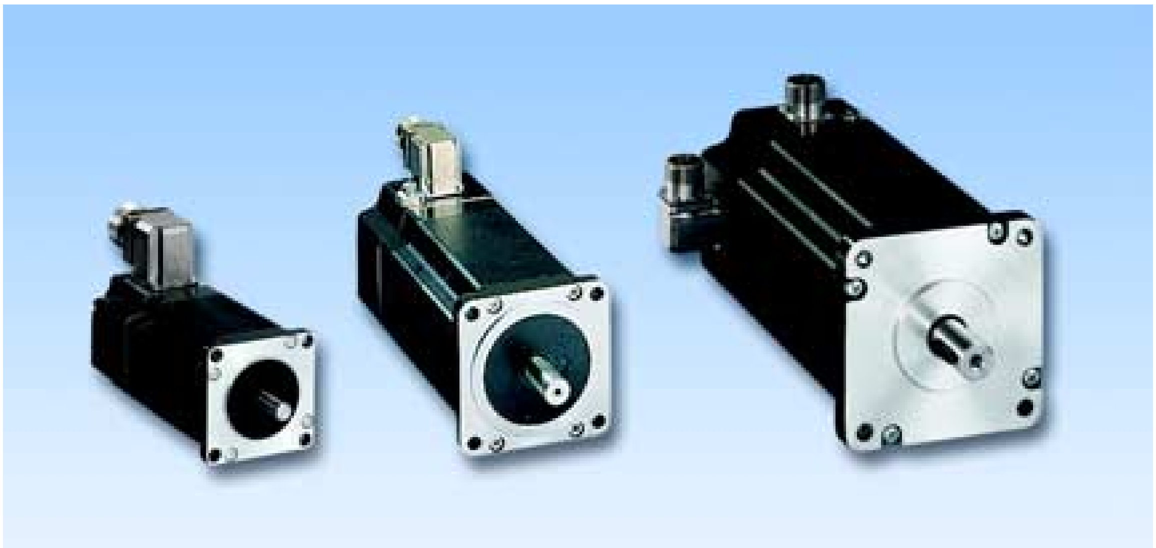
Berger Lahr servomotors are compatible with standard servo connection dimensions, providing flexible solutions to any problem. They all come equipped with an absolute measuring system, the SinCos® (SRS) Singleturn. This measuring system is designed to provide optimum performance with our Twin Line family of devices. You can use the HIPERFACE® interface between motor measuring system and device for a self-initialisation of the motor and current-regulator parameters, considerably simplifying the start-up process.

An AC synchronous servomotor module consists of the AC synchronous servomotor itself and the associated controller. Optimum performance is achieved only when motor and controller are perfectly in tune with each other.

Ever more exacting demands are being placed on the applications of modern drive technology, including:

– Positioning precision
– Rotary-speed precision
– Torque precision
– Regulation range
– Dynamics
– Overload compatibility
– Availability

These demands are fully satisfied by the Berger Lahr family of Twin Line products and by both AC synchronous servomotor programs: Standard and High Performance.



Series of 3-phase stepping motors

3-phase stepping motors

Features

3-phase stepping motors from Berger Lahr are:

– **Powerful** because the optimised internal geometry results in a high power intensity, meaning up to 50 % more torque than standard stepping motors of comparable size.
– **Quiet** due to the sinusoidal commutation of the Twin Line power electronics and the special mechanical construction - the stepping motor runs quietly and virtually resonance-free.
– **Economical** because of the high power intensity, simple wiring and compact Twin Line power electronics.

Characteristic curves

The measurements were performed at a step count of 1000 steps per revolution.

The following characteristic curves are depicted:

– Operating-limit torque curve
– Start-stop curve (start frequency depends on load torque)
– Load inertia curve for start-stop operation

The characteristic curves were generated at the following operating currents:

– VRDM 368 with TLD 011: 0.9 A
– VRDM 397 with TLD 011: 1.75 A
– VRDM 3910 with TLD 011: 2.0 A
– VRDM 3913 with TLD 011: 2.25 A
– VRDM 31117 with TLD 012: 4.0 A
– VRDM 31122 with TLD 012: 4.75 A

Technical specifications

– Testing voltage according to DIN VDE 0530
– Protection type:
  – Motor housing: IP 56
  – Shaft end, front: IP 41
– Insulation class F
– Motor with 90° mounting socket
– Size (flange)
  – VRDM 368 (57.2 x 57.2 mm^2)
  – VRDM 39x (85 x 85 mm^2)
  – VRDM 311x (110 x 110 mm^2)

Optional accessories

– Encoder (1000) for rotation monitoring, including integrated temperature sensor for monitoring the motor temperature
– Integrated holding brake
– Gearbox

Environmental influences

Ambient conditions (based on DIN 50019-R14):

– Temperature: –25 °C to +40 °C
– Humidity: ≤ 75 % R.H. yearly average, 95 % R.H. on 30 days, non-condensing

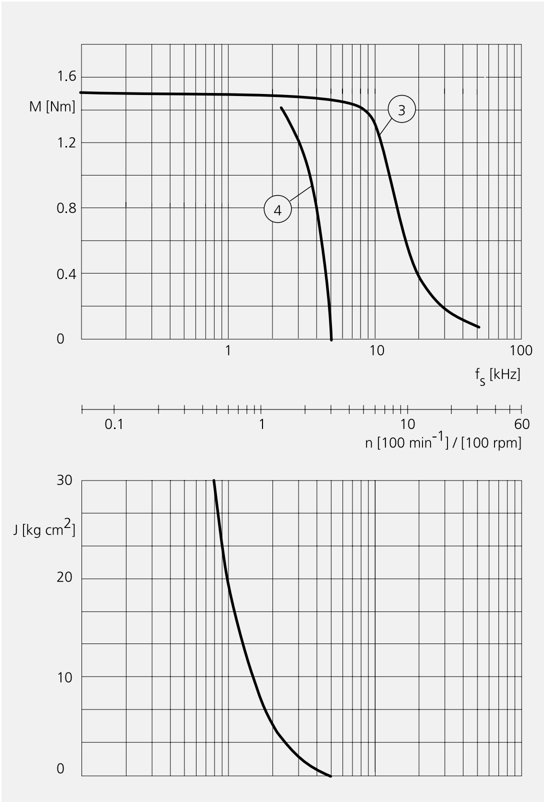
Storage and transport temperature:

– Temperature: –25 °C to +70 °C

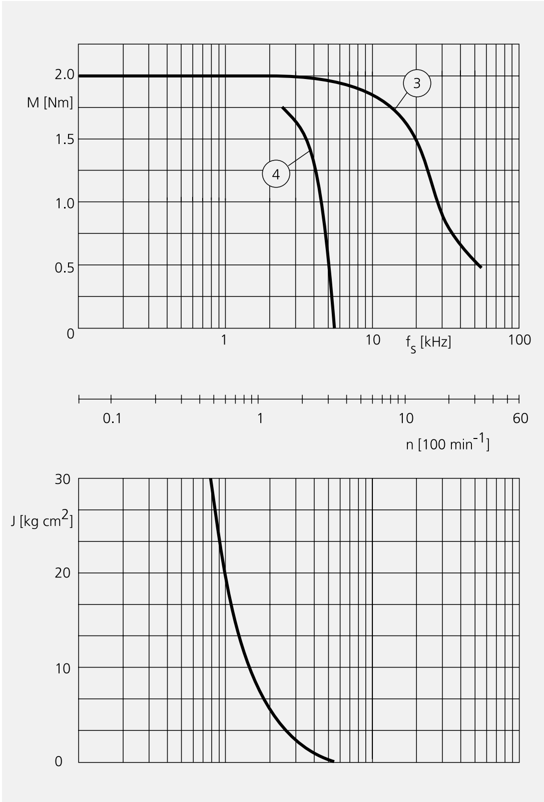
Technical data

		VRDM 368	VRDM 397	VRDM 3910	VRDM 3913	VRDM 31117	VRDM 31122
Max. torque	M_{max}	150 Ncm	200 Ncm	400 Ncm	600 Ncm	1200 Ncm	1650 Ncm
Holding torque	M_H	174 Ncm	226 Ncm	452 Ncm	678 Ncm	1392 Ncm	1914 Ncm
Rotor inertia	J_R	0.38 kgcm^2	1.1 kgcm^2	2.2 kgcm^2	3.3 kgcm^2	10.5 kgcm^2	16 kgcm^2
Max. start frequency	F_{Aom}	6 kHz	5.3 kHz	5.3 kHz	5.3 kHz	4.7 kHz	4.7 kHz
Rated current/ supply	$I\omega$	0.9 A	1.8 A	2.0 A	2.3 A	4.1 A	4.8 A
Resistor/winding	$R\omega$	25 Ω	6.5 Ω	5.8 Ω	6.5 Ω	1.8 Ω	1.9 Ω
Current rise-time constant	τ	4.6 ms	7 ms	9 ms	10 ms	22 ms	22 ms
Permissible dynamic shaft load, axial		8.4 N	60 N	60 N	60 N	60 N	60 N
Permissible dynamic shaft load, radial		50 N	100 N	100 N	110 N	300 N	300 N
Mass	G	1.1 kg	2.5 kg	3.1 kg	4.2 kg	8.0 kg	11 kg

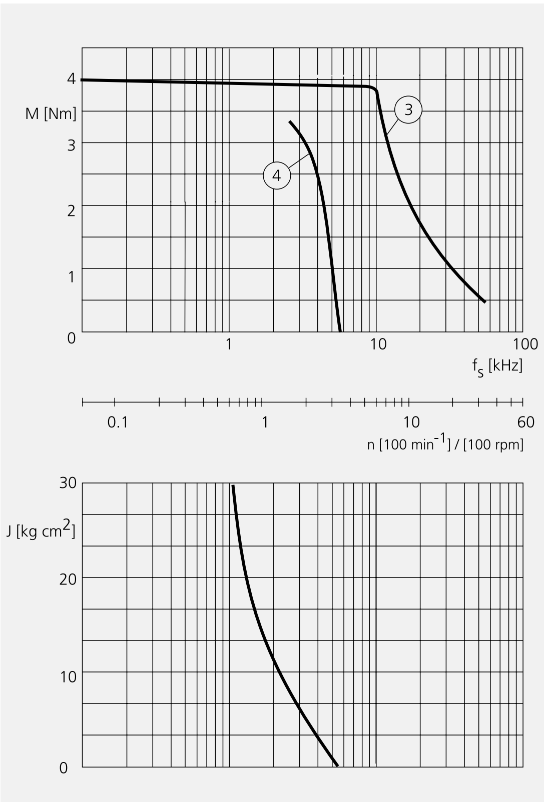
		VRDM 3x
Motor voltage	U	325 V
Step count	z	200/400/500/1000/2000/4000/5000/10000
Stepping angle per step	a	1.8/0.9/0.72/0.36/0.18/0.09/0.072/0.036 °
Encoder line count (optional)		1000



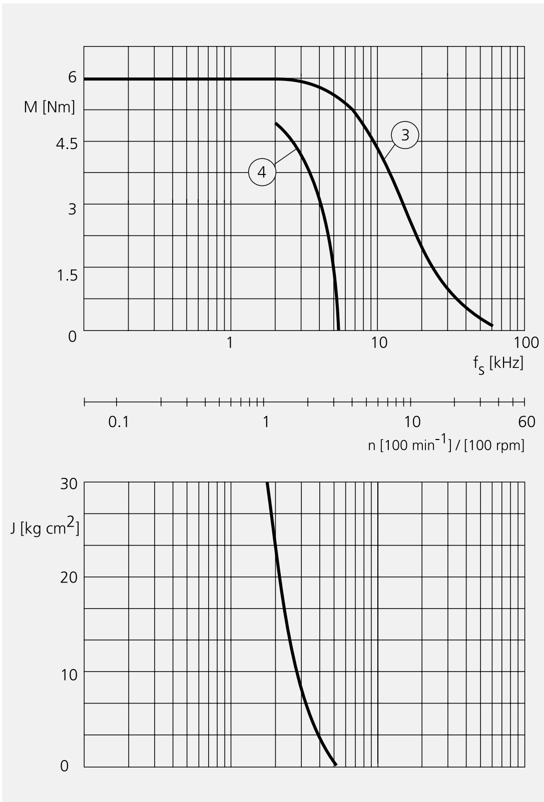
VRDM 368 with TLD 011



VRDM 397 with TLD 011

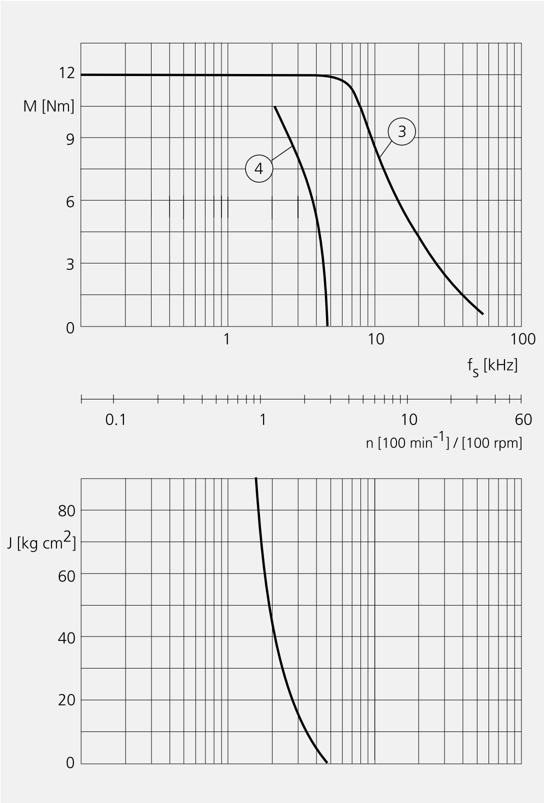


VRDM 3910 with TLD 011

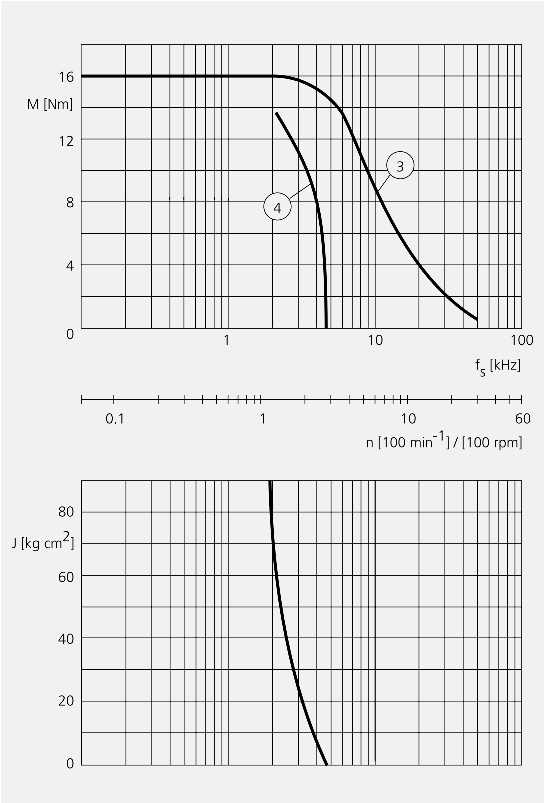


VRDM 3913 with TLD 011

3 Operating-limit torque
4 Start-stop curve

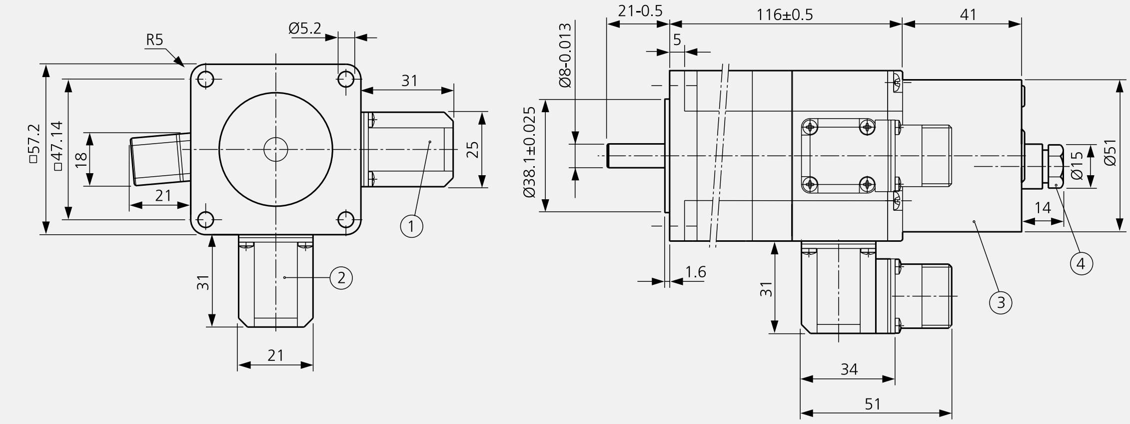


VRDM 31117 with TLD 012

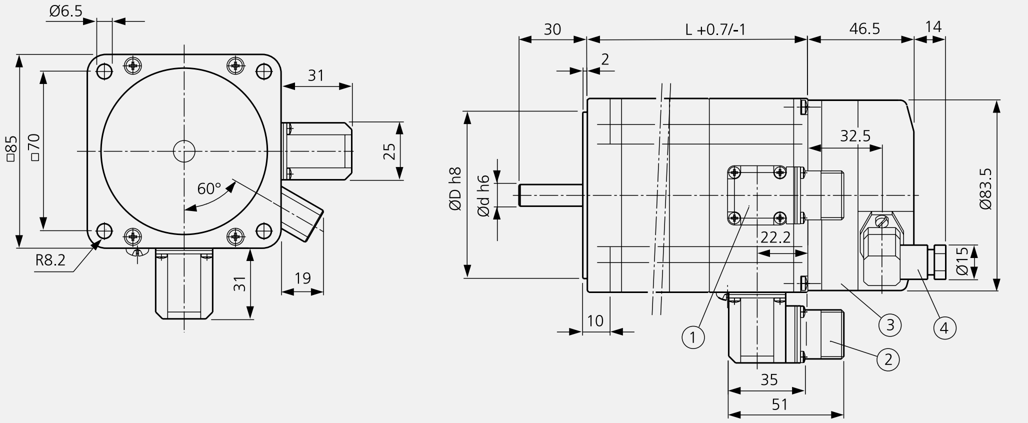


VRDM 31122 with TLD 012

3	Operating-limit torque
4	Start-stop curve

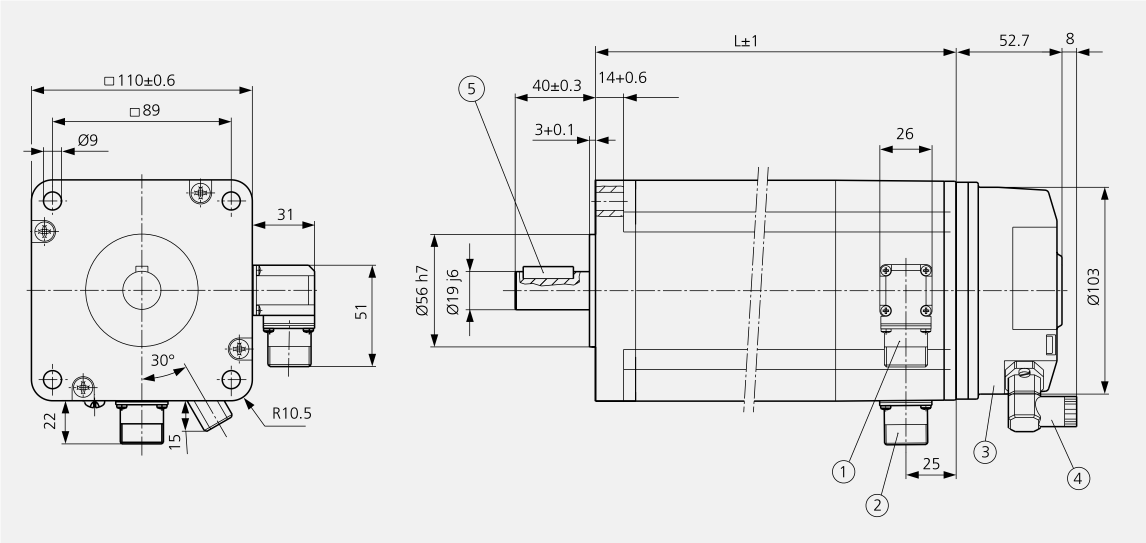


VRDM 368



VRDM 397, 3910, 3913

1 Encoder connector
2 Motor connector
3 Brake
4 Brake connector

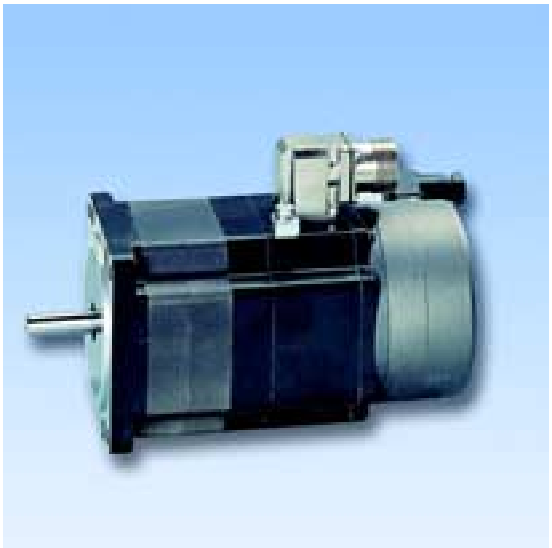


VRDM 31117, 31122

1 Encoder connector
2 Motor connector
3 Brake
4 Brake connector
5 Feather key

Dimensions

		VRDM 368	VRDM 397	VRDM 3910	VRDM 3913	VRDM 31117	VRDM 31122
Shaft diameter	d	8 mm	12 mm	12 mm	14 mm	19 mm	19 mm
Shaft construction		Smooth shaft	Smooth shaft	Smooth shaft	Smooth shaft	Washer/ featherkey A6 x 6 x 25 DIN 6885	Washer/ featherkey A6 x 6 x 25 DIN 6885
Length	L	116 mm	110 mm	140 mm	170 mm	180 mm	228 mm
Centering collar	D	38.1 mm	60 mm	60 mm	60 mm	56 mm	56 mm



3-phase stepping motor with holding brake

Holding brake

The holding brake is an electromagnetic spring-pressure brake for locking the motor axle after the motor current is shut off. In emergency situations, such as in a power failure or during an EMERGENCY STOP, it shuts down the drive, significantly contributing to overall safety. The motor axle must also be locked for weight-induced torque loads, e.g. in cases of vertical axes in manual mode.

Holding brake controller

The holding brake can be controlled either directly or via the **T**win **L**ine **H**olding **B**rake **C**ontroller, which is available as an accessory.

The TL HBC reduces heating of the brake by lowering the pickup voltage.

Caution! Overloading may damage the holding brake! Avoid stationary load torques greater than 25 % of the motor holding torque when using vertical axes with the holding brake.

Technical data of the holding brake

	VRDM 36x	**VRDM 39x**	**VRDM 311x**
Holding torque	1 Nm	6 Nm	16 Nm
Armature inertia	0.016 $kgcm^2$	0.2 $kgcm^2$	0.35 $kgcm^2$
Electrical pickup power	8 W	24 W	32 W
Energise time	58 ms	35 ms	65 ms
De-energise time	14 ms	15 ms	15 ms
Weight	0.5 kg	1.5 kg	2.0 kg

3-phase stepping motor with encoder (cover removed)

Encoder

The encoder reports the actual motor position, provided the power controller is equipped with rotation monitoring electronics. The rotation monitoring system compares the set and actual positions of the motor and reports an error if the difference exceeds a limit (drag-error limit). One advantage of this system is that it can detect and prevent the motor from overloading.

The encoder is fitted in the connector housing – the motor length is unaffected.

The encoder option also includes integrated motor-temperature monitoring. The temperature is evaluated via the data-monitoring option of the Twin Line device.

	VRDM
Resolution	1000 incr./revolutions
Index pulse	1 pulse/revolution
Output	RS 422
Signals	A, B, $\overline{A}$, $\overline{B}$, 0, $\overline{0}$
Impulse form	Rectangular
Supply voltage	5 V ± 5 %
Supply current	0.15 A
Working temperature range	0 to 100 °C

PL 10 and PL 50 planetary gears

PL 100 planetary gear

Gearbox PL 10 ... PL 115

Gearbox data for all types

Gearbox type	Single-stage straight-toothed planetary gear
Nominal storage life*	L_{10h} = 20000 h
Torsional flank clearance	< 12', PL 115 < 3'
Housing material	Aluminium
Surface	Anodised black
Shaft material	C 45
Bearing	Roller bearing
Sealing at shaft end	IP 54
Lubrication	Grease-lubricated for entire service life
Temperature range	–20 °C to +80 °C

* Value in operating hours with a 10 % likelihood of failure; 100 % duty cycle at continuous output torque; operating mode S1 (continuous operation); storage temperature = 30 °C

The PL 10 / 50 / 100 / 115 gearboxes are delivered already mounted to the motor. They can be ordered using the type key for the motor.

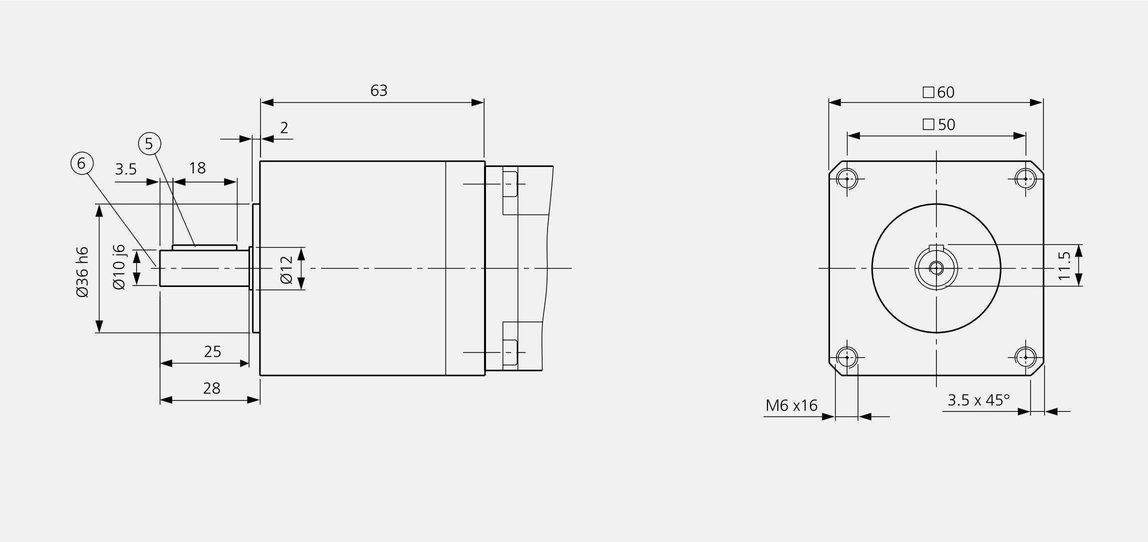
	1	2	3	4	5	J	M_{DG}	M_{max}
		kg	N	N		$kgcm^2$	Nm	Nm
VRDM 368 with PL 10	3:1 5:1 10:1	0.73	225	290	0.9	0.61 0.21 0.07	10 14 7.5	4.05 6.75 13.5
VRDM 397 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	5.4 9 18
VRDM 3910 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	10.8 18 36
VRDM 3913 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	16.2 27 54
VRDM 31117 with PL 100	3:1 5:1 10:1	8.75	760	760	0.9	1.5 0.7 0.5	100 100 80	32.4 54 108
VRDM 31122 with PL 100	3:1 5:1 10:1	8.75	760	760	0.9	1.5 0.7 0.5	100 100 80	44.55 74.25 148.5
VRDM 31122 with PL 115	10:1	9	3200	6500	0.98	1.0	125	148.5

1	Reduction ratio	5	Efficiency
2	Gearbox mass	J	Gearing inertia
3	Max. permissible radial force at n2* = 400 min^{-1}	M_{DG}	Continuous output torque of the gearbox in the continuous endurance range of the toothed parts (motor not taken into account).
4	Max. permissible axial force at n2* = 400 min^{-1}	M_{max}	Max. torque at output (gearbox with motor, efficiency taken into account)

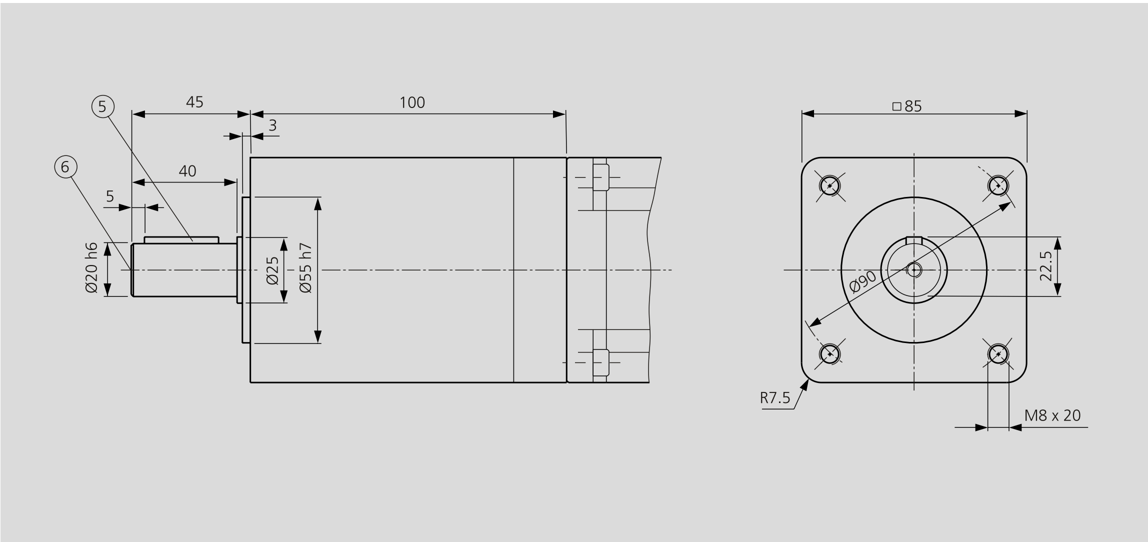
*Gear output speed

Note: M_{DG} may not be exceeded for a long period of time. Dual torque is possible for short periods, e. g. for EMERGENCY STOP situations.

Additional gearboxes are available upon request.



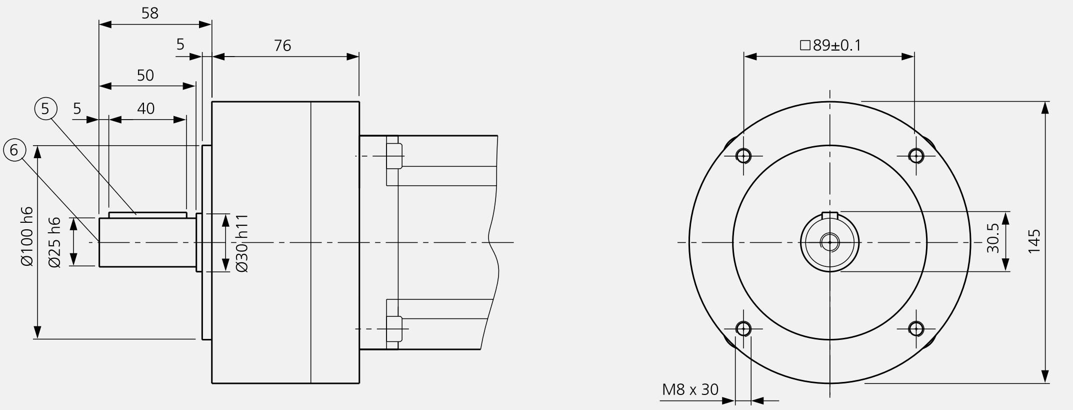
Dimensional drawing of 3-phase stepping motor, size 60, with PL 10 planetary gear



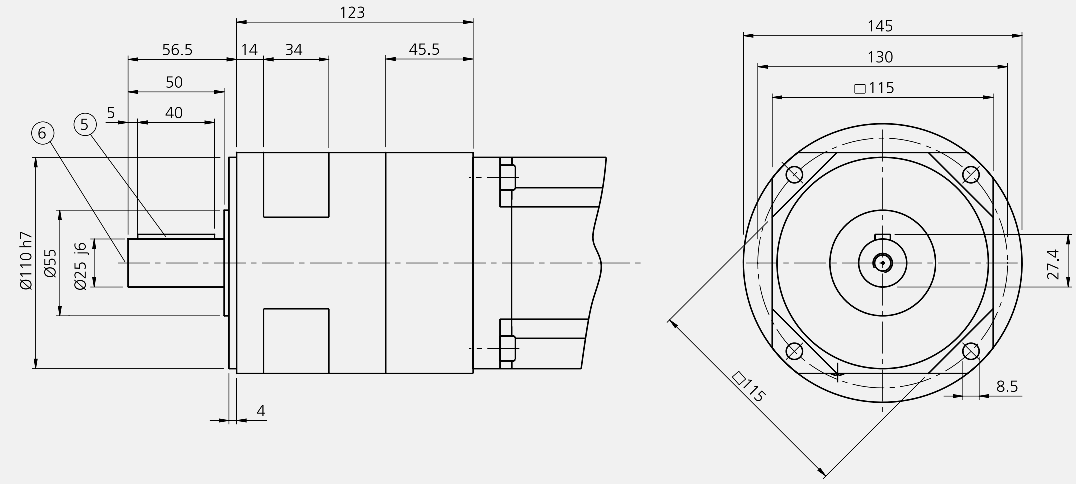
Dimensional drawing of 3-phase stepping motor, size 90, with PL 50 planetary gear

5 Featherkey
6 Centre hole

Gearbox	Featherkey	Centre hole
PL 10	DIN 6885 A4 x 4 x 18	DIN 332 DS M4
PL 50	DIN 6885 A6 x 6 x 28	DIN 332 DS M6



Dimensional drawing of 3-phase stepping motor, size 110, with PL 100 planetary gear



3-phase stepping motor, size 110, with PL 115 planetary gear

5 Featherkey
6 Centre hole

Gearbox	Featherkey	Centre hole
PL 100	DIN 6885 A8 x 7 x 40	DIN 332 DS M10
PL 115	DIN 6885 A8 x 7 x 40	DIN 332 DS M15

3-phase stepping motors

Type key

Example	VRDM	3	X	X	L	W	C	X	X	X	X
Number of phases 3	VRDM	**3**	X	X	L	W	C	X	X	X	X
Size (flange) 6 (57,2 mm) 9 (85 mm) 11 (110 mm)	VRDM	3	**X**	X	L	W	C	X	X	X	X
Length 7 8 10 13 17 22	VRDM	3	X	**X**	L	W	C	X	X	X	X
Rotor L = laminated rotor	VRDM	3	X	X	**L**	W	C	X	X	X	X
Motor voltage W = 325 V	VRDM	3	X	X	L	**W**	C	X	X	X	X
Motor connection C = with connector 90°	VRDM	3	X	X	L	W	**C**	X	X	X	X
Holding brake B = with brake O = without brake	VRDM	3	X	X	L	W	C	**X**	X	X	X
Encoder E = with encoder O = without encoder	VRDM	3	X	X	L	W	C	X	**X**	X	X
Gearbox type PL 10 PL 50 PL 100 PL 115	VRDM	3	X	X	L	W	C	X	X	**X**	X
Gearbox ratios I3 = 3:1 I5 = 5:1 I10 = 10:1	VRDM	3	X	X	L	W	C	X	X	X	**X**

Series of AC synchronous servomotors - Standard

AC synchronous servomotors - Standard

Features

– **High power intensity** by using the latest magnetic materials as well as the optimised motor design. Motors of a smaller size can thus produce comparable torque.
– **High impulse torque** up to five times the continuous stationary torque.
– **Economical** thanks to a streamlined Standard series of compact and powerful AC synchronous servomotors.

Technical specifications

– 8-pin synchronous motors
– SinCos absolute measuring system® (SRS) Singleturn as position and rotary-speed measuring system in Standard series
– Use of high-energy neodymium-iron-born magnets
– High power intensity in a compact package
– Integrated thermal coil monitoring (NTC)
– Vibration level R according to DIN EN 60034-14
– Protection type:
  – Motor housing: IP 56
  – Shaft end, front: IP 41
– Motor and measuring-system connection with mounting socket, straight exit
– Size (flange)
  – SER 39x (85 x 85 mm^2)
  – SER 311x (110 x 110 mm^2)
– Rated speeds depending on length, winding code and power output

Optional accessories

– Measuring system
  – SinCos® (SRM) Multiturn
  – Resolver upon request
– Integrated holding brake
– Gearbox
– Mounting sockets, 90°, can be rotated for:
  – Motor connection
  – Measuring system
– Protection type:
  – Shaft end, front: IP 56

Environmental influences

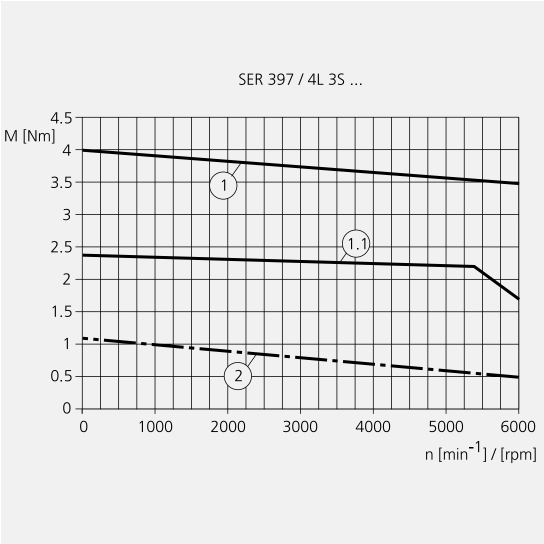
Ambient conditions (based on DIN 50019-R14):
– Temperature: –25 °C to +40 °C
– Humidity: 75 % R.H. yearly average, 95 % R.H. on 30 days, non-condensing

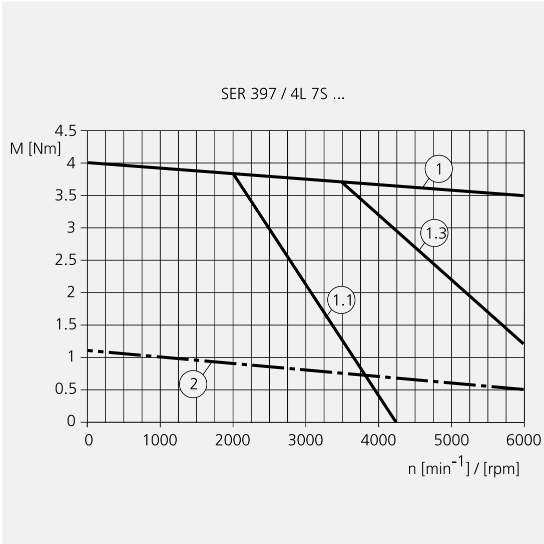
Storage and transport temperature:
– Temperature: –25 °C to +70 °C

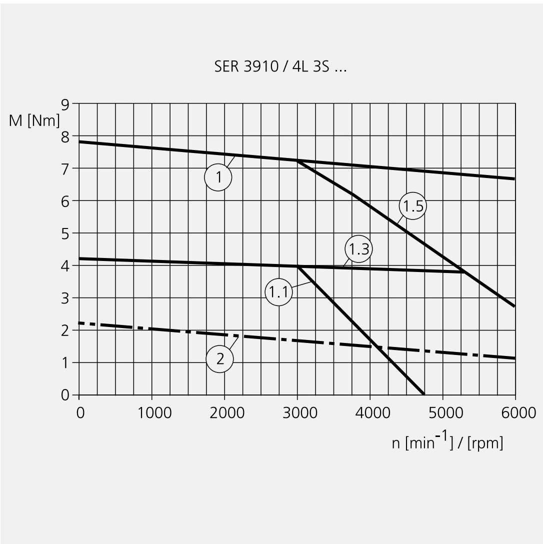
Technical data

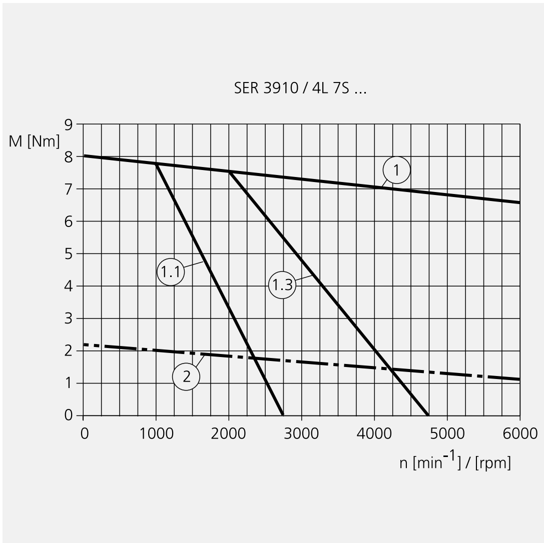
	$U_{DC\text{-}Bus}$	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
SER 397 (3S)	325	1.1	2.6	0.6	1.5	6000	0.38	27.5	4.0	12.0	0.8	2.2
SER 397 (3S)	560	1.1	2.6	0.6	1.5	6000	0.38	27.5	4.0	12.0	0.8	2.2
SER 397 (7S)	325	1.1	1.3	0.8	1.0	3800	0.32	50.7	4.0	6.0	0.8	2.2
SER 397 (7S)	560	1.1	1.3	0.6	0.7	6000	0.38	50.7	4.0	6.0	0.8	2.2
SER 3910 (3S)	325	2.2	3.0	1.6	2.1	4000	0.67	47.2	8.0	12.0	1.6	3.3
SER 3910 (3S)	560	2.2	3.0	1.1	1.8	6000	0.69	47.2	8.0	12.0	1.6	3.3
SER 3910 (7S)	325	2.2	1.7	1.8	1.4	2200	0.42	83.2	8.0	6.0	1.6	3.3
SER 3910 (7S)	560	2.2	1.7	1.5	1.2	4000	0.63	83.2	8.0	6.0	1.6	3.3
SER 3913 (3S)	325	2.9	3.7	2.0	2.9	4000	0.84	49.5	11.5	18.0	2.4	4.4
SER 3913 (3S)	560	2.9	3.7	1.7	2.5	6000	1.06	49.5	11.5	18.0	2.4	4.4
SER 3913 (5S)	325	2.9	2.5	2.5	2.1	2500	0.65	72.3	11.5	12.0	2.4	4.4
SER 3913 (5S)	560	2.9	2.5	2.0	1.8	4500	0.94	72.3	11.5	12.0	2.4	4.4
SER 3913 (7S)	325	2.9	1.3	2.6	1.2	1250	0.34	141.6	11.5	6.0	2.4	4.4
SER 3913 (7S)	560	2.9	1.3	2.5	1.1	2300	0.60	141.6	11.5	6.0	2.4	4.4
SER 3916 (5S)	325	3.6	3.5	2.3	2.3	3000	0.72	65	14.5	17.5	3.2	6.1
SER 3916 (5S)	560	3.6	3.5	1.6	1.9	5000	0.84	65	14.5	17.5	3.2	6.1
SER 31112 (3S)	325	4.6	6.0	2.5	3.0	4000	1.05	44.6	18.0	30.0	4.0	5.0
SER 31112 (3S)	560	4.6	6.0	1.5	2.3	6000	0.94	44.6	18.0	30.0	4.0	5.0
SER 31112 (5S)	325	4.6	3.2	3.4	2.5	2200	0.78	77.6	18.0	16.0	4.0	5.0
SER 31112 (5S)	560	4.6	3.2	2.5	2.0	4000	1.05	77.6	18.0	16.0	4.0	5.0
SER 31112 (7S)	325	4.6	1.8	4.0	1.5	1000	0.42	140.0	18.0	9.0	4.0	5.0
SER 31112 (7S)	560	4.6	1.8	3.5	1.4	2000	0.73	140.0	18.0	9.0	4.0	5.0
SER 31117 (3S)	325	6.6	6.6	3.6	4.0	3300	1.24	58.4	25.0	32.0	8.0	8.0
SER 31117 (3S)	560	6.6	6.6	1.5	1.7	6000	0.94	58.4	25.0	32.0	8.0	8.0
SER 31117 (5S)	325	6.6	5.0	4.2	3.0	2400	1.06	82.0	25.0	24.0	8.0	8.0
SER 31117 (5S)	560	6.6	5.0	3.0	2.5	4000	1.26	82.0	25.0	24.0	8.0	8.0
SER 31117 (7S)	325	6.6	2.7	5.5	2.3	1250	0.72	148.4	25.0	12.5	8.0	8.0
SER 31117 (7S)	560	6.6	2.7	4.6	1.9	2250	1.05	148.4	25.0	12.5	8.0	8.0
SER 31122 (5S)	325	10.0	7.0	4.5	3.0	2250	1.06	90.9	38.0	32.0	11.3	11.0
SER 31122 (5S)	560	10.0	7.0	5.0	3.5	4000	2.09	90.9	38.0	32.0	11.3	11.0
SER 31122 (7S)	325	10.0	3.6	8.2	3.0	1000	0.86	176.0	38.0	16.5	11.3	11.0
SER 31122 (7S)	560	10.0	3.6	7.5	2.7	2000	1.57	176.0	38.0	16.5	11.3	11.0
SER 31127 (5D)	560	13.4	9.2	5.0	3.8	4000	2.2	88.2	48.0	45.0	15.5	13.0
SER 31127 (7S)	325	13.4	5.1	10.8	4.2	1100	1.25	160.0	48.0	25.0	15.5	13.0
SER 31127 (7S)	560	13.4	5.1	9.0	3.7	2000	1.88	160.0	48.0	25.0	15.5	13.0

$U_{DC\text{-}Bus}$	Intermediate-circuit direct voltage from Twin Line drive or controller
M_{dO}	Continuous stationary torque
I_{dO}	Continuous stationary current
M_{dN}	Rated continuous torque
I_{dN}	Rated continuous current
n_N	Rated speed
P_N	Rated power
k_E	Voltage constant at 1000 min^{-1}
M_{max}	Max. torque
I_{max}	Max. current
J_R	Rotor inertia
m	Mass

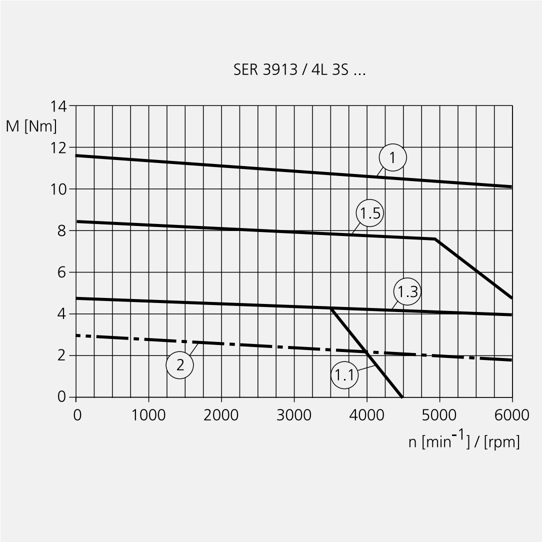


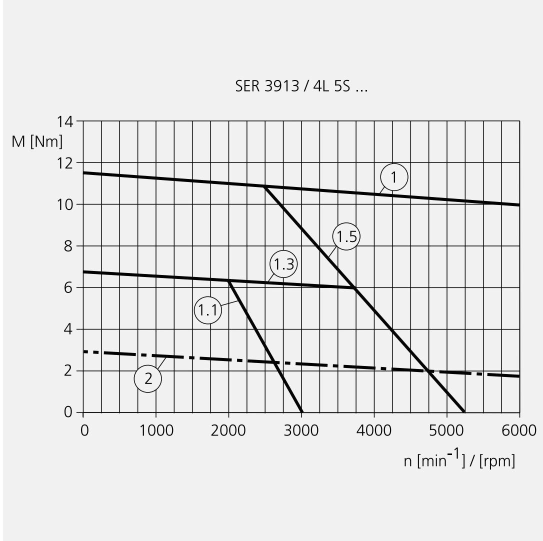


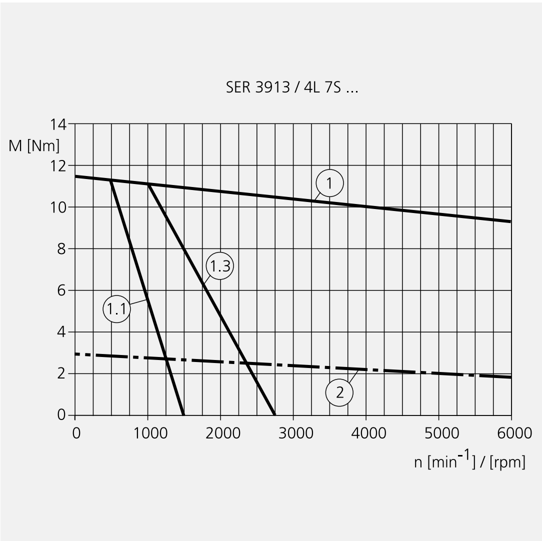


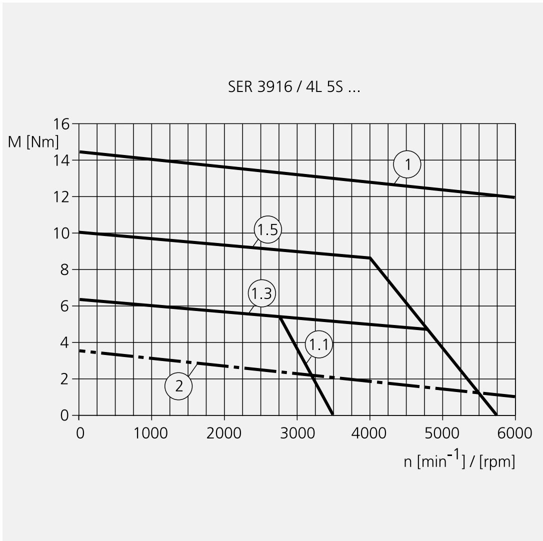


1	Motor peak torque
2	Continuous torque
1.1	Peak torque with TLX x32
1.3	Peak torque with TLX x34
1.5	Peak torque with TLX x36
1.7	Peak torque with TLX x38









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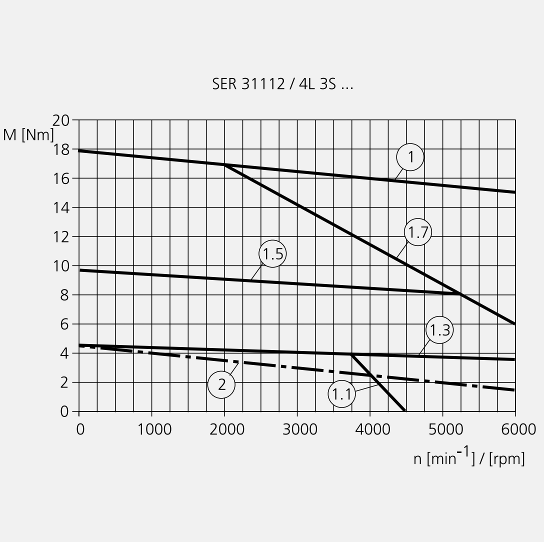
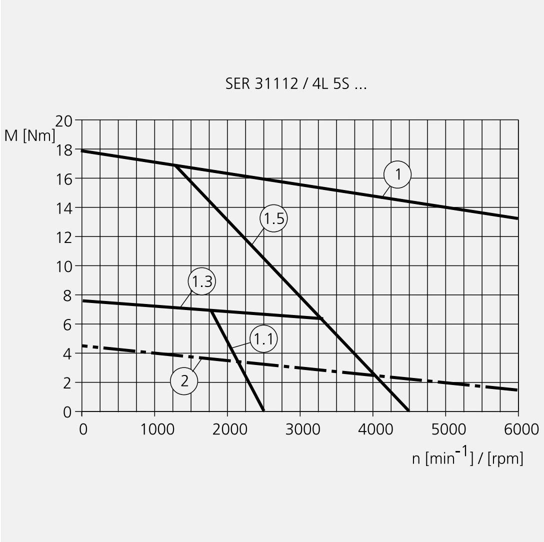
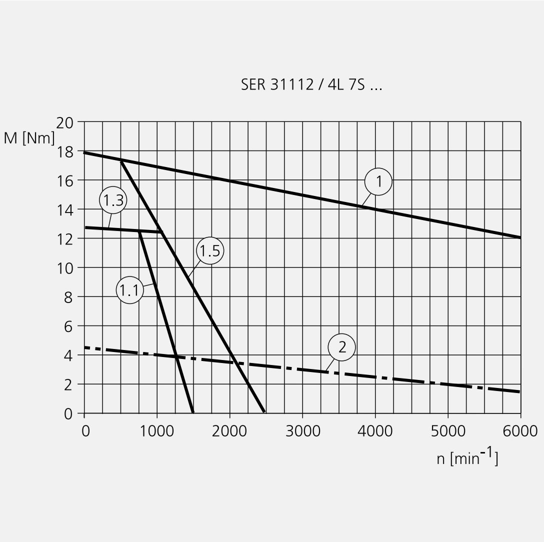
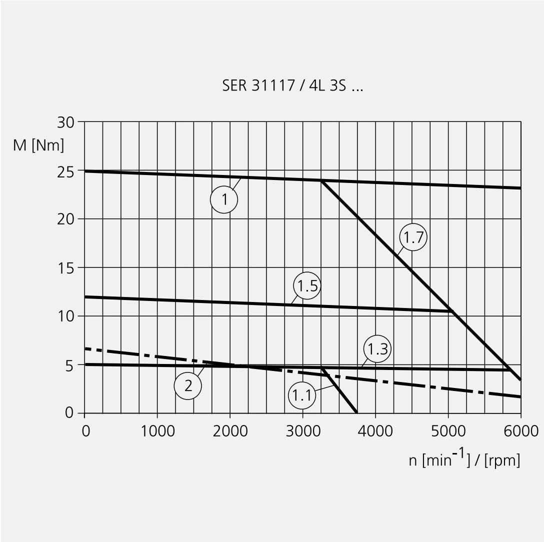
2	Continuous torque
1.1	Peak torque with TLX x32
1.3	Peak torque with TLX x34
1.5	Peak torque with TLX x36
1.7	Peak torque with TLX x38

AC synchronous servomotors - Standard

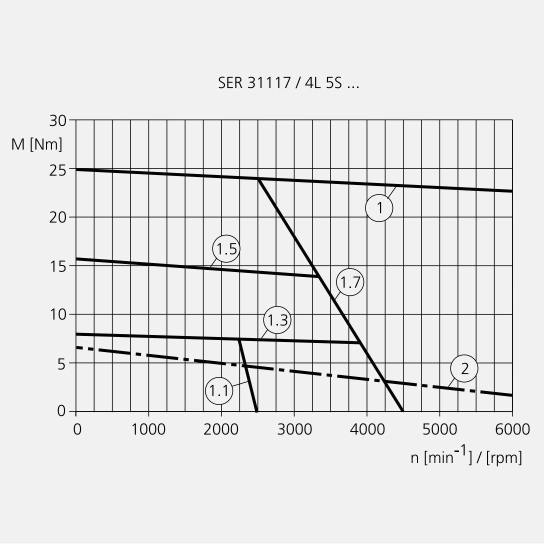


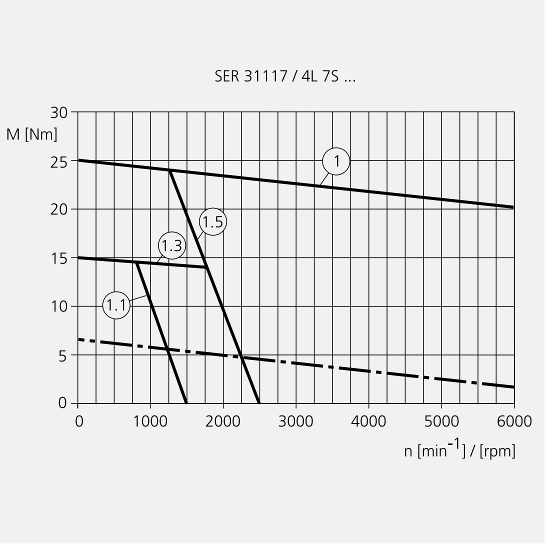


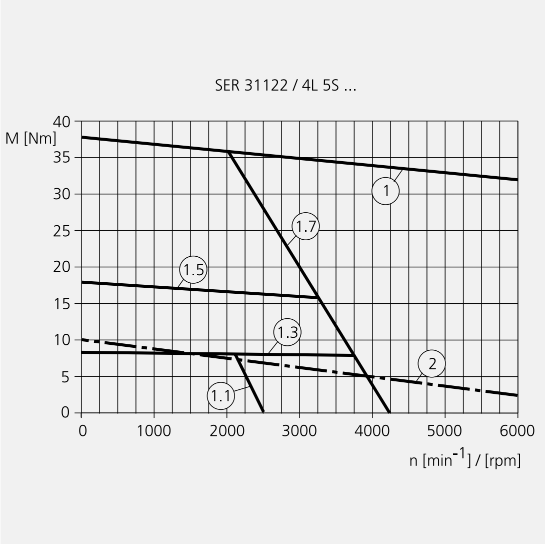


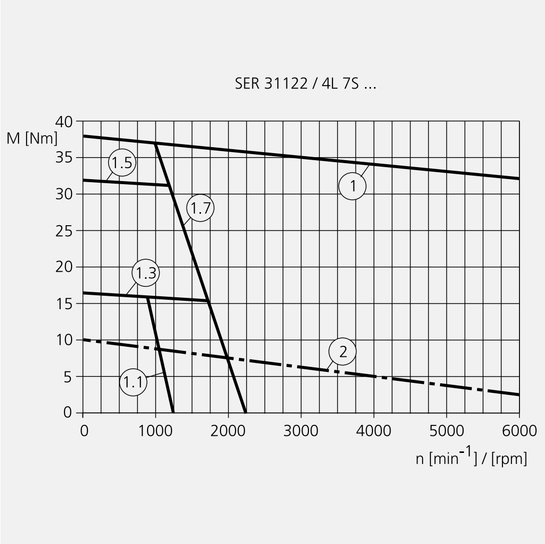


1	Motor peak torque
2	Continuous torque
1.1	Peak torque with TLX x32
1.3	Peak torque with TLX x34
1.5	Peak torque with TLX x36
1.7	Peak torque with TLX x38

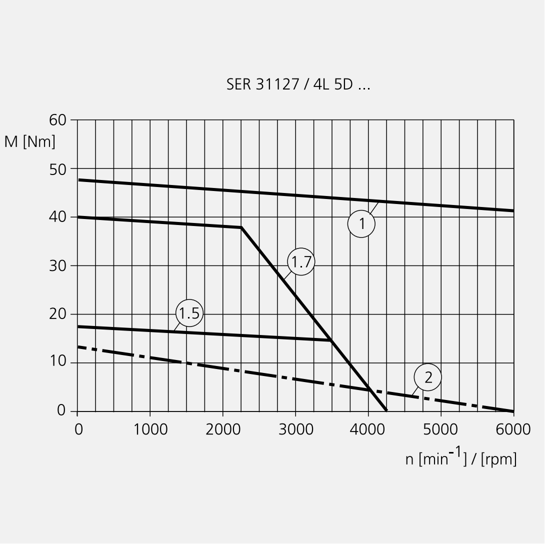


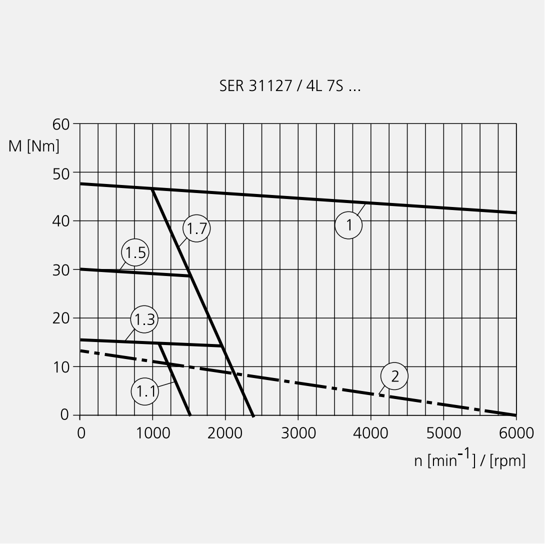




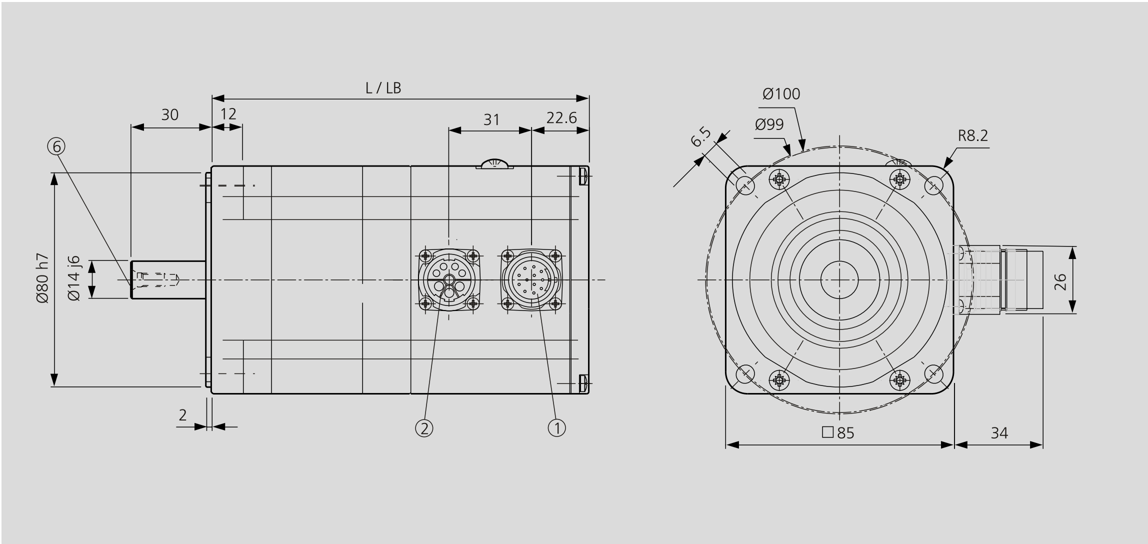


1	Motor peak torque
2	Continuous torque
1.1	Peak torque with TLX x32
1.3	Peak torque with TLX x34
1.5	Peak torque with TLX x36
1.7	Peak torque with TLX x38

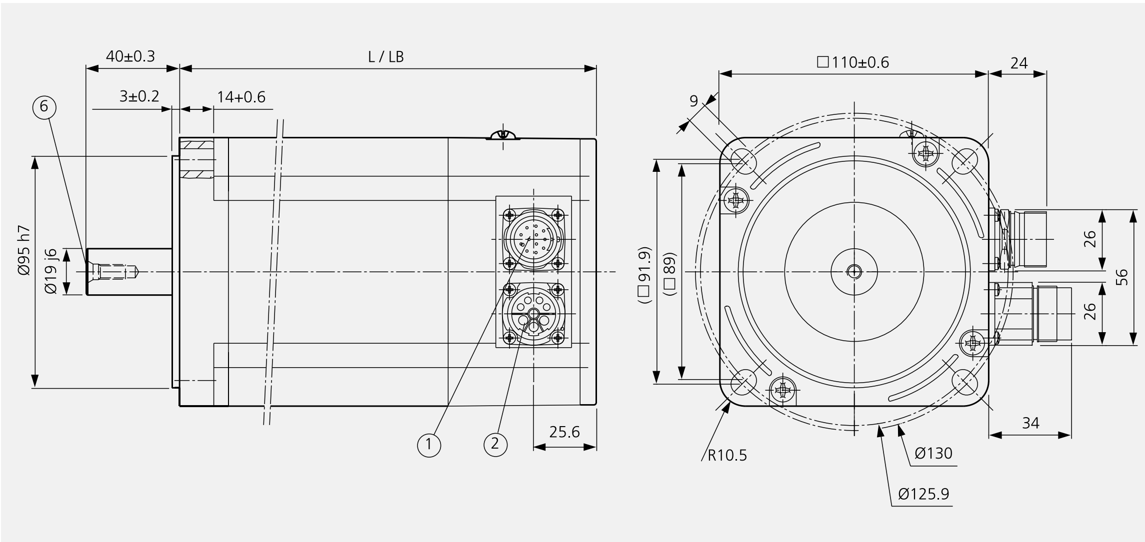




1	Motor peak torque
2	Continuous torque
1.1	Peak torque with TLX x32
1.3	Peak torque with TLX x34
1.5	Peak torque with TLX x36
1.7	Peak torque with TLX x38



Standard AC synchronous servomotor, size 90



Standard AC synchronous servomotor, size 110

1 Encoder connector
2 Motor connector
6 Centre hole

Dimensions

		SER 397	**SER 3910**	**SER 3913**	**SER 3916**	**SER 31112**	**SER 31117**	**SER 31122**	**SER 31127**
Shaft diameter	ø	14 mm	14 mm	14 mm	14 mm	19 mm	19 mm	19 mm	19 mm
Centering collar	ø D	80 mm	80 mm	80 mm	80 mm	95 mm	95 mm	95 mm	95 mm
Total length without brake	L	141 mm	171 mm	201 mm	231 mm	132 mm	180 mm	228 mm	276 mm
Total length with brake	LB	186.5 mm	216.5 mm	246.5 mm	276.5 mm	198 mm	246 mm	294 mm	342 mm

Holding brake

The holding brake is an electromagnetic spring-pressure brake for locking the motor axle after the motor current is shut off. In emergency situations, such as in a power failure or during an EMERGENCY STOP, it shuts down the drive, significantly contributing to overall safety. The motor axle must also be locked for weight-induced torque loads, e.g. in cases of vertical axes in manual mode.

Holding brake controller

The holding brake is controlled via the **T**win **L**ine **H**olding **B**rake **C**ontroller, which is available as an accessory.

The TL HBC reduces heating of the brake by lowering the pickup voltage.

Caution! Overloading may damage the holding brake! Avoid stationary load torques greater than 25 % of the motor holding torque when using vertical axes with the holding brake.

Technical data

		SER 39x	SER 311x
Holding torque	M_{Br}	6 Nm	16 Nm
Armature inertia	J_{Br}	0.2 kgcm^2	0.35 kgcm^2
Electrical pickup power	P_{Br}	24 W	28 W
Energise time	t_E	40 ms	60 ms
De-energise time	t_A	20 ms	30 ms
Weight	m_{Br}	1.8 kg	3.0 kg

Measuring systems

The standard measuring system is the SinCos® (SRS) Singleturn. This measuring system is designed to provide optimum performance with our Twin Line family of controllers. You can use the HIPERFACE® interface between motor-measuring system and device for a self-initialisation of the motor and current-regulator parameters, considerably simplifying the start-up process.

Another option is the SinCos® (SRM) Multiturn or Resolver, 2-pin, which is available as an accessory.

Technical data

	SinCos® (SRS) Singleturn	SinCos® (SRM) Multiturn	Resolver, 2-pin
Resolution with TLx	16384 incr. min^{-1}	16384 incr. min^{-1}	4096 incr. min^{-1}
Precision, integral nonlinearity	± 45 angular seconds	± 45 angular seconds	± 360 angular seconds
Index pulse	–	–	–
Absolute position after activation within [min^{-1}], with the precision	1 ± 45 angular seconds	4096 ± 45 angular seconds	1 ± 360 angular seconds
Signal form	Sinusoidal/cosinusoidal 1024 cycles min^{-1}	Sinusoidal/cosinusoidal 1024 cycles min^{-1}	Sinusoidal/cosinusoidal 1 cycles min^{-1}
Measuring procedure	High-resolution, optical	High-resolution, optical	Inductive
Interface	HIPERFACE®	HIPERFACE®	–
Module required on slot 2, TLx	HIFA-C	HIFA-C	RESO-C
Working temperature range	–20 to +115 °C	–20 to +115 °C	–55 to +155 °C

PL 50 planetary gear

PL 100 planetary gear

Gearbox PL 50 / PL 100

Gearbox data for all types

Gearbox type	Single-stage straight-toothed planetary gear
Rated storage/service life*	L_{10h} = 20000 h
Torsional flank clearance	< 12′
Housing material	Aluminium
Surface	Anodised black
Shaft material	C 45
Bearing	Roller bearing
Sealing at shaft end	IP 54
Lubrication	Grease-lubricated for entire service life
Temperature range	–20 to +80 °C

* Value in operating hours with a 10 % likelihood of failure; 100 % duty cycle at continuous output torque; operating mode S1 (continuous operation); storage temperature = 30 °C

The PL 50 / 100 gearboxes are delivered already mounted to the motor. They can be ordered using the type key for the motor.

Additional gearboxes are available upon request.

The technical data refers to a combination of motor and gearbox

	1	2 kg	3 N	4 N	5	J $kgcm^2$	M_{DG} Nm	M_{max} Nm
SER 397 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	10.8 18.0 36.0
SER 3910 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	21.6 36.0 72.0
SER 3913 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	31.05 51.75 103.50
SER 3916 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	39.15 62.25 130.50
SER 31112 with PL 100	3:1 5:1 10:1	8.75	760	760	0.9	1.5 0.7 0.5	100 100 80	48.6 81.0 162.0
SER 31117 with PL 100	3:1 5:1 10:1	8.75	760	760	0.9	1.5 0.7 0.5	100 100 80	67.5 112.5 225.0
SER 31122 with PL 100	3:1 5:1 10:1	8.75	760	760	0.9	1.5 0.7 0.5	100 100 80	102.6 171.0 342.0
SER 31127 with PL 100	3:1 5:1 10:1	8.75	760	760	0.9	1.5 0.7 0.5	100 100 80	129.6 216.0 432.0

1 Reduction ratio

2 Gearbox mass

3 Max. permissible radial force at $n2^* = 400\ min^{-1}$

4 Max. permissible axial force at $n2^* = 400\ min^{-1}$

5 Efficiency

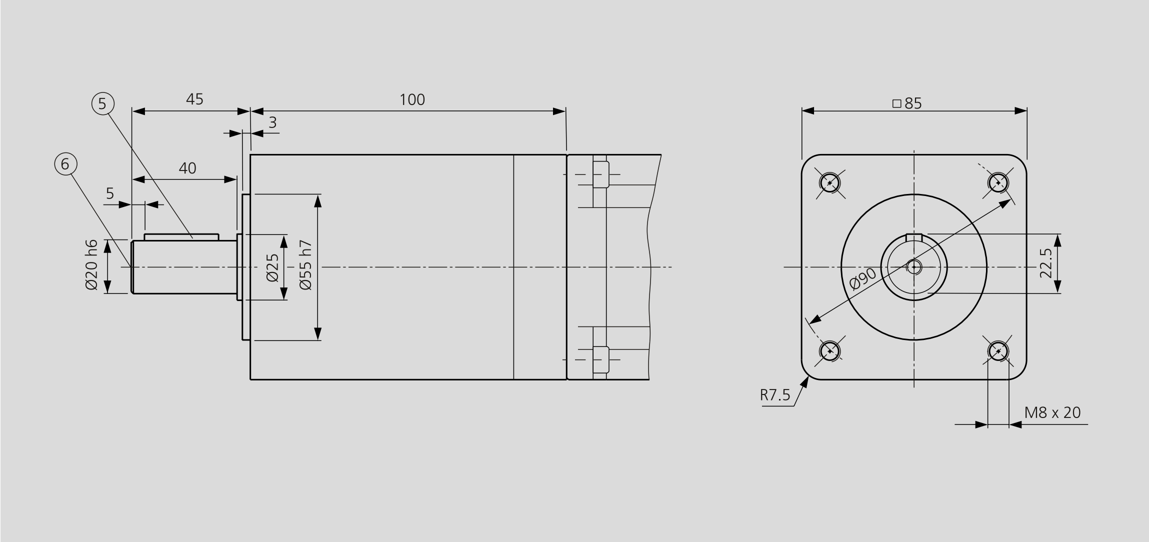
J Gearing inertia

M_{DG} Continuous output torque of the gearbox in the continuous endurance range of the toothed parts (motor not taken into account).

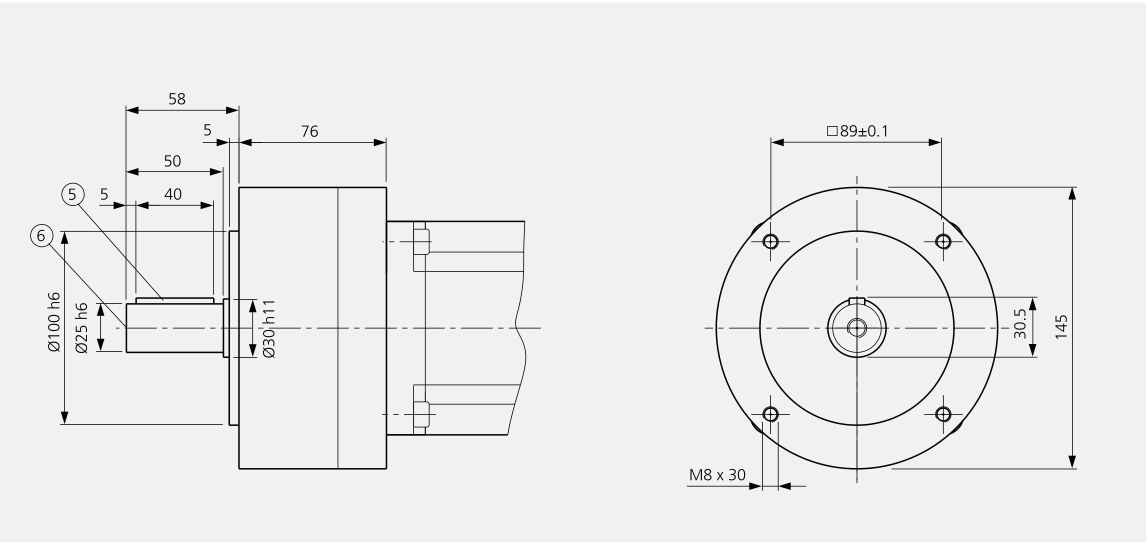
M_{max} Max. torque at output (gearbox with motor, efficiency taken into account), at M_{max} of motor

*Gear output speed

Note: M_{DG} may not be exceeded for a long period of time. Dual torque is possible for short periods, e. g. for EMERGENCY STOP situations. The motor may need to be limited in order to preclude the risk of destroying the gearbox at peak torques.



PL 50 planetary gear for AC synchronous servomotors, size 90



PL 100 planetary gear for AC synchronous servomotors, size 110

5 Featherkey
6 Centre hole

Gearbox	Featherkey	Centre hole
PL 50	DIN 6885 A6 x 6 x 28	DIN 332 DS M6
PL 100	DIN 6885 A8 x 7 x 40	DIN 332 DS M10

AC synchronous servomotors - Standard

Example	**SER**	**3**	**X**	**X**	**/**	**4**	**L**	**X**	**X**	**X**	**0**	**X**	**X**	**X**	**X**
Number of phases 3	SER	**3**	X	X	/	4	L	X	X	X	0	X	X	X	X
Size (flange) 9 (85 mm) 11 (110 mm)	SER	3	**X**	X	/	4	L	X	X	X	0	X	X	X	X
Length 7 10 12 13 16 17 22 27	SER	3	X	**X**	/	4	L	X	X	X	0	X	X	X	X
Pole pair count 4	SER	3	X	X	/	**4**	L	X	X	X	0	X	X	X	X
Rotor inertia L = low inertia	SER	3	X	X	/	4	**L**	X	X	X	0	X	X	X	X
Winding code 3 5 7	SER	3	X	X	/	4	L	**X**	X	X	0	X	X	X	X
Winding circuit S = star D = triangle (only SER 31127)	SER	3	X	X	/	4	L	X	**X**	X	0	X	X	X	X
Measuring system S = SinCos® (SRS) Singleturn M = SinCos® (SRM) Multiturn R = resolver	SER	3	X	X	/	4	L	X	X	**X**	0	X	X	X	X
Resolution 0 = for measuring systems: S, M, R	SER	3	X	X	/	4	L	X	X	X	**0**	X	X	X	X
Motor connection C = with mounting sockets, straight exit T = with mounting sockets, 90°, rotating	SER	3	X	X	/	4	L	X	X	X	0	**X**	X	X	X
Holding brake B = with brake O = without brake	SER	3	X	X	/	4	L	X	X	X	0	X	**X**	X	X
Gearbox type PL 50 PL 100	SER	3	X	X	/	4	L	X	X	X	0	X	X	**X**	X
Gearbox reduction ratio I3 = 3:1 I5 = 5:1 I10 = 10:1	SER	3	X	X	/	4	L	X	X	X	0	X	X	X	**X**

Series of High Performance AC synchronous servomotors

AC synchronous servomotors - High Performance

Features

- **High impulse torque** up to five times the continuous stationary torque.
- **Large power bandwidth** encompassing a continuous stationary torque range from 0.34 to 50 Nm, in six model sizes.
- **High adaptability** to your application, because of the availability of individual sizes in several speed/torque variants.

Technical specifications

- 6-pin synchronous motors
- SinCos absolute measuring system® (SRS) Singleturn as standard position and rotary-speed measuring system, except for DSM 4-05.x, which only comes with the Resolver
- Use of high-energy neodymium-iron-boron magnets
- Integrated thermal efficiency monitoring (NTC)
- Vibration severity level R according to DIN ISO 2373
- Protection type:
  - Motor housing: IP 65
  - Shaft end, front: IP 64
- Motor and measuring-system connection with mounting sockets, straight exit, except DSM 4-19x, motor connection only via terminal box
- Size (flange)
  - DSM 4-05 (55 x 55 mm^2)
  - DSM 4-07 (70 x 70 mm^2)
  - DSM 4-09 (92 x 92 mm^2)
  - DSM 4-11 (110 x 110 mm^2)
  - DSM 4-14 (140 x 140 mm^2)
  - DSM 4-19 (190 x 190 mm^2)
- Rated speeds, depending on motor length
  - DSM 4-05: 6000 min^{-1}
  - DSM 4-07: 4000/6000 min^{-1}
  - DSM 4-09: 3000/4000/6000 min^{-1}
  - DSM 4-11: 3000/4000/6000 min^{-1}
  - DSM 4-14: 2000/3000/4000 min^{-1}
  - DSM 4-19: 1500/2000/3000/4000 min^{-1}

Optional accessories

- Measuring system
  - SinCos® (SRM) Multiturn
  - Resolver only for DSM 4-05.x
- Integrated holding brake
- Gearbox
- Mounting sockets, 90°, can be rotated for:
  - Motor (except DSM 4-19.x)
  - Measuring system
- Special shaft, special flange
- Vibration severity level S
- Level R flange precision
- Different colour scheme

Environmental influences

Ambient conditions (based on DIN 50019-R14):

- Temperature: –20 °C to +40 °C
- Humidity: 75 % R.H. yearly average, 95 % R.H. on 30 days, non-condensing

Storage and transport temperature:

- Temperature: –20 °C to +60 °C

Technical data for DSM 4-05

	$U_{DC\text{-}Bus}$ V	M_{dO} Nm	I_{dO} A_{eff}	M_{dN} Nm	I_{dN} A_{eff}	n_N min^{-1}	P_N kW	k_E V_{eff}	M_{max} Nm	I_{max} A_{eff}	J_R $kgcm^2$	m kg
DSM 4-05.1-1xx.x6	325	0.34	1.20	0.32	1.3	6000	0.20	20.0	1.7	7.07	0.17	1.0
DSM 4-05.1-2xx.x6	560	0.34	0.85	0.32	0.9	6000	0.20	27.6	1.7	5.02	0.17	1.0
DSM 4-05.2-1xx.x6	325	0.50	1.50	0.48	1.7	6000	0.30	20.0	2.5	9.05	0.24	1.2
DSM 4-05.2-2xx.x6	560	0.50	1.00	0.48	1.1	6000	0.30	32.8	2.5	6.01	0.24	1.2
DSM 4-05.3-1xx.x6	325	0.65	2.00	0.60	2.3	6000	0.375	20.0	3.2	10.80	0.31	1.4
DSM 4-05.3-2xx.x6	560	0.65	1.20	0.60	1.3	6000	0.375	35.2	3.2	6.51	0.31	1.4
DSM 4-05.4-1xx.x6	325	1.00	3.20	0.80	3.4	6000	0.500	20.0	5.0	16.97	0.45	1.8
DSM 4-05.4-2xx.x6	560	1.00	1.60	0.80	1.7	6000	0.500	40.0	5.0	8.49	0.45	1.8

Technical data for the DSM 4-07.x and its variations

	$U_{DC\text{-}Bus}$ V	M_{dO} Nm	I_{dO} A_{eff}	M_{dN} Nm	I_{dN} A_{eff}	n_N min^{-1}	P_N kW	k_E V_{eff}	M_{max} Nm	I_{max} A_{eff}	J_R $kgcm^2$	m kg
DSM 4-07.1-1xx.x4	325	0.65	1.9	0.6	2.0	4000	0.25	20.8	3.1	11.38	0.22	1.5
DSM 4-07.1-2xx.x4	560	0.65	0.9	0.6	0.9	4000	0.25	47.9	3.1	5.37	0.22	1.5
DSM 4-07.1-1xx.x6	325	0.65	2.6	0.5	2.5	6000	0.31	15.4	3.1	15.63	0.22	1.5
DSM 4-07.1-2xx.x6	560	0.65	1.3	0.5	1.2	6000	0.31	32.1	3.1	7.85	0.22	1.5
DSM 4-07.2-1xx.x4	325	1.50	3.2	1.3	2.9	4000	0.54	27.7	7.2	19.23	0.36	2.1
DSM 4-07.2-2xx.x4	560	1.50	1.6	1.3	1.4	4000	0.54	57.2	7.2	9.62	0.36	2.1
DSM 4-07.2-1xx.x6	325	1.50	5.0	1.0	4.4	6000	0.62	17.8	7.2	29.98	0.36	2.1
DSM 4-07.2-2xx.x6	560	1.50	2.4	1.0	2.1	6000	0.62	37.5	7.2	14.42	0.36	2.1
DSM 4-07.3-1xx.x4	325	2.30	5.5	2.0	4.7	4000	0.83	26.3	11.0	33.02	0.57	2.9
DSM 4-07.3-2xx.x4	560	2.30	2.4	2.0	2.0	4000	0.83	60.4	11.0	14.42	0.57	2.9
DSM 4-07.3-1xx.x6	325	2.30	7.7	1.5	6.6	6000	0.94	18.6	11.0	46.17	0.57	2.9
DSM 4-07.3-2xx.x6	560	2.30	3.5	1.5	3.0	6000	0.94	41.8	11.0	21.00	0.57	2.9

$U_{DC\text{-}Bus}$	Intermediate-circuit direct voltage from Twin Line drive or controller
M_{dO}	Continuous stationary torque
I_{dO}	Continuous stationary current
M_{dN}	Rated continuous torque
I_{dN}	Rated continuous current
n_N	Rated speed
P_N	Rated power
k_E	Voltage constant at 1000 min^{-1}
M_{max}	Max. torque
I_{max}	Max. current
J_R	Rotor inertia
m	Mass

Technical data for the DSM 4-09.x and its variations

	$U_{DC\text{-}Bus}$	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
DSM 4-09.1-1xx.x3	325	0.95	1.5	0.8	1.3	3000	0.25	36.5	4.3	7.50	1.20	2.7
DSM 4-09.1-2xx.x3	560	0.95	0.8	0.8	0.72	3000	0.25	66.5	4.3	3.96	1.20	2.7
DSM 4-09.1-1xx.x4	325	0.95	2	0.75	1.8	4000	0.31	27.5	4.3	9.97	1.20	2.7
DSM 4-09.1-2xx.x4	560	0.95	1.1	0.75	0.9	4000	0.31	50.2	4.3	5.44	1.20	2.7
DSM 4-09.1-1xx.x6	325	0.95	3	0.7	2.4	6000	0.44	18.3	4.3	14.99	1.20	2.7
DSM 4-09.1-2xx.x6	560	0.95	1.6	0.7	1.3	6000	0.44	33.6	4.3	7.99	1.20	2.7
DSM 4-09.2-1xx.x3	325	2.70	3.2	2.4	2.7	3000	0.75	45.5	12.2	15.98	2.70	3.9
DSM 4-09.2-2xx.x3	560	2.70	1.9	2.4	1.6	3000	0.75	78.8	12.2	9.40	2.70	3.9
DSM 4-09.2-1xx.x4	325	2.70	4.3	2.2	3.6	4000	0.92	34.3	12.2	21.50	2.70	3.9
DSM 4-09.2-2xx.x4	560	2.70	2.5	2.2	2.1	4000	0.92	59	12.2	12.45	2.70	3.9
DSM 4-09.2-1xx.x6	325	2.70	6.5	2.0	5.3	6000	1.25	22.3	12.2	32.46	2.70	3.9
DSM 4-09.2-2xx.x6	560	2.70	3.7	2.0	3	6000	1.25	39.4	12.2	18.46	2.70	3.9
DSM 4-09.3-2xx.x3	560	4.50	2.9	3.9	2.4	3000	1.22	83.5	20.3	14.50	4.20	5.2
DSM 4-09.3-2xx.x4	560	4.50	3.8	3.5	3.1	4000	1.47	64.2	20.3	18.95	4.20	5.2
DSM 4-09.3-2xx.x6	560	4.50	5.6	2.8	3.8	6000	1.76	43.4	20.3	27.93	4.20	5.2
DSM 4-09.4-2xx.x3	560	6.00	4.2	5.0	3.4	3000	1.57	79.7	27.0	21.00	5.40	6.6
DSM 4-09.4-2xx.x4	560	6.00	5.5	4.5	4.4	4000	1.88	61.3	27.0	27.51	5.40	6.6
DSM 4-09.4-2xx.x6	560	6.00	7.8	3	4.5	6000	1.88	42.5	27.0	38.96	5.40	6.6

Technical data for the DSM 4-11.x and its variations

	$U_{DC\text{-}Bus}$	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
DSM 4-11.1-2xx.x3	560	4.20	3	3.7	2.8	3000	1.2	82.7	18.9	10.18	4.80	6.3
DSM 4-11.1-2xx.x4	560	4.20	4	3.5	3.5	4000	1.5	62	18.9	13.58	4.80	6.3
DSM 4-11.1-2xx.x6	560	4.20	6	3	4.8	6000	1.9	41.3	18.9	20.36	4.80	6.3
DSM 4-11.2-2xx.x3	560	7.00	4.8	6.1	4.5	3000	1.9	84.7	31.5	16.26	7.40	7.9
DSM 4-11.2-2xx.x4	560	7.00	6.4	5.8	5.8	4000	2.4	62.9	31.5	21.71	7.40	7.9
DSM 4-11.2-2xx.x6	560	7.00	9.9	3.8	5.9	6000	2.4	40.9	31.5	33.59	7.40	7.9
DSM 4-11.3-2xx.x3	560	10	7.2	8.4	6.3	3000	2.6	84.7	45.0	24.40	9.80	9.6
DSM 4-11.3-2xx.x4	560	10	9.7	7.6	7.7	4000	3.2	62.4	45.0	32.88	9.80	9.6
DSM 4-11.3-2xx.x6	560	10	13.6	5	7.6	6000	3.1	44.6	45.0	46.17	9.80	9.6
DSM 4-11.4-2xx.x3	560	12	8.5	9.9	7.3	3000	3.1	85.9	54.0	28.84	12.70	11.2
DSM 4-11.4-2xx.x4	560	12	11.6	8.6	8.6	4000	3.6	63.1	54.0	39.39	12.70	11.2

$U_{DC\text{-}Bus}$	Intermediate-circuit direct voltage from Twin Line drive or controller
M_{dO}	Continuous stationary torque
I_{dO}	Continuous stationary current
M_{dN}	Rated continuous torque
I_{dN}	Rated continuous current
n_N	Rated speed
P_N	Rated power
k_E	Voltage constant at 1000 min^{-1}
M_{max}	Max. torque
I_{max}	Max. current
J_R	Rotor inertia
m	Mass

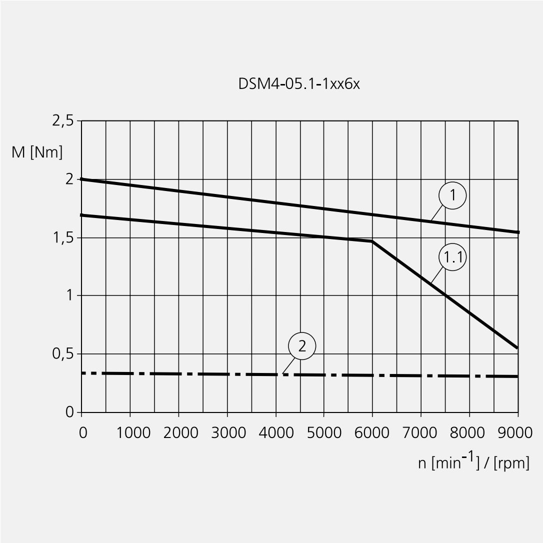
Technical data for the DSM 4-14.x and its variations

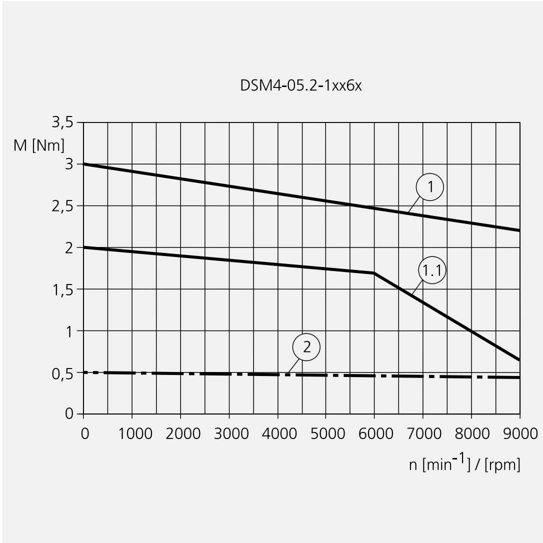
	$U_{DC\text{-}Bus}$	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
DSM 4-14.1-2xx.x2	560	8.5	3.7	7	3.1	2000	1.5	142.3	42	19.80	12.3	10
DSM 4-14.1-2xx.x3	560	8.5	5.6	6.5	4.5	3000	2.0	94.0	42	29.70	12.3	10
DSM 4-14.1-2xx.x4	560	8.5	7.4	5.2	4.8	4000	2.2	71.0	42	39.60	12.3	10
DSM 4-14.2-2xx.x2	560	14.00	5.6	12.2	4.9	2000	2.6	145.4	70	29.70	19.50	12
DSM 4-14.2-2xx.x3	560	14.00	9.0	11.0	7	3000	3.5	96.3	70	48.08	19.50	12
DSM 4-14.2-2xx.x4	560	14.00	12.0	7.6	6.5	4000	3.2	73.1	70	63.64	19.50	12
DSM 4-14.3-2xx.x2	560	19.0	8.1	16.5	7.3	2000	3.5	141.1	85.0	38.89	26.70	16
DSM 4-14.3-2xx.x3	560	19.0	12.4	14.6	9.9	3000	4.6	92.5	85.0	59.40	26.70	16
DSM 4-14.3-2xx.x4	560	19.0	16.2	8.7	7.7	4000	3.6	70.7	85.0	77.78	26.70	16
DSM 4-14.4-2xx.x2	560	27.0	11.9	21.4	9.4	2000	4.5	148.0	121.0	56.57	36	20
DSM 4-14.4-2xx.x3	560	27.0	17.3	15.5	9.9	3000	4.9	101.0	121.0	82.73	36	20

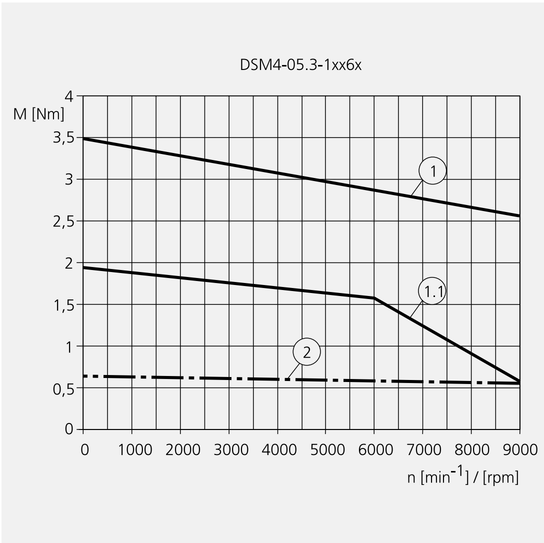
Technical data for the DSM 4-19.x and its variations

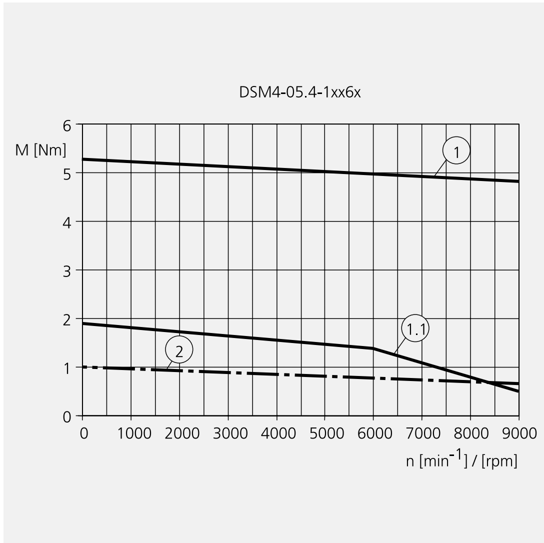
	$U_{DC\text{-}Bus}$	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
DSM 4-19.1-2xx.x1	560	25	8.2	22.5	7.5	1500	3.5	189.2	88	28.99	84	31
DSM 4-19.1-2xx.x2	560	25	11.1	21.5	9.7	2000	4.5	140.6	88	38.89	84	31
DSM 4-19.1-2xx.x3	560	25	17.0	20.0	13.8	3000	6.3	91.9	88	60.10	84	31
DSM 4-19.1-2xx.x4	560	25	22.2	16.0	14.8	4000	6.7	70.3	88	77.78	84	31
DSM 4-19.2-2xx.x1	560	50	17.0	42.0	14.5	1500	6.6	179.6	175	60.1	147	44
DSM 4-19.2-2xx.x2	560	50	22.3	38.0	17.2	2000	7.9	137.3	175	78.5	147	44
DSM 4-19.2-2xx.x3	560	50	32.2	31.0	20.6	3000	9.7	95.1	175	113.1	147	44

$U_{DC\text{-}Bus}$	Intermediate-circuit direct voltage from Twin Line drive or controller	P_N	Rated power
M_{dO}	Continuous stationary torque	k_E	Voltage constant at 1000 min^{-1}
I_{dO}	Continuous stationary current	M_{max}	Max. torque
M_{dN}	Rated continuous torque	I_{max}	Max. current
I_{dN}	Rated continuous current	J_R	Rotor inertia
n_N	Rated speed	m	Mass

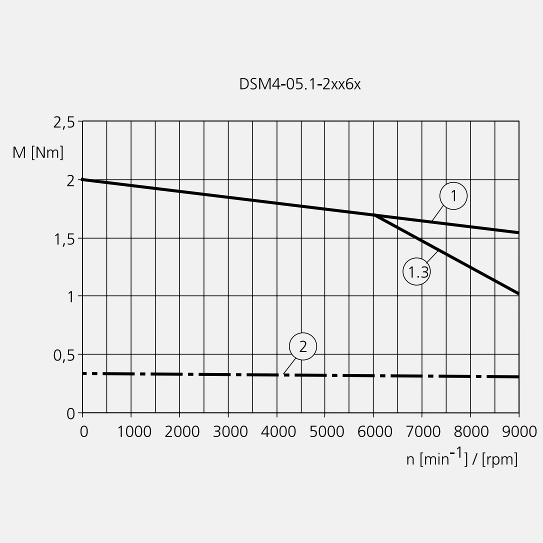


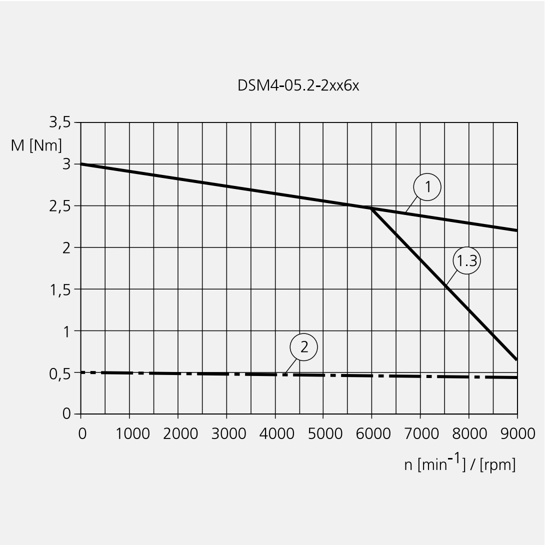


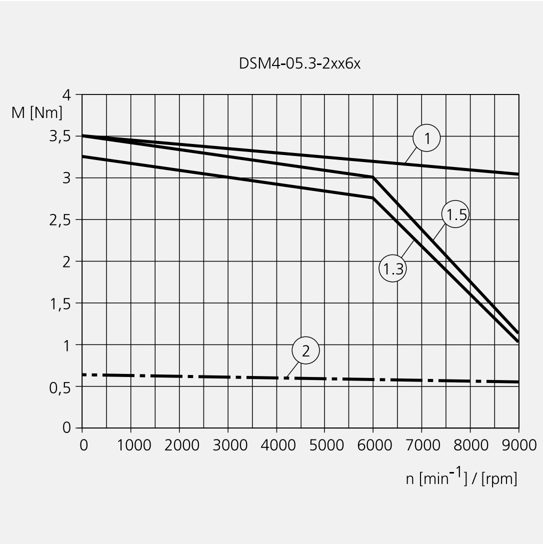


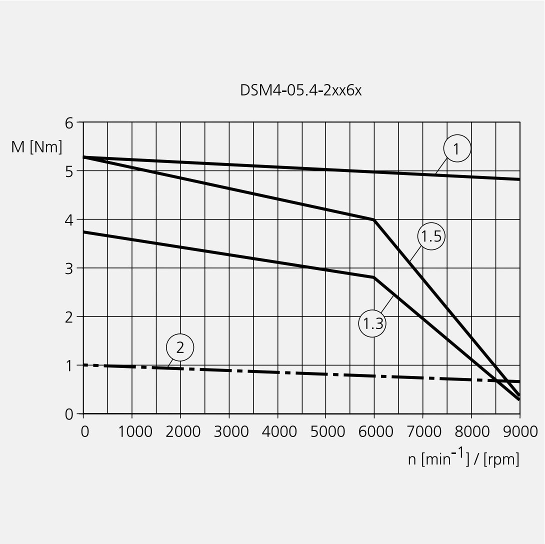


1	Motor peak torque
2	Continuous torque
1.1	Peak torque with TLX x32
1.3	Peak torque with TLX x34
1.5	Peak torque with TLX x36
1.7	Peak torque with TLX x38









1	Motor peak torque
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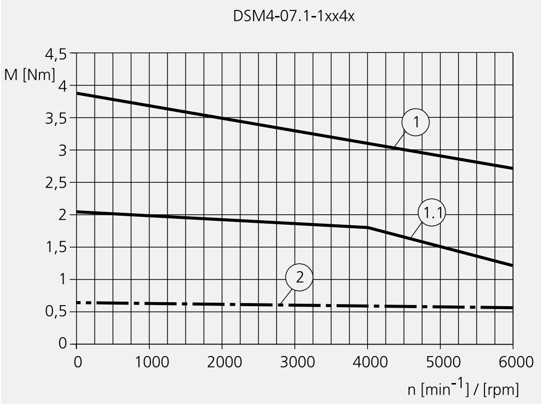
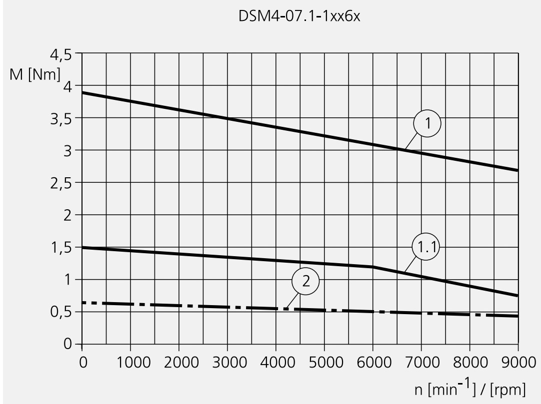
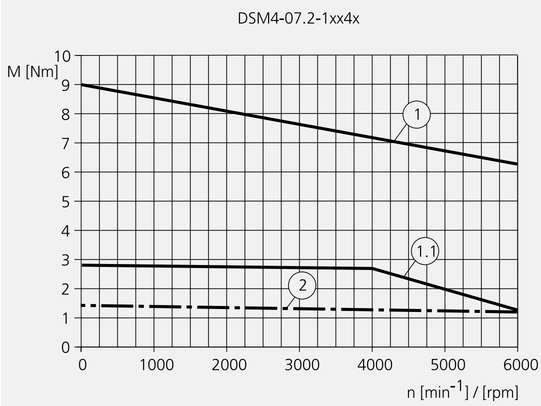
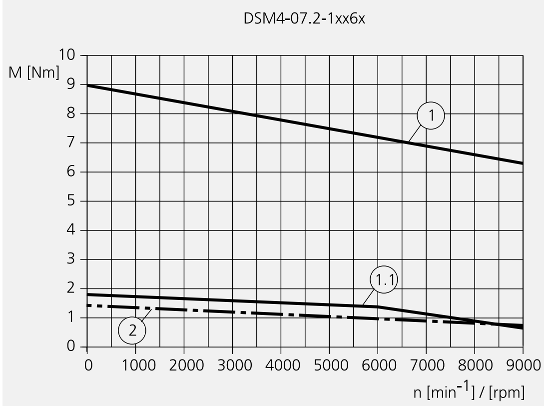
1.7	Peak torque with TLX x38









1	Motor peak torque
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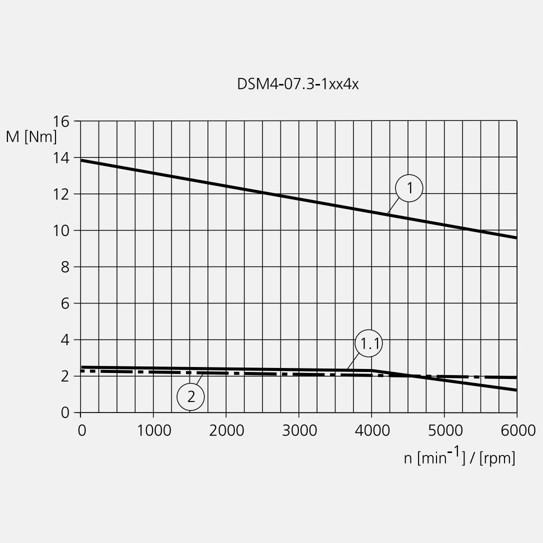

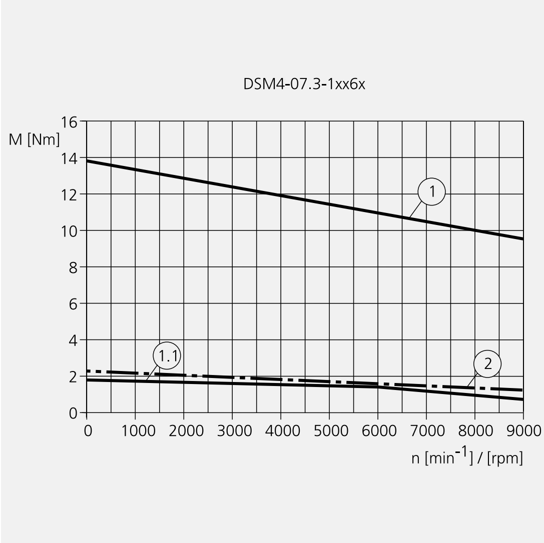

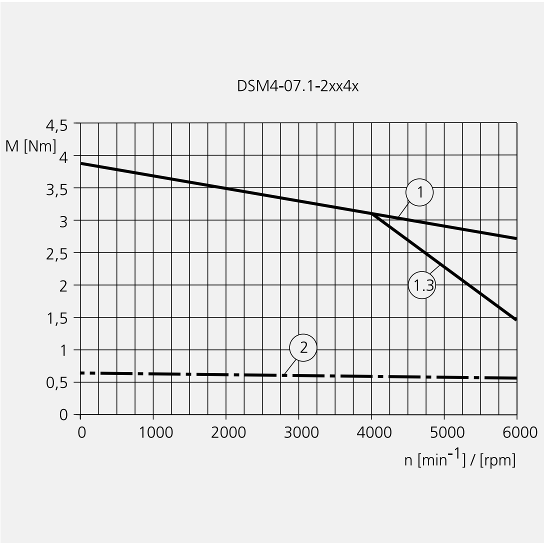

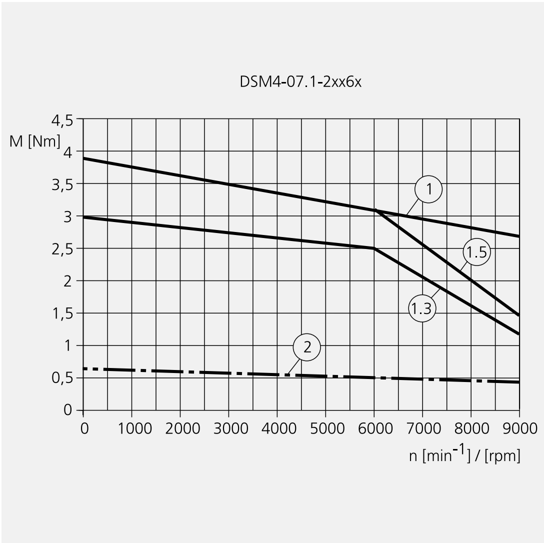

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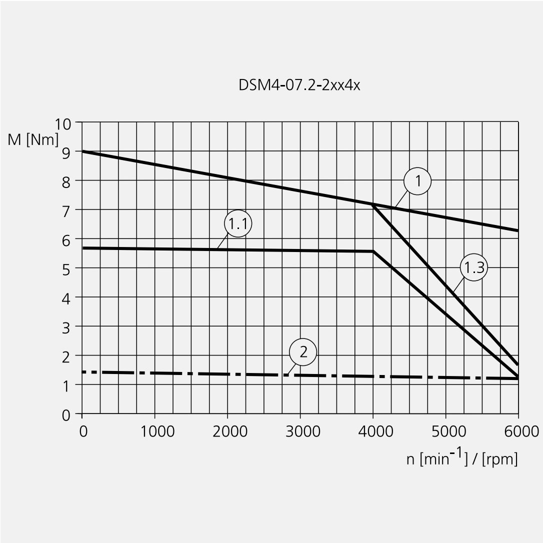
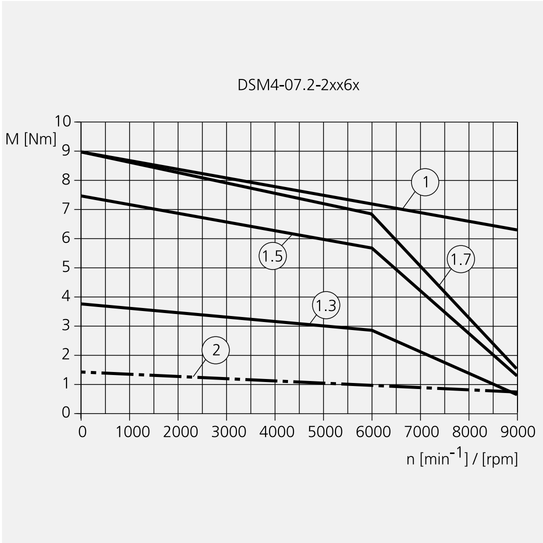
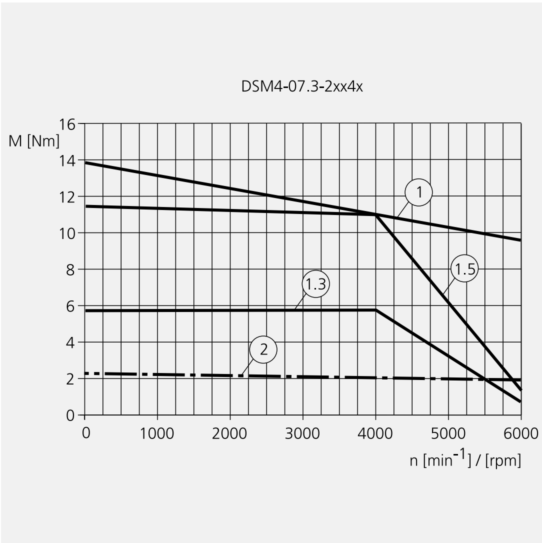
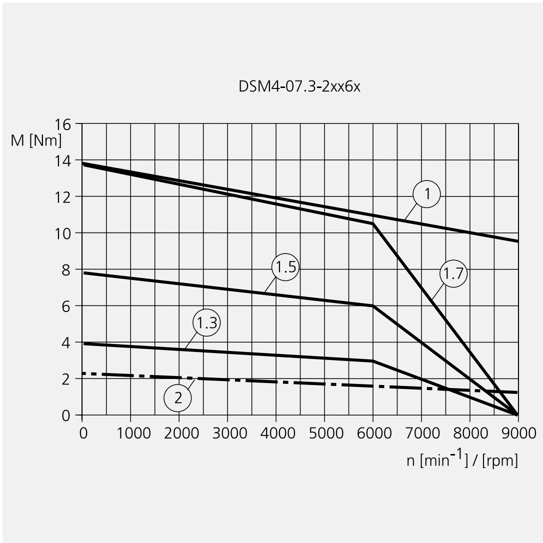
AC synchronous servomotors - High Performance

Characteristic curves









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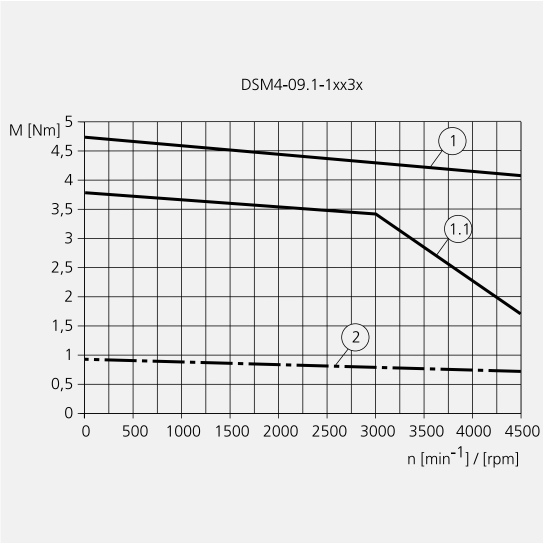

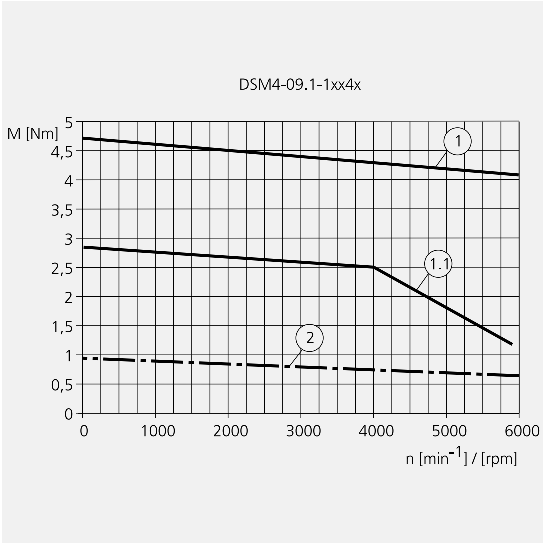

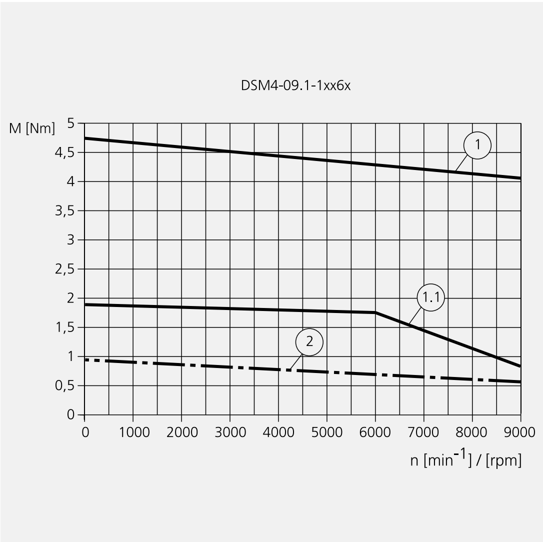

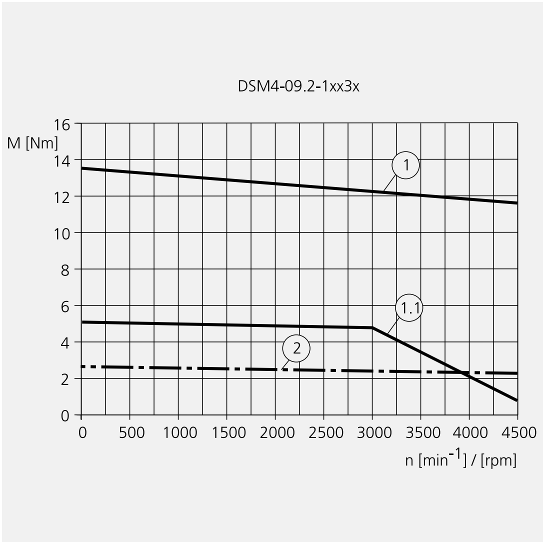

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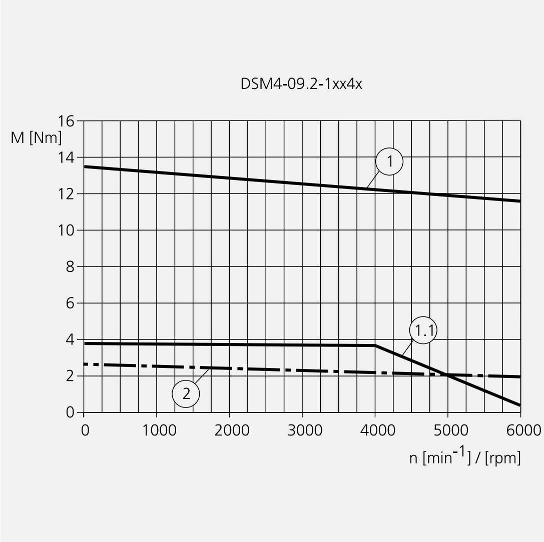

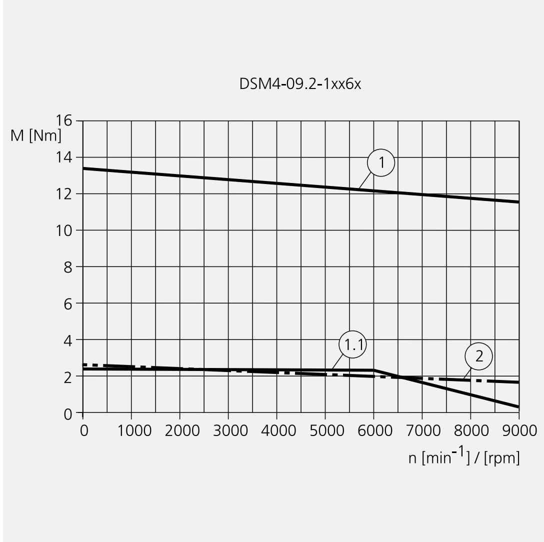

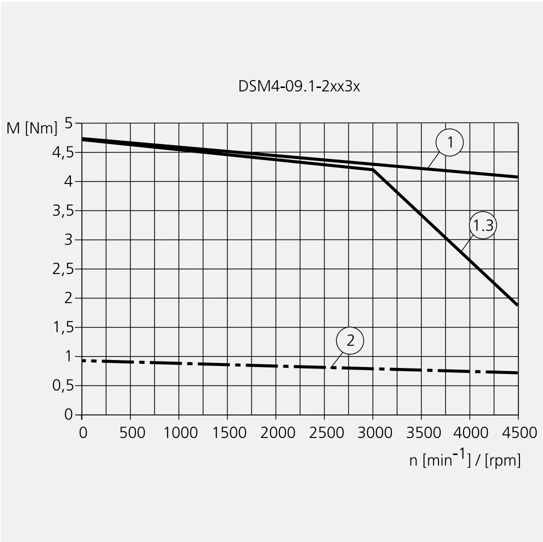

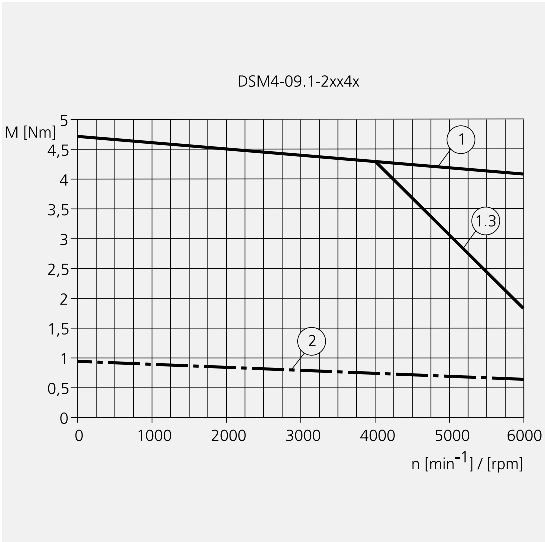

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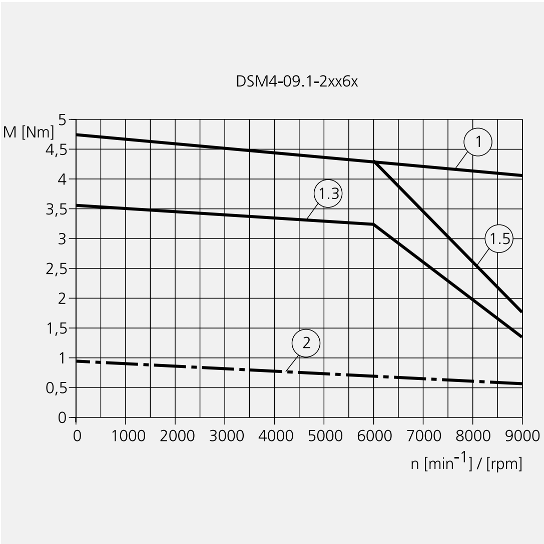
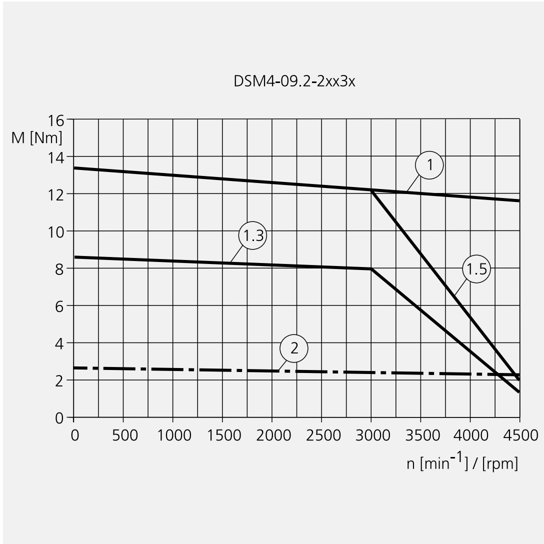
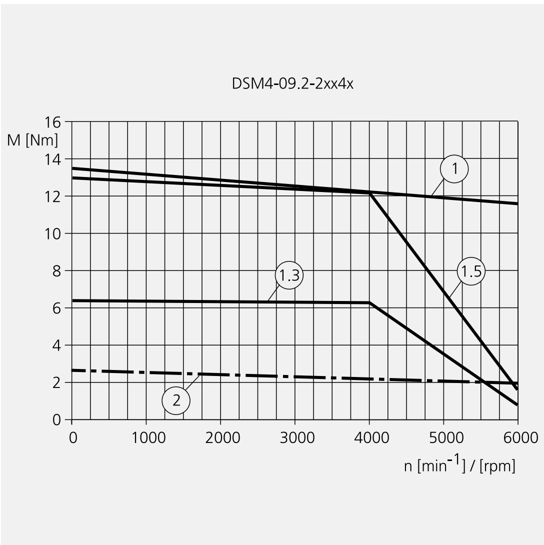
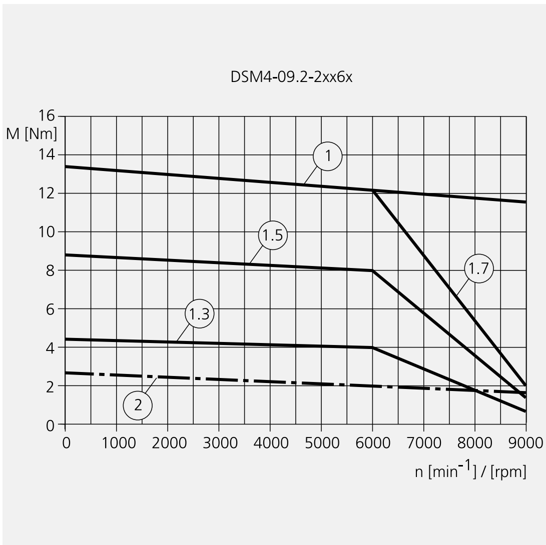
AC synchronous servomotors - High Performance









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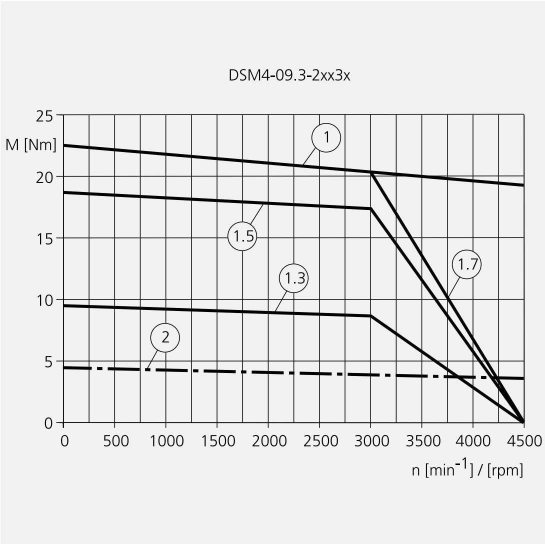

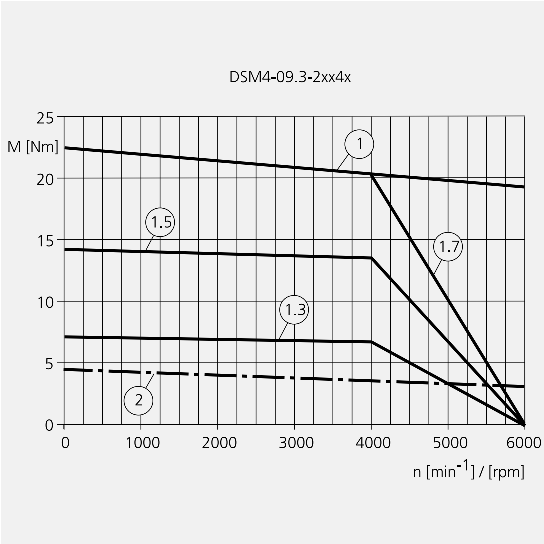

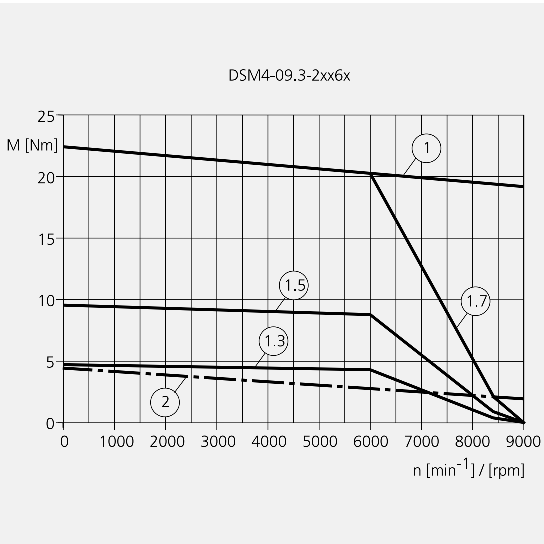

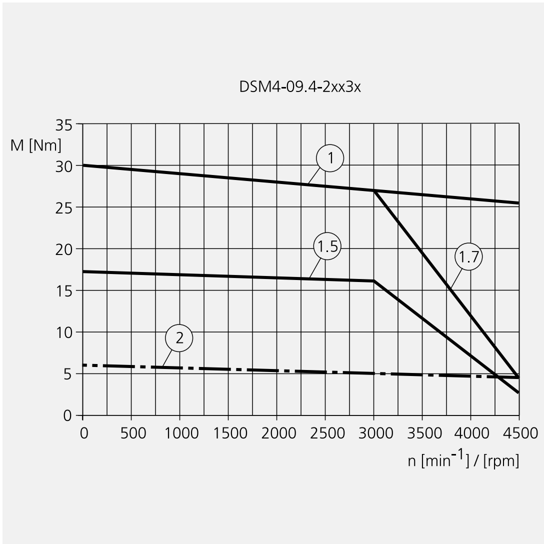

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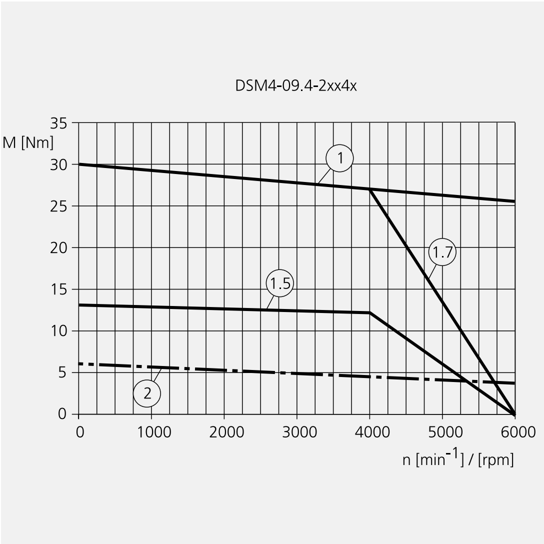

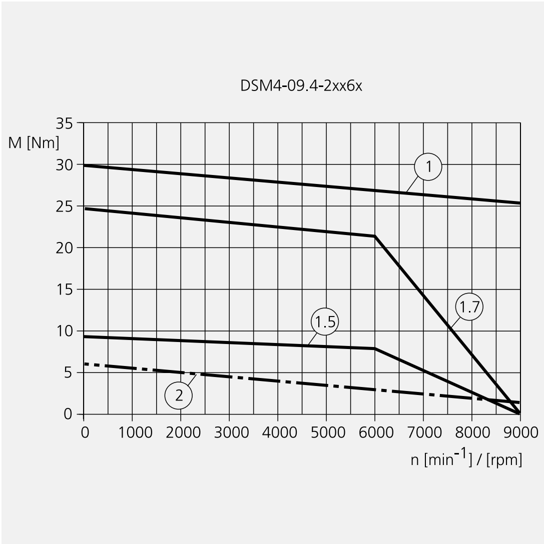

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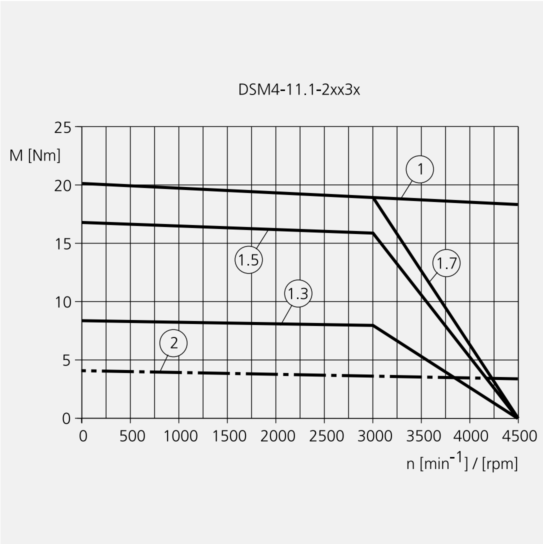

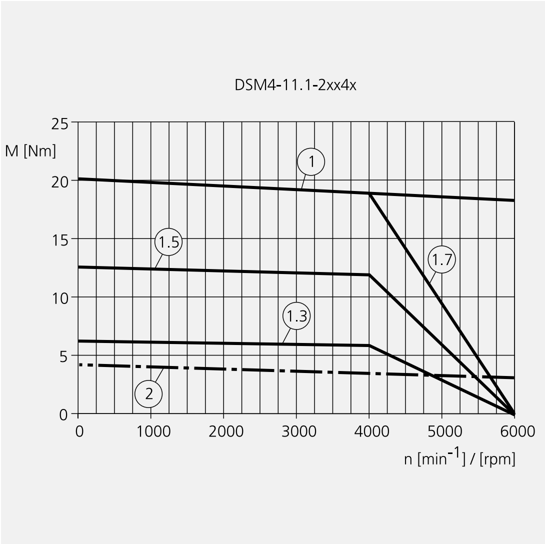

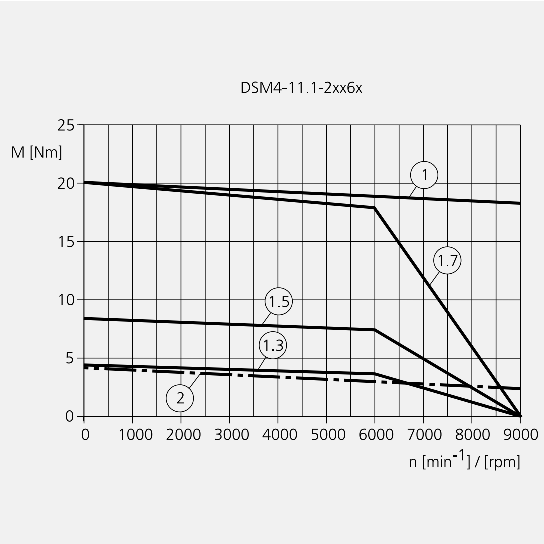

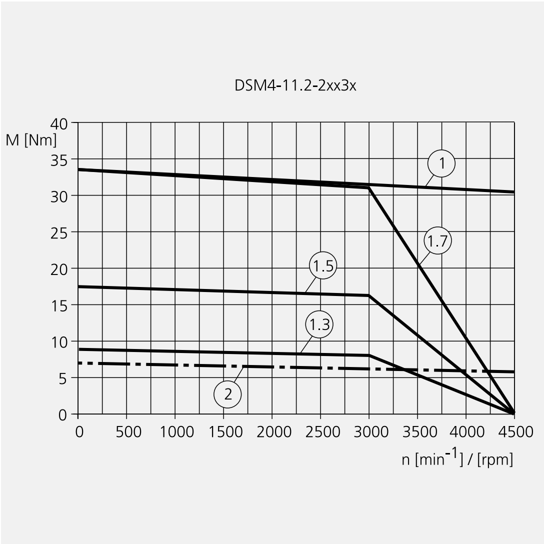

1	Motor peak torque
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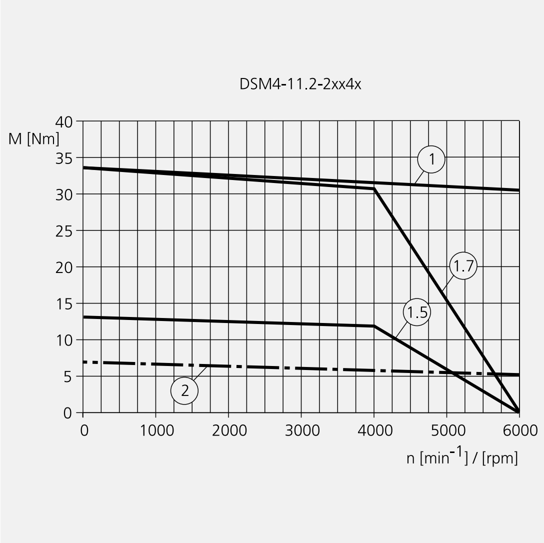

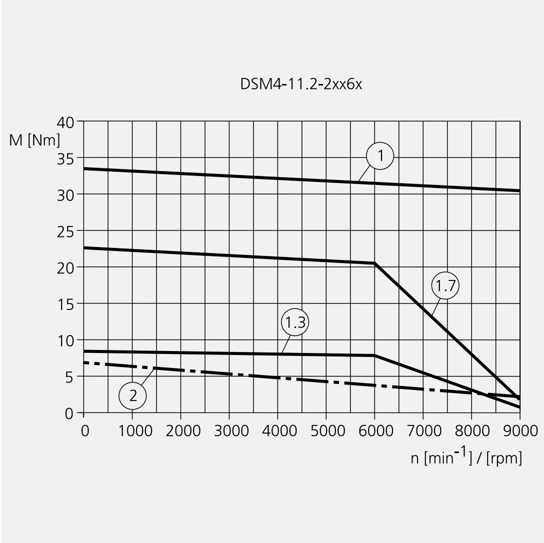

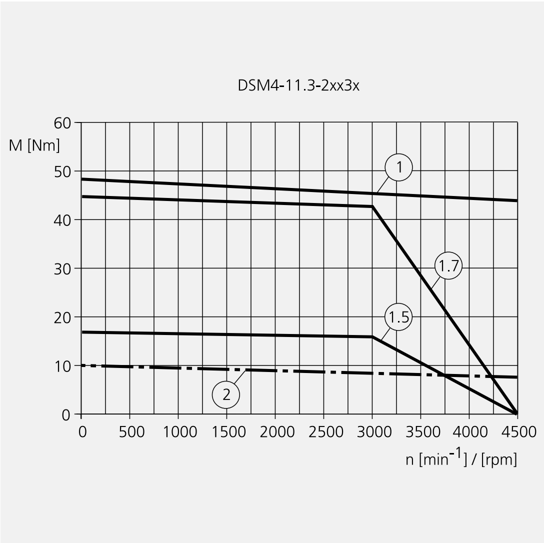

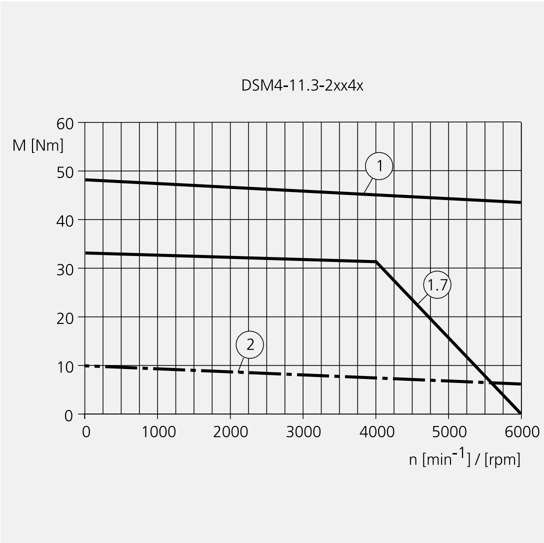

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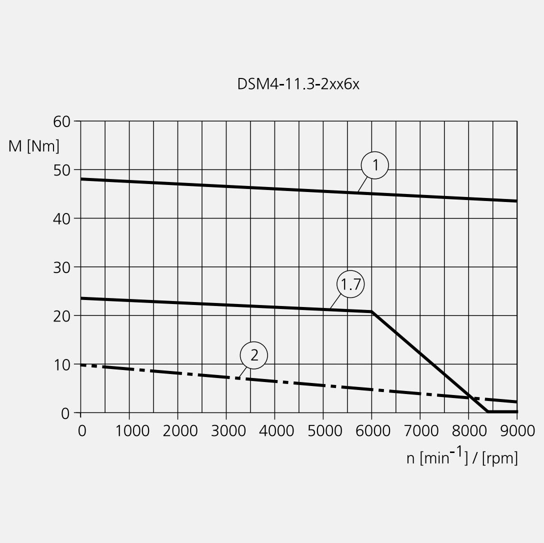

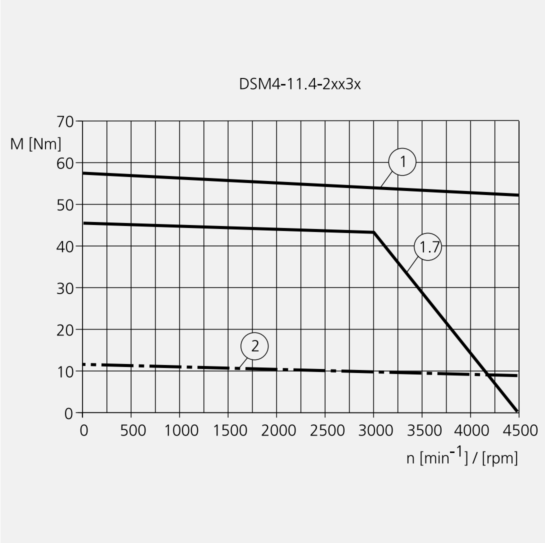

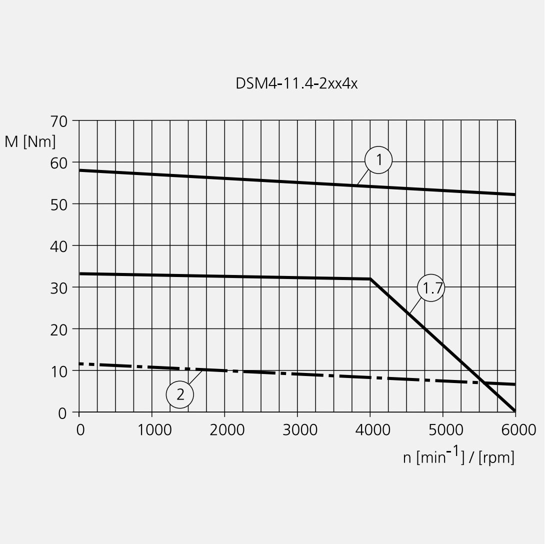

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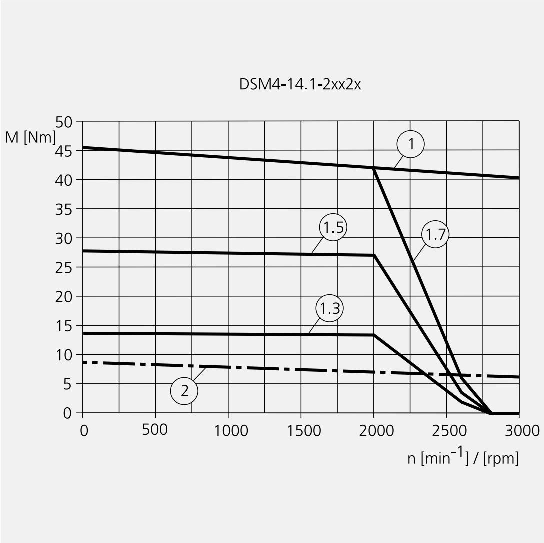

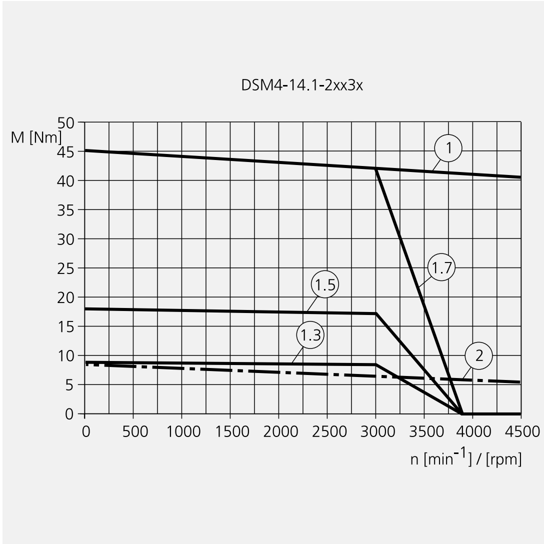

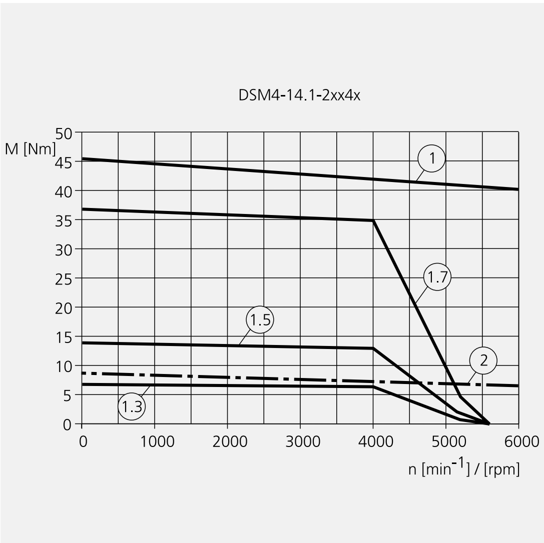

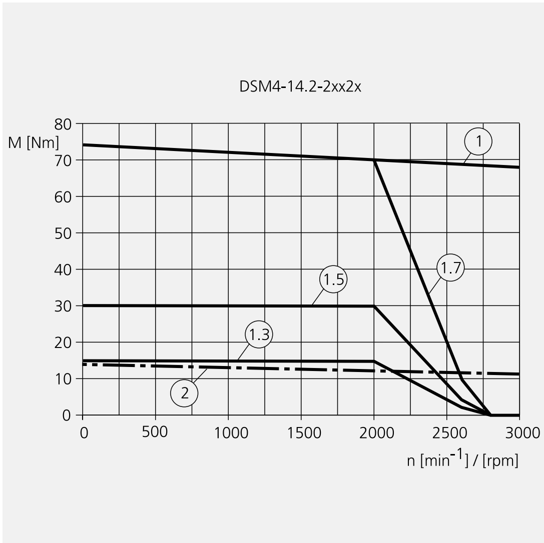

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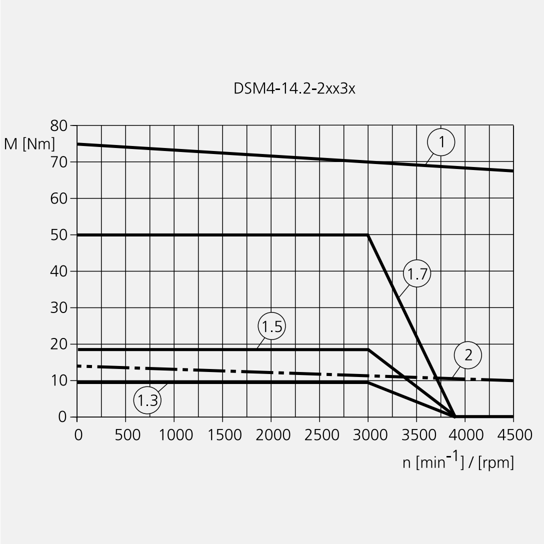
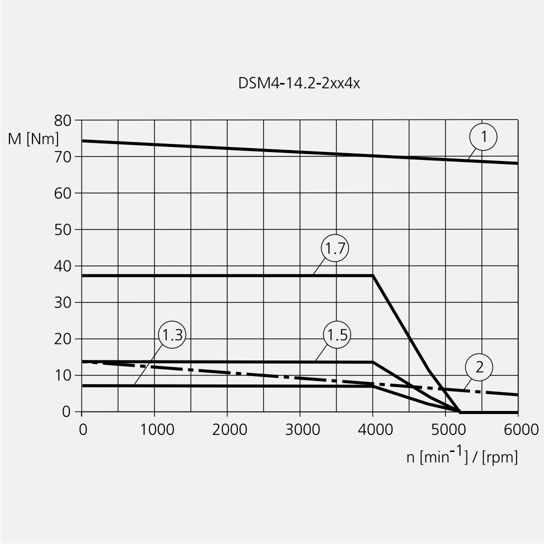
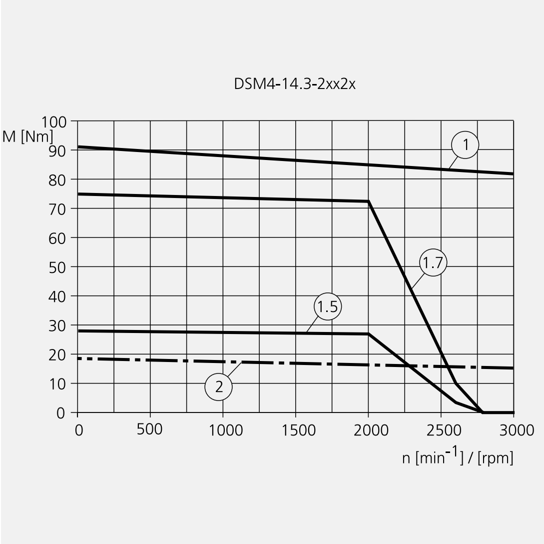
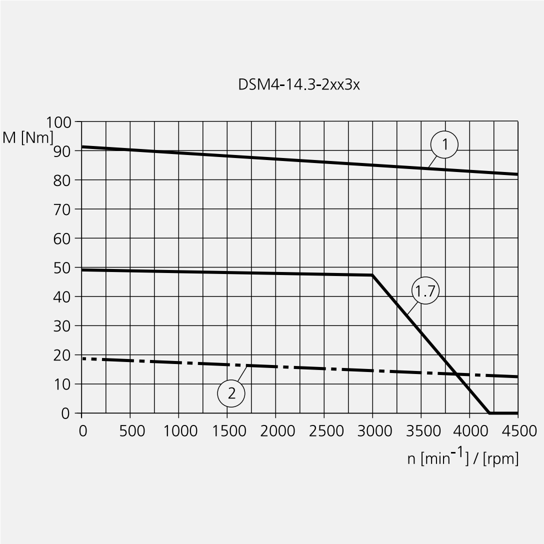
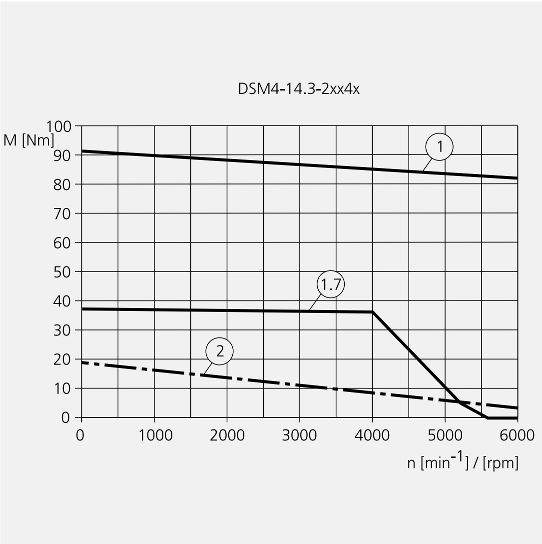


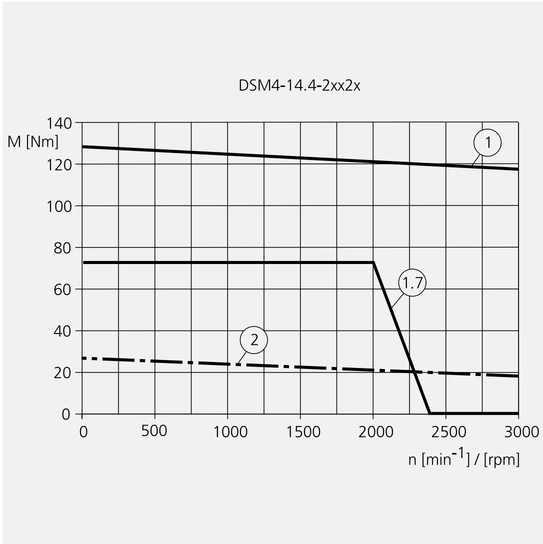


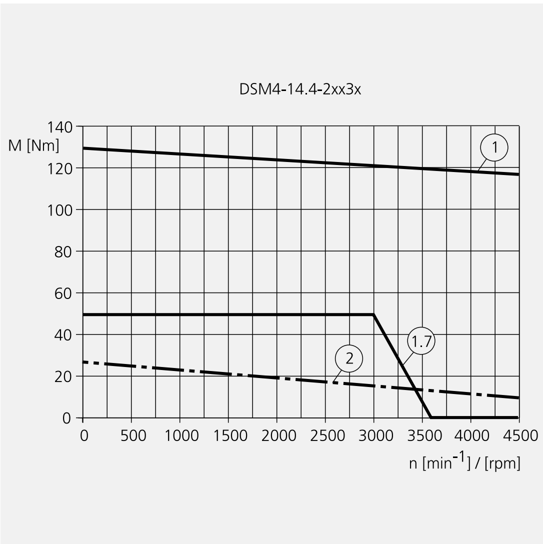




1	Motor peak torque
2	Continuous torque
1.1	Peak torque with TLX x32
1.3	Peak torque with TLX x34
1.5	Peak torque with TLX x36
1.7	Peak torque with TLX x38







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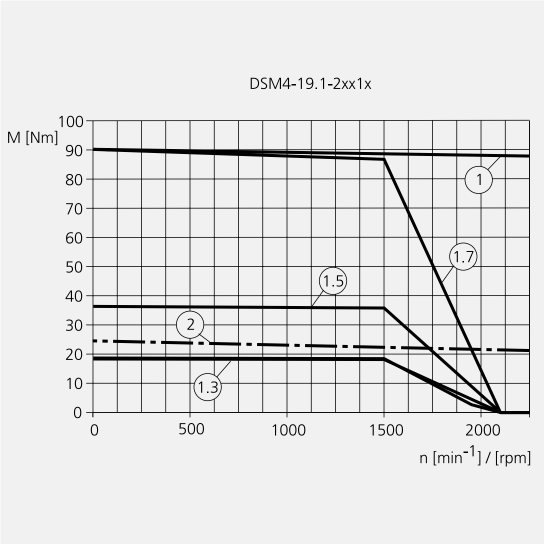

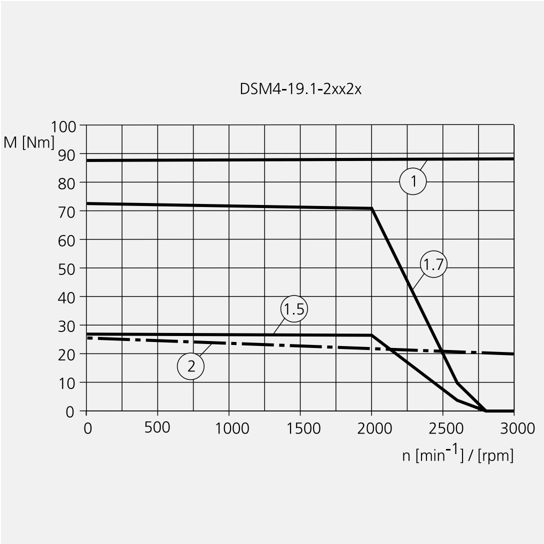

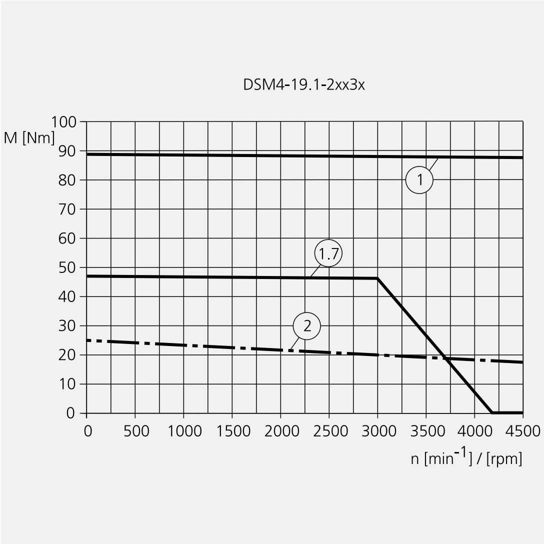

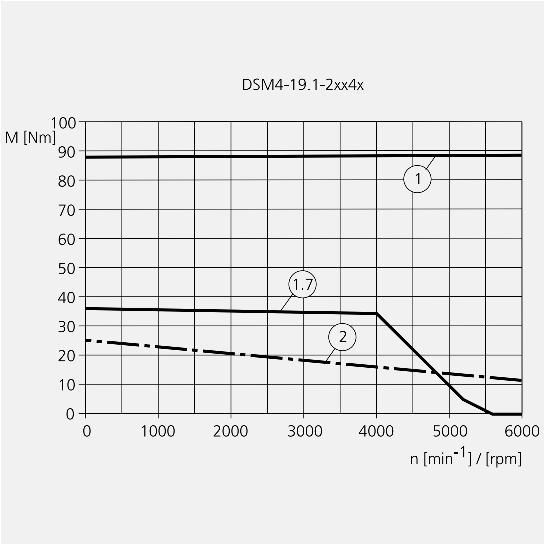

1	Motor peak torque
2	Continuous torque
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1.5	Peak torque with TLX x36
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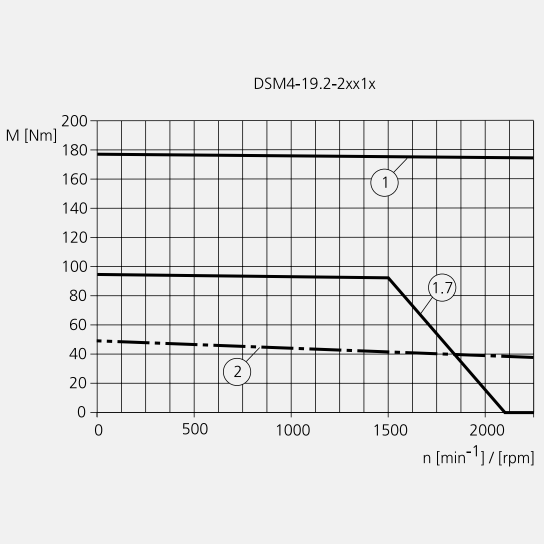
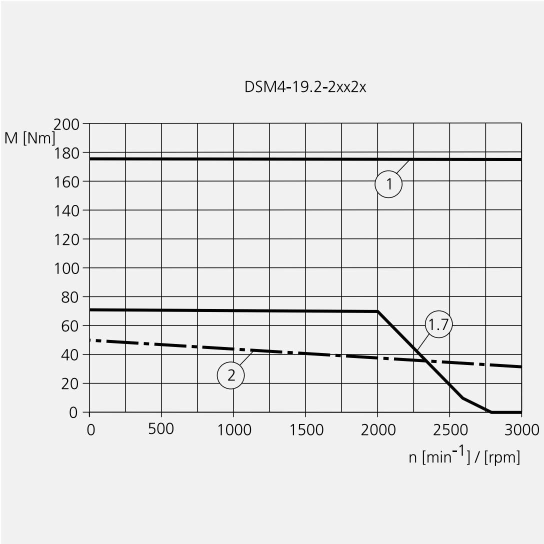
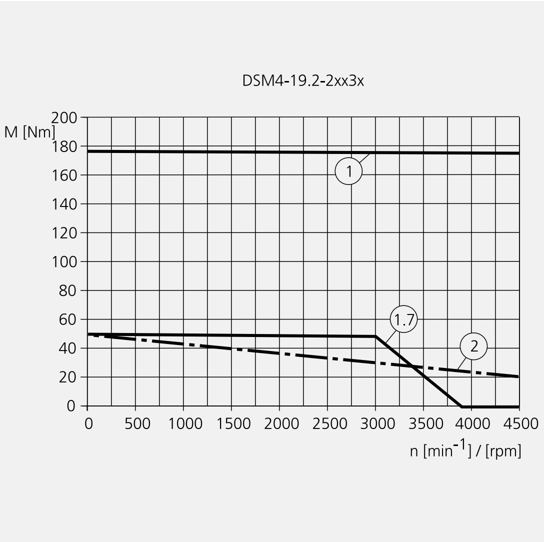
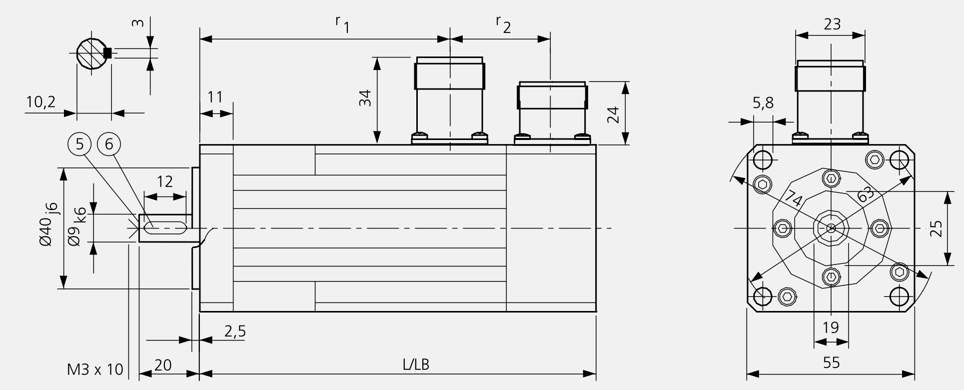


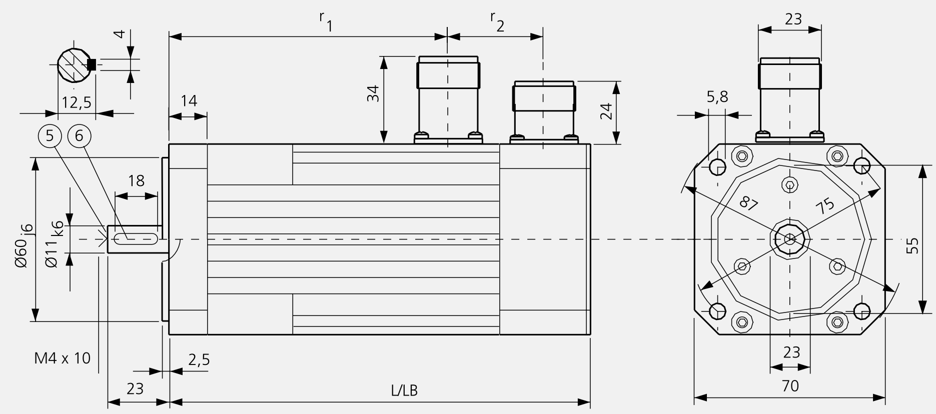




1	Motor peak torque
2	Continuous torque
1.1	Peak torque with TLX x32
1.3	Peak torque with TLX x34
1.5	Peak torque with TLX x36
1.7	Peak torque with TLX x38



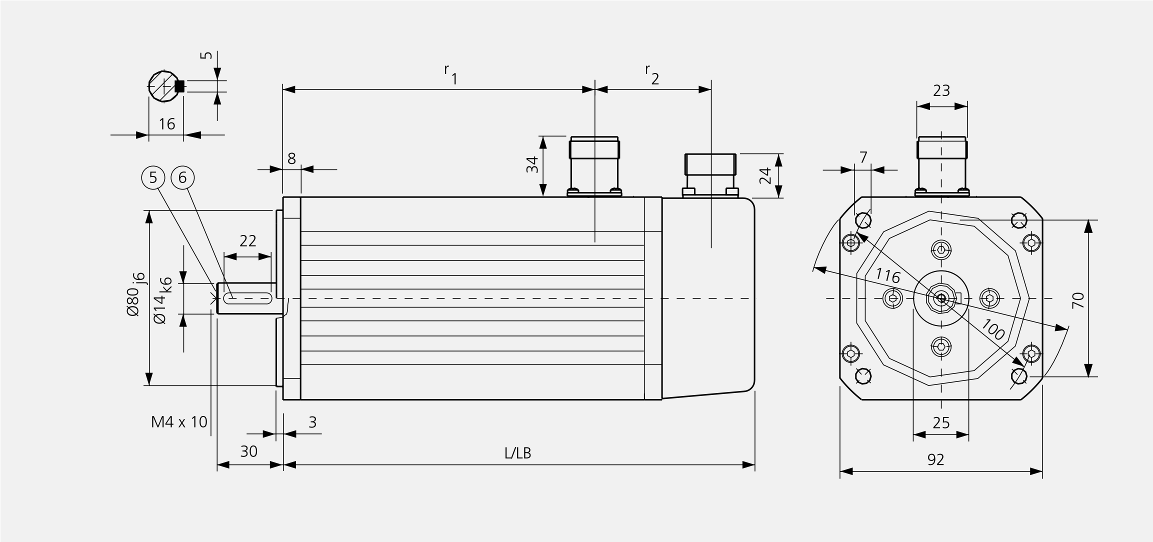
DSM 4-05 High Performance AC synchronous servomotor



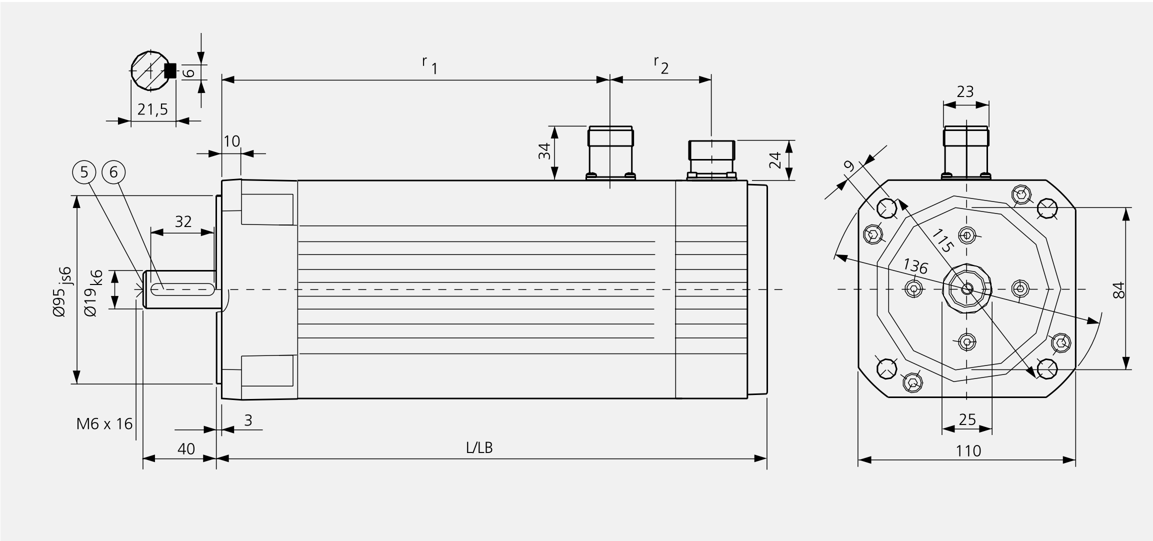
DSM 4-07 High Performance AC synchronous servomotor

5 Centre hole
6 Featherkey

	L = without brake (n. b.)		LB = with brake (w. b.)		r_1 (n. b.)	r_1 (w. b.)	r_2	
	Measuring system						Measuring system	
	SinCos®	Resolver	SinCos®	Resolver			SinCos®	Resolver
DSM 4-05.1	–	121 mm	–	145 mm	72 mm	97 mm	–	33 mm
DSM 4-05.2	–	133 mm	–	157 mm	85 mm	109 mm	–	33 mm
DSM 4-05.3	–	145 mm	–	169 mm	97 mm	121 mm	–	33 mm
DSM 4-05.4	–	170 mm	–	194 mm	121 mm	146 mm	–	33 mm
DSM 4-07.1	177 mm	136 mm	205 mm	164 mm	81 mm	109 mm	66 mm	33 mm
DSM 4-07.2	201 mm	160 mm	229 mm	188 mm	105 mm	133 mm	66 mm	33 mm
DSM 4-07.3	237 mm	196 mm	265 mm	224 mm	141 mm	169 mm	66 mm	33 mm



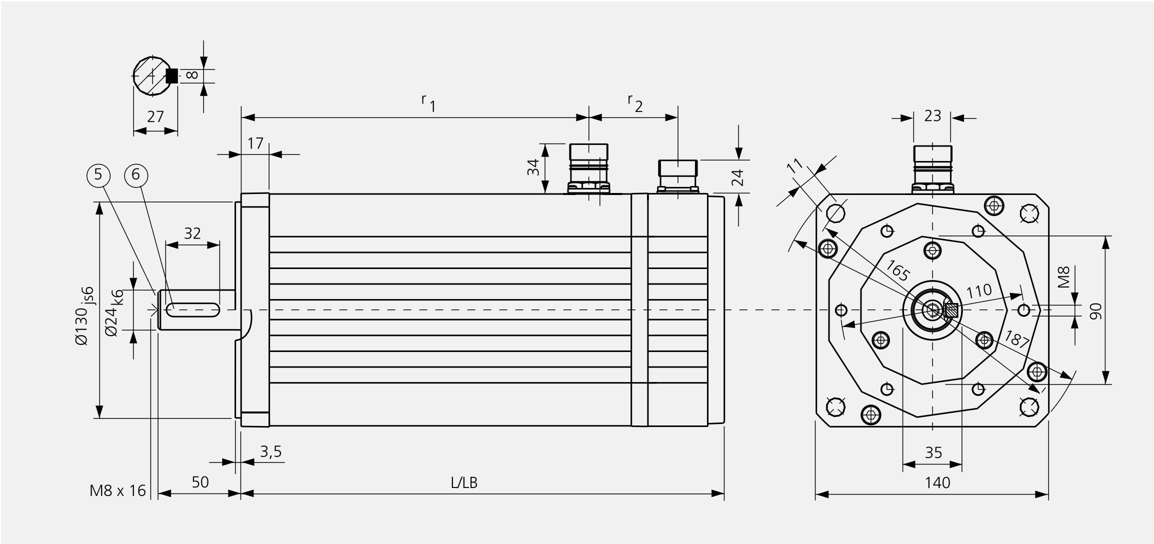
DSM 4-09 High Performance AC synchronous servomotor



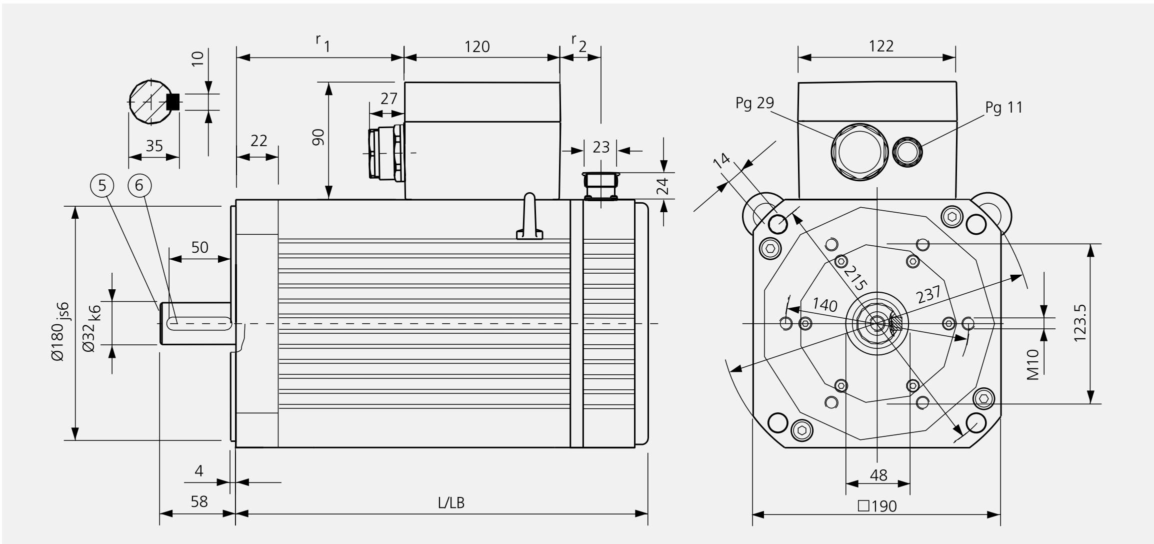
DSM 4-11 High Performance AC synchronous servomotor

5 Centre hole
6 Featherkey

	L = without brake (n. b.)		LB = with brake (w. b.)		r_1 (n. b.)	r_1 (w. b.)	r_2	
	Measuring system						**Measuring system**	
	SinCos®	**Resolver**	**SinCos®**	**Resolver**			**SinCos®**	**Resolver**
DSM 4-09.1	163 mm	156 mm	199 mm	192 mm	85 mm	121 mm	51 mm	51 mm
DSM 4-09.2	187 mm	180 mm	233 mm	226 mm	109 mm	155 mm	51 mm	51 mm
DSM 4-09.3	221 mm	214 mm	267 mm	260 mm	143 mm	189 mm	51 mm	51 mm
DSM 4-09.4	255 mm	248 mm	301 mm	294 mm	177 mm	223 mm	51 mm	51 mm
DSM 4-11.1	255 mm	218 mm	263 mm	226 mm	138 mm	145 mm	82 mm	52 mm
DSM 4-11.2	285 mm	248 mm	293 mm	256 mm	168 mm	175 mm	82 mm	52 mm
DSM 4-11.3	315 mm	278 mm	323 mm	286 mm	198 mm	205 mm	82 mm	52 mm
DSM 4-11.4	345 mm	308 mm	353 mm	316 mm	228 mm	235 mm	82 mm	52 mm



DSM 4-14 High Performance AC synchronous servomotor



DSM 4-19 High Performance AC synchronous servomotor

5 Centre hole
6 Featherkey

	L = without brake (n. b.)		LB = with brake (w. b.)		r_1 (n. b.)	r_1 (w. b.)	r_2	
	Measuring system						Measuring system	
	SinCos®	Resolver	SinCos®	Resolver			SinCos®	Resolver
DSM 4-14.1	238 mm	231 mm	283 mm	276 mm	150 mm	195 mm	54 mm	55 mm
DSM 4-14.2	268 mm	261 mm	313 mm	306 mm	180 mm	225 mm	54 mm	55 mm
DSM 4-14.3	298 mm	291 mm	343 mm	336 mm	210 mm	255 mm	54 mm	55 mm
DSM 4-14.4	343 mm	336 mm	388 mm	381 mm	255 mm	300 mm	54 mm	55 mm
DSM 4-19.1	355 mm	348 mm	355 mm	348 mm	163 mm	163 mm	31 mm	31 mm
DSM 4-19.2	435 mm	428 mm	435 mm	428 mm	243 mm	243 mm	31 mm	31 mm

Holding brake

The holding brake is an electromagnetic spring-pressure brake for locking the motor axle after the motor current is shut off. In emergency situations, such as in a power failure or during an EMERGENCY STOP, it shuts down the drive, significantly contributing to overall safety. The motor axle must also be locked for weight-induced torque loads, e.g. in cases of vertical axes in manual mode.

Holding brake controller

The holding brake is controlled via the **T**win **L**ine **H**olding **B**rake **C**ontroller, which is available as an accessory.

Caution! Overloading may damage the holding brake! Avoid stationary load torques greater than 25 % of the motor holding torque when using vertical axes with the holding brake.

Technical data of the holding brake for DSM motors

		DSM 4-05	DSM 4-07	DSM 4-09	DSM 4-11	DSM 4-14	DSM 4-19
Holding torque	M_{Br}	2.0 Nm	2.5 Nm	9.0 Nm	11.0 Nm	36.0 Nm	85.0 Nm
Armature inertia	J_{Br}	0.067 $kgcm^2$	0.380 $kgcm^2$	0.600 $kgcm^2$	2.300 $kgcm^2$	5.900 $kgcm^2$	17.600 $kgcm^2$
Electrical pickup power	P_{Br}	12 W	12 W	18 W	21 W	27 W	36 W
Energise time	t_E	25 ms	7 ms	15 ms	20 ms	35 ms	60 ms
De-energise time	t_A	15 ms	5 ms	7 ms	35 ms	50 ms	70 ms
Weight	m_{Br}	0.18 kg	0.30 kg	0.50 kg	0.78 kg	1.63 kg	3.80 kg

Measuring systems

The standard measuring system is the SinCos® (SRS) Singleturn. This measuring system is designed to provide optimum performance with our Twin Line family of controllers. You can use the HIPERFACE® interface between motor-measuring system and device for a self-initialisation of the motor and current-regulator parameters, considerably simplifying the start-up process.

The SinCos® (SRM) Multiturn and Resolver, 2-pin, are optionally available.

Technical data

	SinCos® (SRS) Singleturn	SinCos® (SRM) Multiturn	Resolver, 2-pin
Resolution with TLx	16384 incr. min^{-1}	16384 incr. min^{-1}	4096 incr. min^{-1}
Precision, integral nonlinearity	± 45 angular seconds	± 45 angular seconds	± 360 angular seconds
Index pulse	–	–	–
Absolute position after activation within [min^{-1}] with the precision	1 ± 45 angular seconds	4096 ± 45 angular seconds	1 ± 360 angular seconds
Signal form	Sinusoidal/cosinusoidal 1024 cycles min^{-1}	Sinusoidal/cosinusoidal 1024 cycles min^{-1}	Sinusoidal/cosinusoidal 1 cycles min^{-1}
Measuring procedure	High-resolution, optical	High-resolution, optical	Inductive
Interface	HIPERFACE®	HIPERFACE®	–
Module required on slot 2, TLx	HIFA-C	HIFA-C	RESO-C
Working temperature range	–20 to +115 °C	–20 to +115 °C	–55 to +155 °C

Example	**DSM 4 - X . X - X X X X - X X**
Mounting dimensions (flange) 05 (55 mm) 07 (70 mm) 09 (90 mm) 11 (110 mm) 14 (140 mm) 19 (190 mm)	DSM 4 - **X** . X - X X X X - X X
Length 1, 2, 3 or 4	DSM 4 - X . **X** - X X X X - X X
Voltage variant 1 = U_N = 190 V, for amplifier with intermediate circuit voltage 270 to 350 VDC 2 = U_N = 330 V, for amplifier with intermediate circuit voltage 510 to 690 VDC	DSM 4 - X . X - **X** X X X - X X
Holding brake 0 = without holding brake 2 = with holding brake	DSM 4 - X . X - X **X** X X - X X
Measuring system/interface IB = HIFA-C for SinCos® R9 = RESO-C for resolver, only for DSM 4-05X	DSM 4 - X . X - X X **X** X - X X
Rated speed 1 = 1500 rpm, all lengths 2 = 2000 rpm, all lengths 3 = 3000 rpm, all lengths 4 = 4000 rpm, not available for all lengths 6 = 6000 rpm, not available for all lengths	DSM 4 - X . X - X X X **X** - X X
Code for temperature sensors and mounting sockets NTC temperature sensor, connection via measuring-system connector, for devices of the Twin Line series TA = for size/flange: 05/07/19* mounting sockets, straight exit *except DSM4-19.x, motor connection only via terminal box 6N = for size/flange: 09/11/14 mounting sockets, straight exit 4E = for size/flange: 05/07/09/11/14 mounting sockets 90°, rotating	DSM 4 - X . X - X X X X - **X** X
Measuring system (in conjunction with measuring system/interface) G = SinCos® (SRS) Singleturn H = SinCos® (SRM) Multiturn Z = resolver 2 pin	DSM 4 - X . X - X X X X - X **X**

General information

Berger Lahr offers two gearbox series for the High Performance line of AC synchronous servomotors.

Gearbox series:

- LP – The economical solution
  - High reliability
  - Rugged design
  - Low price
- SP – Satisfies the highest expectations
  - High torques
  - Low distortion backlash
  - Smooth running

The gearboxes are normally delivered detached from the motor. You can, however, request to have the gearbox mounted to the order. Mounting the gearbox to the motor is simple and follows a patented procedure.

Additional gearboxes and gearbox variations are available upon request.

LP – Value Line planetary gear

LP gearbox

The LP gearboxes come in five different sizes:

- LP 050
- LP 070
- LP 090
- LP 120
- LP 155

Features

- Max. acceleration torque T_{2B}: 10.5 Nm – 400 Nm
- Increasing ratios
  - 1-stage = 3*/5/10
  - 2-stage = 15*/25/30*/50/100
- High efficiency
  - 1-stage ≥ 97 %
  - 2-stage ≥ 95 %
- Integrated thermal linear compensation
- Low distortion backlash
- Simple, patented motor mounting
- Smooth running
- Suitable for cyclical and continuous operation
- High reliability
- Rugged design
- Low price

Technical data for the LP gearbox series

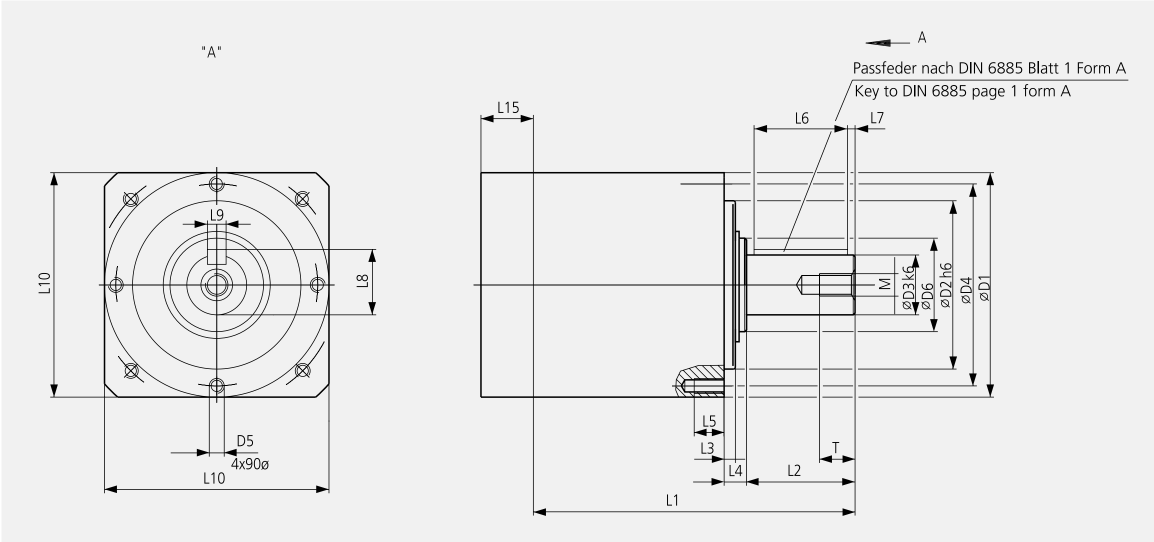
			LP 050	LP 070	LP 090
Max. acceleration torque for cyclical operation	T_{2B}	i = 5/25/50	11.5 Nm	32 Nm	80 Nm
	T_{2B}	i = 3*/10/15*/30*/100	10.5 Nm	29 Nm	72 Nm
EMERGENCY-STOP torque (max. 1000 times per service life)	T_{2Stop}		26 Nm	75 Nm	190 Nm
Rated torque at output	T_{2N}	i = 5/25/50	5.7 Nm	16 Nm	40 Nm
	T_{2N}	i = 3*/10/15*/30*/100	5.2 Nm	15 Nm	35 Nm
Ratio (i)	i	1-stage	3*/5/10	3*/5/10	3*/5/10
		2-stage	15*/25/30*/50/100	15*/25/30*/50/100	15*/25/30*/50/100
Max. radial force with respect to shaft centre at 100 min^{-1}	F_{2RMax}		650 N	1450 N	2400 N
Max. axial force with respect to shaft centre at 100 min^{-1}	F_{2AMax}		700 N	1550 N	1900 N
Distortion rigidity	C_{t21}	i = 5/25/50	0.9 Nm/arcmin	3.3 Nm/arcmin	9 Nm/arcmin
		i = 3*/10/15*/30*/100	0.75 Nm/arcmin	2.8 Nm/arcmin	7.5 Nm/arcmin
Distortion backlash	j_t	1-stage	≤ 12 arcmin	≤ 12 arcmin	≤ 12 arcmin
		2-stage	≤ 15 arcmin	≤ 15 arcmin	≤ 15 arcmin
Rated speed	n_{1N}		4000 min^{-1}	3700 min^{-1}	3400 min^{-1}
Max. drive rotary speed	n_{1Max}		8000 min^{-1}	6000 min^{-1}	6000 min^{-1}
Idling torque at rated speed	T_{012}		≤ 0.05 Nm	≤ 0.14 Nm	≤ 0.38 Nm
Service life	L_h		> 20000 h	> 20000 h	> 20000 h
Efficiency	η	1-stage	> 97 %	> 97 %	> 97 %
		2-stage	> 95 %	> 95 %	> 95 %
Mass inertia	J_1	1-stage	0.059 $kgcm^2$	0.280 $kgcm^2$	1.770 $kgcm^2$
		2-stage	0.055 $kgcm^2$	0.280 $kgcm^2$	1.770 $kgcm^2$
Weight	m	1-stage	0.770 kg	1.900 kg	4.100 kg
		2-stage	0.950 kg	2.200 kg	5.100 kg
Lubrication			Low-viscosity grease		
Primer			RAL 5002	RAL 5002	RAL 5002
Fitting positions			Variable	Variable	Variable
Protection type			IP 64	IP 64	IP 64
Running noise at 3000 min^{-1}	L_{PA}		≤ 68 dB (A)	≤ 70 dB (A)	≤ 72 dB (A)

*Ratio 3 or 15 and 30 only with LP 070/LP 090/LP 120

Technical data for the LP gearbox series

			LP 120	LP 155
Max. acceleration torque for cyclical operation	T_{2B}	i = 5/25/50	200 Nm	400 Nm
	T_{2B}	i = 3*/10/15*/ 30*/100	180 Nm	320 Nm
EMERGENCY-STOP torque (max. 1000 times per service life)	T_{2Stop}		480 Nm	1000 Nm
Rated torque at output	T_{2N}	i = 5/25/50	100 Nm	290 Nm
	T_{2N}	i = 3*/10/15*/ 30*/100	90 Nm	170 Nm
Ratio (i)	i	1-stage	3*/5/10	3*/5/10
		2-stage	15*/25/30*/50/ 100	15*/25/30*/50/ 100
Max. radial force with respect to shaft centre at 100 min^{-1}	F_{2RMax}		4600 N	7500 N
Max. axial force with respect to shaft centre at 100 min^{-1}	F_{2AMax}		4000 N	6000 N
Distortion rigidity	C_{t21}	i = 5/25/50	24 Nm/arcmin	55 Nm/arcmin
		i = 3*/10/15*/ 30*/100	20.5 Nm/arcmin	44 Nm/arcmin
Distortion backlash	j_t	1-stage	≤ 12 arcmin	≤ 12 arcmin
		2-stage	≤ 15 arcmin	≤ 15 arcmin
Rated speed	n_{1N}		2600 min^{-1}	2000 min^{-1}
Max. drive rotary speed	n_{1Max}		4800 min^{-1}	3600 min^{-1}
Idling torque at rated speed	T_{012}		≤ 0.8 Nm	≤ 2.50 Nm
Service life	L_h		> 20000 h	> 20000 h
Efficiency	η	1-stage	> 97 %	> 97 %
		2-stage	> 95 %	> 95 %
Mass inertia	J_1	1-stage	5.420 $kgcm^2$	25.73 $kgcm^2$
		2-stage	5.490 $kgcm^2$	5.33 $kgcm^2$
Weight	m	1-stage	9.000 kg	17.500 kg
		2-stage	11.200 kg	21.000 kg
Lubrication			Low-viscosity grease	
Primer			RAL 5002	RAL 5002
Fitting positions			Variable	Variable
Protection type			IP 64	IP 64
Running noise at 3000 min^{-1}	L_{PA}		≤ 74 dB (A)	≤ 75 dB (A)

*Ratio 3 or 15 and 30 only with LP 070/LP 090/LP 120



LP series gearbox

Dimensions

Size	Toler-ances	LP 050		LP 070		LP 090		LP 120		LP 155	
Gearbox stages		1	2	1	2	1	2	1	2	1	2
D1		50		70		90		120		155	
D2	h6	35		52		68		90		120	
D3	k6	12		16		22		32		40	
D4		44		62		80		108		140	
D5		M4		M5		M6		M8		M10	
D6		17		25		40		50		65	
L1		75	91	104	124	126	152.5	172	204.5	219.5	250
L2		18		28		36		58		82	
L3		4		5		5		6		8	
L4		6.5		8		10		12		15	
L5		8		10		12		16		20	
L6		14		25		32		50		70	
L7		2		2		2		4		6	
L8		13.5		18		24.5		35		43	
L9	h9	4		5		6		10		12	
L10		See motor–gearbox compatibility									
L15		See motor–gearbox compatibility									
M		M4		M5		M8		M12		M16	
T		8		10		13		22		32	

All dimensions in mm

Motor–gearbox compatibility

Gearbox	DSM 4-05	DSM 4-07	DSM 4-09	DSM 4-11	DSM 4-14	DSM 4-19
LP 050-M01	L10 = 55 L15 = 14	L10 = 70 L15 = 24	–	–	–	–
LP 070-M01	L10 = 70 L15 = 15	L10 = 70 L15 = 15	L10 = 90 L15 = 22	–	–	–
LP 090-M01	–	L10 = 90 L15 = 22	L10 = 90 L15 = 22	L10 = 100 L15 = 32	L10 = 140 L15 = 42	–
LP 120-M01	–	–	L10 = 120 L15 = 28	L10 = 120 L15 = 28	L10 = 140 L15 = 38	L10 = 190 L15 = 48
LP 155-M01	–	–	–	L10 = 150 L15 = 36	L10 = 150 L15 = 46	L10 = 190 L15 = 46
All dimensions in mm						

Example	LP X - M 0 X - X - 1 / Motor
Gearbox type 050 070 090 120 155	LP **X** - M 0 X - X - 1 / Motor
Gearbox version M = motor-mounted gearbox	LP X - **M** 0 X - X - 1 / Motor
Gearbox model 0 = standard	LP X - M **0** X - X - 1 / Motor
Stage count 1 = 1-stage 2 = 2-stage	LP X - M 0 **X** - X - 1 / Motor
Reduction ratio 005/010 =1-stage 025/050/100 = 2-stage	LP X - M 0 X - **X** - 1 / Motor
Form of drive shaft 1 = shaft with featherkey DIN 6885 form A	LP X - M 0 X - X - **1** / Motor
Motor description see Motor type key or Motor–gearbox compatibility	LP X - M 0 X - X - 1 / **DSM 4-X**

SP – low-backlash planetary gear

SP gearbox

The SP gearboxes come in five different sizes:

- SP 060
- SP 075
- SP 100
- SP 140
- SP 180

Features

- Max. acceleration torque T_{2B}: 32 Nm – 1100 Nm
- Increasing ratios
  - 1-stage = 4/5/7/10
  - 2-stage = 16/20/28/40/50/70/100
- Low distortion backlash
  - 1-stage ≤ 4 arcmin / ≤ 2 arcmin
  - 2-stage ≤ 6 arcmin / ≤ 4 arcmin
- High efficiency
  - 1-stage ≥ 97 %
  - 2-stage ≥ 94 %
- Integrated thermal linear compensation
- Simple, patented motor mounting
- Smooth running
- Suitable for cyclical and continuous operation

Gearbox options SP

Technical data for the SP gearbox series

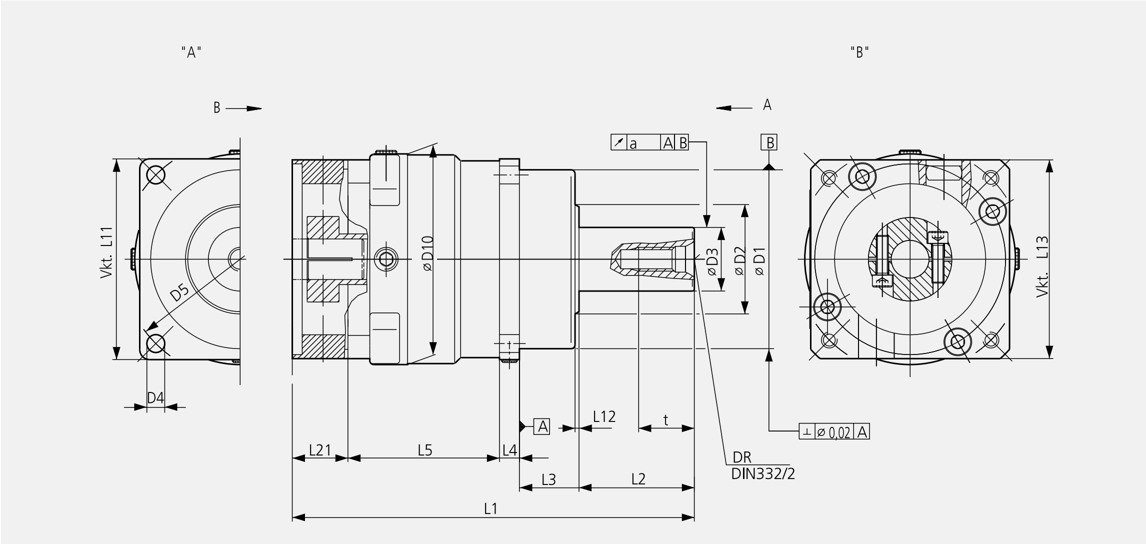
			SP 060	SP 075	SP 100
Max. acceleration torque for cyclical operation	T_{2B}	i = 4 – 7 / 16 – 70	40 Nm	100 Nm	250 Nm
		i = 10/100	32 Nm	80 Nm	200 Nm
EMERGENCY-STOP torque (max. 1000 times per service life)	T_{2Stop}	i = 4 – 7 / 16 – 70	100 Nm	250 Nm	625 Nm
		i = 10/100	80 Nm	200 Nm	500 Nm
Rated torque at output	T_{2N}	i = 4 – 7 / 16 – 70	25 Nm	70 Nm	170 Nm
		i = 10/100	15 Nm	45 Nm	110 Nm
Max. drive rotary speed	n_{1Max}	1-stage	6000 min^{-1}	6000 min^{-1}	4500 min^{-1}
		2-stage	6000 min^{-1}	6000 min^{-1}	4500 min^{-1}
Rated speed at drive	n_{1N}	i = 4/5	3300 min^{-1}	2900 min^{-1}	2500 min^{-1}
		i = 7/10	4000 min^{-1}	3100 min^{-1}	2800 min^{-1}
		i = 16	4400 min^{-1}	3500 min^{-1}	3100 min^{-1}
		i = 50	4800 min^{-1}	3800 min^{-1}	3500 min^{-1}
		i = 100	5500 min^{-1}	4500 min^{-1}	4200 min^{-1}
Ratio (i)	i	1-stage	4/5/7/10	4/5/7/10	4/5/7/10
		2-stage	16/20/28/40/ 50/70/100	16/20/28/40/ 50/70/100	16/20/28/40/ 50/70/100
Distortion backlash, standard	j_t	1-stage	≤ 6 arcmin	≤ 6 arcmin	≤ 4 arcmin
		2-stage	≤ 8 arcmin	≤ 8 arcmin	≤ 6 arcmin
Distortion backlash, reduced	j_t	1-stage	≤ 4 arcmin	≤ 4 arcmin	≤ 2 arcmin
		2-stage	≤ 6 arcmin	≤ 6 arcmin	≤ 4 arcmin
Distortion rigidity	C_{t21}		3 Nm/arcmin	8 Nm/arcmin	24 Nm/arcmin
Max. axial force with respect to shaft centre at output	F_{2AMax}		2300 N	3200 N	5400 N
Max. radial force with respect to shaft centre at output	F_{2RMax}		2600 N	3800 N	6000 N
Idling torque at 20 °C gearbox temperature and 3000 min^{-1}	T_{012}	i = 4	≤ 0.5 Nm	≤ 0.9 Nm	≤ 2.7 Nm
		i = 16	≤ 0.3 Nm	≤ 0.7 Nm	≤ 1.7 Nm
		i = 100	≤ 0.2 Nm	≤ 0.4 Nm	≤ 0.7 Nm
Max. pull-out torque	M_{2KMax}		133 Nm	225 Nm	464 Nm
Service life	L_h		> 20000 h	> 20000 h	> 20000 h
Efficiency at full load	η	1-stage	> 97 %	> 97 %	> 97 %
		2-stage	> 94 %	> 94 %	> 94 %
Weight	m	1-stage	1.500 kg	2.800 kg	6.200 kg
		2-stage	1.800 kg	3.100 kg	7.100 kg
Lubrication			Synth. gearbox oil, viscosity class ISO VG220	Synth. gearbox oil, viscosity class ISO VG220	Synth. gearbox oil, viscosity class ISO VG220
Paint			RAL 5002	RAL 5002	RAL 5002
Fitting positions			Variable	Variable	Variable
Permissible gearbox temperature			–10 to +90 °C	–10 to +90 °C	–10 to +90 °C
Direction of rotation			Motor and gearbox in same direction		
Protection type			IP 64	IP 64	IP 64
Running noise at 3000 min^{-1}	L_{PA}		≤ 68 dB (A)	≤ 68 dB (A)	≤ 70 dB (A)

Technical data for the SP gearbox series

			SP 140	SP 180
Max. acceleration torque for cyclical operation	T_{2B}	i = 4 – 7 / 16 – 70	500 Nm	1100 Nm
		i = 10/100	400 Nm	880 Nm
EMERGENCY-STOP torque (max. 1000 times per service life)	T_{2Stop}	i = 4 – 7 / 16 – 70	1250 Nm	2750 Nm
		i = 10/100	1000 Nm	2200 Nm
Rated torque at output	T_{2N}	i = 4 – 7 / 16 – 70	360 Nm	550 Nm
		i = 10/100	215 Nm	550 Nm
Max. drive rotary speed	n_{1Max}	1-stage	4000 min^{-1}	3500 min^{-1}
		2-stage	4000 min^{-1}	4000 min^{-1}
Rated speed at drive	n_{1N}	i = 4/5	2100 min^{-1}	1500 min^{-1}
		i = 7/10	2600 min^{-1}	2300 min^{-1}
		i = 16	2900 min^{-1}	2700 min^{-1}
		i = 50	3200 min^{-1}	2900 min^{-1}
		i = 100	3900 min^{-1}	3400 min^{-1}
Ratio (i)	i	1-stage	4/5/7/10	4/5/7/10
		2-stage	16/20/28/40/ 50/70/100	16/20/28/40/ 50/70/100
Distortion backlash, standard	j_t	1-stage	≤ 4 arcmin	≤ 4 arcmin
		2-stage	≤ 6 arcmin	≤ 6 arcmin
Distortion backlash, reduced	j_t	1-stage	≤ 2 arcmin	≤ 2 arcmin
		2-stage	≤ 4 arcmin	≤ 4 arcmin
Distortion rigidity	C_{t21}		45 Nm/arcmin	144 Nm/arcmin
Max. axial force with respect to shaft centre at output	F_{2AMax}		9400 N	13500 N
Max. radial force with respect to shaft centre at output	F_{2RMax}		9000 N	14000 N
Idling torque at 20 °C gearbox temperature and 3000 min^{-1}	T_{012}	i = 4	≤ 3.9 Nm	≤ 6.2 Nm
		i = 16	≤ 2.4 Nm	–
		i = 100	≤ 1.1 Nm	–
Max. pull-out torque	M_{2KMax}		907 Nm	1523 Nm
Service life	L_h		> 20000 h	> 20000 h
Efficiency at full load	η	1-stage	> 97 %	> 97 %
		2-stage	> 94 %	> 94 %
Weight	m	1-stage	11.500 kg	27.000 kg
		2-stage	14.500 kg	29.000 kg
Lubrication			Synth. gearbox oil, viscosity class ISO VG220	Synth. gearbox oil, viscosity class ISO VG220
Paint			RAL 5002	RAL 5002
Fitting positions			Variable	Variable
Permissible gearbox temperature			–10 to +90 °C	–10 to +90 °C
Direction of rotation			Motor and gearbox in same direction	
Protection type			IP 64	IP 64
Running noise at 3000 min^{-1}	L_{PA}		≤ 70 dB (A)	≤ 70 dB (A)

Mass inertia

J_1 in kgcm^2												
Gearbox size	**Shaft diameter [mm]**	**Increasing ratio**										
		single-stage				**double-stage**						
		4	**5**	**7**	**10**	**16**	**20**	**28**	**40**	**50**	**70**	**100**
SP 060	≤ 11	0.14	0.14	0.13	0.12	0.15	0.15	0.15	0.12	0.12	0.12	0.12
	> 11 to ≤ 14	0.17	0.17	0.16	0.15	0.19	0.19	0.19	0.15	0.15	0.15	0.15
SP 075	≤ 11	0.52	0.44	0.38	0.35	0.48	0.47	0.47	0.34	0.34	0.34	0.34
	> 11 to ≤ 14	0.57	0.49	0.43	0.40	0.53	0.52	0.52	0.39	0.39	0.39	0.39
	> 14 to ≤ 19	0.63	0.55	0.49	0.46	0.59	0.58	0.58	0.45	0.45	0.45	0.45
SP 100	≤ 14	1.9	1.6	1.3	1.2	1.7	1.7	1.7	1.1	1.1	1.1	1.1
	> 14 to ≤ 19	2.0	1.7	1.4	1.3	1.8	1.8	1.8	1.2	1.2	1.2	1.2
	> 19 to ≤ 24	2.7	2.4	2.1	2.0	2.5	2.5	2.5	1.9	1.9	1.9	1.9
	> 24 to ≤ 28	3.5	3.2	2.9	2.8	3.3	3.3	3.3	2.7	2.7	2.7	2.7
	> 28 to ≤ 32	4.6	4.3	4.0	3.9	4.4	4.4	4.4	3.8	3.8	3.8	3.8
SP 140	≤ 19	5.0	4.1	3.3	2.8	4.4	4.4	4.4	2.7	2.7	2.7	2.7
	> 19 to ≤ 24	5.7	4.8	4.0	3.5	5.1	5.1	5.1	3.4	3.4	3.4	3.4
	> 24 to ≤ 32	8.4	7.5	6.7	6.2	7.8	7.8	7.8	6.1	6.1	6.1	6.1
	> 32 to ≤ 35	8.2	7.3	6.5	6.0	7.6	7.6	7.6	5.9	5.9	5.9	5.9
	> 35 to ≤ 38	10.0	9.1	8.3	7.8	9.4	9.4	9.4	7.7	7.7	7.7	7.7
SP 180	≤ 19	–	–	–	–	5.0	4.8	4.6	2.8	2.8	2.7	2.7
	> 19 to ≤ 24	–	–	–	–	5.7	5.5	5.3	3.5	3.5	3.4	3.4
	> 24 to ≤ 32	–	–	–	–	8.4	8.2	8.0	6.2	6.2	6.1	6.1
	> 32 to ≤ 35	–	–	–	–	8.2	8.0	7.8	6.0	6.0	5.9	5.9
	> 35 to ≤ 38	–	–	–	–	10.0	9.8	9.6	7.8	7.8	7.7	7.7
	≤ 32	30.6	24.9	20.0	17.4	–	–	–	–	–	–	–
	> 32 to ≤ 38	31.7	26.0	21.1	18.5	–	–	–	–	–	–	–
	> 38 to ≤ 48	36.2	30.5	25.6	23.0	–	–	–	–	–	–	–



SP series gearbox

Dimensions

Size	Toler- ances	SP 060		SP 075		SP 100		SP 140		SP 180	
Gearbox stages		1	2	1	2	1	2	1	2	1	2
DR		M5		M8		M12		M16		M20	
D1	g6	60		70		90		130		160	
D2		30		38		55		70		90	
D3	k6	16		22		32		40		55	
D4		5.5		6.6		9		11		13	
D5		68		85		120		165		215	
D10	+ 1	61.5		82		106		140		193	
L1	± 2	129	149	156	182.5	202	234.5	256.5	296.5	297	315.5
L2		28		36		58		82		82	
L3		20		20		30		30		30	
L4		6		7		10		12		15	
L5		60	80	71	97.5	76	108.5	102	142	132.5	158
L11	± 2	62		76		101		141		182	
L12		2		2		2		3		3	
L13	+ 1	60		80		100		140		190	140
L21		15		22		28		30.5		37.5	30.5
t		12.5		19		28		36		42	

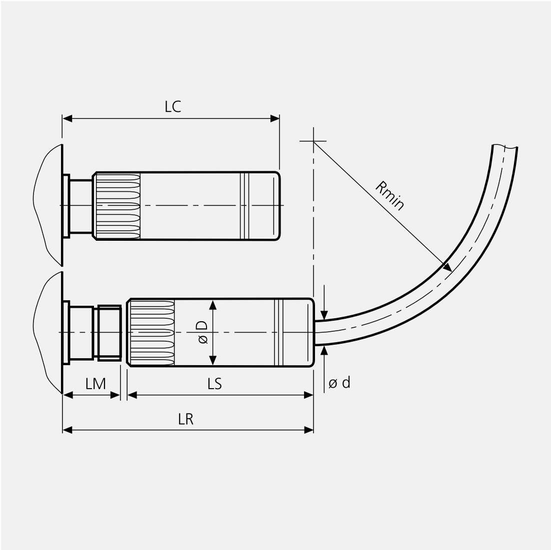
All dimensions in mm

Motor–gearbox compatibility

Gearbox	DSM 4-05	DSM 4-07	DSM 4-09	DSM 4-11	DSM 4-14	DSM 4-19
SP 060-MF1	L13 = 60 L21 = 15	L13 = 70 L21 = 15	L13 = 90 L21 = 15	–	–	–
SP 075-MF1	–	L13 = 80 L21 = 22	L13 = 90 L21 = 22	L13 = 100 L21 = 22	–	–
SP 100-MF1	–	–	L13 = 100 L21 = 28	L13 = 100 L21 = 28	L13 = 140 L21 = 28	–
SP 140-MF1	–	–	L13 = 140 L21 = 30.5	L13 = 140 L21 = 30.5	L13 = 140 L21 = 30.5	–
SP 180-MF1	–	–	–	–	L13 = 190 L21 = 37.5	L13 = 190 L21 = 37.5
All dimensions in mm						

Gearbox options SP

Example	SP X - M F X - X - X X X / Motor
Gearbox type 060 075 100 140 180 210 240	SP **X** - M F X - X - X X X / Motor
Gearbox version M = motor-mounted gearbox	SP X - **M** F X - X - X X X / Motor
Gearbox model F = standard model FPM seals (Viton®)	SP X - M **F** X - X - X X X / Motor
Stage count 1 = 1-stage 2 = 2-stage	SP X - M F **X** - X - X X X / Motor
Reduction ratio 004/005/007/010 = 1-stage 016/020/028/040/050/070/100 = 2-stage	SP X - M F X - **X** - X X X / Motor
Form of drive shaft 0 = smooth shaft 1 = smooth shaft with featherkey, form A DIN 6885 2 = involute DIN 5480 4 = other	SP X - M F X - X - **X** X X / Motor
Drilling diameter of the clamping receiver prescribed by supplier based on motor description	SP X - M F X - X - X **X** X / Motor
Backlash level 1 = standard 0 = reduced	SP X - M F X - X - X X **X** / Motor
Motor description see Motor type key or Motor–gearbox compatibility	SP X - M F X - X - X X X / **DSM 4-X**



Schematic diagram of the connector fitting space

Connector fitting space

The rule of thumb for calculating the connector fitting space R_{min} is:

– Drag-chain lines (mobile): R_{min} = 15 x d
– Stationary wiring: R_{min} = 10 x d

The permissible temperature range depends on whether the cables are mobile or stationary:

– Stationary: –40 °C to +85 °C
– Mobile: –20 °C to +85 °C

The following data applies only to Berger Lahr motor and encoder cables or connectors:

Connector data

Dimensions	Servomotor connector	Servo-encoder connector	Stepping-motor connector (motor, encoder)
D	28	26	25
LS	79	54	65
LR	115	80	89
LC	95	65	75
LM	34	24	22

Cable data for motor connection

Cross section	d	Tolerance	Permissible voltage
1.5 mm^2	9.5 mm	± 0.3 mm	500 V (stepping motor)
1.5 mm^2	11.3 mm		800 V (servo)
2.5 mm^2	14.1 mm		800 V (servo)
4.0 mm^2	15.4 mm		800 V (servo)

Cable data for encoder connection

Cross section	d	Tolerance
–	8.8 mm	± 0.3 mm

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Catalogue

Stepper Motor Drives SD3

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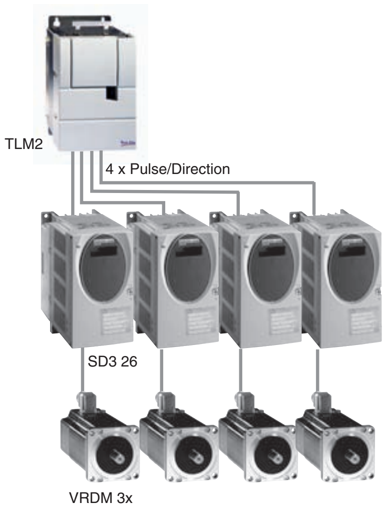


Product overview

The SD3 is a universally applicable stepper drive.
Reference values are typically preset and monitored by a higher level PLC or a Berger Lahr motion controller (TLM2).
A very compact and high-performance drive system has been created in combination with the VRDM 3 3-phase stepper motors by Berger Lahr.

Special features

Compactness
With its compact dimensions (H x W x D: 145 mm x 72 mm x 140 mm) the SD3 stepper drive requires little space in the switching cabinet.

Simplicity
The simple cabling and parameterisation of the SD3 26 makes it easy to commission quickly. Commissioning software is not required.
The SD3 28 can be easily configured with the integrated control panel (HMI), via fieldbus or with the "BLCT" commissioning software.

Flexibility
SD3 is available in two power classes: 2.5 A and 6.8 A. Depending on the device type the SD3 includes the following components:

- an opto-isolated signal interface for 5-V and 24-V input signals (SD3 26 only)
- an RS422 interface for pulse/direction signals or A/B encoder signals (SD3 28)
- a fieldbus interface for SD3 28•: CANopen and Modbus (SD3 28A) or Profibus (SD3 28B)
- analogue reference input ±10 V (SD3 28)
- a power supply unit for single-phase mains voltages of 115 V_{AC} and 230 V_{AC}
- integrated mains filter

The SD3 26 can optionally be delivered with an electronic system for rotation monitoring and brake control.

Application options

The SD3 stepper motor drive has very good synchronisation characteristics, which are necessary for scanning or exposure, for example.

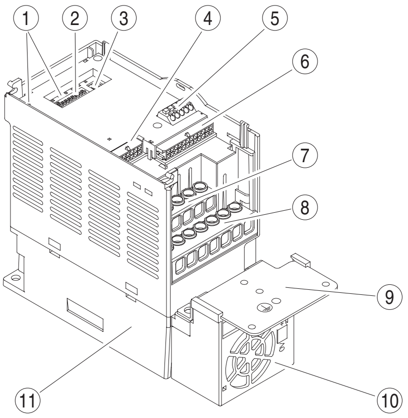
Due to the high torque at low speeds, the stepper motor drive is particularly suited for short-distance position movements.

Another advantage is its high holding torque at standstill. This allows automated tasks such as “pick and place” to be implemented very economically

Assignment of stepper motors and SD3 stepper motor drives

3-phase stepper motors	SD3 26•U25 SD3 28•U25	SD3 26•U68 SD3 28•U68
	115 V / 230 V; 2.5 A; including mains filter	115 V / 230 V; 6.8 A; including mains filter and fan
	 	 
VRDM 368 / 50L W	1.7 Nm / 1.5 Nm [1]	
VRDM 397 / 50L W	2.3 Nm / 2.0 Nm	
VRDM 3910 / 50L W	4.5 Nm / 4.0 Nm	
VRDM 3913 / 50L W	6.8 Nm / 6.0 Nm	
VRDM 31117 / 50L W		13.5 Nm / 12.0 Nm
VRDM 31122 / 50L W		19.7 Nm / 16.5 Nm

1) The 1st value is the holding torque M_H at standstill of the stepper motor, the 2nd value is the nominal torque M_N during operation of the motor.



Product Description

Device overview

(1) LEDs for status display
(2) Parameter switch for configuration of the device
(3) Rotary switch for adjustment of the motor current
(4) CN2 rotation monitoring (12-p in female connector, optional)
(5) 24V CN3 interface (spring loaded terminals, optional)
- 24V controller supply voltage
- 24V outputs (holding brake and encoder errors)

(6) CN1 signal interface (24-pin female connector)
- Inputs 5V, opto-isolated
- Inputs 24V, opto-isolated
- Output Readiness

(7) Screw terminals for connecting the mains supply
(8) Screw terminals for connecting the motor
(9) EMC mounting plate (included with the servo drive)
(10) Fan (in scope of supply for SD326•U68)
(11) Heat sink

Signal interface CN1

The setpoint position of the stepper motor is preset as a pulse signal by a controller via the CN1 signal interface. A pulse corresponds to one step of the motor.
In addition, the following functions can be activated via input signals:
- Activate/deactivate power amplifier or pulses
- Direction of rotation left/right
- Increase/decrease step count by a factor of 10
- Change motor current

An electronic relay contact reports operating readiness. All input signals can be sent as 5-V or 24-V signals via optocouplers.

CN2 rotation monitoring (optional)

If the SD3 26 includes electronics for rotation monitoring and the stepper motor has an encoder, the encoder on the CN2 interface can be connected for position monitoring. If the actual position of the motor deviates from the setpoint position, the SD3 26 reports an encoder error via a 24-V output on the CN3 interface. The power for the encoder is supplied via the CN2 interface.
An input signal of the CN2 interface is used to monitor the temperature of the motor.

Holding brake output on CN3 (optional)

If the SD3 26 is equipped with electronics for rotation monitoring, a holding brake on the stepper motor can be controlled via a 24-V output.

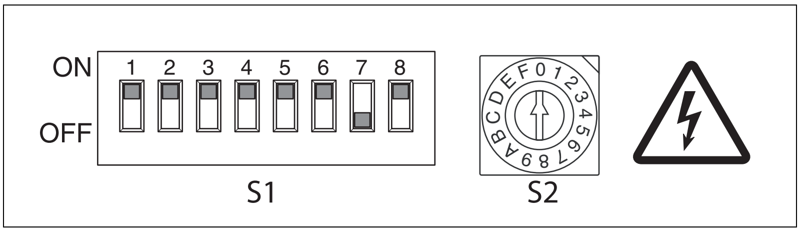
The SD3 26 is optionally available in the combination of holding brake output and rotation monitoring. Rotation monitoring can be activated by a parameter switch.

Functions

Parameter setting

The following functions can be activated via the parameter switch of the SD3 26:

- Motor phase current
- Number of steps
- Current reduction when idle
- “Softstep”
- Rotation monitoring (only for device versions with rotation monitoring SD3 26R...)
- Function of the signal inputs "ENABLE/GATE" and "PULSE/DIR or CW/CCW"



Parameter switches

Setting motor phase current

The motor phase current is set on the rotary switch S2. The motor phase current should not exceed the nominal current of the motor because otherwise there is a danger that the motor can overheat. A low motor phase current produces a low torque.

Setting options with rotary switches

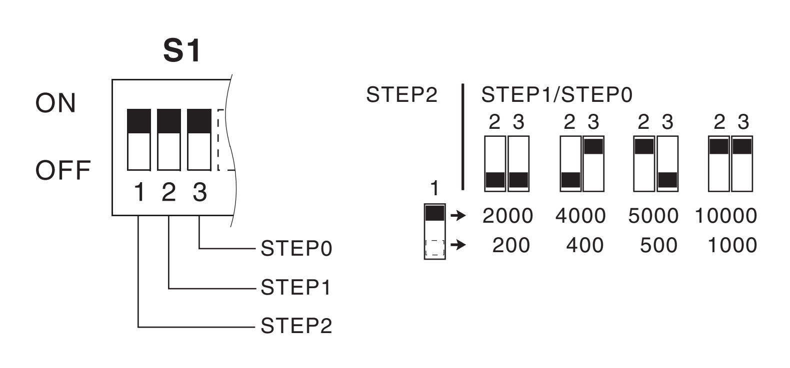
Switch position S2	Motor phase current [A]	
	SD3 26•U25	SD3 26•U68
0 (factory setting)	0.6	1.7
1	0.8	2.0
2	0.9	2.4
3	1.0	2.7
4	1.1	3.1
5	1.3	3.4
6	1.4	3.7
7	1.5	4.1
8	1.6	4.4
9	1.8	4.8
A	1.9	5.1
B	2.0	5.4
C	2.1	5.8
D	2.3	6.1
E	2.4	6.5
F	2.5	6.8

Setting number of steps

The resolution of the stepper motor drive is set via the step number.

Example:
With a step number of 1000, the stepper motor drive performs exactly one revolution for 1000 pulses. With a pulse frequency of 1 kHz, the result is therefore a speed of rotation of 60 1/min.

Setting options via parameter switches
Step number: 200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000 per revolution



Setting number of steps

The switch setting S1.1 "STEP2" can be inverted via the input signal `STEP2_INV`. As a result, the step number is increased or decreased by a factor of 10.

Activate motor phase current reduction when idle

When the full holding torque is not required when idle, it is possible to use the "Motor phase current reduction" function in order to reduce the holding torque. As a result, there is less heating up of the motor and electronics and efficiency is increased.
The motor phase current is reduced to approximately 60% of the set current value 100 ms after receiving the last pulse edge.

Setting options via parameter switches
Activate/deactivate motor phase current reduction

Activate "Softstep" function

In the "Softstep" function, reference value is set internally with a higher resolution. The result is a significantly quieter running motor, particularly at low speeds of rotation or an erratic change in the reference value.
The motor accelerates and delays virtually jerk-free. The transitions are smoothed out, i. e. the motor can follow the set reference value significantly better with rapid changes in the frequency.

Setting options via parameter switches
Activate/deactivate "Softstep" function

Activate “rotation monitoring” function (only for SD3 26R... with rotation monitoring)

The "rotation monitoring" function compares the setpoint and actual position of the motor and reports errors if the setpoint position deviates from the actual position. A prerequisite for this is that the SD3 be equipped with electronics for rotation monitoring and the stepper motor has an encoder with a resolution of 1000 increments/rotation.

Setting options via parameter switches
Activate/deactivate “Rotation monitoring” function

Signal inputs

All signal inputs are available as a 5-V- or 24-V optocoupler inputs.

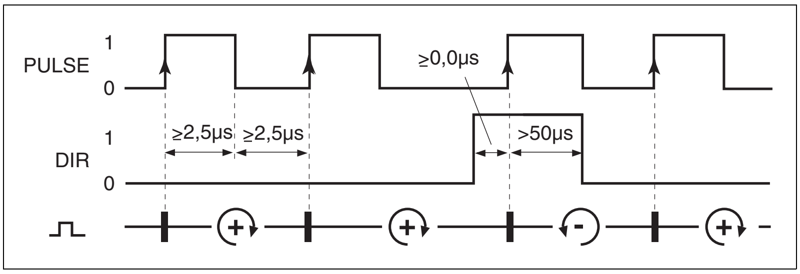
The reference value is set via the signal input "PULSE/DIR or CW/CCW"

The reference value can alternatively be set via one of the two following interface modes:

- `PULSE/DIR`
- `CW/CCW`

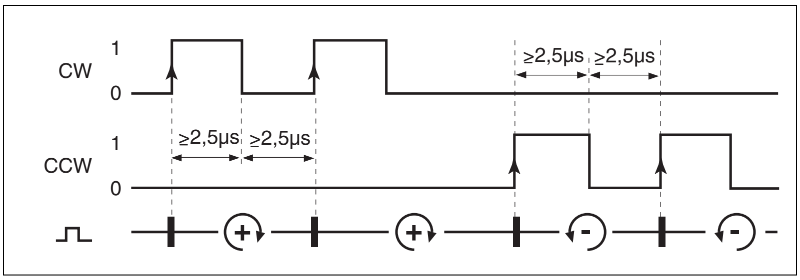
The pulse frequency is 200 kHz.

"PULSE/DIR" interface mode
With the rising edge of the signal `PULSE`, the motor executes an angular step. The direction of rotation is controlled with the signal `DIR`.



"PULSE/DIR" interface mode

"CW/CCW" interface mode
With the rising edge of the signal `CW`, the motor executes a positive angular step. With the rising edge of the signal `CCW`, the motor executes a negative angular step.



“CW/CCW” interface mode

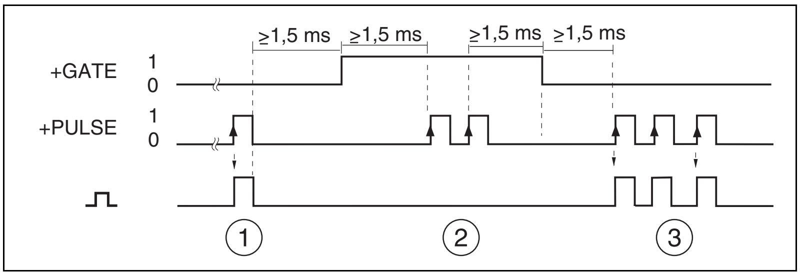
Setting options via parameter switches
Set the function of the signal input "PULSE/DIR or CW/CCW"

Setting function of the "ENABLE/GATE" signal input

The signal input "ENABLE/GATE" can take over two functions:

"ENABLE" function: release/enable power amplifier
The "ENABLE" function enables the power amplifier to allow control of the motor.

“GATE” function: Release/disable the pulse input
The “GATE“ function disables the pulses on the reference value input without shutting off operating readiness. In a multiple-axle system, you can select the “GATE“ function for individual axes.



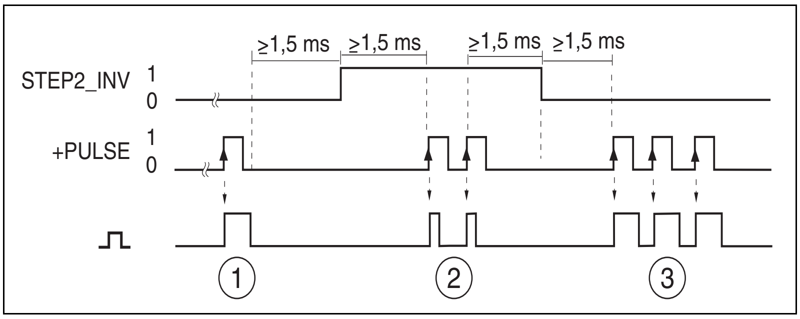
Signal results when activating via the “GATE” function

(1) Motor step
(2) No motor steps
(3) Motor steps

Setting options via parameter switches
Set the function of the signal input "ENABLE/GATE"

Changing the step with signal input "STEP2_INV"

The signal input "STEP2_INV" can be used if a high positioning precision is required but the output frequency of the master controller is limited.
The number of steps can be increased or reduced by a factor of 10 with the signal input "STEP2_INV".



Signal sequences as with switching the signal `STEP2_INV`

(1) Large motor step
(2) Motor steps lower by a factor of 10
(3) Large motor steps

Control the motor phase current via the signal input "PWM"

Through the pulse-pause ratio of a rectangular signal on the signal input "PWM" (PWM: pulse width modulation), you can change the motor phase current between 0% and 100% of the maximum current set on the rotary switch. The frequency of the rectangular signal must be between 6 kHz and 25 kHz.
At constant 1-level no motor phase current flows (current reset to zero).
At constant 0-level the motor operates at the specified maximum motor phase current.

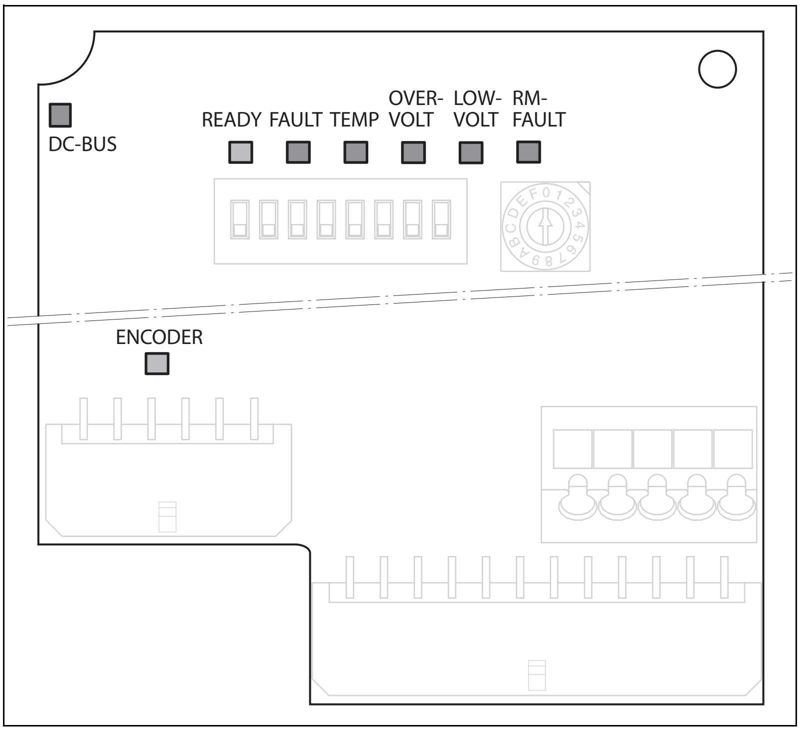
Signal outputs

The following signal outputs are available:

- electronic "ACTIVE_OUT" relay contact to display operating readiness
- 24-V signal output "+BRAKE_OUT" to control a motor holding brake (optional only for SD3 26R...)
- 24-V signal output "RM-FAULT_OUT" to display an error during rotation monitoring (optional only for SD3 26R...)

Status display

The LEDs display the current operating status.

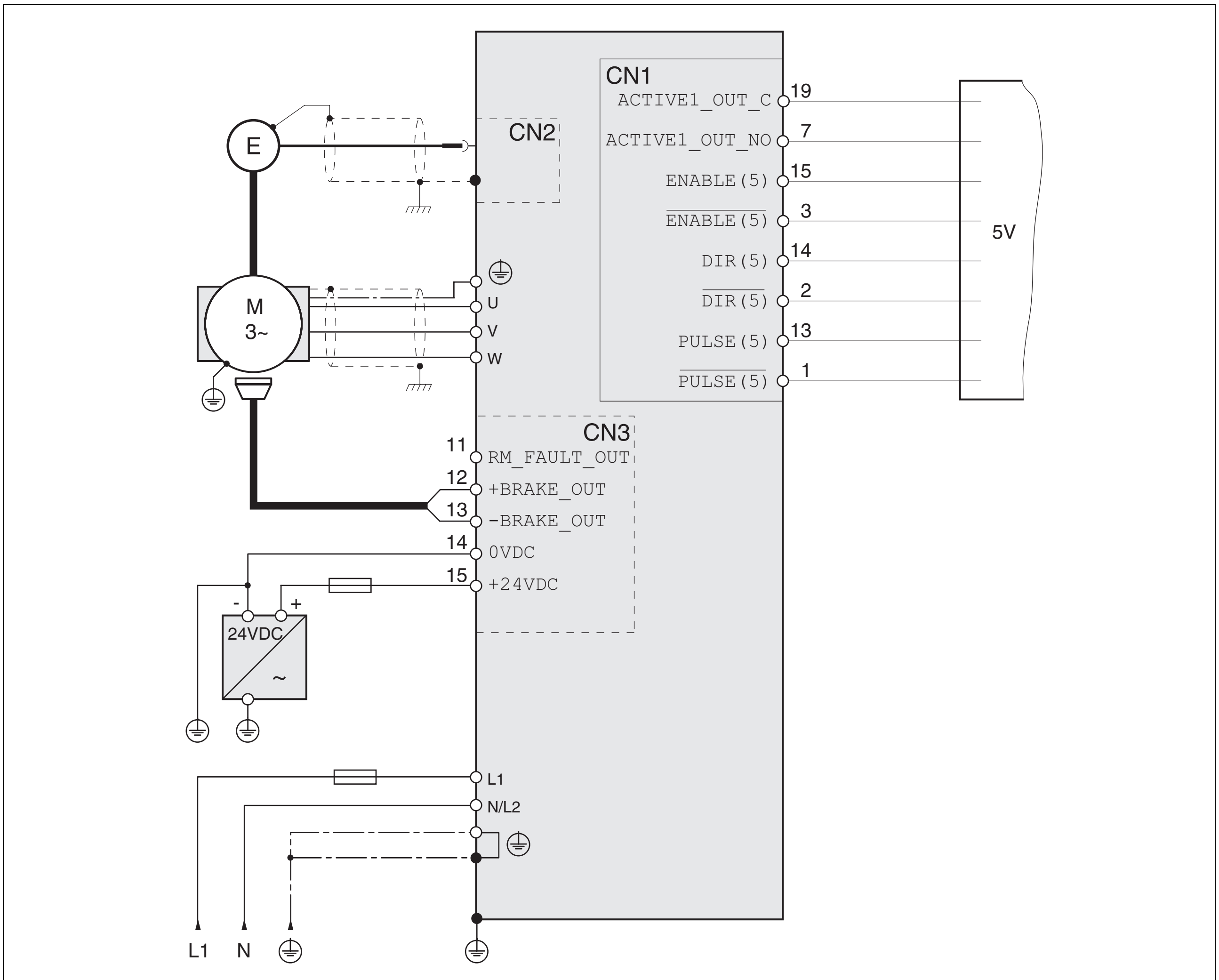


Status display

LED	Description
READY	Ready, power amplifier activated, motor receiving current (1-level on input signal ENABLE)
FAULT	Short circuit between two motor phases or between motor phase against PE
TEMP (static) TEMP (flashing [1])	Overtemperature power amplifier Overtemperature motor
OVER-VOLT	Overvoltage (>410%)
LOW-VOLT	Undervoltage (<200%)
RM-FAULT [1]	Error message by rotation monitoring
OVER-VOLT, LOW-VOLT	Power amplifier deactivated, motor current-free (0-level on input signal ENABLE)
FAULT, TEMP, OVER-VOLT, LOW-VOLT	Frequency at signal interface too high

1) Only for SD3 26R...

Wiring example



Wiring example

Technical Data

Mechanical data

		SD3 26•U25	SD3 26•U68
Dimensions (W x H x D)	mm	72 x 145 x 140	
Weight	kg	1.1	1.2
Type of cooling		Convection	Fan
Max. motor speed	1/min	3000	

Electrical Data

Mains supply		**SD3 26•U25**	**SD3 26•U68**
Nominal voltage (switching)	V	115 / 230 (1~)	
Max. rated motor current	A	2.5	6.8
Nominal power (115 V / 230 V)	W	180 / 270	280 / 420
Max. permissible mains short circuit current	kA	0.5	0.5
Line-side fuse (115V/230V)	A	6 / 6	10 / 6
Voltage range and tolerance			
• 115 V_{AC}	V	100 - 15% ... 120 + 10%	
• 230 V_{AC}	V	200 - 15% ... 240 + 10%	
Frequency	Hz	47...63	
Transient overvoltage		Overvoltage category III	
Inrush current	A	< 60	
Leakage current (as per IEC 60990, Figure 3)	mA	<30	
Signal interface CN1			
5-V optocoupler input signals			
• Logic 1 (U_{high})	V	+2.5 ... +5.25	
• Logic 0 (U_{low})	V	≤0.5	
• Input current	mA	≤25	
• Max. input frequency	kHz	≤200	
24-V optocoupler input signals			
• Logic 1 (U_{high})	V	+15...+30	
• Logic 0 (U_{low})	V	≤5	
• Input current	mA	≤7	
• Max. input frequency	kHz	≤200	
"Readiness" signal output		Electronic relay	
• Max. switching voltage	V_{DC}	≤30	
• Max. switching current	mA	≤200	
• Voltage drop at 50 mA load	V	≤1	
Rotation monitoring interface CN2 (optional)			
"ENC+5V_OUT" signal output		Sense-regulated, short-circuit-proof, overload-proof	
• Supply voltage	V	4.75 ... 5.25	
• Max. output current	mA	≤100	
• Voltage drop at 50 mA	V	≤1	
"ENC_A/ENC_B" signal input			
• Voltage symmetrical	V	conforming to RS422	
• Input frequency	kHz	≤ 400	
24-V interface CN3 (optional)			
24-V control voltage		As per IEC 61131-2	
• Input voltage	V	24 -15% / +20%	
• Current consumption	A	≤0.2	
• Ripple voltage	%	< 5	
24V output signals		As per IEC 61131-2	
• Output voltage	V	≤30	
• Max. switching current $\overline{\texttt{RM-FAULT\_OUT}}$	V	≤50	
• Max. switching current `+BRAKE_OUT`	A	≤1.7	
• Voltage drop at 50 mA load	V	≤1	

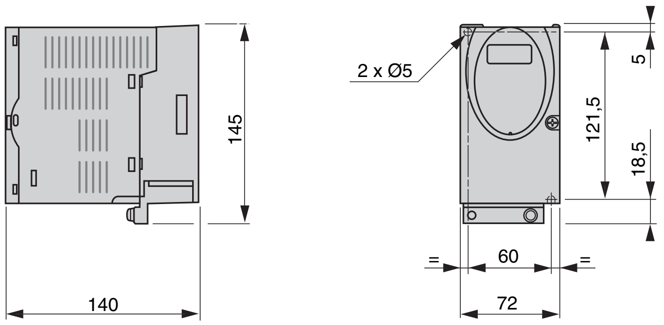
Ambient conditions

Ambient temperature [1]	°C	0...+50
Transport and storage temperature	°C	-25 ... +70
Pollution degree		Step 2
Relative humidity	%	5 ... 85, no condensation permissible
Installation height above mean sea level for 100% power	m	< 1000
Installation height	m	<2000; with max. ambient temperature 40 °C, without protective film and a lateral distance >50 mm
Oscillation and vibration		as per IEC/EN 60068-2-6 3 ... 13 Hz: 1.5 mm peak 13 ... 150 Hz: 1g
Shock loading		as per IEC/EN 60068-2-27 15 g for 11 ms
Degree of protection		IP 20
		IP 40 restricted: from above only, without distance to protective cover

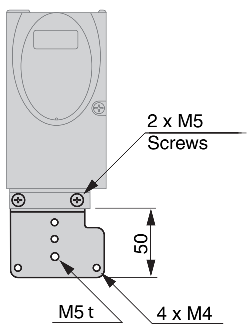
[1] no icing

Dimensional drawings

SD3 26



EMC mounting plate (included in scope of supply)



Type code

Example	SD3	26	D	U25	S2
Product designation SD3 = stepper drive 3-phase	**SD3**	26	D	U25	S2
Product type 26 = standard stepper drive	SD3	**26**	D	U25	S2
Interfaces D = pulse direction without rotation monitoring R = pulse-direction with rotation monitoring and holding brake connection	SD3	26	**D**	U25	S2
Max. rated motor current U25 = 2.5 A U68 = 6.8 A	SD3	26	D	**U25**	S2
Power amplifier supply voltage S2 = 1~, 115 V_{AC} / 230 V_{AC} (switching)	SD3	26	D	U25	**S2**

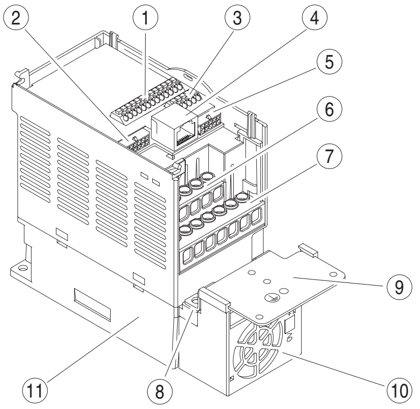
Possible order numbers

Type	Order number
SD3 26D U25 S2	063711110100
SD3 26D U68 S2	063711110101
SD3 26R U25 S2	063711110200
SD3 26R U68 S2	063711110201

Product Description

Device overview

Components and interfaces



(1) CN1, I/O signal connection (spring loaded terminals)
- Analogue reference value input ±10V in oscillator operating mode (SD3 28A only)
- CANopen for fieldbus control (SD3 28A only)
- Profibus for fieldbus control (SD3 28B only)
- Eight digital inputs/outputs. The assignment depends on the selected operating mode.

(2) 12-pin CN2 female connector for motor encoder
(3) CN3 connection for 24-V power supply and holding brake terminal
(4) CN4, RJ45 female connector for connecting
- Fieldbus: Modbus or CANopen (SD3 28A only)
- PC with BLCT commissioning software
- Remote terminal

(5) 10-pin CN5 female connector for
- Feed of pulse/direction of A/B encoder signals in electronic gear operating mode

(6) Screw terminals for connecting the mains supply
(7) Screw terminals for connecting the motor and external braking resistors
(8) Base for attachment of the EMC mounting plate
(9) EMC mounting plate
(10) Fan (SD3 28•U68 only)
(11) Heat sink

Drive system

The SD3 28 is a universally applicable stepper drive.
Reference values are typically preset and monitored by a higher level PLC or a Berger Lahr motion controller, e.g. TLM2.
It offers a very compact and powerful drive system in combination with selected stepper motors from Berger Lahr.

Control

The setpoint value can be specified via:
- Fieldbus for profile position mode, profile velocity and oscillator mode (SD3 28A only). The SD3 28A can be controlled by Modbus and CANopen, the SD3 28B by Profibus.
- a ±10-V analogue signal in oscillator mode (SD3 28A only)
- Pulse/direction signals or A/B encoder signals for implementing electronic gear.

Rotation monitoring / motor monitoring

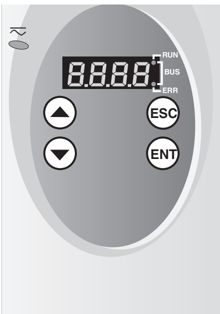
If a stepper motor is connected to an integrated encoder, the following functions can be enabled:
- Rotation monitoring:
  the calculated setpoint position and the actual position of the motor are compared. If a permanently defined variation is exceeded a rotation monitoring error is reported.
- Line monitoring:
  the encoder cable is monitored by a line monitor; a cable error is reported if a faulty or missing cable is detected.
- Motor temperature monitoring:
  the device shuts off if the motor temperature is too high.

Local communication

Overview

The SD3 28 stepper drive can be operated locally as follows:
- Integrated control panel (HMI) on the SD3 28 with keys and display
- Remote terminal
- "BLCT" PC commissioning software

Integrated control panel (HMI)



Integrated control panel (HMI)

The SD3 28 can be used to edit parameters with the integrated control panel (HMI – Human Machine Interface). Displays for diagnosis are also possible.
The integrated control panel includes the following options:
- Initial settings:
  - Motor selection
  - Fieldbus address and baud rate
  - Logic type of digital inputs and outputs (SD3 28A only)
- Device settings:
  - Special gear ratios
  - Phase current components for standstill, acceleration and constant movement
- Device configuration:
  - Processing the motor encoder position
  - Signal selection at position interface
  - Definition of direction of rotation
  - Time delay for opening and closing/releasing the holding brake
- Traverse motor manually
- Error display
- Status information:
  - Status of digital inputs and outputs
  - Actual speed and position of the motor
  - DC bus voltage of power amplifier supply voltage
  - Temperature of stepper drive and motor
  - Saved warnings and monitoring signals
  - Operating hours counter

Remote terminal

Remote terminal

A remote terminal can be connected to the SD3 28, which can be attached to a switching cabinet door with an IP 65 seal.
The remote terminal has a display and enables access to the same functions as the control panel integrated into the stepper drive (HMI).

"BLCT" PC commissioning software

"BLCT" PC commissioning software

The Windows-based "BLCT" commissioning software is used for easy commissioning, parameterisation, simulations and diagnostics of the SD3 28.
The BLCT software includes the options of loading and saving controller parameters and motor data.
Compared to the integrated control panel the "BLCT" commissioning software offers further options such as:
- Graphic interface for parameterisation and status display
- Extensive diagnostic tools for optimisation and maintenance
- Long-term recording as an aid to assessing operating behaviour
- Testing input and output signals
- Tracking signal sequences on the monitor
- Archiving all device settings and recordings with export functions for data processing

Functions

Commissioning functions

Commissioning can be run with the following tools:

- Integrated control panel (HMI)
- Remote terminal
- "BLCT" PC commissioning software
- Fieldbus

Two important commissioning functions of the SD3 28A are explained below. A detailed description of the commissioning functions is given in the device documentation.

Control over fieldbus or locally (SD3 28A only)

When a device is started for the first time, the setup menu must be used to specify whether access and parameterisation will be via local controller or via fieldbus. This specification can only be modified by restoring the factory setting. The operating modes available for the device also depend on this setting.

With local control the integrated control panel (HMI), the remote terminal (functionally equivalent to the integrated control panel) or the "BLCT" PC commissioning software is used. The movement is then preset with a ±10 V analogue signal or with RS422 signals (pulse/direction signals). Limit switches or reference switches cannot be connected with the local control.

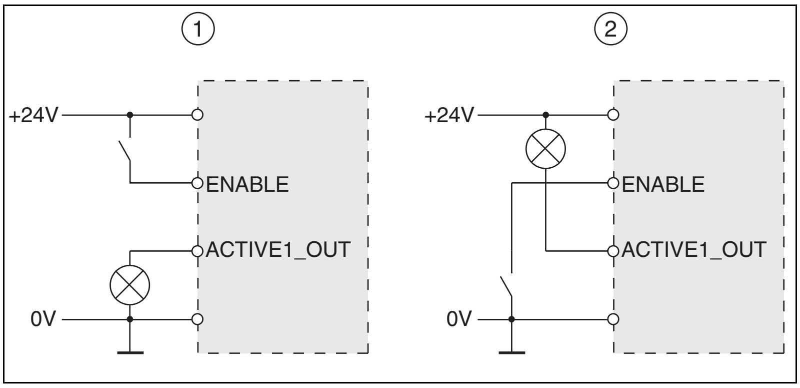
In fieldbus control mode all communications are made via fieldbus commands.

Determining logic type of signals (SD3 28A only)

At commissioning the signal logic (positive or negative) of the 24 V inputs and outputs can be specified.
This setting affects the wiring and the control of sensors and must be thoroughly clarified during engineering with regard to the application.
The SD3 28A can switch the 24-V inputs and outputs as follows:

- "Source" logic type:
  output supplies current, current flows to the input
- "Sink" logic type:
  output draws current, current flows from the input

By default the device is set to the "Source" logic type. The inputs for the "Power Removal" safety function are independent of the setting **always** executed in the "Source" logic type!



Logic type

(1) "Source"
(2) "Sink"

Operating modes

Overview of operating modes

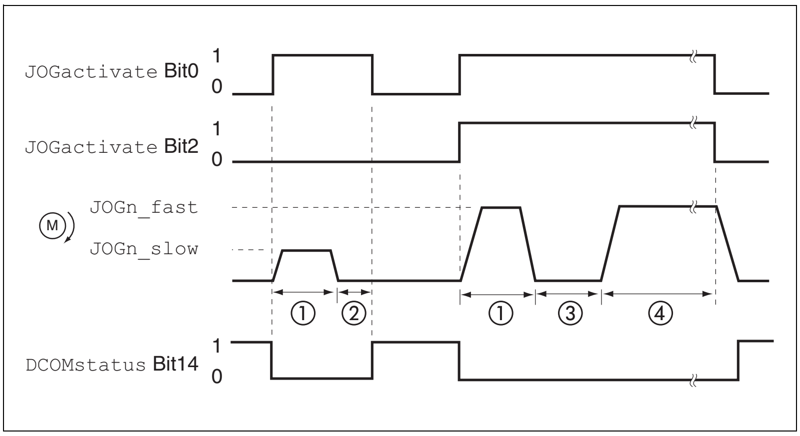
Operating mode	with SD3..		Controller via		Reference value preset by
	28 A	28B	Fieldbus	local	
Jog	x	x	x	x	Fieldbus, "BLCT" commissioning software or integrated control panel (HMI)
Oscillator	x		x	x	Fieldbus, "BLCT" commissioning software or ±10-V analogue signals
Electronic gear	x	x	x	x	Pulse/direction or A/B encoder signals
Profile position mode	x	x	x		Fieldbus or "BLCT" commissioning software
Profile velocity	x	x	x		Fieldbus or "BLCT" commissioning software
Homing	x	x	x		Fieldbus or "BLCT" commissioning software

Jog

The motor traverses by one traverse unit or at constant speed in continuous operation. The length of the traverse unit, the speed steps and the change-over time in continuous operation can be adjusted.

Reference value default
The reference values are set via fieldbus, with the "BLCT" PC commissioning software or the integrated control panel (HMI).

Application example
Setting up the machine during commissioning



Jog, slow and fast

(1) `JOGstepusr`
(2) t < `JOGtime`
(3) t > `JOGtime`
(4) Continuous operation

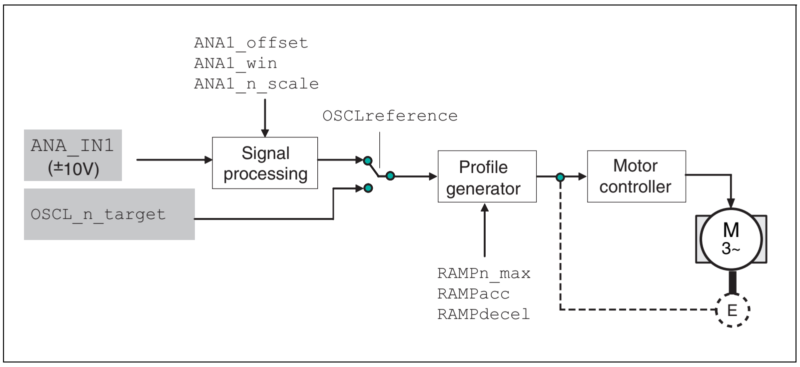
Inching distance, wait time and manual movement speeds can be set. If the inching distance is zero, jog starts directly with continuous movement irrespective of the wait time.

Oscillator (SD3 28A only)

In "Oscillator" operating mode the speed of rotation of the motor is set by a ±10-V analogue signal or by fieldbus parameters.

Reference value default
The reference values are set via fieldbus, with the "BLCT" PC commissioning software or ±10-V analogue signals.

Application example
Roller control in roller conveyors.



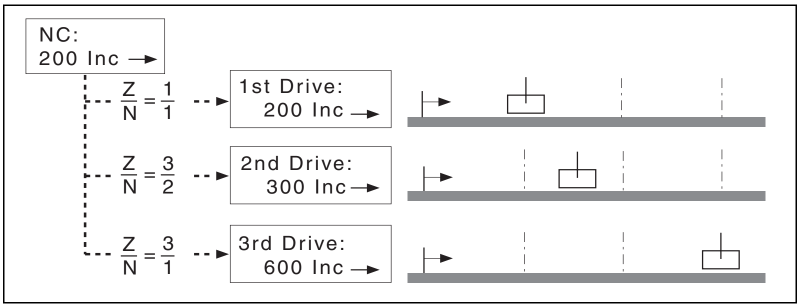
Overview operating mode "Oscillator"

Electronic gear

In "electronic gear" operating mode the reference signal from an encoder (A/B signals) or a controller (pulse/direction signals) are fed in and a new position setpoint is calculated with an adjustable gear ratio.

Reference value default
The reference value is set via pulse/direction or A/B encoder signals.

Example of application
Synchronisation of motion sequences, e.g. cutting material on a conveyor.



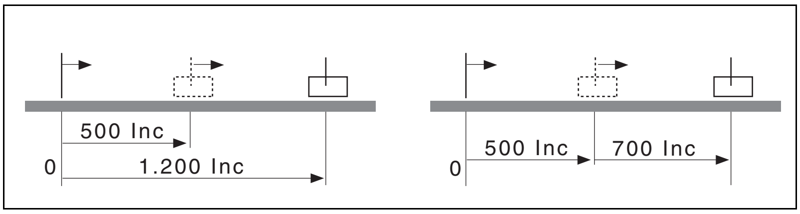
"Electronic gear" operating mode

Profile position mode

In "profile position" operating mode the motor is positioned from a point A to a point B with a positioning command.

Setting options
The positioning path can be input in two ways:

- Absolute positioning, reference point is the zero point of the axis
- Relative positioning, reference point is the current position of the motor



"Profile position" operating mode, absolute and relative

Reference value default
The reference values are set via fieldbus or with the "BLCT" PC commissioning software.

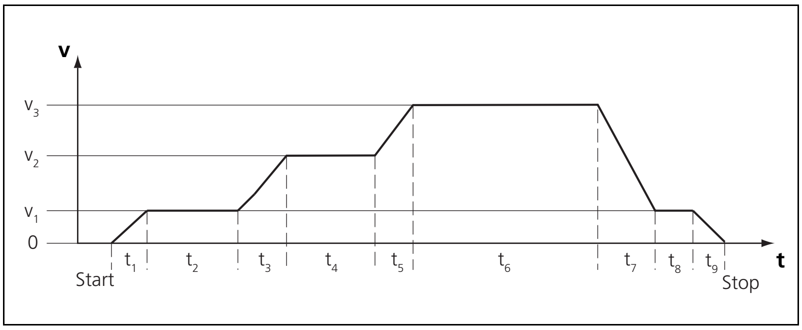
Application example
Pick-and-place with a linear robot

Profile velocity

In "profile velocity" operating mode a set speed for the motor is set and a movement without a target position is started. This speed is maintained until a different set speed is input or the operating mode is changed.

Reference value default
The reference values are set via fieldbus or with the "BLCT" PC commissioning software.

Example of application
Coating application in CD manufacture



Operating mode "profile velocity"

t_1, t_3, t_5	= acceleration
t_2, t_4, t_6, t_8	= constant movement
t_7, t_9	= braking

Homing

There are two types of homing:

- Reference movementSpecifying the dimension reference by approach to a limit or reference switch
- Set dimensionsSpecifying the dimension reference relative to the current motor position

Reference movement
In the reference movement a defined position on the axis is approached. The defined position is specified by a mechanical switch:

- Limit switch
- Reference switchREF

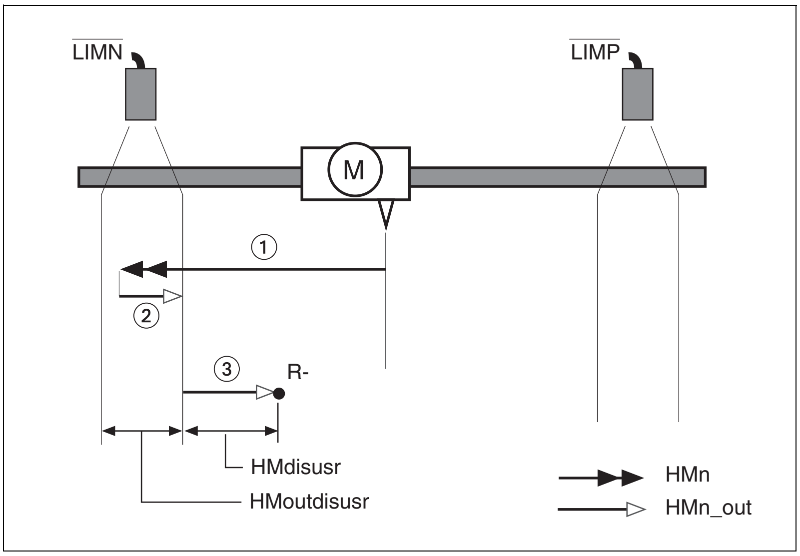
Types of reference movements
4 standard reference movements are available

- Movement to negative limit switch $\overline{\text{LIMN}}$
- Movement to positive limit switch $\overline{\text{LIMP}}$
- Movement to reference switch $\overline{\text{REF}}$ with counterclockwise rotation movement
- Movement to reference switch $\overline{\text{REF}}$ with clockwise rotation movement

A reference movement can be conducted with or without index pulse.

- Reference movement without index pulse
  Movement from the edge of the switch to a distance set by parameters from the edge of the switch.
- Reference movement with index pulse
  movement from switching edge to the physical index pulse of the motor.

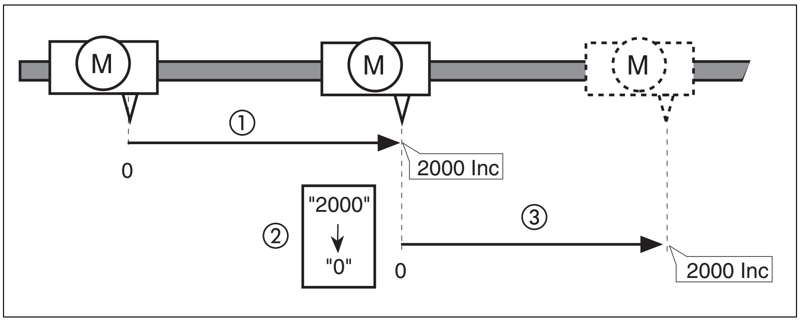
Example 1: Reference movement towards limit switch



"homing" operating mode, reference movement to the negative limit switch

(1) Movement to limit switch at search speed
(2) Movement to switching edge with clearance speed
(3) Movement at the distance to switching edge with clearance speed

Example 2: Dimension setting
Dimension setting can be used to carry out a continuous motor movement without exceeding positioning limits.



Positioning by 4000 increments with set dimensions

(1) The motor is positioned by 2000 Inc.
(2) By setting dimensions to 0 the current motor position is set to position value 0 and the new zero point is simultaneously defined.
(3) After triggering a new travel command by 2000 Inc the new target position is 2000 Inc.

This method avoids crossing absolute position limits during a positioning operation because the zero point is continuously tracked.

Reference value default
The reference values are set via fieldbus or with the "BLCT" PC commissioning software.

Application example
Before absolute positioning in profile position mode.

Safety function

Definition

Power Removal
The "Power Removal" safety function shuts off the motor torque safely. The supply voltage must not be interrupted. There is no monitoring at standstill.

Category 0 stop (EN60204-1)
Standstill by immediate power shutdown to the machine drive elements (i.e. an uncontrolled stop).

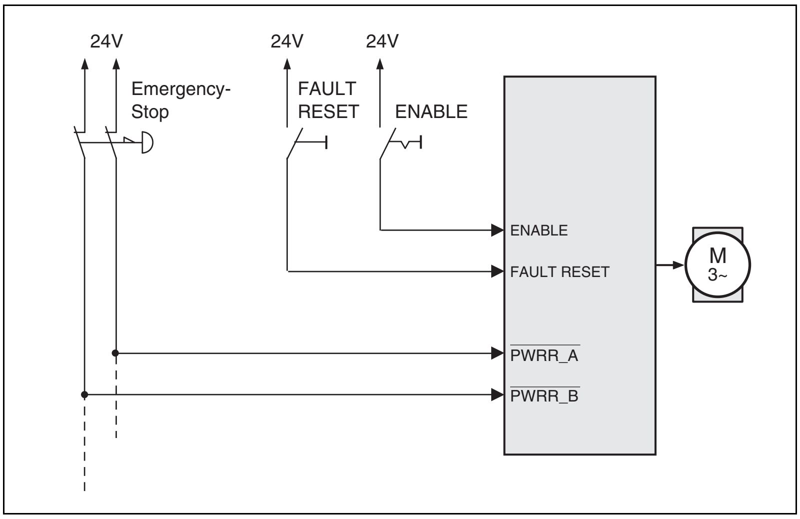
Category 1 stop (EN60204-1)
A controlled stop in which the machine drive elements are retained to effect the standstill. Power feed is only interrupted when everything has come to a standstill.

Description

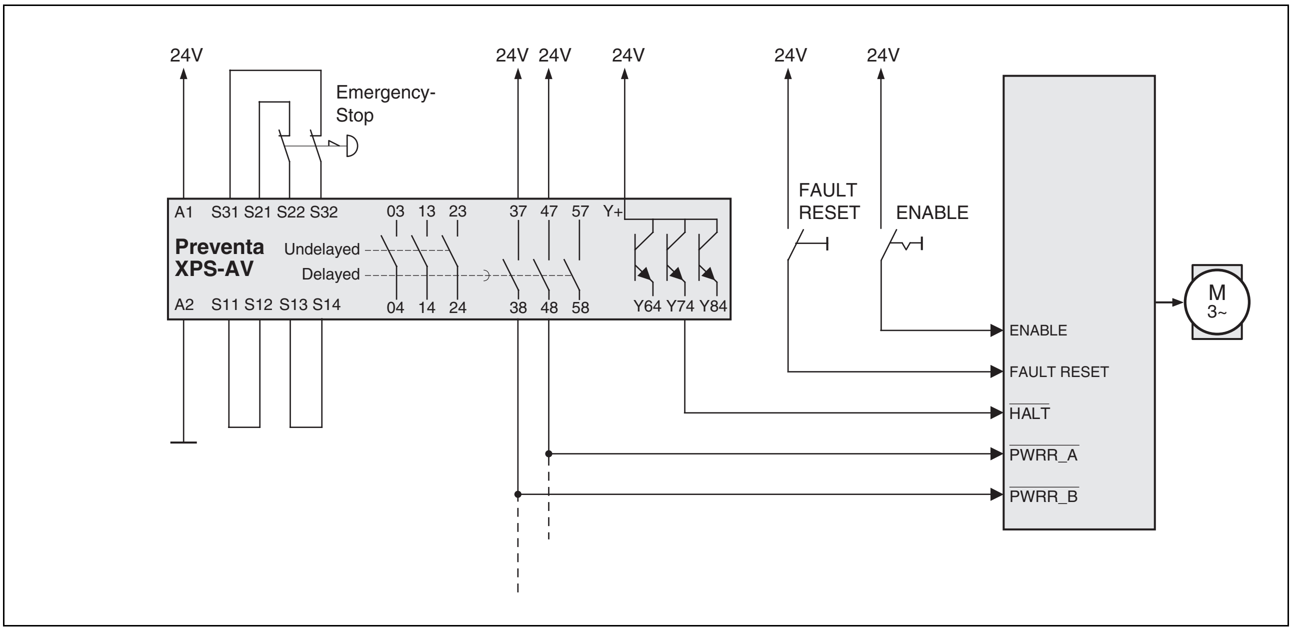
The "Power Removal" safety function integrated into the product can be used to implement the "Emergency Stop" control function (EN 60204-1) for Category 0 Stop and Category 1 Stop. This safety function also prevents the compact drive from unexpected restart.
The following safety levels are implemented in accordance with the standards for functional safety:

- IEC 61508, SIL 2: functional safety of electrical/electronic programmable safety-related systems
- pr IEC 62061, SIL 2: Safety of machinery - Functional safety of electrical, electronic and programmable controllers of machines
- EN 954-1, Category 3: Safety of machinery, Safety of components of control devices, Part 1: General design requirements
- pr EN 13849-1, Category 3: Safety of machines, Safety of components of control devices, Part 1: General design requirements

Examples of applications for the safety function



Example category 0 stop



Example category 1 stop

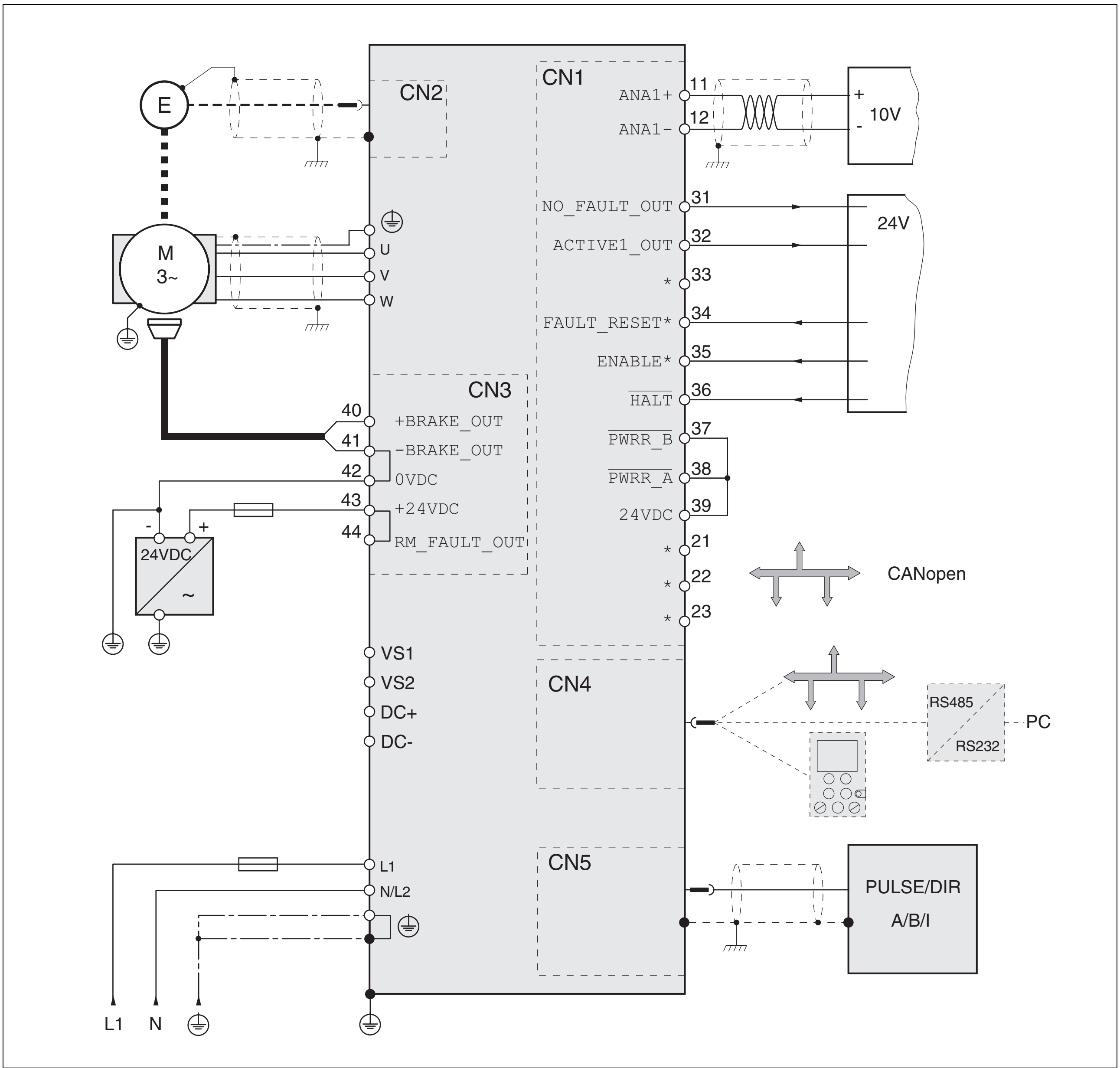
Operating functions

Additional monitoring and operating functions can be activated via fieldbus, the "BLCT" PC commissioning software or the integrated control panel (HMI):

- Setting motor phase current
- Monitoring functions
- Status monitoring in movement mode
- Monitoring of axis signals
- Monitoring internal signals
  - Earth fault and short-circuit monitoring
- Scaling for conversion of user-defined units to internal units
- Setting travel profile via profile generator
- Triggering Quick Stop function
- Setting STOP signal
- Fast position capture
- Velocity window
- Triggering brake functions on motor with holding brake
- Reversing direction of rotation of motor

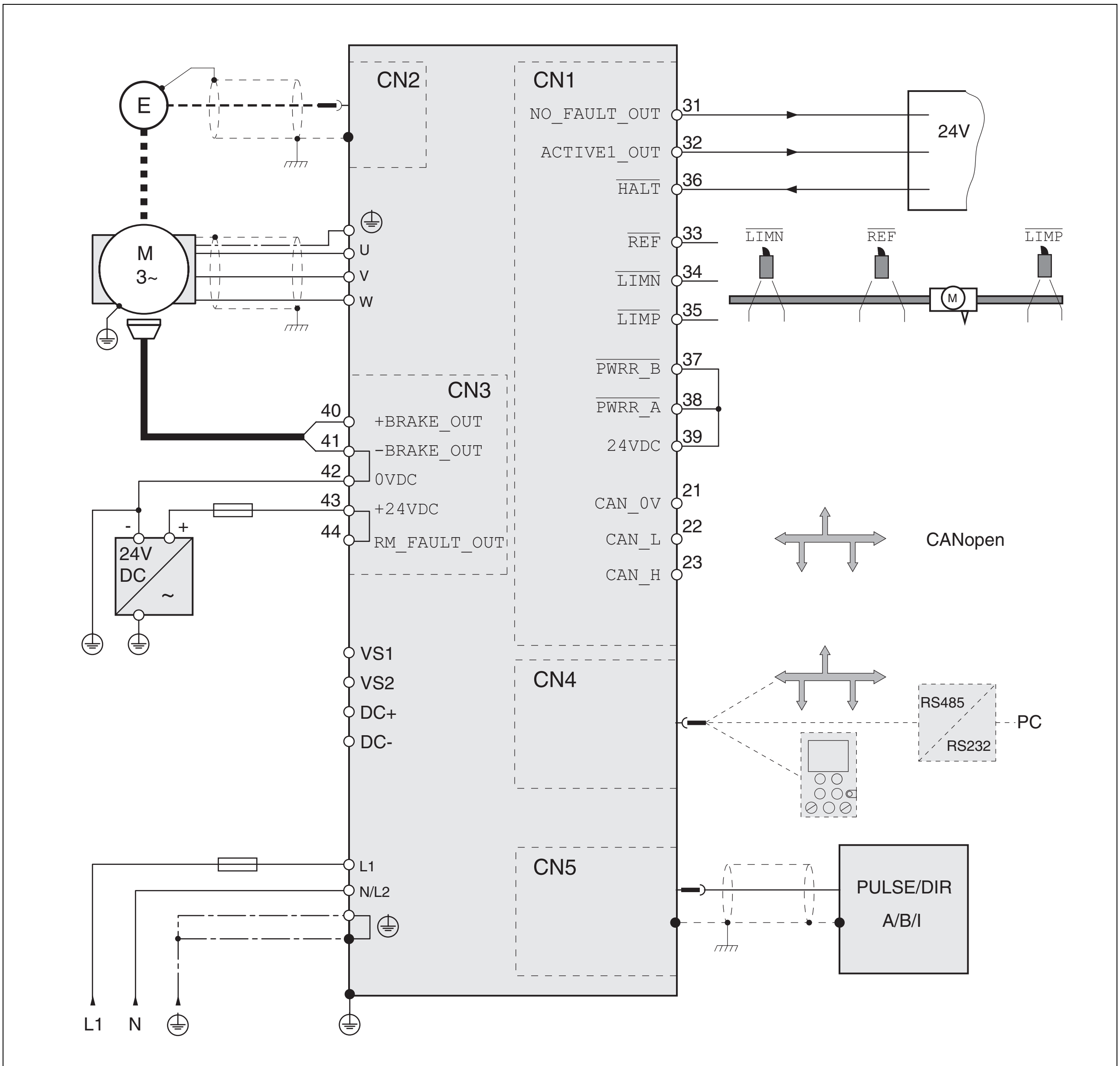
Wiring examples

Wiring example for SD3 28A



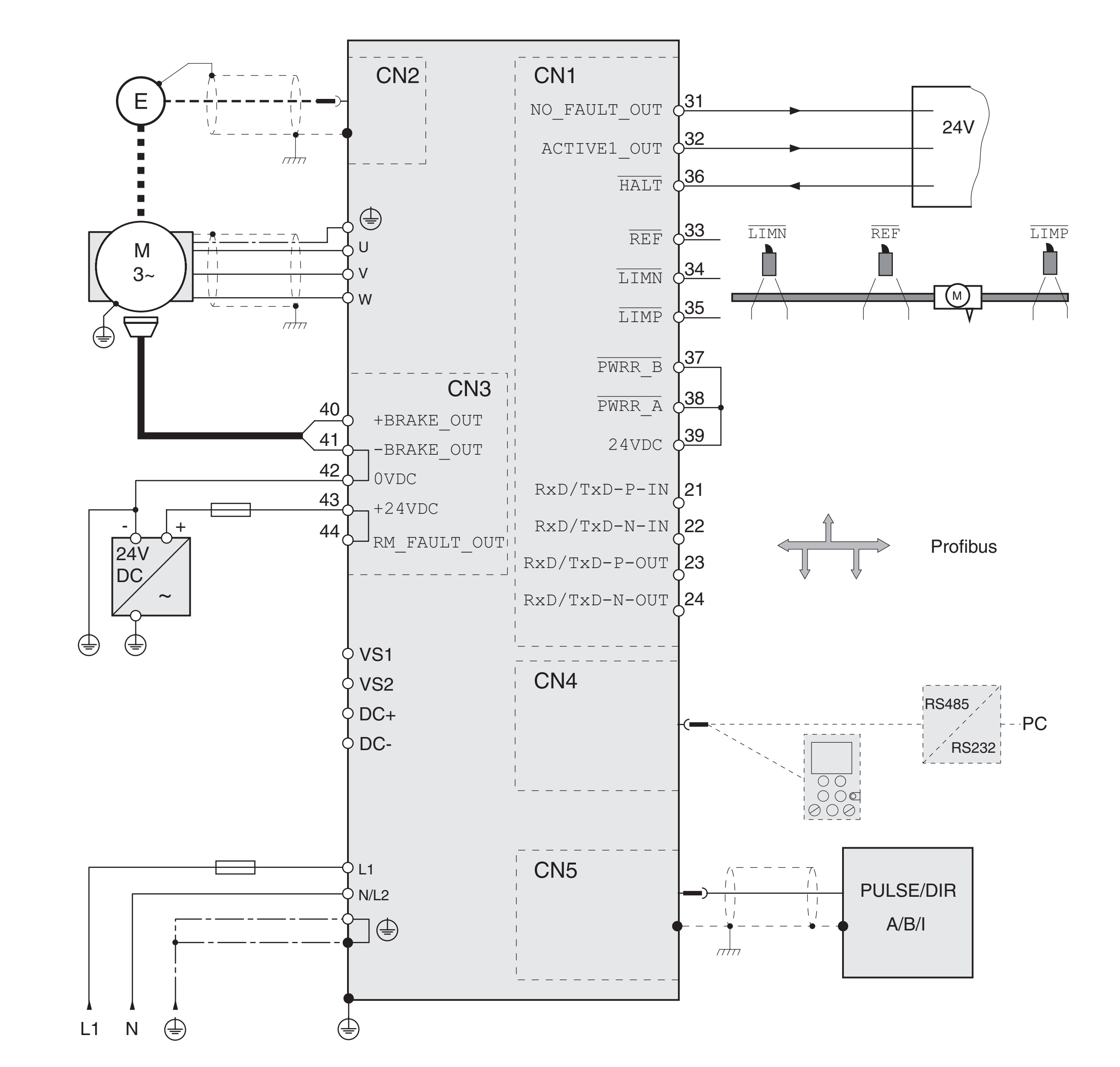
Wiring example for SD3 28A, local controllers

Wiring example for SD3 28A



Wiring example for SD3 28A, fieldbus controller

Wiring example for SD3 28B



Wiring example for SD3 28B, fieldbus controller

Technical Data

Mechanical data

		SD3 28•U25	SD3 28•U68
Dimensions (W x H x D)	mm	72 x 145 x 140	
Weight	kg	1.1	1.2
Type of cooling		Convection	Fan
Max. motor speed	1/min	3000	

Electrical Data

Mains supply		**SD3 28•U25**	**SD3 28•U68**
Nominal voltage (switching)	V	115 / 230 (1~)	115 / 230 (1~)
Current consumption (115 V/230 V)	A	4 / 3	7 / 5
Max. rated motor current	A	2.5	6.8
Max. motor speed	1/min	3000	3000
Nominal power (115 V / 230 V)	W	180 / 270	280 / 420
Max. permissible mains short circuit current	kA	0.5	0.5
power loss	W	≤26	≤65
Line-side fuse (115V/230V) [1]	A	6 / 6	10 / 6
Voltage range and tolerance			
• 115 V_{AC}	V	100 - 15% ... 120 + 10%	
• 230V_{AC}	V	200 - 15% ... 240 + 10%	
Frequency	Hz	50 - 5% ... 60 + 5%	
Transient overvoltage		overvoltage category III	
Inrush current	A	< 60	
Leakage current (as per IEC 60990, Figure 3; motor cable length <10 m)	mA	<30	
Fan			
Input voltage	V_{DC}	-	24
Current consumption	mA	-	130
Signal interface CN1			
Analogue input signals (SD3 28A only)			
• Differential input voltage range	V	-10 - +10	
• Resistance	kΩ	≥≥10	
• ResolutionANA1	Bit	14	
• Sampling time ANA1	ms	0.25	
Rotation monitoring interface CN2			
"ENC+5V_OUT" signal output		sense-regulated, short-circuit-proof, overload-proof	
• Supply voltage	V	4.75 ... 5.25	
• Max. output current	mA	≤100	
"ENC_A", "ENC_B", "ENC_I" signal inputs			
• Voltage	V	conforming to RS422	
• Input frequency	kHz	≤400	
CN3 24-V signal interface			
24-V control voltage		as per IEC 61131-2	
• Input voltage	V	24 -15% / +20%	
• Current consumption [2]	A	≤0.2	
• Ripple voltage	%	< 5	
24-V input signals			
• Logic 1 (U_{high})	V	+15 ... +30	
• Logic 0 (U_{low})	V	-3 ... +5	
• Input current (typical)	mA	≤10	
• Debounce time [3]	ms	1 ... 1.5	
• Debounce time $\overline{\text{PWRR\_A}}$ and $\overline{\text{PWRR\_B}}$	ms	1 - 5	
• Max. skew until detection of signal differences between $\overline{\text{PWRR\_A}}$ and $\overline{\text{PWRR\_B}}$	s	≤1	
• Debounce time CAP1 and CAP2	µs	1 - 10	
24-V output signals		as per IEC 61131-2	
• Output voltage	V	≤30	
• Max. switching current	mA	≤50	
• Voltage drop at 50 mA load	V	≤1	

[1] Fuses: fusible links of class CC or as per UL 248-4, alternatively miniature circuit-breakers with B or C-characteristic

[2] Without loading the outputs

[3] Except for $\overline{\text{PWRR\_A}}$, $\overline{\text{PWRR\_B}}$, CAP1 and CAP2

Electrical Data

CN5 pulse/direction interface		
Symmetrical		as per RS 422
Resistance	kΩ	5
Pulse/direction frequency	kHz	≤200
A/B frequency	kHz	< 400
CN1 or CN4 CANopen interface (SD3 28A only)		
Terminals		RJ45 connector (CN4); spring-loaded terminals (CN1)
Network management		Slave
Baud rate	kbps	125 / 250 / 500 / 1024
Address (node ID)		1 ... 127; configurable with the integrated control panel (HMI) or the "BLCT" commissioning software
Max. number of connected stepper drives		127
Polarisation		A switching line terminal resistor is integrated into the stepper drives.
Services		
• PDO (Process Data Objects)		Implicit exchange of PDOs (Process Data Objects) • 3 PDOs as per DSP 402 ("profile position" and "profile velocity" operating modes) • 1 PDO with freely configurable assignment
• PDO operating modes		Event triggering, time triggering, remotely requested; sync, cyclic and acyclic
• PDO mapping		1 PDO configurable
• SDO		Explicit exchange of SDOs (Service Data Objects) • 2 SDO receive • 2 SDO send
• Emergency		Yes
• Profile		CiA DSP 402: CANopen "device profile drives and axis control", "profile position" and "profile velocity" operating modes
• Communication monitoring		Node guarding, heartbeat
Diagnostics		2 LEDs "RUN" (operation) and "ERR" (error) on integrated HMI; errors are displayed by the 7-segment display on the integrated control panel (HMI); complete diagnostic data with "BLCT" commissioning software
Description file		The EDS file is supplied on the CD-ROM, which also contains the technical documentation for the SD3 28.
CN4 Modbus interface (SD3 28A only)		
Terminals		RJ45 connector (CN4)
Physical interface		2-wire, multipoint RS485
Transmission mode		RTU
Baud rate	bps	9600 / 19200 / 38400
Address (node ID)		1 ... 247; configurable with the integrated HMI or the "BLCT" commissioning software
Max. number of connected stepper drives		31
Polarisation		No polarisation impedance. They must be supplied by the wiring system, e.g. in master.
Format		Configurable via the integrated HMI or the "BLCT" software • 8 bit, odd parity, 1 stop bit • 8 bit, even parity, 1 stop bit • 8 bit, no parity, 1 stop bit • 8 bit, no parity, 2 stop bits
Services		
• Message administration		• Read holding register (03), max. 63 words • Write single register (06) • Write multiple registers (16), max. 61 words • Read/write multiple registers (23), max. 63/59 words • Read device ID (43) • Diagnostics (08)
• Communication monitoring		Monitoring function (node monitoring) can be activated. "Timeout" can be set between 0.1 s and 10 s.
Diagnostics		Errors are displayed by the 7-segment display on the integrated HMI.

Electrical Data

CN1 Profibus DP interface (SD3 28B only)		
Terminals		Spring-loaded terminals (CN1)
Physical interface		2-wire, multipoint RS485
Baud rate	kbps	9.6 / 19.2 / 45.45 / 93.75 / 187 / 500
	mbps	1.5 / 3 / 6 / 12
Address (node ID)		1 ... 126; configurable with the integrated HMI or the "BLCT" commissioning software
Services		
• Periodic variables		PPO type 2; 8 PKW bytes; 12 process data bytes
• Communication monitoring		Can be blocked. "Timeout" can be set with the configurator of the Profibus DP network.
Diagnostics		2 LEDs "RUN" (operation) and "ERR" (error) on integrated HMI; errors are displayed by the 7-segment display on the integrated control panel (HMI); complete diagnostic data with "BLCT" commissioning software
Description file		The GSD file is supplied on the CD-ROM, which also contains the technical documentation for the SD3 28. The GSD file does not contain a description of the drive parameters.

Safety functions

Life time corresponding to safety life cycle (IEC 61508)	years	20
SFF (Safe Failure Fraction, IEC 61508)	%	66
Probability of failure (PFH, IEC 61508)	1/h	1.092×10^{-9}
Response time until activation of power amplifier	ms	< 10

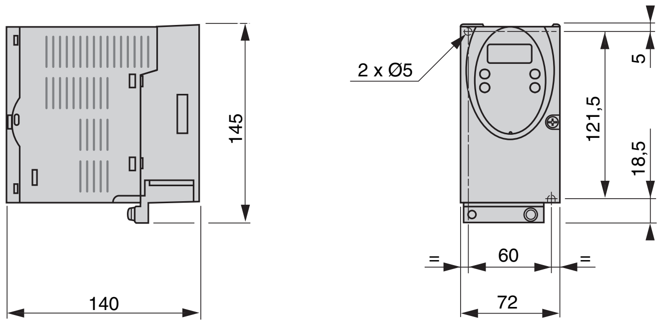
Ambient conditions

Operating temperature [1]	°C	0...+50
Operating temperature when used in accordance with UL[1]	°C	0 ... +40
Transport and storage temperature	°C	-25 ... +70
Pollution degree		Step 2
Relative humidity	%	5 ... 85, no condensation permissible
Installation height above mean sea level for 100% power	m	< 1000
Installation height with max ambient temperature 40 °C, without protective film and with a side distance >50 mm	m	< 2000
Oscillation and vibration		as per IEC/EN 60068-2-6 3 ... 13 Hz: 1.5 mm peak 13 ... 150 Hz: 1g
Shock loading		as per IEC/EN 60068-2-27 15 g for 11 ms
Degree of protection		IP 20
		IP 40 restricted: from above only, without distance to protective cover

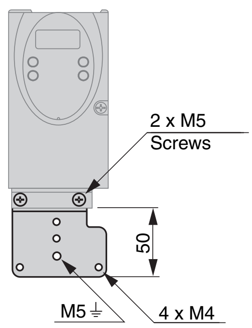
[1] no icing

Dimensional drawings

SD3 28



EMC mounting plate (included in scope of supply)



Type code

Example:	SD3	28	A	U25	S2
Product designation SD3 = stepper drive 3-phase	**SD3**	28	A	U25	S2
Product type 28 = stepper drive for fieldbus	SD3	**28**	A	U25	S2
Interfaces A = CANopen fieldbus, Modbus fieldbus and analogue input B = Profibus fieldbus	SD3	28	**A**	U25	S2
Max. motor phase current U25 = 2.5 A U68 = 6.8 A	SD3	28	A	**U25**	S2
Power amplifier supply voltage S2 = 1~, 115 V_{AC} / 230 V_{AC} (switching)	SD3	28	A	U25	**S2**

Possible order numbers

Type	Order number
SD3 28A U25 S2	063711140100
SD3 28A U68 S2	063711140101
SD3 28B U25 S2	063711140200
SD3 28B U68 S2	063711140201

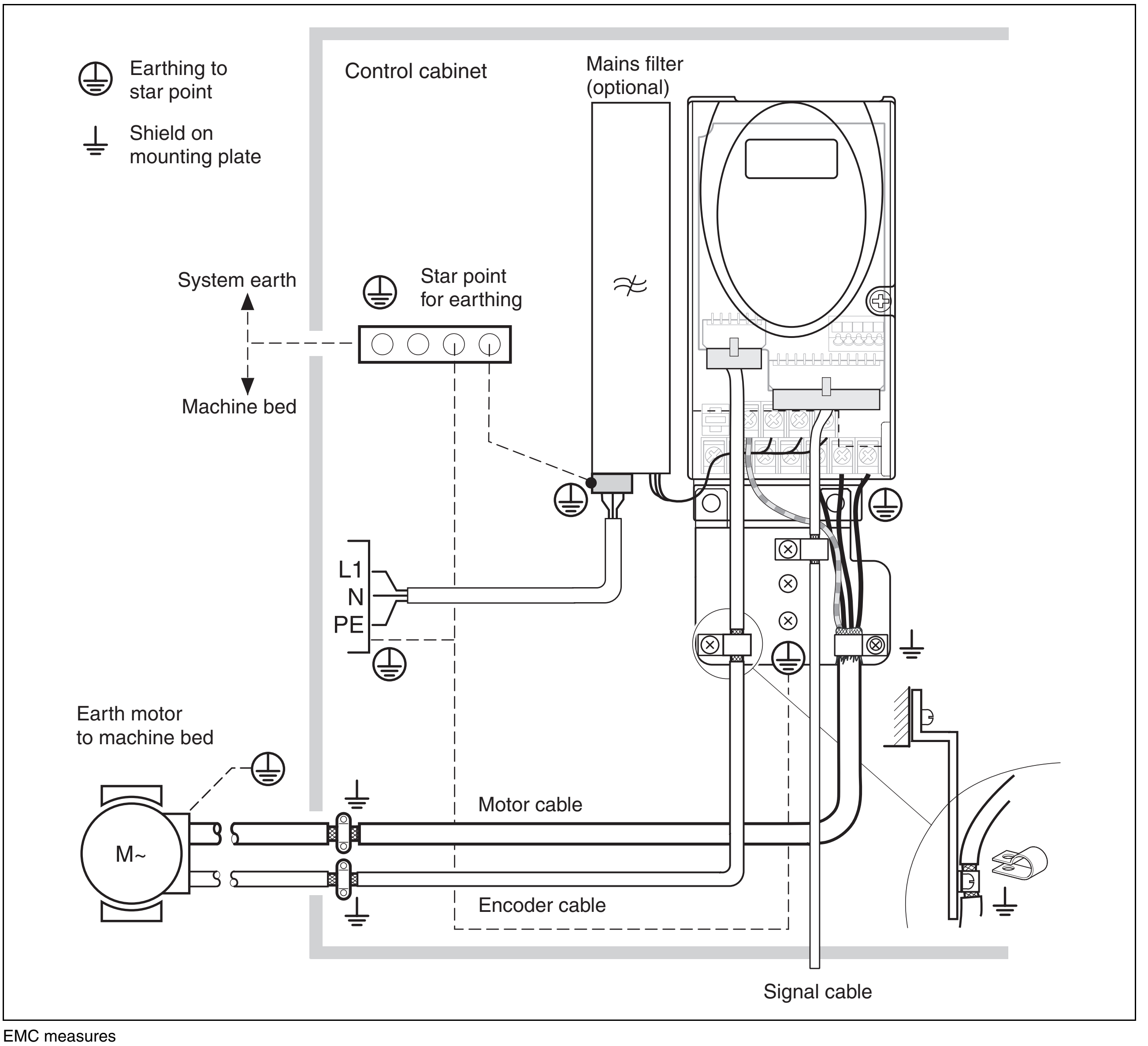
Mounting and installation

EMC-compliant installation

The SD3 stepper drive meets the EMC requirements for the second environment as per IEC 61800-3.
An EMC-compliant design is required to maintain the specified limit values. Depending in the case better results can be achieved with the following measures:

- Upstream mains reactors. Information on current distortions can be obtained on request.
- Upstream external mains filters, particularly to maintain limit values for the first environment (living area, category C2)
- Particularly EMC-compliant design, e.g. in an enclosed switching cabinet with 15 dB damping of radiated interference

EMC measures for SD3 stepper motor drive



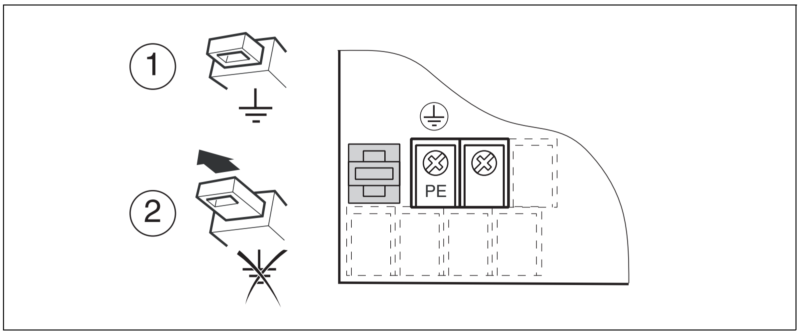
EMC measures

Operation in IT mains

An IT mains sets itself apart through an insulated or a high impedance grounded neutral conductor. If you use permanent insulation monitoring, it must be suitable for non-linear loads (e. g. type XM200 by Merlin Gerin). If an error is still reported despite proper wiring, you can separate the earthing connection of Y-capacitors (deactivate Y-capacitors) for products with a built-in mains filter.

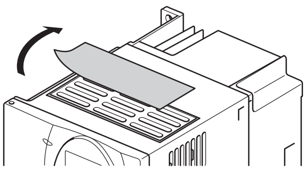
With all other networks except for IT mains the earth connection via the Y-capacitors must be maintained.

When the earthing connection of the Y-capacitors is disconnected, the information on the transmission of electrical magnetic malfunctions is no longer followed! Compliance with national regulations and standards should be safeguarded by other measures.



Operation in an IT mains

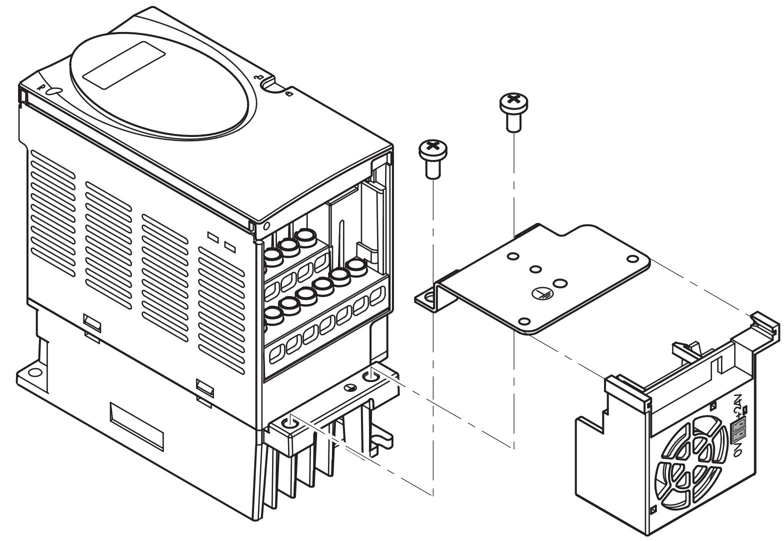
Insulation monitoring error
(1) Y-capacitors of the internal filter effective (standard)
(2) Y-capacitors of the internal filter disabled (IT mains)



Mounting distances and ventilation

SD3 2••U25 stepper drives are ventilated from bottom to top by air circulation. The SD3 2••U68 stepper drives include a fan, which must be mounted at the bottom of the device.
When selecting the position of the device in the switching cabinet, note the following instructions:

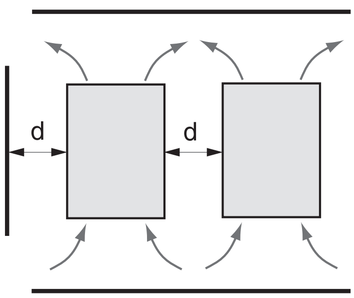
- The device must be adequately cooled by compliance with the minimum installation distances. Avoid heat accumulation.
- The device must not be installed close to heat sources or mounted on flammable materials.
- The warm airflow from other devices and components must not heat the air used for cooling the device.
- The drive will switch off as a result of overtemperature when operated above the thermal limits.



Mounting fans

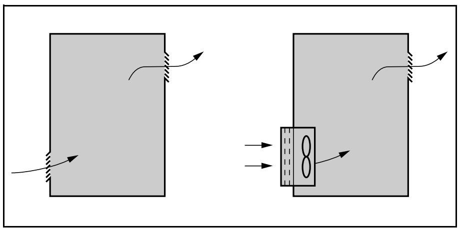
Ambient temperature	Mounting distances [1]	Measures without protective film [2]	Measures with protective film
0 °C ... +40 °C	d > 50mm	None	None
	d < 50mm	None	d > 10 mm
+40 °C ... +50 °C	d > 50mm	None	Reduce nominal current and constant current [3]
	d < 50mm	Reduce nominal current and constant current	Operation not possible

[1] Distance in front of the device: 10 mm, above: 50 mm, below: 200 mm
[2] Recommendation: remove protective foil on completion of the installation
[3] by 2.2% for each °C above 40 °C



At least 10 mm of free space is required in front of the device.
At least 50 mm of free space is required above the device.
The connector cables come out of the bottom of the housing. At least 200 mm free space under the device is required to ensure that wiring can be installed without excessive bending.
An alternative to fastening the unit directly to the switching cabinet mounting plate is adapter plates for snap-mounting to top-hat rails. In this case mains filters cannot be attached directly beside or behind the device.

Mounting in housing or switching cabinet



Please read the instructions on mounting in the section "Mounting distances and ventilation".
Proceed as follows to ensure adequate device ventilation:

- Provide air inlet vent on the housing.
- The air inlet vent must have an air throughput of at least 0.3 m³/min (SD3 2••U25S2) or 0.55 m³/min (SD3 2••U68S2) per device. If the air throughput is less, external ventilation must be installed.
- Use IP 54 special filter.
- Remove the top cover on the device.
- The throughput of the fan should be at least 0.3 m³/min.

Sheet metal housing and switching cabinet (degree of protection IP 54)

The SD3 stepper drive must be installed in a sealed housing under the following ambient conditions: dust, corrosive gases, high humidity with the danger of condensation and surface water accumulation, …
In this cases the SD3 can be installed in a housing with an internal temperature of up to 50 °C.

Calculation of housing dimensions

Maximum heat resistance R_{th} in °C/W
$R_{th} = (q - q_e)/P$

q = maximum temperature (°C) in interior of housing
q_e = maximum outside temperature (°C)
P = Total power loss (W) in the housing

Power loss in the stepper motor drive, see chapter "Technical data".
Consider the power loss of the other components.

Usable heat dissipation area of housing A in m²
(with wall mounting: sides + top + front)

$A = K/R_{th}$

K = heat resistance, based on the housing area
Sheet metal housing: K = 0.12 with fan, K = 0.15 without fan

Note:**Because of the poor heat dissipation insulating material housing must not be used.**.

Product Description

The 3-phase stepper motors from Berger Lahr are extremely robust, maintenance-free motors. They carry out precise stepper movements that are controlled by a stepper drive. A stepper motor drive consists of a stepper motor and the matching stepper drive. The maximum power can be reached only if motor and electronics are optimally matched.

The 3-phase stepper motors can be operated at very high resolutions depending on the stepper motor controller.

Options such as rotation monitoring and holding brake with robust, low-play planetary gears extend the application options.
There are also 3-phase stepper motors by Berger Lahr in normal and explosion-proof types (explosion degree of protection EEx d IIC T4).

Stepper motor drive system

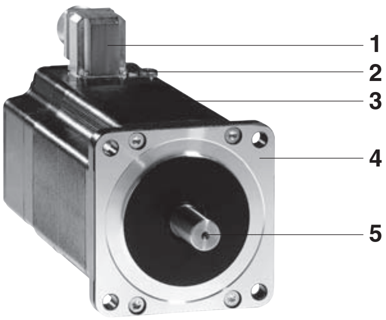
Special features

Quiet
Due to the sinus-commutation of the drive and the special mechanical construction of the motors, the result is a very quiet stepper motor that runs virtually resonance-free.

Strong
The optimised internal geometry of the motor offers a high power density; i.e. up to 50% greater torque compared to conventional stepper motors of comparable size.

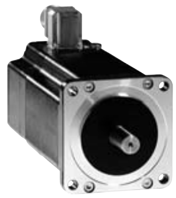
Flexible
It is possible to manufacture and supply a wide variety of motor types due to their flexible modular system and modern version management.

Design



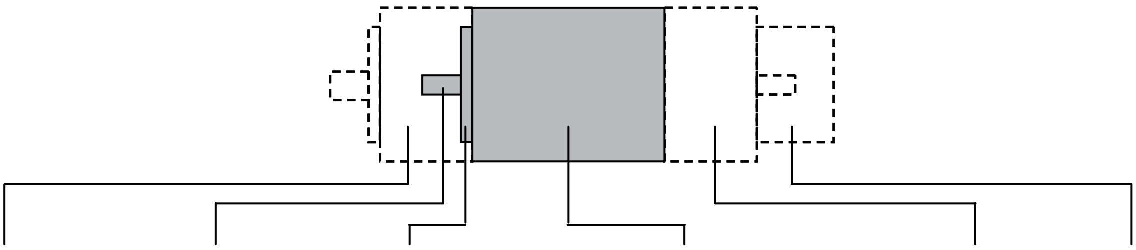
(1) Motor connection, here versions with an offset connector
(2) Additional terminal for protective conductor
(3) Housing, with black protective coating
(4) Axial flange with four mounting points as per DIN 42918
(5) Smooth shaft end as per DIN 42918

Product quotation

3-phase stepper motors		VRDM 36x	VRDM 39x	VRDM 311x
				
Size		6	9	11
Max. torque M_{max}	Nm	1.50	2.0...6.0	12.0...16.5
Holding torque M_H	Nm	1.70	2.26 ... 6.78	13.5 ... 19.7
Steps per revolution z [1]		200 / 500 / 1000 / 2000 / 4000 / 5000 / 10000		
Step angle α[1]	°	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036		

1) with suitable control

Motor types



Gearing [1]	Shaft model		Centring collar	Size (Flange dimen-sion)	Length (Dimension without shaft)	Winding	Motor connec-tion	Options [2]
VRDM 36x								
PLE 60 PLS 70	Smooth shaft	Ø 8 mm	Ø 38.1 mm	6 (57.2 mm)	8 (79 mm)	W	Terminal box Plug	2nd shaft end Holding brake Encoders
VRDM 39x								
PLE 80 PLS 90	Smooth shaft with slide spring	Ø 9.5 mm [3] Ø 12 mm Ø 14 mm	Ø 60 mm Ø 73 mm	9 (85 mm)	7 (68 mm) 10 (98 mm) 13 (128 mm)	W	Terminal box Plug	2. Shaft end Holding brake Encoders
VRDM 311x								
PLE 120 PLS 115	with parallel key	Ø 19 mm	Ø 56 mm	11 (110 mm)	17 (180 mm) 22 (228 mm)	W	Terminal box Plug	2nd shaft end Holding brake Encoders

1) Planetary gear each available in the gear ratios 3:1, 5:1 and 8:1.

2) The optional 2nd shaft end and holding brake cannot be selected together. An encoder can only be used with motors with "connector" motor connection.

3) Ø 9.5 mm and Ø 12 mm at VRDM 397 and VRDM 3910; Ø 14 mm at VRDM 3913

Technical Data

Electrical and mechanical data

Motor type VRDM ...		368	397	3910	3913	31117	31122
Max. supply voltage U_{max}	V_{AC}	230					
Nominal voltage DC bus U_N	V_{DC}	325					
Nominal torque M_N	Nm	1.50	2	4	6	12	16.5
Holding torque M_H	Nm	1.70	2.26	4.52	6.78	13.5	19.7
Rotor inertia J_R	kgcm²	0.38	1.1	2.2	3.3	10.5	16
Steps per revolution z		200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000					
Step angle α	°	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036					
Systematic angular tolerance $\Delta\alpha_s$ [1]	’	±6					
Max. starting frequency f_{Aom}	kHz	8.5	5.3			4.7	
Phase current I_N	A_{rms}	0.9	1.75	2	2.25	4.1	4.75
Winding resistance R_W	Ω	25	6.5	5.8	6.5	1.8	1.9
current rise time constant τ	ms	4.6	~7	~9	~10	~22	~22
Mass m [2]	kg	2.0	2.1	3.2	4.3	8.2	11.2
Shaft load [3]							
• Max. radial force 1st shaft end [4]	N	50	100		110	300	
• Max. radial force 2nd shaft end (optional) [4]	N	25	50			150	
• Max. axial force pull	N	100	175			330	
• Max. axial force compression	N	8.4	30			60	
• Bearing lifetime L_{10h} [5]	h	20000	20000			20000	

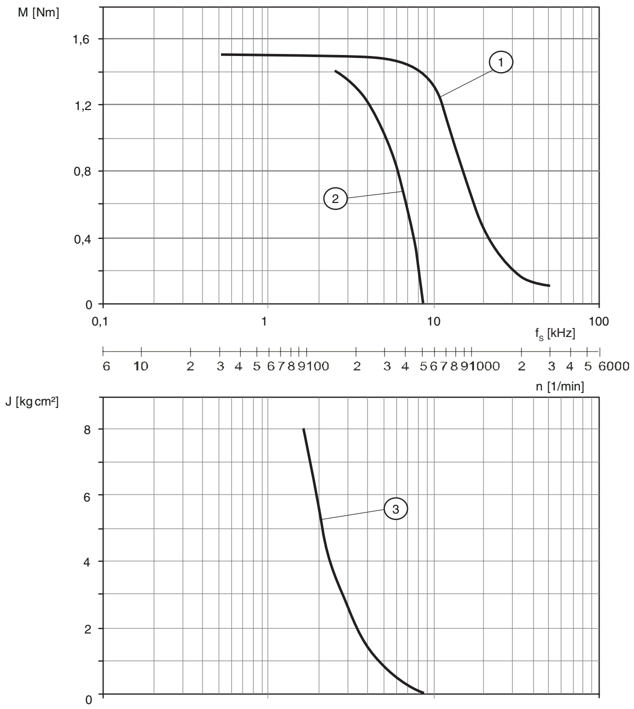
1) Measured at 1000 steps/revolution, unit: angular minutes
2) Mass of the motor version with cable retaining screws and connector
3) Conditions for the shaft load: speed of rotation 600 1/min, 100% duty cycle at nominal torque, ambient temperature 40 °C (storage temperature ≈80 °C)
4) Point of attack of radial force: in the middle of the shaft end
5) Operating hours at a probability of failure of 10%

Ambient conditions

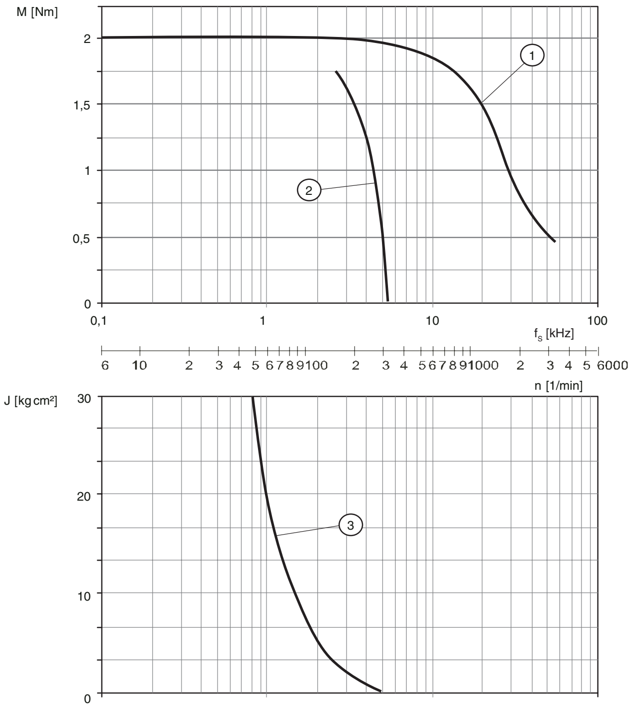
Ambient temperature	°C	-25 ... +40
Installation height without power reduction	m above MSL	< 1000
Transport and storage temperature	°C	-25 ... +70
Relative humidity	%	5 ... 85, no condensation permissible
Vibration severity in operation as per DIN EN 60034-14		A
Max. vibration load	m/s^2	20
Degree of protection as per DIN EN 60034-5		
• Total except shaft bushing		IP 56
• Shaft bushing		IP 41
Thermal class		155 (F)
Shaft wobble and run-out accuracy		DIN EN 50 347 (IEC 60072-1)
Max. rotary acceleration	$Wheel/s^2$	200000

Characteristic curves

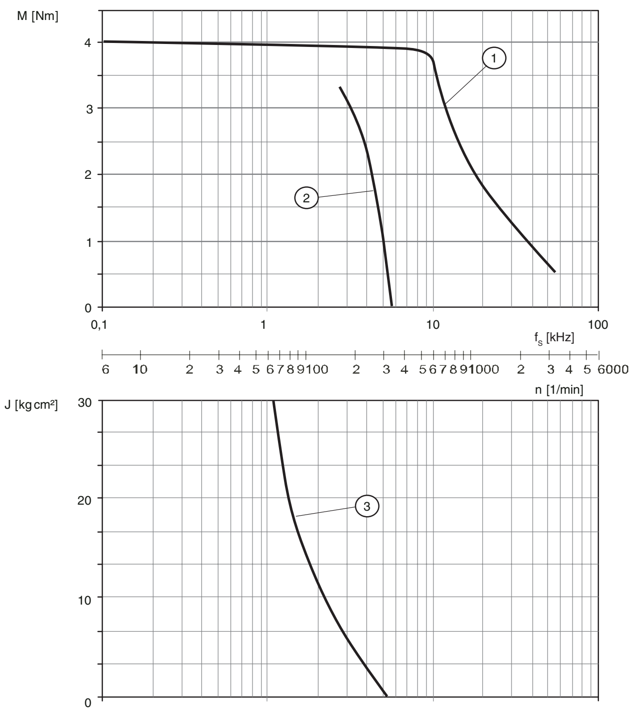
VRDM 368 / 50L W



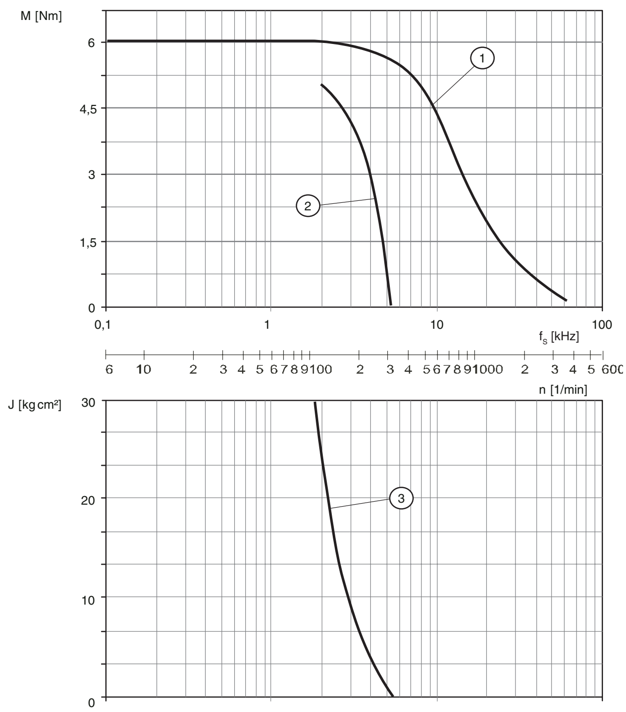
VRDM 397 / 50L W



VRDM 3910 / 50L W



VRDM 3913 / 50L W



Measurement at 1000 steps/revolution, nominal voltage DC bus U_N and phase current I_N

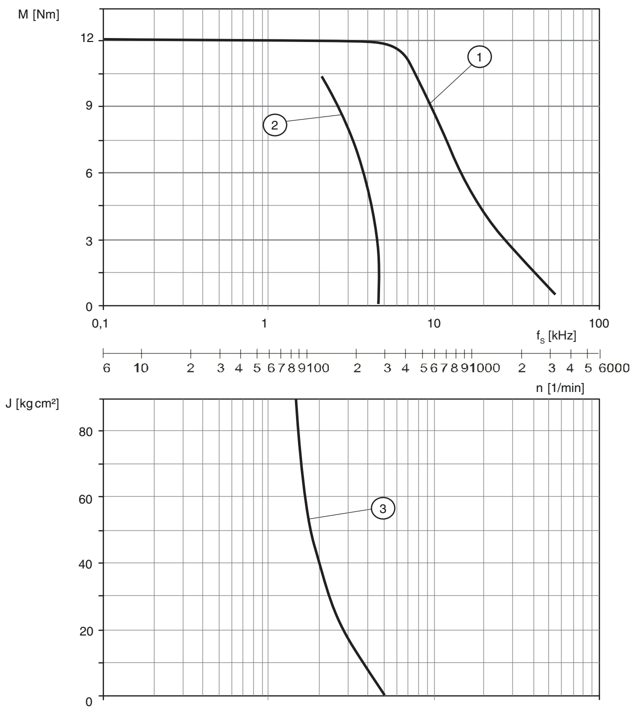
(1) Pull-out torque

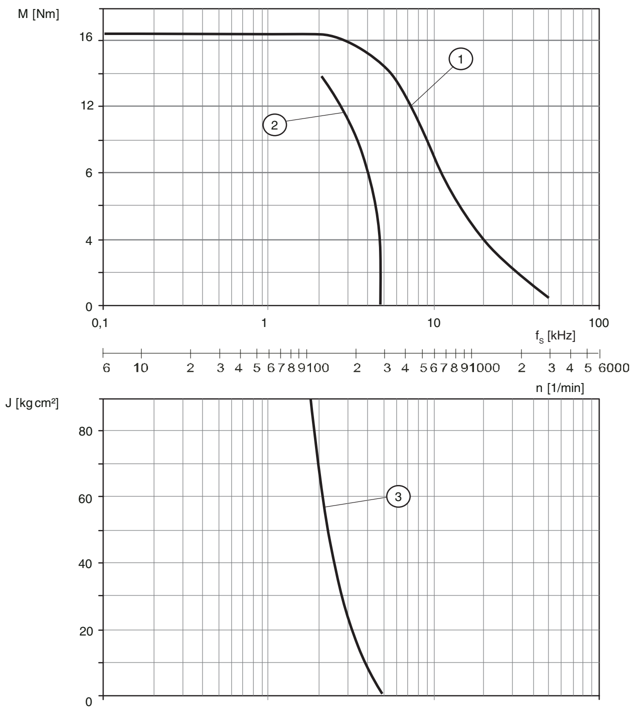
(2) Pull-in torque

(3) Maximum load inertia

Characteristic curves

VRDM 31117 / 50L W	VRDM 31122 / 50L W





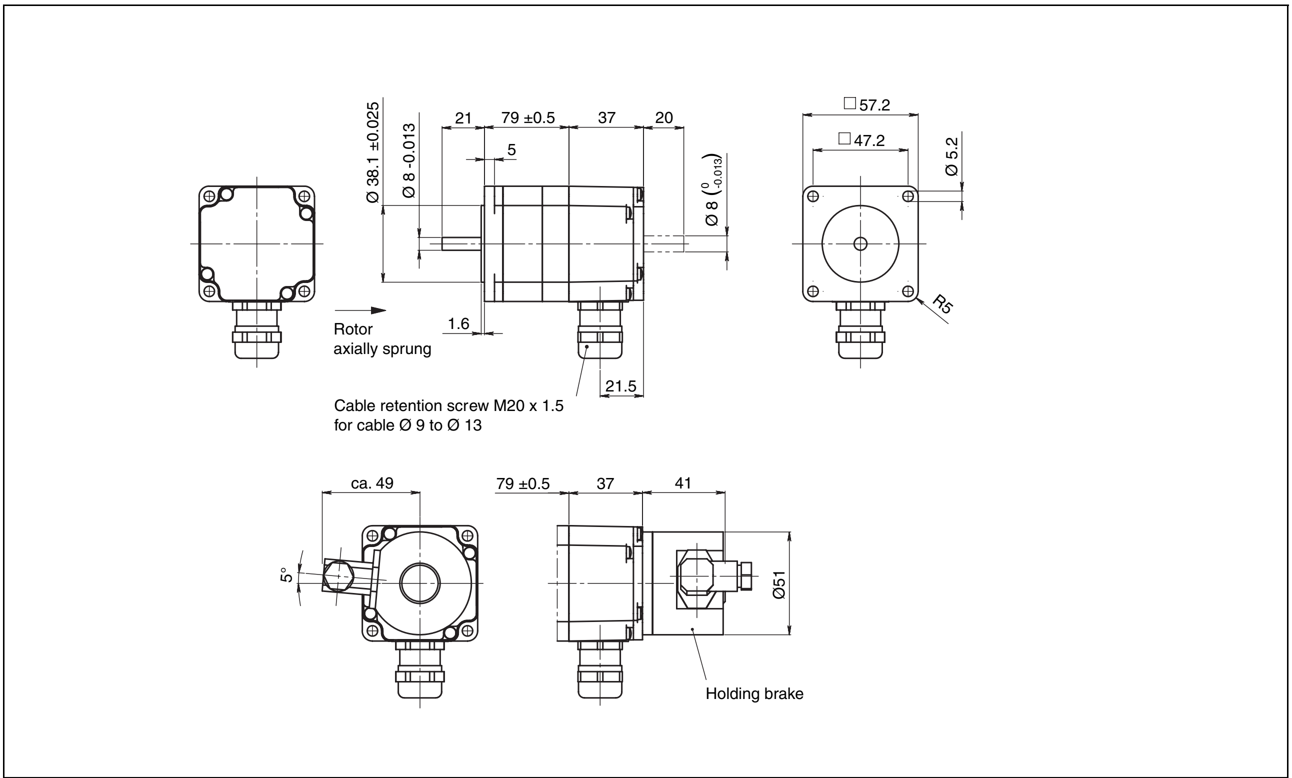
Measurement at 1000 steps/revolution, nominal voltage DC bus U_N and phase current I_N

(1) Pull-out torque

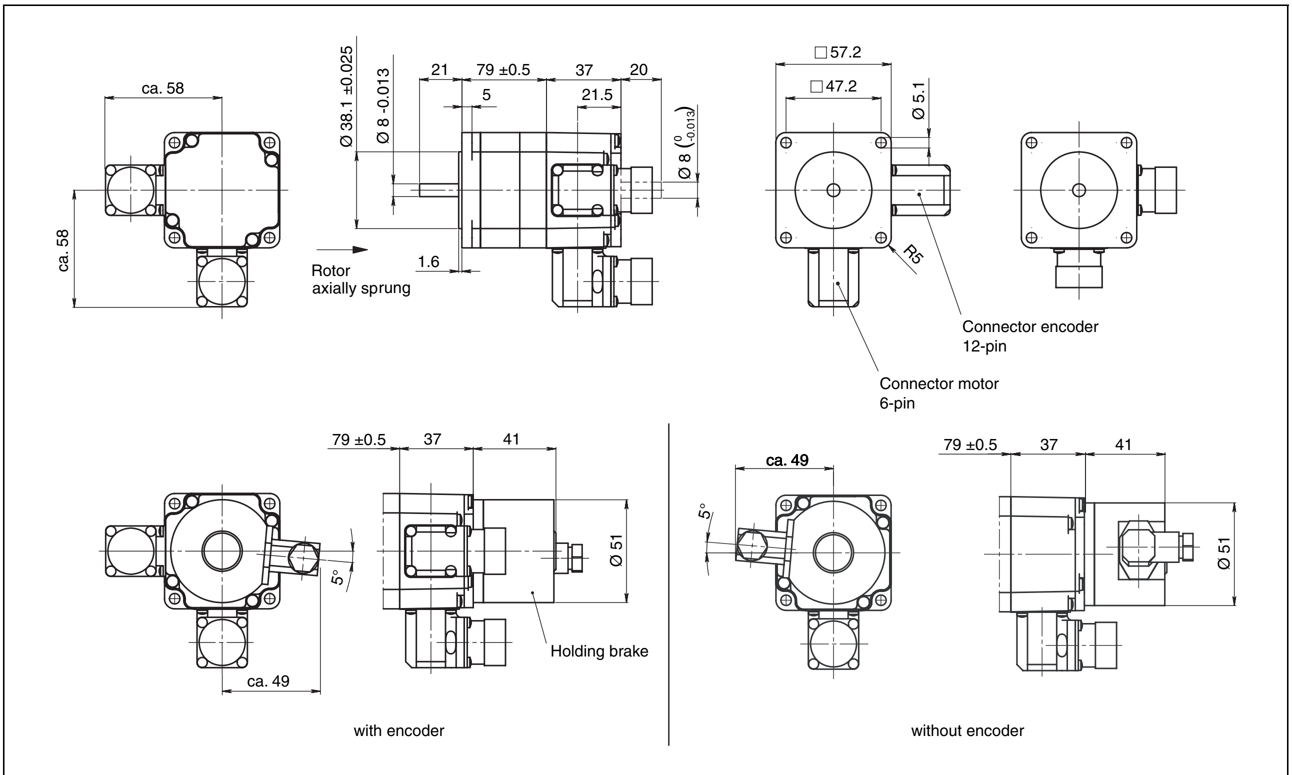
(2) Pull-in torque

(3) Maximum load inertia

Dimensional drawings
VRDM 368

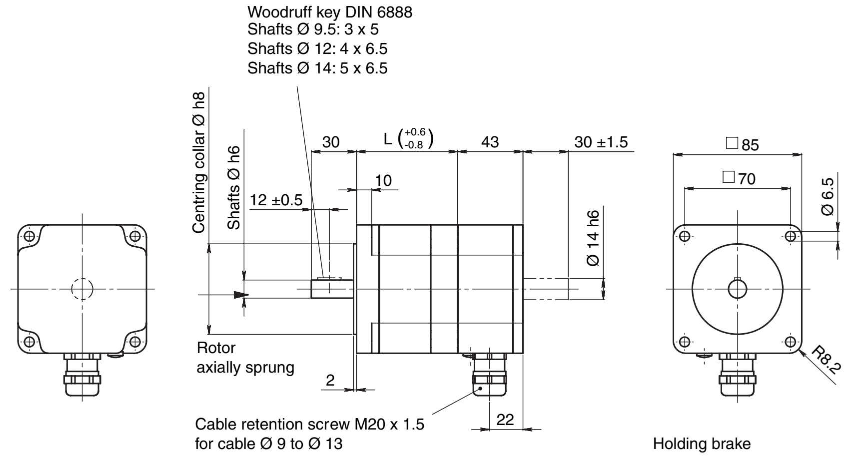


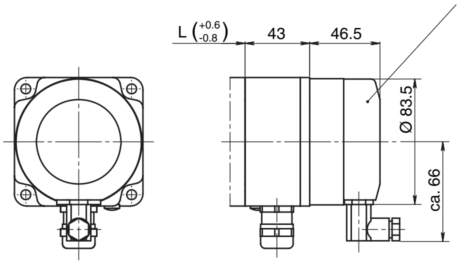
3-phase stepper motor VRDM 368 in terminal box version



3-phase stepper motor VRDM 368 in connector version

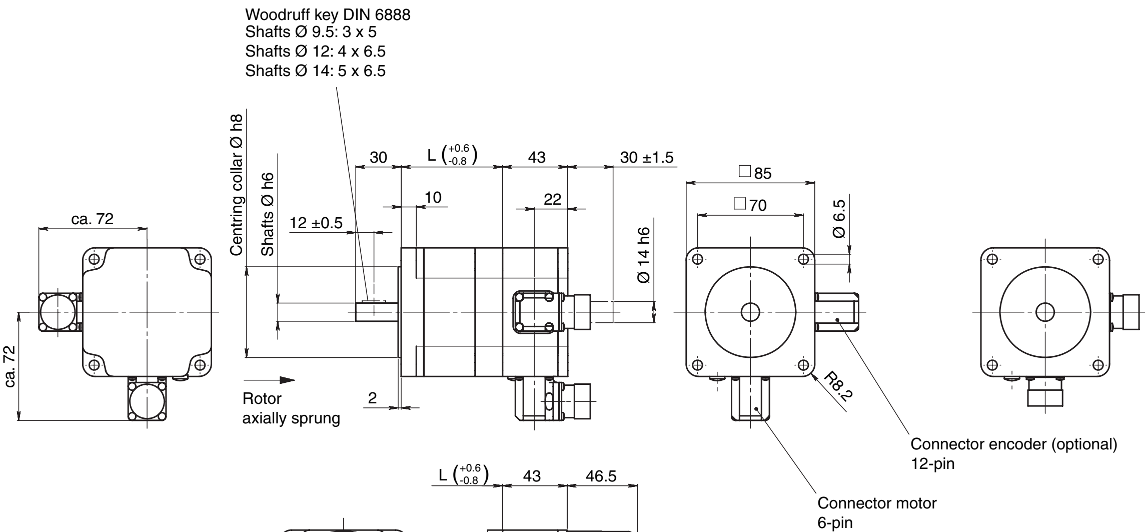
VRDM 39•

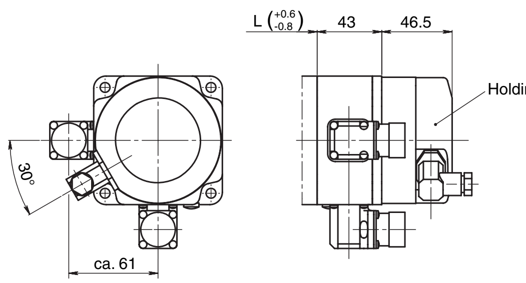




	Length L	Shafts Ø		Centring collar Ø	
VRDM 397	67.5	9.5	12	60	73
VRDM 3910	97.5	9.5	12	60	73
VRDM 3913	127.5	14		60	73

3-phase stepper motor VRDM 39• in terminal box version

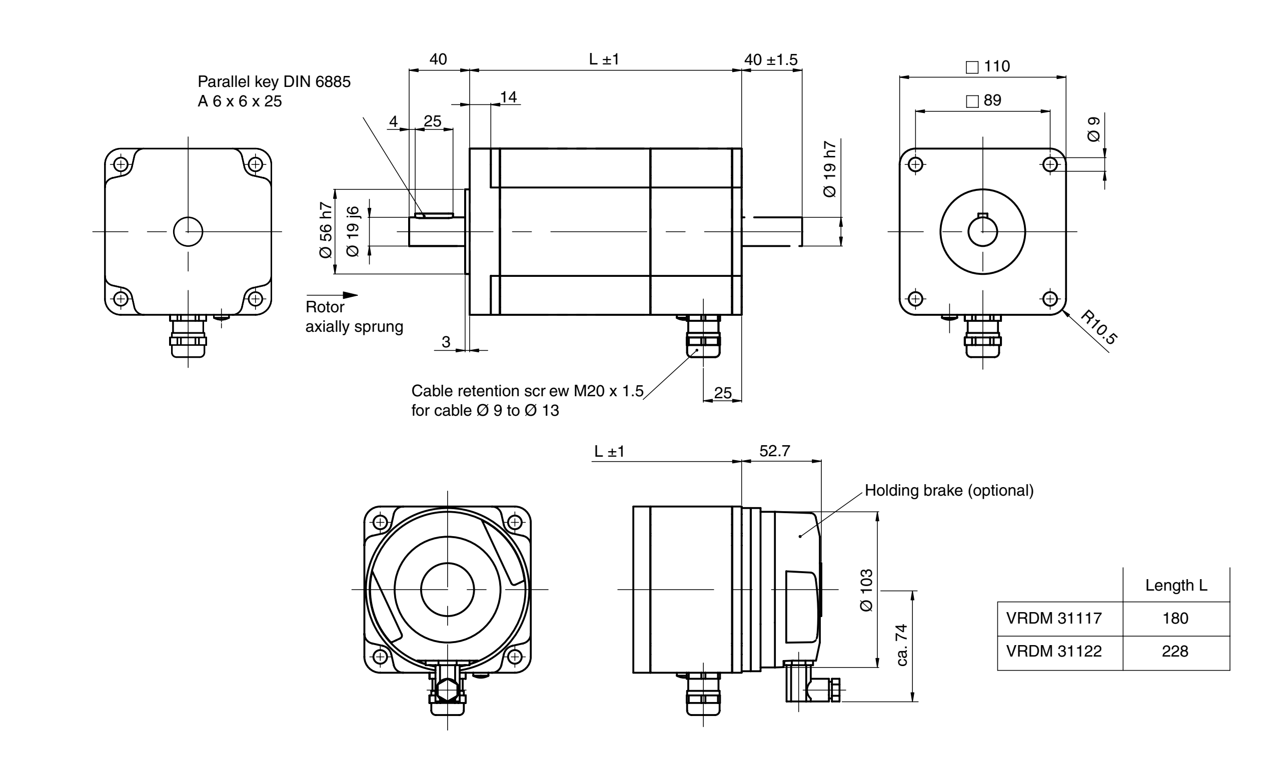




	Length L	Shafts Ø		Centring collar Ø	
VRDM 397	67.5	9.5	12	60	73
VRDM 3910	97.5	9.5	12	60	73
VRDM 3913	127.5	14		60	73

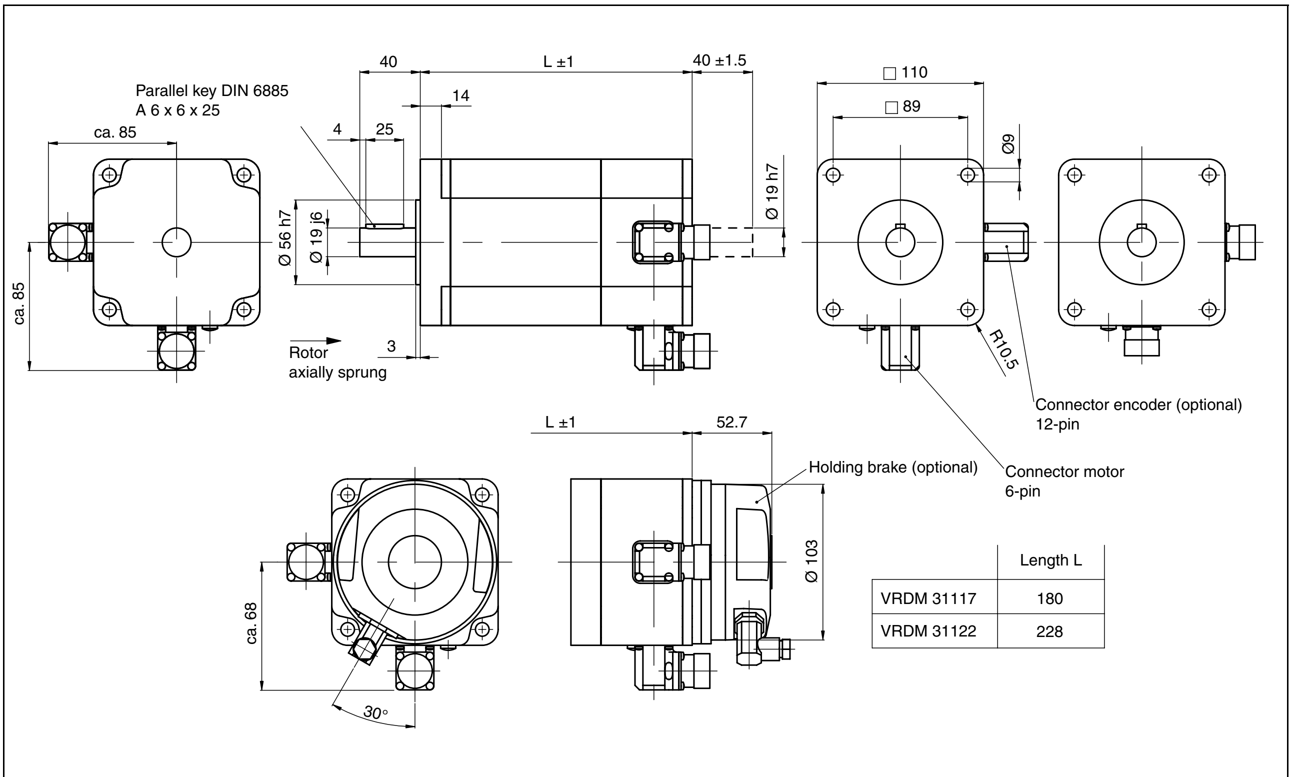
3-phase stepper motor VRDM 39• in connector version

VRDM 311•



	Length L
VRDM 31117	180
VRDM 31122	228

3-phase stepper motor VRDM 311• in terminal box version



	Length L
VRDM 31117	180
VRDM 31122	228

3-phase stepper motor VRDM 311• in connector version

Options

Holding brake

The holding brake is an electromagnetic sprung brake and fixes the motor axis after switching off the motor current (e.g. in case of power failure or emergency stop). The shaft must be fixed with torque loads resulting from gravity, e.g. with Z-axes in handling technology.

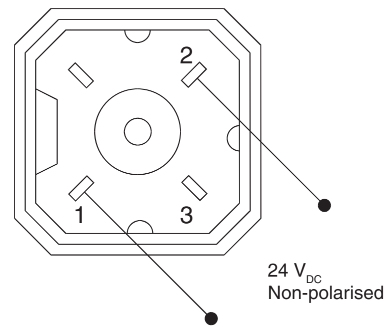
Technical Data

Holding brake for motor type		VRDM 36•	VRDM 39•	VRDM 311•
Nominal voltage	V	24	24	24
Holding torque	Nm	1	6	16
Pull-in power	W	8	24	28
Moment of inertia	kgcm²	0.016	0.2	0.35
Energise time (release brake)	ms	58	40	60
Shutdown time (apply brake)	ms	14	20	30
Mass	kg	Approx. 0.5	Approx. 1.5	Approx. 2.0

Note: In order to ensure the safe function of the holding brake for Z-axes, the static load torque must be no greater than 25% of the holding torque of the motor.

Wiring diagram

The connector is a part of the scope of supply.
Connector name: Hirschmann Type G4 5M



Wiring diagram of the connector for the holding brake

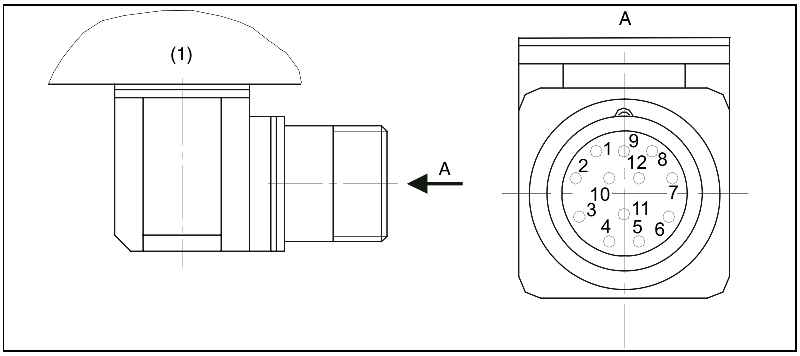
Encoder

Three-phase stepper motors from Berger Lahr can be fitted with an encoder. If the stepper drive is fitted with rotation monitoring electronics, the encoder operates as a measurement system for reporting the actual position of the rotor.
The rotation monitoring compares the setpoint and actual position of the motor and reports errors if the actual position deviates from the setpoint position. For example, this enables detection of mechanical overload of the motor.
Note: an encoder can only be used with motors with connector. A temperature sensor is integrated to protect the encoder from high temperatures.

Technical Data

Resolution	Inc/rev.	1000
Index plus	Inc/rev.	1
Output		RS 422
Signals		A; B; I
Signal shape		Rectangular
Supply voltage	V	5 ± 5%
Supply current	A	max.0.125

Wiring diagram



Wiring diagram of encoder plug on VRDM 3••

(1) Motor housing

Pin	Designation
1	A
2	A negated
3	B
4	B negated
5	C, I
6	C negated, negated
7	$5V_{GND}$
8	+ 5
9	-SENSE
10	+SENSE
11	Temperature sensor
12	not connected

Gear

Stepper motors from Berger Lahr can also be fitted with integrated planetary gear. The PLE gearboxes are economical planetary gears that meet most requirements for accuracy. The PLS gearboxes are high-quality gearboxes with very low rotation play. This gearbox can be supplied with one of three ratios: 3:1, 5:1 and 8:1.
The output torque of the gearbox is determined by multiplying the torque of the motor with the gear ratio and the efficiency of the gearbox (0.96).
The following table shows the preferred gearboxes for the motors.

Motor type	Gearbox type	
VRDM 368	PLE 60	PLS 70
VRDM 39•	PLE 80	PLS 90
VRDM 31117	PLE 120	PLS 115
VRDM 31122		PLS 115

Technical data PLE gearboxes

PLE gearbox general		
Gear stages		1
Life time [1]	h	10000
Efficiency at full load	%	96
Housing material		aluminium
Surface		black anodised
Shaft material		C 45
Bearings		roller bearing
Operating temperature [2]	°C	-25 ... +90, shortly +120
Degree of protection [3]		IP 54
Lubrication		life lubrication

1) Life time with an output speed of 100 1/min and T = 30 °C
2) Referring to the housing surface
3) With mounting position IM V3 (drive shaft vertical, shaft end upward) only protection class IP 41 is guaranteed

Size of PLE		60	80	120
Max. radial force [1) 2)]	N	500	950	2000
Max. axial force	N	600	1200	2800
Torsional play	arcmin	< 20	< 12	<8
Max. drive speed	1/min	13000	7000	6500
Recommended drive speed	1/min	4000	4000	3500
Torsional stiffness	Nm/arcmin	2.3	6	12
Weight	kg	0.9	2.1	6.0

1) The information refers to min. 20000 h life time with an output speed of 100 1/min and application factor K = 100 min and S1 operating mode for electrical machines and T=30°C
2) Refers to the centre of the drive shaft and 50% duty cycle

Caution: the actual output torque must be less than the rated output torque of the gearbox, otherwise the gearbox may be destroyed.

Technical data PLS gearboxes

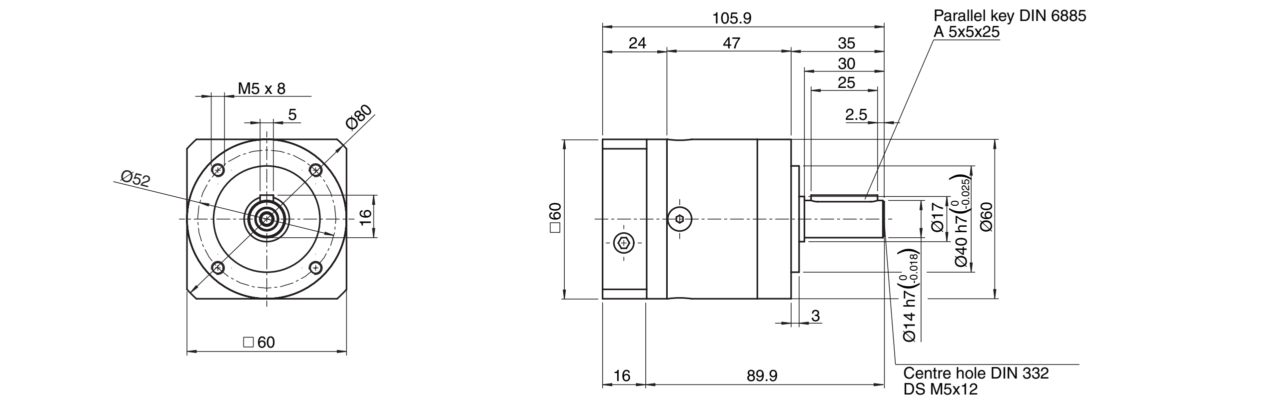
PLS gearbox general		
Gear stages		1
Life time [1]	h	20000
Efficiency at full load	%	98
Housing material		aluminium
Surface		black anodised
Shaft material		C 45
Bearings		tapered roller bearings
Operating temperature [2]	°C	-25 ... +100, shortly +124
Degree of protection [3]		IP 65
Lubrication		life lubrication

1) Life time with an output speed of 100 1/min and T = 30 °C
2) Referring to the housing surface
3) With mounting position IM V3 (drive shaft vertical, shaft end upward) only protection class IP 41 is guaranteed

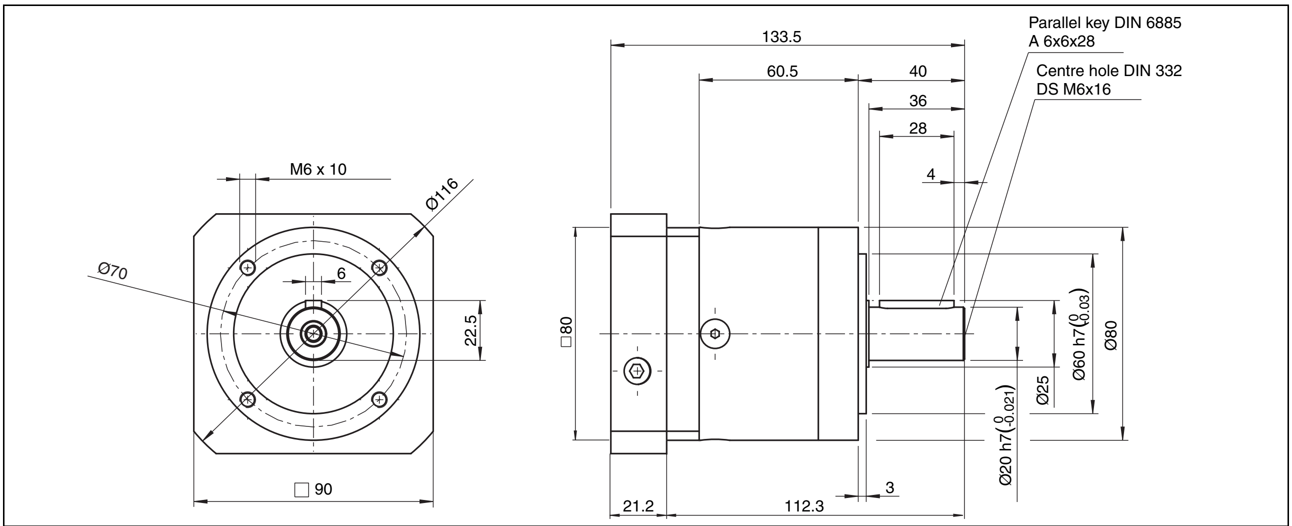
Size of PLS		70	90	115
Max. radial force [1) 2)]	N	3000	4000	5000
Max. axial force	N	6000	9000	12000
Torsional play	arcmin	<3	<3	<3
Max. drive speed	1/min	14000	10000	8500
Recommended drive speed	1/min	5000	4500	4000
Torsional stiffness	Nm/arcmin	6	9	20
Weight	kg	3.0	4.3	9.0

1) The information refers to min. 20000 h life time with an output speed of 100 1/min and application factor K = 100 min and S1 operating mode for electrical machines and T=30°C
2) Refers to the centre of the drive shaft and 50% ED

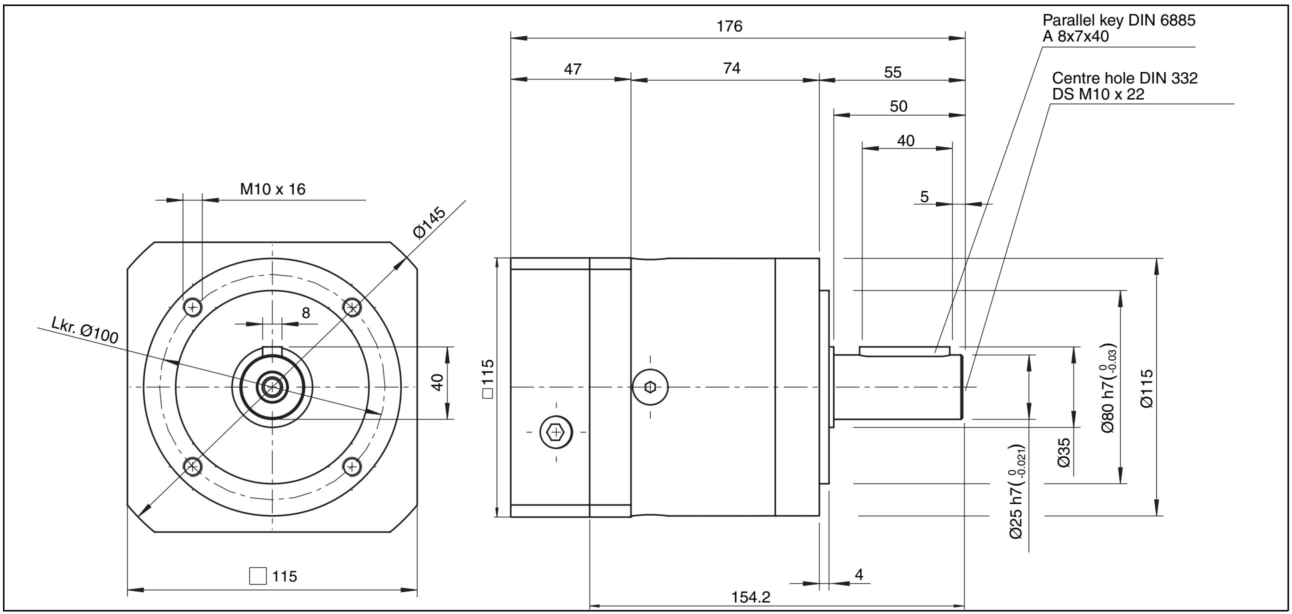
Dimensional drawings



PLE 60 gearbox, 1-stage

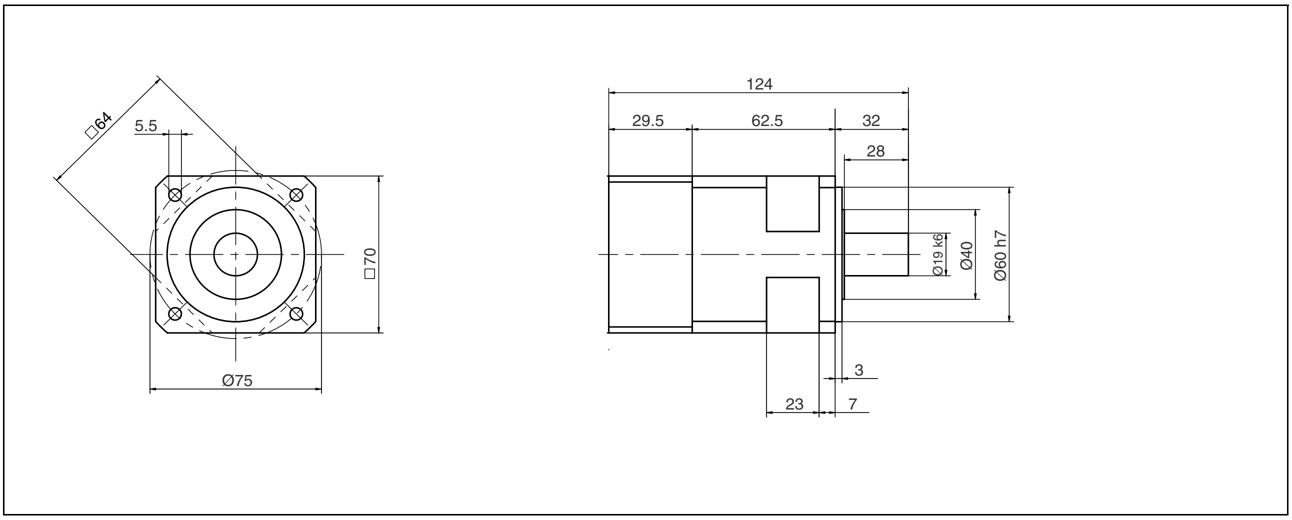


PLE 80 gearbox, 1-stage

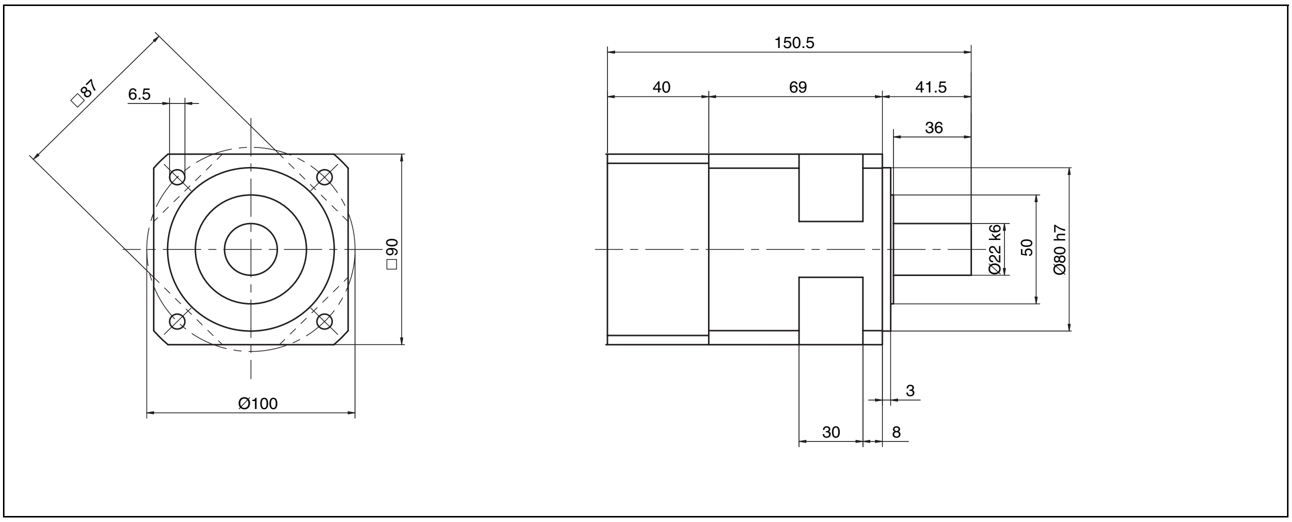


PLE 120 gearbox, 1-stage

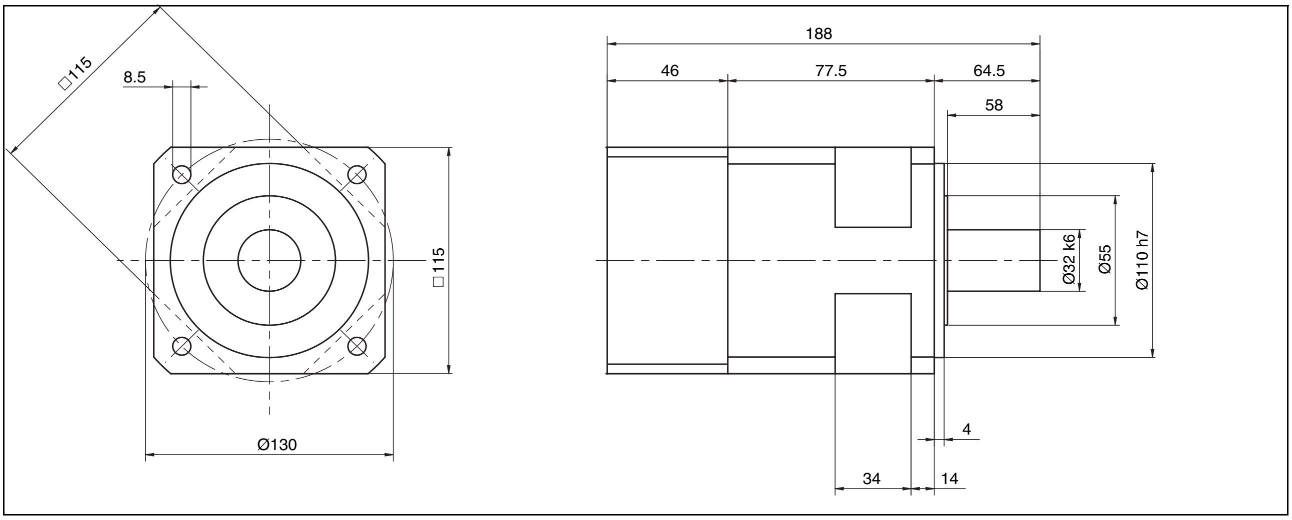
Dimensional drawings



PLS gearbox 70



PLS gearbox 90



PLS gearbox 115

Type code

VRDM 368

Example:	**VRDM**	**3**	**6**	**8**	**/**	**50**	**L**	**W**	**C**	**E**	**O**	**IP41**	**2**	**5**	**DO**	**O**	**OO**	**2**	**B**	**B**	**O**	**OOO**
Phase count 3	VRDM	**3**	6	8	/	50	L	W	C	E	O	IP41	2	5	DO	O	OO	2	B	B	O	OOO
Size (Flange) 6 = 57.2 mm	VRDM	3	**6**	8	/	50	L	W	C	E	O	IP41	2	5	DO	O	OO	2	B	B	O	OOO
Length 8 = 79 mm	VRDM	3	6	**8**	/	50	L	W	C	E	O	IP41	2	5	DO	O	OO	2	B	B	O	OOO
Number of pole pairs 50	VRDM	3	6	8	/	**50**	L	W	C	E	O	IP41	2	5	DO	O	OO	2	B	B	B	OOO
Rotor L = laminated rotor plate	VRDM	3	6	8	/	50	**L**	W	C	E	O	IP41	2	5	DO	O	OO	2	B	B	O	OOO
Maximum voltage W = 230 V_{AC} (325 V_{DC})	VRDM	3	6	8	/	50	L	**W**	C	E	O	IP41	2	5	DO	O	OO	2	B	B	B	OOO
Connection type B = Terminal box C = connector	VRDM	3	6	8	/	50	L	W	**C**	E	O	IP41	2	5	DO	O	OO	2	B	B	O	OOO
Position capture E = Encoder (1000 increments/revolution) O = without encoder	VRDM	3	6	8	/	50	L	W	C	**E**	O	IP41	2	5	DO	O	OO	2	B	B	O	OOO
holding brake B = Brake O = Without brake	VRDM	3	6	8	/	50	L	W	C	E	**O**	IP41	2	5	DO	O	OO	2	B	B	O	OOO
Degree of protection IP41 = IP 41 at shaft bushing	VRDM	3	6	8	/	50	L	W	C	E	O	**IP41**	2	5	DO	O	OO	2	B	B	O	OOO
Gearbox type O = Without gearbox 2 = PLE 60 A = PLS 70	VRDM	3	6	8	/	50	L	W	C	E	O	IP41	**2**	5	DO	O	OO	2	B	B	O	OOO
Gear ratio O = Without gearbox 3 = 3:1 5 = 5:1 8 = 8:1	VRDM	3	6	8	/	50	L	W	C	E	O	IP41	2	**5**	DO	O	OO	2	B	B	O	OOO
Shaft diameter D8 = 8 mm DO = with gearbox	VRDM	3	6	8	/	50	L	W	C	E	O	IP41	2	5	**DO**	O	OO	2	B	B	O	OOO
Shaft modelFront O = Smooth shaft or gearbox	VRDM	3	6	8	/	50	L	W	C	E	O	IP41	2	5	DO	**O**	OO	2	B	B	O	OOO
Centring collar 38 = 38.10 mm OO = with gearbox	VRDM	3	6	8	/	50	L	W	C	E	O	IP41	2	5	DO	O	**OO**	2	B	B	O	OOO
Second shaft: O = without 2 = with	VRDM	3	6	8	/	50	L	W	C	E	O	IP41	2	5	DO	O	OO	**2**	B	B	O	OOO
Connection direction motor plug [1)] O = without, L = left, R = right B = back, F = front, S = straight	VRDM	3	6	8	/	50	L	W	C	E	O	IP41	2	5	DO	O	OO	2	**B**	B	O	OOO
Connection direction encoder plug [1)] O = without, L = left, R = right B = back, F = front, S = straight	VRDM	3	6	8	/	50	L	W	C	E	O	IP41	2	5	DO	O	OO	2	B	**B**	O	OOO
Braided wire output O = Without	VRDM	3	6	8	/	50	L	W	C	E	O	IP41	2	5	DO	O	OO	2	B	B	**O**	OOO
Braided wire length OOO = Without	VRDM	3	6	8	/	50	L	W	C	E	O	IP41	2	5	DO	O	OO	2	B	B	O	**OOO**

1) Connection direction viewed from front at 1st shaft end, connector up.

Note:
Please note the description of the possible motor types on page 38.

VRDM 39•

Example:	**VRDM**	**3**	**9**	**10**	**/**	**50**	**L**	**W**	**C**	**E**	**O**	**IP41**	**3**	**5**	**DO**	**O**	**OO**	**2**	**B**	**B**	**O**	**OOO**
Phase count 3	VRDM	**3**	9	10	/	50	L	W	C	E	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Size (Flange) 9 = 85 mm	VRDM	3	**9**	10	/	50	L	W	C	E	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Motor length 7 = 68 mm 10 = 98 mm 13 = 128 mm	VRDM	3	9	**10**	/	50	L	W	C	E	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Number of pole pairs 50	VRDM	3	9	10	/	**50**	L	W	C	E	O	IP41	3	5	DO	O	OO	2	B	B	B	OOO
Rotor L = laminated rotor plate	VRDM	3	9	10	/	50	**L**	W	C	E	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Maximum voltage W = 230 V_{AC} (325 V_{DC})	VRDM	3	9	10	/	50	L	**W**	C	E	O	IP41	3	5	DO	O	OO	2	B	B	B	OOO
Connection type B = Terminal box C = connector	VRDM	3	9	10	/	50	L	W	**C**	E	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Position capture E = Encoder (1000 increments/revolution) O = without encoder	VRDM	3	9	10	/	50	L	W	C	**E**	O	IP41	3	5	DO	O	OO	2	B	B	O	OOO
holding brake B = Brake O = Without brake	VRDM	3	9	10	/	50	L	W	C	E	**O**	IP41	3	5	DO	O	OO	2	B	B	O	OOO
Degree of protection IP41 = IP 41 at shaft bushing IP56 = 56 at shaft bushing at front	VRDM	3	9	10	/	50	L	W	C	E	O	**IP41**	3	5	DO	O	OO	2	B	B	O	OOO
Gearbox type O = Without gearbox 3 = PLE 80 B = PLS 90	VRDM	3	9	10	/	50	L	W	C	E	O	IP41	**3**	5	DO	O	OO	2	B	B	O	OOO
Gear ratio O = Without gearbox 3 = 3:1 5 = 5:1 8 = 8:1	VRDM	3	9	10	/	50	L	W	C	E	O	IP41	3	**5**	DO	O	OO	2	B	B	O	OOO
Shaft diameter D9 = 9.5 mm D2 = 12 mm D4 = 14 mm DO = with gearbox	VRDM	3	9	10	/	50	L	W	C	E	O	IP41	3	5	**DO**	O	OO	2	B	B	O	OOO
Shaft modelFront O = smooth shaft or gearbox K = sliding spring per DIN 6888	VRDM	3	9	10	/	50	L	W	C	E	O	IP41	3	5	DO	**O**	OO	2	B	B	O	OOO
Centring collar 60 = 60 mm 73 = 73 mm OO = with gearbox	VRDM	3	9	10	/	50	L	W	C	E	O	IP41	3	5	DO	O	**OO**	2	B	B	O	OOO
Second shaft O = without 2 = with	VRDM	3	9	10	/	50	L	W	C	E	O	IP41	3	5	DO	O	OO	**2**	B	B	O	OOO
Connection direction motor plug [1)] O = without, L = left, R = right B = back, F = front, S = straight	VRDM	3	9	10	/	50	L	W	C	E	O	IP41	3	5	DO	O	OO	2	**B**	B	O	OOO
Connection direction encoder plug [1)] O = without, L = left, R = right B = back, F = front, S = straight	VRDM	3	9	10	/	50	L	W	C	E	O	IP41	3	5	DO	O	OO	2	B	**B**	O	OOO
Braided wire output O = Without	VRDM	3	9	10	/	50	L	W	C	E	O	IP41	3	5	DO	O	OO	2	B	B	**O**	OOO
Braided wire length OOO = Without	VRDM	3	9	10	/	50	L	W	C	E	O	IP41	3	5	DO	O	OO	2	B	B	O	**OOO**

[1)] Connection direction viewed from front at 1st shaft end, connector up.

Note:
Please note the description of the possible motor types on page 38.

VRDM 311•

Example:	**VRDM**	**3**	**11**	**17**	**/**	**50**	**L**	**W**	**C**	**E**	**O**	**IP41**	**4**	**5**	**DO**	**O**	**OO**	**2**	**B**	**B**	**O**	**OOO**
Phase count 3	VRDM	**3**	11	17	/	50	L	W	C	E	O	IP41	4	5	DO	O	OO	2	B	B	O	OOO
Size (Flange) 11 = 110 mm	VRDM	3	**11**	17	/	50	L	W	C	E	O	IP41	4	5	DO	O	OO	2	B	B	O	OOO
Length 17 = 180 mm 22 = 228 mm	VRDM	3	11	**17**	/	50	L	W	C	E	O	IP41	4	5	DO	O	OO	2	B	B	O	OOO
Number of pole pairs 50	VRDM	3	11	17	/	**50**	L	W	C	E	O	IP41	4	5	DO	O	OO	2	B	B	B	OOO
Rotor L = laminated rotor plate	VRDM	3	11	17	/	50	**L**	W	C	E	O	IP41	4	5	DO	O	OO	2	B	B	O	OOO
Maximum voltage W = 230 V_{AC} (325 V_{DC})	VRDM	3	11	17	/	50	L	**W**	C	E	O	IP41	4	5	DO	O	OO	2	B	B	B	OOO
Connection type B = Terminal box C = connector	VRDM	3	11	17	/	50	L	W	**C**	E	O	IP41	4	5	DO	O	OO	2	B	B	O	OOO
Recording of position E = Encoder (1000 increments/revolution) O = without encoder	VRDM	3	11	17	/	50	L	W	C	**E**	O	IP41	4	5	DO	O	OO	2	B	B	O	OOO
holding brake B = Brake O = Without brake	VRDM	3	11	17	/	50	L	W	C	E	**O**	IP41	4	5	DO	O	OO	2	B	B	O	OOO
Degree of protection IP41 = IP 41 at shaft bushing IP56 = IP 56 at shaft bushing at front	VRDM	3	11	17	/	50	L	W	C	E	O	**IP41**	4	5	DO	O	OO	2	B	B	O	OOO
Gearbox type O = Without gearbox 4 = PLE 120 C = PLS 115	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	**4**	5	DO	O	OO	2	B	B	O	OOO
Gear ratio O = Without gearbox 3 = 3:1 5 = 5:1 8 = 8:1	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	**5**	DO	O	OO	2	B	B	O	OOO
Shaft diameter D9 = 19 mm DO = with gearbox	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	5	**DO**	O	OO	2	B	B	O	OOO
Shaft modelFront O = Smooth shaft or gearbox K = parallel key as per DIN 6885	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	5	DO	**O**	OO	2	B	B	O	OOO
Centring collar 56 = 56 mm OO = with gearbox	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	5	DO	O	**OO**	2	B	B	O	OOO
Second shaft O = without 2 = with	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	5	DO	O	OO	**2**	B	B	O	OOO
Connection direction motor plug [1)] O = without, L = left, R = right B = back, F = front, S = straight	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	5	DO	O	OO	2	**B**	B	O	OOO
Connection direction encoder plug [1)] O = without, L = left, R = right B = back, F = front, S = straight	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	5	DO	O	OO	2	B	**B**	O	OOO
Braided wire output O = Without	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	5	DO	O	OO	2	B	B	**O**	OOO
Braided wire length OOO = Without	VRDM	3	11	17	/	50	L	W	C	E	O	IP41	4	5	DO	O	OO	2	B	B	O	**OOO**

1) Connection direction viewed from front at 1st shaft end, connector up.

Note:
Please note the description of the possible motor types on page 38.

Accessories

EMC mains filter

Function

A mains filter is integrated in the SD3 as standard equipment to comply with the IEC/EN 61800-3 standards governing electromagnetic compatibility (EMC). These standards must be met for the CE approval under the EMC guideline.
The additional mains filter makes it possible to meet stricter requirements.
This drive system meets the EMC requirements for the second environment according to the standard IEC 61800-3, if the described measures are taken into account during installation. The following note should be taken into account outside of the application area:
Better values can be achieved depending on the device and the application and also the structure, e.g. on mounting in an enclosed switching cabinet.
If the limit values for the first environment (public networks, category C2) are required, external mains filters must be connected in series.
The following limiting values for wiring related interference quantities are met by EMC compatible designs:

Without external mains filter	C3 up to 10m motor cable length
With external mains filter	C2 up to 20 m motor cable length C3 up to 50m motor cable length

The operator must ensure compliance with the EMC Directives.

Usage depending on the power network type

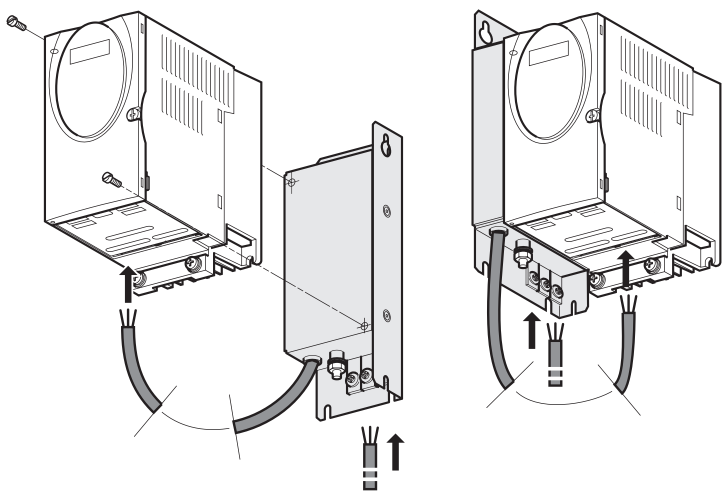
This mains filter can only be used in TN networks (connection to neutral conductor) and TT networks (neutral conductor connected to earth).
The filters cannot be used in IT mains (isolated or over a high impedance earthed neutral conductor).
Standard IEC 61800-3, Annex D2.1, states that the mains filters may not be used for this mains type because correct operation of the insulation monitoring equipment cannot be guaranteed.
In addition, the efficiency of the mains filter in this network type depends on the type of impedance between neutral conductor and earth. Therefore, the efficiency is not predictable.
An isolating transformer is required for machines that must be installed on an IT mains to allow the machine to be operated locally as on a TN or TT system.

Technical data on the external mains filter

Compliance with the standards		EN 133200
Degree of protection		IP 21 and IP 41 in upper section
Maximum relative humidity		93% without condensation and surface water accumulation as per IEC 68-2-3
Ambient temperature		
• Operating temperature	°C	-10 ... +60
• Transport and storage temperature	°C	-5...+70
Maximum installation height	m	1000 (Over 1000 m decrease the current by 1% per additional 100 m)
Oscillation stress as per IEC 80068-2-6		3 ... 13 Hz: 1.5 mm peak13 ... 150 Hz: 1 g peak
Shock stress as per IEC 60068-2-27		15 g for 11 ms
Maximum rated voltage		
• 50/60 Hz, 1-phase	V	240 + 10%
• 50/60 Hz, 3-phase	V	240 + 10% 500 + 10% 600 + 10%

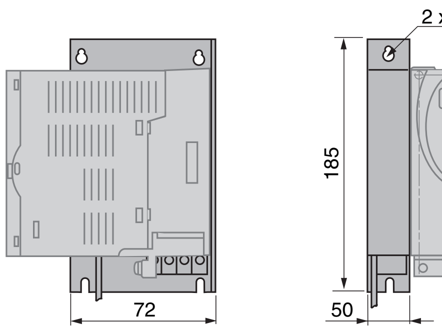
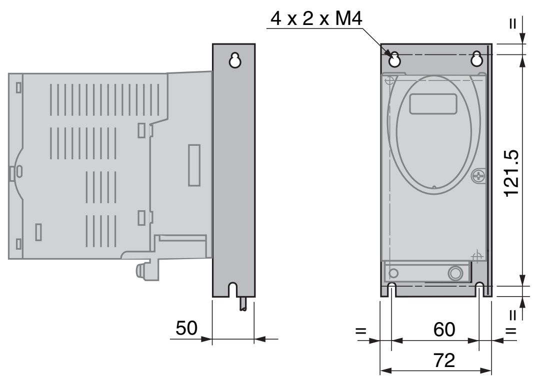
Application case, category:EN 61800-3: 2001-02; IEC 61800-3, Ed. 2	Description
First environment, general availability; category C1	Use in living area, sale e. g. through construction market
First environment, restricted availability; category C2	Operation in living areas, sale through dealers only
Second environment; category C3	Operation in industrial mains

Mounting



Mounting mains filters

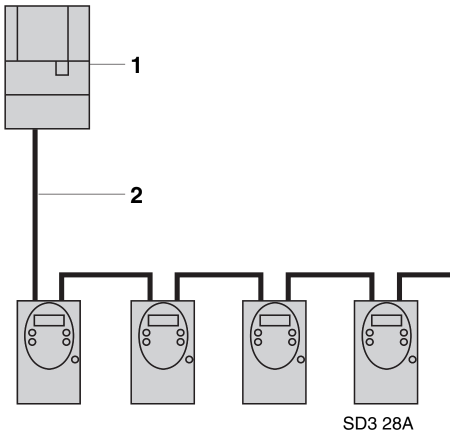
Dimensional drawings

Mounting of the mains filter next to the stepper drive	Mounting of the mains filter behind to the stepper drive
	

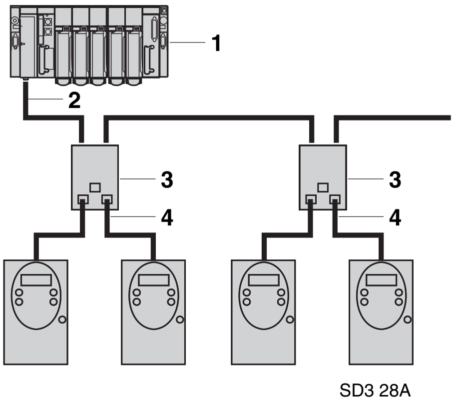
Order data

Designation	Description	for SD3..			Order number
		26	28 A	28B	
EMC mains filter	EMC mains filter 1-phase, 9 A, 115/230 V_{AC}	x	x	x	**VW3A31401**

Fieldbus CANopen



CANopen connection without tapping box



CANopen connection with tapping box

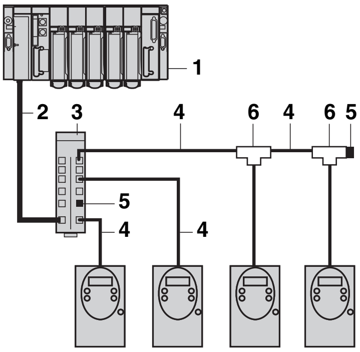
(1) PLC or motion controller, e.g. TLM2
(2) CANopen cable
(3) CANopen tapping box VW3CANTAP2
(4) CANopen cable VW3CANCARR••

The SD3 28A stepper drive can be connected directly to a CANopen fieldbus over two interfaces (CN1 or CN4).
At interface CN1 three pins as spring loaded terminals and three connections are available. The CN4 interface is a RJ45 plug.
In a CAN bus multiple network devices can be connected over one bus cable. Every network device must be configured before operation on the network. The baud rate must be the same for all devices in the fieldbus. Address and baud rate are set during commissioning.
The devices at the two ends of a bus cable string must be terminated. On a CAN this can be done with terminating resistors. A terminating resistor is integrated in the device. It is enabled with the S1 switch.

Order data

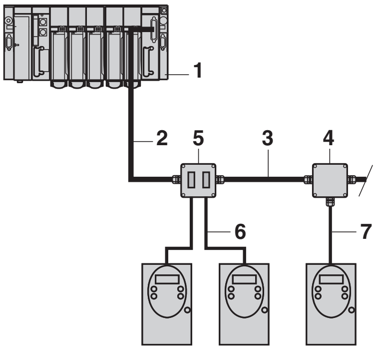
Designation	Description		for SD3..			Order number
			26	28 A	28B	
CANopen tapping box				x		**VW3CANTAP2**
CAN cable	with 2 RJ45 connectors	0.3 m		x		**VW3CANCARR03**
		1.0 m		x		**VW3CANCARR1**

Modbus fieldbus



Connection through terminal modules and RJ45 connectors

(1) PLC
(2) Modbus cable, depending on the types of control unit or PLC
(3) Modbus LU9GC3 terminal module
(4) Modbus cable VW3A8306R••
(5) RC terminal adapter VW3A8306RC
(6) Modbus T-tappng module VW3A8306TF••



Connection via tapping boxes

(1) PLC
(2) Modbus cable, depending on the types of control unit or PLC
(3) Modbus cable VW3A8306
(4) Modbus tapping box TSXSCA50
(5) Modbus cable VW3A8306
(6) Modbus T-tappng module VW3A8306TF••
(7) Modbus cable VW3A8306D30

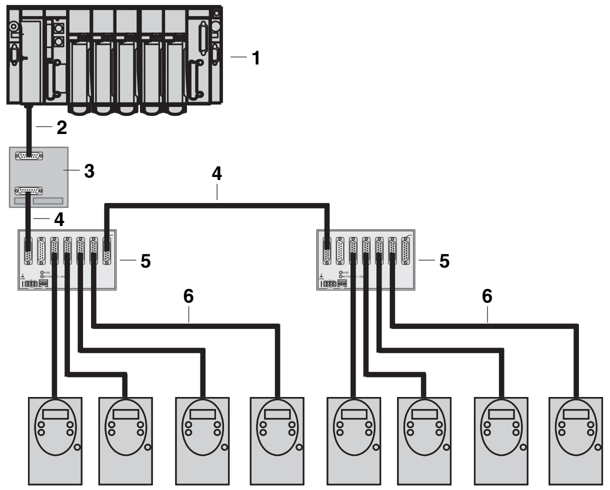
Connection via screw terminals:
In this case a Modbus VW3A8306D30 cable and an RC VW3A8306DRC terminal adapter are required.

The SD3 28A stepper motor drive can be connected directly to a Modbus fieldbus via the CN4 interface.
In Modbus multiple network devices can be connected over one bus cable. Every network device must be configured before operation on the network. Every device is assigned a unique node address.
The baud rate must be the same for all devices in the fieldbus.

Order data

Designation	Description		for SD3...			Order number
			26	28 A	28B	
Modbus tapping box	3 screw terminal strips, RC terminal adapter, for connection to VW3A8306D30 cable			x		**TSXSCA50**
Modbus 2-way tapping box	2 15-pin SubD female connectors, 2 screw terminal strips, RC terminal adapter, for connection with VW3A8306 cable			x		**TSXSCA62**
Modbus connector module	10 RJ45 connectors, 1 screw terminal strip			x		**LU9GC3**
Modbus RC terminal adapter	for RJ45 connectors	120 Ω, 1 nF		x		**VW3A8306RC**
		150 Ω		x		**VW3A8306R**
	for screw terminal strip	120 Ω, 1 nF		x		**VW3A8306DRC**
		150 Ω		x		**VW3A8306DR**
Modbus T-branch module	with integrated cable	0.3 m		x		**VW3A8306TF03**
		1.0 m		x		**VW3A8306TF10**
Modbus cable	with 1 RJ45 connector, 1 end isolated, for Modbus tapping box TSXSCA50	3.0 m		x		**VW3A8306D30**
Modbus cable	with 1 RJ45 connector, 1 15-pin SubD connector, for Modbus 2-way tapping box TSXSCA62	3.0 m		x		**VW3A8306**
Modbus cable	2 RJ45 connectors	0.3 m		x		**VW3A8306R03**
		1.0 m		x		**VW3A8306R10**
		3.0 m		x		**VW3A8306R30**
Modbus cable	4-wire, shield and twisted, RS485, without connector	100 m		x		**TSXCSA100**
		200 m		x		**TSXCSA200**
		500 m		x		**TSXCSA500**

Pulse/direction interface (SD3 28)



SD3 28A

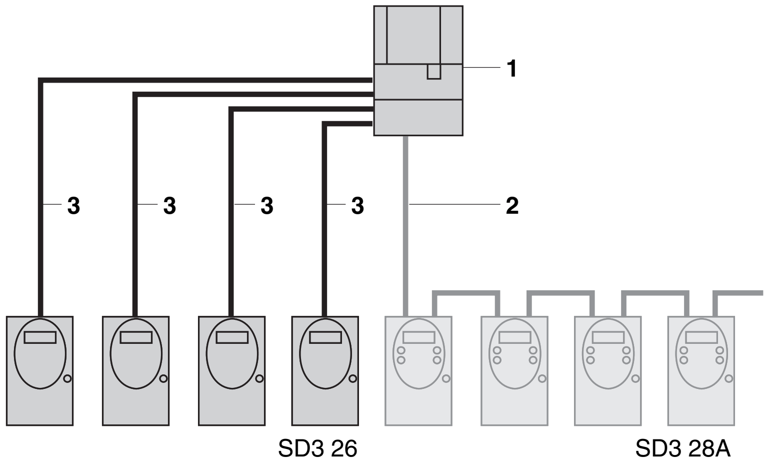
(1) PLC
(2) Connector cable VW3M8210R••
(3) RS422 interface adapter USIC VW3M3102
(4) Cascading cable VW3M8211R05
(5) Reference Value Adapter VW3M3101
(6) Connector cable VW3M8209R••

The SD3 28 stepper drives are suitable for setting reference values over externally fed pulse/direction signals. This is required for the "electronic gear" operating mode. In this case, the CN5 pulse/direction interface is used for feeding the reference signals (pulse/direction) or A/B encoder signals.

Order data

Designation	Description		for SD 3..			Order number
			26	28 A	28B	
Reference value adapter	For distribution of A/B encoder signals and P/R signals on 5 devices with 24-V_{DC} power supply unit for 5-V_{DC} encoder power supply; for installation on top-hat rail			x	x	**VW3M3101**
Cascading cable	For Reference Value Adapter RVA VW3M3101; with 2 15-pin SubD15 female connectors	0.5 m		x	x	**VW3M8211R05**
RS422 interface adapter USIC (Universal Signal Interface Converter)	for adaptation of activation signals to RS422 standard			x	x	**VW3M3102**
Pulse/direction connector cable for connecting a PLC to USIC	Shielded; USIC-side with SubD15 female connector,other end open	0.5 m		x	x	**VW3M8210R05**
		1.5 m		x	x	**VW3M8210R15**
		3.0 m		x	x	**VW3M8210R30**
		5.0 m		x	x	**VW3M8210R50**
Cable for pulse/direction, ESIM, A/B	Device side with 10-pin Molex connector, other cable end open	0.5 m		x	x	**VW3M8201R05**
		1.5 m		x	x	**VW3M8201R15**
		3.0 m		x	x	**VW3M8201R30**
		5.0 m		x	x	**VW3M8201R50**
Pulse/direction connector cable on Schneider Premium CFY	Device side with 10-pin Molex plug, CFY side with 15-pin SubD connector	0.5 m		x	x	**VW3M8204R05**
		1.5 m		x	x	**VW3M8204R15**
		3.0 m		x	x	**VW3M8204R30**
		5.0 m		x	x	**VW3M8204R50**
Pulse/direction connector cable on Siemens S5 IP247	Device side with 10-pin Molex plug, IP247 side with SubD9 connector	3.0 m		x	x	**VW3M8205R30**
Pulse/direction connector cable on Siemens S5 IP267	Device side with 10-pin Molex plug, IP267 side with SubD9 connector	3.0 m		x	x	**VW3M8206R30**
Pulse/direction connector cable on Siemens S7 -300 FM353	Device side with 10-pin Molex plug, FM353 side with SubD15 connector	3.0 m		x	x	**VW3M8207R30**
Pulse/direction connector cable, A/B to Reference Value Adapter, USIC, TLM2 or WP/WPM 311	Device side with 10-pin Molex connector, other end of cable with SubD15 female connector	0.5 m		x	x	**VW3M8209R05**
		1.5 m		x	x	**VW3M8209R15**
		3.0 m		x	x	**VW3M8209R30**
		5.0 m		x	x	**VW3M8209R50**

Signal interface (SD3 26)



(1) PLC or Motion Controller
(2) CANopen cable
(3) Connector cable VW3S8208..

The CN1 signal interface of the SD3 26 stepper drive is used for feeding the reference signals (pulse/direction).

Order data

Designation	Description		for SD 3.. 26	28 A	28B	Order number
Pulse/direction cable	5 V, shielded; device side with 24-pin Molex plug; other cable end open	0.5 m	x			**VW3S8201R05**
		1.5 m	x			**VW3S8201R15**
		3.0 m	x			**VW3S8201R30**
		5.0 m	x			**VW3S8201R50**
	24 V, shielded; device side with 24-pin Molex plug; other cable end open	0.5 m	x			**VW3S8202R05**
		1.5 m	x			**VW3S8202R15**
		3.0 m	x			**VW3S8202R30**
		5.0 m	x			**VW3S8202R50**
Pulse/direction connector cable on Schneider Premium CFY	Device side with 24-pin Molex plug; CFY-side with 15-pin SubD connector	1.5 m	x			**VW3S8204R15**
		3.0 m	x			**VW3S8204R30**
Pulse/direction connector cable on Siemens S7-300 FM353	Device side with 24-pin Molex plug; FM353 side with SubD15 female connector	0.5 m	x			**VW3S8206R15**
		1.5 m	x			**VW3S8206R30**
Connector cable pulse/direction to TLM2 or WP/WPM 311	Device side with 24-pin Molex plug; other cable end with SubD15 female connector	0.5 m	x			**VW3S8208R05**
		1.5 m	x			**VW3S8208R15**
		3.0 m	x			**VW3S8208R30**
		5.0 m	x			**VW3S8208R50**

Remote terminal

A remote terminal can be connected to the SD3 28 stepper drive, which can be attached to a switching cabinet door with an IP 65 seal.
The terminal has a display and enables access to the same functions as the control panel integrated into the stepper drive (HMI).

Description

(1) Display
- Four seven-segment displays, still legible from 5 m away
- Display of numeric values and codes
- Save values when display flashes
- Flashing display on device fault

(2) ESC
- Closing a menu or parameter
- Return from displayed to last saved value

(3) Red LED on: DC bus under power

(4) ENT
- Calling a menu or parameter
- Save the displayed value

(5) Quick Stop (Software Stop)

(6) Error reset (Continue)

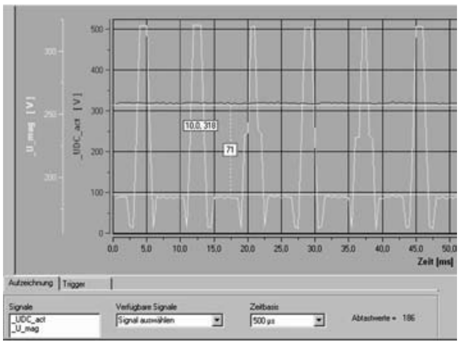
(7) No function

(8) Down arrow
- Switch to next menu or parameter
- Reduce the displayed value

(9) Up arrow
- Switch to previous menu or parameter
- Increase the displayed value

Order data

Designation	Description		for SD3..			Order number
			26	28 A	28B	
Remote terminal	incl. cable with 2 plugs, seal and screws for mounting in degree of protection IP 65 on the switching cabinet door			x	x	**VW3A31101**



BLCT commissioning software

Description

The Windows-based BLCT commissioning software is used for easy commissioning, parameterisation, simulations and diagnostics of the SD3 28 stepper drive.
Compared to the integrated control panel (HMI) the commissioning software offers further options such as:

- Graphic interfaces for parameterisation and status display
- Extensive diagnostic tools for optimisation and maintenance
- Long-term recording as an aid to assessing operating behaviour
- Testing input and output signals
- Tracking signal sequences on the monitor
- Archiving of all device settings and records (with export functions for data processing)

System requirements

You will need a PC or laptop with a free serial port and MS Windows® 2000 or newer.

Reference source

The current version of the BLCT commissioning software can be downloaded from the download area of the Berger Lahr web site http://www.berger-lahr.de.

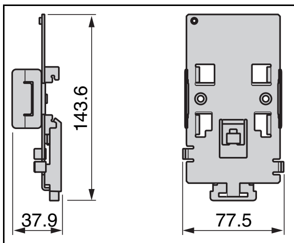
Order data

Designation	Description		for SD3..			Order number
			26	28 A	28B	
RJ45 programming cable with RS485/RS232 adapter		3.0 m		x	x	**ACC2CRAAEF030**

Adapter plate

The adapter plate is used for mounting the SD3 on a top-hat rail.

Dimensional drawing



Adapter plate

Order data

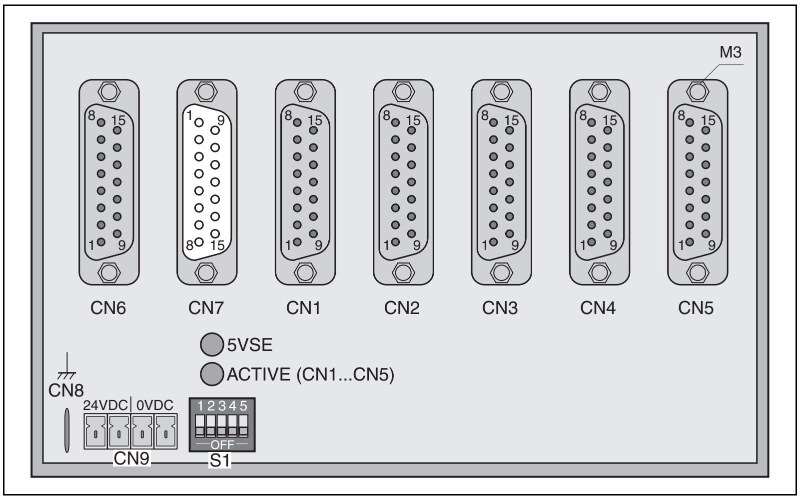
Designation	Description	for SD3..			Order number
		26	**28 A**	**28B**	
Adapter plate	For mounting on top-hat rail	x	x	x	**VW3A11851**

Reference value adapter RVA

Reference signals of a master device can be sent simultaneously to up to five devices using the RVA (Reference Value Adapter). This adapter also supplies the supply voltage (5V, monitored with sense wires) for the encoder. The correct power supply is shown by a "5VSE" LED.
An external rotary encoder (A/B signals) or an encoder simulation (ESIM) can be used as a master device. Pulse/direction signals can also be sent from a master controller.

The RVA reference value adapter is powered by 24 V at the CN9 terminals. A master controller (pulse/direction) can be connected to CN6. An external rotary encoder or an ESIM signal can be applied to CN7.

Terminals



Reference Value Adapter RVA, connections

Technical Data

Mechanical data		
Dimensions (H x W x D)	mm	77 x 135 x 37
Electrical Data		
Input		
• Supply voltage	V_{DC}	19.2 ... 30
• Current consumption	A	15 ... 150
- 5VSE unloaded	mA	50
- 5VSE 300 mA	mA	150
Output, encoder		sense-regulated, short-circuit-proof, overload-proof
• 5VSE		4.75 ... 5.25
• Max. output current	mA	300

Order data

Designation	Description		for SD3..			Order number
			26	28 A	28B	
Reference value adapter	For distribution of A/B encoder signals and P/R signals on 5 devices with 24-V_{DC} power supply unit for 5-V_{DC} encoder power supply; for mounting on top-hat rail			x	x	**VW3M3101**
Cascading cable	for Reference Value Adapter VW3M3101	0.5 m		x	x	**VW3M8211R05**

RS422 interface adapter USIC

The USIC (Universal Signal Interface Converter) is an interface adapter, which is used as a universal adapter from a pulse/direction interface to a master controller (e.g. PLC).
A USIC is recommended in the following cases:

- If 24-V signals are to be connected to 5-V inputs.
- If the signals must be electrically isolated (e.g. incorrect reference potential, strong interference in environment).
- If signals with an open collector are connected over distances greater than 3 m or the frequency is greater than 50 kHz.

The USIC has the following features:

- 24V or 5V inputs (optocoupler) are available as required.
- Actuation signals are adapted for products with inputs that comply with RS422.
- Electrical isolation of signals

Note: a power supply (24 V corresponding to PELV) must be provided by the customer.

Technical Data

Mechanical data		
Dimensions (H x W x D)	mm	68 x 73 x 38
Degree of protection as per EN 60529		IP 00
Electrical Data		
Supply voltage	V_{DC}	20 ... 30
Current consumption	A	15 ... 150
Ripple voltage	V_{SS}	< 2
Signal inputs		opto-isolated, secure against reverse polarity
• Resistance network, plugged in		75 Ω, standard from factory
- Level		5-V level (U_S: 2.5 ... 5.25 Nm)
- Max. input voltage	V	5.25
- Turn-on point U_E	V	2.5
- Turn-off point U_A	V	0.4
- Typ. input current at nominal voltage	mA	10
• Resistance network		
- Level		24 V level (U_S: 20 ... 30 V)
- Max. input voltage	V	30
- Turn-on point U_E	V	20
- Turn-off point U_A	V	3
- Typ. input current at nominal voltage	mA	10
Signal outputs		open collector outputs, short-circuit protected
• Open collector outputs		short-circuit protected
- Max. output voltage	V	30
- Max. output current	mA	50
• RS422 outputs		short-circuit protected
Ambient conditions		
Operating temperature [1]	°C	0 - +50
Transport and storage temperature	°C	-25 ... +70
Pollution degree		Step 2
Rel. humidity as per IEC 60721-3-3, Class 3K3	%	5 ... 85%, no condensation allowed
Oscillation stress as per IEC 80068-2-6		3 ... 13 Hz: 1.5 mm peak13 ... 150 Hz: 1 g peak
Shock stress as per IEC 60068-2-27		15 g for 11 ms

[1] no icing

Order data

Designation	Description		for SD3.. 26	28 A	28B	Order number
USIC (Universal Signal Interface Converter)	for adaptation of activation signals to RS422 standard			x	x	**VW3M3102**
Pulse/direction connector cable for connecting a PLC to USIC	Shielded; USIC-side with SubD15 female connector,other end open	0.5 m		x	x	**VW3M8210R05**
		1.5 m		x	x	**VW3M8210R15**
		3.0 m		x	x	**VW3M8210R30**
		5.0 m		x	x	**VW3M8210R50**

Order data – general overview

Designation	Description		for SD3..			Order number
			26	28 A	28B	
EMC mains filter	EMC mains filter 1-phase, 9 A, 115/230 V_{AC}		x	x	x	**VW3A31401**
CANopen						
CANopen tapping box				x		**VW3CANTAP2**
CAN cable	With 2 RJ45 connectors	0.3 m		x		**VW3CANCARR03**
		1.0 m		x		**VW3CANCARR1**
Modbus						
Modbus tapping box	3 screw terminal strips, RC terminal adapter, for connection to VW3A8306D30 cable			x		**TSXSCA50**
Modbus 2-way tapping box	2 15-pin SubD female connectors, 2 screw terminal strips, RC terminal adapter, for connection with VW3A8306 cable			x		**TSXSCA62**
Modbus connector module	10 RJ45 connectors, 1 screw terminal strip			x		**LU9GC3**
Modbus RC terminal adapter	For RJ45 connectors	120 Ω, 1 nF		x		**VW3A8306RC**
		150 Ω		x		**VW3A8306R**
	For screw terminal strip	120 Ω, 1 nF		x		**VW3A8306DRC**
		150 Ω		x		**VW3A8306DR**
Modbus T-branch module	With integrated cable	0.3 m		x		**VW3A8306TF03**
		1.0 m		x		**VW3A8306TF10**
Modbus cable	With 1 RJ45 connector, 1 end isolated, for Modbus tapping box TSXSCA50	3.0 m		x		**VW3A8306D30**
Modbus cable	With 1 RJ45 connector, 1 15-pin SubD connector, for Modbus 2-way tapping box TSXSCA62	3.0 m		x		**VW3A8306**
Modbus cable	2 RJ45 connectors	0.3 m		x		**VW3A8306R03**
		1.0 m		x		**VW3A8306R10**
		3.0 m		x		**VW3A8306R30**
Modbus cable	4-wire, shield and twisted, RS485, without connector	100 m		x		**TSXCSA100**
		200 m		x		**TSXCSA200**
		500 m		x		**TSXCSA500**
Pulse/direction interface						
Reference value adapter	For distribution of A/B encoder signals and P/R signals on 5 devices with 24-V_{DC} power supply unit for 5-V_{DC} encoder power supply; for mounting on top-hat rail			x	x	**VW3M3101**
Cascading cable	For Reference Value Adapter VW3M3101	0.5 m		x	x	**VW3M8211R05**
USIC (Universal Signal Interface Converter)	For adaptation of activation signals to RS422 standard			x	x	**VW3M3102**
Pulse/direction connector cable for connecting a PLC to USIC	Shielded; USIC-side with SubD15 female connector,other end open	0.5 m		x	x	**VW3M8210R05**
		1.5 m		x	x	**VW3M8210R15**
		3.0 m		x	x	**VW3M8210R30**
		5.0 m		x	x	**VW3M8210R50**
Cable for pulse/direction, ESIM, A/B	Device side with 10-pin Molex connector, other cable end open	0.5 m		x	x	**VW3M8201R05**
		1.5 m		x	x	**VW3M8201R15**
		3.0 m		x	x	**VW3M8201R30**
		5.0 m		x	x	**VW3M8201R50**
Pulse/direction connector cable on Schneider Premium CFY	Device side with 10-pin Molex plug, CFY side with 15-pin SubD connector	0.5 m		x	x	**VW3M8204R05**
		1.5 m		x	x	**VW3M8204R15**
		3.0 m		x	x	**VW3M8204R30**
		5.0 m		x	x	**VW3M8204R50**
Pulse/direction connector cable on Siemens S5 IP247	Device side with 10-pin Molex plug, IP247 side with SubD9 connector	3.0 m		x	x	**VW3M8205R30**
Pulse/direction connector cable on Siemens S5 IP267	Device side with 10-pin Molex plug, IP267 side with SubD9 connector	3.0 m		x	x	**VW3M8206R30**
Pulse/direction connector cable on Siemens S7-300 FM353	Device side with 10-pin Molex plug, FM353 side with SubD15 connector	3.0 m		x	x	**VW3M8207R30**
Pulse/direction connector cable, A/B to Reference Value Adapter, USIC, TLM2 or WP/WPM 311	Device side with 10-pin Molex connector, other end of cable with SubD15 female connector	0.5 m		x	x	**VW3M8209R05**
		1.5 m		x	x	**VW3M8209R15**
		3.0 m		x	x	**VW3M8209R30**
		5.0 m		x	x	**VW3M8209R50**

Designation	Description		for SD3.. 26	28 A	28B	Order number
Signal interface						
Pulse/direction cable	5 V, shielded; Device side with 24-pin Molex plug; other cable end open	0.5 m	x			**VW3S8201R05**
		1.5 m	x			**VW3S8201R15**
		3.0 m	x			**VW3S8201R30**
		5.0 m	x			**VW3S8201R50**
	24 V, shielded; Device side with 24-pin Molex plug; other cable end open	0.5 m	x			**VW3S8202R05**
		1.5 m	x			**VW3S8202R15**
		3.0 m	x			**VW3S8202R30**
		5.0 m	x			**VW3S8202R50**
Pulse/direction connector cable on Schneider Premium CFY	Device side with 24-pin Molex plug; CFY-side with 15-pin SubD connector	1.5 m	x			**VW3S8204R15**
		3.0 m	x			**VW3S8204R30**
Pulse/direction connector cable on Siemens S7-300 FM353	Device side with 24-pin Molex plug; FM353 side with SubD15 female connector	0.5 m	x			**VW3S8206R15**
		1.5 m	x			**VW3S8206R30**
Pulse/direction connector cable to TLM2 or WP/WPM 311	Device side with 24-pin Molex plug; other cable end with SubD15 female connector	0.5 m	x			**VW3S8208R05**
		1.5 m	x			**VW3S8208R15**
		3.0 m	x			**VW3S8208R30**
		5.0 m	x			**VW3S8208R50**
Motor cable						
Cable for 3-phase stepper motor	4 x 1.5 mm, shielded; Motor side with 6-pin circular plug; other cable end open	3.0 m	x	x	x	**VW3S5101R30**
		5.0 m	x	x	x	**VW3S5101R50**
		10.0 m	x	x	x	**VW3S5101R100**
		15.0 m	x	x	x	**VW3S5101R150**
		20.0 m	x	x	x	**VW3S5101R200**
	4 x 1.5 mm, shielded; both cable ends open	3.0 m	x	x	x	**VW3S5102R30**
		5.0 m	x	x	x	**VW3S5102R50**
		10.0 m	x	x	x	**VW3S5102R100**
		15.0 m	x	x	x	**VW3S5102R150**
		20.0 m	x	x	x	**VW3S5102R200**
Encoder cable						
Encoder cable	Configured for stepper motor; shielded; motor side with 12-pin encoder plug; device side with 12-pin Molex plug	3.0 m	x	x	x	**VW3S8101R30**
		5.0 m	x	x	x	**VW3S8101R50**
		10.0 m	x	x	x	**VW3S8101R100**
		15.0 m	x	x	x	**VW3S8101R150**
		20.0 m	x	x	x	**VW3S8101R200**
BLCT commissioning software						
RJ45 programming cable with RS485/RS232 adapter		3.0 m		x	x	**ACC2CRAAEF030**
Reference value adapter RVA						
Reference value adapter	For distribution of A/B encoder signals and P/R signals on 5 devices with 24-V_{DC} power supply unit for 5-V_{DC} encoder power supply; for installation on top-hat rail			x	x	**VW3M3101**
Cascading cable	for Reference Value Adapter VW3M3101	0.5 m		x	x	**VW3M8211R05**
USIC						
USIC (Universal Signal Interface Converter)	For adaptation of activation signals to RS422 standard			x	x	**VW3M3102**
Pulse/direction connector cable for connecting a PLC to USIC	Shielded; USIC-side with SubD15 female connector,other end open	0.5 m		x	x	**VW3M8210R05**
		1.5 m		x	x	**VW3M8210R15**
		3.0 m		x	x	**VW3M8210R30**
		5.0 m		x	x	**VW3M8210R50**
Other accessories						
Remote terminal	Incl. cable with 2 plugs, seal and screws for mounting in degree of protection IP 65 on the switching cabinet door			x	x	**VW3A31101**
Adapter plate	For mounting on top-hat rail		x	x	x	**VW3A11851**
Connector set	With 5 24-pin Molex plugs; with crimp contacts		x	x	x	**VW3S8212**
Fan set	Fan set 24 V_{DC}		x	x	x	**VW3S3101**
Technical documentation	CD-ROM, multilingual		x	x	x	**ACC1RDBAM00XX**

Conversion tables

Rotor inertia

	lb·in^2	lb·ft^2	lb·in·s^2	lb·ft·s^2 slug·ft^2	kg·cm^2	kg·cm·s^2	g·cm^2	g·cm·s^2	oz·in^2	oz·in·s^2
lb·in^2	–	6.94×10^{-3}	2.59×10^{-3}	2.15×10^{-4}	2.926	2.98×10^{-3}	2.92×10^{3}	2.984	16	4.14×10^{-2}
lb·ft^2	144	–	0.3729	3.10×10^{-2}	421.40	0.4297	4.21×10^{5}	429.71	2304	5.967
lb·in·s^2	386.08	2.681	–	8.33×10^{-2}	1.129×10^{3}	1.152	1.129×10^{6}	1.152×10^{3}	6.177×10^{3}	16
lb·ft·s^2 slug·ft^2	4.63×10^{3}	32.17	12	–	1.35×10^{4}	13.825	1.355×10^{7}	1.38×10^{4}	7.41×10^{4}	192
kg·cm^2	0.3417	2.37×10^{-3}	8.85×10^{-4}	7.37×10^{-6}	–	1.019×10^{-3}	1000	1.019	5.46	1.41×10^{-2}
kg·cm·s^2	335.1	2.327	0.8679	7.23×10^{-2}	980.66	–	9.8×10^{5}	1000	5.36×10^{3}	13.887
g·cm^2	3.417×10^{-4}	2.37×10^{-6}	8.85×10^{-7}	7.37×10^{-8}	1×10^{-3}	1.01×10^{-6}	–	1.01×10^{-3}	5.46×10^{-3}	1.41×10^{-6}
g·cm·s^2	0.335	2.32×10^{-3}	8.67×10^{-4}	7.23×10^{-5}	0.9806	1×10^{-3}	980.6	–	5.36	1.38×10^{-2}
oz·in^2	0.0625	4.3×10^{-4}	1.61×10^{-6}	1.34×10^{-6}	0.182	1.86×10^{-4}	182.9	0.186	–	2.59×10^{-3}
oz·in·s^2	24.13	0.1675	6.25×10^{-2}	5.20×10^{-3}	70.615	7.20×10^{-2}	7.06×10^{4}	72	386.08	–

Torque

	lb·in	lb·ft	oz·in	Nm	kg·m	kg·cm	g·cm	dyne·cm
lb·in	–	8.333×10^{-2}	16	0.113	1.152×10^{-2}	1.152	1.152×10^{3}	1.129×10^{6}
lb·ft	12	–	192	1.355	0.138	13.825	1.382×10^{4}	1.355×10^{7}
oz·in	6.25×10^{-2}	5.208×10^{-3}	–	7.061×10^{-3}	7.200×10^{-4}	7.200×10^{-2}	72.007	7.061×10^{4}
Nm	8.850	0.737	141.612	–	0.102	10.197	1.019×10^{4}	1×10^{7}
kg·m	86.796	7.233	1.388×10^{3}	9.806	–	100	1×10^{5}	9.806×10^{7}
kg·cm	0.8679	7.233×10^{-2}	13.877	9.806×10^{-2}	10^{-2}	–	1000	9.806×10^{5}
g·cm	8.679×10^{-4}	7.233×10^{-5}	1.388×10^{-2}	9.806×10^{-5}	1×10^{-5}	1×10^{-3}	–	980.665
dyne·cm	8.850×10^{-7}	7.375×10^{-8}	1.416×10^{-5}	10^{-7}	1.019×10^{-8}	1.0197×10^{-6}	1.019×10^{-6}	–

Power

	H.P.	W
H.P.	–	745.7
W	1.31×10^{-3}	–

Length

	in	ft	yd	m	cm	mm
in	–	0.0833	0.028	0.0254	2.54	25.4
ft	12	–	0.333	0.3048	30.48	304.8
yd	36	3	–	0.914	91.44	914.4
m	39.37	3.281	1.09	–	100	1000
cm	0.3937	0.03281	1.09 x 10-2	0.01	–	10
mm	0.03937	0.00328	1.09 x 10-3	0.001	0.1	–

Rotation

	1/min (rpm)	rad/sec	deg./sec
1/min (rpm)	–	0.105	6.0
rad/sec	9.55	–	57.30
deg./sec	0.167	1.745×10^{-2}	–

Weight

	lb	oz	slug	kg	g
lb	–	16	0.0311	0.453592	453.592
oz	6.35×10^{-2}	–	1.93×10^{-3}	0.028349	28.35
slug	32.17	514.8	–	14.5939	1.459×10^{4}
kg	2.20462	35.274	0.0685218	–	1000
g	2.205×10^{-3}	3.527×10^{-3}	6.852×10^{-5}	0.001	–

Temperature

	°F	°C
°F	–	$(\vartheta - 32) \cdot {}^5/_9$
°C	$\vartheta \cdot {}^9/_5 + 32$	–

Force

	lb	oz	gf	dyne	N
lb	–	16	453.592	4.448×10^{5}	4.4482
oz	0.0625	–	28.35	2.780×10^{4}	0.27801
gf	2.205×10^{-3}	0.03527	–	980,665	N.A.
dyne	2.248×10^{-6}	3.59×10^{-6}	1.02×10^{-3}	–	0.0001
N	0.22481	3.5967	N.A.	100,000	–

Example for conversion:
Conversion of a 10 inch length measurement into metres. Look for the entry “in” (= inch) in the “Length” table in the left column and the entry “m” (= metre) in the header. The table cell at the point of intersection of the column and the row will show the conversion factor: “0.0254”. Multiply 10 inches by 0.0254 and you will get the value in metres: 10 in x 0.0254 = 0.254 m.

BERGER LAHR

Berger Lahr offers you the positioning and automation solutions you need, based on our technology and proven series of products. Our comprehensive engineering and consulting service is ready to support and advise you every step of the way.
Berger Lahr is a member company of the Schneider Electric Group. With its Merlin Gerlin, Square D and Telemecanique brands, Schneider Electric is one of the leading providers of electrical and automation-engineering solutions.

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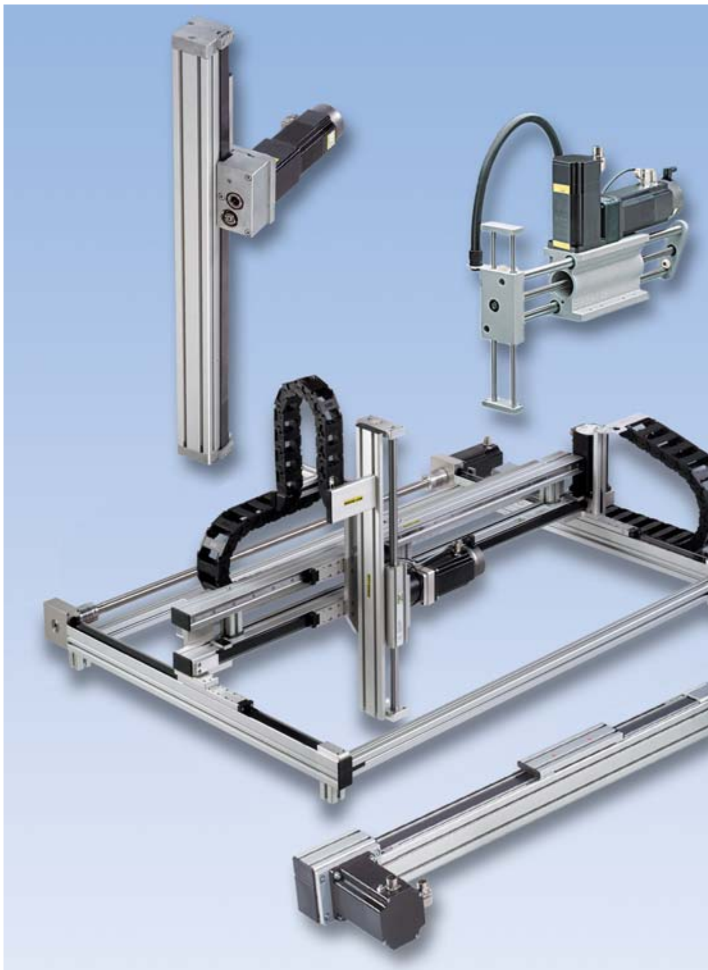


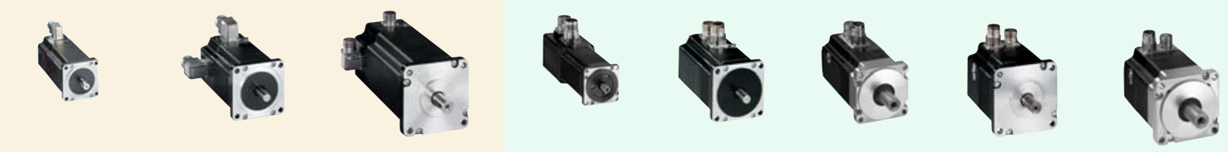
Catalogue of Robotics

Edition 2/2005

a company of Schneider Electric

Twin Line Motors

	3-phase stepping motors			AC synchronous servomotors (Standard)				
Torque [Nm][1]	1,5	2-6	12-16,5	0,32-0,9	1,1-3,6	4,3-11,25	4,6-13,4	17,8-38,8
Motor type	VRDM 36X	VRDM 39X	VRDM 311X	SER 36X	SER 39X	RIG 39X	SER 311X	RIG 311X
	VRDM 368	VRDM 397 3910 3913	VRDM 31117 31122	SER 364 366 368 3610	SER / RIG 397 3910 3913 3916[2]		SER / RIG 31112 31117	SER / RIG 31117 31122 31127[2]



Twin Line Power electronics

Power class	3 A / 350 W / 1~	7 A / 750 W / 1~	3 A / 750 W / 1~	3 A / 1,5 kW / 3~	6 A / 3 kW / 3~
for single axis systems	TLD 011	TLD 012	TLD 132	TLD 134	TLD 136

Twin Line Positioning controllers

Power class	3 A / 350 W / 1~	7 A / 750 W / 1~	3 A / 750 W / 1~	3 A / 1,5 kW / 3~	6 A / 3 kW / 3~
with data set processsing	TLC 411	TLC 412	TLC 432	TLC 434	TLC 436
with fieldbus interface	TLC 511	TLC 512	TLC 532	TLC 534	TLC 536
freely programmable according to IEC 61131-3	TLC 611	TLC 612	TLC 632	TLC 634	TLC 636

Robotics

Single-axis-systems

Portal axis

Cantilever axis

Telescope axis

[1] Stepping motors: max. torque M_{max}
AC synchronous servo: permanent idle torque M_{d0}

[2] only Motor type SER

AC synchronous servomotors (High Performace)

0,34-1,0	0,65-2,3	0,95-6	4,2-12	8,5-27	25-50
DSM4-05.X	**DSM4-07.X**	**DSM4-09.X**	**DSM4-11.X**	**DSM4-14.X**	**DSM4-19.X**
					

DSM	DSM	DSM	DSM
4-05.1-.4 4-07.1-.2 4-09.1-.2	4-07.1-.3 4-09.1-.3	4-07.1-.3 4-09.1-.4 4-11.1-.2	4-11.1-.4 4-14.1-.4 4-19.1-.2

Catalogue of
Twin Line Motors

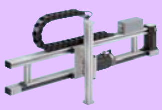
3 A / 750 W / 1~	3 A / 1,5 kW / 3~	6 A / 3 kW / 3~	16 A / 8 kW / 3~
			
TLD 132	**TLD 134**	**TLD 136**	**TLD 138**

Catalogue of
Twin Line Power electronics

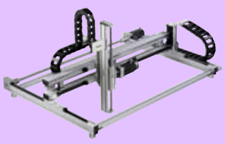
3 A / 750 W / 1~	3 A / 1,5 kW / 3~	6 A / 3 kW / 3~	16 A / 8 kW / 3~
			
TLC 432	**TLC 434**	**TLC 436**	**TLC 438**
TLC 532	**TLC 534**	**TLC 536**	**TLC 538**
TLC 632	**TLC 634**	**TLC 636**	**TLC 638**

Catalogue of
Twin Line Positioning controllers

Multi-axis-systems



Double-axis systems



Triple-axis systems

Low-mass system

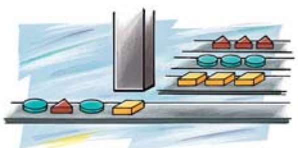
This Catalogue includes

Robotics

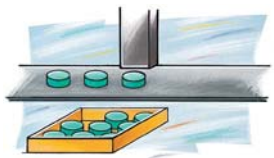
Linear modules powered by motors manufactured by Berger Lahr make it simple to automate a number of handling tasks. Both their positioning actions and their motion patterns may be precisely controlled to complete the task at hand. Combining two or three linear modules in the X, Y and/or Z direction enables free movement on the vertical or horizontal plane or in space providing a diverse array of robotics solutions. Gripping, soldering and gluing tools can easily be integrated and managed via the respective controller.

What would you like to handle?

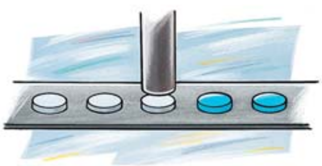
The modular robotics systems from Berger Lahr handle automation tasks such as parts processing, assembly and work-piece tasks quickly, reliably and economically, enabling you to achieve enormous efficiency potentials.



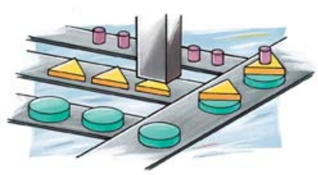
Sorting



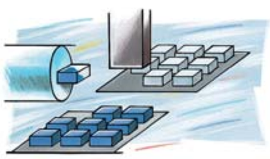
Packaging



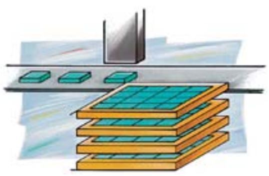
Printing, stamping, gluing, soldering, screwing, plugging



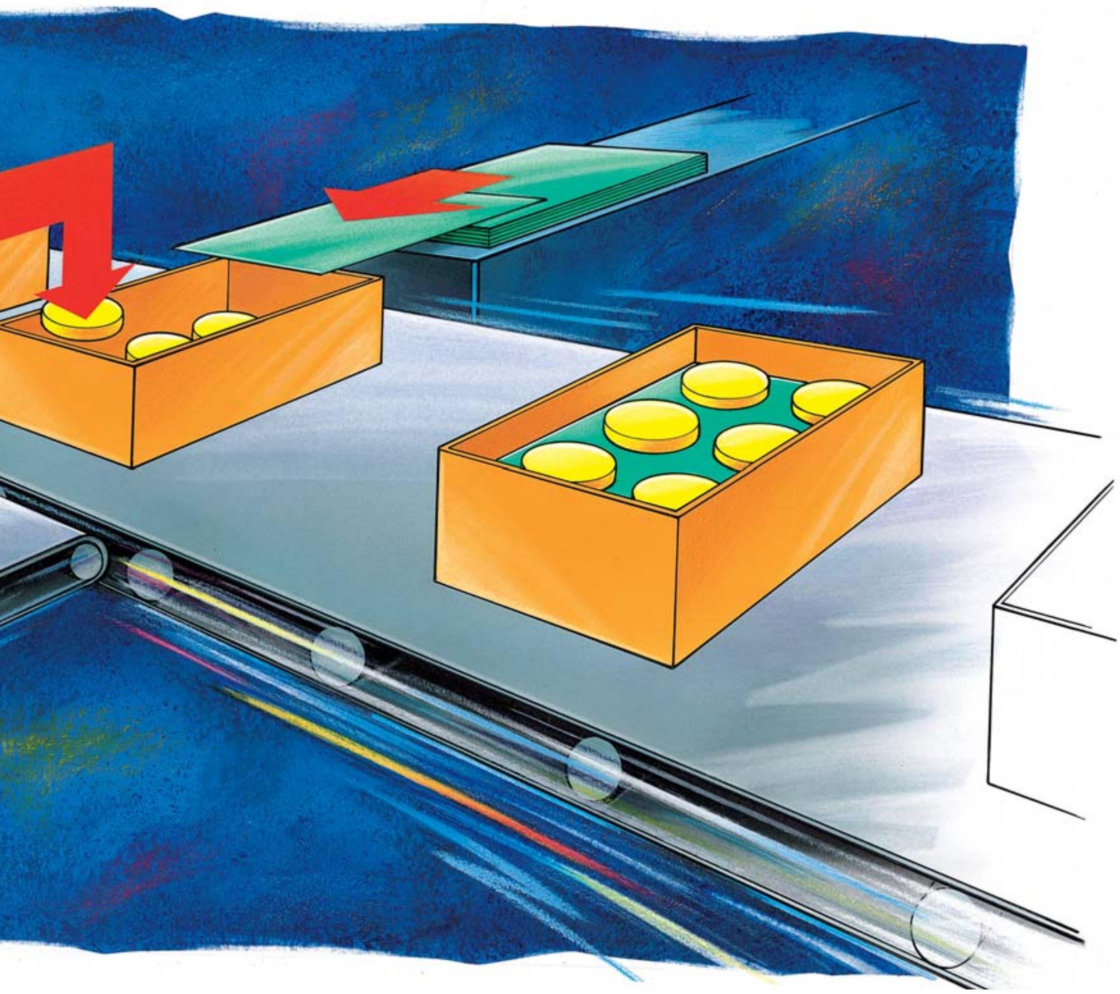
Assembling

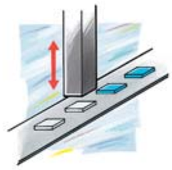


Loading/unloading

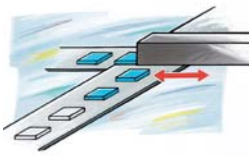


Palettising

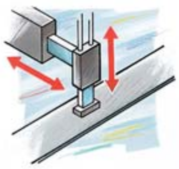




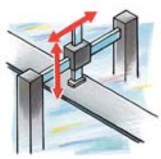
Single-axis application



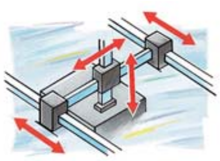
Single-axis application



Double-axis application



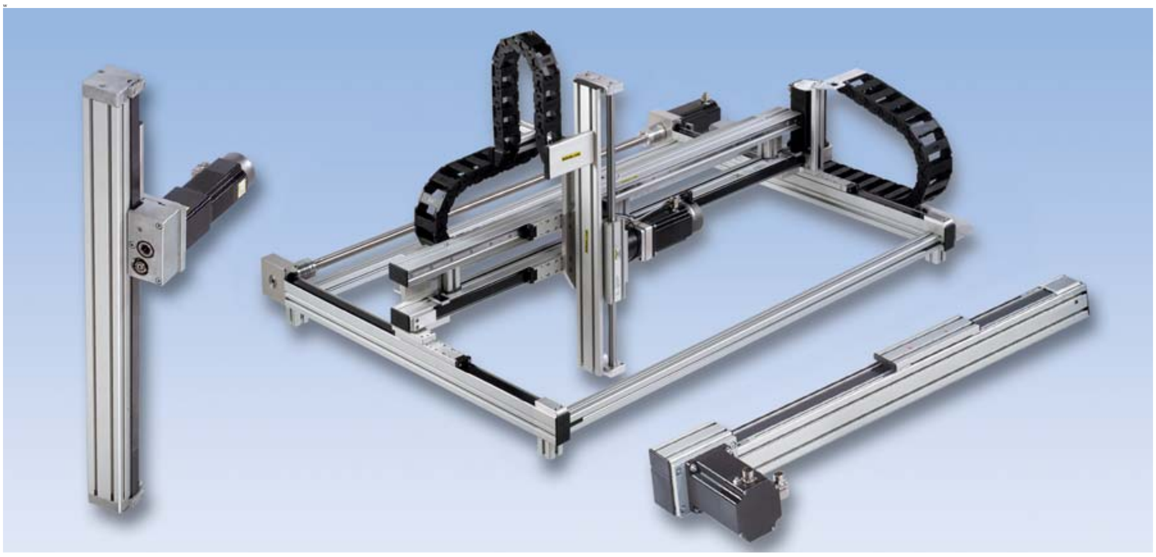
Double-axis application



Triple-axis application

The handling is in the design

Axis modules from Berger Lahr provide robotics solutions for the various applications depicted below.



Cartesian robots

Based on its comprehensive series of motors, power electronics, positioning control systems and axle systems, Berger Lahr can offer complete solutions tailor-made to the customer's specific requirements. Motors and controllers act as positioning modules for axle systems, resulting in precise and powerful Cartesian robots for single- or multi-axis positioning tasks.

Berger Lahr offers both single- and multi-dimensional Cartesian robots:

- linear modules: cantilever, portal and telescope axes
- double- and triple-axis systems: linear positioning system, linear-, portal- and wall-mounted robots
- low-mass systems

All linear modules can be combined, are compatible with Item sections and are modular. Several axes may be joined together to form handling systems whose components are precisely in tune with each other.

From component to system

In addition to Cartesian robots, Berger Lahr offers continuous and co-operative dialogue with the customer to comprehensively develop customised robotics solutions. This service consists of the following principal features:

- project analysis and management
- design
- construction of a prototype
- creation of software
- quality assurance
- training
- customer support

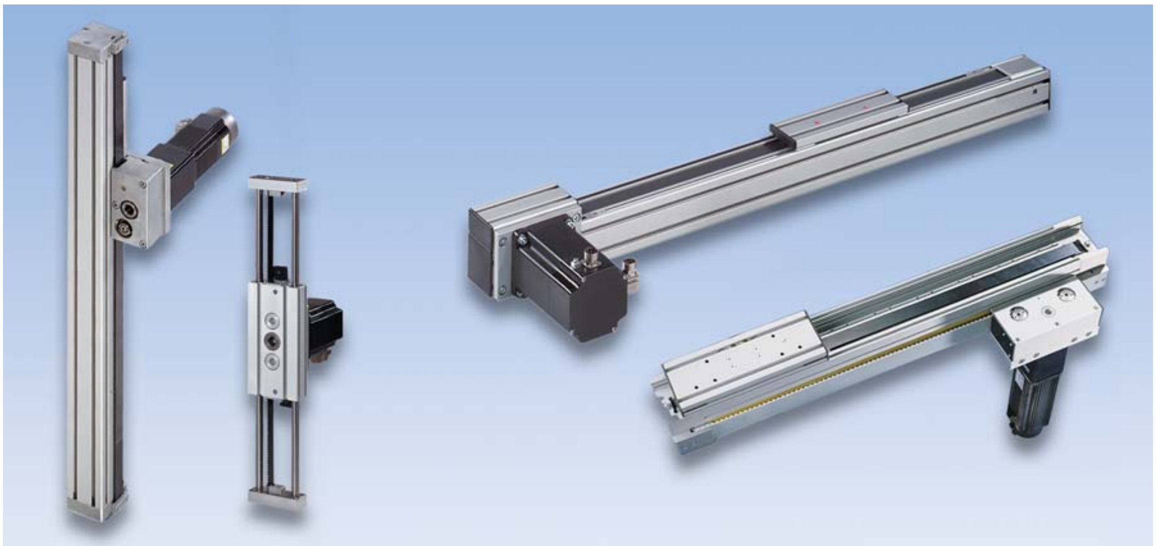
Your advantages

- **high-quality products –** based on years of experience with continuous product improvement
- **everything from the one source** – from the simple linear module to complete systems of co-ordinated components
- **design of all multi-axis systems based on linear modules**
- **quick and competent consultation**
- **high rate of re-usability** – the modular design means that the robots easily adapt to different applications
- **different models available** – travel path (stroke) precise down to the millimetre, various carriage lengths, rust-proof construction, with/without limit switch, with/without motor or gearing, etc.

Application list

The descriptions of the single- or multi-axis systems detail the most important design criteria, e.g. load or stroke. In some cases, however, the design process and calculations can be very extensive and time-consuming. Berger Lahr offers free, no-obligation consultation.

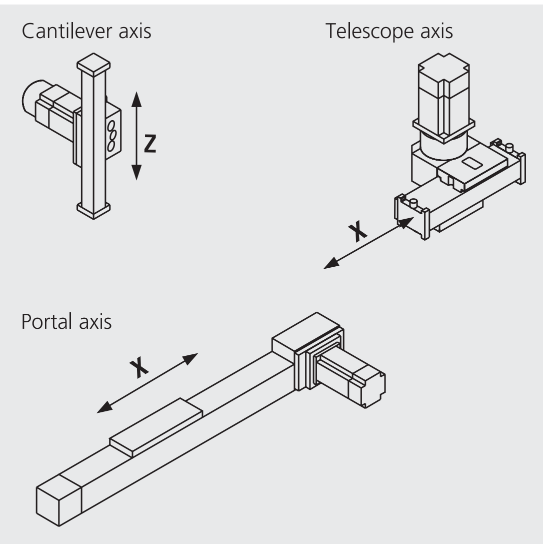
If you would like to take advantage of this service, please fill out the application list at the end of the Robotics catalogue and contact your nearest Berger Lahr sales office.


Single-axis systems

Linear modules

Linear modules are single-axis systems for movements in one dimension. Three different models, which vary in their method of operation, are available:

– with the **portal axis**, only the carriage moves, and the axis body rigidly spans the working area.
– with the **cantilver axis**, only the axis body moves: It moves into the working area.
– with the **Telescopic axis**, both carriage and axis body move out of the retracted, run-in position and into the working area.



Working areas of linear modules

Guides

The linear modules are equipped with low-play, internal guides which help realise the compact design as well as protect against dirt and other environmental influences. The low-maintenance, long-lasting guide ensures that the axis runs smoothly and quietly. Berger Lahr offers linear modules with roller- or recirculating ball-bearing guides.

Roller guide

The low-play roller guide is especially well suited to high speeds. Strippers on each end of the carriage clean the guide before it comes into contact with the rollers. The guide rod is lubricated for its entire service life via oil-soaked, cushioned felt pieces.

Recirculating ball-bearing guide

The recirculating ball-bearing guide was designed for high load ratings and high torque values. It is excellently suited to supporting rigid loads at right angles to the guide itself. The ball bearings are lubricated for their entire service life.

Drive elements

The linear modules are equipped with robust drive elements capable of handling various loads with precision repeatability of up to ±0.05 mm. Berger Lahr offers linear modules driven by either toothed belts or toothed rods.

Toothed belts

Toothed belts yield high speeds and high feed forces, and they provide a cover for the internal guide of the linear module. While the toothed belt is responsible only for acceleration in a horizontal position, it must also accommodate gravitational forces in a vertical position. The toothed belts are made of polyurethane-covered steel cords which can endure forces of thousands of Newtons and speeds up to 5 m/s. They are quiet, low-maintenance and have a high load-carrying capacity.

Toothed rods

Toothed rods guarantee high feed forces at high levels of rigidity.

Motors

The linear modules are powered by maintenance-free motors manufactured by Berger Lahr as a standard feature. You may also order gear systems with varying reduction ratios.

Different, customer-specific motors are available upon request. When selecting a motor, make sure to take into account the maximum permissible drive torque on the axis drive shaft.

The motor or gear is mounted directly on the drive pinion, without featherkey, eliminating any play in the connection as well as the need for additional couplings.

Corrosion resistant construction

All motor blocks, carriages and axis bodies are made of anodised, corrosion resistant aluminium. To protect all parts of a linear module against environmental influences and moisture, corrosion resistant linear modules-in which the ball bearings, screws, guides and all connecting components are made of corrosion resistant steel-are also available.

Selection lists

The linear modules have a modular design, are assembled according to the customer's specific needs and are delivered ready to be installed. Information on the axis model, degree of rust resistance or optional limit switches is thus essential to the successful completion of an order.

Before ordering, please fill out the selection lists for the respective linear modules.

Type keys

Example	LM -	X	X	X	X	X

Axis type	LM -	**X**	X	X	X	X
A = Cantilever axis		A				
H = Portal axis as auxiliary axis		H				
P = Portal axis with motor		P				
S = Portal axis as shaft axis		S				
T = Telescope axis		T				

Size	LM -	X	**X**	X	X	X
0, 108, 210, 212, 316 (Round-bar models)						
404 = Extruded-section model 40 x 65 mm²						
504 = Extruded-section model 40 x 40 mm² bzw. 40 x 65 mm²						
608 = Extruded-section model 80 x 80 mm²						
812 = Extruded-section model 80 x 120 mm² bzw. 120 x 120 mm²						

Guide	LM -	X	X	**X**	X	X
K = Recirculating ball-bearing guide				K		
R = Roller guide				R		
B = Recirculationg ball bushing				B		

Drive element	LM -	X	X	X	**X**	X
T = Toothed belt					T	
Z = Rack and pinion					Z	

Stroke / rotation	LM -	X	X	X	X	**X**
50 = 50 mm Stroke / rotation						50
75 = 75 mm Stroke / rotation						75
100 = 100 mm Stroke / rotation						100
144 = 144 mm Stroke / rotation						144
150 = 150 mm Stroke / rotation						150
175 = 175 mm Stroke / rotation						175
240 = 240 mm Stroke / rotation						240

Recommended Berger Lahr motors

Axis	3-phase stepping motors	AC synchronous servomotors
LM-P404RT100	VRDM 3913 LWC	SER 397/4L3S
LM-P404KT100	VRDM 3913 LWC	SER 397/4L3S
LM-P608RT100	VRDM 31117 LWC	SER 397/4L3S with PLE80 3:1
LM-P608KT100	VRDM 31117 LWC	SER 397/4L3S with PLE80 3:1
LM-P608RT175	VRDM 31122 LWC	SER 3910/4L3S with PLE80 3:1
LM-P608KT175	VRDM 31122 LWC	SER 3910/4L3S with PLE80 3:1
LM-P812RT100	VRDM 31117 LWC	SER 3913/4L3S with PLE80 3:1
LM-P812KT100	VRDM 31117 LWC	SER 31117/4L3S with PLE120 3:1
LM-P812RT100	VRDM 31117 LWC with PLE120 3:1	SER 31117/4L3S with PLE120 3:1
LM-P812KT240	VRDM 31117 LWC with PLE120 3:1	SER 31117/4L3S with PLE120 5:1
LM-A0BZ50	VRDM 368 LWC with holding brake	–
LM-A108BT75	VRDM 368 LWC with holding brake	–
LM-A210BT100	VRDM 3910 LWC with holding brake	–
LM-A212BT100	VRDM 3913 LWC with holding brake	SER 3910/4L3S with PLE80 3:1
LM-A316BT100	VRDM 3913 LWC with holding brake	–
LM-A504RT100	VRDM 3910 LWC with holding brake	SER 3910/4L3S with PLE80 3:1
LM-A504KT100	VRDM 3910 LWC with holding brake	SER 3910/4L3S with PLE80 3:1
LM-A608RT100	VRDM 3913 LWC with holding brake and PLE80 3:1	SER 397/4L3S with PLE80 3:1
LM-A608KT100	VRDM 3913 LWC with holding brake and PLE80 3:1	SER 397/4L3S with PLE80 3:1
LM-A608KZ144	VRDM 3913 LWC with holding brake and PLE80 3:1	SER 397/4L3S with PLE80 3:1
LM-A812RT150	VRDM 31117 LWC with holding brake and PLE120 3:1	SER 3913/4L3S with PLE80 3:1
LM-A812KT150	VRDM 31117 LWC with holding brake and PLE120 3:1	SER 3913/4L3S with PLE80 3:1
LM-A812KZ100	VRDM 31117 LWC with holding brake and PLE120 3:1	SER 3913/4L3S with PLE80 3:1
LM-T812RT300	VRDM 31117 LWC with holding brake and PLE120 3:1	SER 31112/4L3S with PLE120 5:1
LM-T812KT300	VRDM 31117 LWC with holding brake and PLE120 3:1	SER 31112/4L3S with PLE120 5:1
LP-A	X axis: VRDM 3910 LWC Z axis: VRDM 3913 LWC with holding brake	–
LP-P	X axis: VRDM 31117 LWC Z axis: VRDM 31117 LWC with holding brake	–

Additional Berger Lahr motors or motor/gearbox combinations are available upon request.

May also be equipped with customer-specific motors.

Make sure to take into account the maximum permissible drive torque on the axis drive shaft when selecting a motor.

Berger Lahr offers a free, no-obligation consultation. Please contact your nearest Berger Lahr sales office.

LM-P608 portal axis

Portal axes

Portal axes consist of a stationary axis body and a mobile carriage. The fixed motor is mounted on one side. The axis body is constructed of anodised, extruded aluminium section with especially high torsion- and bend-resistance. Rows of T-grooves on three sides of the section body are provided for attaching trailing cables to the axis, or for attaching the axis itself to portal columns.

A special fabrication process permits the observance of extremely narrow tolerances for the guide-rod clearance.

A toothed belt transmits the power from motor to carriage and also provides an external cover for the guide.

Portal axes provide the following advantages:

- small dimensions
- high rigidity and load-bearing capacity
- ITEM-section compatible grooves on three sides
- smooth underside for level support
- various carriage lengths, e.g. for high torque values or large-surface loads
- low carriage mass
- available with low-play roller guide for high speeds or low-play recirculating ball-bearing guide for large loads
- motor may be mounted on the left-hand or right-hand side
- available in all dimensions-millimetre precise-to the maximum stroke

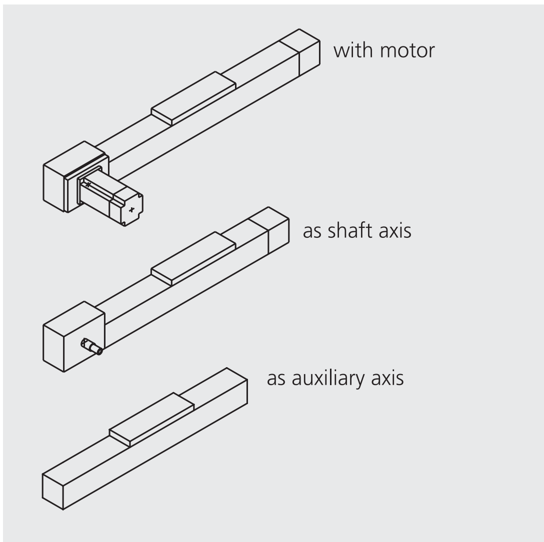
Motors

Portal axes are driven by 3-phase stepping motors or AC synchronous servomotors, depending on load and dynamic requirements. Different, customer-specific motors are available upon request. When selecting a motor, make sure to take into account the maximum permissible drive torque on the axis drive shaft.

The motor or gearbox is mounted directly on the drive pinion, without featherkey, eliminating any play in the connection or the need for additional couplings.

Portal axis models

The portal axes may also be ordered without a motor, e.g. for use as a shaft axis or auxiliary axis.



Portal axis models

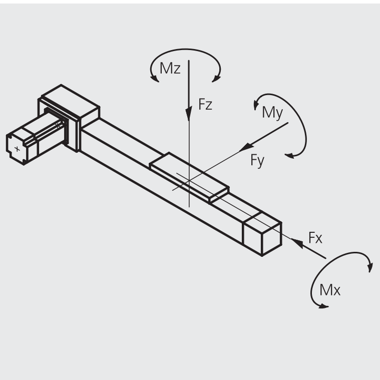
Technical data for portal axes

	LM-P404 RT100	LM-P404 KT100	LM-P608 RT100	LM-P608 KT100	LM-P608 RT175	LM-P608 KT175
Max. load	10 kg	20 kg	30 kg	60 kg	30 kg	60 kg
Max. recommended stroke [1)]	3.000 mm	3.000 mm	5600 mm	5600 mm	5600 mm	5600 mm
Min. stroke with oil contact of the rollers	110 mm	–	168 mm	–	168 mm	–
Max. drive torque on the axis drive shaft	11 Nm	11 Nm	15 Nm	15 Nm	25 Nm	25 Nm
Idle torque	0.22 Nm	0.27 Nm	0.67 Nm	0.56 Nm	1.06 Nm	0.89 Nm
Max. speed (depending on load and stroke)	5 m/s	5 m/s	5 m/s	5 m/s	5 m/s	5 m/s
Positioning repeatability	±0.05 mm	±0.05 mm	±0.05 mm	±0.05 mm	±0.05 mm	±0.05 mm
Stroke per revolution of the axis drive shaft	100 mm	100 mm	100 mm	100 mm	175 mm	175 mm
Effective pitch diameter of drive shaft	31.83 mm	31.83 mm	31.83 mm	31.83 mm	55.7 mm	55.7 mm
mass moment of inertia (without motor)	0.32 $kgcm^2$	0.32 $kgcm^2$	2.1 $kgcm^2$	2.1 $kgcm^2$	2.8 $kgcm^2$	2.8 $kgcm^2$
Total mass with 0 mm stroke (without motor)	2.45 kg	3.35 kg	7.8 kg	8 kg	7.8 kg	8 kg
Moving mass (trolley)	0.3 kg	0.6 kg	1.9 kg	1.9 kg	1.9 kg	1.9 kg
Extruded section mass with 100 mm stroke	0.38 kg	0.43 kg	0.76 kg	0.82 kg	0.76 kg	0.82 kg
Drive element	Toothed belt b20 AT5	Toothed belt b20 AT5	Toothed belt b32 AT5	Toothed belt b32 AT5	Toothed belt b32 AT5	Toothed belt b32 AT5
Guide	Roller guide	Recirculating ball-bearing guide	Roller guide	Recirculating ball-bearing guide	Roller guide	Recirculating ball-bearing guide

1) Please request for a longer stroke length.

Maximum forces and torque values, portal axes

	LM-P404 RT100	LM-P404 KT100	LM-P608 RT100	LM-P608 KT100	LM-P608 RT175	LM-P608 KT175
Max. force Fx	691 N	691 N	942 N	942 N	942 N	942 N
Max. force Fy	100 N	200 N	300 N	600 N	300 N	600 N
Max. force Fz	100 N	200 N	300 N	600 N	300 N	600 N
Max. torque Mx	6.6 Nm	20 Nm	35 Nm	60 Nm	35 Nm	60 Nm
Max. torque My	10 Nm	70 Nm	100 Nm	250 Nm	100 Nm	250 Nm
Max. torque Mz	12 Nm	55 Nm	160 Nm	200 Nm	160 Nm	200 Nm



Maximum forces and torque values, portal axes

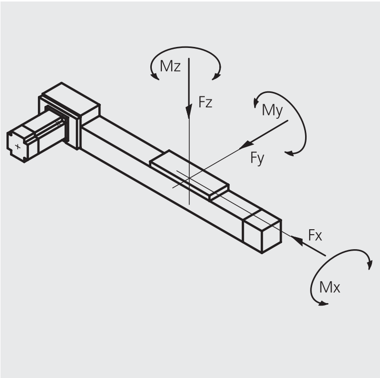
Recommended motors, see Page 9

Technical data for portal axes

	LM-P812 RT100	LM-P812 KT100	LM-P812 RT240	LM-P812 KT240
Max. load	60 kg	90 kg	60 kg	90 kg
Max. recommended stroke	5600 mm	5600 mm	5600 mm	5600 mm
Min. stroke with oil contact of the rollers	230 mm	–	230 mm	–
Max. drive torque on the axis drive shaft	30 Nm	30 Nm	80 Nm	80 Nm
Idle torque	1.11 Nm	1.05 Nm	2.98 Nm	2.83 Nm
Max. speed (depending on load and stroke)	5 m/s	5 m/s	5 m/s	5 m/s
Positioning repeatability	±0.05 mm	±0.05 mm	±0.05 mm	±0.05 mm
Stroke per revolution of the axis drive shaft	100 mm	100 mm	240 mm	240 mm
Effective pitch diameter of drive shaft	31.83 mm	31.83 mm	76.39 mm	76.39 mm
Mass moment of inertia (without motor)	9.47 $kgcm^2$	9.47 $kgcm^2$	13.46 $kgcm^2$	13.46 $kgcm^2$
Total mass with 0 mm stroke (without motor)	17.67 kg	17.67 kg	17.67 kg	17.67 kg
Moving mass (trolley)	3.43 kg	3.86 kg	3.43 kg	3.86 kg
Extruded section mass with 100 mm stroke	1.5 kg	1.61 kg	1.51 kg	1.61 kg
Drive element	Toothed belt b50 AT5	Toothed belt b50 AT5	Toothed belt b50 AT10	Toothed belt b50 AT10
Guide	Roller guide	Recirculating ball-bearing guide	Roller guide	Recirculating ball-bearing guide

Maximum forces and torque values, portal axes

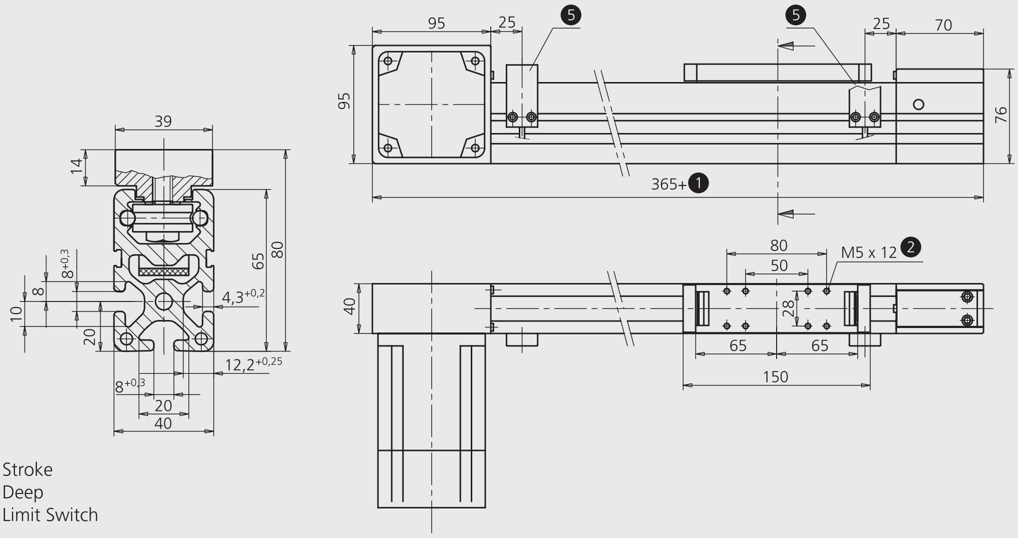
	LM-P812 RT100	LM-P812 KT100	LM-P812 RT240	LM-P812 KT240
Max. force Fx	1570 N	1570 N	2000 N	2000 N
Max. force Fy	680 N	1050 N	680 N	1050 N
Max. force Fz	680 N	1050 N	680 N	1050 N
Max. torque Mx	70 Nm	80 Nm	70 Nm	80 Nm
Max. torque My	160 Nm	320 Nm	160 Nm	320 Nm
Max. torque Mz	250 Nm	270 Nm	250 Nm	270 Nm



Maximum forces and torque values, portal axes

Recommended motors, see Page 9

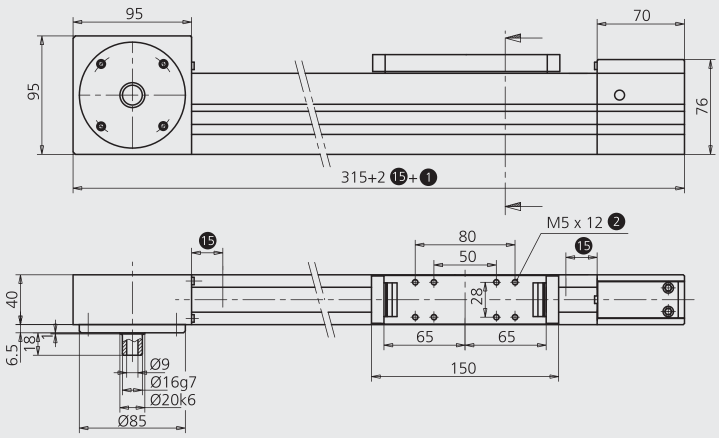
[mm]



1 = Stroke
2 = Deep
5 = Limit Switch

Portal axis LM-P404R (carriage length 150 mm)

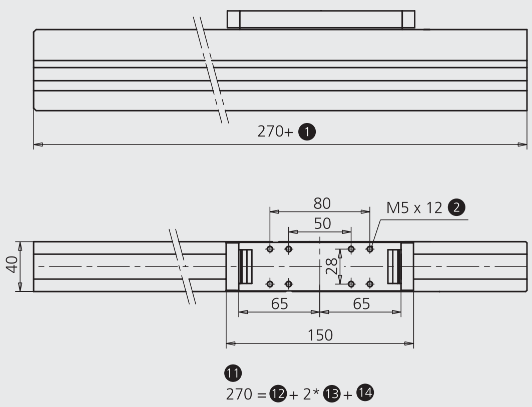
[mm]



1 = Stroke
2 = Deep
15 = Limit Switch way standard: 25mm

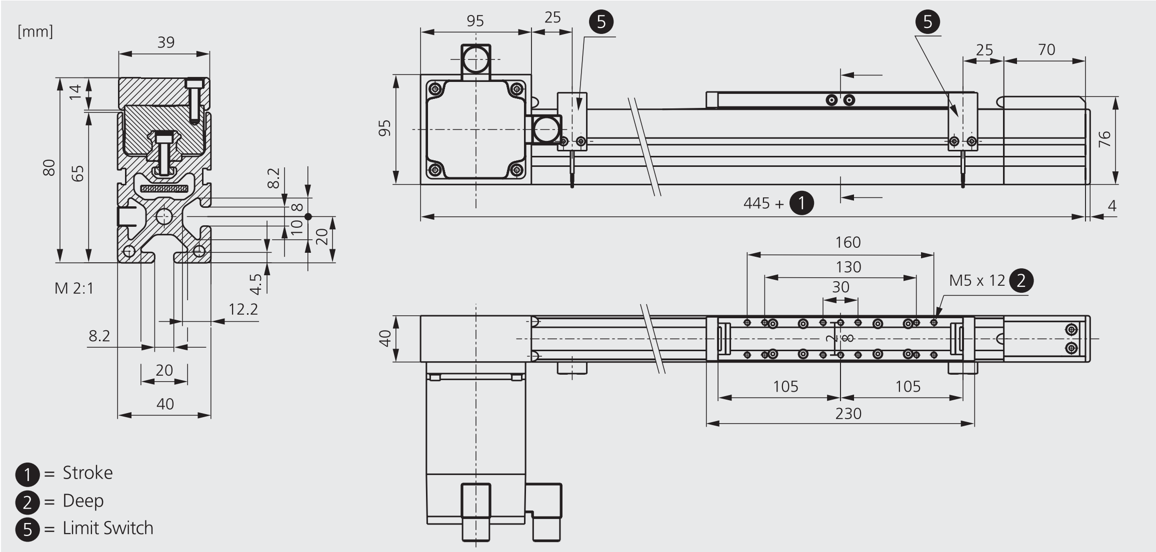
Shaft axis LM-S404R (carriage length 150 mm)

[mm]

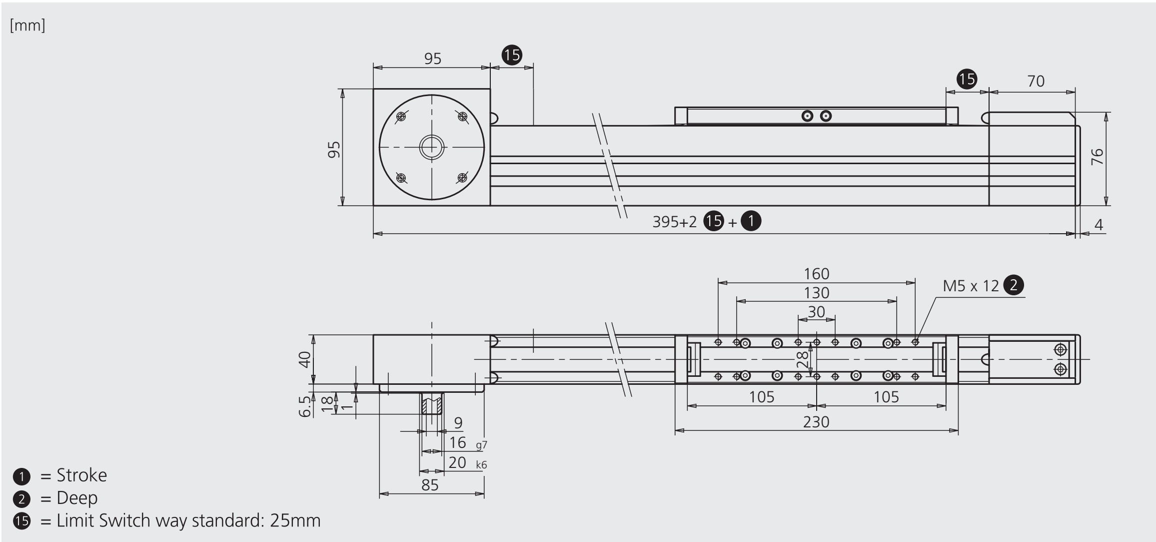


1 = Stroke
2 = Deep
11 = Total length in combination with LM-P
12 = Carriage length
13 = Limit switch way
14 = Endblock

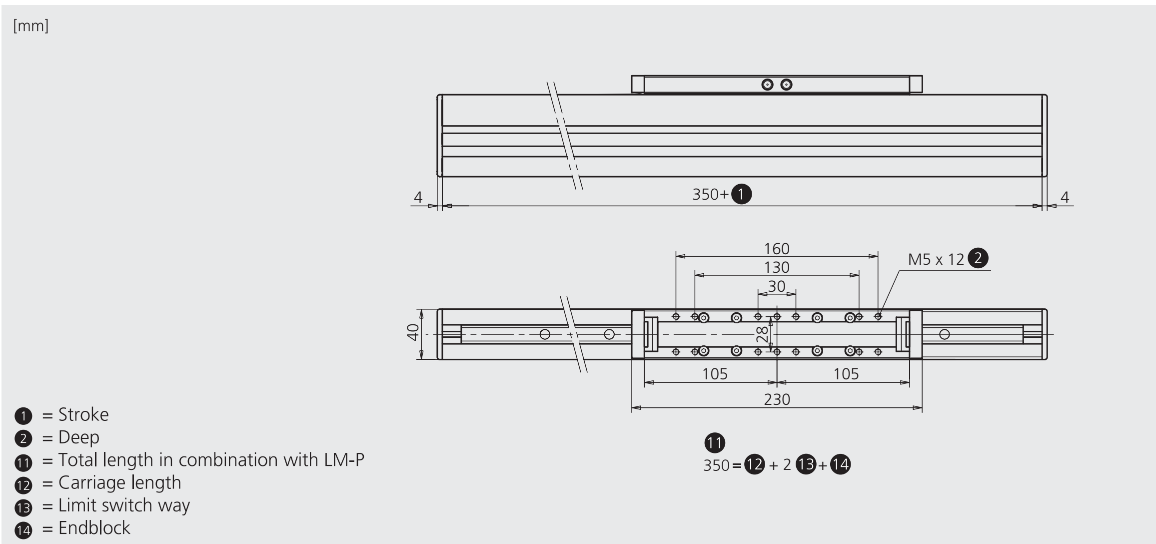
Auxiliary axis LM-H404R (carriage length 150 mm)



Portal axis LM-P404K (carriage length 230 mm)



Shaft axis LM-S404K (carriage length 230 mm)

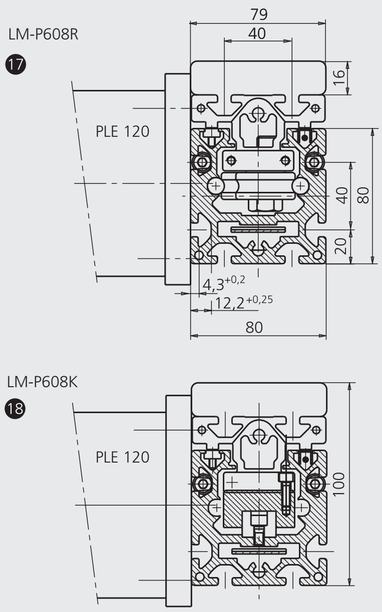


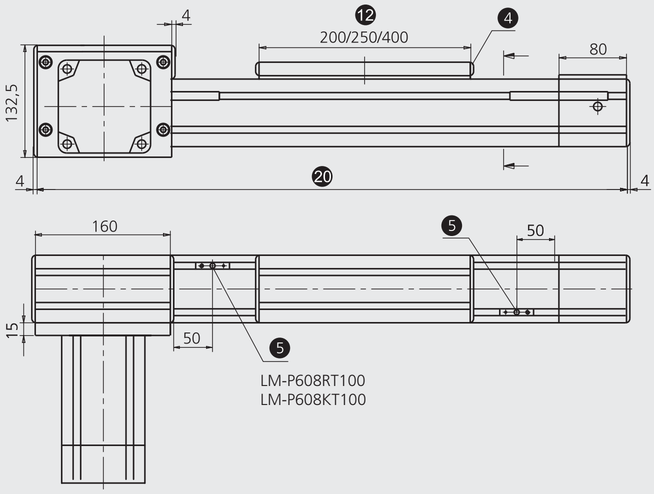
Auxiliary axis LM-H404K (carriage length 230 mm)

[mm]

LM-P608R

⓱





⓬	⓴
200	540 + ❶
250	590 + ❶
400	740 + ❶

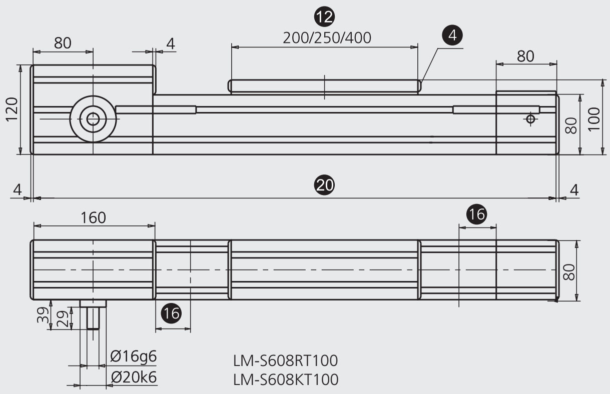
❶ = Stroke
❹ = Cover
❺ = Limit Switch
⓬ = Carriage length
⓱ = Roller guide
⓲ = Recirculating ball-bearing guide
⓴ = Total length

LM-P608 portal axis

[mm]

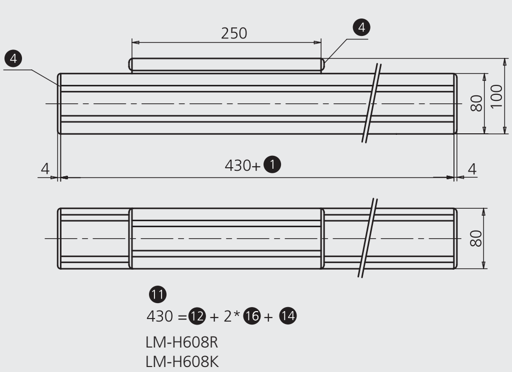
⓬	⓴	⓫
200	440 + ❶	440 + (2x⓰) + ❶
250	490 + ❶	490 + (2x⓰) + ❶
400	640 + ❶	640 + (2x⓰) + ❶

❶ = Stroke
❹ = Cover
⓫ = Total length in combination with LM-P
⓬ = Carriage length
⓰ = Limit Switch way standard: 50mm
⓴ = Total length



LM-S608 shaft axis

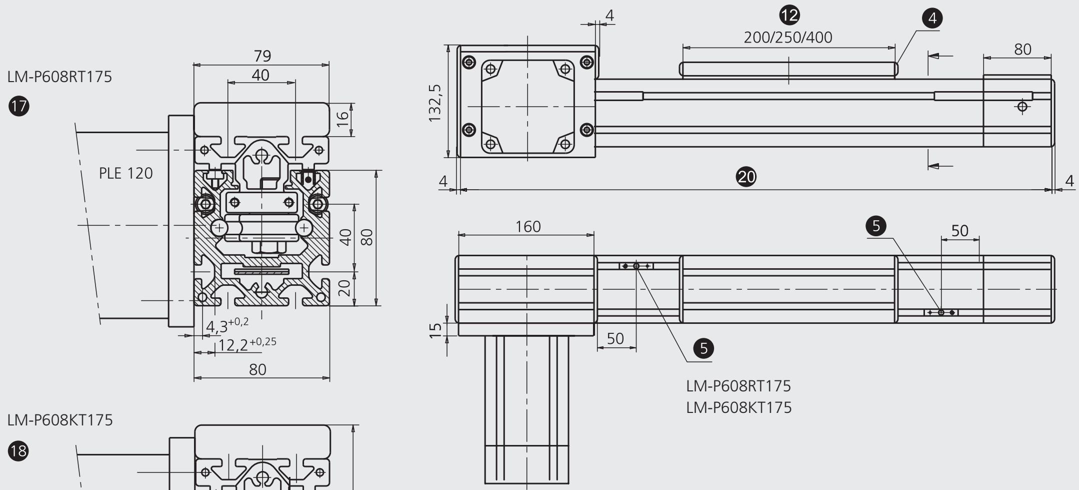
[mm]



❶ = Stroke
❹ = Cover
⓫ = Total length in combination with LM-P
⓬ = Carriage length
⓮ = Endblock
⓰ = Limit Switch way standard: 50mm

LM-H608 auxiliary axis

[mm]

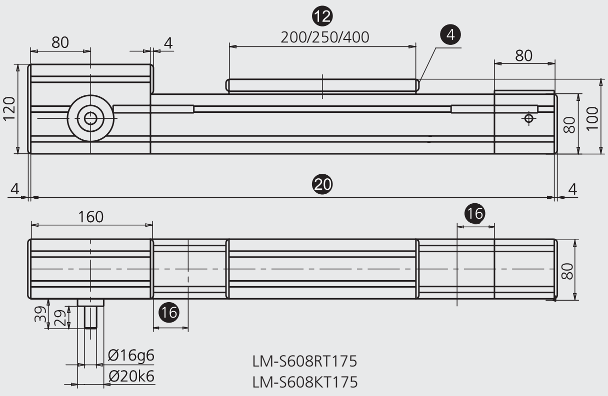


12	20
200	540 + 1
250	590 + 1
400	740 + 1

1 = Stroke
4 = Cover
5 = Limit Switch
12 = Carriage length
17 = Roller guide
18 = Recirculating ball-bearing guide
20 = Total length

LM-P608B portal axis

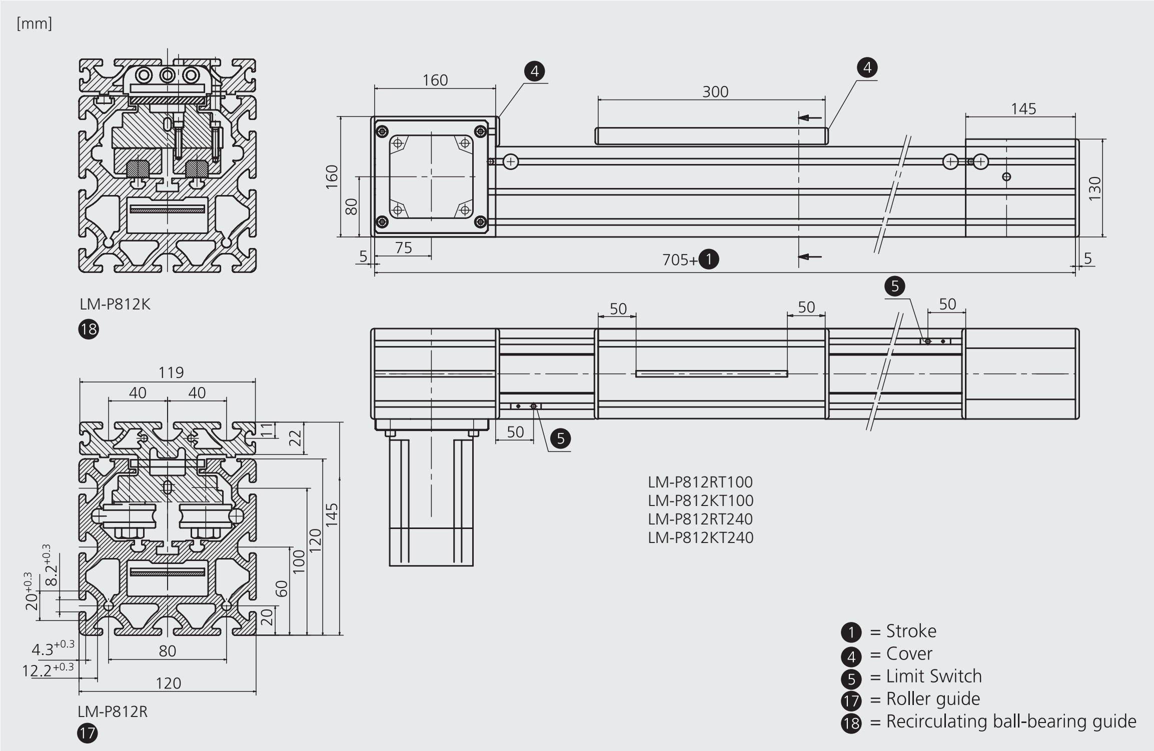
[mm]



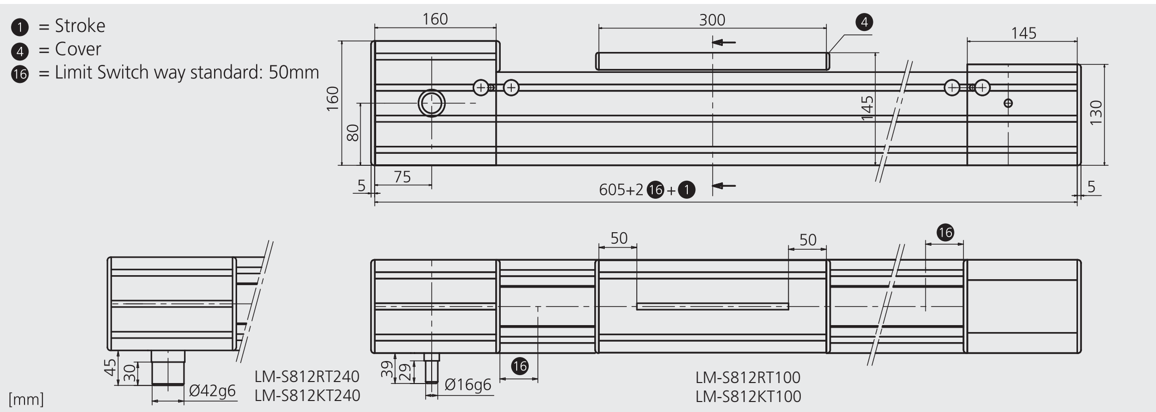
12	20	11
200	440 + 1	440 + (2x 16) + 1
250	490 + 1	490 + (2x 16) + 1
400	640 + 1	640 + (2x 16) + 1

1 = Stroke
4 = Cover
11 = Total length in combination with LM-P
12 = Carriage length
16 = Limit Switch way standard: 50mm
20 = Total length

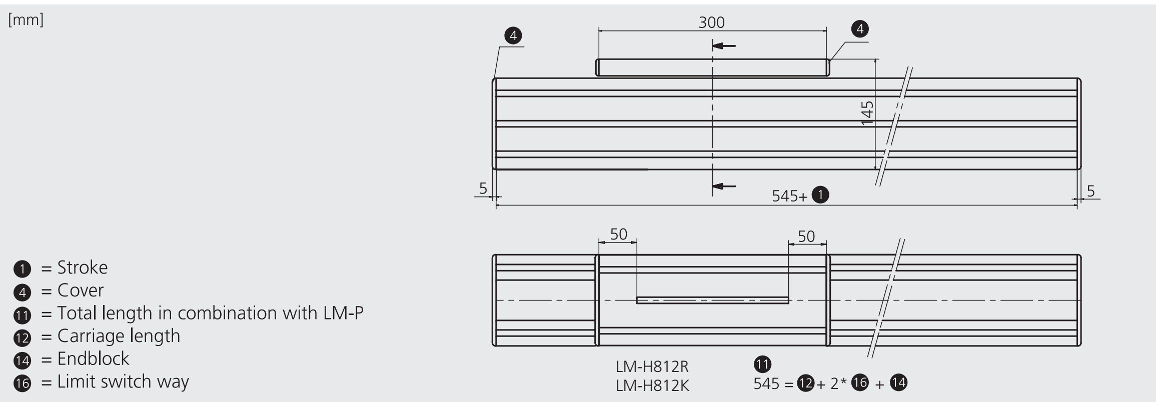
Shaft axis LM-S608



Portal axis LM-P812



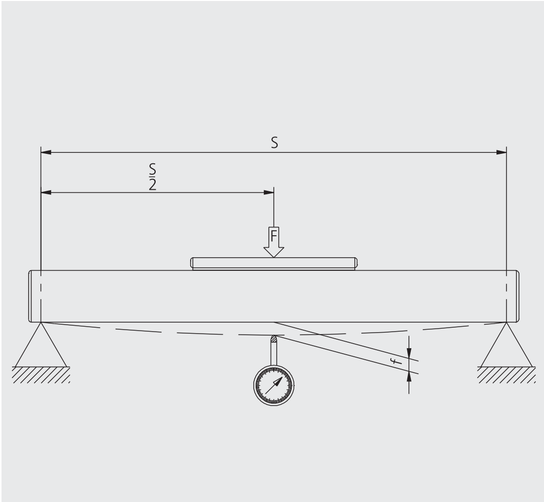
Shaft axis LM-S812



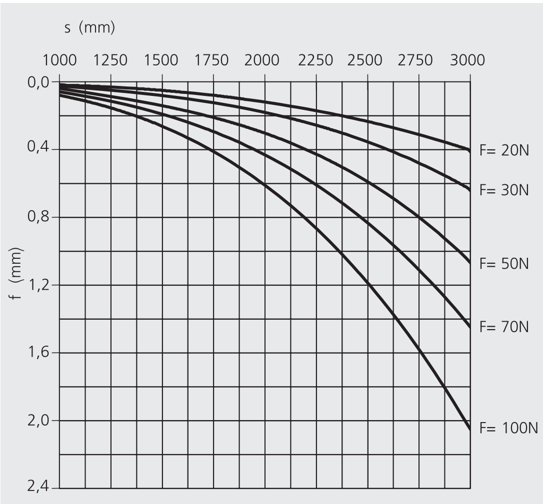
Auxiliary axis LM-H812

Axis rigidity

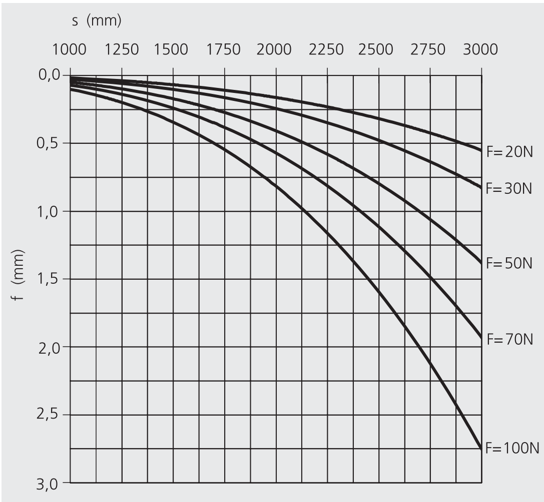
Note the axis rigidity when selecting the positioning axes. The flexibility characteristics show the flexibility (f) in relation to the load (F) and the distance (S) between the fastening points.



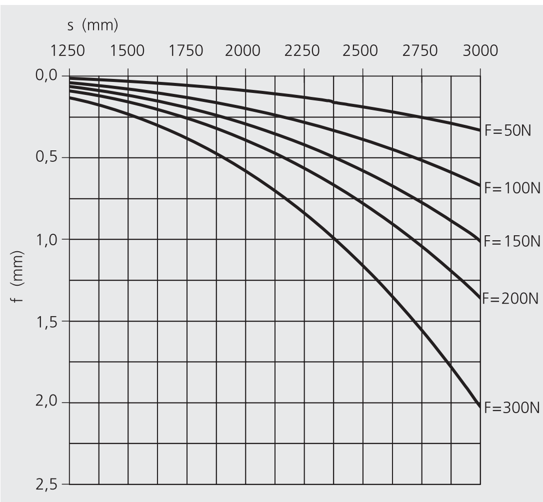
Measuring structure for establishing the flexibility characteristics



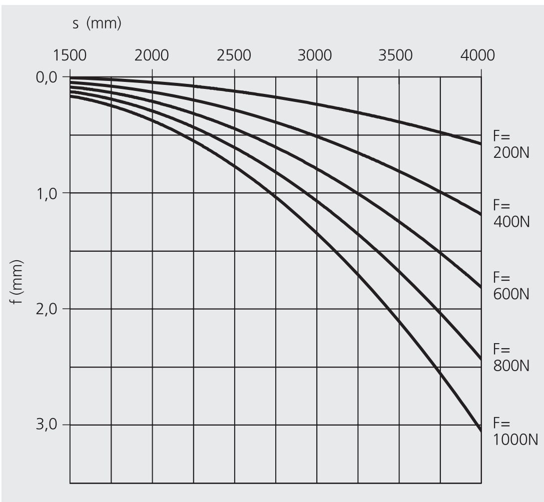
Flexibility LM-P404RT100



Flexibility LM-P404KT100



Flexibility LM-P608RT100, LM-P608KT100, LM-P608RT175, LM-P608KT175



Flexibility LM-P812RT100, LM-P812KT100, LM-P812RT240, LM-P812KT240

Request

The modular design of the Berger Lahr linear modules enables you to select the optimum solution for your application. Please fill out this request form and send a copy to your nearest Berger Lahr sales office.

Sender

Contact ____________________
Company ____________________
Street/PO Box ____________________
Locality ____________________
Post Code ____________________

Telephone ____________________
Fax ____________________
email ____________________
Date ____________________

Portal axis LM-P... | Shaft axis LM-S... | Auxiliary axis LM-H...

Portal axis LM-P...

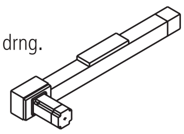
Base model

☐ LM-P404RT100
☐ LM-P404KT100
☐ LM-P608RT100
☐ LM-P608RT175
☐ LM-P608KT100
☐ LM-P608KT175
☐ LM-P812RT100
☐ LM-P812KT100
☐ LM-P812RT240
☐ LM-P812KT240

Motor mount

☐ right (standard), see drng.

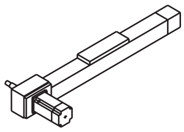
☐ left



Shaft stump

☐ without (standard)

☐ with, see drng.



Drive

☐ motor/gearbox from Berger Lahr, type designation ____________________ (see Catalogue of Twin Line Motors)

☐ customer-specific drive ____________________

Shaft axis LM-S...

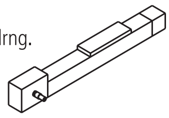
Base model

☐ LM-S404RT100
☐ LM-S404KT100
☐ LM-S608RT100
☐ LM-S608RT175
☐ LM-S608KT100
☐ LM-S608KT175
☐ LM-S812RT100
☐ LM-S812KT100
☐ LM-S812RT240
☐ LM-S812KT240

Shaft mount

☐ right (standard), see drng.

☐ left



Additional shaft stump

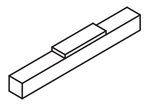
☐ without (standard)

☐ with

Auxiliary axis LM-H...

Base model

☐ LM-H404R
☐ LM-H404K
☐ LM-H608R
☐ LM-H608K
☐ LM-H812R
☐ LM-H812K



Rust-proof construction

☐ no (standard)

☐ yes (only with roller guide)

Number of carriages

☐ one (standard)

☐ two, ________ mm clearance

LM-**P404...**, LM-**S404...**, LM-**H404...**

Stroke length	Carriage length	Limit switch	→ Limit switch
☐ ________ mm (max. 3000 mm)	☐ 150 mm (only with roller guide)	☐ none	☐ 5 m cable
	☐ 230 mm	☐ two (standard)	☐ 10 m cable
		☐ three	☐ with plug

LM-**P608...**, LM-**S608...**, LM-**H608...**

Stroke length	Carriage length	Limit switch	→ Limit switch
☐ ________ mm (max. 5600 mm)	☐ 200 mm	☐ none	☐ 5 m cable
	☐ 250 mm (standard)	☐ two (standard)	☐ 10 m cable
	☐ 400 mm	☐ three	

LM-**P812...**, LM-**S812...**, LM-**H812...**

Stroke length	Carriage length	Limit switch	→ Limit switch
☐ ________ mm (max. 5600 mm)	☐ 300 mm	☐ none	☐ 5 m cable
		☐ two (standard)	☐ 10 m cable
		☐ three	

Additional axis models are available upon request.

Cantilever axis, round-bar model (left) and extruded-section model (right)

Cantilever axes

Cantilever axes consist of a stationary motor unit and a mobile axis body, which moves into the working area. The axis body consists of either extruded section or round bars, each offering distinct advantages for various loads and travel distances (stroke). Both axes models guarantee high resolution and high positioning repeatability.

Extruded-section model

The axis body is constructed of anodised, extruded aluminium section with especially high torsion- and bend-resistance. The free end of the cantilever axis may be mounted to various gripping or other tools.

A toothed rod or toothed belt transmits the motor power and also provides an external cover for the guide.

Round-bar model

The axis body consists of a two-rod guide which provides both low weight and high rigidity.

The motor power is transmitted via a toothed belt or toothed rod.

The round-bar model offers the following special features:
– low impelled mass
– takes up little space
– diverse combination possibilities
– high rigidity

Motors

Depending on load and dynamic requirements, cantilever axes are driven by either 3-phase stepping motors or AC synchronous servomotors from Berger Lahr. Different, customer-specific motors are available upon request. When selecting a motor, make sure to take into account the maximum permissible drive torque on the axis drive shaft.

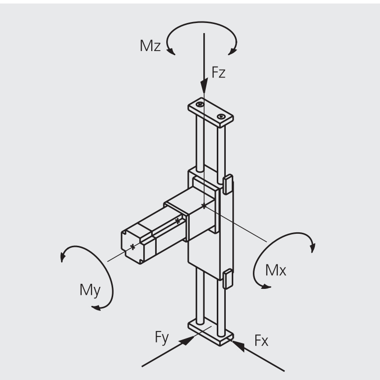
The motor or gear is mounted directly on the drive pinion, without featherkey, eliminating any play in the connection as well as the need for additional couplings.

Technical data for cantilever axes (round-bar model)

	LM-A0 BZ50	LM-A108 BT75	LM-A210 BT100	LM-A212 BT100	LM-A316 BT100
Max. load	1 kg	3 kg	5 kg	10 kg	18 kg
Max. recommended stroke	150 mm	200 mm	300 mm	400 mm	500 mm
Max. drive torque on the axis drive shaft	1.5 Nm	1.5 Nm	4.9 Nm	9.5 Nm	12.2 Nm
Idle torque	0.12 Nm	0.14 Nm	0.3 Nm	0.48 Nm	0.33 Nm
Max. speed (depending on load and stroke)	2 m/s	2 m/s	2 m/s	2 m/s	2 m/s
Positioning repeatability	±0.05 mm	±0.05 mm	±0.05 mm	±0.05 mm	±0.05 mm
Stroke per revolution of the axis drive shaft	50 mm	75 mm	100 mm	100 mm	100 mm
Effective pitch diameter of drive shaft	15.91 mm	23.87 mm	31.83 mm	31.83 mm	31.83 mm
Mass moment of inertia (without motor)	0.06 $kgcm^2$	0.1 $kgcm^2$	0.26 $kgcm^2$	0.59 $kgcm^2$	1.3 $kgcm^2$
Total mass with 0 mm stroke (without motor)	1.8 kg	1 kg	2.65 kg	4.7 kg	6.6 kg
Moving mass with 0 mm stroke	0.24 kg	0.34 kg	1.05 kg	1.92 kg	2.41 kg
Moving mass with an additional 100 mm stroke	0.13 kg	0.12 kg	0.25 kg	0.51 kg	0.5 kg
Drive element	Toothed rod m = 0.636	Toothed belt b10 T5	Toothed belt b20 AT5	Toothed belt b25 AT5	Toothed belt b32 AT5
Guide	Recirculating ball-bearing guide	Recirculating ball-bearing guide	Recirculating ball-bearing guide	Recirculating ball-bearing guide	Recirculating ball-bearing guide

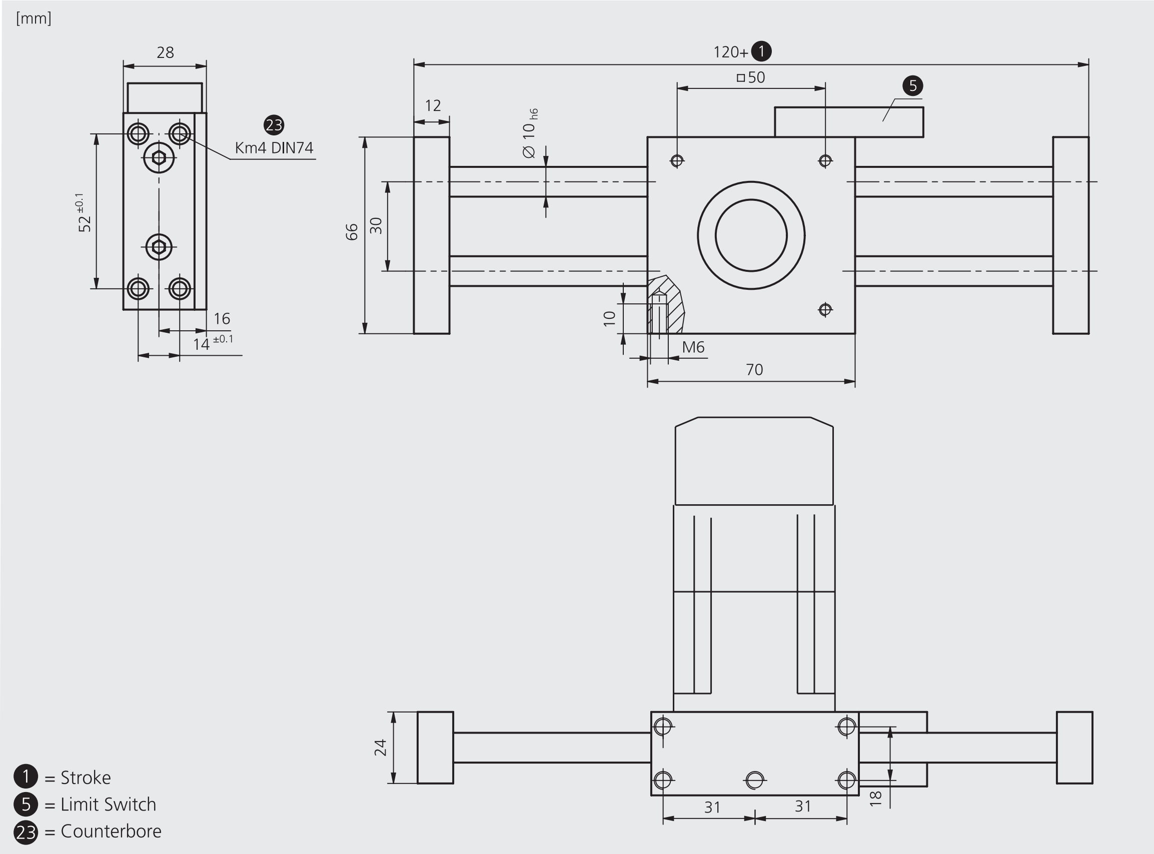
Maximum forces and torque values, cantilever axes (round-bar model)

	LM-A0 BZ50	LM-A108 BT75	LM-A210 BT100	LM-A212 BT100	LM-A316 BT100
Max. force Fx	60 N	60 N	115 N	144 N	305 N
Max. force Fy	60 N	60 N	115 N	144 N	305 N
Max. force Fz	188 N	127 N	305 N	597 N	769 N
Max. torque Mx	6 Nm	10 Nm	17 Nm	36 Nm	67 Nm
Max. torque My	13.5 Nm	18 Nm	41 Nm	72 Nm	133 Nm
Max. torque Mz	1.35 Nm	1.35 Nm	5 Nm	15 Nm	22 Nm

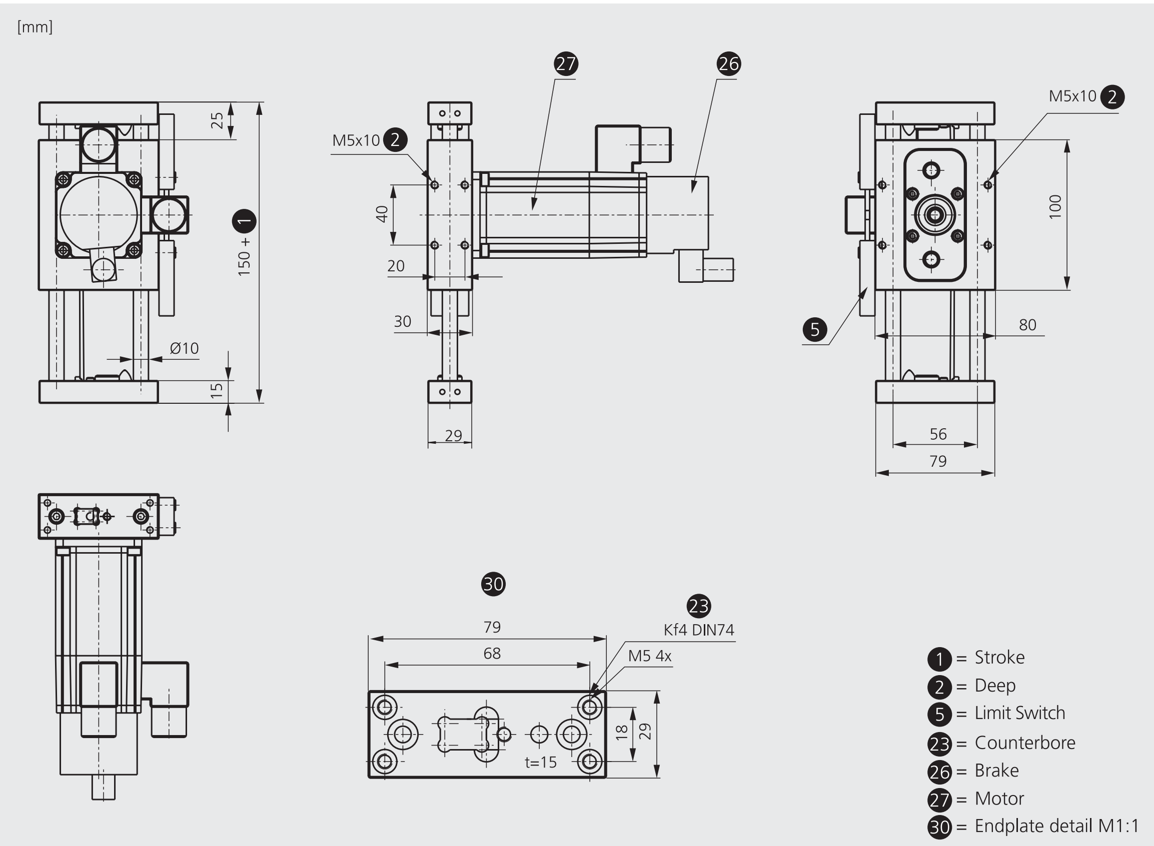


Maximum forces and torque values for cantilever axes (round-bar model)

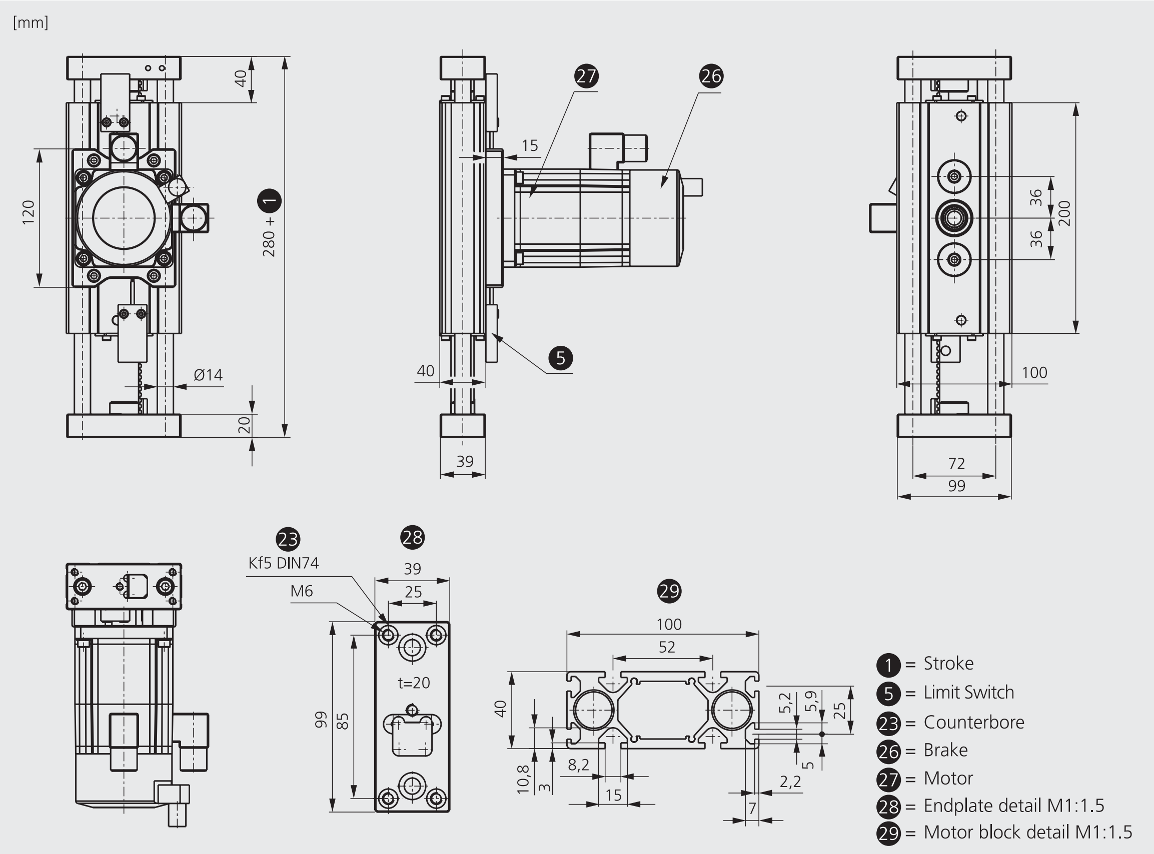
Recommended motors, see Page 9



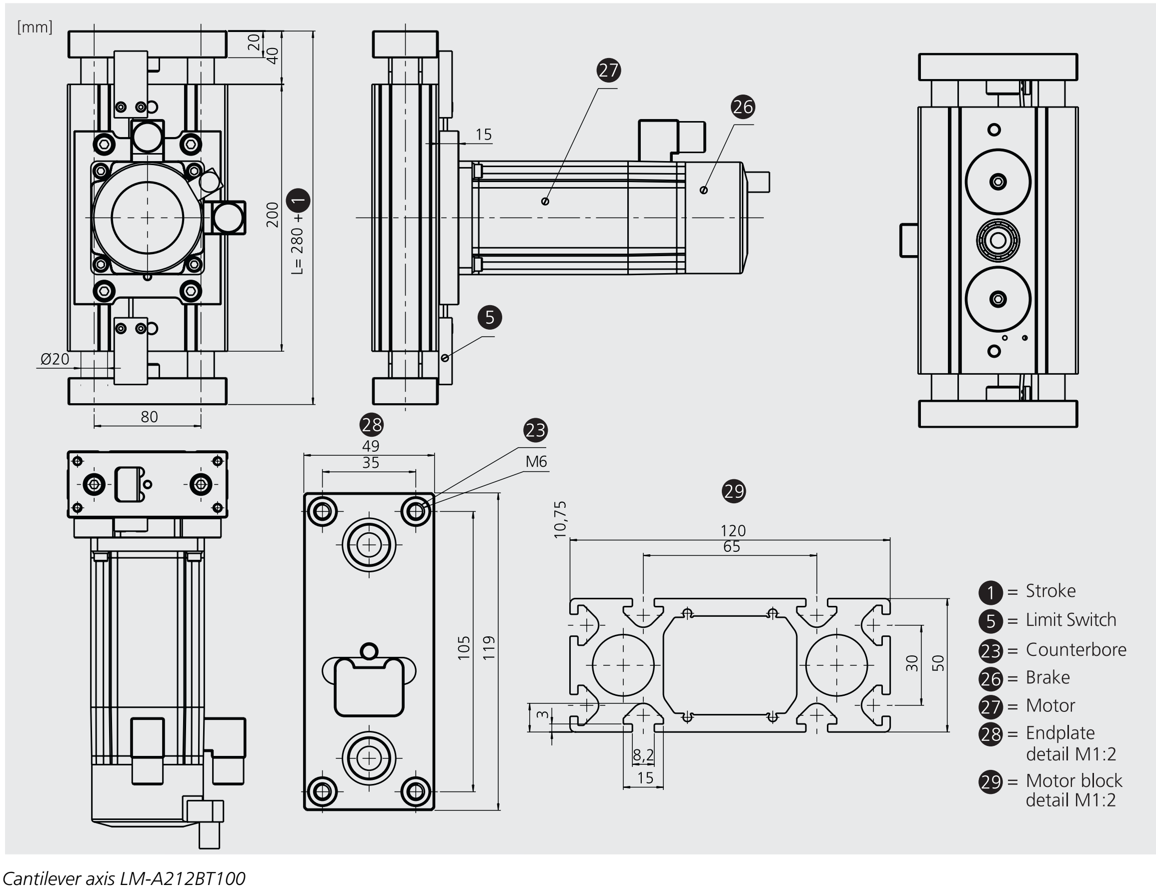
Cantilever axis LM-A0BZ50



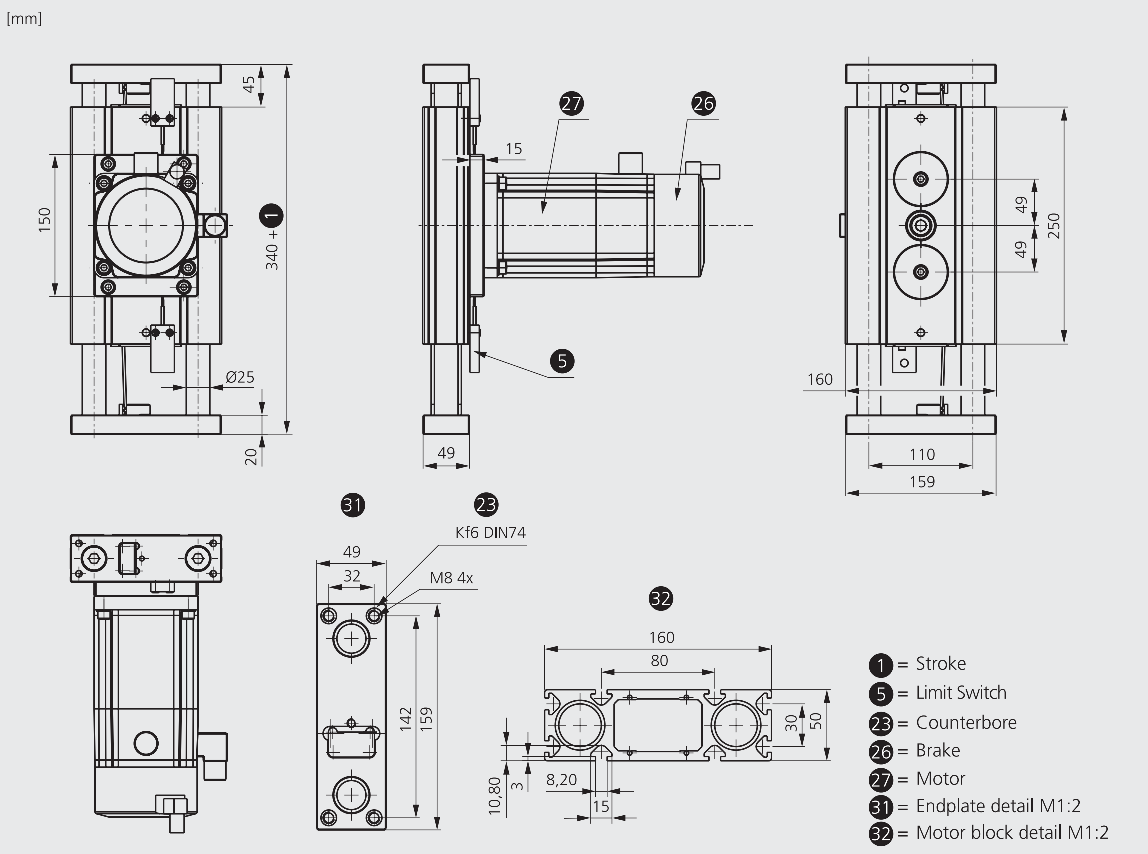
Cantilever axis LM-A108BT75



Cantilever axis LM-A210BT100



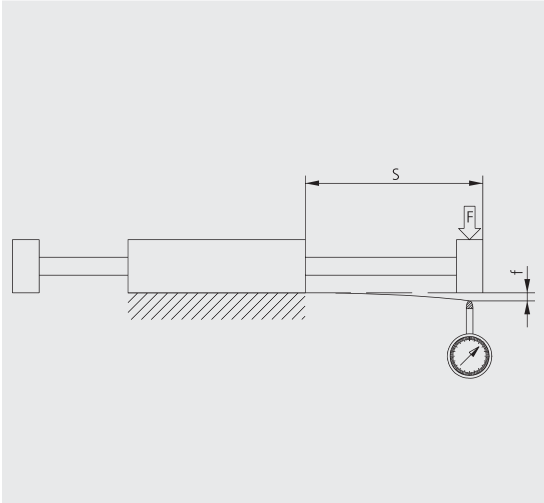
Cantilever axis LM-A212BT100



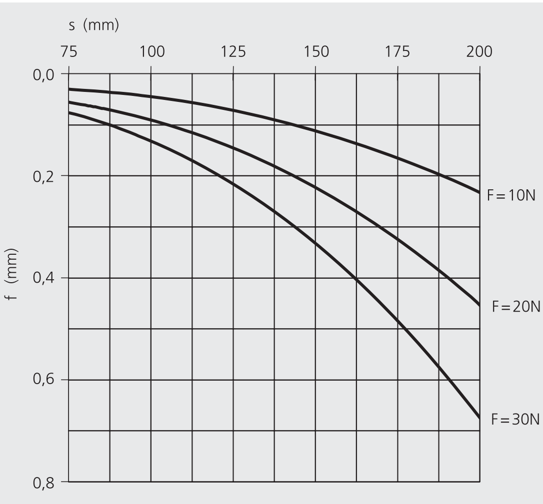
Cantilever axis LM-A316BT100

Axis rigidity

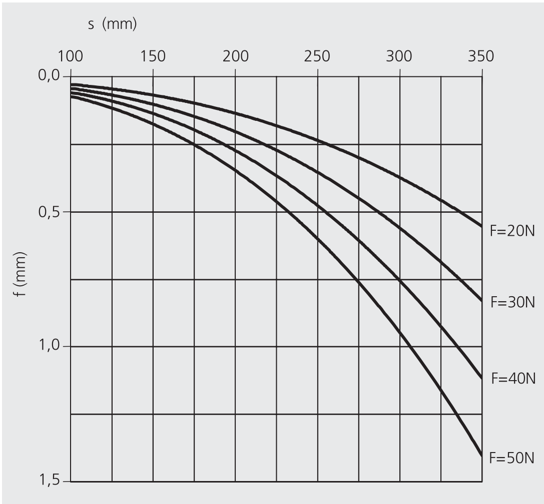
Note the axis rigidity when selecting the positioning axes. The flexibility characteristics show the flexibility (f) in relation to the load (F) and the stroke (S).



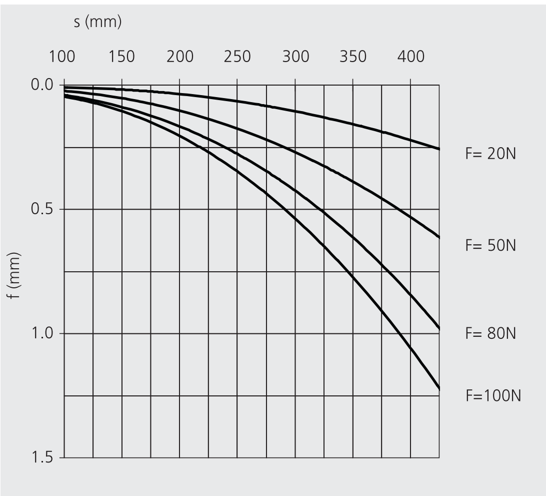
Measuring structure for establishing the flexibility characteristics with horizontal motor block (round-bar model)



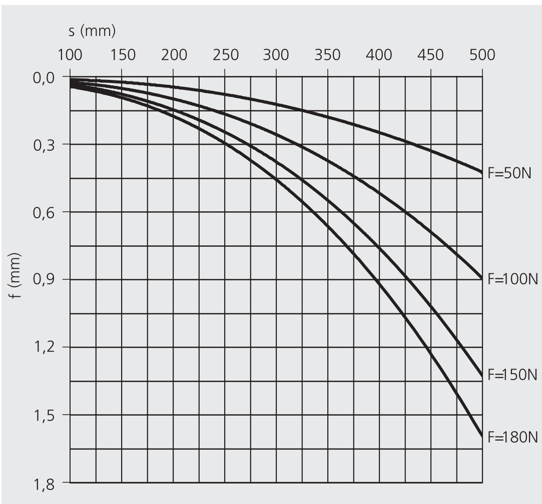
Flexibility LM-A108BT75 with horizontal motor block



Flexibility LM-A210BT100 with horizontal motor block

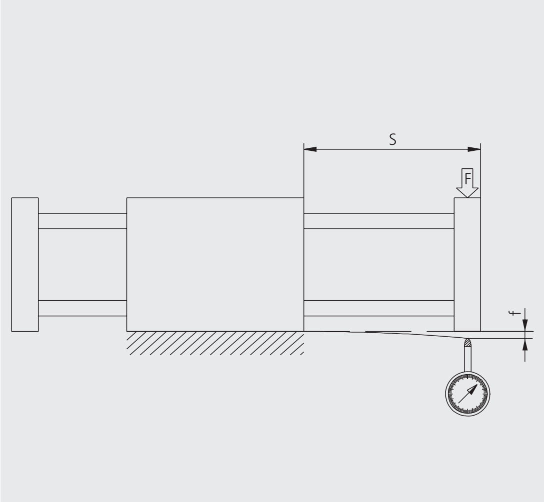


Flexibility LM-A212BT100 with horizontal motor block

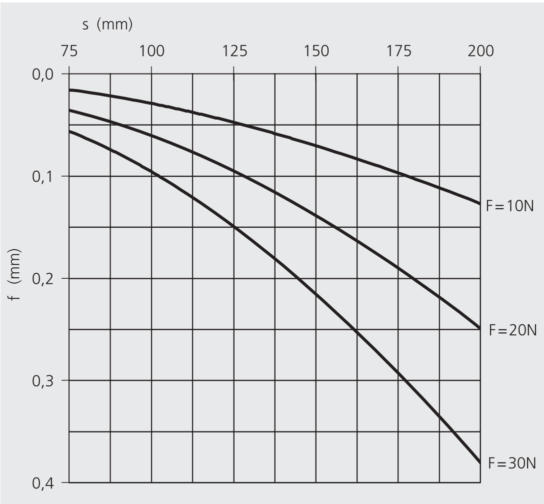


Flexibility LM-A316BT100 with horizontal motor block

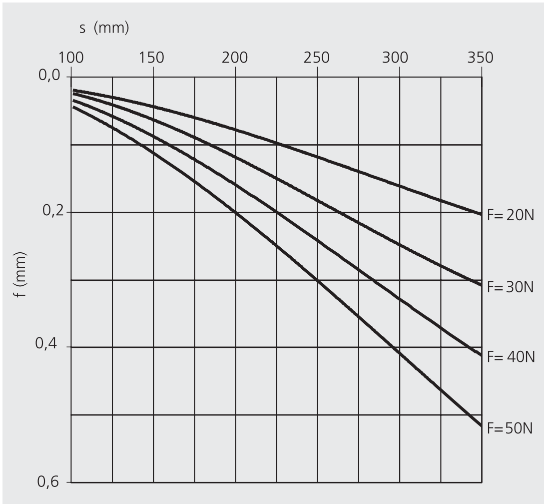
Note the axis rigidity when selecting the positaxeshar



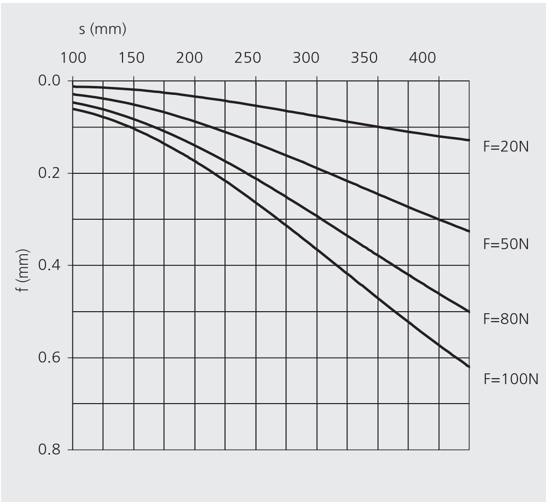
Measuring structure for establishing the flexibility characteristics with upright motor block (round-bar model)



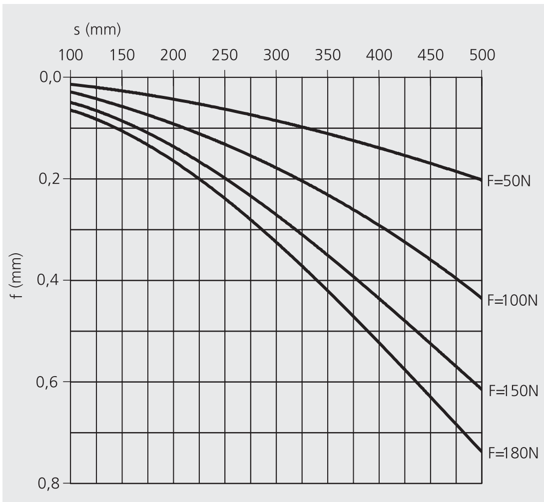
Flexibility LM-A108BT75 with upright motor block



Flexibility LM-A210BT100 with upright motor block



Flexibility LM-A212BT100 with upright motor block



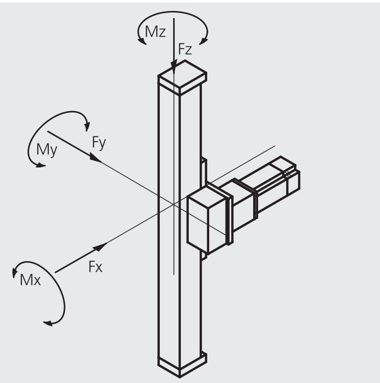
Flexibility LM-A316BT100 with upright motor block

Technical data for cantilever axes (extruded-section model)

	LM-A504 RT100	LM-A504 KT100	LM-A608 RT100	LM-A608 KT100	LM-A608 KZ144	LM-A812 RT150	LM-A812 KT150	LM-A812 KZ100
Max. load	1 kg	6 kg	18 kg	18 kg	18 kg	30 kg	30 kg	30 kg
Max. recommended stroke	500 mm	600 mm	600 mm	600 mm	600 mm	1200 mm	1200 mm	1200 mm
Min. stroke with oil contact of the rollers	110 mm	-	160 mm	–	–	133 mm	–	–
Max. drive torque on the axis drive shaft	7 Nm	7 Nm	15 Nm	15 Nm	22 Nm	30 Nm	30 Nm	30 Nm
Idle torque	0.5 Nm	0.5 Nm	0.54 Nm	0.49 Nm		1.84 Nm	1.74 Nm	
Max. speed (depending on load and stroke)	5 m/s	5 m/s	5 m/s	2 m/s	2 m/s	5 m/s	2 m/s	2 m/s
Positioning repeatability	±0.05 mm	±0.05 mm	±0.05 mm	±0.05 mm	±0.05 mm	±0.05 mm	±0.05 mm	±0.05 mm
Stroke per revolution of the axis drive shaft	100 mm	100 mm	100 mm	100 mm	144.5 mm	150 mm	150 mm	100.53 mm
Effective pitch diameter of drive shaft	31.83 mm	31.83 mm	31.83 mm	31.83 mm	46 mm	47.75 mm	47.75 mm	32 mm
Mass moment of inertia (without motor)	0.47 $kgcm^2$	0.39 $kgcm^2$	0.13 $kgcm^2$	0.13 $kgcm^2$	0.1 $kgcm^2$	5.1 $kgcm^2$	5.1 $kgcm^2$	1.53 $kgcm^2$
Total mass with 0 mm stroke (without motor)	2.6 kg	2.8 kg	10.7 kg	11.2 kg	14 kg	12.2 kg	12.5 kg	10 kg
Moving mass with 0 mm stroke	0.82 kg	1.21 kg	4.5 kg	5 kg	5.5 kg	4.9 kg	5.4 kg	6.2 kg
Moving mass with an additional 100 mm stroke	0.22 kg	0.43 kg	0.9 kg	1 kg	1.15 kg	0.75 kg	0.85 kg	1.15 kg
Drive element	Toothed belt b20 AT5	Toothed belt b20 AT5	Toothed belt b32 AT5	Toothed belt b32 AT5	Toothed rod m = 2	Toothed belt b50 T10	Toothed belt b50 T10	Toothed rod m = 2
Guide	Roller guide	Roller guide	Roller guide	Recirculating ballbearing guide	Recirculating ballbearing guide	Roller guide	Recirculating ballbearing guide	Recirculating ballbearing guide

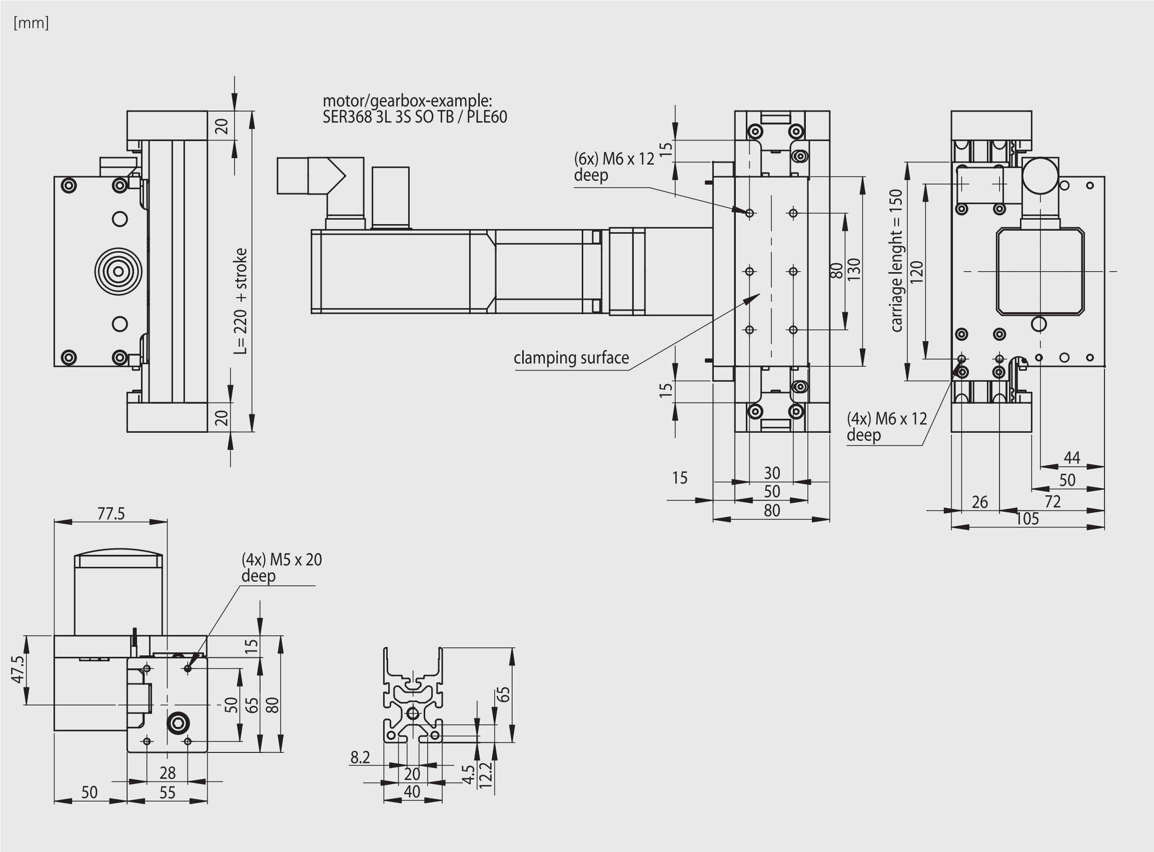
Maximum forces and torque values, cantilever axes (extruded-section model)

	LM-A504 RT100	LM-A504 KT100	LM-A608 RT100	LM-A608 KT100	LM-A608 KZ144	LM-A812 RT150	LM-A812 KT150	LM-A812 KZ100
Max. force Fx	100 N	115 N	300 N	600 N	600 N	500 N	700 N	700 N
Max. force Fy	100 N	115 N	300 N	600 N	600 N	500 N	700 N	700 N
Max. force Fz	440 N	440 N	942 N	942 N	942 N	1256 N	1256 N	1256 N
Max. torque Mx	12 Nm	22 Nm	205 Nm	250 Nm	250 Nm	220 Nm	270 Nm	270 Nm
Max. torque My	10 Nm	28 Nm	125 Nm	300 Nm	300 Nm	140 Nm	320 Nm	320 Nm
Max. torque Mz	6.6 Nm	12 Nm	35 Nm	60 Nm	60 Nm	55 Nm	80 Nm	80 Nm

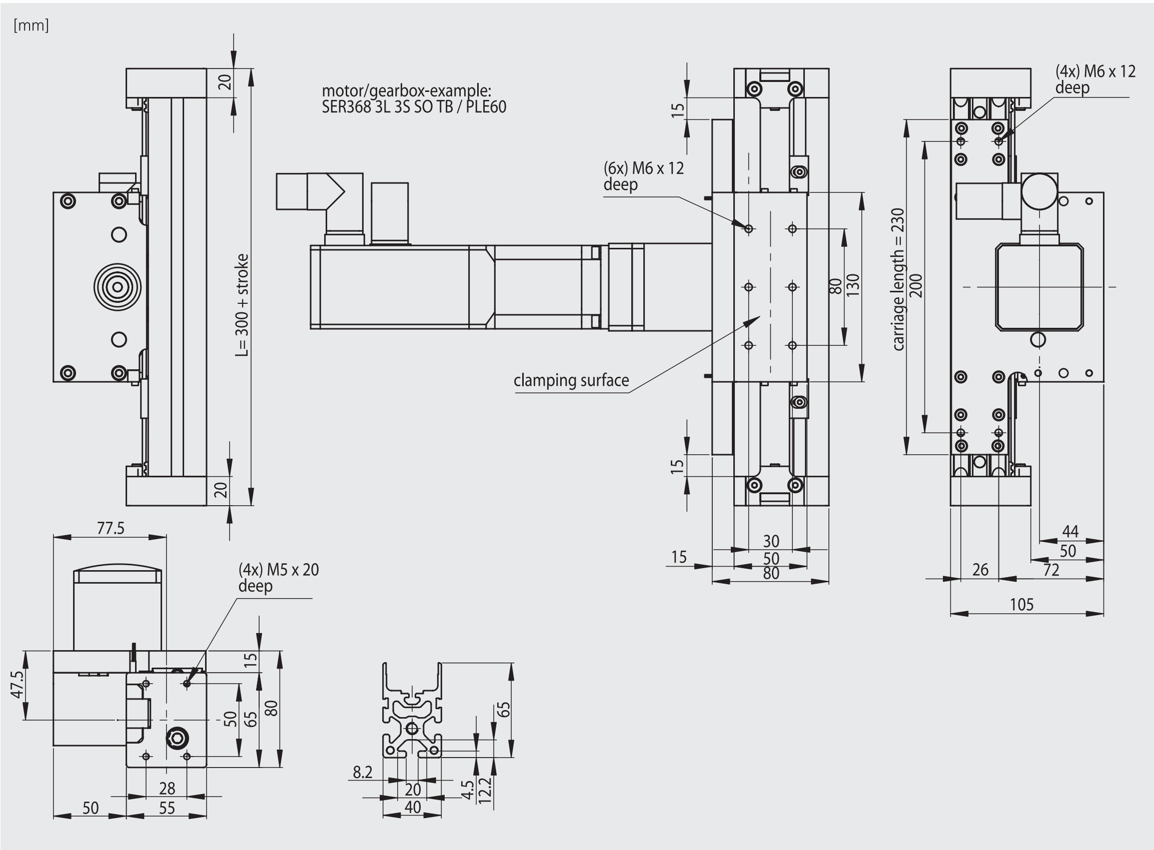


Maximum forces and torque values, cantilever axes (extruded-section model)

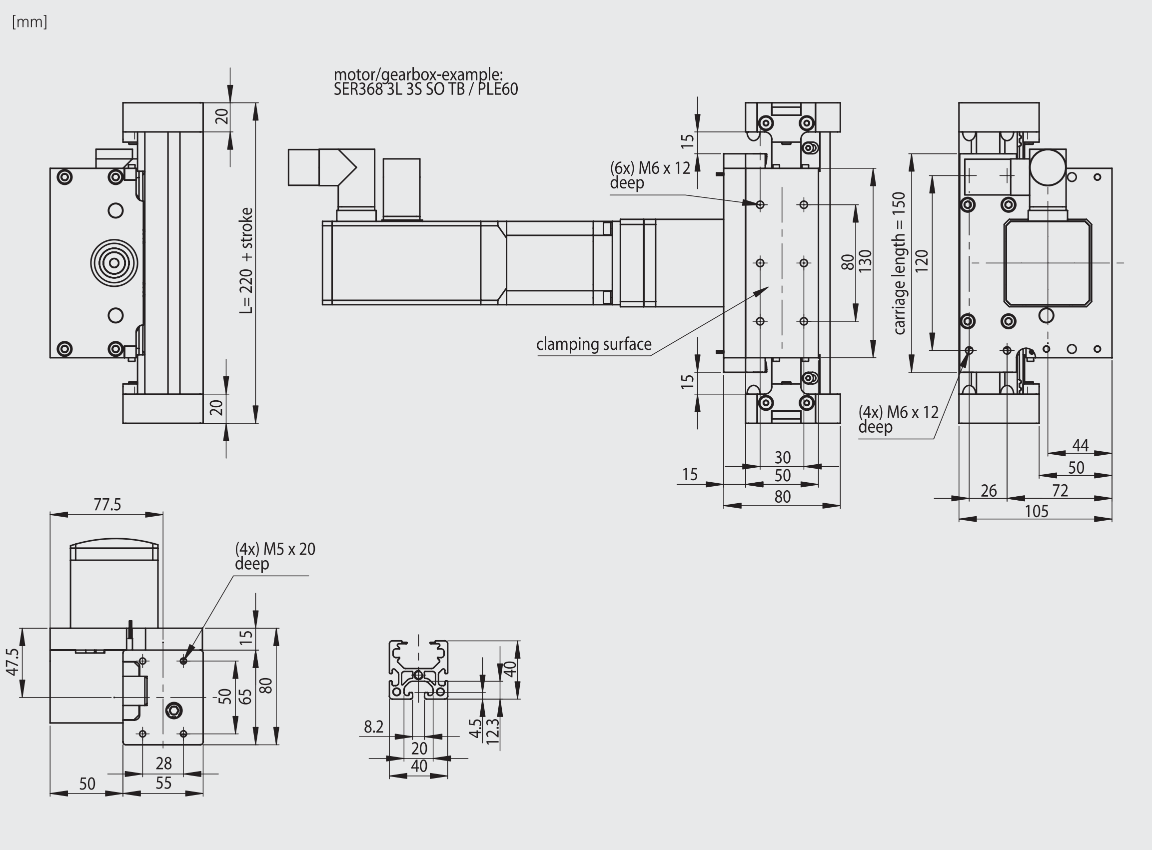
Recommended motors, see Page 9



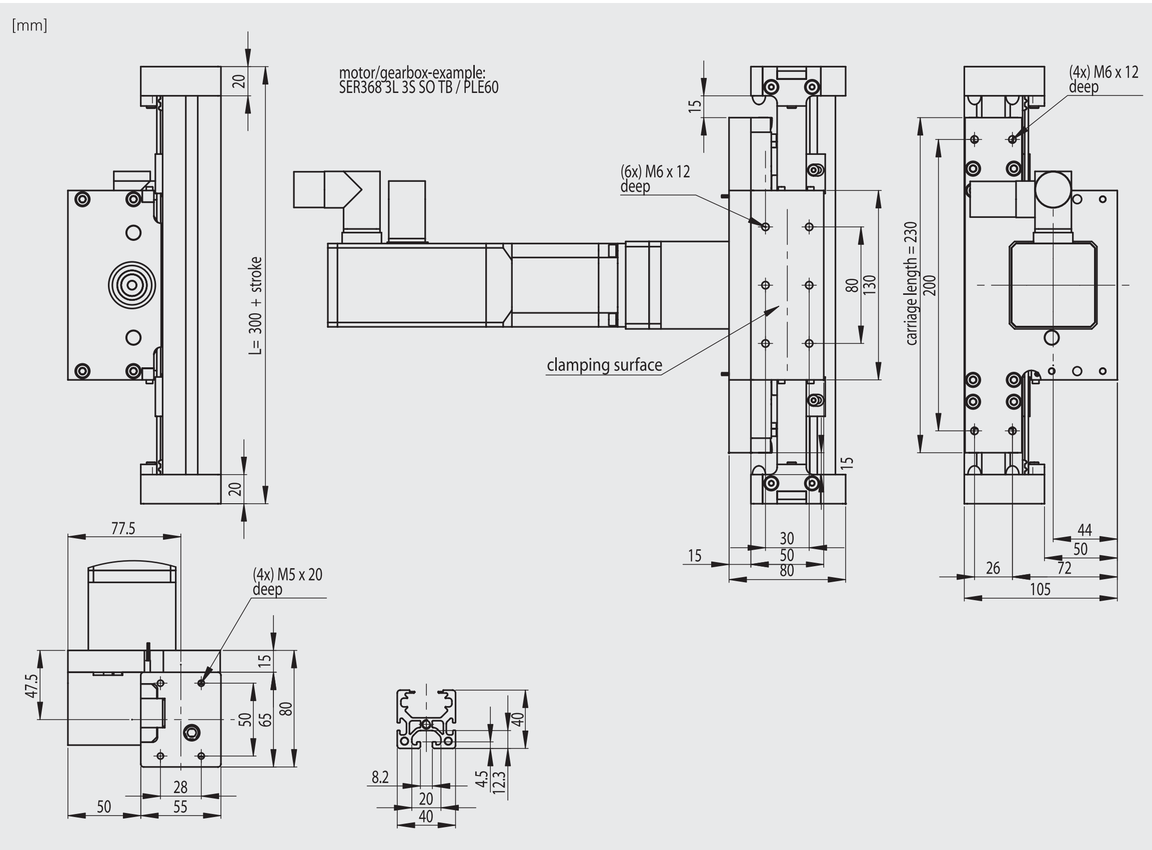
Cantilever axis LM-A504KT100-LW150



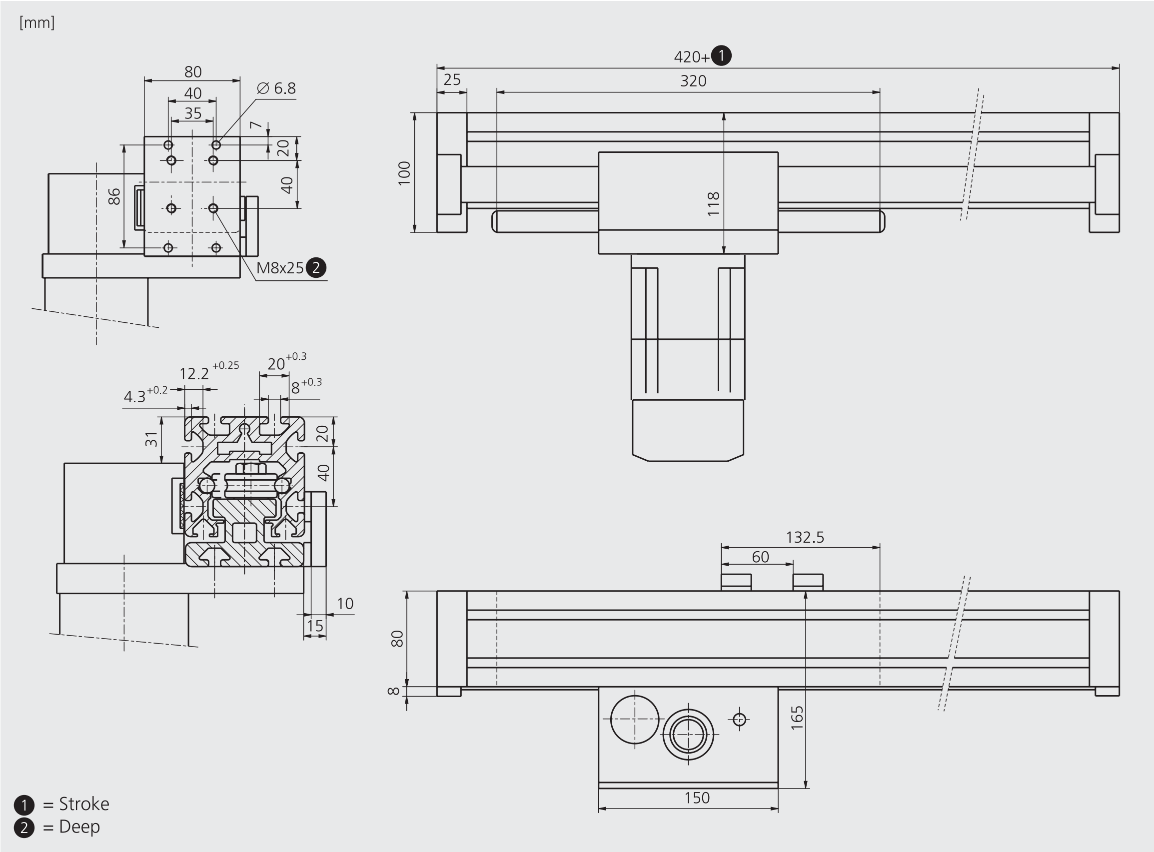
Cantilever axis LM-A504KT100-LW230



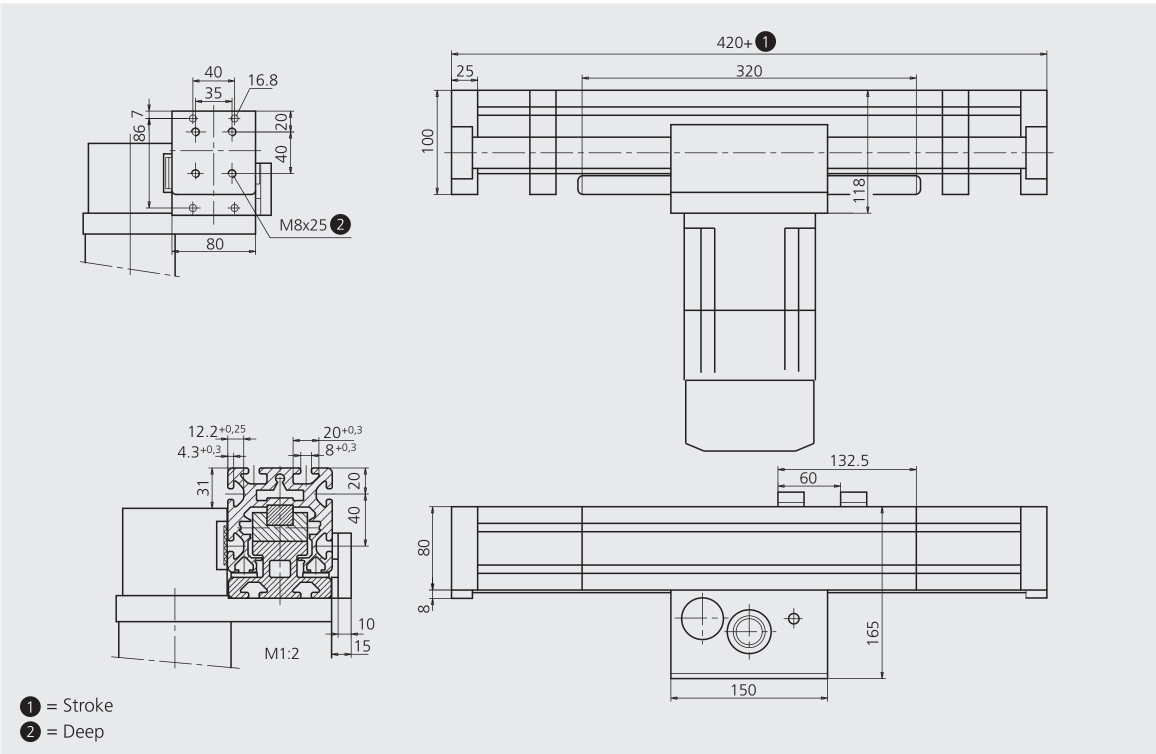
Cantilever axis LM-A504RT100-LW150



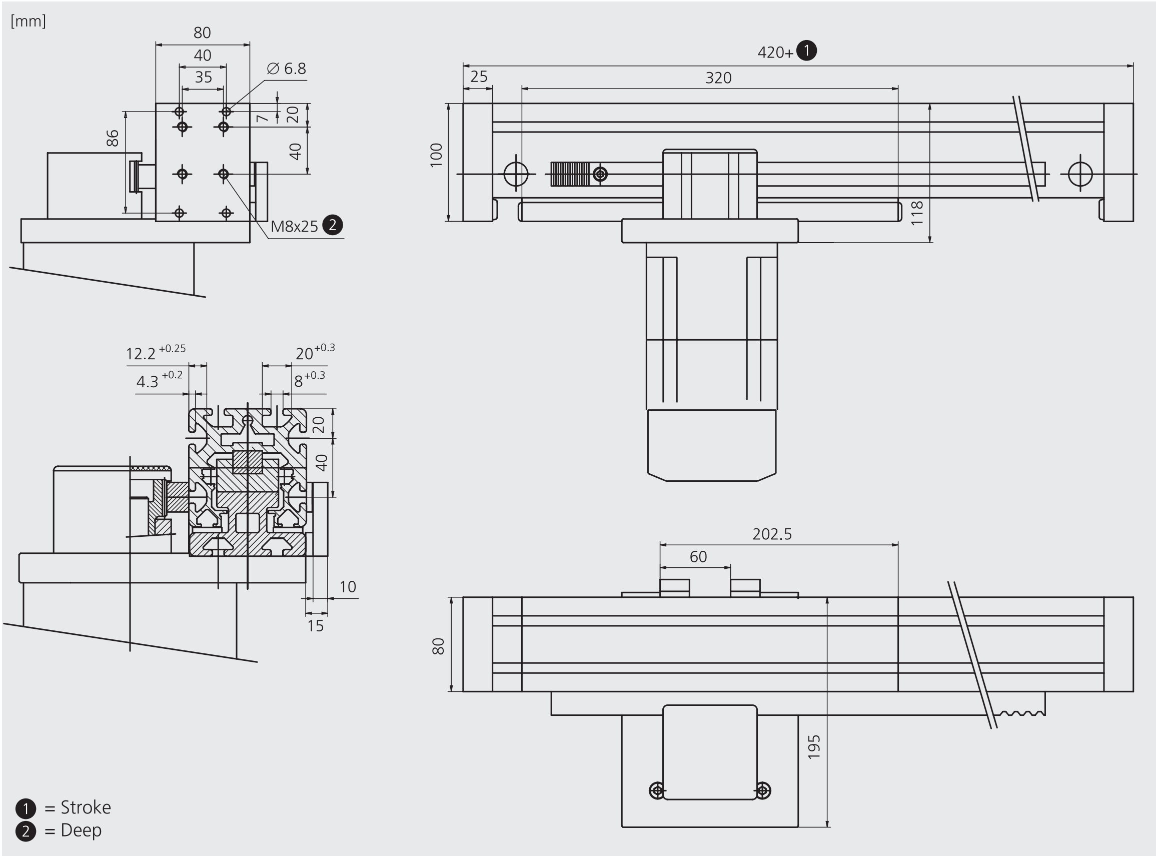
Cantilever axis LM-A504RT100-LW230



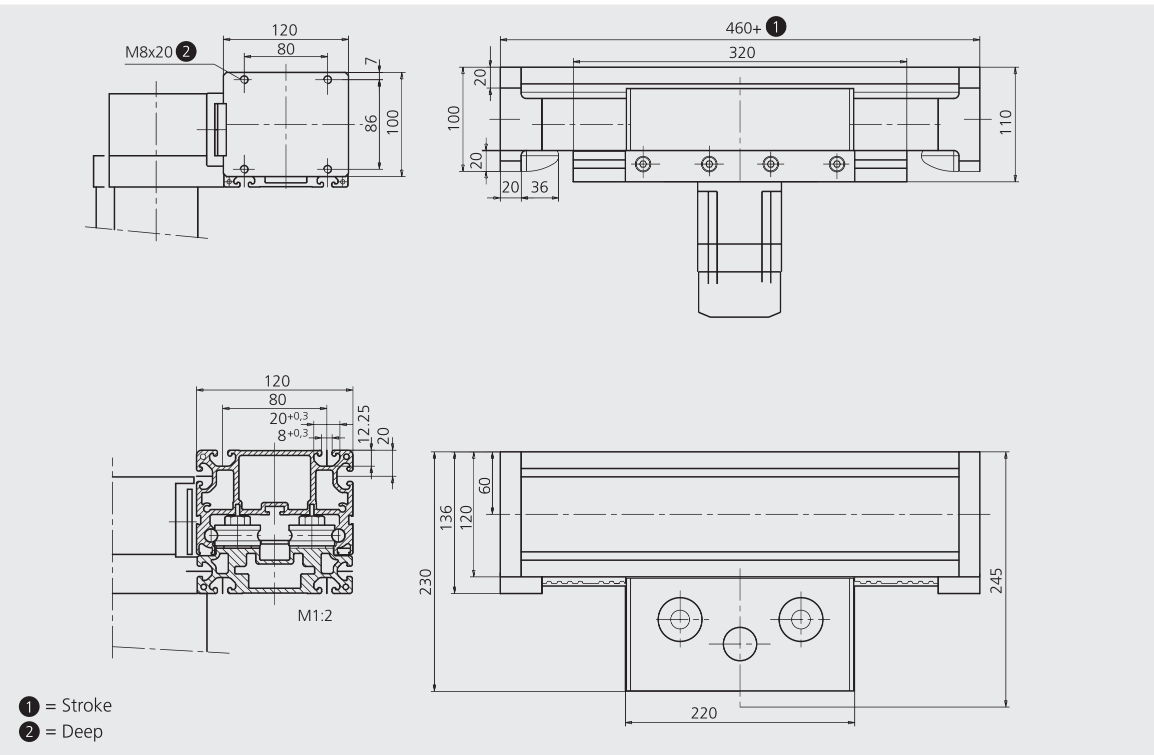
Cantilever axis LM-A608RT100



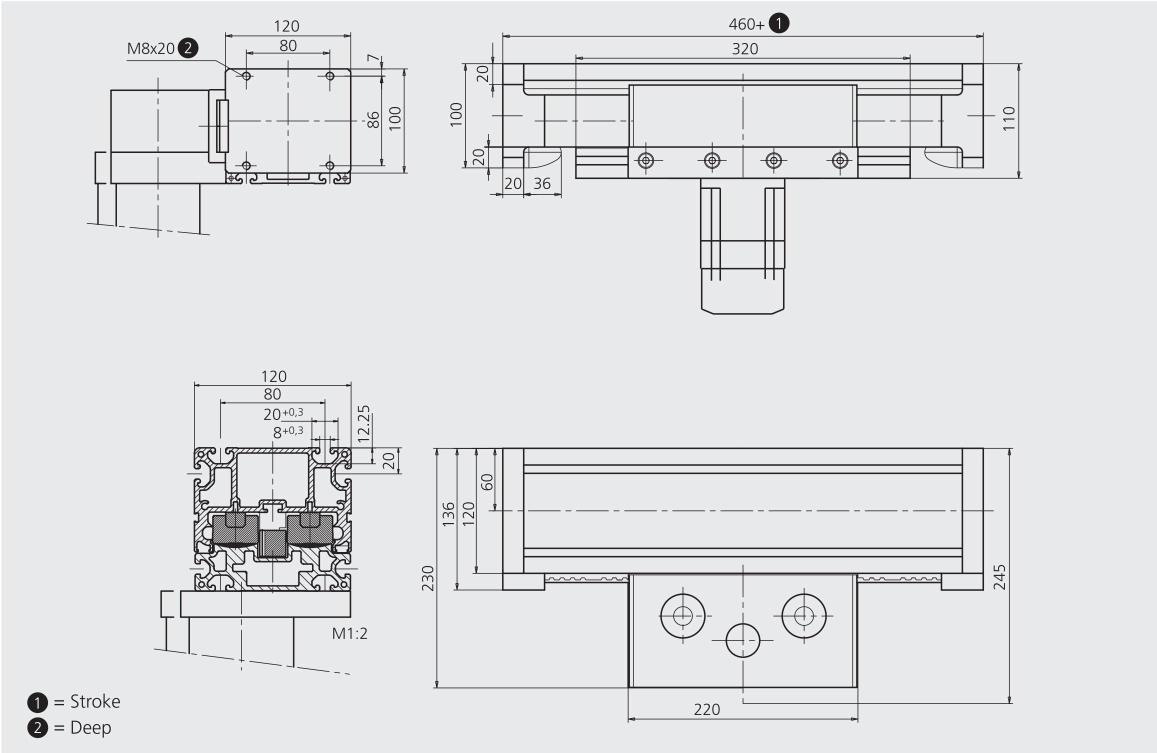
Cantilever axis LM-A608KT100



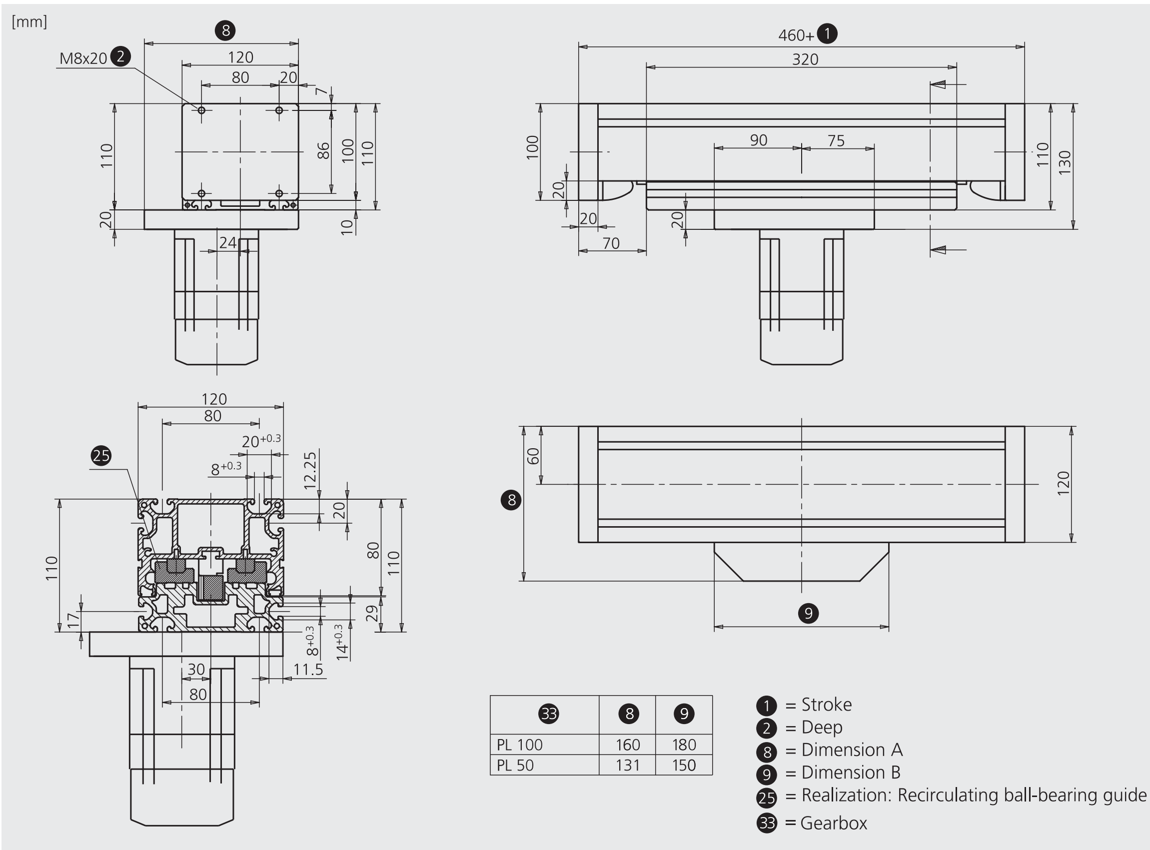
Cantilever axis LM-A608KZ144



Cantilever axis LM-A812RT150



Cantilever axis LM-A812KT150



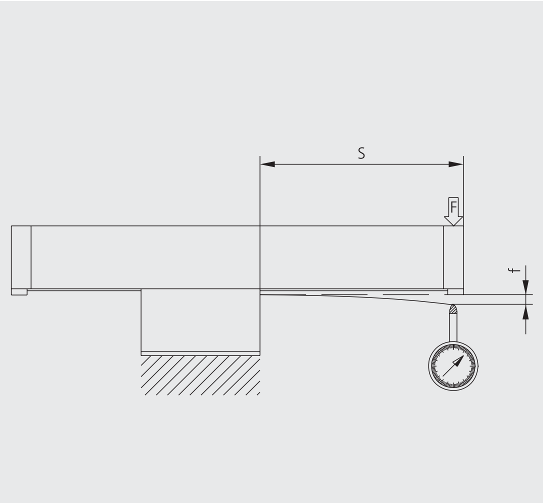
33	8	9
PL 100	160	180
PL 50	131	150

1 = Stroke
2 = Deep
8 = Dimension A
9 = Dimension B
25 = Realization: Recirculating ball-bearing guide
33 = Gearbox

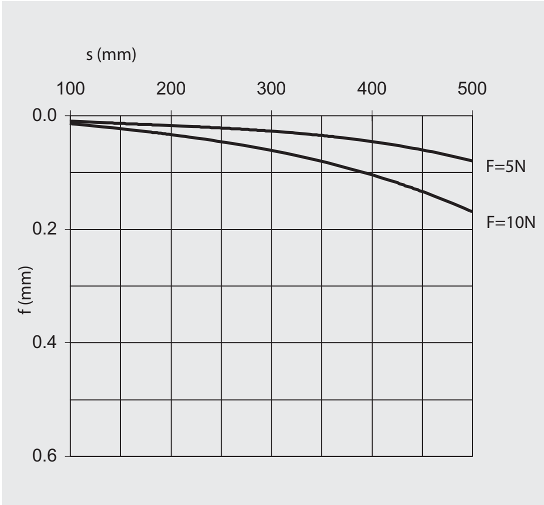
Cantilever axis LM-A812KZ100

Axis rigidity

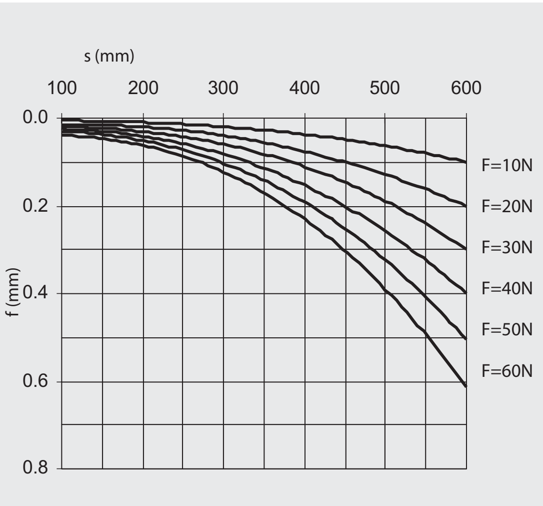
Note the axis rigidity when selecting the positioning axes. The flexibility characteristics show the flexibility (f) in relation to the load (F) and the stroke (S).



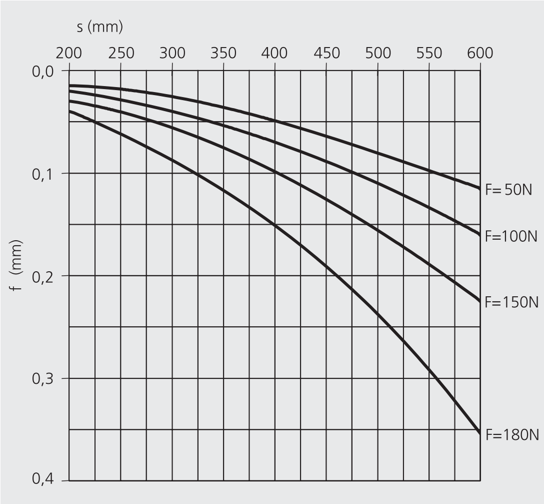
Measuring structure for establishing the flexibility characteristics (extruded-section model)



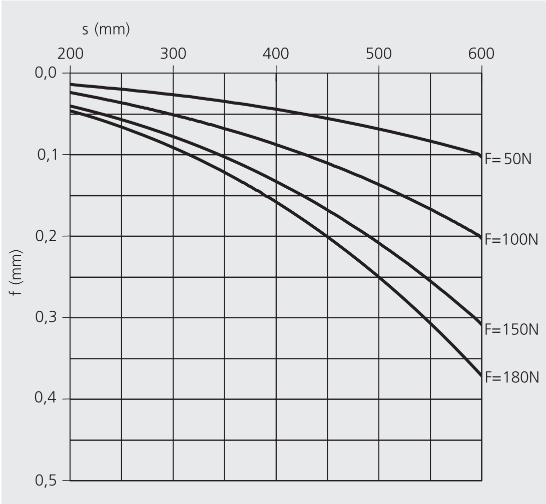
Flexibility LM-A504RT100



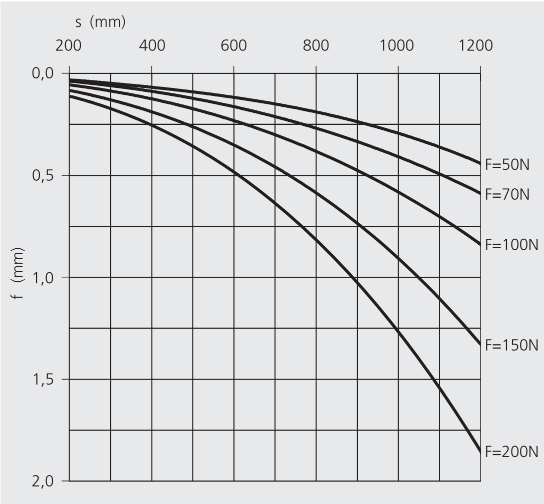
Flexibility LM-A504KT100



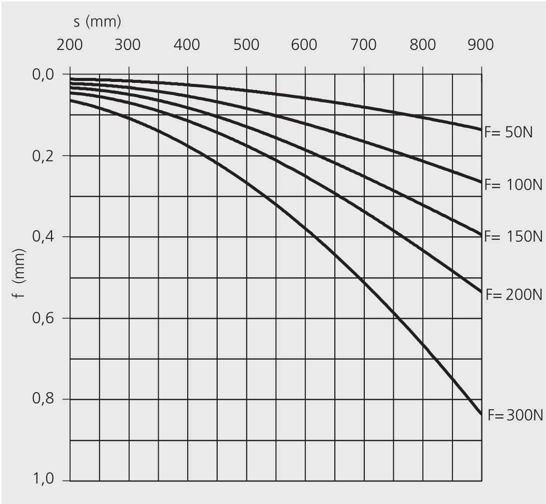
Flexibility LM-A608RT100



Flexibility LM-A608KT100



Flexibility LM-A812RT150



Flexibility LM-A812KT150

Request
The modular design of the Berger Lahr linear modules enables you to select the optimum solution for your application. Please fill out this request form and send a copy to your nearest Berger Lahr sales office.

Sender

Contact ____________________
Company ____________________
Street/PO Box ____________________
Locality ____________________
Post Code ____________________
Telephone ____________________
Fax ____________________
email ____________________
Date ____________________

Cantilever axis LM-A...

Base model

☐ LM-A0BZ50
☐ LM-A108BT75
☐ LM-A210BT100
☐ LM-A212BT100
☐ LM-A316BT100
☐ LM-A504RT100
☐ LM-A504KT100
☐ LM-A608RT100
☐ LM-A608KT100
☐ LM-A608KZ144
☐ LM-A812RT150
☐ LM-A812KT150
☐ LM-A812KZ100

Rust-proof construction

☐ no (standard)
☐ yes (only with roller guide)

LM-**A0**, LM-**A108**, LM-**A210**, LM-**A212**, LM-**A316**

Stroke length

LM-**A0** ☐ _______ mm (max. 150 mm)
LM-**A108** ☐ _______ mm (max. 200 mm)
LM-**A210** ☐ _______ mm (max. 300 mm)
LM-**A212**, ☐ _______ mm (max. 400 mm)
LM-**A316** ☐ _______ mm (max. 500 mm)

Limit switch

☐ none
☐ two (standard)

→ **Limit switch**

☐ 5 m cable
☐ 10 m cable
☐ with plug

LM-**A504...**

Stroke length

☐ _______ mm (max. 500 mm)

Limit switch

☐ none
☐ two (standard)
☐ three

→ **Limit switch**

☐ 5 m cable
☐ 10 m cable

LM-**A608...**

Stroke length

☐ _______ mm (max. 600 mm)

Limit switch

☐ none
☐ two (standard)
☐ three

→ **Limit switch**

☐ 5 m cable
☐ 10 m cable
☐ with plug

LM-**A812...**

Stroke length

☐ _______ mm (max. 1200 mm)

Limit switch

☐ none
☐ two (standard)
☐ three

→ **Limit switch**

☐ 5 m cable
☐ 10 m cable

Drive

☐ motor/gearbox from Berger Lahr, type designation ________________ (see Catalogue of Twin Line Motors)
☐ customer-specific drive ____________________________
Motor brake recommended for vertikal applications

Additional axis models are available upon request.

Telescopic axis

Telescopic axes

Telescopic axes consist of a mobile axis body, mobile carriage and stationary motor. The Telescopic axis moves into the working area and then completely out of it again. The maximum travel path (stroke) is thus considerably longer than the axis itself.

A telescopic axis is ideal for loading and unloading working areas that a handling system may only enter at certain times and in which there is only a limited amount of space, as in the case of injection moulding machines.

Features of the Telescopic axes

– the roller guides for optimally adapted running features
– internal guides which can be lubricated from the outside but require no further maintenance
– axis profile constructed from extruded aluminium, resulting in high torsion and bend resistance with low mass
– standard motors are mounted directly on the drive pinion, doing away with the need for motor couplings and thus saving weight, space and costs
– limit switch within the profile footprint
– axis can be delivered in rust-proof construction
– available in all dimensions-millimetre precise-up to the maximum stroke

Telescopic axes are available with various carriage lengths, e.g. for accommodating greater torque values and or large-surface loads, and can be delivered millimetre-precise in all required dimensions to the maximum stroke.

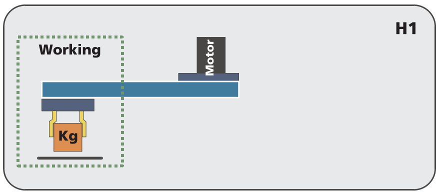
Please contact your nearest Berger Lahr sales office for further technical information.

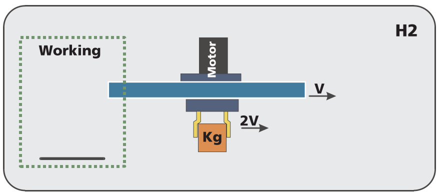
Motors

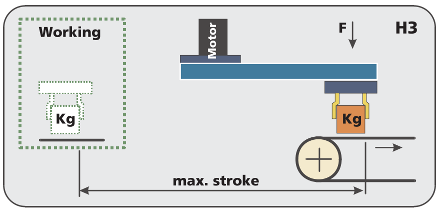
A toothed belt transmits the motor power to the axis body and carriage.

Depending on load and dynamic requirements, portal axes are powered by either 3-phase stepping motors or AC synchronous servomotors manufactured by Berger Lahr. Different, customer-specific motors with a torque up to 30 Nm are also available upon request. When selecting a motor, make sure to take into account the maximum permissible drive torque on the axis drive shaft.

The motor or gearbox is mounted directly on the drive pinion, without featherkey, eliminating any play in the connection or the need for additional couplings.





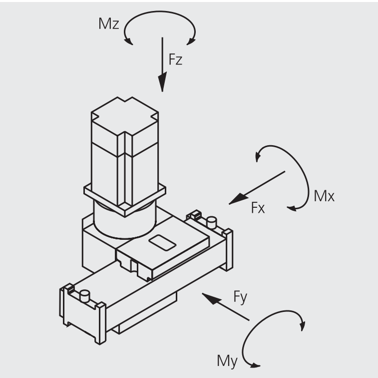


Technical data for telescopic axes

	LM-T812RT300	**LM-T812KT300**
Max. load	25 kg	35 kg
Max. recommended stroke (relation to total axis length)	2400 mm	2400 mm
Min. stroke with oil contact of the rollers	110 mm	110 mm
Max. drive torque on the axis drive shaft	30 Nm	30 Nm
Idle torque	2.46 Nm	2.36 Nm
Max. speed (depending on load and stroke)	5 m/s	2 m/s
Positioning repeatability	±0.1 mm	±0.1 mm
Stroke per revolution of the axis drive shaft Extruded section Trolley	 150 mm 300 mm	 150 mm 300 mm
Effective pitch diameter of axis drive shaft	47.75 mm	47.75 mm
Mass moment of inertia (without motor)	9 kgcm^2	9 kgcm^2
Total mass with 0 mm stroke (without motor)	14 kg	14.3 kg
Impelled extruded section mass with 0 mm stroke Extruded section per 100 mm stroke Trolley* (*taken account of in "total weight at 0 mm stroke")	3.8 kg 1.0 kg 2.7 kg	4.2 kg 1.1 kg 3.1 kg
Drive element Extruded section Trolley	Toothed belts b50 T10 b32 AT5	Toothed belts b50 T10 b32 AT5
Frictional force on the axis drive shaft	54 N	60 N

Maximum forces and torque values, Telescopic axes

	LM-T812RT300	**LM-T812KT300**
Max. force Fx	1256 N	1256 N
Max. force Fy	500 N	700 N
Max. force Fz	500 N	700 N
Max. torque Mx	55 Nm	80 Nm
Max. torque My	140 Nm	320 Nm
Max. torque Mz	220 Nm	270 Nm



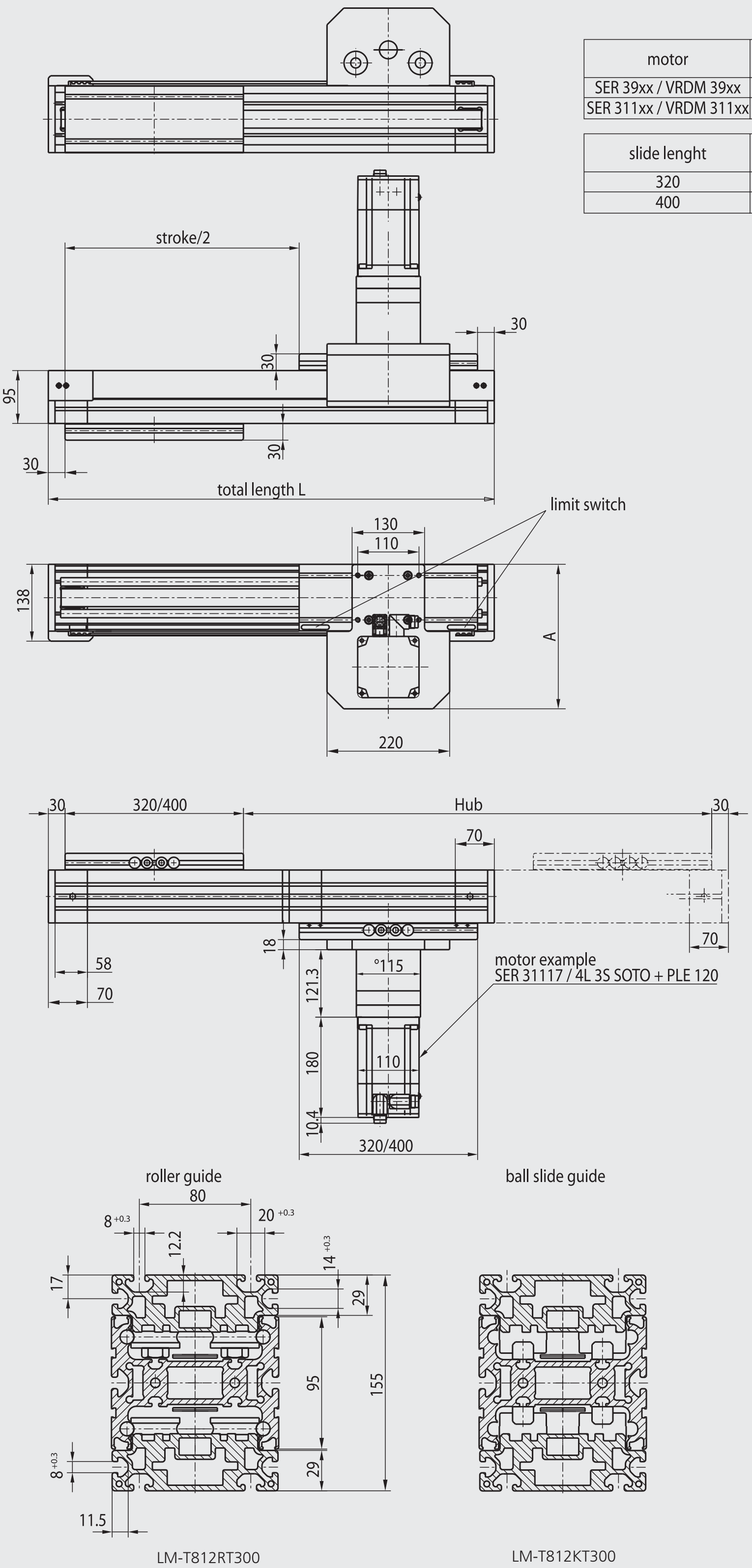
Maximum forces and torque values, Telescopic axes

Recommended motors, see Page 9

[mm]

motor	gear	dimension A
SER 39xx / VRDM 39xx	PLE 80	230
SER 311xx / VRDM 311xx	PLE 120	259

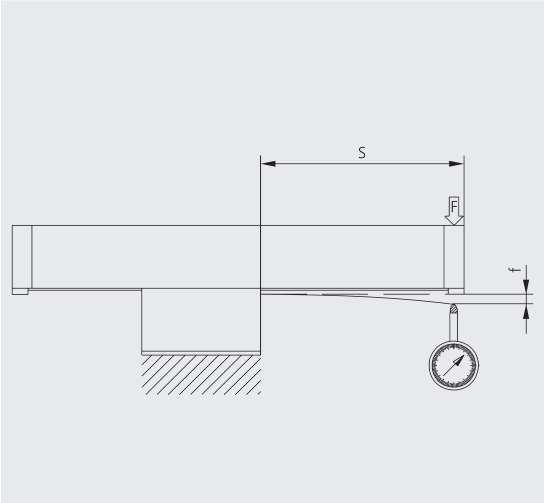
slide lenght	total lenght L
320	380 + stroke/2
400	460 + stroke/2



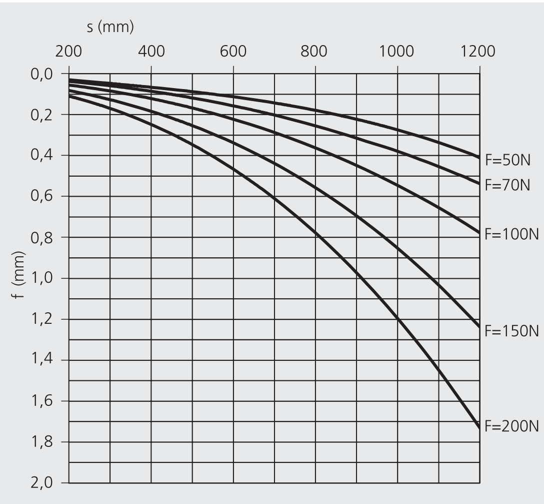
Telescopic axis LM-T812

Axis rigidity

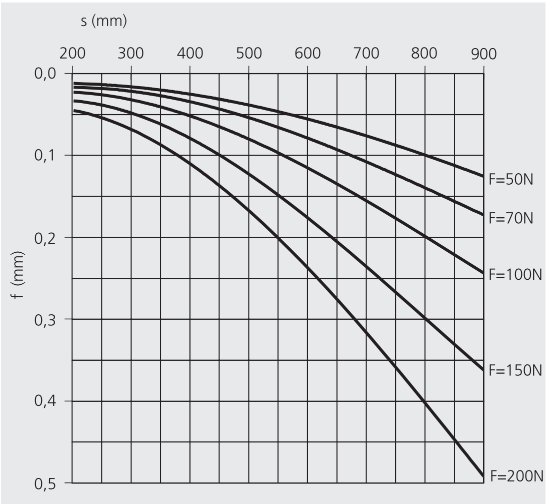
Note the axis rigidity when selecting the positioning axes. The flexibility characteristics show the flexibility (f) in relation to the load (F) and the stroke (S).



Measuring structure for establishing the flexibility characteristics



Flexibility LM-T812RT300



Flexibility LM-T812KT300

Request
The modular design of the Berger Lahr linear modules enables you to select the optimum solution for your application. Please fill out this request form and send a copy to your nearest Berger Lahr sales office.

Sender

Contact ____________________ Telephone ____________________
Company ____________________ Fax ____________________
Street/PO Box ____________________ email ____________________
Locality ____________________ Date ____________________
Post Code ____________________

Telescop axis LM-T812

Basic model

☐ LM-T812RT300
☐ LM-T812KT300

Rust-proof construction

☐ no (standard)
☐ yes (only with LM-812R300)

LM-**T812...**

Stroke length

☐ _______ mm (max. 2400 mm)

Limit switch → **Limit switch**

☐ none
☐ two (standard)
☐ three

☐ 5 m cable
☐ 10 m cable

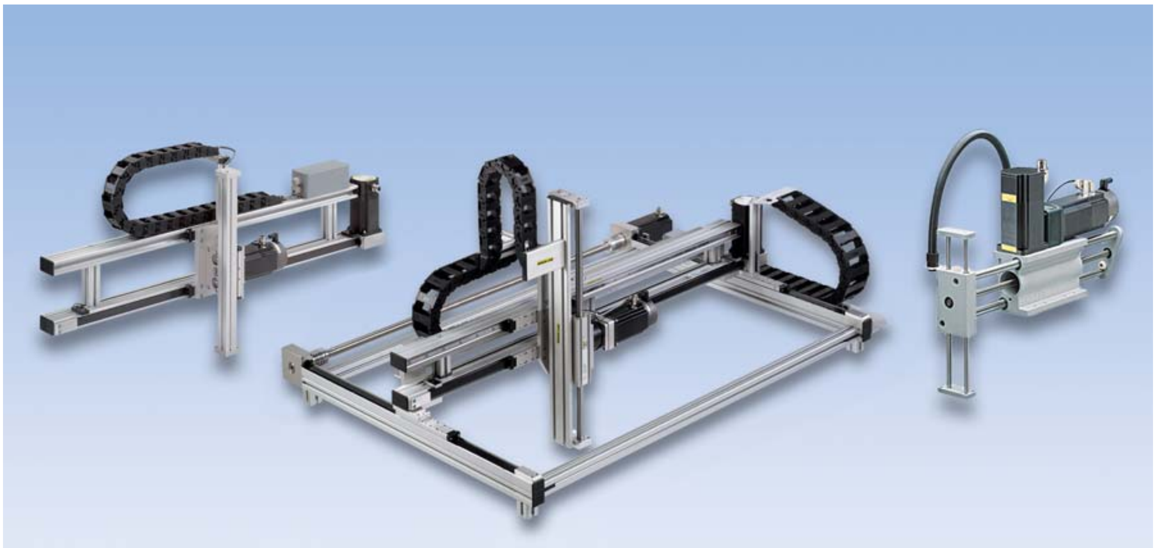
Carriage length

☒ 300 mm

Drive

☐ Motor/gearbox from Berger Lahr, type designation ________________ (see catalogue of Twin Line Motors)
☐ customer-specific drive ____________________________
Motor brake recommended for vertikal applications

Additional axis models are available upon request.



Multi-axis systems

Multi-axis systems

Linear modules manufactured by Berger Lahr may be combined to form multi-axis systems. These systems vary in the type, size and co-ordination of the combined axes. Depending on individual requirements, the systems may be equipped with gripping and processing tools, operated as autonomous units or integrated into assembly and production lines.

Double- and triple-axis systems differ based on the working area and working direction of constituent linear positioning system, linear-, portal-, and wall-mounted portal robots. A parallel series of products is the highly dynamic, **low-mass** positioning systems.

Linear positioning system

The linear positioning system operates below or above the working area. It works in the X/Z direction and is designed especially for handling dynamic loads on short travel paths in the Z direction.

Linear robots

The linear robot operates next to the working area and is designed for handling loads at high speeds on short travel paths.

Portal robots

The space-saving portal robot operates over the working area and is designed for handing loads on longer travel paths.

Wall-mounted portal robots

The wall-mounted portal robot, designed to handle tasks on vertical surfaces, operates next to the working area. Mounting extensions, extra protective coverings and secured doors can turn the wall-mounted portal robot into an autonomous handling unit.

Low-mass systems

The low-mass systems manufactured by Berger Lahr are equipped with stationary motors in order to reduce the moving mass. When working with small loads requiring fast positioning and a short cycle time, e.g. small-parts handling, the low moving mass enhances the dynamics of the handling process.

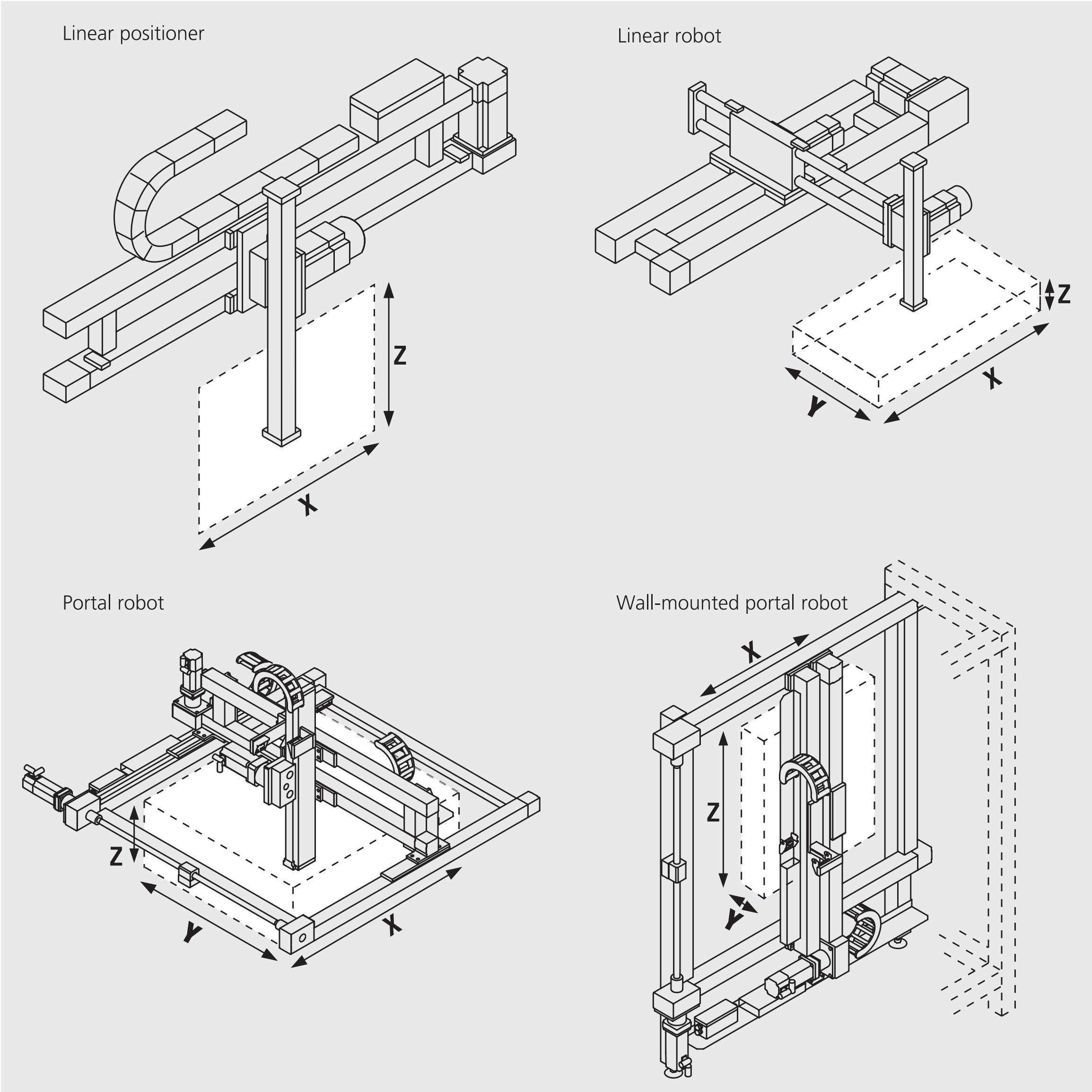
Type keys

Example	X	-	X	/	X

Axis systems	X	-	X	/	X
LP = Linear positioner	LP				
LR = Linear robot	LR				
PR = Portal robot	PR				
WR = Wall-mounted portal robot	WR				

Section size, X-axis	X	-	X	/	X
4 = LM-P404			4		
6 = LM-P608			6		
8 = LM-P812			8		

Number of axes	X	-	X	/	X
2					2
3					3

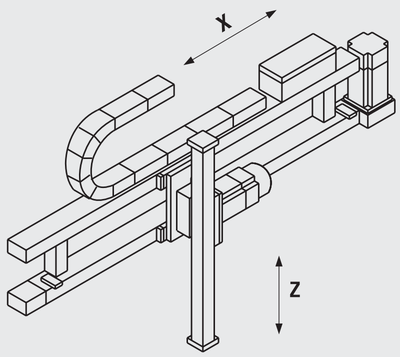


Working areas, multi-axis systems

Double-axis systems

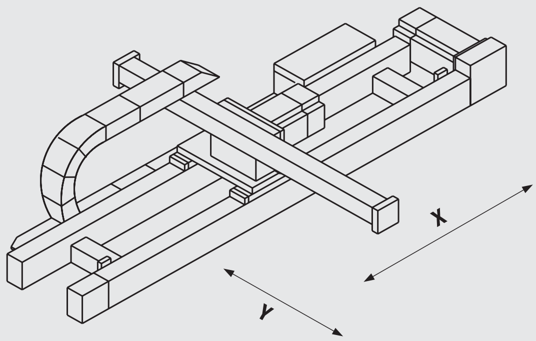
A small selection of our standard products in the field of double-axis systems is listed below. Of course, we also offer additional axis systems upon request, customized to your specific application.

Berger Lahr offers a free, no-obligation consultation. If you would like to take advantage of this service, please fill out the request at the end of the Chapter 'Multi-axis systems' and contact your nearest Berger Lahr sales office.



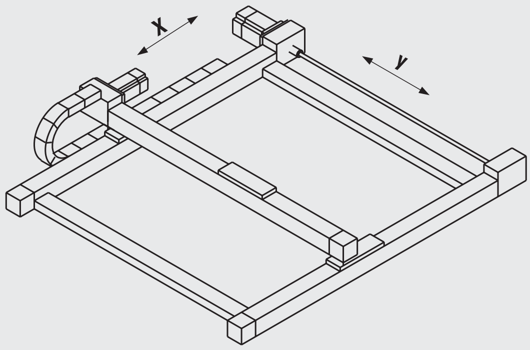
Type	**X**	**Z**	**load**
LP-4/2	2.500 mm	400 mm	4 kg
LP-6/2	5.600 mm	500 mm	20 kg
LP-8/2	5.400 mm	800 mm	30 kg

Example 1: Linear positioning system LP-x/2



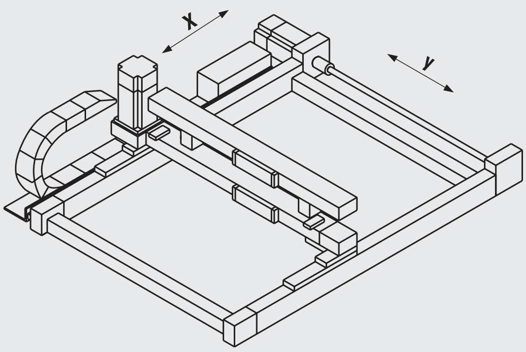
Type	**X**	**Y**	**load**
LR-4/2	2.500 mm	300 mm	3 kg
LR-6/2	5.600 mm	500 mm	10 kg
LR-8/2	5.400 mm	700 mm	15 kg

Example 2: Linear robot LR-x/2



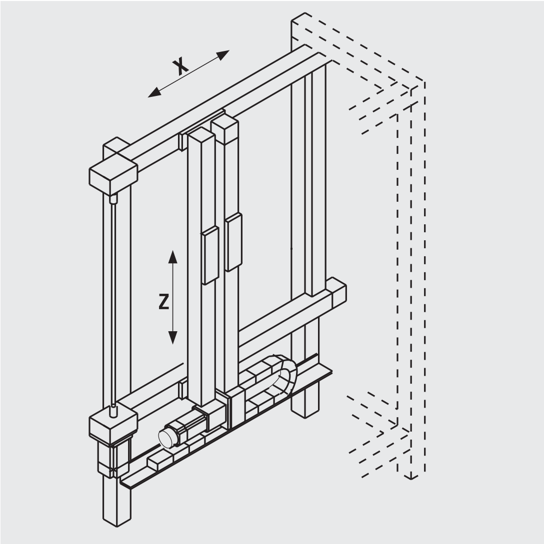
Type	**X**	**Y**	**load**
PR-4/2	2.500 mm	1.000 mm	5 kg
PR-6/2	4.000 mm	1.500 mm	10 kg
PR-8/2	5.400 mm	2.000 mm	30 kg

Example 3: Portal robot PR-x/2, for smaller loads



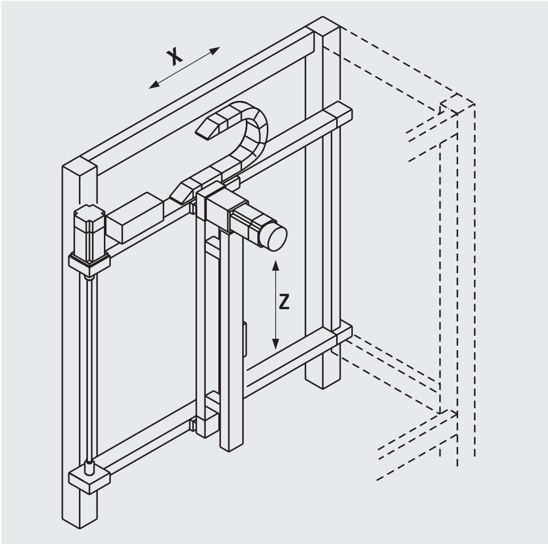
Type	**X**	**Y**	**load**
PR-4/2	2.500 mm	1.000 mm	10 kg
PR-6/2	4.000 mm	1.500 mm	20 kg
PR-8/2	5.400 mm	2.500 mm	50 kg

Example 4: Portal robot PR-x/2 for larger loads



Type	X	Z	load
WR-4/2	1.500 mm	1.000 mm	5 kg
WR-6/2	3.000 mm	1.500 mm	20 kg
WR-8/2	4.500 mm	2.000 mm	40 kg

Example 5: Wall-mounted portal robot WR-x/2, motor below



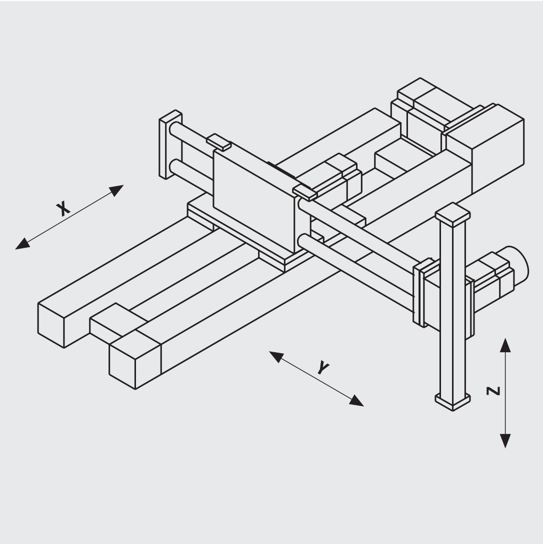
Type	X	Z	load
WR-4/2	1.500 mm	1.000 mm	5 kg
WR-6/2	3.000 mm	1.500 mm	20 kg
WR-8/2	4.500 mm	2.000 mm	40 kg

Example 6: Wall-mounted portal robot WR-x/2, motor above

Triple-axis systems

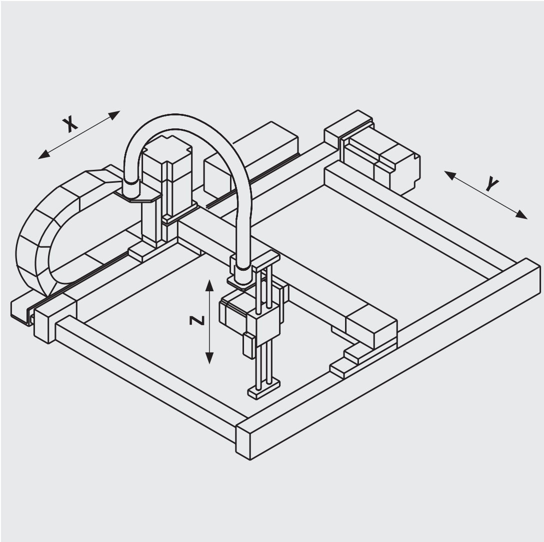
A small selection of our standard products in the field of triple-axis systems is listed below. Of course we also offer additional axis systems upon request, custom made to your specific application.

Berger Lahr offers a free, no-obligation consultation. If you would like to take advantage of this service, please fill out the request at the end of the Chapter 'Multiple sy-stems' and contact your nearest Berger Lahr sales office.



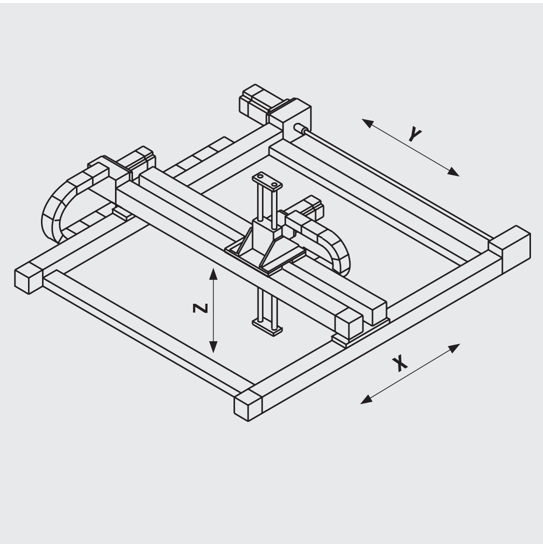
Type	X	Y	Z	load
LR-6/3	5.600 mm	400 mm	300 mm	3 kg

Example 1: Linear robot LR-x/3



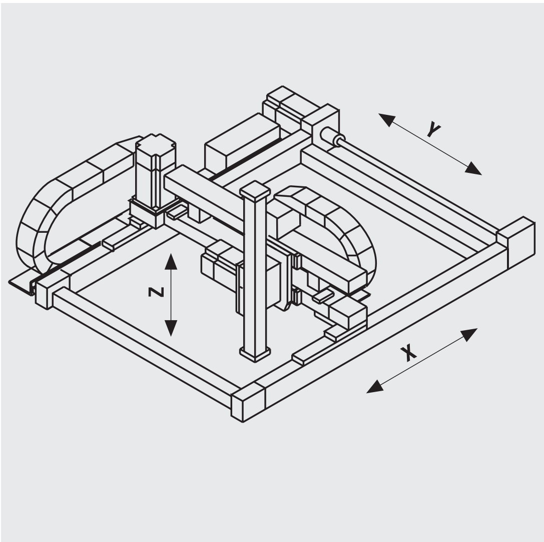
Type	X	Y	Z	load
PR-4/3	1.500 mm	400 mm	150 mm	1 kg

Example 3: Portal robot PR-4/3, Z-axis, round-bar model



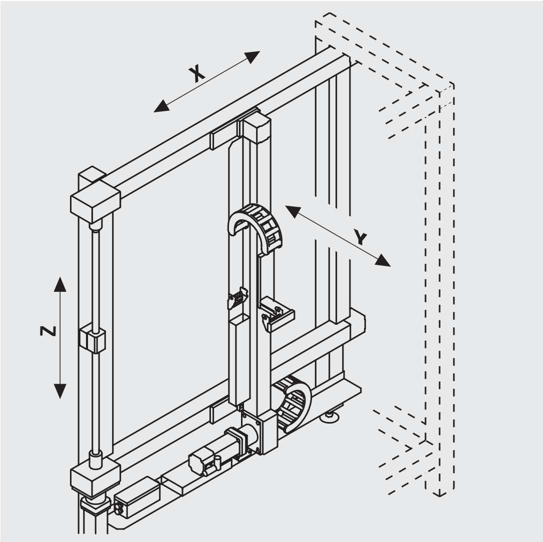
Type	X	Y	Z	load
PR-4/3	2.500 mm	1.000 mm	300 mm	5 kg
PR-6/3	4.000 mm	1.500 mm	300 mm	7 kg

Example 2: Portal robot PR-x/3



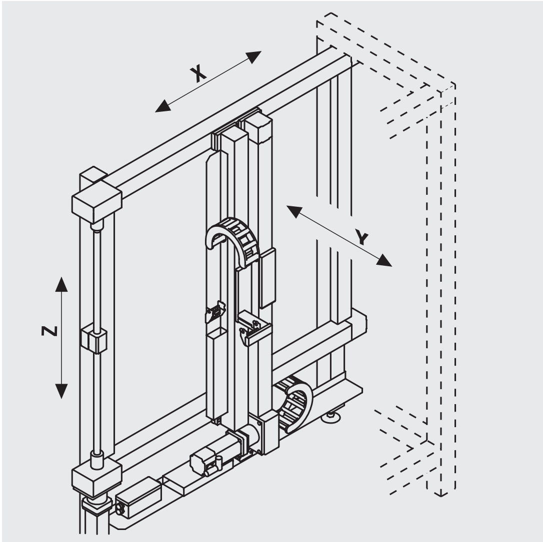
Type	X	Y	Z	load
PR-4/3	2.500 mm	1.000 mm	300 mm	5 kg
PR-6/3	4.000 mm	1.500 mm	600 mm	10 kg
PR-8/3	5.400 mm	2.000 mm	800 mm	20 kg

Example 4: Portal robot PR-x/3, Z-axis, extruded-section model



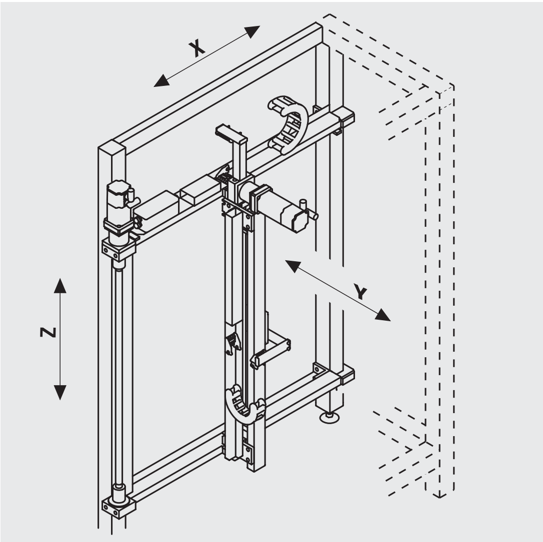
Type	X	Z	load
WR-6/2	3.000 mm	1.500 mm	15 kg

Example 5: Wall-mounted portal robot WR-6/2



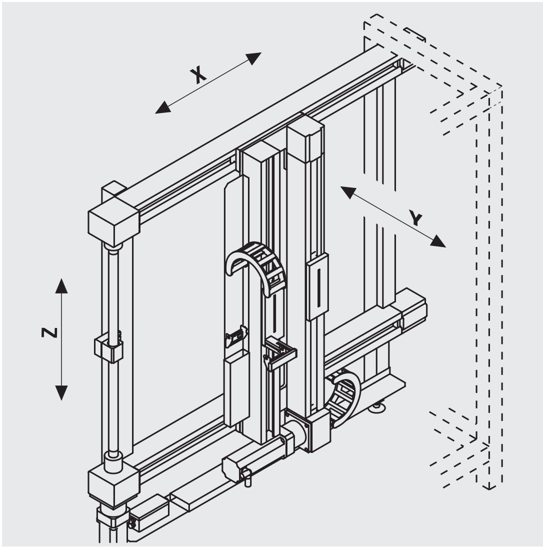
Type	X	Z	load
WR-6/2	3.000 mm	1.500 mm	25 kg

Example 6: Wall-mounted portal robot WR-6/2



Type	X	Z	load
WR-4/2	2.000 mm	1.000 mm	8 kg

Example 5: Wall-mounted portal robot WR-4/2



Type	X	Z	load
WR-8/2	4.000 mm	2.000 mm	100 kg

Example 5: Wall-mounted portal robot WR-8/2

Request
The modular design of the Berger Lahr linear modules enables you to select the optimum solution for your application.
Please fill out this request form and send a copy to your nearest Berger Lahr sales office.

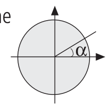
Sender

Contact ______________________ Telephone ______________________
Company ______________________ Fax ______________________
Street/PO Box ______________________ email ______________________
Locality ______________________ Date ______________________
Post Code ______________________

Design and orientation

What should the Cartesian robot look like? Please include any available dimensional drawings or supplementary diagrams.

	X-direction	Y-direction	Z-direction
Axis type (A = cantilever, P = portal, T = telescope)	___	___	___
Max. stoke	___ mm	___ mm	___ mm
Inclination of the axis to the horizontal plane	___ °	___ °	___ °



Load

Diagram including position and mass of load (incl. tools) as well as fastening point

Forces, torques

Without load and tools, time of action

Critical movements

e.g. for max. mass and/or travel path or min. positioning time

			X-direction		Y-direction		Z-direction	
Phase	Cycle duration	Load	Travel path	Time	Travel path	Time	Travel path	Time
I	___ s	___ kg	___ mm	___ s	___ mm	___ s	___ mm	___ s
II	___ s	___ kg	___ mm	___ s	___ mm	___ s	___ mm	___ s
III	___ s	___ kg	___ mm	___ s	___ mm	___ s	___ mm	___ s
max. speed (if required)			___ m/s		___ m/s		___ m/s	
max. acceleration (if required)			___ m/s^2		___ m/s^2		___ m/s^2	

Ambient conditions

Temperature, humidity (%), dust/water, clean-room, etc.

Special requirements

Rust-proof construction, grippers/sensors, safety, etc.

Linear positioning system LP-A

Linear positioning system LP-P

General information

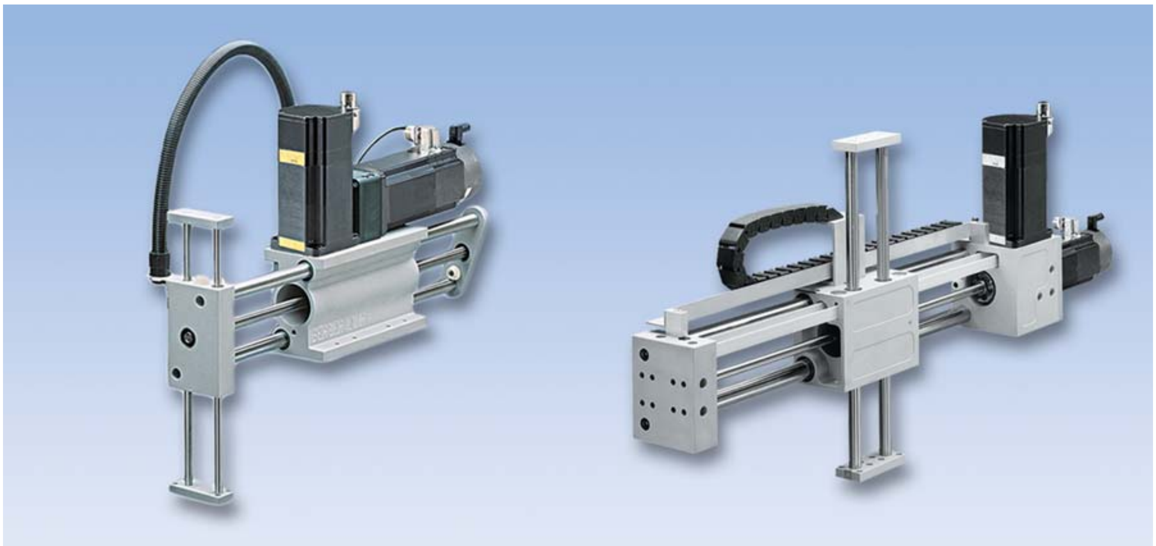
Low-mass systems manufactured by Berger Lahr are double-axis systems with stationary motors.

A relatively high dead weight is moved during most two-dimensional movements, since at least one motor and the connected cables and energy management chain must also be moved.

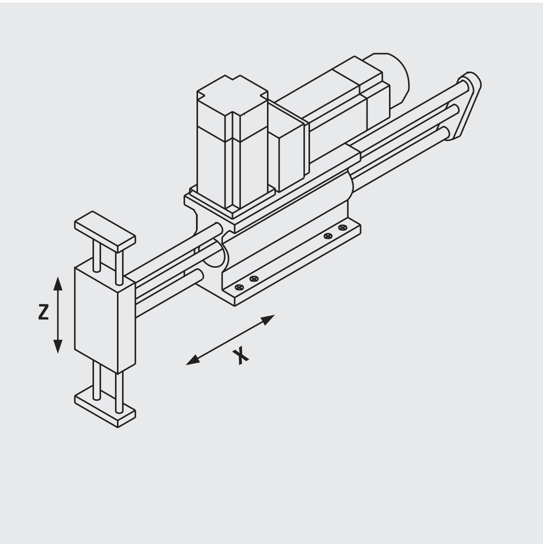
The motor mounted on one axis must yield a large part of its available torque for moving the extra weight.

Higher speeds and faster acceleration are achieved when the total torque is available.

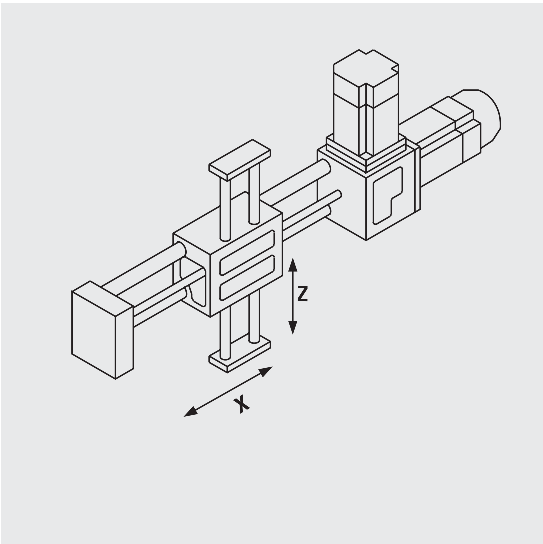
When working with small loads requiring fast positioning and a short cycle time, the low moving mass enhances the dynamics of the handling process.



Linear positioning systems LP-A (left) / LP-P (right)



Linear positioning system LP-A movement pattern



Linear positioning system LP-P movement patterns

Linear positioning systems

A linear positioning system is used on the XZ plane for the movements. It is positioned below or above the working area.

The linear positioning system **LP-A** is a combination of two cantilever axes with a mounting point on one surface. Two low cantilever weights and stationary motors enable dynamic travel patterns, harmonic movements and short cycle times.

The linear positioning system **LP-P** is a combination of a portal axis and a cantilever axis with a mounting point on two surfaces. A low cantilever carriage weight enables dynamic travel pattern, harmonic movements and short cycle times at high drive torque values.

Features of the linear positioning system

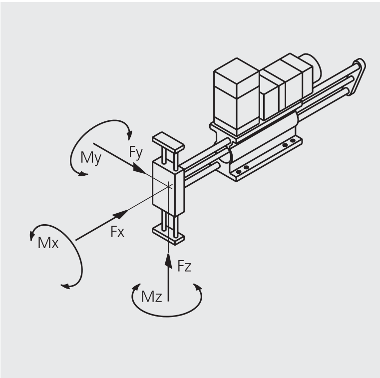
- significantly reduced dead weight due to stationary motors resulting in greater dynamics during the positioning process.
- narrow construction resulting in a succession of several positioning tasks in a very small space.
- extreme torque rigidity combined with high positioning precision.
- flexible system installation (LP-A) via central mounting surface
- high drive torque (LP-P), permissible up to 12 Nm

Technical data for linear positioning systems

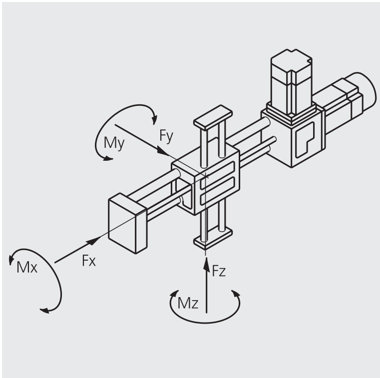
	LP-A		LP-P	
Max. load	2 kg		5 kg	
Dead weight at 0 mm stroke (without motor)	8.91 kg		15.9 kg	
	X	Z	X	Z
Max. recommended stroke	300 mm	150 mm	700 mm	300 mm
Max. drive torque on the axis drive shaft	4 Nm	4 Nm	12 Nm	12 Nm
Max. speed (depending on load and stroke)	5 m/s	5 m/s	5 m/s	5 m/s
Positioning repeatability	±0.1 mm	±0.1 mm	±0.1 mm	±0.1 mm
Stroke per revolution of the axis drive shaft	100 mm	50 mm	100 mm	100 mm
Effective pitch diameter of drive shaft	31.83 mm	15.92 mm	31.83 mm	31.83 mm
Moving mass at 0 mm stroke	3.72 kg (including Z axis)	0.37 kg	6.18 kg (including Z axis)	1.5 kg
Moving mass per 100 mm stroke	0.66 kg	0.13 kg	1.1 kg	0.5 kg
Drive element	Gearbox	4-spline shaft	Gear wheel	4-spline shaft

Maximum forces and torque values for linear positioning systems

	LP-A	LP-P
Max. force Fy	40 N	180 N
Max. torque Mx	8 Nm	54 Nm
Max. torque My	6 Nm	30 Nm
Max. torque Mz	2.5 Nm	14.5 Nm



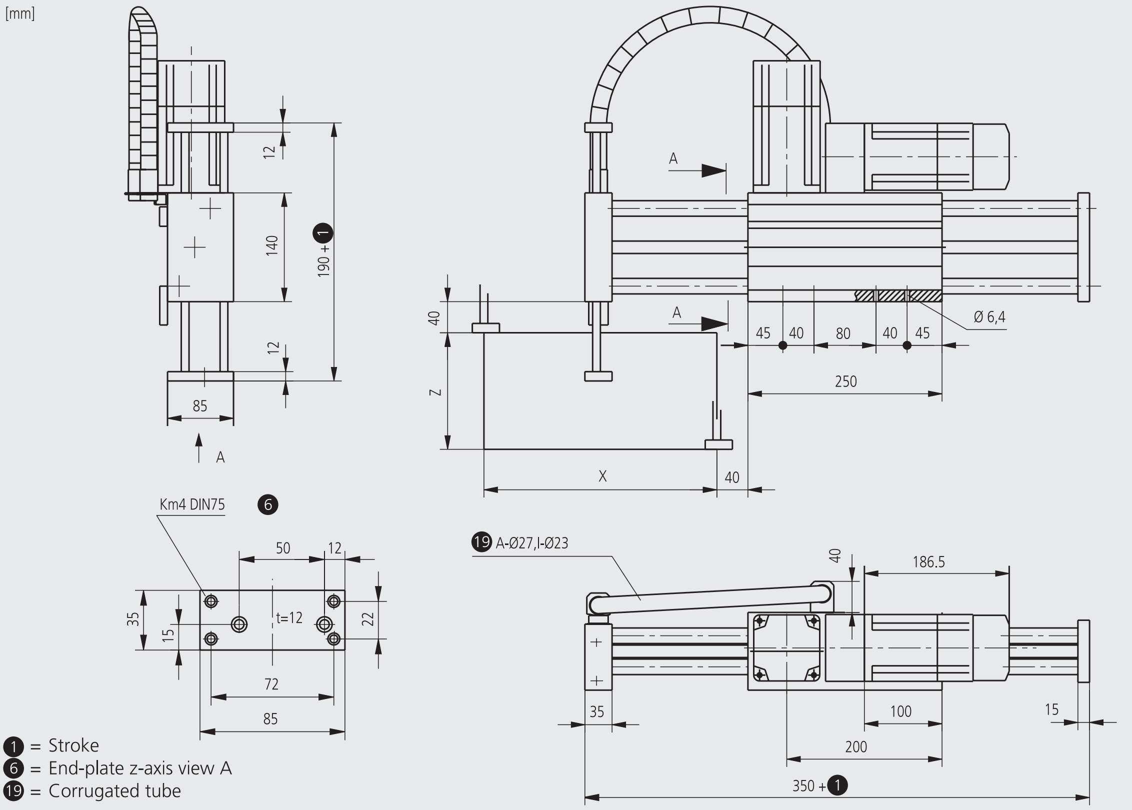
Maximum forces and torque values for linear positioning system LP-A



Maximum forces and torque values for the linear positioning system LP-P

Recommended motors, see Page 9

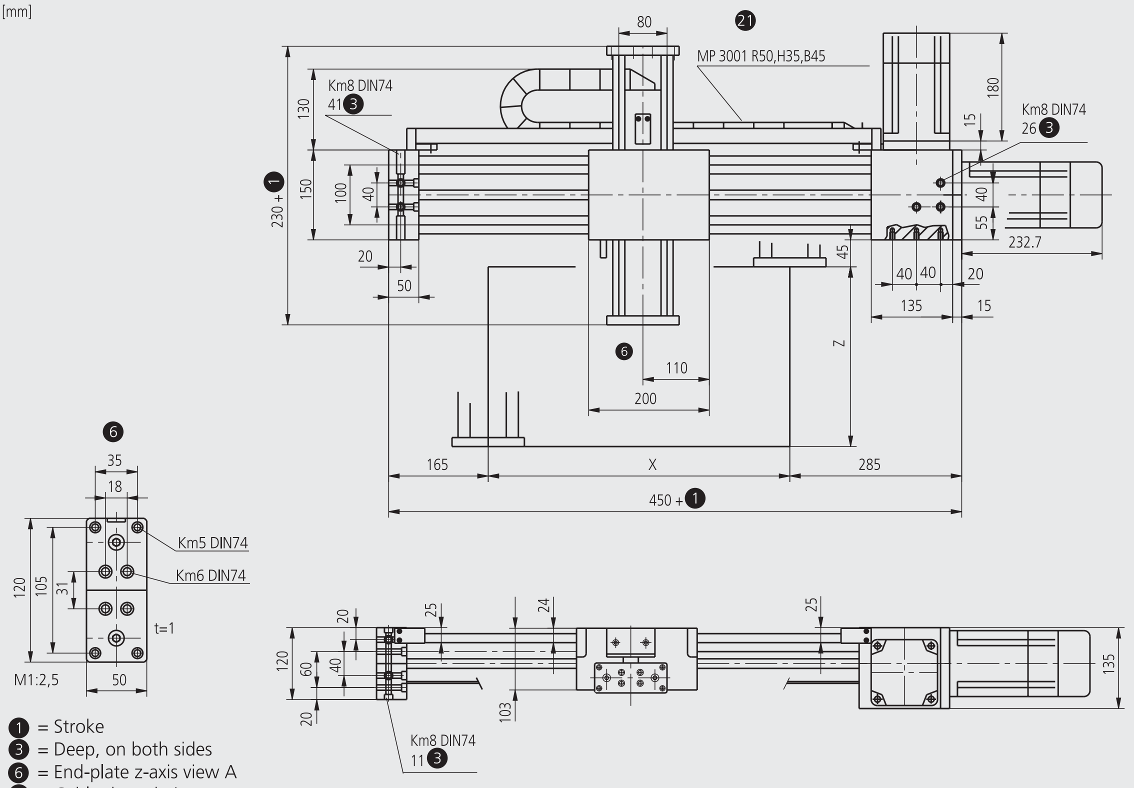
[mm]



❶ = Stroke
❻ = End-plate z-axis view A
⓳ = Corrugated tube

Linear positioning system LP-A

[mm]



❶ = Stroke
❸ = Deep, on both sides
❻ = End-plate z-axis view A
㉑ = Cable drag chain

Linear positioning system LP-P

Request
The modular design of the Berger Lahr linear modules enables you to select the optimum solution for your application.
Please fill out this request form and send a copy to your nearest Berger Lahr sales office.

Sender

Contact	____________	Telephone	____________
Company	____________	Fax	____________
Street/PO Box	____________	email	____________
Locality	____________	Date	____________
Post Code	____________		

Linear Positioner LP-...

Basic model
☐ LP-A
☐ LP-P

LP-A

Stroke length X-Axis
☐ _______ mm (max. 300 mm)

Limit switch → **Limit switch**
☐ none ☐ two (standard) → ☐ 5 m cable ☐ 10 m cable ☐ with plug

Stroke length Z-Axis
☐ _______ mm (max. 150 mm)

Limit switch → **Limit switch**
☐ none ☐ two (standard) → ☐ 5 m cable ☐ 10 m cable ☐ with plug

LP-P

Stroke length X-Axis
☐ _______ mm (max. 700 mm)

Limit switch → **Limit switch**
☐ none ☐ two (standard) → ☐ 5 m cable ☐ 10 m cable ☐ with plug

Stroke length Z-Axis
☐ _______ mm (max. 300 mm)

Limit switch → **Limit switch**
☐ none ☐ two (standard) → ☐ 5 m cable ☐ 10 m cable ☐ with plug

Drive

☐ Motor/gearbox from Berger Lahr, (see catalogue of Twin Line Motors)
type designation ______________ / ______________

☐ Customer-specific drive ______________ / ______________

Motor connection
☐ with plug
☐ with terminal box

Motor options
☐ with encoder (only for motors with plug)
☐ with brake

Additional axis models are available upon request.

Limit switches

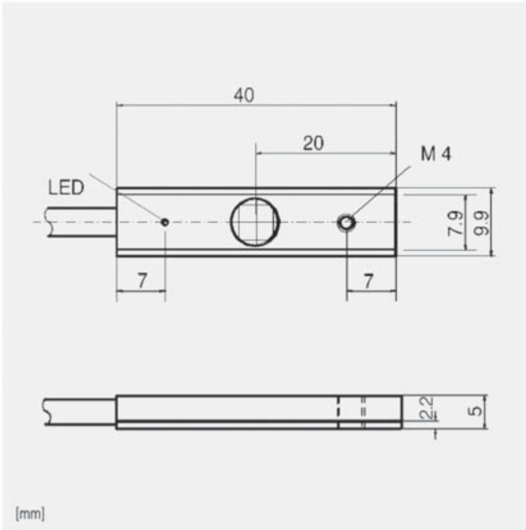
Limit switches are contactless sensors, so-called inductive proximity switches, which are standard equipment on all linear modules and multi-axis systems. The limit switches, installed in or flush to the running rail, are of the break type. When the carriage reaches the limit switch, the limit switch opens.

All limit switches are equipped with clocked short-circuit protection, are polarised and overload-proof, have no residual current, and indicate their present status via a red LED.

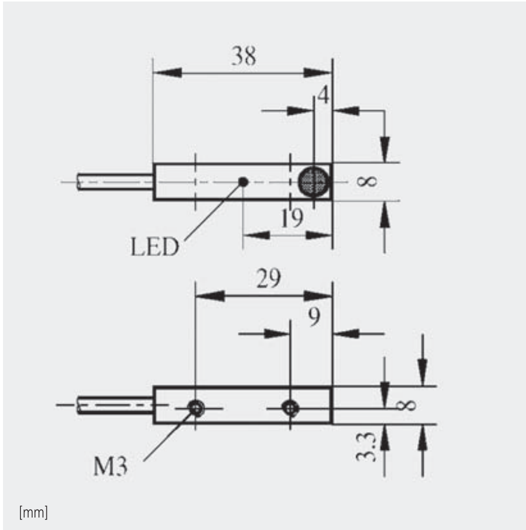
Each linear module includes a corresponding limit switch with varying cable length.

Technical data for limit switches

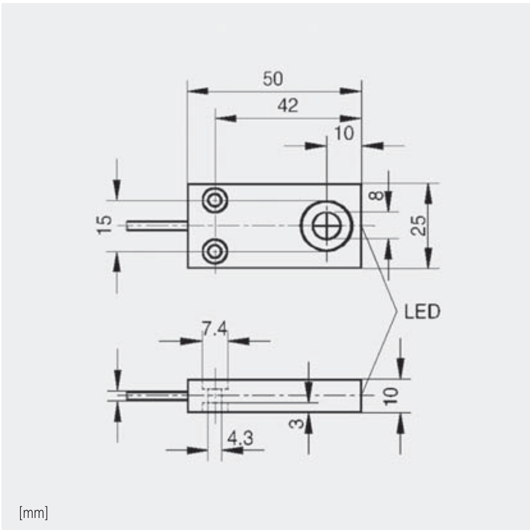
	Limit switch for LM-P608/ LM-P812	**Limit switch for LM-P404/LM-A0/ LM-A108/LM-A210/LM-A212/ LM-A316/LM-A608**		**Limit switch for LM-A404/ LM-A812/ LM-T812**
Connection	LIY11Y drag-chain line, 3 x 0.14 mm^2	LIY11Y drag-chain line, 3 x 0.14 mm^2	Connector M8	LIY11Y drag-chain line, 3 x 0.14 mm^2
Cable length	5 m/10 m	5 m/10 m	without cable	5 m/10 m
Max. cable diameter	3.2 mm ±0.2 mm	3.2 mm ±0.2 mm	3.2 mm ±0.2 mm	3.2 mm ±0.2 mm
Rated switching distance	2 mm	2.5 mm	2.5 mm	2 mm
Operating voltage	10 to 30 VDC	5 to 30 VDC	5 to 30 VDC	10 to 30 VDC
Current carrying capacity	200 mA	200 mA	200 mA	200 mA
Short-circuit protected, clocked	yes	yes	yes	yes
Polarised, overload-proof	yes	yes	yes	yes
Voltage drop	< 3 V	< 3 V	< 3 V	< 3 V
Residual current	–	–	–	–
Idle current intake	< 8 mA	< 20 mA	< 20 mA	< 8 mA
Switching frequency	1000 Hz	1000 Hz	1000 Hz	1000 Hz
Switching hysteresis	3 to 15 %	3 to 15 %	3 to 15 %	3 to 15 %
Switching status display	red LED	red LED	red LED	red LED
Ambient temperature	–25 to +70 °C	–25 to +70 °C	–25 to +70 °C	–25 to +70 °C
Protection type	IP 67	IP 67	IP 67	IP 67
Housing material	aluminium	PA6.6/GF black	PA6.6/GF black	aluminium



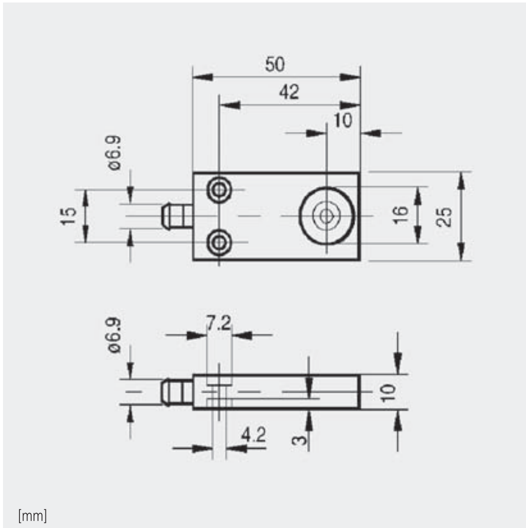
Limit switches for linear modules LM-P608/LM-P812



Limit switch for linear modules LM-A504/LM-A812/LM-T812



Limit switch for linear modules LM-P404/LM-A0/LM-A108/LM-A210/ LM-A316/LM-A608, cable length 5 m or 10 m



Limit switch for linear modules LM-P404/LM-A0/LM-A108/LM-A210/ LM-A316/LM-A608 without cable with plug

we control **motion**

Berger Lahr offers you the positioning and automation solutions you need, based on our tried and proven series of products. Our comprehensive engineering and consulting service is ready to support and advise you every step of the way.

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Lexium 15 motion control

BDH servo motors

105999

BDH servo motor

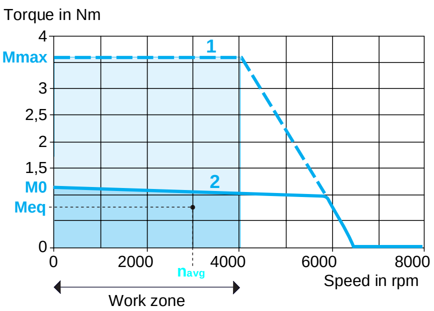
Presentation

Thanks to the advanced technology incorporated into their design, BDH servo motors represent a compact and high-performance solution for your machines, offering one of the best torque/size ratios available on the market.
7 flange sizes and multiple winding possibilities mean that these servo motors can be sized to match the requirements of each application. This product offer covers a torque range of between 0.18 Nm to 53 Nm for speeds from 10,000 to 8000 rpm.

The BDH servo motors come in 7 flange sizes available in IEC or NEMA mounting: 40, 58, 70, 88, 108, 138 and 188 mm. They are fitted as standard with angled connectors, with the exception of the 40 mm flange size which is supplied with remote straight connectors. Thermal protection is provided by a PTC probe integrated into the servo motor.
They are certified as "Recognized" ꭱᴜ by the Underwriters Laboratories and conform to UL 1004 standards as well as to European directives (CE marking).

BDH servo motors are available with the following variants:

- IP 54 or IP 67 degree of protection
- with or without holding brake
- resolver, SinCos Hiperface® single turn or multiturn encoder
- untapped or keyed shaft end
- IEC or NEMA mounting



Torque/speed characteristics

The BDH servo motors provide torque/speed curve profiles similar to the example shown on the left with:
1 Peak torque, depending on the servo drive model
2 Continuous torque, depending on the servo drive model
where:

- 8000 (in rpm) corresponds to the servo motor's maximum mechanical speed
- M_{max} (in Nm) represents the peak stall torque value
- M_{max} (in Nm) represents the continuous stall torque value

Principle for determining servo motor size according to the application

The torque/speed curves can be used to determine the correct servo motor size. For example, for a power supply voltage of 230 V single phase, the curves used are curves 1 and 2. Then:
1 Position the work zone of the application in relation to speed
2 Verify, using the motor cycle diagram, that the torques required by the application during the different cycle phases are located within the area bound by curve 1 in the work zone
3 Calculate the average speed n_{avg} and the equivalent thermal torque M_{eq} (see page 146)
4 The point defined by n_{avg} and M_{eq} must be located below curve 2 in the work zone

***Note:** Sizing of servo motors, see page 146*

Functions

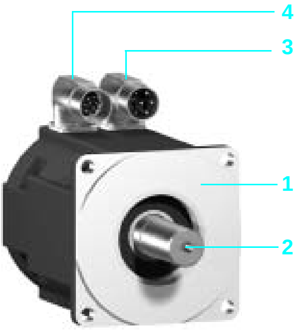
General functions

BDH servo motors have been developed to meet the following requirements:

- Functional characteristics, robustness, safety, ... in compliance with IEC/EN 60034-1
- Ambient operating temperature: 5...40°C in compliance with EN 50178 climatic class 3K3. Maximum 50°C with derating from 40°C of 1 % per additional °C
- Relative humidity: 95% without condensation in compliance with EN 50178 climatic class 3K3
- Altitude: 1000m without derating, 2000m with k = 0.94 *(1)*, 3000m with k = 0.83
- Storage and transport temperature: - 25...55°C in compliance with EN 50178 climatic class 1K4
- Winding insulation class: F (threshold temperature for windings 155°C) in compliance with DIN 57530
- Power and sensor connection using angled connectors (with the exception of the 40 mm flange size supplied with remote straight connectors)
- Thermal protection by built-in PTC thermistor probe, controlled by the Lexium 15 servo drive

(1) k: derating factor

Characteristics: pages 84 to 129
References: pages 130 to 133
Dimensions: pages 134 to 137



Functions (continued)

General functions (continued)

- Out-of-round, concentricity and perpendicularity between flange and shaft in accordance with DIN 42955, class N
- Flange compliant with standard DIN 42948
- Authorized mounting positions: no mounting restriction IMB5, IMV1 and IMV4 in accordance with DIN 42950
- Opaque black lacquer paint RAL 9005
- Degree of protection:
  - of the frame: IP 65 in accordance with IEC/EN 60529
  - of the shaft end: IP 54 or IP 67 in accordance with IEC/EN 60529
- Integrated sensor: resolver, SinCos Hiperface® high resolution single turn or multiturn encoder
- Untapped or keyed shaft end in standard sizes (according to DIN 748)

Holding brake (depending on model)

The integrated brake fitted to the BDH servo motors (depending on the model) is a failsafe electro-magnetic holding brake.

⚠ **Do not use the holding brake as a dynamic brake for deceleration, as this will rapidly damage the brake.**

Built-in position sensor

The servo drive is fitted, depending on the model, with a position sensor which can be:

- A 2-pole resolver providing angular precision of the shaft position, accurate to less than ±30 arc minutes.
- A SinCos Hiperface® high resolution single turn (4096 points) or multiturn (4096 points x 4096 turns) absolute encoder providing angular precision of the shaft position, accurate to less than ±1.3 arc minutes.

These sensors perform the following functions:

- Give the angular position of the rotor in such a way that flows can be synchronized
- Measure the motor speed via the associated Lexium servo drive. This information is used by the speed controller of the Lexium servo drive
- Measure the position information for the Lexium servo drive position controller, if necessary
- Measure and transmit position information in incremental or absolute format for the position return of a motion control module (Encoder emulation output of the Lexium servo drive).

Description

BDH servo drives with a 3-phase stator and a 6- to 10-pole rotor (depending on model) with Neodymium Iron Borium (NdFeB) magnets consist of:

1 An axial flange with 4 fixing points in accordance with standard DIN 42948
2 Standard shaft end according to DIN 748, untapped or keyed (depending on the model)
3 An angled dust and damp-proof male screw connector for connecting the power cable (with the exception of the 40 mm flange size supplied with remote straight connectors)
4 An angled dust and damp-proof male screw connector for connecting the control (sensor) cable (with the exception of the 40 mm flange size supplied with remote straight connectors)

Connecting cables must be ordered separately, see pages 132 and 133.

Schneider Electric has taken particular care to ensure compatibility between BDH servo motors and Lexium 15 servo drives. This compatibility can only be assured by using cables and connectors sold by Schneider Electric (see pages 132 and 133).

Characteristics: pages 84 to 129 | References: pages 130 to 133 | Dimensions: pages 134 to 137

Lexium 15 motion control
BDH servo motors

Characteristics of BDH 0401B/0402C servo motors

Type of servo motor				BDH 0401B		BDH 0402C	
Associated with Lexium 15 servo drive				LXM 15LD13M3		LXM 15LD13M3	
Line supply voltage			V	230 single phase	230 3-phase	230 single phase	230 3-phase
Torque	Continuous stall	M_0	Nm	0.18		0.31	
	Peak stall	M_{max}	Nm	0.609		1.08	
Nominal operating point	Nominal torque		Nm	0.17		0.28	
	Nominal speed		rpm	8000			
Maximum current			A rms	0.82		1.06	

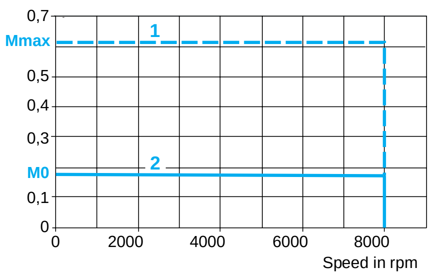
Servo motor characteristics

Maximum mechanical speed			rpm	8000	
Constants (at 120°C)	Torque		Nm/A rms	0.16	0.21
	Back emf		V_{rms}/krpm	10.2	13.3
Rotor	Number of poles			6	
	Inertia – Without brake	J_m	kgcm²	0.017	0.031
	Inertia – With brake	J_m	kgcm²	–	
Stator (at 20°C)	Resistance (phase/phase)		Ω	20.2	12,4
	Inductance (phase/phase)		mH	12,5	9.10
	Electrical time constant		ms	0.62	0.73
Holding brake (according to model)				See page 138	

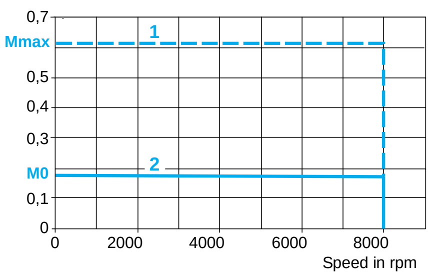
Torque/speed curves

BDH 0401B servo motor

With LXM 15LD13M3 servo drive
230 V single phase

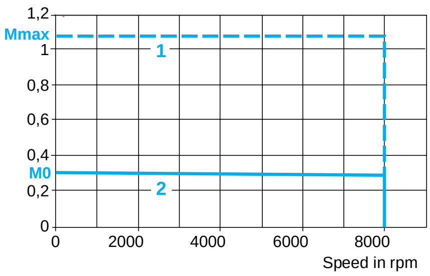


With LXM 15LD13M3 servo drive
230 V 3-phase

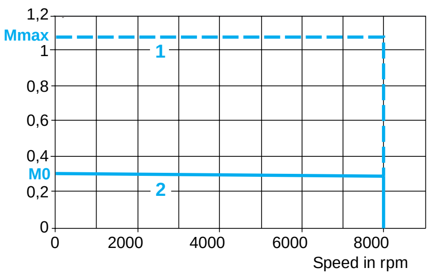


BDH 0402C servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0403C servo motors

Type of servo motor				**BDH 0403C**	
Associated with Lexium 15 servo drive				**LXM 15LD13M3**	
Line supply voltage			**V**	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	0.41	
	Peak stall	M_{max}	**Nm**	1.46	
Nominal operating point	Nominal torque		**Nm**	0.36	
	Nominal speed		**rpm**	8000	
Maximum current			**A rms**	1.04	

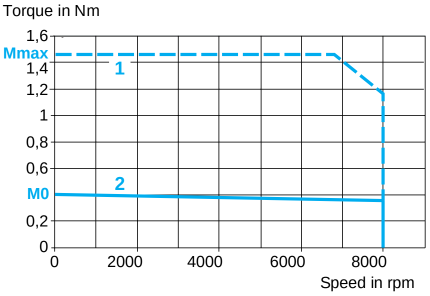
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	0.28
	Back emf			**V_{rms}/krpm**	17.9
Rotor	Number of poles				6
	Inertia	Without brake	J_m	**kgcm²**	0.045
		With brake	J_m	**kgcm²**	–
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	13.5
	Inductance (phase/phase)			**mH**	10.3
	Electrical time constant			**ms**	0.76
Holding brake (according to model)					See page 138

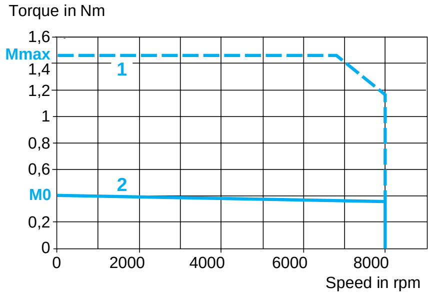
Torque/speed curves

BDH 0403C servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 0582C/0582E servo motors

Type of servo motor				**BDH 0582C**			**BDH 0582E**	
Associated with Lexium 15 servo drive				**LXM 15LU60N4**			**LXM 15LD13M3**	
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	0.84			0.87	
	Peak stall	M_{max}	**Nm**	2.34			2.42	
Nominal operating point	Nominal torque		**Nm**	0.78	0.72	0.69	0.71	
	Nominal speed		**rpm**	3120	6240	7680	6880	
Maximum current			**A rms**	3.95			7.7	

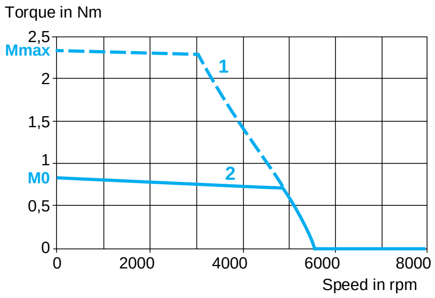
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000	
Constants (at 120°C)	Torque			**Nm/A rms**	0.61	0.32
	Back emf			**V_{rms}/krpm**	39	20.4
Rotor	Number of poles				6	
	Inertia	Without brake	J_m	**kgcm²**	0.16	
		With brake	J_m	**kgcm²**	0.171	
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	19.4	5.09
	Inductance (phase/phase)			**mH**	35.5	9.7
	Electrical time constant			**ms**	1.83	1.91
Holding brake (according to model)					See page 138	

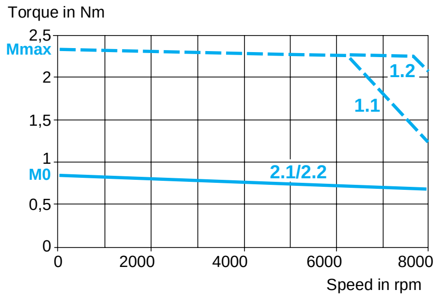
Torque/speed curves

BDH 0582C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase

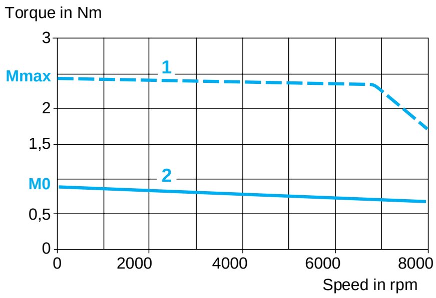


With LXM 15LU60N4 servo drive
400/480 V 3-phase

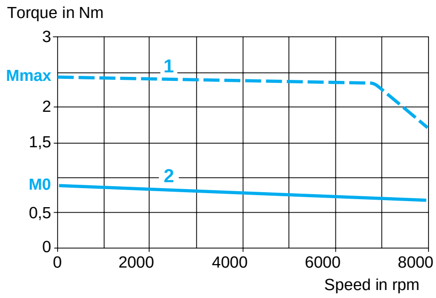


BDH 0582E servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0583C servo motors

Type of servo motor				BDH 0583C		
Associated with Lexium 15 servo drive				**LXM 15LU60N4**		
Line supply voltage			V	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	1.13		
	Peak stall	M_{max}	Nm	3.2		
Nominal operating point	Nominal torque		Nm	1	0.87	0.82
	Nominal speed		rpm	2400	4880	6000
Maximum current			A rms	3.95		

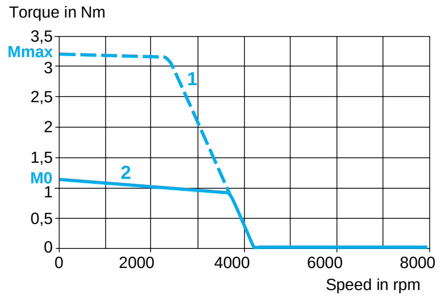
Servo motor characteristics

Maximum mechanical speed			rpm	8000
Constants (at 120°C)	Torque		Nm/A rms	0.8
	Back emf		V_{rms}/krpm	51.8
Rotor	Number of poles			6
	Inertia Without brake	J_m	kgcm²	0.22
	Inertia With brake	J_m	kgcm²	0.231
Stator (at 20°C)	Resistance (phase/phase)		Ω	20.3
	Inductance (phase/phase)		mH	40.7
	Electrical time constant		ms	2
Holding brake (according to model)				See page 138

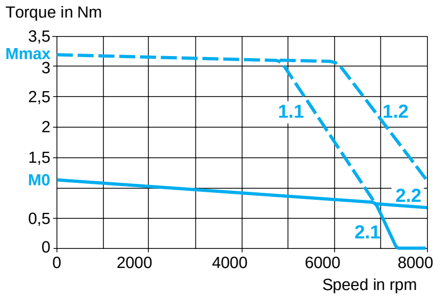
Torque/speed curves

BDH 0583C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Lexium 15 motion control
BDH servo motors

Characteristics of BDH 0583D servo motors

Type of servo motor				**BDH 0583D**			
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD10N4**	
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.16				
	Peak stall	M_{max}	**Nm**	3.58				
Nominal operating point	Nominal torque		**Nm**	1.06	1.05	1.06	0.94	
	Nominal speed		**rpm**	4080			7680	8000
Maximum current			**A rms**	6.22				

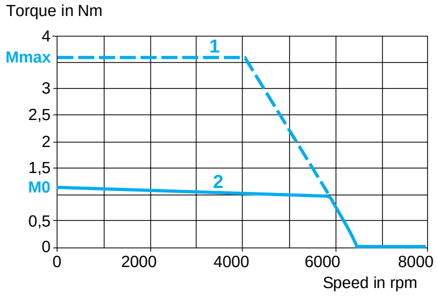
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	0.52
	Back emf		**V_{rms}/krpm**	33.8
Rotor	Number of poles			6
	Inertia	Without brake J_m	**kgcm²**	0.22
		With brake J_m	**kgcm²**	0.231
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	8.36
	Inductance (phase/phase)		**mH**	17.3
	Electrical time constant		**ms**	2.07
Holding brake (according to model)				See page 138

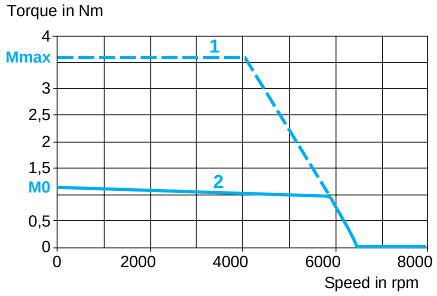
Torque/speed curves

BDH 0583D servo motor

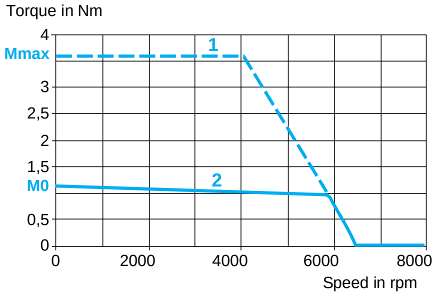
With LXM 15LD13M3 servo drive
230 V single phase



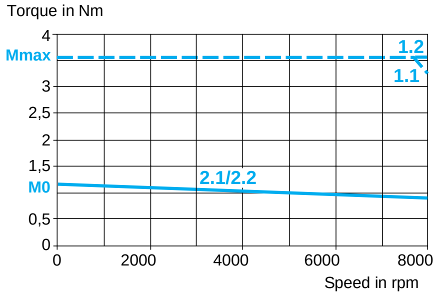
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

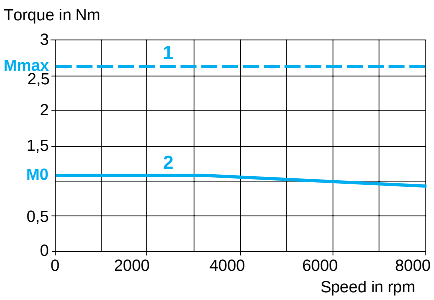
Characteristics of BDH 0583F/0584C servo motors

Type of servo motor				BDH 0583F		BDH 0584C		
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LU60N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.08	1.18	1.38		
	Peak stall	M_{max}	**Nm**	2.62	3.52	3.94		
Nominal operating point	Nominal torque		**Nm**	0.92		1.28	1.18	1.13
	Nominal speed		**rpm**	8000		2000	4080	5120
Maximum current			**A rms**	12.16		4.03		
Servo motor characteristics								
Maximum mechanical speed			**rpm**	8000				
Constants (at 120°C)	Torque		**Nm/A rms**	0.27		0.97		
	Back emf		**V_{rms}/krpm**	17.6		62.4		
Rotor	Number of poles			6				
	Inertia – Without brake	J_m	**kgcm²**	0.22		0.27		
	Inertia – With brake	J_m	**kgcm²**	0.231		0.281		
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	2.23		20.4		
	Inductance (phase/phase)		**mH**	4.68		43.8		
	Electrical time constant		**ms**	2.10		2.15		
Holding brake (according to model)				See page 138				

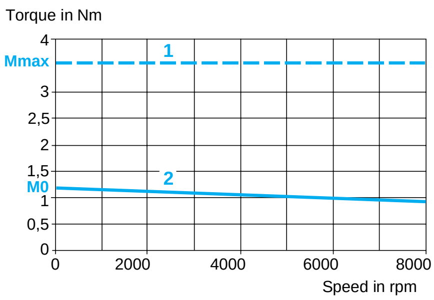
Torque/speed curves

BDH 0583F servo motor

With LXM 15LD21M3 servo drive
230 V single phase

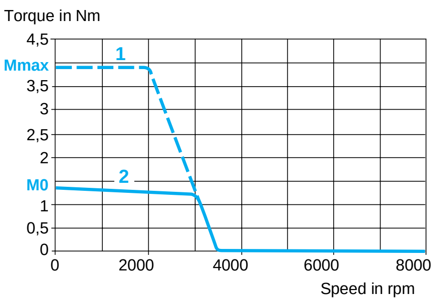


With LXM 15LD21M3 servo drive
230 V 3-phase

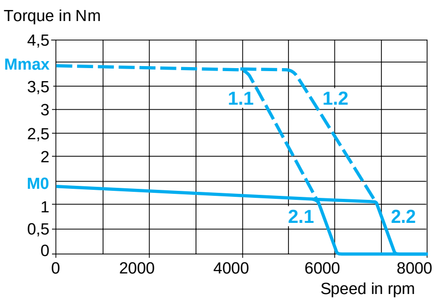


BDH 0584C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 0584D servo motors

Type of servo motor				**BDH 0584D**				
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.41				
	Peak stall	M_{max}	**Nm**	4.4				
Nominal operating point	Nominal torque		**Nm**	1.18			1	0.92
	Nominal speed		**rpm**	3520			6640	8000
Maximum current			**A rms**	6.22				

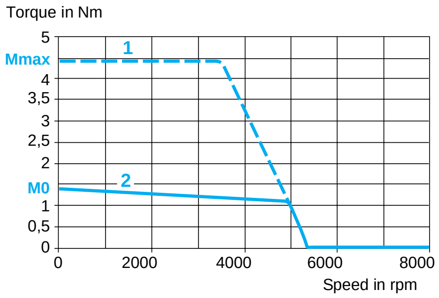
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	0.63
	Back emf			**V_{rms}/krpm**	40.8
Rotor	Number of poles				6
	Inertia	Without brake	J_m	**kgcm²**	0.27
		With brake	J_m	**kgcm²**	0.281
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	8.4
	Inductance (phase/phase)			**mH**	18.7
	Electrical time constant			**ms**	2.23
Holding brake (according to model)					See page 138

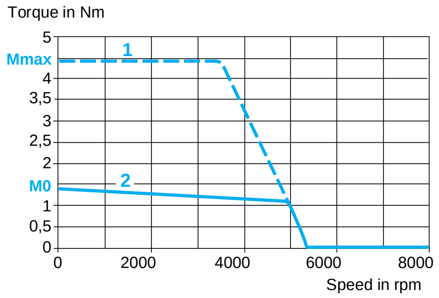
Torque/speed curves

BDH 0584D servo motor

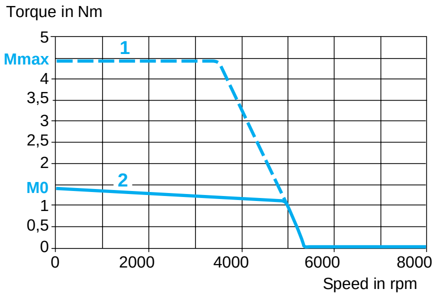
With LXM 15LD13M3 servo drive
230 V single phase



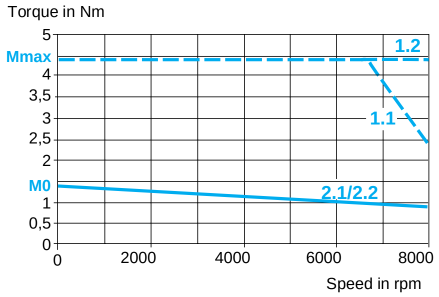
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83
References:
pages 130 to 133
Dimensions:
pages 134 to 137

Characteristics of BDH 0584F servo motors

Type of servo motor				**BDH 0584F**	
Associated with Lexium 15 servo drive				**LXM 15LD21M3**	
Line supply voltage			**V**	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	1.42	
	Peak stall	M_{max}	**Nm**	3.57	4.46
Nominal operating point	Nominal torque		**Nm**	1.06	1.03
	Nominal speed		**rpm**	6000	6560
Maximum current			**A rms**	11.03	

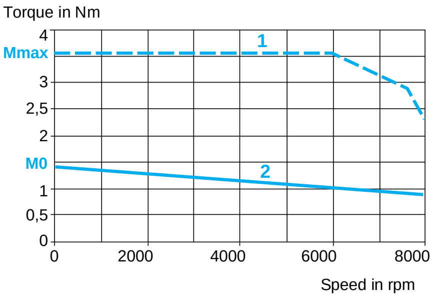
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	0.36
	Back emf			**V_{rms}/krpm**	23.4
Rotor	Number of poles				6
	Inertia	Without brake	J_m	**kgcm²**	0.27
		With brake	J_m	**kgcm²**	0.281
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	2.77
	Inductance (phase/phase)			**mH**	6.16
	Electrical time constant			**ms**	2.22
Holding brake (according to model)					See page 138

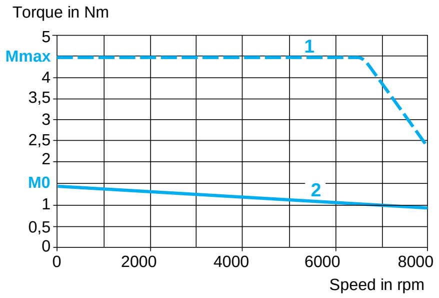
Torque/speed curves

BDH 0584F servo motor

With LXM 15LD21M3 servo drive
230 V single phase



With LXM 15LD21M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

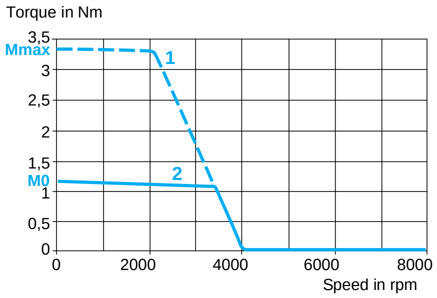
Characteristics of BDH 0701C/0701E servo motors

Type of servo motor				**BDH 0701C**			**BDH 0701E**	
Associated with Lexium 15 servo drive				**LXM 15LU60N4**			**LXM 15LD13M3**	
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	1.15			1.2	
	Peak stall	M_{max}	**Nm**	3.34			3.24	
Nominal operating point	Nominal torque		**Nm**	1.09	1.04	1	1.2	
	Nominal speed		**rpm**	2080	4320	5360		
Maximum current			**A rms**	3.89			8.48	
Servo motor characteristics								
Maximum mechanical speed			**rpm**	8000				
Constants (at 120°C)	Torque		**Nm/A rms**	0.85			0.41	
	Back emf		**V_{rms}/krpm**	54.5			26.1	
Rotor	Number of poles			8				
	Inertia Without brake	J_m	**kgcm²**	0.33				
	Inertia With brake	J_m	**kgcm²**	0.341				
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	21.4			4.58	
	Inductance (phase/phase)		**mH**	37.5			8.6	
	Electrical time constant		**ms**	1.75			1.88	
Holding brake (according to model)				See page 138				

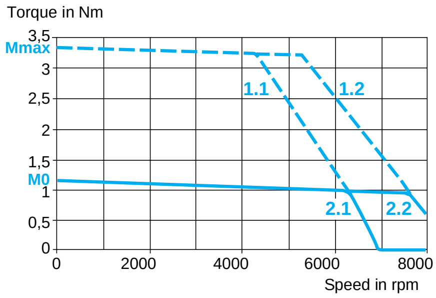
Torque/speed curves

BDH 0701C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase

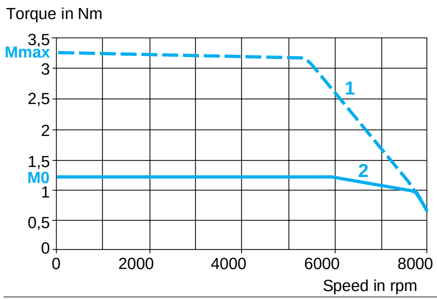


With LXM 15LU60N4 servo drive
400/480 V 3-phase

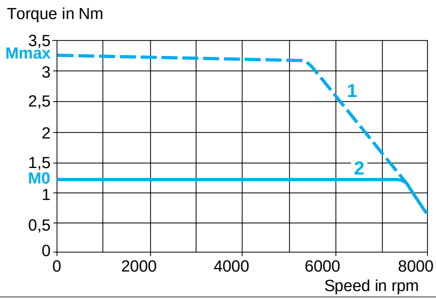


BDH 0701E servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0702C servo motors

Type of servo motor			**BDH 0702C**		
Associated with Lexium 15 servo drive			**LXM 15LU60N4**		
Line supply voltage		**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall M_0	**Nm**	2		
	Peak stall M_{max}	**Nm**	5.74		
Nominal operating point	Nominal torque	**Nm**	1.85	1.7	1.64
	Nominal speed	**rpm**	1280	2800	3440
Maximum current		**A rms**	4.03		

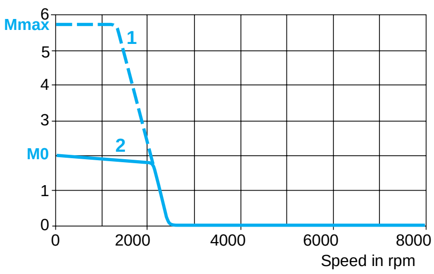
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	1.4
	Back emf		**V_{rms}/krpm**	89.8
Rotor	Number of poles			8
	Inertia	Without brake J_m	**kgcm²**	0.59
		With brake J_m	**kgcm²**	0.601
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	23
	Inductance (phase/phase)		**mH**	46.5
	Electrical time constant		**ms**	2.02
Holding brake (according to model)				See page 138

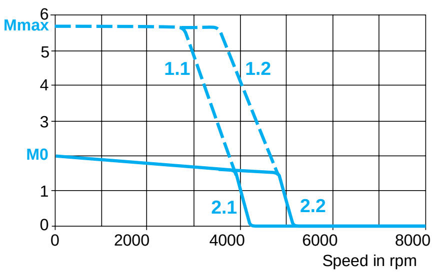
Torque/speed curves

BDH 0702C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0702D servo motors

Type of servo motor				BDH 0702D				
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage			V	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	2.04				
	Peak stall	M_{max}	Nm	6.51				
Nominal operating point	Nominal torque		Nm	1.82			1.6	1.51
	Nominal speed		rpm	2320			4480	5520
Maximum current			A rms	6.29				

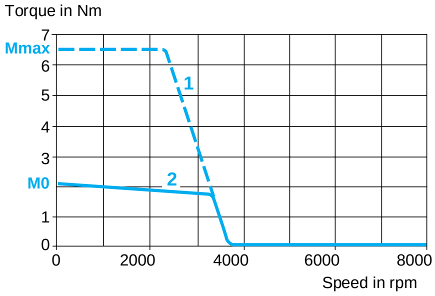
Servo motor characteristics

Maximum mechanical speed				rpm	8000
Constants (at 120°C)	Torque			Nm/A rms	0.92
	Back emf			V_{rms}/krpm	59
Rotor	Number of poles				8
	Inertia	Without brake	J_m	kgcm²	0.59
		With brake	J_m	kgcm²	0.601
Stator (at 20°C)	Resistance (phase/phase)			Ω	9.57
	Inductance (phase/phase)			mH	20.1
	Electrical time constant			ms	2.10
Holding brake (according to model)					See page 138

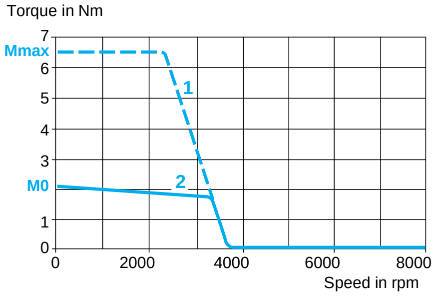
Torque/speed curves

BDH 0702D servo motor

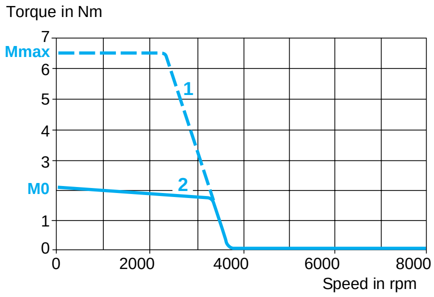
With LXM 15LD13M3 servo drive
230 V single phase



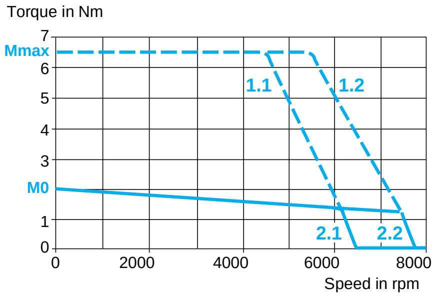
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

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pages 82 and 83

References:
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Characteristics of BDH 0702H servo motors

Type of servo motor				**BDH 0702H**	
Associated with Lexium 15 servo drive				**LXM 15LD21M3**	
Line supply voltage			**V**	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	2.1	
	Peak stall	M_{max}	**Nm**	5.36	
Nominal operating point	Nominal torque		**Nm**	1.56	1.3
	Nominal speed		**rpm**	4320	6560
Maximum current			**A rms**	15.56	

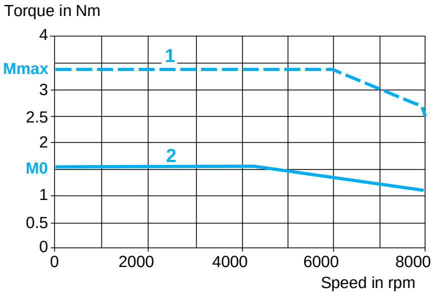
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	0.39
	Back emf			**V_{rms}/krpm**	24.8
Rotor	Number of poles				8
	Inertia	Without brake	J_m	**kgcm²**	0.59
		With brake	J_m	**kgcm²**	0.601
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	1.64
	Inductance (phase/phase)			**mH**	3.55
	Electrical time constant			**ms**	2.16
Holding brake (according to model)					See page 138

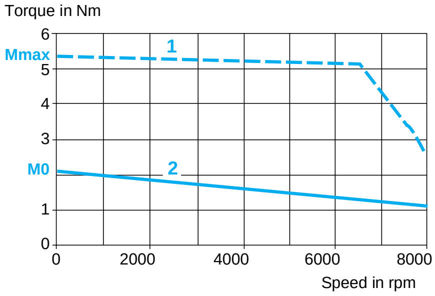
Torque/speed curves

BDH 0702H servo motor

With LXM 15LD21M3 servo drive
230 V single phase



With LXM 15LD21M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
pages 82 and 83

References:
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Dimensions:
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Characteristics of BDH 0703C servo motors

Type of servo motor				**BDH 0703C**		
Associated with Lexium 15 servo drive				**LXM 15LU60N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	2.71		
	Peak stall	M_{max}	**Nm**	7.83		
Nominal operating point	Nominal torque		**Nm**	2.6	2.55	2.51
	Nominal speed		**rpm**	880	2080	2560
Maximum current			**A rms**	4.17		

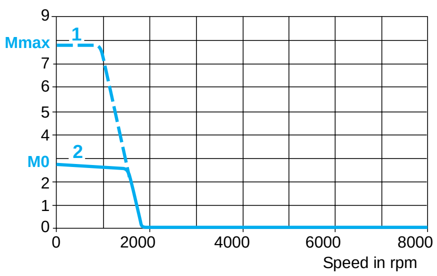
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	1.86
	Back emf			**V_{rms}/krpm**	120
Rotor	Number of poles				8
	Inertia	Without brake	J_m	**kgcm²**	0.85
		With brake	J_m	**kgcm²**	0.861
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	25.4
	Inductance (phase/phase)			**mH**	53.6
	Electrical time constant			**ms**	2.11
Holding brake (according to model)					See page 138

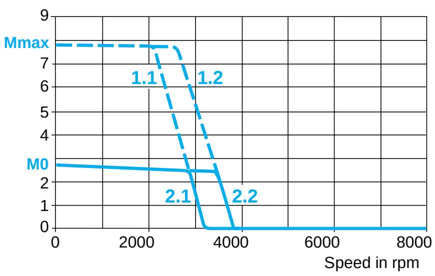
Torque/speed curves

BDH 0703C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BDH 0703E servo motors

Type of servo motor				**BDH 0703E**				
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	2.79				
	Peak stall	M_{max}	**Nm**	8.55				
Nominal operating point	Nominal torque		**Nm**	2.55			2.4	2.3
	Nominal speed		**rpm**	2000			3920	4800
Maximum current			**A rms**	7.28				

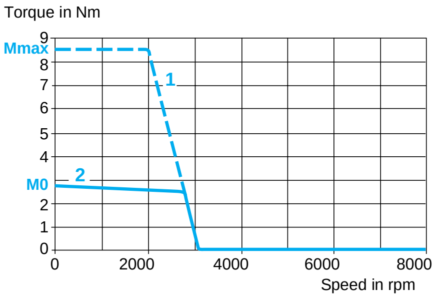
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	1.1
	Back emf		**V_{rms}/krpm**	70.6
Rotor	Number of poles			8
	Inertia – Without brake	J_m	**kgcm²**	0.85
	Inertia – With brake	J_m	**kgcm²**	0.861
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	8.36
	Inductance (phase/phase)		**mH**	18.5
	Electrical time constant		**ms**	2.21
Holding brake (according to model)				See page 138

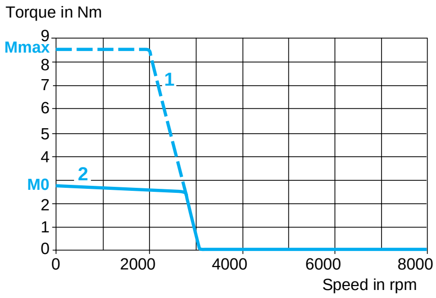
Torque/speed curves

BDH 0703E servo motor

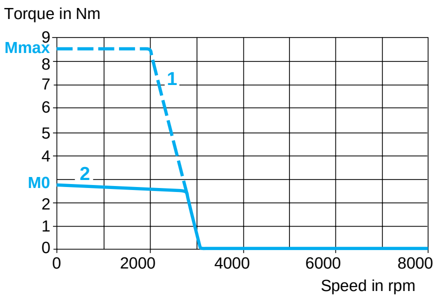
With LXM 15LD13M3 servo drive
230 V single phase



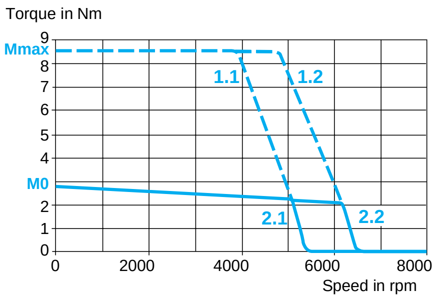
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0703H servo motors

Type of servo motor					BDH 0703H	
Associated with Lexium 15 servo drive					**LXM 15LD21M3**	
Line supply voltage				V	230 single phase	230 3-phase
Torque	Continuous stall		M_0	Nm	2.08	2.88
	Peak stall		M_{max}	Nm	4.52	7.35
Nominal operating point	Nominal torque			Nm	2.08	1.64
	Nominal speed			rpm	4400	4960
Maximum current				A rms	15.91	

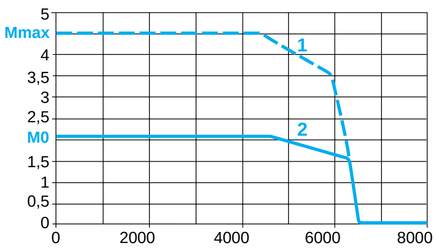
Servo motor characteristics

Maximum mechanical speed				rpm	8000
Constants (at 120°C)	Torque			Nm/A rms	0.52
	Back emf			V_{rms}/krpm	33.4
Rotor	Number of poles				8
	Inertia	Without brake	J_m	kgcm²	0.85
		With brake	J_m	kgcm²	0.861
Stator (at 20°C)	Resistance (phase/phase)			Ω	1.82
	Inductance (phase/phase)			mH	4.1
	Electrical time constant			ms	2.25
Holding brake (according to model)					See page 138

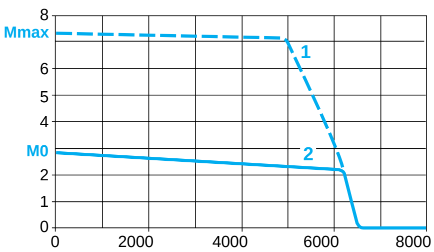
Torque/speed curves

BDH 0703H servo motor

With LXM 15LD21M3 servo drive
230 V single phase



With LXM 15LD21M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
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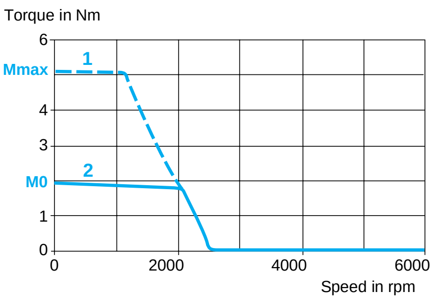
Characteristics of BDH 0841C servo motors

Type of servo motor				**BDH 0841C**		
Associated with Lexium 15 servo drive				**LXM 15LU60N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.95		
	Peak stall	M_{max}	**Nm**	5.12		
Nominal operating point	Nominal torque		**Nm**	1.88	1.83	1.8
	Nominal speed		**rpm**	1140	2280	2820
Maximum current			**A rms**	4.1		
Servo motor characteristics						
Maximum mechanical speed			**rpm**	6000		
Constants (at 120°C)	Torque		**Nm/A rms**	1.34		
	Back emf		**V_{rms}/krpm**	86.3		
Rotor	Number of poles			10		
	Inertia, Without brake	J_m	**kgcm²**	0.81		
	Inertia, With brake	J_m	**kgcm²**	0.878		
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	21.7		
	Inductance (phase/phase)		**mH**	66.1		
	Electrical time constant		**ms**	3.05		
Holding brake (according to model)				See page 138		

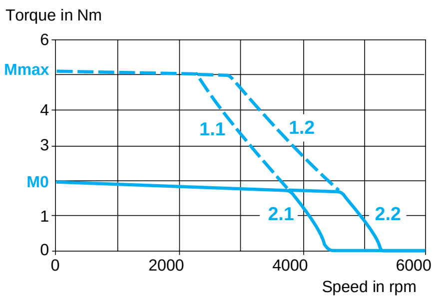
Torque/speed curves

Characteristics of BDH 0841C servo motors

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BDH 0841E servo motors

Type of servo motor			BDH 0841E				
Associated with Lexium 15 servo drive			**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage		**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall M_0	**Nm**	2.02				
	Peak stall M_{max}	**Nm**	5.33		5.13		
Nominal operating point	Nominal torque	**Nm**	1.84			1.67	1.62
	Nominal speed	**rpm**	2460		2520	4620	5640
Maximum current		**A rms**	8.06				

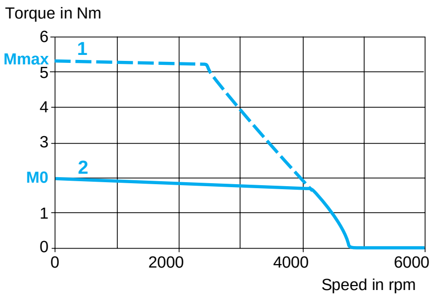
Servo motor characteristics

Maximum mechanical speed		**rpm**	6000
Constants (at 120°C)	Torque	**Nm/A rms**	0.71
	Back emf	**V_{rms}/krpm**	45.6
Rotor	Number of poles		10
	Inertia Without brake J_m	**kgcm²**	0.81
	With brake J_m	**kgcm²**	0.878
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	5.7
	Inductance (phase/phase)	**mH**	18.4
	Electrical time constant	**ms**	3.23
Holding brake (according to model)			See page 138

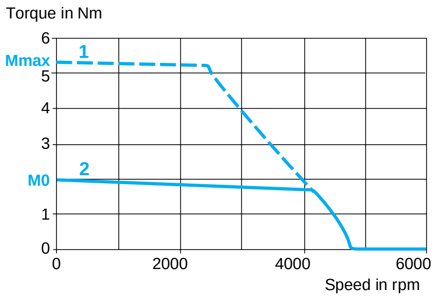
Torque/speed curves

BDH 0841E servo motor

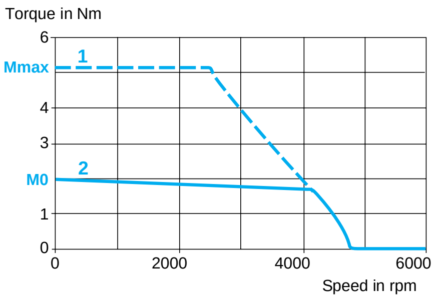
With LXM 15LD13M3 servo drive
230 V single phase



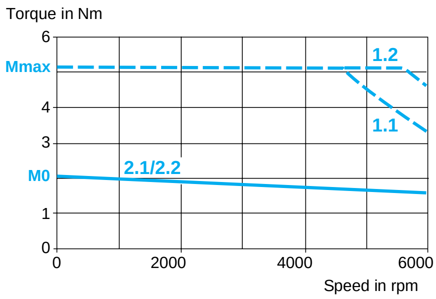
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83
References:
pages 130 to 133
Dimensions:
pages 134 to 137

Characteristics of BDH 0841H/0842C servo motors

Type of servo motor				**BDH 0841H**		**BDH 0842C**		
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LU60N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.5	2.06	3.35		
	Peak stall	M_{max}	**Nm**	3.14	4.78	9.37		
Nominal operating point	Nominal torque		**Nm**	1.48	1.68	3.25	3.1	3
	Nominal speed		**rpm**	6000	5340	600	1320	1680
Maximum current			**A rms**	15.84		3.97		

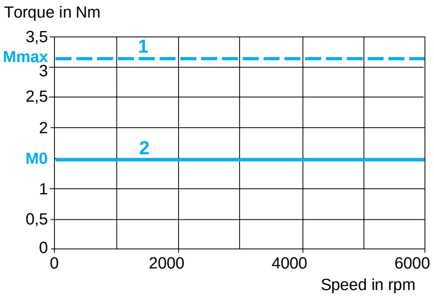
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	0.37	2.4
	Back emf		**V_{rms}/krpm**	23.7	154
Rotor	Number of poles			10	
	Inertia — Without brake	J_m	**kgcm²**	0.81	1.5
	Inertia — With brake	J_m	**kgcm²**	0.878	1.568
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.51	27.5
	Inductance (phase/phase)		**mH**	5	97.4
	Electrical time constant		**ms**	3.31	3.54
Holding brake (according to model)				See page 138	

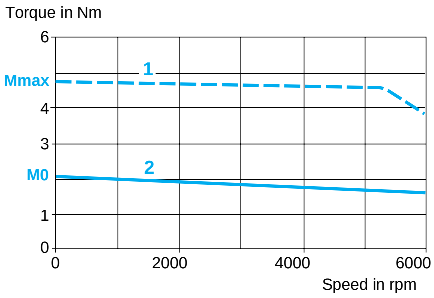
Torque/speed curves

BDH 0841H servo motor

With LXM 15LD21M3 servo drive
230 V single phase

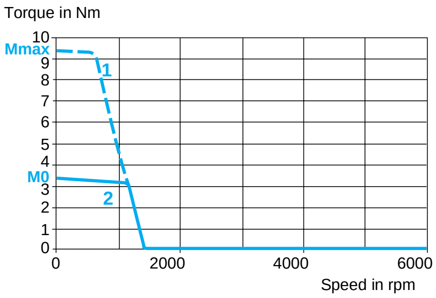


With LXM 15LD21M3 servo drive
230 V 3-phase

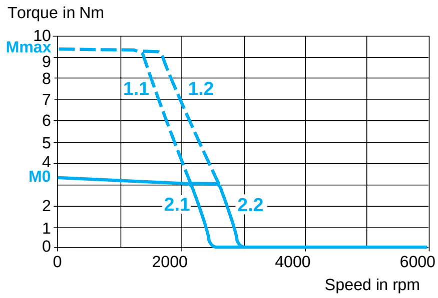


BDH 0842C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83
References:
pages 130 to 133
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Characteristics of BDH 0842E servo motors

Type of servo motor			BDH 0842E				
Associated with Lexium 15 servo drive			**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage		V	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall M_0	Nm	3.42				
	Peak stall M_{max}	Nm	9.72		9.41		
Nominal operating point	Nominal torque	Nm	3.15			2.9	2.8
	Nominal speed	rpm	1500			2820	3480
Maximum current		A rms	7.78				

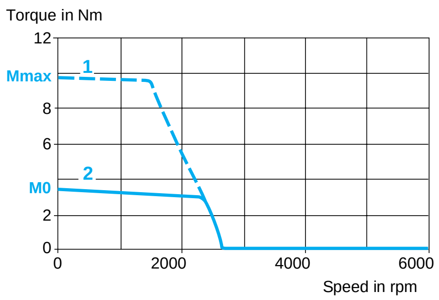
Servo motor characteristics

Maximum mechanical speed		rpm	6000
Constants (at 120°C)	Torque	Nm/A rms	1.26
	Back emf	V_{rms}/krpm	80.9
Rotor	Number of poles		10
	Inertia, Without brake J_m	kgcm²	1.5
	Inertia, With brake J_m	kgcm²	1.568
Stator (at 20°C)	Resistance (phase/phase)	Ω	7.22
	Inductance (phase/phase)	mH	26.8
	Electrical time constant	ms	3.71
Holding brake (according to model)			See page 138

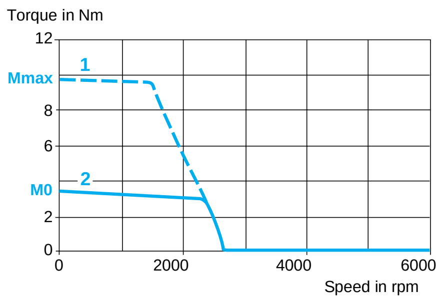
Torque/speed curves

BDH 0842E servo motor

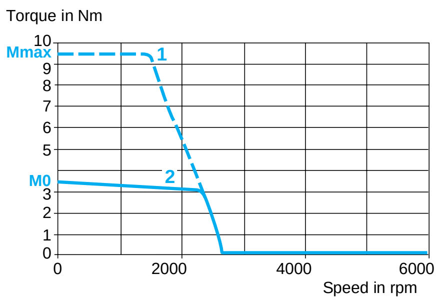
With LXM 15LD13M3 servo drive
230 V single phase



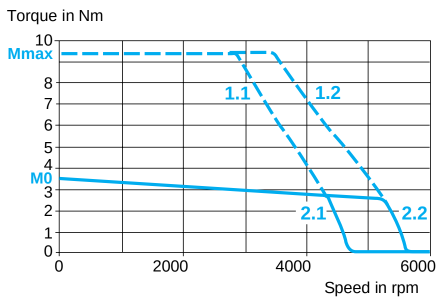
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0842G servo motors

Type of servo motor				**BDH 0842G**				
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	2.96	3.53			
	Peak stall	M_{max}	**Nm**	6.54	9.56	8.66		
Nominal operating point	Nominal torque		**Nm**	2.94	2.96		2.5	2.35
	Nominal speed		**rpm**	3000	2760	2880	5280	6000
Maximum current			**A rms**	13.58				

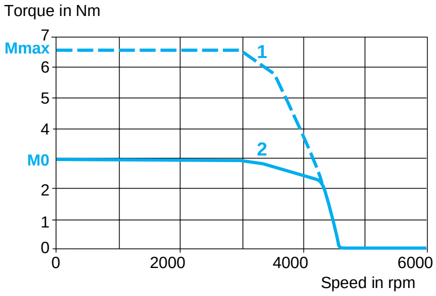
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	0.74
	Back emf			**V_{rms}/krpm**	47.5
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	1.5
		With brake	J_m	**kgcm²**	1.568
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	2.38
	Inductance (phase/phase)			**mH**	9.2
	Electrical time constant			**ms**	3.87
Holding brake (according to model)					See page 138

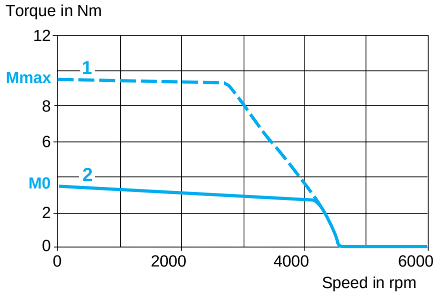
Torque/speed curves

BDH 0842G servo motor

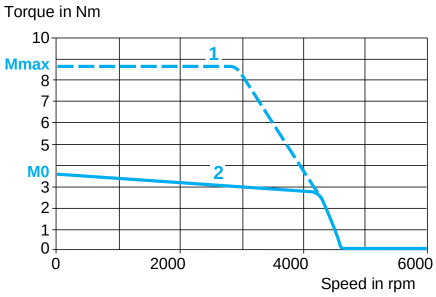
With LXM 15LD21M3 servo drive
230 V single phase



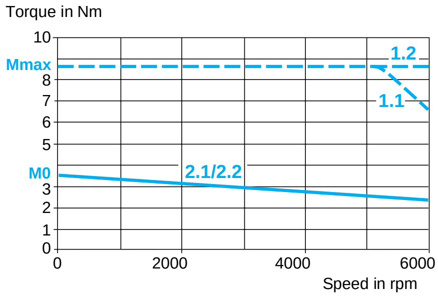
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BDH 0842J/0843E servo motors

Type of servo motor			**BDH 0842J**		**BDH 0843E**		
Associated with Lexium 15 servo drive			**LXM 15LD28M3**	**LXM 15MD28N4**	**LXM 15LD10N4**		
Line supply voltage		**V**	230 3-phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall M_0	**Nm**	3.56		4.7		
	Peak stall M_{max}	**Nm**	7.56		11.7		
Nominal operating point	Nominal torque	**Nm**	2.5		4.35	4	3.85
	Nominal speed	**rpm**	5400		1140	2220	2700
Maximum current		**A rms**	23.83		7.78		

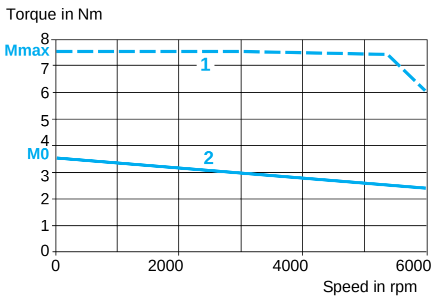
Servo motor characteristics

Maximum mechanical speed		**rpm**	6000	
Constants (at 120°C)	Torque	**Nm/A rms**	0.43	1.72
	Back emf	**V_{rms}/krpm**	27.5	111
Rotor	Number of poles		10	
	Inertia Without brake J_m	**kgcm²**	1.5	2.1
	Inertia With brake J_m	**kgcm²**	1.568	2.168
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	0.8	8.04
	Inductance (phase/phase)	**mH**	3.1	32.6
	Electrical time constant	**ms**	3.88	4.05
Holding brake (according to model)			See page 138	

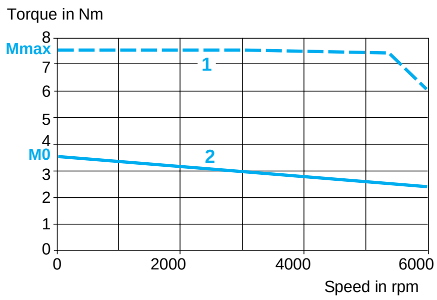
Torque/speed curves

BDH 0842J servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase

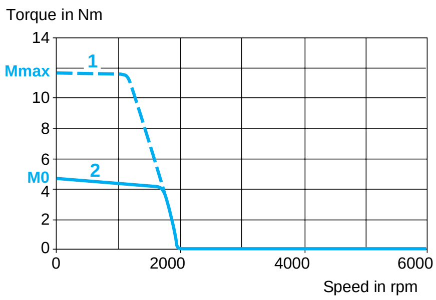


With LXM 15MD28N4 servo drive
230 V 3-phase

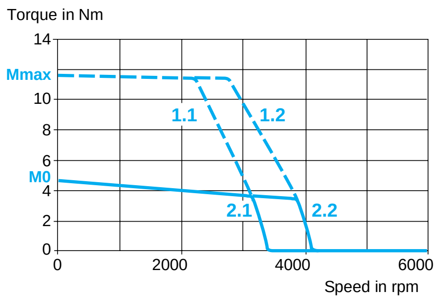


BDH 0843E servo motor

With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 0843G servo motors

Type of servo motor				**BDH 0843G**				
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	3.96	4.8			
	Peak stall	M_{max}	**Nm**	8.8	13.2	11.68		
Nominal operating point	Nominal torque		**Nm**	3.96	4	3.9	3.25	2.95
	Nominal speed		**rpm**	2220	2160	2280	4140	4980
Maximum current			**A rms**	13.79				

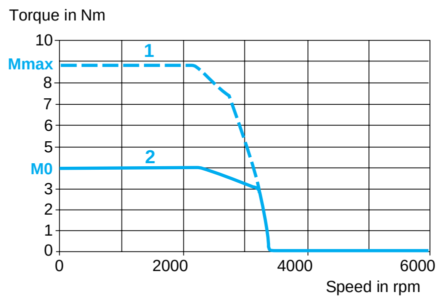
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	0.99
	Back emf			**V_{rms}/krpm**	63.9
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	2.1
		With brake	J_m	**kgcm²**	2.168
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	2.61
	Inductance (phase/phase)			**mH**	10.8
	Electrical time constant			**ms**	4.14
Holding brake (according to model)					See page 138

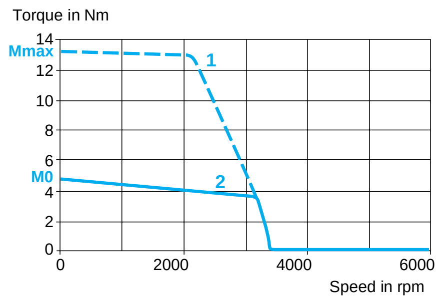
Torque/speed curves

BDH 0843G servo motor

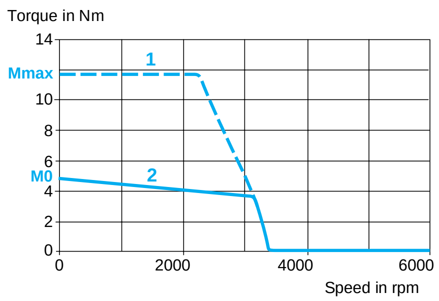
With LXM 15LD21M3 servo drive
230 V single phase



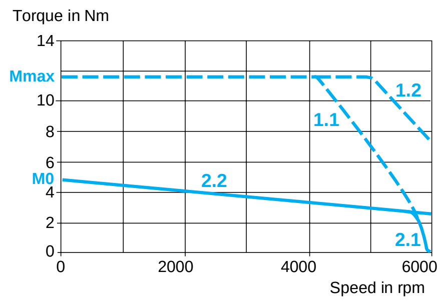
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BDH 0843K/0844E servo motors

Type of servo motor				**BDH 0843K**		**BDH 0844E**		
Associated with Lexium 15 servo drive				**LXM 15LD28M3**	**LXM 15MD28N4**	**LXM 15LD10N4**		
Line supply voltage			**V**	230 3-phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	4.9		5.76		
	Peak stall	M_{max}	**Nm**	9.02		14.1		
Nominal operating point	Nominal torque		**Nm**	3		5.25	4.85	4.6
	Nominal speed		**rpm**	4920		1020	1920	2400
Maximum current			**A rms**	27.08		8.06		

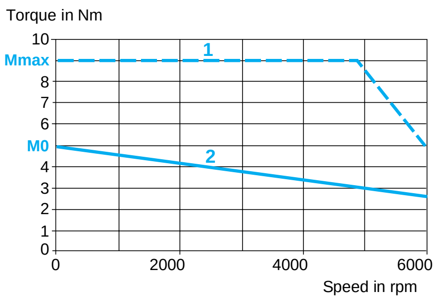
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	0.52	2.04
	Back emf		**V_{rms}/krpm**	33.2	132
Rotor	Number of poles			10	
	Inertia – Without brake	J_m	**kgcm²**	2.1	2.7
	Inertia – With brake	J_m	**kgcm²**	2.168	2.768
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.7	8.08
	Inductance (phase/phase)		**mH**	2.9	33.9
	Electrical time constant		**ms**	4.14	4.20
Holding brake (according to model)				See page 138	

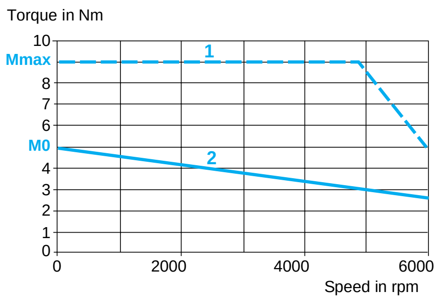
Torque/speed curves

BDH 0843K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase

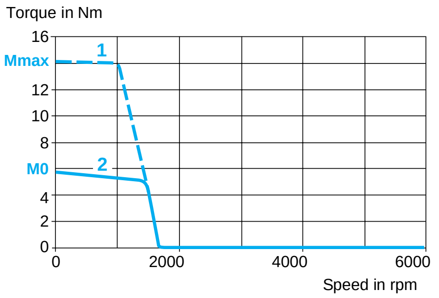


With LXM 15MD28N4 servo drive
230 V 3-phase

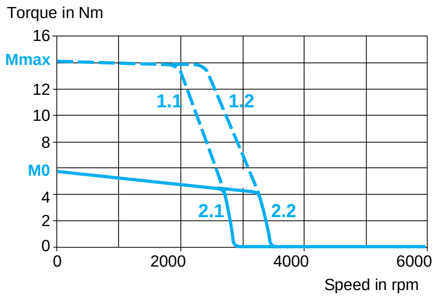


BDH 0844E servo motor

With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

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pages 82 and 83

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Characteristics of BDH 0844G servo motors

Type of servo motor				**BDH 0844G**				
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	4.76	5.88			
	Peak stall	M_{max}	**Nm**	10.55	16.1	13.97		
Nominal operating point	Nominal torque		**Nm**	4.76	4.9	4.85	3.95	3.5
	Nominal speed		**rpm**	1860		1960	3600	4380
Maximum current			**A rms**	14.14				

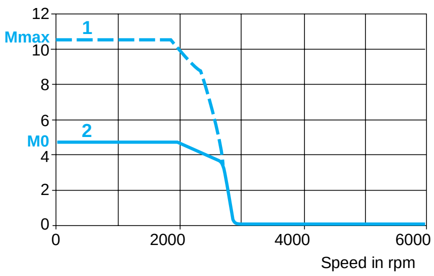
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000
Constants (at 120°C)	Torque		**Nm/A rms**	1.19
	Back emf		**V_{rms}/krpm**	76.6
Rotor	Number of poles			10
	Inertia Without brake	J_m	**kgcm²**	2.7
	With brake	J_m	**kgcm²**	2.768
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	2.65
	Inductance (phase/phase)		**mH**	11.5
	Electrical time constant		**ms**	4.34
Holding brake (according to model)				See page 138

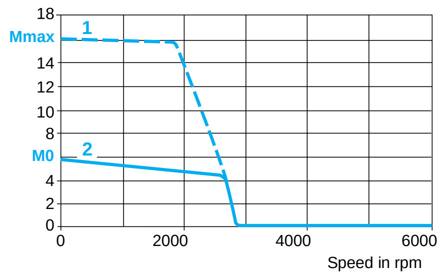
Torque/speed curves

BDH 0844G servo motor

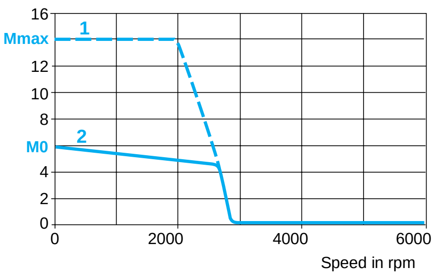
With LXM 15LD21M3 servo drive
230 V single phase



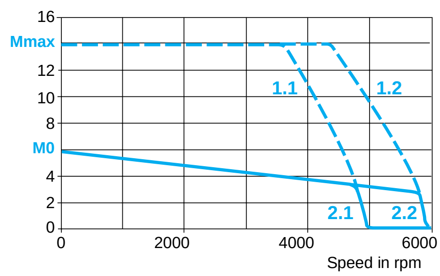
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
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Lexium 15 motion control
BDH servo motors

Characteristics of BDH 0844J servo motors

Type of servo motor				**BDH 0844J**	
Associated with Lexium 15 servo drive				**LXM 15LD28M3**	**LXM 15MD28N4**
Line supply voltage			**V**	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	6	
	Peak stall	M_{max}	**Nm**	12.18	
Nominal operating point	Nominal torque		**Nm**	4	
	Nominal speed		**rpm**	3660	
Maximum current			**A rms**	24.89	

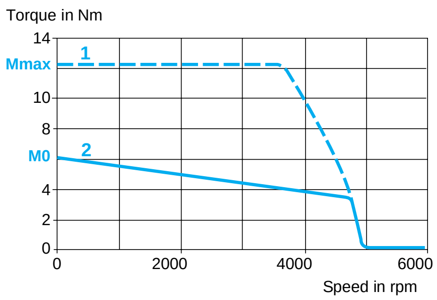
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000
Constants (at 120°C)	Torque		**Nm/A rms**	0.69
	Back emf		**V_{rms}/krpm**	44.2
Rotor	Number of poles			10
	Inertia	Without brake J_m	**kgcm²**	2.7
		With brake J_m	**kgcm²**	2.768
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.88
	Inductance (phase/phase)		**mH**	3.8
	Electrical time constant		**ms**	4.32
Holding brake (according to model)				See page 138

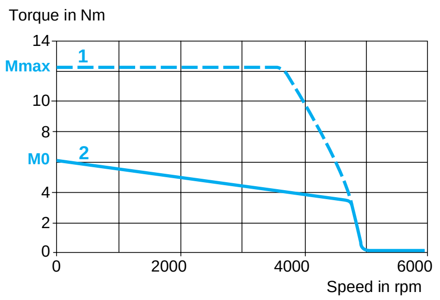
Speed/torque curves

BDH 0844J servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
pages 82 and 83
References:
pages 130 to 133
Dimensions:
pages 134 to 137

Characteristics of BDH 1081E servo motors

Type of servo motor				**BDH 1081E**		
Associated with Lexium 15 servo drive				**LXM 15LD10N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	4.7		
	Peak stall	M_{max}	**Nm**	10.71		
Nominal operating point	Nominal torque		**Nm**	4.35	4	3.85
	Nominal speed		**rpm**	1260	2340	2880
Maximum current			**A rms**	5.83		

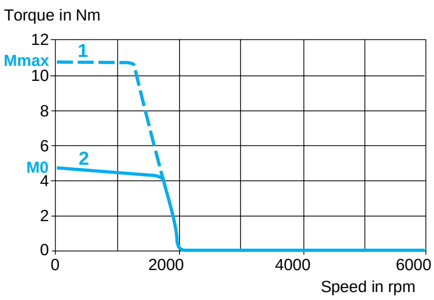
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	1.72
	Back emf			**V_{rms}/krpm**	110
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	3.4
		With brake	J_m	**kgcm²**	3.573
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	8.47
	Inductance (phase/phase)			**mH**	36.6
	Electrical time constant			**ms**	4.32
Holding brake (according to model)					See page 138

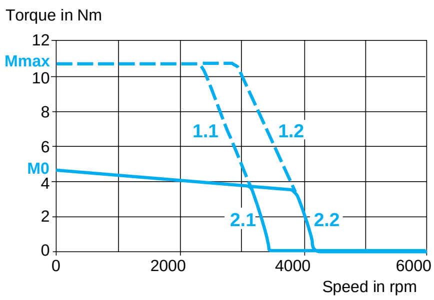
Torque/speed curves

BDH 1081E servo motor

With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
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Dimensions:
pages 134 to 137

Characteristics of BDH 1081G servo motors

Type of servo motor				**BDH 1081G**				
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	3.96	4.75			
	Peak stall	M_{max}	**Nm**	9.41	10.82			
Nominal operating point	Nominal torque		**Nm**	3.96	3.65		2.75	2.35
	Nominal speed		**rpm**	1680	2340		4260	5160
Maximum current			**A rms**	10.25				

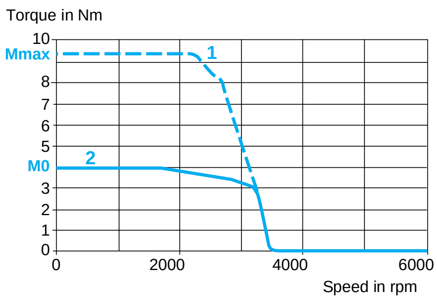
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	0.99
	Back emf			**V_{rms}/krpm**	63.6
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	3.4
		With brake	J_m	**kgcm²**	3.573
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	2.75
	Inductance (phase/phase)			**mH**	12.1
	Electrical time constant			**ms**	4.4
Holding brake (according to model)					See page 138

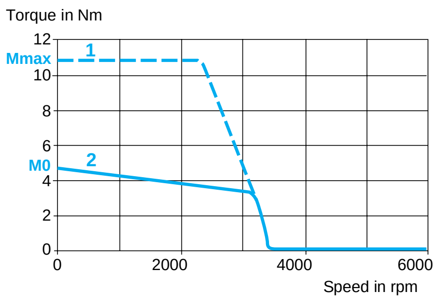
Torque/speed curves

BDH 1081G servo motor

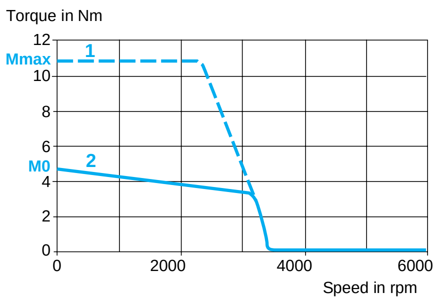
With LXM 15LD21M3 servo drive
230 V single phase



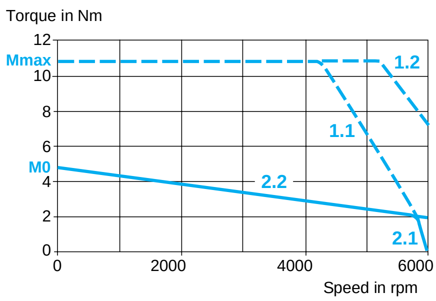
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

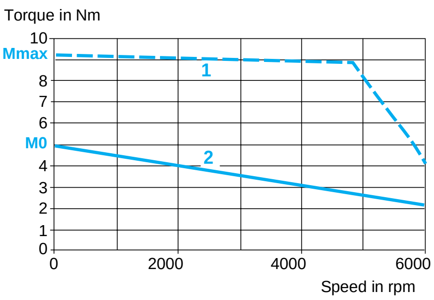
Characteristics of BDH 1081K/1082E servo motors

Type of servo motor					**BDH 1081K**		**BDH 1082E**		
Associated with Lexium 15 servo drive					**LXM 15LD28M3**	**LXM 15MD28N4**	**LXM 15LD10N4**		
Line supply voltage				**V**	230 3-phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall		M_0	**Nm**	4.9		8.34		
	Peak stall		M_{max}	**Nm**	9.22		18.08		
Nominal operating point	Nominal torque			**Nm**	2.65		7.9	7.5	7.3
	Nominal speed			**rpm**	4800		780	1500	1860
Maximum current				**A rms**	20.01		6.36		
Servo motor characteristics									
Maximum mechanical speed				**rpm**	6000				
Constants (at 120°C)	Torque			**Nm/A rms**	0.52		2.79		
	Back emf			**V_{rms}/krpm**	33.5		179		
Rotor	Number of poles				10				
	Inertia	Without brake	J_m	**kgcm²**	3.4		6.2		
		With brake	J_m	**kgcm²**	3.573		6.373		
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	0.75		8.59		
	Inductance (phase/phase)			**mH**	3.4		44.7		
	Electrical time constant			**ms**	4.53		5.2		
Holding brake (according to model)					See page 138				

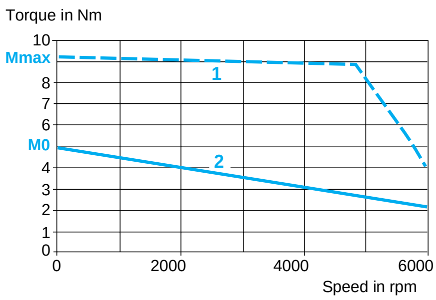
Torque/speed curves

BDH 1081K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase

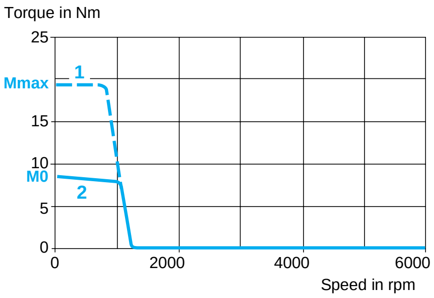


With LXM 15MD28N4 servo drive
230 V 3-phase

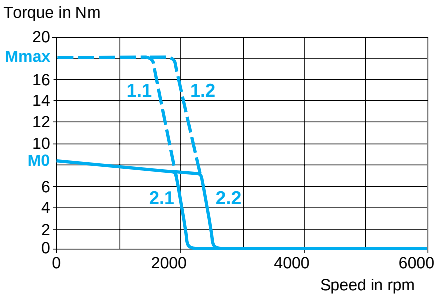


BDH 1082E servo motor

With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 1082G servo motors

Type of servo motor				**BDH 1082G**				
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	7.16	8.43			
	Peak stall	M_{max}	**Nm**	17.31	19.51			
Nominal operating point	Nominal torque		**Nm**	7.16	7.65		7	6.66
	Nominal speed		**rpm**	1140	1320		2460	3000
Maximum current			**A rms**	10.04				

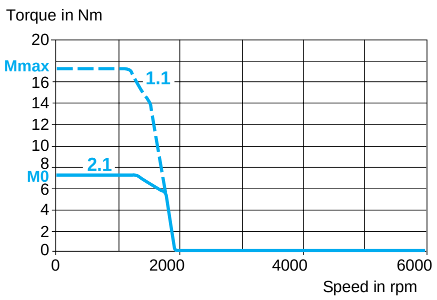
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	1.79
	Back emf			**V_{rms}/krpm**	115
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	6.2
		With brake	J_m	**kgcm²**	6.373
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	3.47
	Inductance (phase/phase)			**mH**	18.5
	Electrical time constant			**ms**	5.33
Holding brake (according to model)					See page 138

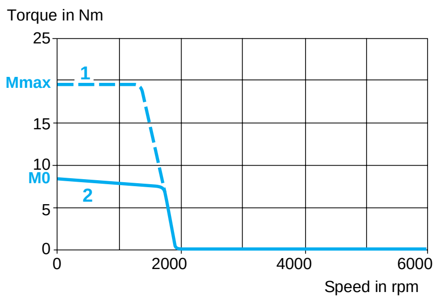
Torque/speed curves

BDH 1082G servo motor

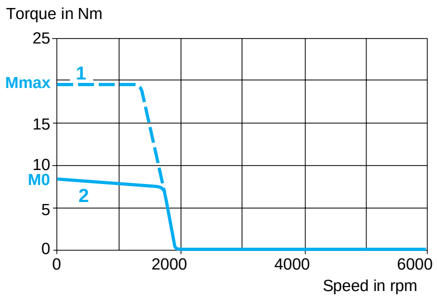
With LXM 15LD21M3 servo drive
230 V single phase



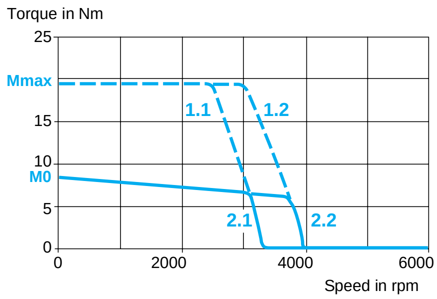
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

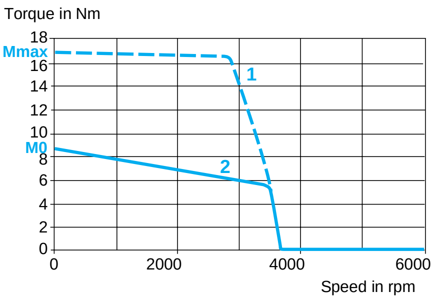
Characteristics of BDH 1082K/1082M/1083G servo motors

Type of servo motor					BDH 1082K		BDH 1082M	BDH 1083G		
Associated with Lexium 15 servo drive					LXM 15LD28M3	LXM 15MD28N4	LXM 15MD40N4	LXM 15LD17N4		
Line supply voltage				V	230 3-phase	230 3-phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall		M_0	Nm	8.6			11.4		
	Peak stall		M_{max}	Nm	16.9		16.7	25.83		
Nominal operating point	Nominal torque			Nm	6		5.5	10.6	9.8	9.5
	Nominal speed			rpm	2820		4080	1020	1920	2340
Maximum current				A rms	19.66		27.86	10.11		
Servo motor characteristics										
Maximum mechanical speed				rpm	6000					
Constants (at 120°C)	Torque			Nm/A rms	0.93		0.66	2.39		
	Back emf			V_{rms}/krpm	60.1		42.4	154		
Rotor	Number of poles				10					
	Inertia	Without brake	J_m	kgcm²	6.2			9.273		
		With brake	J_m	kgcm²	6.373					
Stator (at 20°C)	Resistance (phase/phase)			Ω	0.93		0.48	3.75		
	Inductance (phase/phase)			mH	5		2.5	21.3		
	Electrical time constant			ms	5.38		5.21	5.68		
Holding brake (according to model)					See page 138					

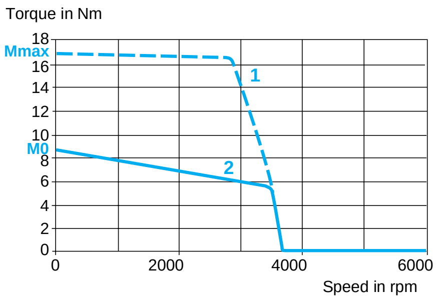
Torque/speed curves

BDH 1082K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase

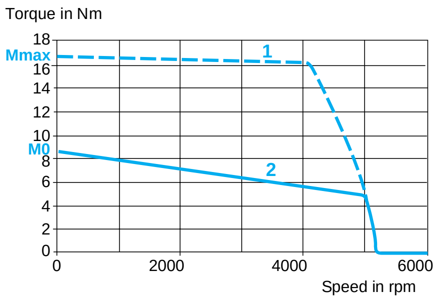


With LXM 15MD28N4 servo drive
230 V 3-phase



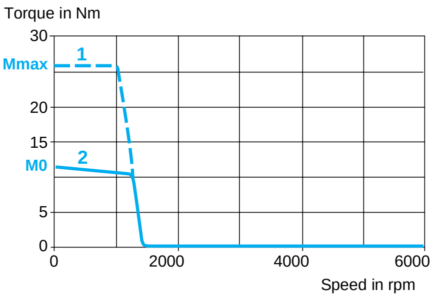
BDH 1082M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase

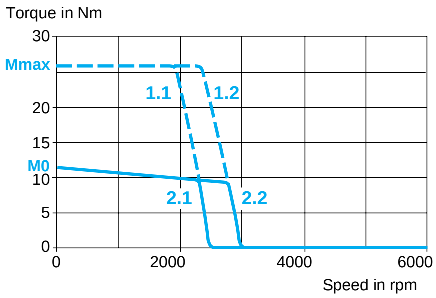


BDH 1083G servo motor

With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BDH 1083K/1083M/1083P servo motors

Type of servo motor				BDH 1083K		BDH 1083M	BDH 1083P
Associated with Lexium 15 servo drive				**LXM 15LD28M3**	**LXM 15MD28N4**	**LXM 15MD40N4**	**LXM 15MD56N4**
Line supply voltage			**V**	230 3-phase	230 3-phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	11.6		11.4	
	Peak stall	M_{max}	**Nm**	22.9		22.1	22.2
Nominal operating point	Nominal torque		**Nm**	9.4		8.5	6.2
	Nominal speed		**rpm**	2100		3180	4740
Maximum current			**A rms**	19.87		28.5	40.59

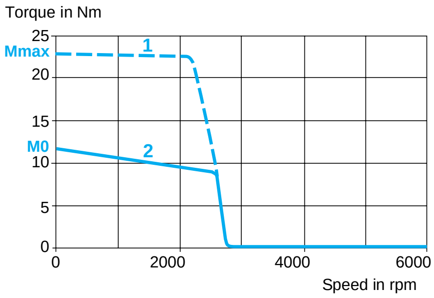
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000		
Constants (at 120°C)	Torque		**Nm/A rms**	1.24	0.85	0.6
	Back emf		**V_{rms}/krpm**	79.8	54.7	38.4
Rotor	Number of poles			10		
	Inertia	Without brake J_m	**kgcm²**	9.1		
		With brake J_m	**kgcm²**	9.273		
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1	0.51	0.27
	Inductance (phase/phase)		**mH**	5.7	2.7	1.3
	Electrical time constant		**ms**	5.7	5.29	4.81
Holding brake (according to model)				See page 138		

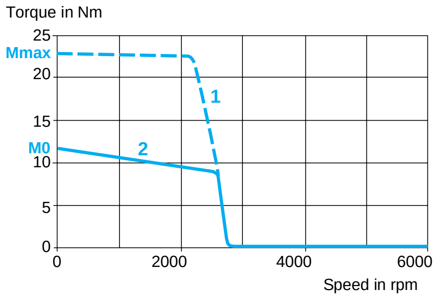
Torque/speed curves

BDH 1083K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase

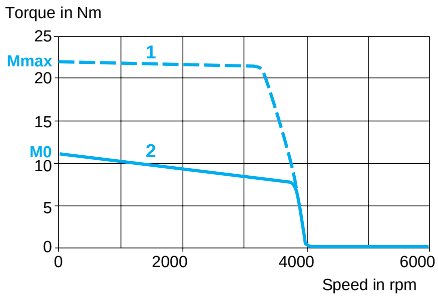


With LXM 15MD28N4 servo drive
230 V 3-phase



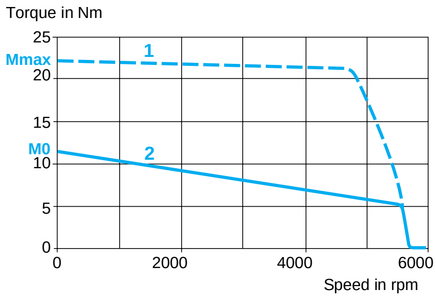
BDH 1083M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



BDH 1083P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
pages 82 and 83
References:
pages 130 to 133
Dimensions:
pages 134 to 137

Characteristics of BDH 1084G/1084K servo motors

Type of servo motor				BDH 1084G			BDH 1084K	
Associated with Lexium 15 servo drive				LXM 15LD17N4			LXM 15LD28M3	LXM 15MD28N4
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	14.3			14.4	
	Peak stall	M_{max}	**Nm**	31.7			28.1	
Nominal operating point	Nominal torque		**Nm**	13.4	12.7	12.3	12.1	
	Nominal speed		**rpm**	840	1620	1980	1800	
Maximum current			**A rms**	10.54			20.65	

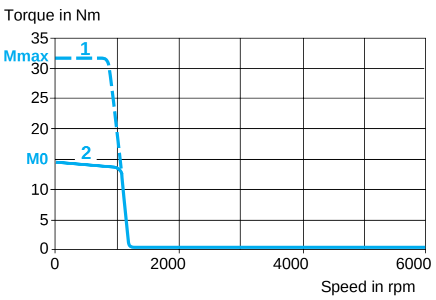
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	2.88	1.5
	Back emf		**V_{rms}/krpm**	185	96.6
Rotor	Number of poles			10	
	Inertia – Without brake	J_m	**kgcm²**	12	
	Inertia – With brake	J_m	**kgcm²**	12.173	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	3.8	1.02
	Inductance (phase/phase)		**mH**	22.9	6.2
	Electrical time constant		**ms**	6.03	6.08
Holding brake (according to model)				See page 138	

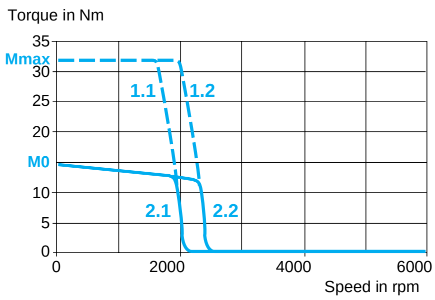
Torque/speed curves

BDH 1084G servo motor

With LXM 15LD17N4 servo drive
230 V 3-phase

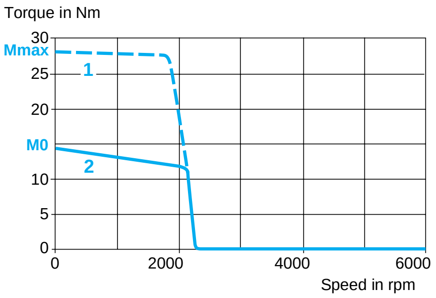


With LXM 15LD17N4 servo drive
400/480 V 3-phase

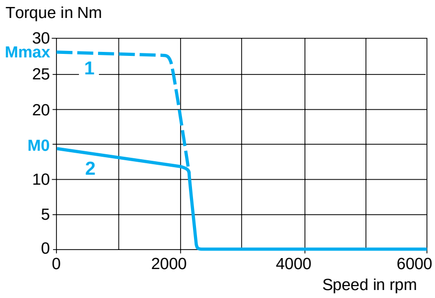


BDH 1084K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BDH 1084L/1084N servo motors

Type of servo motor				**BDH 1084L**		**BDH 1084N**
Associated with Lexium 15 servo drive				**LXM 15MD40N4**		**LXM 15MD56N4**
Line supply voltage			**V**	230 3-phase	400 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	14.1		
	Peak stall	M_{max}	**Nm**	27.28		25.5
Nominal operating point	Nominal torque		**Nm**	11.2	9	9.1
	Nominal speed		**rpm**	2400	4260	3780
Maximum current			**A rms**	37.76		26.52

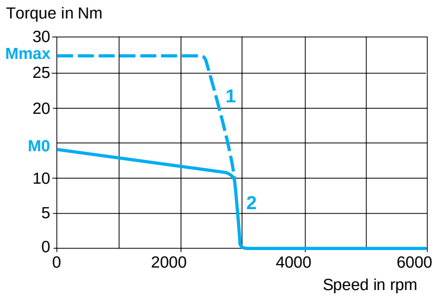
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	0.8	1.13
	Back emf		**V_{rms}/krpm**	51.3	72.9
Rotor	Number of poles			10	
	Inertia – Without brake	J_m	**kgcm²**	12	
	Inertia – With brake	J_m	**kgcm²**	12.173	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.33	0.63
	Inductance (phase/phase)		**mH**	1.8	3.5
	Electrical time constant		**ms**	5.45	5.56
Holding brake (according to model)				See page 138	

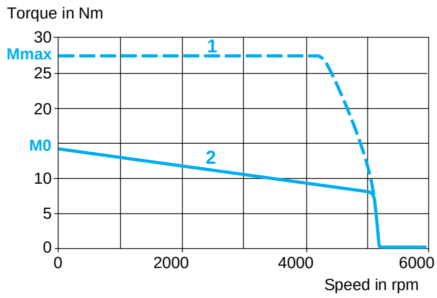
Torque/speed curves

BDH 1084L servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase

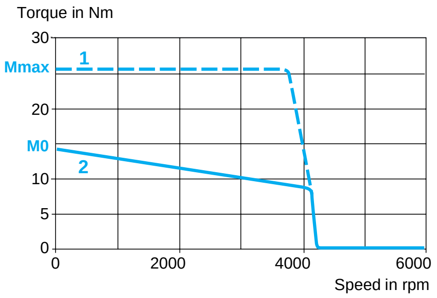


With LXM 15MD40N4 servo drive
400 V 3-phase



BDH 1084N servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 1382G/1382K servo motors

Type of servo motor				BDH 1382G			BDH 1382K	
Associated with Lexium 15 servo drive				**LXM 15LD17N4**			**LXM 15LD28M3**	**LXM 15MD28N4**
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	11.9			12.2	
	Peak stall	M_{max}	**Nm**	25.6			22.7	
Nominal operating point	Nominal torque		**Nm**	11.3	10.6	10.4		
	Nominal speed		**rpm**	780	1500	1800	1860	
Maximum current			**A rms**	10.32			20.29	

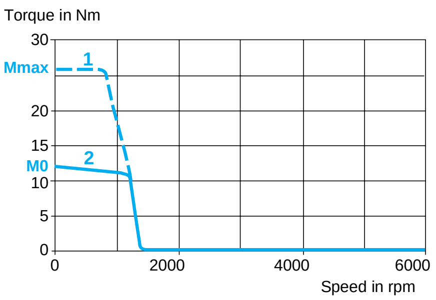
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	2.47	1.28
	Back emf		**V_{rms}/krpm**	159	82.1
Rotor	Number of poles			10	
	Inertia Without brake	J_m	**kgcm²**	17	
	Inertia With brake	J_m	**kgcm²**	17.61	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	3.94	1.05
	Inductance (phase/phase)		**mH**	31.7	8.5
	Electrical time constant		**ms**	8.05	8.10
Holding brake (according to model)				See page 138	

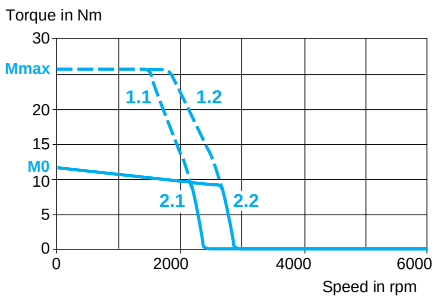
Torque/speed curves

BDH 1382G servo motor

With LXM 15LD17N4 servo drive
230 V 3-phase

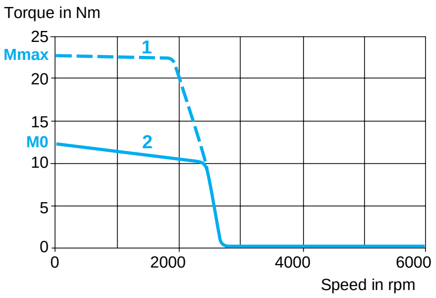


With LXM 15LD17N4 servo drive
400/480 V 3-phase

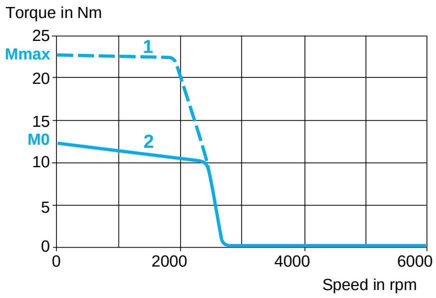


BDH 1382K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Lexium 15 motion control
BDH servo motors

Characteristics of BDH 1382M/1382P servo motors

Type of servo motor				**BDH 1382M**			**BDH 1382P**
Associated with Lexium 15 servo drive				**LXM 15MD40N4**			**LXM 15MD56N4**
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	12.2			12.3
	Peak stall	M_{max}	**Nm**	22.8			23.2
Nominal operating point	Nominal torque		**Nm**	9.3	7	5.9	8.7
	Nominal speed		**rpm**	2640	4800	5820	3840
Maximum current			**A rms**	28.5			39.95

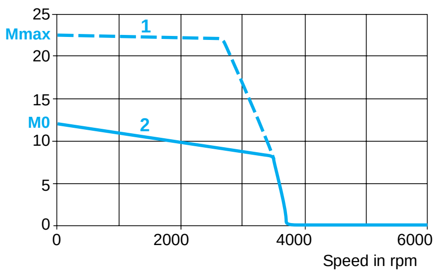
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	0.91	0.66
	Back emf		**V_{rms}/krpm**	58.8	42.2
Rotor	Number of poles			10	
	Inertia: Without brake	J_m	**kgcm²**	17	
	Inertia: With brake	J_m	**kgcm²**	17.61	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.55	0.3
	Inductance (phase/phase)		**mH**	4.4	2.2
	Electrical time constant		**ms**	8	7.33
Holding brake (according to model)				See page 138	

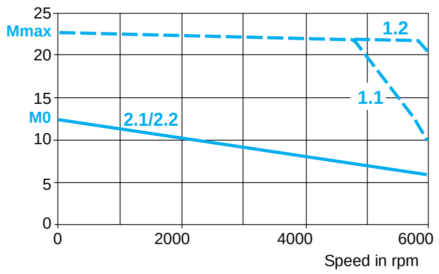
Torque/speed curves

BDH 1382M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase

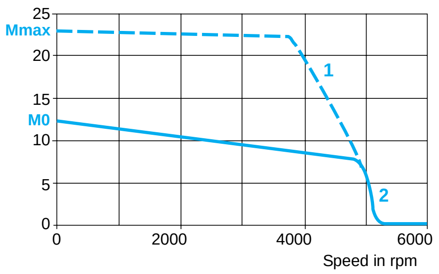


With LXM 15MD40N4 servo drive
400/480 V 3-phase



BDH 1382P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83
References:
pages 130 to 133
Dimensions:
pages 134 to 137

Characteristics of BDH 1383G/1383K servo motors

Type of servo motor			BDH 1383G			BDH 1383K	
Associated with Lexium 15 servo drive			**LXM 15LD17N4**			**LXM 15LD28M3**	**LXM 15MD28N4**
Line supply voltage		**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	230 3-phase
Torque	Continuous stall M_0	**Nm**	16.5			16.8	
	Peak stall M_{max}	**Nm**	38.4			31	
Nominal operating point	Nominal torque	**Nm**	15.7	15	14.6	14.8	
	Nominal speed	**rpm**	600	1140	1440	1500	
Maximum current		**A rms**	9.48			21	

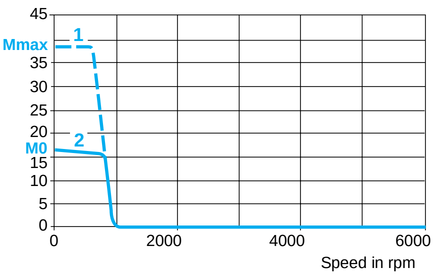
Servo motor characteristics

Maximum mechanical speed		**rpm**	6000	
Constants (at 120°C)	Torque	**Nm/A rms**	3.7	1.71
	Back emf	**V_{rms}/krpm**	238	110
Rotor	Number of poles		10	
	Inertia Without brake J_m	**kgcm²**	24	
	Inertia With brake J_m	**kgcm²**	24.61	
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	5.16	1.09
	Inductance (phase/phase)	**mH**	43.5	9.3
	Electrical time constant	**ms**	8.43	8.53
Holding brake (according to model)			See page 138	

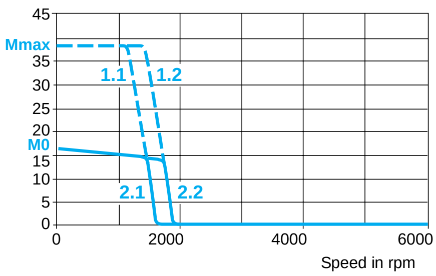
Torque/speed curves

BDH 1383G servo motor

With LXM 15LD17N4 servo drive
230 V 3-phase

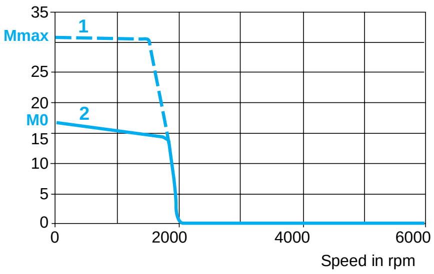


With LXM 15LD17N4 servo drive
400/480 V 3-phase

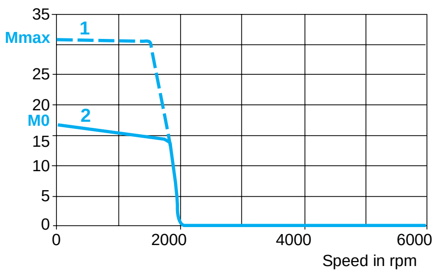


BDH 1383K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BDH 1383M/1383N servo motors

Type of servo motor				BDH 1383M			BDH 1383N		
Associated with Lexium 15 servo drive				**LXM 15MD40N4**			**LXM 15MD56N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	17					
	Peak stall	M_{max}	**Nm**	31.4			34.8		
Nominal operating point	Nominal torque		**Nm**	14	11.7	10.5	12.7	9.4	7.6
	Nominal speed		**rpm**	2100	3720	4500	2580	4620	5580
Maximum current			**A rms**	29.27			36.91		

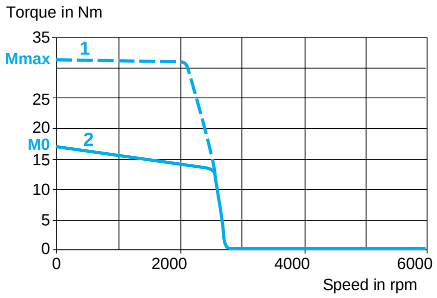
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	1.24	0.98
	Back emf		**V_{rms}/krpm**	79.9	63.3
Rotor	Number of poles			10	
	Inertia Without brake	J_m	**kgcm²**	24	
	Inertia With brake	J_m	**kgcm²**	24.61	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.58	0.38
	Inductance (phase/phase)		**mH**	4.9	3.1
	Electrical time constant		**ms**	8.45	8.16
Holding brake (according to model)				See page 138	

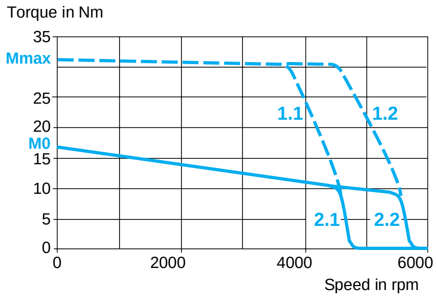
Torque/speed curves

BDH 1383M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase

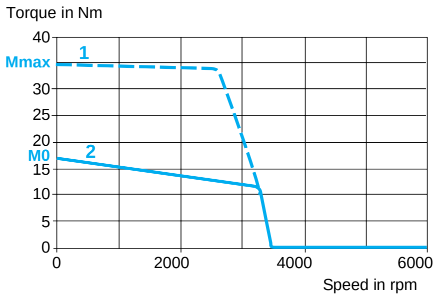


With LXM 15MD40N4 servo drive
400/480 V 3-phase

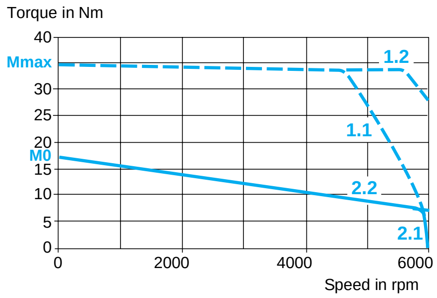


BDH 1383N servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 1384K/1384L servo motors

Type of servo motor			**BDH 1384K**			**BDH 1384L**		
Associated with Lexium 15 servo drive			**LXM 15MD28N4**			**LXM 15MD40N4**		
Line supply voltage		**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall M_0	**Nm**	20.8			21		
	Peak stall M_{max}	**Nm**	41.2			41.9		
Nominal operating point	Nominal torque	**Nm**	18.8	17	16.5	18	15.6	14.6
	Nominal speed	**rpm**	1080	2040	2460	1560	2820	3420
Maximum current		**A rms**	19.45			27.15		

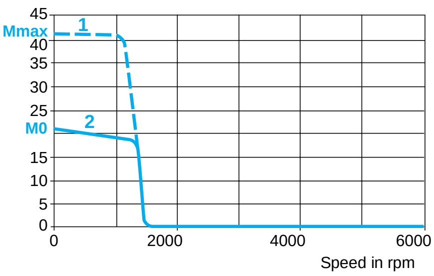
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	2.28	1.66
	Back emf		**V_{rms}/krpm**	147	107
Rotor	Number of poles			10	
	Inertia	Without brake J_m	**kgcm²**	32	
		With brake J_m	**kgcm²**	32.61	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.34	0.71
	Inductance (phase/phase)		**mH**	11.8	6.2
	Electrical time constant		**ms**	8.81	8.86
Holding brake (according to model)				See page 138	

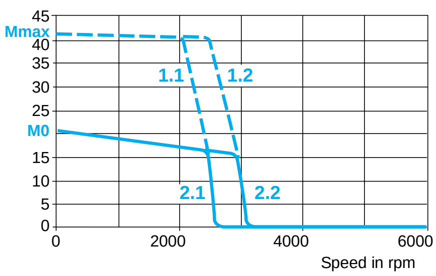
Torque/speed curves

BDH 1384K servo motor

With LXM 15MD28N4 servo drive
230 V 3-phase

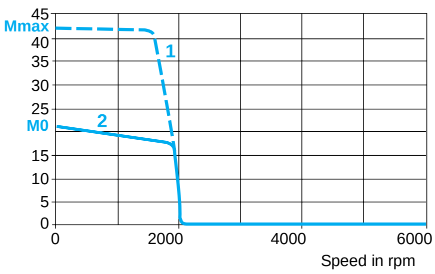


With LXM 15MD28N4 servo drive
400/480 V 3-phase

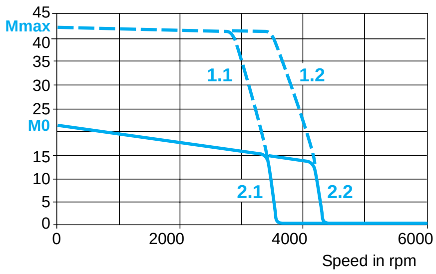


BDH 1384L servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83
References:
pages 130 to 133
Dimensions:
pages 134 to 137

Characteristics of BDH 1384P/1385K servo motors

Type of servo motor			BDH 1384P			BDH 1385K		
Associated with Lexium 15 servo drive			LXM 15MD56N4			LXM 15MD28N4		
Line supply voltage		V	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall M_0	Nm	20.4			24.8		
	Peak stall M_{max}	Nm	40.2			46.8		
Nominal operating point	Nominal torque	Nm	15.3	11.3	9.4	19.4	20.5	22.5
	Nominal speed	rpm	2460	4380	5280	1020	1860	2280
Maximum current		A rms	39.53			20.79		

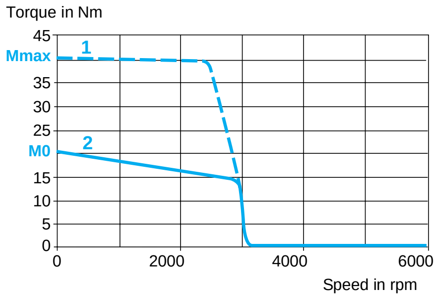
Servo motor characteristics

			BDH 1384P	BDH 1385K
Maximum mechanical speed		rpm	6000	
Constants (at 120°C)	Torque	Nm/A rms	1.1	2.54
	Back emf	V_{rms}/krpm	71	164
Rotor	Number of poles		10	
	Inertia – Without brake J_m	kgcm²	32	40
	Inertia – With brake J_m	kgcm²	32.61	40.61
Stator (at 20°C)	Resistance (phase/phase)	Ω	0.36	1.27
	Inductance (phase/phase)	mH	2.8	11.4
	Electrical time constant	ms	7.78	8.98
Holding brake (according to model)			See page 138	

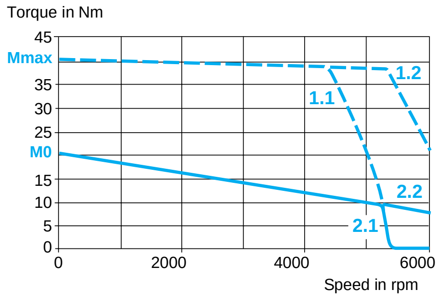
Torque/speed curves

BDH 1384P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase

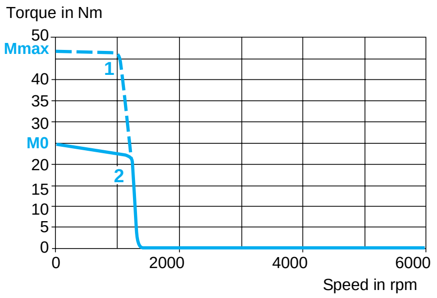


With LXM 15MD56N4 servo drive
400/480 V 3-phase

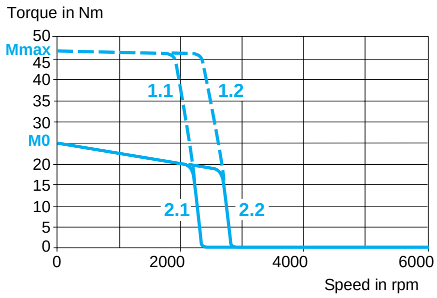


BDH 1385K servo motor

With LXM 15MD28N4 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 1385M/1385N servo motors

Type of servo motor				**BDH 1385M**			**BDH 1385N**		
Associated with Lexium 15 servo drive				**LXM 15MD40N4**			**LXM 15MD56N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	25			24.3		
	Peak stall	M_{max}	**Nm**	47.6			50.2		
Nominal operating point	Nominal torque		**Nm**	21.7	19	17.55	19.4	16	14
	Nominal speed		**rpm**	1440	2640	3180	1980	3540	4260
Maximum current			**A rms**	28.92			37.69		

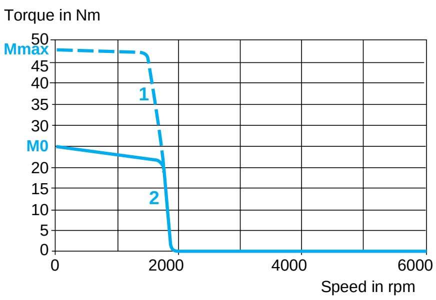
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000	
Constants (at 120°C)	Torque			**Nm/A rms**	1.85	1.38
	Back emf			**V_{rms}/krpm**	119	88.8
Rotor	Number of poles				10	
	Inertia	Without brake	J_m	**kgcm²**	40	
		With brake	J_m	**kgcm²**	40.61	
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	0.68	0.42
	Inductance (phase/phase)			**mH**	6.1	3.4
	Electrical time constant			**ms**	8.97	8.10
Holding brake (according to model)					See page 138	

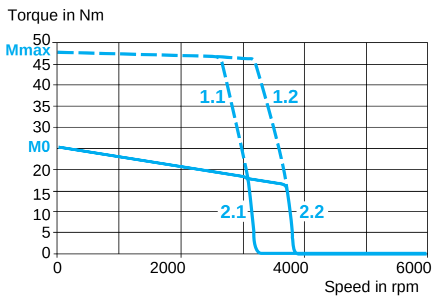
Torque/speed curves

BDH 1385M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase

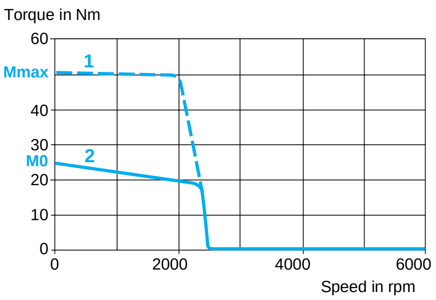


With LXM 15MD40N4 servo drive
400/480 V 3-phase

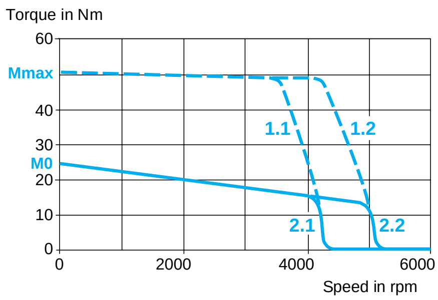


BDH 1385N servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 1882K/1882M servo motors

Type of servo motor				BDH 1882K			BDH 1882M		
Associated with Lexium 15 servo drive				**LXM 15MD28N4**			**LXM 15MD40N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	29.7			30		
	Peak stall	M_{max}	**Nm**	59.4			59.8		
Nominal operating point	Nominal torque		**Nm**	27.5	25.7	24.5	27	24	23
	Nominal speed		**rpm**	720	1320	1620	1020	1860	2220
Maximum current			**A rms**	19.66			27.51		

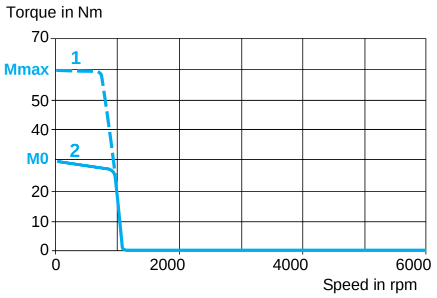
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	3.23	2.33
	Back emf		**V_{rms}/krpm**	208	150
Rotor	Number of poles			10	
	Inertia	Without brake J_m	**kgcm²**	65	
		With brake J_m	**kgcm²**	66.64	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.22	0.64
	Inductance (phase/phase)		**mH**	20.7	10.8
	Electrical time constant		**ms**	16.97	16.88
Holding brake (according to model)				See page 138	

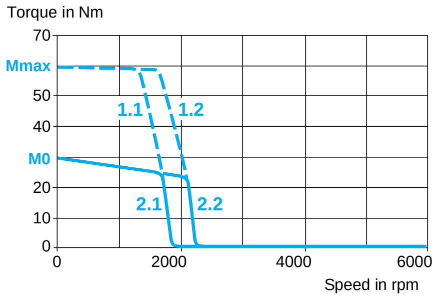
Torque/speed curves

BDH 1882K servo motor

With LXM 15MD28N4 servo drive
230 V 3-phase

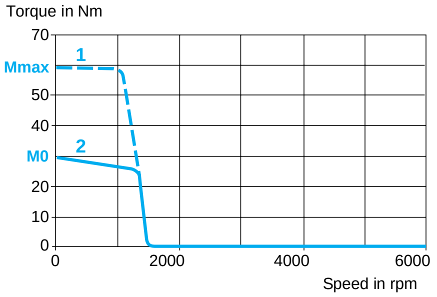


With LXM 15MD28N4 servo drive
400/480 V 3-phase

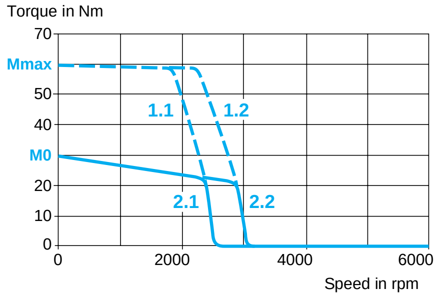


BDH 1882M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

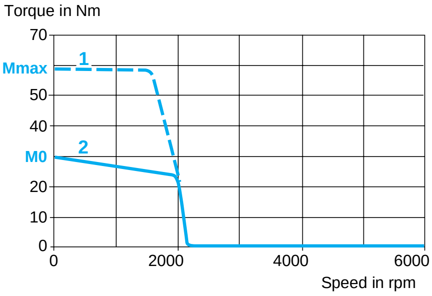
Characteristics of BDH 1882P/1883M servo motors

Type of servo motor			BDH 1882P			BDH 1883M		
Associated with Lexium 15 servo drive			**LXM 15MD56N4**			**LXM 15MD40N4**		
Line supply voltage		V	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall M_0	Nm	29.4			42		
	Peak stall M_{max}	Nm	58.4			80.7		
Nominal operating point	Nominal torque	Nm	24.5	20.5	18.5	37.5	34	32.5
	Nominal speed	rpm	1560	2820	3360	780	1440	1740
Maximum current		A rms	39.67			28.85		
Servo motor characteristics								
Maximum mechanical speed		rpm	6000					
Constants (at 120°C)	Torque	Nm/A rms	1.58			3.1		
	Back emf	V_{rms}/krpm	102			200		
Rotor	Number of poles		10					
	Inertia Without brake J_m	kgcm²	65			92		
	Inertia With brake J_m	kgcm²	66.64			93.64		
Stator (at 20°C)	Resistance (phase/phase)	Ω	0.33			0.68		
	Inductance (phase/phase)	mH	5			12.4		
	Electrical time constant	ms	15.15			18.24		
Holding brake (according to model)			See page 138					

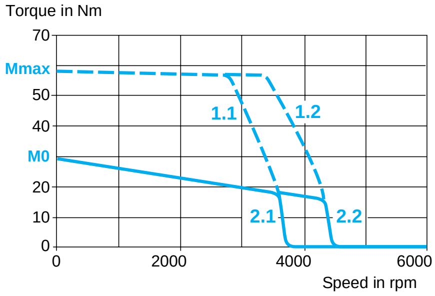
Torque/speed curves

BDH 1882P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase

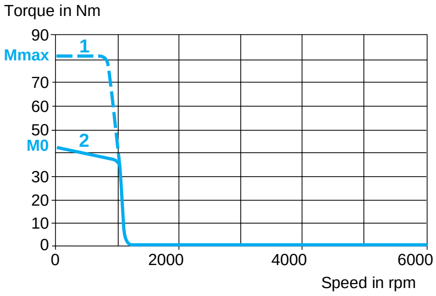


With LXM 15MD56N4 servo drive
400/480 V 3-phase

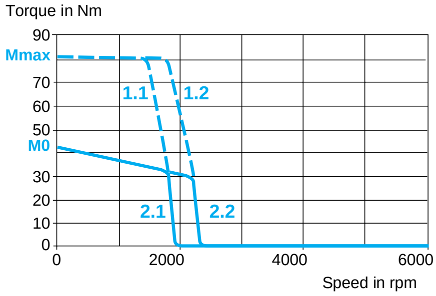


BDH 1883M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 1883P/1884L servo motors

Type of servo motor			BDH 1883P			BDH 1884L		
Associated with Lexium 15 servo drive			**LXM 15MD56N4**			**LXM 15MD40N4**		
Line supply voltage		**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall M_0	**Nm**	41.6			53		
	Peak stall M_{max}	**Nm**	79.4			108		
Nominal operating point	Nominal torque	**Nm**	35	29.5	27.5	48	44	42
	Nominal speed	**rpm**	1200	2160	2580	600	1080	1320
Maximum current		**A rms**	41.44			27.37		

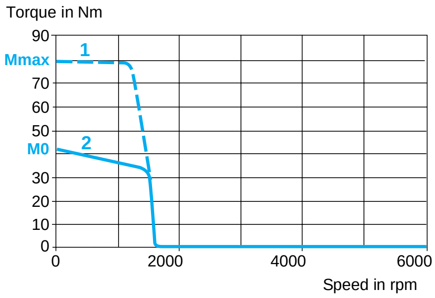
Servo motor characteristics

			BDH 1883P	BDH 1884L
Maximum mechanical speed		**rpm**	6000	
Constants (at 120°C)	Torque	**Nm/A rms**	2.13	4.14
	Back emf	**V_{rms}/krpm**	137	266
Rotor	Number of poles		10	
	Inertia – Without brake J_m	**kgcm²**	92	120
	Inertia – With brake J_m	**kgcm²**	93.64	121.64
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	0.35	0.85
	Inductance (phase/phase)	**mH**	5.9	16.4
	Electrical time constant	**ms**	16.86	19.29
Holding brake (according to model)			See page 138	

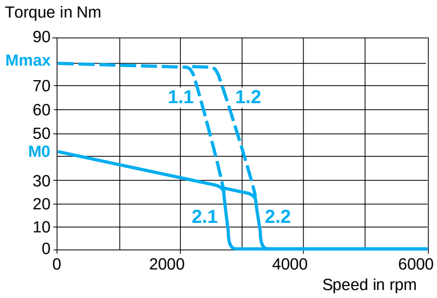
Torque/speed curves

BDH 1883P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase

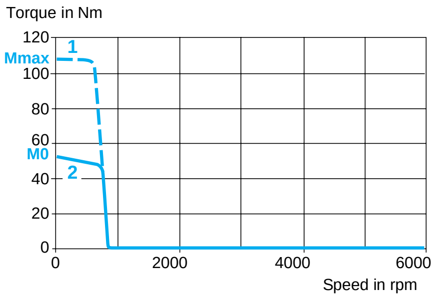


With LXM 15MD56N4 servo drive
400/480 V 3-phase

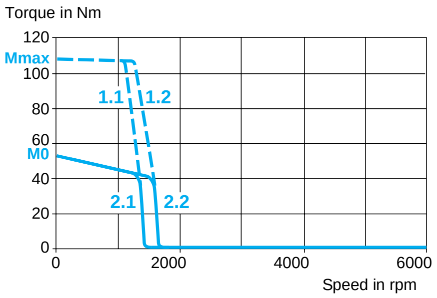


BDH 1884L servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 1884P servo motors

Type of servo motor				**BDH 1884P**		
Associated with Lexium 15 servo drive				**LXM 15MD56N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	52.5		
	Peak stall	M_{max}	**Nm**	106		
Nominal operating point	Nominal torque		**Nm**	45	39	36
	Nominal speed		**rpm**	900	1620	1980
Maximum current			**A rms**	39.24		

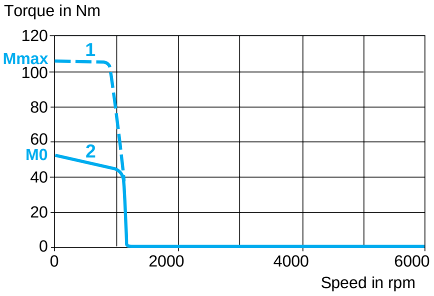
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	2.84
	Back emf			**V_{rms}/krpm**	183
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	120
		With brake	J_m	**kgcm²**	121.64
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	0.43
	Inductance (phase/phase)			**mH**	7.7
	Electrical time constant			**ms**	17.91
Holding brake (according to model)					See page 138

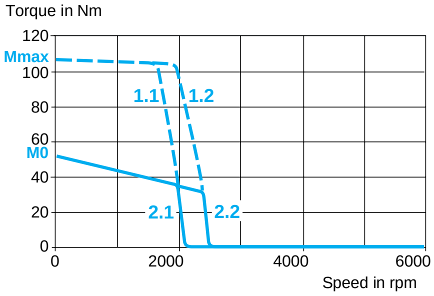
Torque/speed curves

BDH 1884P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

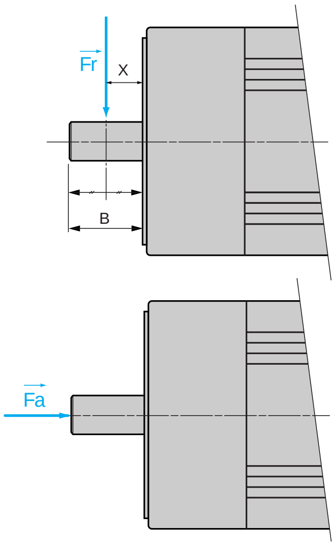
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137



Radial and axial forces permitted on the motor shaft

Even when the servo motors are used under optimum conditions, their service life is limited by that of the bearings.

Conditions	
Nominal service life of bearings *(1)*	L_{10h} = 20,000 hours
Ambient temperature (temperature of bearings ~ 100°C)	40°C
Force application point	Fr applied at the middle point of the shaft end X = B/2 (dimension B, see pages 134 to 137)

(1) Hours of service with a failure probability of 10%

The following conditions must be adhered to:

- Radial and axial forces must not be applied simultaneously
- Shaft end with IP 54 or IP 67 degree of protection
- The bearings cannot be changed by the user as the built-in position sensor must be realigned if the unit is dismantled.

			Maximum radial force Fr							
Mechanical speed		**rpm**	**1000**	**2000**	**3000**	**4000**	**5000**	**6000**	**7000**	**8000**
Servo motor	BDH 040	**N**	46	43	40	37	33	30	27	23
	BDH 058	**N**	138	137	135	133	132	130	128	127
	BDH 070	**N**	300	240	200	180	165	150	–	–
	BDH 084	**N**	460	430	400	370	340	310	–	–
	BDH 108	**N**	425	400	375	350	325	300	–	–
	BDH 138	**N**	1200	900	775	700	650	600	–	–
	BDH 188	**N**	1400	1100	800	–	–	–	–	–
			Maximum axial force: Fa = $\frac{Fr}{3}$							

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of servo motor/servo drive power connection cables

Cables fitted with a connector on servo motor side

Cable type		VW3 M5 101 R●●●
External sleeve, insulation		PUR orange coloured RAL 2003, TPM or PP/PE
Capacity	pF/m	< 70 (conductors/shielding)
Number of conductors (shielded)		[(4 x 1.5 mm²) + (2 x 1 mm²)]
Connector type		1 industrial connector (BDH servo motor side) and 1 free wire end (Lexium 15 LP servo drive side)
External diameter	mm	12 ± 0.2
Curvature radius	mm	90, suitable for daisy-chaining, cable carrier system
Working voltage	V	600
Maximum usable length	m	50, for connection with a Lexium 15 LP servo drive
Operating temperature	°C	- 40...+ 90 (fixed), - 20…+ 80 (mobile)
Certification		UL, CSA, VDE, CE, DESINA

Cables fitted with a connector on both the servo motor and servo drive sides

Cable type		VW3 M5 201 R●●●	VW3 M5 202 R●●●	VW3 M5 203 R●●●
External sleeve, insulation		PUR orange coloured RAL 2003, TPM or PP/PE		
Capacity	pF/m	< 70 (conductors/shielding)		
Number of conductors (shielded)		[(4 x 1.5 mm²) + (2 x 1 mm²)]	[(4 x 2.5 mm²) + (2 x 1 mm²)]	[(4 x 4 mm²) + (2 x 1 mm²)]
Connector type		1 industrial connector (BDH servo motor side) and 1 removable 6-way connector (Lexium 15 MP servo drives side)		
External diameter	mm	12 ± 0.2	14.3 ± 0.3	16.3 ± 0.3
Curvature radius	mm	90, suitable for daisy-chaining, cable carrier system	110, suitable for daisy-chaining, cable carrier system	125, suitable for daisy-chaining, cable carrier system
Working voltage	V	600		
Maximum usable length	m	100, for connection with a Lexium 15 MP servo drive		
Operating temperature	°C	- 40...+ 90 (fixed), - 20…+ 80 (mobile)		
Certification		UL, CSA, VDE, CE, DESINA		

Characteristics of the servo motor/servo drive control connection cables

Cable type		VW3 M8 301 R●●●	VW3 M8 401 R●●●
Sensor		SinCos Hiperface® encoder	Resolver
External sleeve, insulation		PUR green coloured RAL 6018, polyester	
Number of conductors (shielded)		5 x (2 x 0.25 mm²) + (2 x 0.5 mm²)	
External diameter	mm	8.8 ± 0.2	
Connector type		1 industrial connector (servo motor side) and 1 x 15-way SUB-D male connector (servo drive side)	1 industrial connector (servo motor side) and 1 x 9-way SUB-D male connector (servo drive side)
Min. curvature radius	mm	68, suitable for daisy-chaining, cable carrier system	
Working voltage	V	350 (0.25 mm²), 500 (0.5 mm²)	
Operating temperature	°C	- 50…+ 90 (fixed), - 40...+ 80 (mobile)	
Certification		UL, CSA, VDE, CE, DESINA	

Presentation:
pages 82 and 83

References:
pages 132 and 133

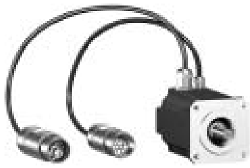
Dimensions:
pages 134 to 137

Lexium 15 motion control
BDH servo motors

BDH servo motors

The BDH servo motors shown below are supplied without a gearbox. For GBX gearboxes see page 143.

105995



BDH 0401●

105997

BDH 0701●

105999

BDH 1081●

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 15	Maximum nominal speed *(1)*	Reference *(2)*	Weight *(3)*
Nm	Nm	rpm		rpm		kg
0.18	0.61	8000	LD13M3	8000	**BDH 0401B ●5A2●**	0.350
0.31	1.08	8000	LD13M3	8000	**BDH 0402C ●5A2●**	0.490
0.41	1.46	8000	LD13M3	8000	**BDH 0403C ●5A2●**	0.630
0.84	2.34	8000	LU60N4	7680	**BDH 0582C ●●●2●**	1.100
0.87	2.42	8000	LD13M3	6880	**BDH 0582E ●●●2●**	1.100
1.08	2.62	8000	LD21M3	8000	**BDH 0583F ●●●2●**	1.380
1.13	3.2	8000	LU60N4	6000	**BDH 0583C ●●●2●**	1.380
1.15	3.34	8000	LU60N4	5360	**BDH 0701C ●●●2A**	1.550
1.16	3.58	8000	LD13M3	4080	**BDH 0583D ●●●2●**	1.380
			LD10N4	8000		
1.18	3.52	8000	LD21M3	8000	**BDH 0583F ●●●2●**	1.380
1.2	3.24	8000	LD13M3	5360	**BDH 0701E ●●●2A**	1.550
1.38	3.94	8000	LU60N4	5120	**BDH 0584C ●●●2●**	1.660
1.41	4.4	8000	LD13M3	3520	**BDH 0584D ●●●2●**	1.660
			LD10N4	8000		
1.42	3.57	8000	LD21M3	6000	**BDH 0584F ●●●2●**	1.660
	4.46	8000	LD21M3	6560		
1.5	3.14	6000	LD21M3	6000	**BDH 0841H ●●●2●**	2.440
1.95	5.12	6000	LU60N4	2820	**BDH 0841C ●●●2●**	2.440
2	5.74	8000	LU60N4	3440	**BDH 0702C ●●●2A**	2.230
2.02	5.13	6000	LD13M3	5640	**BDH 0841E ●●●2●**	2.440
	5.33	6000	LD10N4	2460		
2.04	6.51	8000	LD13M3	2320	**BDH 0702D ●●●2A**	2.230
			LD10N4	5520		
2.06	4.78	6000	LD21M3	5340	**BDH 0841H ●●●2●**	2.440
2.08	4.52	8000	LD21M3	4400	**BDH 0703H●●●2A**	2.900
2.1	5.36	8000	LD21M3	6560	**BDH 0702H ●●●2A**	2.230
2.71	7.83	8000	LU60N4	2560	**BDH 0703C ●●●2A**	2.900
2.79	8.55	8000	LD13M3	2000	**BDH 0703E ●●●2A**	2.900
			LD10N4	4800		
2.88	7.35	8000	LD21M3	4960	**BDH 0703H ●●●2A**	2.900
2.96	6.54	6000	LD21M3	3000	**BDH 0842G ●●●2●**	3.390
3.35	9.37	6000	LU60N4	1680	**BDH 0842C ●●●2●**	3.390
3.42	9.41	6000	LD10N4	3480	**BDH 0842E ●●●2●**	3.390
	9.72	6000	LD13M3	1500		
3.53	8.66	6000	LD17N4	6000	**BDH 0842G ●●●2●**	3.390
	9.56	6000	LD21M3	2760		
3.56	7.56	6000	LD28M3	5400	**BDH 0842J ●●●2●**	3.390
			MD28N4	5400		
3.96	8.8	6000	LD21M3	2220	**BDH 0843G ●●●2●**	4.350
	9.41	6000	LD21M3	1680	**BDH 1081G ●●●2●**	4.200
4.7	10.71	6000	LD10N4	2880	**BDH 1081E ●●●2●**	4.200
	11.7	6000	LD10N4	2700	**BDH 0843E ●●●2●**	4.350
4.75	10.82	6000	LD21M3	2340	**BDH 1081G ●●●2●**	4.200
			LD17N4	5160		
4.76	10.55	6000	LD21M3	1860	**BDH 0844G ●●●2●**	5.300
4.8	11.68	6000	LD17N4	4980	**BDH 0843G ●●●2●**	4.350
	13.2	6000	LD21M3	2160		
4.9	9.02	6000	LD28M3	4920	**BDH 0843K ●●●2●**	4.350
			MD28N4	4920		
	9.22	6000	LD28M3	4800	**BDH 1081K ●●●2●**	4.200
			MD28N4	4800		
5.76	14.1	6000	LD10N4	2400	**BDH 0844E ●●●2●**	5.300
5.88	13.97	6000	LD17N4	4380	**BDH 0844G ●●●2●**	5.300
	16.1	6000	LD21M3	1860		
6	12.8	6000	LD28M3	3660	**BDH 0844J ●●●2●**	5.300
			MD28N4	3660		
7.16	17.31	6000	LD21M3	1140	**BDH 1082G ●●●2●**	5.800

(1) Derating possible according to the power supply voltage, see characteristics pages 84 to 127.
(2) Complete each reference based on the available options, see table page 131.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 138.

BDH servo motors (continued)

106001

BDH 1882●

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 15	Maximum nominal speed *(1)*	Reference *(2)*	Weight *(3)*
Nm	Nm	rpm		rpm		kg
8.34	18.08	6000	LD10N4	1860	**BDH 1082E ●●●2●**	5.800
8.43	19.51	6000	LD21M3	1320	**BDH 1082G ●●●2●**	5.800
			LD17N4	3000		
8.6	16.7	6000	LD17N4	4080	**BDH 1082M ●●●2●**	5.800
	16.9	6000	LD28M3	2820	**BDH 1082K ●●●2●**	5.800
			MD28N4	2820		
11.4	22.1	6000	MD40N4	3180	**BDH 1083M ●●●2●**	7.400
	22.2	6000	MD56N4	4740	**BDH 1083P ●●●2●**	7.400
	25.83	6000	LD17N4	2340	**BDH 1083G ●●●2●**	7.400
11.6	22.9	6000	LD28M3	2100	**BDH 1083K ●●●2●**	7.400
			MD28N4	2100		
11.9	25.6	6000	LD17N4	1800	**BDH 1382G ●●●2●**	8.900
12.2	22.7	6000	LD28M3	1860	**BDH 1382K ●●●2●**	8.900
			MD28N4	1860		
	22.8	6000	MD40N4	5820	**BDH 1382M ●●●2●**	8.900
12.3	23.2	6000	MD56N4	3840	**BDH 1382P ●●●2●**	8.900
14.1	25.5	6000	MD56N4	3780	**BDH 1084N ●●●2●**	9.000
	27.28	6000	MD40N4	4260	**BDH 1084L ●●●2●**	9.000
14.3	31.7	6000	LD17N4	1980	**BDH 1084G ●●●2●**	9.000
14.4	28.1	6000	LD28M3	1800	**BDH 1084K ●●●2●**	9.000
16.5	38.4	6000	LD17N4	1440	**BDH 1383G ●●●2●**	11.100
16.8	31	6000	LD28M3	1500	**BDH 1383K ●●●2●**	11.100
			MD28N4	1500		
17	31.4	6000	MD40N4	4500	**BDH 1383M ●●●2●**	11.100
	34.8	6000	MD56N4	5580	**BDH 1383N ●●●2●**	11.100
20.4	40.2	6000	MD56N4	5280	**BDH 1384P ●●●2●**	13.300
20.8	41.2	6000	MD28N4	2460	**BDH 1384K ●●●2●**	13.300
21	41.9	6000	MD40N4	3420	**BDH 1384L ●●●2●**	13.300
24.3	50.2	6000	MD56N4	4260	**BDH 1385N ●●●2●**	15.400
24.8	46.8	6000	MD28N4	2280	**BDH 1385K ●●●2●**	15.400
25	47.6	6000	MD40N4	3180	**BDH 1385M ●●●2●**	15.400
29.4	58.4	6000	MD56N4	3360	**BDH 1882P ●●●2●**	19.700
29.7	59.4	6000	MD28N4	1620	**BDH 1882K ●●●2●**	19.700
30	59.8	6000	MD40N4	2220	**BDH 1882M ●●●2●**	19.700
41.6	79.4	6000	MD56N4	2580	**BDH 1883P ●●●2●**	26.700
42	80.7	6000	MD40N4	1740	**BDH 1883M ●●●2●**	26.700
52.5	106	6000	MD56N4	1980	**BDH 1884P ●●●2●**	33.600
53	108	6000	MD40N4	1320	**BDH 1884L ●●●2●**	33.600

To order a BDH servo motor complete each reference with:

		BDH 0583D	●	●	●	2	●
Shaft end	IP 54	Untapped *(4)*	**0**				
		Keyed *(6) (7)*	**1**				
	IP 67	Untapped *(4)*	**2**				
		Keyed *(6) (7)*	**3**				
Integrated sensor	Single turn, SinCos Hiperface® 4096 points/turn *(5)*			**1**			
	Multiturn, SinCos Hiperface® 4096 points/turn, 4096 turns *(5)*			**2**			
	2-pole resolver			**5**			
Holding brake	None				**A**		
	With *(5)*				**F**		
Connection	Angled connectors that can be rotated through 90°					**2**	
Flange	International IEC standard *(7)*						**A**
	NEMA *(6) (7) (8)*						**B**

Note: *The example above is for a **BDH 0583D** servo motor. Replace **BDH 0583D** with the relevant reference for other servo motors.*

(1) Derating possible according to the power supply voltage, see characteristics pages 84 to 127.
(2) To complete each reference see the above table.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 138.
(4) Not available in NEMA mounting for BDH 084●●, BDH 108●●, BDH 138●● and BDH 188●● servo motors.
(5) Not available for BDH 040●● servo motors.
(6) Not available in NEMA mounting for BDH 040●● servo motors and BDH 058●●.
(7) The type of key differs according to the type of mounting (IEC or NEMA) and the servo motor rating, see pages 134 to 137:
- *EMC mounting: BDH 040●●, open shaft key; other BDH servo motors, closed shaft key.*
- *NEMA mounting: BDH 084●●, BDH 108●●, BDH 138●● and BDH 188●●, open shaft key. Shaft key option not available for BDH 040●● and BDH 058●●.*

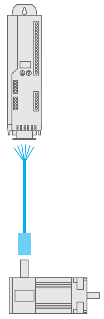
(8) Not available for BDH 070●● servo motors.

Presentation: pages 82 and 83
Characteristics: pages 84 to 128
Dimensions: pages 134 to 137

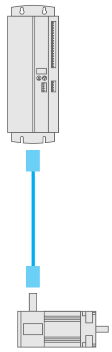
Lexium 15 motion control

BDH servo motors

Power supply connection cables



VW3 M5 101 R●●●



VW3 M5 201/202/203 R●●●

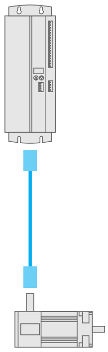
Description	From servo motor	To servo drive	Composition	Length m	Reference	Weight kg
Cables fitted with a connector on servo motor side	BDH 040●● BDH 058●● BDH 070●● BDH 084●● BDH 108●E BDH 108●G BDH 108●K BDH 138●G BDH 138●K	LXM 15L●●●●●	[(4 x 1.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 101 R30**	0.810
				5	**VW3 M5 101 R50**	2.290
				10	**VW3 M5 101 R100**	2.290
				15	**VW3 M5 101 R150**	3.400
				20	**VW3 M5 101 R200**	4.510
				25 *(1)*	**VW3 M5 101 R250**	6.200
				50 *(1)*	**VW3 M5 101 R500**	12.325
Cables fitted with two connectors	BDH 084●● BDH 108●K BDH 138●K BDH 188●K	LXM 15MD●●N4	[(4 x 1.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 201 R30**	0.885
				5	**VW3 M5 201 R50**	1.375
				10	**VW3 M5 201 R100**	2.600
				15	**VW3 M5 201 R150**	3.825
				20	**VW3 M5 201 R200**	5.050
				25 *(1)*	**VW3 M5 201 R250**	6.275
				50 *(1)*	**VW3 M5 201 R500**	12.400
				75 *(1)*	**VW3 M5 201 R750**	18.525
	BDH 108●L BDH 108●M BDH 138●L BDH 138●M BDH 188●L BDH 188●M	LXM 15MD●●N4	[(4 x 2.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 202 R30**	1.137
				5	**VW3 M5 202 R50**	1.795
				10	**VW3 M5 202 R100**	3.430
				15	**VW3 M5 202 R150**	5.085
				20	**VW3 M5 202 R200**	6.730
				25 *(1)*	**VW3 M5 202 R250**	8.375
				50 *(1)*	**VW3 M5 202 R500**	16.600
				75 *(1)*	**VW3 M5 202 R750**	24.825
	BDH 108●N BDH 108●P BDH 138●N BDH 138●P BDH 188●P	LXM 15MD●●N4	[(4 x 4 mm²) + (2 x 1 mm²)]	3	**VW3 M5 203 R30**	1.536
				5	**VW3 M5 203 R50**	2.460
				10	**VW3 M5 203 R100**	4.770
				15	**VW3 M5 203 R150**	7.080
				20	**VW3 M5 203 R200**	9.390
				25 *(1)*	**VW3 M5 203 R250**	11.700
				50 *(1)*	**VW3 M5 203 R500**	23.250
				75 *(1)*	**VW3 M5 203 R750**	34.800

(1) For cables longer than 20m, a motor choke is compulsory, see page 47.

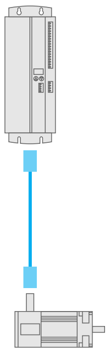
Presentation:
pages 82 and 83

Characteristics:
page 129

Control connecting cables


VW3 M8 301 R●●●

Description	From servo motor	To servo drive	Composition	Length m	Reference	Weight kg
SinCos Hiperface® encoder cables fitted with two connectors	BDH, all ratings	LXM 15, all ratings	5x(2 x 0.25 mm^2) + (2 x 0.5 mm^2)	3	**VW3 M8 301 R30**	–
				5	**VW3 M8 301 R50**	–
				10	**VW3 M8 301 R100**	–
				15	**VW3 M8 301 R150**	–
				20	**VW3 M8 301 R200**	–
				25	**VW3 M8 301 R250**	–
				50	**VW3 M8 301 R500**	–
				75	**VW3 M8 301 R750**	–
Resolver cables fitted with two connectors	BDH, all ratings	LXM 15, all ratings	5x(2 x 0.25 mm^2) + (2 x 0.5 mm^2)	3	**VW3 M8 401 R30**	–
				5	**VW3 M8 401 R50**	–
				10	**VW3 M8 401 R100**	–
				15	**VW3 M8 401 R150**	–
				20	**VW3 M8 401 R200**	–
				25	**VW3 M8 401 R250**	–
				50	**VW3 M8 401 R500**	–
				75	**VW3 M8 401 R750**	–

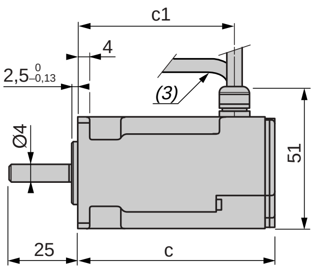

VW3 M8 401 R●●●

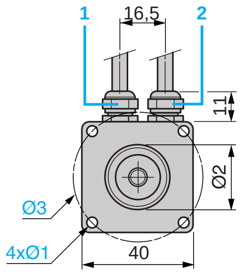
Presentation:
pages 82 and 83

Characteristics:
page 129

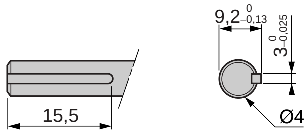
Lexium 15 motion control
BDH servo motors

BDH 040 (straight remote connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*





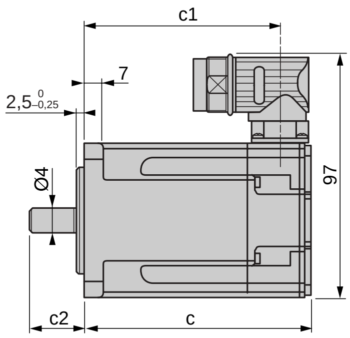
Keyed shaft end (optional) *(2)*

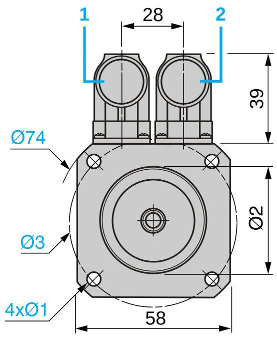


	With resolver		IEC mounting				NEMA mounting			
	c	**c1**	**Ø1**	**Ø2**	**Ø3**	**Ø4**	**Ø1**	**Ø2**	**Ø3**	**Ø4**
BDH 0401	69.6	56.1	4.3	30 h7	46	8 h7	3.56	$20.015^{+0.025}_{-0.025}$	46.69	$6.35^{0}_{-0.012}$
BDH 0402	88.6	75.1	4.3	30 h7	46	8 h7	3.56	$20.015^{+0.025}_{-0.025}$	46.69	$6.35^{0}_{-0.012}$
BDH 0403	107.6	94.1	4.3	30 h7	46	8 h7	3.56	$20.015^{+0.025}_{-0.025}$	46.69	$6.35^{0}_{-0.012}$

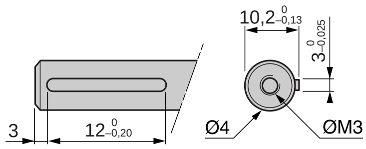
(1) SinCos Hiperface® encoder options and holding brake not available.
(2) Not available in NEMA mounting.
(3) Supplied with remote connectors, connection length: 500 mm

BDH 058 (angled connectors: power supply for servo motor/brake 2 and sensor 1)





Keyed shaft end (optional) *(1)*



	With resolver		With SinCos encoder			IEC mounting					NEMA mounting				
	c (without brake)	**c** (with brake)	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**
BDH 0582	105.2	148.5	114.4	148.5	93.6	20	4.8	40 j6	63	9 k6	$31.75^{+0.79}_{-0.79}$	5.1	$38.1^{0}_{-0.005}$	66.68	$9.525^{0}_{-0.013}$
BDH 0583	124.2	167.5	133.4	167.5	112.6	20	4.8	40 j6	63	9 k6	$31.75^{+0.79}_{-0.79}$	5.1	$38.1^{0}_{-0.005}$	66.68	$9.525^{0}_{-0.013}$
BDH 0584	143.2	186.5	152.4	186.5	131.6	20	4.8	40 j6	63	9 k6	$31.75^{+0.79}_{-0.79}$	5.1	$38.1^{0}_{-0.005}$	66.68	$9.525^{0}_{-0.013}$

(1) Not available in NEMA mounting.

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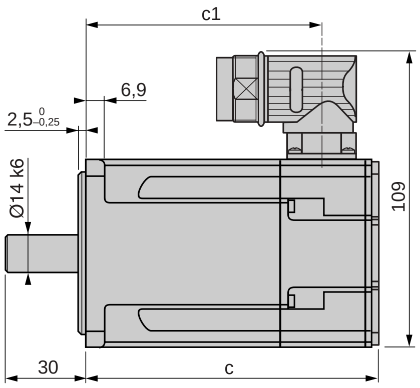
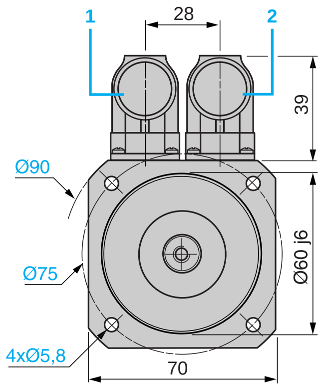
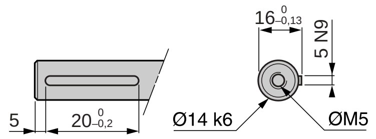
pages 82 and 83
Characteristics:
pages 84 to 129
References:
pages 130 to 133

BDH 070 (angled connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*





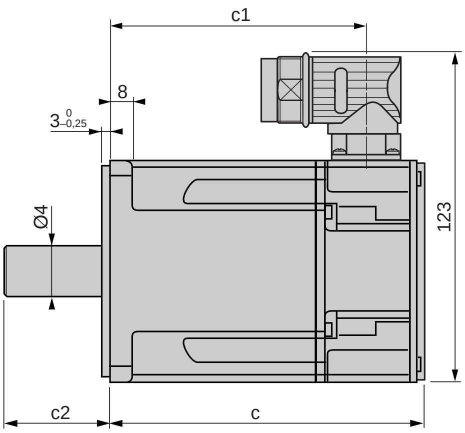
Keyed shaft end (optional)

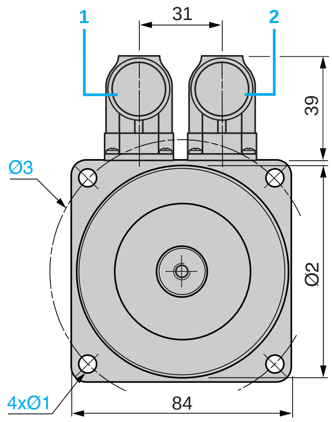


	With resolver or SinCos encoder		
	c (without brake)	**c** (with brake)	**c1**
BDH 0701	109.8	140.3	87.9
BDH 0702	140.8	171.3	118.9
BDH 0703	171.8	202.3	149.9

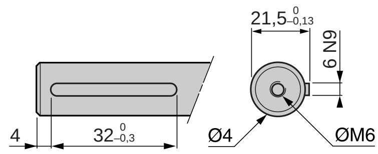
(1) Not available in NEMA mounting.

BDH 084 (angled connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*

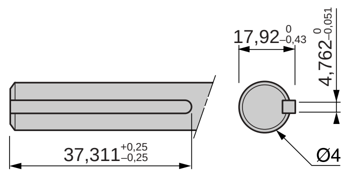




Keyed shaft end, IEC mounting (optional)



Keyed shaft end, NEMA mounting *(1)*



	With resolver or SinCos encoder			IEC mounting					NEMA mounting				
	c (without brake)	**c** (with brake)	**c1**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**
BDH 0841	118.8	152.3	96.4	40	7	80 j6	100	19 k6	52.4 $^{+0.79}_{-0.79}$	5.54	73.025 $^{0}_{-0.051}$	98.43	15.875 $^{0}_{-0.013}$
BDH 0842	147.8	181.3	125.5	40	7	80 j6	100	19 k6	52.4 $^{+0.79}_{-0.79}$	5.54	73.025 $^{0}_{-0.051}$	98.43	15.875 $^{0}_{-0.013}$
BDH 0843	176.8	210.3	154.4	40	7	80 j6	100	19 k6	52.4 $^{+0.79}_{-0.79}$	5.54	73.025 $^{0}_{-0.051}$	98.43	15.875 $^{0}_{-0.013}$
BDH 0844	205.8	239.3	183.4	40	7	80 j6	100	19 k6	52.4 $^{+0.79}_{-0.79}$	5.54	73.025 $^{0}_{-0.051}$	98.43	15.875 $^{0}_{-0.013}$

(1) The untapped shaft end option is not available in NEMA mounting.

Presentation:
pages 82 and 83

Characteristics:
pages 84 to 129

References:
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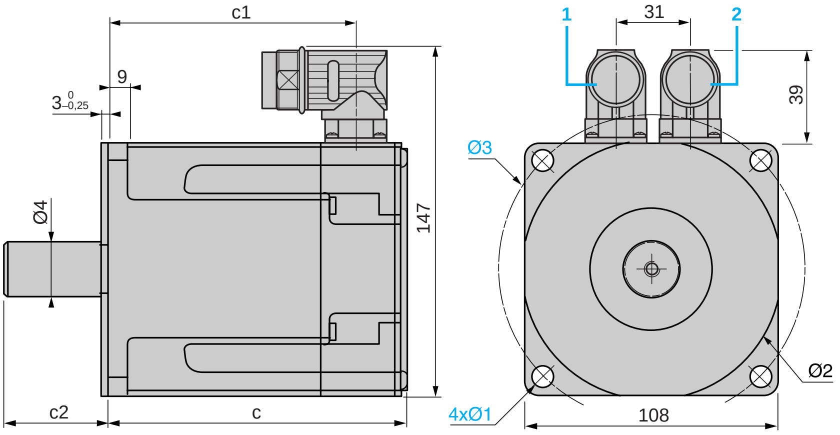
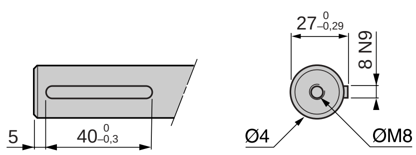
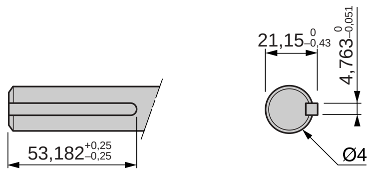
BDH 108 (angled connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*



Keyed shaft end, IEC mounting (optional)



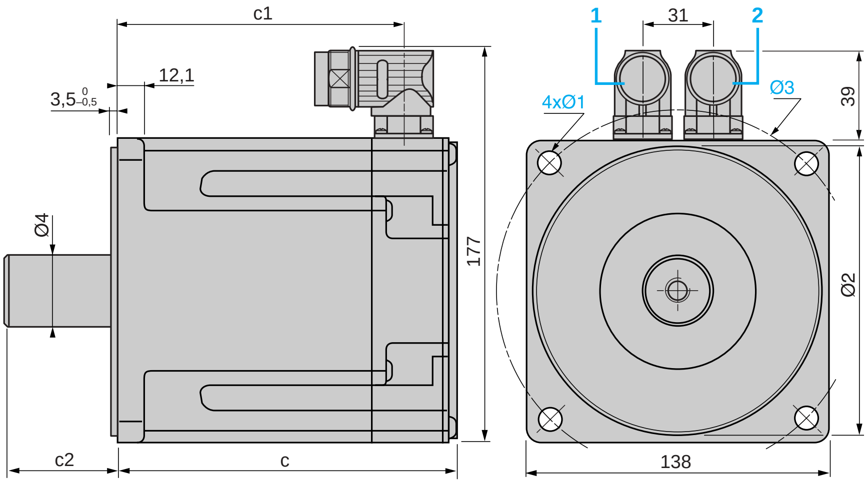
Keyed shaft end, NEMA mounting *(1)*



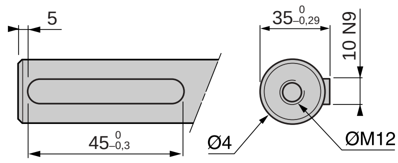
	With resolver		With SinCos encoder			IEC mounting					NEMA mounting				
	c (without brake)	**c** (with brake)	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**
BDH 1081	127.5	172.5	146	189	105.3	50	9	110 j6	130	24 k6	57.15 +0.79/-0.79	8.33	55.563 0/-0.051	125.73	19.05 0/-0.013
BDH 1082	158.5	203.5	177	220	136.3	50	9	110 j6	130	24 k6	57.15 +0.79/-0.79	8.33	55.563 0/-0.051	125.73	19.05 0/-0.013
BDH 1083	189.5	234.5	208	251	167.3	50	9	110 j6	130	24 k6	57.15 +0.79/-0.79	8.33	55.563 0/-0.051	125.73	19.05 0/-0.013
BDH 1084	220.5	265.5	239	282	196.3	50	9	110 j6	130	24 k6	57.15 +0.79/-0.79	8.33	55.563 0/-0.051	125.73	19.05 0/-0.013

(1) The untapped shaft end option is not available in NEMA mounting.

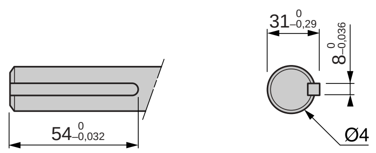
BDH 138 (angled connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*



Keyed shaft end, IEC mounting (optional)



Keyed shaft end, NEMA mounting *(1)*



	With resolver		With SinCos encoder			IEC mounting					NEMA mounting				
	c (without brake)	**c** (with brake)	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**
BDH 1382	153.7	200.7	172.2	218.7	130.5	58	11 +0.36/0	130 j6	165	32 k6	60	9 +0.36/0	110 h7	145	28 h6
BDH 1383	178.7	225.7	197.2	224.7	155.5	58	11 +0.36/0	130 j6	165	32 k6	60	9 +0.36/0	110 h7	145	28 h6
BDH 1384	203.7	250.7	222.2	268.7	180.5	58	11 +0.36/0	130 j6	165	32 k6	60	9 +0.36/0	110 h7	145	28 h6
BDH 1385	228.7	275.7	247.2	294.7	205.5	58	11 +0.36/0	130 j6	165	32 k6	60	9 +0.36/0	110 h7	145	28 h6

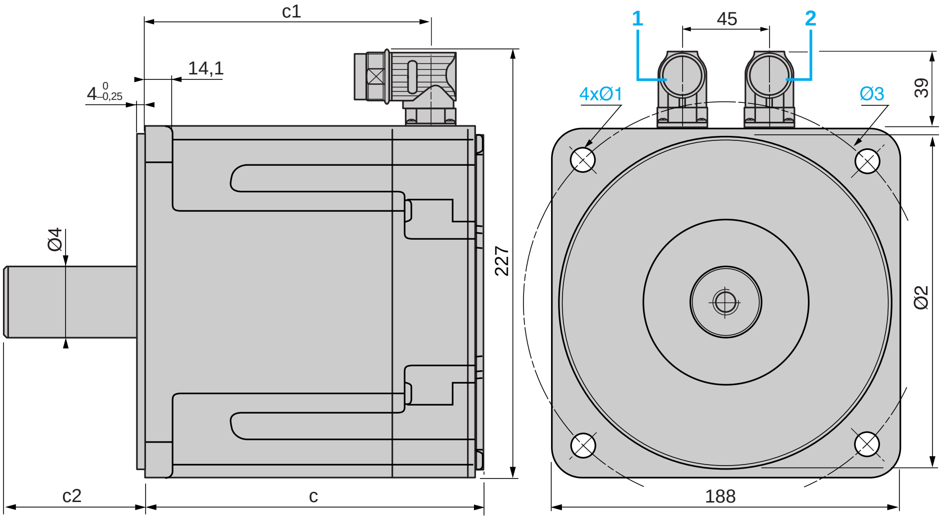
(1) The untapped shaft end option is not available in NEMA mounting.

Presentation:
pages 82 and 83

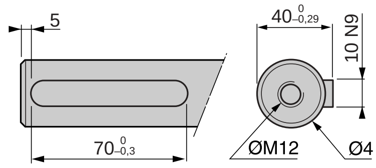
Characteristics:
pages 84 to 129

References:
pages 130 to 133

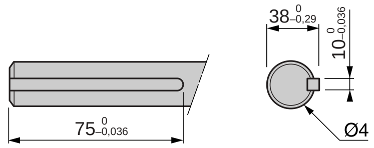
BDH 188 (angled connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*



Keyed shaft end, IEC mounting (optional)



Keyed shaft end, NEMA mounting *(1)*



	With resolver		With SinCos encoder			IEC mounting					NEMA mounting				
	c (without brake)	**c** (with brake)	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**
BDH 1882	192.5	234.5	201.7	253.3	164.5	80	13.5 $^{+0.43}_{0}$	180 j6	215	38 k6	79	13.5 $^{+0.43}_{0}$	114.3 $^{0}_{-0.025}$	200	35 h6
BDH 1883	226.5	268.5	235.7	287.3	198.5	80	13.5 $^{+0.43}_{0}$	180 j6	215	38 k6	79	13.5 $^{+0.43}_{0}$	114.3 $^{0}_{-0.025}$	200	35 h6
BDH 1884	260.5	302.5	269.7	321.3	232.5	80	13.5 $^{+0.43}_{0}$	180 j6	215	38 k6	79	13.5 $^{+0.43}_{0}$	114.3 $^{0}_{-0.025}$	200	35 h6

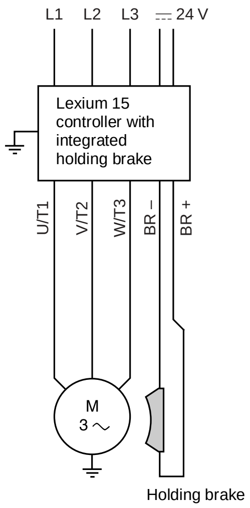
(1) The untapped shaft end option is not available in NEMA mounting.

Lexium 15 motion control

BDH servo motors
Option: integrated holding brake

Holding brake *(1)*

Presentation



The holding brake integrated into the BDH servo motor, depending on the model, is an electromagnetic pressure spring brake with that blocks the servo motor axis once the output current has been switched off. In the event of an emergency, such as a power outage or an emergency stop, the drive is immobilized, significantly increasing safety.
Blocking the servo motor axis is also necessary in cases of torque overload, such as in the event of vertical axis movement.

Activation of the holding brake is directly controlled by the Lexium 15 servo drive.

Characteristics

Type of servo motor	BDH	058	070	084	108	138	188
Holding torque M_{Br}	**Nm**	1.42	2.5	6	14.5	25	53
Inertia of rotor (brake only) J_{Br}	**kgcm²**	0.011	0.011	0.068	0.173	0.61	1.64
Electrical clamping power P_{Br}	**W**	8.4	10.1	12.8	19.5	25.7	35.6
Supply voltage		24 V⎓ -10…+10 %					
Opening time	**ms**	20	27	35	80	105	110
Closing time	**ms**	18	10	15	15	20	35
Weight	**kg**	0.270	0.350	0.610	1.100	2.000	2.100

References

105998

BDH servo motor

Selection of BDH servo motor with **F** *(1)* or without **A** holding brake, see references page 131.

(1) Not available for BDH 040●● servo motors.

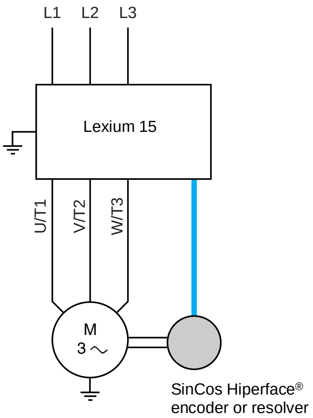
Dimensions:
pages 134 to 137

Lexium 15 motion control

BDH servo motors
Option: integrated sensor

Sensor integrated into BDH servo motors

Presentation



BDH servo motors can be fitted with 2 types of sensor:
- 2-pole resolver
- SinCos high resolution Hiperface® *(1)* encoder:
  - single turn
  - multiturn

These measurement devices are perfectly adapted to the Lexium 15 range of servo drives.

The use of a resolver allows (at low cost):
- The angular position of the rotor to be identified
- The servo motor speed to be measured

The use of a SinCos Hiperface® *(1)* encoder also allows:
- The BDH servo motor data to be automatically identified by the servo drive
- The servo drive's control loops to be automatically initialized. These functions therefore simplify the installation of the motion control device.

Characteristics

Type of sensor		Resolver	Single turn SinCos *(1)*	Multiturn SinCos *(1)*
Sinus periods per turn		1	128	128
Number of points		–	4096	4096 x 4096 turns
Encoder precision		± 30 arc minutes	± 1.3 arc minutes	
Measurement method		Electromagnetic demodulation	Optical high resolution	
Interface		–	Hiperface®	
Operating temperature	°C	+55…+155	+5…+110	

References

105998

BDH servo motor

Selection of resolver sensor **5**, type of SinCos Hiperface® encoder *(1)* integrated into the BDH servo motor (single turn **1** or multiturn **2**), see references page 131.

(1) Not available for BDH 040●● servo motors.

Dimensions:
pages 134 to 137

Lexium 15 motion control

BDH servo motors
Option: GBX planetary gearboxes

Presentation

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GBX planetary gearboxes

In many cases, motion control requires the use of planetary gearboxes to adapt speeds and torques, while ensuring the precision demanded by the application.

Schneider Electric has selected GBX gearboxes made by Neugart to be used in association with the BDH servo motor range. These gearboxes are lubricated for life and are designed for applications not requiring very low backlash. As their association with BDH servo motors has been fully qualified and they are very easy to mount, the gearboxes are simple to put into operation and risk free.

Available in 5 sizes (GBX 40... GBX 160), the planetary gearboxes are offered in 12 gear ratios (3:1...40:1), see table below.

Continuous stall torques and peak stall torques available from the gearbox are obtained by multiplying the characteristic values of the servo motor by the reduction ratio and gearbox efficiency (0.96 or 0.94 depending on the speed reduction ratio).

The table below shows the most suitable servo motor/gearbox combinations. For other combinations, see the servo motor data sheets.

BDH servo motor/GBX gearbox associations

Type of servo motor	Speed reduction ratio											
	3:1	4:1	5:1	8:1	9:1	12:1	15:1	16:1	20:1	25:1	32:1	40:1
BDH 0401B	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 60
BDH 0402C	GBX 40	GBX 40	GBX 40	GBX 60	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60
BDH 0403C	GBX 40	GBX 40	GBX 40	GBX 60	GBX 40	GBX 40	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60	GBX 60*
BDH 0582C	GBX 60	GBX 60	GBX 60	GBX 60*	GBX 40	GBX 60	GBX 60	GBX 60	GBX 60	GBX 60*	GBX 60*	GBX 60*
BDH 0582E	GBX 60	GBX 60	GBX 60	GBX 60*	GBX 40	GBX 60	GBX 60	GBX 60	GBX 60	GBX 60*	GBX 60*	GBX 60*
BDH 0583C	GBX 60	GBX 60	GBX 60	GBX 60*	GBX 60	GBX 60	GBX 60*	GBX 60*	GBX 60*	GBX 60*	GBX 60*	GBX 60*
BDH 0583D	GBX 60	GBX 60	GBX 60	GBX 60*	GBX 60	GBX 60	GBX 60*	GBX 60*	GBX 60*	GBX 60*	GBX 60*	GBX 60*
BDH 0583F	GBX 60	GBX 60	GBX 60	GBX 60*	GBX 60	GBX 60	GBX 60*	GBX 60*	GBX 60*	GBX 60*	GBX 60*	GBX 60*
BDH 0584C	GBX 60	GBX 60	GBX 60*	GBX 60*	GBX 60	GBX 60	GBX 60*	GBX 60*	GBX 60*	GBX 60*	GBX 60*	GBX 60*
BDH 0584D	GBX 60	GBX 60	GBX 60*	GBX 60*	GBX 60	GBX 60	GBX 60*	GBX 60*	GBX 60*	GBX 60*	GBX 60*	GBX 60*
BDH 0584F	GBX 60	GBX 60	GBX 60*	GBX 60*	GBX 60	GBX 60	GBX 60*	GBX 60*	GBX 60*	GBX 60*	GBX 60*	GBX 60*
BDH 0701C	GBX 60	GBX 60	GBX 60	GBX 80	GBX 60	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120
BDH 0701E	GBX 60	GBX 60	GBX 60	GBX 80	GBX 60	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120
BDH 0702C	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0702D	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0702H	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0703C	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120*
BDH 0703E	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120*
BDH 0703H	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120*
BDH 0841C	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0841E	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0841H	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0842C	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160
BDH 0842E	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160
BDH 0842G	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160
BDH 0842J	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160
BDH 0843E	GBX 80	GBX 80	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 0843G	GBX 80	GBX 80	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 0843K	GBX 80	GBX 80	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 0844E	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160
BDH 0844G	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160
BDH 0844J	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160

GBX 60* *For associations in italics and marked with an asterisk, you must check that the application does not exceed the maximum continuous output torque of the gearbox, see values page 142.*

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Lexium 15 motion control
BDH servo motors
Option: GBX planetary gearboxes

BDH servo motor/GBX gearbox associations (continued)

Type of servo motor	Speed reduction ratio											
	3:1	4:1	5:1	8:1	9:1	12:1	15:1	16:1	20:1	25:1	32:1	40:1
BDH 1081E	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 1081G	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 1081K	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 1082E	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*
BDH 1082G	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*
BDH 1082K	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*
BDH 1082M	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*
BDH 1083G	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1083K	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1083M	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1083P	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1084G	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1084K	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1084L	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1084N	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1382G	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1382K	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1382M	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1382P	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*
BDH 1383G	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1383K	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1383M	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1383N	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1384K	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1384L	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1384P	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1385K	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1385M	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*
BDH 1385N	GBX 160	GBX 160	GBX 160	GBX 160*	GBX 160*	GBX 160	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*	GBX 160*

GBX 160* — *For associations in italics and marked with an asterisk, you must check that the application does not exceed the maximum continuous output torque of the gearbox, see values page 142.*

Lexium 15 motion control

BDH servo motors

Option: GBX planetary gearboxes

Characteristics of GBX gearboxes

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Type of gearbox			Planetary gearbox with straight teeth, single reduction stage				
Backlash	**3:1...8:1**	**arc min**	< 30	< 20	< 12	< 8	< 6
	9:1...40:1		< 35	< 25	< 17	< 12	< 10
Torsion rigidity	**3:1...8:1**	**Nm/arc min**	1.0	2.3	6	12	38
	9:1...40:1		1.1	2.5	6.5	13	41
Noise level		**dB (A)**	55	58	60	65	70
Junction box			Black anodized aluminum				
Shaft material			C 45				
Shaft output dust and damp protection			IP 54				
Lubrification			Lubricated for life				
Average service life *(1)*		**hr**	30,000				
Mounting position			All positions				
Operating temperature		**°C**	- 25...+ 90				

Characteristics of BDH servo motor/GBX gearbox associations

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Efficiency	**3:1...8:1**		0.96				
	9:1...40:1		0.94				
Maximum permitted radial force *(1) (2)*	L_{10h} = 10,000 hours	**N**	200	500	950	2000	6000
	L_{10h} = 30,000 hours		160	340	650	1500	4200
Maximum permitted axial force *(1)*	L_{10h} = 10,000 hours	**N**	200	600	1200	2800	8000
	L_{10h} = 30,000 hours		160	450	900	2100	6000
Inertia of gearbox	**3:1**	**kgcm²**	0.031	0.135	0.77	2.63	12.14
	4:1	**kgcm²**	0.022	0.093	0.52	1.79	7.78
	5:1	**kgcm²**	0.019	0.078	0.45	1.53	6.07
	8:1	**kgcm²**	0.017	0.065	0.39	1.32	4.63
	9:1	**kgcm²**	0.030	0.131	0.74	2.62	–
	12:1	**kgcm²**	0.029	0.127	0.72	2.56	12.37
	15:1	**kgcm²**	0.023	0.077	0.71	2.53	12.35
	16:1	**kgcm²**	0.022	0.088	0.50	1.75	7.47
	20:1	**kgcm²**	0.019	0.075	0.44	1.50	6.64
	25:1	**kgcm²**	0.019	0.075	0.44	1.49	5.81
	32:1	**kgcm²**	0.017	0.064	0.39	1.30	6.36
	40:1	**kgcm²**	0.016	0.064	0.39	1.30	5.28
Continuous output torque *(1)* M_{2N}	**3:1**	**Nm**	4.5	12	40	80	400
	4:1	**Nm**	6	16	50	100	450
	5:1	**Nm**	6	16	50	110	450
	8:1	**Nm**	5	15	50	120	450
	9:1	**Nm**	16.5	44	130	210	–
	12:1	**Nm**	20	44	120	260	800
	15:1	**Nm**	18	44	110	230	700
	16:1	**Nm**	20	44	120	260	800
	20:1	**Nm**	20	44	120	260	800
	25:1	**Nm**	18	40	110	230	700
	32:1	**Nm**	20	44	120	260	800
	40:1	**Nm**	18	40	110	230	700

(1) Values refer to an output shaft speed of 100 rpm in S1 mode (cyclic ratio = 1) on electrical machines and an ambient temperature of 30°C.
(2) Force applied at mid-distance from the output shaft.

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References:
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Lexium 15 motion control

BDH servo motors
Option: GBX planetary gearboxes

References

535526

GBX●●●

Size	Speed reduction ratio	Reference (1)	Weight kg
GBX 40	3:1, 4:1, 5:1 and 8:1	**GBX 040 ●●● ●●● ●D**	0.350
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 040 ●●● ●●● ●D**	0.450
GBX 60	3:1, 4:1, 5:1 and 8:1	**GBX 060 ●●● ●●● ●D**	0.900
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 060 ●●● ●●● ●D**	1.100
GBX 80	3:1, 4:1, 5:1 and 8:1	**GBX 080 ●●● ●●● ●D**	2.100
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 080 ●●● ●●● ●D**	2.600
GBX 120	3:1, 4:1, 5:1 and 8:1	**GBX 120 ●●● ●●● ●D**	6.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 120 ●●● ●●● ●D**	8.000
GBX 160	3:1, 4:1, 5:1 and 8:1	**GBX 160 ●●● ●●● ●D**	18.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 160 ●●● ●●● ●D**	22.000

To order a GBX planetary gearbox, complete each reference with:

		GBX	●●●	●●●	●●●	●	B
Size	Junction box diameter (see associations table with BDH servo motor, pages 140 and 141)	40 mm	**040**				
		60 mm	**060**				
		80 mm	**080**				
		115 mm	**120**				
		160 mm	**160**				
Speed reduction ratio		3:1		**003**			
		4:1		**004**			
		5:1		**005**			
		8:1		**008**			
		9:1		**009**			
		12:1		**012**			
		15:1		**015**			
		16:1		**016**			
		20:1		**020**			
		25:1		**025**			
		32:1		**032**			
		40:1		**040**			
Associated BDH servo motor	Type	BDH 040			**040**		
		BDH 058			**058**		
		BDH 070			**070**		
		BDH 084			**084**		
		BDH 108			**108**		
		BDH 138			**138**		
	Model	BDH ●●●1				**1**	
		BDH ●●●2				**2**	
		BDH ●●●3				**3**	
		BDH ●●●4				**4**	
		BDH ●●●5				**5**	
BDH servo motor adaptation							**D**

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Lexium 15 motion control

BDH servo motors
Option: GBX planetary gearboxes

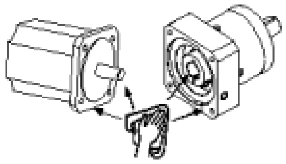
Mounting

No specialized tool is required to install the GBX planetary gearbox on the BDH servo motor. The general usage rules for mechanical mounting must be observed:

1 Clean support areas and joints.
2 Align the shafts to be linked and assemble in vertical position.
3 Join the servo motor flange to the gearbox flange in uniform manner, with cross tightening of the screws.
4 Using a torque wrench, tighten the TA ring following tightening torque (2...40 Nm according to the gearbox model).

For more information, consult the user instructions supplied with the products).

1



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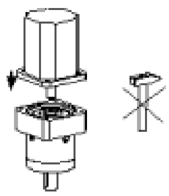

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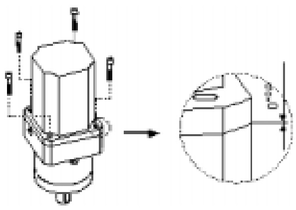

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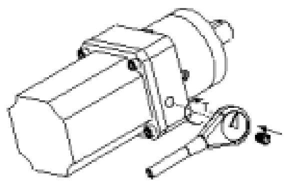

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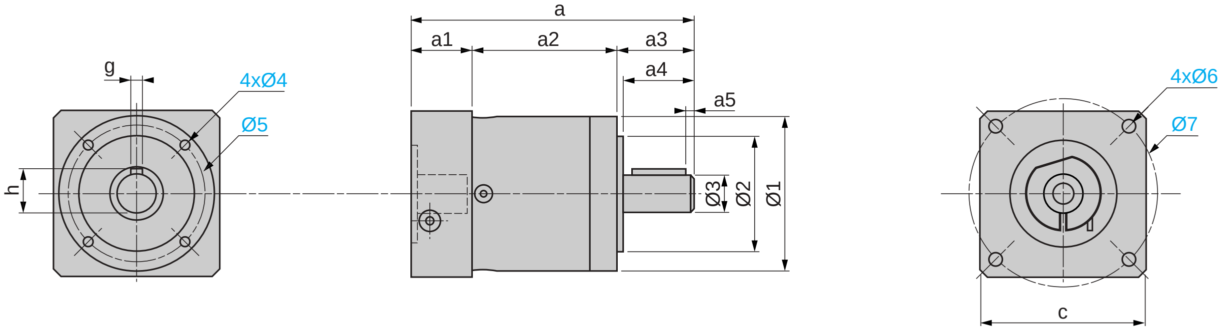
Lexium 15 motion control
BDH servo motors
Option: GBX planetary gearboxes

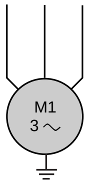
Dimensions

Servo motor assembly



GBX	c	a	a1	a2	a3	a4	a5	h	g	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7
040 003...008	40	93.5	28.5	39	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
040 009...032	40	106.5	28.5	52	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
060 003...008	60	106.5	24.5	47	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
060 009...040	60	118.5	24.5	59	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
080 003...008	90	134	33.5	60.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
080 009...032	90	151	33.5	77.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
120 003...008	115	176.5	47.5	74	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
120 009...040	115	203.5	47.5	101	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
160 003...008	140	255.5	64.5	104	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165
160 009...040	140	305	64.5	153.5	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165

Presentation:
pages 140 and 141
Characteristics:
page 142
References:
page 143



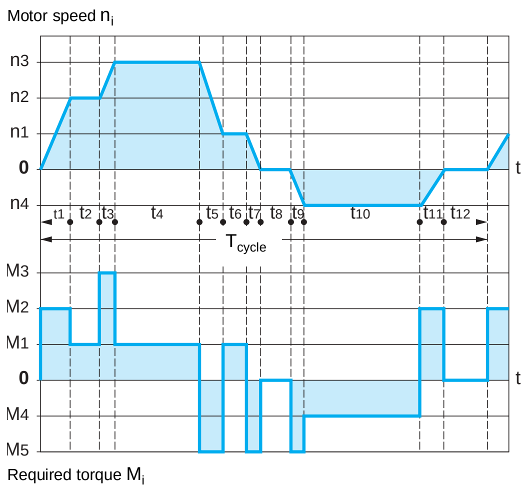
Sizing of BDH servo motors

To assist you in sizing your servo motor, the "**Lexium Sizer**" software tool is available on the website **www.telemecanique.com**

These 2 pages are to help you understand the method used for calculation.

To size the servo motor you need to know the equivalent thermal torque and the average speed required by the mechanics to be used with the servo motor.
Both values are calculated using the motor cycle trend diagram and can be compared with the speed/torque curves given for each servo motor (see BDH servo motor curves, pages 84 to 127).

Motor cycle trend diagram



The motor cycle is made up of various sub-cycles for which the duration of each is known.
Each sub-cycle is broken down into phases which correspond to the periods of time during which the motor torque is constant (1 to 3 phases maximum per sub-cycle).
This breakdown makes it possible to find out for each phase:

- The duration (t_j)
- The speed (n_i)
- The required torque value (M_i)

The curves on the left show the 4 phase types:

- Constant acceleration during t_1, t_3 and t_9
- At work during t_2, t_4, t_6 and t_{10}
- Constant deceleration during t_5, t_7 and t_{11}
- Motor stopped during t_8 and t_{12}

The total cycle duration is:

$T_{cycle} = t_1 + t_2 + t_3 + t_4 + t_5 + t_6 + t_7 + t_8 + t_9 + t_{10} + t_{11} + t_{12}$

Calculating the average speed n_{avg}

The average speed is calculated using the formula opposite with: $n_{avg} = \frac{\sum |ni| \cdot t_j}{\sum t_j}$

- n_i corresponds to the various work speeds.
- $\frac{ni}{2}$ corresponds to the average speeds during constant acceleration and deceleration phases.

In the above example:

Duration t_j	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}	t_{12}
Speed $\|ni\|$	$\frac{\|n2\|}{2}$	$\|n2\|$	$\frac{\|n3\| + \|n2\|}{2}$	$\|n3\|$	$\frac{\|n3\| + \|n1\|}{2}$	$\|n1\|$	$\frac{\|n1\|}{2}$	0	$\frac{\|n4\|}{2}$	$\|n4\|$	$\frac{\|n4\|}{2}$	0

The average speed is calculated as follows:

$$n_{moy} = \frac{\frac{n2}{2} \cdot t1 + n2 \cdot t2 + \frac{n3 + n2}{2} \cdot t3 + n3 \cdot t4 + \frac{n3 + n1}{2} \cdot t5 + n1 \cdot t6 + \frac{n1}{2} \cdot t7 + \frac{n4}{2} \cdot t9 + n4 \cdot t10 + \frac{n4}{2} \cdot t11}{Tcycle}$$

Calculating the equivalent thermal torque M_{eq}

The equivalent thermal torque is calculated using the following formula:

$$M_{eq} = \sqrt{\frac{\sum Mi^2 \cdot t_j}{Tcycle}}$$

In the above example, this formula gives the following calculation:

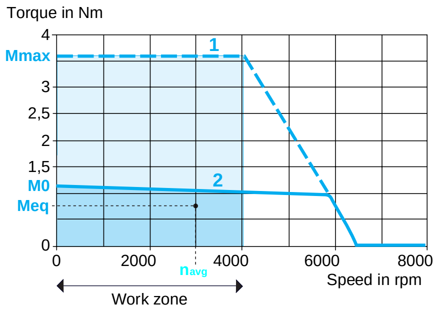
$$M_{eq} = \sqrt{\frac{M2^2 \cdot t1 + M1^2 \cdot t2 + M3^2 \cdot t3 + M1^2 \cdot t4 + M5^2 \cdot t5 + M1^2 \cdot t6 + M5^2 \cdot t7 + M5^2 \cdot t9 + M4^2 \cdot t10 + M2^2 \cdot t11}{Tcycle}}$$

Presentation:
pages 82 and 83

Characteristics:
pages 84 to 127

References:
pages 130 to 133

Dimensions:
pages 134 to 137



Sizing of BDH servo motors (continued)

Determining the size of the servo motor

The point defined by the 2 preceding calculations (average speed and equivalent thermal torque) where:

- the horizontal axis represents the average speed n_{avg}
- the vertical axis represents the thermal torque M_{eq}

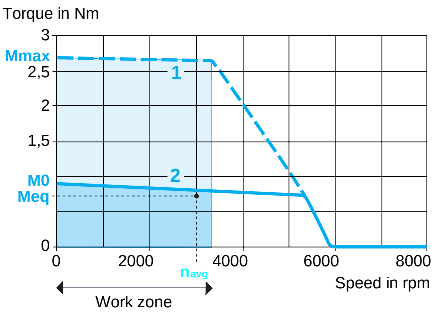
must be within the area bound by curve **2** and the work zone.

The motor cycle trend diagram must also be used to ensure that all torques M_i required for the different speeds n_i during the various cycle phases are within the area bound by curve **1** and the work zone.

1 Peak torque
2 Continuous torque

BSH servo motor with straight connectors

BSH servo motor with angled connectors



Presentation

BSH servo motors offer an excellent solution for dynamics and precision requirements. With five flange sizes and available in a variety of lengths, they are perfectly suited to most applications, covering a torque range of between 0.5 Nm to 90 Nm and speeds from 1250 to 8000 rpm.
Incorporating the latest technology in their windings, based on salient poles, BSH servo motors are far more compact than conventional servo motors.

BSH servo motors are available in five flange sizes: 55, 70, 100, 140 and 205 mm. Thermal protection is provided by a temperature probe integrated into the servo motor. They are certified as "Recognized" by the Underwriters Laboratories and conform to UL 1004 standards as well as to European directives (CE marking).

BSH servo motors are available with the following variants:
- IP 40 or IP 65 degree of protection
- with or without holding brake
- straight or angled connectors *(1)*
- SinCos Hiperface® single turn or multiturn encoders
- untapped or keyed shaft end

Torque/speed characteristics

BSH servo motors provide torque/speed curve profiles similar to the example shown on the left with:
1 Peak torque, depending on the servo drive model
2 Continuous torque, depending on the servo drive model
where:
- 8000 (in rpm) corresponds to the servo motor's maximum mechanical speed,
- M_{max} (in Nm) represents the peak stall torque value
- M_0 (in Nm) represents the continuous stall torque value

Principle for determining motor size according to the application

The torque/speed curves can be used to determine the correct servo motor size. For example, for a power supply voltage of 230 V single phase, the curves used are curves 1 and 2. Then:
1 Position the work zone of the application in relation to speed.
2 Verify, using the motor cycle trend diagram, that the torques required by the application during the different cycle phases are located within the area bound by curve 1 in the work zone.
3 Calculate the average speed n_{avg} and the equivalent thermal torque M_{eq} (see page 192).
4 The point defined by n_{avg} and M_{eq} must be located below curve 2 in the work zone.

***Note:** Sizing of servo motors, see page 192*

Functions

General functions

BSH servo motors were developed to meet the following requirements:
- Functional characteristics, robustness, safety, ... in compliance with IEC/EN 60034-1
- Ambient operating temperature: - 20...40°C according to DIN 50019R14. Maximum 55°C with derating from 40°C of 1% per additional °C
- Relative humidity: Class F according to DIN 400
- Altitude: 1000 m without derating, 2000 m with k = 0.86 *(2)*, 3000 m with k = 0.8
- Storage and transport temperature: - 25...70°C
- Winding insulation class: F (threshold temperature for windings 155°C) in compliance with DIN VDE 0530
- Power and sensor connection using straight or angled connectors *(1)*
- Thermal protection via built-in PTC thermistor probes, controlled by the Lexium 15 servo drive

(1) BSH 2052 ● and BSH 2053● servo motors are supplied with a power connection terminal and an angled connector for sensor connection
(2) k: derating factor

Characteristics: pages 150 to 177
References: pages 178 to 181
Dimensions: pages 182 to 185

Functions (continued)

General functions (continued)

■ Out-of-round, concentricity and perpendicularity between flange and shaft in accordance with DIN 42955, class N
■ Flange compliant with standard DIN 42948
■ Authorized mounting positions: no mounting restriction IMB5, IMV1 and IMV4 in accordance with DIN 42950
■ Polyester resin-based paint: Opaque black paint RAL 9005
■ Degree of protection:
□ of the frame: IP 65 in accordance with IEC/EN 60529
□ of the shaft end: IP 40 or IP 65 in accordance with IEC/EN 60529*(1)*
■ Integrated sensor: SinCos Hiperface® high resolution single turn or multiturn encoder
■ Standard sized untapped or keyed shaft end (according to DIN 42948)

Holding brake (depending on model)

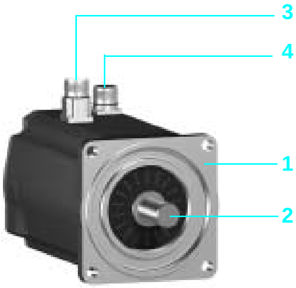
The integrated brake fitted to the BSH servo motors (depending on the model) is a failsafe electro-magnetic holding brake.

⚠ **Do not use the holding brake as a dynamic brake for deceleration, as this will rapidly damage the brake.**

Built-in sensor

The servo motor is fitted with a SinCos Hiperface® high resolution single turn (4096 points) or multiturn (4096 points x 4096 turns) absolute encoder providing angular precision of the shaft position, accurate to less than ±1.3 arc minutes.

This sensor performs the following functions:
■ Gives the angular position of the rotor in such a way that flows can be synchronized
■ Measures the servo motor speed via the associated Lexium servo drive. This information is used by the speed controller of the Lexium servo drive
■ Measures the position information for the Lexium servo drive position controller
■ Measures and transmits position information in incremental format for the position return of a motion control module (Encoder emulation output of the Lexium servo drive)



Description

BSH servo motors with a 3-phase stator and a 6- to 10-pole rotor (depending on model) with Neodymium Iron Borium (NdFeB) magnets consist of:
1 An axial flange with 4 fixing points in accordance with standard DIN 42948.
2 Standard shaft end according to DIN 42948, untapped or keyed (depending on model).
3 A straight dust and damp-proof male screw connector for connecting the power cable *(2)*.
4 A straight dust and damp-proof male screw connector for connecting the control (sensor) cable *(2)*.

Connecting cables must be ordered separately; for connection to Lexium 15 servo drives, see pages 180 and 181.

Schneider Electric has taken particular care to ensure compatibility between BSH servo motors and Lexium 15 servo drives. This compatibility can only be assured by using cables and connectors sold by Schneider Electric (see pages 180 and 181).

(1) IP 40 when motor is mounted in position IMV3 (vertical mounting, upper shaft end).
(2) Available in angled version for BSH 055●●, BSH 070●●, BSH 100●●, BSH 140●● and BSH 2051● servo motors. The BSH 2052 ● and BSH 2053● servo motors are supplied with a power connection terminal and an angled connector for the sensor connection.

Lexium 15 motion control
BSH servo motors

Characteristics of BSH 0551P/0551T servo motors

				BSH 0551P		BSH 0551T
Type of servo motor				**BSH 0551P**		**BSH 0551T**
Associated with Lexium 15 servo drive				**LXM 15LD13M3**	**LXM 15LU60N4**	**LXM 15LD13M3**
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	0.5		
	Peak stall	M_{max}	**Nm**	1.4		
Nominal operating point	Nominal torque		**Nm**	0.46		0.41
	Nominal speed		**rpm**	3200		7040
Maximum current			**A rms**	3.5		6.2

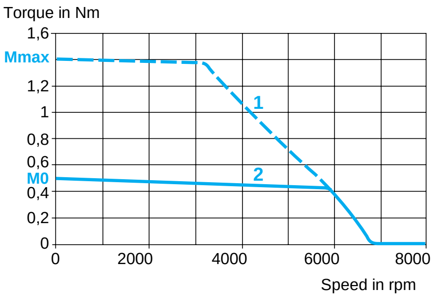
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000	
Constants (at 120°C)	Torque			**Nm/A rms**	0.5	0.28
	Back emf			**V_{rms}/krpm**	32	18
Rotor	Number of poles				6	
	Inertia	Without brake	J_m	**kgcm²**	0.09	
		With brake	J_m	**kgcm²**	0.1113	
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	33.8	11
	Inductance (phase/phase)			**mH**	37	12
	Electrical time constant			**ms**	1.09	
Holding brake (according to model)					See page 186	

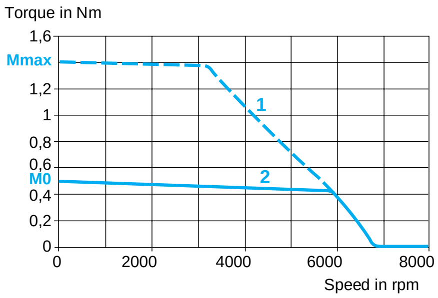
Torque/speed curves

BSH 0551P servo motor

With LXM 15LD13M3 servo drive
230 V single phase

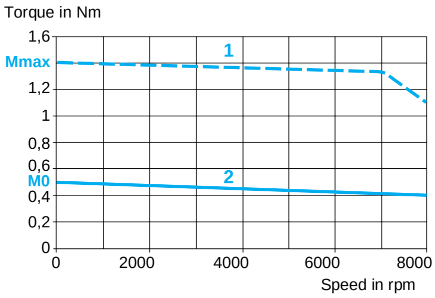


With LXM 15LU60N4 servo drive
230 V 3-phase



BSH 0551T servo motor

With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
pages 148 and 149
References:
pages 178 to 181
Dimensions:
pages 182 to 185

Characteristics of BSH 0552M/0552P servo motors

Type of servo motor				BSH 0552M		BSH 0552P		
Associated with Lexium 15 servo drive				**LXM 15LU60N4**		**LXM 15LD13M3**		**LXM 15LU60N4**
Line supply voltage			**V**	400 3-phase	480 3-phase	230 single phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	0.9		0.9		
	Peak stall	M_{max}	**Nm**	2.25		2.7		2.26
Nominal operating point	Nominal torque		**Nm**	0.8	0.77	0.8		0.78
	Nominal speed		**rpm**	3200	4080	3360		3760
Maximum current			**A rms**	2.4		5.9		

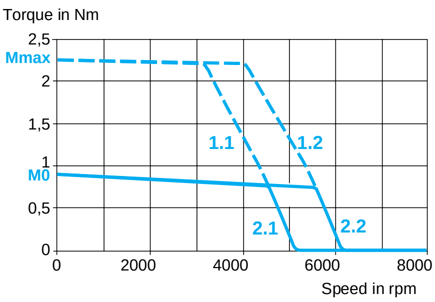
Servo motor characteristics

				BSH 0552M	BSH 0552P
Maximum mechanical speed			**rpm**	8000	
Constants (at 120°C)	Torque		**Nm/A rms**	1.125	0.56
	Back emf		**V_{rms}/krpm**	74	37
Rotor	Number of poles			6	
	Inertia – Without brake	J_m	**kgcm²**	0.14	
	Inertia – With brake	J_m	**kgcm²**	0.1613	0.1113
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	62.0	15.5
	Inductance (phase/phase)		**mH**	76.8	19.2
	Electrical time constant		**ms**	1.24	
Holding brake (according to model)				See page 186	

Torque/speed curves

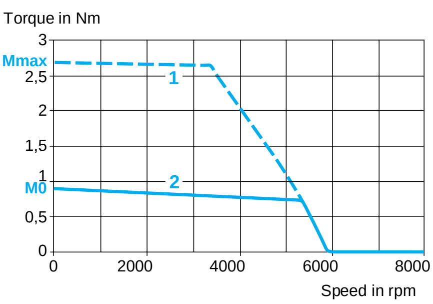
BSH 0552M servo motor

With LXM 15LU60N4 servo drive
400/480 V 3-phase

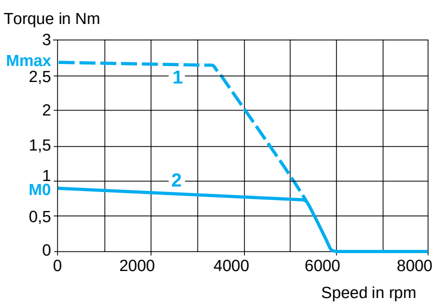


BSH 0552P servo motor

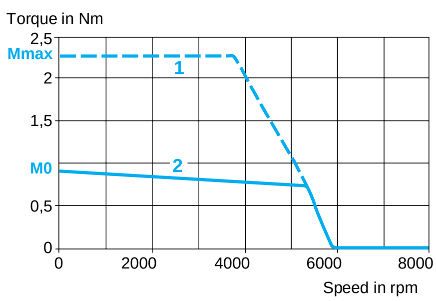
With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 0552T servo motors

Type of servo motor				**BSH 0552T**	
Associated with Lexium 15 servo drive				**LXM 15LD13M3**	
Line supply voltage			**V**	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	0.9	
	Peak stall	M_{max}	**Nm**	2.54	
Nominal operating point	Nominal torque		**Nm**	0.72	0.68
	Nominal speed		**rpm**	5920	7120
Maximum current			**A rms**	10.3	

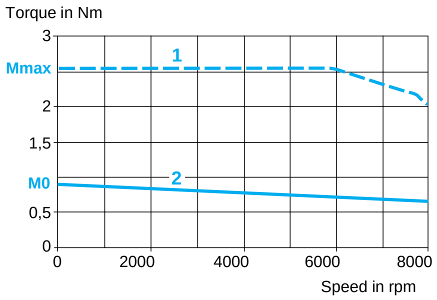
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	0.32
	Back emf			**V_{rms}/krpm**	21
Rotor	Number of poles				6
	Inertia	Without brake	J_m	**kgcm²**	0.14
		With brake	J_m	**kgcm²**	0.1613
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	5
	Inductance (phase/phase)			**mH**	6.2
	Electrical time constant			**ms**	1.24
Holding brake (according to model)					See page 186

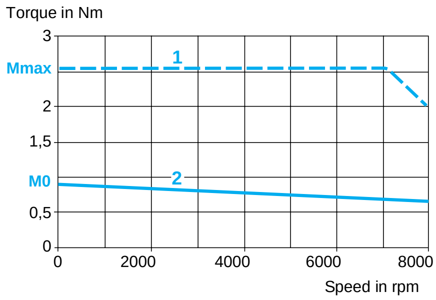
Torque/speed curves

BSH 0552T servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Characteristics of BSH 0553M/0553P servo motors

Type of servo motor				**BSH 0553M**		**BSH 0553P**		
Associated with Lexium 15 servo drive				**LXM 15LU60N4**		**LXM 15LD13M3**		**LXM 15LD10N4**
Line supply voltage			**V**	400 3-phase	480 3-phase	230 single phase	230 3-phase	400 3-phase
Torque	Continuous stall	M_0	**Nm**	1.3				
	Peak stall	M_{max}	**Nm**	3.5		4.2		3.87
Nominal operating point	Nominal torque		**Nm**	1.07	1.01	1.08	1.05	0.8
	Nominal speed		**rpm**	3360	4240	3200	3600	7280
Maximum current			**A rms**	3.6		8.7		

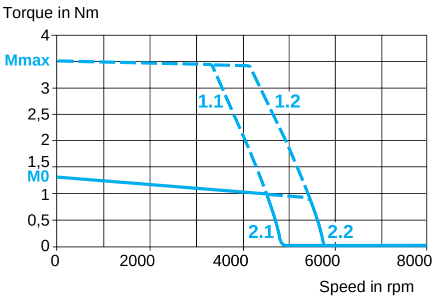
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000	
Constants (at 120°C)	Torque			**Nm/A rms**	1.18	0.59
	Back emf			**V_{rms}/krpm**	78	39
Rotor	Number of poles				6	
	Inertia	Without brake	J_m	**kgcm²**	0.19	
		With brake	J_m	**kgcm²**	0.2113	
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	32	8
	Inductance (phase/phase)			**mH**	48	12
	Electrical time constant			**ms**	1.5	
Holding brake (according to model)					See page 186	

Torque/speed curves

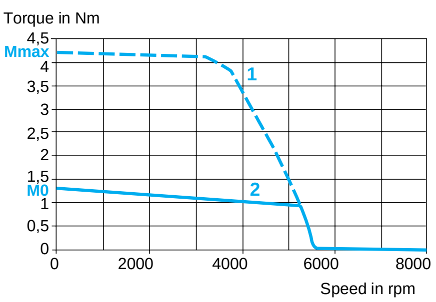
BSH 0553M servo motor

With LXM 15LU60N4 servo drive
400/480 V 3-phase

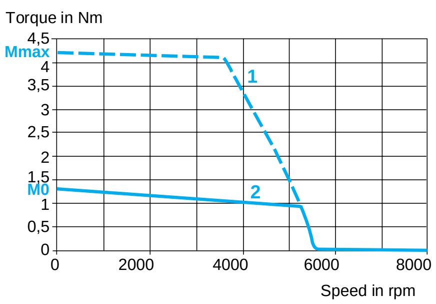


BSH 0553P servo motor

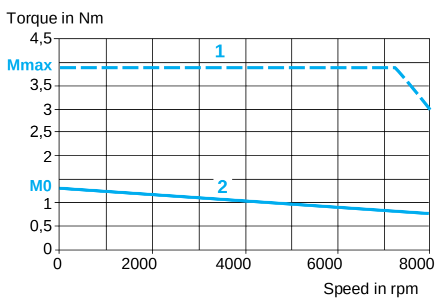
With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Lexium 15 motion control

BSH servo motors

Characteristics of BSH 0701T servo motors

Type of servo motor				**BSH 0701T**					
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD21M3**	**LXM 15LD10N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.4					
	Peak stall	M_{max}	**Nm**	3.19			2.91		
Nominal operating point	Nominal torque		**Nm**	1.25				1.23	
	Nominal speed		**rpm**	5040			5200	6000	
Maximum current			**A rms**	9.9					

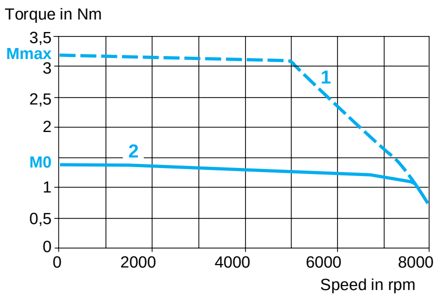
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	0.45
	Back emf		**V_{rms}/krpm**	26
Rotor	Number of poles			6
	Inertia – Without brake	J_m	**$kgcm^2$**	0.25
	Inertia – With brake	J_m	**$kgcm^2$**	0.322
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	3.4
	Inductance (phase/phase)		**mH**	14.1
	Electrical time constant		**ms**	4.15
Holding brake (according to model)				See page 186

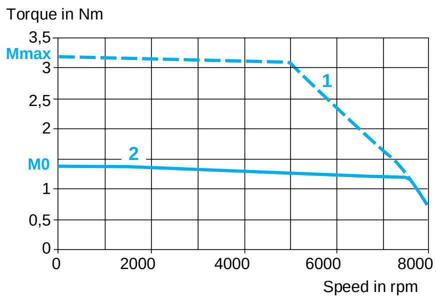
Torque/speed curves

BSH 0701T servo motor

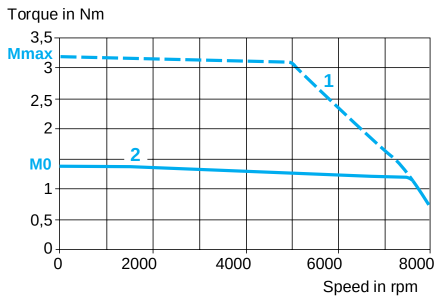
With LXM 15LD13M3 servo drive
230 V single phase



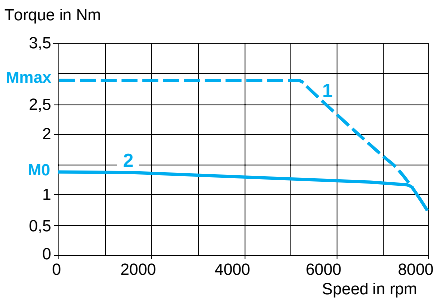
With LXM 15LD13M3 servo drive
230 V 3-phase



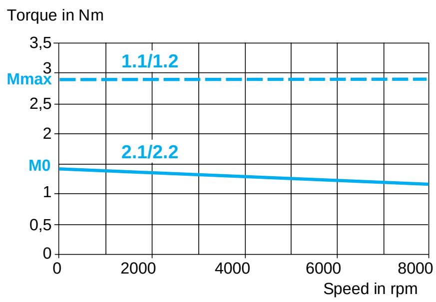
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

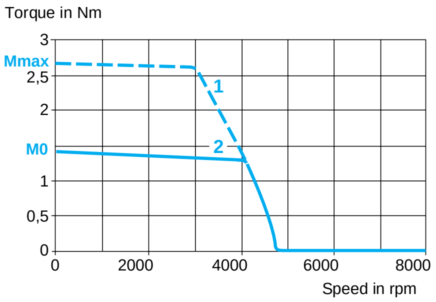
Characteristics of BSH 0701P servo motors

					BSH 0701P	
Type of servo motor					**BSH 0701P**	
Associated with Lexium 15 servo drive					**LXM 15LD13M3**	**LXM 15LU60N4**
Line supply voltage				**V**	230 single phase	230 3-phase
Torque	Continuous stall		M_0	**Nm**	1.41	
	Peak stall		M_{max}	**Nm**	2.66	
Nominal operating point	Nominal torque			**Nm**	1.31	1.32
	Nominal speed			**rpm**	2960	3040
Maximum current				**A rms**	5.3	
Servo motor characteristics						
Maximum mechanical speed				**rpm**	8000	
Constants (at 120°C)	Torque			**Nm/A rms**	0.78	
	Back emf			**V_{rms}/krpm**	46	
Rotor	Number of poles				6	
	Inertia	Without brake	J_m	**kgcm²**	0.25	
		With brake	J_m	**kgcm²**	0.322	
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	10.4	
	Inductance (phase/phase)			**mH**	42.6	
	Electrical time constant			**ms**	4.1	
Holding brake (according to model)					See page 186	

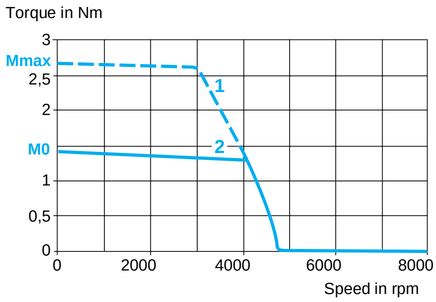
Torque/speed curves

BSH 0701P servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LU60N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Characteristics of BSH 0702M/0702P servo motors

Type of servo motor				BSH 0702M		BSH 0702P			
Associated with Lexium 15 servo drive				**LXM 15LU60N4**		**LXM 15LD13M3**	**LXM 15LD10N4**		
Line supply voltage			**V**	400 3-phase	480 3-phase	230 single phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	2.12		2.2			
	Peak stall	M_{max}	**Nm**	5.63			4.85		
Nominal operating point	Nominal torque		**Nm**	1.93	1.89	1.9	1.88	1.68	1.59
	Nominal speed		**rpm**	2400	2960	2880	3120	5680	6880
Maximum current			**A rms**	5.9		11.8			

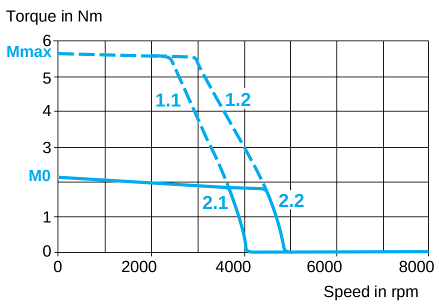
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000	
Constants (at 120°C)	Torque		**Nm/A rms**	1.46	0.77
	Back emf		**V_{rms}/krpm**	93	48
Rotor	Number of poles			6	
	Inertia	Without brake J_m	**kgcm²**	0.41	
		With brake J_m	**kgcm²**	0.482	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	17.3	4.2
	Inductance (phase/phase)		**mH**	84.4	19
	Electrical time constant		**ms**	4.88	4.52
Holding brake (according to model)				See page 186	

Torque/speed curves

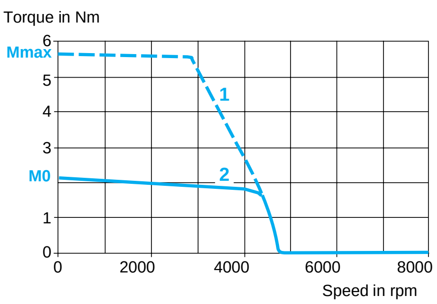
BSH 0702M servo motor

With LXM 15LU60N4 servo drive
400/480 V 3-phase

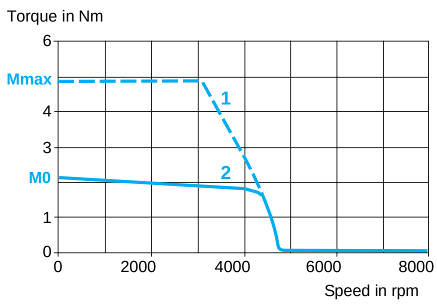


BSH 0702P servo motor

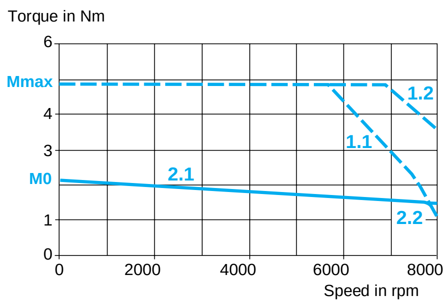
With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BSH 0702T servo motors

Type of servo motor			**BSH 0702T**	
Associated with Lexium 15 servo drive			**LXM 15LD21M3**	**LXM 15LD17N4**
Line supply voltage		**V**	230 3-phase	230 3-phase
Torque	Continuous stall M_0	**Nm**	2.12	
	Peak stall M_{max}	**Nm**	5.45	4.47
Nominal operating point	Nominal torque	**Nm**	1.71	1.66
	Nominal speed	**rpm**	5280	5920
Maximum current		**A rms**	20.6	

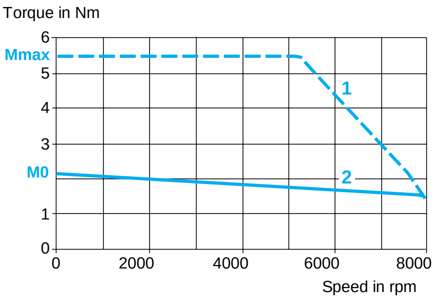
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	0.42
	Back emf		**V_{rms}/krpm**	28
Rotor	Number of poles			6
	Inertia	Without brake J_m	**kgcm²**	0.41
		With brake J_m	**kgcm²**	0.482
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.5
	Inductance (phase/phase)		**mH**	6.6
	Electrical time constant		**ms**	4.5
Holding brake (according to model)				See page 186

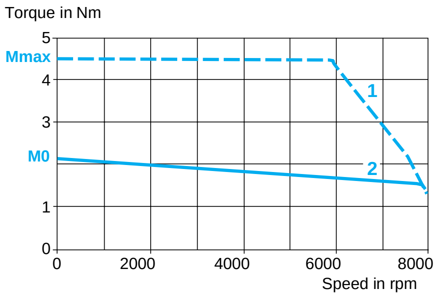
Torque/speed curves

BSH 0702T servo motor

With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
pages 148 and 149
References:
pages 178 to 181
Dimensions:
pages 182 to 185

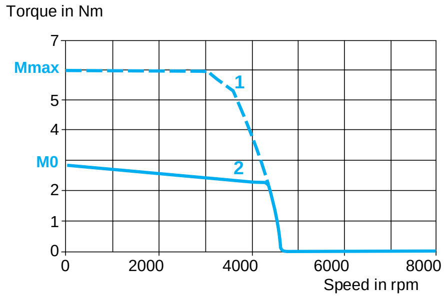
Characteristics of BSH 0703P/0703T servo motors

Type of servo motor				**BSH 0703P**					**BSH 0703T**
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**			**LXM 15LD28M3**
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	2.83					
	Peak stall	M_{max}	**Nm**	5.99	9.28	7.71			7.38
Nominal operating point	Nominal torque		**Nm**	2.4	2.48	2.41	2.11	1.96	2.08
	Nominal speed		**rpm**	2960	2560	2960	5360	6480	5520
Maximum current			**A rms**	15.2					30.9
Servo motor characteristics									
Maximum mechanical speed			**rpm**	8000					
Constants (at 120°C)	Torque		**Nm/A rms**	0.78					0.42
	Back emf		**V_{rms}/krpm**	49					29
Rotor	Number of poles			6					
	Inertia – Without brake	J_m	**$kgcm^2$**	0.58					
	Inertia – With brake	J_m	**$kgcm^2$**	0.81					
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	2.7					0.9
	Inductance (phase/phase)		**mH**	14.6					5
	Electrical time constant		**ms**	5.41					5.55
Holding brake (according to model)				See page 186					

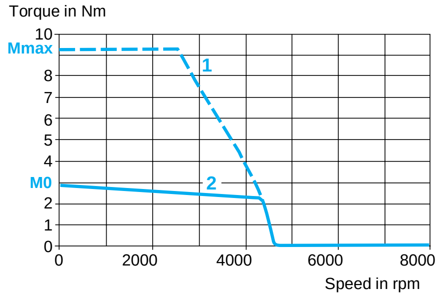
Torque/speed curves

BSH 0703P servo motor

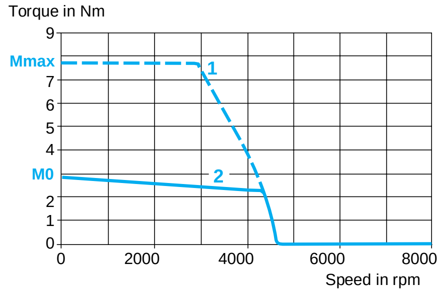
With LXM 15LD21M3 servo drive
230 V single phase



With LXM 15LD21M3 servo drive
230 V 3-phase

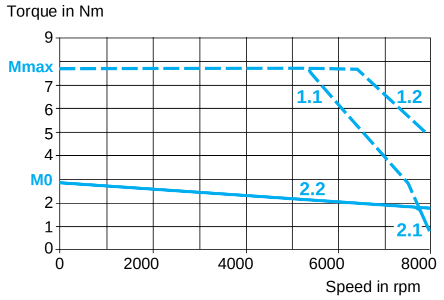


With LXM 15LD17N4 servo drive
230 V 3-phase



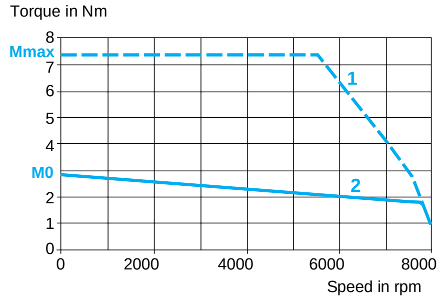
BSH 0703P servo motor

With LXM 15LD17N4 servo drive
400/480 V 3-phase



BSH 0703T servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

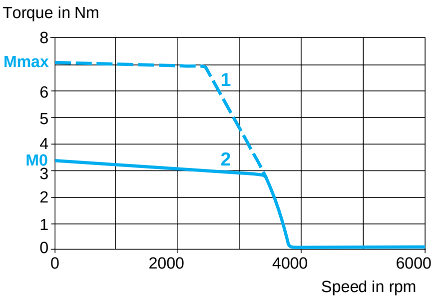
Characteristics of BSH 1001P/1001T servo motors

Type of servo motor				BSH 1001P			BSH 1001T
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD10N4**	**LXM 15LD28M3**
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	3.39			
	Peak stall	M_{max}	**Nm**	7.08		6.19	8.5
Nominal operating point	Nominal torque		**Nm**	3.01		2.99	2.77
	Nominal speed		**rpm**	2400		2580	3960
Maximum current			**A rms**	12			23
Servo motor characteristics							
Maximum mechanical speed			**rpm**	6000			
Constants (at 120°C)	Torque		**Nm/A rms**	0.89			0.51
	Back emf		**V_{rms}/krpm**	60			28
Rotor	Number of poles			8			
	Inertia – Without brake	J_m	**kgcm²**	1.4			
	Inertia – With brake	J_m	**kgcm²**	2.018			
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	3.8			0.9
	Inductance (phase/phase)		**mH**	19			4.3
	Electrical time constant		**ms**	5			4.78
Holding brake (according to model)				See page 186			

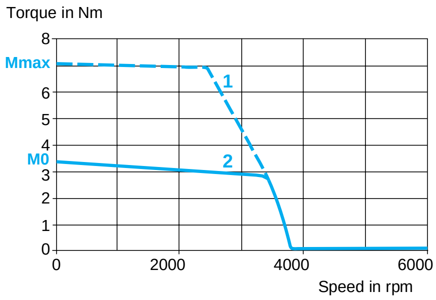
Torque/speed curves

BSH 1001P servo motor

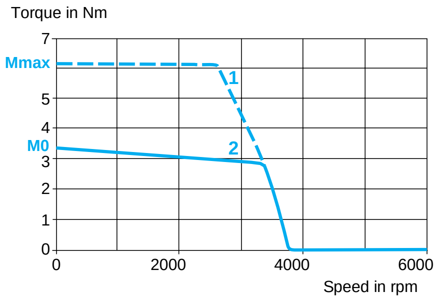
With LXM 15LD21M3 servo drive
230 V single phase



With LXM 15LD21M3 servo drive
230 V 3-phase

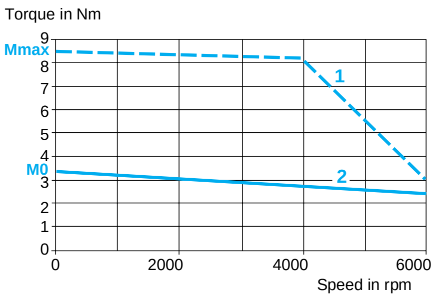


With LXM 15LD10N4 servo drive
230 V 3-phase



BSH 1001T servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

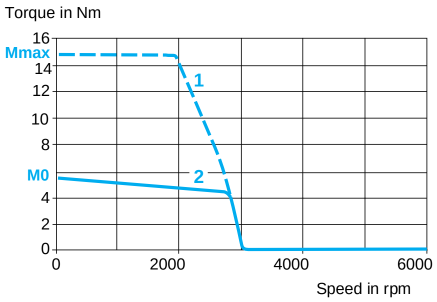
Characteristics of BSH 1002P/1002T servo motors

Type of servo motor			**BSH 1002P**			**BSH 1002T**
Associated with Lexium 15 servo drive			**LXM 15LD21M3**	**LXM 15LD17N4**		**LXM 15LD28M3**
Line supply voltage		**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase
Torque	Continuous stall M_0	**Nm**	5.8			5.5
	Peak stall M_{max}	**Nm**	14.79	12.13		11.59
Nominal operating point	Nominal torque	**Nm**	4.8	4.06	3.75	4
	Nominal speed	**rpm**	1920	3900	4740	4080
Maximum current		**A rms**	17.1			31.2
Servo motor characteristics						
Maximum mechanical speed		**rpm**	6000			
Constants (at 120°C)	Torque	**Nm/A rms**	1.21			0.64
	Back emf	**V_{rms}/krpm**	77			33
Rotor	Number of poles		8			
	Inertia – Without brake J_m	**kgcm²**	2.31			
	Inertia – With brake J_m	**kgcm²**	2.928			
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	2.4			0.6
	Inductance (phase/phase)	**mH**	13.5			2.9
	Electrical time constant	**ms**	5.63			4.83
Holding brake (according to model)			See page 186			

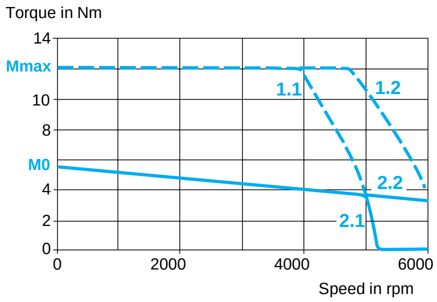
Torque/speed curves

BSH 1002P servo motor

With LXM 15LD21M3 servo drive
230 V 3-phase

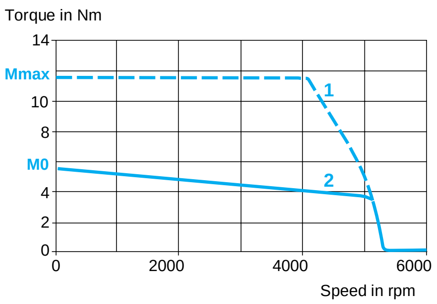


With LXM 15LD17N4 servo drive
400/480 V 3-phase



BSH 1002T servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

Characteristics of BSH 1003M servo motors

Type of servo motor				**BSH 1003M**		
Associated with Lexium 15 servo drive				**LXM 15LD10N4**	**LXM 15LD17N4**	
Line supply voltage			**V**	400 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	7.76		
	Peak stall	M_{max}	**Nm**	15.19	22.95	
Nominal operating point	Nominal torque		**Nm**	6.36	6.65	6.36
	Nominal speed		**rpm**	2040	1620	2040
Maximum current			**A rms**	15.6		

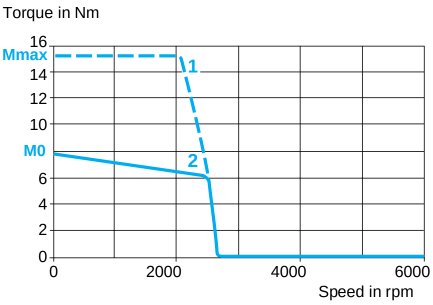
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	2.22
	Back emf			**V_{rms}/krpm**	144
Rotor	Number of poles				8
	Inertia	Without brake	J_m	**kgcm²**	3.22
		With brake	J_m	**kgcm²**	3.838
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	5.3
	Inductance (phase/phase)			**mH**	33.7
	Electrical time constant			**ms**	6.36
Holding brake (according to model)					See page 186

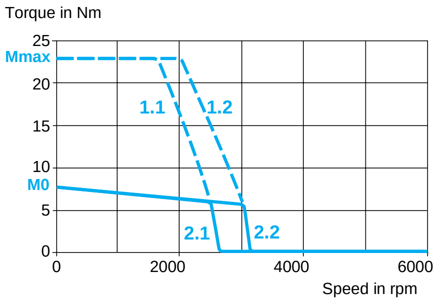
Torque/speed curves

BSH 1003M servo motor

With LXM 15LD10N4 servo drive
400 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

Characteristics of BSH 1003P servo motors

Type of servo motor				**BSH 1003P**			
Associated with Lexium 15 servo drive				**LXM 15LD28M3**	**LXM 15MD28N4**		**LXM 15MD40N4**	
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	7.8				
	Peak stall	M_{max}	**Nm**	19.69			23.17	
Nominal operating point	Nominal torque		**Nm**	6.32	5.13	4.6	5.34	4.8
	Nominal speed		**rpm**	2100	3840	4620	3540	4320
Maximum current			**A rms**	28.3				

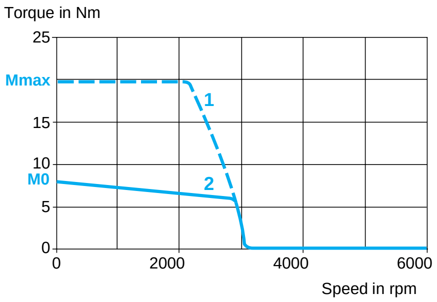
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	1.22
	Back emf			**V_{rms}/krpm**	77
Rotor	Number of poles				8
	Inertia	Without brake	J_m	**kgcm²**	3.22
		With brake	J_m	**kgcm²**	3.838
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	1.43
	Inductance (phase/phase)			**mH**	9.4
	Electrical time constant			**ms**	6.57
Holding brake (according to model)					See page 186

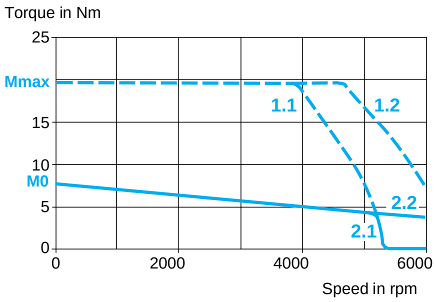
Torque/speed curves

BSH 1003P servo motor

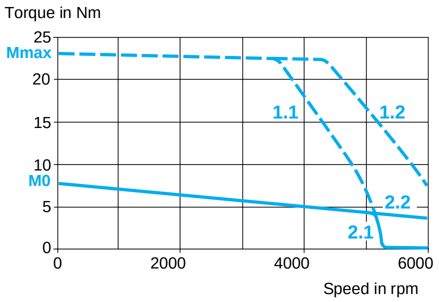
With LXM 15LD28M3 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
400/480 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

Telemecanique

Characteristics of BSH 1004M servo motors

Type of servo motor				**BSH 1004M**				
Associated with Lexium 15 servo drive				**LXM 15LD10N4**	**LXM 15LD17N4**		**LXM 15MD40N4**	
Line supply voltage			**V**	400 3-phase	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	9.31				
	Peak stall	M_{max}	**Nm**	19.8	29.87		34.17	
Nominal operating point	Nominal torque		**Nm**	8.13	8.31	8.05	8.35	8.13
	Nominal speed		**rpm**	1620	1380	1740	1320	1620
Maximum current			**A rms**	17.4				

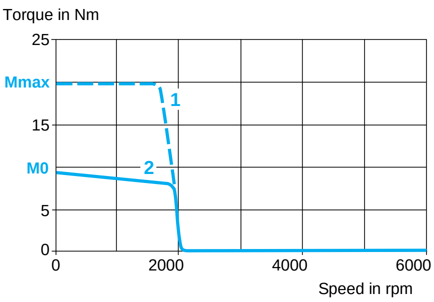
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000
Constants (at 120°C)	Torque			**Nm/A rms**	3
	Back emf			**V_{rms}/krpm**	195
Rotor	Number of poles				8
	Inertia	Without brake	J_m	**kgcm²**	4.22
		With brake	J_m	**kgcm²**	5.245
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	7.1
	Inductance (phase/phase)			**mH**	43.9
	Electrical time constant			**ms**	6.18
Holding brake (according to model)					See page 186

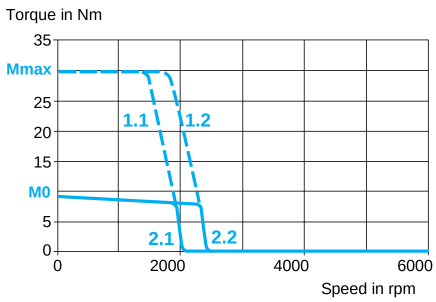
Torque/speed curves

BSH 1004M servo motor

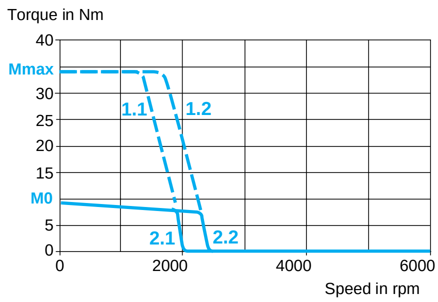
With LXM 15LD10N4 servo drive
400 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

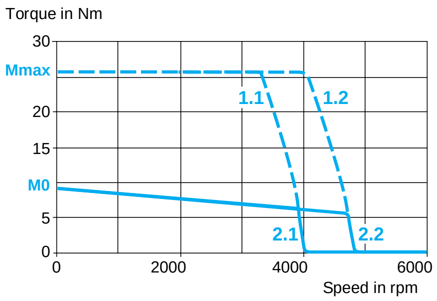
Characteristics of BSH 1004P/1004T servo motors

Type of servo motor			**BSH 1004P**					**BSH 1004T**
Associated with Lexium 15 servo drive			**LXM 15MD28N4**		**LXM 15MD40N4**			**LXM 15MD40N4**
Line supply voltage		**V**	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase	230 3-phase
Torque	Continuous stall M_0	**Nm**	9.31					
	Peak stall M_{max}	**Nm**	25.7		33.83			21.04
Nominal operating point	Nominal torque	**Nm**	6.91	6.5	8.18	7.17	6.69	6.8
	Nominal speed	**rpm**	3300	4020	1560	2940	3600	3480
Maximum current		**A rms**	34.8					61
Servo motor characteristics								
Maximum mechanical speed		**rpm**	6000					
Constants (at 120°C)	Torque	**Nm/A rms**	1.62					0.86
	Back emf	**V_{rms}/krpm**	103					50
Rotor	Number of poles		8					
	Inertia – Without brake J_m	**kgcm²**	4.22					
	Inertia – With brake J_m	**kgcm²**	5.245					
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	1.81					0.45
	Inductance (phase/phase)	**mH**	13					2.9
	Electrical time constant	**ms**	7.18					6.44
Holding brake (according to model)			See page 186					

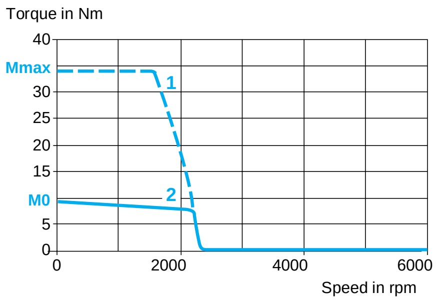
Torque/speed curves

BSH 1004P servo motor

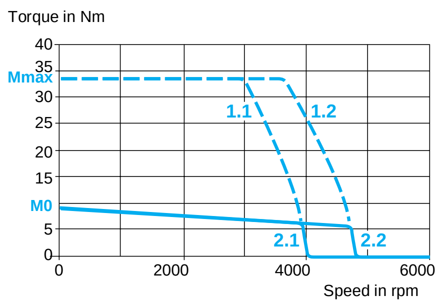
With LXM 15MD28N4 servo drive
400/480 V 3-phase



With LXM 15MD40N4 servo drive
230 V 3-phase

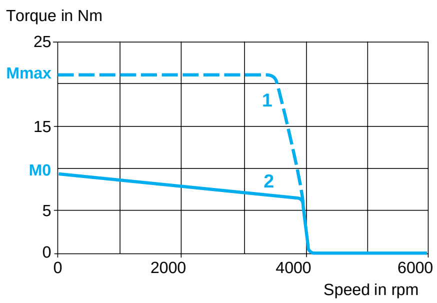


With LXM 15MD40N4 servo drive
400/480 V 3-phase



BSH 1004T servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

Characteristics of BSH 1401M/1401P servo motors

Type of servo motor				**BSH 1401M**		**BSH 1401P**			
Associated with Lexium 15 servo drive				**LXM 15MD28N4**		**LXM 15MD28N4**		**LXM 15MD40N4**	
Line supply voltage			**V**	400 3-phase	480 3-phase	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	11.1					
	Peak stall	M_{max}	**Nm**	26		23.33			
Nominal operating point	Nominal torque		**Nm**	10.4	10.1	7.63	6.8	7.63	6.8
	Nominal speed		**rpm**	1080	1320	2520	3080	2520	3080
Maximum current			**A rms**	10.8		20.8			

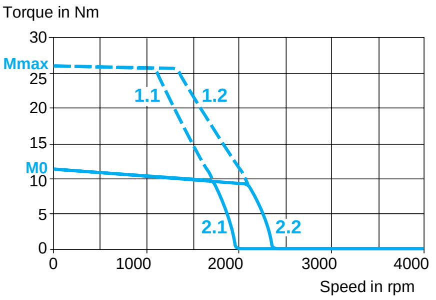
Servo motor characteristics

Maximum mechanical speed				**rpm**	4000	
Constants (at 120°C)	Torque			**Nm/A rms**	2.78	1.43
	Back emf			**V_{rms}/krpm**	194	100
Rotor	Number of poles				10	
	Inertia	Without brake	J_m	**kgcm²**	7.41	
		With brake	J_m	**kgcm²**	8.56	
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	5.3	1.41
	Inductance (phase/phase)			**mH**	60.85	16.34
	Electrical time constant			**ms**	11.59	
Holding brake (according to model)					See page 186	

Torque/speed curves

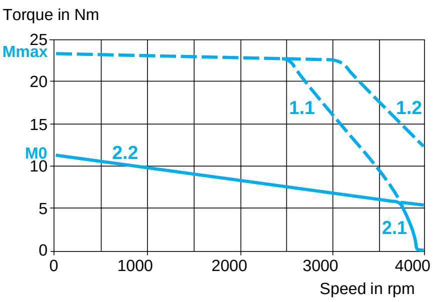
BSH 1401M servo motor

With LXM 15MD28N4 servo drive
400/480 V 3-phase

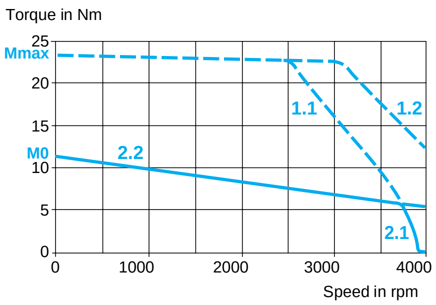


BSH 1401P servo motor

With LXM 15MD28N4 servo drive
400/480 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BSH 1401T servo motors

Type of servo motor				**BSH 1401T**
Associated with Lexium 15 servo drive				**LXM 15MD56N4**
Line supply voltage			**V**	230 3-phase
Torque	Continuous stall	M_0	**Nm**	11.1
	Peak stall	M_{max}	**Nm**	23.33
Nominal operating point	Nominal torque		**Nm**	7.63
	Nominal speed		**rpm**	2520
Maximum current			**A rms**	37.1

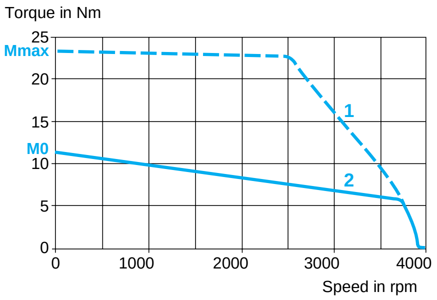
Servo motor characteristics

Maximum mechanical speed				**rpm**	4000
Constants (at 120°C)	Torque			**Nm/A rms**	0.83
	Back emf			**V_{rms}/krpm**	56
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	7.41
		With brake	J_m	**kgcm²**	8.56
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	0.4
	Inductance (phase/phase)			**mH**	5.15
	Electrical time constant			**ms**	12.88
Holding brake (according to model)					See page 186

Speed/torque curves

BSH 1401T servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

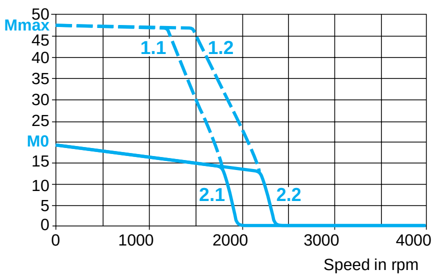
Characteristics of BSH 1402M/1402P servo motors

Type of servo motor					**BSH 1402M**		**BSH 1402P**			
Associated with Lexium 15 servo drive					**LXM 15MD40N4**		**LXM 15MD40N4**		**LXM 15MD56N4**	
Line supply voltage				**V**	400 3-phase	480 3-phase	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall		M_0	**Nm**	19.5					
	Peak stall		M_{max}	**Nm**	47.5		39.33		47.5	
Nominal operating point	Nominal torque			**Nm**	15.9	15	11.47	9.9	12.14	10.68
	Nominal speed			**rpm**	1200	1480	2760	3320	2520	3040
Maximum current				**A rms**	22.4		44.1			
Servo motor characteristics										
Maximum mechanical speed				**rpm**	4000					
Constants (at 120°C)	Torque			**Nm/A rms**	2.91		1.47			
	Back emf			**V_{rms}/krpm**	199		101			
Rotor	Number of poles				10					
	Inertia	Without brake	J_m	**kgcm²**	12.68					
		With brake	J_m	**kgcm²**	13.83					
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	2.3		0.6			
	Inductance (phase/phase)			**mH**	29.79		7.71			
	Electrical time constant			**ms**	12.85					
Holding brake (according to model)					See page 186					

Torque/speed curves

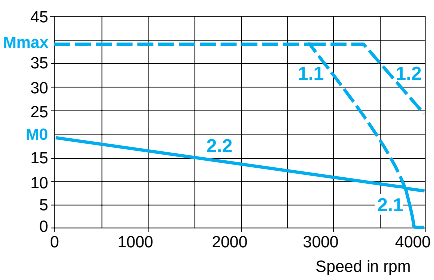
BSH 1402M servo motor

With LXM 15MD40N4 servo drive
400/480 V 3-phase

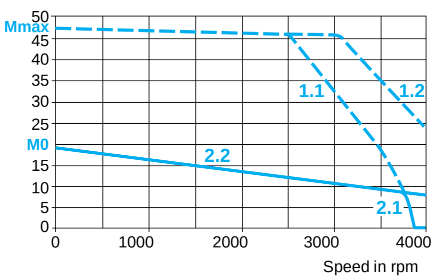


BSH 1402P servo motor

With LXM 15MD40N4 servo drive
400/480 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BSH 1403M/1403P servo motors

Type of servo motor				BSH 1403M		BSH 1403P	
Associated with Lexium 15 servo drive				LXM 15MD40N4		LXM 15MD56N4	
Line supply voltage			**V**	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	27.8			
	Peak stall	M_{max}	**Nm**	71.76		57.32	
Nominal operating point	Nominal torque		**Nm**	21.48	20.67	13.81	11.39
	Nominal speed		**rpm**	1160	1400	2680	3240
Maximum current			**A rms**	31.3		61	

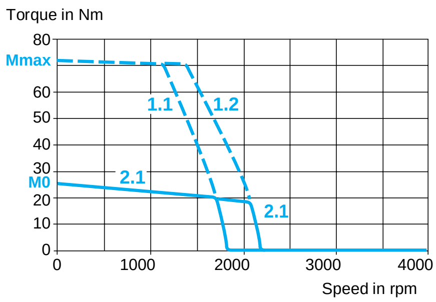
Servo motor characteristics

Maximum mechanical speed			**rpm**	4000	
Constants (at 120°C)	Torque		**Nm/A rms**	3.09	1.59
	Back emf		**V_{rms}/krpm**	205	105
Rotor	Number of poles			10	
	Inertia – Without brake	J_m	**kgcm²**	17.94	
	Inertia – With brake	J_m	**kgcm²**	23.44	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.52	0.4
	Inductance (phase/phase)		**mH**	20.3	5.32
	Electrical time constant		**ms**	13.31	13.3
Holding brake (according to model)				See page 186	

Torque/speed curves

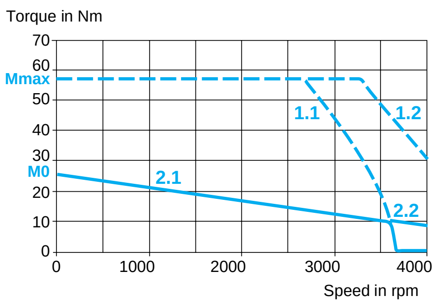
BSH 1403M servo motor

With LXM 15MD40N4 servo drive
400/480 V 3-phase



BSH 1403P servo motor

With LXM 15MD56N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 1404M servo motors

Type of servo motor			**BSH 1404M**			
Associated with Lexium 15 servo drive			**LXM 15MD40N4**		**LXM 15MD56N4**	
Line supply voltage		**V**	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall M_0	**Nm**	33.4			
	Peak stall M_{max}	**Nm**	82.32		95	
Nominal operating point	Nominal torque	**Nm**	26.5	25.4	26.92	25.5
	Nominal speed	**rpm**	1160	1400	1080	1320
Maximum current		**A rms**	47.8			

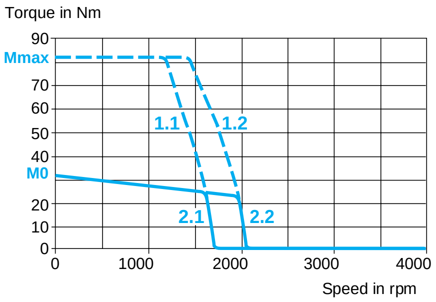
Servo motor characteristics

Maximum mechanical speed				**rpm**	4000
Constants (at 120°C)	Torque			**Nm/A rms**	3.12
	Back emf			**V_{rms}/krpm**	208
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	23.7
		With brake	J_m	**kgcm²**	29.2
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	1.12
	Inductance (phase/phase)			**mH**	16.28
	Electrical time constant			**ms**	14.54
Holding brake (according to model)					See page 186

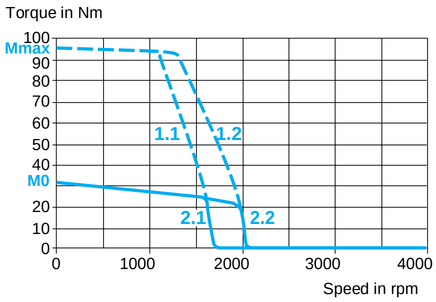
Torque/speed curves

BSH 1404M servo motor

With LXM 15MD40N4 servo drive
400/480 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 2051M servo motors

Type of servo motor				**BSH 2051M**					
Associated with Lexium 15 servo drive				**LXM 15MD40N4**		**LXM 15MD56N4**		**LXM 15HC11N4X**	
Line supply voltage			**V**	400 3-phase	480 3-phase	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	36					
	Peak stall	M_{max}	**Nm**	68.33					
Nominal operating point	Nominal torque		**Nm**	32	31.2	32	31.2	32.3	31.3
	Nominal speed		**rpm**	1500	1700	1500	1700	1500	1700
Maximum current			**A rms**	40.4					

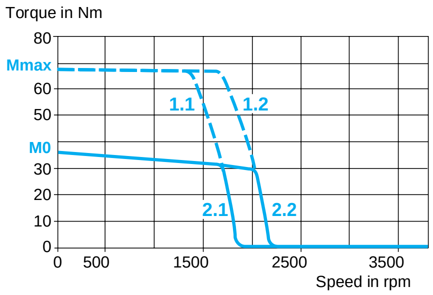
Servo motor characteristics

Maximum mechanical speed				**rpm**	3800
Constants (at 120°C)	Torque			**Nm/A rms**	3.1
	Back emf			**V_{rms}/krpm**	208
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	77
		With brake	J_m	**kgcm²**	93
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	1.1
	Inductance (phase/phase)			**mH**	21.3
	Electrical time constant			**ms**	19.4
Holding brake (according to model)					See page 186

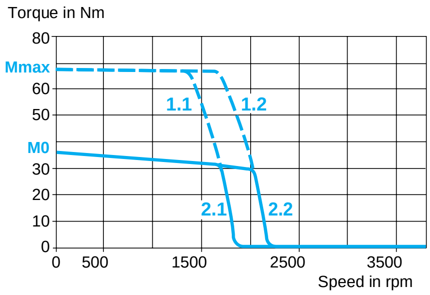
Torque/speed curves

BSH 2051M servo motor

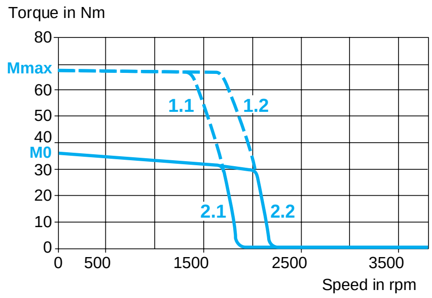
With LXM 15MD40N4 servo drive
400/480 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



With LXM 15HC11N4X servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BSH 2051P servo motors

Type of servo motor				**BSH 2051P**		
Associated with Lexium 15 servo drive				**LXM 15HC11N4X**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	36		
	Peak stall	M_{max}	**Nm**	82		
Nominal operating point	Nominal torque		**Nm**	31.9	28.2	27
	Nominal speed		**rpm**	1444	2622	3192
Maximum current			**A rms**	78.1		

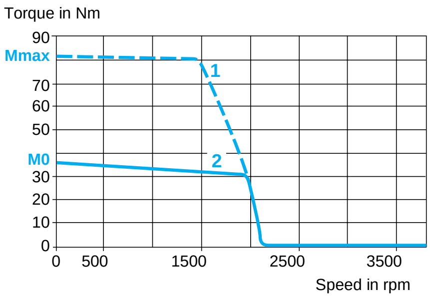
Servo motor characteristics

Maximum mechanical speed			**rpm**	3800
Constants (at 120°C)	Torque		**Nm/A rms**	1.6
	Back emf		**V_{rms}/krpm**	104
Rotor	Number of poles			10
	Inertia Without brake	J_m	**kgcm²**	77
	With brake	J_m	**kgcm²**	93
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.3
	Inductance (phase/phase)		**mH**	5.7
	Electrical time constant		**ms**	19
Holding brake (according to model)				See page 186

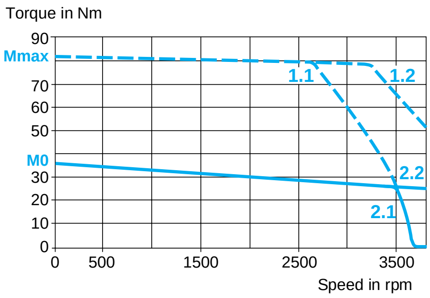
Torque/speed curves

BSH 2051P servo motor

With LXM 15HC11N4X servo drive
230 V 3-phase



With LXM 15HC11N4X servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BSH 2052M servo motors

Type of servo motor				**BSH 2052M**					
Associated with Lexium 15 servo drive				**LXM 15HC11N4X**			**LXM 15HC20N4X**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	65					
	Peak stall	M_{max}	**Nm**	200					
Nominal operating point	Nominal torque		**Nm**	56.5	49	45.6	56.5	49	45.6
	Nominal speed		**rpm**	500	1000	1300	500	1000	1300
Maximum current			**A rms**	49.6					

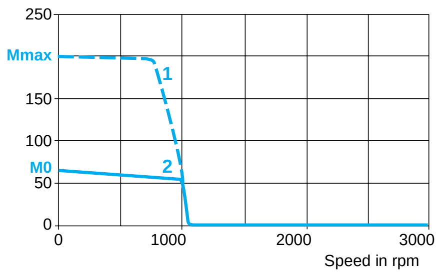
Servo motor characteristics

Maximum mechanical speed			**rpm**	3800
Constants (at 120°C)	Torque		**Nm/A rms**	5.04
	Back emf		**V_{rms}/krpm**	314
Rotor	Number of poles			10
	Inertia – Without brake	J_m	**kgcm²**	129
	Inertia – With brake	J_m	**kgcm²**	145
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.1
	Inductance (phase/phase)		**mH**	20.6
	Electrical time constant		**ms**	18.72
Holding brake (according to model)				See page 186

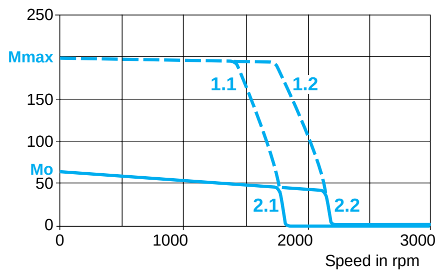
Torque/speed curves

BSH 2052M servo motor

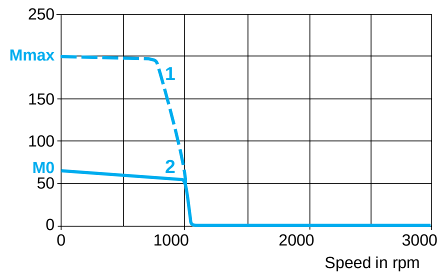
With LXM 15HC11N4X servo drive
230 V 3-phase



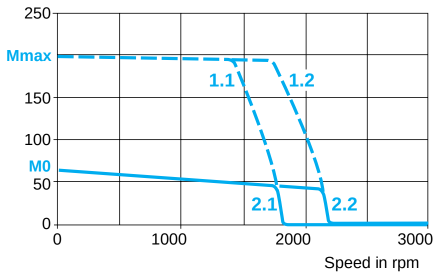
With LXM 15HC11N4X servo drive
400/480 V 3-phase



With LXM 15HC20N4X servo drive
230 V 3-phase



With LXM 15HC20N4X servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BSH 2052P servo motors

Type of servo motor				**BSH 2052P**					
Associated with Lexium 15 servo drive				**LXM 15HC11N4X**			**LXM 15HC20N4X**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	65					
	Peak stall	M_{max}	**Nm**	118.54			193.45		
Nominal operating point	Nominal torque		**Nm**	55	49		56	49.32	49
	Nominal speed		**rpm**	1000	2000		1000	2000	3000
Maximum current			**A rms**	96.8					

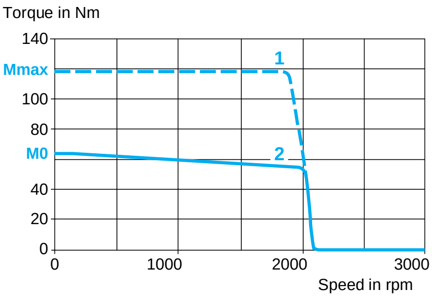
Servo motor characteristics

Maximum mechanical speed				**rpm**	3800
Constants (at 120°C)	Torque			**Nm/A rms**	2.58
	Back emf			**V_{rms}/krpm**	161
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	129
		With brake	J_m	**kgcm²**	145
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	0.3
	Inductance (phase/phase)			**mH**	5.4
	Electrical time constant			**ms**	18
Holding brake (according to model)					See page 186

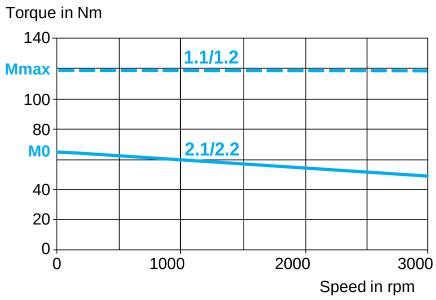
Torque/speed curves

BSH 2052P servo motor

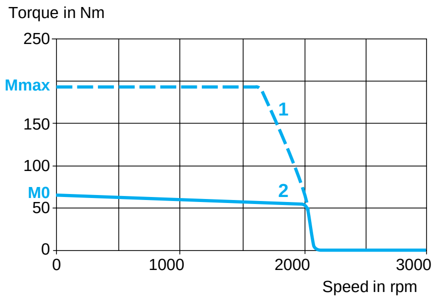
With LXM 15HC11N4X servo drive
230 V 3-phase



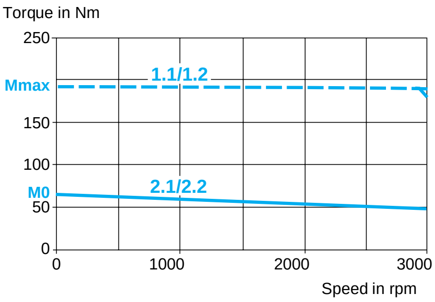
With LXM 15HC11N4X servo drive
400/480 V 3-phase



With LXM 15HC20N4X servo drive
230 V 3-phase



With LXM 15HC20N4X servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BSH 2053M servo motors

Type of servo motor				**BSH 2053M**					
Associated with Lexium 15 servo drive				**LXM 15HC11N4X**			**LXM 15HC20N4X**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	90					
	Peak stall	M_{max}	**Nm**	227.18			300		
Nominal operating point	Nominal torque		**Nm**	80.2	70.45	64.6	80.2	70.45	64.6
	Nominal speed		**rpm**	500	1000	1300	500	1000	1300
Maximum current			**A rms**	68					

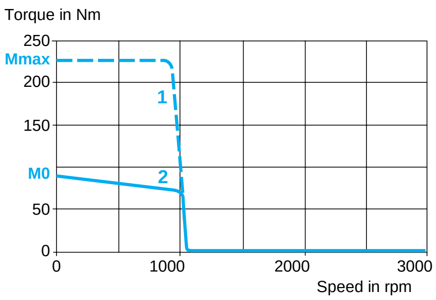
Servo motor characteristics

Maximum mechanical speed				**rpm**	3800
Constants (at 120°C)	Torque			**Nm/A rms**	5.5
	Back emf			**V_{rms}/krpm**	344
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	182
		With brake	J_m	**kgcm²**	196
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	0.8
	Inductance (phase/phase)			**mH**	16.8
	Electrical time constant			**ms**	20
Holding brake (according to model)					See page 186

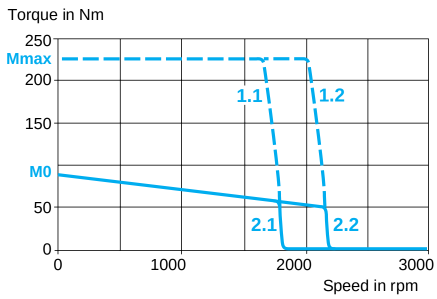
Torque/speed curves

BSH 2053M servo motor

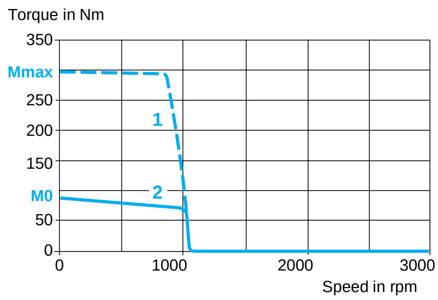
With LXM 15HC11N4X servo drive
230 V 3-phase



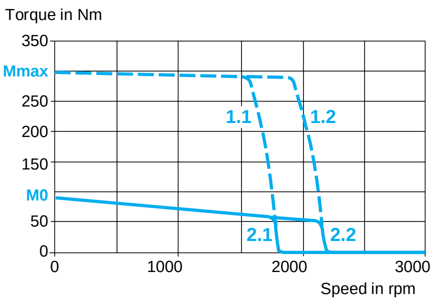
With LXM 15HC11N4X servo drive
400/480 V 3-phase



With LXM 15HC20N4X servo drive
230 V 3-phase



With LXM 15HC20N4X servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

Characteristics of BSH 2053P servo motors

Type of servo motor					**BSH 2053P**		
Associated with Lexium 15 servo drive					**LXM 15HC20N4X**		
Line supply voltage				**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall		M_0	**Nm**	90		
	Peak stall		M_{max}	**Nm**	202.96		
Nominal operating point	Nominal torque			**Nm**	70.45	37.37	
	Nominal speed			**rpm**	1000	2000	
Maximum current				**A rms**	136.1		

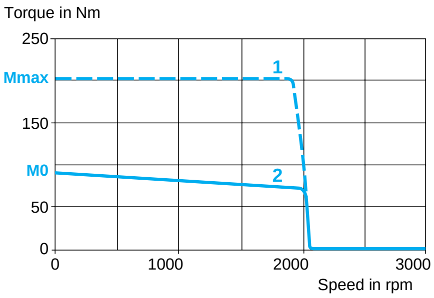
Servo motor characteristics

Maximum mechanical speed				**rpm**	3800
Constants (at 120°C)	Torque			**Nm/A rms**	2.76
	Back emf			**V_{rms}/krpm**	172
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	182
		With brake	J_m	**kgcm²**	196
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	0.2
	Inductance (phase/phase)			**mH**	4.2
	Electrical time constant			**ms**	21
Holding brake (according to model)					See page 186

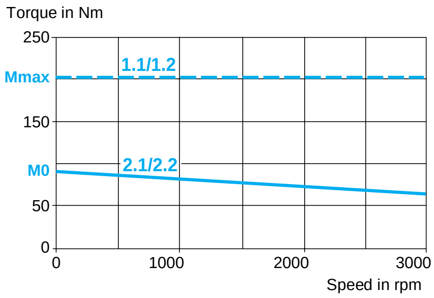
Torque/speed curves

BSH 2053P servo motor

With LXM 15HC20N4X servo drive
230 V 3-phase



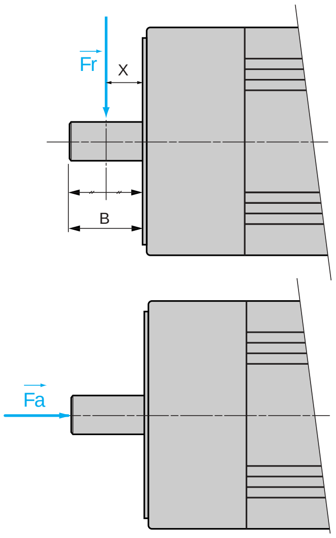
With LXM 15HC20N4X servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase



Radial and axial forces permitted on the motor shaft

Even when the servo motors are used under optimum conditions, their service life is limited by that of the bearings.

Conditions	
Nominal service life of bearings *(1)*	L_{10h} = 20,000 hours
Ambiant temperature (temperature of bearings ~ 100°C)	40°C
Force application point	Fr applied at the middle point of the shaft end X = B/2 (dimension B, see pages 182 to 185)

(1) Hours of use with a failure probability of 10%

The following conditions must be adhered to:

- Radial and axial forces must not be applied simultaneously
- Shaft end with IP 40 or IP 65 degree of protection
- The bearings cannot be changed by the user as the built-in position sensor must be realigned if the unit is dismantled.

			Maximum radial force Fr							
Mechanical speed		**rpm**	**1000**	**2000**	**3000**	**4000**	**5000**	**6000**	**7000**	**8000**
Servo motor	BSH 0551	**N**	340	270	240	220	200	190	180	170
	BSH 0552	**N**	370	290	260	230	220	200	190	190
	BSH 0553	**N**	390	310	270	240	230	210	200	190
	BSH 0701	**N**	660	520	460	410	380	360	–	–
	BSH 0702	**N**	710	560	490	450	410	390	–	–
	BSH 0703	**N**	730	580	510	460	430	400	–	–
	BSH 1001	**N**	900	720	630	570	530	–	–	–
	BSH 1002	**N**	990	790	690	620	–	–	–	–
	BSH 1003	**N**	1050	830	730	660	–	–	–	–
	BSH 1004	**N**	1070	850	740	–	–	–	–	–
	BSH 1401	**N**	2210	1760	1530	–	–	–	–	–
	BSH 1402	**N**	2430	1930	1680	–	–	–	–	–
	BSH 1403	**N**	2560	2030	1780	–	–	–	–	–
	BSH 1404	**N**	2660	2110	1840	–	–	–	–	–
	BSH 2051	**N**	3730	2960	2580	–	–	–	–	–
	BSH 2052	**N**	4200	3330	2910	–	–	–	–	–
	BSH 2053	**N**	4500	3570	3120	–	–	–	–	–
			Maximum axial force: Fa = 0.2 x Fr							

Characteristics of servo motor/servo drive power connection cables

Cables fitted with a connector on servo motor side

Cable type		**VW3 M5 101 R●●●**	**VW3 M5 103 R●●●**
External sleeve, insulation		PUR orange coloured RAL 2003, TPM or PP/PE	
Capacity	**pF/m**	< 70 (conductors/shielding)	
Number of conductors (shielded)		[(4 x 1.5 mm²) + (2 x 1 mm²)]	[(4 x 4 mm²) + (2 x 1 mm²)]
Connector type		1 industrial connector (on BSH servo motor side) and 1 free wire end (on Lexium 15 LP and 15 HP servo drive side)	
External diameter	**mm**	12 ± 0.2	16.3 ± 0.3
Curvature radius	**mm**	90, suitable for daisy-chaining, cable carrier system	125, suitable for daisy-chaining, cable carrier system
Working voltage	**V**	600	
Maximum usable length	**m**	50, for connection with a Lexium 15 LP servo drive 100, for connection with a Lexium 15 HP servo drive	
Operating temperature	**°C**	- 40...+ 90 (fixed), - 20…+ 80 (mobile)	
Certification		UL, CSA, VDE, CE, DESINA	

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

Characteristics of servo motor/servo drive power connection cables (continued)

Cables fitted with a connector on both the servo motor and servo drive sides

Cable type		VW3 M5 201 R●●●	VW3 M5 202 R●●●	VW3 M5 203 R●●●
External sleeve, insulation		PUR orange coloured RAL 2003, TPM or PP/PE		
Capacity	pF/m	< 70 (conductors/shielding)		
Number of conductors (shielded)		[(4 x 1.5 mm²) + (2 x 1 mm²)]	[(4 x 2.5 mm²) + (2 x 1 mm²)]	[(4 x 4 mm²) + (2 x 1 mm²)]
Connector type		1 industrial connector (BSH servo motor side) and 1 removable 6-way connecteur (Lexium 15 MP servo drives side)		
External diameter	mm	12 ± 0.2	14.3 ± 0.3	16.3 ± 0.3
Curvature radius	mm	90, suitable for daisy-chaining, cable-carrier system	110, suitable for daisy-chaining, cable-carrier system	125, suitable for daisy-chaining, cable-carrier system
Working voltage	V	600		
Maximum usable length	m	100, for connection with a Lexium 15 MP servo drive		
Operating temperature	°C	- 40...+ 90 (fixed), - 20…+ 80 (mobile)		
Certification		UL, CSA, VDE, CE, DESINA		

Cables

Cable type		VW3 M5 304 R●●●●
External sleeve, insulation		PUR orange coloured RAL 2003, TPM or PP/PE
Capacity	pF/m	< 70 (conductors/shielding)
Number of conductors (shielded)		[(4 x 10 mm²) + (2 x 1 mm²)]
Connector type		Without connectors; cable for connection of BSH 2052 and BSH 2053 servo motors (terminal) with Lexium 15 HP servo drive (terminal)
External diameter	mm	18 ± 0.3
Curvature radius	mm	135, suitable for daisy-chaining, cable-carrier system
Working voltage	V	600
Maximum usable length	m	100
Operating temperature	°C	- 40...+ 90 (fixed), - 20…+ 80 (mobile)
Certification		UL, CSA, VDE, CE, DESINA

Characteristics of the servo motor/servo drive control connection cables

Cable type		VW3 M8 301 R●●●
Sensor		SinCos Hiperface® encoder
External sleeve, insulation		PUR green coloured RAL 6018, polyester
Number of conductors (shielded)		5 x (2 x 0.25 mm²) + (2 x 0.5 mm²)
External diameter	mm	8.8 ± 0.2
Connector type		1 industrial connector (servo motor side) and 1 x 15-way SUB-D male connector (servo drive side)
Min. curvature radius	mm	68, suitable for daisy-chaining, cable-carrier system
Working voltage	V	350 (0.25 mm²), 500 (0.5 mm²)
Operating temperature	°C	- 50…+ 90 (fixed), - 40...+ 80 (mobile)
Certification		UL, CSA, VDE, CE, DESINA

Presentation:
pages 148 and 149

References:
pages 180 and 181

Dimensions:
pages 182 to 185

Lexium 15 motion control

BSH servo motors

BSH servo motors

The BSH servo motors shown below are not equipped with gearboxes.
For GBX gearboxes see page 190.

105990

BSH 055●●

105991

BSH 070●●

105992

BSH 100●●

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 15	Maximum nominal speed *(1)*	Reference *(2)*	Weight *(3)*
Nm	Nm	rpm		rpm		kg
0.5	1.4	8000	LD13M3	3200	**BSH 0551P ●●●●A**	0.800
			LU60N4	3200		
			LD13M3	7040	**BSH 0551T ●●●●A**	0.800
0.9	2.25	8000	LU60N4	4080	**BSH 0552M ●●●●A**	1.100
	2.26	8000	LU60N4	3760	**BSH 0552P ●●●●A**	1.100
	2.54	8000	LD13M3	7120	**BSH 0552T ●●●●A**	1.100
	2.7	8000	LD13M3	3360	**BSH 0552P ●●●●A**	1.100
1.3	3.5	8000	LU60N4	4240	**BSH 0553M ●●●●A**	1.400
	3.87	8000	LD10N4	7280	**BSH 0553P ●●●●A**	1.400
	4.2	8000	LD13M3	3600		
1.4	2.91	8000	LD10N4	6000	**BSH 0701T ●●●●A**	2.100
	3.19	8000	LD13M3	5040		
			LD21M3	5040		
1.41	2.66	8000	LD13M3	2960	**BSH 0701P ●●●●A**	2.100
			LU60N4	3040		
2.12	4.47	8000	LD17N4	5920	**BSH 0702T ●●●●A**	2.800
	5.45	8000	LD21M3	5280		
	5.63	8000	LU60N4	2960	**BSH 0702M ●●●●A**	2.800
2.2	4.85	8000	LD10N4	6880	**BSH 0702P ●●●●A**	2.800
	5.63	8000	LD13M3	2880		
2.83	5.99	8000	LD21M3	2960	**BSH 0703P ●●●●A**	3.600
	7.38	8000	LD28M3	5520	**BSH 0703T ●●●●A**	3.600
	7.71	8000	LD17N4	6480	**BSH 0703P ●●●●A**	3.600
	9.28	8000	LD21M3	2560		
3.39	6.19	6000	LD10N4	2580	**BSH 1001P ●●●●A**	4.300
	7.08	6000	LD21M3	2400		
	8.5	6000	LD28M3	3960	**BSH 1001T ●●●●A**	4.300
5.5	11.59	6000	LD28M3	4080	**BSH 1002T ●●●●A**	5.800
5.8	12.13	6000	LD17N4	4740	**BSH 1002P ●●●●A**	5.800
	14.79	6000	LD21M3	1920		
7.76	15.19	6000	LD10N4	2040	**BSH 1003M ●●●●A**	7.500
	22.95	6000	LD17N4	2040		
7.8	19.69	6000	LD28M3	2100	**BSH 1003P ●●●●A**	7.500
			MD28N4	4620		
	23.17	6000	MD40N4	4320		
9.31	19.8	6000	LD10N4	1620	**BSH 1004M ●●●●A**	9.200
	21.04	6000	MD40N4	3480	**BSH 1004T ●●●●A**	9.200
	25.7	6000	MD28N4	4020	**BSH 1004P ●●●●A**	9.200
	29.87	6000	LD17N4	1740	**BSH 1004M ●●●●A**	9.200
	33.83	6000	MD40N4	3600	**BSH 1004P ●●●●A**	9.200
	34.17	6000	MD40N4	1620	**BSH 1004M ●●●●A**	9.200

(1) Derating possible according to the power supply voltage, see characteristics pages 150 to 175.
(2) To complete each reference see the table on page 179.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 186.

BSH servo motors (continued)

BSH 2051●

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 15	Maximum nominal power *(1)*	Reference *(2)*	Weight *(3)*
Nm	Nm	rpm		rpm		kg
11.1	23.33	4000	MD56N4	2520	**BSH 1401T ●●●●A**	11.900
			MD28N4	3080	**BSH 1401P ●●●●A**	11.900
			MD40N4	3080		
	26	4000	MD28N4	1320	**BSH 1401M ●●●●A**	11.900
19.5	39.33	4000	MD40N4	3320	**BSH 1402P ●●●●A**	16.600
	47.5	4000	MD40N4	1480	**BSH 1402M ●●●●A**	16.600
			MD56N4	3040	**BSH 1402P ●●●●A**	16.600
27.8	57.32	4000	MD56N4	3240	**BSH 1403P ●●●●A**	21.300
	71.76	4000	MD40N4	1400	**BSH 1403M ●●●●A**	21.300
33.4	82.32	4000	MD40N4	1400	**BSH 1404M ●●●●A**	26.000
	95	4000	MD56N4	1320		
36	68.33	3800	MD40N4	1672	**BSH 2051M ●●●●A**	33.000
			MD56N4	1672		
			HC11N4X	1672		
	82	3800	HC11N4X	3190	**BSH 2051P ●●●●A**	33.000
65	118.54	3800	HC11N4X	3000	**BSH 2052P ●●●3A** *(4)*	44.000
	193.45	3800	HC20N4X	3000		
	200	3800	HC11N4X	1710	**BSH 2052M ●●●3A** *(4)*	44.000
		3800	HC20N4X	1710		
90	202.96	3800	HC20N4X	3000	**BSH 2053P ●●●3A** *(4)*	56.000
	227.18	3800	HC11N4X	1980	**BSH 2053M ●●●3A** *(4)*	56.000
	300	3800	HC20N4X	1890		

To order a BSH servo motor complete each reference with:

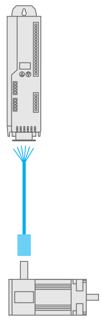
			BSH 0701P ●	●	●	●	A
Shaft end	IP 40	Untapped	**0**				
		Keyed	**1**				
	IP 65	Untapped	**2**				
		Keyed	**3**				
Integrated sensor	Single turn, SinCos Hiperface® 4096 points/turn			**1**			
	Multiturn, SinCos Hiperface® 4096 points/turn, 4096 turns			**2**			
Holding brake	None				**A**		
	With				**F**		
Connection *(4)*	Straight connectors					**1**	
	Rotatable right-angled connectors					**2**	
Flange	International standard						**A**

***Note:** The example above is for a **BSH 0701P** servo motor. Replace **BSH 0701P** by the relevant reference for other servo motors.*

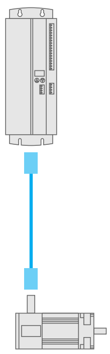
(1) Derating possible according to the power supply voltage, see characteristics pages 150 to 175.
(2) To complete each reference see the table above.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 186.
(4) The BSH 2052 ● and BSH 2053● servo motors are supplied with a power connection terminal and an angled connector for the control connection (sensor), see page 185. The product reference is BSH 205●● ●●●3A.

Lexium 15 motion control
BSH servo motors

Power connection cables



VW3 M5 101/103 R●●●

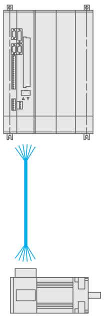


VW3 M5 201/202/203 R●●●

Description	From servo motor	To servo drive	Composition	Length m	Reference	Weight kg
Cables fitted with a connector on servo motor side	BSH 055●● BSH 070●● BSH 100●●	LXM 15L●●●●●	[(4 x 1.5 mm^2) + (2 x 1 mm^2)]	3	**VW3 M5 101 R30**	0.810
				5	**VW3 M5 101 R50**	1.210
				10	**VW3 M5 101 R100**	2.290
				15	**VW3 M5 101 R150**	3.400
				20	**VW3 M5 101 R200**	4.510
				25 *(1)*	**VW3 M5 101 R250**	6.200
				50 *(1)*	**VW3 M5 101 R500**	12.325
	BSH 2051M BSH 2051P	LXM 15HC●●N4X	[(4 x 4 mm^2) + (2 x 1 mm^2)]	3	**VW3 M5 103 R30**	1.330
				5	**VW3 M5 103 R50**	2.130
				10	**VW3 M5 103 R100**	4.130
				15	**VW3 M5 103 R150**	6.120
				20	**VW3 M5 103 R200**	8.090
				25	**VW3 M5 103 R250**	11.625
				50	**VW3 M5 103 R500**	23.175
				75	**VW3 M5 103 R750**	34.725
Cables fitted with two connectors	BSH 1003P BSH 1004● BSH 1401M BSH 1401P BSH 1402M BSH 1402P BSH 1403M BSH 1404M	LXM 15MD●●N4	[(4 x 1.5 mm^2) + (2 x 1 mm^2)]	3	**VW3 M5 201 R30**	0.885
				5	**VW3 M5 201 R50**	1.375
				10	**VW3 M5 201 R100**	2.600
				15	**VW3 M5 201 R150**	3.825
				20	**VW3 M5 201 R200**	5.050
				25 *(1)*	**VW3 M5 201 R250**	6.275
				50 *(1)*	**VW3 M5 201 R500**	12.400
				75 *(1)*	**VW3 M5 201 R750**	18.525
	BSH 1401T BSH 1402T BSH 1403P BSH 1404P	LXM 15MD●●N4	[(4 x 2.5 mm^2) + (2 x 1 mm^2)]	3	**VW3 M5 202 R30**	1.137
				5	**VW3 M5 202 R50**	1.795
				10	**VW3 M5 202 R100**	3.430
				15	**VW3 M5 202 R150**	5.085
				20	**VW3 M5 202 R200**	6.730
				25 *(1)*	**VW3 M5 202 R250**	8.375
				50 *(1)*	**VW3 M5 202 R500**	16.600
				75 *(1)*	**VW3 M5 202 R750**	24.825
	BSH 2051M	LXM 15MD●●N4	[(4 x 4 mm^2) + (2 x 1 mm^2)]	3	**VW3 M5 203 R30**	1.536
				5	**VW3 M5 203 R50**	2.460
				10	**VW3 M5 203 R100**	4.770
				15	**VW3 M5 203 R150**	7.080
				20	**VW3 M5 203 R200**	9.390
				25 *(1)*	**VW3 M5 203 R250**	11.700
				50 *(1)*	**VW3 M5 203 R500**	23.250
				75 *(1)*	**VW3 M5 203 R750**	34.800

(1) For cables longer than 20 m, a motor choke is compulsory, see page 47.

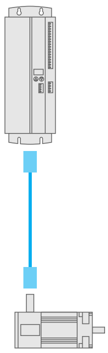
Power connection cables (continued)



VW3 M5 304 R●●●●

Description	From servo motor	To servo drive	Composition	Length m	Reference	Weight kg
Cable	BSH 2052M BSH 2052P BSH 2053M BSH 2053P	LXM 15HC●●N4X	[(4 x 10 mm²) + (2 x 1 mm²)]	10	**VW3 M5 304 R100**	8.530
				25	**VW3 M5 304 R250**	21.325
				50	**VW3 M5 304 R500**	42.650
				100	**VW3 M5 304 R1000**	85.300

Control connecting cables



VW3 M8 301 R●●●

Description	From servo motor	To servo drive	Composition	Length m	Reference	Weight kg
SinCos Hiperface® encoder cables fitted with two connectors	BSH, all ratings	LXM 15, all ratings	5x(2 x 0.25 mm²) + (2 x 0.5 mm²)	3	**VW3 M8 301 R30**	–
				5	**VW3 M8 301 R50**	–
				10	**VW3 M8 301 R100**	–
				15	**VW3 M8 301 R150**	–
				20	**VW3 M8 301 R200**	–
				25	**VW3 M8 301 R250**	–
				50	**VW3 M8 301 R500**	–
				75	**VW3 M8 301 R750**	–

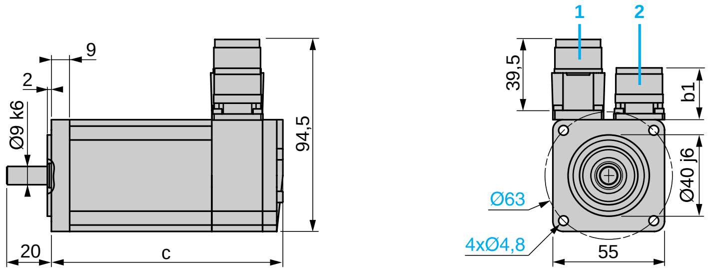
Presentation:
pages 148 and 149

Characteristics:
pages 176 and 177

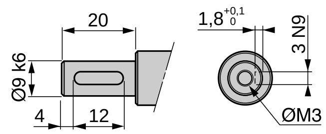
Lexium 15 motion control

BSH servo motors

BSH 055 (example with straight connectors: power supply for servo motor/brake 1 and encoder 2)

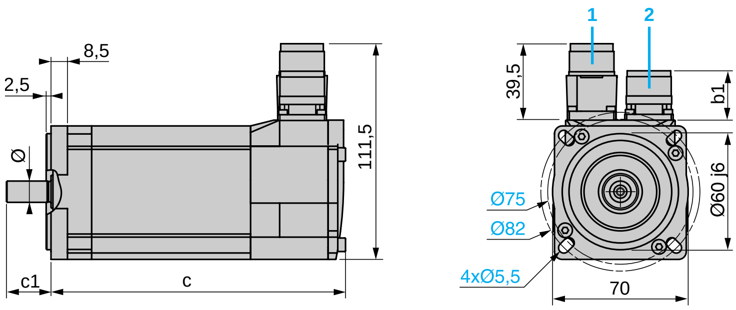


Shaft end, keyed slot (optional)

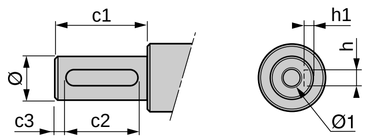


	Straight connectors	Rotary angled connectors		
	b1	**b1**	**c** (without brake)	**c** (with brake)
BSH 0551	25.5	39.5	132.5	159
BSH 0552	25.5	39.5	154.5	181
BSH 0553	25.5	39.5	176.5	203

BSH 070 (example with straight connectors: power supply for servo motor/brake 1 and encoder 2)



Shaft end, keyed slot (optional)



	Straight connectors	Rotary angled connectors									
	b1	**b1**	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**c3**	**h**	**h1**	**Ø**	**Ø1**
BSH 0701	25.5	39.5	154	180	23	18	2.5	4 N9	$2.5^{+0.1}_{0}$	11 k6	M4
BSH 0702	25.5	39.5	187	213	23	18	2.5	4 N9	$2.5^{+0.1}_{0}$	11 k6	M4
BSH 0703	25.5	39.5	220	256	30	20	5	5 N9	$3^{+0.1}_{0}$	14 k6	M5

Presentation:
pages 148 and 149

Characteristics:
pages 150 to 177

References:
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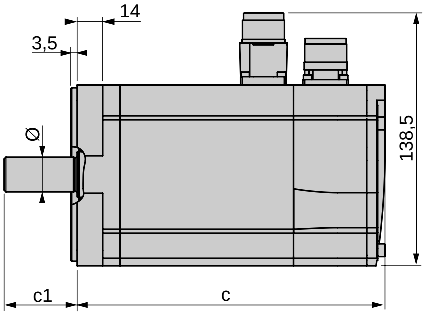
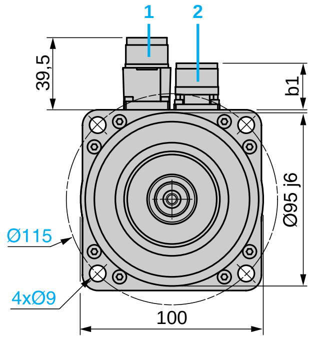
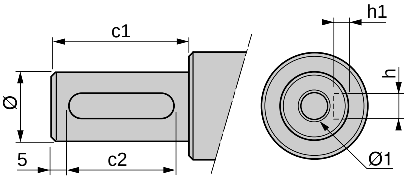
BSH 100 (example with straight connectors: power supply for servo motor/brake 1 and encoder 2)



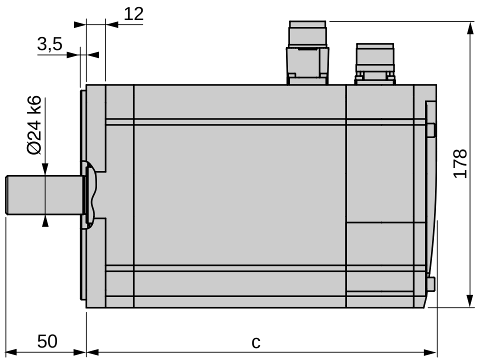


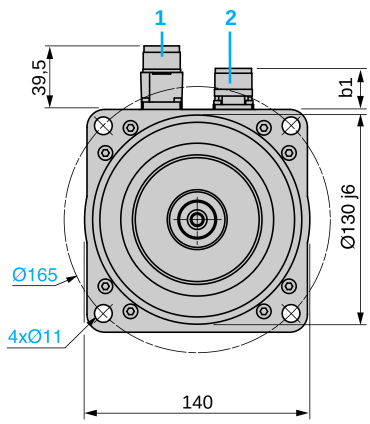
Shaft end, keyed slot (optional)



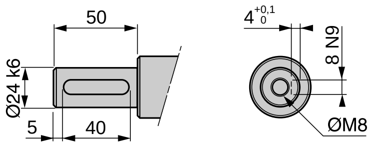
	Straight connectors	Rotary angled connectors								
	b1	**b1**	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**h**	**h1**	**Ø**	**Ø1**
BSH 1001	25.5	39.5	169	200	40	30	6 N9	$3.5^{+0.1}_{0}$	19 k6	M6
BSH 1002	25.5	39.5	205	236	40	30	6 N9	$3.5^{+0.1}_{0}$	19 k6	M6
BSH 1003	25.5	39.5	241	272	40	30	6 N9	$3.5^{+0.1}_{0}$	19 k6	M6
BSH 1004	25.5	39.5	277	308	50	40	8 N9	$4^{+0.1}_{0}$	24 k6	M8

BSH 140 (example with straight connectors: power supply for servo motor/brake 1 and encoder 2)





Shaft end, keyed slot (optional)



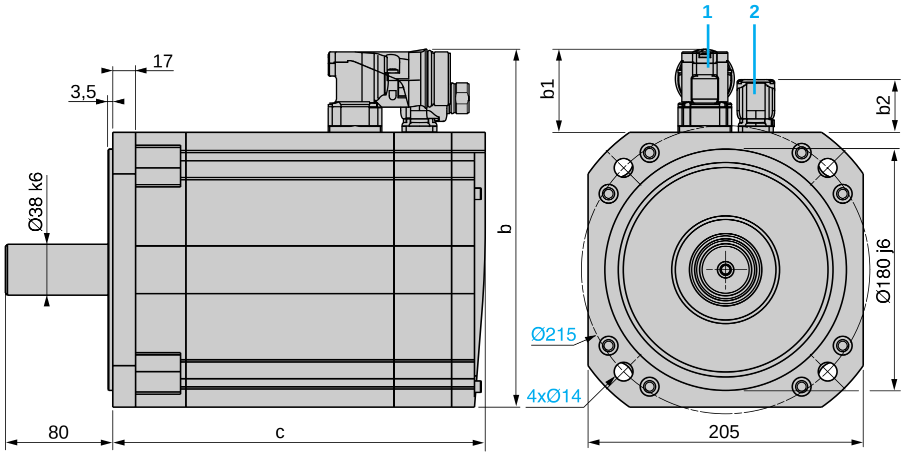
	Straight connectors	Rotary angled connectors		
	b1	**b1**	**c** (without brake)	**c** (with brake)
BSH 1401	25.5	39.5	218	256
BSH 1402	25.5	39.5	273	311
BSH 1403	25.5	39.5	328	366
BSH 1404	25.5	39.5	383	421

Presentation:
pages 148 and 149

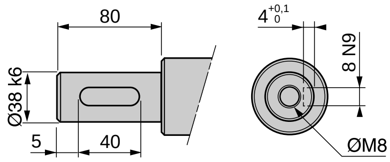
Characteristics:
pages 150 to 177

References:
pages 178 to 181

BSH 2051 (example with rotary angled connectors: power supply for servo motor/brake 1 and encoder 2)



Shaft end, keyed slot (optional)



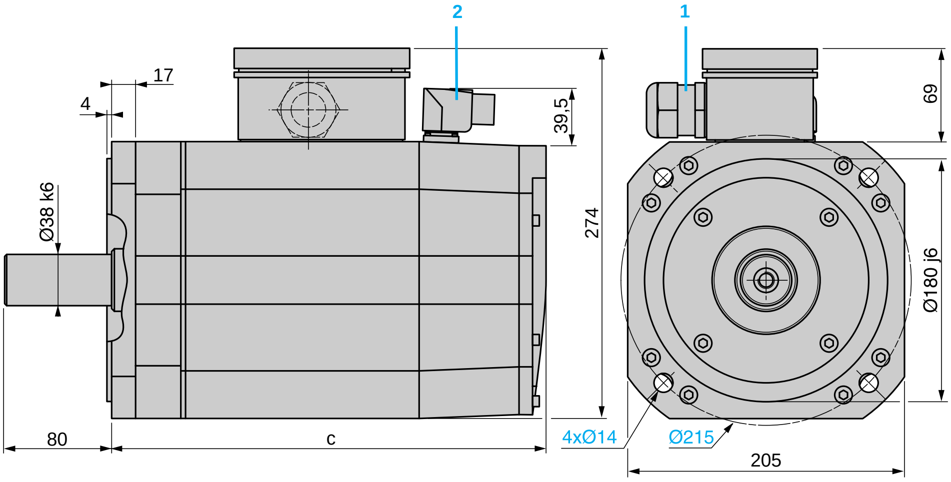
	Straight connectors			Rotary angled connectors				
	b	**b1**	**b2**	**b**	**b1**	**b2**	**c** (without brake)	**c** (with brake)
BSH 2051	259	54	25.5	267	70	39.5	321	370.5

Presentation:
pages 148 and 149
Characteristics:
pages 150 to 177
References:
pages 178 to 181

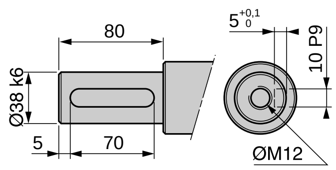
Lexium 15 motion control

BSH servo motors

BSH 2052 and 2053 (example with angled connectors: power supply for servo motor/brake 1 and encoder 2) ***(1)***



Shaft end, keyed slot (optional)



	c (without brake)	**c** (with brake)
BSH 2052	405	454.5
BSH 2053	489	538.5

(1) Not available with straight connectors. The power supply cable for servo motor/brake 1 is connected via a terminal.

Presentation:
pages 148 and 149
Characteristics:
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References:
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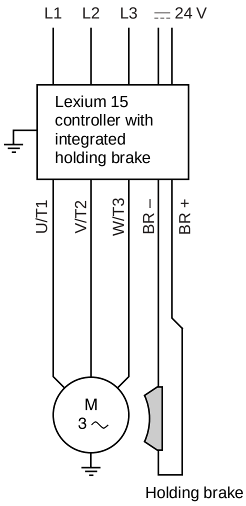
Lexium 15 motion control
BSH servo motors
Option: integrated holding brake

Holding brake
Presentation



The holding brake integrated into the BSH servo motor, depending on the model, is an electromagnetic pressure spring brake that blocks the servo motor axis once the output current has been switched off. In the event of an emergency, such as a power outage or an emergency stop, the drive is immobilized, significantly increasing safety.
Blocking the servo motor axis is also necessary in cases of torque overload, such as in the event of vertical axis movement.

Activation of the holding brake is directly controlled by the Lexium 15 servo drive.

Characteristics

Type of servo motor	BSH	0551 0552 0553	0701 0702	0703	1001 1002 1003	1004	1401 1402	1403 1404	2051 2052 2053
Holding torque M_{Br}	**Nm**	0.8	2	3	9	12	23	36	80
Inertia of rotor (brake only) J_{Br}	**kgcm²**	0.0213	0.072	0.23	0.613	1.025	1.15	5.5	16
Electrical clamping power P_{Br}	**W**	10	11	12	18	20	24	26	40
Supply voltage		24 V⎓ -10…+6 %							
Opening time	**ms**	12	25	35	40	45	50	100	200
Closing time	**ms**	6	8	15	18	20	25	30	50
Weight (brake only)	**kg**	0.080	0.450	0.320	0.450	0.690	1.100	1.790	3.600

References

105992

BSH servo motor

Selection of BSH servo motor with **F** or without **A** holding brake , see references page 179.

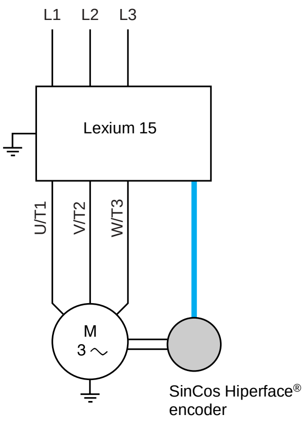
Dimensions:
pages 182 to 185

Lexium 15 motion control

BSH servo motors
Option: integrated sensor

Sensor integrated into BSH servo motors

Presentation



The standard measurement device is the SinCos Hiperface® single turn or multiturn encoder integrated into the BSH servo motors. This measurement device is perfectly adapted to the Lexium 15 range of servo drives.

Use of this encoder allows:
- The BSH servo motor data to be automatically identified by the servo drive
- The servo drive's control loops to be automatically initialized. These functions therefore simplify the installation of the motion control device.

Characteristics

Type of sensor		Single turn SinCos	Multiturn SinCos
Sinus periods per turn		128	128
Number of points		4096	4096 x 4096 turns
Encoder precision		± 1.3 arc minutes	
Measurement method		Optical high resolution	
Interface		Hiperface®	
Operating temperature	**°C**	+5...+110	

References

105992

BSH servo motor

Selection of SinCos Hiperface® single turn **1** or multiturn **2** encoder integrated into the BSH servo motor, see references page 179.

Dimensions:
pages 182 to 185

Lexium 15 motion control
BSH servo motors
Option: GBX planetary gearboxes

Presentation

535593

GBX planetary gearbox

In many cases, motion control requires the use of planetary gearboxes to adapt speeds and torques, while ensuring the precision demanded by the application.

Schneider Electric has selected GBX gearboxes made by Neugart to be used in association with the BSH servo motor range. These gearboxes are lubricated for life and are designed for applications not requiring very low backlash. As their association with BSH servo motors has been thoroughly qualified and they are very easy to mount, the gearboxes are simple to put into operation and risk free.

Available in 5 sizes (GBX 40... GBX 160), the planetary gearboxes are offered in 12 speed reduction ratios (3:1...40:1), see table below.

Continuous stall torques and peak stall torques available from the gearbox are obtained by multiplying the characteristic values of the servo motor by the reduction ratio and gearbox efficiency (0.96 or 0.94 depending on the speed reduction ratio).

The table below shows the most suitable servo motor/gearbox combinations. For other associations consult the servo motor data sheets.

BSH servo motor/GBX gearbox associations

Type of servo motor	Speed reduction ratio											
	3:1	4:1	5:1	8:1	9:1	12:1	15:1	16:1	20:1	25:1	32:1	40:1
BSH 0551	GBX 40	GBX 40	GBX 40	GBX 60	GBX 40	GBX 40	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60	_GBX 60*_
BSH 0552	GBX 60	GBX 60	GBX 60	GBX 60	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60	_GBX 60*_	_GBX 60*_	_GBX 60*_
BSH 0553	GBX 60	GBX 60	GBX 60	_GBX 60*_	GBX 40	GBX 60	GBX 60	GBX 60	GBX 60	_GBX 60*_	_GBX 60*_	_GBX 60*_
BSH 0701	GBX 60	GBX 60	GBX 80	GBX 80	GBX 60	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120
BSH 0702	GBX 80	GBX 80	GBX 80	GBX 80	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120
BSH 0703	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BSH 1001	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 160
BSH 1002	GBX 80	GBX 80	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BSH 1003	GBX 80	GBX 120	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BSH 1004	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	_GBX 160*_	_GBX 160*_	_GBX 160*_
BSH 1401	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	_GBX 160*_	_GBX 160*_	_GBX 160*_
BSH 1402	GBX 160	GBX 160	GBX 160	GBX 160	_GBX 160*_	GBX 160	GBX 160	GBX 160	GBX 160	_GBX 160*_	_GBX 160*_	_GBX 160*_
BSH 1403	GBX 160	GBX 160	GBX 160	GBX 160	_GBX 160*_	GBX 160	GBX 160	GBX 160	GBX 160	_GBX 160*_	_GBX 160*_	_GBX 160*_
BSH 1404	GBX 160	GBX 160	GBX 160	GBX 160	_GBX 160*_	GBX 160	GBX 160	GBX 160	GBX 160	_GBX 160*_	_GBX 160*_	_GBX 160*_
BSH 2051	_GBX 160*_	_GBX 160*_	_GBX 160*_	_GBX 160*_	–	–	–	–	–	–	–	–
BSH 2052	–	–	–	–	–	–	–	–	–	–	–	–
BSH 2053	–	–	–	–	–	–	–	–	–	–	–	–

GBX 60* *For associations in italics and marked with an asterisk, you must check that the application does not exceed the maximum continuous output torque of the gearbox, see values page 189.*

Characteristics:
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References:
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Dimensions:
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Lexium 15 motion control
BSH servo motors
Option: GBX planetary gearboxes

Characteristics of GBX gearboxes

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Type of gearbox			Planetary gearbox with straight teeth, single reduction stage				
Backlash	3:1...8:1	**arc min**	< 30	< 20	< 12	< 8	< 6
	9:1...40:1		< 35	< 25	< 17	< 12	< 10
Torsion rigidity	3:1...8:1	**Nm/arc min**	1.0	2.3	6	12	38
	9:1...40:1		1.1	2.5	6.5	13	41
Noise level		**dB (A)**	55	58	60	65	70
Junction box			Black anodized aluminum				
Shaft material			C 45				
Shaft output dust and damp protection			IP 54				
Lubrification			Lubricated for life				
Average service life *(1)*		**hr**	30,000				
Mounting position			All positions				
Operating temperature		**°C**	- 25...+ 90				

Characteristics of BSH servo motor/GBX gearbox associations

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Efficiency	3:1...8:1		0.96				
	9:1...40:1		0.94				
Maximum permitted radial force *(1) (2)*	L_{10h} = 10,000 hours	**N**	200	500	950	2000	6000
	L_{10h} = 30,000 hours		160	340	650	1500	4200
Maximum permitted axial force *(1)*	L_{10h} = 10,000 hours	**N**	200	600	1200	2800	8000
	L_{10h} = 30,000 hours		160	450	900	2100	6000
Moment of gearbox inertia	3:1	**kgcm²**	0.031	0.135	0.77	2.63	12.14
	4:1	**kgcm²**	0.022	0.093	0.52	1.79	7.78
	5:1	**kgcm²**	0.019	0.078	0.45	1.53	6.07
	8:1	**kgcm²**	0.017	0.065	0.39	1.32	4.63
	9:1	**kgcm²**	0.03	0.131	0.74	2.62	–
	12:1	**kgcm²**	0.029	0.127	0.72	2.56	12.37
	15:1	**kgcm²**	0.023	0.077	0.71	2.53	12.35
	16:1	**kgcm²**	0.022	0.088	0.5	1.75	7.47
	20:1	**kgcm²**	0.019	0.075	0.44	1.5	6.64
	25:1	**kgcm²**	0.019	0.075	0.44	1.49	5.81
	32:1	**kgcm²**	0.017	0.064	0.39	1.3	6.36
	40:1	**kgcm²**	0.016	0.064	0.39	1.3	5.28
Continuous output torque *(1)* M_{2N}	3:1	**Nm**	4.5	12	40	80	400
	4:1	**Nm**	6	16	50	100	450
	5:1	**Nm**	6	16	50	110	450
	8:1	**Nm**	5	15	50	120	450
	9:1	**Nm**	16.5	44	130	210	–
	12:1	**Nm**	20	44	120	260	800
	15:1	**Nm**	18	44	110	230	700
	16:1	**Nm**	20	44	120	260	800
	20:1	**Nm**	20	44	120	260	800
	25:1	**Nm**	18	40	110	230	700
	32:1	**Nm**	20	44	120	260	800
	40:1	**Nm**	18	40	110	230	700

(1) Values refer to an output shaft speed of 100 rpm in S1 mode (cyclical ratio = 1) on electrical machines for an ambient temperature of 30°C.
(2) Force applied at mid-distance from the output shaft.

Presentation:
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References:
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Dimensions:
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Lexium 15 motion control

BSH servo motors

Option: GBX planetary gearboxes

References

535593

GBX ●●●

Size	Speed reduction ratio	Reference (1)	Weight kg
GBX 40	3:1, 4:1, 5:1 and 8:1	**GBX 040 ●●● ●●● ●F**	0.350
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 040 ●●● ●●● ●F**	0.450
GBX 60	3:1, 4:1, 5:1 and 8:1	**GBX 060 ●●● ●●● ●F**	0.900
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 060 ●●● ●●● ●F**	1.100
GBX 80	3:1, 4:1, 5:1 and 8:1	**GBX 080 ●●● ●●● ●F**	2.100
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 080 ●●● ●●● ●F**	2.600
GBX 120	3:1, 4:1, 5:1 and 8:1	**GBX 120 ●●● ●●● ●F**	6.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 120 ●●● ●●● ●F**	8.000
GBX 160	3:1, 4:1, 5:1 and 8:1	**GBX 160 ●●● ●●● ●F**	18.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 160 ●●● ●●● ●F**	22.000

To order a GBX planetary gearbox, complete each reference with:

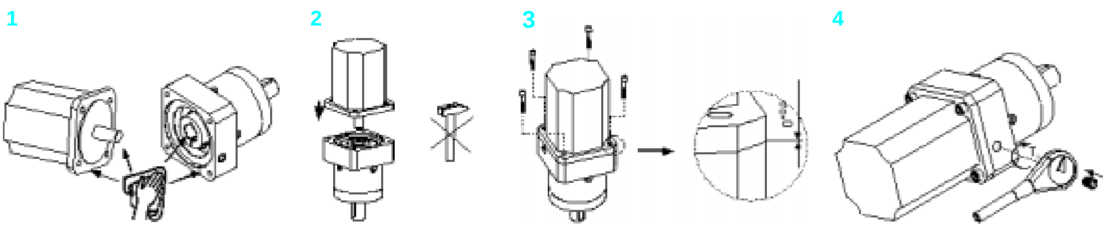
			GBX ●●●	●●●	●●●	●	F
Size	Junction box diameter (see associations table with BSH servo motor, page 188)	40 mm	**040**				
		60 mm	**060**				
		80 mm	**080**				
		115 mm	**120**				
		160 mm	**160**				
Speed reduction ratio		3:1		**003**			
		4:1		**004**			
		5:1		**005**			
		8:1		**008**			
		9:1		**009**			
		12:1		**012**			
		15:1		**015**			
		16:1		**016**			
		20:1		**020**			
		25:1		**025**			
		32:1		**032**			
		40:1		**040**			
Associated BSH servo motor	Type	BSH 055			**055**		
		BSH 070			**070**		
		BSH 100			**100**		
		BSH 140			**140**		
		BSH 205			**205**		
	Model	BSH ●●●1				**1**	
		BSH ●●●2				**2**	
		BSH ●●●3				**3**	
		BSH ●●●4				**4**	
BSH servo motor adaptation							**F**

Mounting

No specialized tool is required to mount the GBX planetary gearbox on the BSH servo motor. The general usage rules for mechanical mounting must be observed:

1 Clean support areas and joints.
2 Align shafts to be linked and assemble in vertical position.
3 Join the servo motor flange to the gearbox flange in uniform manner, with cross tightening of the screws.
4 Using a torque wrench, tighten the TA ring following tightening torque (2...40 Nm according to the gearbox model).

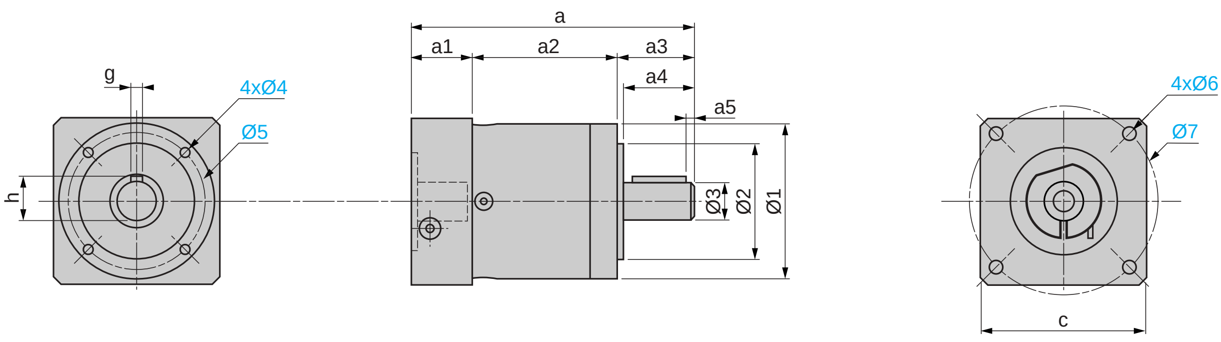
For more information, consult the user instructions supplied with the products).



Lexium 15 motion control
BSH servo motors
Option: GBX planetary gearboxes

Dimensions

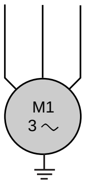
Servo motor assembly



GBX	c	a	a1	a2	a3	a4	a5	h	g	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7
040 003...008	40	93.5	28.5	39	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
040 009...016	40	106.5	28.5	52	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
060 003...008	60	106.5	24.5	47	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
060 009...040	60	118.5	24.5	59	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
080 003...008	90	134	33.5	60.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
080 009...032	90	151	33.5	77.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
120 003...008	115	176.5	47.5	74	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
120 009...040	115	203.5	47.5	101	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
160 003...008	140	255.5	64.5	104	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165
160 009...040	140	305	64.5	153.5	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165

Presentation:
page 188
Characteristics:
page 189
References:
page 190

Lexium 15 motion control
BSH servo motors

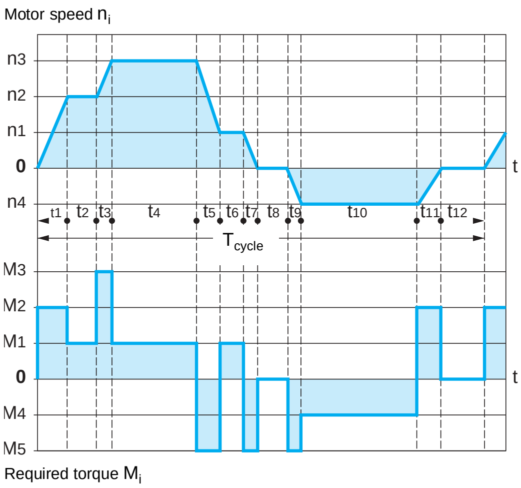


Sizing of BSH servo motor

To assist you in sizing the servo motor, the "**Lexium Sizer**" software tool is available on the website www.telemecanique.com

These 2 pages are to help you understand the method used for calculation.

To size the servo motor you need to know the equivalent thermal torque and the average speed required by the mechanics to be associated with the servo motor. Both values are calculated using the motor cycle trend diagram and should be compared with the speed/torque curves given for each servo motor (see BSH servo motor curves, pages 150 to 175).



Motor cycle trend diagram

The motor cycle is made up of several sub-cycles for which the duration of each is known.
Each sub-cycle is broken down into phases which correspond to the periods of time during which the motor torque is constant (1 to 3 phases maximum per sub-cycle).
This breakdown can be used to calculate, for each phase:
- the duration (t_j)
- the speed (n_i)
- the required torque value (M_i)

The curves on the left show the 4 phase types:
- constant acceleration during t_1, t_3 and t_9
- at work during t_2, t_4, t_6 and t_{10}
- constant deceleration during t_5, t_7 and t_{11}
- motor stopped during t_8 and t_{12}

The total cycle duration is:
$T_{cycle} = t_1 + t_2 + t_3 + t_4 + t_5 + t_6 + t_7 + t_8 + t_9 + t_{10} + t_{11} + t_{12}$

Calculating the average speed n_{avg}

The average speed is calculated using the formula opposite where: $n_{avg} = \dfrac{\sum |ni| \cdot t_j}{\sum t_j}$

- n_i corresponds to the different work speeds.
- $\dfrac{ni}{2}$ corresponds to the average speeds during constant acceleration and deceleration phases.

In the above example:

Duration t_j	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}	t_{12}
Speed $\|ni\|$	$\frac{\|n2\|}{2}$	$\|n2\|$	$\frac{\|n3\| + \|n2\|}{2}$	$\|n3\|$	$\frac{\|n3\| + \|n1\|}{2}$	$\|n1\|$	$\frac{\|n1\|}{2}$	0	$\frac{\|n4\|}{2}$	$\|n4\|$	$\frac{\|n4\|}{2}$	0

The average speed is calculated as follows:

$$n_{avg} = \frac{\frac{n2}{2} \cdot t1 + n2 \cdot t2 + \frac{n3 + n2}{2} \cdot t3 + n3 \cdot t4 + \frac{n3 + n1}{2} \cdot t5 + n1 \cdot t6 + \frac{n1}{2} \cdot t7 + \frac{n4}{2} \cdot t9 + n4 \cdot t10 + \frac{n4}{2} \cdot t11}{Tcycle}$$

Calculating the equivalent thermal torque M_{eq}

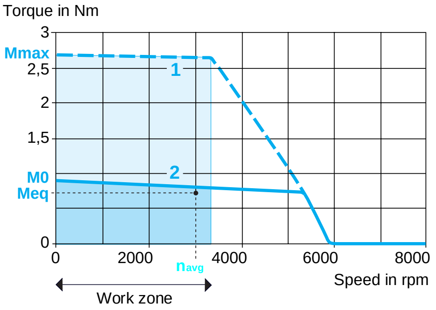
The equivalent thermal torque is calculated using the following formula:

$$M_{eq} = \sqrt{\frac{\sum Mi^2 \cdot t_j}{Tcycle}}$$

In the above example, this formula gives the following calculation:

$$M_{eq} = \sqrt{\frac{M2^2 \cdot t1 + M1^2 \cdot t2 + M3^2 \cdot t3 + M1^2 \cdot t4 + M5^2 \cdot t5 + M1^2 \cdot t6 + M5^2 \cdot t7 + M5^2 \cdot t9 + M4^2 \cdot t10 + M2^2 \cdot t11}{Tcycle}}$$

Presentation:
pages 148 and 149
Characteristics:
pages 150 to 175
References:
pages 178 to 181
Dimensions:
pages 182 to 185



Sizing of BSH servo motor (continued)

Determining the size of the servo motor

The point defined by the 2 preceding calculations (average speed and equivalent thermal torque) where the:

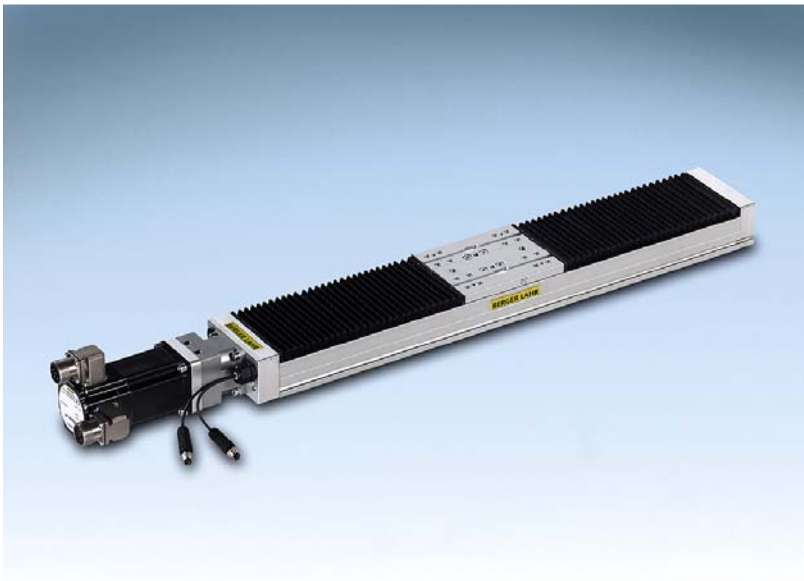
- horizontal axis represents the average speed n_{avg}
- vertical axis represents the thermal torque M_{eq}

must be within the area bound by the curve 2 and the work zone.

The motor cycle trend diagram should also be used to ensure that all torques M_i required for the different speeds n_i during the various cycle phases are within the area bound by the curve 1 and the work zone.

1 Peak torque
2 Continuous torque

BERGER LAHR



Catalogue Linear Tables

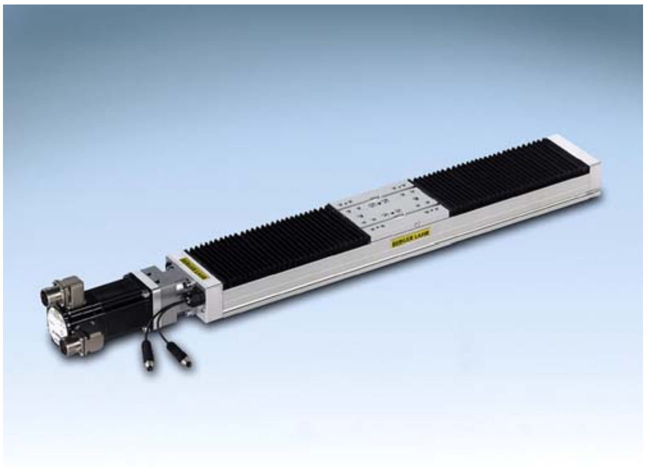
Edition 11/2004

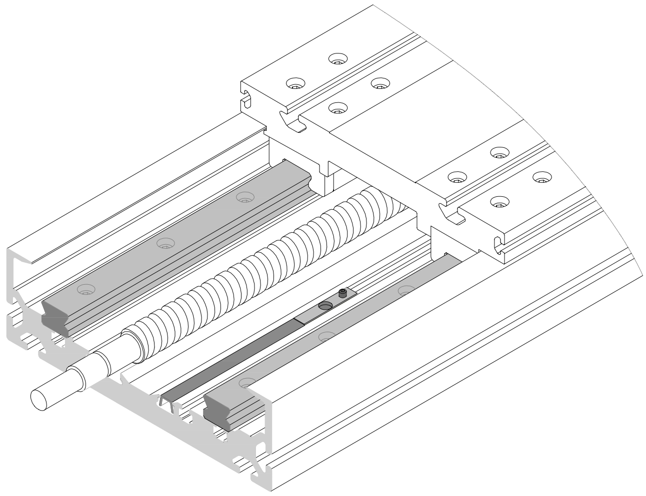
LT

a company of Schneider Electric

Berger Lahr Linear Tables are designed for automation technology applications.

The table base consists of a very stiff precision aluminum profile. Through selection and placement of the guiding, high **loads and torques** can be handled. The integrated **ball screw** makes precise **and stiff feed moves** possible as well as **high feed forces** at a **high positioning accuracy and repeatability**.





Application examples

- **Precise and zero backlash feed moves**
  Requirement for cutting, separating, marking or the application of glue and seal materials.
- **Exact positioning**
  Sensitive devices such as vision systems, laser heads, ….for different processes.
- **Pick and place**
  For accurate positioning of heavy parts.
- **High feed forces**
  Which are required for joining and clamping processes.

Special product features

- **High system stiffness** due to the special aluminum base profile.
- **Compact outer dimensions**, the stroke can be ordered in millimeter increments.
- **Service friendly construction** with integrated central lubrication.
- **Simple integration** through profile technology and plug connections.
- **Zero backlash movement** through pre-stressed re-circulating ball bearings and ball screws.

Three sizes are available for different loads. For an **optimized** drive configuration we recommend adapted Berger Lahr stepping motors or servomotors with the matching motor control.

Overview

	LT-100	LT-150	LT-200
C dyn.	12,8 kN	45 kN	60 kN
	Ø 12 x 02 Ø 12 x 05 Ø 12 x 10	Ø 16 x 05 Ø 16 x 10 Ø 16 x 16	Ø 20 x 05 Ø 20 x 10 Ø 20 x 20
Max. Speed	30 m/min.	48 m/min.	60 m/min.
Stroke	30 - 600 mm	40 - 1000 mm	50 - 1500 mm

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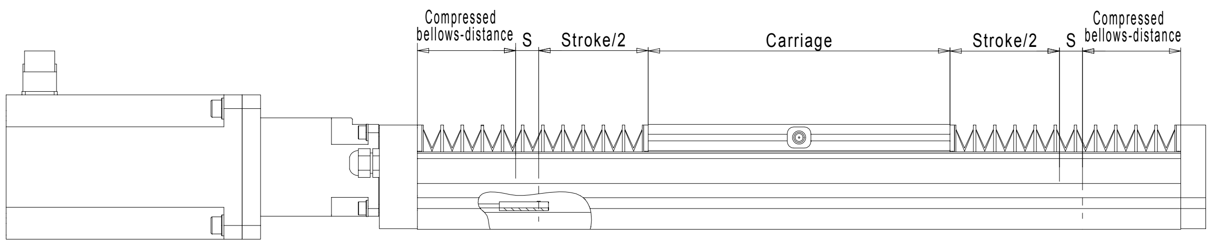
BERGER LAHR GmbH & Co. KG • Breslauer Str. 7 • D-77933 Lahr • www.berger-lahr.de

Technical Specifications

Stroke / Travel of the linear table

Upon request, Berger Lahr linear tables are manufactured to a specific stroke length.
Per type there is a minimum stroke and a maximum stroke.

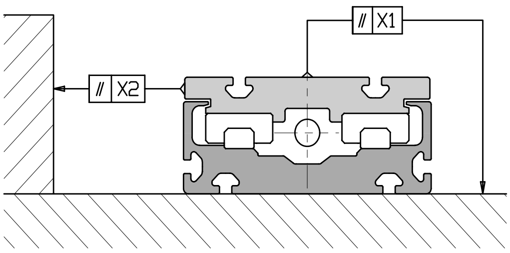
- The stroke is the travel of the carriage between the switch points of the negative and the positive limit switch.
- Next is the safety distance – S, that is available for over-travel until the bellows are compressed. The safety distances vary and are based on the stroke and the total length of linear table.
- Safety distances min. – max.: LT-100 → 7 – 10 mm; LT-150 → 12 – 15 mm; LT-200 → 17 – 20 mm

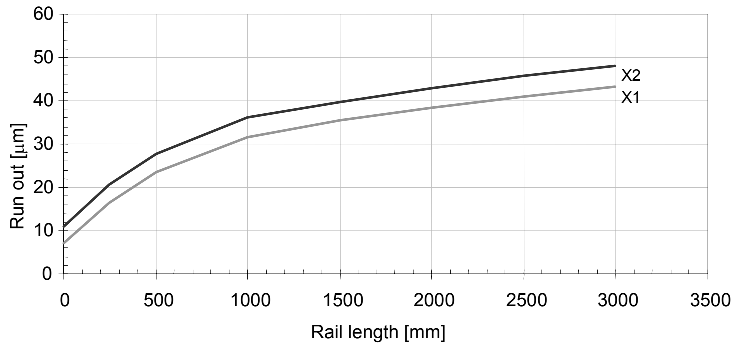


Accuracy

All listed values are for the mounted condition on an ideally even mounting surface !

1. Run-out





2. Positioning accuracy

The positioning accuracy mainly depends on the accuracy class of the lead screw.

A skived IT 7 lead screw is integrated in the standard versions of Berger Lahr Linear Tables,
A skived IT 5 lead screw is available as an option.

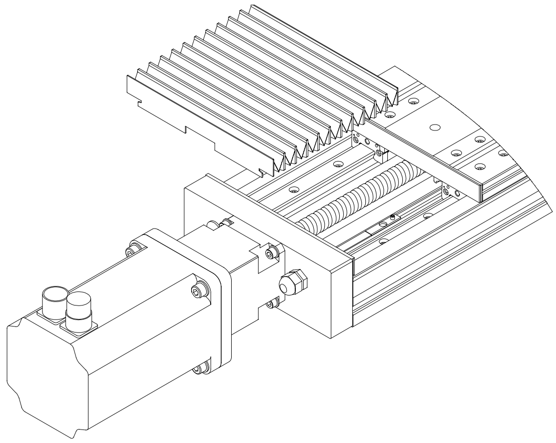
	Lead screw lengths [mm]								
	over until	315	315 400	400 500	500 630	630 800	800 1000	1000 1250	1250 1600
Tolerance class [+/- µm]	IT 7*	52	57	63	70	80	90	105	125
	IT 5	23	25	27	30	35	40	46	54

* According to DIN 69051 (Part 3)

3. Repeatability

The repeatability of Berger Lahr Linear Tables is ± 0.02 mm.
This value is influenced by temperature changes, speed as well as load.

Technical Features



Base profile

The base profile is a precision aluminum profile, which has the following advantages:

- Maximum stiffness with a minimum weight.
- Simple mounting and combination with other modules.
- Compact design, mechanics and sensors are protected.

For surface protection, the aluminum parts are anodized.

Ball screw

A skived lead screw of the quality class IT 7 mechanically drives the carriage of the linear table. Different pitches are available.

There are solid lead screw bearings at the motor side and lose bearings at the end.

The ball screw is pre-stressed, the ball nut is protected with wipers. Option: IT 5 quality class ball screw.

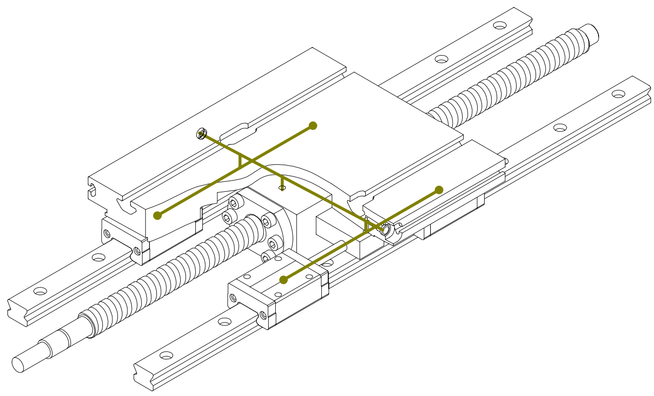
Guiding

The integrated linear guiding system is comprised of two guide rails, each with two re-circulating ball bearing elements with **integrated ball chain.** This system features high smoothness of running and durability, and this even with high loads and load forces. The guiding system is pre-stressed, wipers prevent the penetration of dirt.

Central lubrication

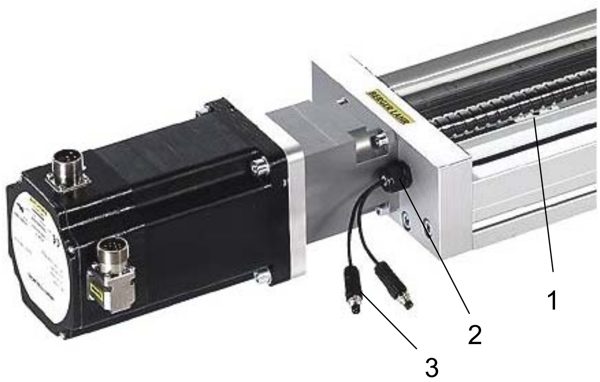
Regular lubrication intervals are a necessity for a high durability, especially with high loads and speeds.

A central lubrication point is located at both sides of the carriage. Depending on the carriage accessibility, the ball screw and the linear guides can be lubricated via a lubricating nipple.



Limit switches

Protected in a profile groove, two inductive limit switches are mounted: The – (negative) limit switch at the motor end and the + (positive) limit switch at the opposite end. The limit switch cables are routed through the front panel and are available with open ends or with connectors.



1 = **"Negative"** limit switch (at the motor side)
2 = Strain relief cable conduit
3 = Plug

Ambient conditions

- Ambient temperatures of – 10° C to + 40° C
- Humidity of ≤ 75% relative humidity annual average / 95% relative humidity at 30 days, no condensation.
- Not suitable for operation in a vacuum (→ limit switches)
- Storage – and transport temperature of –25° C to + 70° C

Drive

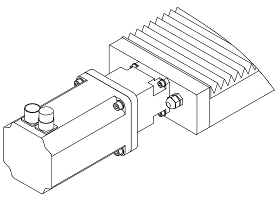
Based on our comprehensive product palette, we offer complete solutions that are comprised of:
Linear Table with adapted motor and positioning controller.
Attention: please note, that the maximum motor torque may not be higher than the maximum drive torque of the ball screw.

Recommended Berger Lahr mounted motors

Type	Stepping motor	Max. Motor Torque	Servomotor	Max. Motor * Torque
LT-100			SER 366	2,2 Nm
	VRDM 368 LWC	1,5 Nm	SER 368	3,0 Nm
LT-150	VRDM 397 LWC	2,0 Nm	SER 397	4,0 Nm
	VRDM 3910 LWC	4,0 Nm	SER 3910	8,0 Nm
	VRDM 3913 LWC	6,0 Nm	SER 3913	11,5 Nm
LT-200	VRDM 3910 LWC	4,0 Nm	SER 3910	8,0 Nm
	VRDM 3913 LWC	6,0 Nm	SER 3913	11,5 Nm
	VRDM 31117 LWC	12,0 Nm	SER 3916	14,5 Nm
	VRDM 31122 LWC	16,5 Nm	SER 31112	18,0 Nm

* The nominal torque of the servo motors is significantly lower as the maximum torque.
Please see the Berger Lahr motor catalogue for additional motor data, additional Berger Lahr motors upon request.

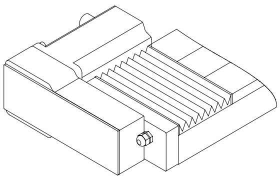
Motor mounting variants



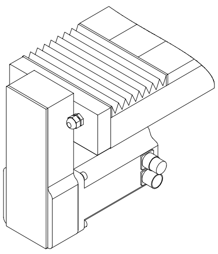
Motor mounting straight

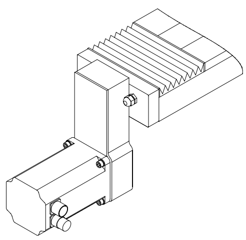
If possible the motor should be mounted **straight** .

Advantage: The lead screw can be driven **directly** via a torsionally stiff coupling.



Motor mounting horizontally left, inside





Motor mount vertically below
Motor inside

Motor outside

Mounting of belt gears

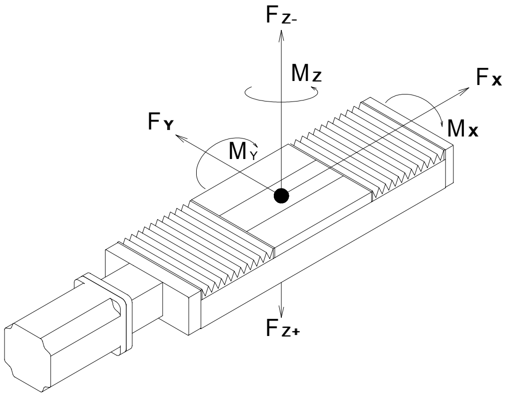
For space reasons the motor can be mounted via a **zero backlash** belt gear with the transmission ratio 1:1.

The belt gear can be positioned **horizontally, left** and **right**, as well as **vertically above** and **below**.

Motor mount

Motor mounted on the inside is standard.
Motor mounted on the outside is an option.

Technical Specifications

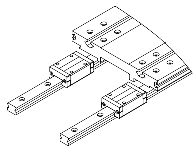


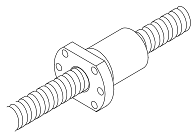
Maximum Load 12.8 kN

Minimum Stroke 30 mm

Maximum Stroke 600 mm

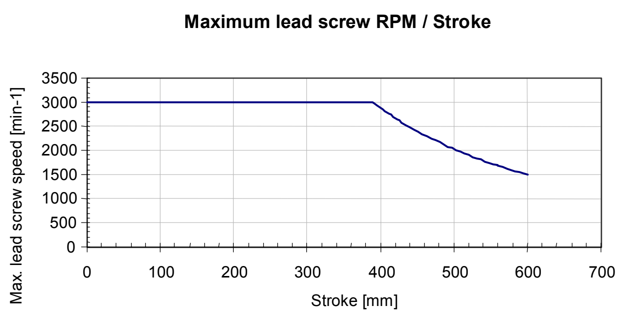
Maximum Speed 30 m/min.

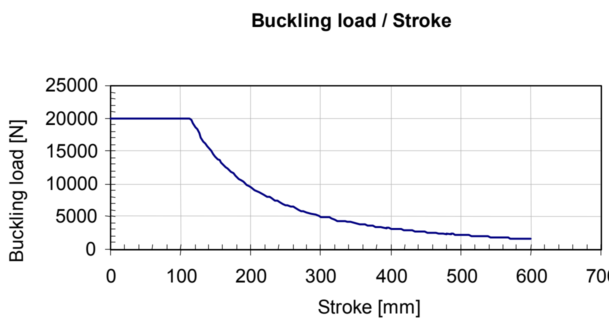




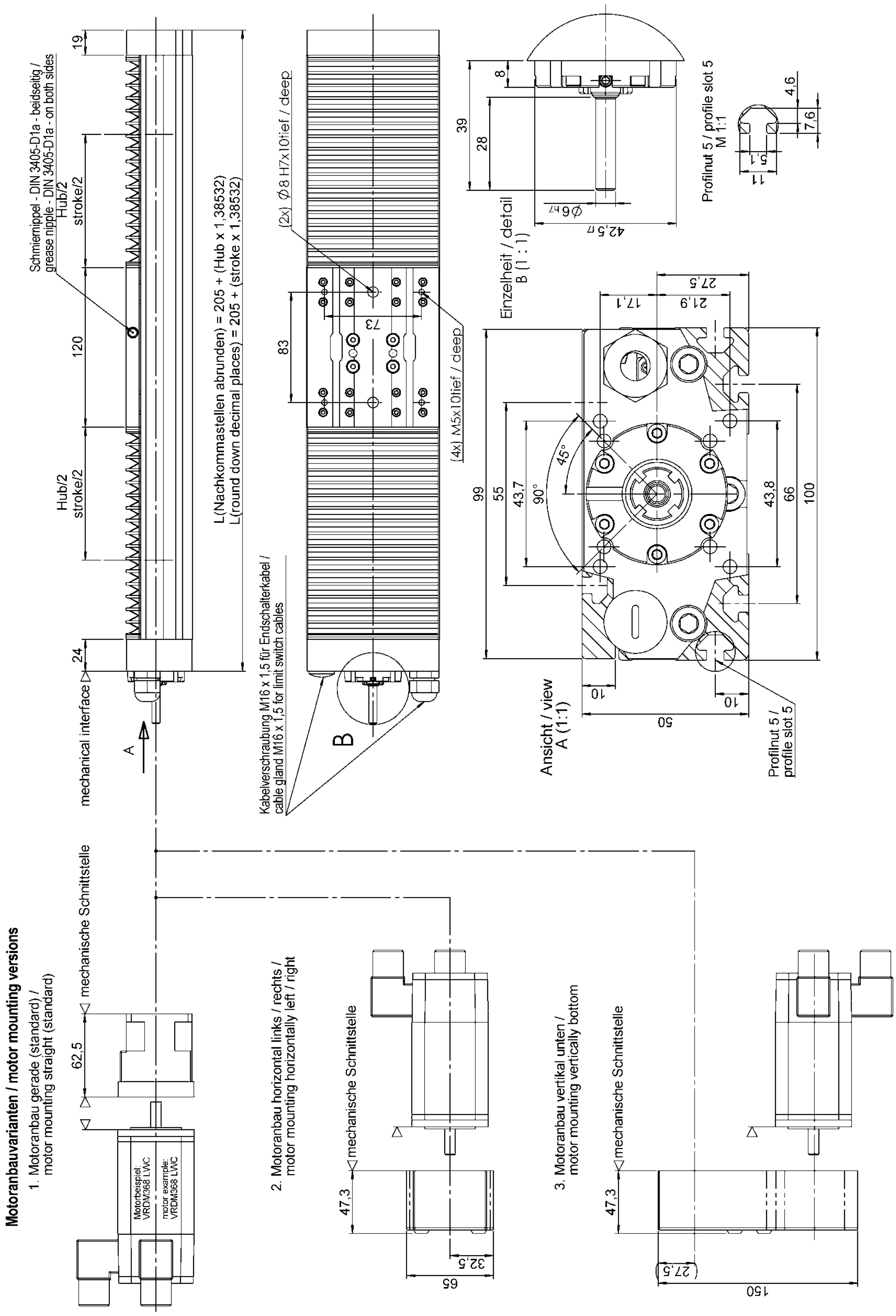
		Guiding		Ball screw				
		Static	Dynamic	Diameter	[mm]	12		
Fz +	[N]	11,300	12,800	Pitch	[mm]	2	5	10
Fz -	[N]	11.300	12,800	Static load force	[N]	3,200	4,900	4,800
Fy	[N]	7,400	8,400	Dynamic load force [1)]	[N]	2,500	4,000	3,900
Fx	[N]	Not applicable		Max. thrust force [2)]	[N]	1,750	1,800	1,755
M x	[Nm]	310	350	Max. drive torque	[Nm]	0.7	1.7	3.3
M y	[Nm]	470	530	Max. RPM	[1/min]	3,000		
M z	[Nm]	310	350	Max. buckling load	[N]	20,000		

1) Loads of up to 20% of the dynamic forces and movements are considered as acceptable for the desired service life.
2) This is based on the maximum permissible drive torque.





Detent torque moment	[Nm]	0.2
Mass at 0 mm stroke, without motor mounted	[kg]	2.4
Mass at 0 mm stroke, straight motor mount, without motor	[kg]	2.8
Mass at 0 mm stroke with belt gear, without motor	[kg]	3.15
Mass per 100 mm stroke	[kg]	0.85
Mass of carriage	[kg]	0.7
Ix axial area inertia moment of the axis profile	[mm4]	111,842
Iy axial area inertia moment of the axis profile	[mm4]	1,511,703

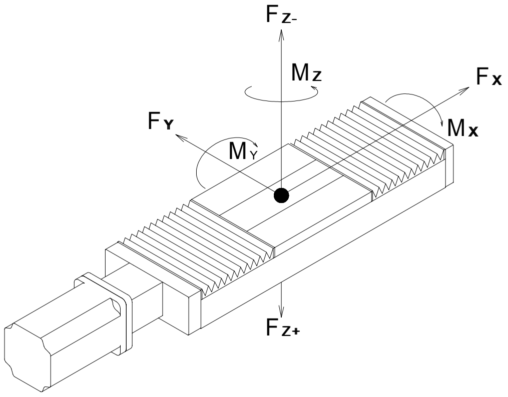


Calculation of the total linear table length

Example: A linear table with 70mm stroke is required. Formula: L = 205+ (Stroke x 1.38532)

→ 205+ (70 x 1.38532) = 301.97 mm; Round down decimals → **L = 301.0 mm**

Technical Specifications

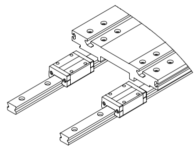


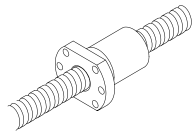
Maximum Load 45 kN

Minimum Stroke 40 mm

Maximum Stroke 1000 mm

Maximum Speed 48 m/min.

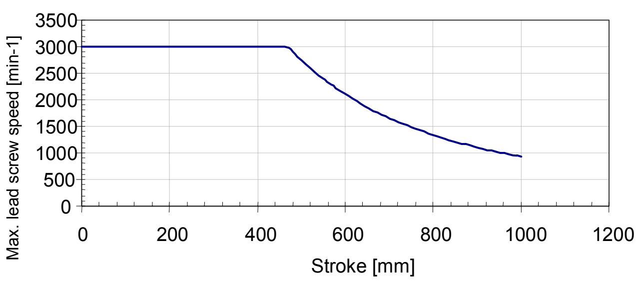




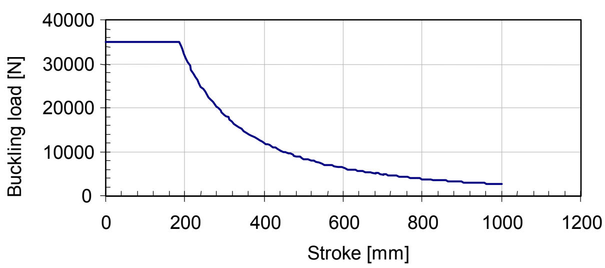
		Guiding		Ball screw				
		Static	Dynamic	Diameter	[mm]	16		
Fz +	[N]	50,000	45,000	Pitch	[mm]	5	10	16
Fz -	[N]	26,000	23,000	Static load force	[N]	18,000	8,400	8,200
Fy	[N]	15,000	15,000	Dynamic load force 1)	[N]	11,000	5,600	5,400
Fx	[N]	Not applicable		Max. thrust force 2)	[N]	4,950	2,520	2,430
M x	[Nm]	1,160	1,040	Max. drive torque	[Nm]	4.6	5.0	7.3
M y	[Nm]	1,580	1,400	Max. RPM	[1/min]	3,000		
M z	[Nm]	900	900	Max. buckling load	[N]	35,000		

1) Loads of up to 20% of the dynamic forces and movements are considered as acceptable for the desired service life.
2) This is based on the maximum permissible drive torque.

Maximum lead screw RPM / Stroke



Buckling load / Stroke



Detent torque moment	[Nm]	0.3
Mass at 0 mm stroke, without motor mounted	[kg]	6.4
Mass at 0 mm stroke, straight motor mount, without motor	[kg]	7.4
Mass at 0 mm stroke with belt gear, without motor	[kg]	8.45
Mass per 100 mm stroke	[kg]	1.35
Mass of carriage	[kg]	2.2
Ix axial area inertia moment of the axis profile	[mm4]	363,233
Iy axial area inertia moment of the axis profile	[mm4]	5,885,272

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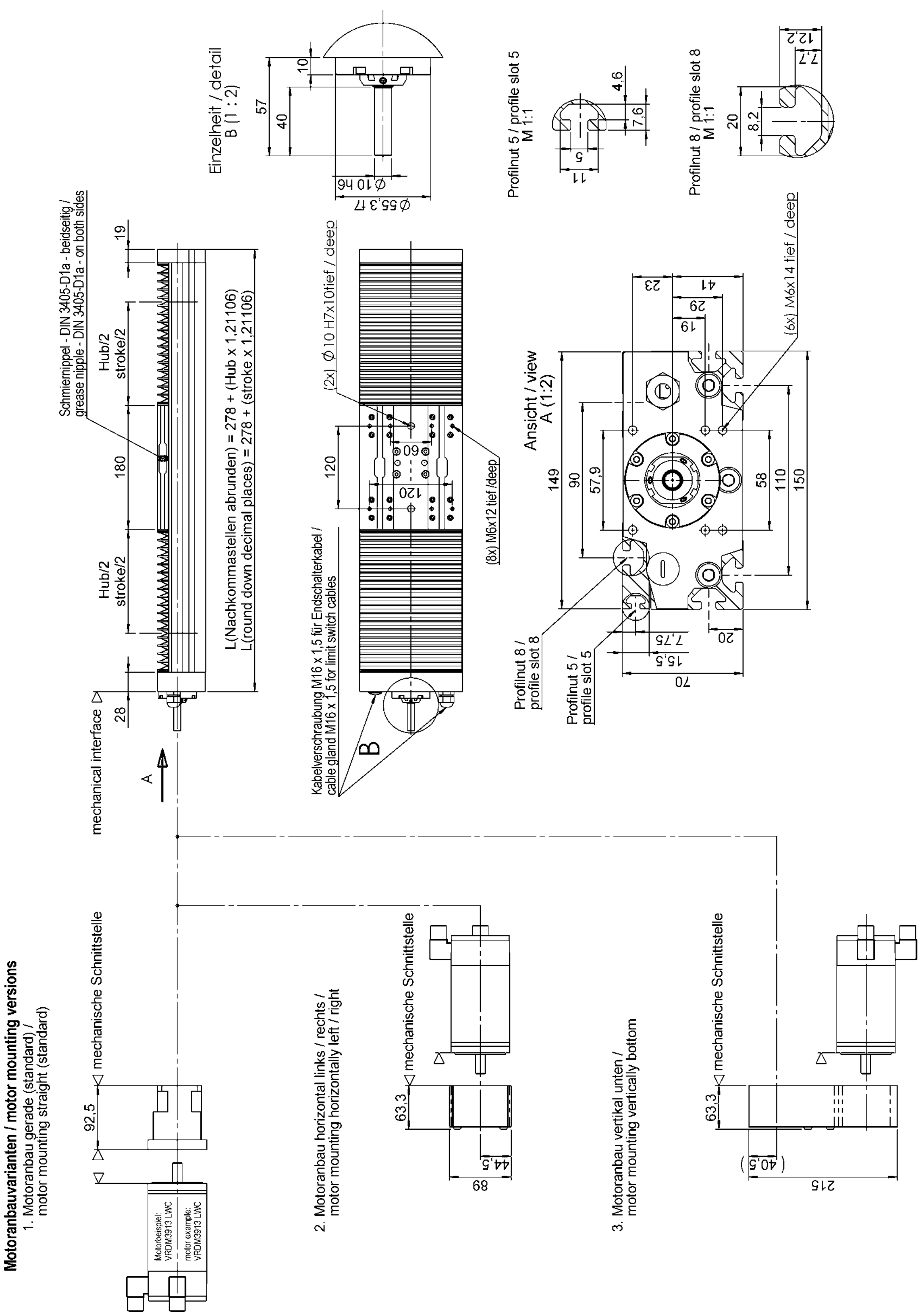
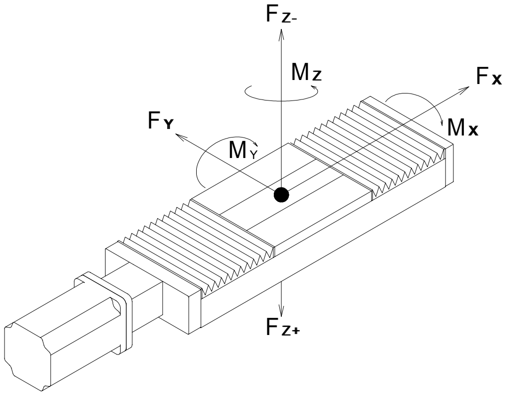


Calculation of the total linear table length

Example: A linear table with 245 mm stroke is required. Formula: L = 278+ (Stroke x 1.21106)

→ 278+ (245 x 1.21106) = 574.71 mm, Round down decimals → **L = 574.0 mm**

Technical Specifications

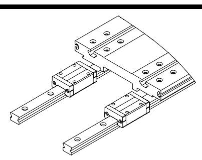


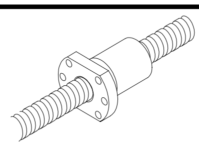
Maximum Load 60 kN

Minimum Stroke 50 mm

Maximum Stroke 1500 mm

Maximum Speed 60 m/min.

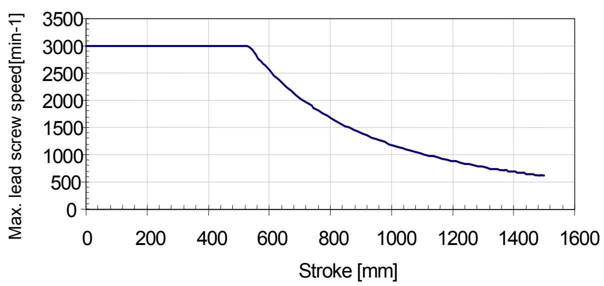




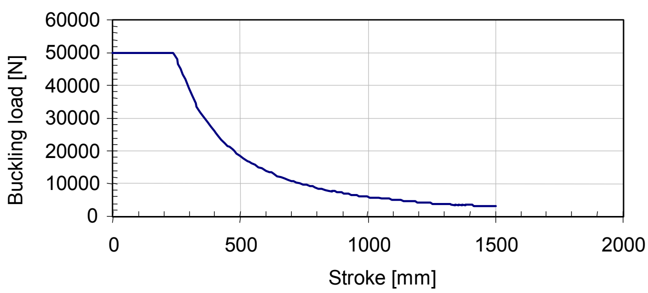
		Guiding		Ball screw				
		Static	Dynamic	Diameter	[mm]	20		
Fz +	[N]	70,000	60,000	Pitch	[mm]	5	10	20
Fz -	[N]	37,000	31,000	Static load force	[N]	25,000	12,000	11,600
Fy	[N]	21,000	21,000	Dynamic load force [1)]	[N]	12,000	8,800	8,500
Fx	[N]	Not applicable		Max. thrust force [2)]	[N]	5,160	3,520	3,400
M x	[Nm]	2,200	1,900	Max. drive torque	[Nm]	4.8	6.6	12.7
M y	[Nm]	3,000	2,500	Max. RPM	[1/min]	3,000		
M z	[Nm]	1,700	1,700	Max. buckling load	[N]	50,000		

1) Loads of up to 20% of the dynamic forces and movements are considered as acceptable for the desired service life.
2) This is based on the maximum permissible drive torque.

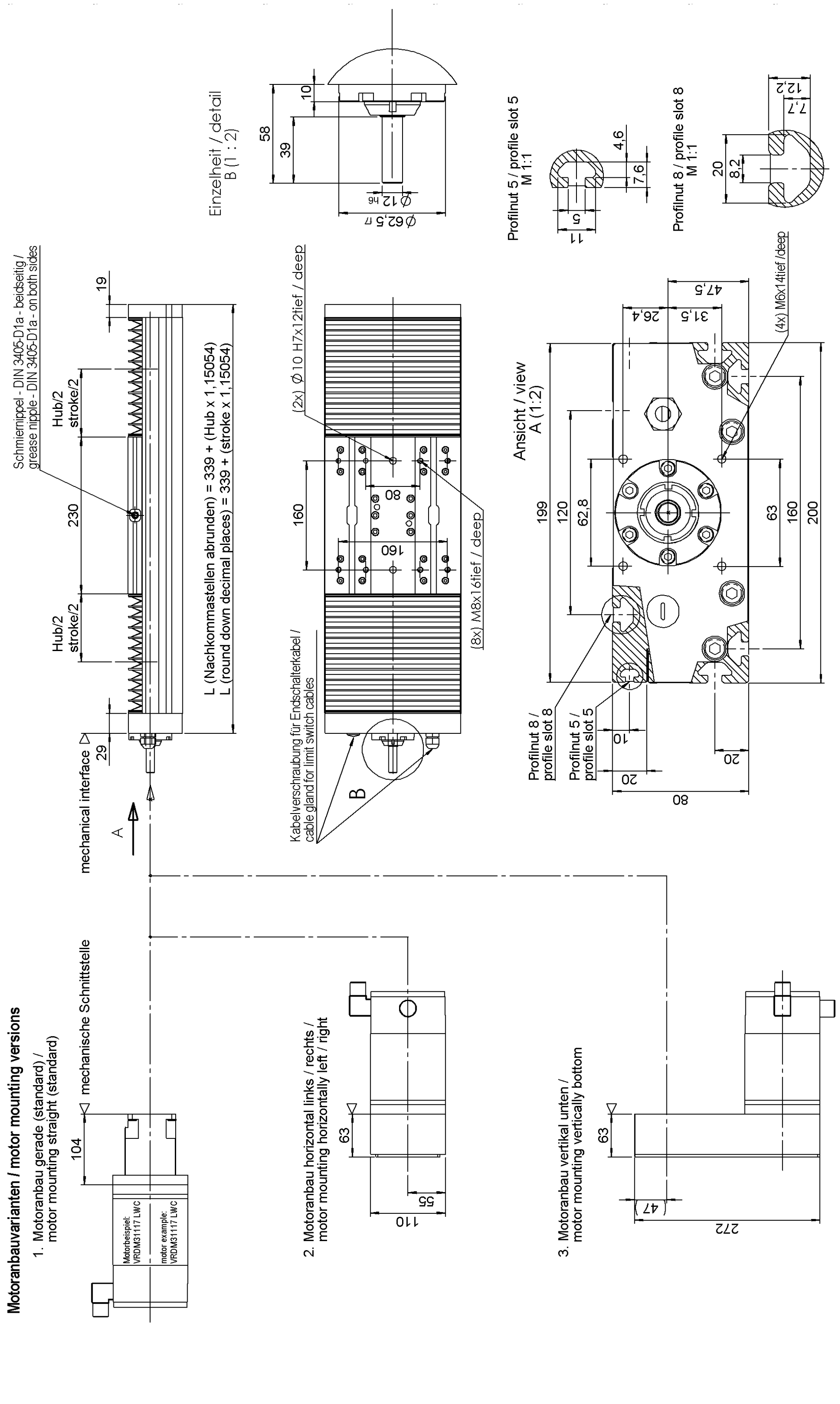
Maximum lead screw RPM / Stroke



Buckling load / Stroke



Detent torque moment	[Nm]	0.4
Mass at 0 mm stroke, without motor mounted	[kg]	11.7
Mass at 0 mm stroke, straight motor mount, without motor	[kg]	13.1
Mass at 0 mm stroke with belt gear, without motor	[kg]	15.0
Mass per 100 mm stroke	[kg]	2.0
Mass of carriage	[kg]	4.1
Ix axial area inertia moment of the axis profile	[mm4]	654,179
Iy axial area inertia moment of the axis profile	[mm4]	15,702,592



Calculation of the total linear table length

Example: A linear table with 455 mm stroke is required. Formula: L = 339+ (Stroke x 1.15054)

→ 339+ (455 x 1.15054) = 862.45 mm; Round down decimals → **L = 862.0 mm**

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Type designation key

Example	LT - 150KS16 - 690 - VRDM3913 - V - S
Product family LT = Linear Tables	**LT** - 150KS16 – 690 - VRDM3913 - V - S
Size 100 150 200	LT - **150**KS16 – 690 - VRDM3913 - V - S
Guiding system K = Re-circulating ball bearings	LT - 150**K**S16 – 690 - VRDM3913 - V - S
Drive element S = Lead screw	LT - 150K**S**16 – 690 - VRDM3913 - V - S
Lead screw pitch 2 = 2 mm Travel/Revolution 5 = 5 mm Travel/Revolution 10 = 10 mm Travel/Revolution 16 = 16 mm Travel/Revolution 20 = 20 mm Travel/Revolution	LT - 150KS**16** – 690 - VRDM3913 - V - S
Stroke 690 = Example 690 mm	LT - 150KS16 – **690** - VRDM3913 - V - S
Motor = Without motor K = Customer motor VRDM3913 = Berger Lahr motor type	LT - 150KS16 – 690 - **VRDM3913** - V - S
Motor mounting = Without motor mounted G = Straight motor mounting V = Belt gear	LT - 150KS16 – 690 - VRDM3913 - **V** - S
Special version S = Special version	LT - 150KS16 – 690 - VRDM3913 - V - **S**

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Inquiry

Please fill out this form and send it to your local Berger Lahr Positec sales office.

You will then receive an offer within the next days.

Sender:

Contact __________________________________

Company __________________________________

Address/PO box __________________________________

Postal code/City __________________________________

Phone __________________________________

Fax __________________________________

Date __________________________________

Size	Rolled lead screw			Stroke	Amount
	D: Diameter [mm] x **p**: Pitch [mm]				
LT-100	12 x 02 ❑	12 x 05 ❑	12 x 10 ❑	________ mm	_______ Each
LT-150	16 x 05 ❑	16 x 10 ❑	16 x 16 ❑	________ mm	_______ Each
LT-200	20 x 05 ❑	20 x 10 ❑	20 x 20 ❑	________ mm	_______ Each

Ball screw

- ❑ Accuracy class ISO 7 (Standard)
- ❑ Accuracy class ISO 5 *

Cover

- ❑ Bellows (Standard)
- ❑ Without Bellows *

Limit switches

- ❑ 2 inductive limit switches PNP–NC (Standard)
- ❑ 1 additional switch PNP-NC 10mm fixed before …
- ❑ 1 additional switch PNP-NO 10mm fixed before …

… the positive switch (plug reserve).

Interface

- ❑ Cable end with connector, 200 mm long
- ❑ Open cable end, min. 3000 mm long
- ❑ Open cable end, min. 8000 mm long.

Motor

Type: ______________________________

- ❑ Berger Lahr motor mounted. (Standard)
- ❑ Customer motor mounted *
- ❑ Without motor

Accessories

- ❑ One **printed** technical documentation.
- ❑ Rail nut to mount linear table.
- ❑ Mounting clamps for linear table.

Limit switch opposite connector, with

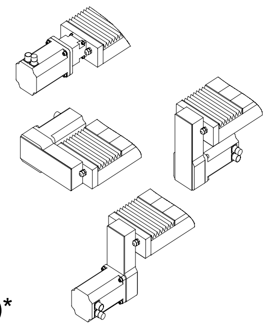
- ❑ 5m cable device side open.
- ❑ 10m cable device side open.

Motor mounting variants

- ❑ Straight

Belt gear 1:1

- ❑ horizontal left (graphic)
- ❑ horizontal right
- ❑ vertical below (graphic)
- ❑ vertical above
- ❑ Motor inside
- ❑ Motor outside (see below)*



Note: * labeled options are processed as special inquiries → longer lead times.

Remarks

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we control **motion**

Berger Lahr offers you the positioning and automation solutions you need, based on our tried and proven series of products. Our comprehensive engineering and consulting service is ready to support and advise you every step of the way.

Berger Lahr is a member company of the Schneider Electric Group. With its Merlin Gerlin, Square D and Telemecanique brands, Schneider Electric is one of the leading providers of electrical and automation-engineering solutions.

BERGER LAHR

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35.201 GB 11.04 VTD Printed in Germany

Series of AC synchronous servomotors - Standard

AC synchronous servomotors - Standard

Features

- **High power intensity** by using the latest magnetic materials as well as the optimised motor design. Motors of a smaller size can thus produce comparable torque.
- **High impulse torque** up to five times the continuous stationary torque.
- **Economical** thanks to a streamlined Standard series of compact and powerful AC synchronous servomotors.

Technical specifications

- 8-pin synchronous motors
- SinCos absolute measuring system® (SRS) Singleturn as position and rotary-speed measuring system in Standard series
- Use of high-energy neodymium-iron-born magnets
- High power intensity in a compact package
- Integrated thermal coil monitoring (NTC)
- Vibration level R according to DIN EN 60034-14
- Protection type:
  - Motor housing: IP 56
  - Shaft end, front: IP 41
- Motor and measuring-system connection with mounting socket, straight exit
- Size (flange)
  - SER 39x (85 x 85 mm^2)
  - SER 311x (110 x 110 mm^2)
- Rated speeds depending on length, winding code and power output

Optional accessories

- Measuring system
  - SinCos® (SRM) Multiturn
  - Resolver upon request
- Integrated holding brake
- Gearbox
- Mounting sockets, 90°, can be rotated for:
  - Motor connection
  - Measuring system
- Protection type:
  - Shaft end, front: IP 56

Environmental influences

Ambient conditions (based on DIN 50019-R14):

- Temperature: –25 °C to +40 °C
- Humidity: 75 % R.H. yearly average, 95 % R.H. on 30 days, non-condensing

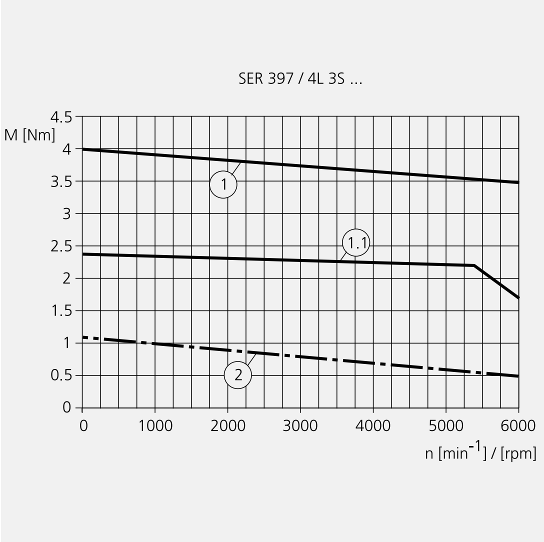
Storage and transport temperature:

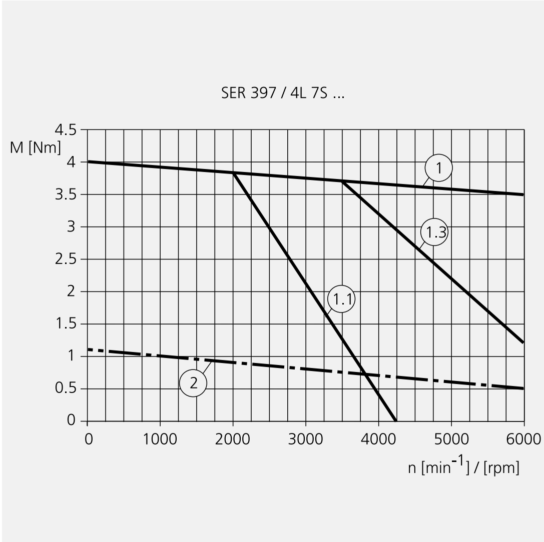
- Temperature: –25 °C to +70 °C

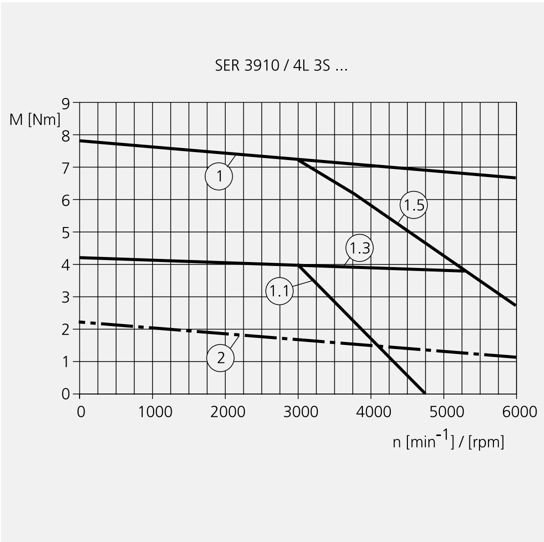
Technical data

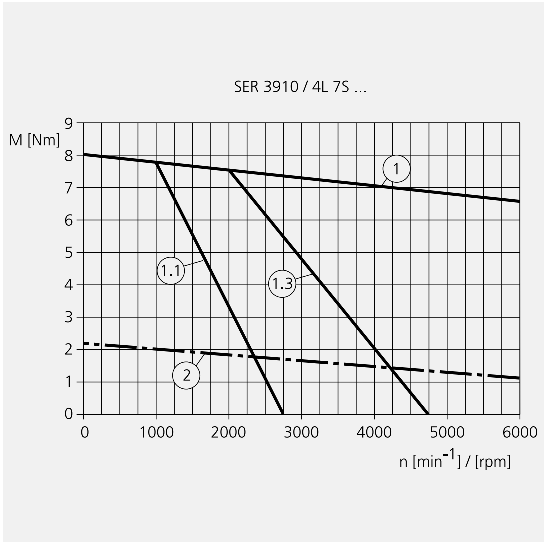
	$U_{DC\text{-}Bus}$	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
SER 397 (3S)	325	1.1	2.6	0.6	1.5	6000	0.38	27.5	4.0	12.0	0.8	2.2
SER 397 (3S)	560	1.1	2.6	0.6	1.5	6000	0.38	27.5	4.0	12.0	0.8	2.2
SER 397 (7S)	325	1.1	1.3	0.8	1.0	3800	0.32	50.7	4.0	6.0	0.8	2.2
SER 397 (7S)	560	1.1	1.3	0.6	0.7	6000	0.38	50.7	4.0	6.0	0.8	2.2
SER 3910 (3S)	325	2.2	3.0	1.6	2.1	4000	0.67	47.2	8.0	12.0	1.6	3.3
SER 3910 (3S)	560	2.2	3.0	1.1	1.8	6000	0.69	47.2	8.0	12.0	1.6	3.3
SER 3910 (7S)	325	2.2	1.7	1.8	1.4	2200	0.42	83.2	8.0	6.0	1.6	3.3
SER 3910 (7S)	560	2.2	1.7	1.5	1.2	4000	0.63	83.2	8.0	6.0	1.6	3.3
SER 3913 (3S)	325	2.9	3.7	2.0	2.9	4000	0.84	49.5	11.5	18.0	2.4	4.4
SER 3913 (3S)	560	2.9	3.7	1.7	2.5	6000	1.06	49.5	11.5	18.0	2.4	4.4
SER 3913 (5S)	325	2.9	2.5	2.5	2.1	2500	0.65	72.3	11.5	12.0	2.4	4.4
SER 3913 (5S)	560	2.9	2.5	2.0	1.8	4500	0.94	72.3	11.5	12.0	2.4	4.4
SER 3913 (7S)	325	2.9	1.3	2.6	1.2	1250	0.34	141.6	11.5	6.0	2.4	4.4
SER 3913 (7S)	560	2.9	1.3	2.5	1.1	2300	0.60	141.6	11.5	6.0	2.4	4.4
SER 3916 (5S)	325	3.6	3.5	2.3	2.3	3000	0.72	65	14.5	17.5	3.2	6.1
SER 3916 (5S)	560	3.6	3.5	1.6	1.9	5000	0.84	65	14.5	17.5	3.2	6.1
SER 31112 (3S)	325	4.6	6.0	2.5	3.0	4000	1.05	44.6	18.0	30.0	4.0	5.0
SER 31112 (3S)	560	4.6	6.0	1.5	2.3	6000	0.94	44.6	18.0	30.0	4.0	5.0
SER 31112 (5S)	325	4.6	3.2	3.4	2.5	2200	0.78	77.6	18.0	16.0	4.0	5.0
SER 31112 (5S)	560	4.6	3.2	2.5	2.0	4000	1.05	77.6	18.0	16.0	4.0	5.0
SER 31112 (7S)	325	4.6	1.8	4.0	1.5	1000	0.42	140.0	18.0	9.0	4.0	5.0
SER 31112 (7S)	560	4.6	1.8	3.5	1.4	2000	0.73	140.0	18.0	9.0	4.0	5.0
SER 31117 (3S)	325	6.6	6.6	3.6	4.0	3300	1.24	58.4	25.0	32.0	8.0	8.0
SER 31117 (3S)	560	6.6	6.6	1.5	1.7	6000	0.94	58.4	25.0	32.0	8.0	8.0
SER 31117 (5S)	325	6.6	5.0	4.2	3.0	2400	1.06	82.0	25.0	24.0	8.0	8.0
SER 31117 (5S)	560	6.6	5.0	3.0	2.5	4000	1.26	82.0	25.0	24.0	8.0	8.0
SER 31117 (7S)	325	6.6	2.7	5.5	2.3	1250	0.72	148.4	25.0	12.5	8.0	8.0
SER 31117 (7S)	560	6.6	2.7	4.6	1.9	2250	1.05	148.4	25.0	12.5	8.0	8.0
SER 31122 (5S)	325	10.0	7.0	4.5	3.0	2250	1.06	90.9	38.0	32.0	11.3	11.0
SER 31122 (5S)	560	10.0	7.0	5.0	3.5	4000	2.09	90.9	38.0	32.0	11.3	11.0
SER 31122 (7S)	325	10.0	3.6	8.2	3.0	1000	0.86	176.0	38.0	16.5	11.3	11.0
SER 31122 (7S)	560	10.0	3.6	7.5	2.7	2000	1.57	176.0	38.0	16.5	11.3	11.0
SER 31127 (5D)	560	13.4	9.2	5.0	3.8	4000	2.2	88.2	48.0	45.0	15.5	13.0
SER 31127 (7S)	325	13.4	5.1	10.8	4.2	1100	1.25	160.0	48.0	25.0	15.5	13.0
SER 31127 (7S)	560	13.4	5.1	9.0	3.7	2000	1.88	160.0	48.0	25.0	15.5	13.0

$U_{DC\text{-}Bus}$	Intermediate-circuit direct voltage from Twin Line drive or controller
M_{dO}	Continuous stationary torque
I_{dO}	Continuous stationary current
M_{dN}	Rated continuous torque
I_{dN}	Rated continuous current
n_N	Rated speed
P_N	Rated power
k_E	Voltage constant at 1000 min^{-1}
M_{max}	Max. torque
I_{max}	Max. current
J_R	Rotor inertia
m	Mass

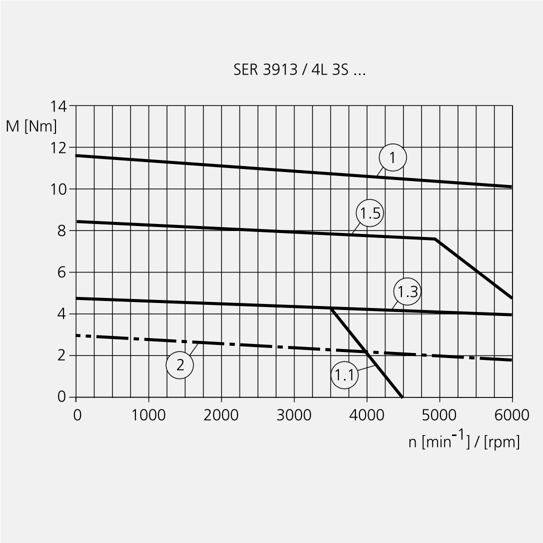


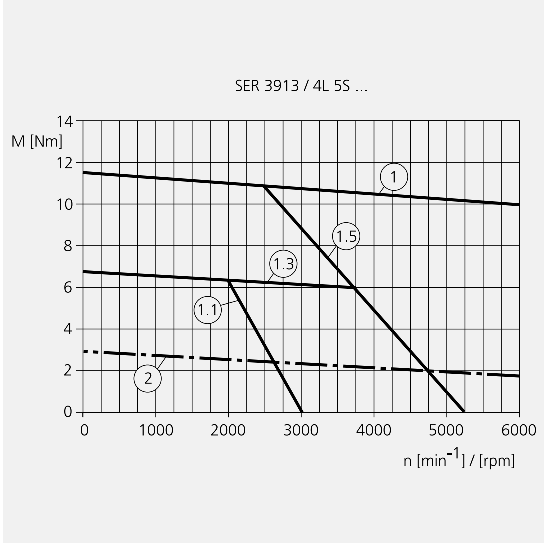


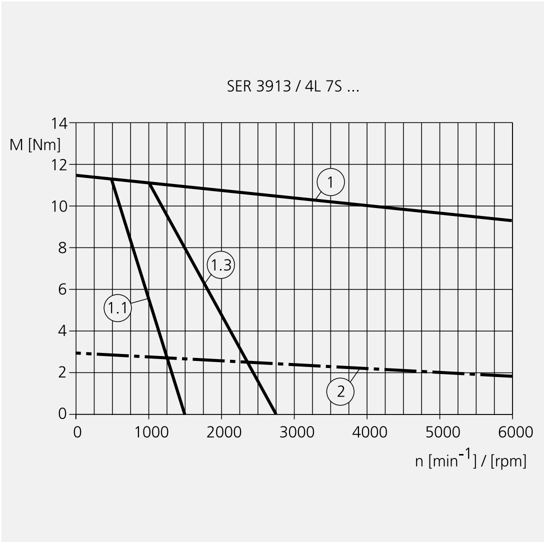


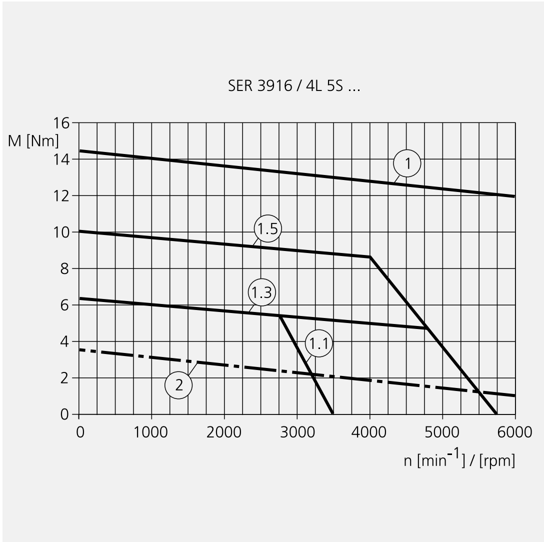


1	Motor peak torque
2	Continuous torque
1.1	Peak torque with TLX x32
1.3	Peak torque with TLX x34
1.5	Peak torque with TLX x36
1.7	Peak torque with TLX x38









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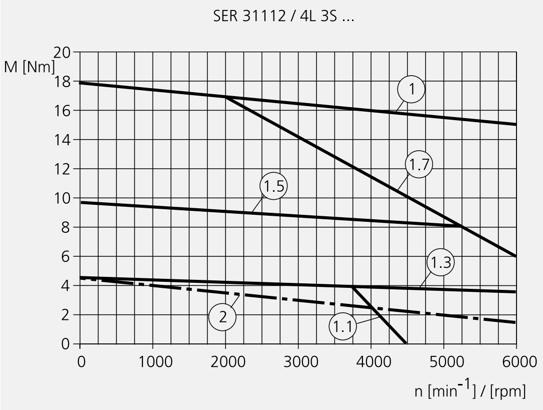

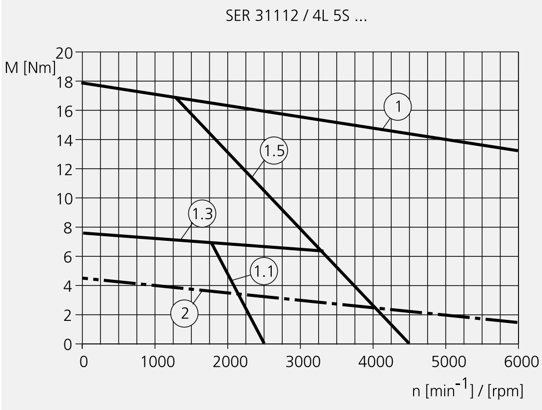

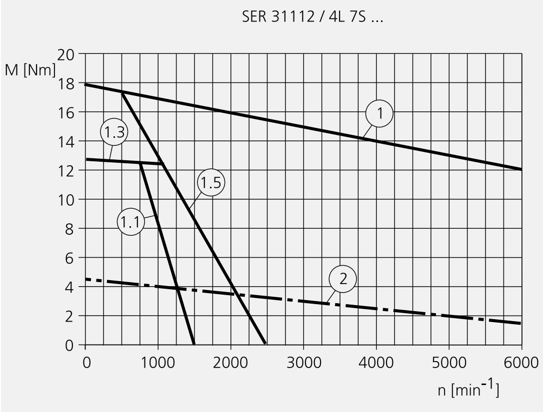

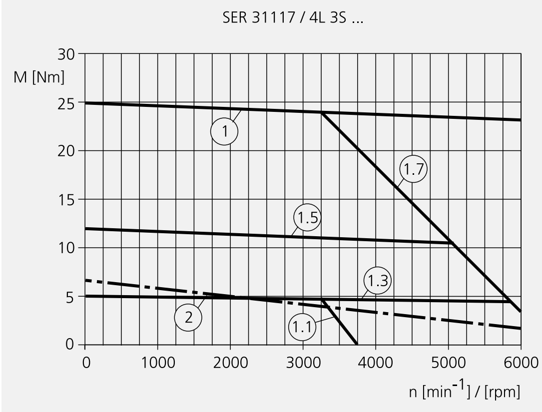

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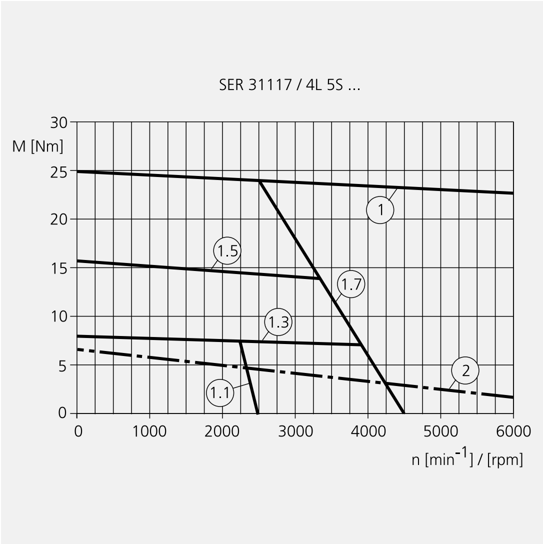

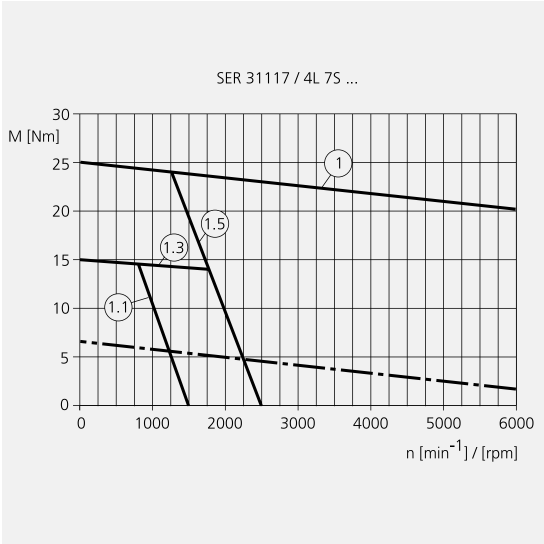

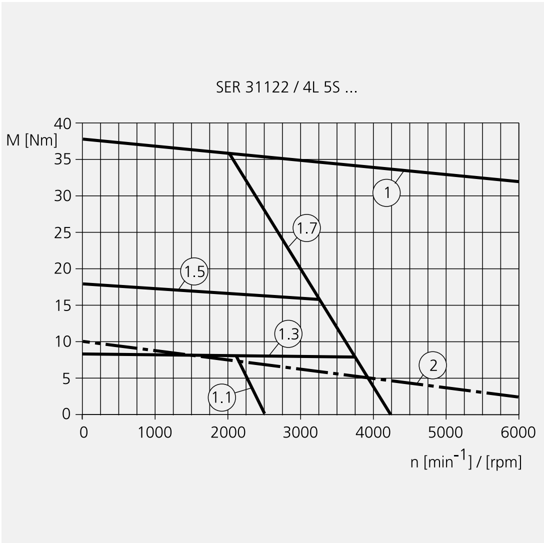

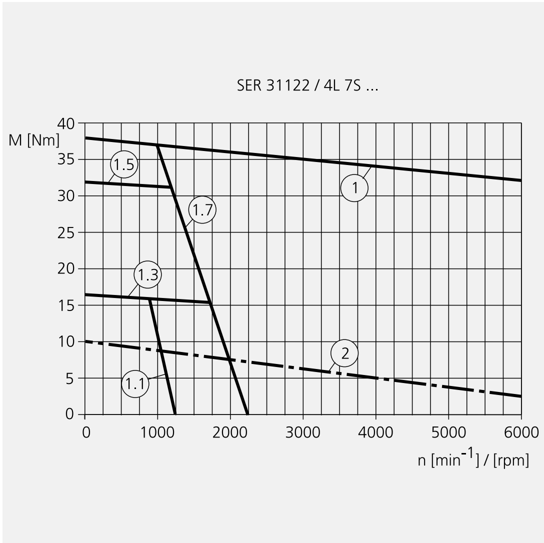

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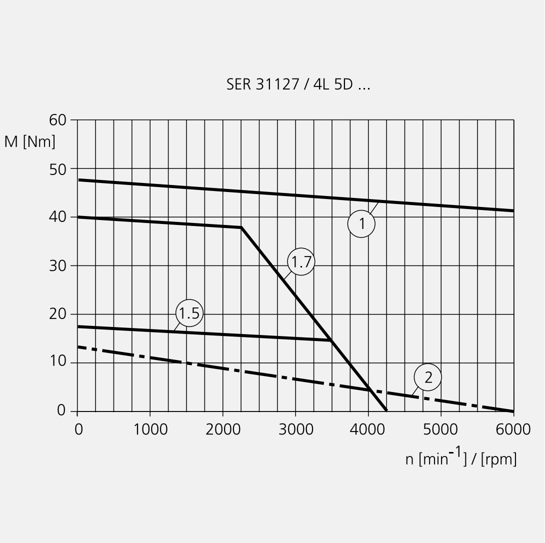

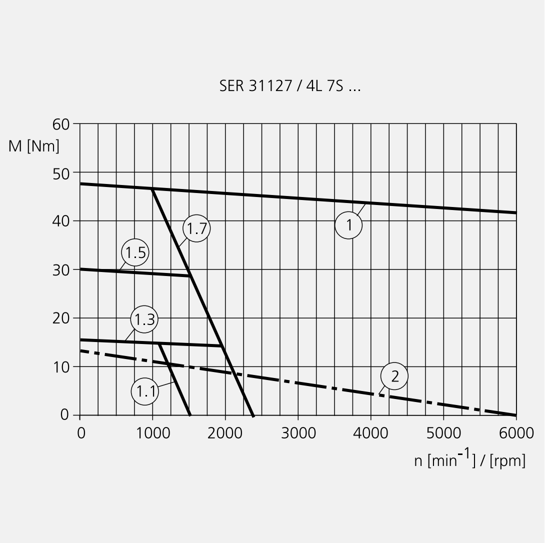

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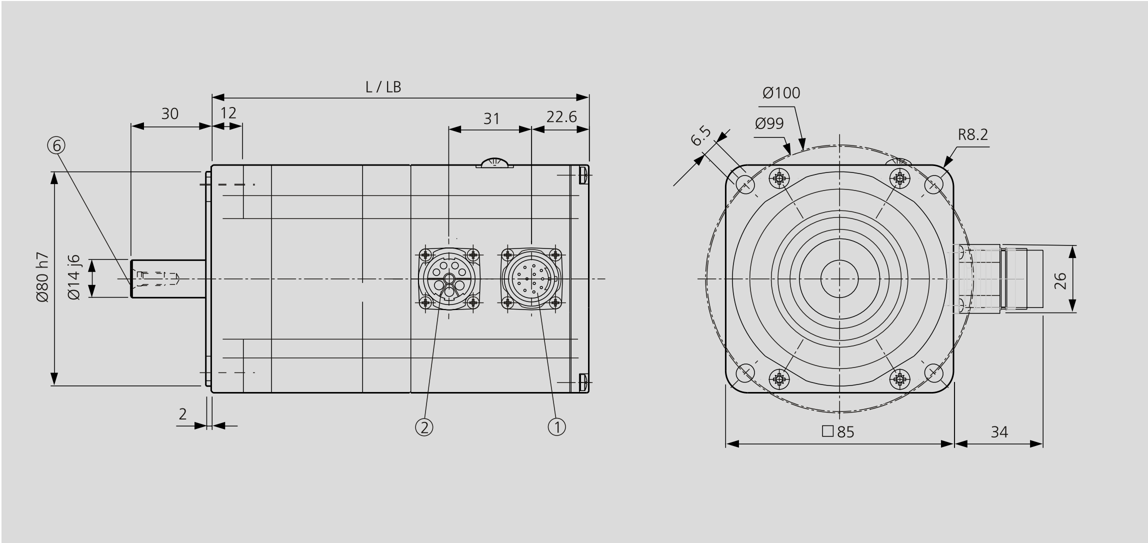
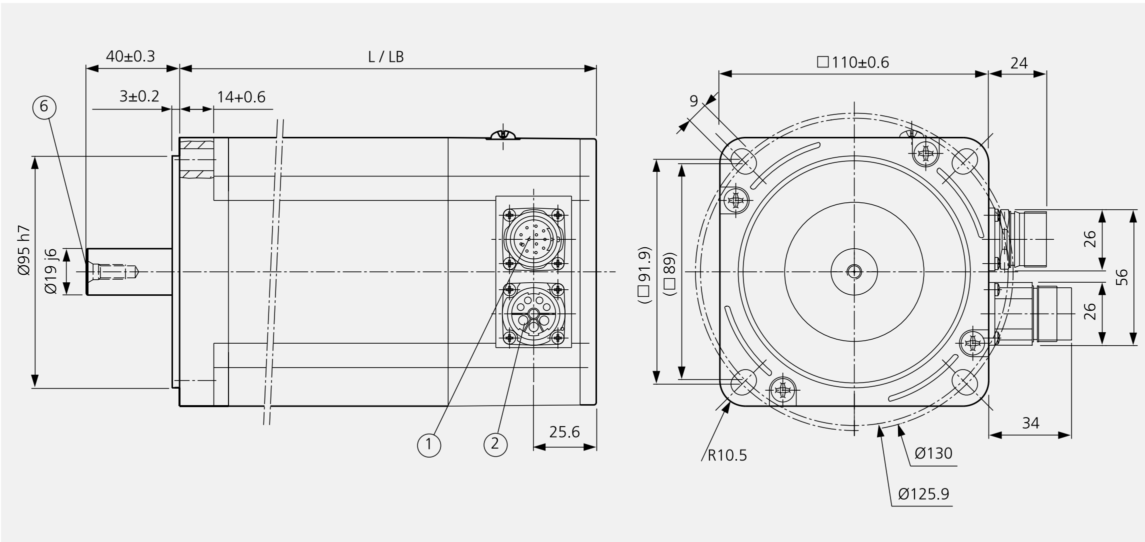


Standard AC synchronous servomotor, size 90



Standard AC synchronous servomotor, size 110

1 Encoder connector
2 Motor connector
6 Centre hole

Dimensions

		SER 397	SER 3910	SER 3913	SER 3916	SER 31112	SER 31117	SER 31122	SER 31127
Shaft diameter	ø	14 mm	14 mm	14 mm	14 mm	19 mm	19 mm	19 mm	19 mm
Centering collar	ø D	80 mm	80 mm	80 mm	80 mm	95 mm	95 mm	95 mm	95 mm
Total length without brake	L	141 mm	171 mm	201 mm	231 mm	132 mm	180 mm	228 mm	276 mm
Total length with brake	LB	186.5 mm	216.5 mm	246.5 mm	276.5 mm	198 mm	246 mm	294 mm	342 mm

Holding brake

The holding brake is an electromagnetic spring-pressure brake for locking the motor axle after the motor current is shut off. In emergency situations, such as in a power failure or during an EMERGENCY STOP, it shuts down the drive, significantly contributing to overall safety. The motor axle must also be locked for weight-induced torque loads, e.g. in cases of vertical axes in manual mode.

Holding brake controller

The holding brake is controlled via the **T**win **L**ine **H**olding **B**rake **C**ontroller, which is available as an accessory.

The TL HBC reduces heating of the brake by lowering the pickup voltage.

Caution! Overloading may damage the holding brake! Avoid stationary load torques greater than 25 % of the motor holding torque when using vertical axes with the holding brake.

Technical data

		SER 39x	SER 311x
Holding torque	M_{Br}	6 Nm	16 Nm
Armature inertia	J_{Br}	0.2 kgcm^2	0.35 kgcm^2
Electrical pickup power	P_{Br}	24 W	28 W
Energise time	t_E	40 ms	60 ms
De-energise time	t_A	20 ms	30 ms
Weight	m_{Br}	1.8 kg	3.0 kg

Measuring systems

The standard measuring system is the SinCos® (SRS) Singleturn. This measuring system is designed to provide optimum performance with our Twin Line family of controllers. You can use the HIPERFACE® interface between motor-measuring system and device for a self-initialisation of the motor and current-regulator parameters, considerably simplifying the start-up process.

Another option is the SinCos® (SRM) Multiturn or Resolver, 2-pin, which is available as an accessory.

Technical data

	SinCos® (SRS) Singleturn	SinCos® (SRM) Multiturn	Resolver, 2-pin
Resolution with TLx	16384 incr. min^{-1}	16384 incr. min^{-1}	4096 incr. min^{-1}
Precision, integral nonlinearity	± 45 angular seconds	± 45 angular seconds	± 360 angular seconds
Index pulse	–	–	–
Absolute position after activation within [min^{-1}], with the precision	1 ± 45 angular seconds	4096 ± 45 angular seconds	1 ± 360 angular seconds
Signal form	Sinusoidal/cosinusoidal 1024 cycles min^{-1}	Sinusoidal/cosinusoidal 1024 cycles min^{-1}	Sinusoidal/cosinusoidal 1 cycles min^{-1}
Measuring procedure	High-resolution, optical	High-resolution, optical	Inductive
Interface	HIPERFACE®	HIPERFACE®	–
Module required on slot 2, TLx	HIFA-C	HIFA-C	RESO-C
Working temperature range	–20 to +115 °C	–20 to +115 °C	–55 to +155 °C

PL 50 planetary gear

PL 100 planetary gear

Gearbox PL 50 / PL 100

Gearbox data for all types

Gearbox type	Single-stage straight-toothed planetary gear
Rated storage/service life*	L_{10h} = 20000 h
Torsional flank clearance	< 12′
Housing material	Aluminium
Surface	Anodised black
Shaft material	C 45
Bearing	Roller bearing
Sealing at shaft end	IP 54
Lubrication	Grease-lubricated for entire service life
Temperature range	–20 to +80 °C

* Value in operating hours with a 10 % likelihood of failure; 100 % duty cycle at continuous output torque; operating mode S1 (continuous operation); storage temperature = 30 °C

The PL 50 / 100 gearboxes are delivered already mounted to the motor. They can be ordered using the type key for the motor.

Additional gearboxes are available upon request.

The technical data refers to a combination of motor and gearbox

	1	2 kg	3 N	4 N	5	J $kgcm^2$	M_{DG} Nm	M_{max} Nm
SER 397 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	10.8 18.0 36.0
SER 3910 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	21.6 36.0 72.0
SER 3913 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	31.05 51.75 103.50
SER 3916 with PL 50	3:1 5:1 10:1	2.3	550	580	0.9	0.63 0.14 0.07	38 50 41	39.15 62.25 130.50
SER 31112 with PL 100	3:1 5:1 10:1	8.75	760	760	0.9	1.5 0.7 0.5	100 100 80	48.6 81.0 162.0
SER 31117 with PL 100	3:1 5:1 10:1	8.75	760	760	0.9	1.5 0.7 0.5	100 100 80	67.5 112.5 225.0
SER 31122 with PL 100	3:1 5:1 10:1	8.75	760	760	0.9	1.5 0.7 0.5	100 100 80	102.6 171.0 342.0
SER 31127 with PL 100	3:1 5:1 10:1	8.75	760	760	0.9	1.5 0.7 0.5	100 100 80	129.6 216.0 432.0

1 Reduction ratio

2 Gearbox mass

3 Max. permissible radial force at $n2^* = 400\ min^{-1}$

4 Max. permissible axial force at $n2^* = 400\ min^{-1}$

5 Efficiency

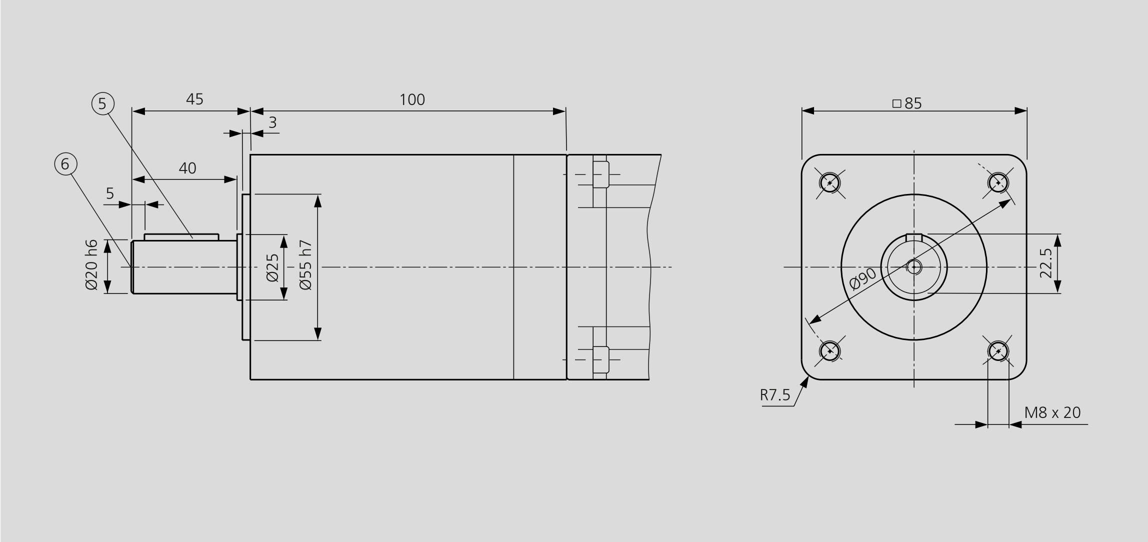
J Gearing inertia

M_{DG} Continuous output torque of the gearbox in the continuous endurance range of the toothed parts (motor not taken into account).

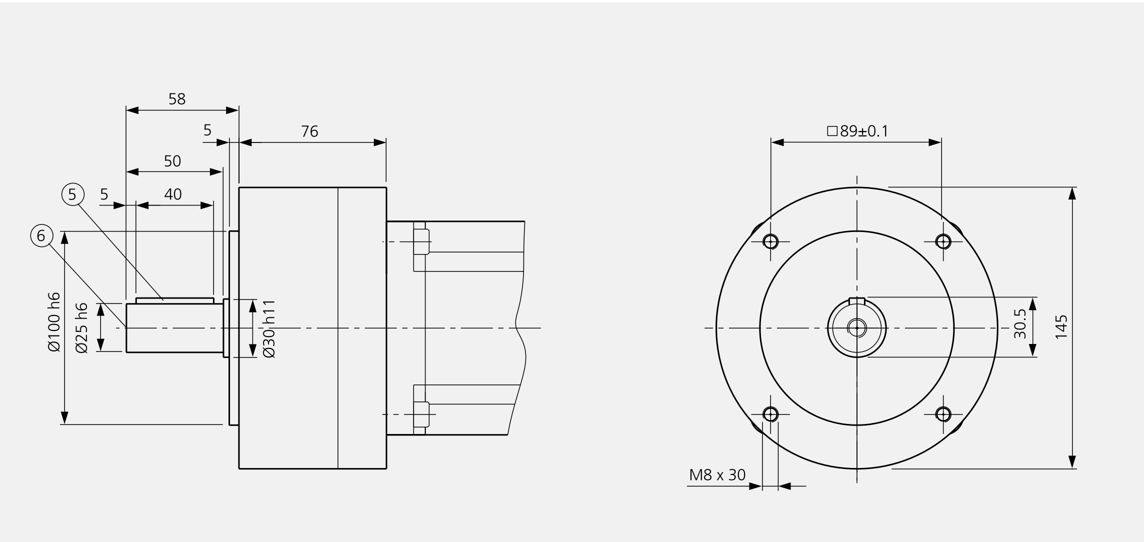
M_{max} Max. torque at output (gearbox with motor, efficiency taken into account), at M_{max} of motor

*Gear output speed

Note: M_{DG} may not be exceeded for a long period of time. Dual torque is possible for short periods, e. g. for EMERGENCY STOP situations. The motor may need to be limited in order to preclude the risk of destroying the gearbox at peak torques.



PL 50 planetary gear for AC synchronous servomotors, size 90



PL 100 planetary gear for AC synchronous servomotors, size 110

5 Featherkey
6 Centre hole

Gearbox	Featherkey	Centre hole
PL 50	DIN 6885 A6 x 6 x 28	DIN 332 DS M6
PL 100	DIN 6885 A8 x 7 x 40	DIN 332 DS M10

AC synchronous servomotors - Standard

Example	SER	3	X	X	/	4	L	X	X	X	0	X	X	X	X
Number of phases 3	SER	**3**	X	X	/	4	L	X	X	X	0	X	X	X	X
Size (flange) 9 (85 mm) 11 (110 mm)	SER	3	**X**	X	/	4	L	X	X	X	0	X	X	X	X
Length 7 10 12 13 16 17 22 27	SER	3	X	**X**	/	4	L	X	X	X	0	X	X	X	X
Pole pair count 4	SER	3	X	X	/	**4**	L	X	X	X	0	X	X	X	X
Rotor inertia L = low inertia	SER	3	X	X	/	4	**L**	X	X	X	0	X	X	X	X
Winding code 3 5 7	SER	3	X	X	/	4	L	**X**	X	X	0	X	X	X	X
Winding circuit S = star D = triangle (only SER 31127)	SER	3	X	X	/	4	L	X	**X**	X	0	X	X	X	X
Measuring system S = SinCos® (SRS) Singleturn M = SinCos® (SRM) Multiturn R = resolver	SER	3	X	X	/	4	L	X	X	**X**	0	X	X	X	X
Resolution 0 = for measuring systems: S, M, R	SER	3	X	X	/	4	L	X	X	X	**0**	X	X	X	X
Motor connection C = with mounting sockets, straight exit T = with mounting sockets, 90°, rotating	SER	3	X	X	/	4	L	X	X	X	0	**X**	X	X	X
Holding brake B = with brake O = without brake	SER	3	X	X	/	4	L	X	X	X	0	X	**X**	X	X
Gearbox type PL 50 PL 100	SER	3	X	X	/	4	L	X	X	X	0	X	X	**X**	X
Gearbox reduction ratio I3 = 3:1 I5 = 5:1 I10 = 10:1	SER	3	X	X	/	4	L	X	X	X	0	X	X	X	**X**

Series of High Performance AC synchronous servomotors

AC synchronous servomotors - High Performance

Features

- **High impulse torque** up to five times the continuous stationary torque.
- **Large power bandwidth** encompassing a continuous stationary torque range from 0.34 to 50 Nm, in six model sizes.
- **High adaptability** to your application, because of the availability of individual sizes in several speed/torque variants.

Technical specifications

- 6-pin synchronous motors
- SinCos absolute measuring system® (SRS) Singleturn as standard position and rotary-speed measuring system, except for DSM 4-05.x, which only comes with the Resolver
- Use of high-energy neodymium-iron-boron magnets
- Integrated thermal efficiency monitoring (NTC)
- Vibration severity level R according to DIN ISO 2373
- Protection type:
  - Motor housing: IP 65
  - Shaft end, front: IP 64
- Motor and measuring-system connection with mounting sockets, straight exit, except DSM 4-19x, motor connection only via terminal box
- Size (flange)
  - DSM 4-05 (55 x 55 mm^2)
  - DSM 4-07 (70 x 70 mm^2)
  - DSM 4-09 (92 x 92 mm^2)
  - DSM 4-11 (110 x 110 mm^2)
  - DSM 4-14 (140 x 140 mm^2)
  - DSM 4-19 (190 x 190 mm^2)
- Rated speeds, depending on motor length
  - DSM 4-05: 6000 min^{-1}
  - DSM 4-07: 4000/6000 min^{-1}
  - DSM 4-09: 3000/4000/6000 min^{-1}
  - DSM 4-11: 3000/4000/6000 min^{-1}
  - DSM 4-14: 2000/3000/4000 min^{-1}
  - DSM 4-19: 1500/2000/3000/4000 min^{-1}

Optional accessories

- Measuring system
  - SinCos® (SRM) Multiturn
  - Resolver only for DSM 4-05.x
- Integrated holding brake
- Gearbox
- Mounting sockets, 90°, can be rotated for:
  - Motor (except DSM 4-19.x)
  - Measuring system
- Special shaft, special flange
- Vibration severity level S
- Level R flange precision
- Different colour scheme

Environmental influences

Ambient conditions (based on DIN 50019-R14):

- Temperature: –20 °C to +40 °C
- Humidity: 75 % R.H. yearly average, 95 % R.H. on 30 days, non-condensing

Storage and transport temperature:

- Temperature: –20 °C to +60 °C

Technical data for DSM 4-05

	U_{DC-Bus}	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
DSM 4-05.1-1xx.x6	325	0.34	1.20	0.32	1.3	6000	0.20	20.0	1.7	7.07	0.17	1.0
DSM 4-05.1-2xx.x6	560	0.34	0.85	0.32	0.9	6000	0.20	27.6	1.7	5.02	0.17	1.0
DSM 4-05.2-1xx.x6	325	0.50	1.50	0.48	1.7	6000	0.30	20.0	2.5	9.05	0.24	1.2
DSM 4-05.2-2xx.x6	560	0.50	1.00	0.48	1.1	6000	0.30	32.8	2.5	6.01	0.24	1.2
DSM 4-05.3-1xx.x6	325	0.65	2.00	0.60	2.3	6000	0.375	20.0	3.2	10.80	0.31	1.4
DSM 4-05.3-2xx.x6	560	0.65	1.20	0.60	1.3	6000	0.375	35.2	3.2	6.51	0.31	1.4
DSM 4-05.4-1xx.x6	325	1.00	3.20	0.80	3.4	6000	0.500	20.0	5.0	16.97	0.45	1.8
DSM 4-05.4-2xx.x6	560	1.00	1.60	0.80	1.7	6000	0.500	40.0	5.0	8.49	0.45	1.8

Technical data for the DSM 4-07.x and its variations

	U_{DC-Bus}	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
DSM 4-07.1-1xx.x4	325	0.65	1.9	0.6	2.0	4000	0.25	20.8	3.1	11.38	0.22	1.5
DSM 4-07.1-2xx.x4	560	0.65	0.9	0.6	0.9	4000	0.25	47.9	3.1	5.37	0.22	1.5
DSM 4-07.1-1xx.x6	325	0.65	2.6	0.5	2.5	6000	0.31	15.4	3.1	15.63	0.22	1.5
DSM 4-07.1-2xx.x6	560	0.65	1.3	0.5	1.2	6000	0.31	32.1	3.1	7.85	0.22	1.5
DSM 4-07.2-1xx.x4	325	1.50	3.2	1.3	2.9	4000	0.54	27.7	7.2	19.23	0.36	2.1
DSM 4-07.2-2xx.x4	560	1.50	1.6	1.3	1.4	4000	0.54	57.2	7.2	9.62	0.36	2.1
DSM 4-07.2-1xx.x6	325	1.50	5.0	1.0	4.4	6000	0.62	17.8	7.2	29.98	0.36	2.1
DSM 4-07.2-2xx.x6	560	1.50	2.4	1.0	2.1	6000	0.62	37.5	7.2	14.42	0.36	2.1
DSM 4-07.3-1xx.x4	325	2.30	5.5	2.0	4.7	4000	0.83	26.3	11.0	33.02	0.57	2.9
DSM 4-07.3-2xx.x4	560	2.30	2.4	2.0	2.0	4000	0.83	60.4	11.0	14.42	0.57	2.9
DSM 4-07.3-1xx.x6	325	2.30	7.7	1.5	6.6	6000	0.94	18.6	11.0	46.17	0.57	2.9
DSM 4-07.3-2xx.x6	560	2.30	3.5	1.5	3.0	6000	0.94	41.8	11.0	21.00	0.57	2.9

U_{DC-Bus}	Intermediate-circuit direct voltage from Twin Line drive or controller	P_N	Rated power
M_{dO}	Continuous stationary torque	k_E	Voltage constant at 1000 min^{-1}
I_{dO}	Continuous stationary current	M_{max}	Max. torque
M_{dN}	Rated continuous torque	I_{max}	Max. current
I_{dN}	Rated continuous current	J_R	Rotor inertia
n_N	Rated speed	m	Mass

Technical data for the DSM 4-09.x and its variations

	U_{DC-Bus}	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
DSM 4-09.1-1xx.x3	325	0.95	1.5	0.8	1.3	3000	0.25	36.5	4.3	7.50	1.20	2.7
DSM 4-09.1-2xx.x3	560	0.95	0.8	0.8	0.72	3000	0.25	66.5	4.3	3.96	1.20	2.7
DSM 4-09.1-1xx.x4	325	0.95	2	0.75	1.8	4000	0.31	27.5	4.3	9.97	1.20	2.7
DSM 4-09.1-2xx.x4	560	0.95	1.1	0.75	0.9	4000	0.31	50.2	4.3	5.44	1.20	2.7
DSM 4-09.1-1xx.x6	325	0.95	3	0.7	2.4	6000	0.44	18.3	4.3	14.99	1.20	2.7
DSM 4-09.1-2xx.x6	560	0.95	1.6	0.7	1.3	6000	0.44	33.6	4.3	7.99	1.20	2.7
DSM 4-09.2-1xx.x3	325	2.70	3.2	2.4	2.7	3000	0.75	45.5	12.2	15.98	2.70	3.9
DSM 4-09.2-2xx.x3	560	2.70	1.9	2.4	1.6	3000	0.75	78.8	12.2	9.40	2.70	3.9
DSM 4-09.2-1xx.x4	325	2.70	4.3	2.2	3.6	4000	0.92	34.3	12.2	21.50	2.70	3.9
DSM 4-09.2-2xx.x4	560	2.70	2.5	2.2	2.1	4000	0.92	59	12.2	12.45	2.70	3.9
DSM 4-09.2-1xx.x6	325	2.70	6.5	2.0	5.3	6000	1.25	22.3	12.2	32.46	2.70	3.9
DSM 4-09.2-2xx.x6	560	2.70	3.7	2.0	3	6000	1.25	39.4	12.2	18.46	2.70	3.9
DSM 4-09.3-2xx.x3	560	4.50	2.9	3.9	2.4	3000	1.22	83.5	20.3	14.50	4.20	5.2
DSM 4-09.3-2xx.x4	560	4.50	3.8	3.5	3.1	4000	1.47	64.2	20.3	18.95	4.20	5.2
DSM 4-09.3-2xx.x6	560	4.50	5.6	2.8	3.8	6000	1.76	43.4	20.3	27.93	4.20	5.2
DSM 4-09.4-2xx.x3	560	6.00	4.2	5.0	3.4	3000	1.57	79.7	27.0	21.00	5.40	6.6
DSM 4-09.4-2xx.x4	560	6.00	5.5	4.5	4.4	4000	1.88	61.3	27.0	27.51	5.40	6.6
DSM 4-09.4-2xx.x6	560	6.00	7.8	3	4.5	6000	1.88	42.5	27.0	38.96	5.40	6.6

Technical data for the DSM 4-11.x and its variations

	U_{DC-Bus}	M_{dO}	I_{dO}	M_{dN}	I_{dN}	n_N	P_N	k_E	M_{max}	I_{max}	J_R	m
	V	Nm	A_{eff}	Nm	A_{eff}	min^{-1}	kW	V_{eff}	Nm	A_{eff}	$kgcm^2$	kg
DSM 4-11.1-2xx.x3	560	4.20	3	3.7	2.8	3000	1.2	82.7	18.9	10.18	4.80	6.3
DSM 4-11.1-2xx.x4	560	4.20	4	3.5	3.5	4000	1.5	62	18.9	13.58	4.80	6.3
DSM 4-11.1-2xx.x6	560	4.20	6	3	4.8	6000	1.9	41.3	18.9	20.36	4.80	6.3
DSM 4-11.2-2xx.x3	560	7.00	4.8	6.1	4.5	3000	1.9	84.7	31.5	16.26	7.40	7.9
DSM 4-11.2-2xx.x4	560	7.00	6.4	5.8	5.8	4000	2.4	62.9	31.5	21.71	7.40	7.9
DSM 4-11.2-2xx.x6	560	7.00	9.9	3.8	5.9	6000	2.4	40.9	31.5	33.59	7.40	7.9
DSM 4-11.3-2xx.x3	560	10	7.2	8.4	6.3	3000	2.6	84.7	45.0	24.40	9.80	9.6
DSM 4-11.3-2xx.x4	560	10	9.7	7.6	7.7	4000	3.2	62.4	45.0	32.88	9.80	9.6
DSM 4-11.3-2xx.x6	560	10	13.6	5	7.6	6000	3.1	44.6	45.0	46.17	9.80	9.6
DSM 4-11.4-2xx.x3	560	12	8.5	9.9	7.3	3000	3.1	85.9	54.0	28.84	12.70	11.2
DSM 4-11.4-2xx.x4	560	12	11.6	8.6	8.6	4000	3.6	63.1	54.0	39.39	12.70	11.2

U_{DC-Bus}	Intermediate-circuit direct voltage from Twin Line drive or controller	P_N	Rated power
M_{dO}	Continuous stationary torque	k_E	Voltage constant at 1000 min^{-1}
I_{dO}	Continuous stationary current	M_{max}	Max. torque
M_{dN}	Rated continuous torque	I_{max}	Max. current
I_{dN}	Rated continuous current	J_R	Rotor inertia
n_N	Rated speed	m	Mass

AC synchronous servomotors - High Performance

Technical data for the DSM 4-14.x and its variations

	$U_{DC\text{-}Bus}$ V	M_{dO} Nm	I_{dO} A_{eff}	M_{dN} Nm	I_{dN} A_{eff}	n_N min^{-1}	P_N kW	k_E V_{eff}	M_{max} Nm	I_{max} A_{eff}	J_R $kgcm^2$	m kg
DSM 4-14.1-2xx.x2	560	8.5	3.7	7	3.1	2000	1.5	142.3	42	19.80	12.3	10
DSM 4-14.1-2xx.x3	560	8.5	5.6	6.5	4.5	3000	2.0	94.0	42	29.70	12.3	10
DSM 4-14.1-2xx.x4	560	8.5	7.4	5.2	4.8	4000	2.2	71.0	42	39.60	12.3	10
DSM 4-14.2-2xx.x2	560	14.00	5.6	12.2	4.9	2000	2.6	145.4	70	29.70	19.50	12
DSM 4-14.2-2xx.x3	560	14.00	9.0	11.0	7	3000	3.5	96.3	70	48.08	19.50	12
DSM 4-14.2-2xx.x4	560	14.00	12.0	7.6	6.5	4000	3.2	73.1	70	63.64	19.50	12
DSM 4-14.3-2xx.x2	560	19.0	8.1	16.5	7.3	2000	3.5	141.1	85.0	38.89	26.70	16
DSM 4-14.3-2xx.x3	560	19.0	12.4	14.6	9.9	3000	4.6	92.5	85.0	59.40	26.70	16
DSM 4-14.3-2xx.x4	560	19.0	16.2	8.7	7.7	4000	3.6	70.7	85.0	77.78	26.70	16
DSM 4-14.4-2xx.x2	560	27.0	11.9	21.4	9.4	2000	4.5	148.0	121.0	56.57	36	20
DSM 4-14.4-2xx.x3	560	27.0	17.3	15.5	9.9	3000	4.9	101.0	121.0	82.73	36	20

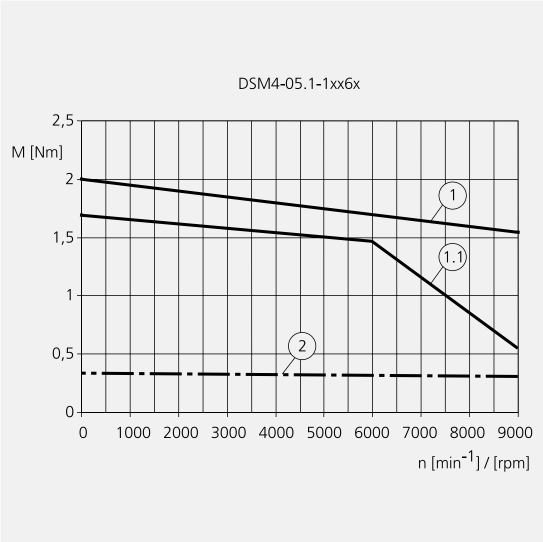
Technical data for the DSM 4-19.x and its variations

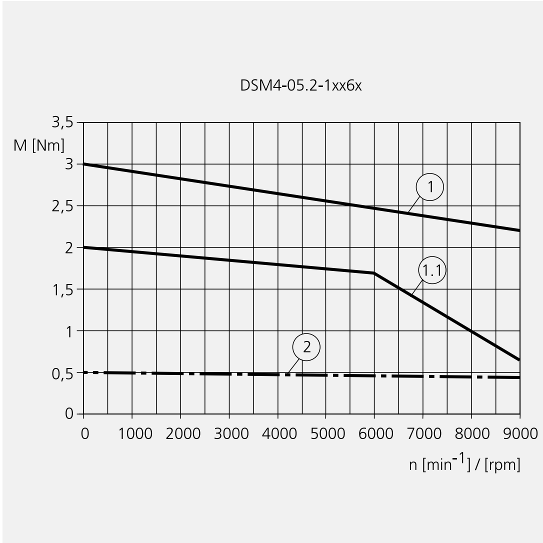
	$U_{DC\text{-}Bus}$ V	M_{dO} Nm	I_{dO} A_{eff}	M_{dN} Nm	I_{dN} A_{eff}	n_N min^{-1}	P_N kW	k_E V_{eff}	M_{max} Nm	I_{max} A_{eff}	J_R $kgcm^2$	m kg
DSM 4-19.1-2xx.x1	560	25	8.2	22.5	7.5	1500	3.5	189.2	88	28.99	84	31
DSM 4-19.1-2xx.x2	560	25	11.1	21.5	9.7	2000	4.5	140.6	88	38.89	84	31
DSM 4-19.1-2xx.x3	560	25	17.0	20.0	13.8	3000	6.3	91.9	88	60.10	84	31
DSM 4-19.1-2xx.x4	560	25	22.2	16.0	14.8	4000	6.7	70.3	88	77.78	84	31
DSM 4-19.2-2xx.x1	560	50	17.0	42.0	14.5	1500	6.6	179.6	175	60.1	147	44
DSM 4-19.2-2xx.x2	560	50	22.3	38.0	17.2	2000	7.9	137.3	175	78.5	147	44
DSM 4-19.2-2xx.x3	560	50	32.2	31.0	20.6	3000	9.7	95.1	175	113.1	147	44

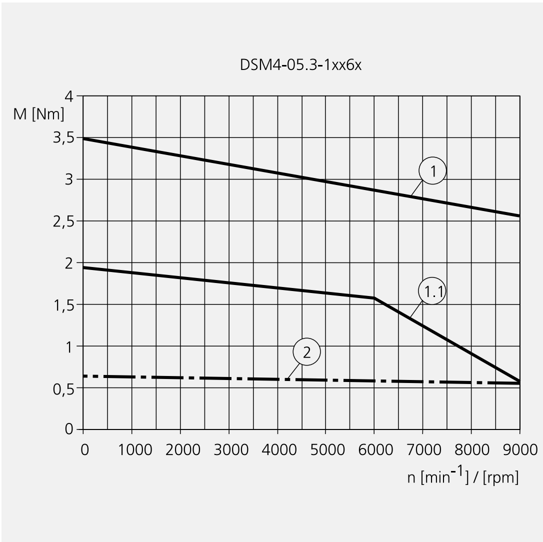
$U_{DC\text{-}Bus}$	Intermediate-circuit direct voltage from Twin Line drive or controller	P_N	Rated power
M_{dO}	Continuous stationary torque	k_E	Voltage constant at 1000 min^{-1}
I_{dO}	Continuous stationary current	M_{max}	Max. torque
M_{dN}	Rated continuous torque	I_{max}	Max. current
I_{dN}	Rated continuous current	J_R	Rotor inertia
n_N	Rated speed	m	Mass

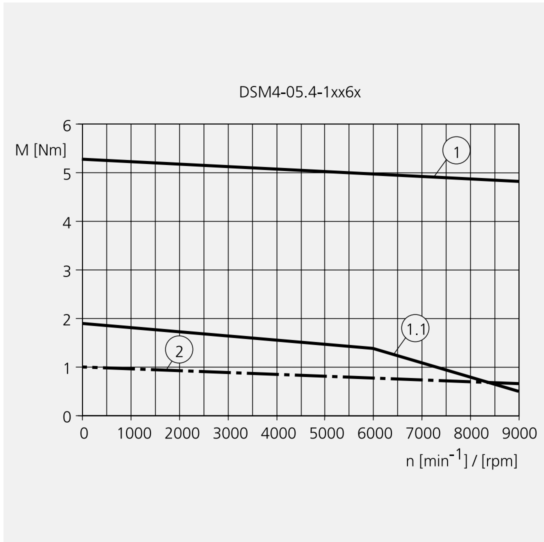
AC synchronous servomotors - High Performance

Characteristic curves

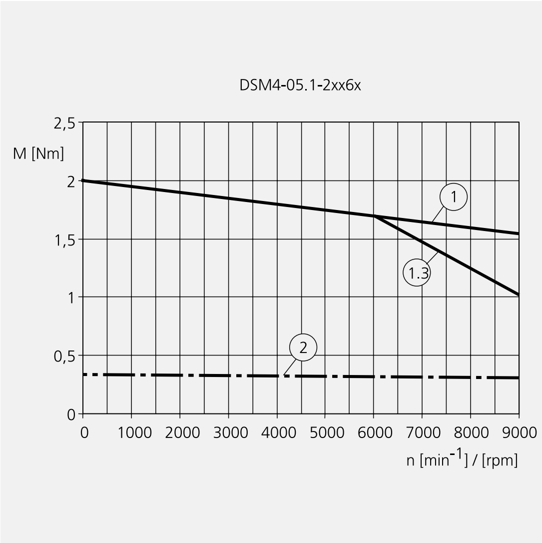


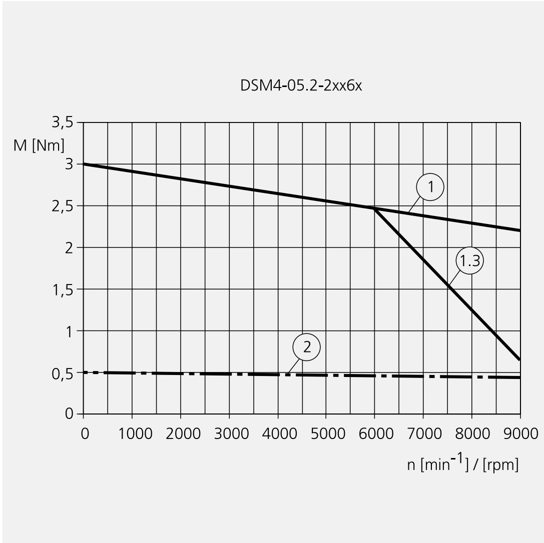


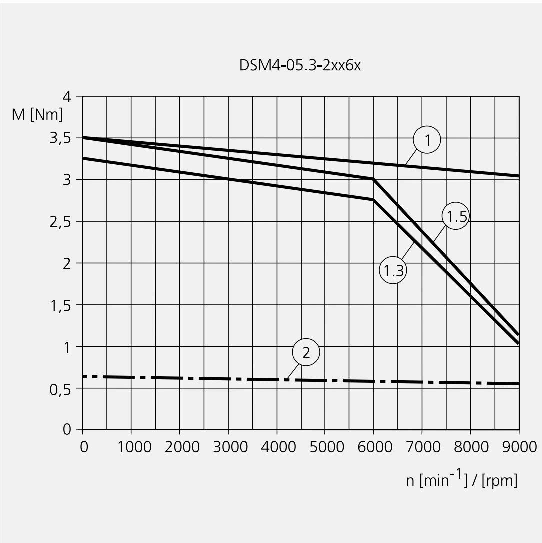


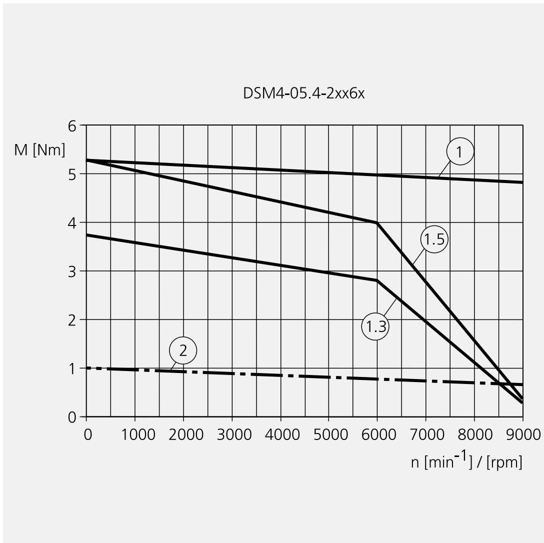


1	Motor peak torque
2	Continuous torque
1.1	Peak torque with TLX x32
1.3	Peak torque with TLX x34
1.5	Peak torque with TLX x36
1.7	Peak torque with TLX x38









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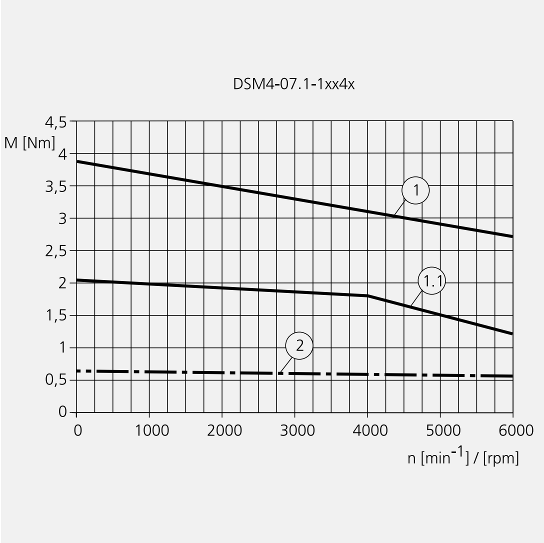

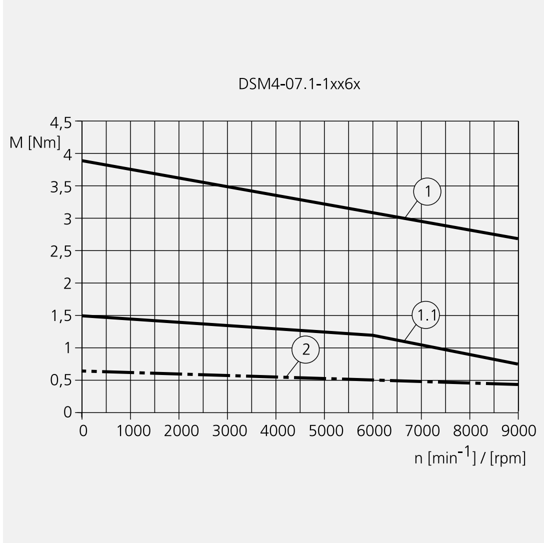

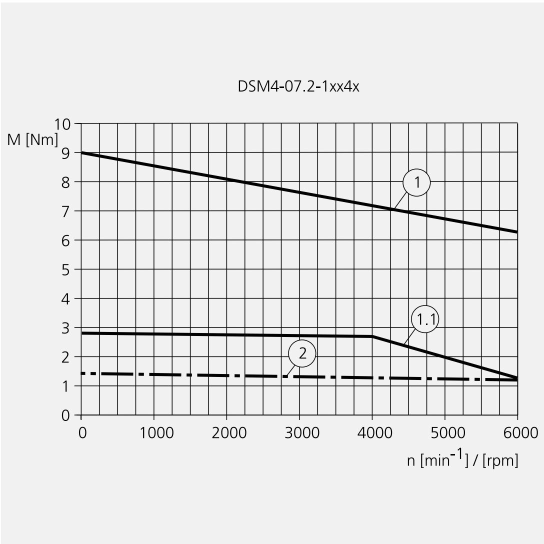

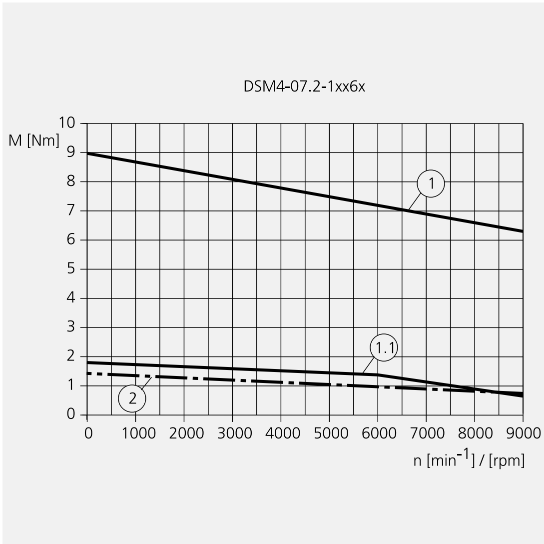

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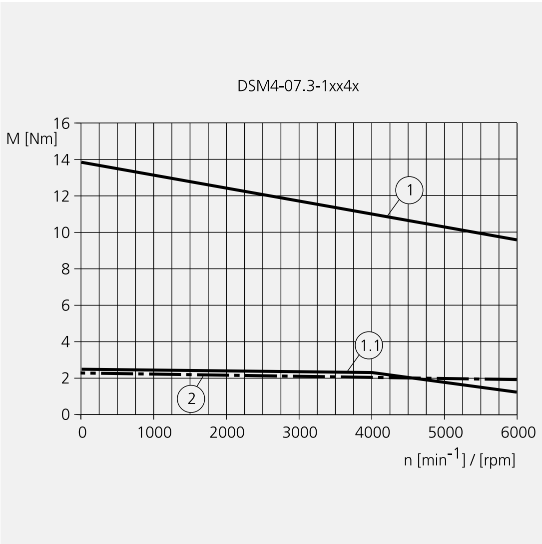

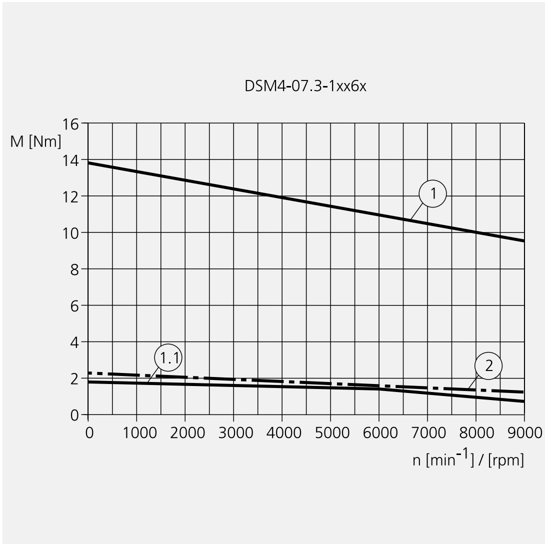

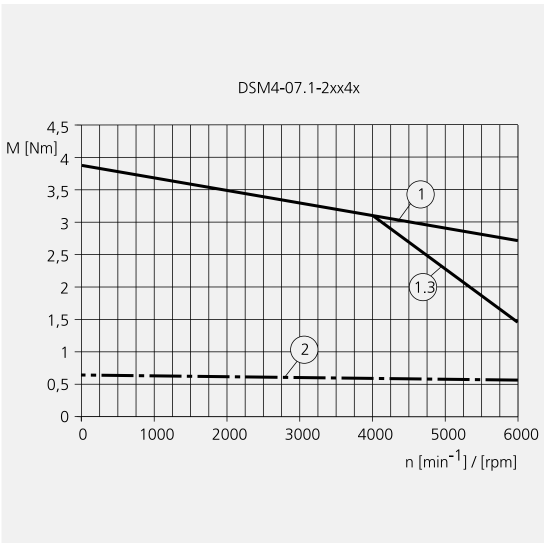

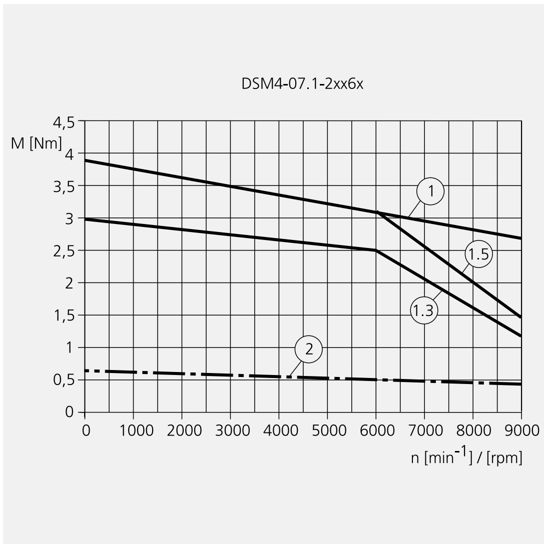

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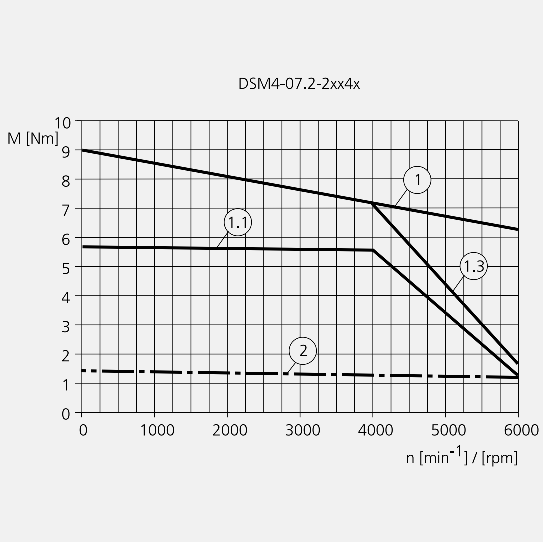
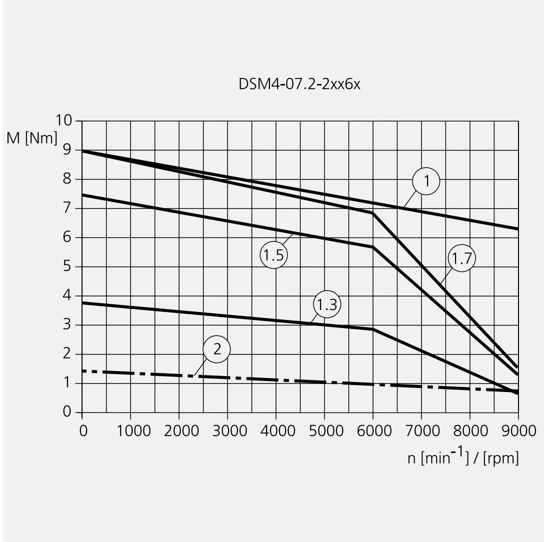
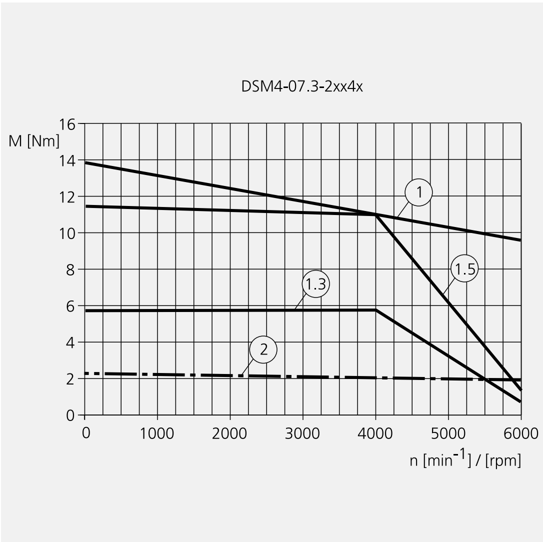
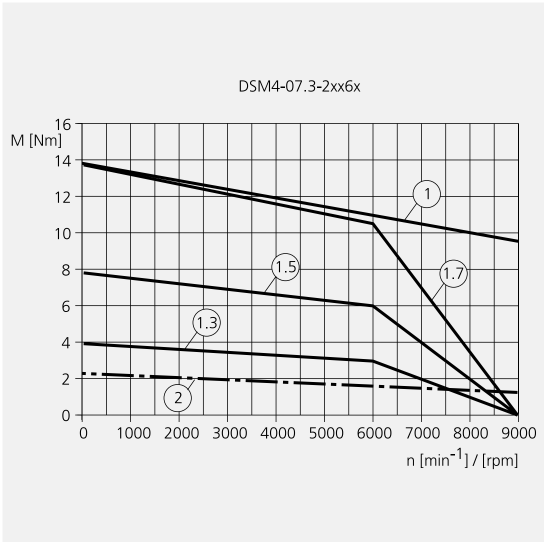
AC synchronous servomotors - High Performance

Characteristic curves









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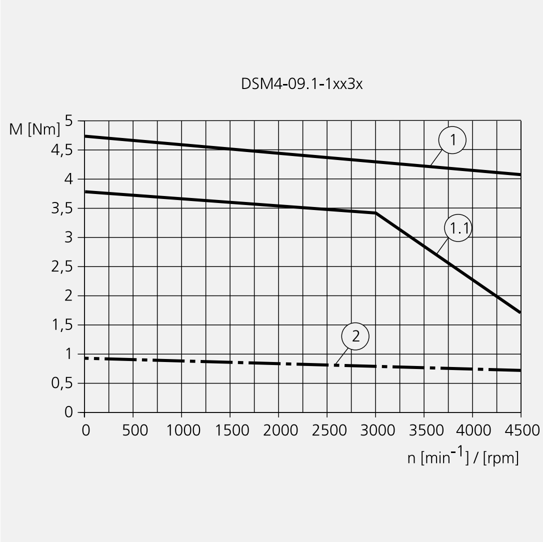

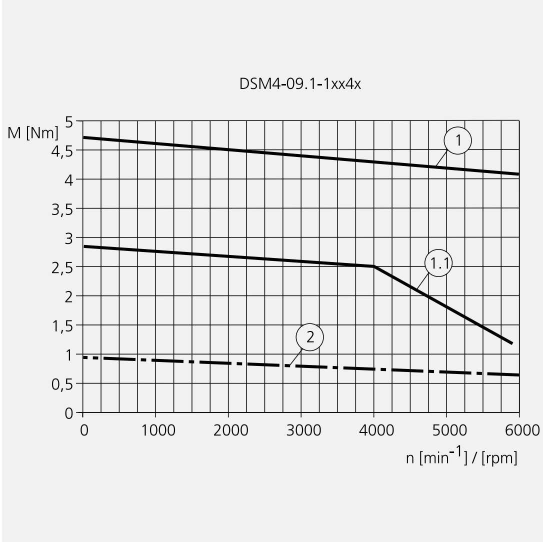

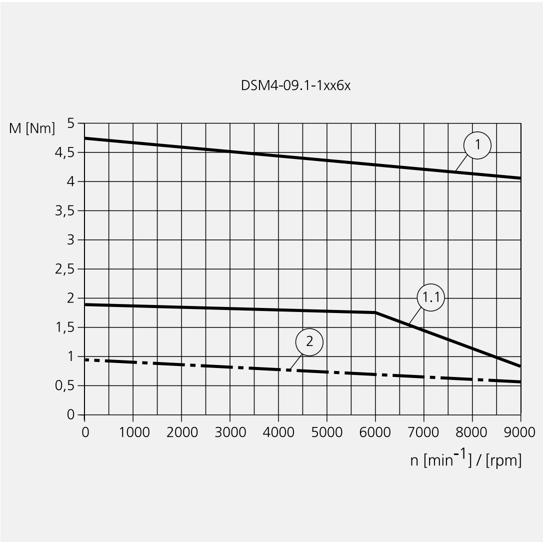

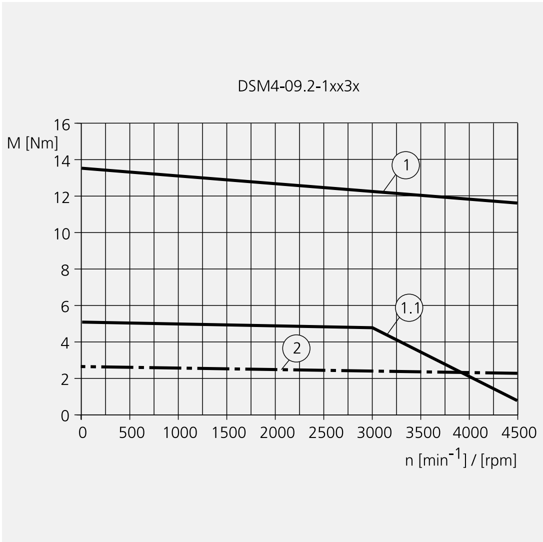

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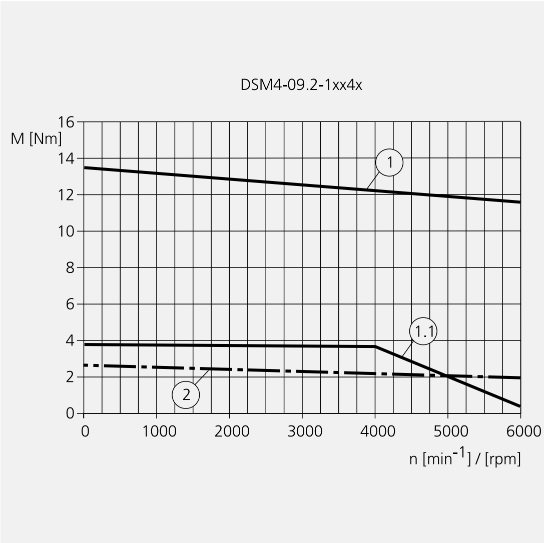

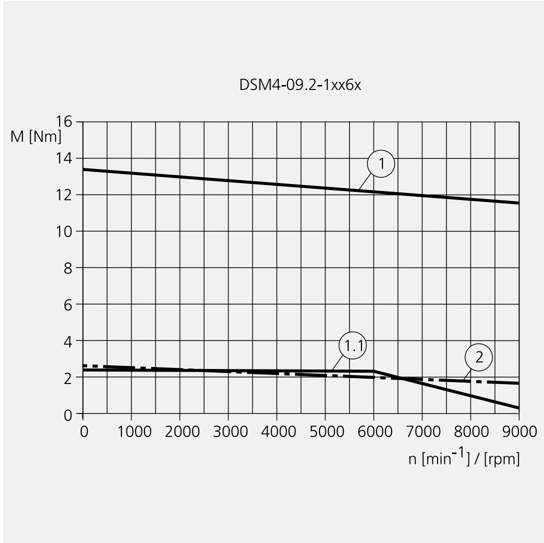

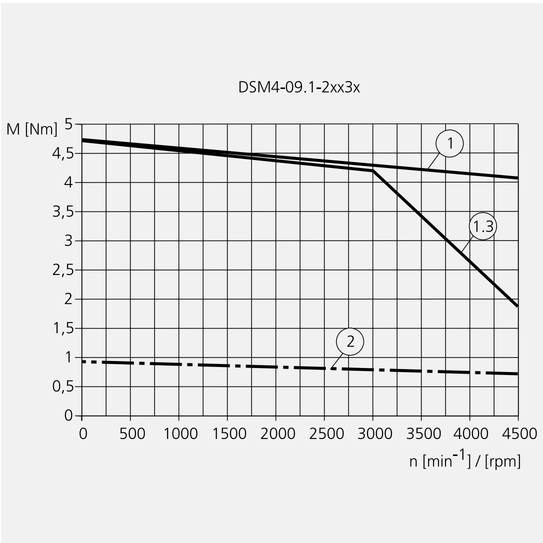

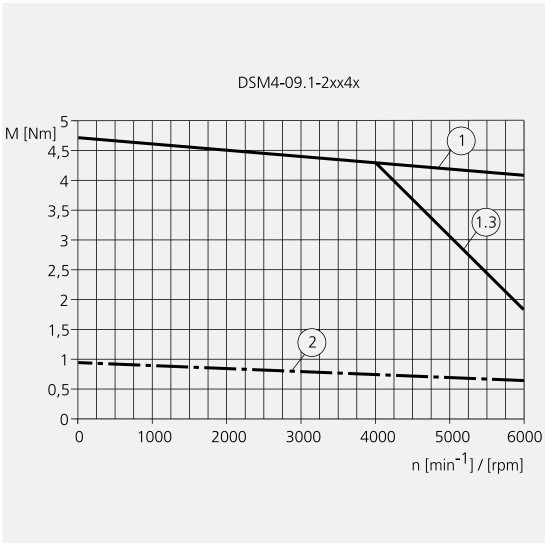

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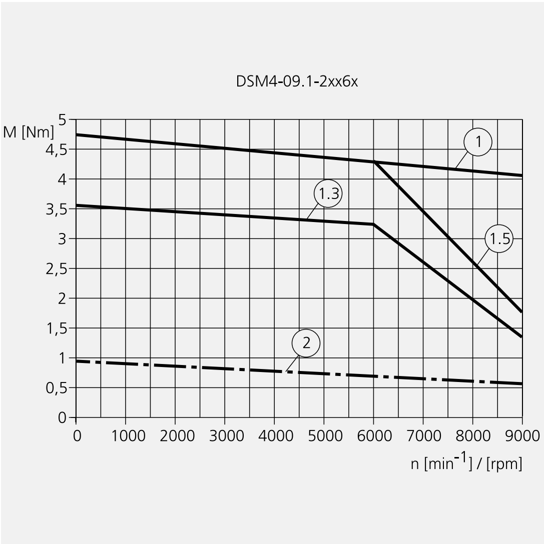

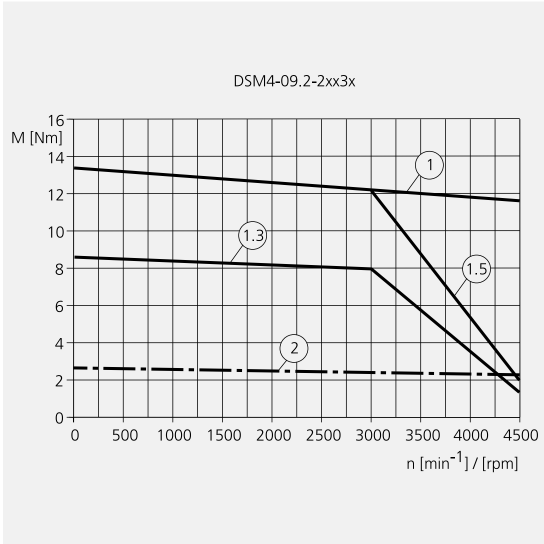

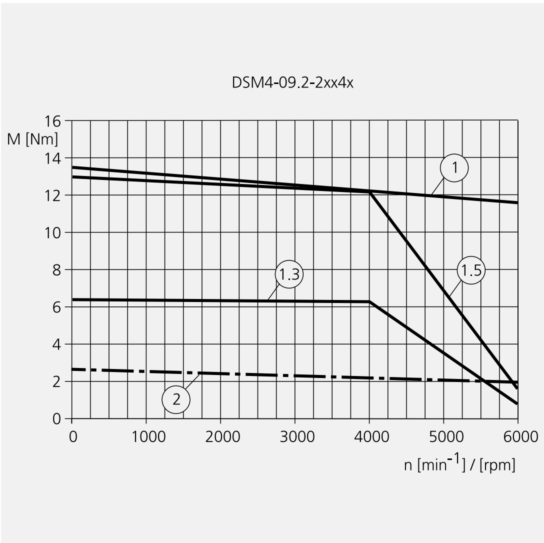

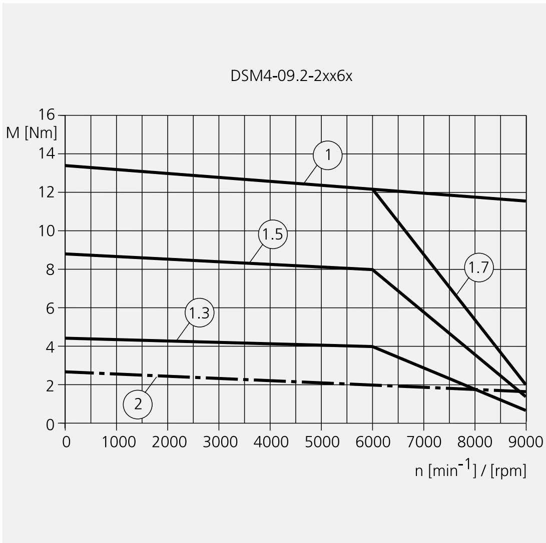

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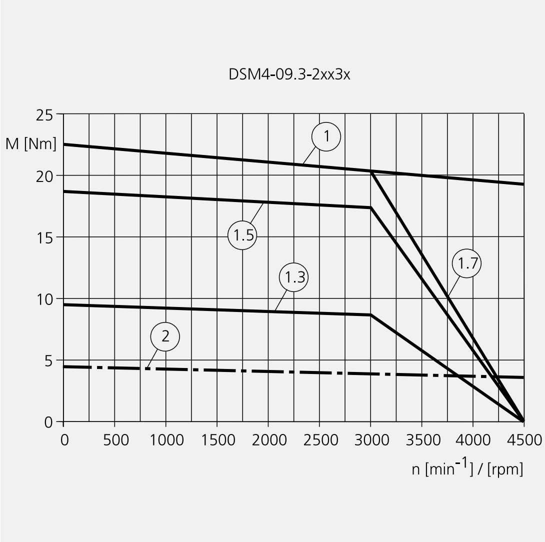

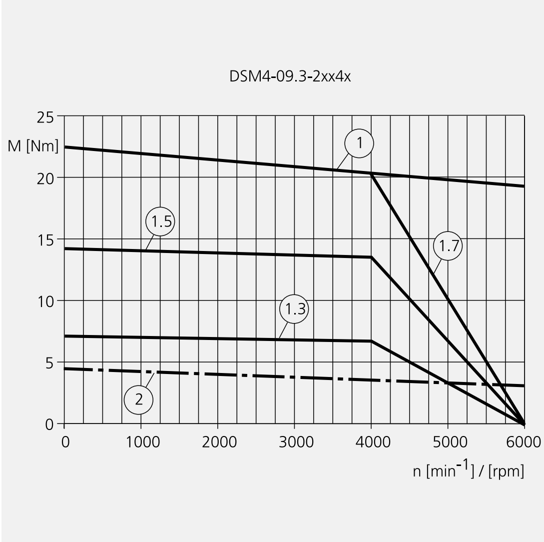

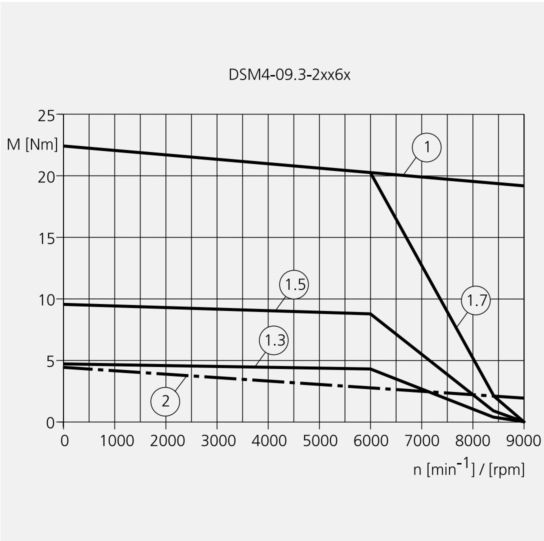

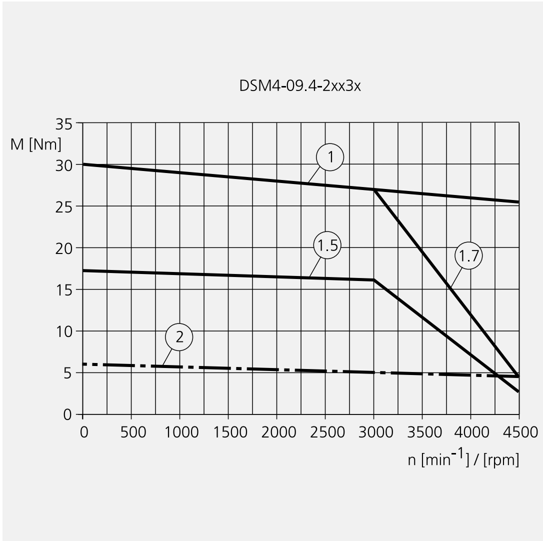

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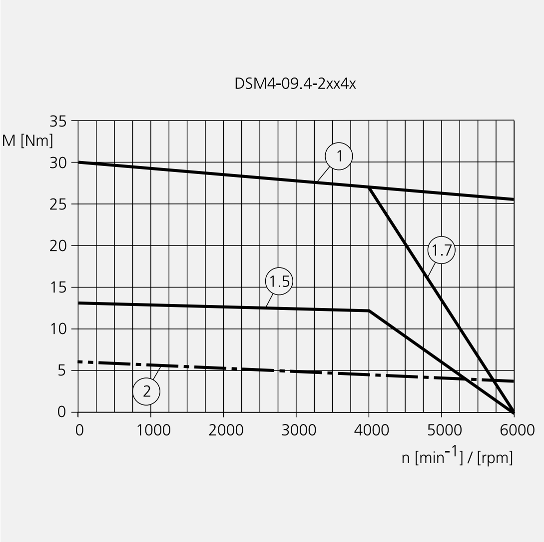

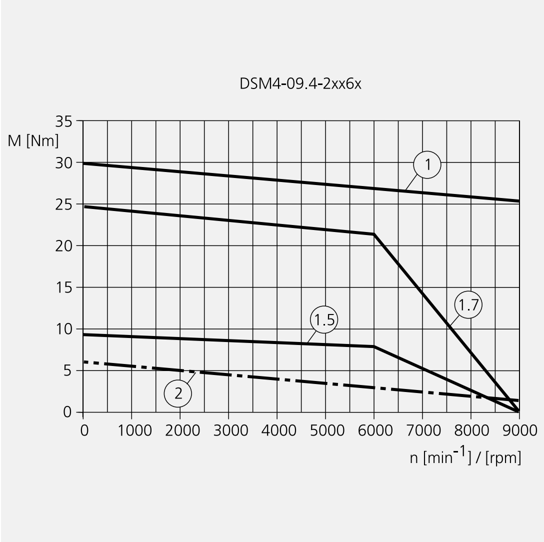

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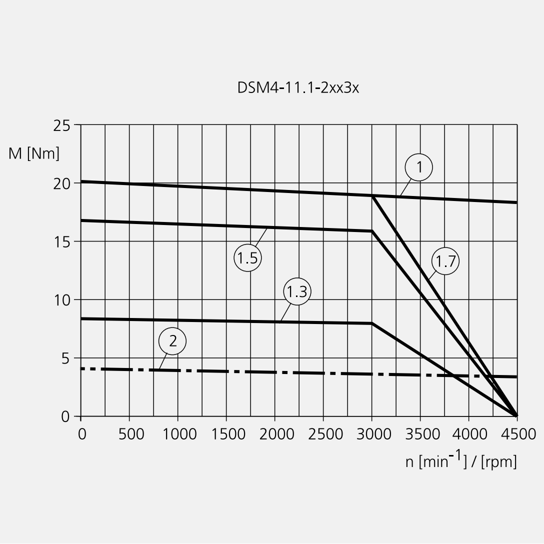

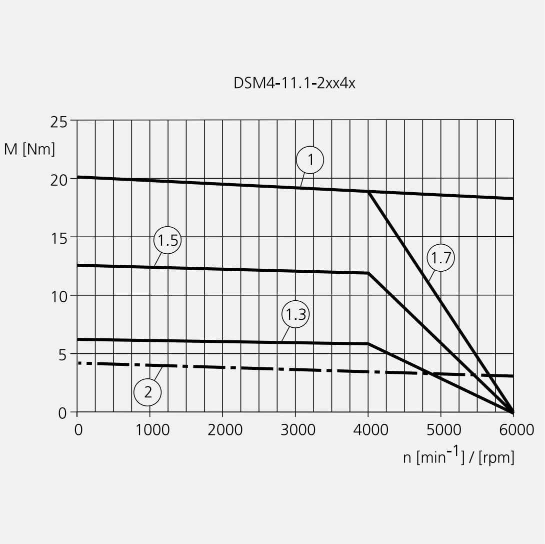

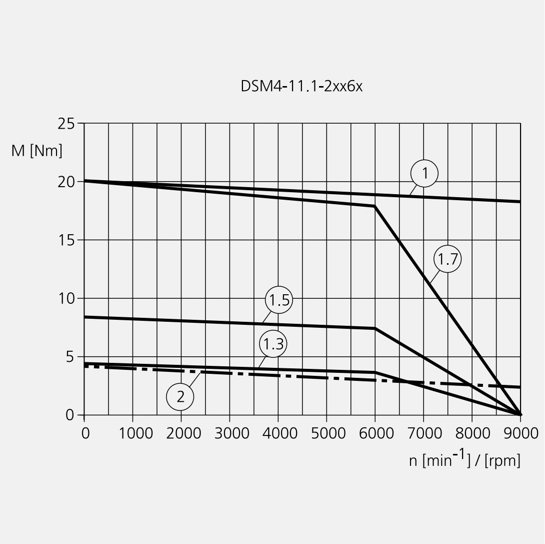

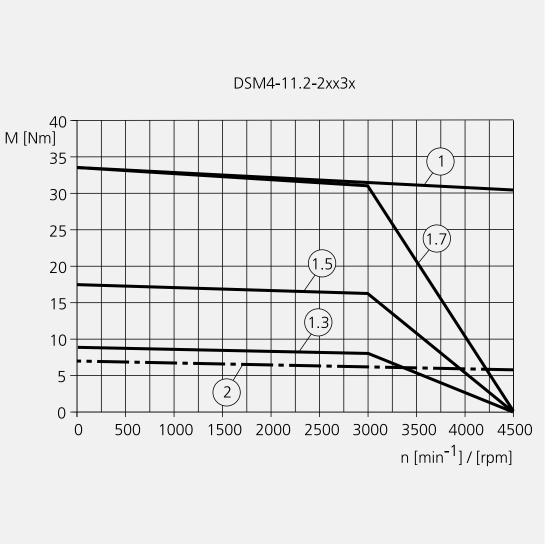

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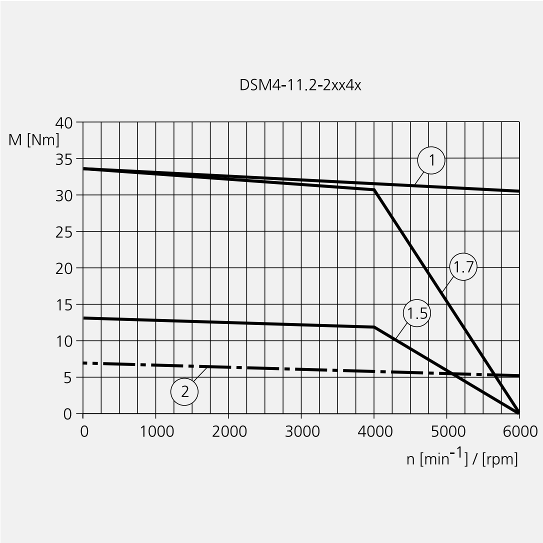
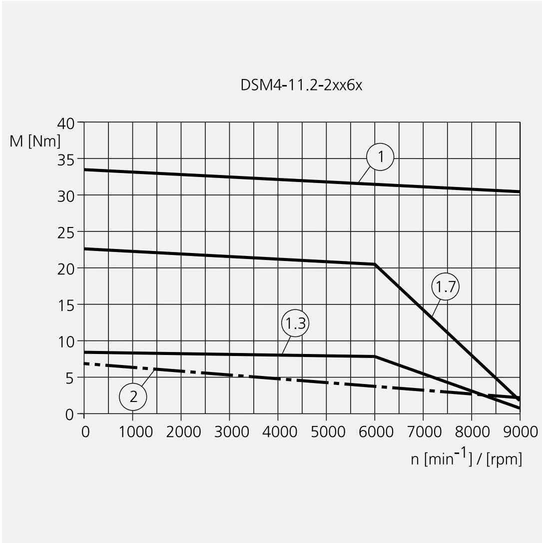
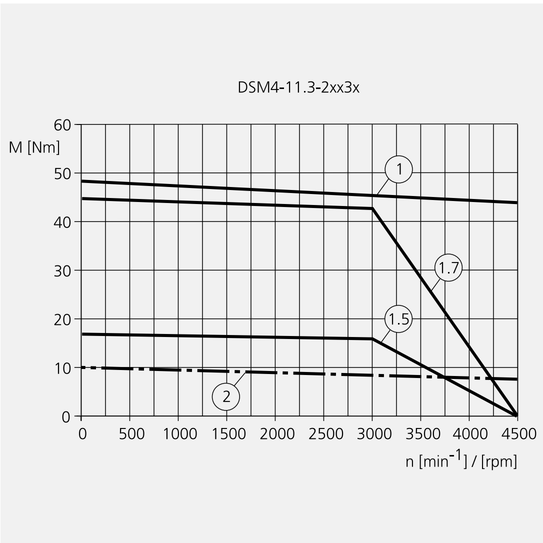
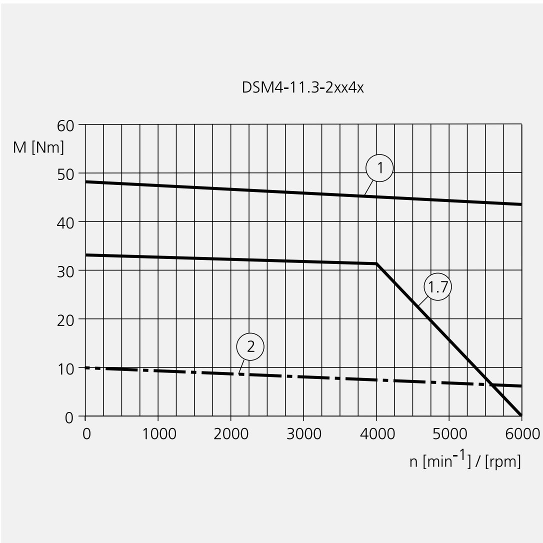
AC synchronous servomotors - High Performance









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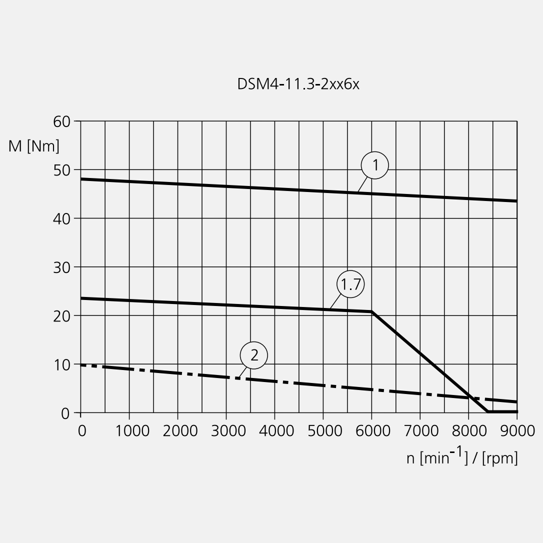
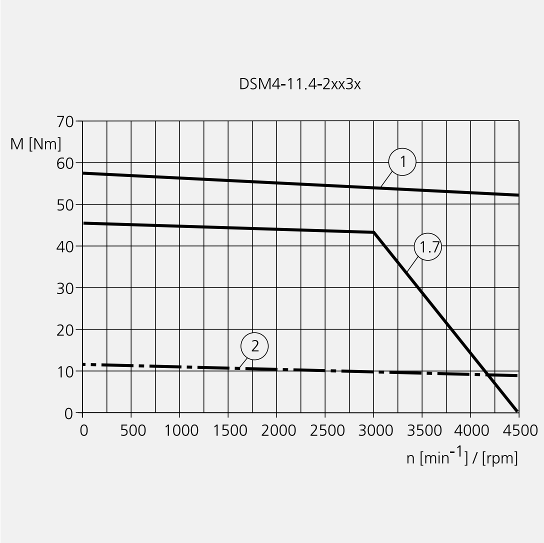
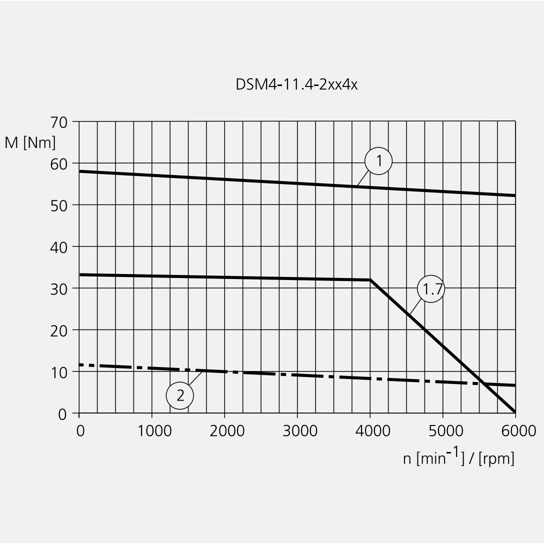
AC synchronous servomotors - High Performance







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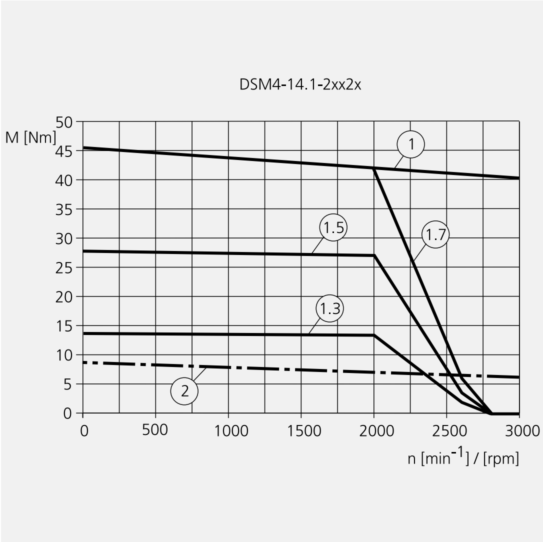

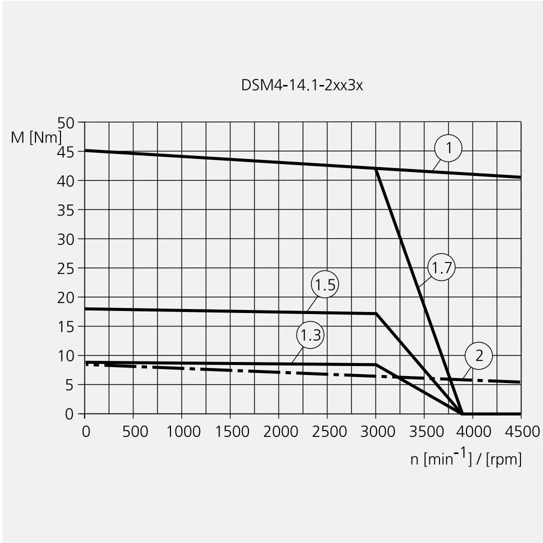

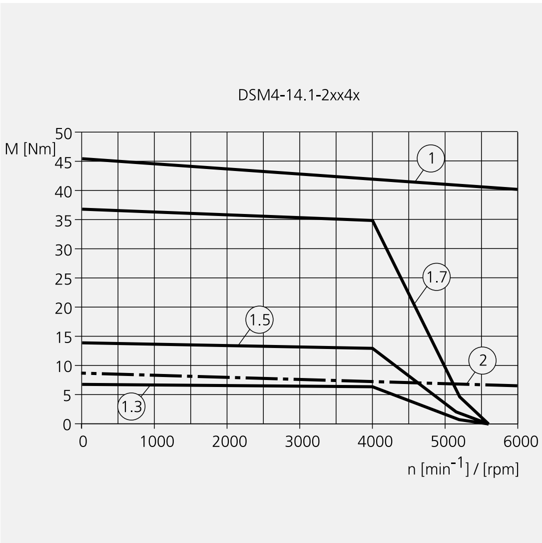

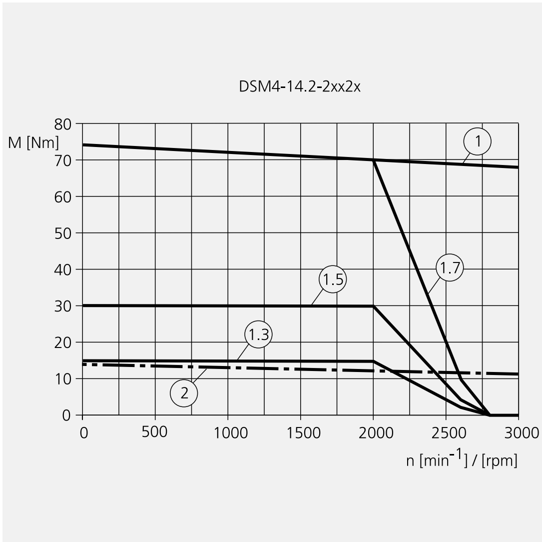

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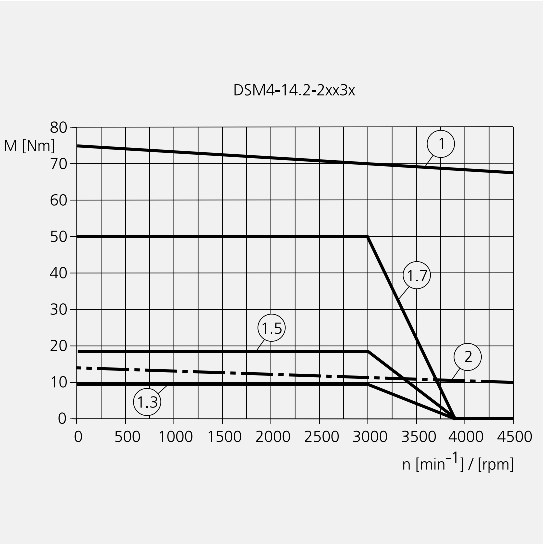

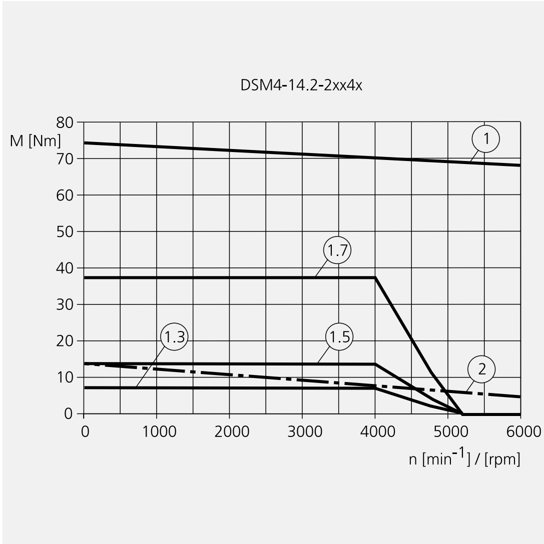

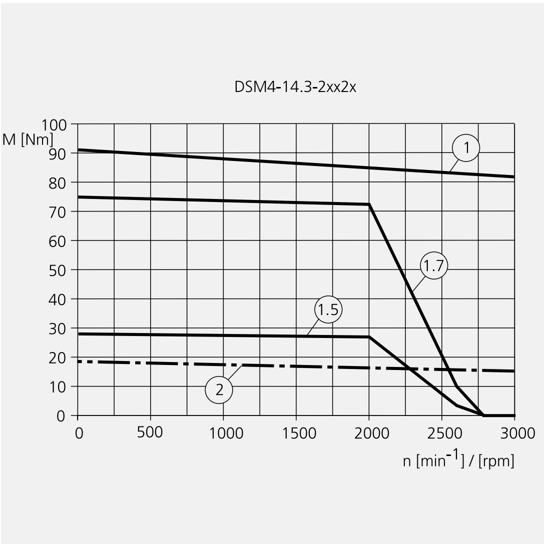

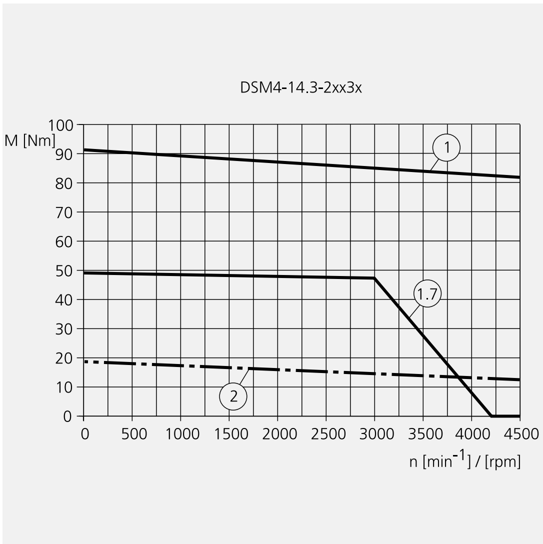

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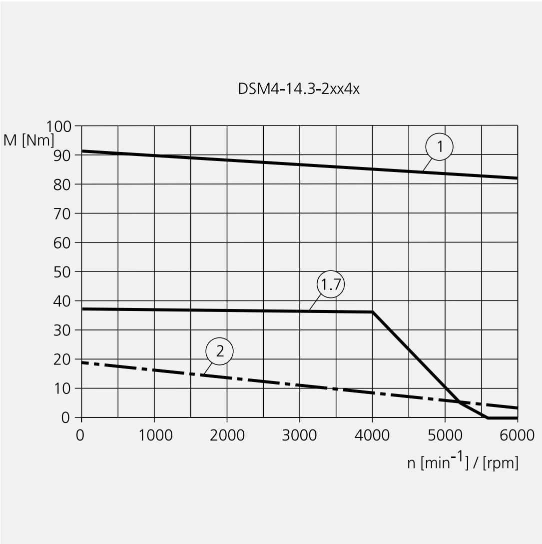

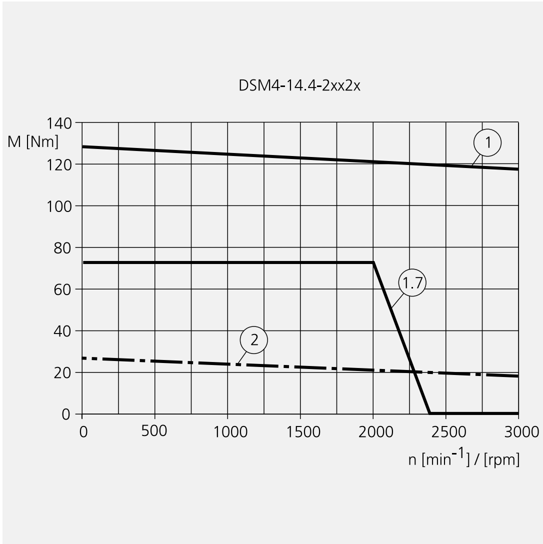

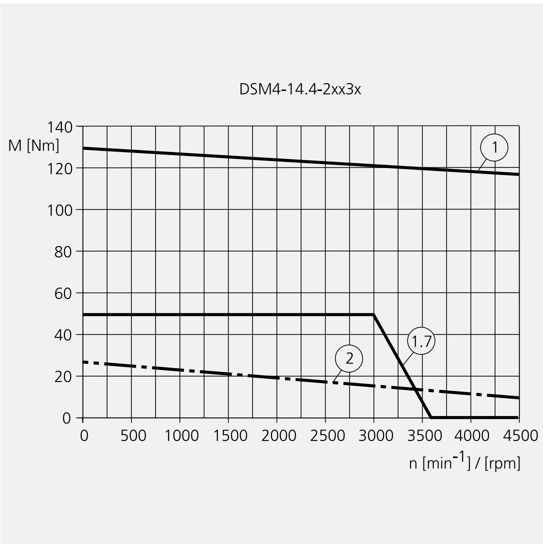

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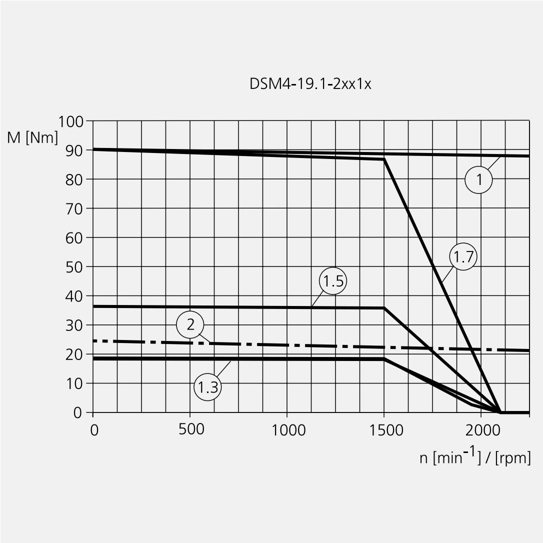

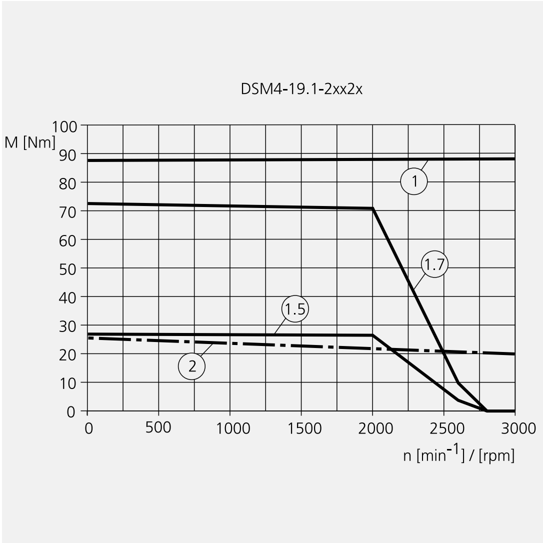

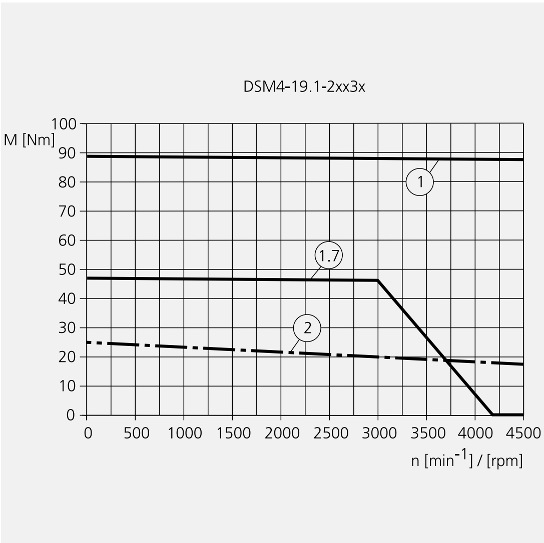

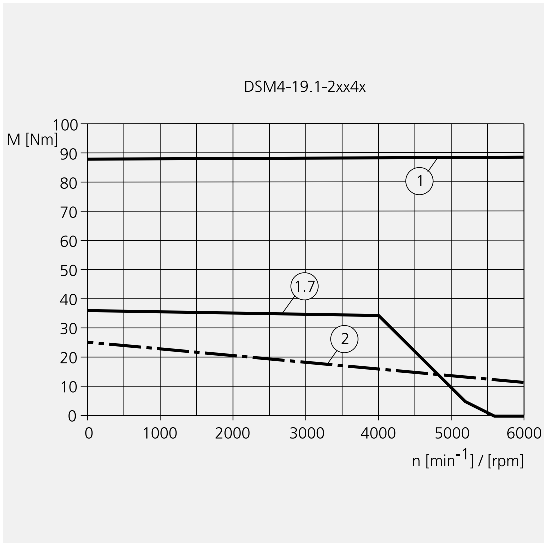

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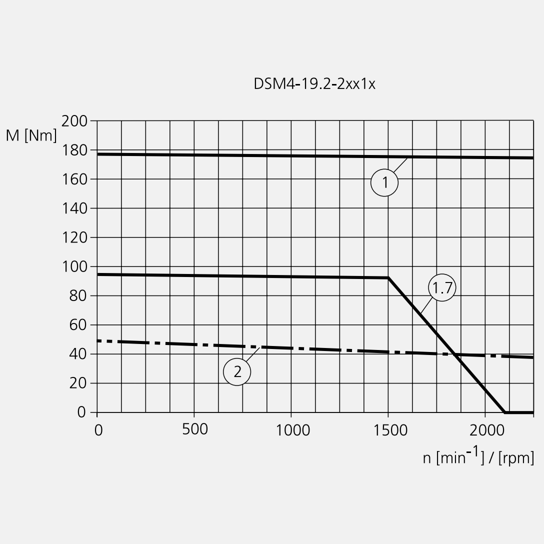
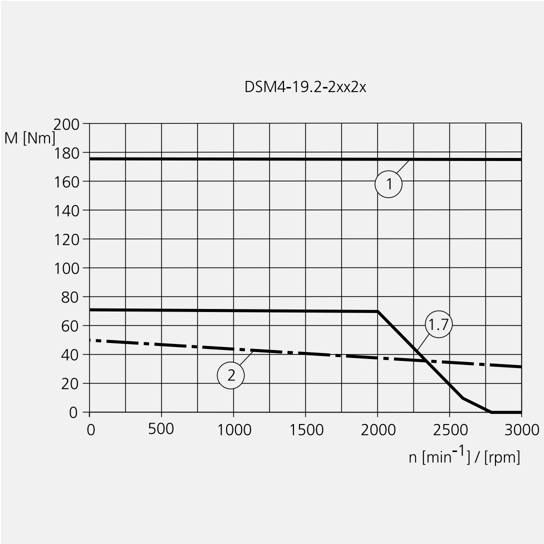
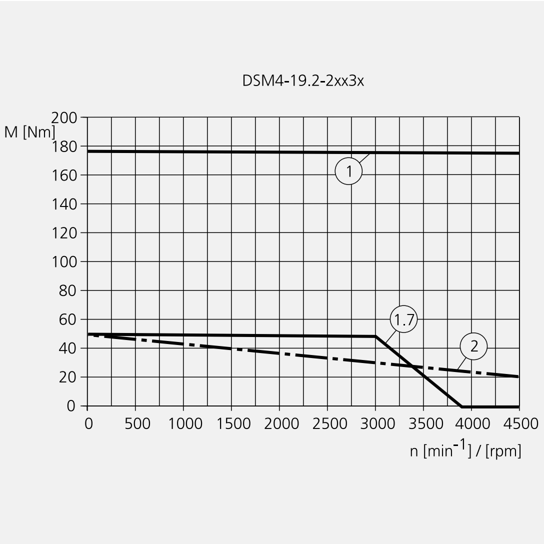
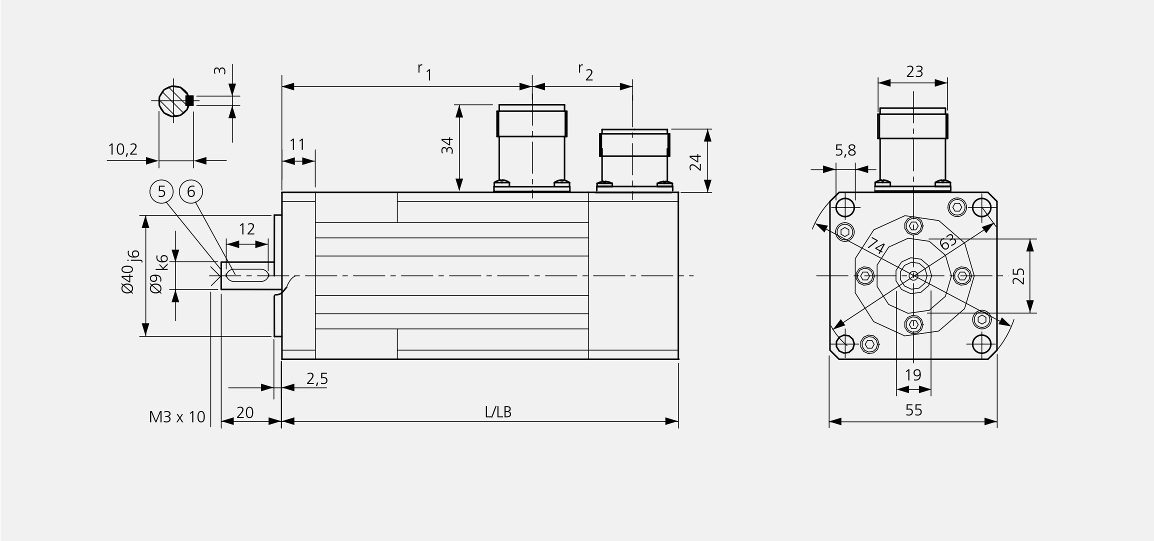


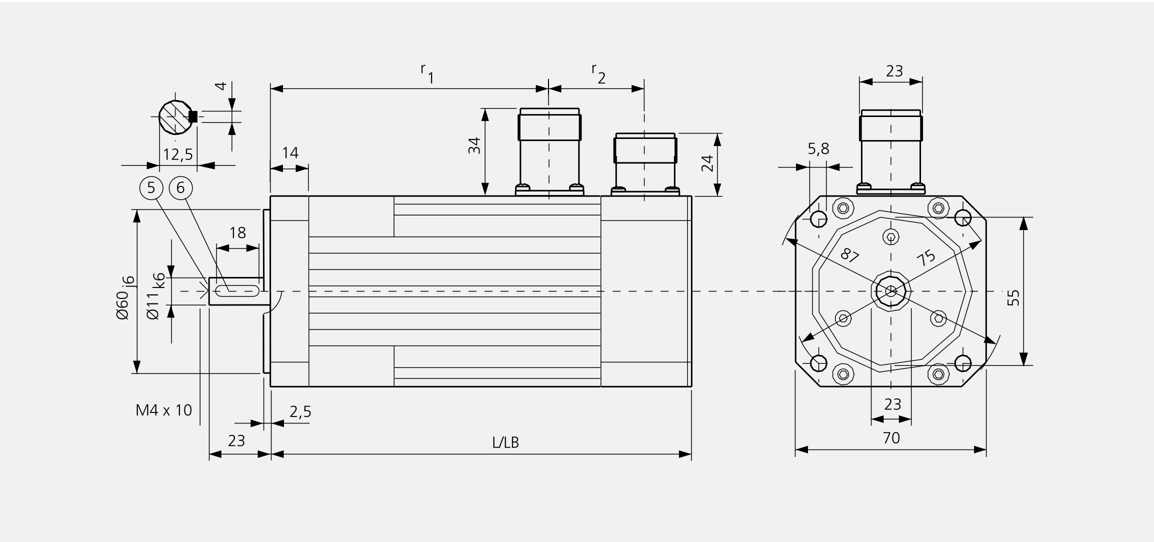




1	Motor peak torque
2	Continuous torque
1.1	Peak torque with TLX x32
1.3	Peak torque with TLX x34
1.5	Peak torque with TLX x36
1.7	Peak torque with TLX x38



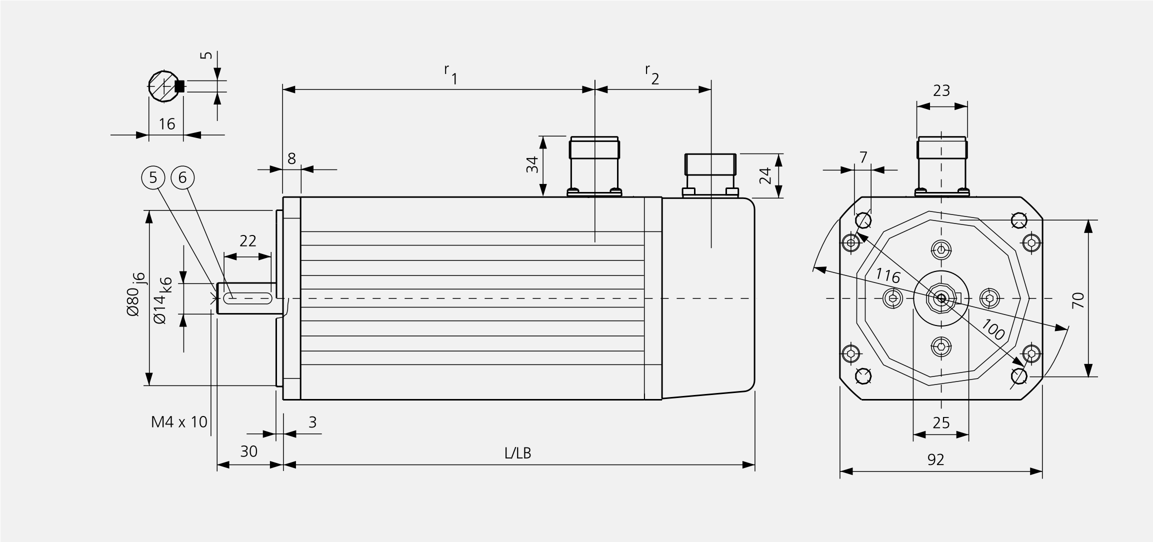
DSM 4-05 High Performance AC synchronous servomotor



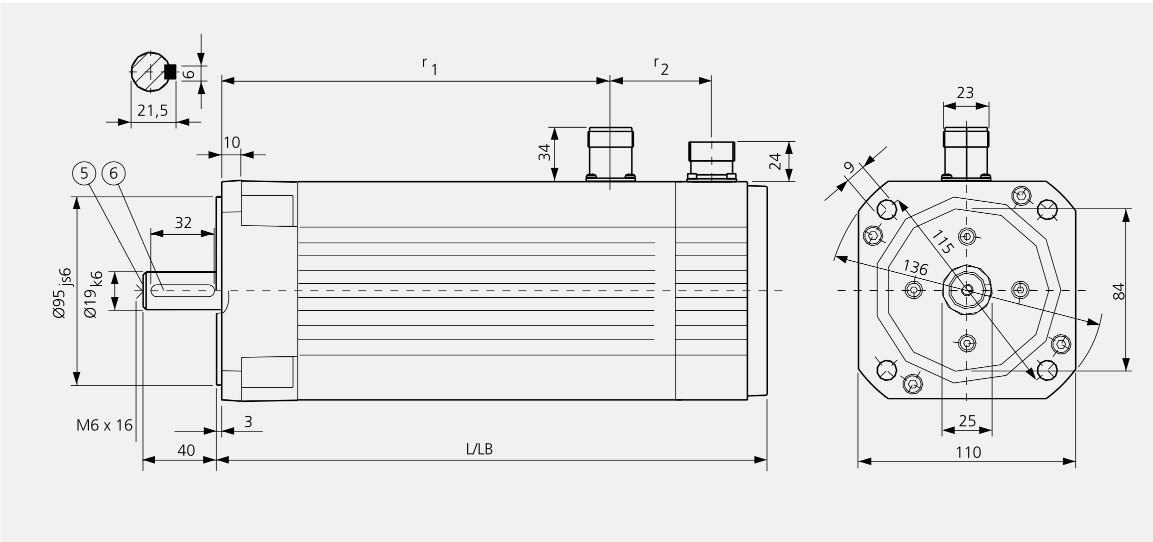
DSM 4-07 High Performance AC synchronous servomotor

5 Centre hole
6 Featherkey

	L = without brake (n. b.)		LB = with brake (w. b.)		r_1 (n. b.)	r_1 (w. b.)	r_2	
	Measuring system						Measuring system	
	SinCos®	Resolver	SinCos®	Resolver			SinCos®	Resolver
DSM 4-05.1	–	121 mm	–	145 mm	72 mm	97 mm	–	33 mm
DSM 4-05.2	–	133 mm	–	157 mm	85 mm	109 mm	–	33 mm
DSM 4-05.3	–	145 mm	–	169 mm	97 mm	121 mm	–	33 mm
DSM 4-05.4	–	170 mm	–	194 mm	121 mm	146 mm	–	33 mm
DSM 4-07.1	177 mm	136 mm	205 mm	164 mm	81 mm	109 mm	66 mm	33 mm
DSM 4-07.2	201 mm	160 mm	229 mm	188 mm	105 mm	133 mm	66 mm	33 mm
DSM 4-07.3	237 mm	196 mm	265 mm	224 mm	141 mm	169 mm	66 mm	33 mm



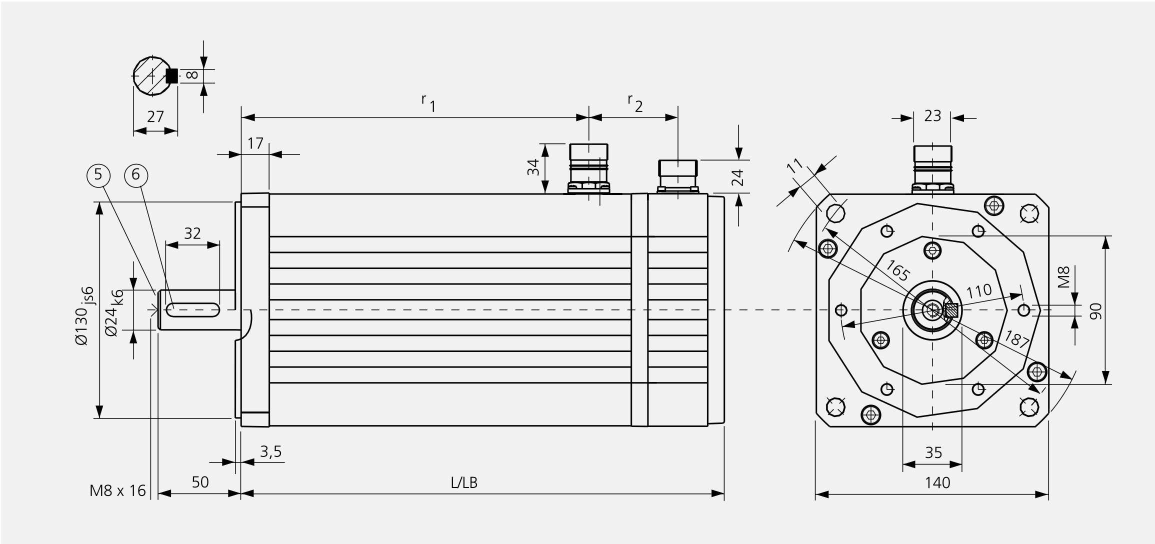
DSM 4-09 High Performance AC synchronous servomotor



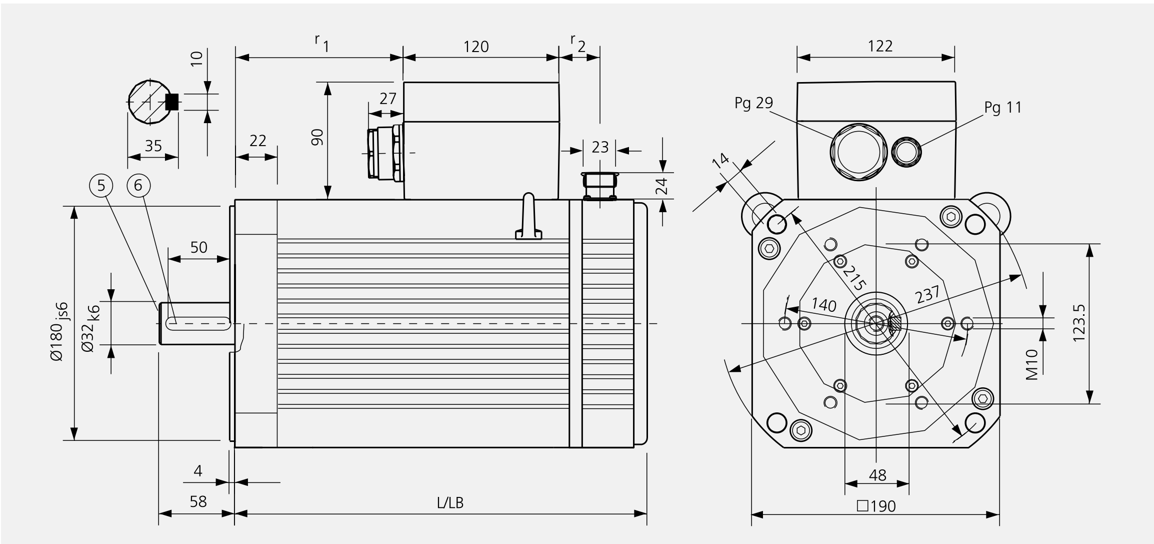
DSM 4-11 High Performance AC synchronous servomotor

5 Centre hole
6 Featherkey

	L = without brake (n. b.)		**LB = with brake (w. b.)**		**r_1 (n. b.)**	**r_1 (w. b.)**	**r_2**	
	Measuring system						**Measuring system**	
	SinCos®	**Resolver**	**SinCos®**	**Resolver**			**SinCos®**	**Resolver**
DSM 4-09.1	163 mm	156 mm	199 mm	192 mm	85 mm	121 mm	51 mm	51 mm
DSM 4-09.2	187 mm	180 mm	233 mm	226 mm	109 mm	155 mm	51 mm	51 mm
DSM 4-09.3	221 mm	214 mm	267 mm	260 mm	143 mm	189 mm	51 mm	51 mm
DSM 4-09.4	255 mm	248 mm	301 mm	294 mm	177 mm	223 mm	51 mm	51 mm
DSM 4-11.1	255 mm	218 mm	263 mm	226 mm	138 mm	145 mm	82 mm	52 mm
DSM 4-11.2	285 mm	248 mm	293 mm	256 mm	168 mm	175 mm	82 mm	52 mm
DSM 4-11.3	315 mm	278 mm	323 mm	286 mm	198 mm	205 mm	82 mm	52 mm
DSM 4-11.4	345 mm	308 mm	353 mm	316 mm	228 mm	235 mm	82 mm	52 mm



DSM 4-14 High Performance AC synchronous servomotor



DSM 4-19 High Performance AC synchronous servomotor

5 Centre hole
6 Featherkey

	L = without brake (n. b.)		**LB = with brake (w. b.)**		**r_1 (n. b.)**	**r_1 (w. b.)**	**r_2**	
	Measuring system						**Measuring system**	
	SinCos®	**Resolver**	**SinCos®**	**Resolver**			**SinCos®**	**Resolver**
DSM 4-14.1	238 mm	231 mm	283 mm	276 mm	150 mm	195 mm	54 mm	55 mm
DSM 4-14.2	268 mm	261 mm	313 mm	306 mm	180 mm	225 mm	54 mm	55 mm
DSM 4-14.3	298 mm	291 mm	343 mm	336 mm	210 mm	255 mm	54 mm	55 mm
DSM 4-14.4	343 mm	336 mm	388 mm	381 mm	255 mm	300 mm	54 mm	55 mm
DSM 4-19.1	355 mm	348 mm	355 mm	348 mm	163 mm	163 mm	31 mm	31 mm
DSM 4-19.2	435 mm	428 mm	435 mm	428 mm	243 mm	243 mm	31 mm	31 mm

Holding brake

The holding brake is an electromagnetic spring-pressure brake for locking the motor axle after the motor current is shut off. In emergency situations, such as in a power failure or during an EMERGENCY STOP, it shuts down the drive, significantly contributing to overall safety. The motor axle must also be locked for weight-induced torque loads, e.g. in cases of vertical axes in manual mode.

Holding brake controller

The holding brake is controlled via the **T**win **L**ine **H**olding **B**rake **C**ontroller, which is available as an accessory.

Caution! Overloading may damage the holding brake! Avoid stationary load torques greater than 25 % of the motor holding torque when using vertical axes with the holding brake.

Technical data of the holding brake for DSM motors

		DSM 4-05	DSM 4-07	DSM 4-09	DSM 4-11	DSM 4-14	DSM 4-19
Holding torque	M_{Br}	2.0 Nm	2.5 Nm	9.0 Nm	11.0 Nm	36.0 Nm	85.0 Nm
Armature inertia	J_{Br}	0.067 $kgcm^2$	0.380 $kgcm^2$	0.600 $kgcm^2$	2.300 $kgcm^2$	5.900 $kgcm^2$	17.600 $kgcm^2$
Electrical pickup power	P_{Br}	12 W	12 W	18 W	21 W	27 W	36 W
Energise time	t_E	25 ms	7 ms	15 ms	20 ms	35 ms	60 ms
De-energise time	t_A	15 ms	5 ms	7 ms	35 ms	50 ms	70 ms
Weight	m_{Br}	0.18 kg	0.30 kg	0.50 kg	0.78 kg	1.63 kg	3.80 kg

Measuring systems

The standard measuring system is the SinCos® (SRS) Singleturn. This measuring system is designed to provide optimum performance with our Twin Line family of controllers. You can use the HIPERFACE® interface between motor-measuring system and device for a self-initialisation of the motor and current-regulator parameters, considerably simplifying the start-up process.

The SinCos® (SRM) Multiturn and Resolver, 2-pin, are optionally available.

Technical data

	SinCos® (SRS) Singleturn	SinCos® (SRM) Multiturn	Resolver, 2-pin
Resolution with TLx	16384 incr. min^{-1}	16384 incr. min^{-1}	4096 incr. min^{-1}
Precision, integral nonlinearity	± 45 angular seconds	± 45 angular seconds	± 360 angular seconds
Index pulse	–	–	–
Absolute position after activation within [min^{-1}] with the precision	1 ± 45 angular seconds	4096 ± 45 angular seconds	1 ± 360 angular seconds
Signal form	Sinusoidal/cosinusoidal 1024 cycles min^{-1}	Sinusoidal/cosinusoidal 1024 cycles min^{-1}	Sinusoidal/cosinusoidal 1 cycles min^{-1}
Measuring procedure	High-resolution, optical	High-resolution, optical	Inductive
Interface	HIPERFACE®	HIPERFACE®	–
Module required on slot 2, TLx	HIFA-C	HIFA-C	RESO-C
Working temperature range	–20 to +115 °C	–20 to +115 °C	–55 to +155 °C

Example	**DSM 4 - X . X - X X X X - X X**
Mounting dimensions (flange) 05 (55 mm) 07 (70 mm) 09 (90 mm) 11 (110 mm) 14 (140 mm) 19 (190 mm)	DSM 4 - **X** . X - X X X X - X X
Length 1, 2, 3 or 4	DSM 4 - X . **X** - X X X X - X X
Voltage variant 1 = U_N = 190 V, for amplifier with intermediate circuit voltage 270 to 350 VDC 2 = U_N = 330 V, for amplifier with intermediate circuit voltage 510 to 690 VDC	DSM 4 - X . X - **X** X X X - X X
Holding brake 0 = without holding brake 2 = with holding brake	DSM 4 - X . X - X **X** X X - X X
Measuring system/interface IB = HIFA-C for SinCos® R9 = RESO-C for resolver, only for DSM 4-05X	DSM 4 - X . X - X X **X** X - X X
Rated speed 1 = 1500 rpm, all lengths 2 = 2000 rpm, all lengths 3 = 3000 rpm, all lengths 4 = 4000 rpm, not available for all lengths 6 = 6000 rpm, not available for all lengths	DSM 4 - X . X - X X X **X** - X X
Code for temperature sensors and mounting sockets NTC temperature sensor, connection via measuring-system connector, for devices of the Twin Line series TA = for size/flange: 05/07/19* mounting sockets, straight exit *except DSM4-19.x, motor connection only via terminal box 6N = for size/flange: 09/11/14 mounting sockets, straight exit 4E = for size/flange: 05/07/09/11/14 mounting sockets 90°, rotating	DSM 4 - X . X - X X X X - **X** X
Measuring system (in conjunction with measuring system/interface) G = SinCos® (SRS) Singleturn H = SinCos® (SRM) Multiturn Z = resolver 2 pin	DSM 4 - X . X - X X X X - X **X**

General information

Berger Lahr offers two gearbox series for the High Performance line of AC synchronous servomotors.

Gearbox series:

- LP – The economical solution
  - High reliability
  - Rugged design
  - Low price
- SP – Satisfies the highest expectations
  - High torques
  - Low distortion backlash
  - Smooth running

The gearboxes are normally delivered detached from the motor. You can, however, request to have the gearbox mounted to the order. Mounting the gearbox to the motor is simple and follows a patented procedure.

Additional gearboxes and gearbox variations are available upon request.

LP – Value Line planetary gear

LP gearbox

The LP gearboxes come in five different sizes:

- LP 050
- LP 070
- LP 090
- LP 120
- LP 155

Features

- Max. acceleration torque T_{2B}: 10.5 Nm – 400 Nm
- Increasing ratios
  - 1-stage = 3*/5/10
  - 2-stage = 15*/25/30*/50/100
- High efficiency
  - 1-stage ≥ 97 %
  - 2-stage ≥ 95 %
- Integrated thermal linear compensation
- Low distortion backlash
- Simple, patented motor mounting
- Smooth running
- Suitable for cyclical and continuous operation
- High reliability
- Rugged design
- Low price

Technical data for the LP gearbox series

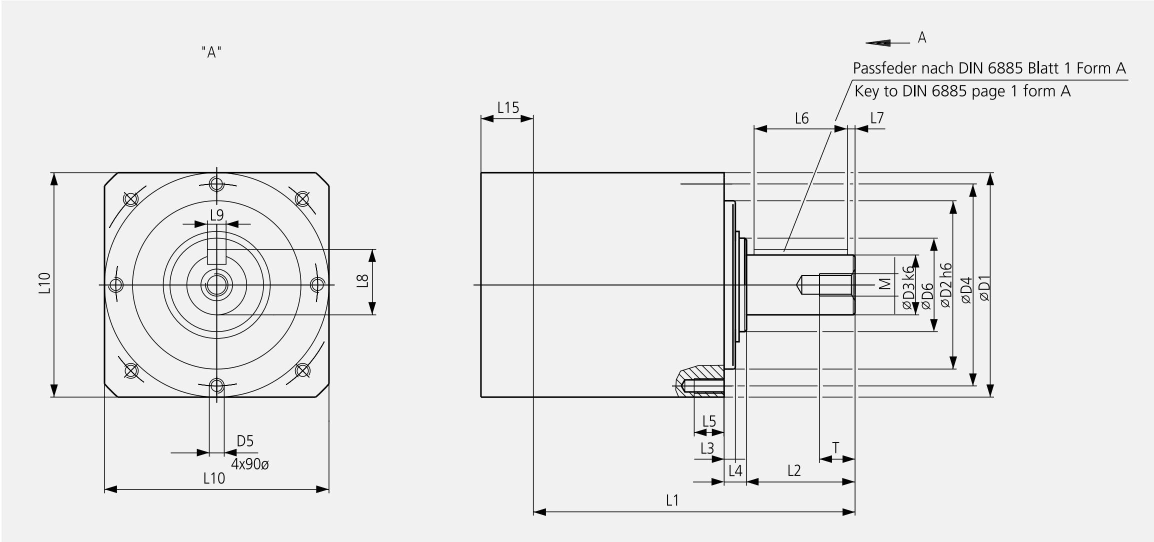
			LP 050	LP 070	LP 090
Max. acceleration torque for cy-clical operation	T_{2B}	i = 5/25/50	11.5 Nm	32 Nm	80 Nm
	T_{2B}	i = 3*/10/15*/ 30*/100	10.5 Nm	29 Nm	72 Nm
EMERGENCY-STOP torque (max. 1000 times per service life)	T_{2Stop}		26 Nm	75 Nm	190 Nm
Rated torque at output	T_{2N}	i = 5/25/50	5.7 Nm	16 Nm	40 Nm
	T_{2N}	i = 3*/10/15*/ 30*/100	5.2 Nm	15 Nm	35 Nm
Ratio (i)	i	1-stage	3*/5/10	3*/5/10	3*/5/10
		2-stage	15*/25/30*/50/ 100	15*/25/30*/50/ 100	15*/25/30*/50/ 100
Max. radial force with respect to shaft centre at 100 min^{-1}	F_{2RMax}		650 N	1450 N	2400 N
Max. axial force with respect to shaft centre at 100 min^{-1}	F_{2AMax}		700 N	1550 N	1900 N
Distortion rigidity	C_{t21}	i = 5/25/50	0.9 Nm/arcmin	3.3 Nm/arcmin	9 Nm/arcmin
		i = 3*/10/15*/ 30*/100	0.75 Nm/arcmin	2.8 Nm/arcmin	7.5 Nm/arcmin
Distortion backlash	j_t	1-stage	≤ 12 arcmin	≤ 12 arcmin	≤ 12 arcmin
		2-stage	≤ 15 arcmin	≤ 15 arcmin	≤ 15 arcmin
Rated speed	n_{1N}		4000 min^{-1}	3700 min^{-1}	3400 min^{-1}
Max. drive rotary speed	n_{1Max}		8000 min^{-1}	6000 min^{-1}	6000 min^{-1}
Idling torque at rated speed	T_{012}		≤ 0.05 Nm	≤ 0.14 Nm	≤ 0.38 Nm
Service life	L_h		> 20000 h	> 20000 h	> 20000 h
Efficiency	η	1-stage	> 97 %	> 97 %	> 97 %
		2-stage	> 95 %	> 95 %	> 95 %
Mass inertia	J_1	1-stage	0.059 $kgcm^2$	0.280 $kgcm^2$	1.770 $kgcm^2$
		2-stage	0.055 $kgcm^2$	0.280 $kgcm^2$	1.770 $kgcm^2$
Weight	m	1-stage	0.770 kg	1.900 kg	4.100 kg
		2-stage	0.950 kg	2.200 kg	5.100 kg
Lubrication			Low-viscosity grease		
Primer			RAL 5002	RAL 5002	RAL 5002
Fitting positions			Variable	Variable	Variable
Protection type			IP 64	IP 64	IP 64
Running noise at 3000 min^{-1}	L_{PA}		≤ 68 dB (A)	≤ 70 dB (A)	≤ 72 dB (A)

*Ratio 3 or 15 and 30 only with LP 070/LP 090/LP 120

Technical data for the LP gearbox series

			LP 120	LP 155
Max. acceleration torque for cyclical operation	T_{2B}	i = 5/25/50	200 Nm	400 Nm
	T_{2B}	i = 3*/10/15*/ 30*/100	180 Nm	320 Nm
EMERGENCY-STOP torque (max. 1000 times per service life)	T_{2Stop}		480 Nm	1000 Nm
Rated torque at output	T_{2N}	i = 5/25/50	100 Nm	290 Nm
	T_{2N}	i = 3*/10/15*/ 30*/100	90 Nm	170 Nm
Ratio (i)	i	1-stage	3*/5/10	3*/5/10
		2-stage	15*/25/30*/50/ 100	15*/25/30*/50/ 100
Max. radial force with respect to shaft centre at 100 min^{-1}	F_{2RMax}		4600 N	7500 N
Max. axial force with respect to shaft centre at 100 min^{-1}	F_{2AMax}		4000 N	6000 N
Distortion rigidity	C_{t21}	i = 5/25/50	24 Nm/arcmin	55 Nm/arcmin
		i = 3*/10/15*/ 30*/100	20.5 Nm/arcmin	44 Nm/arcmin
Distortion backlash	j_t	1-stage	≤ 12 arcmin	≤ 12 arcmin
		2-stage	≤ 15 arcmin	≤ 15 arcmin
Rated speed	n_{1N}		2600 min^{-1}	2000 min^{-1}
Max. drive rotary speed	n_{1Max}		4800 min^{-1}	3600 min^{-1}
Idling torque at rated speed	T_{012}		≤ 0.8 Nm	≤ 2.50 Nm
Service life	L_h		> 20000 h	> 20000 h
Efficiency	η	1-stage	> 97 %	> 97 %
		2-stage	> 95 %	> 95 %
Mass inertia	J_1	1-stage	5.420 $kgcm^2$	25.73 $kgcm^2$
		2-stage	5.490 $kgcm^2$	5.33 $kgcm^2$
Weight	m	1-stage	9.000 kg	17.500 kg
		2-stage	11.200 kg	21.000 kg
Lubrication			Low-viscosity grease	
Primer			RAL 5002	RAL 5002
Fitting positions			Variable	Variable
Protection type			IP 64	IP 64
Running noise at 3000 min^{-1}	L_{PA}		≤ 74 dB (A)	≤ 75 dB (A)

*Ratio 3 or 15 and 30 only with LP 070/LP 090/LP 120



LP series gearbox

Dimensions

Size	Toler-ances	LP 050		LP 070		LP 090		LP 120		LP 155	
Gearbox stages		1	2	1	2	1	2	1	2	1	2
D1		50		70		90		120		155	
D2	h6	35		52		68		90		120	
D3	k6	12		16		22		32		40	
D4		44		62		80		108		140	
D5		M4		M5		M6		M8		M10	
D6		17		25		40		50		65	
L1		75	91	104	124	126	152.5	172	204.5	219.5	250
L2		18		28		36		58		82	
L3		4		5		5		6		8	
L4		6.5		8		10		12		15	
L5		8		10		12		16		20	
L6		14		25		32		50		70	
L7		2		2		2		4		6	
L8		13.5		18		24.5		35		43	
L9	h9	4		5		6		10		12	
L10		See motor–gearbox compatibility									
L15		See motor–gearbox compatibility									
M		M4		M5		M8		M12		M16	
T		8		10		13		22		32	

All dimensions in mm

Motor–gearbox compatibility

Gearbox	DSM 4-05	DSM 4-07	DSM 4-09	DSM 4-11	DSM 4-14	DSM 4-19
LP 050-M01	L10 = 55 L15 = 14	L10 = 70 L15 = 24	–	–	–	–
LP 070-M01	L10 = 70 L15 = 15	L10 = 70 L15 = 15	L10 = 90 L15 = 22	–	–	–
LP 090-M01	–	L10 = 90 L15 = 22	L10 = 90 L15 = 22	L10 = 100 L15 = 32	L10 = 140 L15 = 42	–
LP 120-M01	–	–	L10 = 120 L15 = 28	L10 = 120 L15 = 28	L10 = 140 L15 = 38	L10 = 190 L15 = 48
LP 155-M01	–	–	–	L10 = 150 L15 = 36	L10 = 150 L15 = 46	L10 = 190 L15 = 46
All dimensions in mm						

Gearbox options LP

Example	LP X - M 0 X - X - 1 / Motor
Gearbox type 050 070 090 120 155	LP **X** - M 0 X - X - 1 / Motor
Gearbox version M = motor-mounted gearbox	LP X - **M** 0 X - X - 1 / Motor
Gearbox model 0 = standard	LP X - M **0** X - X - 1 / Motor
Stage count 1 = 1-stage 2 = 2-stage	LP X - M 0 **X** - X - 1 / Motor
Reduction ratio 005/010 =1-stage 025/050/100 = 2-stage	LP X - M 0 X - **X** - 1 / Motor
Form of drive shaft 1 = shaft with featherkey DIN 6885 form A	LP X - M 0 X - X - **1** / Motor
Motor description see Motor type key or Motor–gearbox compatibility	LP X - M 0 X - X - 1 / **DSM 4-X**

SP – low-backlash planetary gear

SP gearbox

The SP gearboxes come in five different sizes:

– SP 060
– SP 075
– SP 100
– SP 140
– SP 180

Features

– Max. acceleration torque T_{2B}: 32 Nm – 1100 Nm
– Increasing ratios
  – 1-stage = 4/5/7/10
  – 2-stage = 16/20/28/40/50/70/100
– Low distortion backlash
  – 1-stage ≤ 4 arcmin / ≤ 2 arcmin
  – 2-stage ≤ 6 arcmin / ≤ 4 arcmin
– High efficiency
  – 1-stage ≥ 97 %
  – 2-stage ≥ 94 %
– Integrated thermal linear compensation
– Simple, patented motor mounting
– Smooth running
– Suitable for cyclical and continuous operation

Technical data for the SP gearbox series

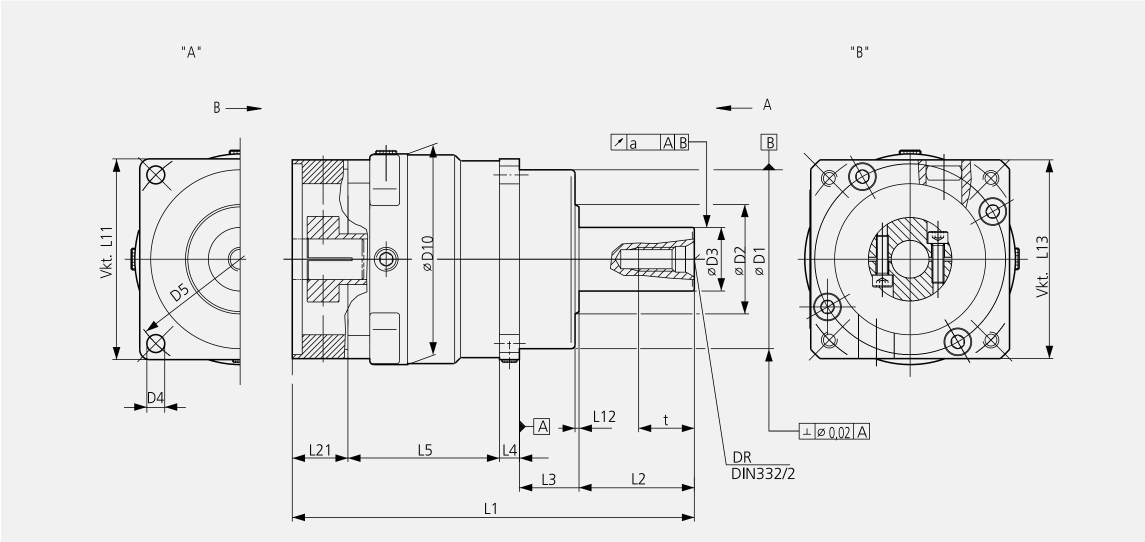
			SP 060	SP 075	SP 100
Max. acceleration torque for cyclical operation	T_{2B}	i = 4 – 7 / 16 – 70	40 Nm	100 Nm	250 Nm
		i = 10/100	32 Nm	80 Nm	200 Nm
EMERGENCY-STOP torque (max. 1000 times per service life)	T_{2Stop}	i = 4 – 7 / 16 – 70	100 Nm	250 Nm	625 Nm
		i = 10/100	80 Nm	200 Nm	500 Nm
Rated torque at output	T_{2N}	i = 4 – 7 / 16 – 70	25 Nm	70 Nm	170 Nm
		i = 10/100	15 Nm	45 Nm	110 Nm
Max. drive rotary speed	n_{1Max}	1-stage	6000 min^{-1}	6000 min^{-1}	4500 min^{-1}
		2-stage	6000 min^{-1}	6000 min^{-1}	4500 min^{-1}
Rated speed at drive	n_{1N}	i = 4/5	3300 min^{-1}	2900 min^{-1}	2500 min^{-1}
		i = 7/10	4000 min^{-1}	3100 min^{-1}	2800 min^{-1}
		i = 16	4400 min^{-1}	3500 min^{-1}	3100 min^{-1}
		i = 50	4800 min^{-1}	3800 min^{-1}	3500 min^{-1}
		i = 100	5500 min^{-1}	4500 min^{-1}	4200 min^{-1}
Ratio (i)	i	1-stage	4/5/7/10	4/5/7/10	4/5/7/10
		2-stage	16/20/28/40/ 50/70/100	16/20/28/40/ 50/70/100	16/20/28/40/ 50/70/100
Distortion backlash, standard	j_t	1-stage	≤ 6 arcmin	≤ 6 arcmin	≤ 4 arcmin
		2-stage	≤ 8 arcmin	≤ 8 arcmin	≤ 6 arcmin
Distortion backlash, reduced	j_t	1-stage	≤ 4 arcmin	≤ 4 arcmin	≤ 2 arcmin
		2-stage	≤ 6 arcmin	≤ 6 arcmin	≤ 4 arcmin
Distortion rigidity	C_{t21}		3 Nm/arcmin	8 Nm/arcmin	24 Nm/arcmin
Max. axial force with respect to shaft centre at output	F_{2AMax}		2300 N	3200 N	5400 N
Max. radial force with respect to shaft centre at output	F_{2RMax}		2600 N	3800 N	6000 N
Idling torque at 20 °C gearbox temperature and 3000 min^{-1}	T_{012}	i = 4	≤ 0.5 Nm	≤ 0.9 Nm	≤ 2.7 Nm
		i = 16	≤ 0.3 Nm	≤ 0.7 Nm	≤ 1.7 Nm
		i = 100	≤ 0.2 Nm	≤ 0.4 Nm	≤ 0.7 Nm
Max. pull-out torque	M_{2KMax}		133 Nm	225 Nm	464 Nm
Service life	L_h		> 20000 h	> 20000 h	> 20000 h
Efficiency at full load	η	1-stage	> 97 %	> 97 %	> 97 %
		2-stage	> 94 %	> 94 %	> 94 %
Weight	m	1-stage	1.500 kg	2.800 kg	6.200 kg
		2-stage	1.800 kg	3.100 kg	7.100 kg
Lubrication			Synth. gearbox oil, viscosity class ISO VG220	Synth. gearbox oil, viscosity class ISO VG220	Synth. gearbox oil, viscosity class ISO VG220
Paint			RAL 5002	RAL 5002	RAL 5002
Fitting positions			Variable	Variable	Variable
Permissible gearbox temperature			–10 to +90 °C	–10 to +90 °C	–10 to +90 °C
Direction of rotation			Motor and gearbox in same direction		
Protection type			IP 64	IP 64	IP 64
Running noise at 3000 min^{-1}	L_{PA}		≤ 68 dB (A)	≤ 68 dB (A)	≤ 70 dB (A)

Technical data for the SP gearbox series

			SP 140	SP 180
Max. acceleration torque for cyclical operation	T_{2B}	i = 4 – 7 / 16 – 70	500 Nm	1100 Nm
		i = 10/100	400 Nm	880 Nm
EMERGENCY-STOP torque (max. 1000 times per service life)	T_{2Stop}	i = 4 – 7 / 16 – 70	1250 Nm	2750 Nm
		i = 10/100	1000 Nm	2200 Nm
Rated torque at output	T_{2N}	i = 4 – 7 / 16 – 70	360 Nm	550 Nm
		i = 10/100	215 Nm	550 Nm
Max. drive rotary speed	n_{1Max}	1-stage	4000 min^{-1}	3500 min^{-1}
		2-stage	4000 min^{-1}	4000 min^{-1}
Rated speed at drive	n_{1N}	i = 4/5	2100 min^{-1}	1500 min^{-1}
		i = 7/10	2600 min^{-1}	2300 min^{-1}
		i = 16	2900 min^{-1}	2700 min^{-1}
		i = 50	3200 min^{-1}	2900 min^{-1}
		i = 100	3900 min^{-1}	3400 min^{-1}
Ratio (i)	i	1-stage	4/5/7/10	4/5/7/10
		2-stage	16/20/28/40/ 50/70/100	16/20/28/40/ 50/70/100
Distortion backlash, standard	j_t	1-stage	≤ 4 arcmin	≤ 4 arcmin
		2-stage	≤ 6 arcmin	≤ 6 arcmin
Distortion backlash, reduced	j_t	1-stage	≤ 2 arcmin	≤ 2 arcmin
		2-stage	≤ 4 arcmin	≤ 4 arcmin
Distortion rigidity	C_{t21}		45 Nm/arcmin	144 Nm/arcmin
Max. axial force with respect to shaft centre at output	F_{2AMax}		9400 N	13500 N
Max. radial force with respect to shaft centre at output	F_{2RMax}		9000 N	14000 N
Idling torque at 20 °C gearbox temperature and 3000 min^{-1}	T_{012}	i = 4	≤ 3.9 Nm	≤ 6.2 Nm
		i = 16	≤ 2.4 Nm	–
		i = 100	≤ 1.1 Nm	–
Max. pull-out torque	M_{2KMax}		907 Nm	1523 Nm
Service life	L_h		> 20000 h	> 20000 h
Efficiency at full load	η	1-stage	> 97 %	> 97 %
		2-stage	> 94 %	> 94 %
Weight	m	1-stage	11.500 kg	27.000 kg
		2-stage	14.500 kg	29.000 kg
Lubrication			Synth. gearbox oil, viscosity class ISO VG220	Synth. gearbox oil, viscosity class ISO VG220
Paint			RAL 5002	RAL 5002
Fitting positions			Variable	Variable
Permissible gearbox temperature			–10 to +90 °C	–10 to +90 °C
Direction of rotation			Motor and gearbox in same direction	
Protection type			IP 64	IP 64
Running noise at 3000 min^{-1}	L_{PA}		≤ 70 dB (A)	≤ 70 dB (A)

Mass inertia

J_1 in kgcm^2												
Gearbox size	**Shaft diameter [mm]**	**Increasing ratio**										
		single-stage				**double-stage**						
		4	**5**	**7**	**10**	**16**	**20**	**28**	**40**	**50**	**70**	**100**
SP 060	≤ 11	0.14	0.14	0.13	0.12	0.15	0.15	0.15	0.12	0.12	0.12	0.12
	> 11 to ≤ 14	0.17	0.17	0.16	0.15	0.19	0.19	0.19	0.15	0.15	0.15	0.15
SP 075	≤ 11	0.52	0.44	0.38	0.35	0.48	0.47	0.47	0.34	0.34	0.34	0.34
	> 11 to ≤ 14	0.57	0.49	0.43	0.40	0.53	0.52	0.52	0.39	0.39	0.39	0.39
	> 14 to ≤ 19	0.63	0.55	0.49	0.46	0.59	0.58	0.58	0.45	0.45	0.45	0.45
SP 100	≤ 14	1.9	1.6	1.3	1.2	1.7	1.7	1.7	1.1	1.1	1.1	1.1
	> 14 to ≤ 19	2.0	1.7	1.4	1.3	1.8	1.8	1.8	1.2	1.2	1.2	1.2
	> 19 to ≤ 24	2.7	2.4	2.1	2.0	2.5	2.5	2.5	1.9	1.9	1.9	1.9
	> 24 to ≤ 28	3.5	3.2	2.9	2.8	3.3	3.3	3.3	2.7	2.7	2.7	2.7
	> 28 to ≤ 32	4.6	4.3	4.0	3.9	4.4	4.4	4.4	3.8	3.8	3.8	3.8
SP 140	≤ 19	5.0	4.1	3.3	2.8	4.4	4.4	4.4	2.7	2.7	2.7	2.7
	> 19 to ≤ 24	5.7	4.8	4.0	3.5	5.1	5.1	5.1	3.4	3.4	3.4	3.4
	> 24 to ≤ 32	8.4	7.5	6.7	6.2	7.8	7.8	7.8	6.1	6.1	6.1	6.1
	> 32 to ≤ 35	8.2	7.3	6.5	6.0	7.6	7.6	7.6	5.9	5.9	5.9	5.9
	> 35 to ≤ 38	10.0	9.1	8.3	7.8	9.4	9.4	9.4	7.7	7.7	7.7	7.7
SP 180	≤ 19	–	–	–	–	5.0	4.8	4.6	2.8	2.8	2.7	2.7
	> 19 to ≤ 24	–	–	–	–	5.7	5.5	5.3	3.5	3.5	3.4	3.4
	> 24 to ≤ 32	–	–	–	–	8.4	8.2	8.0	6.2	6.2	6.1	6.1
	> 32 to ≤ 35	–	–	–	–	8.2	8.0	7.8	6.0	6.0	5.9	5.9
	> 35 to ≤ 38	–	–	–	–	10.0	9.8	9.6	7.8	7.8	7.7	7.7
	≤ 32	30.6	24.9	20.0	17.4	–	–	–	–	–	–	–
	> 32 to ≤ 38	31.7	26.0	21.1	18.5	–	–	–	–	–	–	–
	> 38 to ≤ 48	36.2	30.5	25.6	23.0	–	–	–	–	–	–	–



SP series gearbox

Dimensions

Size	**Toler-ances**	**SP 060**		**SP 075**		**SP 100**		**SP 140**		**SP 180**	
Gearbox stages		1	2	1	2	1	2	1	2	1	2
DR		M5		M8		M12		M16		M20	
D1	g6	60		70		90		130		160	
D2		30		38		55		70		90	
D3	k6	16		22		32		40		55	
D4		5.5		6.6		9		11		13	
D5		68		85		120		165		215	
D10	+ 1	61.5		82		106		140		193	
L1	± 2	129	149	156	182.5	202	234.5	256.5	296.5	297	315.5
L2		28		36		58		82		82	
L3		20		20		30		30		30	
L4		6		7		10		12		15	
L5		60	80	71	97.5	76	108.5	102	142	132.5	158
L11	± 2	62		76		101		141		182	
L12		2		2		2		3		3	
L13	+ 1	60		80		100		140		190	140
L21		15		22		28		30.5		37.5	30.5
t		12.5		19		28		36		42	

All dimensions in mm

Motor–gearbox compatibility

Gearbox	**DSM 4-05**	**DSM 4-07**	**DSM 4-09**	**DSM 4-11**	**DSM 4-14**	**DSM 4-19**
SP 060-MF1	L13 = 60 L21 = 15	L13 = 70 L21 = 15	L13 = 90 L21 = 15	–	–	–
SP 075-MF1	–	L13 = 80 L21 = 22	L13 = 90 L21 = 22	L13 = 100 L21 = 22	–	–
SP 100-MF1	–	–	L13 = 100 L21 = 28	L13 = 100 L21 = 28	L13 = 140 L21 = 28	–
SP 140-MF1	–	–	L13 = 140 L21 = 30.5	L13 = 140 L21 = 30.5	L13 = 140 L21 = 30.5	–
SP 180-MF1	–	–	–	–	L13 = 190 L21 = 37.5	L13 = 190 L21 = 37.5

All dimensions in mm

Gearbox options SP

Example	SP X - M F X - X - X X X / Motor
Gearbox type 060 075 100 140 180 210 240	SP **X** - M F X - X - X X X / Motor
Gearbox version M = motor-mounted gearbox	SP X - **M** F X - X - X X X / Motor
Gearbox model F = standard model FPM seals (Viton®)	SP X - M **F** X - X - X X X / Motor
Stage count 1 = 1-stage 2 = 2-stage	SP X - M F **X** - X - X X X / Motor
Reduction ratio 004/005/007/010 = 1-stage 016/020/028/040/050/070/100 = 2-stage	SP X - M F X - **X** - X X X / Motor
Form of drive shaft 0 = smooth shaft 1 = smooth shaft with featherkey, form A DIN 6885 2 = involute DIN 5480 4 = other	SP X - M F X - X - **X** X X / Motor
Drilling diameter of the clamping receiver prescribed by supplier based on motor description	SP X - M F X - X - X **X** X / Motor
Backlash level 1 = standard 0 = reduced	SP X - M F X - X - X X **X** / Motor
Motor description see Motor type key or Motor–gearbox compatibility	SP X - M F X - X - X X X / **DSM 4-X**

BERGER LAHR

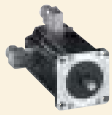
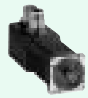
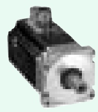
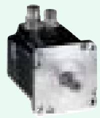
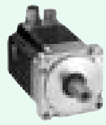
Catalogue of Twin Line Positioning controllers

Edition 7/2003

Twin Line

a company of Schneider Electric

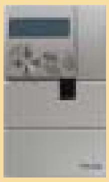
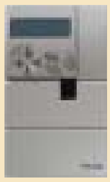
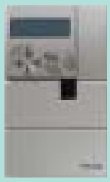
Twin Line Motors

	3-phase stepping motors			AC synchronous servomotors (standard)				
Torque [Nm][1]	1,5	2-6	12-16,5	0,32-0,9	1,1-3,6	4,3-11,25	4,6-13,4	17,8-38,8
Motor type	VRDM 36X	VRDM 39X	VRDM 311X	SER 36X	SER 39X	RIG 39X	SER 311X	RIG 311X
								
	VRDM 368	VRDM 397 3910 3913	VRDM 31117 31122	SER 364 366 368 3610	SER / RIG 397 3910 3913 3916[2]	SER / RIG 31112 31117		SER / RIG 31117 31122 31127[2]

Twin Line Power electronics

Power class	3 A / 350 W / 1~	7 A / 750 W / 1~	3 A / 750 W / 1~	3 A / 1,5 kW / 3~	6 A / 3 kW / 3~
					
for single axis systems	TLD 011	TLD 012	TLD 132	TLD 134	TLD 136

Twin Line Positioning controllers

Power class	3 A / 350 W / 1~	7 A / 750 W / 1~	3 A / 750 W / 1~	3 A / 1,5 kW / 3~	6 A / 3 kW / 3~
					
with data set processsing	TLC 411	TLC 412	TLC 432	TLC 434	TLC 436
with field-bus interface	TLC 511	TLC 512	TLC 532	TLC 534	TLC 536
freely programmable according to IEC 61131-3	TLC 611	TLC 612	TLC 632	TLC 634	TLC 636

Robotics

Single-axis-systems

Portal axis

Cantilever axis

Telescope axis

[1] Stepping motors: max. torque M_{max}
AC synchronous servo: permanent idle torque M_{d0}

[2] only Motor type SER

AC synchronous servomotors (high performance)

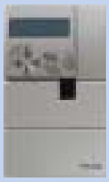
0,34-1,0	0,65-2,3	0,95-6	4,2-12	8,5-27	25-50
DSM4-05.X	DSM4-07.X	DSM4-09.X	DSM4-11.X	DSM4-14.X	DSM4-19.X
					

DSM	DSM	DSM	DSM
4-05.1-.4 4-07.1-.2 4-09.1-.2	4-07.1-.3 4-09.1-.3	4-07.1-.3 4-09.1-.4 4-11.1-.2	4-11.1-.4 4-14.1-.4 4-19.1-.2

Catalogue of
Twin Line Motors

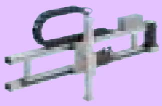
3 A / 750 W / 1~	3 A / 1,5 kW / 3~	6 A / 3 kW / 3~	16 A / 8 kW / 3~
			
TLD 132	TLD 134	TLD 136	TLD 138

Catalogue of
Twin Line Power electronics

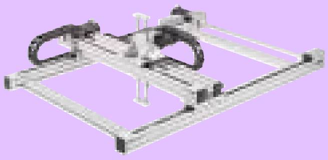
3 A / 750 W / 1~	3 A / 1,5 kW / 3~	6 A / 3 kW / 3~	16 A / 8 kW / 3~
			
TLC 432	TLC 434	TLC 436	TLC 438
TLC 532	TLC 534	TLC 536	TLC 538
TLC 632	TLC 634	TLC 636	TLC 638

This Catalogue includes

Multi-axis-systems



Double-axis systems



Triple-axis systems

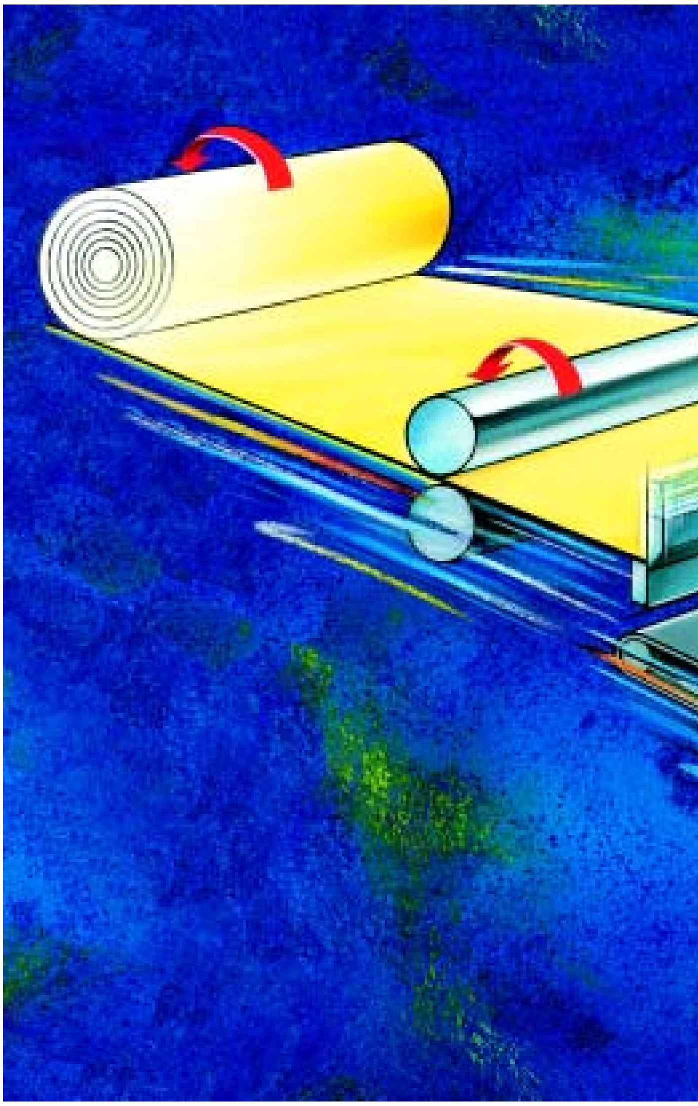
Low-mass systems

Catalogue of
Robotics

Positioning drives

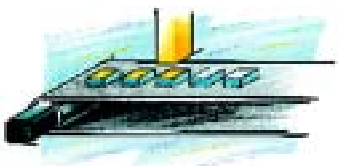
Positioning drives enable the execution of accurate, precisely defined movements. The distances travelled may vary from a few µm to several metres. The digital positioning drives from Berger Lahr are especially well-suited to positioning tasks. They are maintenance-free, simple to control and the movement procedures are easy to program. They can be used to solve almost any task in production automation requiring up to 8 kW of power: from simple point-to-point movements all the way to multi-axis systems with varying travel patterns. Positioning drives from Berger Lahr may be

- operated as autonomous solutions
- controlled by a PLC
- integrated into various networks and standard field-bus systems

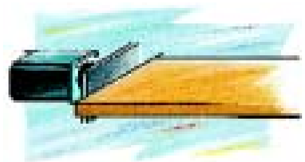


What would you like to position?

Below are some examples of possible positioning tasks. Many other applications are also conceivable.

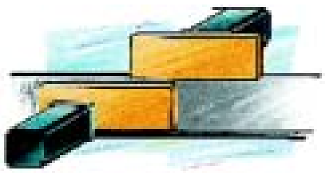


Positioning parts



Positioning limit stops

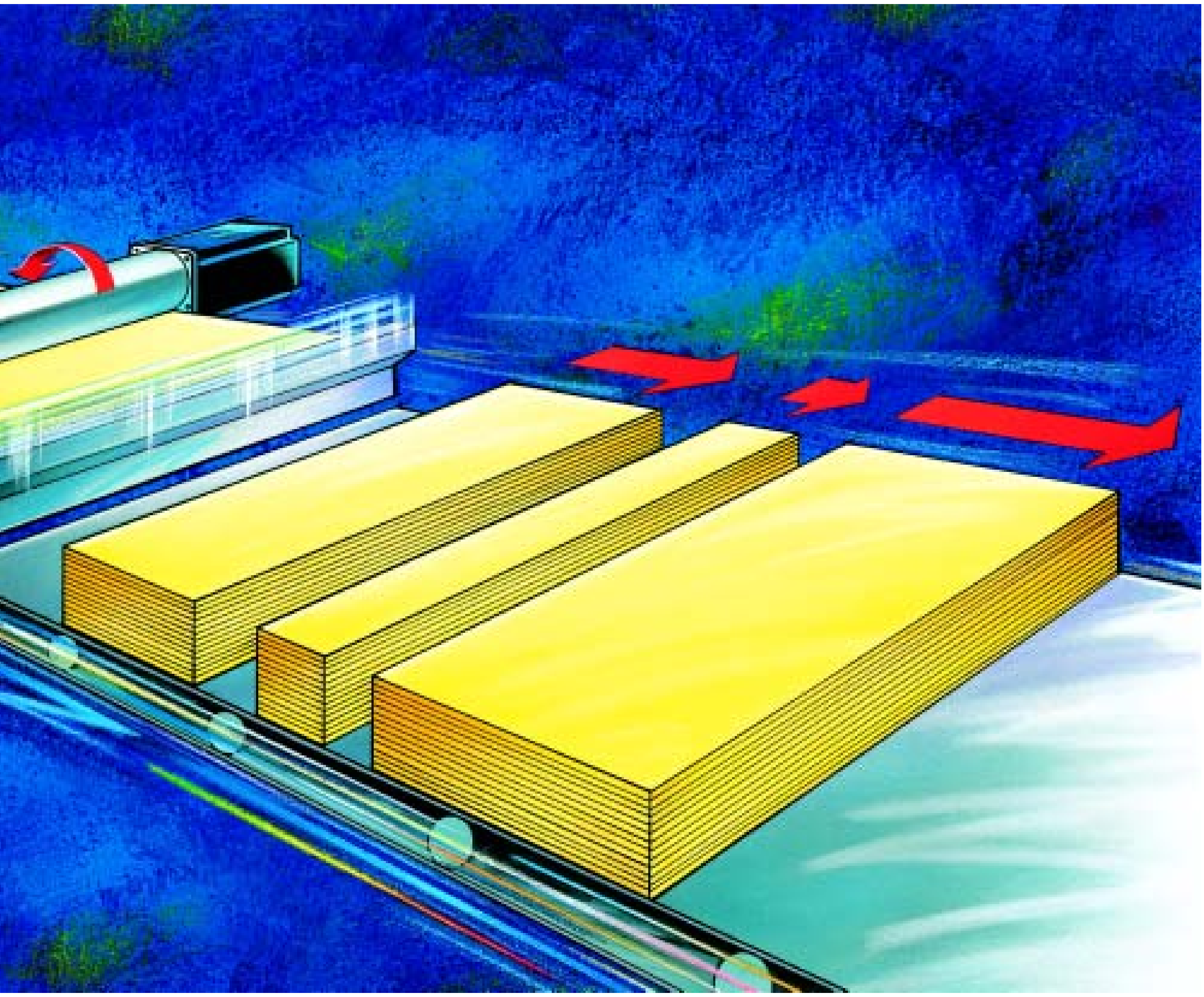
Feed movements

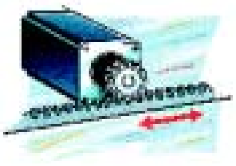


Format setting/adjustment

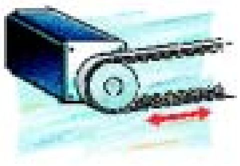
Metering

Cutting to length





Toothed rod



Toothed belt

Chain

Spindle

Gearing

The mobility you need

Mechanical components precisely adjust the motor's rotary motion to the movement type for the positioning task required.

Positioning controllers

General description of positioning controllers

Twin Line positioning controllers are exceptionally adaptable single-axis positioning controllers with integrated power electronics. Controllers of the TLC x1x series are equipped with integrated stepping-motor power electronics, and devices of the TLC x3x series with integrated AC synchronous servomotor power electronics.

Depending on the module configuration, the positioning controllers can manage all sorts of positioning tasks, from the simplest point-to-point positioning to the electronic-gearing function.

The Twin Line positioning drives act as intelligent actuators in a typical automation system. The master control system has access to parameters, system factors and the positioning functionality of the drives via digital signal interface, serial communication or standard field-bus systems.

The integrated intelligence of the drive system shifts the positioning functions and corresponding control loops from the command level to the field level, while considerably reducing the wiring outlay and relieving the load on the master control system.

This design results in coherent structures within the automation solution, which simplify start-up operation, increase flexibility for expansion and reduce maintenance costs. Twin Line devices may thus be replaced or exchanged without difficulty, because the master control system can simply transfer all parameters to the new device.

Up to two high-speed capture inputs – depending on the control functionality - are available for meeting time – critical requirements in a distributed manner during the production process. A high-speed output makes it possible to implement an integrated camshaft control signal with up to 2 x 64 switching points. The capture inputs and the high-speed output have a very short reaction time and a very low jitter. The capture inputs or the high-speed output are operated via serial communication or field-buses.

Depending on the control functionality, the other fully adaptable, process-compatible inputs and outputs reduce the need for extra peripheral components, resulting in significant cost savings.

A jolt-limiter which may be connected during operation ensures smooth mechanical operation and a longer machine service life.

Structural features

- Compact design
- Same mechanical design for all power classes
- Integrated power electronics, stepping or AC synchronous servomotor
- Power supply for the power electronics directly from the mains, without transformer
- Power range from 350 W to 8 kW
- Integrated mains filter, class B (industrial environment), heat dissipater and ventilator
- Protection type IP 20, optional IP 54 for certain power classes
- Device suspension integrated in the housing
- All electrical connections are accessible from the front
- Shielding connection and strain relief are integrated in the device

Functional and economical features

- Operation, parameterisation and control alternatively via
  - Plug-in Twin Line HMI (Human Machine Interface) control unit
  - Twin Line CT (Control Tool) software, which runs under Windows 95/NT/98/2000/XP Professional
  - Master control system
  - Programming system CoDeSys according to IEC 61131-3
- Compatible with various motor encoder systems
- Integrated braking control signal
- Various field-buses or RS 485 configuration
- Various adjustable operating modes
- Simple to install in accordance with EMC directives
- User-friendly
- Multilingual documentation and controlling units
- Complete solution for power-engineering tasks
- Takes up little space
- Modularity for tailor-made system solutions
- External components (mains filter, ventilator, heat dissipator) easily integrated
- Process-applicable I/Os on board

Custom configuration of the interfaces

Twin Line positioning controllers are configured according to customers' needs. The modular design enables the devices to be adapted precisely to various power-engineering tasks and interface requirements.

A module for rotation monitoring can be optionally used for controls with integrated stepping-motor power electronics.

For controllers with integrated AC synchronous servomotor power electronics, a SinCos® (Single and Multi Turn absolute-value encoder) is used to detect the motor position.

The set value for the electronic gearing can be supplied as encoder (A/B), pulse/direction or $\text{pulse}_{\text{forward}}/\text{pulse}_{\text{back}}$ signal.

Device parameters and commands can be transmitted via RS 485 or the standard field-bus systems Profibus-DP, Interbus, CAN and ModBus.

The equipped CAN module can also be configured with the Berger Lahr profile or CANopen DS402 profile, or with DeviceNet.

Optional protection type IP 54

The integration of all components – such as the mains filter, heat dissipater, ventilator, ballast resistor, optional holding-brake controller and condensation guard – reduces the wiring outlay and simplifies commissioning.

The mini-terminal blocks can be snapped onto top hat rails in the device housing, thus eliminating the need for external terminal boxes.

These features enable the Twin Line positioning controllers to be used as field devices without a switch cabinet.

However, devices of this protection type are not suitable for use outdoors or in areas with strongly adhering contaminants which could jam the ventilator.

Option Safety Monitor module SAM-C Integrated safety functions for personal protection

The SAM-C Safety Monitor module extends the series TLCxxx devices using integrated functions for operator safety, e.g. safe stop and reduced speed functions. These safety functions allow the power supply to the motor to remain on even when the protective door is open. In case of Emergency Stop situations, SAM-C offers safe deceleration and switching off of power supply for the motor by means of internal safe blocking of the power stage controller. The power supply does not need to be switched off by means of power contactors. All functions conform to safety category 3 according to EN 954-1. SAM-C features a 24 V I/O interface for the connection of protective door contacts, Emergency Stop, devices, etc.

Approvals

CE, UL, cUL

Accessories

Please refer to the catalogue of **Twin Line Accessories** for additional information and technical data.

General device functions

The TLC 41x models are positioning controllers with integrated power electronics for 3-phase stepping motors or AC synchronous servomotors. The TLC 43x models are positioning controllers with integrated power electronics for AC synchronous servomotors.

Sixty-four data sets are stored in the devices and can be controlled by a master control system (e.g. PC/PLC) via digital signal interface or communication interface.

You can set parameters to assign the inputs and outputs of the following functions:
- Fixed assignment of the input/output signals: the data sets are controlled via digital signal interface. This mode does not require a communication interface.
- Setting of the network address, baud rate and field-bus profile for positioning controllers with RS 485, Modbus, PB-DP and CAN field-bus. The data sets are controlled via communication interface. enabling the Twin Line positioning controllers to be exchanged without any additional start-up tools.
- Freely applicable and process-applicable 14 digital inputs, 5 digital outputs, and an analogous input ±10V, being controlled by field bus or by RS485. The data sets are controlled via communication interface.

The standard controller model is equipped with the following connections:
- I/O signal connection
- Motor connection
- Mains connection
- Brake-triggering signal
- Connection for ballast controller
- RS 232 for communication with the Twin Line CT control software or the Twin Line HMI plug-in controller.

The following interfaces may also be added:
- Encoder-simulation interface for connecting follow-up axes
- RS 485 serial interface or field-bus interface Interbus, Profibus-DP, CAN or ModBus
- SAM module for integrated safety technique
- Analog module IOM with two digital I/Os , and two analog I/Os

Data set processing

Every data set represents a travel job which can be executed as point-to-point positioning or in speed mode.

The individual position sets in data set processing with point-to-point positioning consist of the following data:
- Relative or absolute units system
- Target position
- Travel speed
- Acceleration and deceleration ramps

The individual speed sets in data set processing consist of the following data:
- Travel speed
- Acceleration and deceleration ramps

The data sets can be called up using the Twin Line HMI hand-operated controller, the Twin Line Control Tool software, inputs of the signal interface or an integrated field-bus module. These interfaces can also be used to approach the position values with the teach-in processing as well as to store the current position value in the set memory.

All entries in the data sets can also be made using the Twin Line HMI hand-operated tool, the Twin Line Control Tool software, or via field-bus.

Device-related operation modes and functions:

Point-to-point

In point-to-point mode, a positioning command is used to position from point A to point B. The positioning may be absolute (relative to the zero-point of the axis) or relative (based on the current axis position).

Speed mode

In speed mode, a speed is defined for the axis, and the movement is started without a target position. The axis moves at this speed until another speed set or operating mode is selected.

Reference run

Referencing assigns a defined axis position to a special mechanical position of the motor in the system. Referencing may be performed either by setting the dimensions to the current motor position or by executing a reference run.

The following types of reference run are available:
- Travel to positive, negative or additional limit switches
- Travel to positive, negative or additional limit switches with referencing to the index pulse

Manual run

You can initiate motor runs from a single step to continuous motion by operating the manual inputs or via the Twin Line HMI and Twin Line CT start-up tools.

Teach-in

Teach-in stores the current position value in the selected memory area. You can teach in up to 2 x 64 absolute switching positions of the integrated camshaft function or the 64 paths sets for data set processing via input/output signals, Twin Line HMI or the Twin Line CT. The data may also be read, written and copied via field-bus, Twin Line HMI or Twin Line CT.

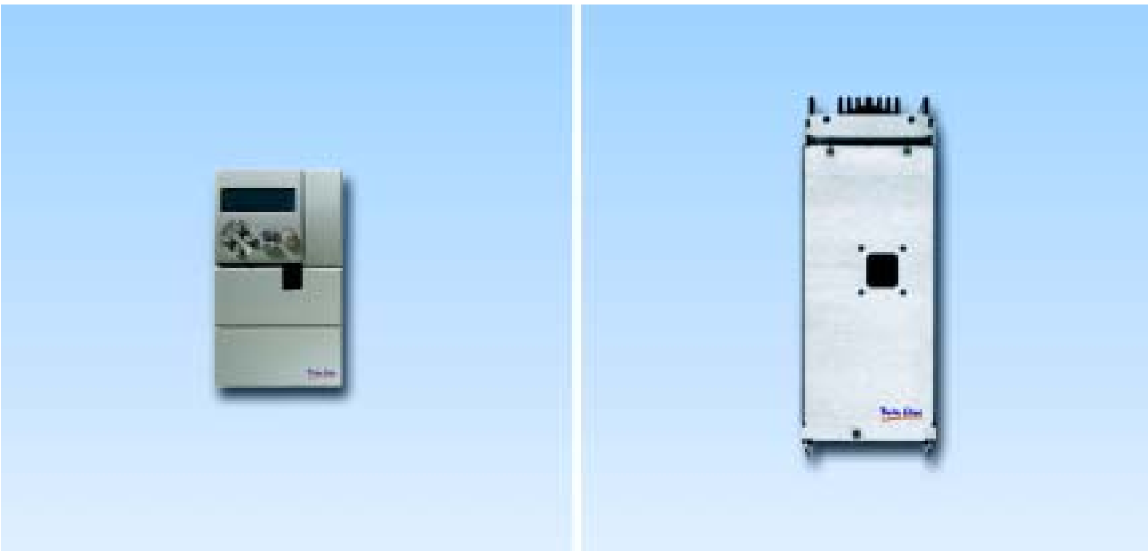
Cam-controller signal output

If the movement exceeds an absolute position value acquired/modified in teach-in mode, the output will be set according to the modified output state, i.e. this high-speed output will be set or reset based on the new position. The position is set parallel to the current operating mode.

Parameterisation

The parameters of the positioning controller and integrated power electronics of devices with an attached communication module can be read and written by the master (PC, PLC etc.) via field-bus or RS 485. Twin Line devices may thus be reproduced or replaced without difficulty, increasing flexibility for extensions and reducing maintenance costs.

The plug-in Twin Line HMI controller and Twin Line CT start-up software enable a complete device parameterisation as well as a transfer of all parameters from one device to another.



Positioning controllers TLC 41x for 3-phase stepping motors

Positioning controllers TLC 41x

Positioning controllers with data set processing and integrated power electronics devices for 3-phase stepping motors are available in the following models:

Protection type IP 20
- TLC 411: Single-axis positioning controller with data set processing, power class 3 A/350 W/1~
- TLC 412: Single-axis positioning controller with data set processing, power class 7 A/750 W/1~

These devices can be specified as follows:
- 230 V mains voltage with integrated mains filter
- Reversible mains voltage 115 V/230 V without integrated mains filter

Optional protection type IP 54
- TLC 411P: Single-axis positioning controller with data set processing, power class 3 A/350 W/1~
- TLC 412P: Single-axis positioning controller with data set processing, power class 7 A/750 W/1~

The mains voltage for these devices is reversible 115 V/230 V. A mains filter is always integrated.

The ventilator and heat dissipater are standard equipment on all devices.

Acceleration and braking ramps

The following asymmetric ramp shapes may be defined for the positioning controller with integrated power electronics for 3-phase stepping motors:
- Linear ramp
- Exponential ramp, i.e. compensation for the torque drop typical of stepping motors at rising speed by a suitable optimised ramp

In addition, a jolt filter may be connected to achieve jolt-free acceleration or braking phases, regardless of the current speed.

Quick-stop

Quick-stop is designed to bring the motor to a stop as quickly as possible.

A linear braking ramp is used as the quick-stop ramp for positioning controllers with integrated power electronics for 3-phase stepping motors.

Rotation monitoring

A shaft-encoder interface module, which enables the Twin Line positioning controller to detect mechanical motor overload, is available as an optional accessory.

The rotation monitoring system compares the set and actual motor positions and returns a rotary error if the difference exceeds the drag-error limit. The motor must be equipped with an encoder (1000 increments) for the rotation monitoring system to function.

Device protection

- Standard: Protection type IP 20 according to DIN EN 60529: 1991
- Optional: Protection type IP 54, category 2 according to DIN EN 60529: 1991
- Protection type 1 according to prEN 50178: 1994
- Overvoltage category III according to prEN 50178: 1994
- Pollution grade 2 according to prEN 50178: 1994

Protective and monitoring devices for
- Excess temperature electronics
- Excess temperature motor (only with the rotation monitoring option)
- Rotation monitoring (optional)
- Short to earth
- Phase failure (Power supply and motor cable)
- Short circuit between the motor phases
- Under-/overvoltage of the intermediate circuit
- Motor velocity
- Data connection to control device

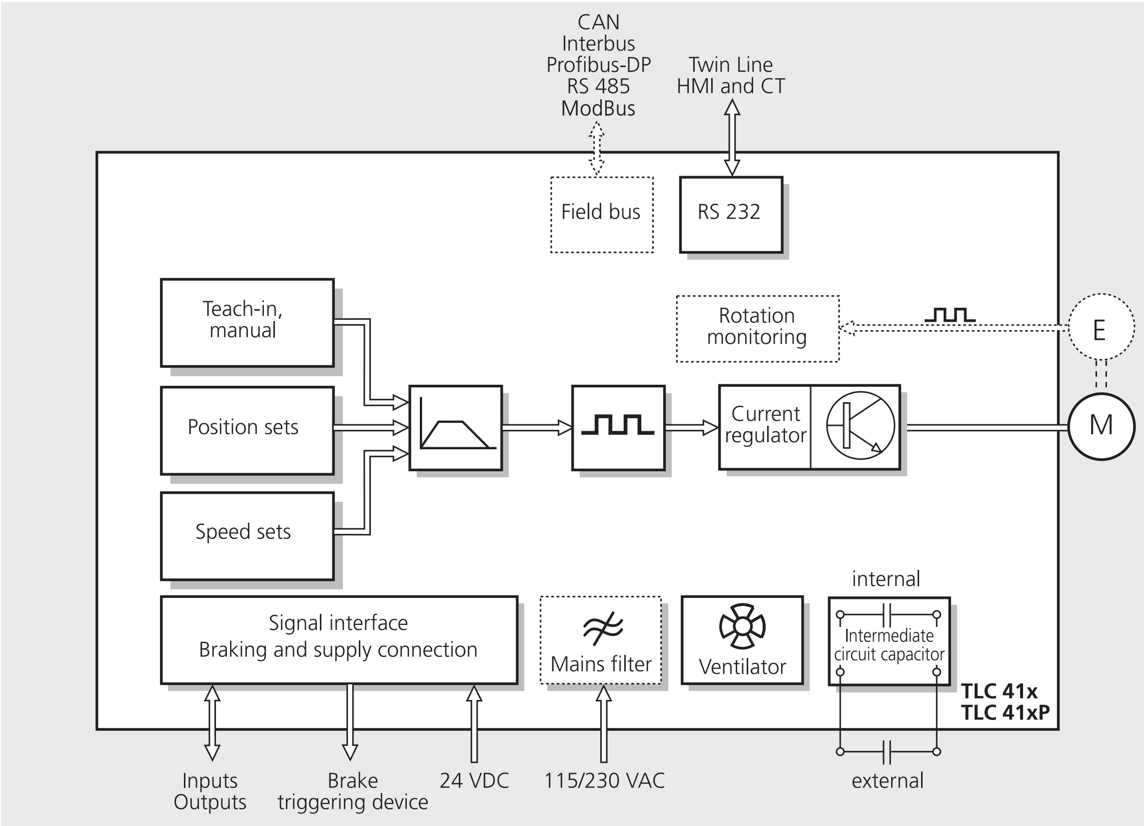


Diagram of positioning controllers with data set processing for 3-phase stepping motors

Technical data TLC 41x, protection type IP 20

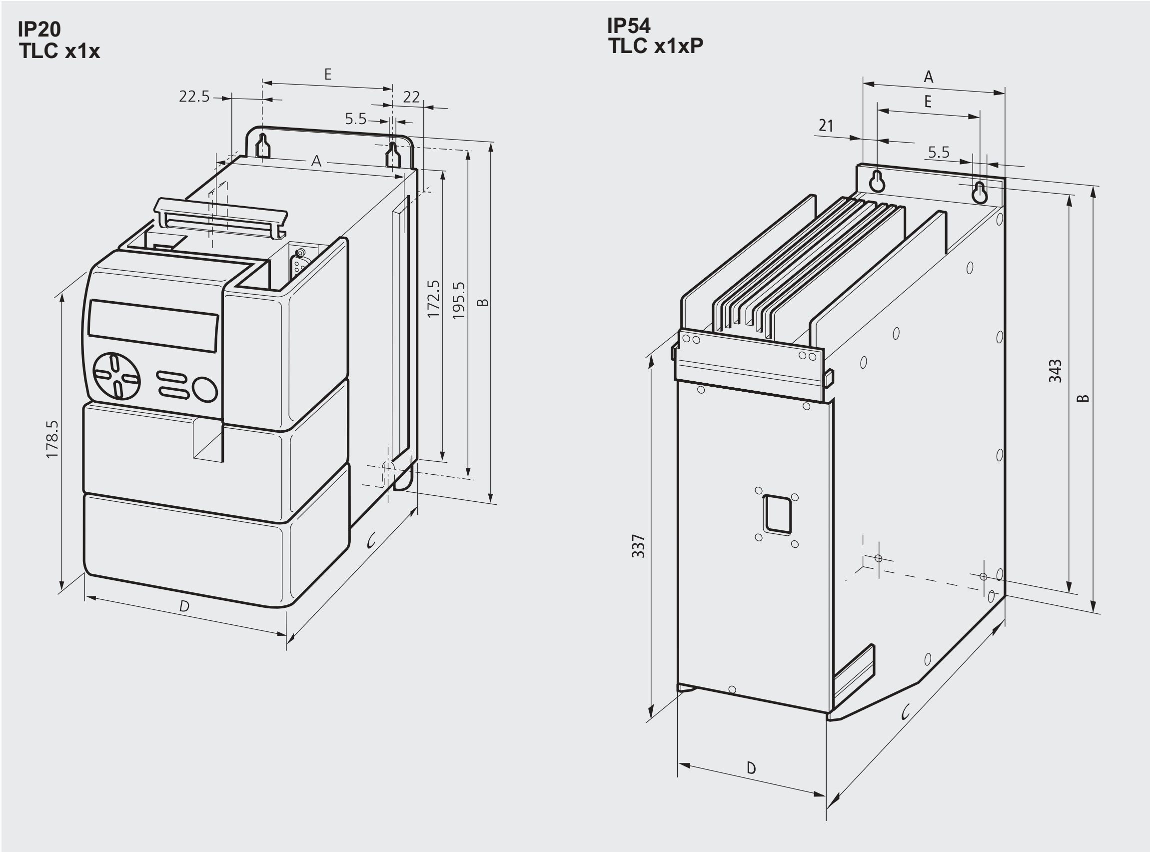
		TLC 411	TLC 412
Mains connection	Mains voltage, non-reversible, mains filter integrated	1 x 230 VAC –20 % to 230 VAC +15 %	
	Mains voltage, reversible, without mains filter	1 x 115 VAC –20 % to 115 VAC +15 % 1 x 230 VAC –20 % to 230 VAC +15 %	
	Mains frequency	47 to 63 Hz	
	Current consumption at 230 V	2 A	5 A
	Current consumption at 115 V	4 A	10 A
	Starting current	< 60 A	
	Fuse protection, external at 230 V	10 A (C, K or similar characteristic)	
	Fuse protection, external at 115 V	10 A (C, K or similar characteristic)	
Motor connection	Rated power at rated current	0.35 kW_{eff}	0.75 kW_{eff}
	Rated current	3 A_{eff}	7 A_{eff}
	Switching frequency	16 kHz	
	Max. rotary speed	3000 min^{-1}	
Motor cable	Cable length	≤ 20 m standard > 20 m upon request	
	Shielding connection	on both sides	
	Cross section	1.5 mm^2	
24 VDC system supply voltage		PELV, DIN 19240, polarised	
	Input voltage range	20 to 30 V	
	Input ripple	< 2 V_{PP}	
	Input current without loading the outputs	< 2.5 A	
Digital signal inputs		polarised, no electrical isolation	
	Debounced	0.7 to 1.5 ms	
	DC voltage U_{high}	12 to 30 V (I ≥ 3 mA)	
	DC voltage U_{low}	≤ 5 V (I ≤ 0.5 mA)	
	Current	≤ 7 mA at 24 V	
Digital signal outputs		short-circuit proof	
	Inductive load capable	150 mH/11 W	
	DC voltage	≤ 30 V	
	Switching current	≤ 400 mA	
	Voltage drop at 400 mA	≤ 1 V	
Analog signal input	Voltage range	+10 V to –10 V	
	Input resistance	5 kΩ	
	Solution	10 Bit	
Mass		2.7 kg	

		TLC 411	TLC 412
Ambient conditions	Ambient temperature	0 to 50 °C	
	Transport and storage temperature	–40 to +70 °C	
	Relative humidity	15 to 85 % no condensation permissible	
	Altitude, without power reduction	h < 1000 m above sea level	
	Protection type according to DIN EN 60529: 1991	IP 20	
Characteristic curves		See catalogue of **Twin Line Motors**	
UL 508C approved		You can find the limit values for the UL 508C approval in the documentation included with the device.	

Technical data TLC 41xP, protection type IP 54

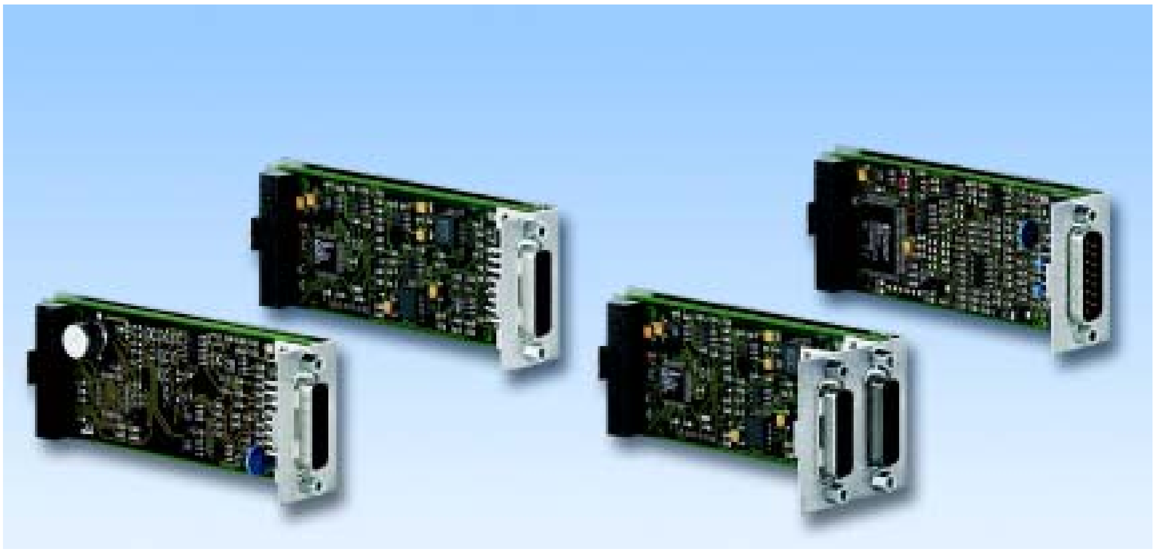
		TLC 411P	TLC 412P
Mains connection	Mains voltage, reversible, mains filter integrated	1 x 115 VAC –20 % to 115 VAC +15 % 1 x 230 VAC –20 % to 230 VAC +15 %	
	Mains frequency	47 to 63 Hz	
	Current consumption at 230 V	2 A	5 A
	Current consumption at 115 V	4 A	10 A
	Starting current	< 60 A	
	Fuse protection, external at 230 V	10 A (C, K or similar characteristic)	
	Fuse protection, external at 115 V	10 A (C, K or similar characteristic)	
Motor connection	Rated power at rated current	0.35 kW_{eff}	0.75 kW_{eff}
	Rated current	3 A_{eff}	7 A_{eff}
	Switching frequency	16 kHz	
	Max. rotary speed	3000 min^{-1}	
Motor cable	Cable length	≤ 20 m standard > 20 m upon request	
	Shielding connection	on both sides	
	Cross section	1.5 mm^2	
24 VDC system supply voltage		PELV, DIN 19240, polarised	
	Input voltage range	20 to 30 V	
	Input ripple	< 2 V_{PP}	
	Input current without loading the outputs	< 2.5 A	
Signal inputs		polarised, no electrical isolation	
	Debounced	0.7 to 1.5 ms	
	DC voltage U_{high}	12 to 30 V (I ≥ 3 mA)	
	DC voltage U_{low}	≤ 5 V (I ≤ 0.5 mA)	
	Current	≤ 7 mA at 24 V	
Signal outputs		short-circuit proof	
	Inductive load capable	150 mH/11 W	
	DC voltage	≤ 30 V	
	Switching current	≤ 400 mA	
	Voltage drop at 400 mA	≤ 1 V	
Analog signal input	Voltage range	+10 V to –10 V	
	Input resistance	5 kΩ	
	Solution	10 Bit	
Mass		8 kg	

		TLC 411P	TLC 412P
Ambient conditions	Ambient temperature	0 to 45 °C	
		The P model is not suitable for use outdoors or in areas with strongly adhering contaminants which could jam the ventilator.	
	Transport and storage temperature	–40 to +70 °C	
	Altitude, without power reduction	h < 1000 m above sea level	
	Protection type according to DIN EN 60529: 1991	IP 54, category 2	
	Protection type of internal air channel for cooling	IP 34	
Characteristic curves		See catalogue of **Twin Line Motors**	
UL 508C approved		You can find the limit values for the UL 508C approval in the documentation included with the device.	



Dimensional drawing of positioning controllers for 3-phase stepping motors

	TLC 41x	TLC 41xP
Width A	108 mm	127 mm
Height B	212.5 mm	360 mm
Depth C	184.5 mm	245 mm
Front width D	105.5 mm	127 mm
Fitting dimension E	63 mm	80 mm



Modules for positioning controller and power electronics

Micromodules

Twin Line micromodules for application-specific configuration

IOM-C

The analogous module receives and generates analogous and digital voltage values. The analogous outputs are user-adjustable. The module furnishes nominal values for control as analogous voltage values. Extension by two analogous I/Os and two digital I/Os.

RM-C

The RM-C module recognizes any position deviations in the movements of a stepping motor.

The actual positions registered by the rotary encoder are compared with the set positions. If the deviation exceeds a defined value, a drag error is returned.

ESIM3-C

The ESIM3-C module outputs the position data of the stepping motor in the form of incremental signals on a 15-pole Sub-D socket. These are two signals electrically phase-displaced by 90°(A/B trails). The transmitted solution can be set from 125 thr. 4000 increments per revolution, an index pulse is not available! Use of this module requires that slot M2 is equipped with an RM-C module.

A typical application for this module is to act as follow-up axes in the electronic gearing mode.

RS 485-C

The RS 485-C is an asynchronous 4-wire interface with level RS 485.

The module provides short-circuit proof voltage supply for the Berger Lahr MP923 interface converter (RS 232 to RS 485).

MODB-C

Module ModBus is an asynchronous 4-wire interface of RS485 level. The user can configure, alternatively, ModBus ASCII or ModBus RTU.

PBDP-C

The Profibus-DP is a high-speed cyclic communication bus. It has a 2-wire interface with level RS 485.

CAN-C

The CAN bus is a serial sensor/actuator bus. It has a 2-wire connection for the CAN-Low and CAN-High lines.

The user can also configure the Berger Lahr Profile, the CANopen DS-402 Profile or DeviceNet.

IBS-C

The Interbus is a sensor/actuator bus which encodes according to the shift-register principle.

SAM-C

The SAM-C Safety Monitor module extends Twin Line positioning controllers using integrated functions for operator safety, e.g. safe stop and reduced speed functions.

Use of this module requires that slot M2 is equipped with an RM-C module.

Technical data micromodules

Modules			
IOM-C	Digital signal inputs		polarity-secured, no galvanic insulation, damping time 0.7 ms - 1.5 ms
		DC voltage U_{high}	12 V - 30 V
		DC voltage U_{low}	<5 V
		Current at 24 V	<7 mA
	Digital signal outputs		inductively load-capable (50 mH), short-circuit-proof, polarity-secured
		DC voltage	12 V - 30 V
		reverse locking current	<100µA
		switching current	<50 mA
		voltage decay at 50 mA	
	Analogous signal inputs	voltage range	–10 V - +10 V
		input resistance	50 k
		solution	10 Bit
	Analogous signal outputs	voltage range	–10 V - +10 V
		output current	max. 5 mA
		solution	12 Bit
RM-C	Signal inputs (A, B)		RS422 level, galvanically connected with 24VGND
		input frequencies	≤ 400 kHz, 160000 Inc/s
		RPM sensor pitch	1000 marks
	output RPM sensor supply		5V ± 5%, ≤ 300 mA, sense-controlled, short circuit and overload-proof
ESIM3-C	Signal outputs A/B		RS 422 voltage compatible, electrically connected to 24 VGND
RS 485-C MODB-C			meets the RS 485 norm, electrically isolated, 4-wire interface
	Transfer rate		max. 38.4 kBaud
	Supply voltage output		+12 V (min. 9 V to max. 15 V)
PBDP-C			meets the RS 485 norm, electrically isolated
	Transfer rate		≤ 12 MBaud
	Supply voltage output		+5 V (max. 10 mA) only for matching resistor
	Cable length		Standard Profibus-DP
CAN-C			Level according to ISO 11898, electrically isolated
	Transfer rate		≤ 1 MBaud, adjustable
	Cable length	at 125 kBaud	max. 500 m
		at 500 kBaud	max. 100 m
	Level	CAN-L/CAN-H	according to ISO 11898
	Matching resistor	at both ends	120 Ω
IBS-C			meets Interbus specification
	Transfer rate		500 kBaud
	Cable length		max. distance to next network participant 400 m

Modules			
SAM-C	24-VDC-supply voltage		PELV, DIN 19240, polarity-secured
		input voltage range (being monitored)	20 - 30 V
		input ripple	< 2 V_{SS}
		input current without load on outputs	< 0,02 A
	Digital signal inputs		polarity-secured, no galvanic insulation, damping time >1 ms
		time window for simultan switching of both signals of one switch pair	10 s
		DC voltage U_{high}	15 V - 30 V (I ≥ 3 mA)
		DC voltage U_{low}	≤ 5 V (I ≤ 0,5 mA)
		Current at 24 V (5 kΩ against GND)	I≤ 0,5 mA
	Digital signal outputs		inductively load-capable (150 mH /11 W), capacitive load capability (C ≤ 1μF), short-circuit-proof
		DC voltage	≤ 30 V
		switching current RELAY_A, RELAY_B, INTERLOCK-OUT	≤ 0,5 A
		switching current SAFETY24VDC-A; SAFETY24VDC-B	≤ 0,3 A
		switching current AUXOUT1, AUXOUT2	≤ 0,1 A

IP 54 options

Positioning drives with protection type IP 54 can be configured with the holding-brake controller option, in addition to the micromodules described above.

Integrated holding-brake controller

The integrated holding-brake controller amplifies the brake signal of the signal interface, ensuring that the brake is actuated quickly with the least possible heat generation. Enabling the output stage automatically opens the holding brake; disabling the output stage automatically closes it.

Wire sleeves

The cables and connectors are guided through the housing. An optional set of wire sleeves is available in order to fulfil protection type IP 54. Please refer to the catalogue of **Twin Line Accessories** for information and technical data on available accessories.

Terminal bracket

A terminal bracket with TS 15 top hat rail for snap-on mini terminal blocks with max. 1.5 mm wire cross section is available for additional wiring as well as to avoid having to use external terminal boxes. The terminal bracket is mounted inside the housing of the positioning controller. Please refer to the catalogue of **Twin Line Accessories** for information and technical data on available accessories.

Type key TLC 41x, protection type IP 20

Example	**TLC**	**4**	**1**	**X**	**X**	**X**	**X**	**X**	**X**
Device function	TLC	**4**	1	X	X	X	X	X	X
4 = Positioning controller with data set processing									
Motor	TLC	4	**1**	X	X	X	X	X	X
1 = 3-phase stepping motor									
Rated power	TLC	4	1	**X**	X	X	X	X	X
1 = 350W 2 = 750W									
Mains Filter	TLC	4	1	X	**X**	X	X	X	X
F = with mains filter, mains voltage 230V NF = without mains filter, mains voltage reversible 115V/230V									
M1 = Analogous	TLC	4	1	X	X	**X**	X	X	X
IOM = analogous module – = not equipped									
M2 = Capture motor position	TLC	4	1	X	X	X	**X**	X	X
RM = Rotation monitoring for 1000-line encoder – = not equipped									
M3 = Encoder simulation	TLC	4	1	X	X	X	X	**X**	X
ESIM3 = Encoder simulation, 1 signal connection, A/B signals (prerequisite: Plug-in M2 with RM-C module) SAM = safety module (prerequisite: Plug-in M2 with RM-C module) – = not equipped									
M4 = Communication	TLC	4	1	X	X	X	X	X	**X**
CAN = CAN, alternative Berger Lahr Profile, CANopen DS-402 Profile or DeviceNet configurable IBS = Interbus MODB = ModBus ASCII or ModBus RTU, to be configured PBDP = Profibus DP RS 485 = RS 485 – = not equipped									

Type key TLC 41xP, protection type IP 54

Example	TLC	4	1	X	P	S	F	X	X	X	X	X

Device function — TLC **4** 1 X P S F X X X X X

4 = Positioning controller with data set processing

Motor — TLC 4 **1** X P S F X X X X X

1 = 3-phase stepping motor

Rated power — TLC 4 1 **X** P S F X X X X X

1 = 350W
2 = 750W

Protection type — TLC 4 1 X **P** S F X X X X X

P = Protection type IP 54

Mains voltage — TLC 4 1 X P **S** F X X X X X

S = Mains voltage, reversible 115V/230V

Mains filter — TLC 4 1 X P S **F** X X X X X

F = with mains filter, mains voltage 115V/230V

M1 = Analogous — TLC 4 1 X P S F **X** X X X X

IOM = analogous module
– = not equipped

M2 = Capture motor position — TLC 4 1 X P S F X **X** X X X

RM = Rotation monitoring for 1000-line encoder
– = not equipped

M3 = Encoder simulation — TLC 4 1 X P S F X X **X** X X

ESIM3 = Encoder simulation, 1 signal connection, A/B signals (prerequisite: Plug-in M2 with RM-C module)
SAM = safety module (prerequisite: Plug-in M2 with RM-C module)
– = not equipped

M4 = Communication — TLC 4 1 X P S F X X X **X** X

CAN = CAN, alternative Berger Lahr Profile, CANopen DS-402 Profile or DeviceNet configurable
IBS = Interbus
MODB = ModBus ASCII or ModBus RTU, to be configured
PBDP = Profibus DP
RS 485 = RS 485
– = not equipped

M5 = Integrated holding-break controller — TLC 4 1 X P S F X X X X **X**

HBC = Holding Brake Controller integrated, cannot be retrofitted
– = not equipped

Positioning controllers TLC 43x for AC synchronous servomotors

Positioning controllers TLC 43x

Positioning controllers with data set processing and integrated power electronics for AC synchronous servomotors are available in the following models:

Protection type IP 20:

- TLC 432: Single-axis positioning controller with data set processing, power class 3 A/750 W/1~
- TLC 434: Single-axis positioning controller with data set processing, power class 3 A/1.5 kW/3~
- TLC 436: Single-axis positioning controller with data set processing, power class 6 A/3 kW/3~
- TLC 438: Single-axis positioning controller with data set processing, power class 16 A/8 kW/3~

Optional protection type IP 54

- TLC 432P: Single-axis positioning controller with data set processing, power class 3 A/750 W/1~
- TLC 434P: Single-axis positioning controller with data set processing, power class 3 A/1.5 kW/3~

A mains filter, heat dissipater and ventilator are standard for all devices.

Acceleration and braking ramps

An asymmetric linear acceleration and braking ramp can be set for the positioning controller with integrated power electronics for AC synchronous servomotors. In addition, a jolt filter may be connected to achieve jolt-free acceleration or braking phases, regardless of the current speed.

Quick-stop

Quick-stop is designed to bring the motor to a stop as quickly as possible.

A linear braking ramp or a torque ramp (max. motor current) may be selected as the quick-stop ramp for positioning controllers with integrated power electronics for AC synchronous servomotors.

Device protection

- Standard: Protection type IP 20 according to DIN EN 60529: 1991
- Option: Protection type IP 54, category 2 according to DIN EN 60529: 1991
- Protection type 1 according to prEN 50178: 1994
- Overvoltage category III according to prEN 50178: 1994
- Pollution grade 2 according to prEN 50178: 1994

Protective and monitoring devices for

- Excess temperature electronics
- Excess temperature motor
- Overheating (I^2t monitoring of motor, internal ballast resistance and output stage)
- Short to earth
- Phase failure (Power supply and motor cable)
- Short circuit between the motor phases
- Under-/overvoltage of the intermediate circuit
- Motor velocity
- Data connection to control device

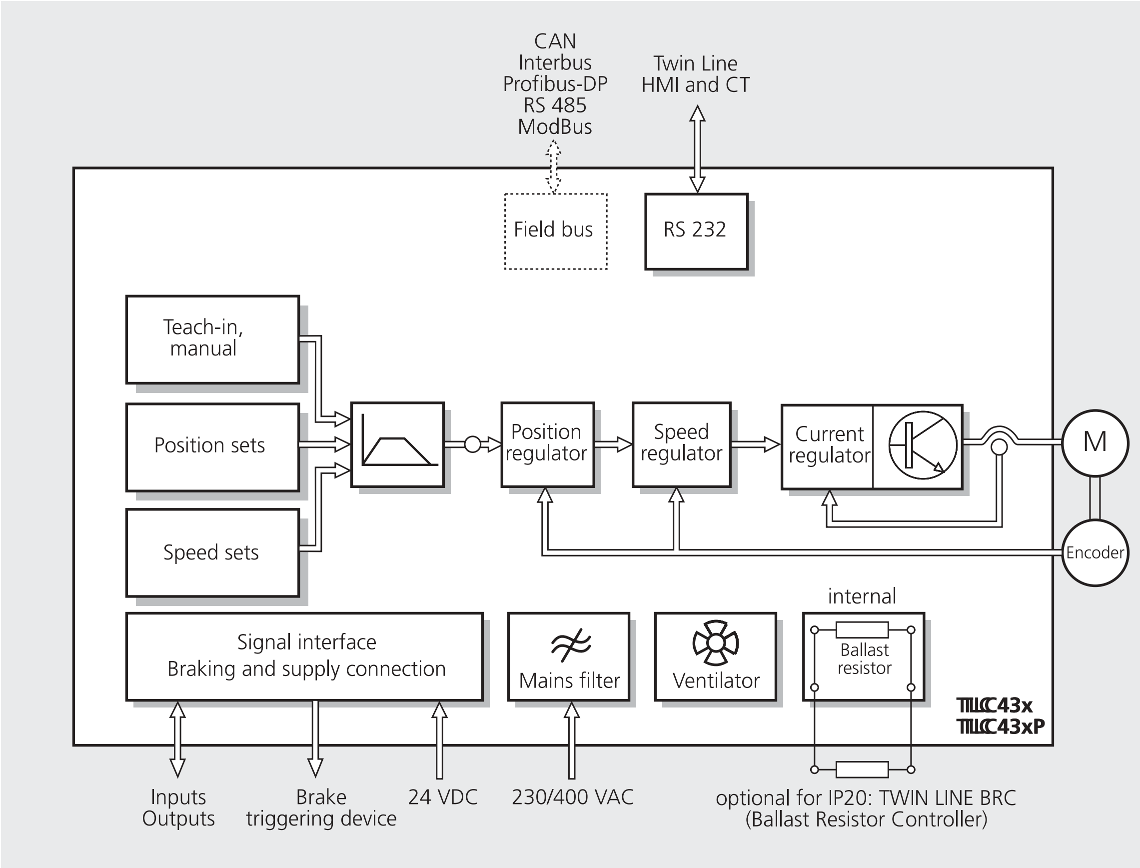


Diagram of positioning controllers with data set processing for AC synchronous servomotors

Technical data TLC 43x, protection type IP 20

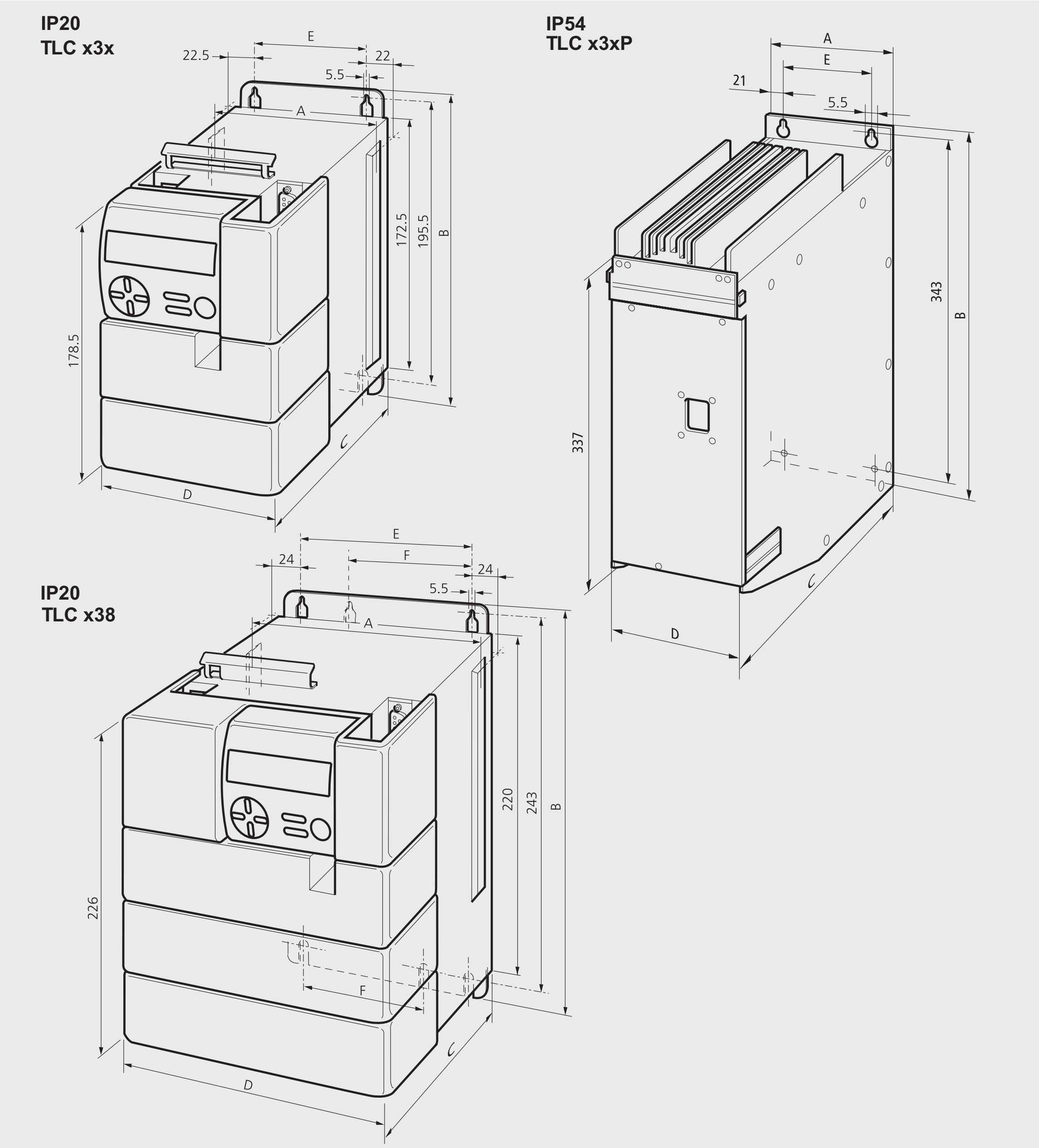
		TLC 432	TLC 434	TLC 436	TLC 438
Mains connection	Mains voltage	1 x 230 VAC –20 % to 240 VAC +10 %		3 x 230 VAC –20 % to 480 VAC +10 %	
	Mains frequency	47 to 63 Hz			
	Current consumption	6.5 A	4 A	7.5 A	20 A
	Starting current	< 60 A			
	Fuse, external (B characteristic)	10 A			25 A
Motor connection	Rated power at rated current and 230 V/1~ or 400 V/3~	0.75 kW_{eff}	1.5 kW_{eff}	3 kW_{eff}	8 kW_{eff}
	Rated current effective value	3 A_{eff}		6 A_{eff}	16 A_{eff}
	Rated current amplitude value	4,24 A_s		8,48 A_s	22,63 A_s
	Peak current for max. 5 s	11;31 A_s		28,28 A_s	45,26 A_s
	Switching frequency	8/16 kHz			4/8 kHz
	Max. rotary speed	6000 min^{-1}			
Motor cable	Cable length	≤ 20 m standard > 20 m upon request			
	Shielding connection	on both sides			
	Cross section (depends on length)	1.5 mm^2	1.5 to 2.5 mm^2		4 mm^2
Intermediate-circuit connection		max. two devices of the same power class may be connected			
Internal breaking circuit	Continuous power	60 W	100 W	200 W	80 W
	Max. energy per braking sequence	350 Ws	600 Ws	100 Ws	130 Ws
24 VDC system supply voltage		PELV, DIN 19240, polarised			
	Input voltage range	20 to 30 V			
	Input ripple	<2 V_{PP}			
	Input current without loading the outputs	< 2.5 A			
Signal inputs		polarised, no electrical isolation			
	Debounced	0.7 to 1.5 ms			
	DC voltage U_{high}	12 to 30 V (I ≥ 3 mA)			
	DC voltage U_{low}	≤ 5 V (I ≤ 0.5 mA)			
	Current	≤ 7 mA at 24 V			
Signal outputs		short-circuit proof			
	Inductive load capable	150 mH/11 W			
	DC voltage	≤ 30 V			
	Switching current	≤ 400 mA			
	Voltage drop at 400 mA	≤ 1 V			
Analog signal input	Voltage range	+10 V to –10 V			
	Input resistance	5 kΩ			
	Solution	10 Bit			

		TLC 432	TLC 434	TLC 436	TLC 438
Mass		2.7 kg	3.7 kg	6.6 kg	10.8 kg
Ambient conditions	Ambient temperature	0 to 50 °C			
	Transport and storage temperature	–40 to +70 °C			
	Relative humidity	15 to 85 % no condensation permissible			
	Altitude, without power reduction	h < 1000 m above sea level			
	Protection type according to DIN EN 60529: 1991	IP 20			
Characteristic curves		See catalogue of **Twin Line Motors**			
UL 508C approved		You can find the limit values for the UL 508C approval in the documentation included with the device.			

Technical data TLC 43xP, protection type IP 54

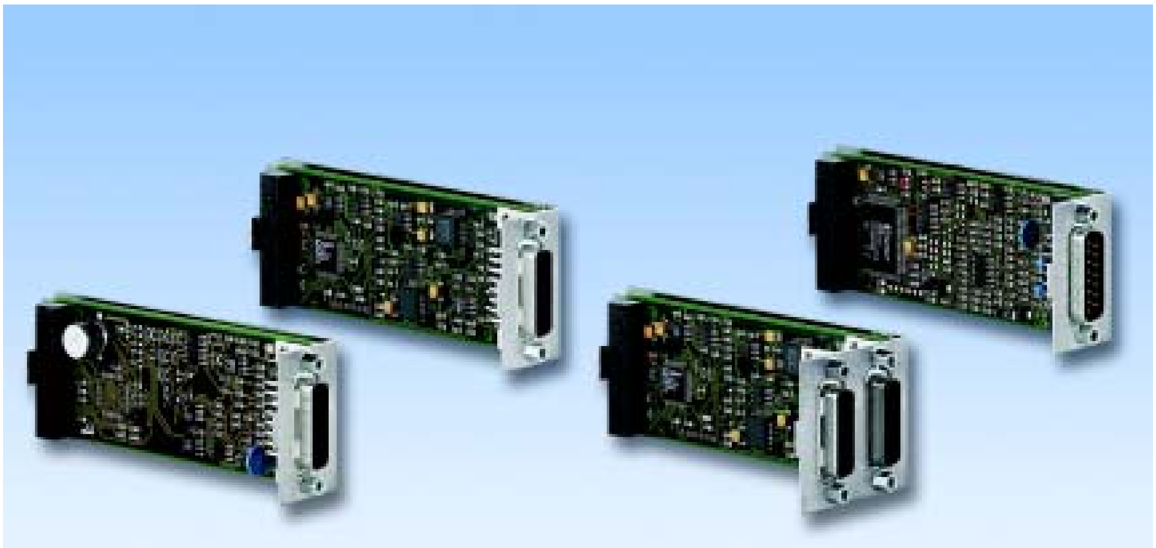
		TLC 432P	TLC 434P
Mains connection	Mains voltage	1 x 230 VAC –20 % to 240 VAC +10 %	3 x 230 VAC –20 % to 480 VAC +10 %
	Mains frequency	47 to 63 Hz	
	Current consumption	6.5 A	4 A
	Starting current	< 60 A	
	Fuse, external (B characteristic)	10 A	
Motor connection	Rated power at rated current and 230 V/1~ or 400 V/3~	0.75 kW_{eff}	1.5 kW_{eff}
	Rated current effective value	3 A_{eff}	
	Rated current amplitude value	4,24 A_s	
	Peak current for max. 5 s	11,31 A_s	
	Switching frequency	8/16 kHz	
	Max. rotary speed	12000 min^{-1}	
Motor cable	Cable length	≤ 20 m standard > 20 m upon request	
	Shielding connection	on both sides	
	Cross section (depends on length)	1.5 mm^2	1.5 to 2.5 mm^2
Intermediate-circuit connection		max. two devices of the same power class may be connected	
Internal breaking circuit	Continuous power	depends on the ambient temperature and ventilation, can be checked upon request	
	Max. energy per braking sequence	depends on the ambient temperature and ventilation, can be checked upon request	
24 VDC system supply voltage		PELV, DIN 19240, polarised	
	Input voltage range	20 to 30 V	
	Input ripple	< 2 V_{PP}	
	Input current without loading the outputs	< 2.5 A	
Signal inputs		polarised, no electrical isolation	
	Debounced	0.7 to 1.5 ms	
	DC voltage U_{high}	12 to 30 V (I ≥ 3 mA)	
	DC voltage U_{low}	≤ 5 V (I ≤ 0.5 mA)	
	Current	≤ 7 mA at 24 V	
Signal outputs		short-circuit proof	
	Inductive load capable	150 mH/11 W	
	DC voltage	≤ 30 V	
	Switching current	≤ 400 mA	
	Voltage drop at 400 mA	≤ 1 V	
Analog signal input	Voltage range	+10 V to –10 V	
	Input resistance	5 kΩ	
	Solution	10 Bit	

		TLC 432P	TLC 434P
Mass		8.5 kg	11 kg
Ambient conditions	Ambient temperature	0 to 45 °C	
		The P model is not suitable for use outdoors or in areas with strongly adhering contaminants which could jam the ventilator.	
	Transport and storage temperature	–40 to +70 °C	
	Altitude, without power reduction	h < 1000 m above sea level	
	Protection type according to DIN EN 60529: 1991	IP 54, category 2	
	Protection type of internal air channel for cooling	IP 24	
Characteristic curves		See catalogue of **Twin Line Motors**	
UL 508C approved		You can find the limit values for the UL 508C approval in the documentation included with the device.	



Dimensional drawing of positioning controllers for AC synchronous servomotors

	TLC 432	TLC 434	TLC 436	TLC 438	TLC 432P	TLC 434P
Width A	108 mm	128 mm	178 mm	248 mm	127 mm	147 mm
Height B	212.5 mm	212.5 mm	260 mm	260 mm	360 mm	360 mm
Depth C	184.5 mm	214.5 mm	244.5 mm	244.5 mm	245 mm	275 mm
Front width D	105.5 mm	125.5 mm	176 mm	246 mm	127 mm	127 mm
Fitting dimension E	63 mm	83 mm	130 mm	200 mm	80 mm	100 mm
Additional dimension F	–	–	–	120 mm	–	–



Modules for positioning controller and power electronics

Micromodules

Twin Line micromodules for application-specific configuration

IOM-C

The analogous module receives and generates analogous and digital voltage values. The analogous outputs are user-adjustable. The module furnishes nominal values for control as analogous voltage values. Extension by two analogous I/Os and two digital I/Os.

HIFA-C

The HIFA-C module captures the motor position of AC synchronous servomotors equipped with a SinCos® absolute-value encoder.

The rotor position in the motor is detected optically and transferred as analog and digital position data to the HIFA-C module. The module resolves the signals with 14-bit resolution, corresponding to 16384 pulses/revolution. The absolute-value encoder integrated in the motor can be either a Single Turn (standard) or Multi Turn encoder. Once the motor is switched on, the Multi Turn encoder has the absolute position within 4096 revolutions.

In addition to the motor position data, the motor parameter set (electronic motor type plate) is transferred from the SinCos® memory to the HIFA-C module via the integrated RS 485 interface.

ESIM3-C

The ESIM3-C module outputs the position data of the AC servomotor in the form of incremental signals on a 15-pole Sub-D socket. These are two signals electrically phase-displaced by 90°(A/B trails). The transmitted solution can be set from 125 thr. 4000 increments per revolution, an index pulse is not available! Use of this module requires that slot M2 is equipped with an RM-C module.

A typical application for this module is to act as follow-up axes in the electronic gearing mode.

RS 485-C

The RS 485-C is an asynchronous 4-wire interface with level RS 485.

The module provides short-circuit proof voltage supply for the Berger Lahr MP923 interface converter (RS 232 to RS 485).

MODB-C

Module ModBus is an asynchronous 4-wire interface of RS485 level. The user can configure, alternatively, ModBus ASCII or ModBus RTU.

PBDP-C

The Profibus-DP is a high-speed cyclic communication bus. It has a 2-wire interface with level RS 485.

CAN-C

The CAN bus is a serial sensor/actuator bus. It has a 2-wire connection for the CAN-Low and CAN-High lines.

The user can also configure the Berger Lahr Profile, the CANopen DS-402 Profile or DeviceNet.

IBS-C

The Interbus is a sensor/actuator bus which encodes according to the shift-register principle.

SAM-C

The SAM-C Safety Monitor module extends Twin Line positioning controllers using integrated functions for operator safety, e.g. safe stop and reduced speed functions.

Technical data micromodules

Modules			
IOM-C	Digital signal inputs		polarity-secured, no galvanic insulation, damping time 0.7 ms - 1.5 ms
		DC voltage U_{high}	12 V - 30 V
		DC voltage U_{low}	<5 V
		Current at 24 V	<7 mA
	Digital signal outputs		inductively load-capable (50 mH), short-circuit-proof, polarity-secured
		DC voltage	12 V - 30 V
		reverse locking current	<100µA
		switching current	<50 mA
		voltage decay at 50 mA	
	Analogous signal inputs	voltage range	–10 V - +10 V
		input resistance	50 k
		solution	10 Bit
	Analogous signal outputs	voltage range	–10 V - +10 V
		output current	max. 5 mA
		solution	12 Bit
ESIM3-C	Signal outputs A/B		RS 422 voltage compatible, electrically connected to 24 VGND
RS 485-C MODB-C			meets the RS 485 norm, electrically isolated, 4-wire interface
	Transfer rate		max. 38.4 kBaud
	Supply voltage output		+12 V (min. 9 V to max. 15 V)
PBDP-C			meets the RS 485 norm, electrically isolated
	Transfer rate		≤ 12 MBaud
	Supply voltage output		+5 V (max. 10 mA) only for matching resistor
	Cable length		Standard Profibus-DP
CAN-C			level according to ISO 11898 electrically isolated
	Transfer rate		≤1 MBaud, adjustable
	Cable length	at 125 kBaud	max. 500 m
		at 500 kBaud	max. 100 m
	Level	CAN-L/CAN-H	according to ISO 11898
	Matching resistor	at both ends	120 Ω
IBS-C			meets Interbus specification
	Transfer rate		500 kBaud
	Cable length		max. distance to next network participant 400 m

Modules			
SAM-C	24-VDC-supply voltage		PELV, DIN 19240, polarity-secured
		input voltage range (being monitored)	20 - 30 V
		input ripple	< 2 V_{SS}
		input current without load on outputs	< 0,02 A
	Digital signal inputs		polarity-secured, no galvanic insulation, damping time >1 ms
		time window for simultan switching of both signals of one switch pair	10 s
		DC voltage U_{high}	15 V - 30 V ($I \geq 3$ mA)
		DC voltage U_{low}	≤ 5 V ($I \leq 0{,}5$ mA)
		Current at 24 V (5 kΩ against GND)	$I \leq 0{,}5$ mA
	Digital signal outputs		inductively load-capable (150 mH /11 W), capacitive load capability ($C \leq 1\mu F$), short-circuit-proof
		DC voltage	≤ 30 V
		switching current RELAY_A, RELAY_B, INTERLOCK-OUT	≤ 0,5 A
		switching current SAFETY24VDC-A; SAFETY24VDC-B	≤ 0,3 A
		switching current AUXOUT1, AUXOUT2	≤ 0,1 A

IP 54 options

Positioning drives with protection type IP 54 can be configured with the holding-brake controller option, in addition to the micromodules described above.

Integrated holding-brake controller

The integrated holding-brake controller amplifies the brake signal of the signal interface, ensuring that the brake is actuated quickly with the least possible heat generation. Enabling the output stage automatically opens the holding brake; disabling the output stage automatically closes it.

Wire sleeves

The cables and connectors are guided through the housing. An optional set of wire sleeves is available in order to fulfil protection type IP 54. Please refer to the catalogue of **Twin Line Accessories** for information and technical data on available accessories.

Terminal bracket

A terminal bracket with TS 15 top hat rail for snap-on mini terminal blocks with max. 1.5 mm wire cross section is available for additional wiring as well as to avoid having to use external terminal boxes. The terminal bracket is mounted inside the housing of the positioning controller. Please refer to the catalogue of **Twin Line Accessories** for information and technical data on available accessories.

Type key TLC 43x, protection type IP 20

Example	TLC	4	3	X	F	X	HIFA	X	X

Device function — TLC **4** 3 X F X HIFA X X

4 = Positioning controller with data set processing

Motor — TLC 4 **3** X F X HIFA X X

3 = AC synchronous servomotor

Rated power — TLC 4 3 **X** F X HIFA X X

2 = 750W
4 = 1500W
6 = 3000W
8 = 8000W

Mains filter — TLC 4 3 X **F** X HIFA X X

F = with mains filter

M1 = Analogous — TLC 4 3 X F **X** HIFA X X

IOM = analogous module
– = not equipped

M2 = Capture motor position — TLC 4 3 X F X **HIFA** X X

HIFA = SinCos® encoder

M3 = Encoder simulation — TLC 4 3 X F X HIFA **X** X

ESIM3 = Encoder simulation, 1 signal connection, A/B signales
SAM = safety module
– = not equipped

M4 = Communication — TLC 4 3 X F X HIFA X **X**

CAN = CAN, alternative Berger Lahr Profile, CANopen DS-402 Profile or DeviceNet configurable
IBS = Interbus
MODB = ModBus ASCII or ModBus RTU, to be configured
PBDP = Profibus-DP
RS 485 = RS 485
– = not equipped

Type key TLC 43xP, protection type IP 54

Example	**TLC**	**4**	**3**	**X**	**P**	**F**	**X**	**HIFA**	**X**	**X**	**X**

Device function — TLC **4** 3 X P F X HIFA X X X

4 = Positioning controller with data set processing

Motor — TLC 4 **3** X P F X HIFA X X X

3 = AC synchronous servomotor

Rated power — TLC 4 3 **X** P F X HIFA X X X

2 = 750W
4 = 1500W

Protection type — TLC 4 3 X **P** F X HIFA X X X

P = Protection type IP 54

Mains filter — TLC 4 3 X P **F** X HIFA X X X

F = with mains filter

M1 = Analogous — TLC 4 3 X P F **X** HIFA X X X

IOM = analogous module
– = not equipped

M2 = Capture motor position — TLC 4 3 X P F X **HIFA** X X X

HIFA = SinCos® encoder

M3 = Encoder simulation — TLC 4 3 X P F X HIFA **X** X X

ESIM3 = Encoder simulation, 1 signal connection, A/B signales
SAM = safety module
– = not equipped

M4 = Communication — TLC 4 3 X P F X HIFA X **X** X

CAN = CAN, alternative Berger Lahr Profile, CANopen DS-402 Profile or DeviceNet configurable
IBS = Interbus
MODB = ModBus ASCII or ModBus RTU, to be configured
PBDP = Profibus-DP
RS485 = RS 485
– = not equipped

M5 = Integrated holding-break controller — TLC 4 3 X P F X HIFA X X **X**

HBC = Holding Brake Controller integrated, cannot be retrofitted
– = not equipped

General device functions

The TLC 51x models are positioning controllers with integrated power electronics for 3-phase stepping motors or AC synchronous servomotors. The TLC 53x models are positioning controllers with integrated power electronics for AC synchronous servomotors. They are triggered via RS 485 or by a field-bus master (e.g. PC/PLC). The processing sequence is controlled via field-bus commands.

You can set parameters to assign the inputs and outputs the following functions:

– Setting of the network address, baud rate and field-bus profile for positioning controllers with RS 485, ModBus, PB-DP and CAN field-bus, enabling the Twin Line positioning controllers to be exchanged without any additional start-up tools
– Freely applicable and process-applicable 14 digital inputs, 5 digital outputs, and an analogous input ±10V, being controlled by field bus or by RS485
– Firmly occupied I/Os for manual operation, Teach-in, and output of internal process statuses

The standard controller model is equipped with the following connections:

– I/O signal connection
– Motor connection
– Mains connection
– Brake-triggering signal
– Connection for ballast controller
– RS 232 for communication with the Twin Line CT control software or the Twin Line HMI plug-in controller.
– Serial interface
– RS 485 serial interface or field-bus interface Interbus, Profibus-DP, CAN or ModBus

The following interfaces may also be added:

– Interface for position reference variable in the "electronic-gearing" mode or external position control (TLC 53x)
– Encoder-simulation interface for connecting follow-up axes
– SAM module for integrated safety technique
– Analog module IOM with two digital I/Os , and two analog I/Os

Positioning with field-bus interface via RS 485, Interbus-S, Profibus-DP or CAN-bus interface

Each operating mode has its own range of parameters for settings and activation. For example, various processing speeds may be set for each operating mode.

You can switch between operating modes via field-bus write access. The field-bus master may be a PC or a PLC, for example.

The master also sends parameters and commands to the Twin Line positioning controller (slave). The controller immediately executes the commands.

Device-related operation modes and functions:

Point-to-point

In point-to-point mode, a positioning command is used to position from point A to point B. The positioning may be absolute (relative to the zero-point of the axis) or relative (based on the current axis position).

Any changes to the set position or set speed are processed immediately (even during axis motion).

Speed mode

In speed mode, a speed is defined for the axis, and the movement is started without a target position. The axis moves at this speed until another speed set or operating mode is selected. This change is processed immediately, even while the axis is moving.

Electronic gearing

In "electronic-gearing" mode, the reference value is specified via a rotary encoder.

The following signal forms may be input as reference variables:

– A/B signals
– Pulse/direction signals
– $\text{Pulse}_{\text{forward}}/\text{pulse}_{\text{back}}$ signals

The supplied reference variable is computed cyclically with the preset gear factor, and the axis is positioned accordingly. A new gear factor may also be entered while the axis is moving.

A point-to-point positioning process may be superimposed over the electronic gearing.

Reference run

Referencing assigns a defined axis position to a special mechanical position of the motor in the system. Referencing may be performed either by setting the dimensions to the current motor position or by executing a reference run.

The following types of reference run are available:

– Travel to positive, negative or additional limit switches
– Travel to positive, negative or additional limit switches with referencing to the index pulse

Manual run

You can initiate motor runs from a single step to continuous motion by operating the manual inputs or via the Twin Line HMI and Twin Line CT start-up tools.

Oscillator operation

In operation mode Oscilator the motor operates with RPM control. RPM setting is entered via ±10 V input of the signal interface.

Current regulation at TLC 53x

In operation mode Current Control the nominal value of motor current is adjustable, either through parameter setting, or via ±10 V input of the signal interface.

Selection of the type of current value entry, as well as setting of the nominal value, through parameter setting is possible via field bus, or with initial start software Twin Line CT.

Teach-in

Teach-in stores the current position value in the selected memory area. Up to 2 x 64 absolute switching positions of the integrated cam function can be “taught in” via input and output signals, Twin Line HMI or Twin Line CT. The data may also be read, written and copied via field-bus, Twin Line HMI or Twin Line CT.

Capture inputs

Current position values can be saved via two high-speed inputs or the index pulse of the position-reference encoder.

The capture inputs can be activated and the saved positions read out via field-bus, Twin Line HMI or Twin Line CT.

Cam-controller signal output

If the movement exceeds an absolute position value acquired/modified in teach-in mode, the output will be set according to the modified output state, i.e. this high-speed output will be set or reset based on the new position. The position is set parallel to the current operating mode.

Parameterisation

The parameters of the positioning controller and integrated power electronics of devices with an attached communication module can be read and written by the master (PC, PLC etc.) via field-bus or RS 485. Twin Line devices may thus be reproduced or replaced without difficulty, increasing flexibility for extensions and reducing maintenance costs.

The plug-in Twin Line HMI controller and Twin Line CT start-up software enable a complete device parameterisation as well as a transfer of all parameters from one device to another.

External position control at TLC 53x

An additional motor-separated incremental sensor (e.g. glass dipstick) is connected with the Twin Line device by an incremental sensor module (RS422-C) on module located at plug position M1. This executes direct position measurement of the installation.

The commutation position and the actual velocity (RPM) are still determined by the motor sensor and by the module located in plug position M2 of the Twin Line device.


Positioning controllers TLC 51x for 3-phase stepping motors

Positioning controllers TLC 51x

Positioning controllers with integrated power electronics devices for 3-phase stepping motors are available in the following models:

Protection type IP 20:
– TLC 511: Field-bus single-axis positioning controller, power class 3 A/350 W/1~
– TLC 512: Field-bus single-axis positioning controller, power class 7 A/750 W/1~

These devices can be specified as follows:
– 230 V mains voltage with integrated mains filter
– Reversible mains voltage 115 V/230 V without integrated mains filter

Optional protection type IP 54
– TLC 511P: Field-bus single-axis positioning controller, power class 3 A/350 W/1~
– TLC 512P: Field-bus single-axis positioning controller, power class 7 A/750 W/1~

The mains voltage for these devices is reversible 115 V/ 230 V. A mains filter is always integrated.

The ventilator and heat dissipater are standard equipment on all devices.

Acceleration and braking ramps

The following asymmetric ramp shapes may be defined for the positioning controller with integrated power electronics for 3-phase stepping motors:
– Linear ramp
– Exponential ramp, i.e. compensation for the torque drop typical of stepping motors at rising speed by a suitable optimised ramp

In addition, a jolt filter may be connected to achieve jolt-free acceleration or braking phases, regardless of the current speed.

Quick-stop

Quick-stop is designed to bring the motor to a stop as quickly as possible.

A linear braking ramp is used as the quick-stop ramp for positioning controllers with integrated power electronics for 3-phase stepping motors.

Rotation monitoring

A shaft-encoder interface module, which enables the Twin Line positioning controller to detect mechanical motor overload, is available as an optional accessory.

The rotation monitoring system compares the set and actual motor positions and returns a rotary error if the difference exceeds the drag-error limit. The motor must be equipped with an encoder (1000 increments) for the rotation monitoring system to function.

Device protection

– Standard: Protection type IP 20 according to DIN EN 60529: 1991
– Option: Protection type IP 54, category 2 according to DIN EN 60529: 1991
– Protection type 1 according to prEN 50178: 1994
– Overvoltage category III according to prEN 50178: 1994
– Pollution grade 2 according to prEN 50178: 1994

Protective and monitoring devices for
– Excess temperature electronics
– Excess temperature motor (only with the rotation monitoring option)
– Rotation monitoring (optional)
– Short to earth
– Phase failure (Power supply and motor cable)
– Short circuit between the motor phases
– Under-/overvoltage of the intermediate circuit
– Motor velocity
– Data connection to control device

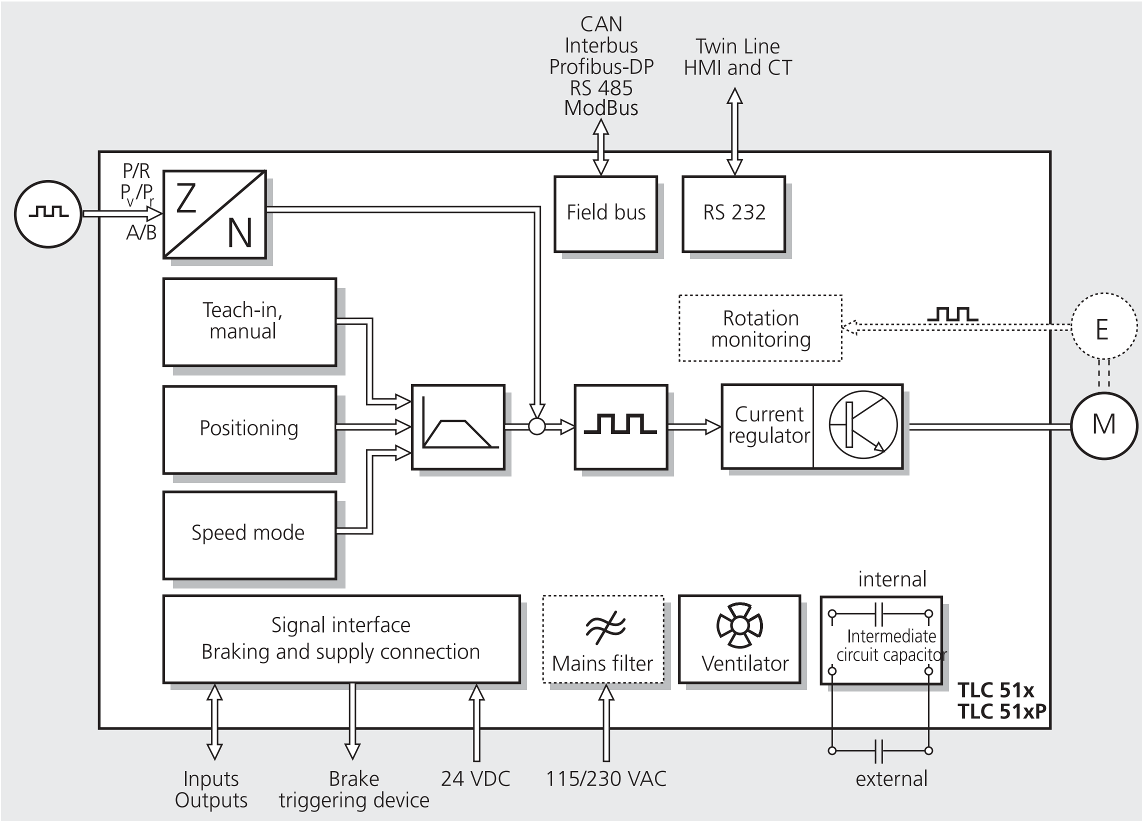


Diagram of positioning controllers with field-bus interface for 3-phase stepping motors

Technical data TLC 51x, protection type IP 20

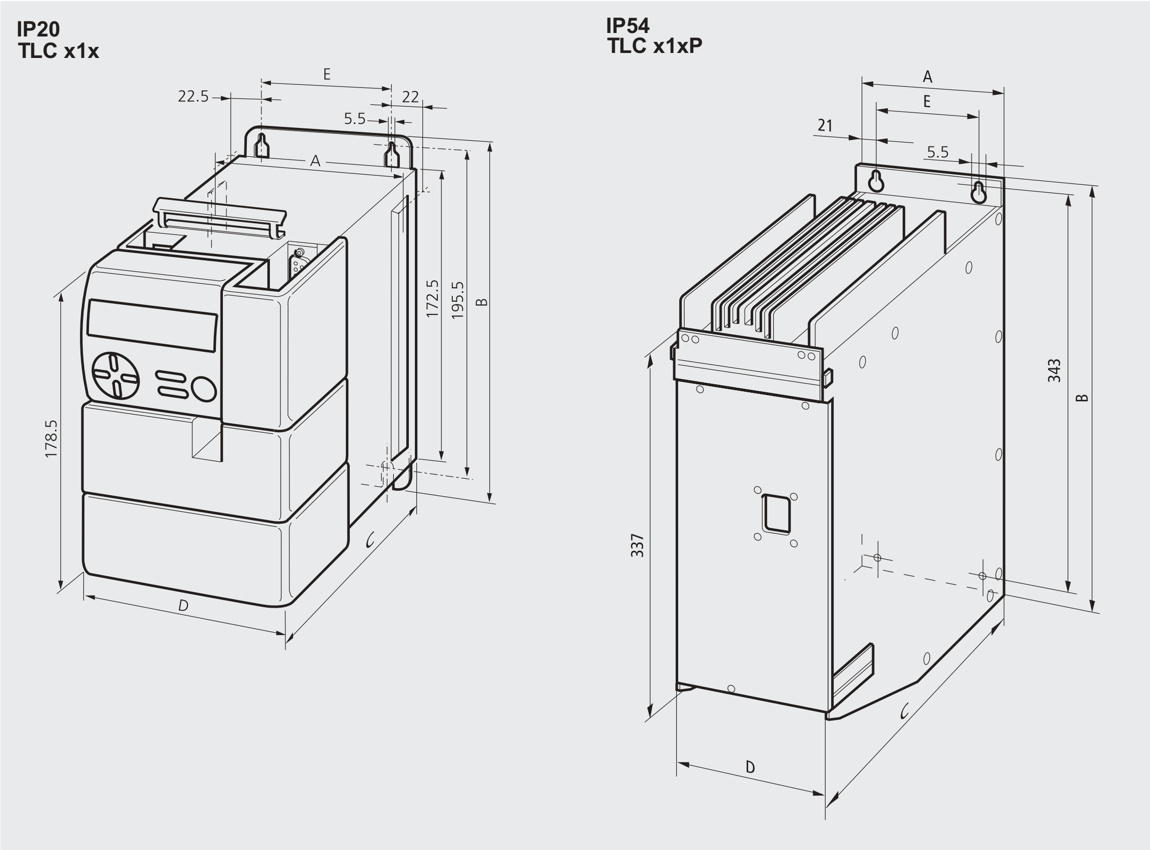
		TLC 511	TLC 512
Mains connection	Mains voltage, non-reversible, mains filter integrated	1 x 230 VAC –20 % to 230 VAC +15 %	
	Mains voltage, reversible without mains filter	1 x 115 VAC –20 % to 115 VAC +15 % 1 x 230 VAC –20 % to 230 VAC +15 %	
	Mains frequency	47 to 63 Hz	
	Current consumption at 230 V	2 A	5 A
	Current consumption at 115 V	4 A	10 A
	Starting current	< 60 A	
	Fuse protection, external at 230 V	10 A (C, K or similar characteristic)	
	Fuse protection, external at 115 V	10 A (C, K or similar characteristic)	
Motor connection	Rated power at rated current	0.35 kW_{eff}	0.75 kW_{eff}
	Rated current	3 A_{eff}	7 A_{eff}
	Switching frequency	16 kHz	
	Max. rotary speed	3000 min^{-1}	
Motor cable	Cable length	≤ 20 m standard > 20 m upon request	
	Shielding connection	on both sides	
	Cross section	1.5 mm^2	
24 VDC system supply voltage		PELV, DIN 19240, polarised	
	Input voltage range	20 to 30 V	
	Input ripple	< 2 V_{PP}	
	Input current without loading the outputs	< 2.5 A	
Signal inputs		polarised, no electrical isolation	
	Debounced	0.7 to 1.5 ms	
	DC voltage U_{high}	12 to 30 V (I ≥ 3 mA)	
	DC voltage U_{low}	≤ 5 V (I ≤ 0.5 mA)	
	Current	≤ 7 mA at 24 V	
Signal outputs		short-circuit proof	
	Inductive load capable	150 mH/11 W	
	DC voltage	≤ 30 V	
	Switching current	≤ 400 mA	
	Voltage drop at 400 mA	≤ 1 V	
Analog signal input	Voltage range	+10 V to –10 V	
	Input resistance	5 kΩ	
	Solution	10 Bit	
Mass		2.7 kg	

		TLC 511	TLC 512
Ambient conditions	Ambient temperature	0 to 50 °C	
	Transport and storage temperature	–40 to +70 °C	
	Relative humidity	15 to 85 % no condensation permissible	
	Altitude, without power reduction	h < 1000 m above sea level	
	Protection type according to DIN EN 60529: 1991	IP 20	
Characteristic curves		See catalogue of **Twin Line Motors**	
UL 508C approved		You can find the limit values for the UL 508C approval in the documentation included with the device.	

Technical data TLC 51xP, protection type IP 54

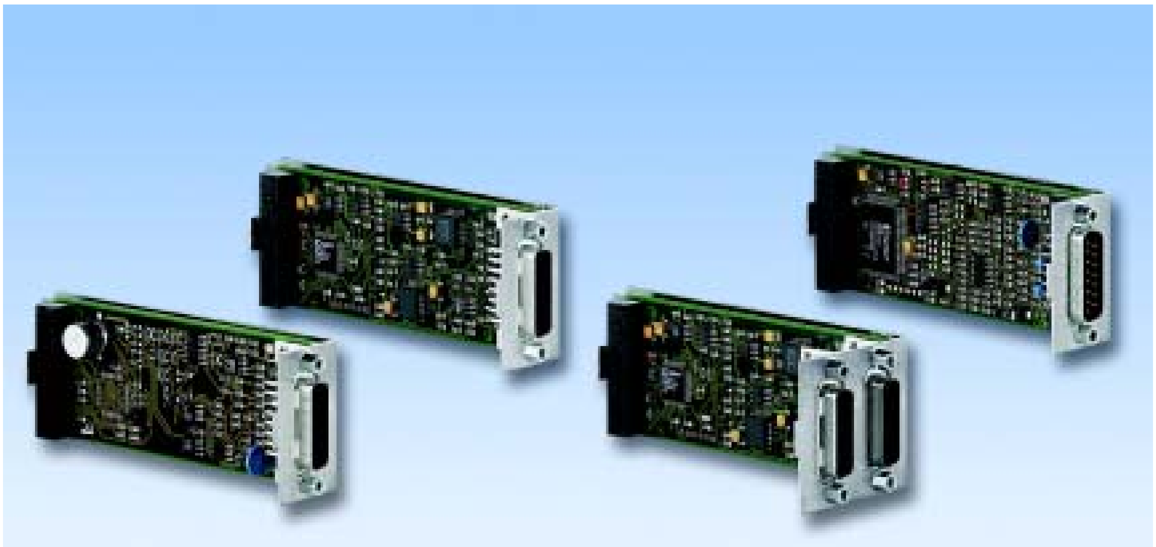
		TLC 511P	TLC 512P
Mains connection	Mains voltage, reversible, mains filter integrated	1 x 115 VAC –20 % to 115 VAC +15 % 1 x 230 VAC –20 % to 230 VAC +15 %	
	Mains frequency	47 to 63 Hz	
	Current consumption at 230 V	2 A	5 A
	Current consumption at 115 V	4 A	10 A
	Starting current	< 60 A	
	Fuse protection, external at 230 V	10 A (C, K or similar characteristic)	
	Fuse protection, external at 115 V	10 A (C, K or similar characteristic)	
Motor connection	Rated power at rated current	0.35 kW_{eff}	0.75 kW_{eff}
	Rated current	3 A_{eff}	7 A_{eff}
	Switching frequency	16 kHz	
	Max. rotary speed	3000 min^{-1}	
Motor cable	Cable length	≤ 20 m standard > 20 m upon request	
	Shielding connection	on both sides	
	Cross section	1.5 mm^2	
24 VDC system supply voltage		PELV, DIN 19240, polarised	
	Input voltage range	20 to 30 V	
	Input ripple	< 2 V_{PP}	
	Input current without loading the outputs	< 2.5 A	
Signal inputs		polarised, no electrical isolation	
	Debounced	0.7 to 1.5 ms	
	DC voltage U_{high}	12 to 30 V (I ≥ 3 mA)	
	DC voltage U_{low}	≤ 5 V (I ≤ 0.5 mA)	
	Current	≤ 7 mA at 24 V	
Signal outputs		short-circuit proof	
	Inductive load capable	150 mH/11 W	
	DC voltage	≤ 30 V	
	Switching current	≤ 400 mA	
	Voltage drop at 400 mA	≤ 1 V	
Analog signal input	Voltage range	+10 V to –10 V	
	Input resistance	5 kΩ	
	Solution	10 Bit	
Mass		8 kg	

		TLC 511P	TLC 512P
Ambient conditions	Ambient temperature	0 to 45 °C	
		The P model is not suitable for use outdoors or in areas with strongly adhering contaminants which could jam the ventilator.	
	Transport and storage temperature	–40 to +70 °C	
	Altitude, without power reduction	h < 1000 m above sea level	
	Protection type according to DIN EN 60529: 1991	IP 54, category 2	
	Protection type of internal air channel for cooling	IP 34	
Characteristic curves		See catalogue of **Twin Line Motors**	
UL 508C approved		You can find the limit values for the UL 508C approval in the documentation included with the device.	



Dimensional drawing of positioning controllers for 3-phase stepping motors

	TLC 51x	TLC 51xP
Width A	108 mm	127 mm
Height B	212.5 mm	360 mm
Depth C	184.5 mm	245 mm
Front width D	105.5 mm	127 mm
Fitting dimension E	63 mm	80 mm



Modules for positioning controller and power electronics

Micromodules

Twin Line micromodules for application-specific configuration

IOM-C

The analogous module receives and generates analogous and digital voltage values. The analogous outputs are user-adjustable. The module furnishes nominal values for control as analogous voltage values. Extension by two analogous I/Os and two digital I/Os.

RS 422-C

The RS 422-C encoder module is designed to capture encoder signals, which are fed in as A/B signals. It also detects and evaluates the index pulse. A typical application for this module is the "electronic gearing" function.

PULSE-C

The PULSE-C module captures positioning data as a pulse /direction signal or as a pulse$_{forward}$/pulse$_{back}$ signal. A typical application is the "electronic gearing" function.

RM-C

The RM-C module recognizes any position deviations in the movements of a stepping motor.

The actual positions registered by the rotary encoder are compared with the set positions. If the deviation exceeds a defined value, a drag error is returned.

ESIM3-C

The ESIM3-C module outputs the position data of the stepping motor in the form of incremental signals on a 15-pole Sub-D socket. These are two signals electrically phase-displaced by 90°(A/B trails). The transmitted solution can be set from 125 thr. 4000 increments per revolution, an index pulse is not available! Use of this module requires that slot M2 is equipped with an RM-C module.

A typical application for this module is to act as follow-up axes in the electronic gearing mode.

RS 485-C

The RS 485-C is an asynchronous 4-wire interface with level RS 485.

The module provides short-circuit proof voltage supply for the Berger Lahr MP923 interface converter (RS 232 to RS 485).

MODB-C

Module ModBus is an asynchronous 4-wire interface of RS485 level. The user can configure, alternatively, ModBus ASCII or ModBus RTU.

PBDP-C

The Profibus-DP is a high-speed cyclic communication bus. It has a 2-wire interface with level RS 485.

CAN-C

The CAN bus is a serial sensor/actuator bus. It has a 2-wire connection for the CAN-Low and CAN-High lines.

The user can also configure the Berger Lahr Profile, the CANopen DS-402 Profile or DeviceNet.

IBS-C

The Interbus is a sensor/actuator bus which encodes according to the shift-register principle.

SAM-C

The SAM-C Safety Monitor module extends Twin Line positioning controllers using integrated functions for operator safety, e.g. safe stop and reduced speed functions.

Use of this module requires that slot M2 is equipped with an RM-C module.

Technical data micromodules

Modules			
IOM-C	Digital signal inputs		polarity-secured, no galvanic insulation, damping time 0.7 ms - 1.5 ms
		DC voltage U_{high}	12 V - 30 V
		DC voltage U_{low}	<5 V
		Current at 24 V	<7 mA
	Digital signal outputs		inductively load-capable (50 mH), short-circuit-proof, polarity-secured
		DC voltage	12 V - 30 V
		reverse locking current	<100µA
		switching current	<50 mA
		voltage decay at 50 mA	
	Analogous signal inputs	voltage range	–10 V - +10 V
		input resistance	50 k
		solution	10 Bit
	Analogous signal outputs	voltage range	–10 V - +10 V
		output current	max. 5 mA
		solution	12 Bit
RS 422-C	Inputs		RS 422 voltage compatible, electrically connected to 24 VGND
		input frequency	≤ 400 kHz
	Outputs	supply for the master rotary encoder	5 V ±5 %, max. 300 mA, sense- regulated, short-circuit proof, overload-proof
	Signal cable	max. length	100 m
		minimum cross section	0.5 mm^2 for supply voltage 5 VDC and 5 VGND; 0.25 mm^2 for other signals
PULSE-C	Inputs	triggering device	symmetric RS 422, asymmetric 4.5 V to 30 V, electrically connected with 24 VGND
		input resistance	5 kΩ
		input frequency, pulse signals	≤ 200 kHz
		input frequency, enable	≤ 1 kHz
	Outputs		open collector, short-circuit proof
		output voltage	≤ 30 V
		output current	≤ 50 mA
	Signal cable	max. length for an RS 422 connection	100 m
		max. length for an open collector connection	10 m
		minimum cross section of the signal leads	0.14 mm^2
ESIM3-C	Signal outputs A/B		RS 422 voltage compatible, electrically connected to 24 VGND

Modules			
RS 485-C MODB-C			meets the RS 485 norm, electrically isolated, 4-wire interface
	Transfer rate		max. 38.4 kBaud
	Supply voltage output		+12 V (min. 9 V to max. 15 V)
PBDP-C			meets the RS 485 norm, electrically isolated
	Transfer rate		≤ 12 MBaud
	Supply voltage output		+5 V (max. 10 mA) only for matching resistor
	Cable length		standard Profibus-DP
CAN-C			level according to ISO 11898 electrically isolated
	Transfer rate		≤ 1 MBaud, adjustable
	Cable length	at 125 kBaud	max. 500 m
		at 500 kBaud	max. 100 m
	Level	CAN-L/CAN-H	according to ISO 11898
	Matching resistor	at both ends	120 Ω
IBS-C			meets Interbus specification
	Transfer rate		500 kBaud
	Cable length		max. distance to next network participant 400 m
SAM-C	24-VDC-supply voltage		PELV, DIN 19240, polarity-secured
		input voltage range (being monitored)	20 - 30 V
		input ripple	< 2 V_{SS}
		input current without load on outputs	< 0,02 A
	Digital signal inputs		polarity-secured, no galvanic insulation, damping time >1 ms
		time window for simultan switching of both signals of one switch pair	10 s
		DC voltage U_{high}	15 V - 30 V (I ≥ 3 mA)
		DC voltage U_{low}	≤ 5 V (I ≤ 0,5 mA)
		Current at 24 V (5 kΩ against GND)	I≤ 0,5 mA
	Digital signal outputs		inductively load-capable (150 mH /11 W), capacitive load capability (C ≤ 1μF), short-circuit-proof
		DC voltage	≤ 30 V
		switching current RELAY_A, RELAY_B, INTERLOCK-OUT	≤ 0,5 A
		switching current SAFETY24VDC-A; SAFETY24VDC-B	≤ 0,3 A
		switching current AUXOUT1, AUXOUT2	≤ 0,1 A

IP 54 options

Positioning drives with protection type IP 54 can be configured with the holding-brake controller option, in addition to the micromodules described above.

Integrated holding-brake controller

The integrated holding-brake controller amplifies the brake signal of the signal interface, ensuring that the brake is actuated quickly with the least possible heat generation. Enabling the output stage automatically opens the holding brake; disabling the output stage automatically closes it.

Wire sleeves

The cables and connectors are guided through the housing. An optional set of wire sleeves is available in order to fulfil protection type IP 54. Please refer to the catalogue of **Twin Line Accessories** for information and technical data on available accessories.

Terminal bracket

A terminal bracket with TS 15 top hat rail for snap-on mini terminal blocks with max. 1.5 mm wire cross section is available for additional wiring as well as to avoid having to use external terminal boxes. The terminal bracket is mounted inside the housing of the positioning controller. Please refer to the catalogue of **Twin Line Accessories** for information and technical data on available accessories.

Type key TLC 51x, protection type IP 20

Example	TLC	5	1	X	X	X	X	X	X
Device function	TLC	**5**	1	X	X	X	X	X	X
5 = Positioning with field-bus interface									
Motor	TLC	5	**1**	X	X	X	X	X	X
1 = 3-phase stepping motor									
Rated power	TLC	5	1	**X**	X	X	X	X	X
1 = 350W 2 = 750W									
Mains filter	TLC	5	1	X	**X**	X	X	X	X
F = with mains filter, mains voltage 230V NF = without mains filter, mains voltage, reversible 115V/230V									
M1 = Position set values	TLC	5	1	X	X	**X**	X	X	X
IOM = analogous module PULSE = for electronic gearbox A/B signals RS422 = for electronic gearbox pulse/direction signal or $pulse_{forward}$/$pulse_{back}$ signal – = not equipped									
M2 = Capture motor position	TLC	5	1	X	X	X	**X**	X	X
RM = Rotation monitoring for 1000-line encoder – = not equipped									
M3 = Encoder simulation	TLC	5	1	X	X	X	X	**X**	X
ESIM3 = Encoder simulation, 1 signal connection, A/B signals (prerequisite: Plug-in M2 with RM-C module) SAM = safety module (prerequisite: Plug-in M2 with RM-C module) – = not equipped									
M4 = Communication	TLC	5	1	X	X	X	X	X	**X**
CAN = CAN, alternative Berger Lahr Profile, CANopen DS-402 Profile or DeviceNet configurable IBS = Interbus MODB = ModBus ASCII or ModBus RTU, to be configured PBDP = Profibus DP RS 485 = RS 485									

Type key TLC 51xP, protection type IP 54

Example	TLC	5	1	X	P	S	F	X	X	X	X	X

Device function — TLC **5** 1 X P S F X X X X X

5 = Positioning with field-bus interface

Motor — TLC 5 **1** X P S F X X X X X

1 = 3-phase stepping motor

Rated power — TLC 5 1 **X** P S F X X X X X

1 = 350W
2 = 750W

Protection type — TLC 5 1 X **P** S F X X X X X

P = Protection type IP 54

Mains voltage — TLC 5 1 X P **S** F X X X X X

S = Mains voltage, reversible 115V/230V

Mains filter — TLC 5 1 X P S **F** X X X X X

F = with mains filter, mains voltage115V/230V

M1 = Positions set values — TLC 5 1 X P S F **X** X X X X

IOM = analogous module
PULSE = for electronic gearbox pulse/direction signal or $pulse_{forward}/pulse_{back}$ signal
RS422 = for electronic gearbox A/B signals
– = not equipped

M2 = Capture motor position — TLC 5 1 X P S F X **X** X X X

RM = Rotation monitoring for 1000-line encoder
– = not equipped

M3 = Encoder Simulation — TLC 5 1 X P S F X X **X** X X

ESIM3 = Encoder simulation, 1 signal connection, A/B signals (prerequisite: Plug-in M2 with RM-C module)
SAM = safety module (prerequisite: Plug-in M2 with RM-C module)
– = not equipped

M4 = Communication — TLC 5 1 X P S F X X X **X** X

CAN = CAN, alternative Berger Lahr Profile, CANopen DS-402 Profile or DeviceNet configurable
IBS = Interbus
MODB = ModBus ASCII or ModBus RTU, to be configured
PBDP = Profibus DP
RS 485 = RS 485

M5 = Integrated holding-break controller — TLC 5 1 X P S F X X X X **X**

HBC = Holding Brake Controller integrated, cannot be retrofitted
– = not equipped

Positioning controllers TLC 53x for AC synchronous servomotors

Positioning controllers TLC 53x

Positioning controllers with integrated power electronics for AC synchronous servomotors are available in the following models:

Protection type IP 20:
- TLC 532: Field-bus single-axis positioning controller, power class 3 A/750 W/1~
- TLC 534: Field-bus single-axis positioning controller, power class 3 A/1.5 kW/3~
- TLC 536: Field-bus single-axis positioning controller, power class 6 A/3 kW/3~
- TLC 538: Field-bus single-axis positioning controller, power class 16 A/8 kW/3~

Optional protection type IP 54
- TLC 532P: Field-bus single-axis positioning controller, power class 3 A/750 W/1~
- TLC 534P: Field-bus single-axis positioning controller, power class 3 A/1.5 kW/3~

A mains filter, heat dissipater and ventilator are standard for all devices.

Acceleration and braking ramps

An asymmetric linear acceleration and braking ramp can be set for the positioning controller with integrated power electronics for AC synchronous servomotors. In addition, a jolt filter may be connected to achieve jolt-free acceleration or braking phases, regardless of the current speed.

Quick-stop

Quick-stop is designed to bring the motor to a stop as quickly as possible.

A linear braking ramp or a torque ramp (max. motor current) may be selected as the quick-stop ramp for positioning controllers with integrated power electronics for AC synchronous servomotors.

Device protection

- Standard: protection type IP 20 according to DIN EN 60529: 1991
- Option: protection type IP 54, category 2 according to DIN EN 60529: 1991
- Protection type 1 according to prEN 50178: 1994
- Overvoltage category III according to prEN 50178: 1994
- Pollution grade 2 according to prEN 50178: 1994

Protective and monitoring devices for
- Excess temperature electronics
- Excess temperature motor
- Overheating (I^2t monitoring of motor, internal ballast resistance and output stage)
- Short to earth
- Phase failure (Power supply and motor cable)
- Short circuit between the motor phases
- Under-/overvoltage of the intermediate circuit
- Motor velocity
- Data connection to control device

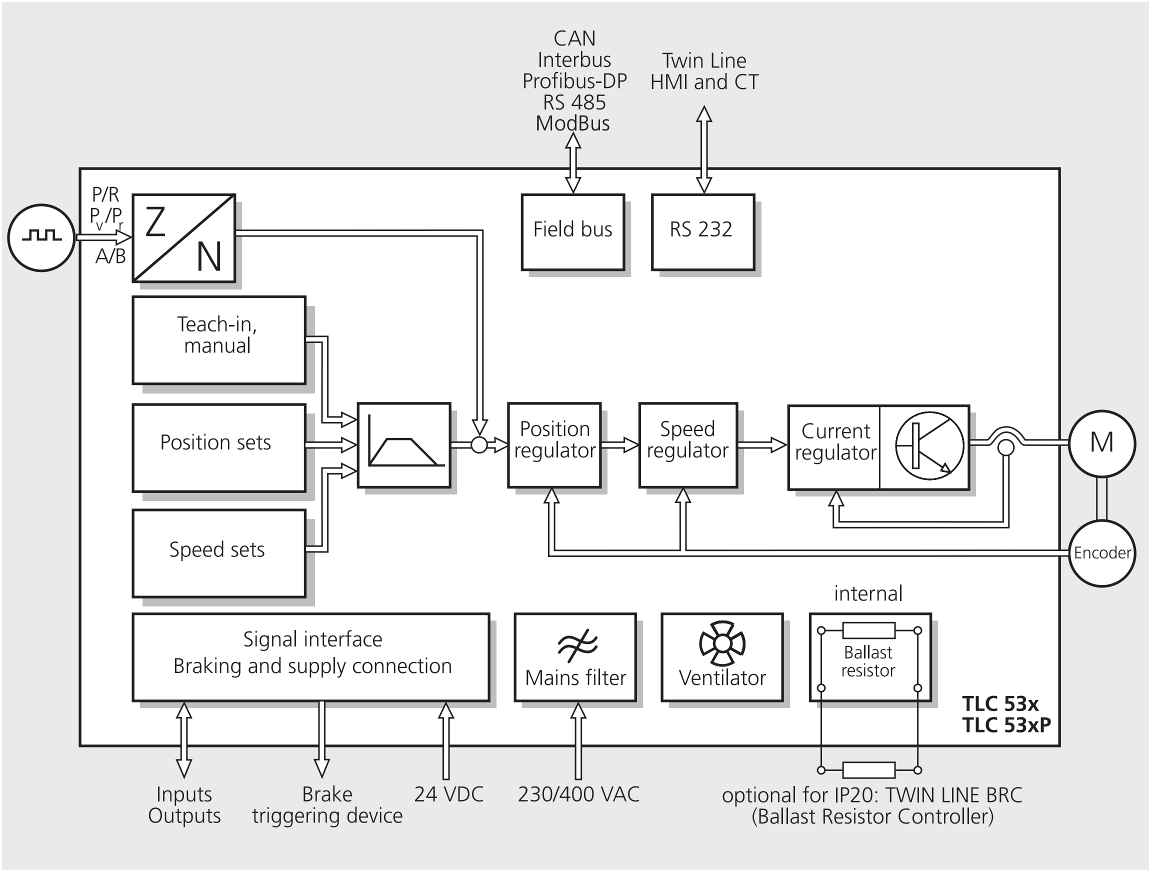


Diagram of positioning controllers with field-bus interface for AC synchronous servomotors

Technical data TLC 53x, protection type IP 20

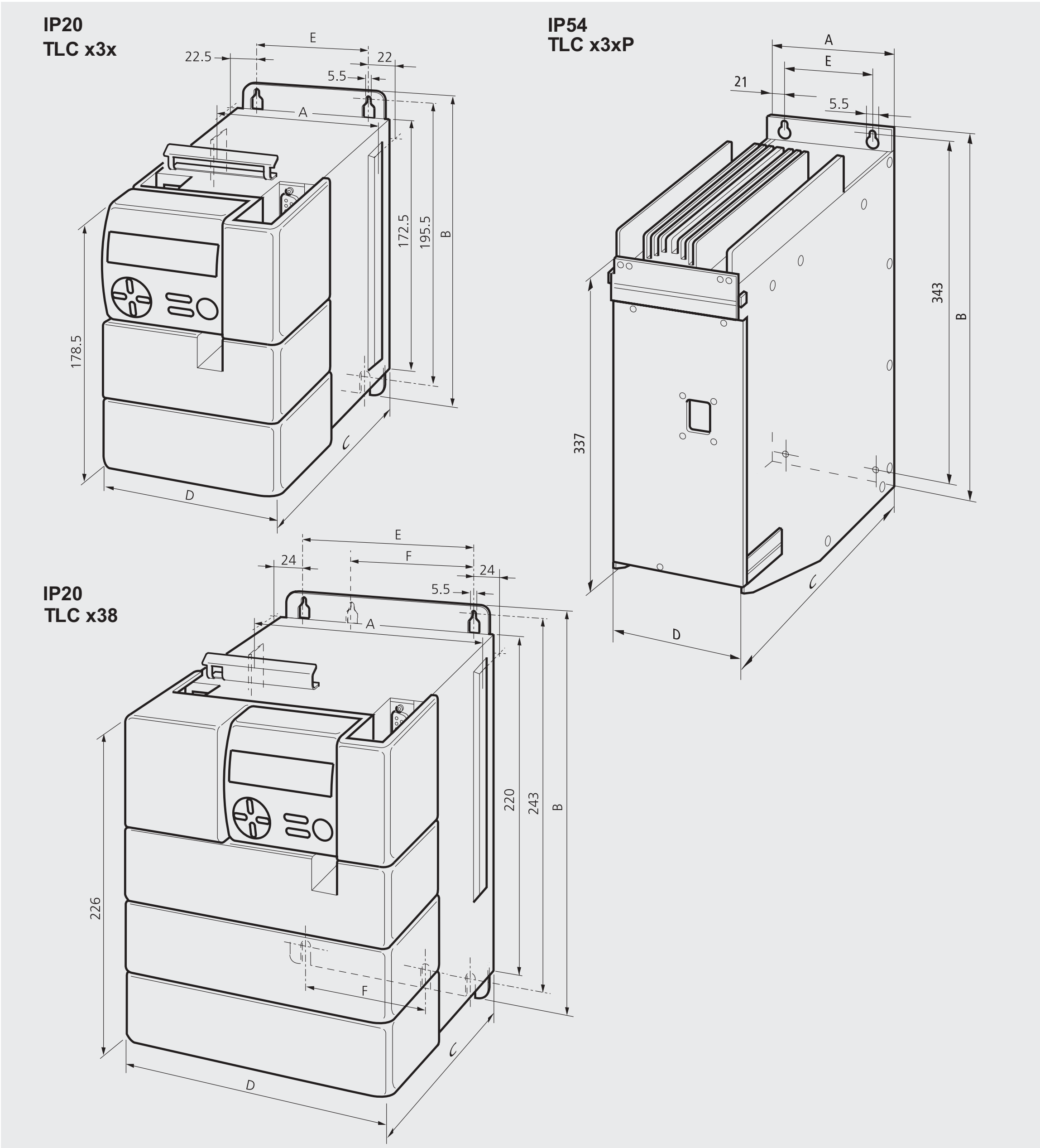
		TLC 532	TLC 534	TLC 536	TLC 538
Mains connection	Mains voltage	1 x 230 VAC –20 % to 240 VAC +10 %		3 x 230 VAC –20 % to 480 VAC +10 %	
	Mains frequency	47 to 63 Hz			
	Current consumption	6.5 A	4 A	7.5 A	20 A
	Starting current	< 60 A			
	Fuse, external (B characteristic)	10 A			25 A
Motor connection	Rated power at rated current and 230 V/1~ or 400 V/3~	0.75 kW_{eff}	1.5 kW_{eff}	3 kW_{eff}	8 kW_{eff}
	Rated current effective value	3 A_{eff}		6 A_{eff}	16 A_{eff}
	Rated current amplitude value	4,24 A_s		8,48 A_s	22,63 A_s
	Peak current for max. 5 s	11;31 A_s		28,28 A_s	45,26 A_s
	Switching frequency	8/16 kHz			4/8 kHz
	Max. rotary speed	12000 min^{-1}			
Motor cable	Cable length	≤ 20 m standard > 20 m upon request			
	Shielding connection	on both sides			
	Cross section (depends on length)	1.5 mm^2	1.5 to 2.5 mm^2		4 mm^2
Intermediate-circuit connection		max. two devices of the same power class may be connected			
Internal breaking circuit	Continuous power	60 W	100 W	200 W	80 W
	Max. energy per braking sequence	350 Ws	600 Ws	100 Ws	130 Ws
24 VDC system supply voltage		PELV, DIN 19240, polarised			
	Input voltage range	20 to 30 V			
	Input ripple	< 2 V_{PP}			
	Input current without loading the outputs	< 2.5 A			
Signal inputs		polarised, no electrical isolation			
	Debounced	0.7 to 1.5 ms			
	DC voltage U_{high}	12 to 30 V (I ≥ 3 mA)			
	DC voltage U_{low}	≤ 5 V (I ≤ 0.5 mA)			
	Current	≤ 7 mA at 24 V			
Signal outputs		short-circuit proof			
	Inductive load capable	150 mH/11 W			
	DC voltage	≤ 30 V			
	Switching current	≤ 400 mA			
	Voltage drop at 400 mA	≤ 1 V			

		TLC 532	TLC 534	TLC 536	TLC 538
Analog signal input	Voltage range	+10 V to –10 V			
	Input resistance	5 kΩ			
	Solution	10 Bit			
Mass		2.7 kg	3.7 kg	6.6 kg	10.8 kg
Ambient conditions	Ambient temperature	0 to 50 °C			
	Transport and storage temperature	–40 to +70 °C			
	Relative humidity	15 to 85 % no condensation permissible			
	Altitude, without power reduction	h < 1000 m above sea level			
	Protection type according to DIN EN 60529: 1991	IP 20			
Characteristic curves		See catalogue of **Twin Line Motors**			
UL 508C approved		You can find the limit values for the UL 508C approval in the documentation included with the device.			

Technical data TLC 53xP, protection type IP 54

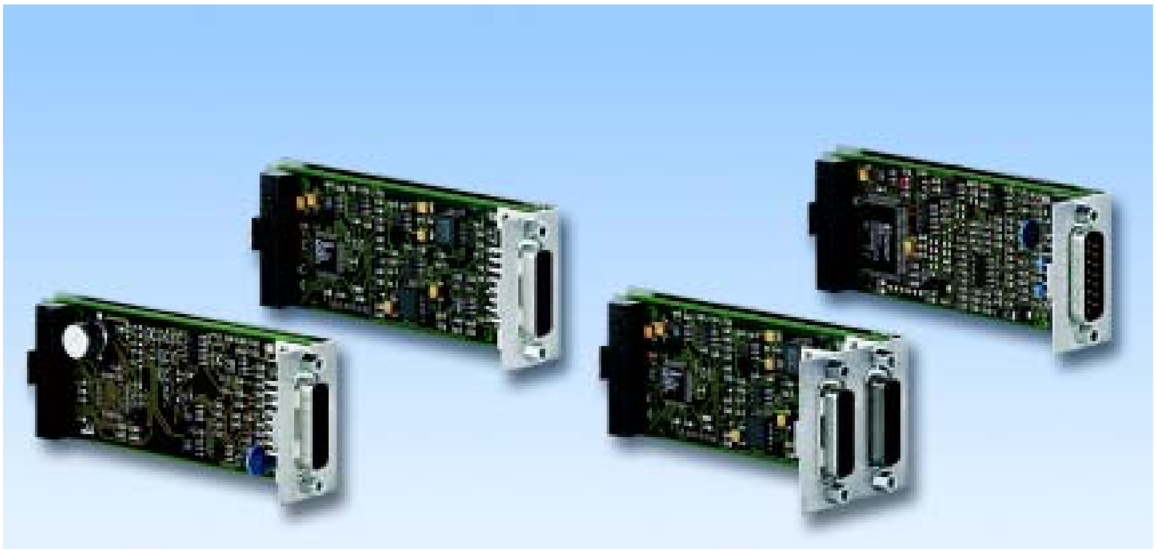
		TLC 532P	TLC 534P
Mains connection	Mains voltage	1 x 230 VAC –20 % to 240 VAC +10 %	3 x 230 VAC –20 % to 480 VAC +10 %
	Mains frequency	47 to 63 Hz	
	Current consumption	6.5 A	4 A
	Starting current	< 60 A	
	Fuse, external (B characteristic)	10 A	
Motor connection	Rated power at rated current and 230 V/1~ or 400 V/3~	0.75 kW_{eff}	1.5 kW_{eff}
	Rated current effective value	3 A_{eff}	
	Rated current amplitude value	4,24 A_s	
	Peak current for max. 5 s	11,31 A_s	
	Switching frequency	8/16 kHz	
	Max. rotary speed	12000 min^{-1}	
Motor cable	Cable length	≤ 20 m standard > 20 m upon request	
	Shielding connection	on both sides	
	Cross section (depends on length)	1.5 mm^2	1.5 to 2.5 mm^2
Intermediate-circuit connection		max. two devices of the same power class may be connected	
Internal breaking circuit	Continuous power	depends on the ambient temperature and ventilation, can be checked upon request	
	Max. energy per braking sequence	depends on the ambient temperature and ventilation, can be checked upon request	
24 VDC system supply voltage		PELV, DIN 19240, polarised	
	Input voltage range	20 to 30 V	
	Input ripple	< 2 V_{PP}	
	Input current without loading the outputs	< 2.5 A	
Signal inputs		polarised, no electrical isolation	
	Debounced	0.7 to 1.5 ms	
	DC voltage U_{high}	12 to 30 V (I ≥ 3 mA)	
	DC voltage U_{low}	≤ 5 V (I ≤ 0.5 mA)	
	Current	≤ 7 mA at 24 V	
Signal outputs		short-circuit proof	
	Inductive load capable	150 mH/11 W	
	DC voltage	≤ 30 V	
	Switching current	≤ 400 mA	
	Voltage drop at 400 mA	≤ 1 V	
Analog signal input	Voltage range	+10 V to –10 V	
	Input resistance	5 kΩ	
	Solution	10 Bit	
Mass		8.5 kg	11 kg

		TLC 532P	TLC 534P
Ambient conditions	Ambient temperature	0 to 45 °C	
		The P model is not suitable for use outdoors or in areas with strongly adhering contaminants which could jam the ventilator.	
	Transport and storage temperature	–40 to +70 °C	
	Altitude, without power reduction	h < 1000 m above sea level	
	Protection type according to DIN EN 60529: 1991	IP 54, category 2	
	Protection type of internal air channel for cooling	IP 24	
Characteristic curves		See catalogue of **Twin Line Motors**	
UL 508C approved		You can find the limit values for the UL 508C approval in the documentation included with the device.	



Dimensional drawing of positioning controllers for AC synchronous servomotors

	TLC 532	TLC 534	TLC 536	TLC 538	TLC 532P	TLC 534P
Width A	108 mm	128 mm	178 mm	248 mm	127 mm	147 mm
Height B	212,5 mm	212,5 mm	260 mm	260 mm	360 mm	360 mm
Depth C	184,5 mm	214,5 mm	244,5 mm	244,5 mm	245 mm	275 mm
Front width D	105,5 mm	125,5 mm	176 mm	246 mm	122 mm	142 mm
Fitting dimension E	63 mm	83 mm	130 mm	200 mm	80 mm	100 mm
Additional dimension F	–	–	–	120 mm	–	–



Modules for positioning controller and power electronics

Micromodules

Twin Line micromodules for application-specific configuration

IOM-C

The analogous module receives and generates analogous and digital voltage values. The analogous outputs are user-adjustable. The module furnishes nominal values for control as analogous voltage values. Extension by two analogous I/Os and two digital I/Os.

RS 422-C

The RS 422-C encoder module is designed to capture encoder signals, which are fed in as A/B signals. It also detects and evaluates the index pulse. A typical application for this module is the "electronic gearing" function or external position control.

PULSE-C

The PULSE-C module captures positioning data as a pulse /direction signal or as a $pulse_{forward}/pulse_{back}$ signal. A typical application is the "electronic gearing" function.

HIFA-C

The HIFA-C module captures the motor position of AC synchronous servomotors equipped with a SinCos® absolute-value encoder.

The rotor position in the motor is detected optically and transferred as analog and digital position data to the HIFA-C module. The module resolves the signals with 14-bit resolution, corresponding to 16384 pulses/revolution. The absolute-value encoder integrated in the motor can be either a Single Turn (standard) or Multi Turn encoder. Once the motor is switched on, the Multi Turn encoder has the absolute position within 4096 revolutions.

In addition to the motor position data, the motor parameter set (electronic motor type plate) is transferred from the SinCos® memory to the HIFA-C module via the integrated RS 485 interface.

ESIM3-C

The ESIM3-C module outputs the position data of the AC servomotor in the form of incremental signals on a 15-pole Sub-D socket. These are two signals electrically phase-displaced by 90°(A/B trails). The transmitted solution can be set from 125 thr. 4000 increments per revolution, an index pulse is not available! Use of this module requires that slot M2 is equipped with an RM-C module.

A typical application for this module is to act as follow-up axes in the electronic gearing mode.

RS 485-C

The RS 485-C is an asynchronous 4-wire interface with level RS 485.

The module provides short-circuit proof voltage supply for the Berger Lahr MP923 interface converter (RS 232 to RS 485).

MODB-C

Module ModBus is an asynchronous 4-wire interface of RS485 level. The user can configure, alternatively, ModBus ASCII or ModBus RTU.

PBDP-C

The Profibus-DP is a high-speed cyclic communication bus. It has a 2-wire interface with level RS 485.

CAN-C

The CAN bus is a serial sensor/actuator bus. It has a 2-wire connection for the CAN-Low and CAN-High lines.

The user can also configure the Berger Lahr Profile, the CANopen DS-402 Profile or DeviceNet.

IBS-C

The Interbus is a sensor/actuator bus which encodes according to the shift-register principle.

SAM-C

The SAM-C Safety Monitor module extends Twin Line positioning controllers using integrated functions for operator safety, e.g. safe stop and reduced speed functions.

Technical data micromodules

Modules			
IOM-C	Digital signal inputs		polarity-secured, no galvanic insulation, damping time 0.7 ms - 1.5 ms
		DC voltage U_{high}	12 V - 30 V
		DC voltage U_{low}	<5 V
		Current at 24 V	<7 mA
	Digital signal outputs		inductively load-capable (50 mH), short-circuit-proof, polarity-secured
		DC voltage	12 V - 30 V
		reverse locking current	<100µA
		switching current	<50 mA
		voltage decay at 50 mA	
	Analogous signal inputs	voltage range	–10 V - +10 V
		input resistance	50 k
		solution	10 Bit
	Analogous signal outputs	voltage range	–10 V - +10 V
		output current	max. 5 mA
		solution	12 Bit
RS 422-C	Inputs		RS 422 voltage compatible, electrically connected to 24 VGND
		input frequency	≤ 400 kHz
	Outputs	Supply for the master rotary encoder	5 V ±5 % max. 300 mA, sense-regulated, short-circuit proof, overload-proof
	Signal cable	max. length	100 m
		minimum cross section	0.5 mm^2 for supply voltage 5 VDC and 5 VGND; 0.25 mm^2 for other signals
PULSE-C	Inputs	triggering device	symmetric RS 422, asymmetric 4.5 V to 30 V, electrically connected with 24 VGND
		input resistance	5 kΩ
		input frequency, pulse signals	≤ 200 kHz
		input frequency, enable	≤ 1 kHz
	Outputs		open collector, short-circuit proof
		output voltage	≤ 30 V
		output current	≤ 50 mA
	Signal cable	max. length for an RS 422 connection	100 m
		max. length for an open collector connection	10 m
		minimum cross section of the signal leads	0.14 mm^2
ESIM3-C	Signal outputs A/B		RS 422 voltage compatible, electrically connected to 24 VGND

Modules			
RS 485-C MODB-C			meets the RS 485 norm, electrically isolated, 4-wire interface
	Transfer rate		max. 38.4 kBaud
	Supply voltage output		+12 V (min. 9 V to max. 15 V)
PBDP-C			meets the RS 485 norm, electrically isolated
	Transfer rate		≤ 12 MBaud
	Supply voltage output		+5 V (max. 10 mA) only for matching resistor
	Cable length		Standard Profibus-DP
CAN-C			Level according to ISO 11898 electrically isolated
	Transfer rate		≤ 1 MBaud, adjustable
	Cable length	at 125 kBaud	max. 500 m
		at 500 kBaud	max. 100 m
	Level	CAN-L/CAN-H	according to ISO 11898
	Matching resistor	at both ends	120 Ω
IBS-C			meets Interbus specification
	Transfer rate		500 kBaud
	Cable length		max. distance to next network participant 400 m
SAM-C	24-VDC-supply voltage		PELV, DIN 19240, polarity-secured
		input voltage range (being monitored)	20 - 30 V
		input ripple	< 2 V_{SS}
		input current without load on outputs	< 0,02 A
	Digital signal inputs		polarity-secured, no galvanic insulation, damping time >1 ms
		time window for simultan switching of both signals of one switch pair	10 s
		DC voltage U_{high}	15 V - 30 V (I ≥ 3 mA)
		DC voltage U_{low}	≤ 5 V (I ≤ 0,5 mA)
		Current at 24 V (5 kΩ against GND)	I≤ 0,5 mA
	Digital signal outputs		inductively load-capable (150 mH /11 W), capacitive load capability (C ≤ 1µF), short-circuit-proof
		DC voltage	≤ 30 V
		switching current RELAY_A, RELAY_B, INTERLOCK-OUT	≤ 0,5 A
		switching current SAFETY24VDC-A; SAFETY24VDC-B	≤ 0,3 A
		switching current AUXOUT1, AUXOUT2	≤ 0,1 A

IP 54 options

Positioning drives with protection type IP 54 can be configured with the holding-brake controller option, in addition to the micromodules described above.

Integrated holding-brake controller

The integrated holding-brake controller amplifies the brake signal of the signal interface, ensuring that the brake is actuated quickly with the least possible heat generation. Enabling the output stage automatically opens the holding brake; disabling the output stage automatically closes it.

Wire sleeves

The cables and connectors are guided through the housing. An optional set of wire sleeves is available in order to fulfil protection type IP 54. Please refer to the catalogue of **Twin Line Accessories** for information and technical data on available accessories.

Terminal bracket

A terminal bracket with TS 15 top hat rail for snap-on mini terminal blocks with max. 1.5 mm wire cross section is available for additional wiring as well as to avoid having to use external terminal boxes. The terminal bracket is mounted inside the housing of the positioning controller. Please refer to the catalogue of **Twin Line Accessories** for information and technical data on available accessories.

Type key TLC 53x, protection type IP 20

Example	TLC	5	3	X	F	X	HIFA	X	X

Device function — 5

5 = Positioning controller with field-bus interface

Motor — 3

3 = AC synchronous servomotor

Rated power — X

2 = 750W
4 = 1500W
6 = 3000W
8 = 8000W

Mains filter — F

F = with mains filter

M1 = Position set values — X

IOM = analogous module
PULSE = for electronic gearbox pulse/direction signal or $\text{pulse}_{forward}/\text{pulse}_{back}$ signal
RS422 = for electronic gearbox A/B signals
– = not equipped

M2 = Capture motor position — HIFA

HIFA = SinCos® encoder

M3 = Encoder Simulation — X

ESIM3 = Encoder simulation, 1 signal connection, A/B signals
SAM = safety module
– = not equipped

M4 = Communication — X

CAN = CAN, alternative Berger Lahr Profile, CANopen DS-402 Profile or DeviceNet configurable
IBS = Interbus
MODB = ModBus ASCII or ModBus RTU, to be configured
PBDP = Profibus DP
RS485 = RS 485

Type key TLC 53xP, protection type IP 54

Example	TLC	5	3	X	P	F	X	HIFA	X	X	X

Device function — **5**

5 = Positioning controller with field-bus interface

Motor — **3**

3 = AC synchronous servomotor

Rated power — **X**

2 = 750W
4 = 1500W

Protection type — **P**

P = protection type IP 54

Mains filter — **F**

F = with mains filter

M1 = Position set values — **X**

IOM = analogous module
PULSE = for electronic gearbox pulse/direction signal or $\text{pulse}_{\text{forward}}$/$\text{pulse}_{\text{back}}$ signal
RS422 = for electronic gearbox A/B signals
– = not equipped

M2 = Capture motor position — **HIFA**

HIFA = SinCos® encoder

M3 = Encoder Simulation — **X**

ESIM3 = Encoder simulation, 1 signal connection, A/B signals
SAM = safety module
– = not equipped

M4 = Communication — **X**

CAN = CAN, alternative Berger Lahr Profile, CANopen DS-402 Profile or DeviceNet configurable
IBS = Interbus
MODB = ModBus ASCII or ModBus RTU, to be configured
PBDP = Profibus DP
RS485 = RS 485

M5 = Integrated holding-break controller — **X**

HBC = Holding Brake Controller integrated, cannot be retrofitted
– = not equipped

General device functions

The TLC 61x models are positioning controllers with integrated power electronics for 3-phase stepper motors or AC synchronous servomotors. The TLC 63x models are positioning controllers with integrated power electronics for AC synchronous servomotors.

The process sequence is freely programmable according to IEC 61131-3. The inputs and outputs are free for use in the sequence program.

The standard controller model is equipped with the following connections:
- I/O signal connection
- Motor connection
- Mains connection
- Brake-triggering signal
- Connection for ballast controller
- RS 232 for communication with the CoDeSys-PC development environment, the Twin Line CT software or with the plug-in Twin Line HMI device

The following interfaces may also be added:
- Interface for position reference variable in the "electronic-gearing" mode or external position control (TLC 63x)
- Encoder-simulation interface for connecting follow-up axes
- RS 485 serial interface or field-bus interface Interbus, Profibus-DP, CAN or ModBus
- SAM module for integrated safety technique
- Analog module IOM with two digital I/Os , and two analog I/Os

Freely programmable positioning controllers

The special feature of these freely programmable positioning and sequence controllers is the control of motor movement with simultaneous monitoring and control of sequences. Inputs and outputs can be processed cyclically parallel to the axis motion. The movement profiles can be freely designed, and the movements can be coupled to and synchronised with external events. The PLC and movement functionality integrated in the devices is programmed freely with the CoDeSys for Automation Alliance according to IEC 61131-3.

The user can select from the following programming languages:
- LD: Ladder diagram
- FBD: Function block diagram
- IL: Instruction list
- ST: Structured text
- SFC: Sequential function chart
- CFC: Continuous function chart

The master functionality controller can handle the following tasks using the plug-in CAN module:
- Device communication between TLC 6xx series devices
- Triggering and control of TLC 4xx and TLC 5xx series devices with the CAN module
- Visualisation and parameterisation using a control panel; various models of the Visu Line series can be adapted to the Twin Line series of devices
- Triggering and control of digital and analog field-bus terminals

In addition to the standard PLC functionality, device-related operation modes and functions are available from a voluminous library:

Point-to-point

In point-to-point mode, a positioning command is used to position from point A to point B. The positioning may be absolute (relative to the zero-point of the axis) or relative (based on the current axis position).

Any changes to the set position or set speed are processed immediately (even during axis motion).

Speed mode

In speed mode, a speed is defined for the axis, and the movement is started without a target position. The axis moves at this speed until another speed set or operating mode is selected. This change is processed immediately, even while the axis is moving.

Electronic gearing

In "electronic-gearing" mode, the reference value is specified via a rotary encoder.

The following signal forms may be input as reference variables:
- A/B signals
- Pulse/direction signals
- $\text{Pulse}_{\text{forward}}/\text{pulse}_{\text{back}}$ signals

The supplied reference variable is computed cyclically with the preset gear factor, and the axis is positioned accordingly. A new gear factor may also be entered while the axis is moving.

A point-to-point positioning process may be superimposed over the electronic gearing.

Reference run

Referencing assigns a defined axis position to a special mechanical position of the motor in the system. Referencing may be performed either by setting the dimensions to the current motor position or by executing a reference run.

The following types of reference run are available:

– Travel to positive, negative or additional limit switches
– Travel to positive, negative or additional limit switches with referencing to the index pulse

Manual run

You can initiate motor runs from a single step to continuous motion by operating the manual inputs or via the Twin Line HMI, Twin Line CT start-up tools, or the CoDeSys programming system.

Oscillator operation

In operation mode Oscilator the motor operates with RPM control. RPM setting is entered via ±10 V input of the signal interface.

Current regulation at TLC 63x

In operation mode Current Control the nominal value of motor current is adjustable, either through parameter setting, or via ±10 V input of the signal interface.

Selection of the type of current value entry, as well as setting of the nominal value, through parameter setting is possible via field bus, or with initial start software Twin Line CT.

Teach-in

Teach-in stores the current position value in the selected memory area. Up to 2 x 64 absolute switching positions of the integrated cam function can be “taught in” via input and output signals, Twin Line HMI or Twin Line CT. The data may also be read, written and copied via field-bus, Twin Line HMI or Twin Line CT.

Capture inputs

Current position values can be saved via two high-speed inputs or the index pulse of the position-reference encoder.

The capture inputs can be activated and the saved positions read out via field-bus, Twin Line HMI, Twin Line CT, or the CoDeSys programming system.

Cam-controller signal output

If the movement exceeds an absolute position value acquired/modified in teach-in mode, the output will be set according to the modified output state, i.e. this high-speed output will be set or reset based on the new position. The position is set parallel to the current operating mode.

Parameterisation

The parameters of the positioning controller and integrated power electronics of devices with an attached communication module can be read and written by the master (PC, PLC etc.) via field-bus or RS 485. Twin Line devices may thus be reproduced or replaced without difficulty, increasing flexibility for extensions and reducing maintenance costs.

The plug-in Twin Line HMI control tool and Twin Line CT start-up software enable a complete device parameterisation as well as a transfer of all parameters from one device to another.

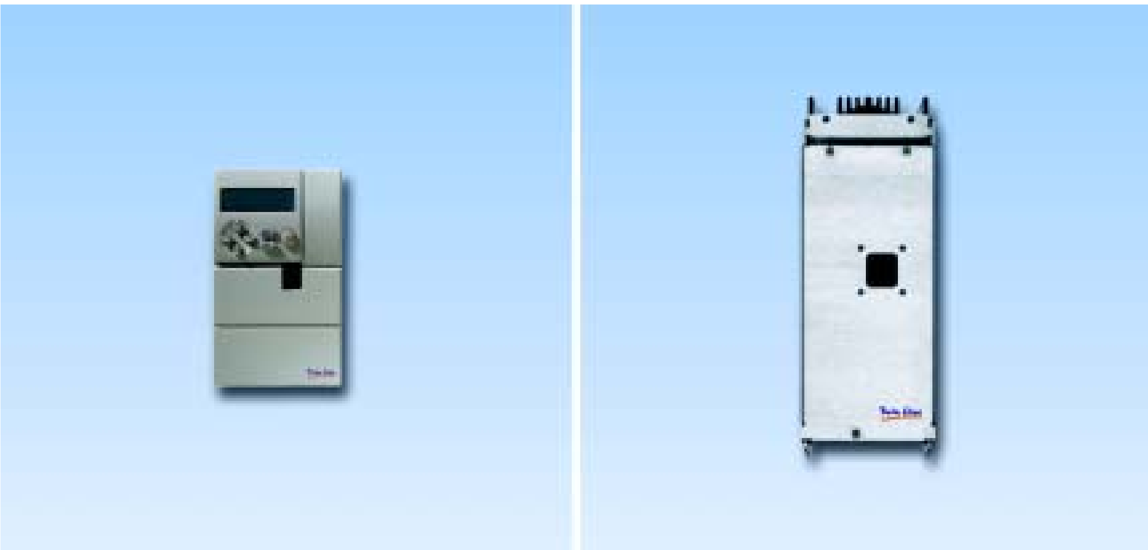
External position control at TLC 63x

An additional motor-separated incremental sensor (e.g. glass dipstick) is connected with the Twin Line device by an incremental sensor module (RS422-C) on module located at plug position M1. This executes direct position measurement of the installation.

The commutation position and the actual velocity (RPM) are still determined by the motor sensor and by the module located in plug position M2 of the Twin Line device.

Electrical cam (CAM)

The electronic cam (CAM) replaces a required mechanical cam, controlling follower sequential motion (Slave motion) via TLC6xx control, in turn controlled by leading position. The relation from leading position to follower position is described in a delineation table furnished together with a software for motion planning.



Positioning controllers TLC 61x for 3-phase stepping motors

Positioning controllers TLC 61x

Positioning controllers with integrated power electronics devices for 3-phase stepping motors are available in the following models:

Protection type IP 20:
- TLC 611: Freely programmable single-axis positioning controller, power class 3 A/350 W/1~
- TLC 612: Freely programmable single-axis positioning controller, power class 7 A/750 W/1~

These devices can be specified as follows:
- 230 V mains voltage with integrated mains filter
- Reversible mains voltage 115 V/230 V without integrated mains filter

Optional protection type IP 54
- TLC 611P: Freely programmable single-axis positioning controller, power class 3 A/350 W/1~
- TLC 612P: Freely programmable single-axis positioning controller, power class 7 A/750 W/1~

The mains voltage for these devices is reversible 115 V/ 230 V. A mains filter is always integrated.

The ventilator and heat dissipater are standard equipment on all devices.

Acceleration and braking ramps

The following asymmetric ramp shapes may be defined for the positioning controller with integrated power electronics for 3-phase stepping motors:
- Linear ramp
- Exponential ramp, i.e. compensation for the torque drop typical of stepping motors at rising speed by a suitable optimised ramp

In addition, a jolt filter may be connected to achieve jolt-free acceleration or braking phases, regardless of the current speed.

Quick-stop

Quick-stop is designed to bring the motor to a stop as quickly as possible.

A linear braking ramp is used as the quick-stop ramp for positioning controllers with integrated power electronics for 3-phase stepping motors.

Rotation monitoring

A shaft-encoder interface module, which enables the Twin Line positioning controller to detect mechanical motor overload, is available as an optional accessory.

The rotation monitoring system compares the set and actual motor positions and returns a rotary error if the difference exceeds the drag-error limit. The motor must be equipped with an encoder (1000 increments) for the rotation monitoring system to function.

Device protection

- Standard: Protection type IP 20 according to DIN EN 60529: 1991
- Option: Protection type IP 54, category 2 according to DIN EN 60529: 1991
- Protection type 1 according to prEN 50178: 1994
- Overvoltage category III according to prEN 50178: 1994
- Pollution grade 2 according to prEN 50178: 1994

Protective and monitoring devices for
- Excess temperature electronics
- Excess temperature motor (only with the rotation monitoring option)
- Rotation monitoring (optional)
- Short to earth
- Phase failure (Power supply and motor cable)
- Short circuit between the motor phases
- Under-/overvoltage of the intermediate circuit
- Motor velocity
- Data connection to control device

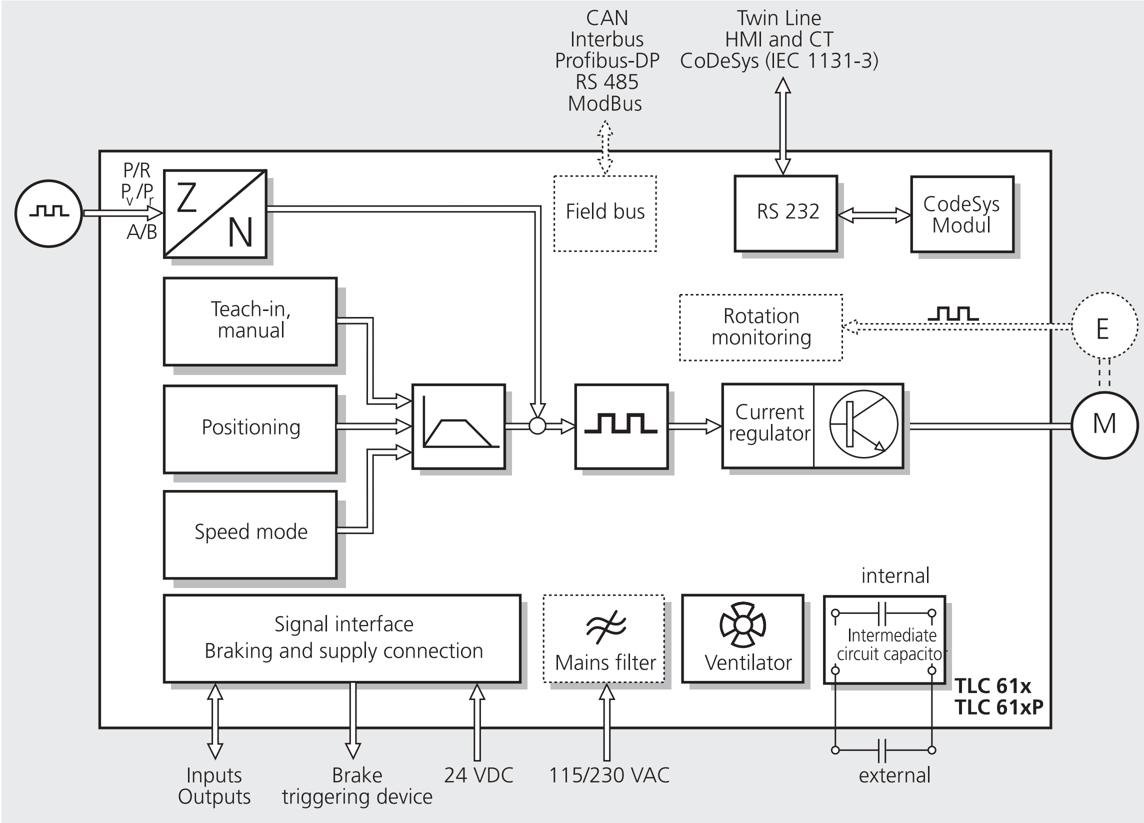


Diagram of freely programmable positioning controllers for 3-phase stepping motors

Technical data TLC 61x, protection type IP 20

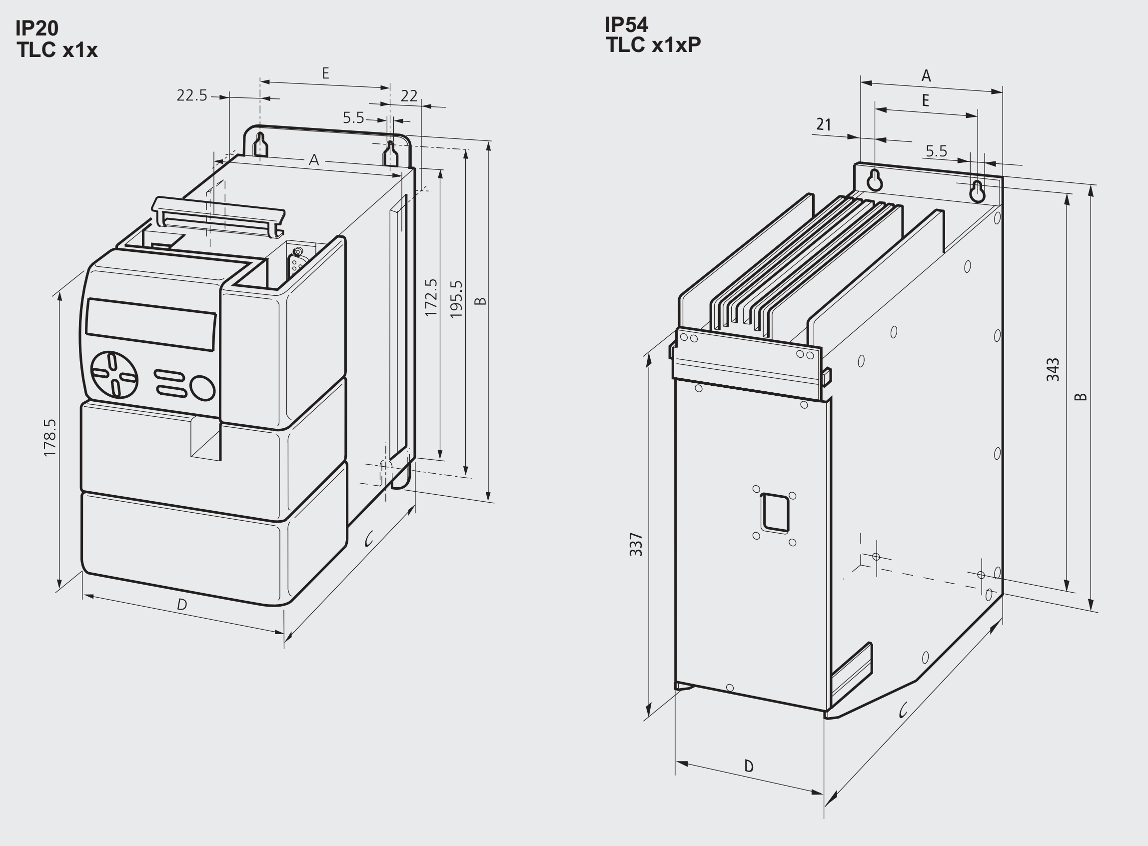
		TLC 611	TLC 612
Mains connection	Mains voltage, non-reversible, mains filter integrated	1 x 230 VAC –20 % to 230 VAC +15 %	
	Mains voltage, reversible, without mains filter	1 x 115 VAC –20 % to 115 VAC +15 % 1 x 230 VAC –20 % to 230 VAC +15 %	
	Mains frequency	47 to 63 Hz	
	Current consumption at 230 V	2 A	5 A
	Current consumption at 115 V	4 A	10 A
	Starting current	< 60 A	
	Fuse protection, external at 230 V	10 A (C, K or similar characteristic)	
	Fuse protection, external at 115 V	10 A (C, K or similar characteristic)	
Motor connection	Rated power at rated current	0.35 kW_{eff}	0.75 kW_{eff}
	Rated current	3 A_{eff}	7 A_{eff}
	Switching frequency	16 kHz	
	Max. rotary speed	3000 min^{-1}	
Motor cable	Cable length	≤ 20 m standard > 20 m upon request	
	Shielding connection	on both sides	
	Cross section	1.5 mm^2	
24 VDC system supply voltage		PELV, DIN 19240, polarised	
	Input voltage range	20 to 30 V	
	Input ripple	< 2 V_{PP}	
	Input current without loading the outputs	< 2.5 A	
Signal inputs		polarised, no electrical isolation	
	Debounced	0.7 to 1.5 ms	
	DC voltage U_{high}	12 to 30 V (I ≥ 3 mA)	
	DC voltage U_{low}	≤ 5 V (I ≤ 0.5 mA)	
	Current	≤ 7 mA at 24 V	
Signal outputs		short-circuit proof	
	Inductive load capable	150 mH/11 W	
	DC voltage	≤ 30 V	
	Switching current	≤ 400 mA	
	Voltage drop at 400 mA	≤ 1 V	
Analog signal input	Voltage range	+10 V to –10 V	
	Input resistance	5 kΩ	
	Solution	10 Bit	
Mass		2.7 kg	

		TLC 611	TLC 612
Ambient conditions	Ambient temperature	0 to 50 °C	
	Transport and storage temperature	–40 to +70 °C	
	Relative humidity	15 to 85 % no condensation permissible	
	Altitude, without power reduction	h < 1000 m above sea level	
	Protection type according to DIN EN 60529: 1991	IP 20	
Characteristic curves		See catalogue of **Twin Line Motors**	
Working memory available for the application	Residual memory for the user program	256 kByte	
	Residual memory for data (Flash PROM)	8 kByte	
	Residual memory for power-fail data (Retain)	100 Byte	
	Non-residual memory for data	128 kByte	
UL 508C approved		You can find the limit values for the UL 508C approval in the documentation included with the device.	

Technical data TLC 61xP, protection type IP 54

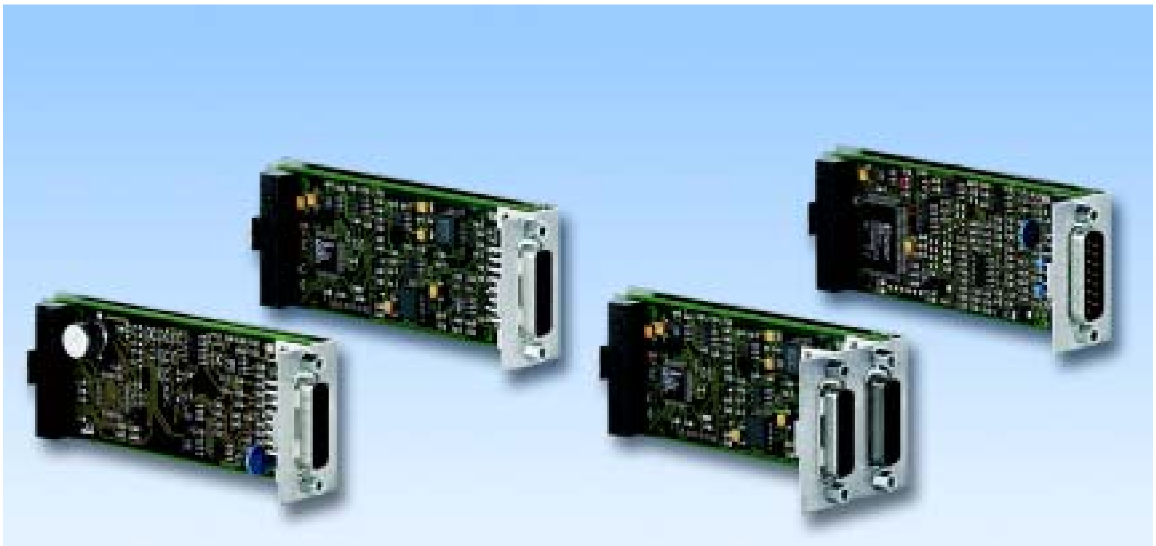
		TLC 611P	TLC 612P
Mains connection	Mains voltage, reversible, mains filter integrated	1 x 115 VAC –20 % to 115 VAC +15 % 1 x 230 VAC –20 % to 230 VAC +15 %	
	Mains frequency	47 to 63 Hz	
	Current consumption at 230 V	2 A	5 A
	Current consumption at 115 V	4 A	10 A
	Starting current	< 60 A	
	Fuse protection, external at 230 V	10 A (C, K or similar characteristic)	
	Fuse protection, external at 115 V	10 A (C, K or similar characteristic)	
Motor connection	Rated power at rated current	0.35 kW_{eff}	0.75 kW_{eff}
	Rated current	3 A_{eff}	7 A_{eff}
	Switching frequency	16 kHz	
	Max. rotary speed	3000 min^{-1}	
Motor cable	Cable length	≤ 20 m standard > 20 m upon request	
	Shielding connection	on both sides	
	Cross section	1.5 mm^2	
24 VDC system supply voltage		PELV, DIN 19240, polarised	
	Input voltage range	20 to 30 V	
	Input ripple	< 2 V_{PP}	
	Input current without loading the outputs	< 2.5 A	
Signal inputs		polarised, no electrical isolation	
	Debounced	0.7 to 1.5 ms	
	DC voltage U_{high}	12 to 30 V (I ≥ 3 mA)	
	DC voltage U_{low}	≤ 5 V (I ≤ 0.5 mA)	
	Current	≤ 7 mA at 24 V	
Signal outputs		short-circuit proof	
	Inductive load capable	150 mH/11 W	
	DC voltage	≤ 30 V	
	Switching current	≤ 400 mA	
	Voltage drop at 400 mA	≤ 1 V	
Analog signal input	Voltage range	+10 V to –10 V	
	Input resistance	5 kΩ	
	Solution	10 Bit	
Mass		8 kg	

		TLC 611P	TLC 612P
Ambient conditions	Ambient temperature	0 to 45 °C	
		The P model is not suitable for use outdoors or in areas with strongly adhering contaminants which could jam the ventilator.	
	Transport and storage temperature	–40 to +70 °C	
	Altitude, without power reduction	h < 1000 m above sea level	
	Protection type according to DIN EN 60529: 1991	IP 54, category 2	
	Protection type of internal air channel for cooling	IP 34	
Characteristic curves		See catalogue of **Twin Line Motors**	
Working memory available for the application	Residual memory for the user program	256 kByte	
	Residual memory for data (Flash PROM)	8 kByte	
	Residual memory for power-fail data (Retain)	100 Byte	
	Non-residual memory for data	128 kByte	
UL 508C approved		You can find the limit values for the UL 508C approval in the documentation included with the device.	



Dimensional drawing of positioning controllers for 3-phase stepping motors

	TLC 61x	TLC 61xP
Width A	108 mm	127 mm
Height B	212.5 mm	360 mm
Depth C	184.5 mm	245 mm
Front width D	105.5 mm	127 mm
Fitting dimension E	63 mm	80 mm



Modules for positioning controller and power electronics

Micromodules

Twin Line micromodules for application-specific configuration

IOM-C

The analogous module receives and generates analogous and digital voltage values. The analogous outputs are user-adjustable. The module furnishes nominal values for control as analogous voltage values. Extension by two analogous I/Os and two digital I/Os.

RS 422-C

The RS 422-C encoder module is designed to capture encoder signals, which are fed in as A/B signals. It also detects and evaluates the index pulse. A typical application for this module is the "electronic gearing" function.

PULSE-C

The PULSE-C module captures positioning data as a pulse /direction signal or as a pulse$_{forward}$/pulse$_{back}$ signal. A typical application is the "electronic gearing" function.

RM-C

The RM-C module recognizes any position deviations in the movements of a stepping motor.

The actual positions registered by the rotary encoder are compared with the set positions. If the deviation exceeds a defined value, a drag error is returned.

ESIM3-C

The ESIM3-C module outputs the position data of the stepping motor in the form of incremental signals on a 15-pole Sub-D socket. These are two signals electrically phase-displaced by 90° (A/B trails). The transmitted solution can be set from 125 thr. 4000 increments per revolution, an index pulse is not available! Use of this module requires that slot M2 is equipped with an RM-C module.

A typical application for this module is to act as follow-up axes in the electronic gearing mode.

RS 485-C

The RS 485-C is an asynchronous 4-wire interface with level RS 485.

The module provides short-circuit proof voltage supply for the Berger Lahr MP923 interface converter (RS 232 to RS 485).

MODB-C

Module ModBus is an asynchronous 4-wire interface of RS485 level. The user can configure, alternatively, ModBus ASCII or ModBus RTU.

PBDP-C

The Profibus-DP is a high-speed cyclic communication bus. It has a 2-wire interface with level RS 485.

CAN-C

The CAN bus is a serial sensor/actuator bus. It has a 2-wire connection for the CAN-Low and CAN-High lines.

The user can also configure the Berger Lahr Profile, the CANopen DS-402 Profile or DeviceNet.

IBS-C

The Interbus is a sensor/actuator bus which encodes according to the shift-register principle.

SAM-C

The SAM-C Safety Monitor module extends Twin Line positioning controllers using integrated functions for operator safety, e.g. safe stop and reduced speed functions.

Use of this module requires that slot M2 is equipped with an RM-C module.

Technical data micromodules

Modules			
IOM-C	Digital signal inputs		polarity-secured, no galvanic insulation, damping time 0.7 ms - 1.5 ms
		DC voltage U_{high}	12 V - 30 V
		DC voltage U_{low}	<5 V
		Current at 24 V	<7 mA
	Digital signal outputs		inductively load-capable (50 mH), short-circuit-proof, polarity-secured
		DC voltage	12 V - 30 V
		reverse locking current	<100µA
		switching current	<50 mA
		voltage decay at 50 mA	
	Analogous signal inputs	voltage range	–10 V - +10 V
		input resistance	50 k
		solution	10 Bit
	Analogous signal outputs	voltage range	–10 V - +10 V
		output current	max. 5 mA
		solution	12 Bit
RS 422-C	Inputs		RS 422 voltage compatible, electrically connected to 24 VGND
		input frequency	≤ 400 kHz
	Outputs	Supply for the master rotary encoder	5 V ±5 %max. 300 mA, sense-regulated short-circuit proof, overload-proof
	Signal cable	max. length	100 m
		minimum cross section	0.5 mm^2 for supply voltage 5 VDC and 5 VGND; 0.25 mm^2 for other signals
PULSE-C	Inputs	triggering device	symmetric RS 422, asymmetric 4.5 V to 30 V, electrically connected with 24 VGND
		input resistance	5 kΩ
		input frequency, pulse signals	≤ 200 kHz
		input frequency, enable	≤ 1 kHz
	Outputs		open collector, short-circuit proof
		output voltage	≤ 30 V
		output current	≤ 50 mA
	Signal cable	max. length for an RS 422 connection	100 m
		max. length for an open collector connection	10 m
		minimum cross section of the signal leads	0.14 mm^2
ESIM3-C	Signal outputs A/B		RS 422 voltage compatible, electrically connected to 24 VGND

Modules			
RS 485-C MODB-C			meets the RS 485 norm, electrically isolated, 4-wire interface
	Transfer rate		max. 38.4 kBaud
	Supply voltage output		+12 V (min. 9 V to max. 15 V)
PBDP-C			meets the RS 485 norm, electrically isolated
	Transfer rate		≤ 12 MBaud
	Supply voltage output		+5 V (max. 10 mA) only for matching resistor
	Cable length		Standard Profibus-DP
CAN-C			Level according to ISO 11898 electrically isolated
	Transfer rate		≤ 1 MBaud, adjustable
	Cable length	at 125 kBaud	max. 500 m
		at 500 kBaud	max. 100 m
	Level	CAN-L/CAN-H	according to ISO 11898
	Matching resistor	at both ends	120 Ω
IBS-C			meets Interbus specification
	Transfer rate		500 kBaud
	Cable length		max. distance to next network participator 400 m
SAM-C	24-VDC-supply voltage		PELV, DIN 19240, polarity-secured
		input voltage range (being monitored)	20 - 30 V
		input ripple	< 2 V_{SS}
		input current without load on outputs	< 0,02 A
	Digital signal inputs		polarity-secured, no galvanic in-sulation, damping time >1 ms
		time window for simultan switching of both signals of one switch pair	10 s
		DC voltage U_{high}	15 V - 30 V (I ≥ 3 mA)
		DC voltage U_{low}	≤ 5 V (I ≤ 0,5 mA)
		Current at 24 V (5 kΩ against GND)	I≤ 0,5 mA
	Digital signal outputs		inductively load-capable (150 mH /11 W), capacitive load capability (C ≤ 1μF), short-circuit-proof
		DC voltage	≤ 30 V
		switching current RELAY_A, RELAY_B, INTERLOCK-OUT	≤ 0,5 A
		switching current SAFETY24VDC-A; SAFETY24VDC-B	≤ 0,3 A
		switching current AUXOUT1, AUXOUT2	≤ 0,1 A

IP 54 options

Positioning drives with protection type IP 54 can be configured with the holding-brake controller option, in addition to the micromodules described above.

Integrated holding-brake controller

The integrated holding-brake controller amplifies the brake signal of the signal interface, ensuring that the brake is actuated quickly with the least possible heat generation. Enabling the output stage automatically opens the holding brake; disabling the output stage automatically closes it.

Wire sleeves

The cables and connectors are guided through the housing. An optional set of wire sleeves is available in order to fulfil protection type IP 54. Please refer to the catalogue of **Twin Line Accessories** for information and technical data on available accessories.

Terminal bracket

A terminal bracket with TS 15 top hat rail for snap-on mini terminal blocks with max. 1.5 mm wire cross section is available for additional wiring as well as to avoid having to use external terminal boxes. The terminal bracket is mounted inside the housing of the positioning controller. Please refer to the catalogue of **Twin Line Accessories** for information and technical data on available accessories.

Type key TLC 61x, protection type IP 20

Example	TLC	6	1	X	X	X	X	X	X

Device function — TLC **6** 1 X X X X X X

6	= Freely programmable positioning controller according to IEC 61131-3

Motor — TLC 6 **1** X X X X X X

1	= 3-phase stepping motor

Rated power — TLC 6 1 **X** X X X X X

1	= 350W
2	= 750W

Mains filter — TLC 6 1 X **X** X X X X

F	= with mains filter, mains voltage115V/230 V
NF	= without mains filter, mains voltage, reversible 115 V/230 V

M1 = Position set values — TLC 6 1 X X **X** X X X

IOM	= analogous module
PULSE	= for electronic gearbox pulse/direction signal or $\text{pulse}_{\text{forward}}/\text{pulse}_{\text{back}}$ signal
RS422	= for electronic gearbox A/B signals
–	= not equipped

M2 = Capture motor position — TLC 6 1 X X X **X** X X

RM	= Rotation monitoring for 1000-line encoder
–	= not equipped

M3 = Encoder Simulation — TLC 6 1 X X X X **X** X

ESIM3	= Encoder simulation, 1 signal connection, A/B signals (prerequisite: Plug-in M2 with RM-C module)
SAM	= safety module (prerequisite: Plug-in M2 with RM-C module)
–	= not equipped

M4 = Communication — TLC 6 1 X X X X X **X**

CAN	= CAN, alternative Berger Lahr Profile, CANopen DS-402 Profile or DeviceNet configurable
IBS	= Interbus
MODB	= ModBus ASCII or ModBus RTU, to be configured
PBDP	= Profibus DP
RS485	= RS 485

Type key TLC 61xP, protection type IP 54

Example TLC 6 1 X P S F X X X X X

Device function TLC **6** 1 X P S F X X X X X

6	= Freely programmable positioning controller according to IEC 61131-3

Motor TLC 6 **1** X P S F X X X X X

1	= 3-phase stepping motor

Rated power TLC 6 1 **X** P S F X X X X X

1	= 350W
2	= 750W

Protection type TLC 6 1 X **P** S F X X X X X

P	= protection type IP 54

Mains voltage TLC 6 1 X P **S** F X X X X X

S	= Mains voltage, reversible 115V/230V

Mains filter TLC 6 1 X P S **F** X X X X X

F	= with mains filter, mains voltage115V/230V

M1 = Positions set values TLC 6 1 X P S F **X** X X X X

IOM	= analogous module
PULSE	= for electronic gearbox pulse/direction signal or $pulse_{forward}/pulse_{back}$ signal
RS422	= for electronic gearbox A/B signals
–	= not equipped

M2 = Capture motor position TLC 6 1 X P S F X **X** X X X

RM	= Rotation monitoring for 1000-line encoder
–	= not equipped

M3 = Encoder Simulation TLC 6 1 X P S F X X **X** X X

ESIM3	= Encoder simulation, 1 signal connection, A/B signals (prerequisite: Plug-in M2 with RM-C module)
SAM	= safety module (prerequisite: Plug-in M2 with RM-C module)
–	= not equipped

M4 = Communication TLC 6 1 X P S F X X X **X** X

CAN	= CAN, alternative Berger Lahr Profile, CANopen DS-402 Profile or DeviceNet configurable
IBS	= Interbus
MODB	= ModBus ASCII or ModBus RTU, to be configured
PBDP	= Profibus DP
RS485	= RS 485

M5 = Integrated holding-break controller TLC 6 1 X P S F X X X X **X**

HBC	= Holding Brake Controller integrated, cannot be retrofitted
–	= not equipped

Freely programmable positioning controllers TLC 63x for AC synchronous servomotors

Positioning controllers TLC 63x

Positioning controllers with integrated power electronics for AC synchronous servomotors are available in the following models:

Protection type IP 20:
- TLC 632: Freely programmable single-axis positioning controller, power class 3 A/750 W/1~
- TLC 634: Freely programmable single-axis positioning controller, power class 3 A/1.5 kW/3~
- TLC 636: Freely programmable single-axis positioning controller, power class 6 A/3 kW/3~
- TLC 638: Freely programmable single-axis positioning controller, power class 16 A/8 kW/3~

Optional protection type IP 54
- TLC 632P: Freely programmable single-axis positioning controller, power class 3 A/750 W/1~
- TLC 634P: Freely programmable single-axis positioning controller, power class 3 A/1.5 kW/3~

A mains filter, heat dissipater and ventilator are standard for all devices.

Acceleration and braking ramps

An asymmetric linear acceleration and braking ramp can be set for the positioning controller with integrated power electronics for AC synchronous servomotors. In addition, a jolt filter may be connected to achieve jolt-free acceleration or braking phases, regardless of the current speed.

Quick-stop

Quick-stop is designed to bring the motor to a stop as quickly as possible.

A linear braking ramp or a torque ramp (max. motor current) may be selected as the quick-stop ramp for positioning controllers with integrated power electronics for AC synchronous servomotors.

Device protection

- Standard: Protection type IP 20 according to DIN EN 60529: 1991
- Option: Protection type IP 54, category 2 according to DIN EN 60529:1991
- Protection type 1 according to prEN 50178: 1994
- Overvoltage category III according to prEN 50178: 1994
- Pollution grade 2 according to prEN 50178: 1994

Protective and monitoring devices for
- Excess temperature electronics
- Excess temperature motor
- Overheating (I^2t monitoring of motor, internal ballast resistance and output stage)
- Short to earth
- Phase failure (Power supply and motor cable)
- Short circuit between the motor phases
- Under-/overvoltage of the intermediate circuit
- Motor velocity
- Data connection to control device

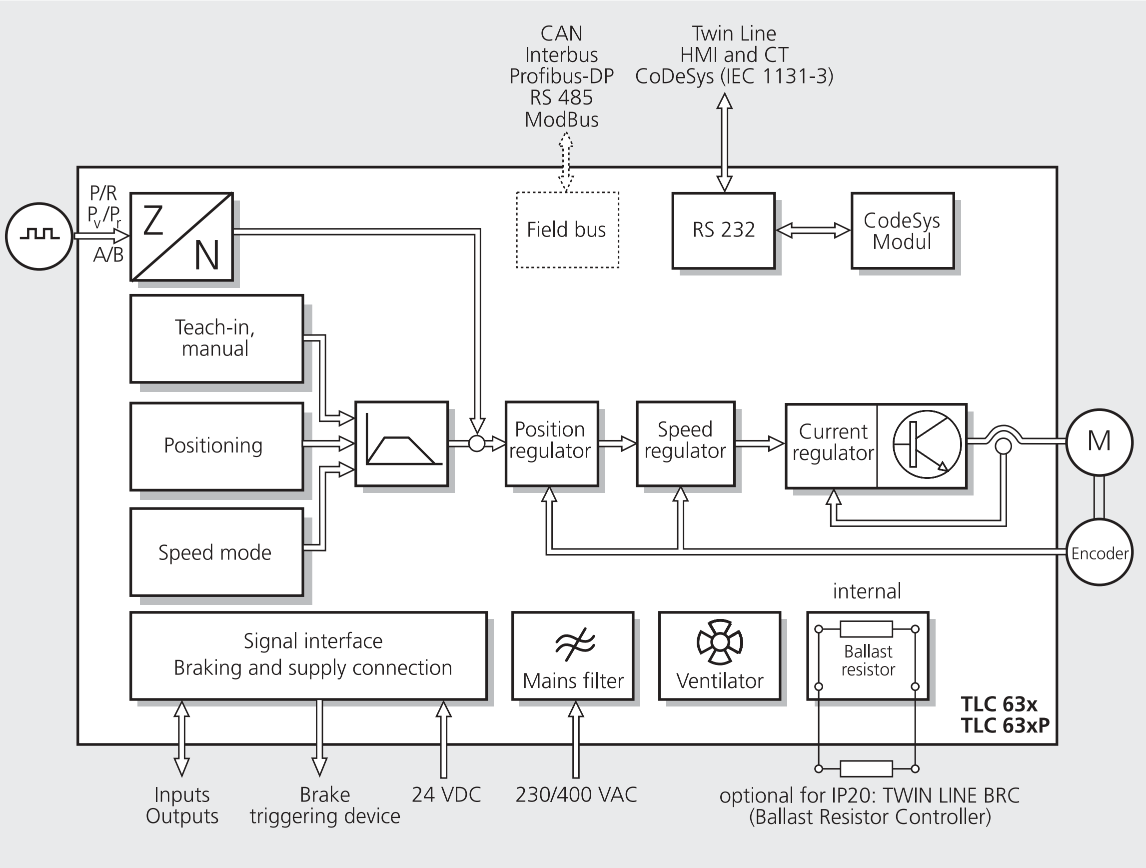


Diagram of freely programmable positioning controllers for AC synchronous servomotors

Technical data TLC 63x, protection type IP 20

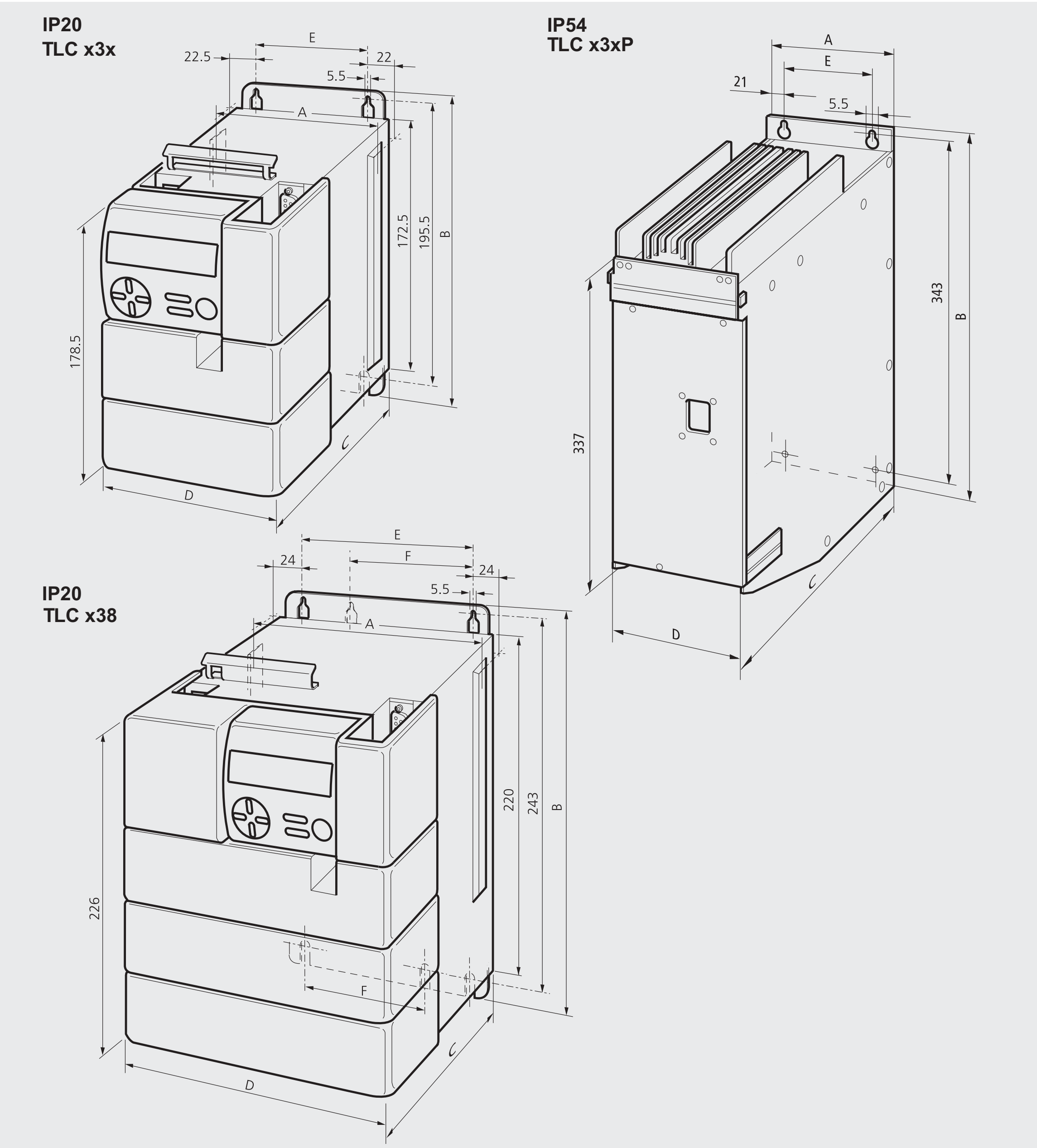
		TLC 632	TLC 634	TLC 636	TLC 638
Mains connection	Mains voltage	1 x 230 VAC –20 % to 240 VAC +10 %		3 x 230 VAC –20 % to 480 VAC +10 %	
	Mains frequency	47 to 63 Hz			
	Current consumption	6.5 A	4 A	7.5 A	20 A
	Starting current	< 60 A			
	Fuse, external (B characteristic)	10 A			25 A
Motor connection	Rated power at rated current and 230 V/1~ or 400 V/3~	0.75 kW_{eff}	1.5 kW_{eff}	3 kW_{eff}	8 kW_{eff}
	Rated current effective value	3 A_{eff}		6 A_{eff}	16 A_{eff}
	Rated current amplitude value	4,24 A_s		8,48 A_s	22,63 A_s
	Peak current for max. 5 s	11;31 A_s		28,28 A_s	45,26 A_s
	Switching frequency	8/16 kHz			4/8 kHz
	Max. rotary speed	12000 min^{-1}			
Motor cable	Cable length	≤ 20 m standard > 20 m upon request			
	Shielding connecion	on both sides			
	Cross section (depends on length)	1.5 mm^2	1.5 to 2.5 mm^2		4 mm^2
Intermediate-circuit connection		max. two devices of the same power class may be connected			
Internal breaking circuit	Continuous power	60 W	100 W	200 W	80 W
	Max. energy per braking sequence	350 Ws	600 Ws	100 Ws	130 Ws
24 VDC system supply voltage		PELV, DIN 19240, polarised			
	Input voltage range	20 to 30 V			
	Input ripple	< 2 V_{PP}			
	Input current without loading the outputs	< 2.5 A			
Signal inputs		polarised, no electrical isolation			
	Debounced	0.7 to 1.5 ms			
	DC voltage U_{high}	12 to 30 V ($I \geq 3$ mA)			
	DC voltage U_{low}	≤ 5 V ($I \leq 0.5$ mA)			
	Current	≤ 7 mA at 24 V			
Signal outputs		short-circuit proof			
	Inductive load capable	150 mH/11 W			
	DC voltage	≤ 30 V			
	Switching current	≤ 400 mA			
	Voltage drop at 400 mA	≤ 1 V			
Analog signal input	Voltage range	+10 V to –10 V			
	Input resistance	5 kΩ			
	Solution	10 Bit			
Mass		2.7 kg	3.7 kg	6.6 kg	10.8 kg

		TLC 632	TLC 634	TLC 636	TLC 638
Ambient conditions	Ambient temperature	0 to 50 °C			
	Transport and storage temperature	–40 to +70 °C			
	Relative humidity	15 to 85 % no condensation permissible			
	Altitude, without power reduction	h < 1000 m above sea level			
	Protection type according to DIN EN 60529: 1991	IP 20			
Characteristic curves		See catalogue of **Twin Line Motors**			
Working memory available for the application	Residual memory for the user program	256 kByte			
	Residual memory for data (Flash PROM)	8 kByte			
	Residual memory for power-fail data (Retain)	100 Byte			
	Non-residual memory for data	128 kByte			
UL 508C approved		You can find the limit values for the UL 508C approval in the documentation included with the device.			

Technical data TLC 63xP, protection type IP 54

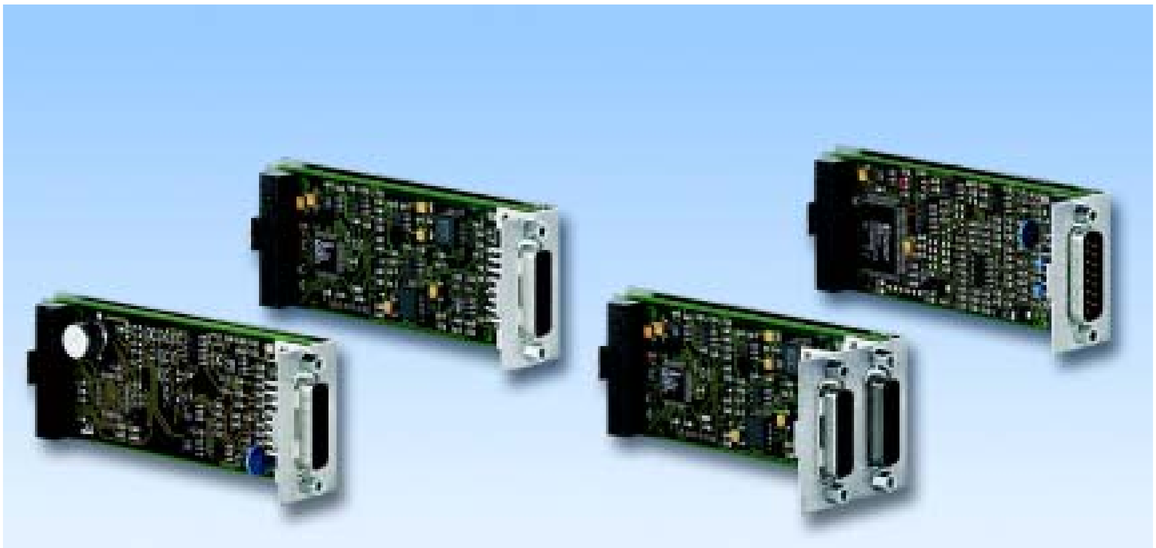
		TLC 632P	TLC 634P
Mains connection	Mains voltage	1 x 230 VAC –20 % to 240 VAC +10 %	3 x 230 VAC –20 % to 480 VAC +10 %
	Mains frequency	47 to 63 Hz	
	Current consumption	6.5 A	4 A
	Starting current	< 60 A	
	Fuse, external (B characteristic)	10 A	
Motor connection	Rated power at rated current and 230 V/1~ or 400 V/3~	0.75 kW_{eff}	1.5 kW_{eff}
	Rated current effective value	3 A_{eff}	
	Rated current amplitude value	4,24 A_s	
	Peak current for max. 5 s	11,31 A_s	
	Switching frequency	8/16 kHz	
	Max. rotary speed	12000 min^{-1}	
Motor cable	Cable length	≤ 20 m standard > 20 m upon request	
	Shielding connection	on both sides	
	Cross section (depends on length)	1.5 mm^2	1.5 to 2.5 mm^2
Intermediate-circuit connection		max. two devices of the same power class may be connected	
Internal breaking circuit	Continuous power	depends on the ambient temperature and ventilation, can be checked upon request	
	Max. energy per braking sequence	depends on the ambient temperature and ventilation, can be checked upon request	
24 VDC system supply voltage		PELV, DIN 19240, polarised	
	Input voltage range	20 to 30 V	
	Input ripple	< 2 V_{PP}	
	Input current without loading the outputs	< 2.5 A	
Signal inputs		polarised, no electrical isolation	
	Debounced	0.7 to 1.5 ms	
	DC voltage U_{high}	12 to 30 V (I ≥ 3 mA)	
	DC voltage U_{low}	≤ 5 V (I ≤ 0.5 mA)	
	Current	≤ 7 mA at 24 V	
Signal outputs		short-circuit proof	
	Inductive load capable	150 mH/11 W	
	DC voltage	≤ 30 V	
	Switching current	≤ 400 mA	
	Voltage drop at 400 mA	≤ 1 V	
Analog signal input	Voltage range	+10 V to –10 V	
	Input resistance	5 kΩ	
	Solution	10 Bit	
Mass		8.5 kg	11 kg

		TLC 632P	TLC 634P
Ambient conditions	Ambient temperature	0 to 45 °C	
		The P model is not suitable for use outdoors or in areas with strongly adhering contaminants which could jam the ventilator.	
	Transport and storage temperature	–40 to +70 °C	
	Altitude, without power reduction	h < 1000 m above sea level	
	Protection type according to DIN EN 60529:1991	IP 54, category 2	
	Protection type of internal air channel for cooling	IP 24	
Characteristic curves		See catalogue of **Twin Line Motors**	
Working memory available for the application	Residual memory for the user program	256 kByte	
	Residual memory for data (Flash PROM)	8 kByte	
	Residual memory for power-fail data (Retain)	100 Byte	
	Non-residual memory for data	128 kByte	
UL 508C approved		You can find the limit values for the UL 508C approval in the documentation included with the device.	



Dimensional drawing of positioning controllers for AC synchronous servomotors

	TLC 632	TLC 634	TLC 636	TLC 638	TLC 632P	TLC 634P
Width A	108 mm	128 mm	178 mm	248 mm	127 mm	147 mm
Height B	212.5 mm	212.5 mm	260 mm	260 mm	360 mm	360 mm
Depth C	184.5 mm	214.5 mm	244.5 mm	244.5 mm	245 mm	275 mm
Front width D	105.5 mm	125.5 mm	176 mm	246 mm	127 mm	127 mm
Fitting dimension E	63 mm	83 mm	130 mm	200 mm	80 mm	100 mm
Additional dimension F	–	–	–	120 mm	–	–



Modules for positioning controller and power electronics

Micromodules

Twin Line micromodules for application-specific configuration

IOM-C

The analogous module receives and generates analogous and digital voltage values. The analogous outputs are user-adjustable. The module furnishes nominal values for control as analogous voltage values. Extension by two analogous I/Os and two digital I/Os.

RS 422-C

The RS 422-C encoder module is designed to capture encoder signals, which are fed in as A/B signals. It also detects and evaluates the index pulse. A typical application for this module is the "electronic gearing" function or external position control.

PULSE-C

The PULSE-C module captures positioning data as a pulse /direction signal or as a $pulse_{forward}/pulse_{back}$ signal. A typical application is the "electronic gearing" function.

HIFA-C

The HIFA-C module captures the motor position of AC synchronous servomotors equipped with a SinCos® absolute-value encoder.

The rotor position in the motor is detected optically and transferred as analog and digital position data to the HIFA-C module. The module resolves the signals with 14-bit resolution, corresponding to 16384 pulses/revolution. The absolute-value encoder integrated in the motor can be either a Single Turn (standard) or Multi Turn encoder. Once the motor is switched on, the Multi Turn encoder has the absolute position within 4096 revolutions.

In addition to the motor position data, the motor parameter set (electronic motor type plate) is transferred from the SinCos® memory to the HIFA-C module via the integrated RS 485 interface.

ESIM3-C

The ESIM3-C module outputs the position data of the AC servomotor in the form of incremental signals on a 15-pole Sub-D socket. These are two signals electrically phase-displaced by 90°(A/B trails). The transmitted solution can be set from 125 thr. 4000 increments per revolution, an index pulse is not available! Use of this module requires that slot M2 is equipped with an RM-C module.

A typical application for this module is to act as follow-up axes in the electronic gearing mode.

RS 485-C

The RS 485-C is an asynchronous 4-wire interface with level RS 485.

The module provides short-circuit proof voltage supply for the Berger Lahr MP923 interface converter (RS 232 to RS 485).

MODB-C

Module ModBus is an asynchronous 4-wire interface of RS485 level. The user can configure, alternatively, ModBus ASCII or ModBus RTU.

PBDP-C

The Profibus-DP is a high-speed cyclic communication bus. It has a 2-wire interface with level RS 485.

CAN-C

The CAN bus is a serial sensor/actuator bus. It has a 2-wire connection for the CAN-Low and CAN-High lines.

The user can also configure the Berger Lahr Profile, the CANopen DS-402 Profile or DeviceNet.

IBS-C

The Interbus is a sensor/actuator bus which encodes according to the shift-register principle.

SAM-C

The SAM-C Safety Monitor module extends Twin Line positioning controllers using integrated functions for operator safety, e.g. safe stop and reduced speed functions.

Technical data micromodules

Modules			
IOM-C	Digital signal inputs		polarity-secured, no galvanic insulation, damping time 0.7 ms - 1.5 ms
		DC voltage U_{high}	12 V - 30 V
		DC voltage U_{low}	<5 V
		Current at 24 V	<7 mA
	Digital signal outputs		inductively load-capable (50 mH), short-circuit-proof, polarity-secured
		DC voltage	12 V - 30 V
		reverse locking current	<100µA
		switching current	<50 mA
		voltage decay at 50 mA	
	Analogous signal inputs	voltage range	–10 V - +10 V
		input resistance	50 k
		solution	10 Bit
	Analogous signal outputs	voltage range	–10 V - +10 V
		output current	max. 5 mA
		solution	12 Bit
RS 422-C	Inputs		RS 422 voltage compatible, electrically connected to 24 VGND
		input frequency	≤ 400 kHz
	Outputs	Supply for the master rotary encoder	5 V ±5 %max. 300 mA, sense-regulated, short-circuit proof, overload-proof
	Signal cable	max. length	100 m
		minimum cross section	0.5 mm^2 for supply voltage 5 VDC and 5 VGND; 0.25 mm^2 for other signals
PULSE-C	Inputs	triggering device	symmetric RS 422, asymmetric 4.5 V to 30 V, electrically connected with 24 VGND
		input resistance	5 kΩ
		input frequency, pulse signals	≤ 200 kHz
		input frequency, enable	≤ 1 kHz
	Outputs		open collector, short-circuit proof
		output voltage	≤ 30 V
		output current	≤ 50 mA
	Signal cable	max. length for an RS 422 connection	100 m
		max. length for an open collector connection	10 m
		minimum cross section of the signal leads	0.14 mm^2
ESIM3-C	Signal outputs A/B		RS 422 voltage compatible, electrically connected to 24 VGND

Modules			
RS 485-C MODB-C			meets the RS 485 norm, electrically isolated, 4-wire interface
	Transfer rate		max. 38.4 kBaud
	Supply voltage output		+12 V (min. 9 V to max. 15 V)
PBDP-C			meets the RS 485 norm, electrically isolated
	Transfer rate		≤12 MBaud
	Supply voltage output		+5 V (max. 10 mA) only for matching resistor
	Cable length		Standard Profibus-DP
CAN-C			Level according to ISO 11898 electrically isolated
	Transfer rate		≤ 1 MBaud, adjustable
	Cable length	at 125 kBaud	max. 500 m
		at 500 kBaud	max. 100 m
	Level	CAN-L/CAN-H	according to ISO 11898
	Matching resistor	at both ends	120 Ω
IBS-C			meets Interbus specification
	Transfer rate		500 kBaud
	Cable length		max. distance to next network participator 400 m
SAM-C	24-VDC-supply voltage		PELV, DIN 19240, polarity-secured
		input voltage range (being monitored)	20 - 30 V
		input ripple	< 2 V_{SS}
		input current without load on outputs	< 0,02 A
	Digital signal inputs		polarity-secured, no galvanic in- sulation, damping time >1 ms
		time window for simultan switching of both signals of one switch pair	10 s
		DC voltage U_{high}	15 V - 30 V (I ≥ 3 mA)
		DC voltage U_{low}	≤ 5 V (I ≤ 0,5 mA)
		Current at 24 V (5 kΩ against GND)	I≤ 0,5 mA
	Digital signal outputs		inductively load-capable (150 mH /11 W), capacitive load capability (C ≤ 1μF), short-circuit-proof
		DC voltage	≤ 30 V
		switching current RELAY_A, RELAY_B, INTERLOCK-OUT	≤ 0,5 A
		switching current SAFETY24VDC-A; SAFETY24VDC-B	≤ 0,3 A
		switching current AUXOUT1, AUXOUT2	≤ 0,1 A

IP 54 options

Positioning drives with protection type IP 54 can be configured with the holding-brake controller option, in addition to the micromodules described above.

Integrated holding-brake controller

The integrated holding-brake controller amplifies the brake signal of the signal interface, ensuring that the brake is actuated quickly with the least possible heat generation. Enabling the output stage automatically opens the holding brake; disabling the output stage automatically closes it.

Wire sleeves

The cables and connectors are guided through the housing. An optional set of wire sleeves is available in order to fulfil protection type IP 54. Please refer to the catalogue of **Twin Line Accessories** for information and technical data on available accessories.

Terminal bracket

A terminal bracket with TS 15 top hat rail for snap-on mini terminal blocks with max. 1.5 mm wire cross section is available for additional wiring as well as to avoid having to use external terminal boxes. The terminal bracket is mounted inside the housing of the positioning controller. Please refer to the catalogue of **Twin Line Accessories** for information and technical data on available accessories.

Type key TLC 63x, protection type IP 20

Example	TLC	6	3	X	F	X	HIFA	X	X

Device function — **6**

6	= Freely programmable positioning controller according to IEC 61131-3

Motor — **3**

3	= AC synchronous servomotor

Rated power — **X**

2	= 750W
4	= 1500W
6	= 3000W
8	= 8000W

Mains filter — **F**

F	= with mains filter

M1 = Position set values — **X**

IOM	= analogous module
PULSE	= for electronic gearbox pulse/direction signal or $pulse_{forward}/pulse_{back}$ signal
RS422	= for electronic gearbox A/B signals
–	= not equipped

M2 = Capture motor position — **HIFA**

HIFA	= SinCos® encoder

M3 = Encoder Simulation — **X**

ESIM3	= Encoder simulation, 1 signal connection, A/B signals
SAM	= safety module
–	= not equipped

M4 = Communication — **X**

CAN	= CAN, alternative Berger Lahr Profile, CANopen DS-402 Profile or DeviceNet configurable
IBS	= Interbus
MODB	= ModBus ASCII or ModBus RTU, to be configured
PBDP	= Profibus DP
RS485	= RS 485
–	= not equipped

Type key TLC 63xP, protection type IP 54

Example	**TLC**	**6**	**3**	**X**	**P**	**F**	**X**	**HIFA**	**X**	**X**	**X**

Device function — TLC **6** 3 X P F X HIFA X X X

6 = Freely programmable positioning controller according to IEC 61131-3

Motor — TLC 6 **3** X P F X HIFA X X X

3 = AC synchronous servomotor

Rated power — TLC 6 3 **X** P F X HIFA X X X

2 = 750W
4 = 1500W

Protection type — TLC 6 3 X **P** F X HIFA X X X

P = protection type IP 54

Mains filter — TLC 6 3 X P **F** X HIFA X X X

F = with mains filter

M1 = Position set values — TLC 6 3 X P F **X** HIFA X X X

IOM = analogous module
PULSE = for electronic gearbox pulse/direction signal or $pulse_{forward}$/$pulse_{back}$ signal
RS422 = for electronic gearbox A/B signals
– = not equipped

M2 = Capture motor position — TLC 6 3 X P F X **HIFA** X X X

HIFA = SinCos® encoder

M3 = Encoder Simulation — TLC 6 3 X P F X HIFA **X** X X

ESIM3 = Encoder simulation, 1 signal connection, A/B signals
SAM = safety module
– = not equipped

M4 = Communication — TLC 6 3 X P F X HIFA X **X** X

CAN = CAN, alternative Berger Lahr Profile, CANopen DS-402 Profile or DeviceNet configurable
IBS = Interbus
MODB = ModBus ASCII or ModBus RTU, to be configured
PBDP = Profibus DP
RS485 = RS 485
– = not equipped

M5 = Integrated holding-break controller — TLC 6 3 X P F X HIFA X X **X**

HBC = Holding Brake Controller integrated, cannot be retrofitted
– = not equipped

we control **motion**

Berger Lahr offers you the positioning and automation solutions you need, based on our tried and proven series of products. Our comprehensive engineering and consulting service is ready to support and advise you every step of the way.

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BERGER LAHR

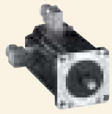
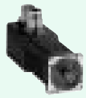
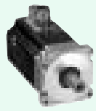
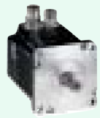
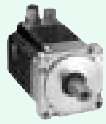
Catalogue of Twin Line Power electronics

Edition 9/2003

Twin Line

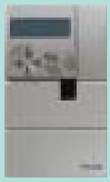
a company of Schneider Electric

Twin Line Motors

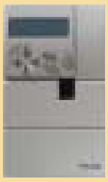
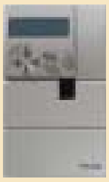
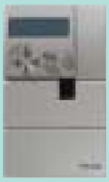
	3-phase stepping motors			AC synchronous servomotors (Standard)				
Torque [Nm][1]	1,5	2-6	12-16,5	0,32-0,9	1,1-3,6	4,3-11,25	4,6-13,4	17,8-38,8
Motor type	VRDM 36X	VRDM 39X	VRDM 311X	SER 36X	SER 39X	RIG 39X	SER 311X	RIG 311X
								

VRDM	VRDM	VRDM	SER	SER / RIG	SER / RIG	SER / RIG
368	397 3910 3913	31117 31122	364 366 368 3610	397 3910 3913 3916[2]	31112 31117	31117 31122 31127[2]

Twin Line Power electronics

Power class	3 A / 350 W / 1~	7 A / 750 W / 1~	3 A / 750 W / 1~	3 A / 1,5 kW / 3~	6 A / 3 kW / 3~
					
for single axis systems	TLD 011	TLD 012	TLD 132	TLD 134	TLD 136

Twin Line Positioning controllers

Power class	3 A / 350 W / 1~	7 A / 750 W / 1~	3 A / 750 W / 1~	3 A / 1,5 kW / 3~	6 A / 3 kW / 3~
					
with data set processsing	TLC 411	TLC 412	TLC 432	TLC 434	TLC 436
with fieldbus interface	TLC 511	TLC 512	TLC 532	TLC 534	TLC 536
freely programmable according to IEC 61131-3	TLC 611	TLC 612	TLC 632	TLC 634	TLC 636

Robotics

Single-axis-systems

Portal axis

Cantilever axis

Telescope axis

[1] Stepping motors: max. torque M_{max}
AC synchronous servo: permanent idle torque M_{d0}

[2] only Motor type SER

AC synchronous servomotors (High Performace)

0,34-1,0	0,65-2,3	0,95-6	4,2-12	8,5-27	25-50
DSM4-05.X	DSM4-07.X	DSM4-09.X	DSM4-11.X	DSM4-14.X	DSM4-19.X

DSM	DSM	DSM	DSM
4-05.1-.4 4-07.1-.2 4-09.1-.2	4-07.1-.3 4-09.1-.3	4-07.1-.3 4-09.1-.4 4-11.1-.2	4-11.1-.4 4-14.1-.4 4-19.1-.2

Catalogue of
Twin Line Motors

3 A / 750 W / 1~	3 A / 1,5 kW / 3~	6 A / 3 kW / 3~	16 A / 8 kW / 3~

TLD 132	TLD 134	TLD 136	TLD 138

This Catalogue includes

Power electronics

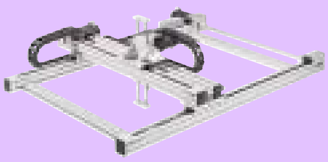
3 A / 750 W / 1~	3 A / 1,5 kW / 3~	6 A / 3 kW / 3~	16 A / 8 kW / 3~

TLC 432	TLC 434	TLC 436	TLC 438
TLC 532	TLC 534	TLC 536	TLC 538
TLC 632	TLC 634	TLC 636	TLC 638

Catalogue of
Twin Line Positioning controllers

Multi-axis-systems

Double-axis systems



Triple-axis systems

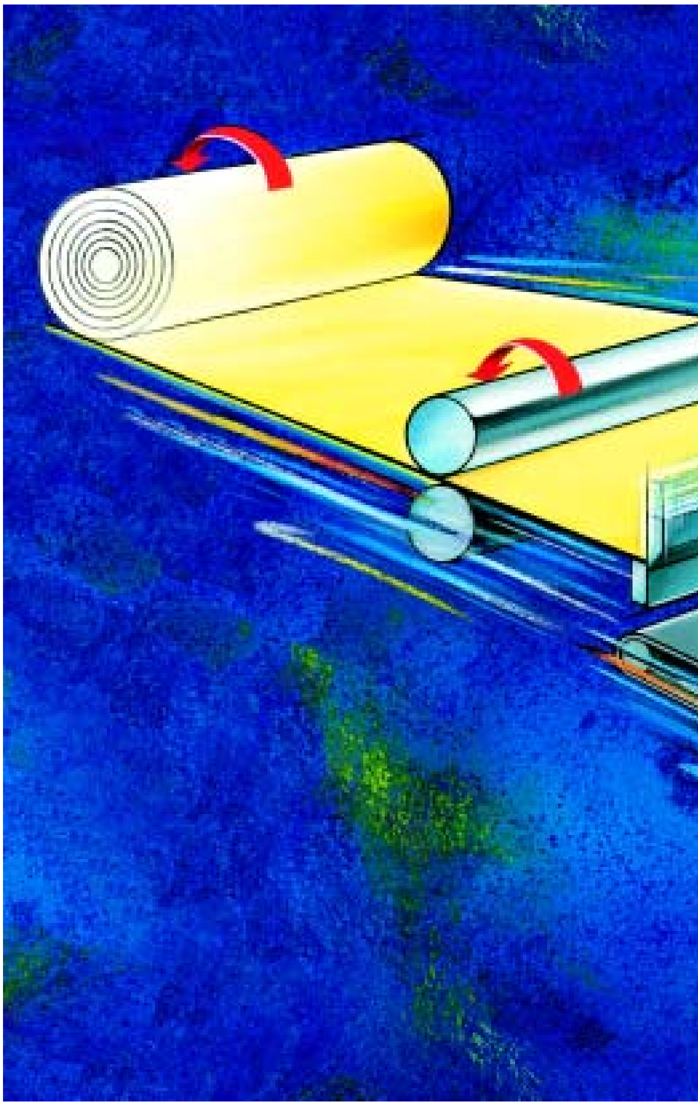
Low-mass system

Catalogue of
Robotics

Positioning drives

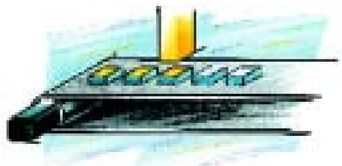
Positioning drives enable the execution of accurate, precisely defined movements. The distances travelled may vary from a few µm to several metres. The digital positioning drives from Berger Lahr are especially well-suited to positioning tasks. They are maintenance-free, simple to control and the movement procedures are easy to program. They can be used to solve almost any task in production automation requiring up to 8 kW of power: from simple point-to-point movements all the way to multi-axis systems with varying travel patterns. Positioning drives from Berger Lahr may be

- operated as autonomous solutions
- controlled by a PLC
- integrated into various networks and standard field-bus systems

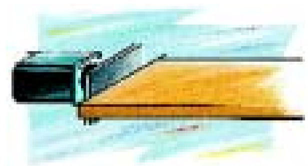


What would you like to position?

Below are some examples of possible positioning tasks. Many other applications are also conceivable.

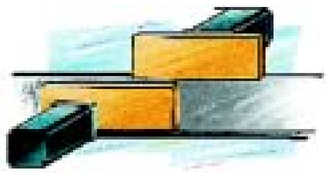


Positioning parts



Positioning limit stops

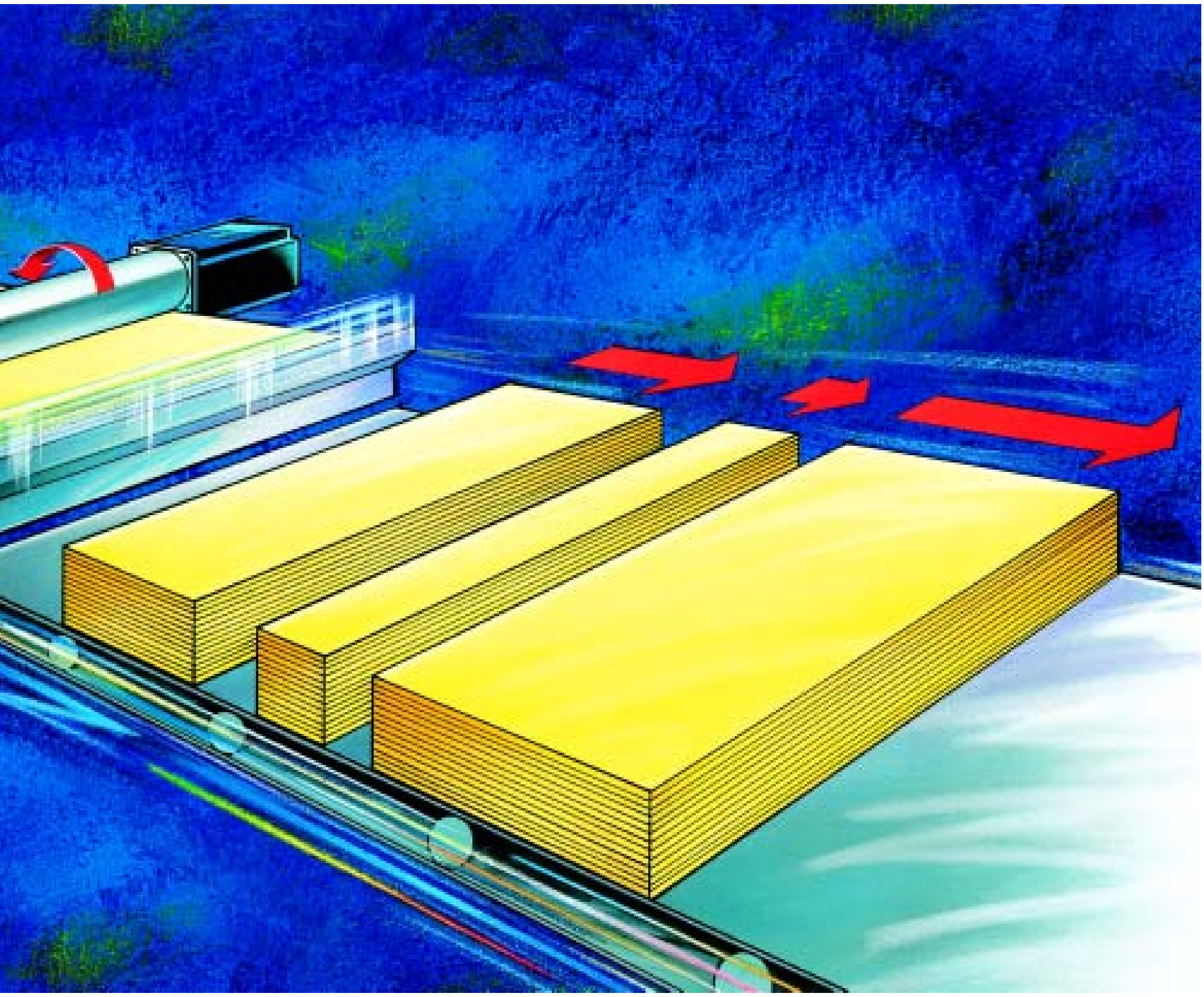
Feed movements

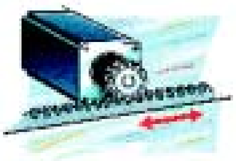


Format setting/adjustment

Metering

Cutting to length





Toothed rod

Spindle

Toothed belt

Gearing

Chain

The mobility you need

Mechanical components precisely adjust the motor's rotary motion to the movement type for the positioning task required.

Overview of power electronics devices

General description

As a solution to all your power-engineering tasks up to 8 kW, we offer a total concept consisting of:
- Power electronics for 3-phase stepping motors and
- Power electronics for AC synchronous servomotors

Depending on the device type and assembly, the power electronics can manage various automation tasks in operating modes such as electronic gearing, stepping motor mode or current/speed regulation.

Structural features

- Compact design
- Same mechanical design for 3-phase stepping motors and AC synchronous servomotors in all power classes
- Power supply for the power electronics directly from the mains, without transformer
- Power range from 350 W to 8 kW
- Integrated mains filter class A (industrial environment), heat dissipater and ventilator for 3-phase stepping motor and AC synchronous servomotor devices
- Device suspension integrated in the housing
- All electrical connections are accessible from the front
- Shielding connection and strain relief are integrated in the device

Functional and economic features

- Simple and user-friendly operation, parameterisation and control
- Suitable for all types of motor encoder systems
- Integrated braking control signal
- Various adjustable operating modes
- Continuity and the same method of operation for 3-phase stepping motors and AC synchronous servomotors
- Simple to install, with electromagnetic compatibility
- Multilingual documentation and controlling units
- Complete solution for power-engineering tasks
- Low space requirement
- Modularity for tailor-made system solutions
- External components easily integrated (mains filter, heat dissipater and ventilator)

Individual configuration of the interfaces

Twin Line power electronics devices are configured according to the customer's needs. The modular design enables the devices to be adapted precisely to various power-engineering tasks and interface requirements.

An optional encoder monitors the rotation of the 3-phase stepping motors. For AC synchronous servomotors, a SinCos® encoder (Single and MultiTurn absolute value encoder) is used to detect the motor position. It is connected to the HIFA-C interface. Different encoder systems may also be integrated.

The set value for the electronic gearing can be supplied in various incremental signal forms.

Modules for transmitting actual values pass the motor position on to follow-up devices operating in electronic-gearing mode, or may be used to complete a master position closed loop control circuit.

Approvals

CE, UL, cUL

Accessories

Please refer to the **Twin Line Accessory** Catalogue for information and technical data on available accessories.

Power electronics TLD 01x for 3-phase stepping motors

Power electronics TLD 01x

Twin Line power electronics devices for 3-phase stepping motors are available in the following models:

– TLD 011: Power class 3 A/350 W/1~
– TLD 012: Power class 7 A/750 W/1~

Parametrisation

The power electronics for 3-phase stepping motors include a hexagonal rotary switch for selecting the phase current and a DIP switch for selecting the function.

Rotation monitoring system

A shaft-encoder interface, which enables the Twin Line power-electronics devices for 3-phase stepping motors to detect mechanical motor overload, is available as an optional accessory.

The rotation monitoring system compares the motor's set and actual step counts. If the difference exceeds the permissible limit value of 18 half-steps, the device returns a drag error. The motor must be equipped with an encoder (1000 lines) for the rotation monitoring system to function.

Device protection

– Protection type IP 20 according to DIN EN 60529: 1991
– Protection class 1 according to prEN 50178: 1994
– Overvoltage category III according to prEN 50178: 1994
– Pollution grade 2 according to prEN 50178: 1994

Protective and monitoring devices for

– excess-temperature, electronics and motor (only with the rotation monitoring option)
– short to earth
– phase failure
– short circuit between the motor phases
– undervoltage/overvoltage of the intermediate circuit
– rotation monitoring (optional)

Ambient conditions

Ambient climate:

– Temperature: 0 °C to +50 °C
– Relative humidity: 15 % to 85 % (no condensation permitted)

Storage and transport temperature:

– Temperature: –40 °C to +70 °C

Altitude for operation without a reduction in power:

– Height: < 1000 m NN

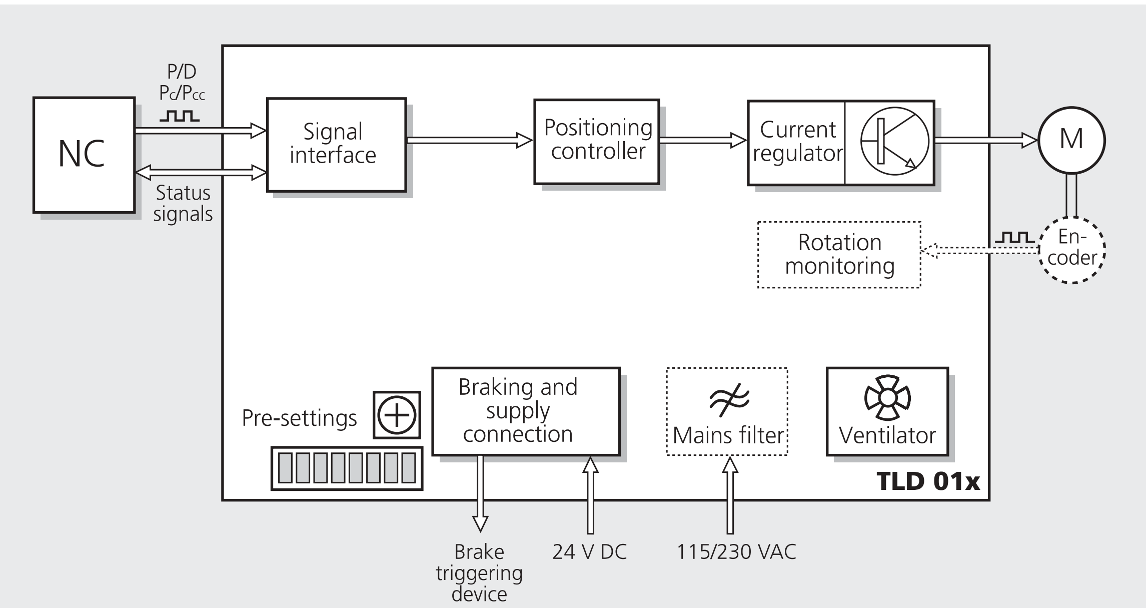
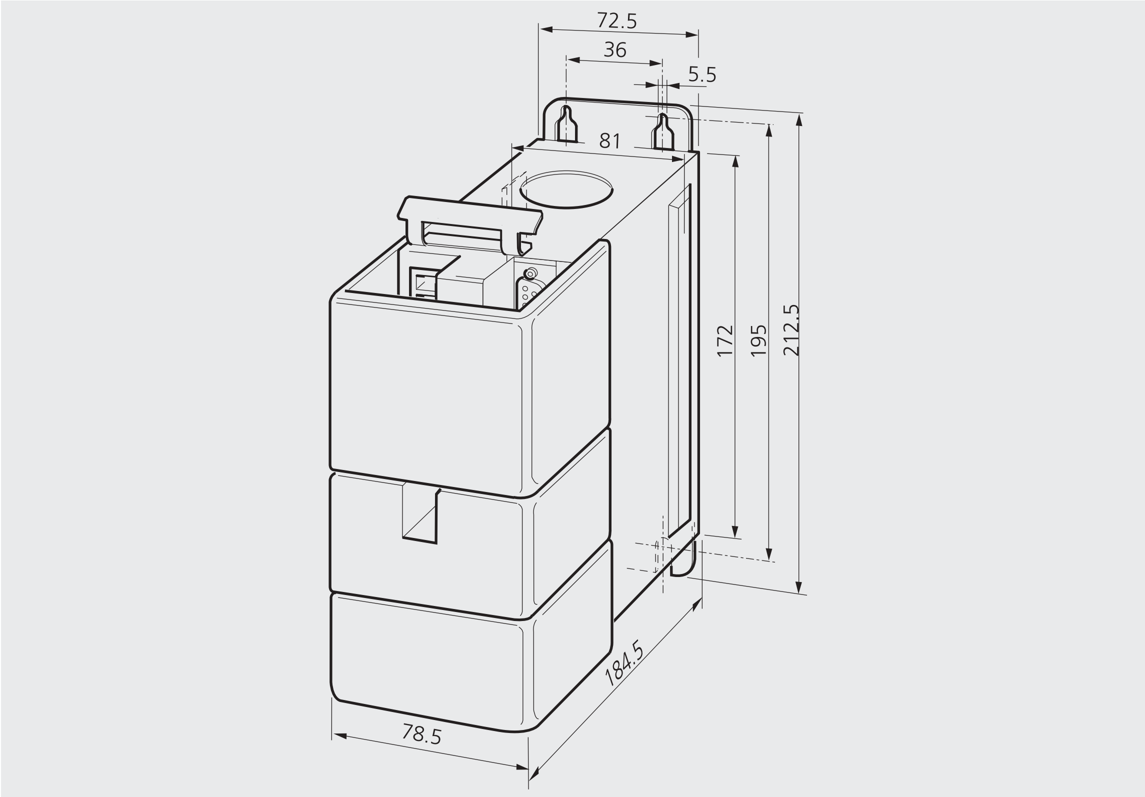


Diagram of power electronics for 3-phase stepping motors

Technical data TLD 01x

		TLD 011	TLD 012
Mains connection	Mains voltage, non-reversible, with integrated mains filter	1 x 230 VAC –20 % to 230 VAC +15 %	
	Mains voltage, reversible, without integrated mains filter	1 x 230 VAC –20 % to 230 VAC +15 % 1 x 115 VAC –20 % to 115 VAC +15 %	
	Mains frequency	47 to 63 Hz	
	Current consumption at 230 V	2 A	5 A
	Current consumption at 115 V	4 A	10 A
	Starting current	< 60 A	
	Fuse protection, external at 230 V	10 A (C, K or similar)	
	Fuse protection, external at 115 V	10 A (C, K or similar)	
Motor connection	Rated power	0.35 kW_{eff}	0.75 kW_{eff}
	Rated current at low switching frequency	3 A_{eff}	7 A_{eff}
	Switching frequency	16 kHz	
	Max. rotary speed	3000 rpm	
Motor cable	Cable length	≤ 20 m standard > 20 m upon request	
	Shielding connection	on both sides	
	Cross section	1.5 mm^2	
24 VDC system supply voltage		PELV, DIN 19240, polarised	
	Input voltage range	20 to 30 V	
	Input ripple	< 2 V_{PP}	
	Current consumption	≤ 1.5 A	
Mass		2.2 kg	
Ambient conditions	Ambient temperature	0 to 50 °C	
	Transport and storage temperature	–40 to +70 °C	
	Relative humidity	15 % to 85 % (no condensation permitted)	
	Altitude, without power reduction	h < 1000 m above sea level	
	Protection type	IP 20	
Rotary encoder connection (optional)	Signal inputs (A,B)	Level RS 422, electrically connected to 24 VGND	
Rotary encoder supply (SENSE)		5 V ± 5 % (I ≤ 300 mA), sense-regulated	
Brake triggering device	Signal output (ACTIVE_CON)	short-circuit proof	
	Output voltage	≤ 30 V	
	Output current	≤ 1.4 A	

			TLD 011	TLD 012
Signal interface	Signal inputs	Symmetric	RS 422 - voltage compatible	
		Asymmetric	4.5 V to 30 V, electrically connected to 24 VGND	
		Input resistance	5 kΩ	
		Input frequency, pulse/direction, pulse$_{forward}$, pulse$_{back}$	≤ 200 kHz	
		Input frequency, enable	≤ 1 kHz	
	Signal outputs ($\overline{\text{ACTIVE}}$, $\overline{\text{FUNC\_OUT}}$)		Open collector, short-circuit proof	
		Output voltage	≤ 30 V	
		Output current	≤ 50 mA	
	Signal cable	Max. length for a RS 422 connection	100 m	
		Max. length for an open collector connection	up to 10 m	
		Minimum cross section of the signal leads	0.14 mm^2	
Step count	Adjustable		200/400/500/1000/2000/4000/5000/10000	
Characteristic curves			See Catalogue of **Twin Line Motors**	



Dimensional drawing of power electronics for 3-phase stepping motors

	TLD 01x
Width	81 mm
Height	212.5 mm
Depth	184.5 mm

Type key TLD 01x

Example	**TLD**	**0**	**1**	**X**	**X**	**PULSE**	**X**
Device function	TLD	**0**	1	X	X	PULSE	X
0 = Power electronics, 3-phase stepping motor							
Motor	TLD	0	**1**	X	X	PULSE	X
1 = 3-phase stepping motor							
Rated power	TLD	0	1	**X**	X	PULSE	X
1 = 350W 2 = 750W							
Mains Filter	TLD	0	1	X	**X**	PULSE	X
F = with mains filter, mains voltage 230V NF = without mains filter, mains voltage 115V/230V reversible							
Position set values	TLD	0	1	X	X	**PULSE**	X
PULSE = pulse/direction signal or $pulse_{forward}/pulse_{back}$ signal ($pulse_{forward}/pulse_{back}$ signal only in combination with option RM = rotation monitoring)							
Rotation monitoring	TLD	0	1	X	X	PULSE	**X**
RM = rotation monitoring for 1000-line encoder – = not equipped							

Power electronics TLD 13x for AC synchronous servomotors

Power electronics TLD 13x

Twin Line power electronics for AC synchronous servomotors are available in the following models:
- TLD 132: Power class 3 A/750 W/1~
- TLD 134: Power class 3 A/1.5 kW/3~
- TLD 136: Power class 6 A/3 kW/3~
- TLD 138: Power class 16 A/8 kW/3~

Parametrisation

The plug-in Twin Line HMI (Human Machine Interface) control tool or the Twin Line CT (Control Tool) start-up software, which runs on Windows 95/NT/98/2000/XP Professional, allows complete device parametrisation as well as duplication of all parameters from one AC synchronous servomotor to another.

Operating modes

The power electronics has four operating modes:
- manual operating mode manual run
- automatic operating mode with current control
- automatic operating mode with speed control
- automatic operating mode electronic gearing if a module is installed in socket M1

Manual run

During manual run, the power electronics operates with speed control. The motor can be moved in manual run with the control software, with the hand-operated control tool HMI or via the input signals for manual operation at two speed levels.

Speed and current control

When using the speed and current control, the motor is moved according to an adjustable speed or current level specification. The speed or current control is only active in automatic operation. The reference variable is specified as a voltage between +10 V and –10 V via the ±10 V analog input of the signal interface.

Electronic gearing

In the electronic gearing operating mode, the power electronics calculates a new position set value for the motor movement from a position specification and an adjustable gear-factor. This operating mode is selected if one or more AC synchronous servomotors are to follow the reference signal of a numerical control or an encoder position-controlled.

In the electronic gearing operating mode, the encoder module RS 422-C or the pulse/direction module PULSE-C must be inserted in the set value socket M1.

Depending on the module, various signal forms can be input:
- A/B signals with the RS 422-C module
- Pulse/direction signal or $pulse_{forward}$-/$pulse_{back}$-signal with the PULSE-C module

Changing the operating modes

The operating mode can be changed during running operation. The power electronics switches back and forth between the automatic operating modes without stopping the motor. When changing between the manual and automatic operating mode, the motor stops briefly and activates the drive parameters and specific settings for the set operating mode.

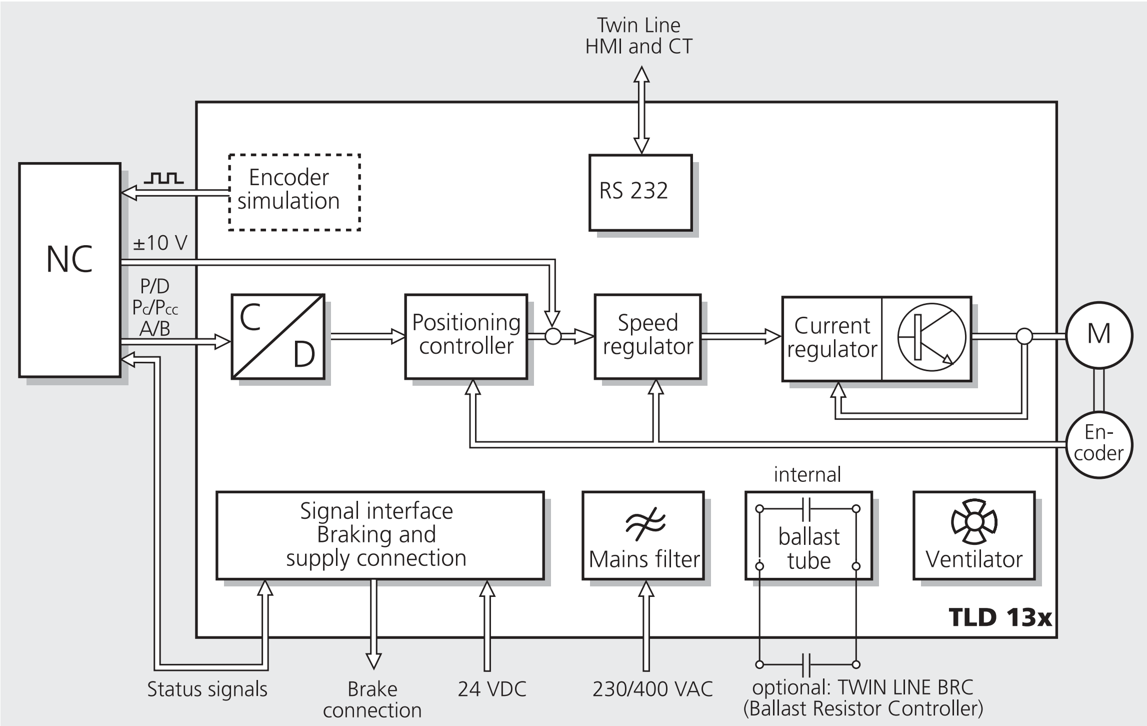
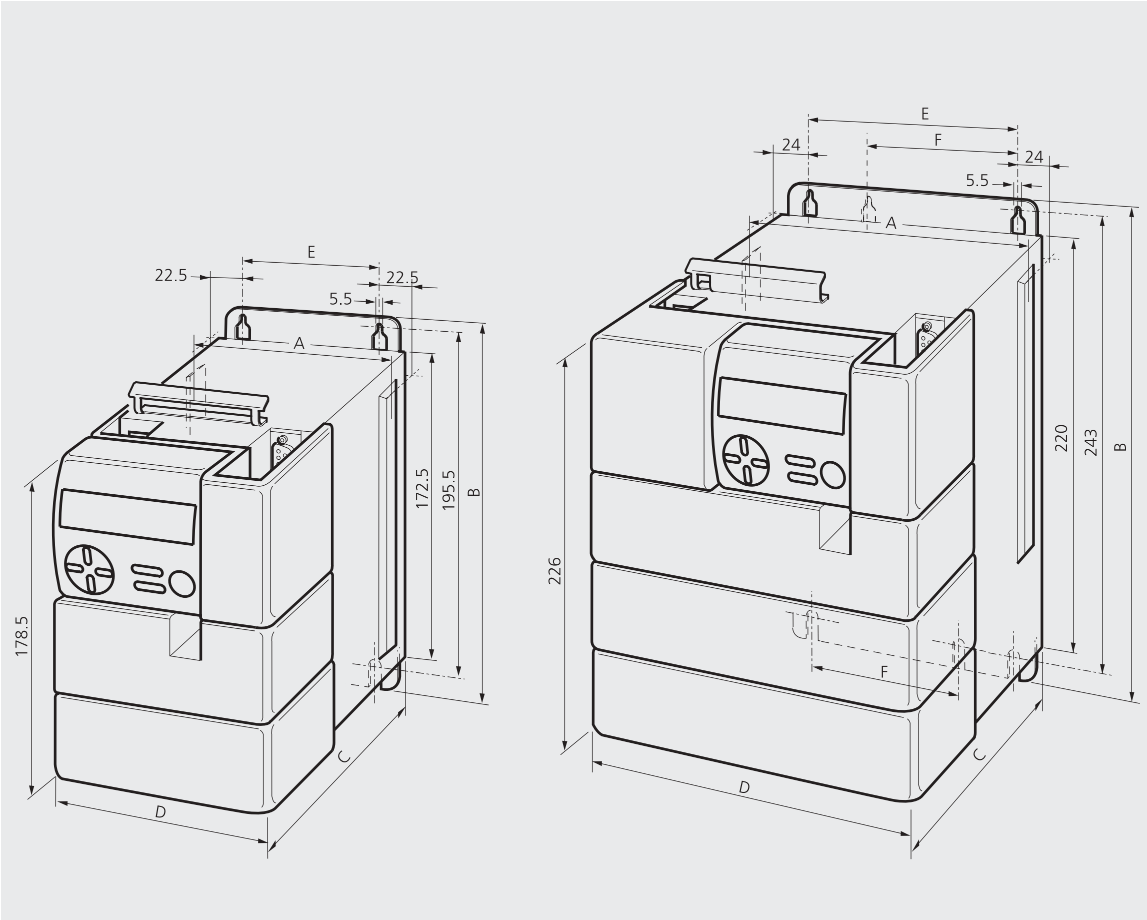


Diagram of power electronics for AC synchronous servomotors

Technical data TLD 13x

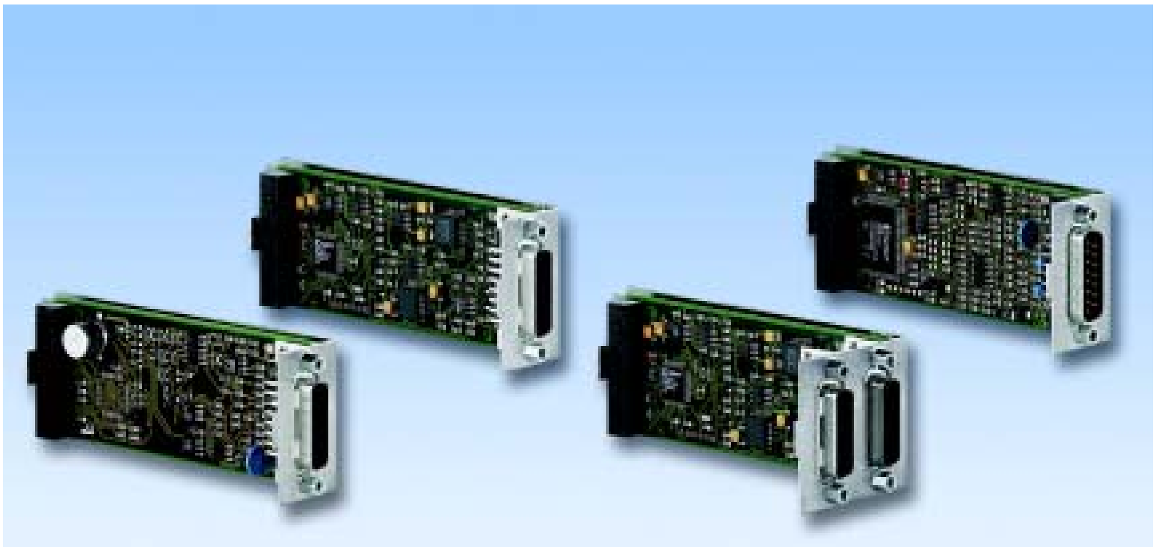
		TLD 132	TLD 134	TLD 136	TLD 138
Mains connection	Mains voltage	1 x 230 VAC –20 % to 240 VAC +10 %	3 x 230 VAC –20 % to 480 VAC +10 %	3 x 230 VAC –20 % to 480 VAC +10 %	3 x 230 VAC –20 % to 480 VAC +10 %
	Mains frequency	47 to 63 Hz			
	Current consumption	6.5 A	4 A	7.5 A	20 A
	Starting current	< 60 A			
	Fuse, external (B characteristic)	10 A	10 A	10 A	25 A
Motor connection	Rated power at rated current and 230 V/1~ or 400 V/3~	0,75 kW_{eff}	1,5 kW_{eff}	3 kW_{eff}	8 kW_{eff}
	Rated current effective value	3 A_{eff}	3 A_{eff}	6 A_{eff}	16 A_{eff}
	Rated current amplitude value	4,24 A_s	4,24 A_s	8,48 A_s	22,63 A_s
	Peak current for max. 5 s	11,31 A_s	11,31 A_s	28,28 A_s	45,26 A_s
	Switching frequency	8/16 kHz	8/16 kHz	8/16 kHz	4/8 kHz
	Max. rotary speed	12000 min^{-1}			
Motor cable	Cable length	≤ 20 m standard > 20 m upon request			
	Shielding connection	on both sides			
	Cross section (length-dependent)	1.5 mm^2	1.5 to 2.5 mm^2	1.5 to 2.5 mm^2	2.5 to 4 mm^2
Intermediate-circuit connection		max. two devices of the same power class may be connected			
Internal breaking circuit	Continuous power	60 W	100 W	200 W	80 W
	Max. energy per braking sequence	350 Ws	600 Ws	100 Ws	130 Ws
24 VDC system supply voltage		PELV, DIN 19240, polarised			
	Input voltage range	20 to 30 V			
	Input ripple	< 2 V_{PP}			
	Input current without loading the outputs	< 2.5 A			
Digital signal inputs		polarised, no electrical isolation			
	Debounced	0.7 to 1.5 ms			
	DC voltage U_{high}	12 to 30 V (I ≥ 3 mA)			
	DC voltage U_{low}	≤ 5 V (I ≤ 0.5 mA)			
	Current	≤ 7 mA at 24 V			
Digital signal outputs		short-circuit proof			
	Inductive load capable	150 mH/11 W			
	DC voltage	≤ 30 V			
	Switching current	≤ 400 mA			
	Voltage drop at 400 mA	≤ 1 V			

		TLD 132	TLD 134	TLD 136	TLD 138
Analog signal input	Voltage range	+10 V to –10 V			
	Input resistance	5 kΩ			
	Solution	12 Bit			
Mass		2.7 kg	3.7 kg	6.6 kg	10.8 kg
Ambient conditions	Ambient temperature	0 to 50 °C			
	Transport and storage tempera-ture	–40 to +70 °C			
	Relative humidity	15 to 85 % no condensation permissible			
	Altitude, without power reduction	h < 1000 m above sea level			
	Protection type	IP 20			
Characteristic curves		see Catalogue of **Twin Line Motors**			



Dimensional drawing of power electronics for AC synchronous servomotors

	TLD 132	TLD 134	TLD 136	TLD 138
Width A	108 mm	128 mm	178 mm	248 mm
Height B	212.5 mm	212.5 mm	260 mm	260 mm
Depth C	184.5 mm	214.5 mm	244.5 mm	244.5 mm
Front width D	105.5 mm	125.5 mm	176 mm	246 mm
Fitting dimension E	63 mm	83 mm	130 mm	200 mm
Additional dimensions F	–	–	–	120 mm



Modules for positioning controller and power electronics

Micromodules

Twin Line Micromodules for application-specific configuration.

IOM-C

The analogous module receives and generates analogous and digital voltage values. The analogous outputs are user-adjustable. The module furnishes nominal values for control as analogous voltage values. Extension by one analogous I/Os and two digital I/Os.

RS 422-C

The RS 422-C encoder module detects encoder signals, which are input as A/B signals. It also detects and evaluates the index pulse. A typical application for this module is the "electronic gearing" function.

PULSE-C

The PULSE-C module captures positioning data as a pulse/direction signal or as a $\text{pulse}_{\text{forward}}$-/$\text{pulse}_{\text{back}}$-signal. A typical application is the "electronic gearing" function.

HIFA-C

The HIFA-C module captures the motor position of AC synchronous servomotors equipped with a SinCos® absolute-value encoder.

The rotor position in the motor is detected optically and transferred as analog and digital position data to the HIFA-C module. The module resolves the signals with 14-bit resolution, corresponding to 16384 pulses/revolution. The absolute-value encoder integrated in the motor can be either a Single Turn (standard) or Multi Turn encoder. Once the motor is switched on, the Multi Turn encoder has the absolute position within 4096 revolutions.

In addition to the motor position data, the motor parameter set (electronic motor type plate) is transferred from the SinCos® memory to the HIFA-C module via the integrated RS 485 interface.

SSI-C

The SSI-C passes the absolute position of the AC servomotor to a master axle assembly via a synchronous serial interface. The module sends the position data serially to the master position controller.

The data rate is phase-controlled by the master control system.

To capture the actual position, position capture signals are counted (socket M2). The transferred resolution is 4096 pulses/revolution.

ESIM1-C

The ESIM1-C module outputs the position data of the stepping motor or AC servomotor in the form of incremental signals on a 15-pole Sub-D socket. These are two signals whose phases are electrically shifted by 90 (A/B trails), as well as a displaceable index impulse with a fixed pulse duration. The transmitted solution can be set from 128 thr. 4096 increments per revolution.

ESIM2-C

The ESIM2-C module outputs the A/B signals and the index pulse parallel on a second socket.

See also ESIM1-C.

Technical data micromodules

Modules			
IOM-C	Digital signal inputs		polarity-secured, no galvanic insulation, damping time 0.7 ms - 1.5 ms
		DC voltage U_{high}	12 V - 30 V
		DC voltage U_{low}	< 5 V
		Current at 24 V	< 7 mA
	Digital signal outputs		inductively load-capable (50 mH), short-circuit-proof, polarity-secured
		DC voltage	12 V - 30 V
		reverse locking current	< 100µA
		switching current	< 50 mA
		voltage decay at 50 mA	
	Analog signal input	voltage range	–10 V thr. +10 V
		input resistance	50 k
		solution	10 Bit
	Analog signal output	voltage range	– 10 V thr. +10 V
		output current	max. 5 mA
		solution	12 Bit
RS 422-C	Inputs		RS 422 voltage compatible
		Input frequency	≤ 400 kHz
	Outputs	Supply of reference pressure transmitter	5 V ± 5 %, 300 mA max., sense-regulated, short-circuit proof, overload-proof
	Signal cable	Max. length	100 m
		Minimum cross section	0.5 mm^2 for supply voltage 5 VDC and 5 VGND; 0.25 mm^2 for other signals
PULSE-C	Inputs	Triggering device	symmetric RS 422, asymmetric 4.5 to 30 V, electrically connected to 24 VGND
		Input resistance	5 kΩ
		Input frequency, pulse signals	≤ 200 kHz
		Input frequency, enable	≤ 1 kHz
	Outputs		open collector, short-circuit proof
		Output voltage	≤ 30 V
		Output current	≤ 50 mA
	Signal cable	Max. length for a RS 422 connection	100 m
		Max. length for an open collector	10 m
		Minimum cross section of the signal leads	0.14 mm^2
SSI-C	Signal outputs		RS 422 voltage compatible, electrically connected to 24 VGND
	Frequency		53 kHz to 2 MHz, min. cycle time limited by monoflop time 20 µs ± 20 %
ESIM1-C	Signal outputs		RS 422 voltage compatible, electrically connected to 24 VGND
ESIM2-C	Signal outputs		RS 422 voltage compatible, electrically connected to 24 VGND, signals A,B,I are applied to both sockets in parallel

Type key TLD 13x

Example	TLD	1	3	X	F	X	HIFA	–	X

Device function — 1

1 = Power electronics, AC synchronous servomotor

Motor — 3

3 = AC synchronous servomotor

Rated power — X

2 = 750W
4 = 1500 W
6 = 3000 W
8 = 8000 W

Mains filter — F

F = with mains filter

M1 = Position set values — X

IOM = analogous module
PULSE = for electronic gearbox pulse/direction signal or $pulse_{forward}/pulse_{back}$ signal
RS422 = for electronic gearbox A/B signals
– = not equipped

M2 = Capture motor position — HIFA

HIFA = SinCos® encoder

M3 = Reserve — –

– = not equipped

M4 = Encoder simulation — X

ESIM1 = Encoder simulation, 1 signal connection, A/B signals
ESIM2 = Encoder simulation, 2 signal connections, A/B signals
SSI = Encoder signals via synchronous serial interface
– = not equipped

All catalog data current at time of printing.
Data may be modified based on later developments.

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Catalogue of Twin Line Accessories

Edition 11/2001

Twin Line Human Machine Interface

Twin Line Human Machine Interface (TL HMI)

The Twin Line Human Machine Interface (TL HMI) is a plug-in control unit for controlling, parameterisation and diagnosing devices of the Twin Line family.

Compatible with the following Twin Line devices:
– TLD xxx, except TLD 01x
– TLC xxx

The TL HMI has an LCD display consisting of 3 lines with 16 characters each, and is either inserted into the receptacle provided on the device or connected to the RS232 communications interface via a 10 m serial cable.

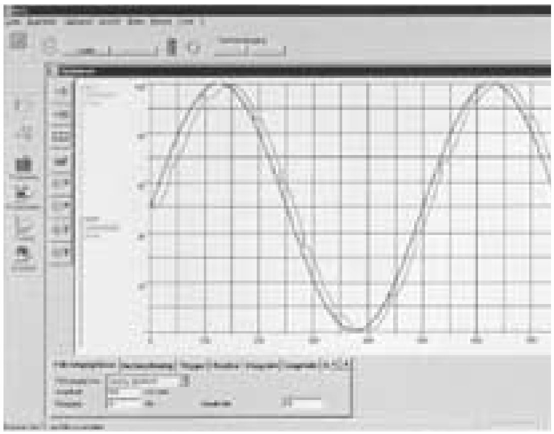
The TL HMI operates in 4 languages (G, GB, F, I) and comes with a brief operating manual.

You can use the TL HMI to
– call up information on motor status, operating mode and operating status
– check and modify parameter values
– diagnose errors
– move motors at the touch of a button
– adjust regulators
– copy device configurations to other devices

Description	Order number
TL HMI	625 011 01 503

Technical data

Height	Width	Depth	Voltage supply	Current consumption
72.5 mm	77 mm	32.5 mm	9 to 15 V	max. 100 mA



Twin Line Control Tool

Twin Line Control Tool (TL CT)

The Twin Line Control Tool (TL CT) control software works together with the Twin Line family of power electronics and positioning controllers.

The Twin Line Control Tool is used for speedy start-up and diagnostics and can be used straight "out of the box" with any Twin Line device with an RS232 interface.

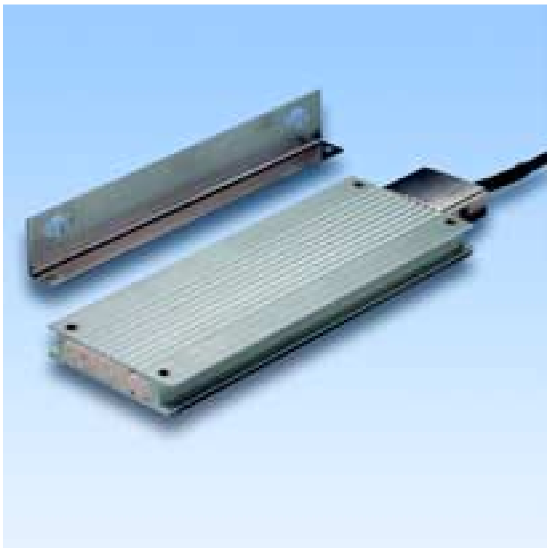
Compatible with the following Twin Line devices:
– TLD xxx, except TLD 01x
– TLC xxx

TL CT software functions:
– entry and display of device parameters
– archival and duplication of device data
– manual motor positioning via the PC
– recording, evaluation and archival of travel progressions
– offline and online processing of parameters and travel tasks
– optimisation of the regulators
– diagnosis of operating malfunctions
– start-up assistant for quickly starting a Twin Line device

Depending on the type of the connected device, a variety of additional functions are also available:
– programming travel tasks
– post-processing travel lists and travel sets
– reference runs

Description	Language	Order number
TL CT	D/GB/F/I	625 011 01 803

Twin Line Ballast Resistor Controller



Ballast resistor

Twin Line Ballast Resistor Controller (TL BRC)

The Twin Line Ballast Resistor Controller (TL BRC) activates an external ballast resistor when the intermediate-circuit connection of the power electronics reaches a high intermediate-circuit voltage.

Compatible with the following Twin Line devices:
- TLD x3x
- TLC x3x

Up to two Twin Line devices of the same power class may be connected to the TL BRC, automatically creating a parallel connection of the intermediate-circuit connections of both devices.

Description	Order number
TL BRC	625 011 01 706

Technical data

Height	Width	Depth
107 mm	104 mm	76 mm

Ballast resistor

The ballast resistor is a high-performance resistor with shielded cable (0.75 m) in IP 54 with mounting bracket.

It is suited for the following Twin Line devices in combination with TL BRC:
- TLD x3x
- TLC x3x

The ballast resistor is available either with 72 Ω or 150 Ω, each for a continuous power of 100 W (at 35 % ED 250 W) or 200 W (at 35 % ED 500 W). The surface temperature must not exceed 250 °C.

Description	Order number
Ballast resistor	590 601 00 XXX

Use the last three digits of the order number to specify the desired connection type from the table below.

Ballast resistor	XXX
BWG 250072 (100 W/72 Ω)	001
BWG 250150 (100 W/150 Ω)	002
BWG 500072 (200 W/72 Ω)	003
BWG 500150 (200 W/150 Ω)	004

Technical data

	Height	Width	Depth
BWG 250xxx	60 mm	110 mm	15 mm
BWG 500xxx	60 mm	216 mm	15 mm

Twin Line Holding Brake Controller

Twin Line Holding Brake Controller (TL HBC)

The Twin Line holding brake controller (TL HBC) amplifies the braking control signal of the Twin Line device, shortening the brake reaction time and generating the least amount of heat possible.

Depending on the motor type used, the rotary switch on the device allows you to select braking voltage reduction.

Compatible with the following Twin Line devices:
- TLD xxx, not required for TLD 01x
- TLC xxx

The TL HBC should always be used if the brake-triggering lines are integrated in the motor cable (power connections and control signal in one cable). The TL HBC ensures that, if there are ruptures in the cable insulation, the motor is safely isolated from the signal connections of the Twin Line device.

Description	Order number
TL HBC	625 011 01 606

Technical data

Height	Width	Depth
107 mm	104 mm	76 mm

Mains filter

Mains filter (1~, 115/230 VAC)

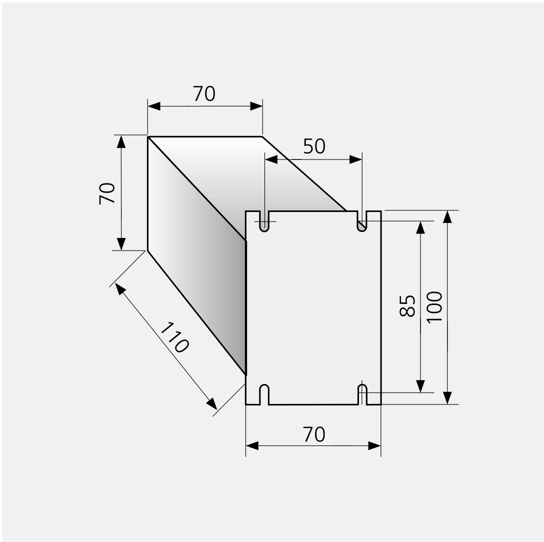
Mains filters are used between the mains and the control for interference suppression in accordance with EN 50081-2: 1993. The cable connection to the device should be as short as possible.

Compatible with the following Twin Line devices:
- TLD x11 and TLD x12 with 350 W or 750 W, without integrated mains filter
- TLC x11 and TLC x12 with 350 W or 750 W, without integrated mains filter

Description	Order number
Mains filter (350 W)	590 511 00 200
Mains filter (750 W)	625 011 01 900

Technical data

Connection data	Leakage current
U ~250 VAC/4 A	< 3.5 mA



Motor cable for 3-phase stepping motors

Motor cable for 3-phase stepping motors

The motor cable connects control units to 3-phase stepping motors. The holding brakes are connected via a separate cable. The brake is equipped with a separate connector (scope of supply see Catalogue of Motors, Optional Holding Brake).

Compatible with the following Twin Line devices:
- TLD x1x
- TLC x1x

Compatible with the following control units:
- WD3-004/008
- WDP3-014/018
- WDPM3-314

Motor-end of the cable has a 6-pin round connector, the device end is open.

Cable cross-section	Order number
3 x 1.5 mm^2 + 2 x 1 mm^2 shielded	625 013 17 XXX

Use the last three digits of the order number to specify the desired cable length from the table below.

Cable length	XXX
3 m	003
5 m	005
10 m	010
15 m	015
20 m	020
> 20 m	upon request

Pin assignment

Round connector, 6-pin, motor-end	Signal	Colour
1	U	brown
2	V	blue
3	W	black
–	–	red
–	–	grey
Earth	Protective conductor	(filler cord)

Motor cable design

Recommendation for 3-phase stepper motor:	Cable length	Cable cross-section
TLx x11, 3 A / 350 W / 1~	3, 5, 10, 15, 20 m	3 x 1.5 mm^2 + 2 x 1 mm^2
TLx x12, 7 A / 750 W / 1~	3, 5, 10, 15, 20 m	3 x 1.5 mm^2 + 2 x 1 mm^2

Note: The cross-section of the motor cable must correspond to that of the power cable. If this is not the case pre-set fuses may not be correctly triggered.

Rotary encoder cable for 3-phase stepping motors

Rotary encoder cable for 3-phase stepping motors

The rotary encoder cable connects the rotary encoder of a 3-phase stepping motor to control devices.

The motor temperature is additionally measured via the rotary encoder cable.

Cable cross-section	Type
5 x (2 x 0.25 mm^2) + 1 x (2 x 0.5 mm^2)	shielded

The motor-end of the rotary encoder cable has a 12-pin round encoder connector and the device end is fitted with a 15-pin connector SUB-D with lateral cable outlet.

Compatible with the following Twin Line devices:
- VRDM 3xx with encoder option
- TLx x1x with RM-C module

Description	Order number
Rotary encoder cable, connector with lateral cable outlet	625 014 40 XXX

Use the last three digits of the order number to specify the desired cable length from the table below.

The motor-end of the rotary encoder cable has a 12-pin round encoder connector and the device end is fitted with a 15-pin connector SUB-D.

Compatible with the following control units:
- WD3-004/008
- WDP3-014/018
- WDPM3-314

Description	Order number
Rotary encoder cable	625 014 04 XXX

Use the last three digits of the order number to specify the desired cable length from the table below.

Cable length	XXX
3 m	003
5 m	005
10 m	010
15 m	015
20 m	020
> 20 m	upon request

Pin assignment

SUB-D connector, 15-pin, on the device	Round socket, 12-pin, on the motor	Signal	Colour
1	1	A	white
2	8	5 VDC	red
3	7	5 VGND	blue
4	–	–	–
5	4	/B	yellow
6	6	/C, /I	pink
7	11	TEMP_MOT	grey/pink
8	–	–	–
9	2	/A	brown
10	10	+Sense	purple
11	9	–Sense	black
12	3	B	green
13	5	C, I	grey
14	–	–	–
15	–	–	–
Housing	Housing	Shielding	–

Motor cable for AC synchronous servomotors

Motor cable for AC synchronous servomotors

The motor cable connects Twin Line devices to AC synchronous servomotors. The holding brakes are also connected via the motor cable.

Compatible with the following servomotors:
– DSM 4 xx.x
– SER xxx

Motor-end of the cable has a 12-pin round connector, the device end is open..

Cable cross-section	Order number
3 x 1.5 mm^2 + 2 x 1 mm^2 shielded	625 013 22 XXX
3 x 2.5 mm^2 + 2 x 1 mm^2 shielded	625 013 19 XXX
3 x 4 mm^2 + 2 x 1 mm^2 shielded	625 013 20 XXX

Cable open at both ends, for motors with terminal boxes (e.g. DSM 4-19.X).

Cable cross-section	Order number
3 x 4 mm^2 + 2 x 1 mm^2 shielded	625 013 21 XXX

Use the last three digits of the order number to specify the desired cable length from the table below.

Cable length	XXX
3 m	003
5 m	005
10 m	010
15 m	015
20 m	020
> 20 m	upon request

Pin assignment

Round connector, 12-pin, on the motor	Signal	Colour
1	U	brown
2	Protective conductor	(filler cord)
3	W	black
4	V	blue
A	brake	red
B	brake	grey
C	–	–
D	–	–

Motor cable design

Recommendation for AC-synchronous servomotors with:	Cable length	Cable cross-section
TLx x32, 3 A / 750 W / 1~	3, 5, 10, 15, 20 m	3 x 1.5 mm^2 + 2 x 1 mm^2
TLx x34, 3 A / 1.5 kW / 3~	3, 5, 10 m 15, 20 m	3 x 1.5 mm^2 + 2 x 1 mm^2 3 x 2.5 mm^2 + 2 x 1 mm^2
TLx x36, 6 A / 3 kW / 3~	3 m 5, 10, 15, 20 m	3 x 1.5 mm^2 + 2 x 1 mm^2 3 x 2.5 mm^2 + 2 x 1 mm^2
TLx x38, 16 A / 8 kW / 3~	3, 5 m 10, 15, 20 m	3 x 2.5 mm^2 + 2 x 1 mm^2 3 x 4 mm^2 + 2 x 1 mm^2

Note: The cross-section of the motor cable must correspond to that of the power cable. If this is not the case pre-set fuses may not be correctly triggered.

Rotary encoder cable for AC synchronous servomotors

Rotary encoder cable for AC synchronous servomotors

The rotary encoder cable connects the rotary encoders of an AC synchronous servomotor to the Twin Line devices. The motor temperature is additionally measured via the rotary encoder cable.

Compatible with the following Twin Line devices:
– Resolver and TLx x3x with RESCO-C module
– SinCoder®and TLx x3x with HIFA-C module
– SinCos® and TLx x3x with HIFA-C module

Compatible with the following AC synchronous servomotors:
– DSM 4 xx.x
– SER xxx

The motor-end of the rotary encoder cable has a round, 12-pin encoder connector and the device-end is fitted with a 15-pin SUB-D connector with lateral cable outlet.

Description	Order number
Rotary encoder cable for AC synchronous servomotor	625 014 39 XXX

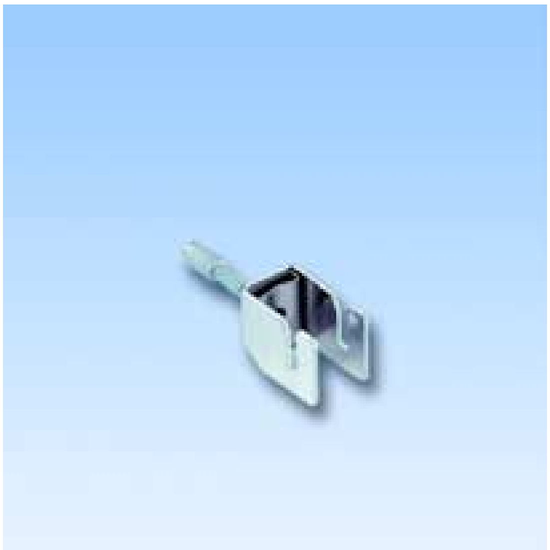
Use the last three digits of the order number to specify the desired cable length from the table below.

Cable length	XXX
3 m	003
5 m	005
10 m	010
15 m	015
20 m	020
> 20 m	upon request

Cable cross-section	Type
5 x (2 x 0.25 mm^2) + 1 x (2 x 0.5 mm^2)	shielded

Pin assignment

D-SUB connector, 15-pin, on the device	round socket, 12-pin on the motor	Signal	Colour
1	8	depending on rotary encoder	white
2	–		–
3	11		blue
4	10		red/blue
5	5		yellow
6	7		pink
7	2		grey/pink
8	–		–
9	4		brown
10	–		–
11	1		black
12	9		green
13	6		grey
14	–		–
15	–		–
Housing	Housing	Shielding	–



Shielding connection clip for Twin Line devices

Shielding connection clip for Twin Line devices

The shielding connection clip is a terminal for connecting the cable shielding of a Twin Line cable to a Twin Line device.

Compatible with the following Twin Line devices:
– TLD xxx
– TLC xxx

The shielding connection clip is equipped with an SK 14 knurled screw.

Description	Order number
Shielding connection clip	625 011 01 400

PC RS 232 interface cable

PC RS 232 interface cable

The PC RS 232 interface cable connects Twin Line devices to the (TL CT) Twin Line Control Tool via a PC.

Compatible with the following Twin Line devices:
– TLD xxx, not for TLD 01x
– TLC xxx

The cable is equipped with a 9-pin SUB-D connector for connection to the device and a 9-pin SUB-D socket for connection to the PC.

Description	Order number
PC RS 232 interface cable	625 014 41 XXX

Use the last three digits of the order number to specify the desired cable length from the table below.

Cable length	XXX
5 m	050
10 m	100

Pin assignment

SUB-D connector, 9-pin, device connection	SUB-D socket, 9-pin, PC connection	Signal	Colour
Pin 2	Pin 2	RxD	white
Pin 3	Pin 3	TxD	brown
Pin 5	Pin 5	GND	green
Housing	Housing	Shielding	–

RS 232 HMI interface cable

The RS 232 HMI interface cable connects Twin Line devices to the Twin Line Human Machine Interface (TL HMI).

Compatible with the following Twin Line devices:
– TLD xxx, not for TLD 01x
– TLC xxx

The cable is equipped with a 9-pin SUB-D connector for connection to the device and a 9-pin SUB-D socket for connection to the HMI.

Description	Order number
RS 232 HMI interface cable	625 014 42 XXX

Use the last three digits of the order number to specify the desired cable length from the table below.

Cable length	XXX
1.5 m	015
3 m	030
5 m	050
10 m	100

Pin assignment

SUB-D connector, 9-pin, device connection	SUB-D socket, 9-pin, HMI connection	Signal	Colour
Pin 2	Pin 2	RxD	white
Pin 3	Pin 3	TxD	brown
Pin 5	Pin 5	GND	green
Pin 9	Pin 9	VDD	yellow
Housing	Housing	Shielding	–

Analog signal cable

The analog signal cable connects Twin Line devices to a master control system, for example, if you are using a ±10 V signal as reference value.

Compatible with the following Twin Line devices:
– TLD x3x
– TLC x3x

Cable cross-section	Type
2 x 0.25 mm^2	shielded

Description	Order number
Analog signal cable	625 014 43 XXX

Use the last three digits of the order number to specify the desired cable length from the table below.

Cable length	XXX
0.5 m	005
1.5 m	015
3 m	030
5 m	050

Ballast cable

The ballast cable connects Twin Line devices to the Twin Line Ballast Resistor Controller (TL BRC).

Compatible with the following Twin Line devices:
– TLD x3x, not with TLD x1x
– TLD x3x, not for TLC x1x

Cable cross-section*	Type
2 x 2.5 mm^2	shielded
2 x 4 mm^2	shielded

*to be selected accordingly ≥ Mains cable cross-section

Description	Order number
Ballast cable (2 x 2.5 mm^2)	625 014 44 XXX
Ballast cable (2 x 4 mm^2)	625 014 45 XXX

Use the last three digits of the order number to specify the desired cable length from the table below.

Cable length	XXX
0.5 m	005
1.5 m	015
3 m	030
5 m	050


CAN cable


Connector plug for CAN cable

CAN cable

The CAN cable connects Twin Line with CAN modules among each other or connects the devices to a CAN master.

The cable is equipped with a 9-pin SUB-D connector and a 9-pin SUB-D socket.

Description	Order number
CAN cable	625 014 46 XXX

Use the last three digits of the order number to specify the desired cable length from the table below.

Cable length	XXX
0.5 m	005
1.5 m	015
3 m	030
5 m	050

Pin assignment

SUB-D connector, 9-pin	SUB-D socket, 9-pin	Signal	Colour
Pin 2	Pin 2	CAN-low	white
Pin 6	Pin 6	GND	green
Pin 7	Pin 7	CAN-high	brown
Housing	Housing	Shielding	–

Connector plug for CAN cable

The type of CAN connector plug required is determined by the output on your CAN module or CAN master. For example, if the CAN master has a plug (male) output, the CAN terminating connector needs to be a socket (female).

Description	Order number
Connector plug for CAN cable	625 015 18 XXX

Use the last three digits of the order number to specify the desired connection type from the table below.

Connection type	XXX
Socket	002
Connector	003

Pulse-C cable

Pulse-C cable

The Pulse-C cable connects Twin Line devices to the Pulse-C interface of a Berger Lahr controller.

The cable is equipped with 15-pin SUB-D connector for connection to both device and controller.

Description	Order number
Pulse-C cable	625 014 47 XXX

Use the last three digits of the order number to specify the desired cable length from the table below.

Cable length	XXX
0.5 m	005
1.5 m	015
3 m	030
5 m	050

Pin assignment

SUB-D connector, 15-pin, device connection	SUB-D connector, 15-pin, control connection	Signal	Colour
Pin 1	Pin 1	P, P_c	white
Pin 2	Pin 2	R, P_{cc}	green
Pin 3	Pin 3	+Enable	grey
Pin 4	Pin 4	–	blue
Pin 5	Pin 5	–	black
Pin 6	Pin 6	–	purple
Pin 7	Pin 7	GND	grey/pink
Pin 8	Pin 8	Active	red/blue
Pin 9	Pin 9	/P, /P_c	brown
Pin 10	Pin 10	/R, /P_{cc}	yellow
Pin 11	Pin 11	–Enable	pink
Pin 12	Pin 12	–	red
Pin 13	Pin 13	/Funct_out	white/ green
Pin 14	Pin 14	GND	brown/ green
Pin 15	Pin 15	GND	white/ yellow
Housing	Housing	Shielding	–

Pulse-C cable with open end

Pulse-C cable with open end

The Pulse-C cable with one open end connects the Pulse-C interface of a Twin Line device to any master control system.

The cable is equipped with a 15-pin SUB-D socket for connection to the device. The other end of the cable is open.

Description	Order number
Pulse-C cable with open end	625 014 52 XXX

Use the last three digits of the order number to specify the desired cable length from the table below.

Cable length	XXX
0.5 m	005
1.5 m	015
3 m	030
5 m	050

Pin assignment

SUB-D socket, 15-pin, device connection	Signal	Colour
Pin 1	P, P_c	white
Pin 2	R, P_{cc}	green
Pin 3	+Enable	grey
Pin 4	–	blue
Pin 5	–	black
Pin 6	–	purple
Pin 7	GND	grey/pink
Pin 8	Active	red/blue
Pin 9	/P, /P_c	brown
Pin 10	/R, /P_{cc}	yellow
Pin 11	–Enable	pink
Pin 12	–	red
Pin 13	/Funct_out	white/green
Pin 14	GND	brown/green
Pin 15	GND	white/yellow
Housing	Shielding	–

RS 422-C cable

RS 422-C cable

The RS 422-C cable connects Twin Line devices equipped with an RS 422-C module to an incremental encoder.

The cable is equipped with a 15-pin SUB-D connector for connection to the device. The cable emerges at an angle less than 90°. The encoder side of the cable is open.

Description	Order number
RS 422-C cable	625 014 48 XXX

Use the last three digits of the order number to specify the desired cable length from the table below.

Cable length	XXX
0.5 m	005
1.5 m	015
3 m	030
5 m	050

Pin assignment

SUB-D connector, 15-pin, device connection	Signal	Colour
Pin 1	A	white
Pin 2	5 VDC	red
Pin 3	5 VGND	blue
Pin 4	–	red/blue
Pin 5	/B	yellow
Pin 6	/I	pink
Pin 7	Temp_Mot	grey/pink
Pin 9	/A	brown
Pin 10	+Sense	purple
Pin 11	–Sense	black
Pin 12	B	green
Pin 13	I	grey
Housing	Shielding	–

ESIM-C-RS 422-C cable

ESIM-C-RS 422-C cable

The ESIM-C RS 422-C cable connects Twin Line devices equipped with an ESIM1-C module or ESIM2-C module to an RS 422-C interface of another Twin Line device as a sequential axis.

The cable is equipped with 15-pin SUB-D connector for connection to both the ESIM module and RS 422 interface. The cable emerges from the ESIM-side connector at the bottom, at an angle less than 90° and from the RS 422-side connector at an angle less than 90° at the top.

Description	Order number
ESIM-C-RS 422-C cable	625 014 53 XXX

Use the last three digits of the order number to specify the desired cable length from the table below.

Cable length	XXX
0.5 m	005
1.5 m	015
3 m	030
5 m	050

Pin assignment

SUB-D connector, 15-pin, ESIM connection	SUB-D connector, 15-pin, on RS 422 connection	Signal	Colour
Pin 1	Pin 1	A	white
Pin 2	Pin 2	5 VDC	red
Pin 3	Pin 3	5 VGND	blue
Pin 5	Pin 5	/B	yellow
Pin 6	Pin 6	/I	pink
Pin 7	Pin 7	Temp_Mot	grey/pink
Pin 9	Pin 9	/A	brown
Pin 10	Pin 10	+Sense	purple
Pin 11	Pin 11	–Sense	black
Pin 12	Pin 12	B	green
Pin 13	Pin 13	I	grey
Housing	Housing	Shielding	–

ESIM-C and SSI-C cables

The ESIM-C or SSI-C cable connects Twin Line devices equipped with an ESIM1-C module, ESIM2-C module or SSI-C module to a master position regulator, sequential axis or sequential device.

The cable is equipped with a 15-pin SUB-D connector on the device, from which the cable emerges at the bottom at an angle less than 90º. The other end of the cable is open.

Description	Order number
ESIM-C and SSI-C cable	625 014 49 XXX

Use the last three digits of the order number to specify the desired cable length from the table below.

Cable length	XXX
0.5 m	005
1.5 m	015
3 m	030
5 m	050

Pin assignment

SUB-D connector, 15-pin, device connection	Signal	Colour
Pin 1	depending on interface	white
Pin 2		red
Pin 3		blue
Pin 4		red/blue
Pin 5		yellow
Pin 6		pink
Pin 7		grey/pink
Pin 9		brown
Pin 10		purple
Pin 11		black
Pin 12		green
Pin 13		grey
Housing	Shielding	–

IBS-C cable

The IBS-C cable connects Twin Line devices with IBS-C modules among each other or connects them to an INTERBUS-S master.

The cable is equipped with a 9-pin SUB-D connector and a 9-pin SUB-D socket.

Description	Order number
IBS-C cable	625 014 51 XXX

Use the last three digits of the order number to specify the desired cable length from the table below.

Cable length	XXX
0.5 m	005
1.5 m	015
3 m	030
5 m	050

Pin assignment

SUB-D connector, 9-pin	SUB-D socket, 9-pin	Signal	Colour
Pin 1	Pin 1	TPDO	white
Pin 2	Pin 2	TPDI	green
Pin 3	Pin 3	GND	blue
Pin 4	Pin 4	–	–
Pin 5 (bridge to Pin 9)	Pin 5	5 VDC	black
Pin 6	Pin 6	/TPDO	brown
Pin 7	Pin 7	/TPDI	yellow
Pin 8	Pin 8	–	–
Pin 9 (bridge to Pin 5)	Pin 9	RBST	pink
Housing	Housing	Shielding	–

Connector plug set for module sockets M1 and M2 of a Twin Line device

Connector plug set for customer-supplied cables for a Twin Line device.

Compatible with the following Twin Line devices:
- TLD 01x

The connector plug set includes the SUB-D mating connectors, hoods and screws necessary for module sockets M1 and M2.

Description	Order number
Connector plug set for module sockets M1 and M2	625 015 19 001

Connector plug set for module sockets M1, M2, M3 and M4 of a Twin Line device

Connector plug set for customer-supplied cables for a Twin Line device.

Compatible with the following Twin Line devices:
- TLD x3x, not for TLD 01x
- TLC xxx

The connector plug set includes the required SUB-D mating connectors, hoods and screws necessary for module sockets M1 through M4 as well as the RS 232 interface.

Description	Order number
Connector plug set for module sockets M1, M2, M3 and M4	625 015 19 002

Documentation

Documentation on CD-ROM

Documentation	Language	Order number
Twin Line documentation CD-ROM	D/GB/F/I	984 411 13 138

Documentation manuals

Documentation for	Language	Order number
Twin Line Control Tool TL CT	D	984 411 13 095
	GB	984 411 13 096
	F	984 411 13 105
	I	984 411 13 106
Twin Line Drive TLD 01x	D	984 411 13 101
	GB	984 411 13 102
	F	984 411 13 103
	I	984 411 13 104
Twin Line Drive TLD 13x	D	984 411 13 097
	GB	984 411 13 098
	F	984 411 13 099
	I	984 411 13 100
Twin Line Controller TLC 51x	D	984 411 13 118
	GB	984 411 13 117
	F	984 411 13 119
	I	984 411 13 120
Twin Line Controller TLC 53x	D	984 411 13 110
	GB	984 411 13 111
	F	984 411 13 112
	I	984 411 13 114
Profibus-DP PB-DP	D	984 411 13 126
	GB	984 411 13 125
	F	984 411 13 127
	I	984 411 13 128
CAN Berger Lahr extruded section	D	984 411 13 122
	GB	984 411 13 121
	F	984 411 13 123
	I	984 411 13 124
CAN CANopen, DS-402 extruded section	D	984 411 13 140
	GB	984 411 13 141
	F	984 411 13 142
	I	984 411 13 143
Interbus-S IBS	D	984 411 13 131
	GB	984 411 13 130
	F	984 411 13 132
	I	984 411 13 133
RS 485 interface RS485	D	984 411 13 135
	GB	984 411 13 134
	F	984 411 13 136
	I	984 411 13 137
Twin Line Human Machine Interface TL HMI	D/GB/F/I	984 411 13 091

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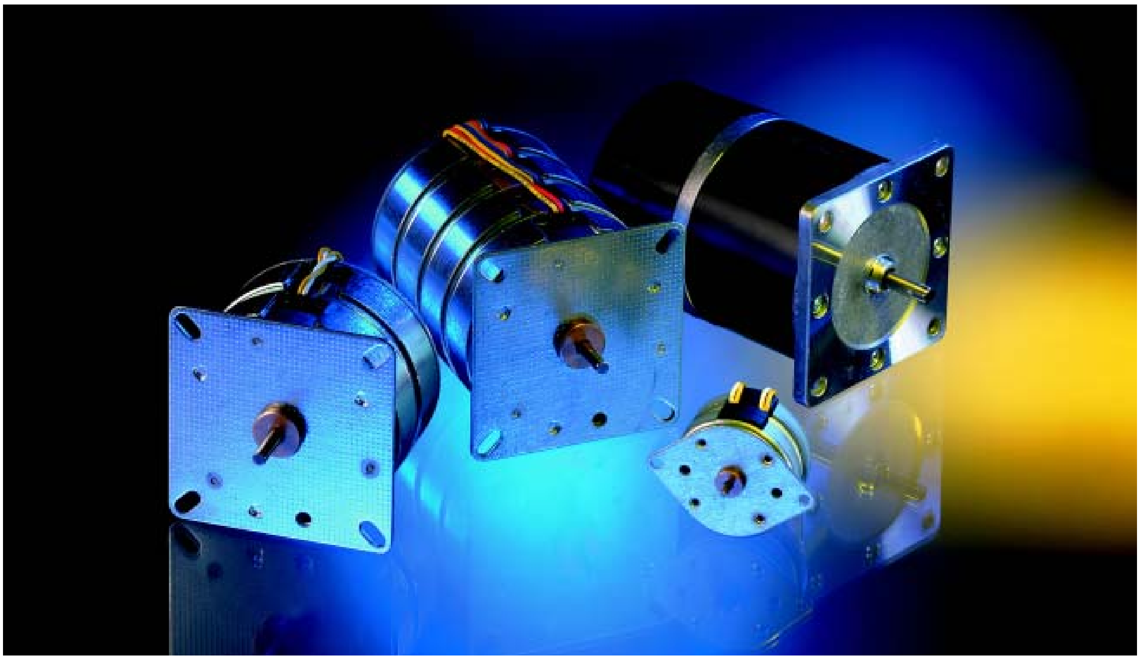


Synchronous motors

Synchronous motors from Berger Lahr are robust and work with great precision. The motors can be operated on a 50 Hz or 60 Hz AC mains without any additional control electronics. In our well-matched range you will find the right motor to meet any requirement. Synchronous motors from Berger Lahr are small, strong and good value for money. We will be happy to tell you of further motor and gearbox options on request.

Overview of synchronous motors

	Speed [r.p.m.]		Torque [Ncm]		Described on ...
	50 Hz	60 Hz	50 Hz	60 Hz	
RSM 36/6 F	500	600	0.95	0.91	Page 77
RSM 36/8 F	375	450	0.77	0.72	Page 79
RSM 36/10 F	300	360	0.76	0.73	Page 81
RSM 36/12 F	250	300	0.75	0.74	Page 83
RSM 42/6 N	500	600	3.26	3.17	Page 85
RSM 42/8 F	375	450	3.08	2.91	Page 87
RSM 42/12 N	250	300	3.17	2.91	Page 89
RSM 51/6 F	500	600	3.8	3.25	Page 91
RSM 51/8 F	375	450	4	3.75	Page 93
RSM 51/12 F	250	300	5	4.4	Page 95
RSM 63/8 F	375	450	13	11.7	Page 97
RSM 63/10 F	300	360	13.2	10	Page 99
RSM 63/12 F	250	300	13.5	10.4	Page 101
RSM 828/3 F	1000	1200	8.4	7.8	Page 103
RSM 842/3 F	1000	1200	9.6	9	Page 105
RSM 856/3 F	1000	1200	13.2	12.6	Page 107
RSM 884/3 F	1000	1200	18.1	15.3	Page 109
RSM 884/3 S	1000	1200	33	31	Page 111

Synchronous motors

Type code for Synchronous motors

Example	**RSM 36/12 NdG 230V 50Hz - G 10:1**
Product family RSM= Reversible Synchronous Motor	**RSM** 36/12 NdG 230V 50Hz - G 10:1
Motor size (diameter) Example 36 = 36 mm diameter 42 = 42 mm diameter 51 = 51 mm diameter 63 = 63 mm diameter	RSM **36**/12 NdG 230V 50Hz - G 10:1
Number of pole pairs 6= number of pole pairs p = 6 8= number of pole pairs p = 8 10 = number of pole pairs p = 10 12= number of pole pairs p = 12	RSM 36/**12** NdG 230V 50Hz - G 10:1
Winding Layout N = Standard layout F = Frequency layout S = Special layout	RSM 36/12 **N**dG 230V 50Hz - G 10:1
Operating Capacitor d = without operating capacitor a = with operating capacitor	RSM 36/12 N**d**G 230V 50Hz - G 10:1
Bearings G = Plain bearing	RSM 36/12 Nd**G** 230V 50Hz - G 10:1
Voltage rating 024V = 24 VAC, 042V = 42 VAC 110V = 110 VAC, 230V = 230 VAC	RSM 36/12 NdG **230V** 50Hz - G 10:1
Frequency 50 Hz 60 Hz	RSM 36/12 NdG 230V **50Hz** - G 10:1
Gearbox type Gearbox type L Gearbox type T Gearbox type G Gearbox type P	RSM 36/12 NdG 230V 50Hz - **G** 10:1
Gearbox reduction Example 10 :1	RSM 36/12 NdG 230V 50Hz - G **10:1**

General technical information

Bearing designs

Synchronous motors constructed on the claw-pole principle, RSM 36/x, 42/x, 51/x and 63/x, are fitted with plain bearings, the packaged synchronous motors RSM 8xx with ball bearings.

Temperatures

The permissible ambient temperature for the synchronous motors lies in the range from -20°C to +60°C. In locations with poor heat dissipation, e.g. in closed plastic housings, a check should be made to see if the permissible winding temperature is being exceeded.

Type of connection

The synchronous motors are available with flying leads. The flying leads are hard-wired, bared, tin-plated and 200 mm in length. Packaged synchronous motors are available with terminal boxes as standard.

Voltages

Synchronous motors are available depending on the type for rated voltages of 24, 42, 110 and 230 VAC.

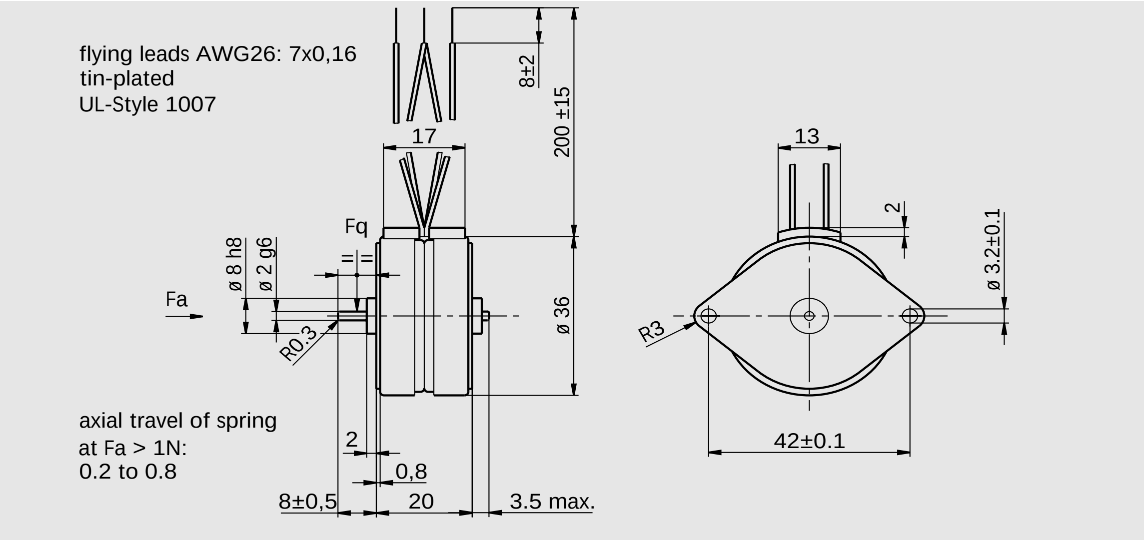
Windings

With the exception of the motors with S windings, the synchronous motors are made to VDE 0530 in operating mode S1 (continuous operation).

- Normal design N: Motors of this design have different capacitance values for 50 Hz and 60 Hz at the same operating voltage.
- Frequency design F: The same operating capacitors are used for 50 Hz and 60 Hz at the same operating voltage.

Operating capacitors for all rated voltages are available as an option. For all RSM 36 units an external device (capacitor or resistor) is required for the 230 V version. These are also available as an option.

Synchronous motors
RSM 36/6 F



Scale drawing RSM 36/6

Technical Data

	Frequency	
	50 Hz	**60 Hz**
Speed	500 rpm	600 rpm
Synchronous torque	0.95 Ncm	0.91 Ncm
Delivery of power	0.5 W	0.57 W
Power consumption	1.96 W	2.1 W
Rated current (110 V) with external device in series RV or CV for 230 V	17.8 mA	19.1 mA
Operating capacitor	0.25 µF	0.25 µF
Maximum externally permitted mass moment of inertia	13.5 gcm^2	8.3 gcm^2
Self-holding torque, type	0.25 Ncm	0.25 Ncm
Excess winding temperature	38 K	40 K
Permitted radial stress F_q	3 N	3 N
Permitted axial stress F_a	1 N	1 N
Weight	0.09 kg	0.09 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

Rated voltage	**230 V***		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	0.25 µF	0.25 µF	1.8 µF	1.8 µF	6.8 µF	6.8 µF
Rated current	17.8 mA	19.1 mA	44.3 mA	47.5 mA	87.9 mA	94.3 mA

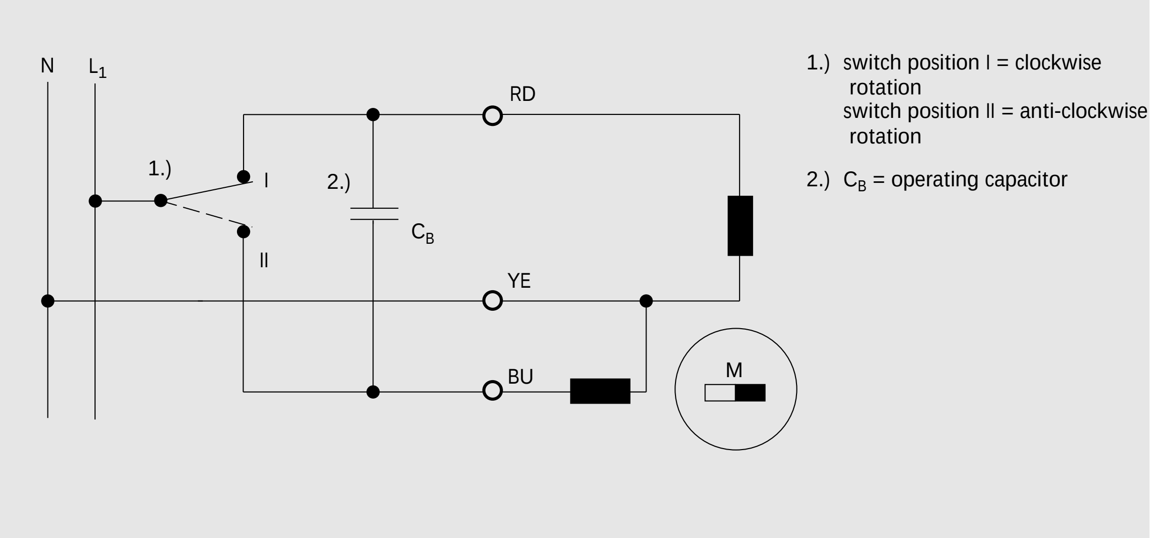
* External series devices R_V 5.6 kΩ, 3W or C_V 0.3µF, 220V~ necessary

Gearbox combinations

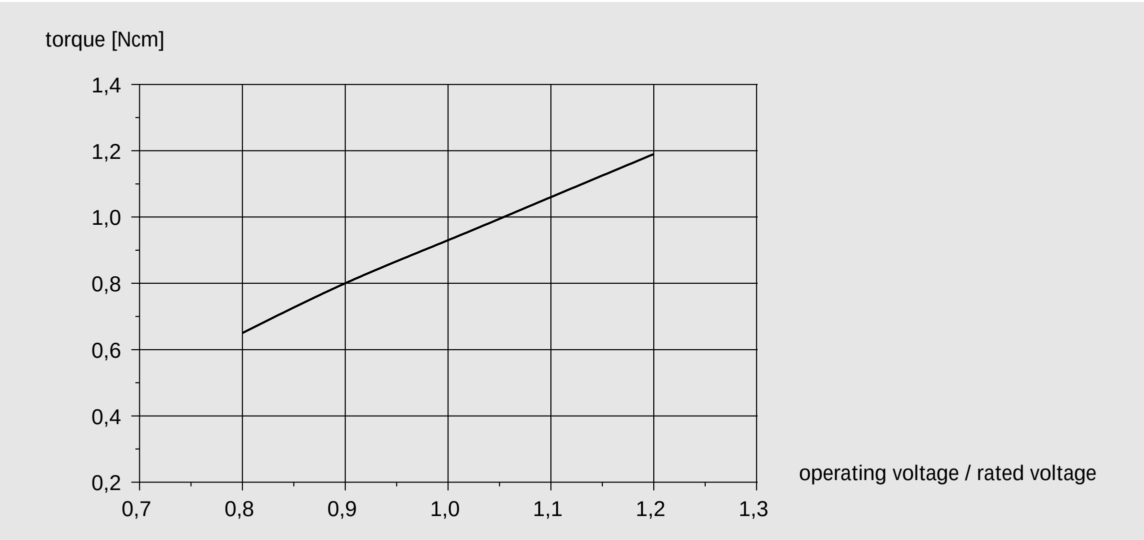
You will find gearbox combinations from page 113.

Synchronous motors

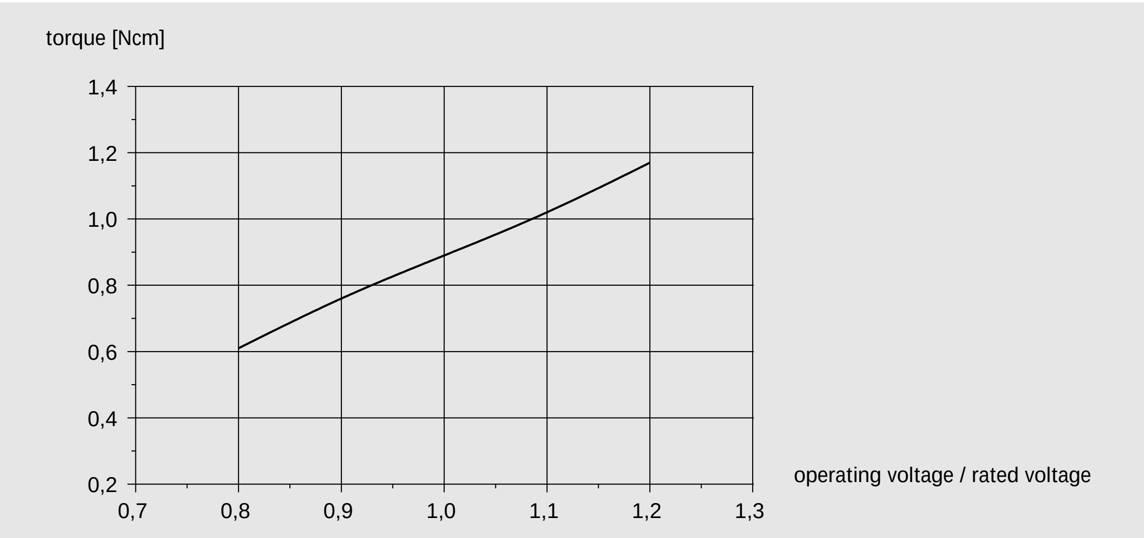
RSM 36/6 F



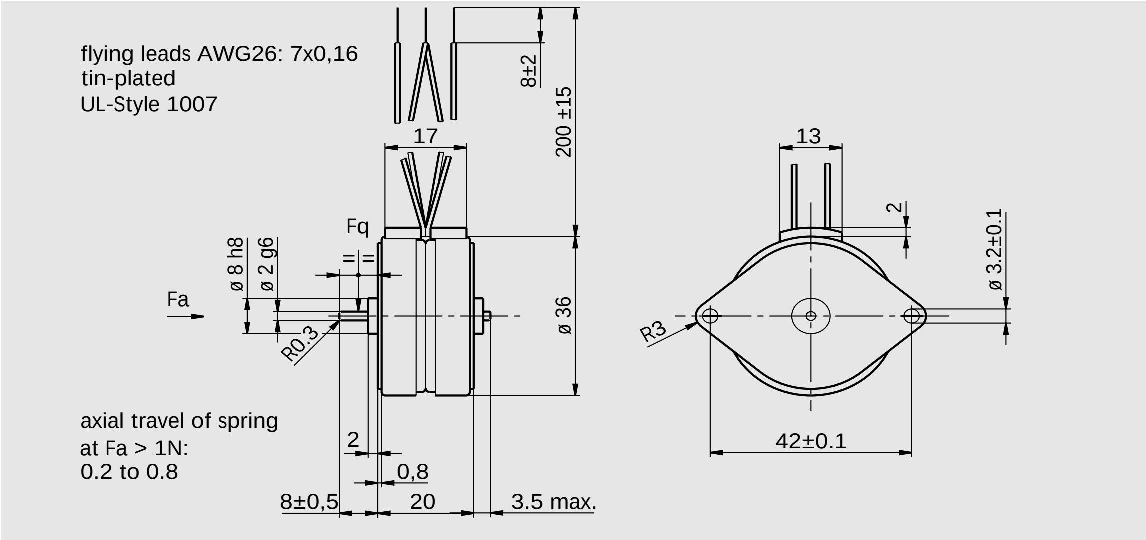
Connections RSM 36/6



Characteristic curve RSM 36/6 at 50 Hz



Characteristic curve RSM 36/6 at 60 Hz



Scale drawing RSM 36/8

Technical Data

	Frequency	
	50 Hz	**60 Hz**
Speed	375 rpm	450 rpm
Synchronous torque	0.77 Ncm	0.72 Ncm
Delivery of power	0.3 W	0.34 W
Power consumption	1.1 W	1.2 W
Rated current (110 V) with external device in series RV or CV for 230 V	10 mA	10.6 mA
Operating capacitor	0.15 µF	0.15 µF
Maximum externally permitted mass moment of inertia	25.5 gcm^2	8.8 gcm^2
Self-holding torque, type	0.2 Ncm	0.2 Ncm
Excess winding temperature	20 K	27 K
Permitted radial stress F_q	3 N	3 N
Permitted axial stress F_a	1 N	1 N
Weight	0.09 kg	0.09 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

Rated voltage	**230 V***		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	0.15 µF	0.15 µF	1 µF	1 µF	3 µF	3 µF
Rated current	10 mA	10.6 mA	22.5 mA	23.9 mA	45.2 mA	47.9 mA

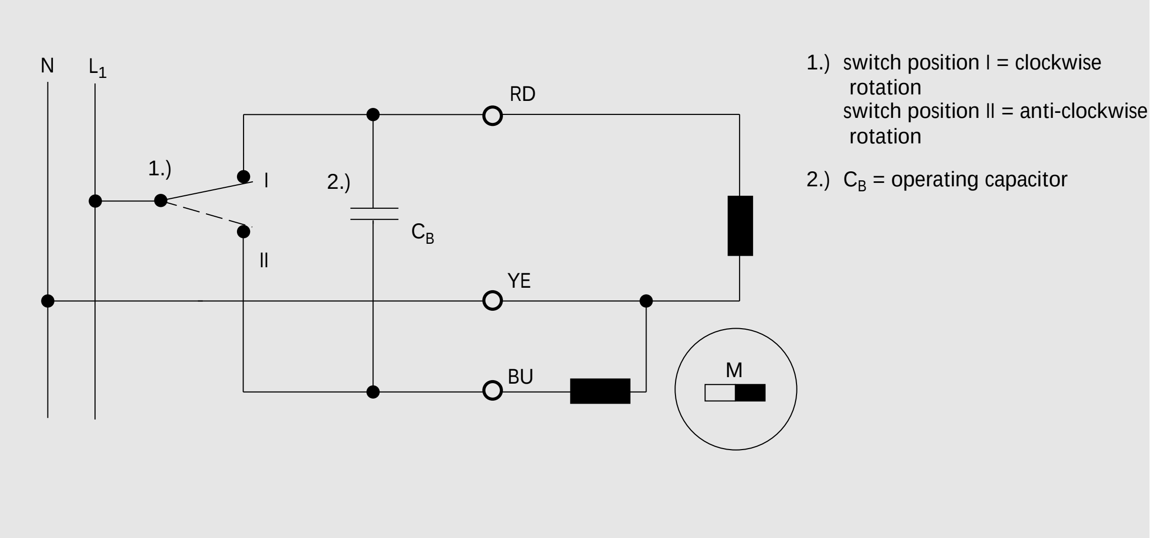
* External series devices R_V 10 kΩ, 1.5 W or C_V 0.15 µF, 220V~ necessary

Gearbox combinations

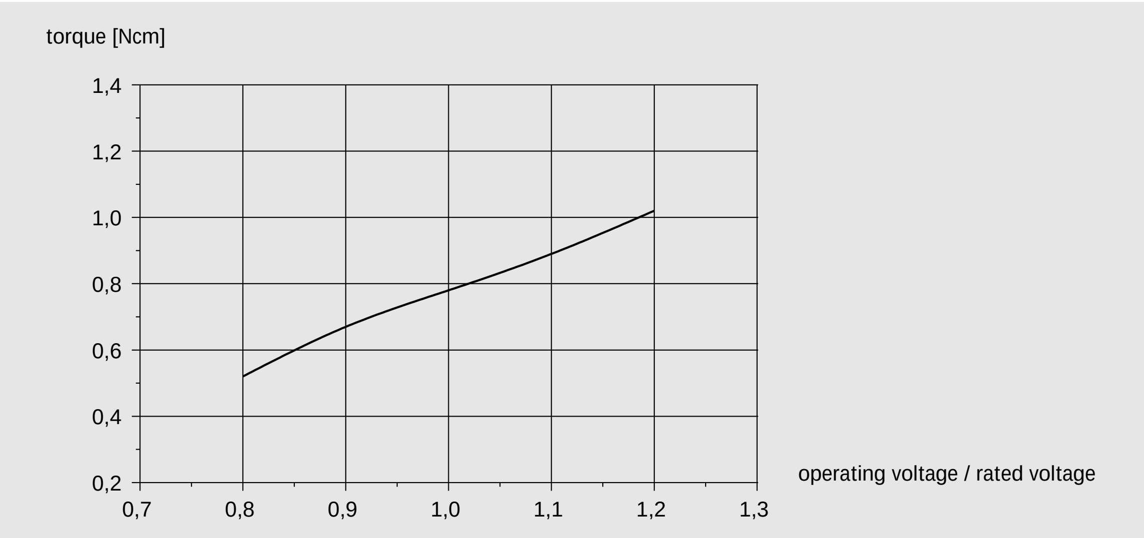
You will find gearbox combinations from page 113.

Synchronous motors

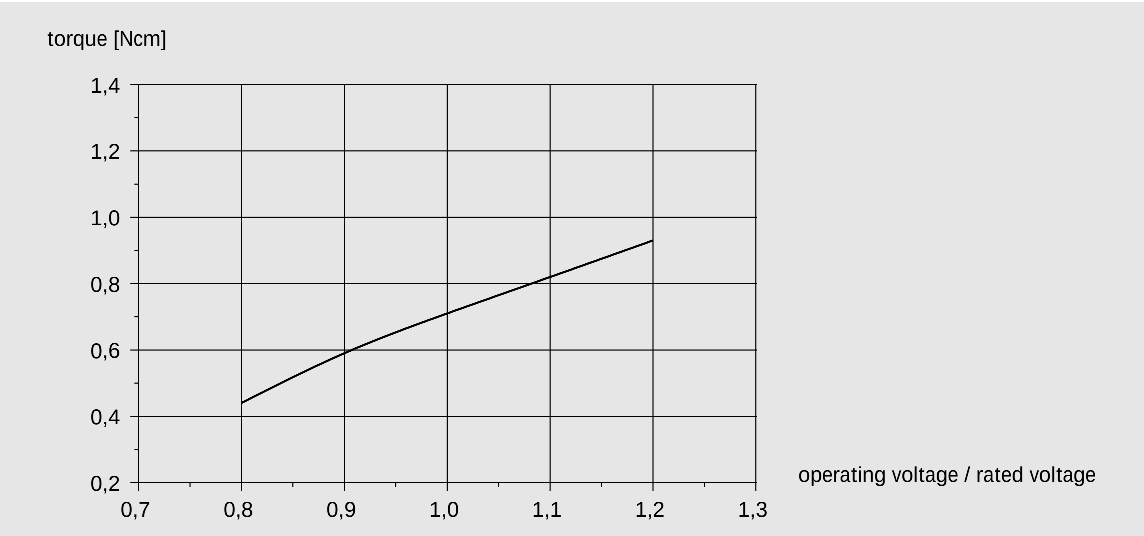
RSM 36/8 F



Connections RSM 36/8

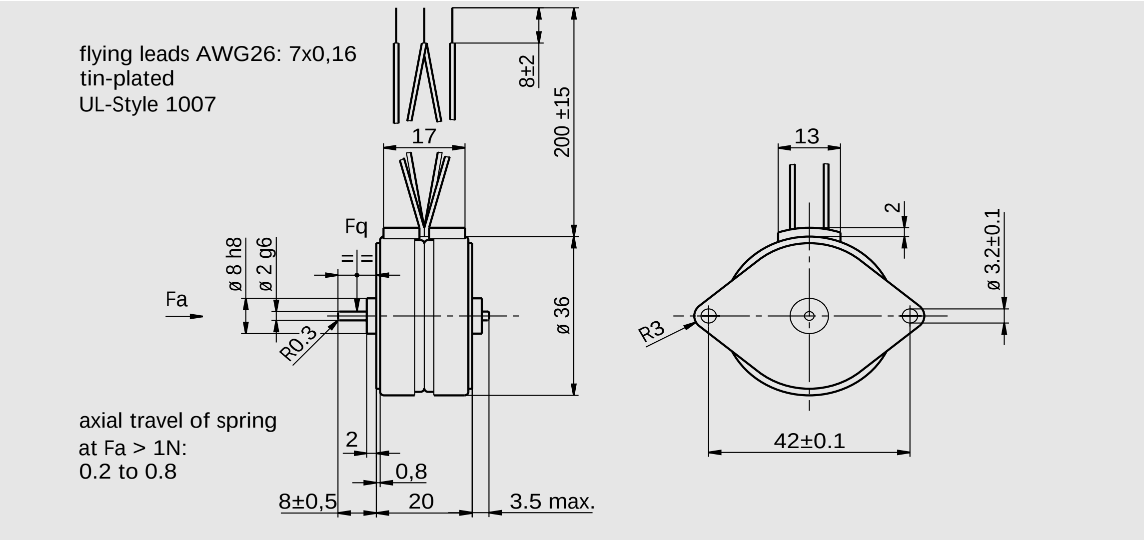


Characteristic curve RSM 36/8 at 50 Hz



Characteristic curve RSM 36/8 at 60 Hz

Synchronous motors
RSM 36/10 F



Scale drawing RSM 36/10

Technical Data

	Frequency	
	50 Hz	**60 Hz**
Speed	300 rpm	360 rpm
Synchronous torque	0.76 Ncm	0.73 Ncm
Delivery of power	0.24 W	0.28 W
Power consumption	1.05 W	1.1 W
Rated current (110 V) with external device in series RV or CV for 230 V	9.5 mA	10.2 mA
Operating capacitor	0.135 µF	0.135 µF
Maximum externally permitted mass moment of inertia	13.8 gcm^2	10 gcm^2
Self-holding torque, type	0.18 Ncm	0.18 Ncm
Excess winding temperature	22 K	29 K
Permitted radial stress F_q	3 N	3 N
Permitted axial stress F_a	1 N	1 N
Weight	0.09 kg	0.09 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

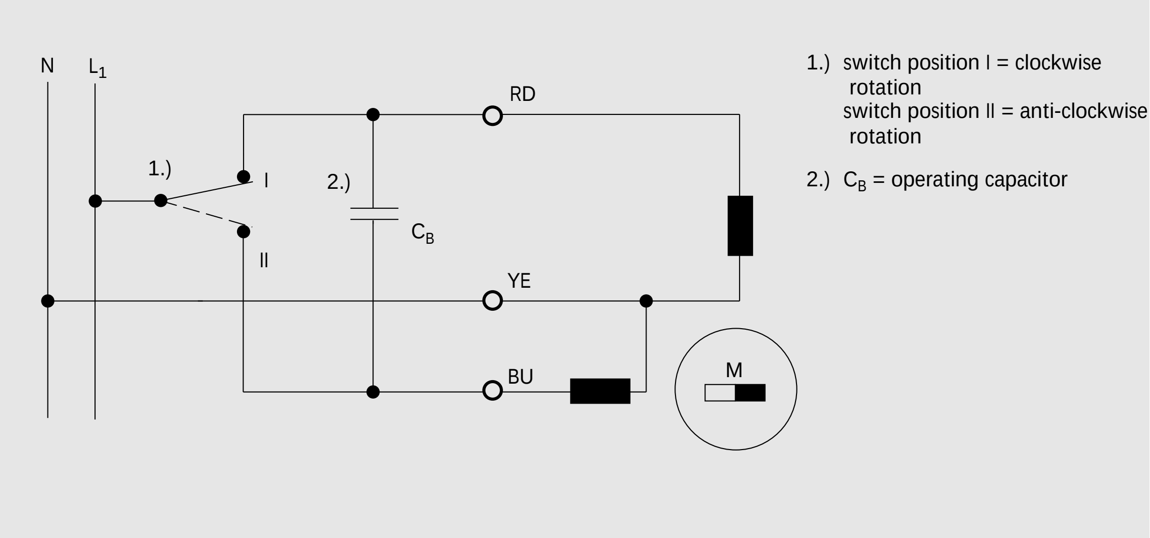
Rated voltage	**230 V***		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	0.135 µF	0.135 µF	0.68 µF	0.68 µF	2.2 µF	2.2 µF
Rated current	9.5 mA	10.2 mA	21.4 mA	23 mA	38 mA	40.8 mA

* External series devices R_V 15 kΩ, 1.5 W oder C_V 0.15 µF, 220V~ notwendig

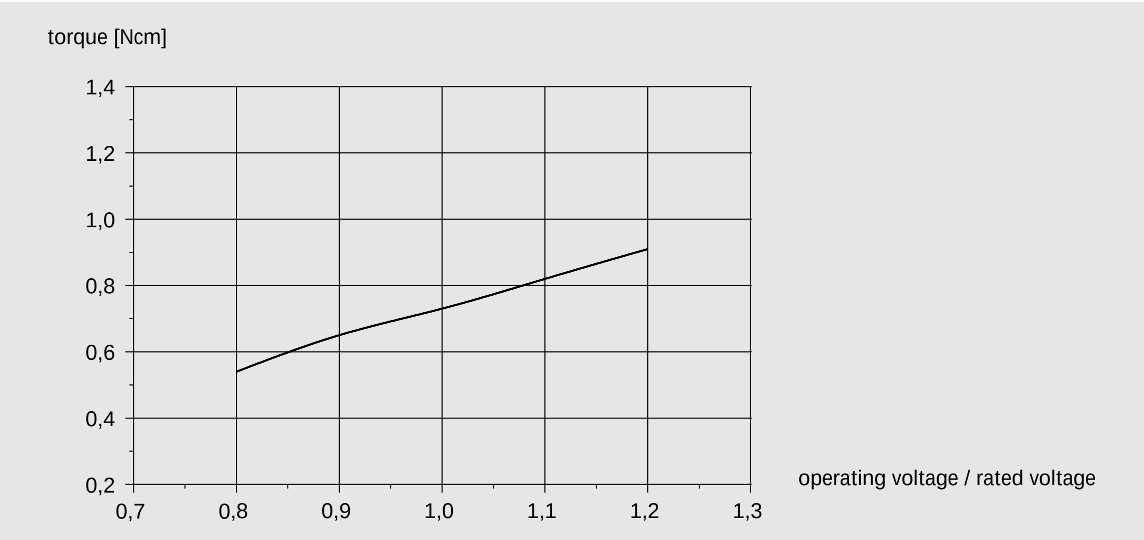
Gearbox combinations

You will find gearbox combinations from page 113.

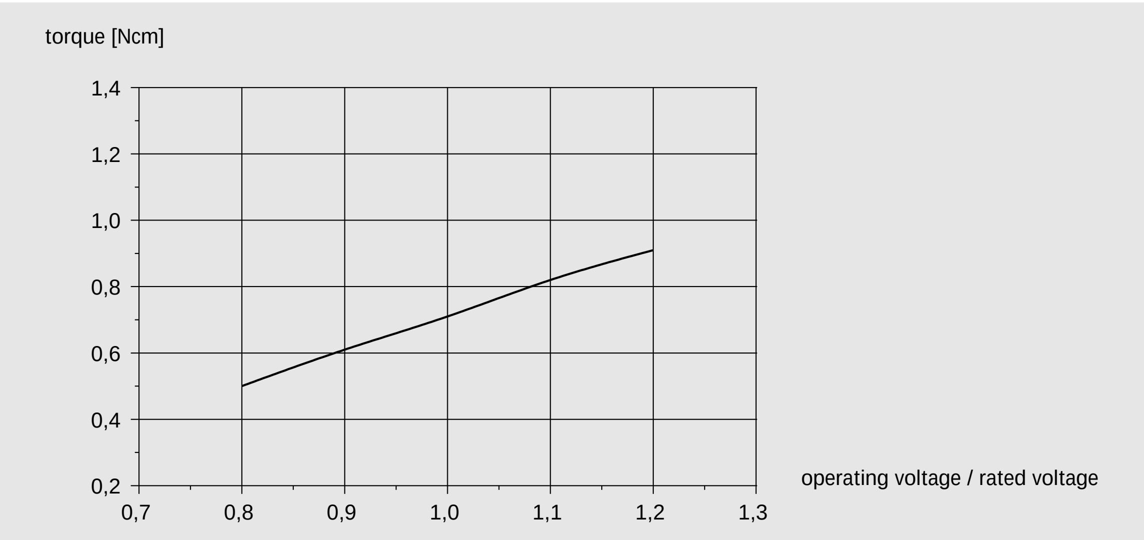
RSM 36/10 F



Connections RSM 36/10

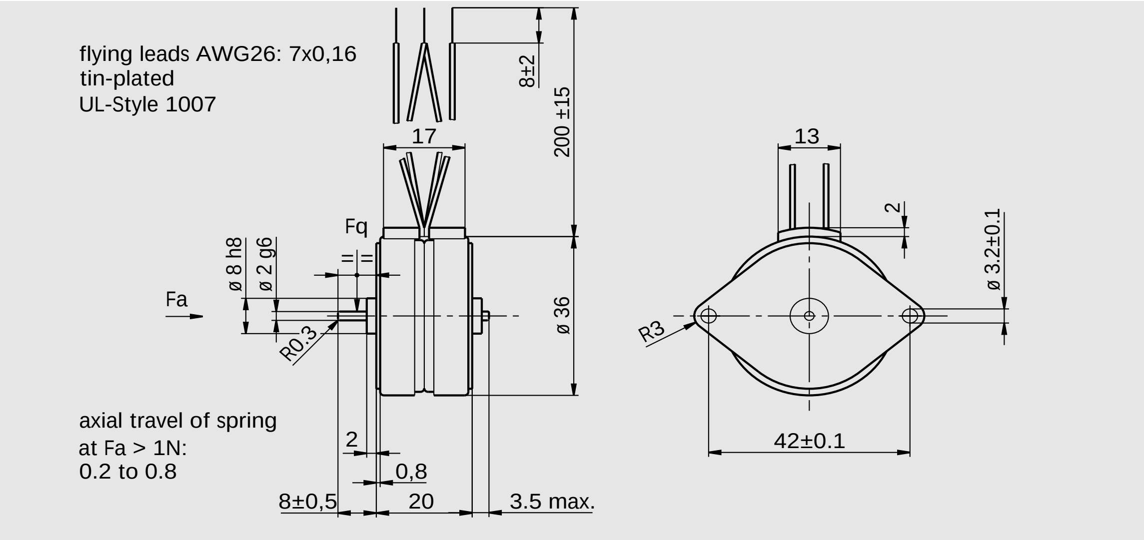


Characteristic curve RSM 36/10 at 50 Hz



Characteristic curve RSM 36/10 at 60 Hz

Synchronmotoren
RSM 36/12 F



Scale drawing RSM 36/12

Technical Data

	Frequency	
	50 Hz	**60 Hz**
Speed	250 rpm	300 rpm
Synchronous torque	0.75 Ncm	0.74 Ncm
Delivery of power	0.2 W	0.23 W
Power consumption	1.17 W	1.28 W
Rated current (110 V) with external device in series RV or CV for 230 V	10.6 mA	11.6 mA
Operating capacitor	0.15 µF	0.15 µF
Maximum externally permitted mass moment of inertia	13.8 gcm^2	12.5 gcm^2
Self-holding torque, type	0.1 Ncm	0.1 Ncm
Excess winding temperature	25 K	32 K
Permitted radial stress F_q	3 N	3 N
Permitted axial stress F_a	1 N	1 N
Weight	0.09 kg	0.09 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

Rated voltage	**230 V***		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	0.15 µF	0.15 µF	1 µF	1 µF	3 µF	3 µF
Rated current	10.6 mA	11.6 mA	26.3 mA	28.8 mA	47.9 mA	52.4 mA

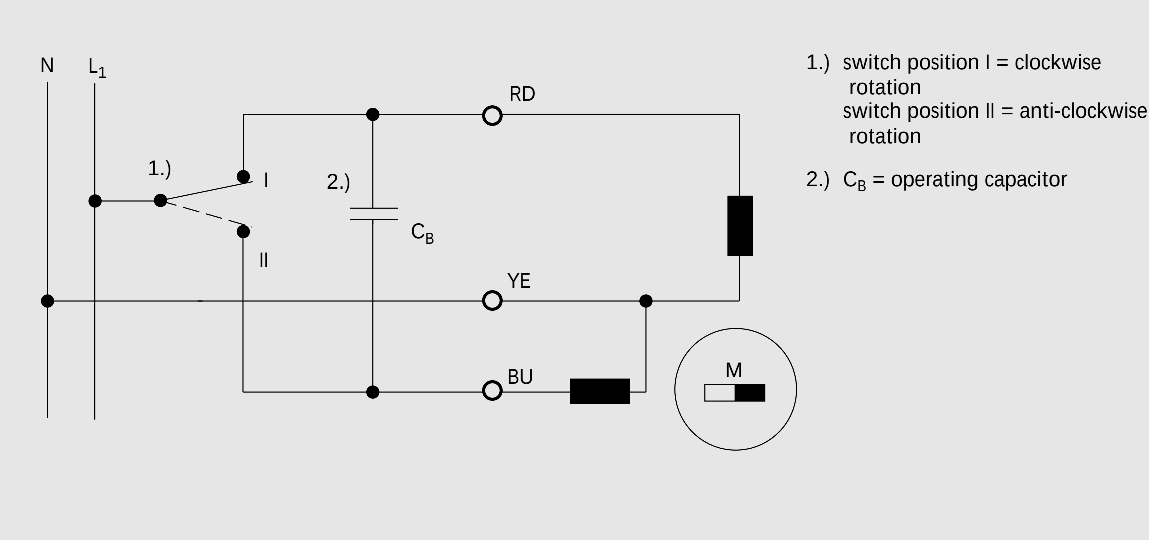
* External series devices R_V 10 kΩ, 1.5 W or C_V 0.15 µF, 250V~ necessary !

Gearbox combinations

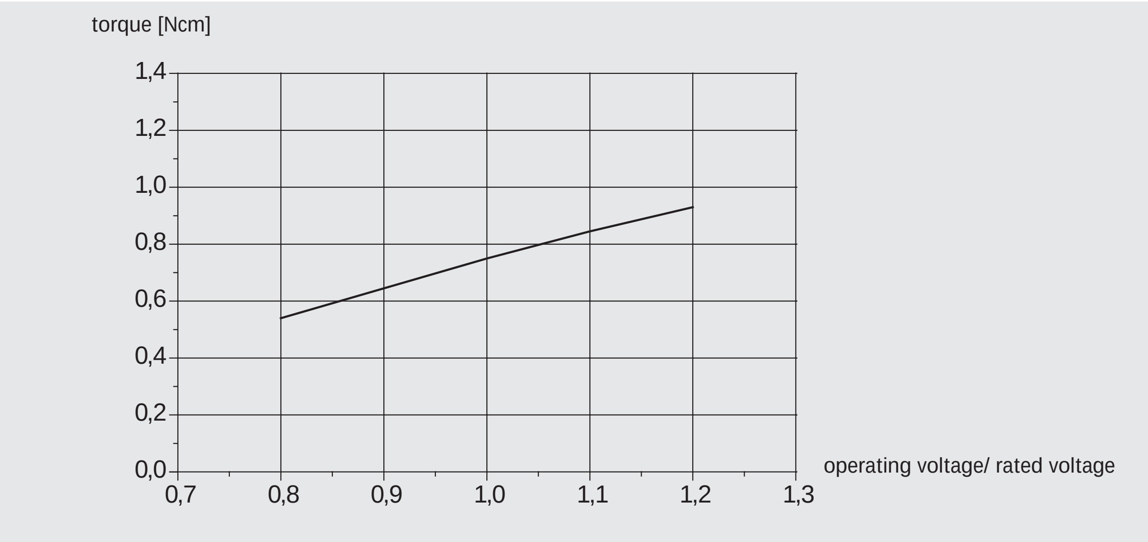
You will find gearbox combinations from page 113.

Synchronous motors

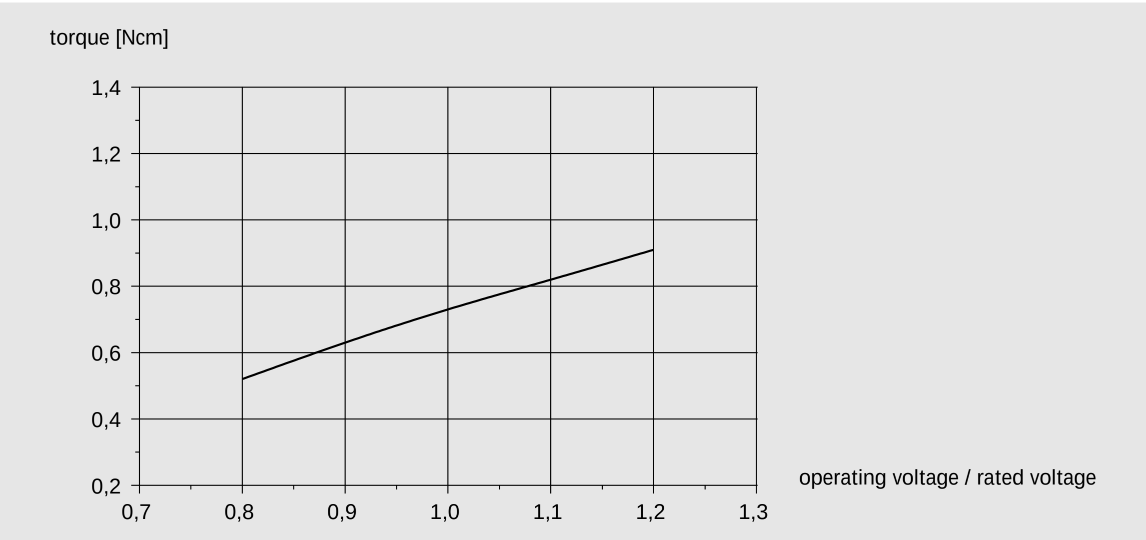
RSM 36/12 F



Connections RSM 36/12

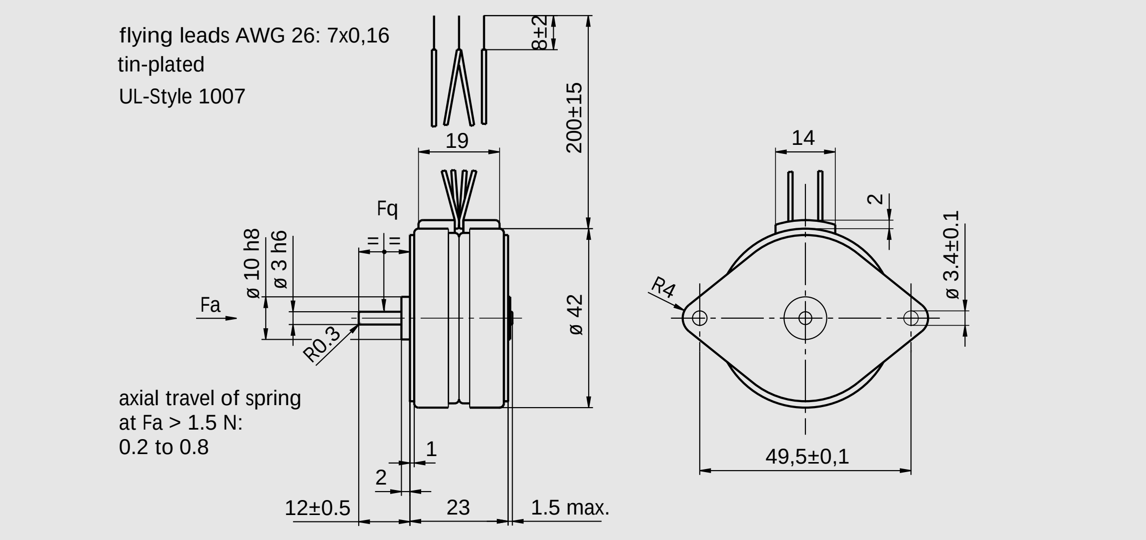


Characteristic curve RSM 36/12 at 50 Hz



Characteristic curve RSM 36/12 at 60 Hz

Synchronous motors
RSM 42/6 N



Scale drawing RSM 42/6

Technical Data

	Frequency	
	50 Hz	**60 Hz**
Speed	500rpm	600 rpm
Synchronous torque	3.41 Ncm	3.17 Ncm
Delivery of power	1.78 W	1.99 W
Power consumption	5.9 W	5.78 W
Rated current (230 V)	25.3 mA	24.6 mA
Operating capacitor	0.18 μF	0.15 μF
Maximum externally permitted mass moment of inertia	31 gcm^2	25 gcm^2
Self-holding torque, type	0.55 Ncm	0.55 Ncm
Excess winding temperature	74 K	72 K
Permitted radial stress F_q	5 N	5 N
Permitted axial stress F_a	1.5 N	1.5 N
Weight	0.15 kg	0.15 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

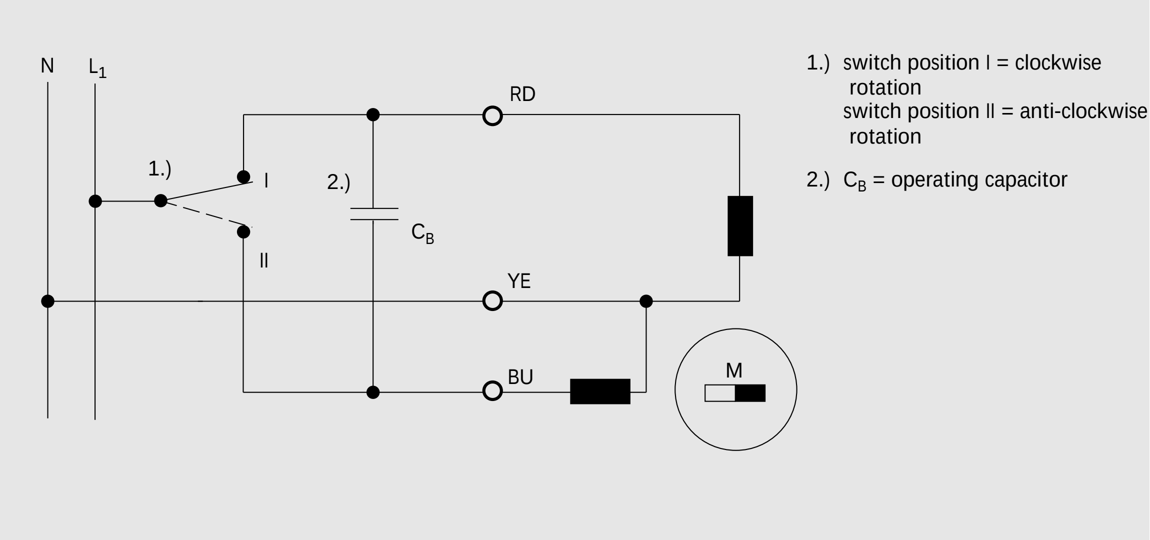
Rated voltage	**110 V**		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	0.68 μF	0.56 μF	5.6 μF	4.7 μF	14 μF	12 μF
Rated current	51.0 mA	49.6 mA	140 mA	137 mA	210 mA	221 mA

Gearbox combinations

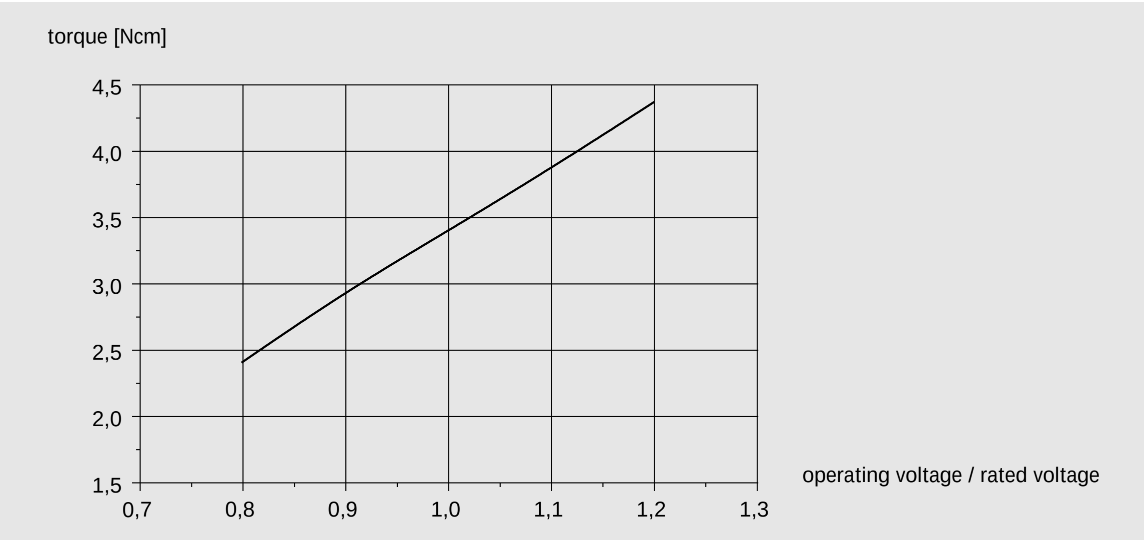
You will find gearbox combinations from page 113.

Synchronous motors

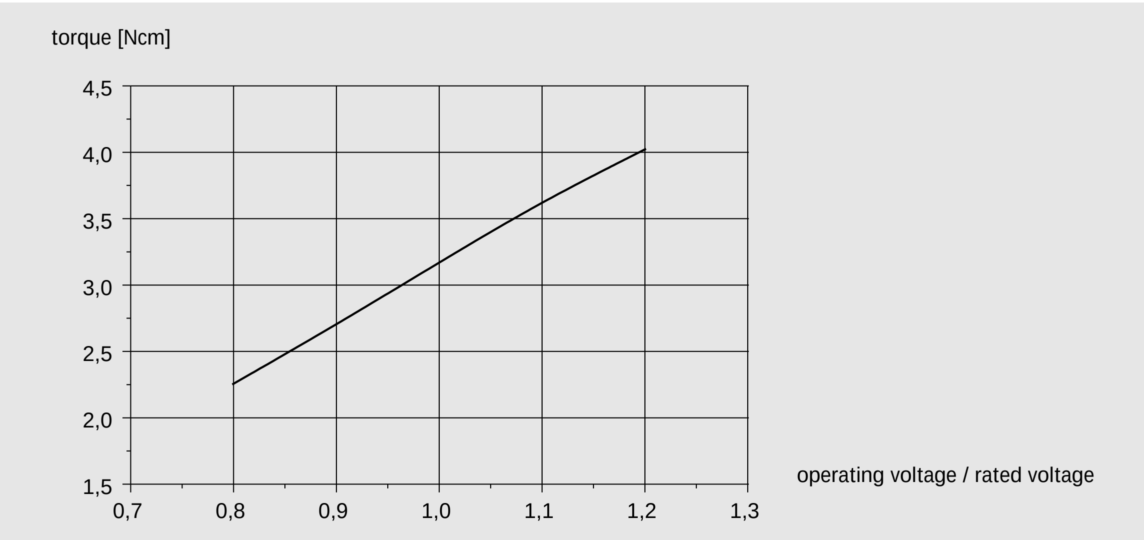
RSM 42/6 N



Connections RSM 42/6

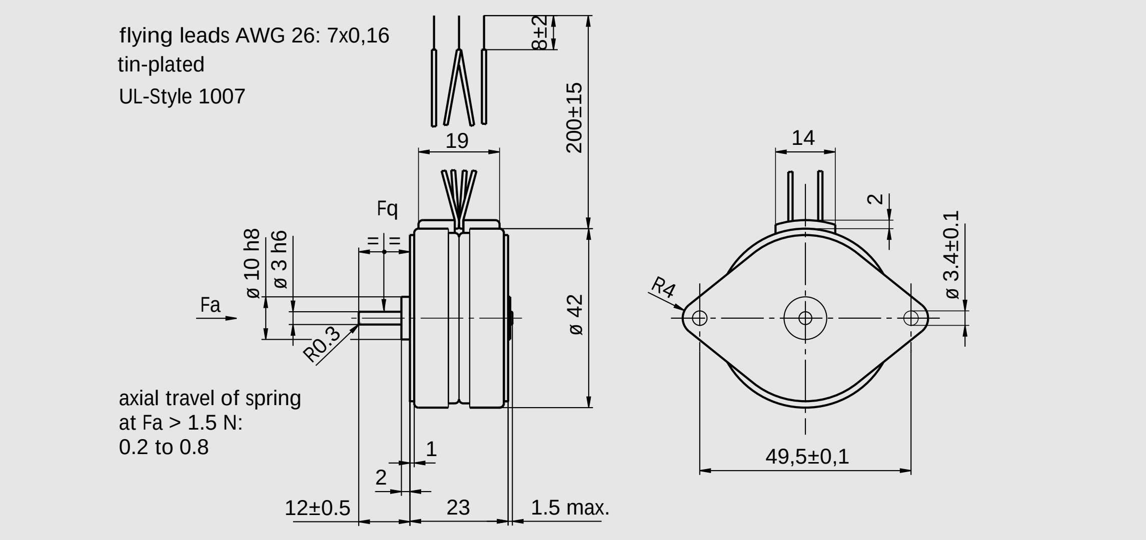


Characteristic curve RSM 42/6 at 50 Hz



Characteristic curve RSM 42/6 at 60 Hz

Synchronous motors
RSM 42/8 F



Scale drawing RSM 42/8

Technical Data

	Frequency	
	50 Hz	**60 Hz**
Speed	375 rpm	450 rpm
Synchronous torque	3.08 Ncm	2.91 Ncm
Delivery of power	1.21 W	1.37 W
Power consumption	3.44 W	3.81 W
Rated current (230 V)	14.4 mA	16 mA
Operating capacitor	0.1 µF	0.1 µF
Maximum externally permitted mass moment of inertia	46 gcm^2	30 gcm^2
Self-holding torque, type	0.5 Ncm	0.5 Ncm
Excess winding temperature	44 K	48 K
Permitted radial stress F_q	5 N	5 N
Permitted axial stress F_a	1.5 N	1.5 N
Weight	0.15 kg	0.15 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

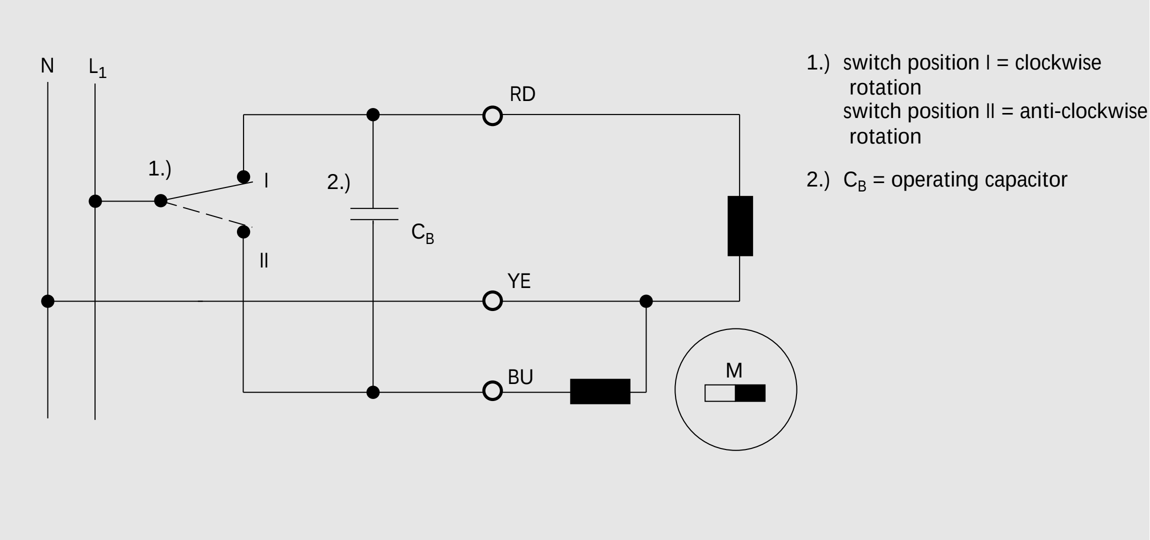
Rated voltage	**110 V**		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	0.39 µF	0.39 µF	2.5 µF	2.5 µF	7 µF	7 µF
Rated current	29 mA	32 mA	71.1 mA	79 mA	120 mA	134 mA

Gearbox combinations

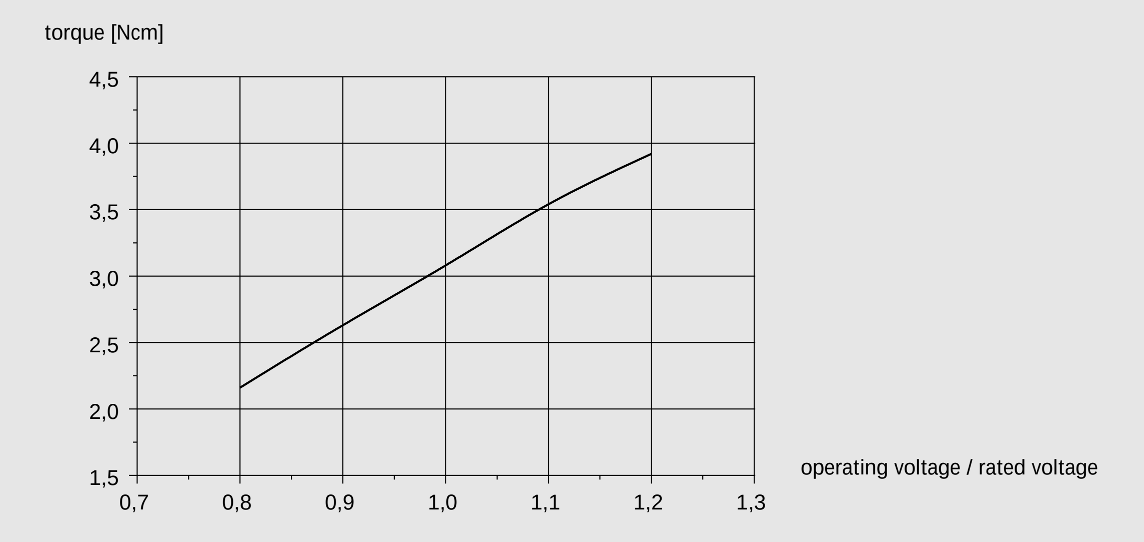
You will find gearbox combinations from page 113.

Synchronous motors

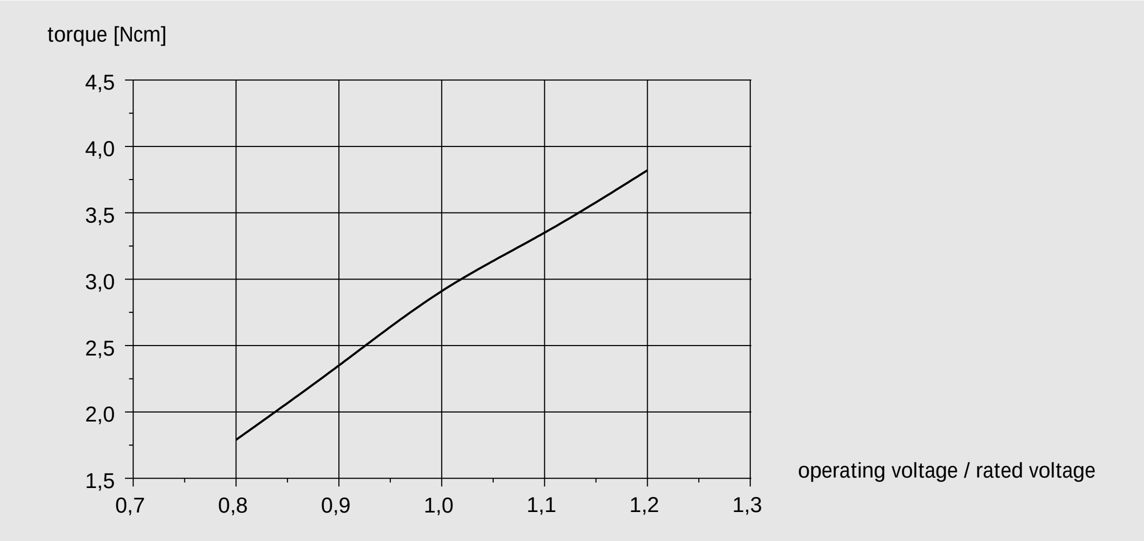
RSM 42/8 F



Connections RSM 42/8

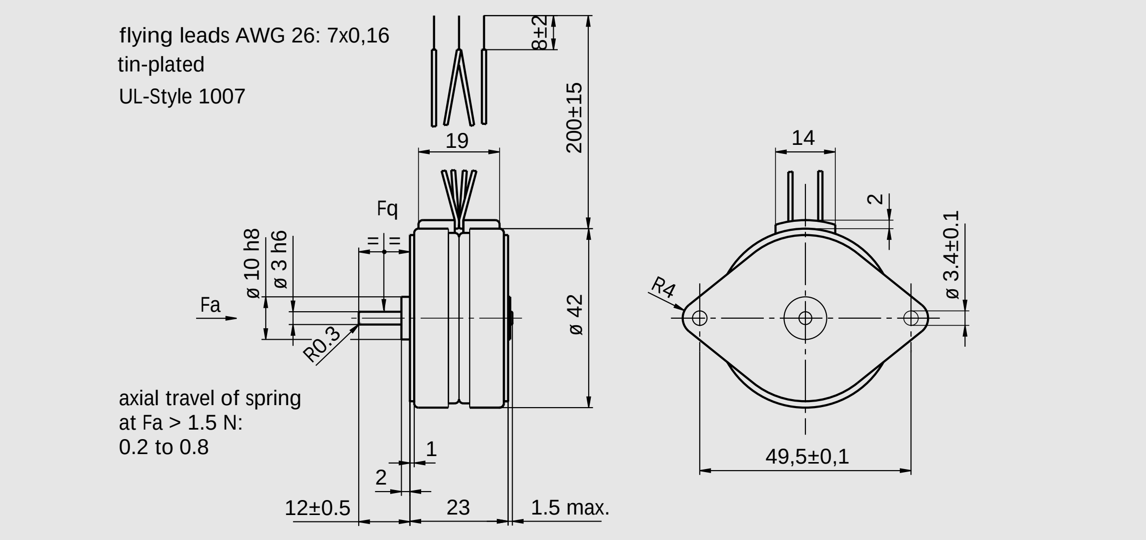


Characteristic curve RSM 42/8 at 50 Hz



Characteristic curve RSM 42/8 at 60 Hz

Synchronous motors
RSM 42/12 N



Scale drawing RSM 42/12

Technical Data

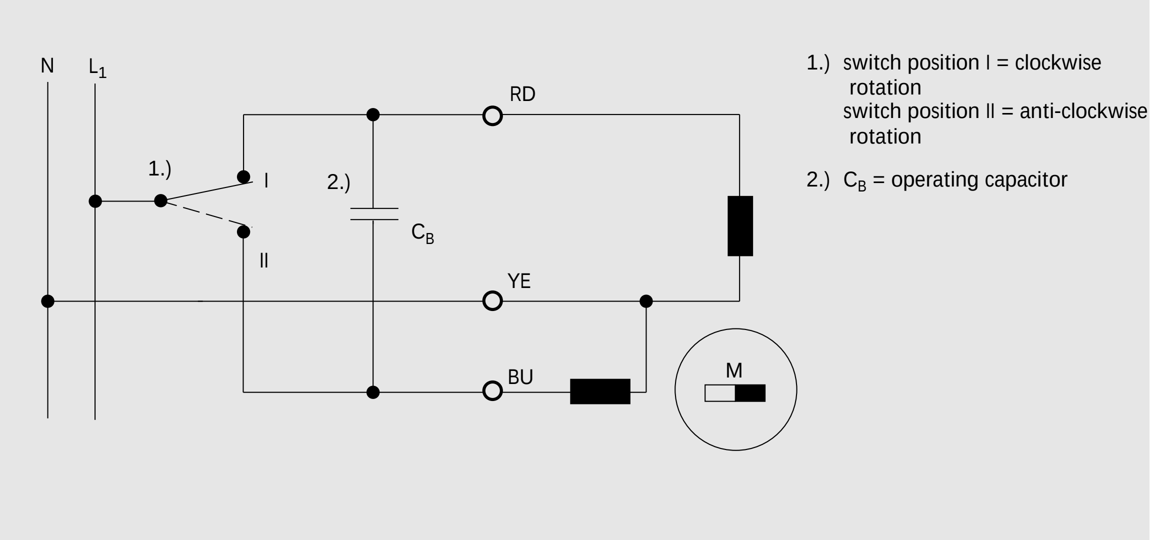
	Frequency	
	50 Hz	**60 Hz**
Speed	250 rpm	300 rpm
Synchronous torque	3.17 Ncm	2.91 Ncm
Delivery of power	0.83 W	0.91 W
Power consumption	2.89 W	2.5 W
Rated current (230 V)	12.2 mA	10.7 mA
Operating capacitor	0.082 µF	0.068 µF
Maximum externally permitted mass moment of inertia	50 gcm^2	45 gcm^2
Self-holding torque, type	0.5 Ncm	0.5 Ncm
Excess winding temperature	36 K	41 K
Permitted radial stress F_q	5 N	5 N
Permitted axial stress F_a	1.5 N	1.5 N
Weight	0.15 kg	0.15 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

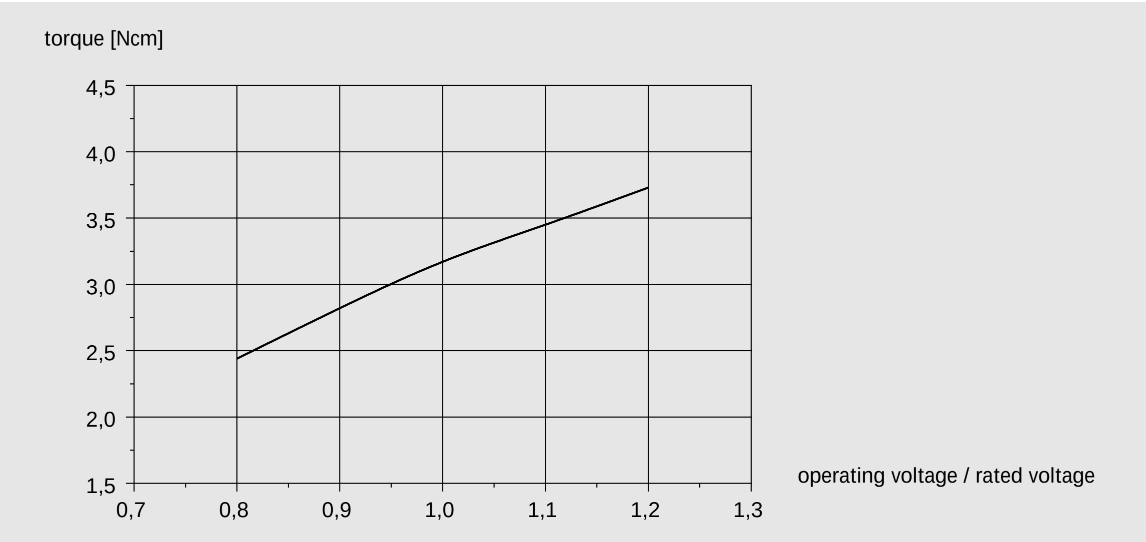
Rated voltage	**110 V**		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	0.33 µF	0.25 µF	2.2 µF	1.8 µF	6.8 µF	5 µF
Rated current	23.9 mA	21 mA	60.3 mA	52.8 mA	103 mA	89.3 mA

Gearbox combinations

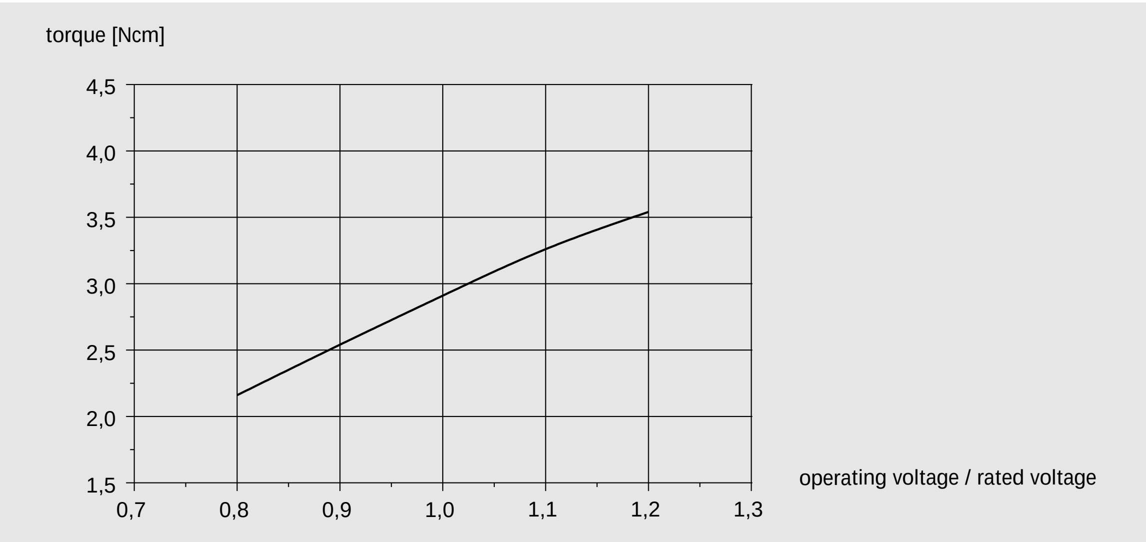
You will find gearbox combinations from page 113.



Connections RSM 42/12

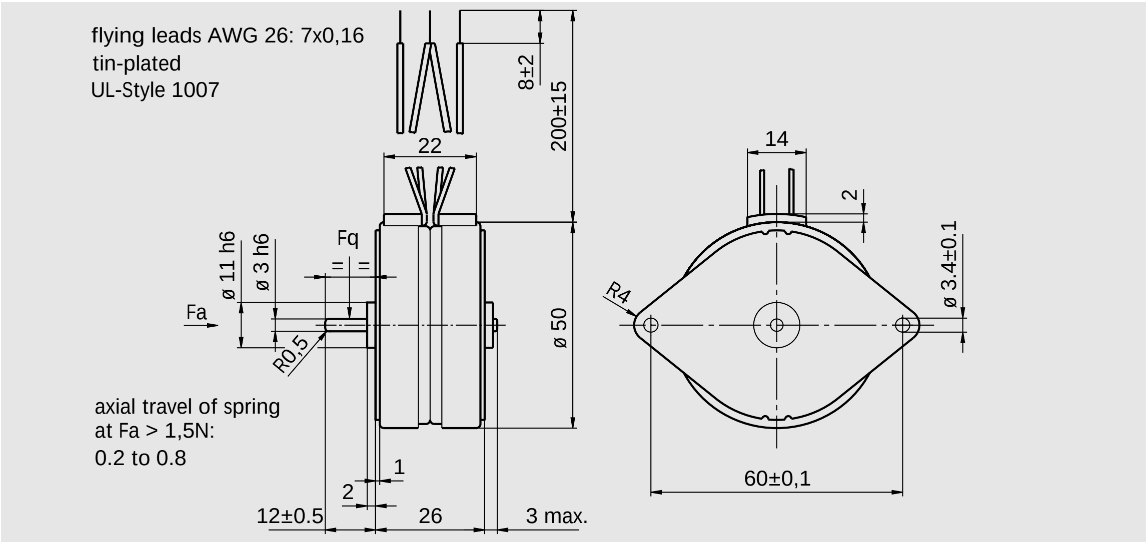


Characteristic curve RSM 42/12 at 50 Hz



Characteristic curve RSM 42/12 at 60 Hz

Synchronous motors
RSM 51/6 F



Scale drawing RSM 51/6

Technical Data

	Frequency	
	50 Hz	**60 Hz**
Speed	500 rpm	600 rpm
Synchronous torque	3.8 Ncm	3.25 Ncm
Delivery of power	2 W	2 W
Power consumption	4.9 W	5.4 W
Rated current (230 V)	21 mA	23 mA
Operating capacitor	0.15 µF	0.15 µF
Maximum externally permitted mass moment of inertia	60 gcm^2	40 gcm^2
Self-holding torque, type	0.8 Ncm	0.8 Ncm
Excess winding temperature	55 K	63 K
Permitted radial stress F_q	5 N	5 N
Permitted axial stress F_a	2 N	2 N
Weight	0.2 kg	0.2 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

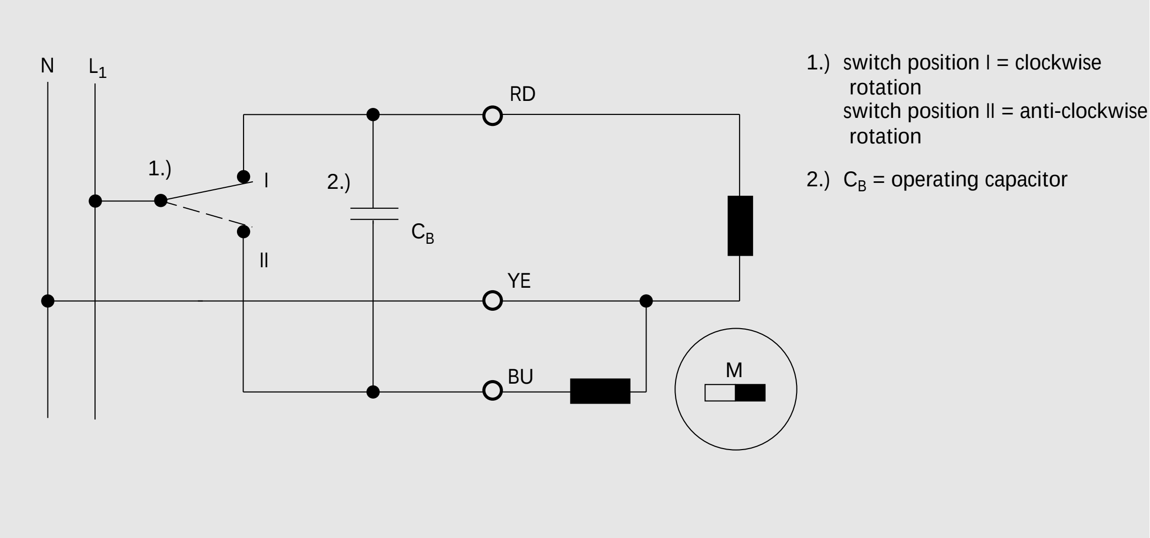
Rated voltage	**110 V**		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	0.56 µF	0.56 µF	4.7 µF	4.7 µF	16 µF	16 µF
Rated current	42.9 mA	47 mA	117 mA	128 mA	217 mA	238 mA

Gearbox combinations

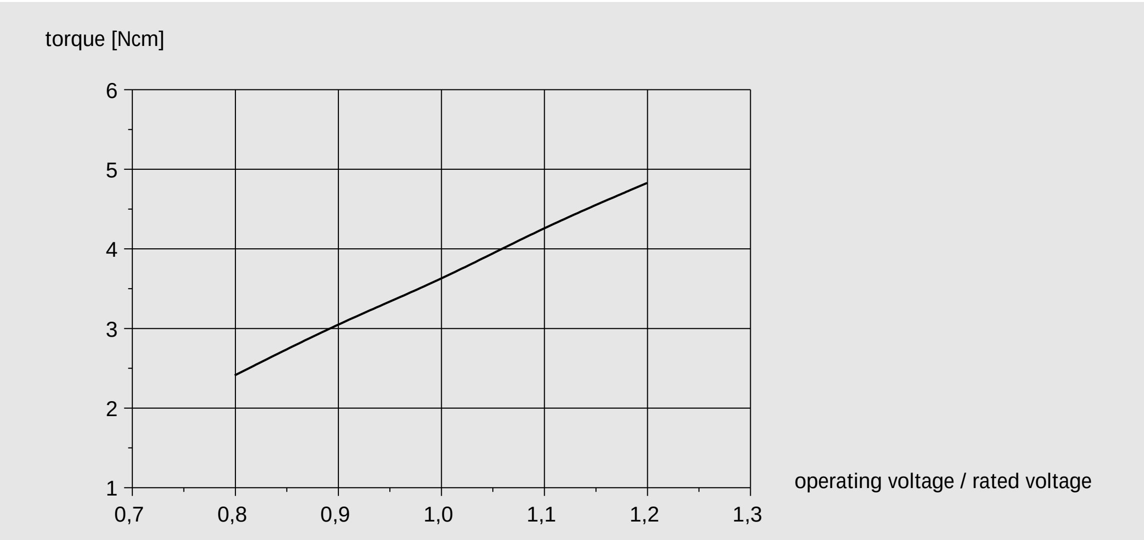
You will find gearbox combinations from page 113.

Synchronous motors

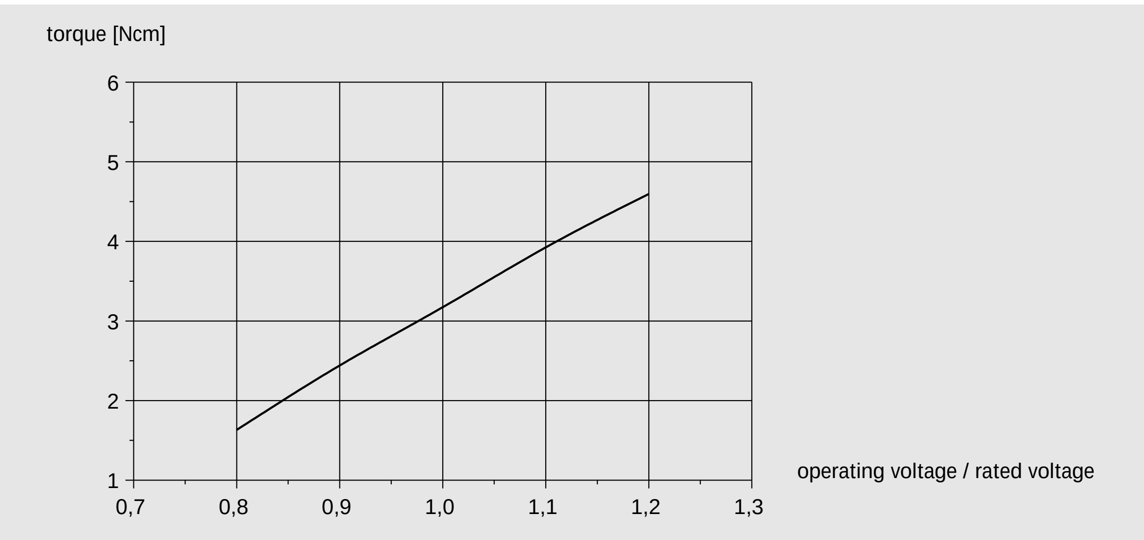
RSM 51/6 F



Connections RSM 51/6

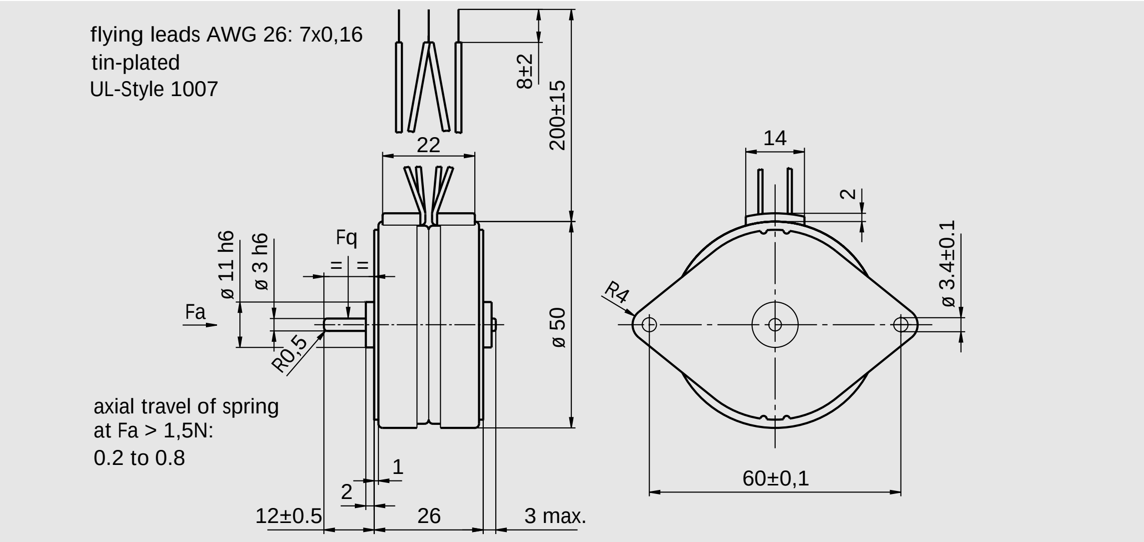


Characteristic curve RSM 51/6 at 50 Hz



Characteristic curve RSM 51/6 at 60 Hz

Synchronous motors
RSM 51/8 F



Scale drawing RSM 51/8

Technical Data

	Frequency	
	50 Hz	**60 Hz**
Speed	375 rpm	450 rpm
Synchronous torque	4 Ncm	3.75 Ncm
Delivery of power	1.57 W	1.77 W
Power consumption	3.9 W	4.3 W
Rated current (230 V)	17 mA	18.7 mA
Operating capacitor	0.12 µF	0.12 µF
Maximum externally permitted mass moment of inertia	90 gcm^2	58 gcm^2
Self-holding torque, type	0.5 Ncm	0.5 Ncm
Excess winding temperature	50 K	58 K
Permitted radial stress F_q	5 N	5 N
Permitted axial stress F_a	2 N	2 N
Weight	0.2 kg	0.2 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

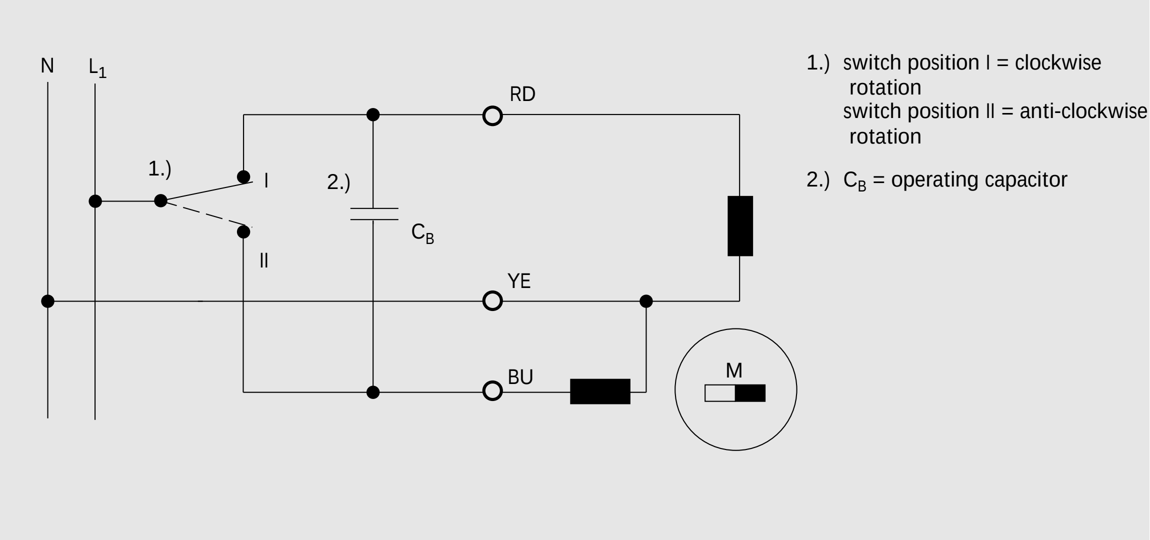
Rated voltage	**110 V**		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	0.5 µF	0.5 µF	3.9 µF	3.9 µF	12 µF	12 µF
Rated current	34.7 mA	38.2 mA	94.5 mA	104 mA	157 mA	172 mA

Gearbox combinations

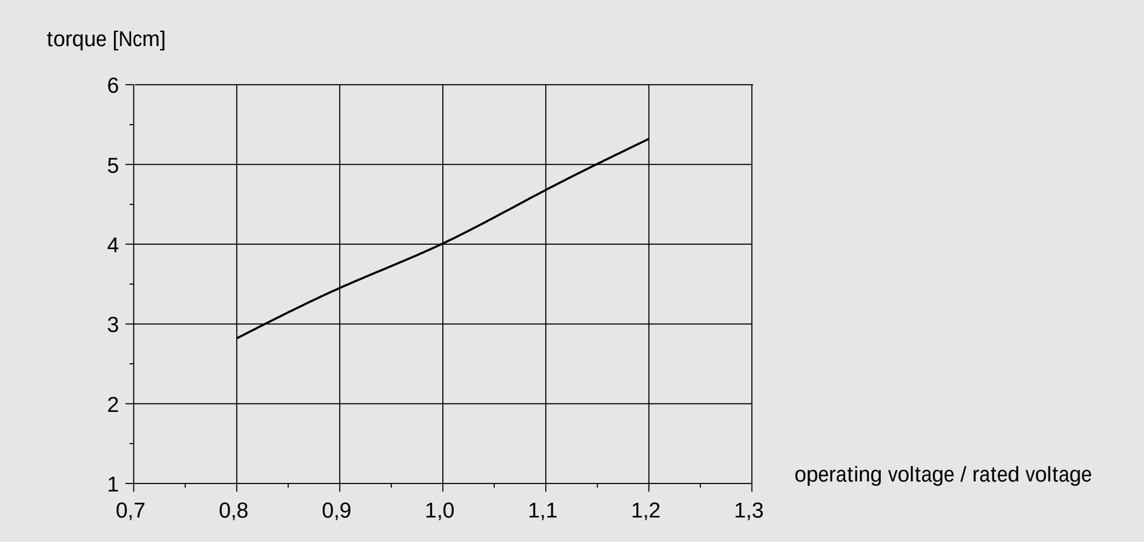
You will find gearbox combinations from page 113.

Synchronous motors

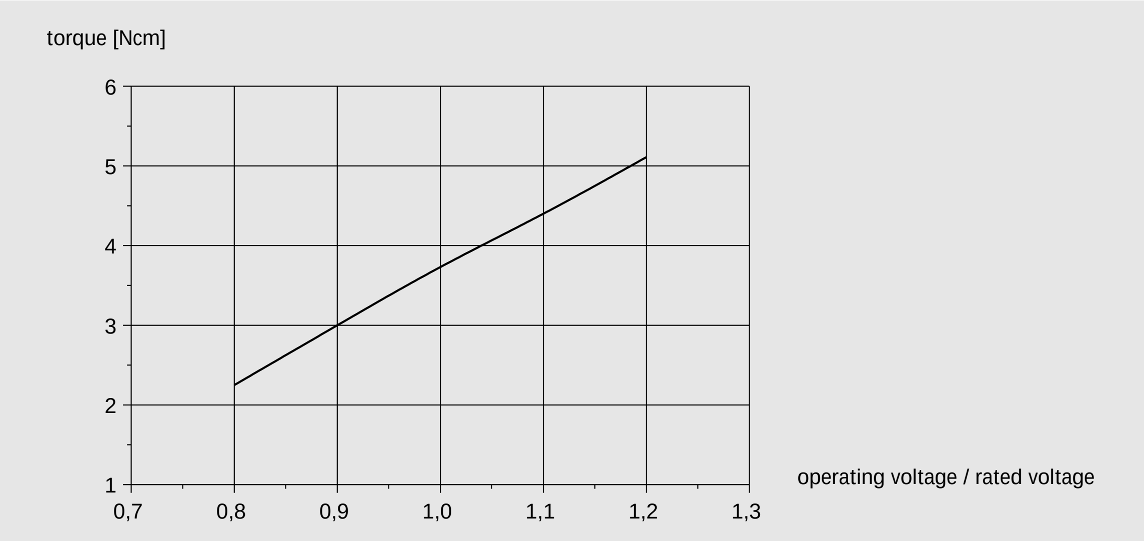
RSM 51/8 F



Connections RSM 51/8

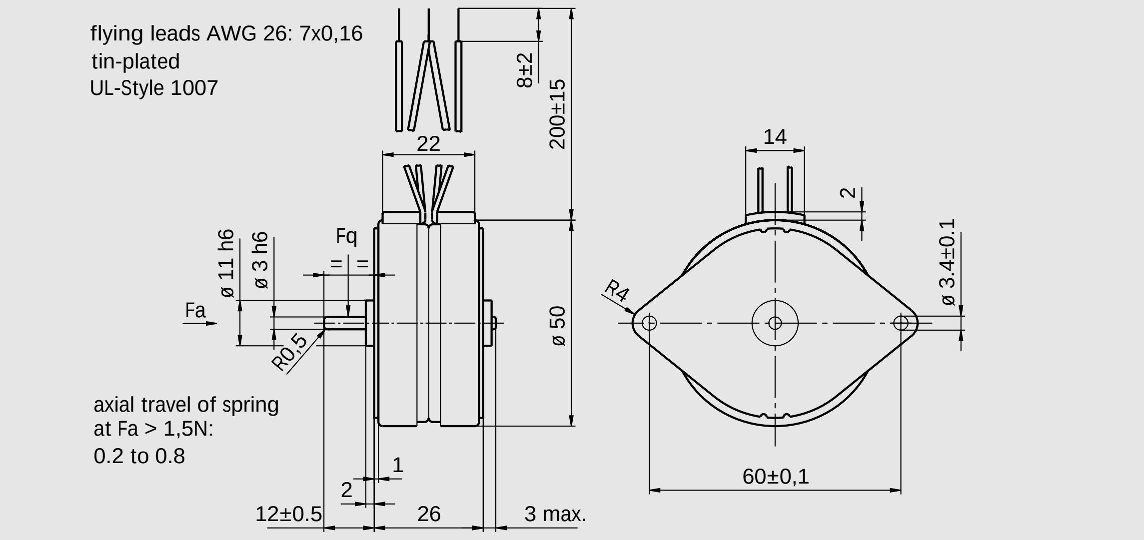


Characteristic curve RSM 51/8 at 50 Hz



Characteristic curve RSM 51/8 at 60 Hz

Synchronous motors
RSM 51/12 F



Scale drawing RSM 51/12

Technical Data

	Frequency	
	50 Hz	**60 Hz**
Speed	250 rpm	300 rpm
Synchronous torque	5 Ncm	4.4 Ncm
Delivery of power	1.3 W	1.4 W
Power consumption	3.7 W	3.6 W
Rated current (230 V)	16 mA	15.6 mA
Operating capacitor	0.12 µF	0.1 µF
Maximum externally permitted mass moment of inertia	120 gcm^2	80 gcm^2
Self-holding torque, type	0.75 Ncm	0.75 Ncm
Excess winding temperature	48 K	46 K
Permitted radial stress F_q	5 N	5 N
Permitted axial stress F_a	2 N	2 N
Weight	0.2 kg	0.2 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

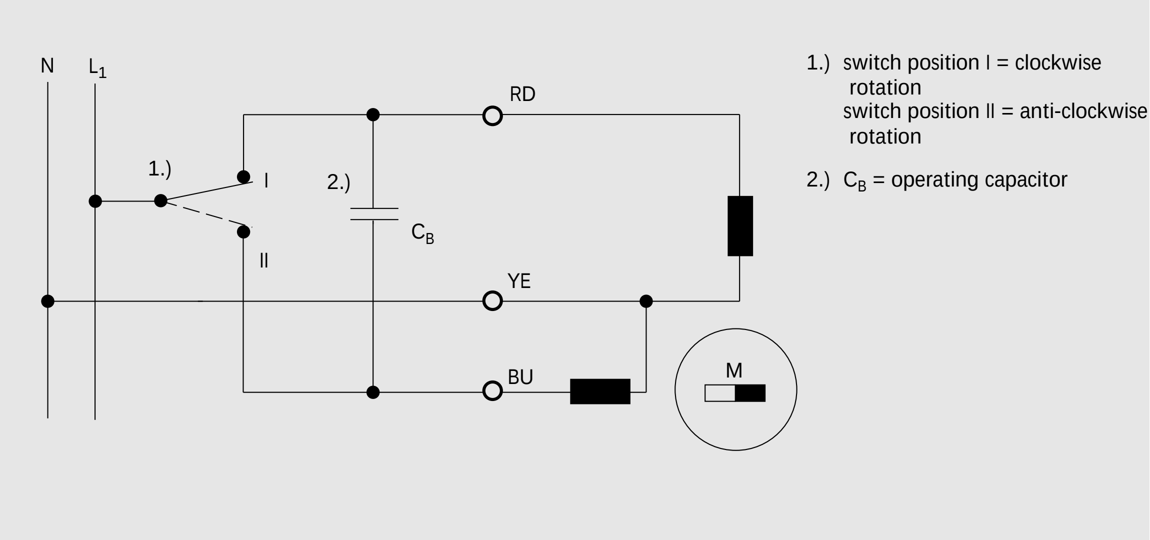
Rated voltage	**110 V**		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	0.5 µF	0.43 µF	3.9 µF	3.3 µF	10 µF	8.2 µF
Rated current	33 mA	32 mA	90 mA	87 mA	150 mA	145 mA

Gearbox combinations

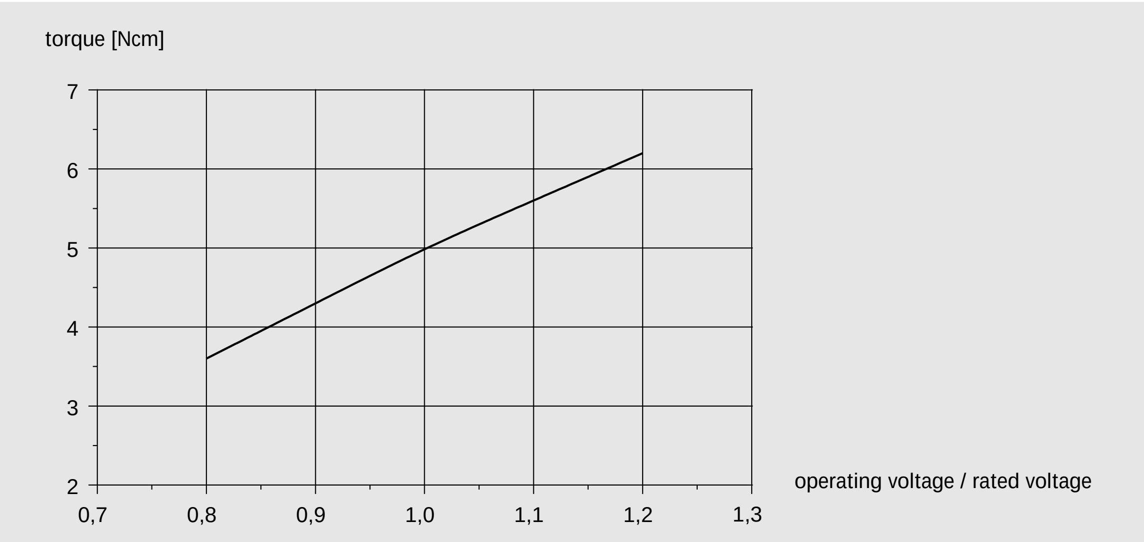
You will find gearbox combinations from page 113.

Synchronous motors

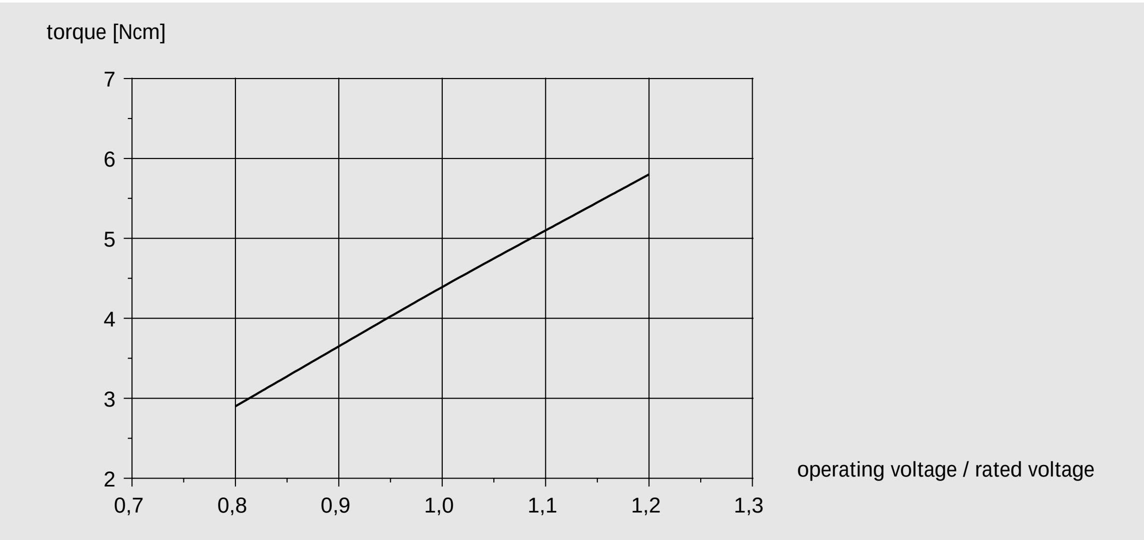
RSM 51/12 F



Connections RSM 51/12

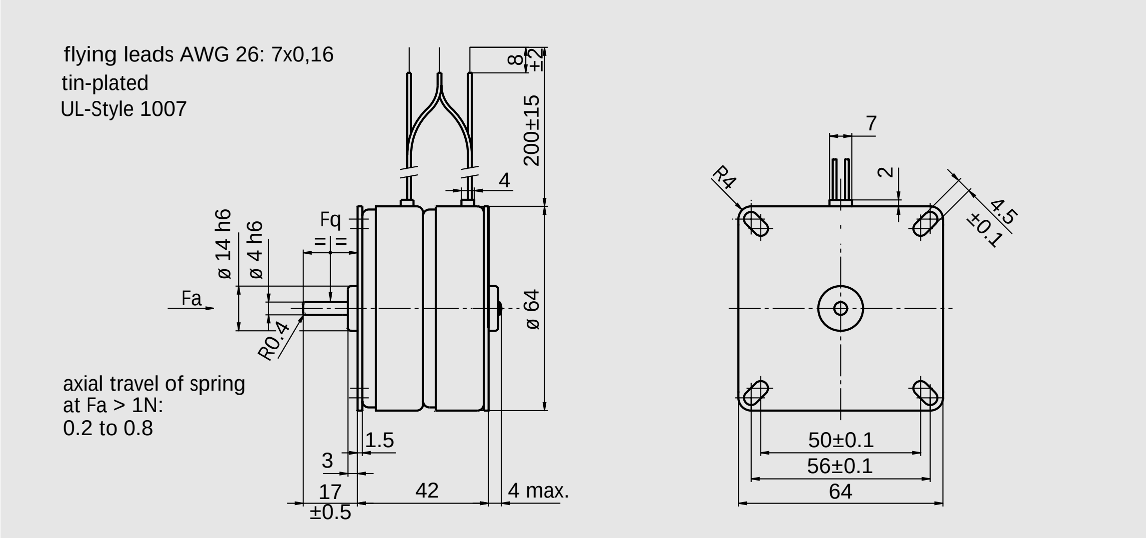


Characteristic curve RSM 51/12 at 50 Hz



Characteristic curve RSM 51/12 at 60 Hz

Synchronous motors
RSM 63/8 F



Scale drawing RSM 63/8

Technical Data

	Frequency	
	50 Hz	**60 Hz**
Speed	375 rpm	450 rpm
Synchronous torque	13 Ncm	11.7 Ncm
Delivery of power	5.1 W	5.5 W
Power consumption	11 W	11.7 W
Rated current (230 V)	48 mA	51 mA
Operating capacitor	0.33 µF	0.33 µF
Maximum externally permitted mass moment of inertia	250 gcm^2	180 gcm^2
Self-holding torque, type	5 Ncm	5 Ncm
Excess winding temperature	45 K	52 K
Permitted radial stress F_q	10 N	10 N
Permitted axial stress F_a	3 N	3 N
Weight	0.46 kg	0.46 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

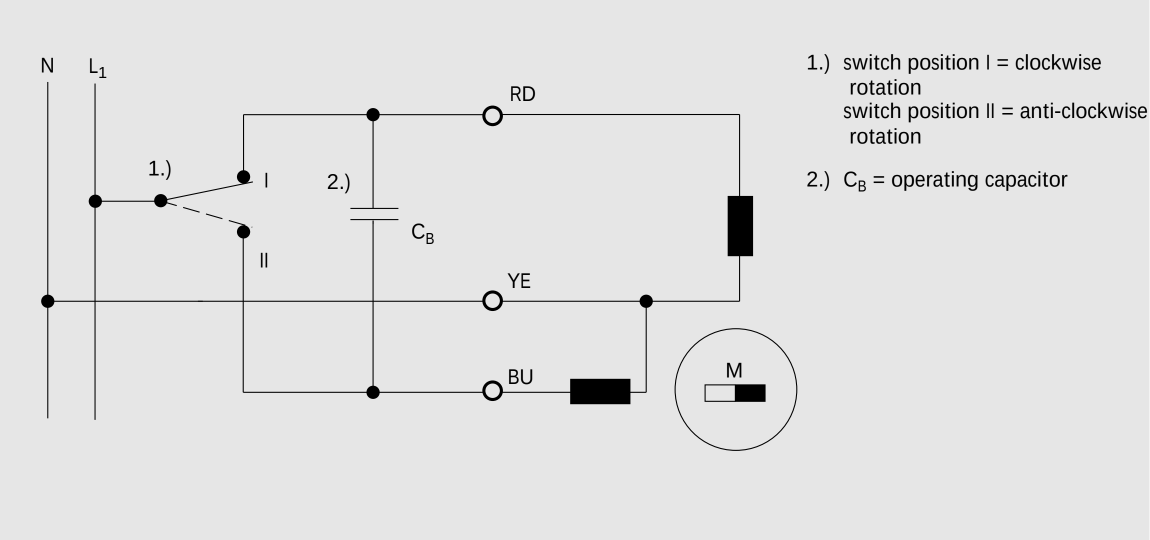
Voltages

Rated voltage	**110 V**		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	1.5 µF	1.5 µF	10 µF	10 µF	32 µF	32 µF
Rated current	100 mA	106 mA	266 mA	283 mA	464 mA	493 mA

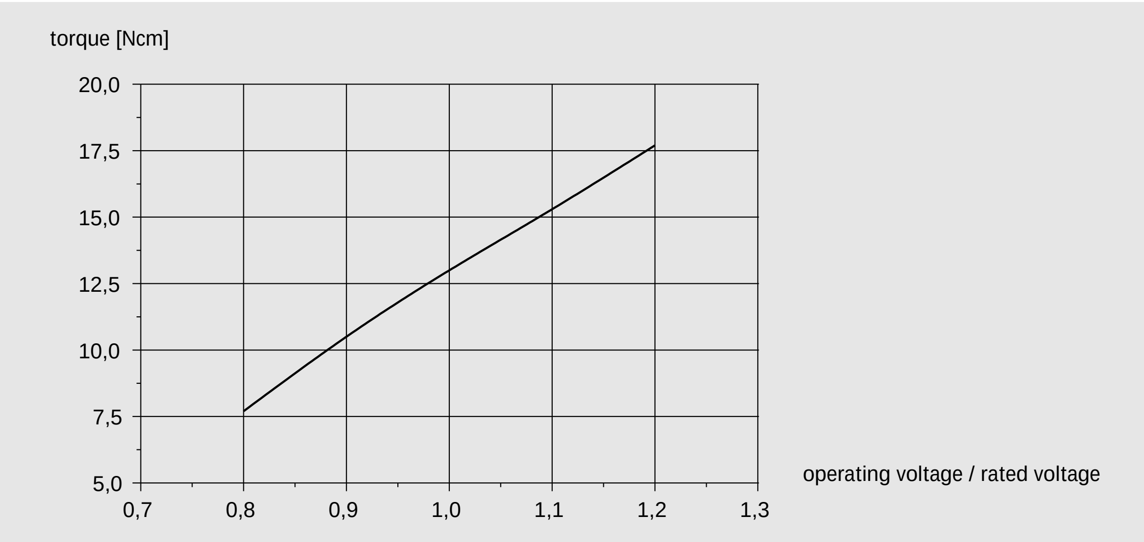
Gearbox combinations

You will find gearbox combinations from page 113.

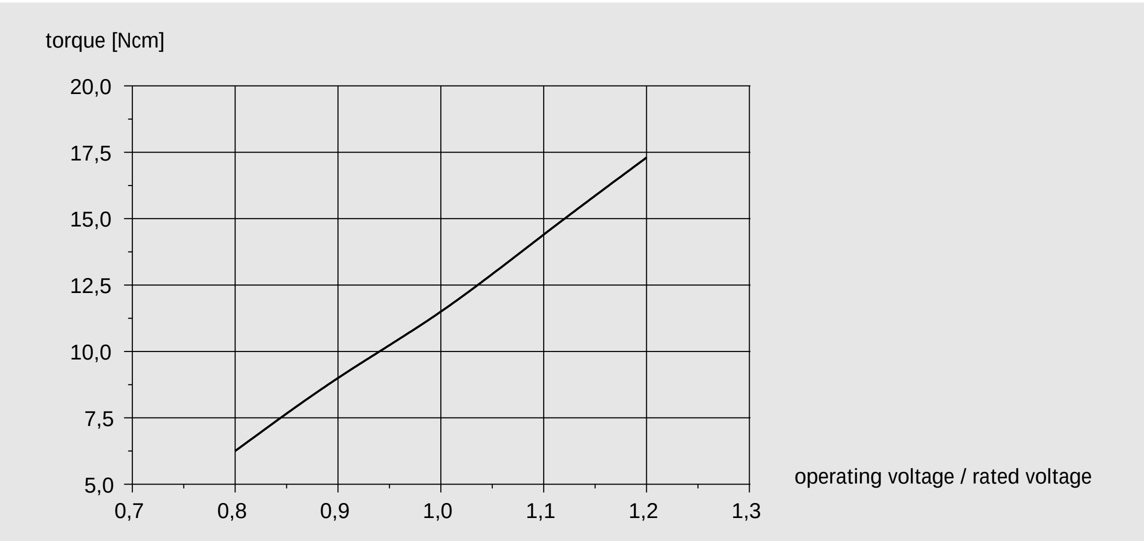
RSM 63/8 F



Connections RSM 63/8

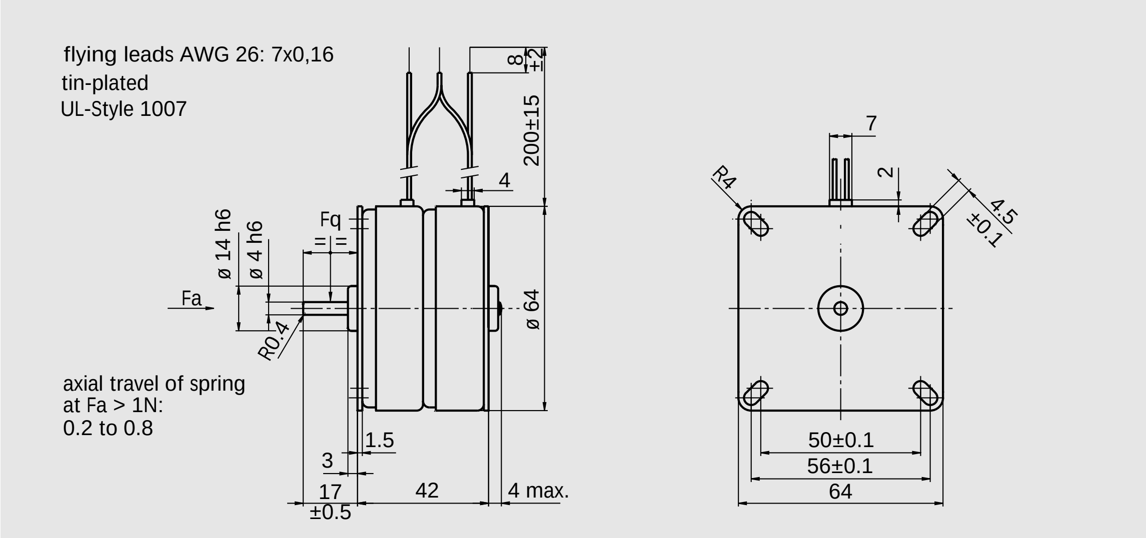


Characteristic curve RSM 63/8 at 50 Hz



Characteristic curve RSM 63/8 at 60 Hz

Synchronous motors
RSM 63/10 F



Scale drawing RSM 63/10

Technical Data

	Frequency	
	50 Hz	**60 Hz**
Speed	300 rpm	360 rpm
Synchronous torque	13.2 Ncm	10 Ncm
Delivery of power	4.2 W	3.8 W
Power consumption	10.2 W	10 W
Rated current (230 V)	45 mA	44 mA
Operating capacitor	0.33 µF	0.33 µF
Maximum externally permitted mass moment of inertia	230 gcm^2	160 gcm^2
Self-holding torque, type	2.1 Ncm	2.1 Ncm
Excess winding temperature	73 K	80 K
Permitted radial stress F_q	10 N	10 N
Permitted axial stress F_a	3 N	3 N
Weight	0.46 kg	0.46 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

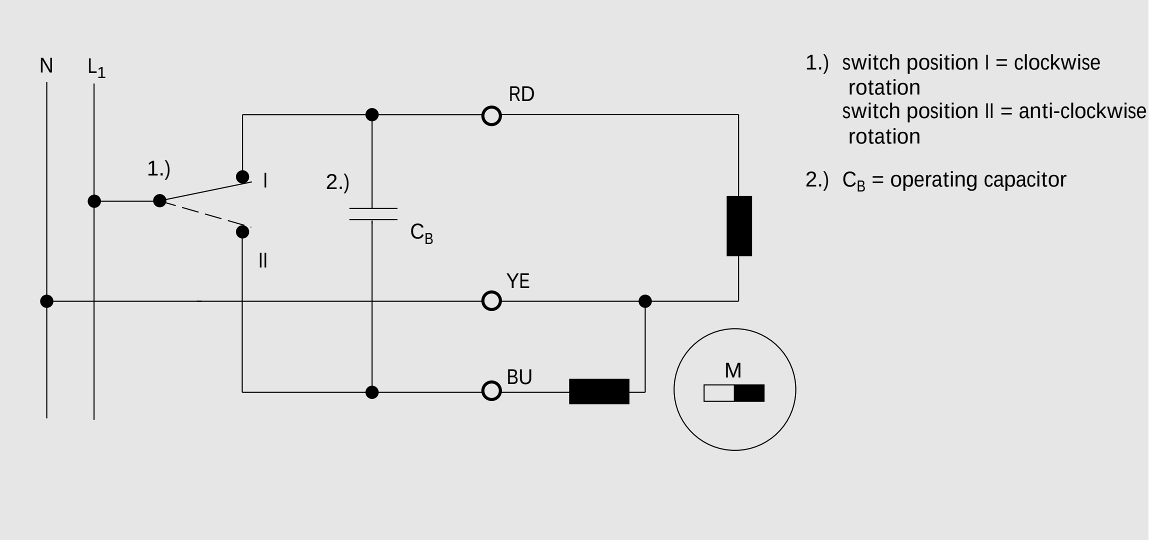
Rated voltage	**110 V**		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	1.5 µF	1.5 µF	10 µF	10 µF	32 µF	32 µF
Rated current	97.9 mA	95.7 mA	254 mA	248 mA	439 mA	430 mA

Gearbox combinations

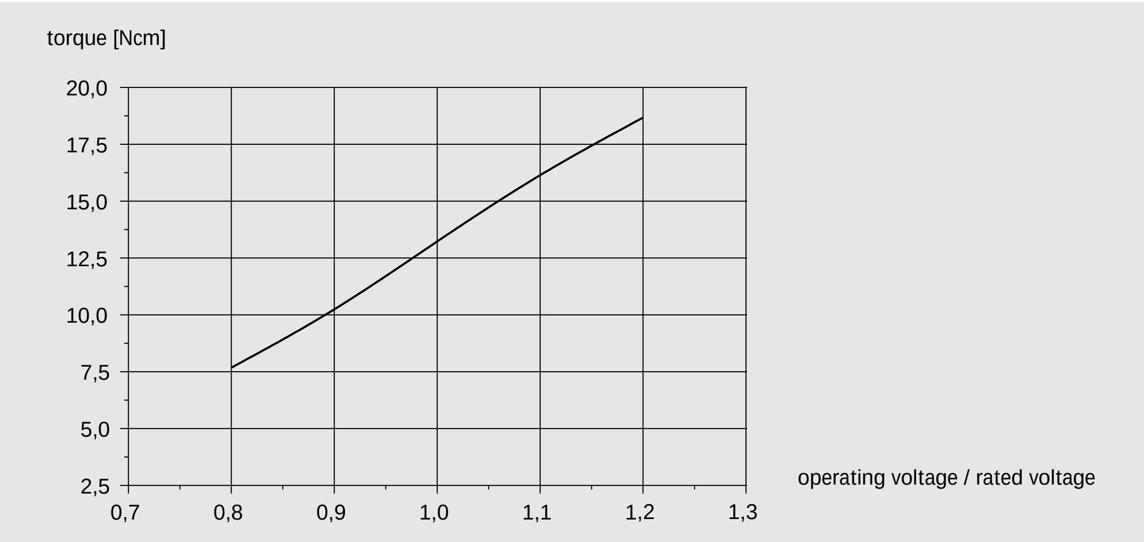
You will find gearbox combinations from page 113.

Synchronous motors

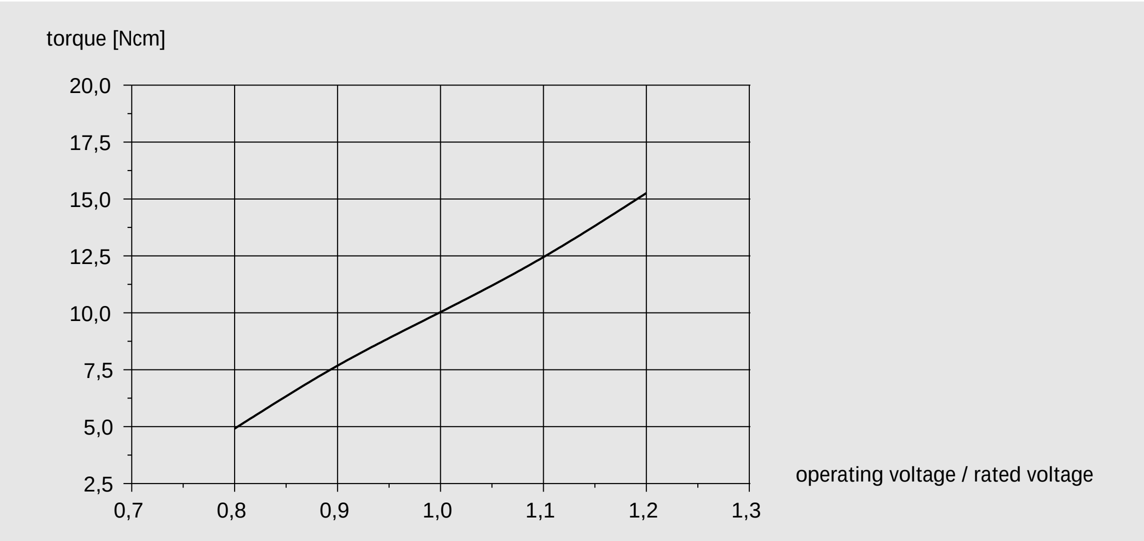
RSM 63/10 F



Connections RSM 63/10

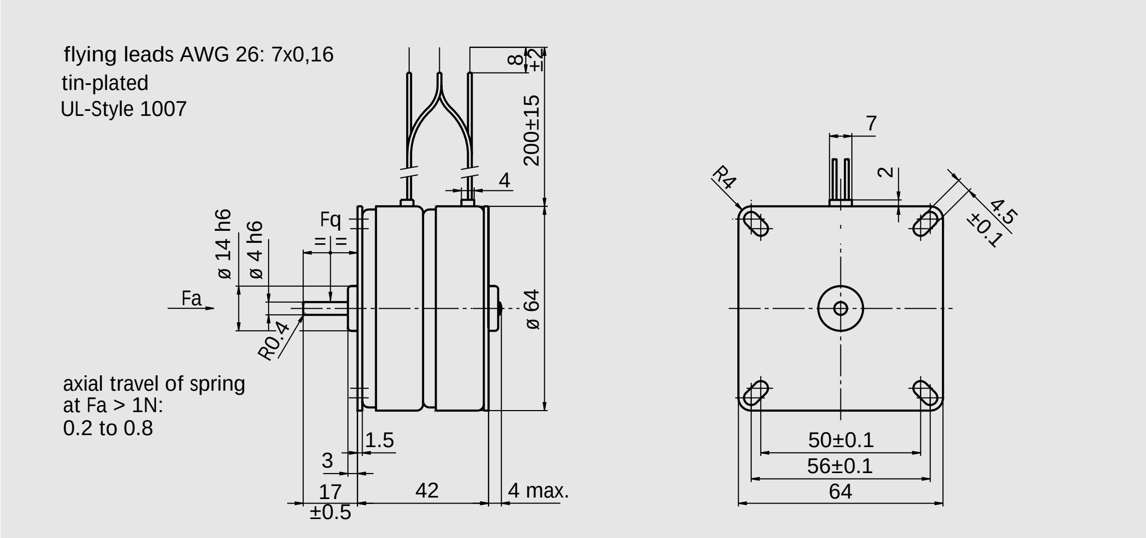


Characteristic curve RSM 63/10 at 50 Hz



Characteristic curve RSM 63/10 at 60 Hz

Synchronous motors
RSM 63/12 F



Scale drawing RSM 63/12

Technical Data

	Frequency	
	50 Hz	**60 Hz**
Speed	250 rpm	300 rpm
Synchronous torque	13.5 Ncm	10.4 Ncm
Delivery of power	3.5 W	3.25 W
Power consumption	8 W	7.7 W
Rated current (230 V)	36 mA	37 mA
Operating capacitor	0.25 µF	0.25 µF
Maximum externally permitted mass moment of inertia	270 gcm^2	240 gcm^2
Self-holding torque, type	1.5 Ncm	1.5 Ncm
Excess winding temperature	62 K	72 K
Permitted radial stress F_q	10 N	10 N
Permitted axial stress F_a	3 N	3 N
Weight	0.46 kg	0.46 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

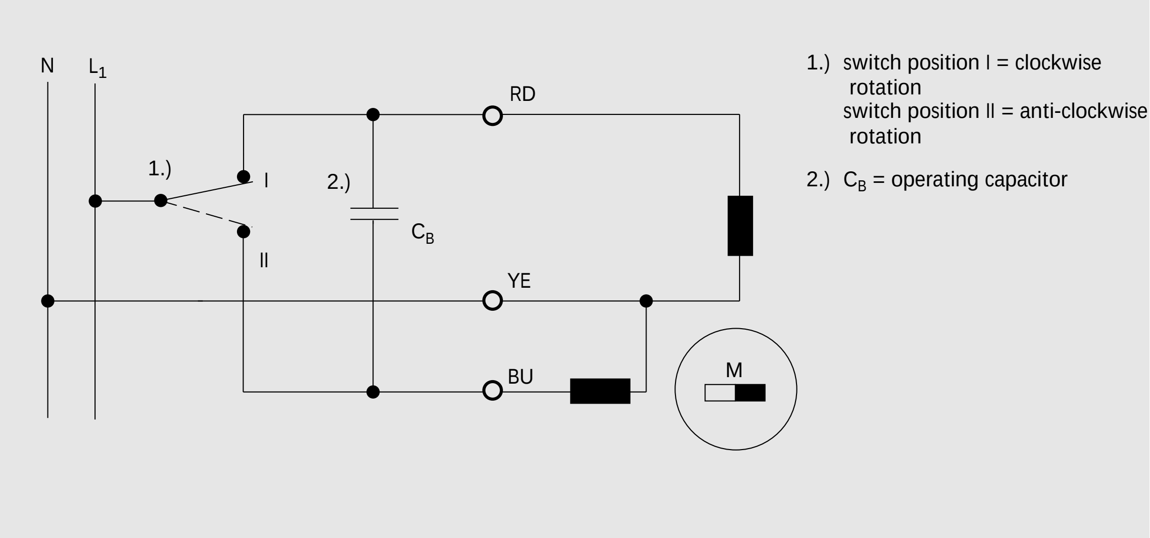
Rated voltage	**110 V**		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	1.2 µF	1.2 µF	8.2 µF	8.2 µF	25 µF	25 µF
Rated current	78.3 mA	80.5 mA	203 mA	209 mA	352 mA	361 mA

Gearbox combinations

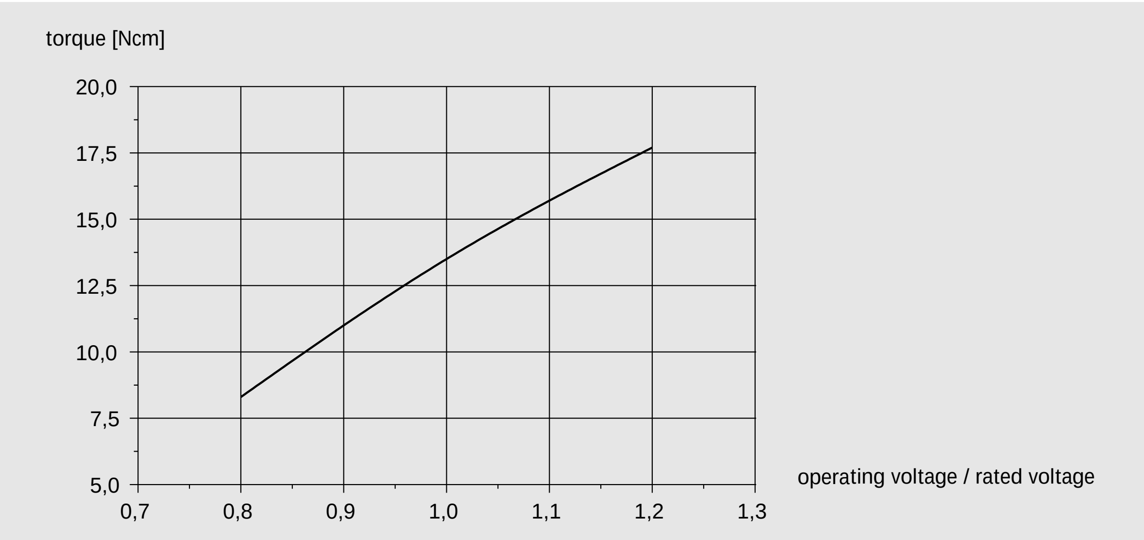
You will find gearbox combinations from page 113.

Synchronous motors

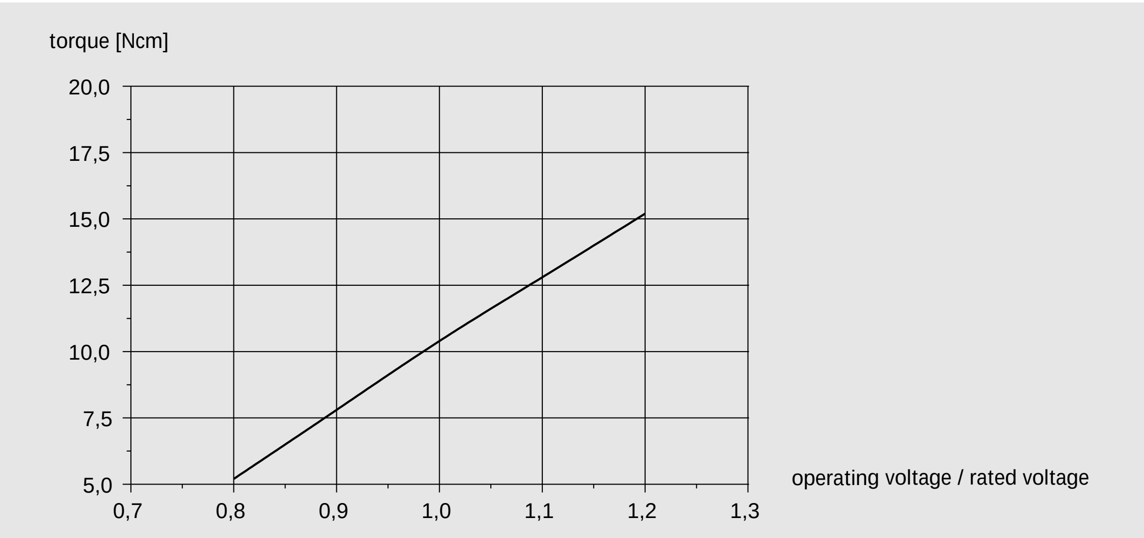
RSM 63/12 F



Connections RSM 63/12

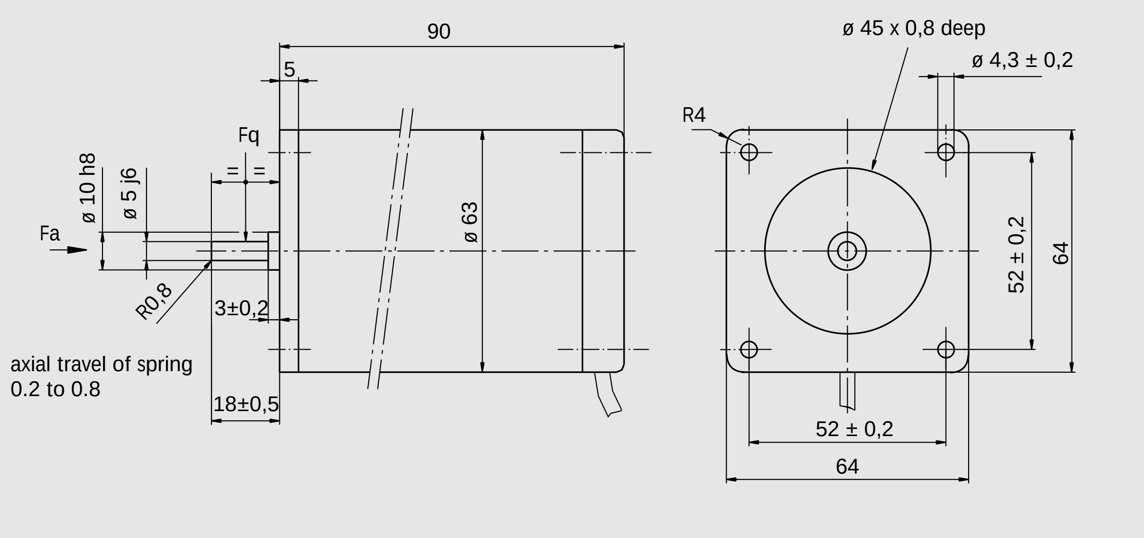


Characteristic curve RSM 63/12 at 50 Hz



Characteristic curve RSM 63/12 at 60 Hz

Synchronous motors
RSM 828/3 F



Scale drawing RSM 828/3

Technical Data

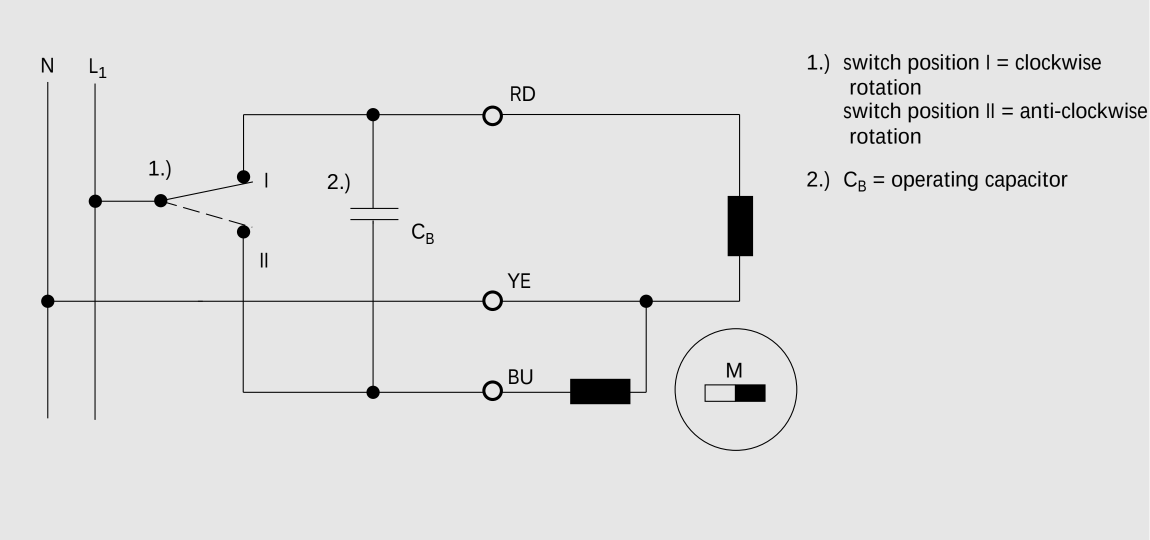
	Frequency	
	50 Hz	**60 Hz**
Speed	1000 rpm	1200 rpm
Synchronous torque	8.4 Ncm	7.8 Ncm
Delivery of power	8.8 W	9.9 W
Power consumption	17.1 W	19.3 W
Rated current (230 V)	75 mA	85 mA
Operating capacitor	0.5 µF	0.5 µF
Maximum externally permitted mass moment of inertia	55 gcm^2	30 gcm^2
Self-holding torque, type	2 Ncm	2 Ncm
Excess winding temperature	75 K	85 K
Permitted radial stress F_q	40 N	40 N
Permitted axial stress F_a	20 N	20 N
Weight	0.55 kg	0.55 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	B gemäß DIN EN 60034-1	B
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

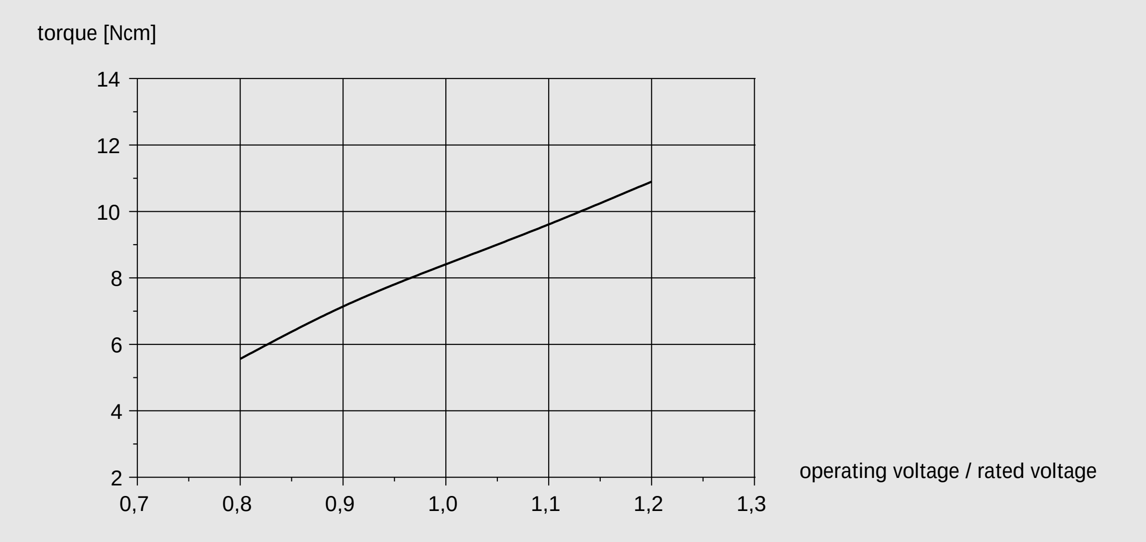
Rated voltage	**110 V**		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	2 µF	2 µF	14 µF	14 µF	42 µF	42 µF
Rated current	145 mA	164 mA	370 mA	420 mA	726 mA	823 mA

Gearbox combinations

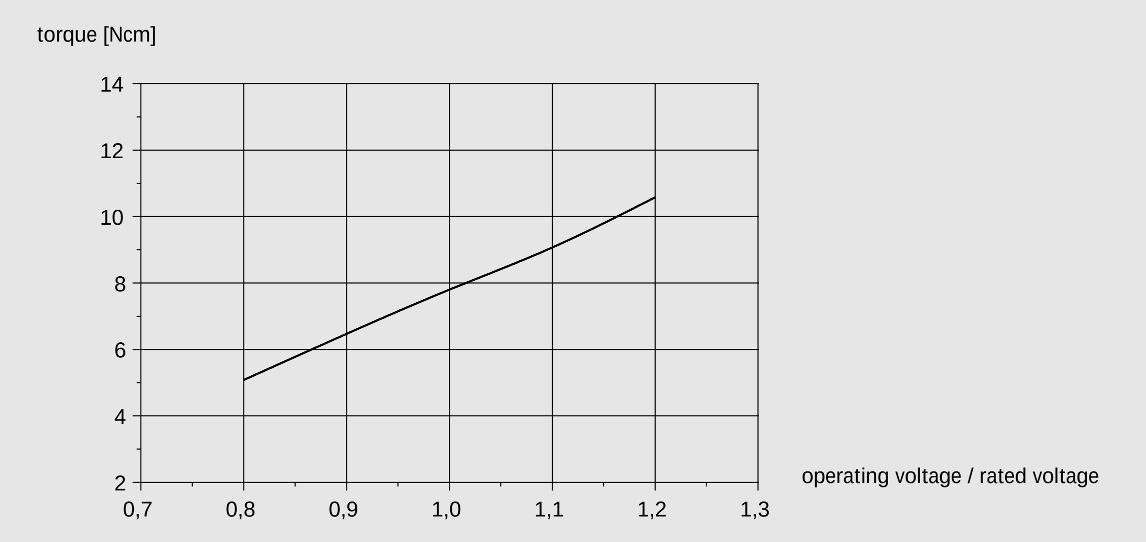
You will find gearbox combinations from page 113.



Connections RSM 828/3

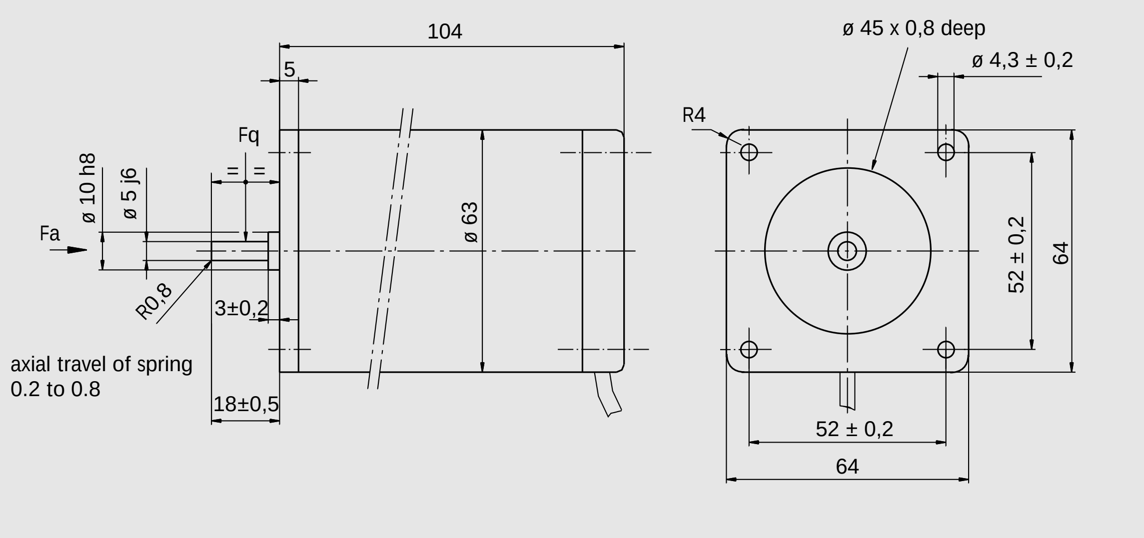


Characteristic curve RSM 828/3 at 50 Hz



Characteristic curve RSM 828/3 at 60 Hz

Synchronous motors
RSM 842/3 F



Scale drawing RSM 842/3

Technical Data

	Frequency	
	50 Hz	**60 Hz**
Speed	1000 rpm	1200 rpm
Synchronous torque	9.6 Ncm	9 Ncm
Delivery of power	10.1 W	11.3 W
Power consumption	20.7 W	23.7 W
Rated current (230 V)	92 mA	105 mA
Operating capacitor	0.6 µF	0.6 µF
Maximum externally permitted mass moment of inertia	80 gcm^2	40 gcm^2
Self-holding torque, type	3.4 Ncm	3.4 Ncm
Excess winding temperature	85 K	95 K
Permitted radial stress F_q	40 N	40 N
Permitted axial stress F_a	20 N	20 N
Weight	0.75 kg	0.75 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	B gemäß DIN EN 60034-1	B
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

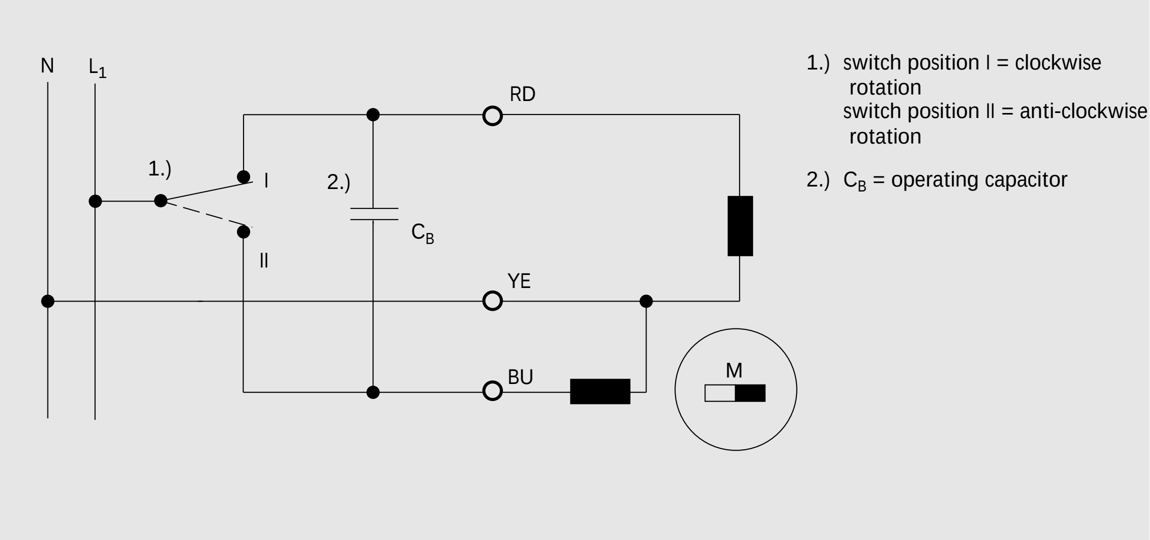
Rated voltage	**110 V**		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	2.5 µF	2.5 µF	16 µF	16 µF	48 µF	48 µF
Rated current	180 mA	206 mA	462 mA	563 mA	828 mA	945 mA

Gearbox combinations

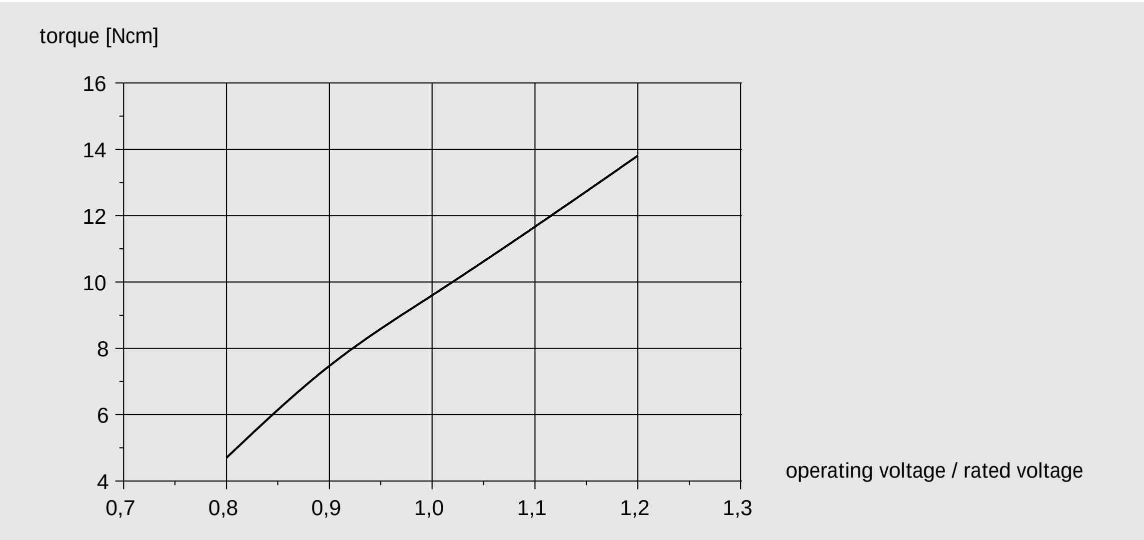
You will find gearbox combinations from page 113.

Synchronous motors

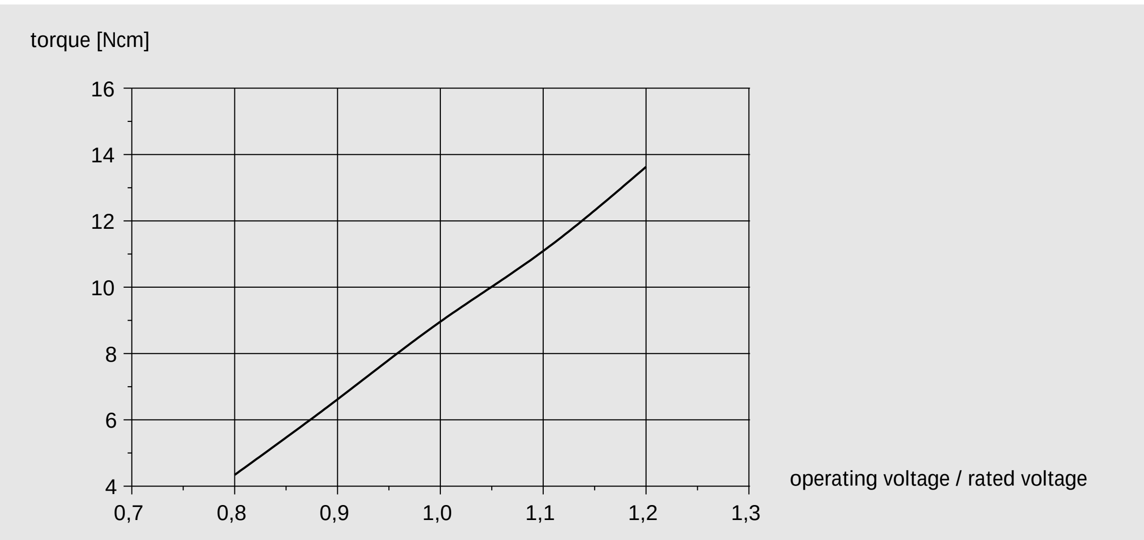
RSM 842/3 F



Connections RSM 842/3

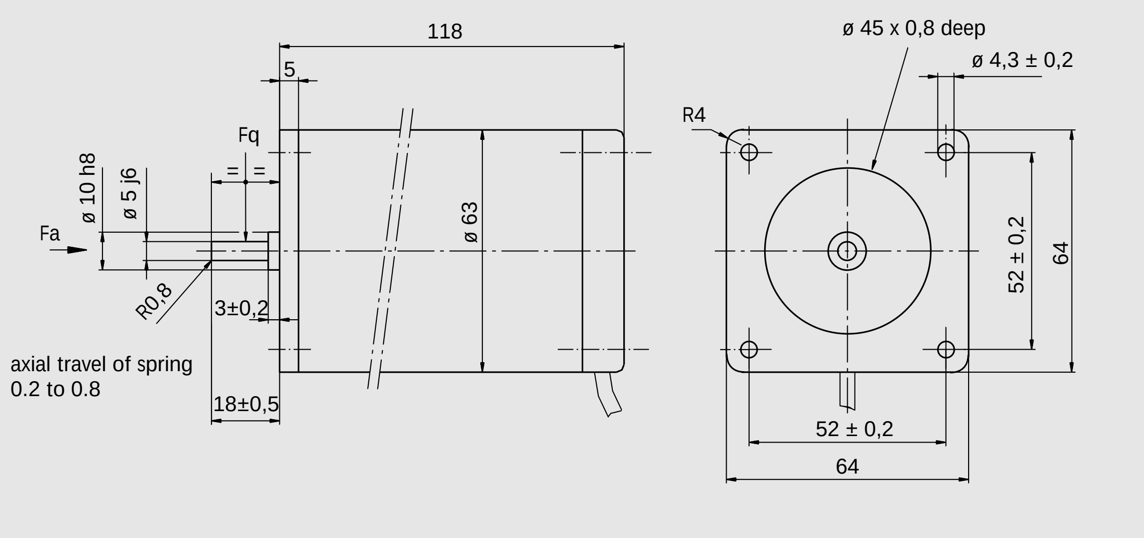


Characteristic curve RSM 842/3 at 50 Hz



Characteristic curve RSM 842/3 at 60 Hz

Synchronous motors
RSM 856/3 F



Scale drawing RSM 856/3

Technical Data

	Frequency	
	50 Hz	**60 Hz**
Speed	1000 rpm	1200 rpm
Synchronous torque	13.2 Ncm	12.6 Ncm
Delivery of power	13.9 W	15.8 W
Power consumption	24.6 W	27.6 W
Rated current (230 V)	109 mA	121 mA
Operating capacitor	0.68 µF	0.68 µF
Maximum externally permitted mass moment of inertia	140 gcm^2	65 gcm^2
Self-holding torque, type	4.1 Ncm	4.1 Ncm
Excess winding temperature	80 K	85 K
Permitted radial stress F_q	40 N	40 N
Permitted axial stress F_a	20 N	20 N
Weight	0.9 kg	0.9 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	B gemäß DIN EN 60034-1	B
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

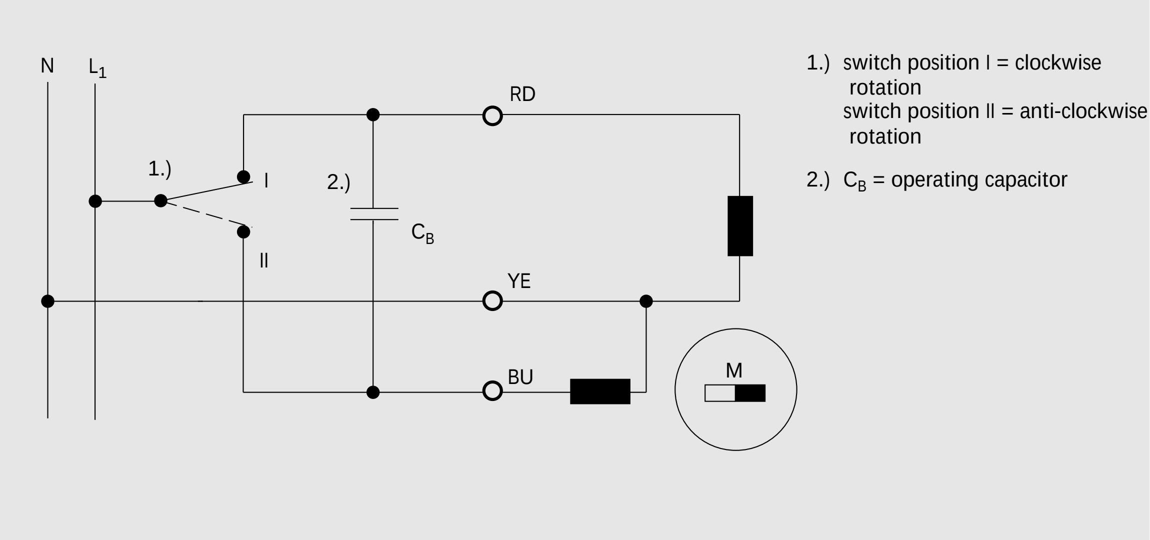
Rated voltage	**110 V**		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	2.7 µF	2.7 µF	18 µF	18 µF	57 µF	57 µF
Rated current	214 mA	237 mA	545 mA	607 mA	981 mA	1089 mA

Gearbox combinations

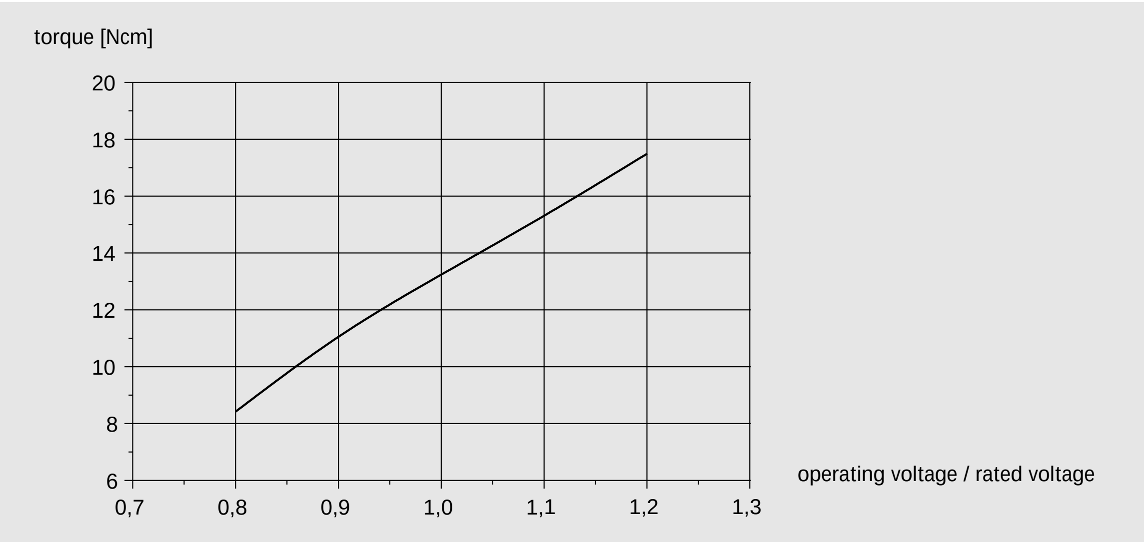
You will find gearbox combinations from page 113.

Synchronous motors

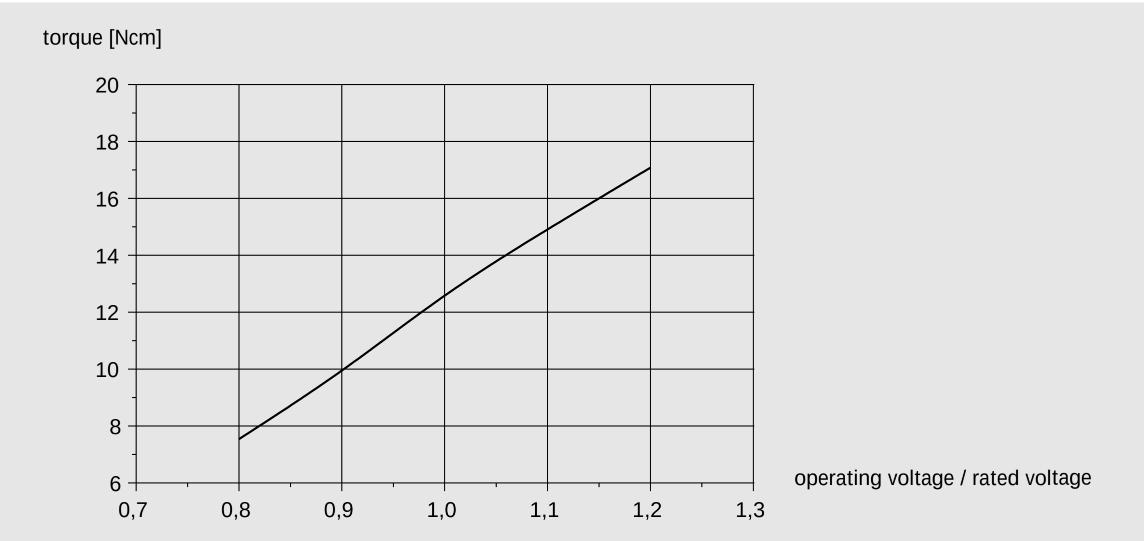
RSM 856/3 F



Connections RSM 856/3

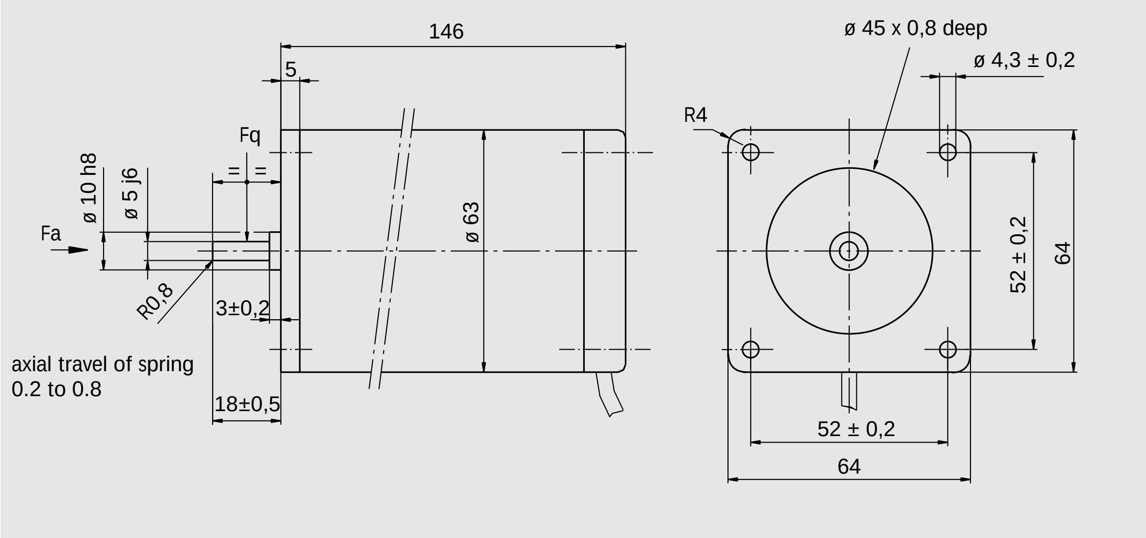


Characteristic curve RSM 856/3 at 50 Hz



Characteristic curve RSM 856/3 at 60 Hz

Synchronous motors
RSM 884/3 F



Scale drawing RSM 884/3

Technical Data

	Frequency	
	50 Hz	**60 Hz**
Speed	1000 rpm	1200 rpm
Synchronous torque	18.1 Ncm	15.3 Ncm
Delivery of power	18.9 W	19.2 W
Power consumption	30.1 W	33.7 W
Rated current (230 V)	134 mA	149 mA
Operating capacitor	0.82 µF	0.82 µF
Maximum externally permitted mass moment of inertia	150 gcm^2	70 gcm^2
Self-holding torque, type	6 Ncm	6 Ncm
Excess winding temperature	70 K	80 K
Permitted radial stress F_q	40 N	40 N
Permitted axial stress F_a	20 N	20 N
Weight	1.25 kg	1.25 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	B gemäß DIN EN 60034-1	B
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

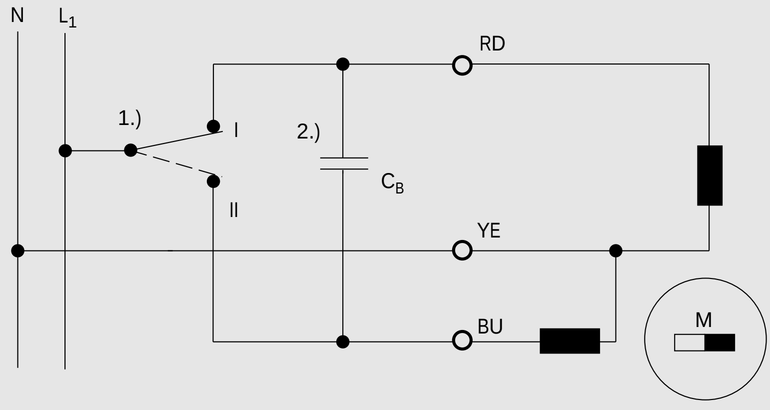
Rated voltage	**110 V**		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	3.3 µF	3.3 µF	27 µF	27 µF	70 µF	70 µF
Rated current	278 mA	309 mA	763 mA	849 mA	1231 mA	1368 mA

Gearbox combinations

You will find gearbox combinations from page 113.

Synchronous motors

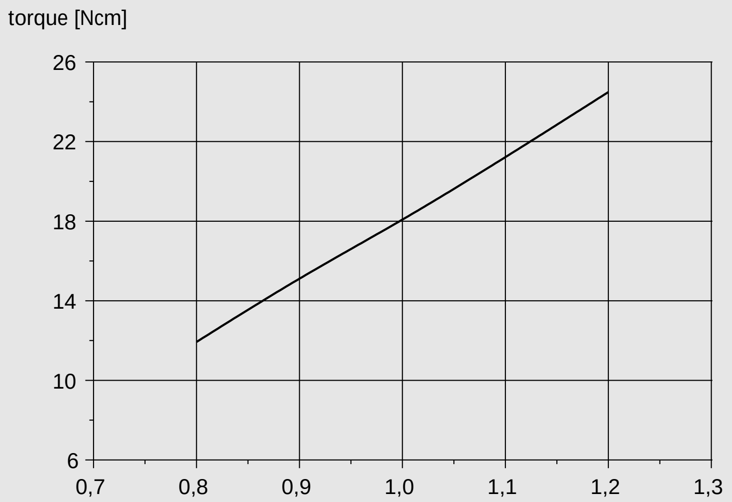
RSM 884/3 F



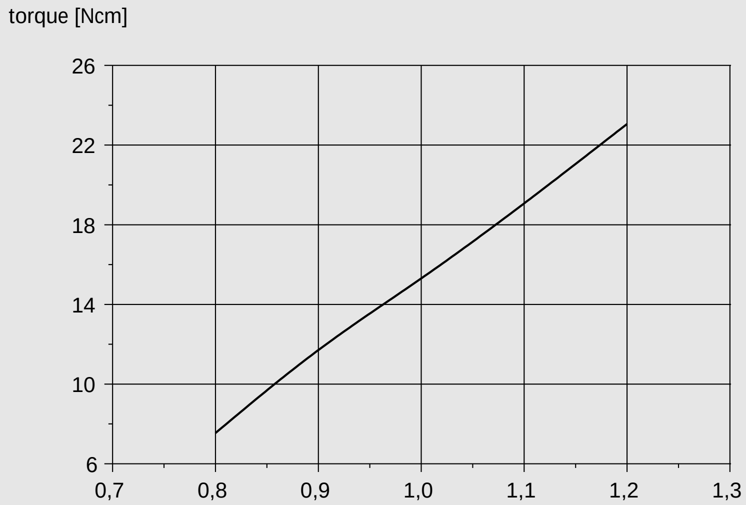
1.) switch position I = clockwise rotation
switch position II = anti-clockwise rotation

2.) C_B = operating capacitor

Connections RSM 884/3

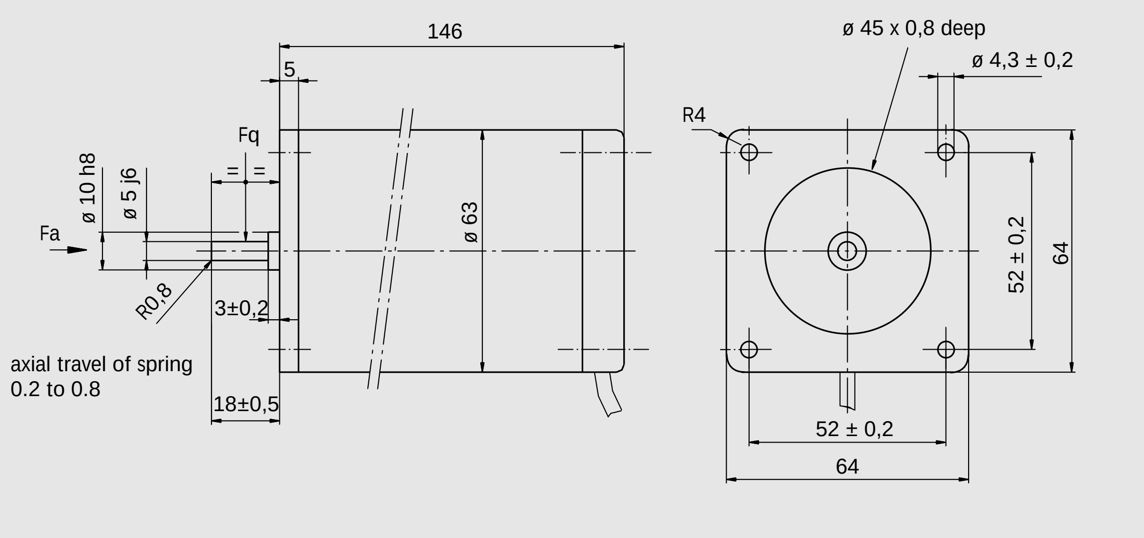


Characteristic curve RSM 884/3 at 50 Hz



Characteristic curve RSM 884/3 at 60 Hz

Synchronous motors
RSM 884/3 S



Scale drawing RSM 884/3 S

Technical Data

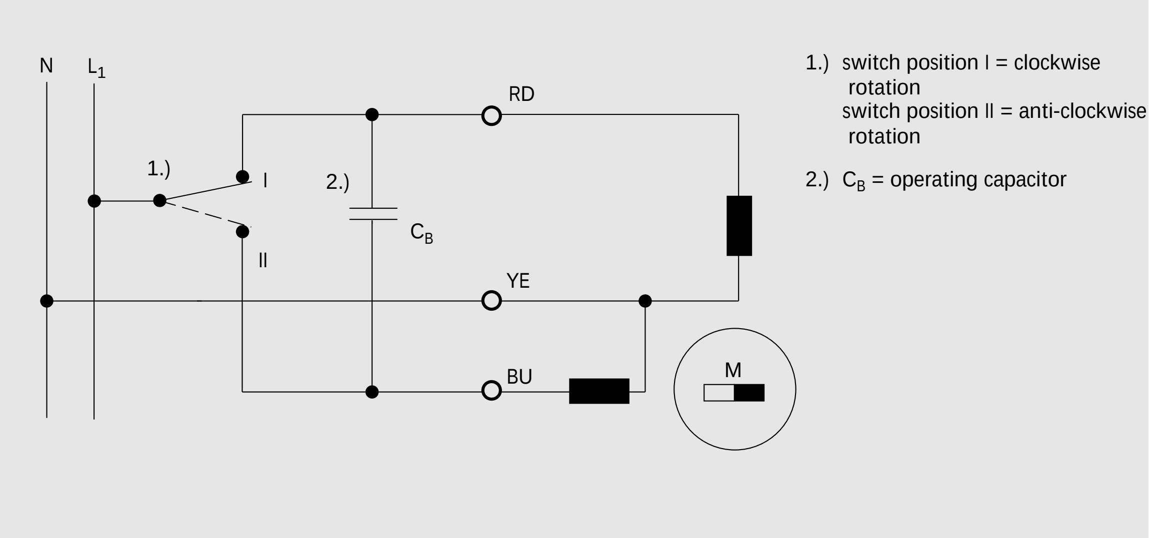
	Frequency	
	50 Hz	**60 Hz**
Speed	1000 rpm	1200 rpm
Synchronous torque	33 Ncm	31 Ncm
Delivery of power	35 W	32 W
Power consumption	70 W	74 W
Rated current (230 V)	308 mA	323 mA
Operating capacitor	2.2 µF	1.8 µF
Maximum externally permitted mass moment of inertia	250 gcm^2	150 gcm^2
Self-holding torque, type	6 Ncm	6 Ncm
Excess winding temperature in short-time operation	max. 85 K	max. 85 K
Permitted radial stress F_q	40 N	40 N
Permitted axial stress F_a	20 N	20 N
Weight	1.25 kg	1.25 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	B gemäß DIN EN 60034-1	B
Dielectric strength	Momentary test, test voltage to DIN EN 60034-1	

Voltages

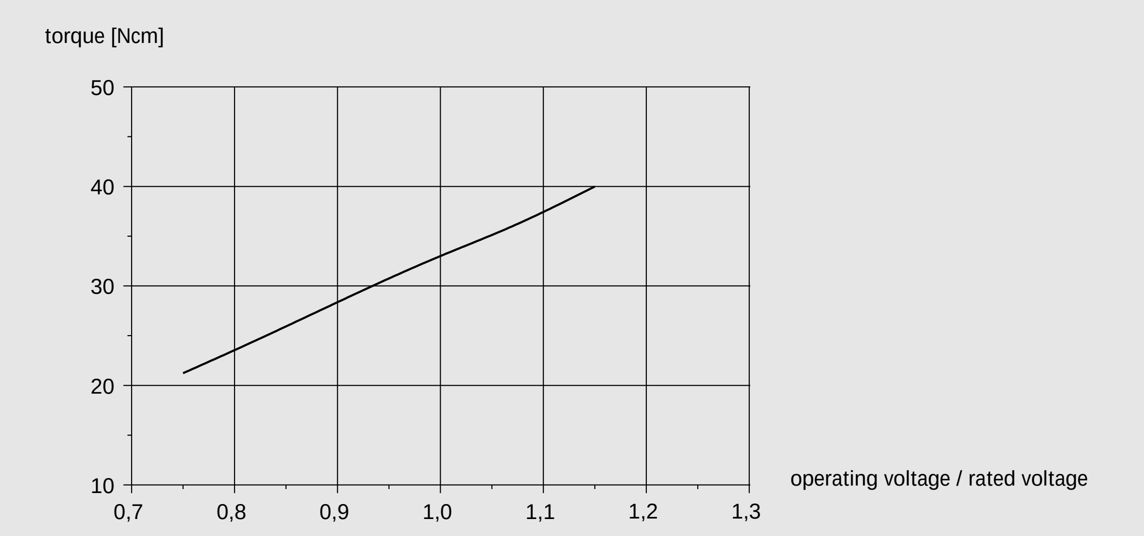
Rated voltage	**110 V**		**42 V**		**24 V**	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Operating capacitor	10 µF	8.2 µF	68 µF	56 µF	180 µF	150 µF
Rated current	670 mA	703 mA	1692 mA	1774 mA	2715 mA	2847 mA

Gearbox combinations

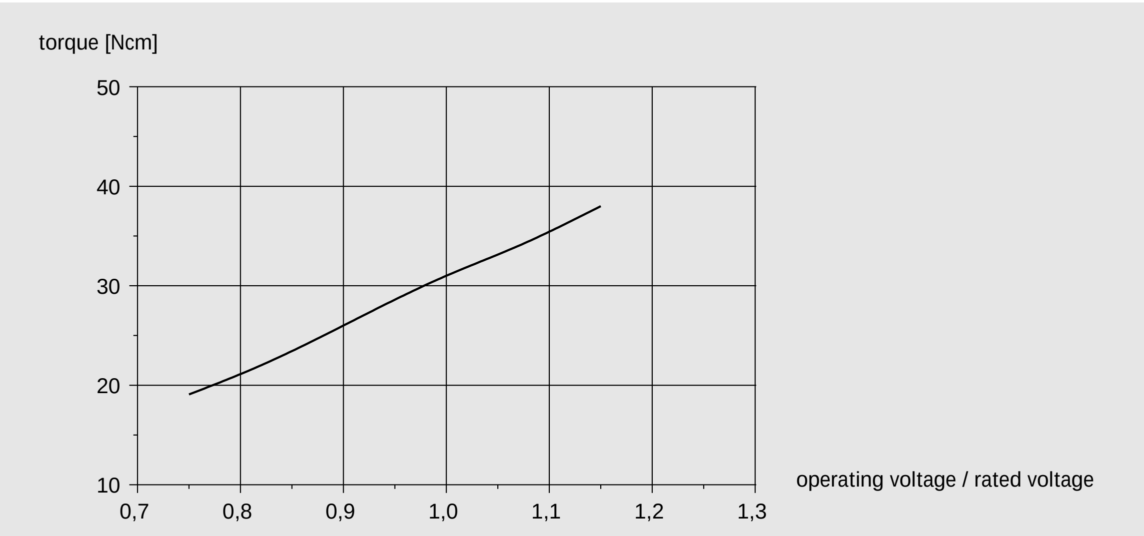
You will find gearbox combinations from page 113.



Connections RSM 884/3 S



Characteristic curve RSM 884/3 S at 50 Hz



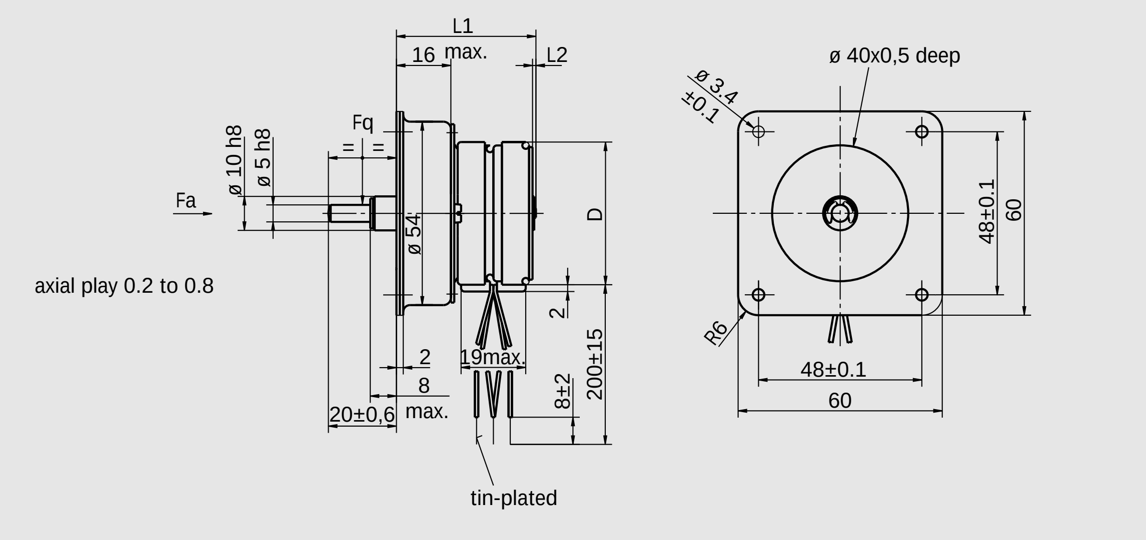
Characteristic curve RSM 884/3 S at 60 Hz

Motor-/ Gearbox combination Synchronous motors (RSM)

Motor type RSM	Gearbox type L	T	G	P
36/8	✓	✓	✓	
36/10			✓	
42/8	✓	✓	✓	
51/8	✓	✓	✓	
63/8			✓	
63/10		✓	✓	
828			✓	✓
842			✓	
856			✓	
884			✓	
884 S			✓	✓

Synchronous motors

Synchronous motors
with gearbox type L



The illustration shows the combination of an RSM 42/8 with gearbox type L and stands for all following combinations of motor and gearbox.

Dimensions for combinations with RSM 36/8, 42/8 and 51/8

Motor type	D	L1	L2
RSM 36/8	36 mm	max. 40 mm	max. 3.5 mm
RSM 42/8	42 mm	max. 41 mm	max. 1.5 mm
RSM 51/8	50 mm	max. 45 mm	max. 3 mm

Gearbox type L

	Values
Max. torque M on the driven shaft	30 Ncm Danger of gear breaking if exceeded!
Permitted radial stress F_q	5 N
Permitted axial stress F_a	2 N
Corrosion protection	Housing finish zinc-plated
Driven Shaft	Nitrided
Bearings	Plain bearings
Seal at shaft exit	none

Synchronous motors

with gearbox type L

Gearbox type L withRSM 36/8

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
24 V, 230 V	4 Ncm	4 Ncm	60 rpm	72 rpm	6.25
24 V	16 Ncm	15 Ncm	15.0 rpm	18.0 rpm	25
24 V	19 Ncm	18 Ncm	12.5 rpm	15.0 rpm	30
24 V	max. 30 Ncm	max. 30 Ncm	5.0 rpm	6.0 rpm	75
24 V, 230 V	max. 30 Ncm	max. 30 Ncm	1.0 rpm	1.2 rpm	375

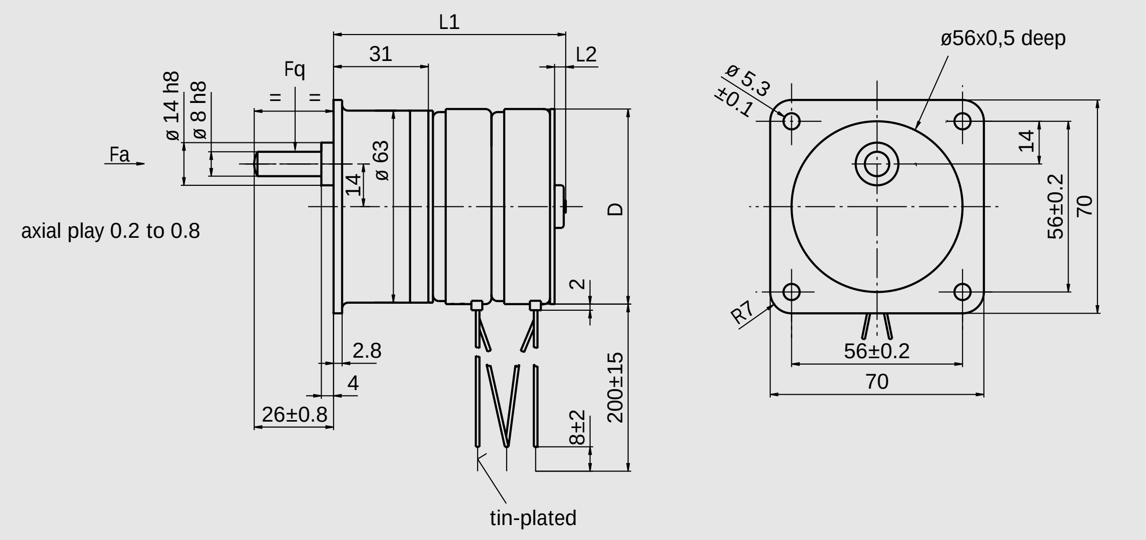
Gearbox type L with RSM 42/8

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
230 V	13 Ncm	12 Ncm	75.0 rpm	90.0 rpm	5
24 V, 230 V	16 Ncm	15 Ncm	60.0 rpm	72.0 rpm	6.25
24 V, 230 V	max. 30 Ncm	30 Ncm	30.0 rpm	36.0 rpm	12.5
24 V, 230 V	max. 30 Ncm	max. 30 Ncm	25.0 rpm	30.0 rpm	15
24 V, 230 V	max. 30 Ncm	max. 30 Ncm	15.0 rpm	18.0 rpm	25
24 V, 230 V	max. 30 Ncm	max. 30 Ncm	12.5 rpm	15.0 rpm	30

Gearbox type L with RSM 51/8

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
230 V	max. 30 Ncm	max. 30 Ncm	3.0 rpm	3.6 rpm	125

Synchronous motors
with gearbox type T



The illustration shows the combination of an RSM 63/8 with gearbox type T and stands for all following combinations of motor and gearbox.

Dimensions for combinations with RSM 36/8, 42/8, 51/8 and 63/10

Motor type	D	L1	L2
RSM 36/8	36 mm	max. 55 mm	max. 3.5 mm
RSM 42/8	42 mm	max. 56 mm	max. 1.5 mm
RSM 51/8	50 mm	max. 60 mm	max. 3 mm
RSM 63/10	63 mm	max. 77 mm	max. 4 mm

Gearbox type T

	Values
Max. torque M on the driven shaft	300 Ncm Danger of gear breaking if exceeded!
Permitted radial stress F_q	30 N
Permitted axial stress F_a	20 N
Corrosion protection	Housing finish zinc-plated
Driven shaft	Nitrided
Bearings	Plain bearings
Seal at shaft exit	Washer

Synchronous motors

with gearbox type T

Gearbox type T with RSM 36/8

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
24 V	76 Ncm	71 Ncm	2.5 rpm	3.0 rpm	150
230 V	95 Ncm	89 Ncm	2.0 rpm	2.4 rpm	187.5
24 V	189 Ncm	177 Ncm	1.0 rpm	1.2 rpm	375

Gearbox type T with RSM 42/8

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
24 V, 230 V	56 Ncm	53 Ncm	15.0 rpm	18.0 rpm	25
24 V, 230 V	84 Ncm	80 Ncm	10.0 rpm	12.0 rpm	37.5
230 V	112 Ncm	106 Ncm	7.5 rpm	9.0 rpm	50
24 V, 230 V	168 Ncm	159 Ncm	5.0 rpm	6.0 rpm	75
24 V, 230 V	189 Ncm	179 Ncm	4.0 rpm	4.8 rpm	93.75
230 V	max. 300 Ncm	286 Ncm	2.5 rpm	3.0 rpm	150
230 V	max. 300 Ncm	max. 300 Ncm	1.0 rpm	1.2 rpm	375

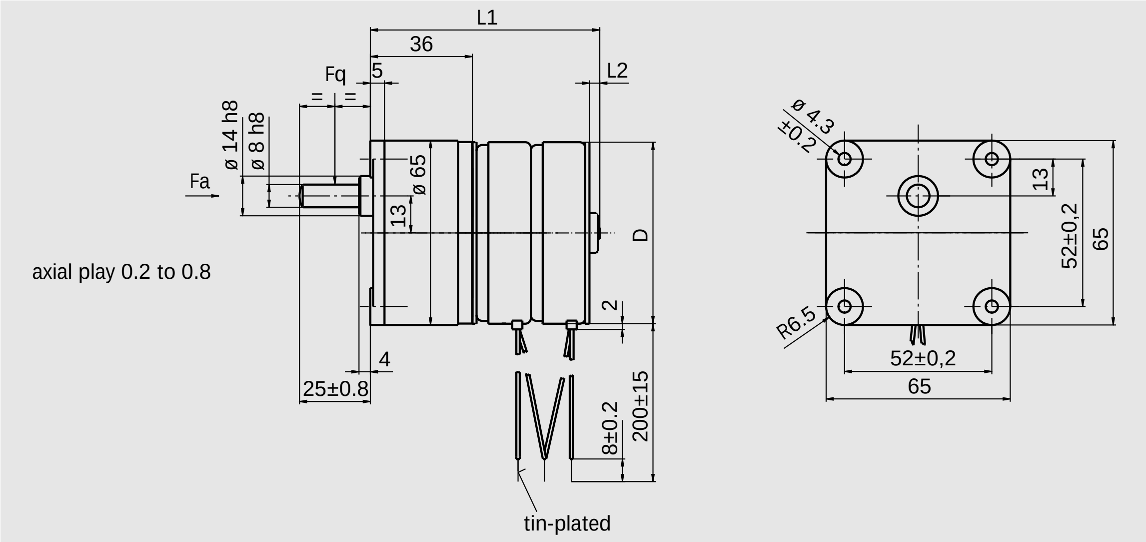
Gearbox type T with RSM 51/8

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
230 V	36 Ncm	34 Ncm	30.0 rpm	36.0 rpm	12.5
230 V	109 Ncm	103 Ncm	10.0 rpm	12.0 rpm	37.5
230 V	219 Ncm	205 Ncm	5.0 rpm	6.0 rpm	75
230 V	max. 300 Ncm	max. 300 Ncm	2 rpm	2.40 rpm	187.5
230 V	max. 300 Ncm	max. 300 Ncm	0.5 rpm	0.6 rpm	750

Gearbox type T with RSM 63/10

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
24 V, 230 V	30 Ncm	23 Ncm	120.0 rpm	144.0 rpm	2.5
24 V, 230 V	67 Ncm	51 Ncm	48.0 rpm	57.6 rpm	6.25
24 V, 230 V	80 Ncm	61 Ncm	40.0 rpm	48.0 rpm	7.5
24 V, 230 V	180 Ncm	137 Ncm	16.0 rpm	19.2 rpm	18.75
24 V, 230 V	max. 300 Ncm	273 Ncm	8.0 rpm	9.6 rpm	37.5

Synchronous motors
with gearbox type G



The illustration shows the combination of an RSM 63/8 with gearbox type G and stands for all following combinations of motor and gearbox.

Dimensions for combinations with RSM 36/x, 42/8, 51/8 und 63/x

Motor type	D	L1	L2
RSM 36/x	36 mm	max. 70 mm	max. 3.5 mm
RSM 42/x	42 mm	max. 60 mm	max. 1.5 mm
RSM 63/x	63 mm	max. 88 mm	max. 4 mm

Gearbox type G

	Values
Max. torque M on the driven shaft	600 Ncm Danger of gear breaking if exceeded!
Permitted radial stress F_q	40 N
Permitted axial stress F_a	20 N
Corrosion protection	Housing finish zinc-plated
Driven shaft	Nitrided
Bearings	Plain bearings
Seal at shaft exit	Washer

Synchronous motors
with gearbox type G

Gearbox type G with RSM 36/8

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
230 V	max. 600 Ncm	max. 600 Ncm	7.5 h^{-1}	9.0 h^{-1}	3000

Gearbox type G with RSM 36/10

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
230 V	max. 600 Ncm	582 Ncm	12.0 h^{-1}	14.4 h^{-1}	1500
230 V	max. 600 Ncm	max. 600 Ncm	6.0 h^{-1}	7.2 h^{-1}	3000
24 V, 230 V	max. 600 Ncm	max. 600 Ncm	1.0 h^{-1}	1.2 h^{-1}	18000
230 V	max. 600 Ncm	max. 600 Ncm	0.33 h^{-1}	0.4 h^{-1}	54000
24 V	max. 600 Ncm	max. 600 Ncm	0.08 h^{-1}	0.1 h^{-1}	216000

Gearbox type G with RSM 42/8

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
24 V	max. 600 Ncm	max. 600 Ncm	1.0 rpm	1.2 rpm	375
24 V	max. 600 Ncm	max. 600 Ncm	15.0 h^{-1}	18.0 h^{-1}	1500

Gearbox type G with RSM 51/8

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
230 V	55 Ncm	51 Ncm	20.0 rpm	24.0 rpm	18.75
230 V	73 Ncm	68 Ncm	15.0 rpm	18.0 rpm	25
230 V	146 Ncm	137 Ncm	7.5 rpm	9.0 rpm	50
230 V	164 Ncm	154 Ncm	6.0 rpm	7.2 rpm	62.5
230 V	197 Ncm	185 Ncm	5.0 rpm	6.0 rpm	75
230 V	246 Ncm	231 Ncm	4.0 rpm	4.8 rpm	93.75
230 V	354 Ncm	332 Ncm	2.5 rpm	3.0 rpm	150
230 V	max. 600 Ncm	max. 600 Ncm	1.0 rpm	1.2 rpm	375

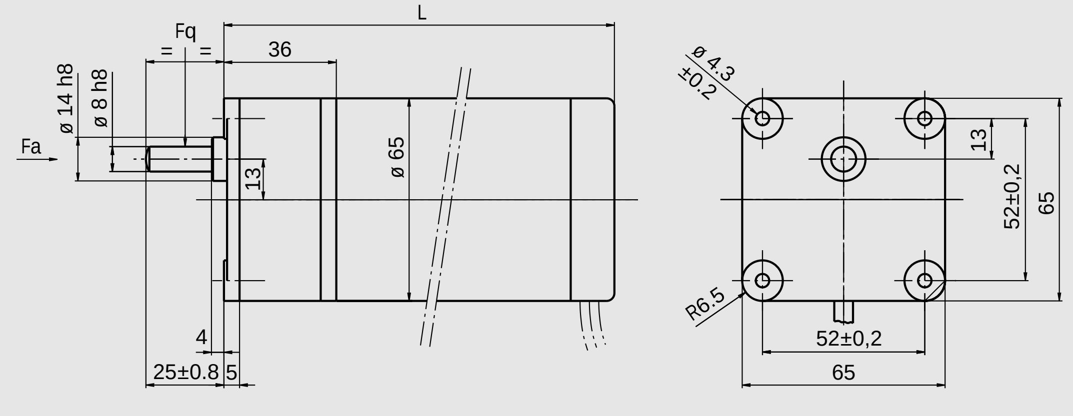
Gearbox type G with RSM 63/8

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
24 V, 230 V	237 Ncm	213 Ncm	15.0 rpm	18.0 rpm	25
24 V, 230 V	474 Ncm	427 Ncm	7.5 rpm	9.0 rpm	50
24 V, 230 V	533 Ncm	480 Ncm	6.0 rpm	7.2 rpm	62.5

Gearbox type G with RSM 63/10

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
24 V, 230 V	481 Ncm	365 Ncm	6.0 rpm	7.2 rpm	50
24 V, 230 V	max. 600 Ncm	max. 600 Ncm	2.0 rpm	2.4 rpm	150

Synchronous motors
with gearbox type G



axial play 0.2 to 0.8

Dimensions for combinations with RSM 8xx

Motor type	L
RSM 828	126 mm
RSM 842	140 mm
RSM 856	154 mm
RSM 884	182 mm

Gearbox type G

	Values
Max. torque M on the driven shaft	600 Ncm Danger of gear breaking if exceeded!
Permitted radial stress F_q	40 N
Permitted axial stress F_a	20 N
Corrosion protection	Housing finish zinc plated
Driven shaft	Nitrided
Bearings	Plain bearings
Seal at shaft exit	Washer

Synchronous motors

with gearbox type G

Gearbox type G with RSM 828

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
24 V, 230 V	43 Ncm	40 Ncm	160 rpm	192 rpm	6.25
24 V, 230 V	61 Ncm	57 Ncm	100.0 rpm	120.0 rpm	10
24 V, 230 V	77 Ncm	71 Ncm	80.0 rpm	96.0 rpm	12.5
24 V, 230 V	102 Ncm	95 Ncm	60.0 rpm	72.0 rpm	16.66
24 V, 230 V	123 Ncm	114 Ncm	50.0 rpm	60.0 rpm	20
24 V, 230 V	184 Ncm	171 Ncm	30.0 rpm	36.0 rpm	33.3
24 V, 230 V	230 Ncm	213 Ncm	24.0 rpm	28.8 rpm	41.66
24 V, 230 V	367 Ncm	341 Ncm	15.0 rpm	18.0 rpm	66.66
24 V, 230 V	459 Ncm	426 Ncm	12.0 rpm	14.4 rpm	83.33
24 V, 230 V	496 Ncm	461 Ncm	10.0 rpm	12.0 rpm	100
24 V, 230 V	max. 600 Ncm	576 Ncm	8.0 rpm	9.6 rpm	125
24 V, 230 V	max. 600 Ncm	max. 600 Ncm	6.0 rpm	7.2 rpm	166.66
24 V, 230 V	max. 600 Ncm	max. 600 Ncm	5.0 rpm	6.0 rpm	200
24 V, 230 V	max. 600 Ncm	max. 600 Ncm	4.0 rpm	4.8 rpm	250
230 V	max. 600 Ncm	max. 600 Ncm	3.0 rpm	3.6 rpm	333.33

Gearbox type G with RSM 842

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
24 V, 230 V	71 Ncm	66 Ncm	100.0 rpm	120.0 rpm	10
24 V, 230 V	117 Ncm	109 Ncm	60.0 rpm	72.0 rpm	16.66
24 V, 230 V	140 Ncm	131 Ncm	50.0 rpm	60.0 rpm	20
24 V, 230 V	175 Ncm	164 Ncm	40.0 rpm	48.0 rpm	25
24 V, 230 V	210 Ncm	197 Ncm	30.0 rpm	36.0 rpm	33.33
24 V, 230 V	262 Ncm	246 Ncm	24.0 rpm	28.8 rpm	41.66
24 V, 230 V	420 Ncm	394 Ncm	15.0 rpm	18.0 rpm	66.66
230 V	525 Ncm	492 Ncm	12.0 rpm	14.4 rpm	83.33
24 V, 230 V	567 Ncm	531 Ncm	10.0 rpm	12.0 rpm	100
230 V	max. 600 Ncm	max. 600 Ncm	8.0 rpm	9.6 rpm	125

Gearbox type G with RSM 856

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
230 V	54 Ncm	51 Ncm	200.0 rpm	240.0 rpm	5
24 V, 230 V	160 Ncm	153 Ncm	60.0 rpm	72.0 rpm	16.66
24 V, 230 V	289 Ncm	276 Ncm	30.0 rpm	36.0 rpm	33.33
24 V, 230 V	433 Ncm	413 Ncm	20.0 rpm	24.0 rpm	50
24 V, 230 V	max. 600 Ncm	max. 600 Ncm	10.0 rpm	12.0 rpm	100
230 V	max. 600 Ncm	max. 600 Ncm	8.0 rpm	9.6 rpm	125
230 V	max. 600 Ncm	max. 600 Ncm	6.0 rpm	7.2 rpm	166.66

Synchronous motors
with gearbox type G

Gearbox type G with RSM 884

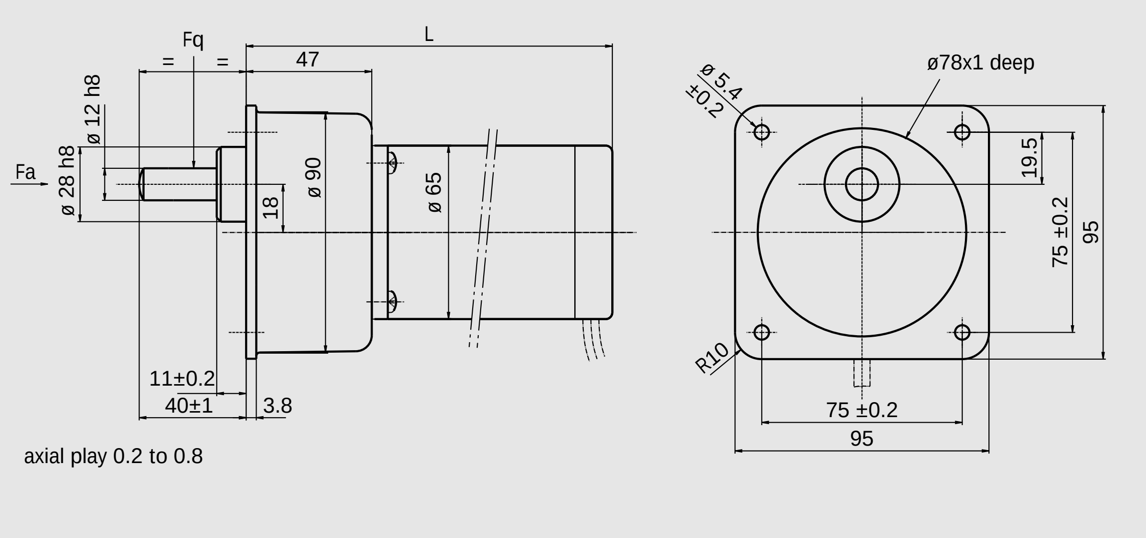
Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
230 V	132 Ncm	112 Ncm	100.0 rpm	120.0 rpm	10
24 V, 230 V	220 Ncm	186 Ncm	60.0 rpm	72.0 rpm	16.66
24 V, 230 V	264 Ncm	223 Ncm	50.0 rpm	60.0 rpm	20
24 V, 230 V	330 Ncm	279 Ncm	40.0 rpm	48.0 rpm	25
24 V, 230 V	396 Ncm	335 Ncm	30.0 rpm	36.0 rpm	33.33
230 V	495 Ncm	418 Ncm	24.0 rpm	28.8 rpm	41.66

Gearbox type G with RSM 884 S

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
230 V	134 Ncm	126 Ncm	200.0 rpm	240.0 rpm	5
230 V	167 Ncm	157 Ncm	160.0 rpm	192.0 rpm	6.25
230 V	241 Ncm	226 Ncm	100.0 rpm	120.0 rpm	10
24 V, 230 V	301 Ncm	283 Ncm	80.0 rpm	96.0 rpm	12.5
230 V	401 Ncm	377 Ncm	60.0 rpm	72.0 rpm	16.66
230 V	481 Ncm	452 Ncm	50.0 rpm	60.0 rpm	20
24 V	max. 600 Ncm	565 Ncm	40.0 rpm	48.0 rpm	25
24 V, 230 V	max. 600 Ncm	max. 600 Ncm	30.0 rpm	36.0 rpm	33.33
230 V	max. 600 Ncm	max. 600 Ncm	24.0 rpm	28.8 rpm	41.66
230 V	max. 600 Ncm	max. 600 Ncm	20.0 rpm	24.0 rpm	50
230 V	max. 600 Ncm	max. 600 Ncm	10.0 rpm	12.0 rpm	100

Synchronous motors

with gearbox type P



Dimensions for combinations with RSM 828 und 884 S

Motor type	L
RSM 828	137 mm
RSM 884 S	193 mm

Gearbox type P

	Values
Max. torque M on the driven shaft	1000 Ncm Danger of gear breaking if exceeded!
Permitted radial stress F_q	60 N
Permitted axial stress F_a	40 N
Corrosion protection	Housing finish zinc-plated
Driven shaft	Nitrided
Bearings	Plain bearings
Seal at shaft exit	Washer

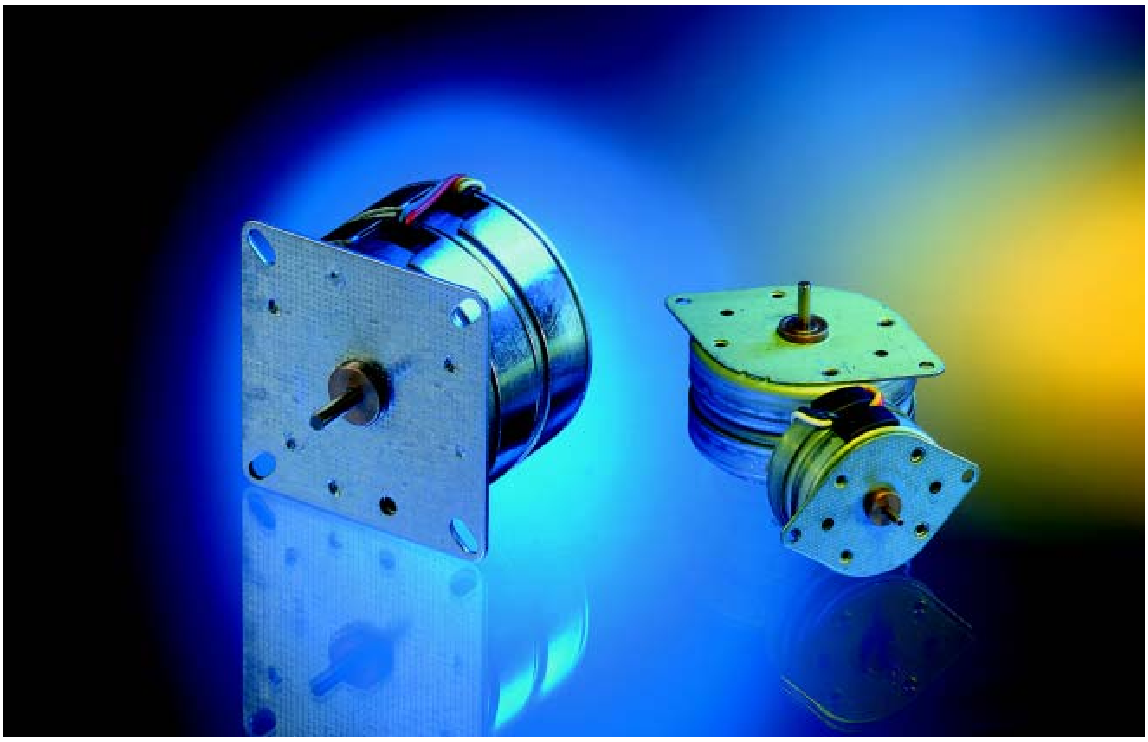
Synchronous motors
with gearbox type P

Gearbox type P with RSM 828

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
24 V, 230 V	345 Ncm	320 Ncm	16.0 rpm	19.2 rpm	62.5
24 V, 230 V	689 Ncm	640 Ncm	8.0 rpm	9.6 rpm	125
24 V, 230 V	max. 1000 Ncm	max. 1000 Ncm	4.0 rpm	4.8 rpm	250
24 V, 230 V	max. 1000 Ncm	max. 1000 Ncm	2.5 rpm	3.0 rpm	400
24 V, 230 V	max. 1000 Ncm	max. 1000 Ncm	2.0 rpm	2.4 rpm	500

Gearbox type P with RSM 884 S

Motor voltage	Torque M on driven shaft		Driven shaft speed n		Transmission ratio i
	50 Hz	60 Hz	50 Hz	60 Hz	
24 V, 230 V	601 Ncm	565 Ncm	40.0 rpm	48.0 rpm	25
230 V	902 Ncm	848 Ncm	26.7 rpm^{-1}	32.0 rpm	37.5
24 V, 230 V	max. 1000 Ncm	max. 1000 Ncm	20.0 rpm	24.0 rpm	50
24 V, 230 V	max. 1000 Ncm	max. 1000 Ncm	16.0 rpm	19.2 rpm	62.5
230 V	max. 1000 Ncm	max. 1000 Ncm	13.3 rpm	16.0 rpm	75
24 V, 230 V	max. 1000 Ncm	max. 1000 Ncm	10.7 rpm	12.8 rpm	93.75
24 V, 230 V	max. 1000 Ncm	max. 1000 Ncm	10.0 rpm	12.0 rpm	100
230 V	max. 1000 Ncm	max. 1000 Ncm	6.7 rpm	8.0 rpm	150



2-phase stepping motors

With the stepping motors from Berger Lahr, positioning problems can be solved in a precise, simple and cost-effective manner. Berger Lahr provides hybrid stepping motors and claw-pole stepping motors. These stepping motors are being used in their millions around the world and have proved their worth.

On request we will be happy to tell you of more motor/ gearbox options besides those presented here.

Overview of 2-phase stepping motors

	Step angle [°]	Max. torque bipolar [Ncm]	Max. torque unipolar [Ncm]	Described on...
RDM 36/6	15	1.24	0.75	Page 53
RDM 36/8	11.25	1.27	0.7	Page 55
RDM 36/10	9	1.18	0.73	Page 57
RDM 36/12	7.5	1.18	0.6	Page 59
RDM 42/12	7.5	4.1	3.1	Page 61
RDM 51/6	15	5.5	3.1	Page 63
RDM 51/8	11.25	6.8	4.1	Page 65
RDM 51/12	7.5	6.9	4.9	Page 67
RDM 63/10	9	22.5	12.5	Page 69
RDM 63/12	7.5	25.5	15	Page 71

2-phase stepping motors

Type code for 2-phase stepping motors

Example	**RDM 36/10 G A2 62 mA - L 25:1**
Product family RDM= Reversible Digital Motor (2-Phase)	**RDM** 36/10 G A2 62mA - L 25:1
Motor size (diameter) Example 36 = 36 mm diameter 42 = 42 mm diameter 51 = 51 mm diameter 63 = 63 mm diameter	RDM **36**/10 G A2 62mA - L 25:1
Number of pole pairs 6= number of polepairs p = 6 8= number of polepairs p = 8 10 = number of polepairs p = 10 12= number of polepairs p = 12	RDM 36/**10** G A2 62mA - L 25:1
Bearings G = Plain bearing	RDM 36/10 **G** A2 62mA - L 25:1
Switching / winding A1 = bipolar A2 = unipolar	RDM 36/10 G **A2** 62mA - L 25:1
Max. current per winding Example: 62mA = 0.62 A	RDM 36/10 G A2 **62mA** - L 25:1
Gearbox type Gearbox type L Gearbox type T Gearbox type G Gearbox type P	RDM 36/10 G A2 62mA - **L** 25:1
Gearbox reduction Example 25 :1	RDM 36/10 G A2 62mA - L **25:1**

General technical information

Bearing designs

The claw-pole stepping motors, RDM 36/x, 42/x, 51/x and 63/x are fitted with plain bearings.

Temperatures

The permissible ambient temperature for the synchronous motors lies in the range from - 20°C to + 60°C.

In locations with poor heat dissipation, e.g. in closed plastic housings, a check should be made to see if the permissible winding temperature is being exceeded.

Type of connection

Claw-pole stepping motors are available with flying leeds. The flying leads are hard-wired, bared, tin-plated and 200 mm in length.

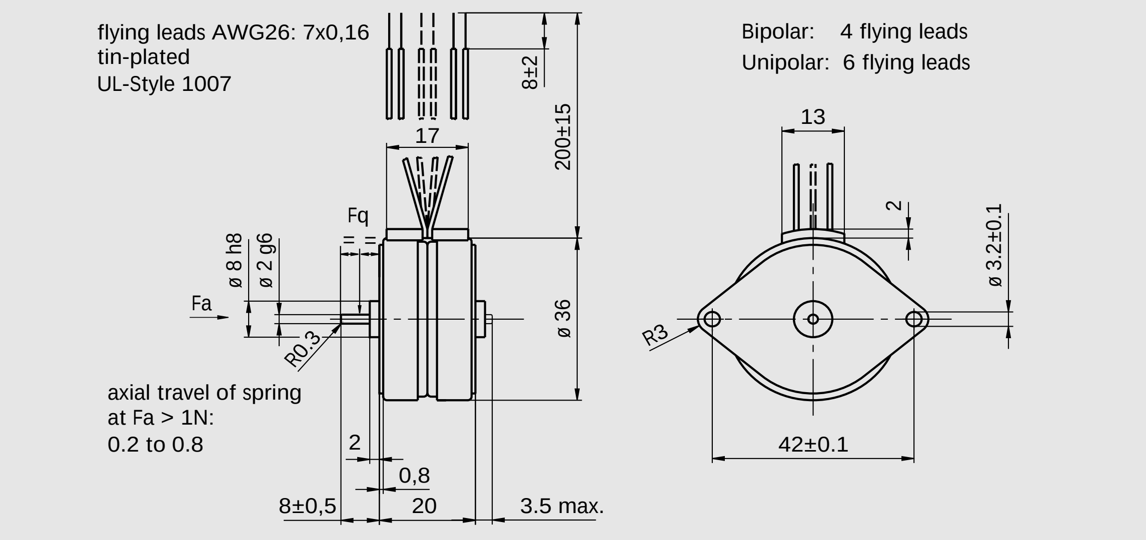
Switching characteristics of the bipolar design

The distinctive characteristic of a bipolar arrangement is that each motor phase consists of one winding (coil). This means that the whole volume of copper on the coil contributes to the formation of torque.

Switching characteristics of the unipolar design

In a unipolar arrangement, each motor phase (coil) consists of two winding halves. In operation only one winding ever carries current at one time. The switching power required in the amplifier is 50% less than for the bipolar arrangement. This means that motor controls can be realised more cost effectively.

2-phase stepping motors
RDM 36/6



Scale drawing RDM 36/6

Technical data

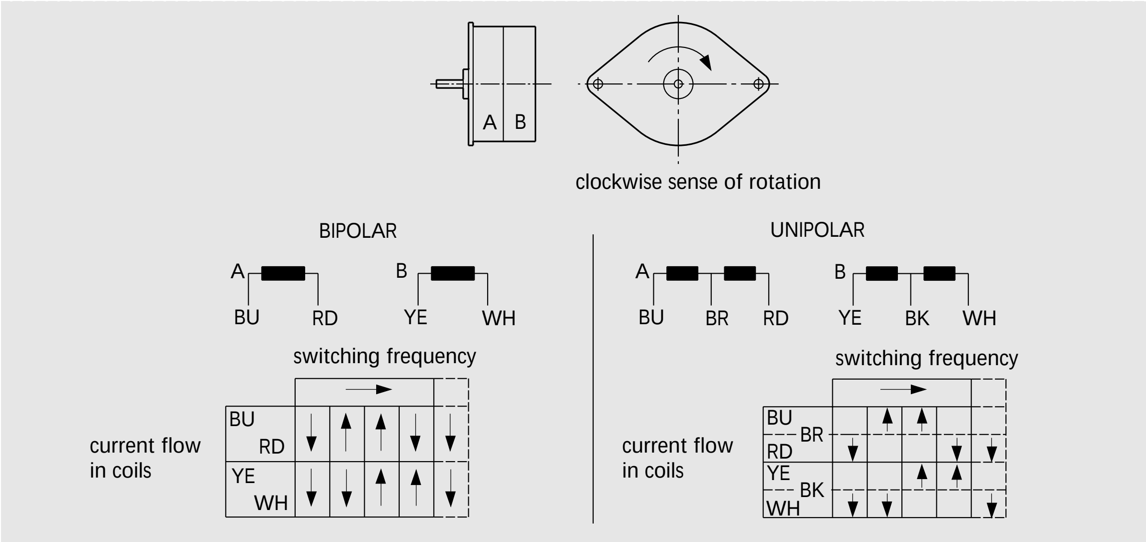
	Control diagram	
	Bipolar	**Unipolar**
Steps / revolution	24	24
Step angle	15°	15°
Step angle tolerance	± 4%	± 4%
Max. torque	1.24 Ncm	0.75 Ncm
Holding torque (excited)	1.9 Ncm	1.4 Ncm
Rotor moment of inertia	2 gcm^2	2 gcm^2
Max. current per winding	0.23 A	0.115 A
Resistance per winding	26 Ω	105 Ω
Permitted shaft load	Axial stress F_a = 1 N, radial stress F_q = 3 N	
Weight approx.	0.075 kg	0.075 kg
Protection grade	IP 41	IP 41
Insulation class	E to VDE 0530	E to VDE 0530
Insulation class	Momentary test: test voltage to VDE 0530	

Gearbox combinations

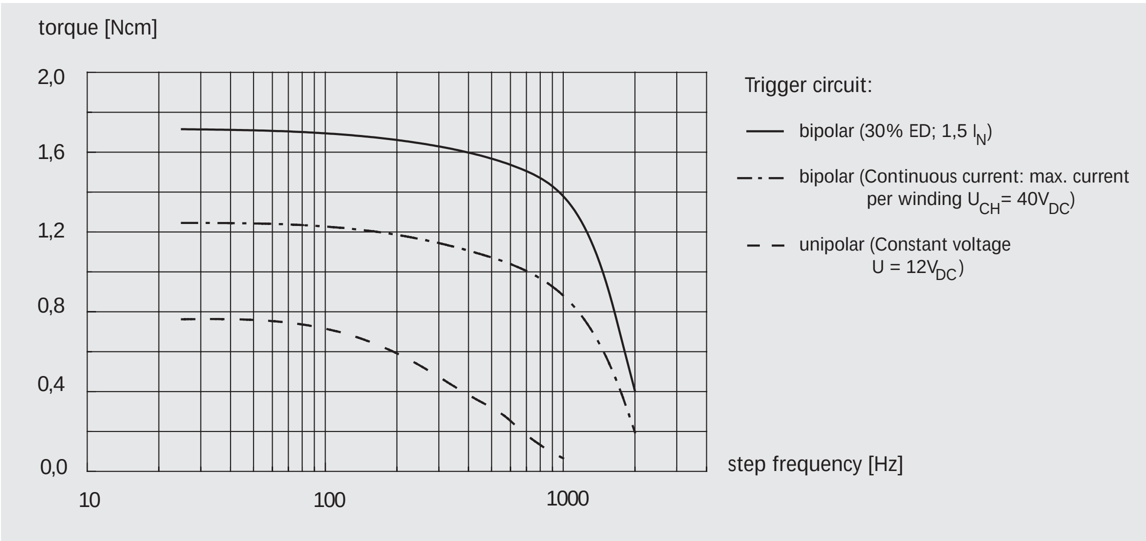
You will find gearbox combinations from page 127.

2-phase stepping motors

RDM 36/6

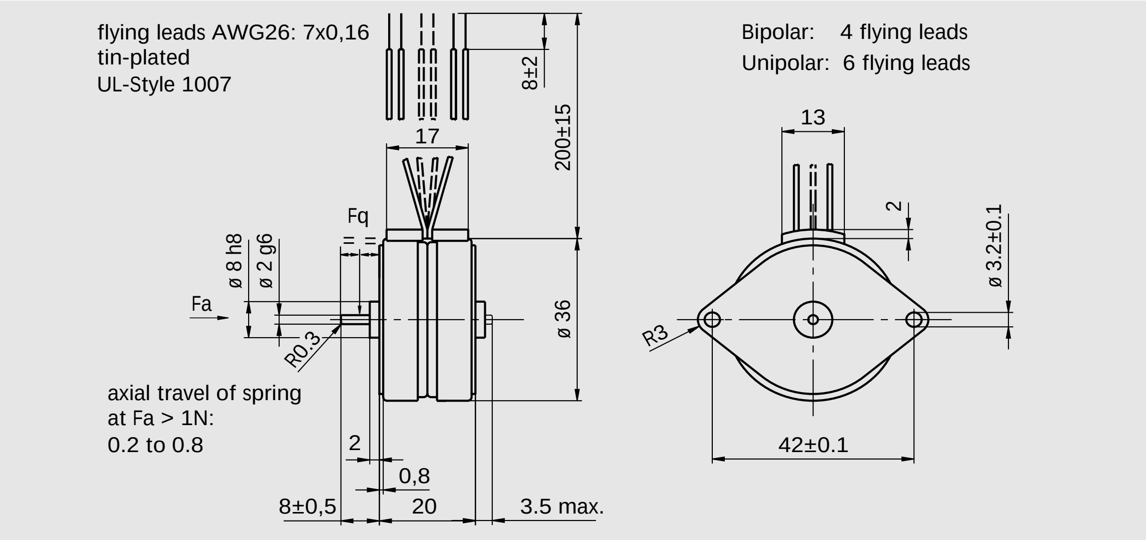


Connections RDM 36/6



Characteristic curve RDM 36/6

2-phase stepping motors
RDM 36/8



Scale drawing RDM 36/8

Technical Data

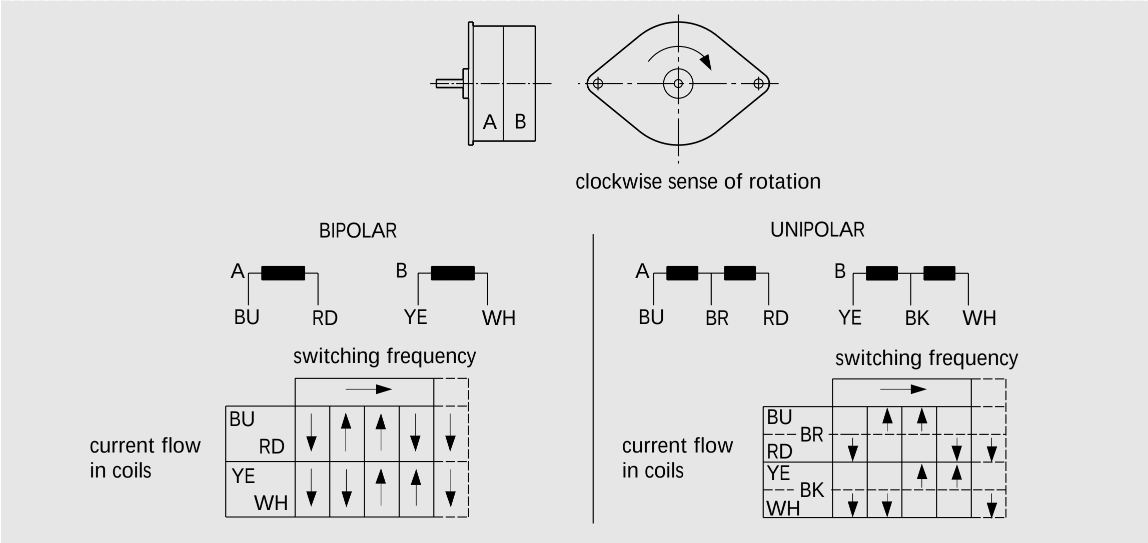
	Control diagram	
	Bipolar	**Unipolar**
Steps / revolution	32	32
Step angle	11.25°	11.25°
Step angle tolerance	± 4%	± 4%
Max. torque	1.27 Ncm	0.7 Ncm
Holding torque (excited)	1.6 Ncm	1.1 Ncm
Rotor moment of inertia	2 gcm^2	2 gcm^2
Max. current per winding	0.23 A	0.115 A
Resistance per winding	26 Ω	105 Ω
Permitted shaft load	Axial stress F_a = 1 N, radial $stress_q$ = 3 N	
Weight approx.	0.075 kg	0.075 kg
Protection grade	IP 41	IP 41
Insulation class	E to DIN EN 60034-1	E
Insulation class	Dielectric strength	

Gearbox combinations

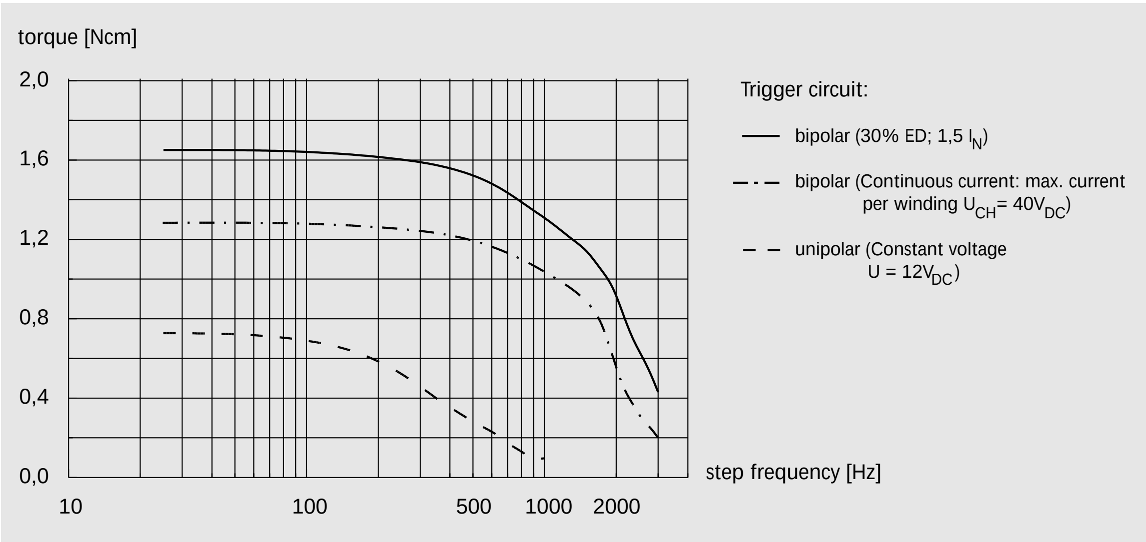
You will find gearbox combinations from page 127.

2-phase stepping motors

RDM 36/8

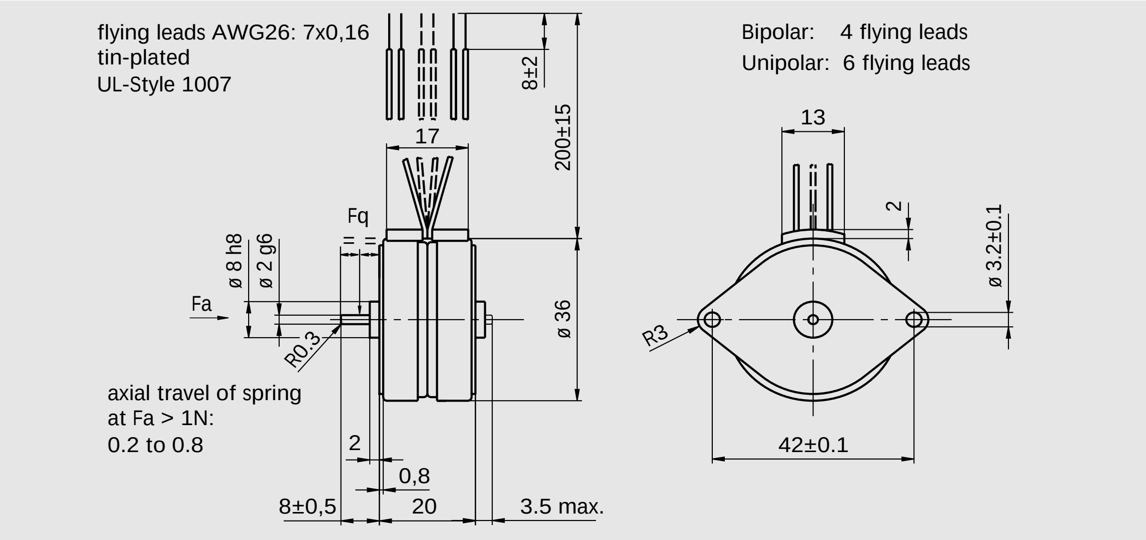


Connections RDM 36/8



Characteristic curve RDM 36/8

2-phase stepping motors
RDM 36/10



Scale drawing RDM 36/10

Technical Data

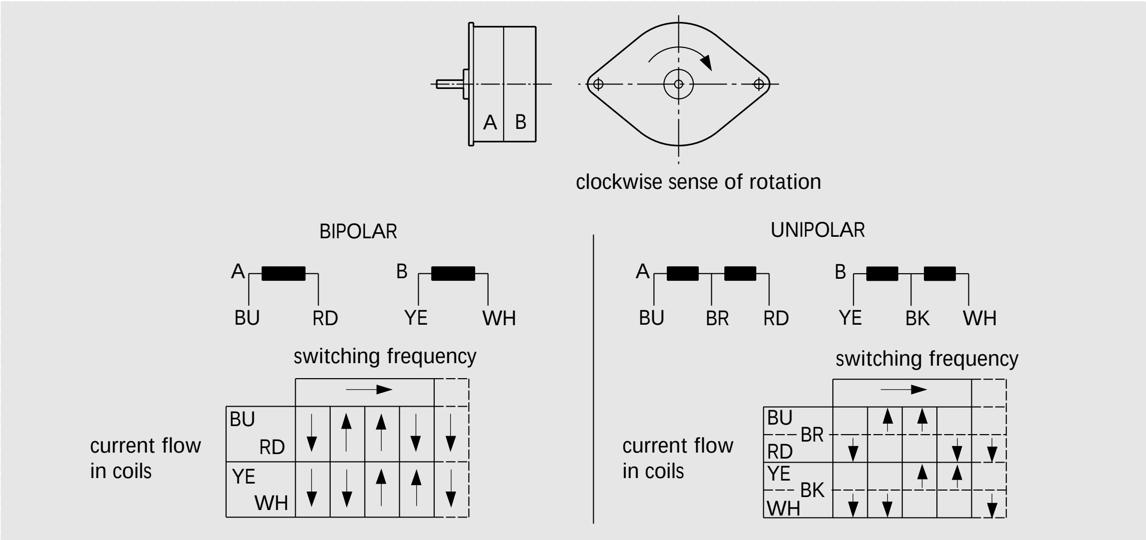
	Control diagram	
	Bipolar	**Unipolar**
Steps / revolution	40	40
Step angle	9°	9°
Step angle tolerance	± 5%	± 6%
Max. torque	1.18 Ncm	0.73 Ncm
Holding torque (excited)	1.6 Ncm	1.0 Ncm
Rotor moment of inertia	2 gcm^2	2 gcm^2
Max. current per winding	0.23 A	0.115 A
Resistance per winding	26 Ω	105 Ω
Permitted shaft load	Axial stress F_a = 1 N, radial stress F_q = 3 N	
Weight approx.	0.075 kg	0.075 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test: test voltage to DIN EN 60034-1	

Gearbox combinations

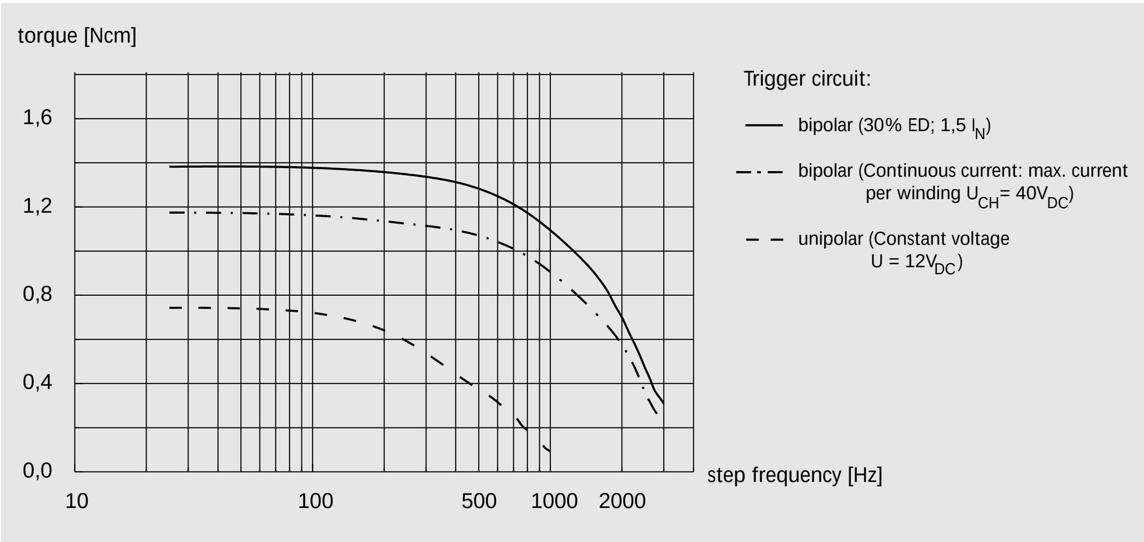
You will find gearbox combinations from page 127.

2-phase stepping motors

RDM 36/10

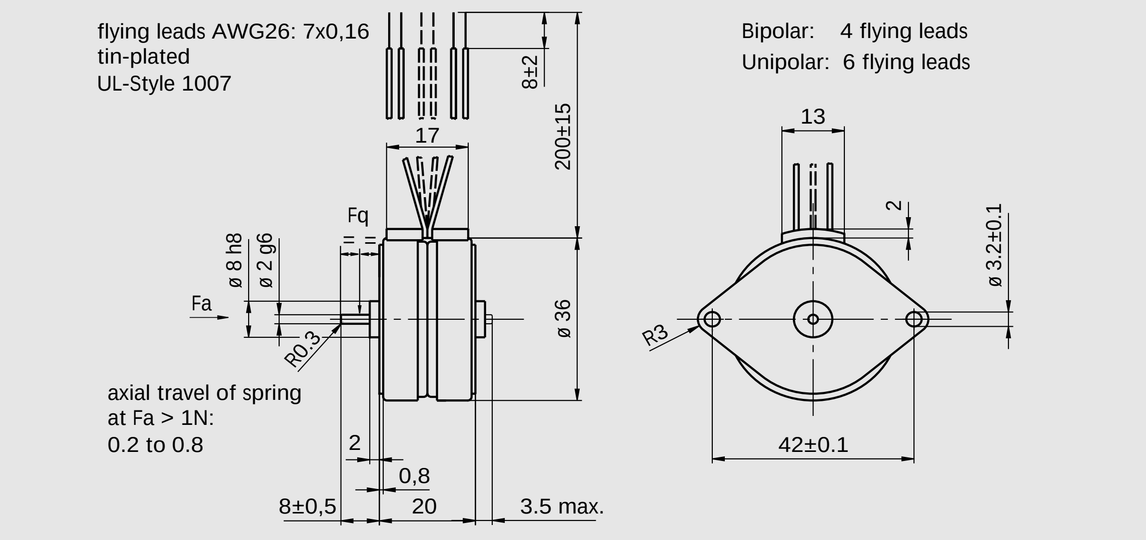


Connections RDM 36/10



Characteristic curve RDM 36/10

2-phase stepping motors
RDM 36/12



Scale drawing RDM 36/12

Technical Data

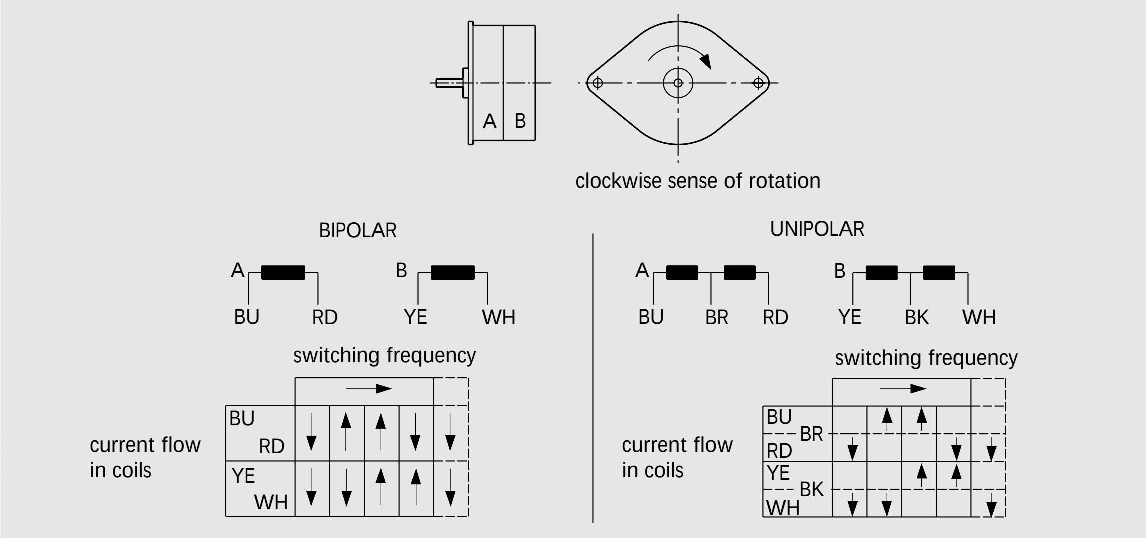
	Control diagram	
	Bipolar	**Unipolar**
Steps / revolution	48	48
Step angle	7.5°	7.5°
Step angle tolerance	± 5%	± 6%
Max. torque	1.18 Ncm	0.6 Ncm
Holding torque (excited)	1.6 Ncm	0.9 Ncm
Rotor moment of inertia	2 gcm^2	2 gcm^2
Max. current per winding	0.23 A	0.115 A
Resistance per winding	26 Ω	105 Ω
Permitted shaft load	Axial stress F_a = 1 N, radial stress F_q = 3 N	
Weight approx.	0.075 kg	0.075 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test: test voltage to DIN EN 60034-1	

Gearbox combinations

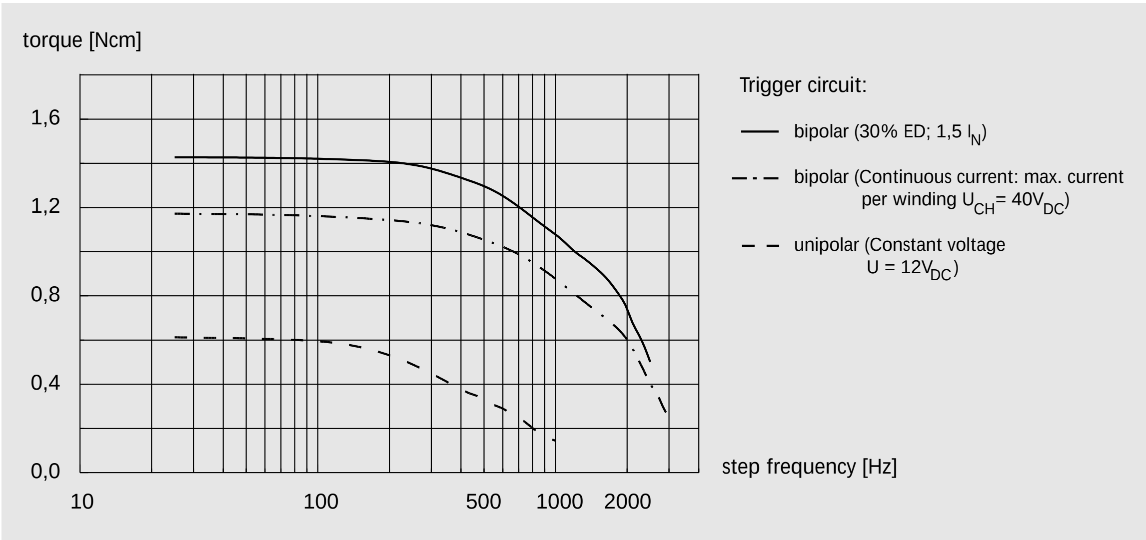
You will find gearbox combinations from page 127.

2-phase stepping motors

RDM 36/12

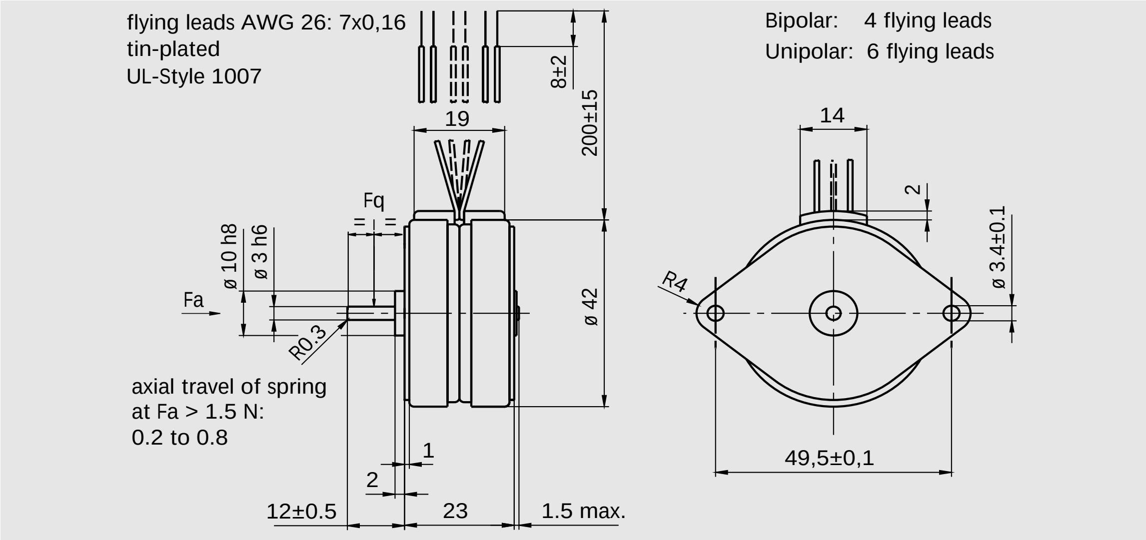


Connections RDM 36/12



Characteristic curve RDM 36/12

2-phase stepping motors
RDM 42/12



Scale drawing RDM 42/12

Technical Data

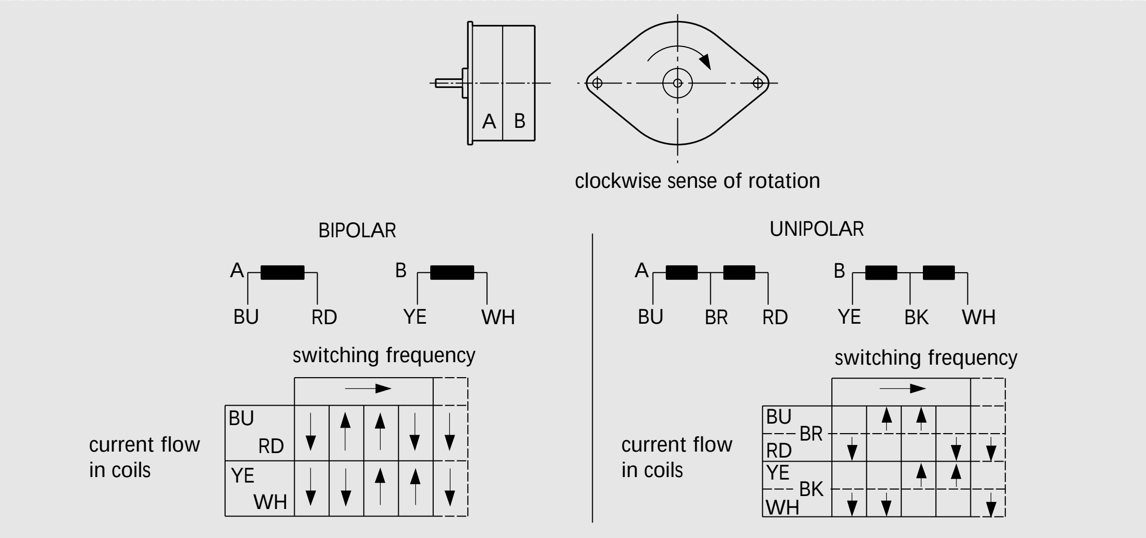
	Control diagram	
	Bipolar	**Unipolar**
Steps / revolution	48	48
Step angle	7.5°	7.5°
Step angle tolerance	± 4 %	± 5 %
Max. torque	4.1 Ncm	3.1 Ncm
Holding torque (excited)	5.3 Ncm	3.9 Ncm
Rotor moment of inertia	7.2 gcm^2	7.2 gcm^2
Max. current per winding	0.335 A	0.165 A
Resistance per winding	18 Ω	72 Ω
Permitted shaft load	Axial stress F_a = 1.5 N, radial stress F_q = 5 N	
Weight approx.	0.143 kg	0.143 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test: test voltage to DIN EN 60034-1	

Gearbox combinations

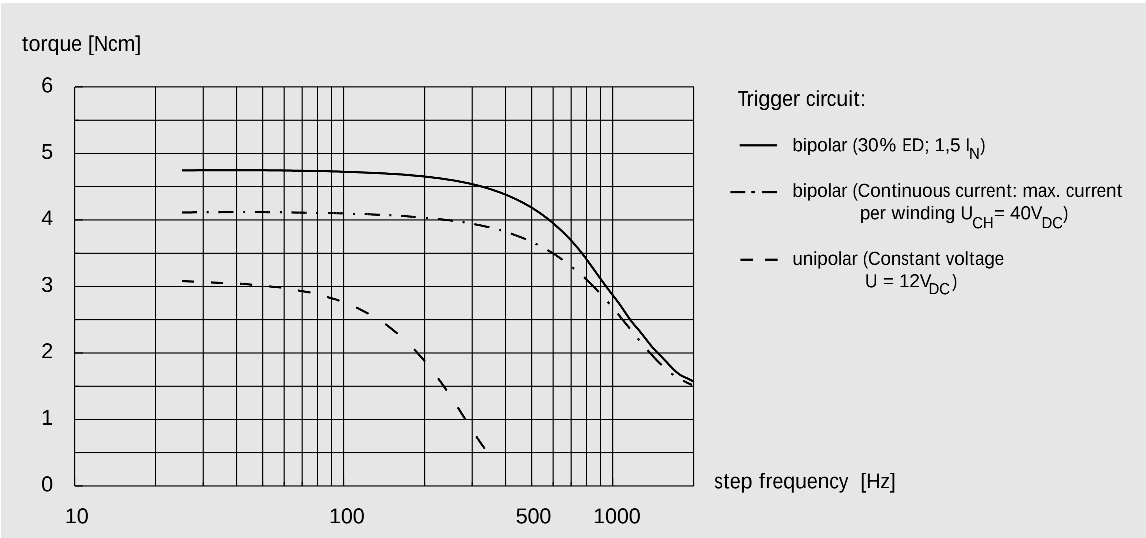
You will find gearbox combinations from page 127.

2-phase stepping motors

RDM 42/12

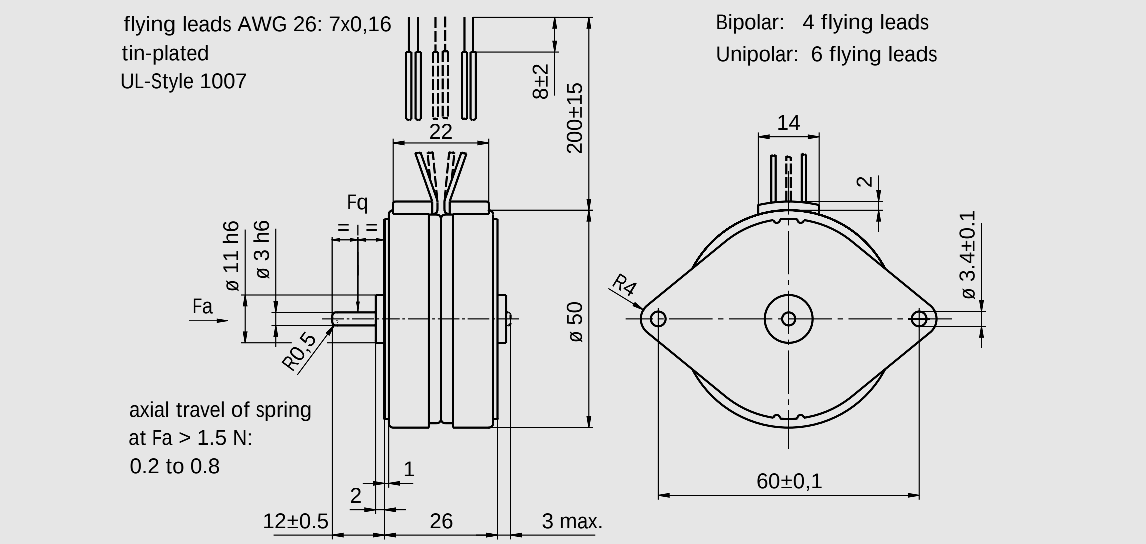


Connections RDM 42/12



Characteristic curve RDM 42/12

2-phase stepping motors
RDM 51/6



Scale drawing RDM 51/6

Technical Data

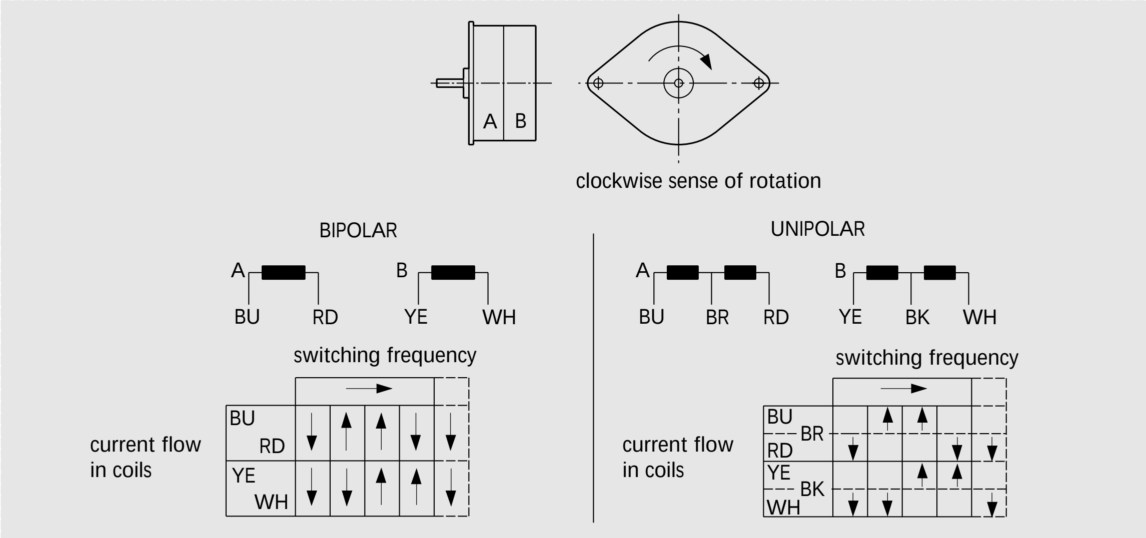
	Control diagram	
	Bipolar	**Unipolar**
Steps / revolution	24	24
Step angle	15°	15°
Step angle tolerance	± 3%	± 4%
Max. torque	5.5 Ncm	3.1 Ncm
Holding torque (excited)	7.2 Ncm	5 Ncm
Rotor moment of inertia	17 gcm^2	17 gcm^2
Max. current per winding	0.4 A	0.2 A
Resistance per winding	15 Ω	60 Ω
Permitted shaft load	Axial stress F_a = 2 N, radial stress F_q = 5 N	
Weight approx.	0.2 kg	0.2 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test: test voltage to DIN EN 60034-1	

Gearbox combinations

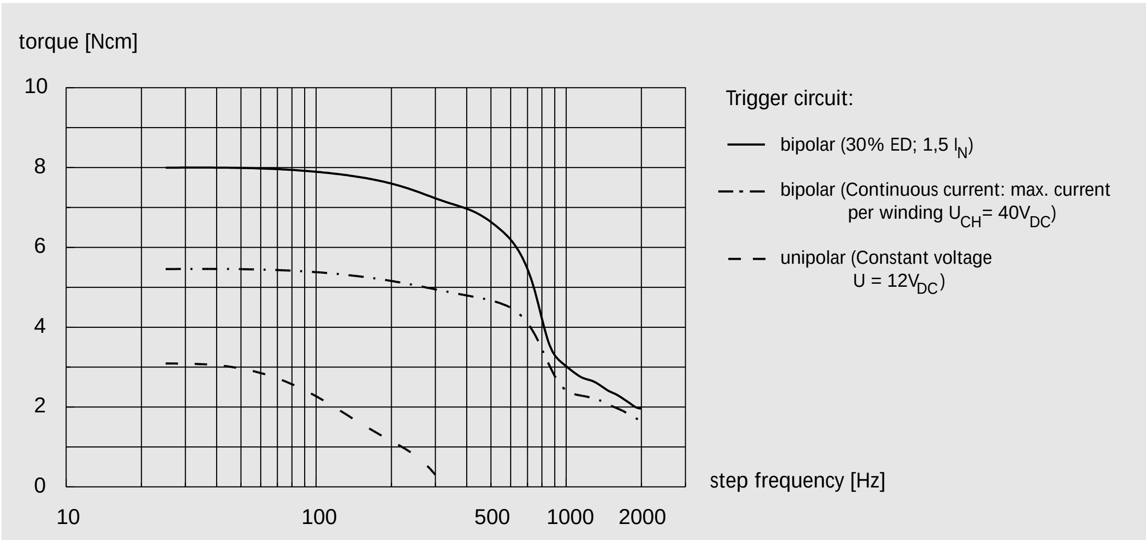
You will find gearbox combinations from page 127.

2-phase stepping motors

RDM 51/6

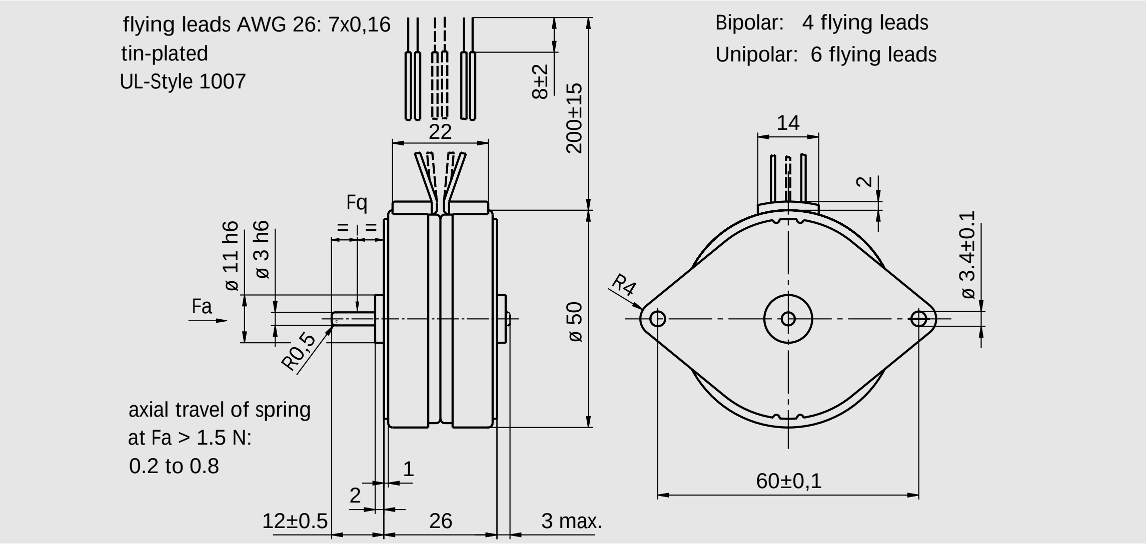


Connections RDM 51/6



Characteristic curve RDM 51/6

2-phase stepping motors
RDM 51/8



Scale drawing RDM 51/8

Technical Data

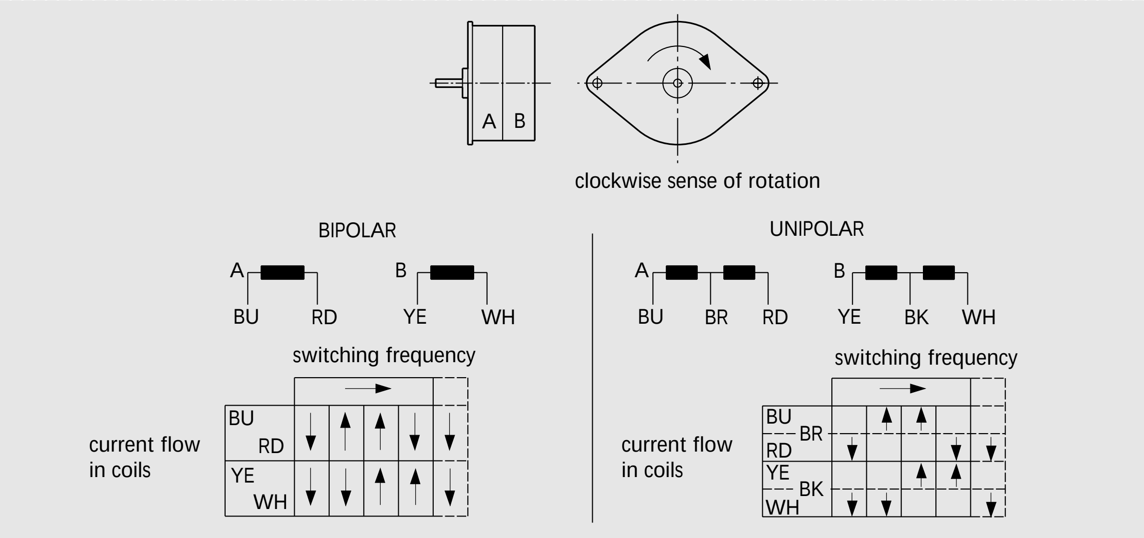
	Control diagram	
	Bipolar	**Unipolar**
Steps / revolution	32	32
Step angle	11.25°	11.25°
Step angle tolerance	± 3%	± 4%
Max. torque	6.8 Ncm	4.1 Ncm
Holding torque (excited)	8.2 Ncm	5.7 Ncm
Rotor moment of inertia	17 gcm^2	17 gcm^2
Max. current per winding	0.4 A	0.2 A
Resistance per winding	15 Ω	60 Ω
Permitted shaft load	Axial stress F_a = 2 N, radial stress F_q = 5 N	
Weight approx.	0.2 kg	0.2 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test: test voltage to DIN EN 60034-1	

Gearbox combinations

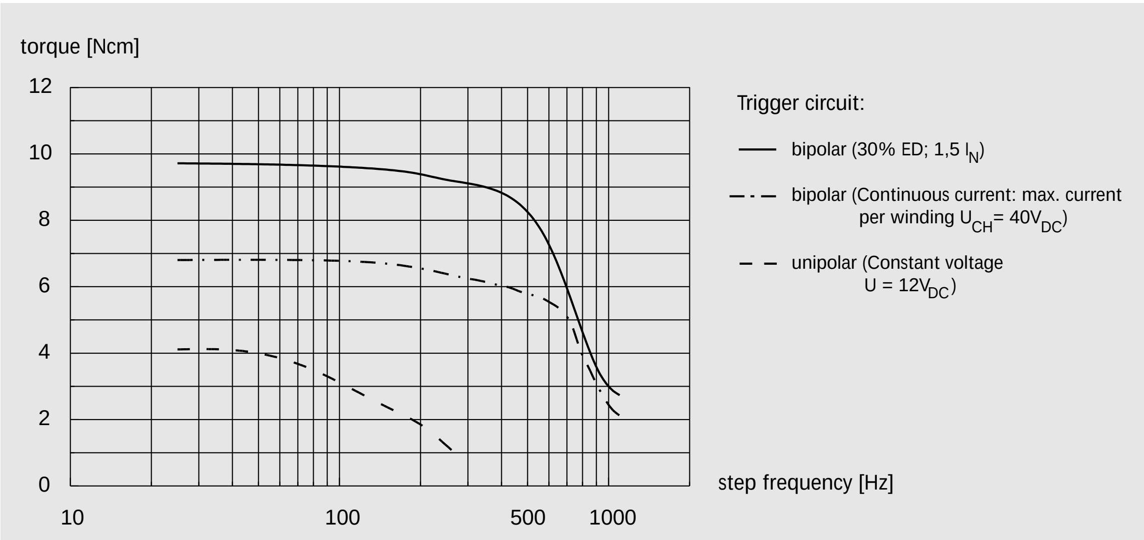
You will find gearbox combinations from page 127.

2-phase stepping motors

RDM 51/8

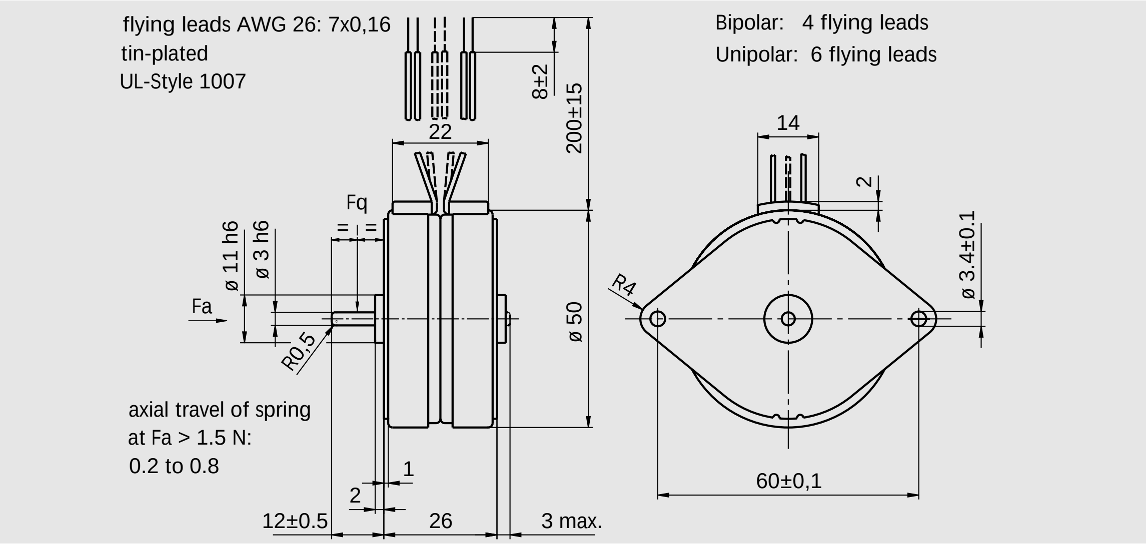


Connections RDM 51/8



Characteristic curve RDM 51/8

2-phase stepping motors
RDM 51/12



Scale drawing RDM 51/12

Technical Data

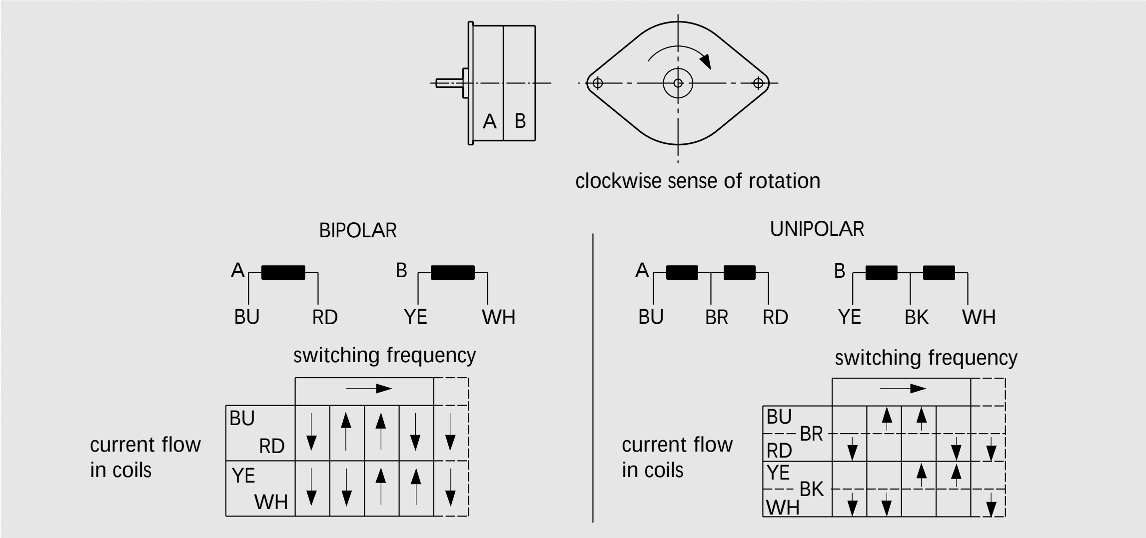
	Control diagram	
	Bipolar	**Unipolar**
Steps / revolution	48	48
Step angle	7.5°	7.5°
Step angle tolerance	± 3%	± 4%
Max. torque	6.9 Ncm	4.9 Ncm
Holding torque (excited)	8.8 Ncm	6.2 Ncm
Rotor moment of inertia	17 gcm^2	17 gcm^2
Max. current per winding	0.4 A	0.2 A
Resistance per winding	15 Ω	60 Ω
Permitted shaft load	Axial stress F_a = 2 N, radial stress F_q = 5 N	
Weight approx.	0.2 kg	0.2 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test: test voltage to DIN EN 60034-1	

Gearbox combinations

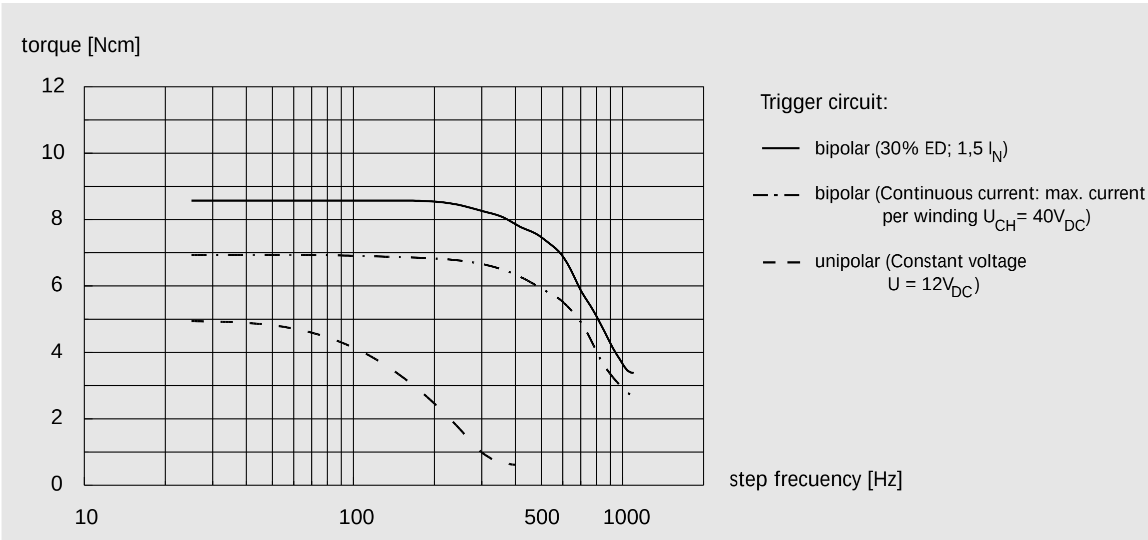
You will find gearbox combinations from page 127.

2-phase stepping motors

RDM 51/12

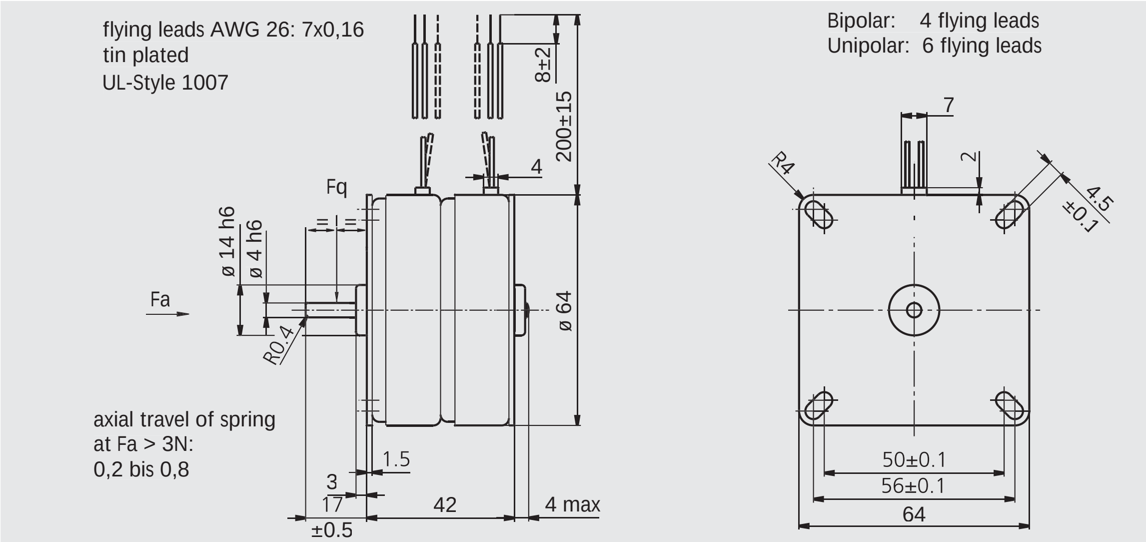


Connections RDM 51/12



Characteristic curve RDM 51/12

2-phase stepping motors
RDM 63/10



Scale drawing RDM 63/10

Technical Data

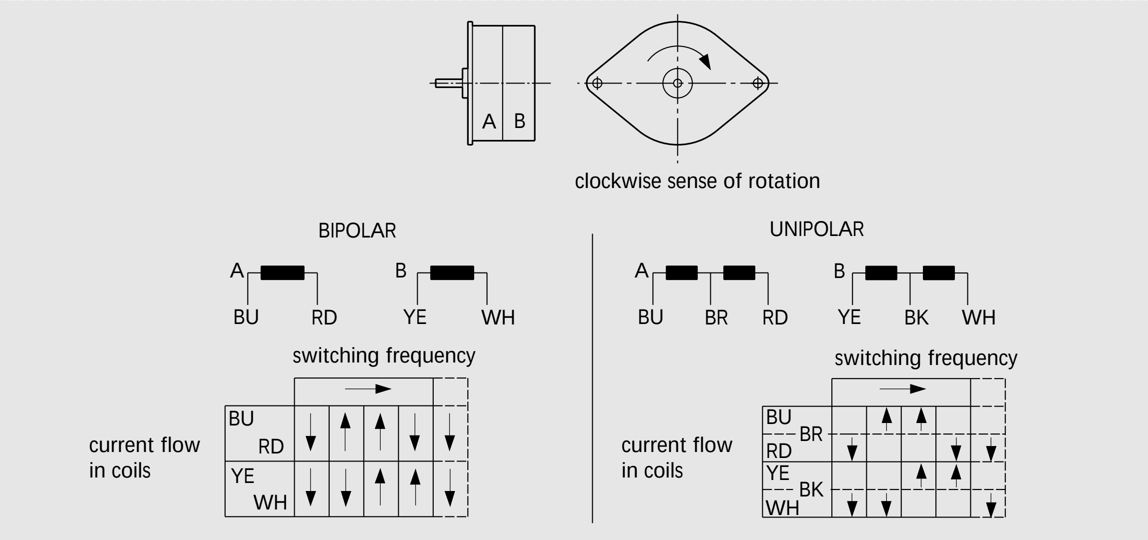
	Control diagram Bipolar	Unipolar
Steps / revolution	40	40
Step angle	9°	9°
Step angle tolerance	± 3%	± 4%
Max. torque	22.5 Ncm	12.5 Ncm
Holding torque (excited)	29 Ncm	20 Ncm
Rotor moment of inertia	150 gcm^2	150 gcm^2
Max. current per winding	0.65 A	0.31 A
Resistance per winding	9.6 Ω	41 Ω
Permitted shaft load	Axial stress F_a = 3 N, radial stress F_q = 10 N	
Weight approx.	0.46 kg	0.46 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test: test voltage to DIN EN 60034-1	

Gearbox combinations

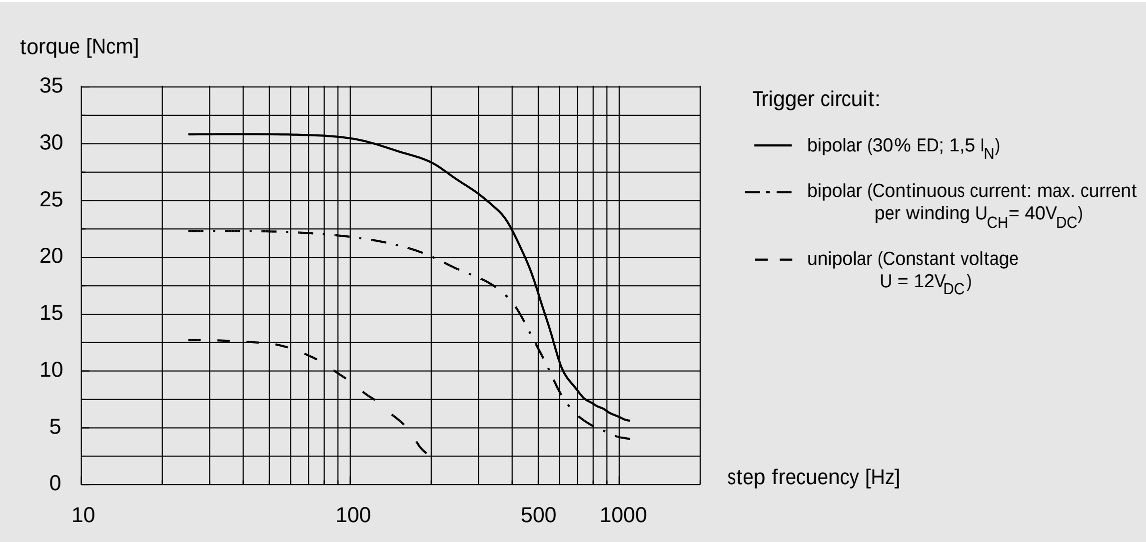
You will find gearbox combinations from page 127.

2-phase stepping motors

RDM 63/10

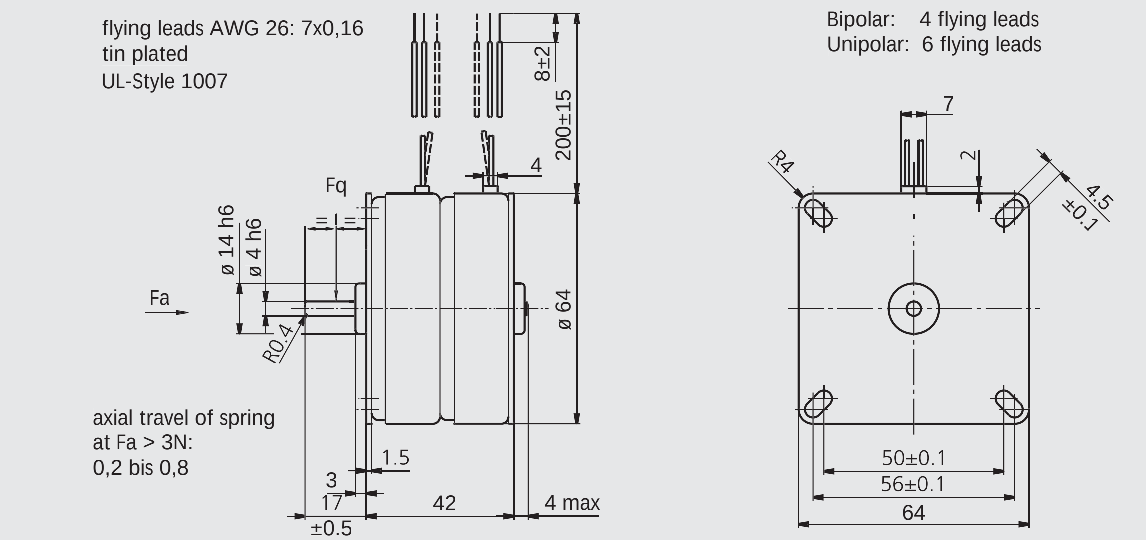


Connections RDM 63/10



Characteristic curve RDM 63/10

2-phase stepping motors
RDM 63/12



Scale drawing RDM 63/12

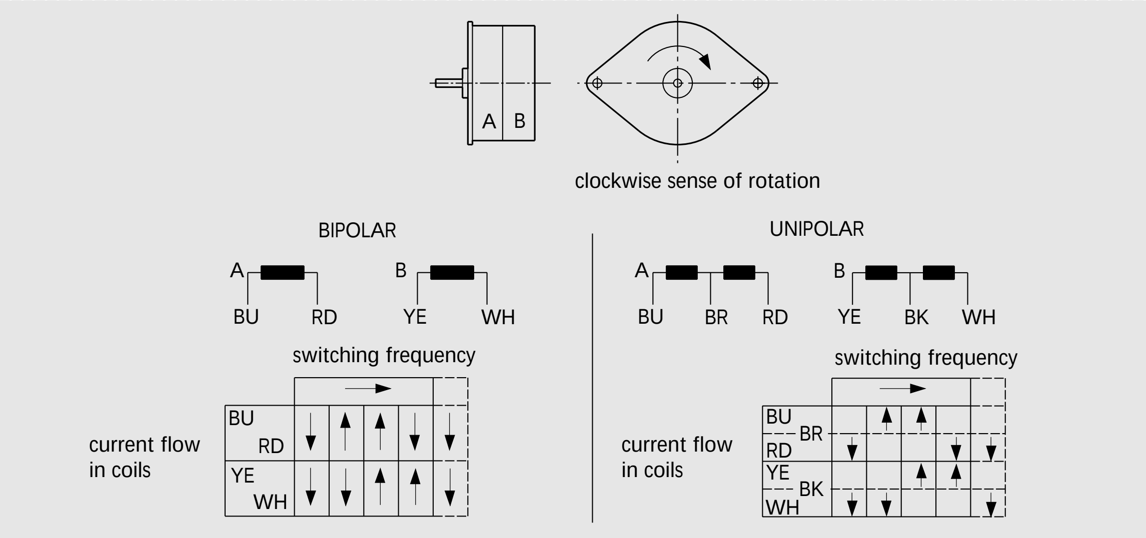
Technical Data

	Control diagram	
	Bipolar	**Unipolar**
Steps / revolution	48	48
Step angle	7.5°	7.5°
Step angle tolerance	± 3%	± 4%
Max. torque	25.5 Ncm	15 Ncm
Holding torque (excited)	32 Ncm	22 Ncm
Rotor moment of inertia	150 gcm^2	150 gcm^2
Max. current per winding	0.65 A	0.31 A
Resistance per winding	9.6 Ω	41 Ω
Permitted shaft load	Axial stress F_a = 3 N, radial stress F_q = 10 N	
Weight approx.	0.47 kg	0.47 kg
Protection grade	IP 41 to DIN EN 60529	IP 41
Insulation class	E to DIN EN 60034-1	E
Dielectric strength	Momentary test: test voltage to DIN EN 60034-1	

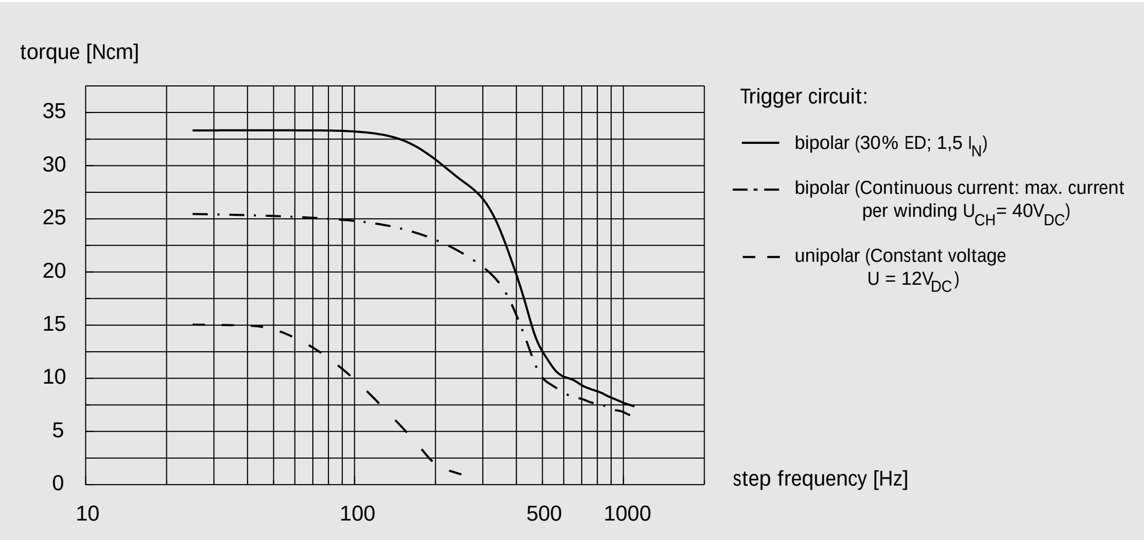
Gearbox combinations

You will find gearbox combinations from page 127.

RDM 63/12

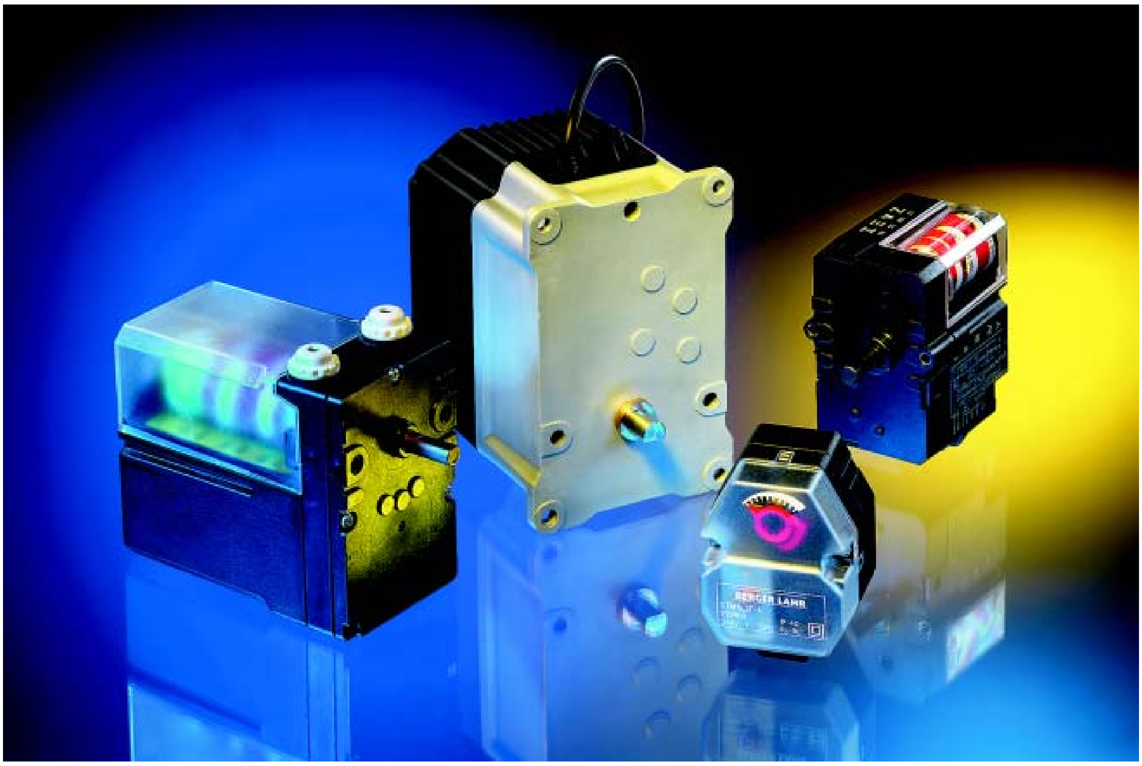


Connections RDM 63/12



Characteristic curve RDM 63/12

Actuators



Actuators

You can use the actuators from Berger Lahr to position flaps, valves or slides with great precision. Inside the compact servo drive housing there is a motor, a gearbox and a control unit. There is a choice of three actuator types to solve your positioning problems: STM, STA and STE.

Overview actuators

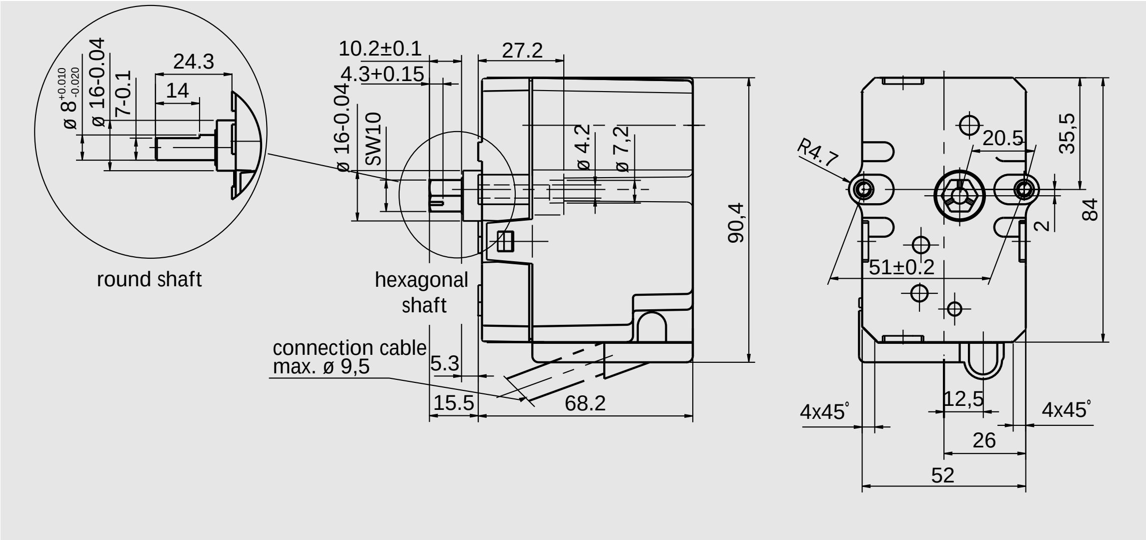
Actuator type	Description	Described on ...
STE	Actuators of type STE are controlled by analogue signals (current or voltage). The angle of rotation of the shaft can be set via analogue signals. The operating range can be freely defined between 0 and 90×. Any angle of rotation can be selected within the defined operating range. Depending on the version, the setpoint can be set as a voltage from 0 to 10 V or as a current from 4 to 20 mA. The limits of the operating range can also be safeguarded by two limit switches.	Page 133 Scale drawings page 131
STA	Actuators of type STA are available with 3, 4 or 5 cams. Two cams serve to define the limits, and the others are available for controlling external devices. The cams are continuously adjustable. Actuators of type STA are also fitted with 1 or 2 relays. Switching actions for controlling the motor are controlled via these relays. STA actuators are used to move air flaps in oil and gas burners. Various wiring arrangements are available for connecting to standard burners. Actuators of type STA can be supplied to run clockwise or anti-clockwise.	Page 137 Scale drawings page 131
STM	Actuators of type STM are constructed in the same way as actuators of type STA. They differ in having no relays. Actuators of type STM are available in clockwise and anti-clockwise versions.	Page 147 Scale drawings page 131

Type code for Actuators

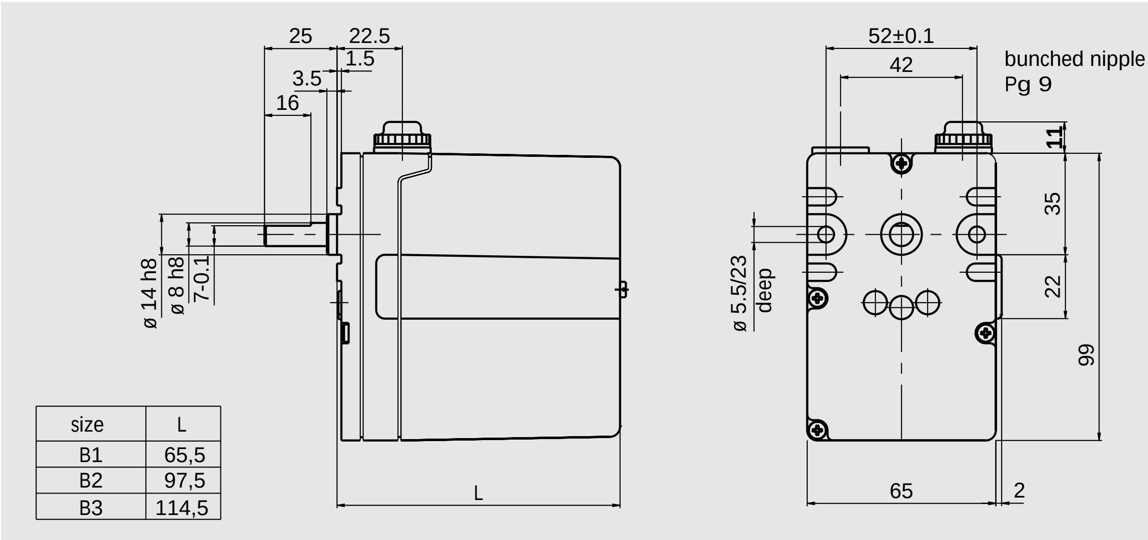
Example	**STM30 B3.37/6 – 51N R P**
Product family Actuators	
Actuator type STE = electronic actuator STA = actuator with cams and relais STM = actuator with cams	**STM**30 B3.37/6 – 51N R P
Running time for 90° Example: 30 = 30 seconds for running time for 90°	STM**30** B3.37/6 – 51N R P
Size / case B0, B1, B2, B3, Q3	STM30 **B3**.37/6 – 51N R P
Motor type : RSM 36/8, RSM 36/12, RSM 37/6, RSM 41/6, RSM 42/6, RSM 51/6	STM30 B3.**37/6** – 51N R P
Operation program / wiring Example: 51N 5 = Number of function cams 1 = Counter number N = Cams	STM30 B3.37/6 – **51N** R P
Sense of rotation R = Right L = Left	STM30 B3.37/6 – 51N **R** P
Potentiometer installation P = Prepared for potentiometer installation POT = Potentiometer integrated (if no P or POT => not prepared for potentiometer installation, no potentiometer integrated)	STM30 B3.37/6 – 51N R **P**

Areas of application

- Air valves for oil and gas burners
- Exhaust valves on boilers
- Mixing valves
- Electrically adjustable armatures
- Slide movements
- Part-turn valve actuators
- Positioning tasks in the construction of apparatus and machines
- Valves for water treatment
- Electrical engineering, open and closed loop control tasks
- Weighing and dosing technology
- Drive technology
- Control technology: Control of ball valves, flow control

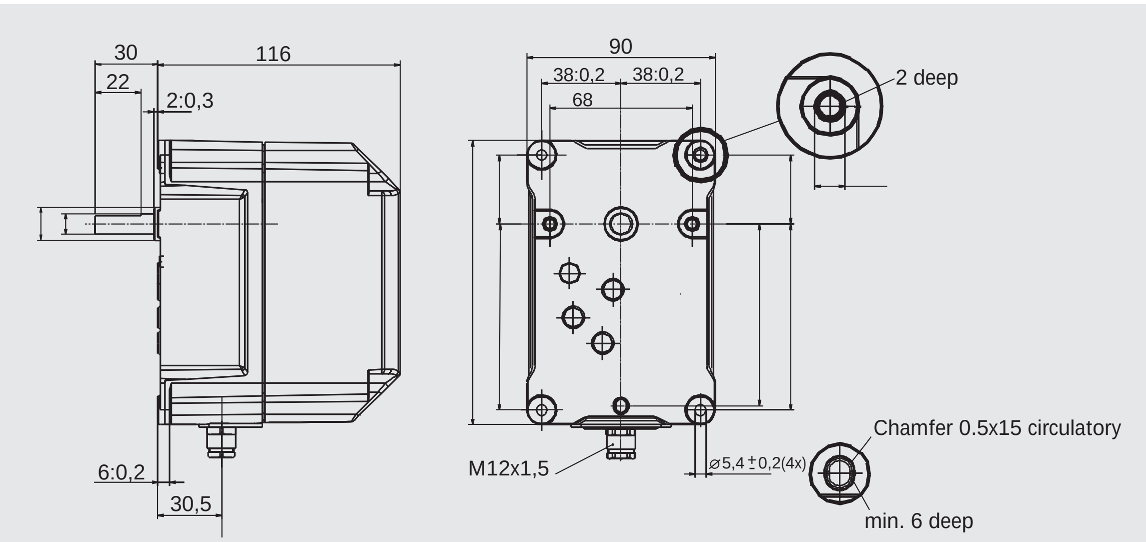


Size B0

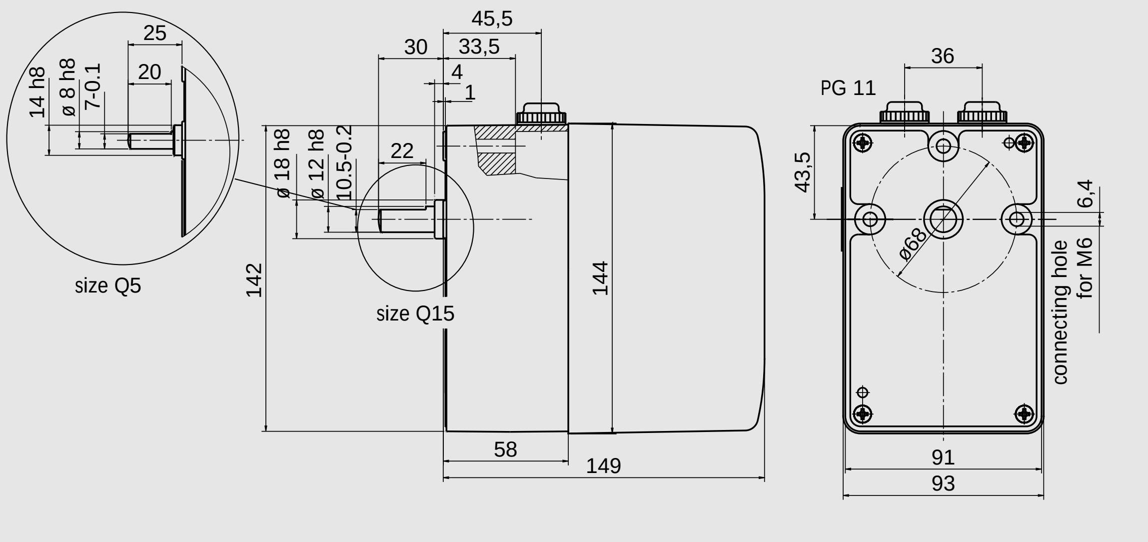


size	L
B1	65,5
B2	97,5
B3	114,5

Sizes B1, B2, B3



Sizes Q3


45,5
30
33,5
4
1
25
20
14 h8
ø 8 h8
7-0.1
size Q5
ø 18 h8
ø 12 h8
10.5-0.2
22
size Q15
142
144
58
149
36
PG 11
43,5
ø68
6,4
connecting hole
for M6
91
93

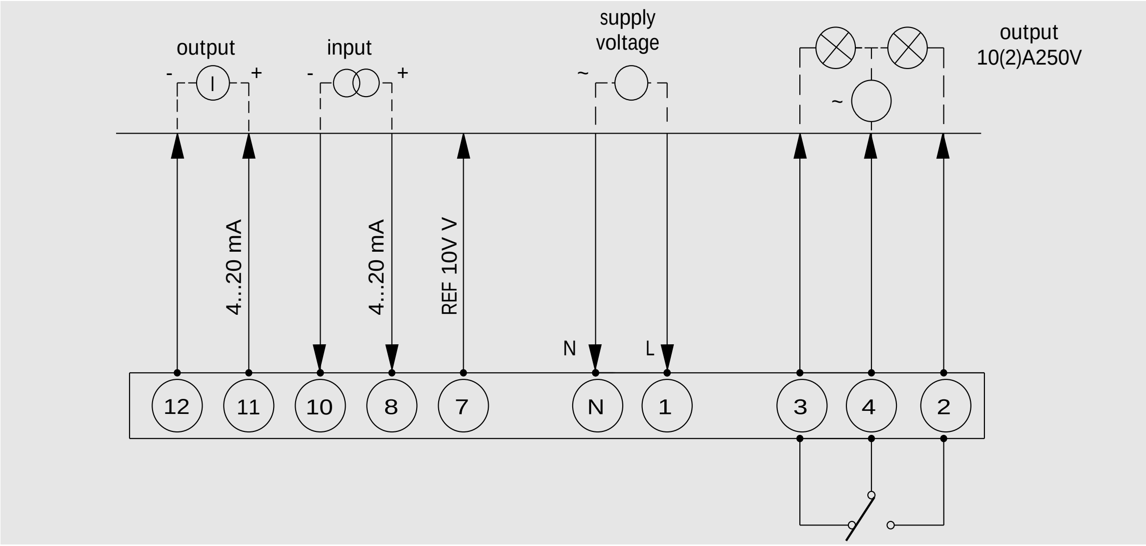
Sizes Q5, Q15

Characteristics of actuators of type STE

- Actuators of type STE work with a power supply of 230 V AC. They can be connected directly to the mains.
- The angle of rotation is set by means of a potentiometer. This permits simple adjustment of the angular area on site.
- Short start/stop times allow precise switching times and improve dynamic performance.
- Precise movements are made possible by speeds which are not affected by changes in voltage or load.
- As the actuator displays high holding torque when de-energized, no additional brake elements are required.
- Through its compact construction, the actuator takes up little room.
- The actuators can be installed in any position, allowing for free flexibility.
- Connection to the mains is made via screw terminals for the B3, Q3 and Q15 and via plug for the B0. This does away with the need for any adaptors.
- The actuators are lubricated for life, and no on-site maintenance is required.

General data for actuator type STE

	Values
Power supply	230 V AC / 50 Hz
Switching power of auxiliary switches	10(2) A 250 V (to CEE 24 / VDE 0630)
Number of limit switches	2
Number of auxiliary switches	1
Degree of noise suppression	N (to VDE 0875)
Protection grade	STE … B3: DIN 40050, IP 40 STE … Q3: DIN 40050, IP 40; IP 54 on request
Permitted ambient temperature	Operation: 0 … 50 °C Transport and storage: -20 … +60 °C



STE with I01 wiring – control via current signals

In heating technology, the STE actuator with I01 wiring can be used for the following components:

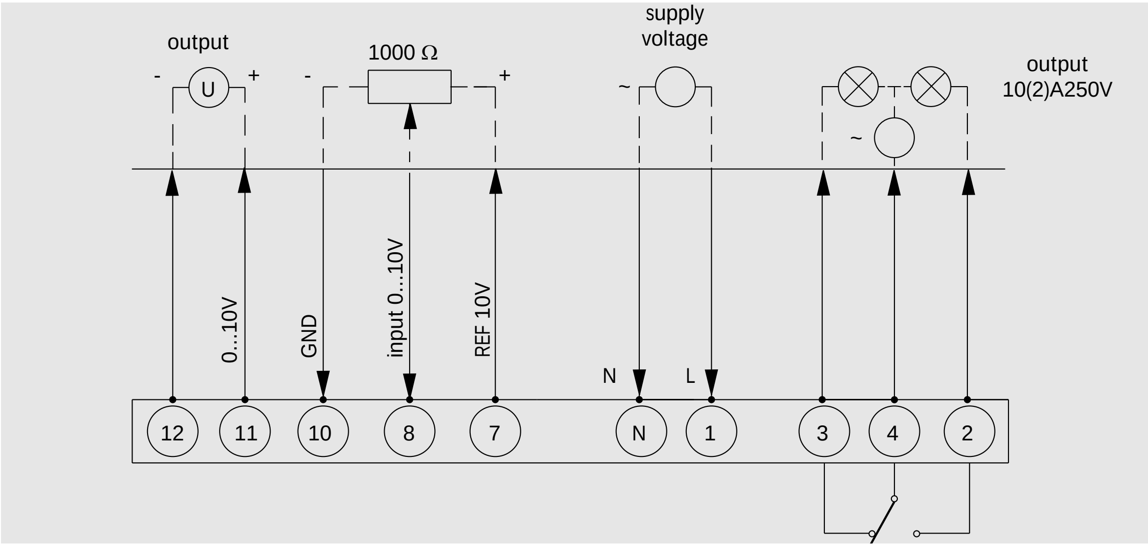
– Positioning valves.

In control technology, the STE actuator with I01 wiring can be used for the following areas of application:

– Moving ball valves
– Flow control.

Technical Data

Actuator type	Sense of rotation	Position-ing signal	Actual value	Auxiliary size	Running time for 90°	Rated torque	Static holding torque
STE30 B3.37/6 - I01	R / L	4 … 20 mA	4 … 20 mA	10 V	30 s	3 Nm	2 Nm
STE30 Q3.51/12	R / L	4 … 20 mA	4 … 20 mA	10 V	30 s	10 Nm	6.5 Nm
STE30 Q15 51/6 - IO1	R / L	4 … 20 mA	4 … 20 mA	10 V	30 s	15 Nm	10 Nm



STE with U01 wiring – control via current signal

In heating technology, the STE actuator with U01 wiring can be used for the following components:

– Positioning valves.

In control technology, the STE actuator with U01 wiring can be used for the following areas of application:

– Moving ball valves
– Flow control.

Technical Data

Actuator type	Sense of rotation	Position-ing signal	Actual value	Auxiliary size	Running time for 90°	Rated torque	Static holding torque
STE30 B3.37/6 - U01	R / L	0 … 10 V	0 … 10 V	—	30 s	3 Nm	2 Nm
STE30 Q3.51/12 - U01	R / L	0 … 10 V	0 … 10 V	—	30 s	10 Nm	6.5 Nm
STE30 Q15.51/6 - U01	R / L	0 … 10 V	0 … 10 V	—	30 s	15 Nm	10 Nm

Actuators

Characteristics of actuators of type STA

- The cams can be continuously adjusted by hand, fine tuning with a screw-driver. This makes on-site adjustment easier.
- Short start/stop times allow precise switching times and ensure good dynamic performance.
- Precise movements are made possible by speeds which are not affected by changes in voltage or load.
- As the actuator displays high holding torque when de-energized, no additional brake elements are required.
- Through its compact construction, the actuator takes up little room.
- Actuators can be installed in any plane.
- Connection to the mains is made via screw terminals for the B1, B2 and B3 and by plug for the B0. This does away with the need for any adaptors.
- The optional version with a potentiometer allows a feedback signal on the angle of rotation to be evaluated.
- The actuators are lubricated for life, and no on-site maintenance is required.

General data for actuator type STA

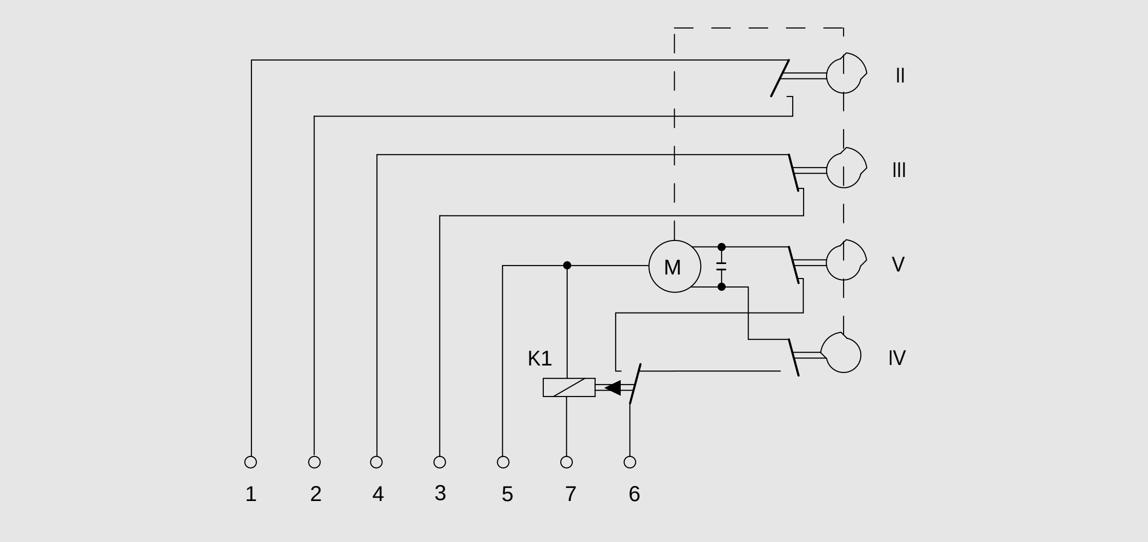
	Values
Power supply	230 V AC / 50Hz
Switching power of auxiliary switches	10(2) A 250 V (to CEE 24 / VDE 0630)
Protection grade	DIN 40050, IP 40 STA, STM ... Q3 ... are available with IP 54
Permitted ambient temperature	Operation: 0 ... 60 °C Transport and storage: -20 ... +60 °C

Accessories: potentiometer installation set

The angle of rotation of the actuators can be recorded by a mechanically coupled potentiometer and passed to an external control unit for further processing. All actuators whose type code ends in a "P" can be retro-fitted with a potentiometer.

Potentiometer installation sets with resistor values of 100Ω and 1000Ω through 90° are available.

STA 2N36

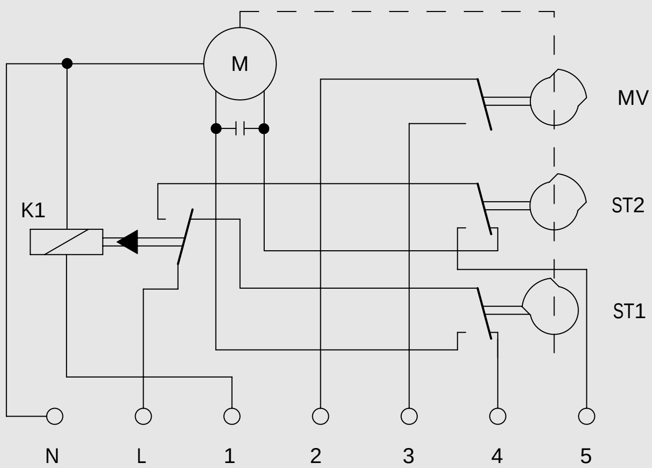


STA with 2N36 wiring

In heating technology, the STA actuator with 2N36 wiring can be used for the following components:
– For **small** and **medium** power burners
– For air valves **with no** air seal.

Technical Data

Actuator type	Sense of rotation	Running time for 90°	Rated torque	Static holding torque
STA3.5 B0.37/6 - 2N36	R / L	3.5 s	0.8 Nm	0.3 Nm
STA5 B0.36/8 - 2N36	R / L	5 s	0.6 Nm	0.2 Nm
STA13 B0.36/8 - 2N36	R / L	13 s	1.0 Nm	0.6 Nm



STA with 2N13 wiring

In heating technology, the STA actuator with 2N13 wiring can be used for the following components:

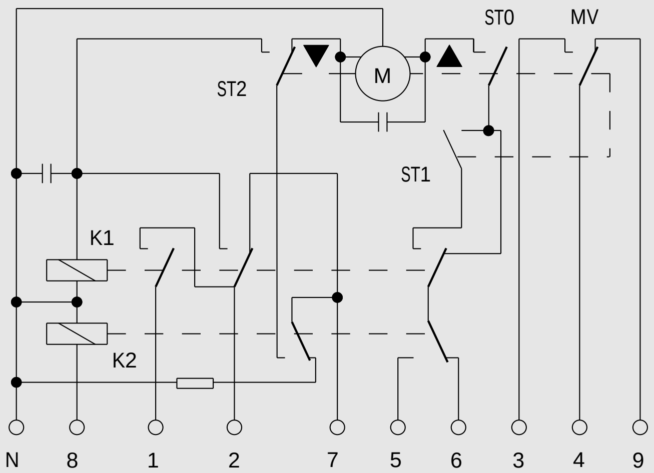
- For **small** and **medium** power burners
- For air valves **with no** air seal.

Technical Data

Actuator type	Sense of rotation	Running time for 90°	Rated torque	Static holding torque
STA3 B2.41/6 - 2N13	R / L	3 s	1.6 Nm	0.4 Nm
STA6 B2.41/6 - 2N13	R / L	6 s	3.0 Nm	0.8 Nm
STA12 B1.37/6 - 2N13	R / L	12 s	2.6 Nm	1.1 Nm
STA30 B1.37/6 - 2N13	R / L	30 s	3.0 Nm	2.0 Nm

Actuators

STA 3N21



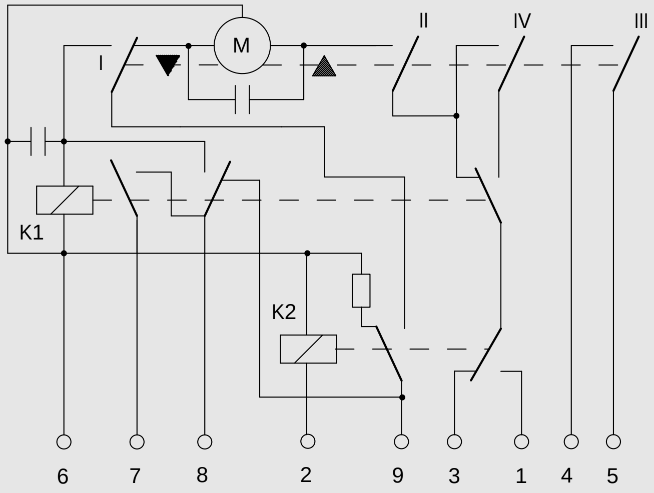
STA with 3N21 wiring

In heating technology, the STA actuator with 3N21 wiring can be used for the following components:

– For two-stage **gas**burners of **medium** and **high** power
– For controlling air valves
– For burner equipment with or without air valve monitoring.

Technical Data

Actuator type	Sense of rotation	Running time for 90°	Rated torque	Static holding torque
STA3 B3.42/ 6-3N21	R / L	3 s	1.6 Nm	0.4 Nm
STA6 B2.37/ 6-3N21	R / L	6 s	1.4 Nm	0.6 Nm
STA6 B3.42/6-3N21	R / L	6 s	2.6 Nm	1.0 Nm
STA12 B2.37/6-3N21	R / L	12 s	3.0 Nm	1.1 Nm
STA30 B2.37/6-3N21	R / L	30 s	3.0 Nm	2.0 Nm



STA with 3N23 wiring

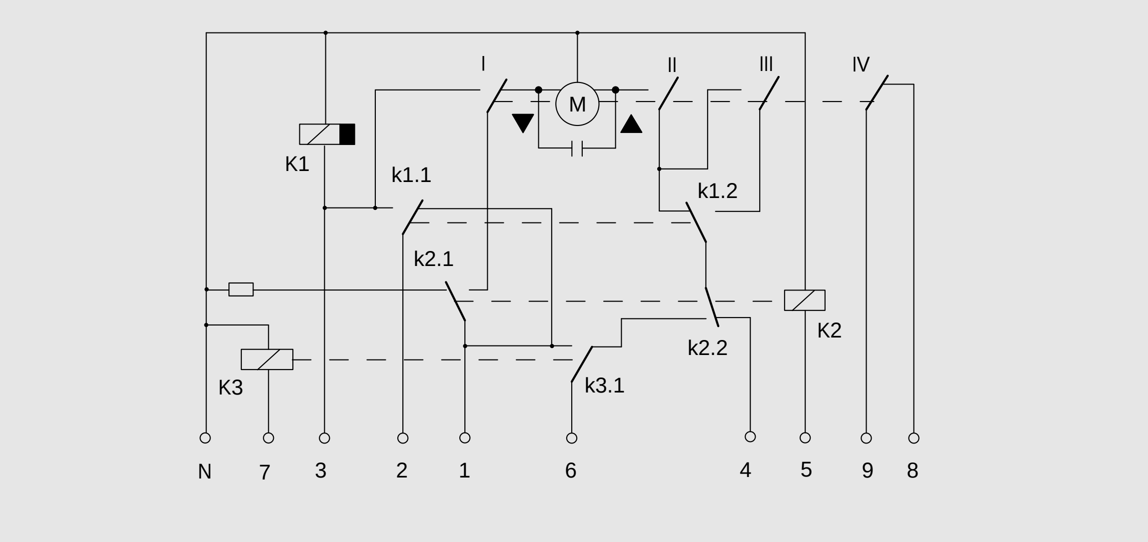
In heating technology, the STA actuator with 3N23 wiring can be used for the following components:

- For two-stage **gas**burners of **small** and **medium** power
- For controlling air valves.

Technical Data

Actuator type	Sense of rotation	Running time for 90°	Rated torque	Static holding torque
STA3.5 B0.37/6 - 3N23	R / L	3.5 s	0.8 Nm	0.3 Nm
STA5 B0.36/8 - 3N23	R / L	5 s	0.6 Nm	0.2 Nm
STA13 B0.36/8 - 3N23	R / L	13 s	1.0 Nm	0.6 Nm

STA 3N27



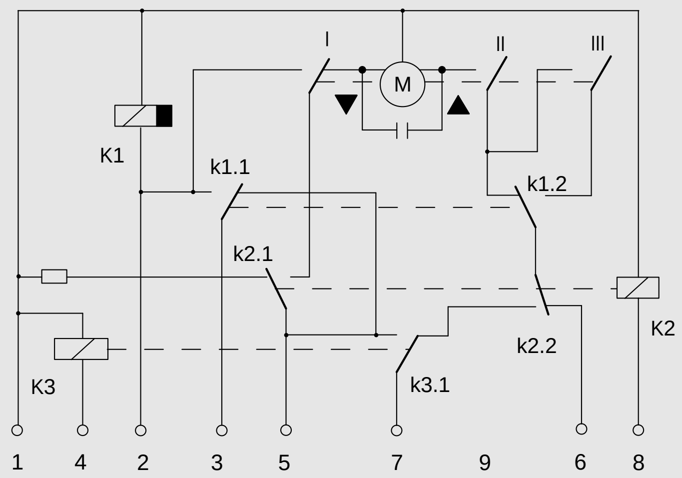
STA with 3N27 wiring

In heating technology, the STA actuator with 3N27 wiring can be used for the following components:

- For two-stage **gas**burners of **medium** and **high** power
- For controlling air valves
- For burner equipment with or without air valve monitoring.

Technical Data

Actuator type	Sense of rotation	Running time for 90°	Rated torque	Static holding torque
STA3 B3.42/6 - 3N27	R / L	3 s	1.6 Nm	0.4 Nm
STA6 B2.37/6 - 3N27	R / L	6 s	1.4 Nm	0.6 Nm
STA6 B3.42/6 - 3N27	R / L	6 s	2.6 Nm	1.0 Nm
STA12 B2.37/6 - 3N27	R / L	12 s	3.0 Nm	1.1 Nm
STA30 B2.37/6 - 3N27	R / L	30 s	3.0 Nm	2.0 Nm



STA with 3N28 wiring

In heating technology, the STA actuator with 3N28 wiring can be used for the following components:

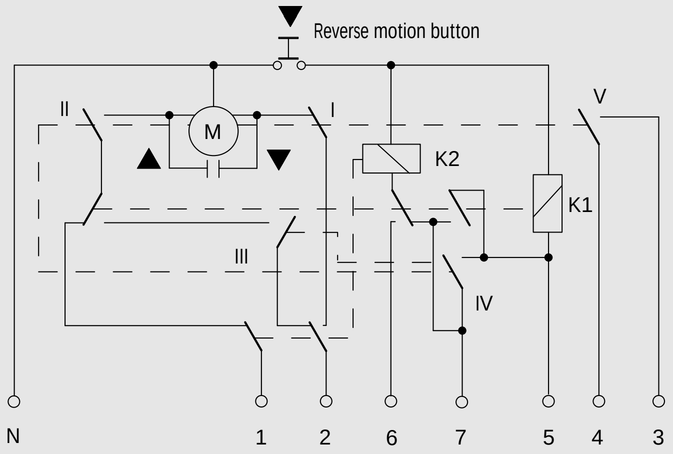
- For two-stage **gas**burners of **medium** and **high** power
- For controlling air valves
- For burner equipment with or without air valve monitoring.

Technical Data

Actuator type	Sense of rotation	Running time for 90°	Rated torque	Static holding torque
STA3 B3.42/6 - 3N28	R / L	3 s	1.6 Nm	0.4 Nm
STA6 B2.37/6 - 3N28	R / L	6 s	1.4 Nm	0.6 Nm
STA6 B3.42/6 - 3N28	R / L	6 s	2.6 Nm	1.0 Nm
STA12 B2.37/6 - 3N28	R / L	12 s	3.0 Nm	1.1 Nm
STA30 B2.37/6 - 3N28	R / L	30 s	3.0 Nm	2.0 Nm

Actuators

STA 4N18



STA with 4N18 wiring

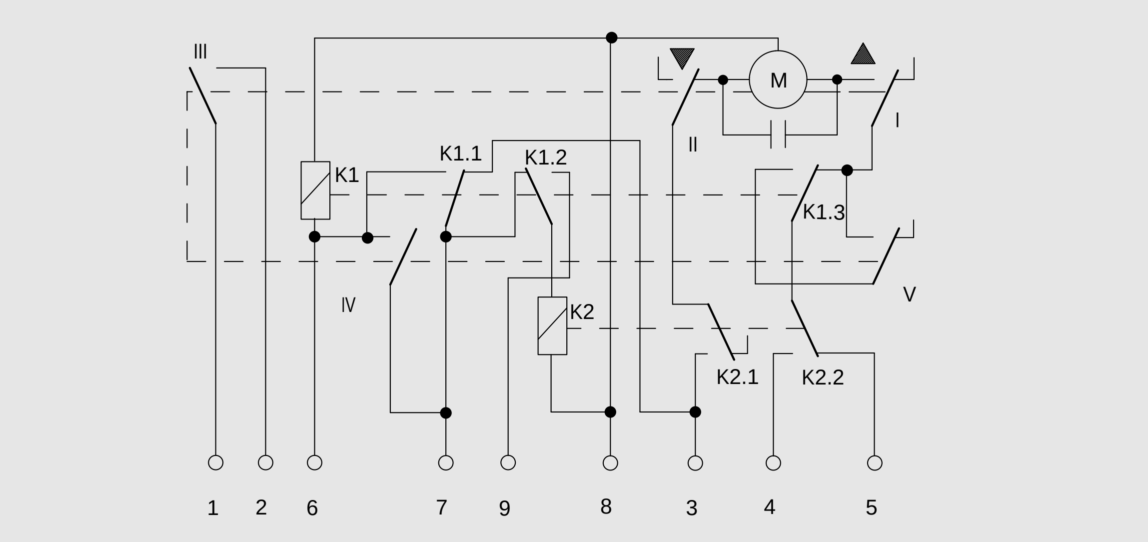
In heating technology, the STA actuator STA with 4N18 wiring can be used for the following components:

– For **oil** and **gas**burners of **small** and **medium** power
– For controlling air valves
– Two-stage or modulating operating mode.

Technical Data

Actuator type	Sense of rotation	Running time for 90°	Rated torque	Static holding torque
STA3 B3.42/6 - 4N18	R / L	3 s	1.6 Nm	0.4 Nm
STA6 B2.37/6 - 4N18	R / L	6 s	1.4 Nm	0.6 Nm
STA6 B3.42/6 - 4N18	R / L	6 s	2.6 Nm	1.0 Nm
STA12 B2.37/6 - 4N18	R / L	12 s	3.0 Nm	1.1 Nm
STA30 B2.37/6 - 4N18	R / L	30 s	3.0 Nm	2.0 Nm

Actuators
STA 4N22



STA with 4N22 wiring

In heating technology, the STA actuator with 4N22 wiring can be used for the following components:

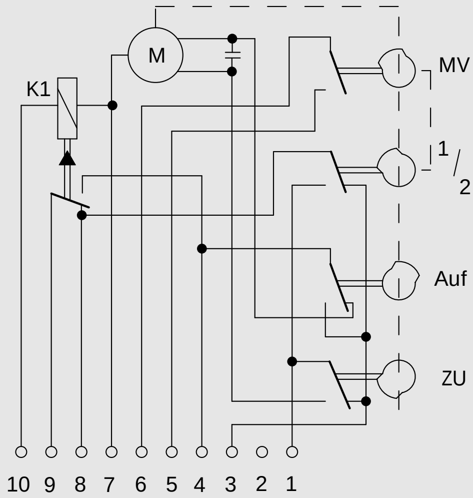
- For **oil** and **gas**burners of **small** and **medium** power
- For controlling air valves
- Two-stage or modulating operating mode.

Technical Data

Actuator type	Sense of rotation	Running time for 90°	Rated torque	Static holding torque
STA3.5 B0.37/6 - 4N22	R / L	3.5 s	0.8 Nm	0.3 Nm
STA5 B0.36/8 - 4N22	R / L	5 s	0.6 Nm	0.2 Nm
STA13 B0.36/8 - 4N22	R / L	13 s	1.0 Nm	0.6 Nm

Actuators

STA 3N12



STA with 3N12 wiring

In heating technology, the STA actuator STA with 4N18 wiring can be used for the following components:

– For **oil** and **gas**burners of **small** and **medium** power
– For controlling air valves
– Two-stage or modulating operating mode.

Technical Data

Actuator type	Sense of rotation	Running time for 90°	Rated torque	Static holding torque
STA3 B3.42/6 - 3N12	R / L	3 s	1.6 Nm	0.4 Nm
STA6 B2.37/6 - 3N12	R / L	6 s	1.4 Nm	0.6 Nm
STA6 B3.42/6 - 3N12	R / L	6 s	2.6 Nm	1.0 Nm
STA12 B2.37/6 - 3N12	R / L	12 s	3.0 Nm	1.1 Nm
STA30 B2.37/6 - 3N12	R / L	30 s	3.0 Nm	2.0 Nm

Characteristics of actuators of type STM

- The cams can be continuously adjusted by hand, fine tuning with a screw-driver. This makes on-site adjustment easier.
- Short start/stop times allow precise switching times and ensure good dynamic performance.
- Precise movements are made possible by speeds which are not affected by changes in voltage or load.
- As the actuator displays high holding torque when de-energized, no additional brake elements are required.
- Through its compact construction, the actuator takes up little room.
- Actuators can be installed in any plane.
- Connection to the mains is made via screw terminals for the B1, B2, B3 and Q3 by plug for the B0. This does away with the need for any adaptors.
- The optional version with a potentiometer allows a feedback signal on the angle of rotation to be evaluated.
- The actuators are lubricated for life, and no on-site maintenance is required.

General data for actuator type STM

	Values
Power supply	230 V AC / 50Hz
Switching power of auxiliary switches	10(2) A 250 V (to CEE 24 / VDE 0630)
Protection grade	DIN 40050, IP 40 STA, STM ... Q3 ... are available with IP 54
Permitted ambient temperature	Operation: 0 ... 60 °C Transport and storage: -20 ... +60 °C

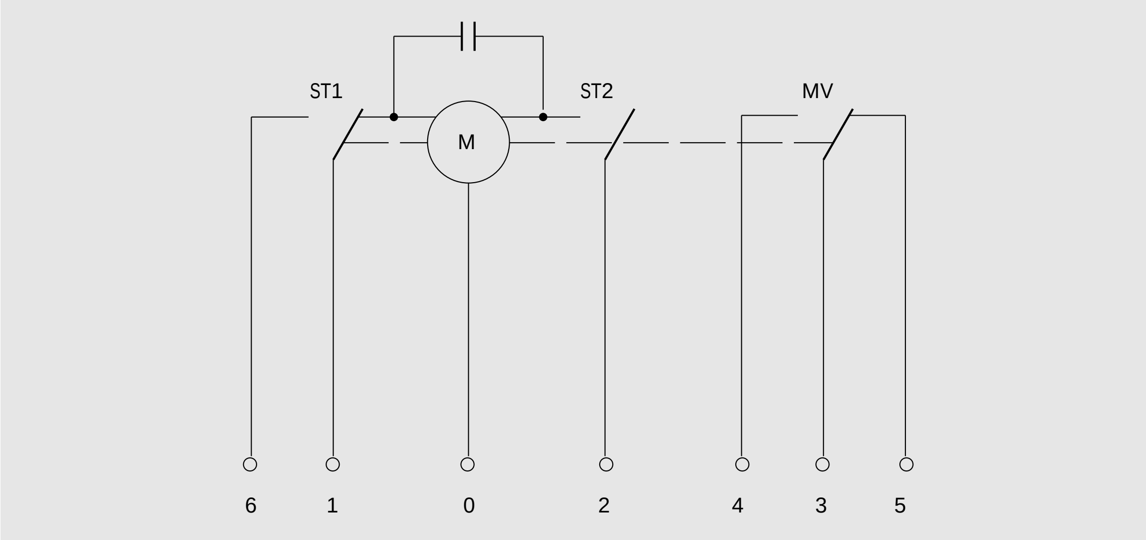
Accessories: potentiometer installation set

The angle of rotation of the actuators can be recorded by a mechanically coupled potentiometer and passed to an external control unit for further processing. All actuators whose type code ends in a "P" can be retro-fitted with a potentiometer.

Potentiometer installation sets with resistor values of 100Ω and 1000Ω through 90° are available.

Actuators

STM 31N



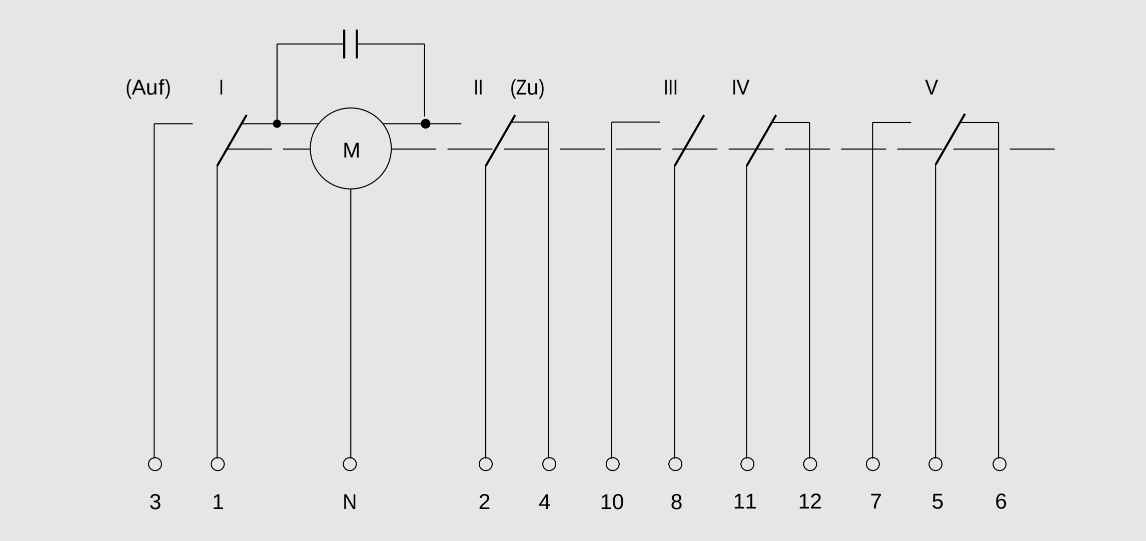
STM with 31N wiring

STM actuators are used in all industries, especially the following:

- Apparatus construction
- Electrical engineering for open and closed loop control tasks
- Weighing and dosing technology for movement tasks
- Heating, air conditioning and ventilation engineering.

Technical Data

Actuator type	Sense of rotation	Running time for 90°	Rated torque	Static holding torque
STM3 B2.41/6 - 31N	R / L	3 s	1.6 Nm	0.4 Nm
STM6 B2.41/6 - 31N	R / L	6 s	2.6 Nm	0.8 Nm
STM12 B1.37/6 - 31N	R / L	12 s	3 Nm	1.1 Nm
STM30 B1.37/6 - 31N	R / L	30 s	3 Nm	2 Nm



STM with 51N wiring

STM actuators are used in all industries, especially the following:

- Apparatus construction
- Electrical engineering for open and closed loop control tasks
- Weighing and dosing technology for movement tasks
- Heating, air conditioning and ventilation engineering.

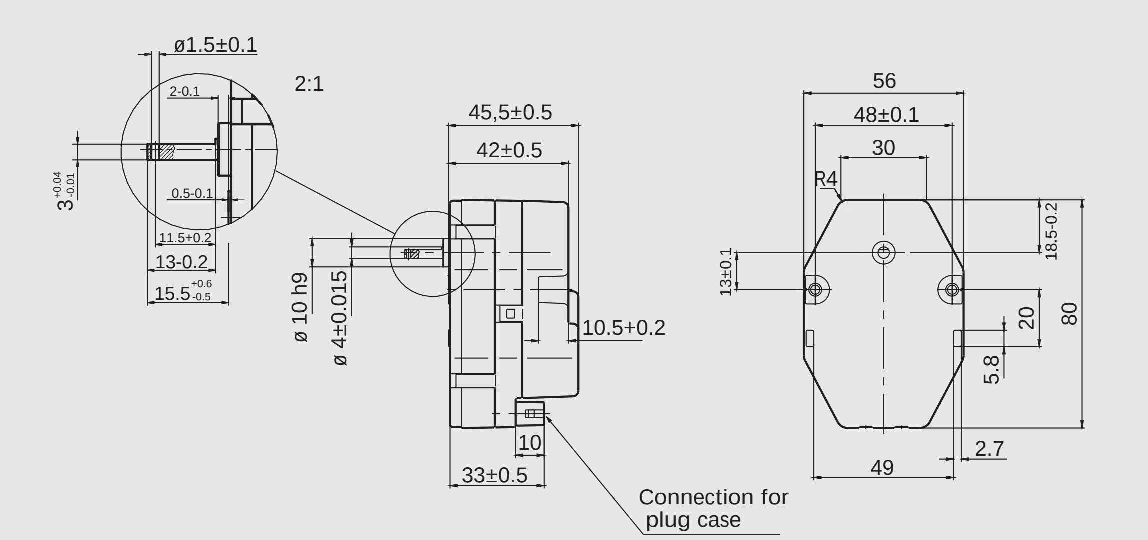
Technical Data

Actuator type	Sense of rotation	Running time for 90°	Rated torque	Static holding torque
STM4.5 Q3.51/6 - 51N [1]	R / L	4.5 s	3 Nm	1.5 Nm
STM9 Q3.51/12 - 51N [1]	R / L	9 s	4 Nm	1.5 Nm
STM12 B2.37/6 - 51N	R / L	12 s	3 Nm	1.1 Nm
STM15 Q3.51/6 - 51N [1]	R / L	15 s	9 Nm	6 Nm
STM30 B3.37/6 - 51N [1]	R / L	30 s	3 Nm	2 Nm
STM30 Q3.51/12 - 51N [1]	R / L	30 s	10 Nm	6.5 Nm

1 Potentiometer installation possible

Actuators

STM 6SF-L



STM 6SF-L

In the simple version of the actuators, the STM 6SF, an anti-blocking asynchronous motor is used as the drive. This actuator moves to a preset limit and the power remains on. When de-energized, the shaft is reset by means of a mechanical spring – a safety precaution in the event of a power failure.

The STM 6SF-L actuator is particularly suited to moving air valves in heating burners in the lower performance range.

Technical Data

	Values
Rated voltage	230 VAC -15% +10%
Rated frequency	50 Hz
Current consumption	24 mA
Apparent power	5.5 VA
Sense of rotation	anti-clockwise
Control time	6 s
Driving torque	26 Ncm
Reverse torque	1 Ncm
Weight	200 g
Ambient temperature	0 ... 60 °C
Operating mode S1	100% ED
Protection grade	IP 40, to DIN 40 050
Insulation class	E, to VDE 0530

Lexium 05 motion control
BSH servo motors

BSH servo motor with straight connectors

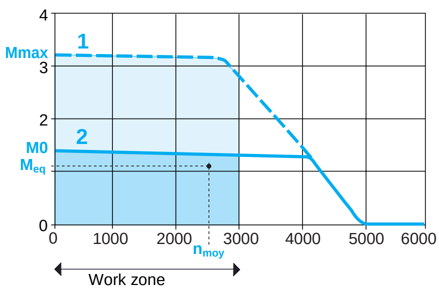
BSH servo motor with angled connectors

Presentation

BSH servo motors are the ideal choice to meet the requirements of dynamics and precision. With five flange sizes and a variety of lengths, there is a suitable solution for most applications, covering a torque range from 0.42 to 33.5 Nm for speeds ranging from 1250 to 6000 rpm.

Their new winding technology based on salient poles makes BSH servo motors very compact in comparison with conventional servo motors.
BSH servo motors are available in 5 flange sizes: 55, 70, 100, 140 and 205 mm.
Thermal protection is provided by a temperature probe integrated in the servo motors. They are certified "Recognized" by the Underwriters Laboratories and comply with standard UL1004 (except for the BSH 1404P servo motor) and with European directives (CE marking).
BSH servo motors are available with the following variants:
- IP40 or IP65 degree of protection
- With or without holding brake
- Straight or angled connectors
- Single turn or multiturn SinCos encoder
- Smooth or keyed shaft end

Torque/speed characteristics



BSH servo motors provide torque/speed curve profiles similar to the example shown on the left with:
1 Peak torque, depending on the servo drive model
2 Continuous torque, depending on the servo drive model
where:
- 6000 (in rpm) corresponds to the servo motor's maximum mechanical speed
- M_{max} (in Nm) represents the peak stall torque value
- M_n (in Nm) represents the continuous stall torque value

Principle for determining servo motor size according to the application

The torque/speed curves can be used to determine the correct servo motor size. For example, for a 115 V single phase supply voltage, the curves used are curves 1 and 2.
1 Locate the work zone of the application in terms of speed.
2 Verify, using the servo motor cycle timing diagram, that the torques required by the application during the various phases of the cycle are located within the area bounded by curve 1 in the work zone.
3 Calculate the average speed n_{avg} and the equivalent thermal torque M_{eq} (see page 92).
4 The point defined by n_{avg} and M_{eq} must be located below curve 2 in the work zone.

Note: *For sizing of servo motors: see page 92.*

Functions

General functions

BSH servo motors have been developed to meet the following requirements:
- Functional characteristics, ruggedness, safety, etc in accordance with IEC/EN 60034-1
- Ambient operating temperature: - 20...40°C according to DIN 50019R14. Maximum 55°C with derating from 40°C of 1% per °C
- Relative humidity: Class F according to DIN 400
- Altitude: 1000 m without derating, 2000 m with k = 0.86 *(1)*, 3000 m with k = 0.8
- Storage and transport temperature: - 25...70°C
- Winding insulation class: F (maximum temperature for windings 155°C) according to DIN VDE 0530
- Power and sensor connections via straight or angled connectors
- Thermal protection by built-in PTC thermistor probe, controlled by the Lexium 05 servo drive
- Out-of-round, concentricity and perpendicularity between flange and shaft according to DIN 42955, class N
- Flange compliant with standard DIN 42948
- Permitted mounting positions: no mounting restrictions for IMB5 - IMV1 and IMV3 according to DIN 42950
- Polyester resin based paint: opaque black RAL 9005

(1) k: derating factor

Characteristics:
pages 56 to 79
References:
pages 80 to 82
Dimensions:
pages 83 to 85

Lexium 05 motion control
BSH servo motors

Functions (continued)

General functions (continued)

■ Degree of protection:
□ Servo motor casing: IP 65 in accordance with IEC/EN 60529
□ Shaft end: IP 40 or IP 65 in accordance with IEC/EN 60529 *(1)*
■ Integrated sensor: SinCos Hiperface single turn or multiturn high resolution encoder
■ Smooth or keyed shaft end in standard sizes (according to DIN 42948)

Holding brake (depending on model)

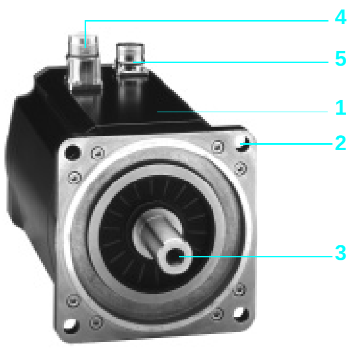
The integrated brake fitted on BSH servo motors (depending on the model) is a failsafe electro-magnetic holding brake.

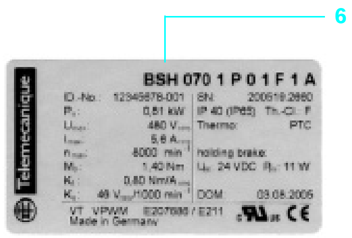
⚠ **Do not use the holding brake as a dynamic brake for deceleration, as this will quickly damage the brake.**

Built-in encoder

The servo motor is fitted with a SinCos Hiperface® high resolution single turn (4096 points) or multiturn (4096 points x 4096 turns) absolute encoder providing angular precision of the shaft position, accurate to less than ± 1.3 arc minutes.

This performs the following functions:
■ Gives the angular position of the rotor so that flows can be synchronized
■ Measures the servo motor speed via the associated Lexium 05 servo drive. This information is used by the speed controller of the Lexium servo drive.
■ Measures the position information for the Lexium servo drive position controller
■ Measures and sends position information in incremental format for the position feedback of a motion control module (“simulated encoder” output of the Lexium 05 servo drive)





Description

BSH servo motors with a 3-phase stator and a 6- to 10-pole rotor (depending on model) with Neodymium Iron Borium (NdFeB) magnets consist of:
1 A casing with a square cross-section, protected by RAL 9005 opaque black paint
2 A 4-point axial fixing flange in accordance with DIN 42948
3 A standard shaft end in accordance with DIN 42948, smooth or keyed (depending on the model)
4 A threaded dust and damp proof male straight connector for connecting the power cable *(2)*
5 A threaded dust and damp proof male straight connector for connecting the encoder cable *(2)*
6 A manufacturer's rating plate on the right side

Connectors to be ordered separately, for connection to Lexium 05 servo drives, see page 82.
Schneider Electric has taken particular care to ensure compatibility between BSH servo motors and Lexium 05 servo drives. This compatibility can only be assured by using cables and connectors sold by Schneider Electric, see page 82.

(1) IP 40 mounted in position IMV3 (vertical mounting with shaft end at the top)
(2) Other model with angled connector that can be rotated through 330°

Characteristics with BSH 0551T servo motors

Type of servo motor				BSH 0551T		
Associated with Lexium 05 servo drive				**LXM 05●D10F1**	**LXM 05●D10M2**	**LXM 05●D10M3X**
Line supply voltage			**V**	115 single phase	230 single phase	230 3-phase
Switching frequency			**kHz**	8		
Torque	Continuous stall	M_0	**Nm**	0.5		
	Peak stall	M_{max}	**Nm**	1.4		
Nominal operating point	Nominal torque		**Nm**	0.46	0.43	0.42
	Nominal speed		**rpm**	3000	6000	
Maximum current			**A rms**	6.2		

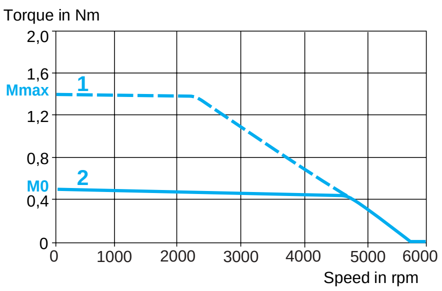
Servo motor characteristics

Maximum mechanical speed			**rpm**	9000
Constants (at 120°C)	Torque		**Nm/A rms**	0.36
	Back emf		**V_{rms}/krpm**	22
Rotor	Number of poles			6
	Inertia Without brake	J_m	**kgcm²**	0.059
	With brake	J_m	**kgcm²**	0.1113
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	12.2
	Inductance (phase/phase)		**mH**	20.8
	Electrical time constant		**ms**	1.705
Holding brake (depending on model)				See page 86

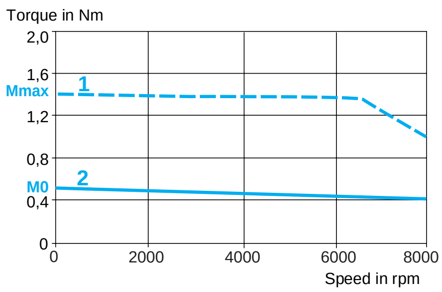
Speed/torque curves

BSH 0551T servo motors

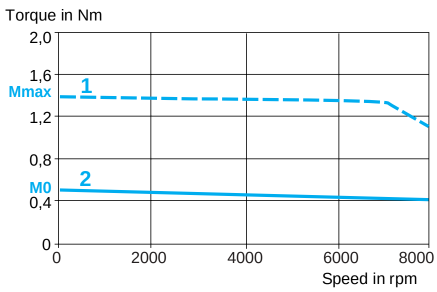
With LXM 05●D10F1 servo drive
115 V single phase



With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

Characteristics of BSH 0552M/0552P servo motors

Type of servo motor				BSH 0552M		BSH 0552P		
Associated with Lexium 05 servo drive				**LXM 05 ●D10M2**	**LXM 05 ●D10M3X**	**LXM 05 ●D10M2**	**LXM 05 ●D10M3X**	**LXM 05 ●D14N4**
Line supply voltage			**V**	230 single phase	230 3-phase	230 single phase	230 3-phase	400/480 3-phase
Switching frequency			**kHz**	4		8		
Torque	Continuous stall	M_0	**Nm**	0.9				
	Peak stall	M_{max}	**Nm**	2.3		2.7		
Nominal operating point	Nominal torque		**Nm**	0.85		0.8		0.70
	Nominal speed		**rpm**	1500		4000		6000
Maximum current			**A rms**	2.9		5.9		

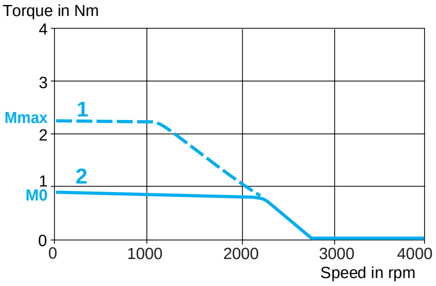
Servo motor characteristics

Maximum mechanical speed			**rpm**	9000				
Constants (at 120°C)	Torque		**Nm/A rms**	1.33		0.7		
	Back emf		**V_{rms}/krpm**	74		40		
Rotor	Number of poles			6				
	Inertia — Without brake	J_m	**$kgcm^2$**	0.096				
	With brake	J_m	**$kgcm^2$**	0.1613				
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	60.2		17.4		
	Inductance (phase/phase)		**mH**	122		35.3		
	Electrical time constant		**ms**	1.24				
Holding brake (depending on model)				See page 86				

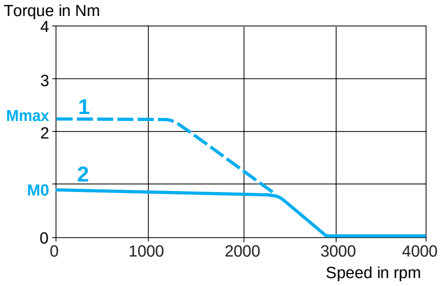
Speed/torque curves

BSH 0552M servo motor

With LXM 05●D10M2 servo drive
230 V single phase

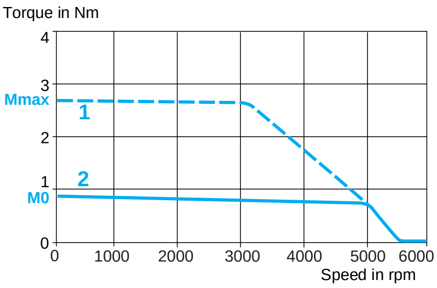


With LXM 05●D10M3X servo drive
230 V 3-phase

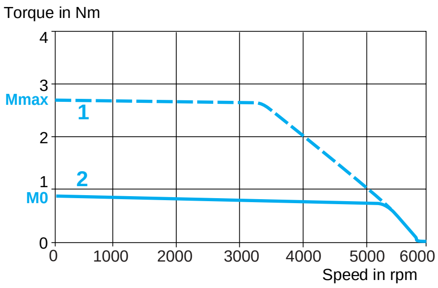


BSH 0552P servo motor

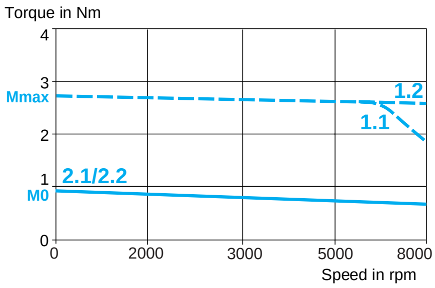
With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



With LXM 05●D14N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase

1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
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Dimensions: pages 83 to 85

Characteristics of BSH 0552T servo motors

Type of servo motor		BSH 0552T			
Associated with Lexium 05 servo drive		**LXM 05 ●D10F1**	**LXM 05 ●D17F1**	**LXM 05 ●D10M2**	**LXM 05 ●D10M3X**
Line supply voltage	**V**	115 single phase	115 single phase	230 single phase	230 3-phase
Switching frequency	**kHz**	8			
Torque – Continuous stall M_0	**Nm**	0.9			
Torque – Peak stall M_{max}	**Nm**	1.77	2.7	1.77	
Nominal operating point – Nominal torque	**Nm**	0.8		0.72	
Nominal operating point – Nominal speed	**rpm**	3000		6000	
Maximum current	**A rms**	10.3			

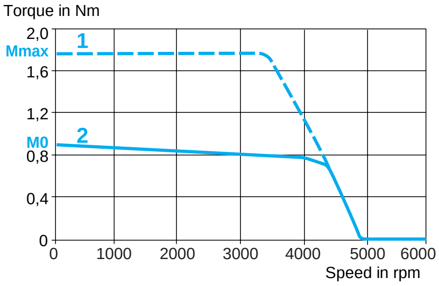
Servo motor characteristics

Maximum mechanical speed		**rpm**	9000
Constants (at 120°C)	Torque	**Nm/A rms**	0.36
	Back emf	**V_{rms}/krpm**	22
Rotor	Number of poles		6
	Inertia – Without brake J_m	**kgcm²**	0.14
	Inertia – With brake J_m	**kgcm²**	0.1613
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	5.2
	Inductance (phase/phase)	**mH**	10.6
	Electrical time constant	**ms**	1.24
Holding brake (depending on model)			See page 86

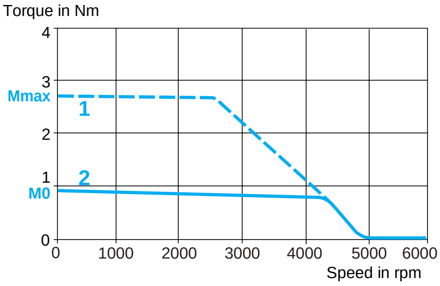
Speed/torque curves

BSH 0552T servo motor

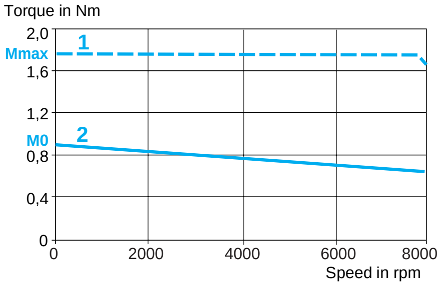
With LXM 05●D10F1 servo drive
115 V single phase



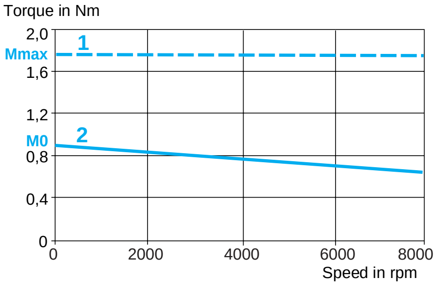
With LXM 05●D17F1 servo drive
115 V single phase



With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

Characteristics of BSH 0553M servo motors

Type of servo motor				**BSH 0553M**	
Associated with Lexium 05 servo drive				**LXM 05 ●D10M2**	**LXM 05 ●D10M3X**
Line supply voltage			**V**	230 single phase	230 3-phase
Switching frequency			**kHz**	4	
Torque	Continuous stall	M_0	**Nm**	1.3	
	Peak stall	M_{max}	**Nm**	4.2	
Nominal operating point	Nominal torque		**Nm**	1.2	
	Nominal speed		**rpm**	1500	
Maximum current			**A rms**	4.3	

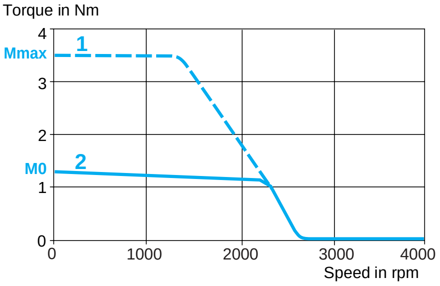
Servo motor characteristics

Maximum mechanical speed				**rpm**	9000
Constants (at 120°C)	Torque			**Nm/A rms**	1.33
	Back emf			**V_{rms}/krpm**	79
Rotor	Number of poles				6
	Inertia	Without brake	J_m	**kgcm²**	0.134
		With brake	J_m	**kgcm²**	0.2113
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	38.4
	Inductance (phase/phase)			**mH**	92.2
	Electrical time constant			**ms**	1.5
Holding brake (depending on model)					See page 86

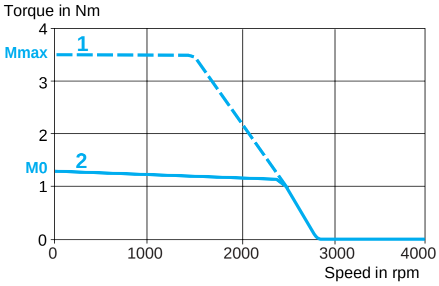
Speed/torque curves

BSH 0553M servo motors

With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

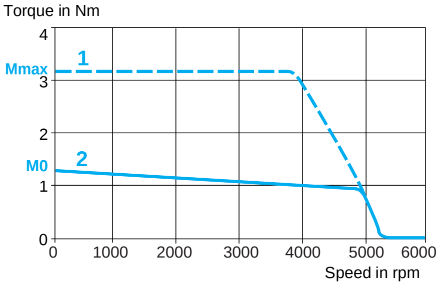
Characteristics of BSH 0553P/0553T servo motors

Type of servo motor			BSH 0553P			BSH 0553T		
Associated with Lexium 05 servo drive			**LXM 05 ●D10M2**	**LXM 05 ●D10M3X**	**LXM 05 ●D14N4**	**LXM 05 ●D17F1**	**LXM 05 ●D17M2**	**LXM 05 ●D17M3X**
Line supply voltage		**V**	230 single phase	230 3-phase	400/480 3-phase	115 single phase	230 single phase	230 3-phase
Switching frequency		**kHz**	8					
Torque	Continuous stall M_0	**Nm**	1.3					
	Peak stall M_{max}	**Nm**	3.18		3.87	3.31		
Nominal operating point	Nominal torque	**Nm**	1		0.9	11	0.9	
	Nominal speed	**rpm**	4000		6000	3000	6000	
Maximum current		**A rms**	8.7			15.2		
Servo motor characteristics								
Maximum mechanical speed		**rpm**	9000					
Constants (at 120°C)	Torque	**Nm/A rms**	0.7			0.39		
	Back emf	**V_{rms}/krpm**	41			22		
Rotor	Number of poles		6					
	Inertia Without brake J_m	**kgcm²**	0.134					
	Inertia With brake J_m	**kgcm²**	0.2113					
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	10.4			3.1		
	Inductance (phase/phase)	**mH**	25			7.4		
	Electrical time constant	**ms**	1.5					
Holding brake (depending on model)			See page 86					

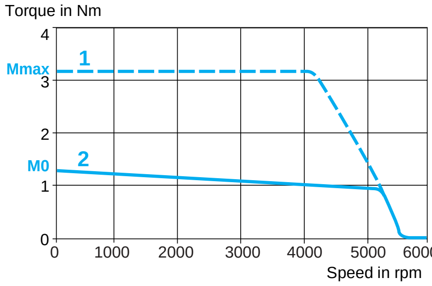
Speed/torque curves

BSH 0553P servo motors

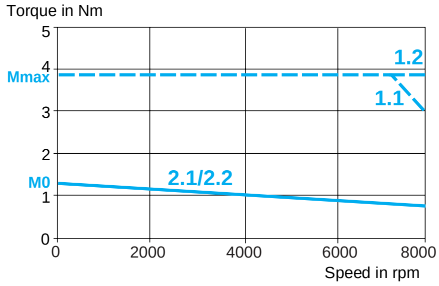
With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase

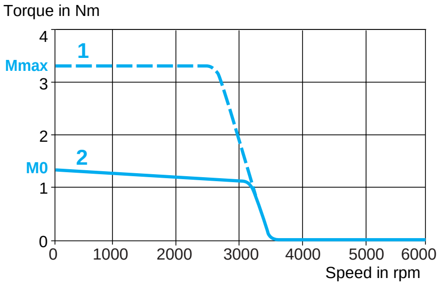


With LXM 05●D14N4 servo drive
400/480 V 3-phase

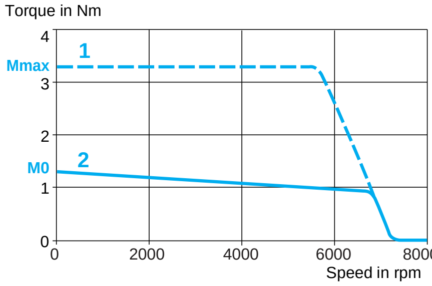


BSH 0553T servo motor

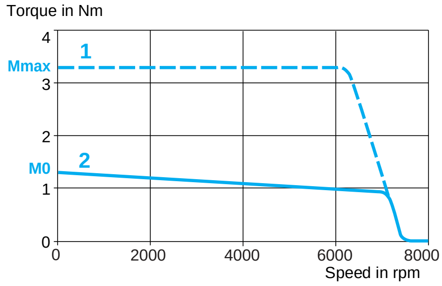
With LXM 05●D17F1 servo drive
115 V single phase



With LXM 05●D17M2 servo drive
230 V single phase



With LXM 05●D17M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

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References: pages 80 to 82
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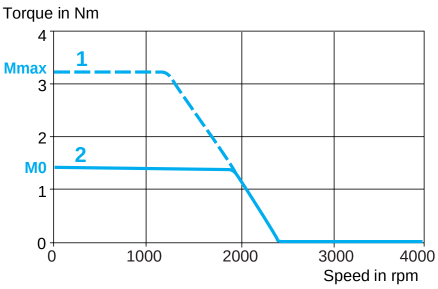
Characteristics of BSH 0701M/0701P servo motors

Type of servo motor				BSH 0701M	BSH 0701P	
Associated with Lexium 05 servo drive				LXM 05 ●D10M3X	LXM 05 ●D10M2	LXM 05 ●D10M3X
Line supply voltage			V	230 3-phase	230 single phase	230 3-phase
Switching frequency			kHz	4		
Torque	Continuous stall	M_0	Nm	1.4		
	Peak stall	M_{max}	Nm	3.2		
Nominal operating point	Nominal torque		Nm	1.36	1.3	
	Nominal speed		rpm	1500	3000	
Maximum current			A rms	2.8	5.3	
Servo motor characteristics						
Maximum mechanical speed			rpm	8000		
Constants (at 120°C)	Torque		Nm/A rms	1.6	0.8	
	Back emf		V_{rms}/krpm	91	46	
Rotor	Number of poles			6		
	Inertia Without brake	J_m	kgcm²	0.25		
	Inertia With brake	J_m	kgcm²	0.322		
Stator (at 20°C)	Resistance (phase/phase)		Ω	41.6	10.4	
	Inductance (phase/phase)		mH	173.2	38.8	
	Electrical time constant		ms	4.16	3.73	
Holding brake (depending on model)				See page 86		

Speed/torque curves

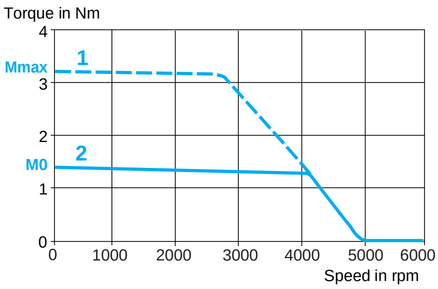
BSH 0701M servo motor

With LXM 05●D10M3X servo drive
230 V 3-phase

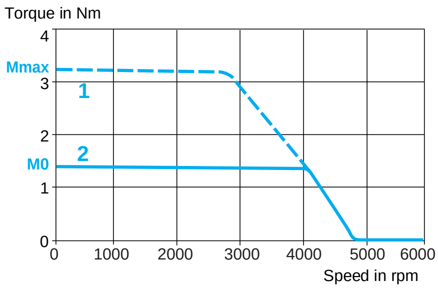


BSH 0701P servo motor

With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

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References: pages 80 to 82
Dimensions: pages 83 to 85

Characteristics of BSH 0701T servo motors

Type of servo motor				BSH 0701T			
Associated with Lexium 05 servo drive				**LXM 05 ●D10F1**	**LXM 05 ●D17M2**	**LXM 05 ●D10M3X**	**LXM 05 ●D17M3X**
Line supply voltage			**V**	115 single phase	230 single phase	230 3-phase	230 3-phase
Switching frequency			**kHz**	8			
Torque	Continuous stall	M_0	**Nm**	1.4			
	Peak stall	M_{max}	**Nm**	2.42	3.19	2.41	3.19
Nominal operating point	Nominal torque		**Nm**	1.43	1.32	1.2	1.32
	Nominal speed		**rpm**	2500	5000	6000	5000
Maximum current			**A rms**	9.9			

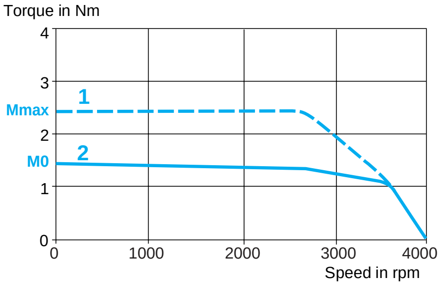
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	0.46
	Back emf		**V_{rms}/krpm**	27
Rotor	Number of poles			6
	Inertia – Without brake	J_m	**kgcm²**	0.25
	Inertia – With brake	J_m	**kgcm²**	0.322
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	3.3
	Inductance (phase/phase)		**mH**	12.6
	Electrical time constant		**ms**	3.81
Holding brake (depending on model)				See page 86

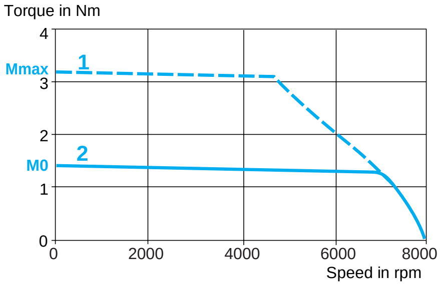
Speed/torque curves

BSH 0701T servo motor

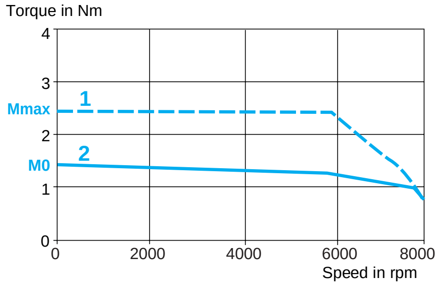
With LXM 05●D10F1 servo drive
115 V single phase



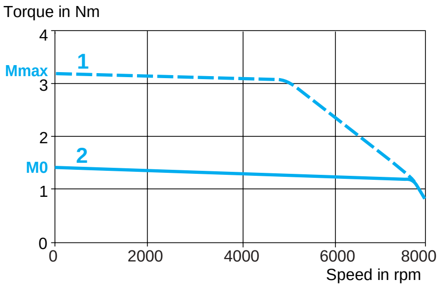
With LXM 05●D17M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



With LXM 05●D17M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

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Dimensions: pages 83 to 85

Characteristics of BSH 0702M servo motors

Type of servo motor				**BSH 0702M**	
Associated with Lexium 05 servo drive				**LXM 05●D10M2**	**LXM 05●D10M3X**
Line supply voltage			**V**	230 single phase	230 3-phase
Switching frequency			**kHz**	4	
Torque	Continuous stall	M_0	**Nm**	2.1	
	Peak stall	M_{max}	**Nm**	6.8	
Nominal operating point	Nominal torque		**Nm**	2.12	
	Nominal speed		**rpm**	1500	
Maximum current			**A rms**	5.9	

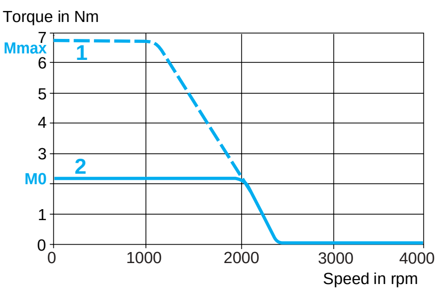
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	1.46
	Back emf			**V_{rms}/krpm**	93
Rotor	Number of poles				6
	Inertia	Without brake	J_m	**kgcm²**	0.41
		With brake	J_m	**kgcm²**	0.482
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	17.3
	Inductance (phase/phase)			**mH**	84.4
	Electrical time constant			**ms**	4.88
Holding brake (depending on model)					See page 86

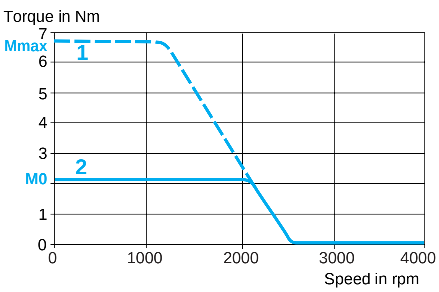
Speed/torque curves

BSH 0702M servo motor

With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
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Characteristics of BSH 0702P servo motors

Type of servo motor				BSH 0702P				
Associated with Lexium 05 servo drive				**LXM 05 ●D10M2**	**LXM 05 ●D17M2**	**LXM 05 ●D10M3X**	**LXM 05 ●D17M3X**	**LXM 05 ●D14N4**
Line supply voltage			**V**	230 single phase	230 single phase	230 3-phase	230 3-phase	400/480 3-phase
Switching frequency			**kHz**	4				
Torque	Continuous stall	M_0	**Nm**	2.2				
	Peak stall	M_{max}	**Nm**	5.37	7.55	5.37	7.55	
Nominal operating point	Nominal torque		**Nm**	1.9				1.6
	Nominal speed		**rpm**	3000				6000
Maximum current			**A rms**	9.8				

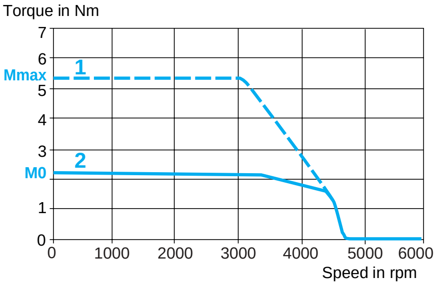
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	0.77
	Back emf			**V_{rms}/krpm**	48
Rotor	Number of poles				6
	Inertia	Without brake	J_m	**$kgcm^2$**	0.41
		With brake	J_m	**$kgcm^2$**	0.482
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	4.2
	Inductance (phase/phase)			**mH**	21.3
	Electrical time constant			**ms**	5.07
Holding brake (depending on model)					See page 86

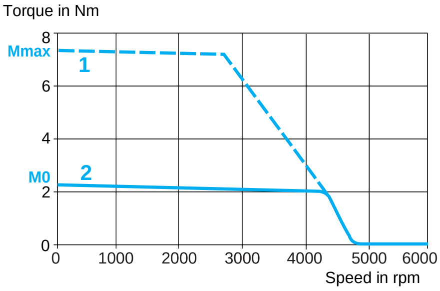
Speed/torque curves

BSH 0702P servo motor

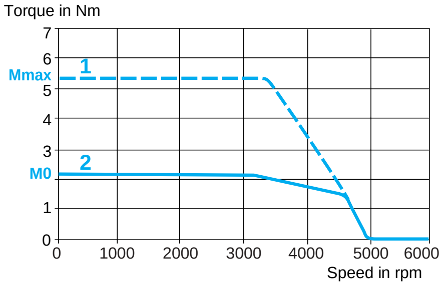
With LXM 05●D10M2 servo drive
230 V single phase



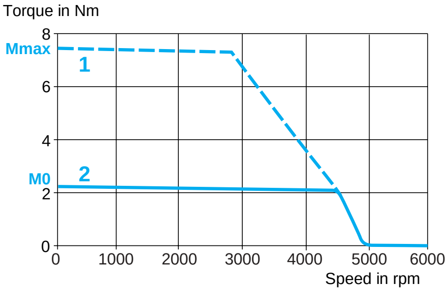
With LXM 05●D17M2 servo drive
230 V single phase



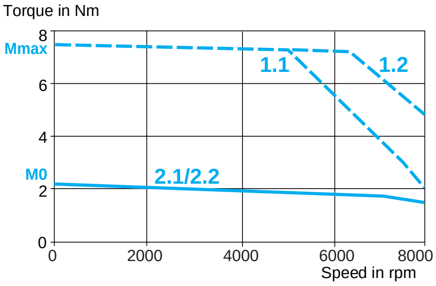
With LXM 05●D10M3X servo drive
230 V 3-phase



With LXM 05●D17M3X servo drive
230 V 3-phase



With LXM 05●D14N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
References: pages 80 to 82
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Characteristics of BSH 0702T servo motors

Type of servo motor					BSH 0702T			
Associated with Lexium 05 servo drive					**LXM 05 ●D17F1**	**LXM 05 ●D17M2**	**LXM 05 ●D28M2**	**LXM 05 ●D42M3X**
Line supply voltage				**V**	115 single phase	230 single phase	230 single phase	230 3-phase
Switching frequency				**kHz**	8			
Torque	Continuous stall		M_0	**Nm**	2.12			
	Peak stall		M_{max}	**Nm**	4.14		6.8	
Nominal operating point	Nominal torque			**Nm**	1.9	1.7	1.76	
	Nominal speed			**rpm**	2500	6000	4500	
Maximum current				**A rms**	20.6			

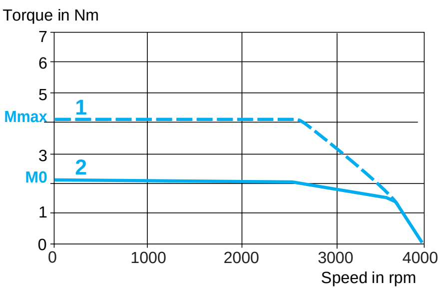
Servo motor characteristics

Maximum mechanical speed				**rpm**	8000
Constants (at 120°C)	Torque			**Nm/A rms**	0.42
	Back emf			**V_{rms}/krpm**	28
Rotor	Number of poles				6
	Inertia	Without brake	J_m	**$kgcm^2$**	0.41
		With brake	J_m	**$kgcm^2$**	0.482
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	1.5
	Inductance (phase/phase)			**mH**	6.6
	Electrical time constant			**ms**	4.4
Holding brake (depending on model)					See page 86

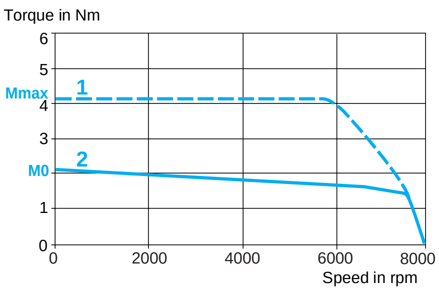
Speed/torque curves

BSH 0702T servo motor

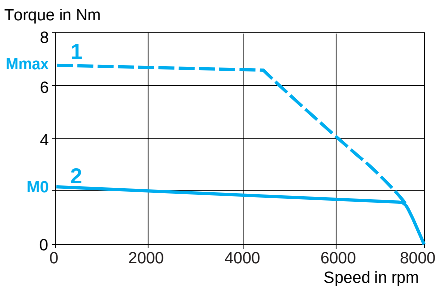
With LXM 05●D17F1 servo drive
115 V single phase



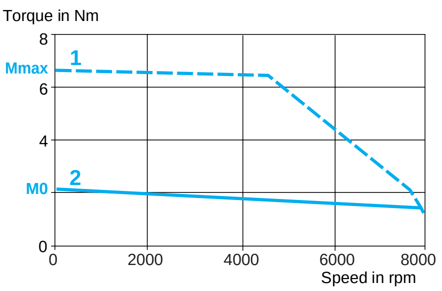
With LXM 05●D17M2 servo drive
230 V single phase



With LXM 05●D28M2 servo drive
230 V single phase



With LXM 05●D42M3X servo drive 230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
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Lexium 05 motion control
BSH servo motors

Characteristics of BSH 0703M servo motors

Type of servo motor				BSH 0703M		
Associated with Lexium 05 servo drive				**LXM 05●D10M2**	**LXM 05●D10M3X**	**LXM 05●D14N4**
Line supply voltage			**V**	230 single phase	230 3-phase	400/480 3-phase
Switching frequency			**kHz**	4		
Torque	Continuous stall	M_0	**Nm**	2.8		
	Peak stall	M_{max}	**Nm**	10		10.3
Nominal operating point	Nominal torque		**Nm**	2.7		2.5
	Nominal speed		**rpm**	1500		3000
Maximum current			**A rms**	7.3		

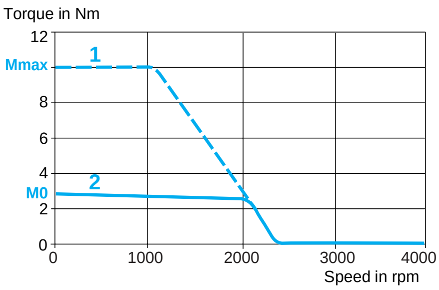
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	1.48
	Back emf		**V_{rms}/krpm**	96
Rotor	Number of poles			6
	Inertia Without brake	J_m	**$kgcm^2$**	0.58
	With brake	J_m	**$kgcm^2$**	0.81
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	10.7
	Inductance (phase/phase)		**mH**	48.1
	Electrical time constant		**ms**	4.5
Holding brake (depending on model)				See page 86

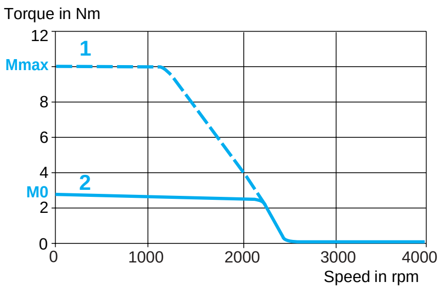
Speed/torque curves

BSH 0703M servo motor

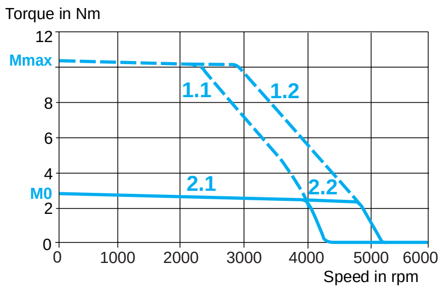
With LXM 05●D10M2 servo drive
230 V single phase



With LXM 05●D10M3X servo drive
230 V 3-phase



With LXM 05●D14N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase

1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

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Characteristics of BSH 0703P servo motors

Type of servo motor				BSH 0703P			
Associated with Lexium 05 servo drive				**LXM 05 ●D17M2**	**LXM 05 ●D28M2**	**LXM 05 ●D17M3X**	**LXM 05 ●D22N4**
Line supply voltage			**V**	230 single phase	230 single phase	230 3-phase	400/480 3-phase
Switching frequency			**kHz**	8			
Torque	Continuous stall	M_0	**Nm**	3.1			
	Peak stall	M_{max}	**Nm**	7.28	10.3	7.28	8.92
Nominal operating point	Nominal torque		**Nm**	2.8	2.3	2.8	2.3
	Nominal speed		**rpm**	3000			6000
Maximum current			**A rms**	15.2			

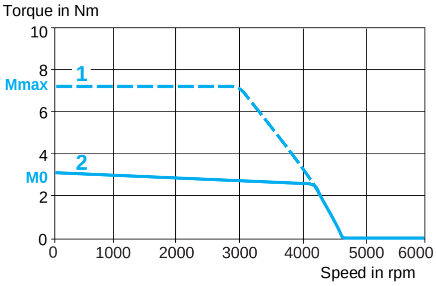
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	0.78
	Back emf		**V_{rms}/krpm**	49
Rotor	Number of poles			6
	Inertia – Without brake	J_m	**$kgcm^2$**	0.58
	Inertia – With brake	J_m	**$kgcm^2$**	0.81
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	2.7
	Inductance (phase/phase)		**mH**	13
	Electrical time constant		**ms**	4.81
Holding brake (depending on model)				See page 86

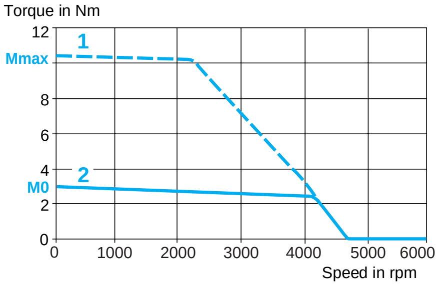
Speed/torque curves

BSH 0703P servo motor

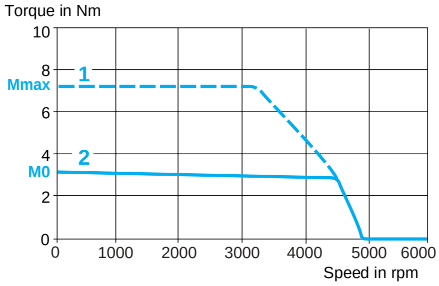
With LXM 05●D17M2 servo drive
230 V single phase



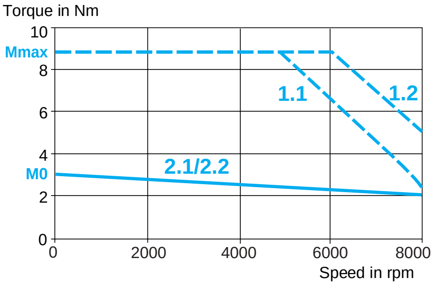
With LXM 05●D28M2 servo drive
230 V single phase



With LXM 05●D17M3X servo drive
230 V 3-phase



With LXM 05●D22N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

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Characteristics of BSH 0703T servo motors

Type of servo motor				BSH 0703T		
Associated with Lexium 05 servo drive				**LXM 05●D28F1**	**LXM 05●D28M2**	**LXM 05●D42M3X**
Line supply voltage			**V**	115 single phase	230 single phase	230 3-phase
Switching frequency			**kHz**	8	8	8
Torque	Continuous stall	M_0	**Nm**	2.8	2.8	2.8
	Peak stall	M_{max}	**Nm**	7.38	7.38	10.25
Nominal operating point	Nominal torque		**Nm**	2.55	2.1	2.1
	Nominal speed		**rpm**	2500	6000	6000
Maximum current			**A rms**	30.9	30.9	30.9

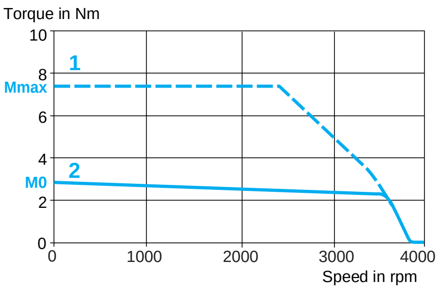
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	0.42
	Back emf		**V_{rms}/krpm**	29
Rotor	Number of poles			6
	Inertia, Without brake	J_m	**$kgcm^2$**	0.58
	Inertia, With brake	J_m	**$kgcm^2$**	0.81
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1
	Inductance (phase/phase)		**mH**	4.4
	Electrical time constant		**ms**	4.4
Holding brake (depending on model)				See page 86

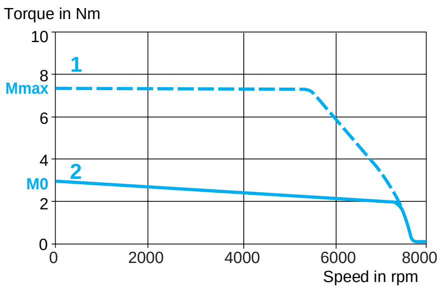
Speed/torque curves

BSH 0703T servo motor

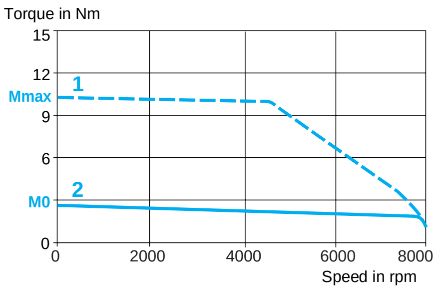
With LXM 05●D28F1 servo drive
115 V single phase



With LXM 05●D28M22 servo drive
230 V single phase



With LXM 05●D42M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

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Lexium 05 motion control

BSH servo motors

Characteristics of 1001M/1001P servo motors

Type of servo motor					BSH 1001M	BSH 1001P	
Associated with Lexium 05 servo drive					LXM 05 ●D14N4	LXM 05 ●D17M3X	LXM 05 ●D22N4
Line supply voltage				V	400/480 3-phase	230 3-phase	400/480 3-phase
Switching frequency				kHz	4		
Torque	Continuous stall		M_0	Nm	3.4	3.3	
	Peak stall		M_{max}	Nm	8.5	9.45	
Nominal operating point	Nominal torque			Nm	3.1		2.8
	Nominal speed			rpm	2000		4000
Maximum current				A rms	5.9	12	

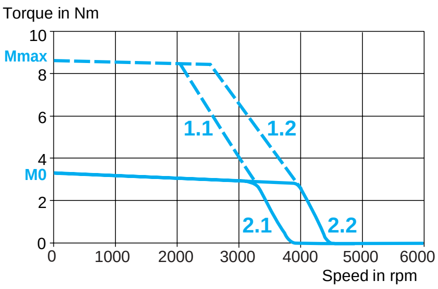
Servo motor characteristics

Maximum mechanical speed				rpm	6000	
Constants (at 120°C)	Torque			Nm/A rms	1.84	0.89
	Back emf			V_{rms}/krpm	112	60
Rotor	Number of poles				8	
	Inertia	Without brake	J_m	kgcm²	1.40	
		With brake	J_m	kgcm²	2.013	
Stator (at 20°C)	Resistance (phase/phase)			Ω	18.4	3.8
	Inductance (phase/phase)			mH	61.5	17.6
	Electrical time constant			ms	3.34	4.63
Holding brake (depending on model)					See page 86	

Speed/torque curves

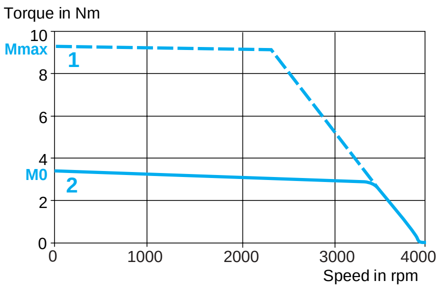
BSH 1001M servo motor

With LXM 05●D14N4 servo drive
400/480 V 3-phase

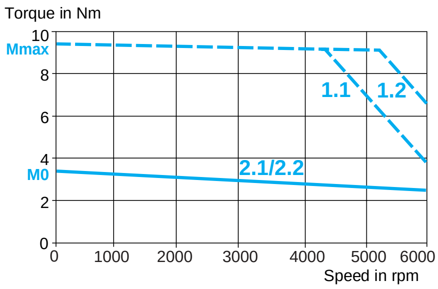


BSH 1001P servo motor

With LXM 05●D17M3X servo drive
230 V 3-phase



With LXM 05●D22N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

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Characteristics of BSH 1001T servo motors

Type of servo motor			**BSH 1001T**		
Associated with Lexium 05 servo drive			**LXM 05 ●D28F1**	**LXM 05 ●D28M2**	**LXM 05 ●D42M3X**
Line supply voltage		**V**	115 single phase	230 single phase	230 3-phase
Switching frequency		**kHz**	8		
Torque	Continuous stall M_0	**Nm**	3.4		
	Peak stall M_{max}	**Nm**	8.5		
Nominal operating point	Nominal torque	**Nm**	3	2.8	
	Nominal speed	**rpm**	2500	4000	
Maximum current		**A rms**	23		

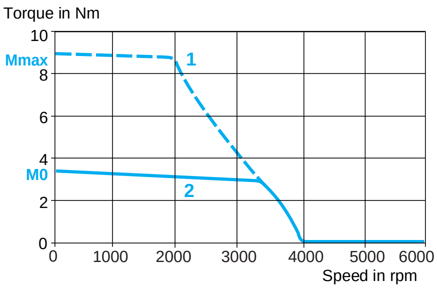
Servo motor characteristics

Maximum mechanical speed		**rpm**	6000
Constants (at 120°C)	Torque	**Nm/A rms**	0.52
	Back emf	**V_{rms}/krpm**	28
Rotor	Number of poles		8
	Inertia – Without brake J_m	**kgcm²**	1.40
	Inertia – With brake J_m	**kgcm²**	2.013
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	0.9
	Inductance (phase/phase)	**mH**	4
	Electrical time constant	**ms**	4.44
Holding brake (depending on model)			See page 86

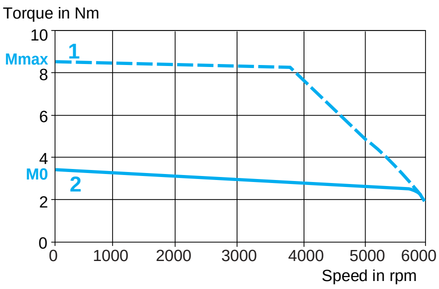
Speed/torque curves

BSH 1001T servo motor

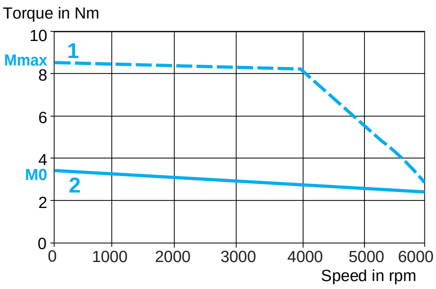
With LXM 05●D28F1 servo drive
115 V single phase



With LXM 05●D28M2 servo drive
230 V single phase



With LXM 05●D42M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

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Characteristics of BSH 1002M/1002P/1002T servo motors

Type of servo motor				BSH 1002M	BSH 1002P			BSH 1002T
Associated with Lexium 05 servo drive				**LXM 05 ●D14N4**	**LXM 05 ●D28M2**	**LXM 05 ●D17M3X**	**LXM 05 ●D22N4**	**LXM 05 ●D42M3X**
Line supply voltage			**V**	400/480 3-phase	230 single phase	230 3-phase	400/480 3-phase	230 3-phase
Switching frequency			**kHz**	4	8			
Torque	Continuous stall	M_0	**Nm**	5.5	5.8			5.52
	Peak stall	M_{max}	**Nm**	16	18.23	12.35	15.43	16
Nominal operating point	Nominal torque		**Nm**	5.1	5.2		4.6	4.4
	Nominal speed		**rpm**	2000			4000	
Maximum current			**A rms**	7.4	17.8			31.2

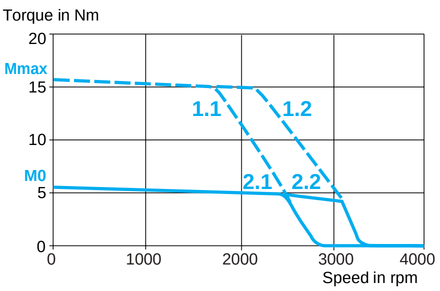
Servo motor characteristics

Maximum mechanical speed				**rpm**	6000		
Constants (at 120°C)	Torque			**Nm/A rms**	2.28	1.21	0.65
	Back emf			**V_{rms}/krpm**	146	77	33
Rotor	Number of poles				8		
	Inertia	Without brake	J_m	**kgcm²**	2.31		
		With brake	J_m	**kgcm²**	2.923		
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	8.6	2.4	0.6
	Inductance (phase/phase)			**mH**	46.1	12.7	2.9
	Electrical time constant			**ms**	5.98	5.91	6.00
Holding brake (depending on model)					See page 86		

Speed/torque curves

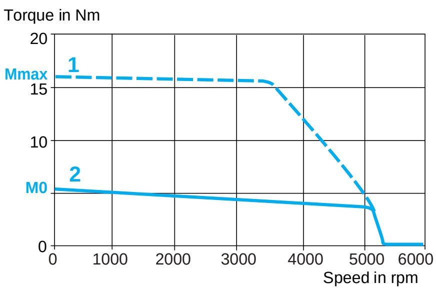
BSH 1002M servo motor

With LXM 05●D14N4 servo drive
400/480 V 3-phase



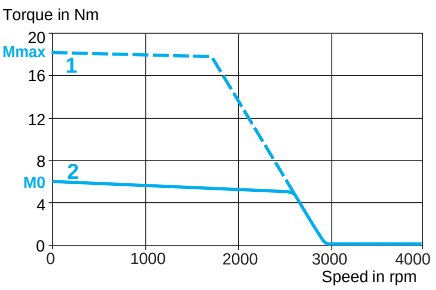
BSH 1002T servo motor

With LXM 05●D17M3X servo drive
230 V 3-phase

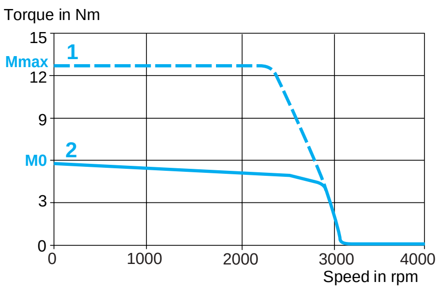


BSH 1002P servo motor

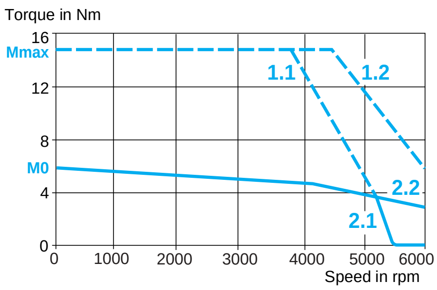
With LXM 05●D28M2 servo drive
230 V single phase



With LXM 05●D17M3X servo drive
230 V 3-phase



With LXM 05●D22N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

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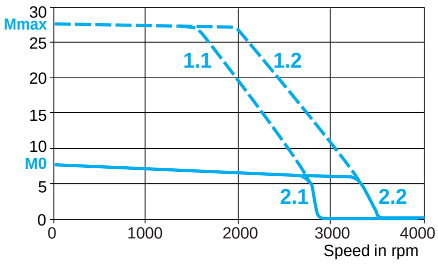
Characteristics of BSH 1003M/1003P servo motors

Type of servo motor					BSH 1003M	BSH 1003P		
Associated with Lexium 05 servo drive					LXM 05 ●D22N4	LXM 05 ●D28M2	LXM 05 ●D42M3X	LXM 05 ●D34N4
Line supply voltage				V	400/480 3-phase	230 single phase	230 3-phase	400/480 3-phase
Switching frequency				kHz	4			
Torque	Continuous stall		M_0	Nm	7.8	8		
	Peak stall		M_{max}	Nm	27.28	22.79	28.31	26.97
Nominal operating point	Nominal torque			Nm	6.6	7		5.7
	Nominal speed			rpm	2000			4000
Maximum current				A rms	15.6	28.3		
Servo motor characteristics								
Maximum mechanical speed				rpm	6000			
Constants (at 120°C)	Torque			Nm/A rms	2.24	1.12		
	Back emf			V_{rms}/krpm	144	77		
Rotor	Number of poles				8			
	Inertia	Without brake	J_m	kgcm²	3.22			
		With brake	J_m	kgcm²	3.833			
Stator (at 20°C)	Resistance (phase/phase)			Ω	5.3	1.43		
	Inductance (phase/phase)			mH	33.7	8.8		
	Electrical time constant			ms	6.36	6.15		
Holding brake (depending on model)					See page 86			

Speed/torque curves

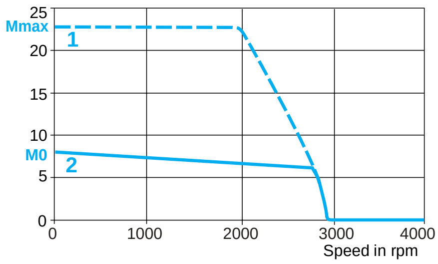
BSH 1003M servo motor

With LXM 05●D22N4 servo drive
400/480 V 3-phase

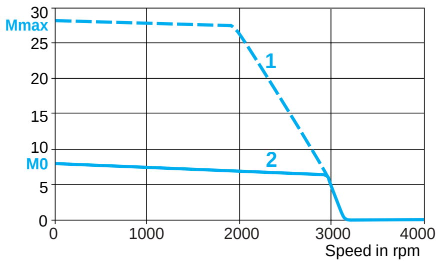


BSH 1003P servo motor

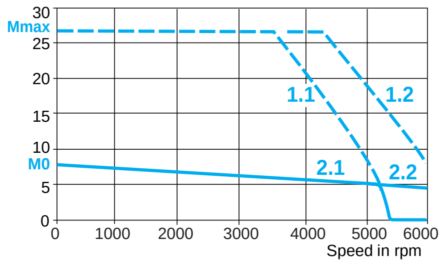
With LXM 05●D28M2 servo drive
230 V single phase



With LXM 05●D42M3X servo drive
230 V 3-phase



With LXM 05●D34N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

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Characteristics of BSH 1004P servo motors

Type of servo motor				**BSH 1004P**		
Associated with Lexium 05 servo drive				**LXM 05●D42M3X**	**LXM 05●D34N4**	**LXM 05●D57N4**
Line supply voltage			**V**	230 3-phase	400/480 3-phase	400/480 3-phase
Switching frequency			**kHz**	8		
Torque	Continuous stall	M_0	**Nm**	10		
	Peak stall	M_{max}	**Nm**	30.41	22.53	30.41
Nominal operating point	Nominal torque		**Nm**	9.5	7.9	7.9
	Nominal speed		**rpm**	1500	3000	3000
Maximum current			**A rms**	23.5		

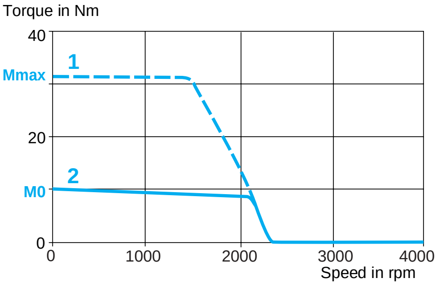
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000
Constants (at 120°C)	Torque		**Nm/A rms**	1.62
	Back emf		**V_{rms}/krpm**	103
Rotor	Number of poles			8
	Inertia Without brake	J_m	**kgcm²**	4.22
	With brake	J_m	**kgcm²**	5.245
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.81
	Inductance (phase/phase)		**mH**	11.8
	Electrical time constant		**ms**	6.52
Holding brake (depending on model)				See page 86

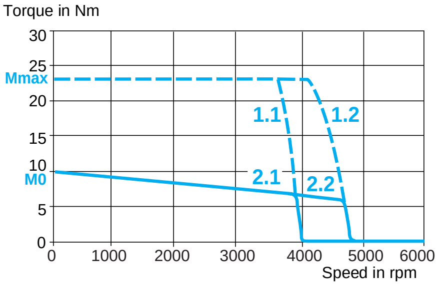
Speed/torque curves

BSH 1004P servo motor

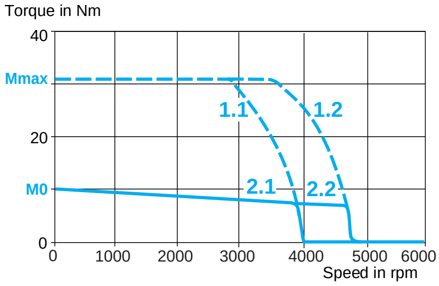
With LXM 05●D42M3X servo drive
230 V 3-phase



With LXM 05●D34N4 servo drive
400/480 V 3-phase



With LXM 05●D57N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

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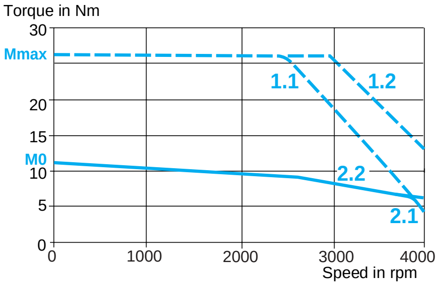
Characteristics of BSH 1401P/1401T servo motors

Type of servo motor				BSH 1401P	BSH 1401T
Associated with Lexium 05 servo drive				**LXM 05●D34N4**	**LXM 05●D42M3X**
Line supply voltage			**V**	400/480 3-phase	230 3-phase
Switching frequency			**kHz**	4	
Torque	Continuous stall	M_0	**Nm**	11.1	
	Peak stall	M_{max}	**Nm**	26.2	24.77
Nominal operating point	Nominal torque		**Nm**	9.55	9.47
	Nominal speed		**rpm**	2500	
Maximum current			**A rms**	20.8	37.1
Servo motor characteristics					
Maximum mechanical speed			**rpm**	4000	
Constants (at 120°C)	Torque		**Nm/A rms**	1.43	0.8
	Back emf		**V_{rms}/krpm**	100	56
Rotor	Number of poles			10	
	Inertia Without brake	J_m	**kgcm²**	7.41	
	With brake	J_m	**kgcm²**	8.56	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.41	0.44
	Inductance (phase/phase)		**mH**	15.6	4.92
	Electrical time constant		**ms**	11.06	11.18
Holding brake (depending on model)				See page 86	

Speed/torque curves

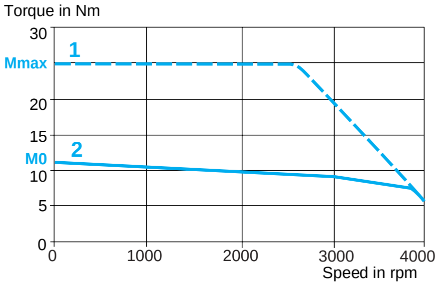
BSH 1401P servo motor

With LXM 05●D34N4 servo drive
400/480 V 3-phase



BSH 1401T servo motor

With LXM 05●D42M3X servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

Characteristics of BSH 1402M/1402P/1402T servo motors

Type of servo motor					BSH 1402M	BSH 1402P		BSH 1402T
Associated with Lexium 05 servo drive					LXM 05 ●D34N4	LXM 05 ●D42M3X	LXM 05 ●D57N4	LXM 05 ●D42M3X
Line supply voltage				V	400/480 3-phase	230 3-phase	400/480 3-phase	230 3-phase
Switching frequency				kHz	4			
Torque	Continuous stall		M_0	Nm	19.5			
	Peak stall		M_{max}	Nm	57.1	46.72	57.42	25.04
Nominal operating point	Nominal torque			Nm	17.1	13.7	12.3	14.44
	Nominal speed			rpm	1250	1500	3000	2000
Maximum current				A rms	22.4	44.1		75.2

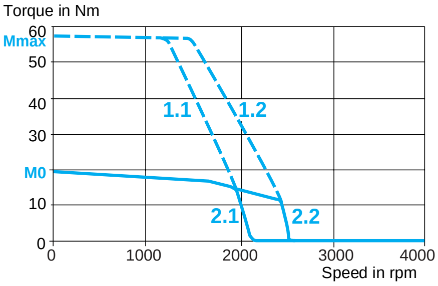
Servo motor characteristics

Maximum mechanical speed				rpm	4000		
Constants (at 120°C)	Torque			Nm/A rms	2.91	1.47	0.87
	Back emf			V_{rms}/krpm	199	101	59
Rotor	Number of poles				10		
	Inertia	Without brake	J_m	kgcm²	12.68		
		With brake	J_m	kgcm²	13.83		
Stator (at 20°C)	Resistance (phase/phase)			Ω	2.32	0.6	0.21
	Inductance (phase/phase)			mH	28.59	7.4	2.54
	Electrical time constant			ms	12.32	12.33	12.2
Holding brake (depending on model)					See page 86		

Speed/torque curves

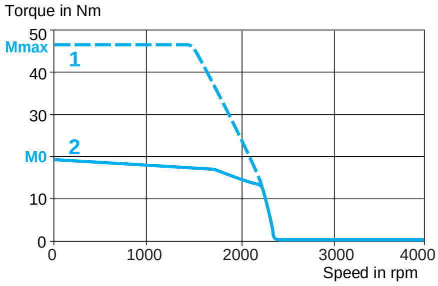
BSH 1402M servo motor

With LXM 05●D34N4 servo drive
400/480 V 3-phase

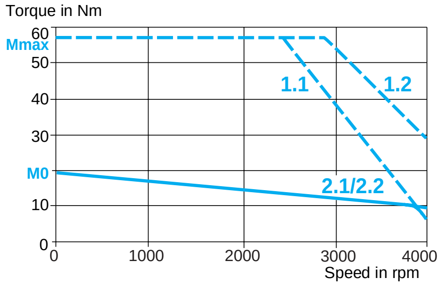


BSH 1402P servo motor

With LXM 05●D42M3X servo drive
230 V 3-phase

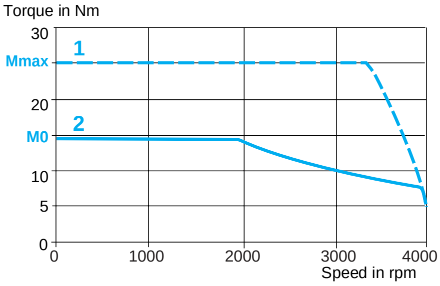


With LXM 05●D57N4 servo drive
400/480 V 3-phase



BSH 1402T servo motor

With LXM 05●D42M3X servo drive 230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

Characteristics of BSH 1403M/1403P servo motors

Type of servo motor			**BSH 1403M**		**BSH 1403P**
Associated with Lexium 05 servo drive			**LXM 05●D34N4**	**LXM 05●D57N4**	**LXM 05●D57N4**
Line supply voltage		**V**	400/480 3-phase		
Switching frequency		**kHz**	4		
Torque	Continuous stall M_0	**Nm**	27.8		
	Peak stall M_{max}	**Nm**	76.66	88.17	57.24
Nominal operating point	Nominal torque	**Nm**	21.5	21.2	12.9
	Nominal speed	**rpm**	1250	1500	3000
Maximum current		**A rms**	27.5		75.2

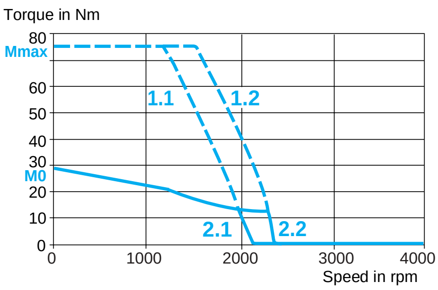
Servo motor characteristics

Maximum mechanical speed		**rpm**	4000	
Constants (at 120°C)	Torque	**Nm/A rms**	3.09	1.58
	Back emf	**V_{rms}/krpm**	205	105
Rotor	Number of poles		10	
	Inertia – Without brake J_m	**kgcm²**	17.94	
	Inertia – With brake J_m	**kgcm²**	23.44	
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	1.52	0.4
	Inductance (phase/phase)	**mH**	19.39	5.1
	Electrical time constant	**ms**	12.76	12.75
Holding brake (depending on model)			See page 86	

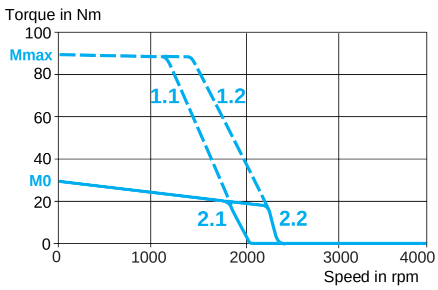
Speed/torque curves

BSH 1403M servo motor

With LXM 05●D34N4 servo drive
400/480 V 3-phase

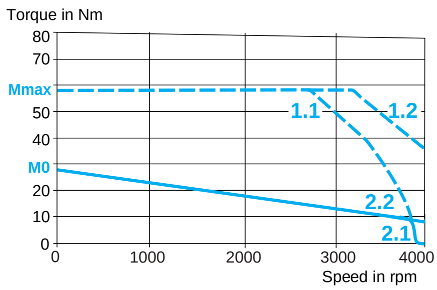


With LXM 05●D57N4 servo drive
400/480 V 3-phase



BSH 1403P servo motor

With LXM 05●D57N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

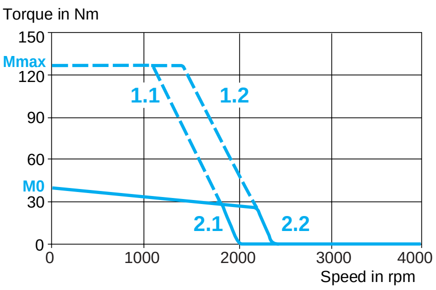
Characteristics of BSH 1404M/1404P servo motors

Type of servo motor				BSH 1404M	BSH 1404P
Associated with Lexium 05 servo drive				LXM 05●D57N4	
Line supply voltage			V	400/480 3-phase	
Switching frequency			kHz	4	
Torque	Continuous stall	M_0	Nm	33.4	
	Peak stall	M_{max}	Nm	126.45	60.04
Nominal operating point	Nominal torque		Nm	26.3	16.1
	Nominal speed		rpm	1500	3000
Maximum current			A rms	47.8	95.6
Servo motor characteristics					
Maximum mechanical speed			rpm	4000	
Constants (at 120°C)	Torque		Nm/A rms	3.12	1.57
	Back emf		V_{rms}/krpm	208	104
Rotor	Number of poles			10	
	Inertia Without brake	J_m	kgcm²	23.70	
	Inertia With brake	J_m	kgcm²	29.20	
Stator (at 20°C)	Resistance (phase/phase)		Ω	1.12	0.28
	Inductance (phase/phase)		mH	15.6	3.9
	Electrical time constant		ms	13.93	
Holding brake (depending on model)				See page 86	

Speed/torque curves

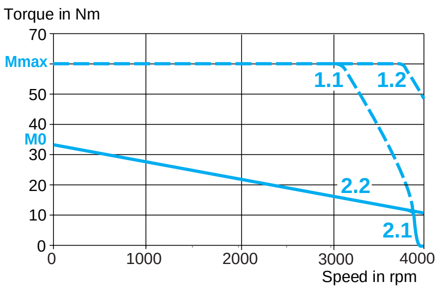
BSH 1404M servo motor

With LXM 05●D57N4 servo drive
400/480 V 3-phase



BSH 1404P servo motor

With LXM 05●D57N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85

Characteristics of BSH 2051M servo motors

Type of servo motor				**BSH 2051M**
Associated with Lexium 05 servo drive				**LXM 05●D57N4**
Line supply voltage			**V**	400/480 3-phase
Switching frequency			**kHz**	4
Torque	Continuous stall	M_0	**Nm**	36
	Peak stall	M_{max}	**Nm**	68.3
Nominal operating point	Nominal torque		**Nm**	33.5
	Nominal speed		**rpm**	1500
Maximum current			**A rms**	31.8

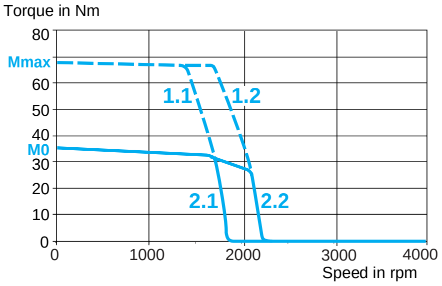
Servo motor characteristics

Maximum mechanical speed				**rpm**	3800
Constants (at 120°C)	Torque			**Nm/A rms**	3.16
	Back emf			**V_{rms}/krpm**	208
Rotor	Number of poles				10
	Inertia	Without brake	J_m	**kgcm²**	62
		With brake	J_m	**kgcm²**	78
Stator (at 20°C)	Resistance (phase/phase)			**Ω**	1.6
	Inductance (phase/phase)			**mH**	15.2
	Electrical time constant			**ms**	9.50
Holding brake (depending on model)					See page 86

Speed/torque curves

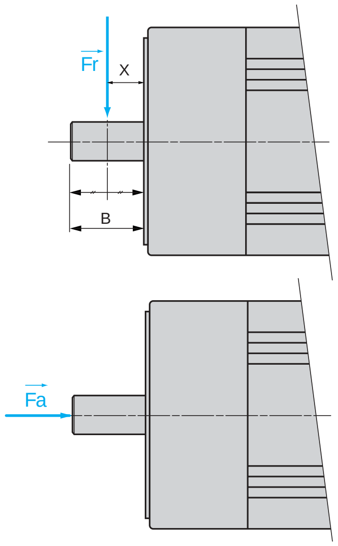
BSH 2051M servo motor

With LXM 05●D57N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V 3-phase
2.1 Continuous torque at 400 V 3-phase
1.2 Peak torque at 480 V 3-phase
2.2 Continuous torque at 480 V 3-phase

Presentation: page 54
References: pages 80 to 82
Dimensions: pages 83 to 85



Radial and axial forces permissible on the motor shaft

Even when the servo motors are used under optimum conditions, their lifetime is limited by that of the bearings.

Conditions	
Nominal lifetime of bearings *(1)*	L_{10h} = 20,000 hours
Ambient temperature (temperature of bearings ~ 100°C)	40°C
Force application point	Fr applied at the middle of the shaft end X = B/2 (dimension B see pages 83 to 85)

(1) Hours of use with 10% probability of failure

⚠ **The following conditions must be observed:**

- Radial and axial forces must not be applied simultaneously.
- Shaft end with IP 40 or IP 65 protection.
- The bearings cannot be changed by the user as the built-in position sensor has to be realigned if the unit is dismantled.

			Maximum radial force Fr							
Mechanical speed		**rpm**	**1000**	**2000**	**3000**	**4000**	**5000**	**6000**	**7000**	**8000**
Servo motor	BSH 0551	**N**	340	270	240	220	200	190	180	170
	BSH 0552	**N**	370	290	260	230	220	200	190	190
	BSH 0553	**N**	390	310	270	240	230	210	200	190
	BSH 0701	**N**	660	520	460	410	380	360	–	–
	BSH 0702	**N**	710	560	490	450	410	390	–	–
	BSH 0703	**N**	730	580	510	460	430	400	–	–
	BSH 1001	**N**	900	720	630	570	530	–	–	–
	BSH 1002	**N**	990	790	690	620	–	–	–	–
	BSH 1003	**N**	1050	830	730	660	–	–	–	–
	BSH 1004	**N**	1070	850	740	–	–	–	–	–
	BSH 1401	**N**	2210	1760	1530	–	–	–	–	–
	BSH 1402	**N**	2430	1930	1680	–	–	–	–	–
	BSH 1403	**N**	2560	2030	1780	–	–	–	–	–
	BSH 1404	**N**	2660	2110	1840	–	–	–	–	–
	BSH 2051	**N**	3730	2960	2580	–	–	–	–	–
			Maximum axial force: Fa = 0.2 x Fr							

Characteristics of servo motor-servo drive power connection cables

		VW3 M5 101R●●●	**VW3 M5 102R●●●**	**VW3 M5 103R●●●**
Outer cover, insulation		PUR (RAL 2003 orange), TPM or PP/PE		
Capacity	**pF/m**	< 70 (conductors/shielding)		
Number of conductors (shielded)		[(4 x 1.5 mm^2) + (2 x 1.0 mm^2)]	[(4 x 2.5 mm^2) + (2 x 1.0 mm^2)]	[(4 x 4 mm^2) + (2 x 1.0 mm^2)]
Connectors		1 industrial connector (motor side) and 1 end with flying leads (drive side)		
External diameter	**mm**	12 ± 0.2	14.3 ± 0.3	16.3 ± 0.3
Curvature radius	**mm**	90, suitable for daisy-chain, cable carrier chain	110, suitable for daisy-chain, cable carrier chain	125, suitable for daisy-chain, cable carrier chain
Operating voltage	**V**	600		
Maximum length	**m**	75 *(1)*		
Operating temperature	**°C**	- 40…+ 90 (fixed), - 20…+ 80 (mobile)		
Certifications		UL, CSA, VDE, CE, DESINA		

Characteristics of servo motor-servo drive encoder connection cables

		VW3 M8 101R●●●
Encoder type		**SinCos encoder**
Outer cover, insulation		PUR (RAL 6018 green), polyester
Number of conductors (shielded)		5 x (2 x 0.25 mm^2) + (2 x 0.5 mm^2)
External diameter	**mm**	8.8 ± 0.2
Connectors		1 industrial connector (motor side) and 1 x 12-way Molex connector (drive side)
Min. curvature radius	**mm**	68, suitable for daisy-chain, cable carrier chain
Operating voltage	**V**	350 (0.25 mm^2), 500 (0.5 mm^2)
Maximum length	**m**	75 *(1)*
Operating temperature	**°C**	- 50…+ 90 (fixed) - 40…+ 80 (mobile)
Certifications		UL, CSA, VDE, CE, DESINA

(1) For cables longer than 75 m, please consult your Regional Sales Office.

Presentation:
page 54

References:
page 82

Dimensions:
pages 83 to 85

Lexium 05 motion control

BSH servo motors

105222

BSH 070●● ●●●1A

105223

BSH 070●● ●●●2A

BSH servo motors

The BSH servo motors shown below are supplied without a gearbox.
For GBX gearboxes, see page 90.

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 05●	Maximum nominal speed *(1)*	Reference *(2)*	Weight *(3)*
Nm	Nm	rpm		rpm		kg
0.5	1.4	9000	D10F1	3000	**BSH 0551T ●●●●A**	0.800
			D10M2	6000		
			D10M3X	6000		
0.9	1.77	9000	D10F1	3000	**BSH 0552T ●●●●A**	1.100
			D10M2	6000		
			D10M3X	6000		
	2.3	9000	D10M2	1500	**BSH 0552M ●●●●A**	1.100
			D10M3X	1500		
	2.7	9000	D17F1	3000	**BSH 0552T ●●●●A**	1.100
			D10M2	4000	**BSH 0552P ●●●●A**	1.100
			D10M3X	4000		
			D14N4	6000		
1.3	3.18	9000	D10M2	4000	**BSH 0553P ●●●●A**	1.400
			D10M3X	4000		
	3.31	9000	D17F1	3000	**BSH 0553T ●●●●A**	1.400
			D17M2	6000		
			D17M3X	6000		
	3.87	9000	D14N4	6000	**BSH 0553T ●●●●A**	1.400
	4.2	9000	D10M2	1500	**BSH 0553M ●●●●A**	1.400
			D10M3X	1500		
1.4	2.41	8000	D10M3X	6000	**BSH 0701T ●●●●A**	2.100
	2.42	8000	D10F1	2500		
	3.19	8000	D17M3X	5000		
			D17M2	5000		
	3.2	8000	D10M3X	1500	**BSH 0701M ●●●●A**	2.100
			D10M2	3000	**BSH 0701P ●●●●A**	2.100
			D10M3X	4500		
2.1	6.8	8000	D10M2	1500	**BSH 0702M ●●●●A**	2.800
			D10M3X	1500		
2.12	4.14	8000	D17F1	2500	**BSH 0702T ●●●●A**	2.800
			D17M2	6000		
	6.8	8000	D28M2	4500		
			D42M3X	4500		
2.2	5.37	8000	D10M2	3000	**BSH 0702P ●●●●A**	2.800
			D10M3X	3000		
	7.55	8000	D14N4	6000		
			D17M2	3000		
			D17M3X	3000		
2.8	7.38	8000	D28F1	2500	**BSH 0703T ●●●●A**	3.600
			D28M2	6000		
	10	8000	D10M2	1500	**BSH 0703M ●●●●A**	3.600
			D10M3X	1500		
	10.25	8000	D42M3X	6000	**BSH 0703T ●●●●A**	3.600
	10.3		D14N4	3000	**BSH 0703M ●●●●A**	3.600
3.1	7.28	8000	D17M2	3000	**BSH 0703P ●●●●A**	3.600
			D17M3X	3000		
	8.92	8000	D22N4	6000		
	10.3	8000	D28M2	3000		

(1) Derating possible according to the supply voltage, see characteristics on pages 56 to 78.
(2) To complete each reference, see the table opposite.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 86.

Presentation:
pages 54 and 55
Characteristics:
pages 56 to 78
Dimensions:
pages 83 to 85

BSH servo motors (continued)

105224

BSH 100●● ●●●1A

105230

BSH 140●● ●●●1A

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 05●	Maximum nominal speed (1)	Reference (2)	Weight (3)
Nm	Nm	rpm		rpm		kg
3.3	9.45	6000	D17M3X	2000	**BSH 1001P ●●●●A**	4.300
			D22N4	4000		
3.4	8.5	6000	D14N4	2000	**BSH 1001M ●●●●A**	4.300
			D28F1	2500	**BSH 1001T ●●●●A**	4.300
			D28M2	4000		
			D42M3X	4000		
5.5	16	6000	D14N4	2000	**BSH 1002M ●●●●A**	5.800
5.52	16	6000	D42M3X	4000	**BSH 1002T ●●●●A**	5.800
5.8	12.35	6000	D17M3X	2000	**BSH 1002P ●●●●A**	5.800
	15.43	6000	D22N4	4000		
	18.23	6000	D28M2	2000		
7.8	27.8	6000	D22N4	2000	**BSH 1003M ●●●●A**	7.500
8	22.79	6000	D28M2	2000	**BSH 1003P ●●●●A**	7.500
	26.97	6000	D34N4	4000		
	28.31	6000	D42M3X	2000		
10	22.53	6000	D34N4	3000	**BSH 1004P ●●●●A**	9.200
	30.41	6000	D42M3X	1500		
			D57N4	3000		
11.1	24.77	4000	D42M3X	2500	**BSH 1401T ●●●●A**	11.900
	26.2	4000	D34N4	2500	**BSH 1401P ●●●●A**	11.900
14.73	25.04	4000	D42M3X	2000	**BSH 1402T ●●●●A**	16.600
19.5	46.72	4000	D42M3X	1500	**BSH 1402P ●●●●A**	16.600
	57.1	4000	D34N4	1250	**BSH 1402M ●●●●A**	16.600
	57.42	4000	D57N4	3000	**BSH 1402P ●●●●A**	16.600
27.8	57.24	4000	D57N4	3000	**BSH 1403P ●●●●A**	21.300
	76.66	4000	D34N4	1250	**BSH 1403M ●●●●A**	21.300
	88.17	4000	D57N4	1500		
33.4	60.04	4000	D57N4	3000	**BSH 1404P ●●●●A**	26.000
	126.45	4000	D57N4	1500	**BSH 1404M ●●●●A**	26.000
36	68.3	3800	D57N4	1500	**BSH 2051M ●●●●A**	33.000

(1) Derating possible according to the supply voltage, see characteristics on pages 56 to 78.
(2) To complete each reference, see the table below.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 86.

To order a BSH motor, complete each reference as appropriate:

		BSH 0701P	●	●	●	●	A
Shaft end	IP 40	Smooth	**0**				
		Keyed	**1**				
	IP 65	Smooth	**2**				
		Keyed	**3**				
Integrated sensor	Single turn, SinCos Hiperface® 4096 points/turn			**1**			
	Multiturn, SinCos Hiperface® (no. of turns: 4096)			**2**			
Holding brake	Without				**A**		
	With				**F**		
Connection	Straight connectors					**1**	
	Rotatable right-angled connectors					**2**	
Flange	International standard						**A**

Presentation:
pages 54 and 55
Characteristics:
pages 56 to 78
Dimensions:
pages 83 to 85

Connection cables


VW3 M5 101/102/103 R●●●

Cables equipped with one connector (servo motor side)

Description	From servo motor	To LXM 05● servo drive	Composition	Length m	Reference	Weight kg
Power cables	BSH 055●● BSH 070●● BSH 100●● BSH 1401P BSH 1402M BSH 1402P BSH 1403M BSH 1404M	All types	[(4 x 1.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 101 R30**	0.810
				5	**VW3 M5 101 R50**	1.210
				10	**VW3 M5 101 R100**	2.290
				15	**VW3 M5 101 R150**	3.400
				20	**VW3 M5 101 R200**	4.510
				25	**VW3 M5 101 R250**	6.200
				50	**VW3 M5 101 R500**	12.325
				75	**VW3 M5 101 R750**	18.450
	BSH 1401T BSH 1402T BSH 1403P BSH 1404P	D42M3X D57N4	[(4 x 2.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 102 R30**	1.070
				5	**VW3 M5 102 R50**	1.670
				10	**VW3 M5 102 R100**	3.210
				15	**VW3 M5 102 R150**	4.760
				20	**VW3 M5 102 R200**	6.300
				25	**VW3 M5 102 R250**	7.945
				50	**VW3 M5 102 R500**	16.170
				75	**VW3 M5 102 R750**	24.095
	BSH 2051M	D57N4	[(4 x 4 mm²) + (2 x 1 mm²)]	3	**VW3 M5 103 R30**	1.330
				5	**VW3 M5 103 R50**	2.130
				10	**VW3 M5 103 R100**	4.130
				15	**VW3 M5 103 R150**	6.120
				20	**VW3 M5 103 R200**	8.090
				25	**VW3 M5 103 R250**	11.625
				50	**VW3 M5 103 R500**	23.175
				75	**VW3 M5 103 R750**	34.725


VW3 M8 101 R●●●

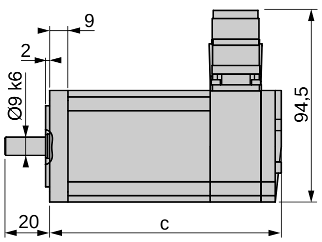
Cables equipped with two connectors

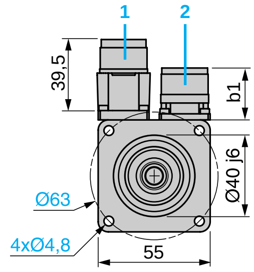
Description	From servo motor	To LXM 05● servo drive	Composition	Length m	Reference	Weight kg
SinCos Hiperface® encoder cables	BSH, all types	All types	5 x (2 x 0.25 mm²) + (2 x 0.5 mm²)	3	**VW3 M8 101 R30**	0.800
				5	**VW3 M8 101 R50**	1.200
				10	**VW3 M8 101 R100**	2.250
				15	**VW3 M8 101 R150**	3.450
				20	**VW3 M8 101 R200**	4.350
				25	**VW3 M8 101 R250**	4.950
				50	**VW3 M8 101 R500**	13.300
				75	**VW3 M8 101 R750**	17.650

Presentation:
pages 54 and 55

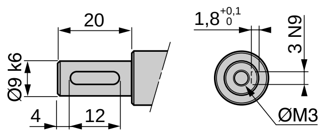
Characteristics:
pages 79

BSH 055 (Example with straight connectors: servo motor/brake power supply 1 and encoder 2)



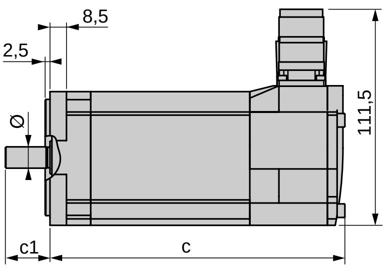


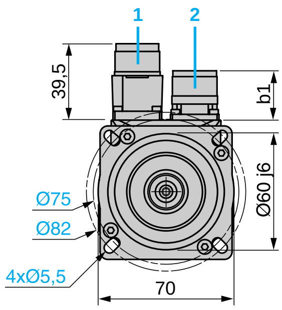
Shaft end, keyed slot (optional)



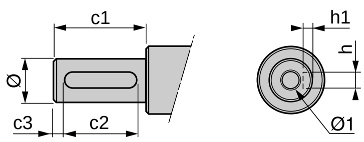
	Straight connectors	Rotatable angled connectors		
	b1	**b1**	**c** (without brake)	**c** (with brake)
BSH 0551	25.5	39.5	132.5	159
BSH 0552	25.5	39.5	154.5	181
BSH 0553	25.5	39.5	176.5	203

BSH 070 (Example with straight connectors: servo motor/brake power supply 1 and encoder 2)





Shaft end, keyed slot (optional)



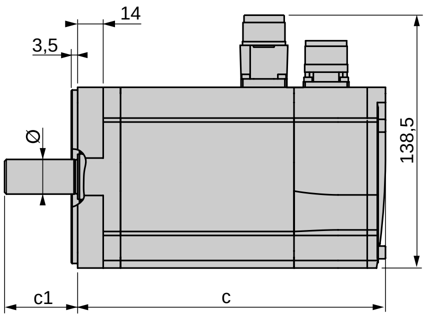
	Straight connectors	Rotatable angled connectors									
	b1	**b1**	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**c3**	**h**	**h1**	**Ø**	**Ø1**
BSH 0701	25.5	39.5	154	180	23	18	2.5	4 N9	$2.5^{+0.1}_{0}$	11 k6	M4
BSH 0702	25.5	39.5	187	213	23	18	2.5	4 N9	$2.5^{+0.1}_{0}$	11 k6	M4
BSH 0703	25.5	39.5	220	256	30	20	5	5 N9	$3^{+0.1}_{0}$	14 k6	M5

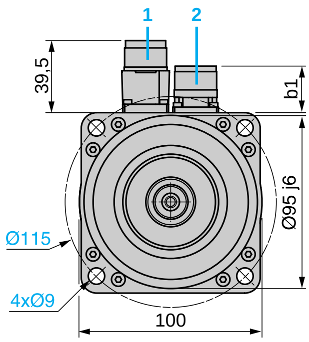
Presentation:
pages 54 and 55

Characteristics:
pages 56 to 79

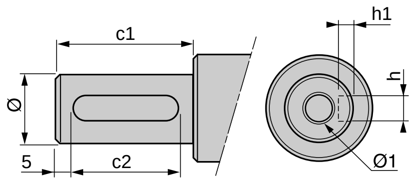
References:
pages 80 to 82

BSH 100 (Example with straight connectors: servo motor/brake power supply 1 and encoder 2)



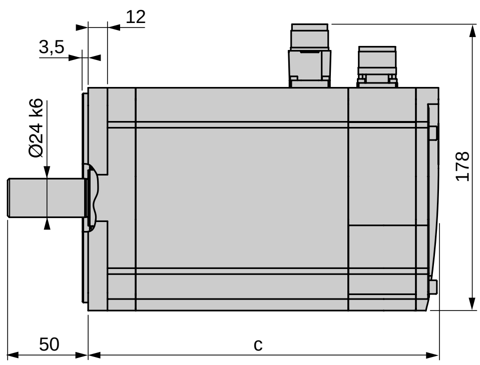


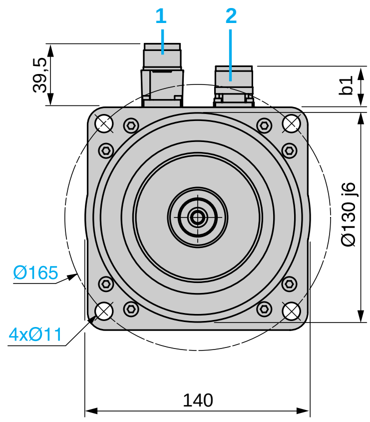
Shaft end, keyed slot (optional)



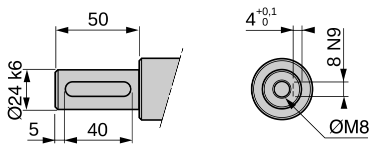
	Straight connectors	Rotatable angled connectors								
	b1	**b1**	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**h**	**h1**	**Ø**	**Ø1**
BSH 1001	25.5	39.5	169	200	40	30	6 N9	$3.5^{+0.1}_{0}$	19 k6	M6
BSH 1002	25.5	39.5	205	236	40	30	6 N9	$3.5^{+0.1}_{0}$	19 k6	M6
BSH 1003	25.5	39.5	241	272	40	30	6 N9	$3.5^{+0.1}_{0}$	19 k6	M6
BSH 1004	25.5	39.5	277	308	50	40	8 N9	$4^{+0.1}_{0}$	24 k6	M8

BSH 140 (Example with straight connectors: servo motor/brake power supply 1 and encoder 2)





Shaft end, keyed slot (optional)



	Straight connectors	Rotatable angled connectors		
	b1	**b1**	**c** (without brake)	**c** (with brake)
BSH 1401	25.5	39.5	218	256
BSH 1402	25.5	39.5	273	311
BSH 1403	25.5	39.5	328	366
BSH 1404	25.5	39.5	383	421

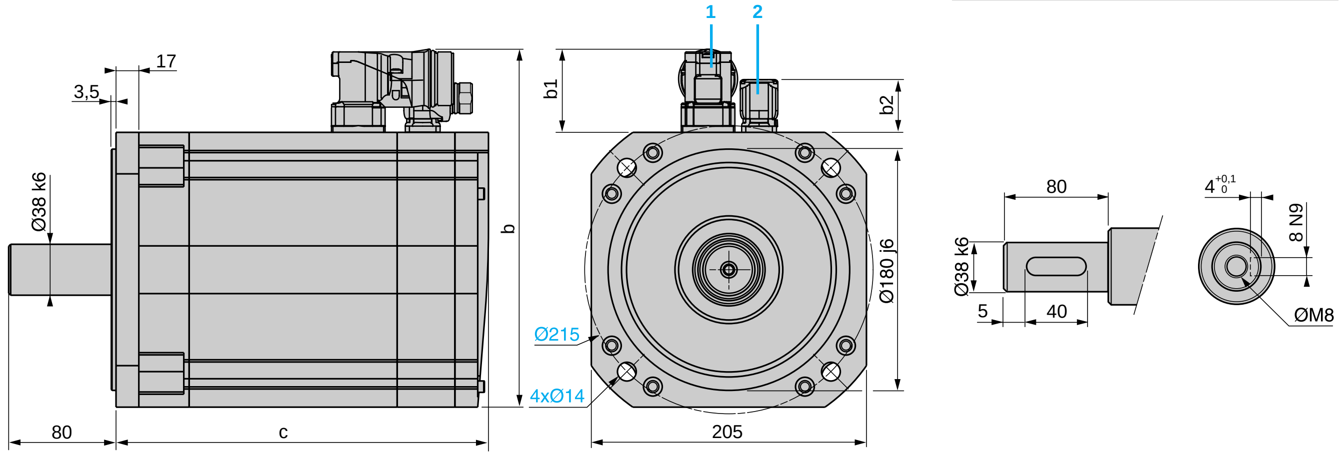
Presentation:
pages 54 and 55

Characteristics:
pages 56 to 79

References:
pages 80 to 82

BSH 2051 (Example with rotatable angled connectors: servo motor/brake power supply 1 and encoder 2)

Shaft end, keyed slot (optional)



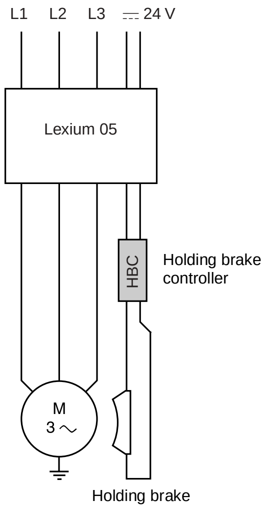
	Straight connectors			Rotatable angled connectors				
	b	**b1**	**b2**	**b**	**b1**	**b2**	**c** (without brake)	**c** (with brake)
BSH 2051	259	54	25.5	267	70	39.5	321	370.5

Lexium 05 motion control

BSH servo motors
Option: holding brake integrated in servo motor

Holding brake

Presentation



The holding brake integrated in the BSH servo motor is an electromagnetic pressure spring brake that blocks the servo motor axis once the motor current has been switched off. In the event of an emergency, such as a power outage or an emergency stop, the drive is immobilized, thus significantly increasing safety. Blocking the servo motor axis is also necessary in cases of torque overload, such as in the case of vertical axis movement.

The holding brake is activated using an external device, the holding brake controller *(HBC)* **VW3 M3 103** (see page 29).

This device also ensures electrical isolation.

Characteristics

Type of servo motor	BSH	0551 0552 0553	0701 0702	0703	1001 1002 1003	1004	1401 1402	1403 1404	2051
Holding torque M_{Br}	**Nm**	0.8	2.0	3.0	9.0	12.0	23	36	80
Rotor moment of inertia (brake only) J_{Br}	**kgcm²**	0.0213	0.072	0.23	0.613	1.025	1.15	5.5	16
Electrical clamping power P_{Br}	**W**	10	11	12	18		24	26	40
Supply voltage	**V**	24 + 6/- 10%							
Opening time	**ms**	12	25	35	40	45	50	100	200
Closing time	**ms**	6	8	15	18	20	25	30	50
Weight (brake only)	**kg**	0.080	0.450	0.320	0.450	0.690	1.100	1.790	3.600

References

BSH servo motor

For selection of BSH servo motor with **F** or without **A** holding brake, see references on page 81.

Dimensions:
pages 33, 83 to 85

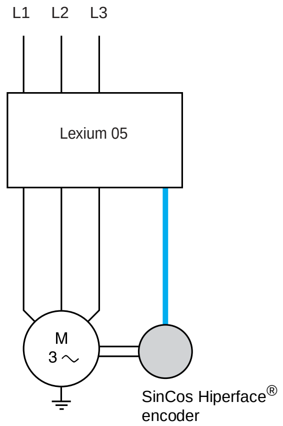
Schemes:
page 41

Lexium 05 motion control

BSH servo motors
Option: encoder integrated in the servo motor

Encoder integrated in the BSH servo motor

Presentation



The standard measurement device is the SinCos Hiperface® single turn or multiturn encoder integrated in BSH servo motors. This measurement device is perfectly suited to the Lexium 05 range of servo drives.

Use of this interface enables:
- Automatic identification of the BSH servo motor data by the servo drive
- Automatic initialization of the servo drive's control loops, thus simplifying installation of the motion control device

Characteristics

Type of encoder		Single turn SinCos	Multiturn SinCos
Sinus periods per turn		128	128
Number of points		4096	4096 x 4096 turns
Encoder precision		± 1.3 arc minutes	
Measurement method		Optical, high resolution	
Interface		Hiperface®	
Operating temperature	**°C**	- 5…+ 110	

References

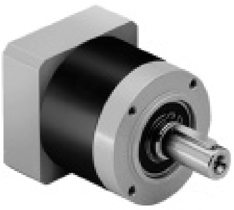
BSH servo motor

For selection of the SinCos Hiperface® single turn **1** or multiturn **2** encoder integrated in BSH servo motor, see references on page 81.

Dimensions:
pages 83 to 85

Lexium 05 motion control
BSH servo motors
Option: GBX planetary gearboxes

Presentation



GBX planetary gearbox

In many cases, motion control requires the use of a planetary gearbox to adapt the speeds and torques, while continuing to provide the precision required by the application.

Schneider Electric has chosen to use GBX gearboxes (made by Neugart) with the BSH range of servo motors. These gearboxes are lubricated for life, and are designed for applications that do not require very low backlash. The fact that their use in combination with BSH servo motors has been fully verified and that they are easily assembled, ensures simple, risk-free operation.

The planetary gearboxes are available in 5 sizes (GBX 40...GBX 160) and with 12 reduction ratios (3:1...40:1) (see the table below).

The continuous and peak stall torques available at the gearbox output are obtained by multiplying the characteristic values of the servo motor by the reduction ratio and efficiency of the gearbox (0.96 or 0.94 depending on the reduction ratio).

The following table gives the most appropriate servo motor/gearbox combinations. For other combinations, please see the servo motor data sheets.

BSH servo motor/GBX gearbox combinations

Type of servo motor	Reduction ratio											
	3:1	4:1	5:1	8:1	9:1	12:1	15:1	16:1	20:1	25:1	32:1	40:1
BSH 0551	GBX 40	GBX 40	GBX 40	GBX 60	GBX 40	GBX 40	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60	GBX 60 *
BSH 0552	GBX 60	GBX 60	GBX 60	GBX 60	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60	GBX 60 *	GBX 60 *	GBX 60 *
BSH 0553	GBX 60	GBX 60	GBX 60	GBX 60 *	GBX 40	GBX 60	GBX 60	GBX 60	GBX 60	GBX 60 *	GBX 60 *	GBX 60 *
BSH 0701	GBX 60	GBX 60	GBX 80	GBX 80	GBX 60	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120
BSH 0702	GBX 80	GBX 80	GBX 80	GBX 80	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120
BSH 0703	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BSH 1001	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 160
BSH 1002	GBX 80	GBX 80	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BSH 1003	GBX 80	GBX 120	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BSH 1004	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160 *	GBX 160 *	GBX 160 *
BSH 1401	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160 *	GBX 160 *	GBX 160 *
BSH 1402	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160 *	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160 *	GBX 160 *	GBX 160 *
BSH 1403	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160 *	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160 *	GBX 160 *	GBX 160 *
BSH 1404	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160 *	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160 *	GBX 160 *	GBX 160 *
BSH 2051	GBX 160 *	GBX 160 *	GBX 160 *	GBX 160 *	–	–	–	–	–	–	–	–

GBX 60 * — *For combinations in italics and with an asterisk, you must check that the application will not result in the continuous output torque of the gearbox being exceeded (see values on page 89).*

Characteristics:
page 89
References:
page 90
Dimensions:
page 91

Lexium 05 motion control

BSH servo motors

Option: GBX planetary gearboxes

Characteristics of GBX gearboxes

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Type of gearbox			Planetary gearbox with single reduction stage and straight teeth				
Backlash in reverse direction	**3:1...8:1**	**min arc**	< 30	< 20	< 12	< 8	< 6
	9:1...40:1		< 35	< 25	< 17	< 12	< 10
Torsional rigidity	**3:1...8:1**	**Nm/min arc**	1.0	2.3	6	12	38
	9:1...40:1		1.1	2.5	6.5	13	41
Sound level		**dB (A)**	55	58	60	65	70
Casing			Black anodised aluminium				
Shaft material			C 45				
Shaft output dust and damp protection			IP 54				
Lubrication			Lubricated for life				
Average service life *(1)*		**h**	30,000				
Mounting position			Any position				
Operating temperature		**°C**	- 25...+ 90				

Characteristics of BSH servo motor/GBX gearbox combinations

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Efficiency	**3:1...8:1**		0.96				
	9:1...40:1		0.94				
Maximum permitted radial force *(1) (2)*	L_{10h} = 10,000 hours	**N**	200	500	950	2000	6000
	L_{10h} = 30,000 hours		160	340	650	1500	4200
Maximum permitted axial force *(1)*	L_{10h} = 10,000 hours	**N**	200	600	1200	2800	8000
	L_{10h} = 30,000 hours		160	450	900	2100	6000
Gearbox moment of inertia	**3:1**	**kgcm²**	0.031	0.135	0.77	2.63	12.14
	4:1	**kgcm²**	0.022	0.093	0.52	1.79	7.78
	5:1	**kgcm²**	0.019	0.078	0.45	1.53	6.07
	8:1	**kgcm²**	0.017	0.065	0.39	1.32	4.63
	9:1	**kgcm²**	0.030	0.131	0.74	2.62	–
	12:1	**kgcm²**	0.029	0.127	0.72	2.56	12.37
	15:1	**kgcm²**	0.023	0.077	0.71	2.53	12.35
	16:1	**kgcm²**	0.022	0.088	0.50	1.75	7.47
	20:1	**kgcm²**	0.019	0.075	0.44	1.50	6.64
	25:1	**kgcm²**	0.019	0.075	0.44	1.49	5.81
	32:1	**kgcm²**	0.017	0.064	0.39	1.30	6.36
	40:1	**kgcm²**	0.016	0.064	0.39	1.30	5.28
Continuous output torque M_{2N} *(1)*	**3:1**	**Nm**	4.5	12	40	80	400
	4:1	**Nm**	6	16	50	100	450
	5:1	**Nm**	6	16	50	110	450
	8:1	**Nm**	5	15	50	120	450
	9:1	**Nm**	16.5	44	130	210	–
	12:1	**Nm**	20	44	120	260	800
	15:1	**Nm**	18	44	110	230	700
	16:1	**Nm**	20	44	120	260	800
	20:1	**Nm**	20	44	120	260	800
	25:1	**Nm**	18	40	110	230	700
	32:1	**Nm**	20	44	120	260	800
	40:1	**Nm**	18	40	110	230	700

(1) Values given at an output shaft speed of 100 rpm, cyclic ratio = 1 (S1 mode) for electrical machines with an ambient temperature of 30°C.
(2) Force applied midway along the output shaft.

Lexium 05 motion control

BSH servo motors
Option: GBX planetary gearboxes

References

GBX ●●●

Size	Reduction ratio	Reference *(1)*	Weight kg
GBX 40	3:1, 4:1, 5:1 and 8:1	**GBX 040 ●●● ●●● ●F**	0.350
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 040 ●●● ●●● ●F**	0.450
GBX 60	3:1, 4:1, 5:1 and 8:1	**GBX 060 ●●● ●●● ●F**	0.900
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 060 ●●● ●●● ●F**	1.100
GBX 80	3:1, 4:1, 5:1 and 8:1	**GBX 080 ●●● ●●● ●F**	2.100
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 080 ●●● ●●● ●F**	2.600
GBX 120	3:1, 4:1, 5:1 and 8:1	**GBX 120 ●●● ●●● ●F**	6.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 120 ●●● ●●● ●F**	8.000
GBX 160	3:1, 4:1, 5:1 and 8:1	**GBX 160 ●●● ●●● ●F**	18.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 160 ●●● ●●● ●F**	22.000

To order a GBX planetary gearbox, add the following to each of the above references:

			GBX	●●●	●●●	●●●	●	F
Size	Diameter of the casing (see table of combinations with BSH servo motor, page 88)	40 mm		**040**				
		60 mm		**060**				
		80 mm		**080**				
		120 mm		**120**				
		160 mm		**160**				
Reduction ratio		3:1			**003**			
		4:1			**004**			
		5:1			**005**			
		8:1			**008**			
		9:1			**009**			
		12:1			**012**			
		15:1			**015**			
		16:1			**016**			
		20:1			**020**			
		25:1			**025**			
		32:1			**032**			
		40:1			**040**			
Associated BSH servo motor	Type	BSH 055				**055**		
		BSH 070				**070**		
		BSH 100				**100**		
		BSH 140				**140**		
		BSH 205				**205**		
	Model	BSH ●●●1					**1**	
		BSH ●●●2					**2**	
		BSH ●●●3					**3**	
		BSH ●●●4					**4**	
BSH servo motor adaptation								**F**

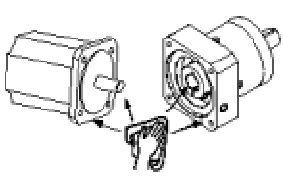
Mounting

No special tool is required for mounting the GBX planetary gearbox on the BSH servo motor. The usual rules for mechanical mounting must be followed:

1. Clean the bearing surfaces and seals.
2. Align the shafts that are to be coupled, and assemble in vertical position.
3. Uniform adhesive force of the servo motor flange on the gearbox flange, with tightening of the Phillips screws.
4. Correct tightening torque of the TA ring using a torque wrench (2...40 Nm depending on the gearbox model).

For more information, please consult the instruction sheets supplied with the products.

1



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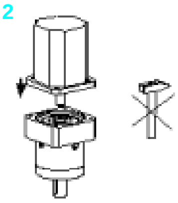

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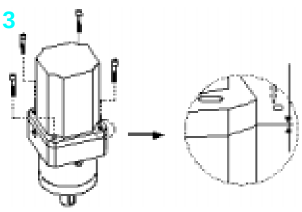
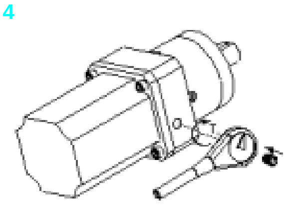


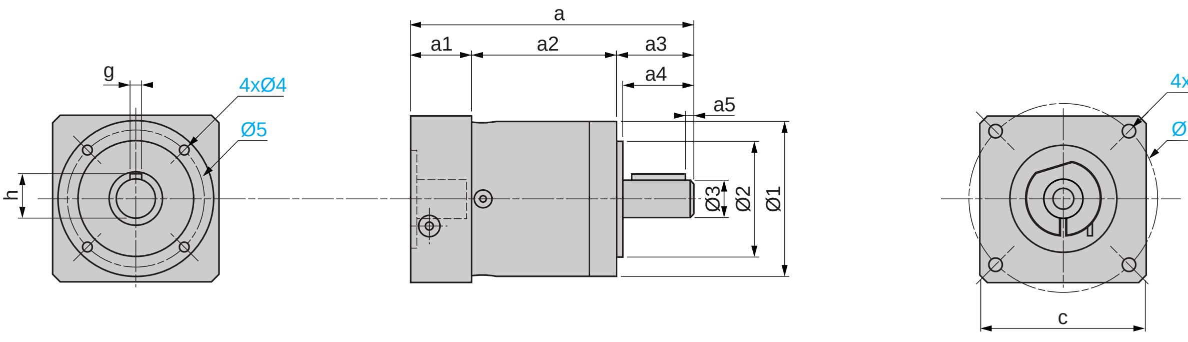
4



Lexium 05 motion control
BSH servo motors
Option: GBX planetary gearboxes

Dimensions

Assembly on servo motor side

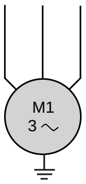


GBX	c	a	a1	a2	a3	a4	a5	h	g	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7
040 003...008	40	93.5	28.5	39	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
040 009...016	40	106.5	28.5	52	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
060 003...008	60	106.5	24.5	47	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
060 009...040	60	118.5	24.5	59	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
080 003...008	90	134	33.5	60.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
080 009...032	90	151	33.5	77.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
120 003...008	115	176.5	47.5	74	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
120 009...040	115	203.5	47.5	101	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
160 003...008	140	255.5	64.5	104	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165
160 009...040	140	305	64.5	153.5	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165

Presentation:
page 88

Characteristics:
page 89

References:
page 90

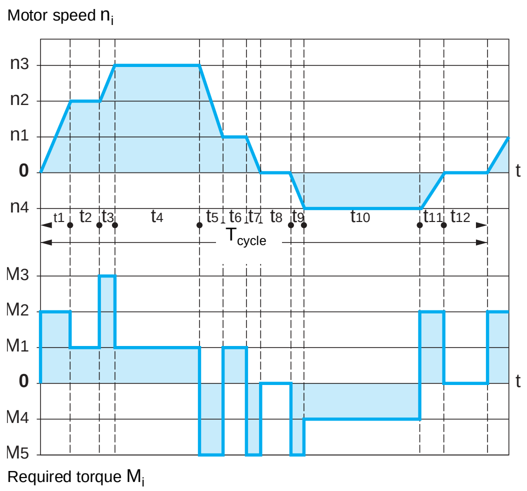


Sizing the servo motor

The "**Lexium Sizer**" sizing tool is available on the www.telemecanique.com website to help you size your servo motor.

These 2 pages are provided to help you understand the calculation method used.

To be able to size the servo motor you need to know the equivalent thermal torque and the average speed required by the mechanism to be used with the servo motor. Both values are calculated using the motor cycle timing diagram and should be compared with the torque/speed curves given for each servo motor (see BSH servo motor curves, on pages 56 to 78).



Motor cycle timing diagram

The motor cycle is made up of several sub-cycles, the duration of which is known. Each sub-cycle is divided into phases which correspond to the periods of time during which the motor torque is constant (1 to 3 phases maximum per sub-cycle).
This division into phases can be used to calculate the following for each phase:
- Duration (tj)
- Speed (n_i)
- Required torque value (M_i)

The curves on the left show the four types of phase:
- Constant acceleration during times t_1, t_3 and t_9
- At work during times t_2, t_4, t_6 and t_{10}
- Constant deceleration during times t_5, t_7 and t_{11}
- Motor stopped during times t_8 and t_{12}

The total duration of the cycle is:
$T_{cycle} = t_1 + t_2 + t_3 + t_4 + t_5 + t_6 + t_7 + t_8 + t_9 + t_{10} + t_{11} + t_{12}$

Calculating the average speed n_{avg}

The average speed is calculated using the formula: $n_{avg} = \dfrac{\sum |ni| \cdot t_j}{\sum t_j}$

- n_i corresponds to the different work speeds
- $\frac{ni}{2}$ corresponds to the average speeds during the acceleration phases constant and constant deceleration

In the above example:

Duration tj	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}	t_{12}
Speed $\lvert ni \rvert$	$\frac{\lvert n2 \rvert}{2}$	$\lvert n2 \rvert$	$\frac{\lvert n3 \rvert + \lvert n2 \rvert}{2}$	$\lvert n3 \rvert$	$\frac{\lvert n3 \rvert + \lvert n1 \rvert}{2}$	$\lvert n1 \rvert$	$\frac{\lvert n1 \rvert}{2}$	0	$\frac{\lvert n4 \rvert}{2}$	$\lvert n4 \rvert$	$\frac{\lvert n4 \rvert}{2}$	0

The average speed is calculated as follows:

$$n_{avg} = \frac{\frac{n2}{2} \cdot t1 + n2 \cdot t2 + \frac{n3 + n2}{2} \cdot t3 + n3 \cdot t4 + \frac{n3 + n1}{2} \cdot t5 + n1 \cdot t6 + \frac{n1}{2} \cdot t7 + \frac{n4}{2} \cdot t9 + n4 \cdot t10 + \frac{n4}{2} \cdot t11}{Tcycle}$$

Calculating the equivalent thermal torque M_{eq}

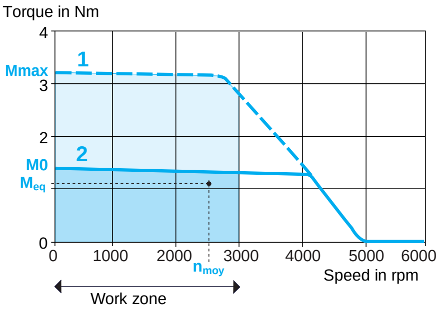
The equivalent thermal torque is calculated using the formula:

$$M_{eq} = \sqrt{\frac{\sum Mi^2 \cdot t_j}{Tcycle}}$$

In the above example, this formula gives the following calculation:

$$M_{eq} = \sqrt{\frac{M2^2 \cdot t1 + M1^2 \cdot t2 + M3^2 \cdot t3 + M1^2 \cdot t4 + M5^2 \cdot t5 + M1^2 \cdot t6 + M5^2 \cdot t7 + M5^2 \cdot t9 + M4^2 \cdot t10 + M2^2 \cdot t11}{Tcycle}}$$

Lexium 05 motion control
BSH servo motors



Sizing the servo motor (continued)

Determining the size of the servo motor

The point defined by the two preceding calculations (average speed and equivalent thermal torque) where the:

- horizontal axis represents the average speed n_{avg}
- vertical axis represents the thermal torque M_{eq}

must be within the area bounded by curve 2 and the work zone.

The motor cycle timing diagram should also be used to ensure that all torques M_i required for the different speeds n_i during the various cycle phases are within the area bounded by curve 1 and the work zone.

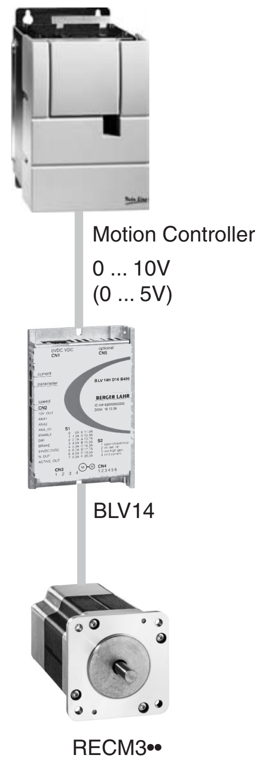
1 Peak torque
2 Continuous torque

BERGER LAHR

Catalogue

Brushless DC Drives

a company of Schneider Electric



Product overview

Berger Lahr offers a complete range of products and services for a wide variety of automation tasks. Motion controllers, motors and associated drives as well as linear axes and linear robots are available. Including consulting, support and service — worldwide.

Berger Lahr brushless DC drive systems are an economical solution for many movement tasks. With compact and powerful motors and matching drives they offer a wide range of options in device technology and industrial automation.

Special features

Compactness
Brushless DC drive systems are noted for their very high efficiency. High output power and torque is available in small sizes. The advantage of the compact design is also applicable for the drives.

Flexibility
The motors are available in two sizes:

- RECM 34• with flange dimension 42 mm, in two lengths with nominal power from 56 to 95 W and nominal torque from 0.13 to 0.22 Nm.
- RECM 37• with flange dimension 66 mm, in four lengths with nominal power from 120 to 370 W and nominal torque from 0.24 to 0.8 Nm.

The brushless DC motors are fitted with Hall sensors as standard. For more accurate position detection the RECM37• motors can be fitted with resolvers or encoders. Motors are also available with planetary or spur wheel gear and holding brake.

The speed defaults are set on the BLV drives by a voltage signal (0…5 V or 0…10 V) or a rotary switch. Controlled or regulated operation is possible.

Economy
The use of Hall sensors for commutation of the motor and the economical drive system electronics offers an economical drive system for speed control.

Application possibilities

The brushless DC motor technology is noted for its very long service life and functional safety. It is used for areas where the performance of a brush system is not adequate for the application.

The ease of adjustment of the speed of rotation with the brushless DC drive systems offers new application possibilities that were formerly not available with fixed rotation frequencies.

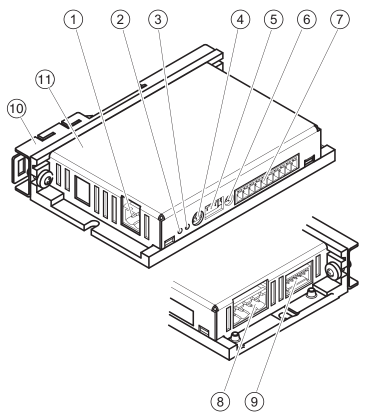
Product Description

The BLV is a universal drive for controlling brushless DC motors. Reference values are analogue settings by an internal potentiometer or an external voltage, for example from a higher level PLC. Two operating modes are available: closed-loop speed control and open-loop speed control with integrated default torque.
In combination with the brushless DC motors of the RECM 34• and RECM 37• series they form an economical and powerful drive system.

Special features

- Speed default via potentiometer or analogue signal
- Open loop or closed loop operation
- Acceleration ramp adjustable with rotary switch
- Brake output for actuating a holding brake controller
- Speed output for feedback of speed of rotation to master controller

Device overview



(1) Supply voltage connection CN1
(2) LED1 (green)
(3) LED2 (red)
(4) Rotary switch for adjustment of the motor current S1
(5) Parameter switch S2
(6) Internal potentiometer S3
(7) CN2 signal connection (10-pin female connector)
  - Analogue inputs
  - Digital inputs
  - Outputs
(8) Connection of motor CN3
(9) Connection of Hall signals CN4
(10) Top-hat rail adapter (optional)
(11) Nameplate with simplified manual

Signal interface

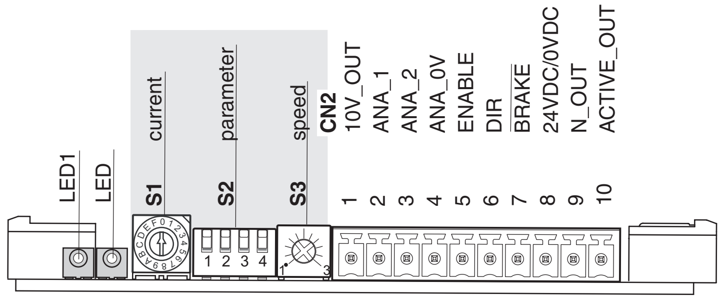
The reference value must be set as an analogue signal over the signal interface. Digital control signals are also connected for release of the power amplifier, the direction of rotation and for the short-circuit brakes.
One output supplies the voltage for the external potentiometer. One output signal reports the operating readiness, another output sends a pulse signal proportionate to the speed of rotation.

Functions

Parameter setting

The following functions can be set with the parameter switches of the BLV brushless DC drive:

- Motor phase current
- Closed-loop / open-loop operation
- Internal / external speed default
- Control parameters and speed range
- Speed of rotation or acceleration ramp



Parameter switches

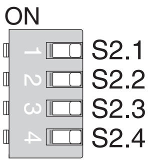
All parameter settings are queried when switching from `DISABLE` to `ENABLE`.

Setting motor phase current

The motor phase current is set with parameter switch S1. The continuous current is limited to half the peak current to protect the motor. The correct setting can be selected depending on the operating mode and the application. The following values can be set via parameter switch S1:

Switch setting S1	Motor phase current in A
0 (factory setting)	0.1
1	1.3
2	2.7
3	4.0
4	5.3
5	6.7
6	8.0
7	9.3
8	11.0
9	12.3
A	13.7
B	15.0
C	16.3
D	17.7
E	19.0
F	20.3

The maximum motor phase current (and thus the torque) is set via the analogue input `ANA_2` or the 16-step switch S1. The value of `ANA_2` or S1 that is higher is used. This means that the unused setting options must always be set to the lowest value.



Setting operating mode and default source

S2.1 speed control (closed loop) and speed control (open loop)

In the case of the speed control (closed loop) the speed of rotation depends on the setting of S2.2 either corresponding to the default of the analogue input or the internal potentiometer. The distances of the commutation signals are measured and compensated in accordance with the default.
In the case of the speed control (open loop) the motor behaves like a conventional DC motor. This means that the speed of rotation decreases as the load increases.

Switch setting S2.1	Description
OFF (factory setting)	Speed control (closed Loop)
ON	Speed control (open loop)

S2.2 setting default source

The default for the open-loop speed control and closed-loop speed control can be set via an external analogue signal `ANA_1` or the internal potentiometer.
When the default is via the internal potentiometer a fixed acceleration ramp is set.
When the default is via the `ANA_1` input the acceleration ramp can be adjusted from very slow to highly dynamic via the potentiometer S3.

Switch setting S2.2	Description
OFF (factory setting)	Speed default by analogue signal `ANA_1`
ON	Speed default by potentiometer S3

S2.3 setting speed control depending on the external load

With speed control (closed loop) the control can be set via the parameter switch S2.3 depending on the external load.

Switch setting S2.3	Description
OFF (factory setting)	Speed control with moment of inertia of load ≤ rotor inertia
ON	Speed control with moment of inertia of load > rotor inertia

S2.4 setting speed range with speed control

With speed control (closed loop) the speed range can be set via the parameter switch S2.4.

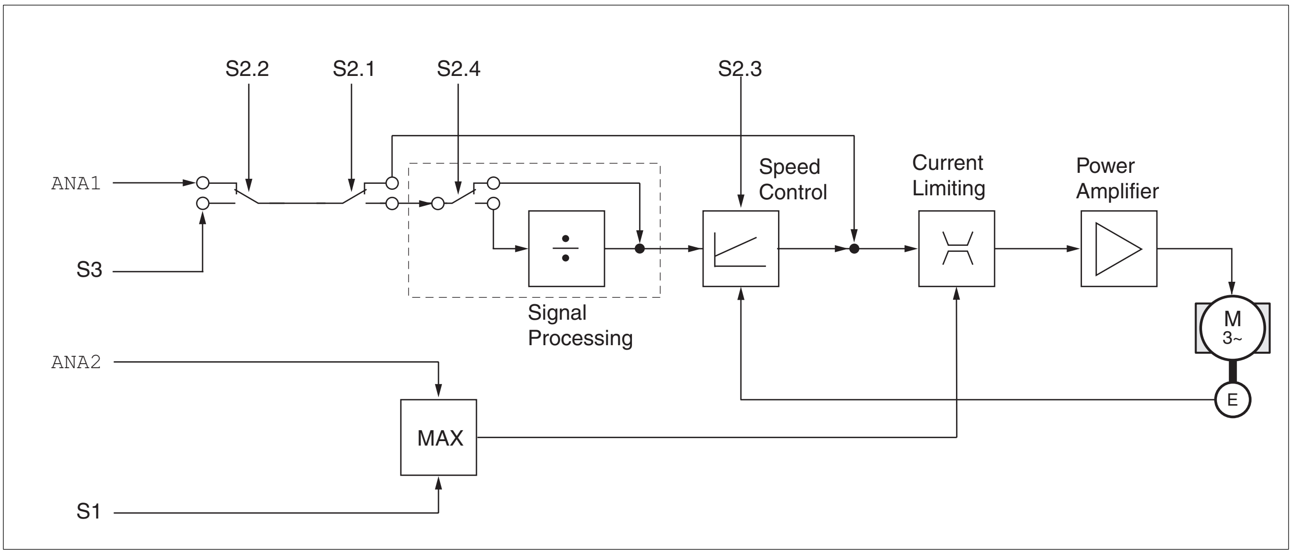
Switch setting S2.4	pole pairs	Speed range in 1/min
OFF (factory setting)	2 3 4 6	0 ... 6000 0 ... 4000 0 ... 3000 0 ... 2000
ON	2 3 4 6	0 ... 12000 0 ... 8000 0 ... 6000 0 ... 4000

Setting speed of rotation or acceleration ramp

The speed of rotation or acceleration ramp is set by the potentiometer S3.
If switch S2.2 is set to ON, the speed of rotation is set.
If switch S2.2 is set to OFF, the acceleration ramp is set.

Speed control operating mode

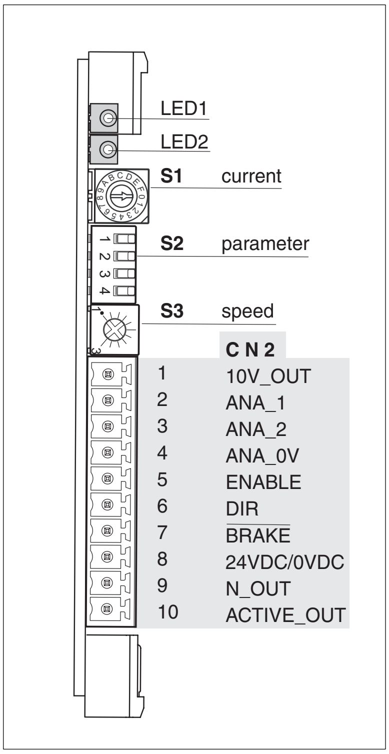
In the speed control (closed loop) operating mode the reference value of the motor speed of rotation is set via the analogue input `ANA_1` or the internal potentiometer S3. The maximum current can be limited via the analogue input `ANA_2` or the parameter switch S1.
The following overview shows the effectivity of the parameters which can be set for this operating mode.



Speed control operating mode, effect of adjustable parameters

Speed control (open loop) operating mode

In the speed control (open loop) operating mode the reference value of the motor speed of rotation is set via the analogue input `ANA_1` or the internal potentiometer. The maximum peak current of the motor (and thus the torque) is set via the analogue input `ANA_2` or the parameter switch S1. The value of `ANA_2` or S1 that is higher is used. This means that the unused setting option must always be set to the lowest value.



Signal inputs

ENABLE signal input

The ENABLE input releases the power amplifier to actuate the motor.
Error messages are reset from inactive to active by a switch.

Signal value		BLV14H••	BLV14L••	Description
inactive	V_{DC}	≤ 5	open / 5	Deactivate power amplifier
active	V_{DC}	24	0VDC	Activate power amplifier
Switch from inactive to active		rising edge	Switch from open to 0 VDC	Reset error message

If there is no breakdown, ACTIVE_OUT indicates readiness after release of the power amplifier (ENABLE) (green LED1 on steady).

When the ENABLE signal is removed the power amplifier is blocked immediately, the motor runs down without current.

DIR signal input

The direction of rotation is controlled by the DIR signal.

Signal value		BLV14H••	BLV14L••	Description
inactive	V_{DC}	≤ 5	open / 5	Clockwise rotation.
active	V_{DC}	24	0VDC	Counterclockwise rotation.

BRAKE signal input

A motor braking procedure can be triggered via the BRAKE input. The input must be activated for normal operation mode.

Signal value		BLV14H••	BLV14L••	Description
inactive	V_{DC}	≤ 5	open / 5	A braking sequence is triggered.
active	V_{DC}	24	0VDC	Normal operating mode.

Signal outputs

ACTIVE_OUT signal output

The ACTIVE_OUT signal output shows the operating readiness of the drive system. In the BLV14H• model the output requires the 24VDC signal power supply at CN3 PIN8. This must not be bridged with VDC (danger from feedback).

Signal value		BLV14H••	BLV14L••	Description
inactive	V_{DC}	0VDC	open	Power amplifier switched off.
active	V_{DC}	24VDC	0VDC	Power amplifier activated.

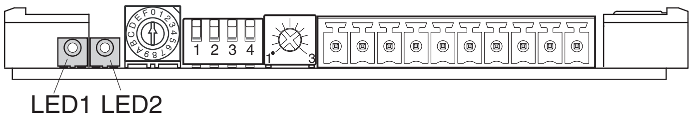
N_OUT signal output (speed signal)

The N_OUT signal output initiates a change of edge at every commutation. In the case of motors with, for example, 4 pole pairs 24 changes of edge per revolution are output. In the BLV14H• model the output requires the 24 VDC signal power supply. This must not be bridged with VDC (danger from feedback).

In the dependence on the number of pole pairs of the motor the following number of commutations or signal changes of edge per revolution is derived:

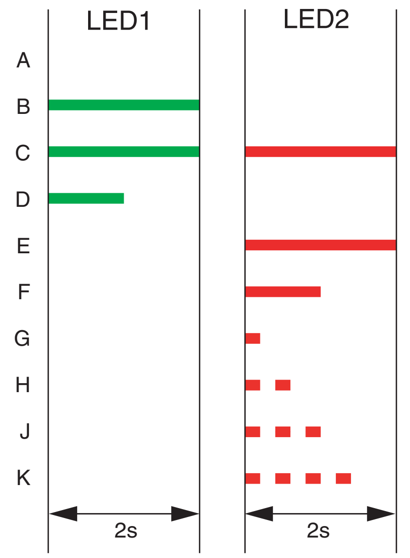
Number of pole pairs	Number of commutations
2	12
3	18
4	24
6	36

Status display via LED



Status display via LED

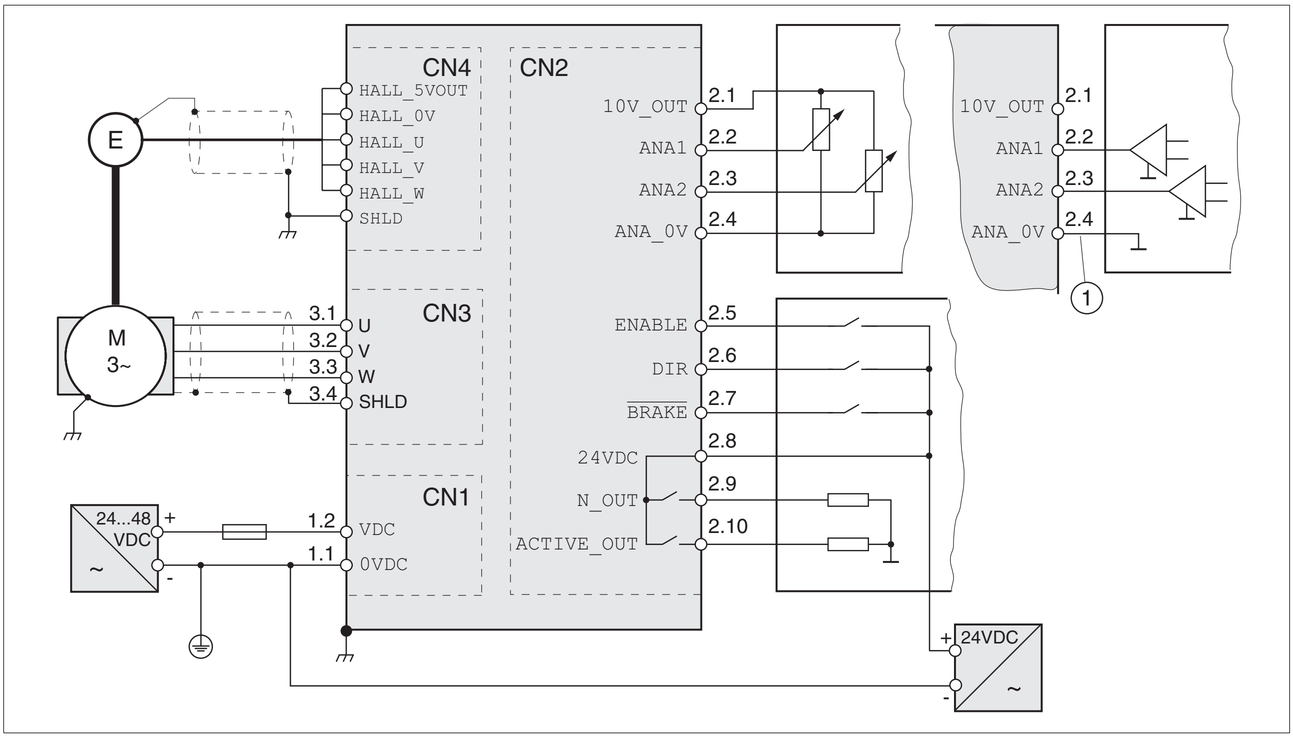
The two LEDs display the current operating status.



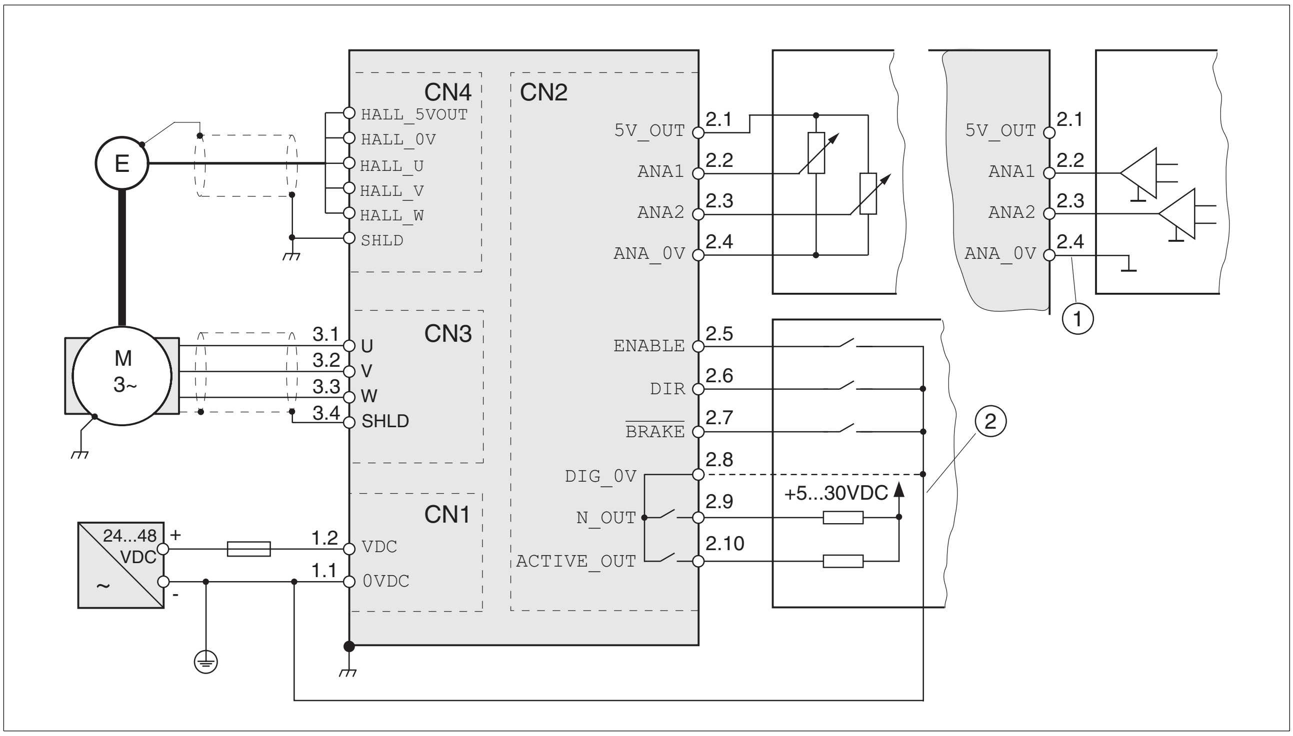
Flash code of LED1 and LED2

(A) No power supply.
(B) Power amplifier is activated.
(C) Holding brake set.
(D) Power amplifier is deactivated.
(E) System error.
(F) Power amplifier overtemperature.
(G) Overvoltage, including with feedback.
(H) Undervoltage.
(J) Commutation error.
(K) Short circuit between two motor phases.

Wiring examples



Wiring example of BLV14H



Wiring example of BLV14L

(1) When all electrical connections are disconnected, `ANA_0V` can be connected.

(2) When the electrical connection is disconnected with `0VDC`, the dashed connection of 2.8 must be connected.

Technical Data

Mechanical data

Dimensions (H x W x D)	mm	23.5 x 117 x 74.5
Weight	kg	0.25
Type of cooling		Free convection

Electrical Data

Power data			
Nominal voltage	V_{DC}	24 … 48	
Input voltage	V_{DC}	-15% / +20% [1]	
Residual ripple		< 5%	
Current consumption	A	6.5	
Nominal power (power output)	W	150 / 300 [2]	
Power loss	W	≤ 7	
Capacity value	µF	1100	
Signal interfaces		**BLV14H••**	**BLV14L••**
Analogue inputs			
Measuring range	V_{DC}	0 … 10	0 … 5
Max. input voltage	V_{DC}	30	10
Input resistance	kΩ	≥ 10	≥ 10
Resolution	Bit	10	10
Digital inputs			
Active	V_{DC}	15 … 30	0 VDC / < 0.8
Inactive	V_{DC}	≤ 5	open / > 4 … 6
Input current	mA	≤ 7	-
Debounce time	ms	1 … 2	1 … 2
Output for potentiometer			
Voltage	V_{DC}	10	5
Max. allowable current	mA	≤ 20	≤ 10
Potentiometer resistance	kΩ	1	1
Digital outputs			
Max. switching voltage	V_{DC}	≤ 30	≤ 30
Max. switching current	mA	≤ 50	≤ 50
Voltage drop at 50 mA load	V_{DC}	≤ 0.5	≤ 0.5
Short-circuit-resistant and overload-proof		yes	yes
Nominal voltage 24V	V_{DC}	24 [2]	0 VDC / < 0.8
N_OUT output (speed signal)			
Number of pole pairs		Pulses / revolutions	
2		12	
3		18	
4		24	
6		36	

(1) The levels correspond to EN 61131-2 Type 1

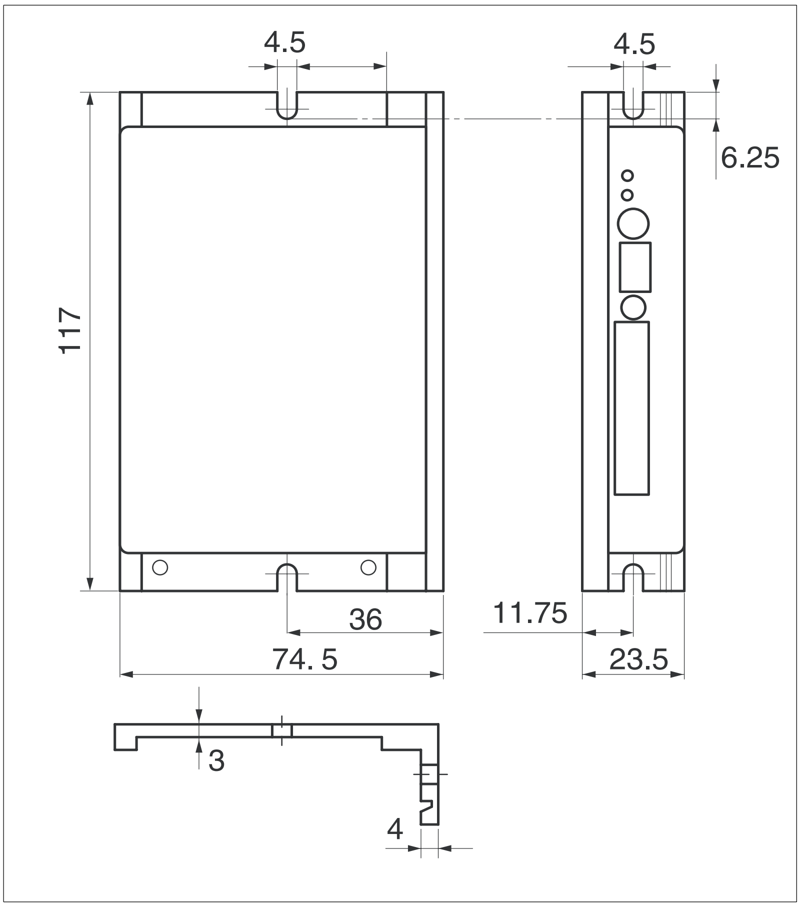
(2) For power supply of ACTIVE_OUT and N_OUT outputs. Must not be bridged with VDC power supply, otherwise danger of feedback.

Ambient conditions

Ambient temperature [1]	°C	0 ... +50
Transport and storage temperature	°C	-25 ... +70
Pollution degree		Step 2
Rel. humidity		as per IEC 60721-3-3, Class 3K3, 5 ... 85%, non-condensing
Installation height above mean sea level for 100% power	m	< 1000
Installation height	m	< 2000; with max. ambient temperature 40 °C, without protective film and a radial distance >50 mm
Oscillation and vibration		as per IEC/EN 60068-2-6 3 ... 13 Hz: 1.5 mm peak 13 ... 150 Hz: 1g
Shock loading		as per IEC/EN 60068-2-27 15 g for 11 ms
Degree of protection		IP20
		IP40 restricted: from above only, without distance to protective cover

1) No icing

Dimensional drawings



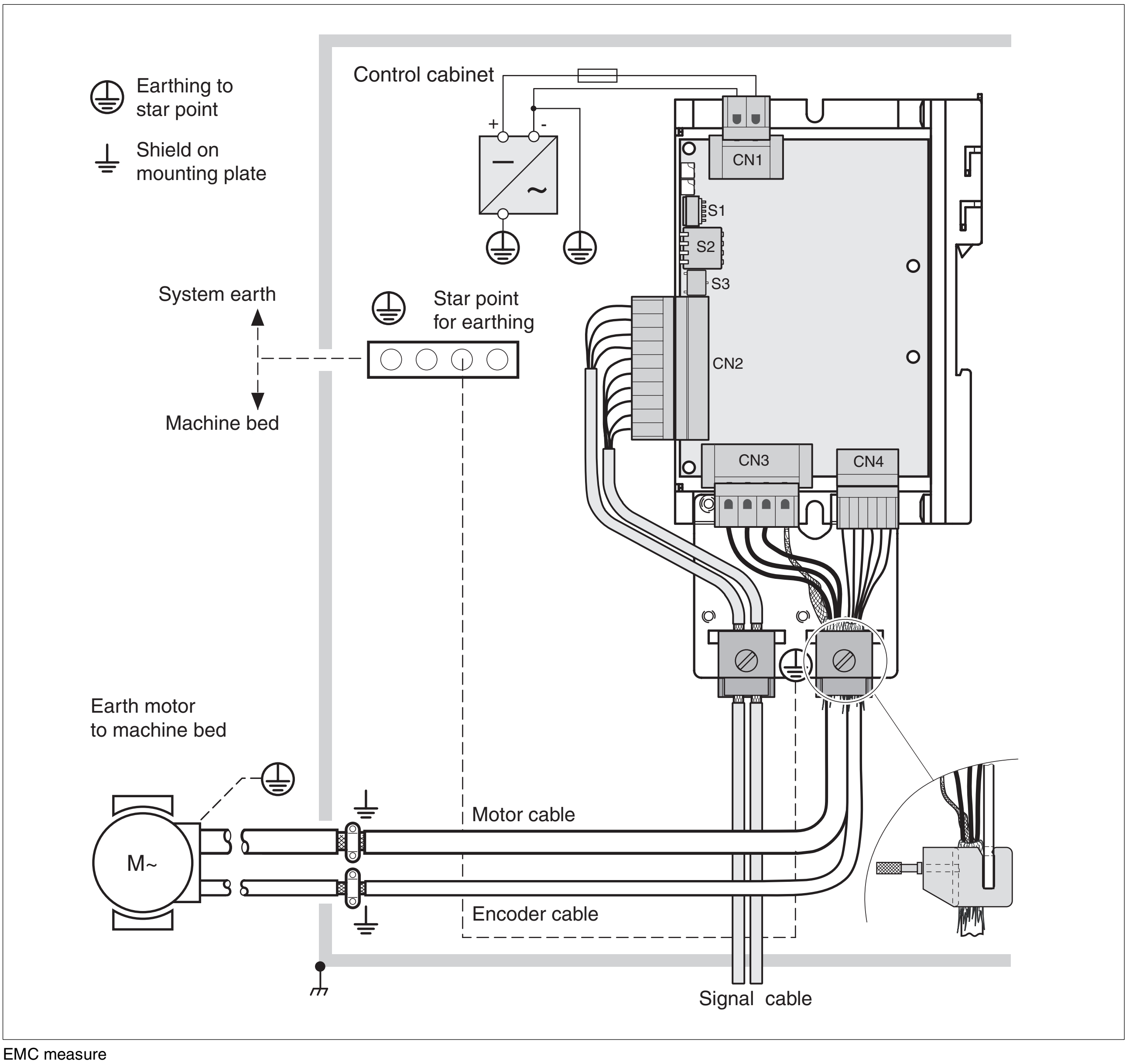
Dimensions of BLV14•

Mounting and installation
EMC-compliant installation

The BLV brushless DC drive meets the EMC requirements for the second environment as per IEC 61800-3.
An EMC-compliant design is required to maintain the specified limit values. Depending in the case better results can be achieved with the following measures:

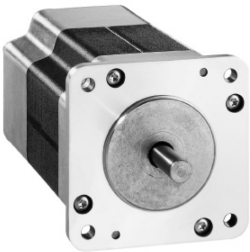
- Upstream mains reactors. Information on current harmonics can be obtained on request.
- Upstream external mains filters, particularly to maintain limit values for the first environment (living area, category C2)
- Particularly EMC-compliant design, e.g. in an enclosed control cabinet with 15 dB damping of radiated interference

EMC measures for BLV brushless DC drive



EMC measure

Type code						
BLV14 brushless DC drive						
Example	**BLV1**	**4**	**H**	**D16**	**B4**	**00**
Product name Power amplifier for brushless DC motors (brushless motor)	**BLV1**	4	H	D16	B4	00
Product design 4 = closed module housing / design	BLV1	**4**	H	D16	B4	00
Interface H = analogue inputs 0 …10 VDC; digital signals 24 VDC L = analogue inputs 0 … 5 VDC; digital signals 5 VDC	BLV1	4	**H**	D16	B4	00
Peak current D16 = max. 16 Aeff	BLV1	4	H	**D16**	B4	00
Power supply B 4= 24 … 48 VDC	BLV1	4	H	D16	**B4**	00
Options 00 = Standard	BLV1	4	H	D16	B4	**00**



Product Description

The motors of the Berger Lahr RECM series are brushless DC motors that are designed as electronically commutated 3-phase synchronous motors. Because of the mechanical design of the brushless DC motor they have a low rotor inertia and very good dynamic characteristics. The use of high-energy magnetic materials means high output power with small sizes. The motors are available with a distinct or low detent torque when not under power.

In specific cases an additional holding brake is unnecessary in the version with high detent torque. The motor version with low detent torque is noted for increased running smoothness.

The motors can be fitted with various types of gearboxgearboxes such as spur wheel or planetary gear depending on the torque and service life requirements. The brushless DC motors are fitted with Hall sensors as standard. High-resolution encoder systems are optionally available for higher positioning resolutions.

Special features

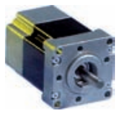
- High detent torque that makes a holding brake unnecessary
- Low holding torque for smooth running
- High torque in relationship to size
- Constant torque over complete speed range

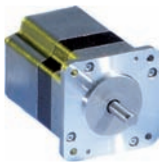
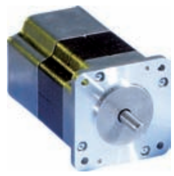
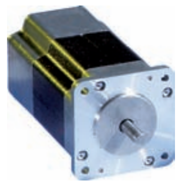
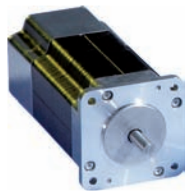
Application possibilities

In industrial applications the brushless DC motors are noted for their high power density with small dimensions and high efficiency. Examples of applications are conveyor drives, pump drives, applications in the textile industry and format changes.

The RECM34• motors with the flange dimension of 42 mm are particularly useful in device technology for new functions, such as in coffee machines and centrifuges.

Product quotation

		RECM 343		RECM 345	
					
RECM...		**343/3**	**343/4**	**345/3**	**345/4**
Flange dimension	mm	42			
Shaft diameter	mm	6			
DC bus voltage U_{DC}	V	24 / 48			
Nominal power P_N	W	56.5	59.9	103.7	95.1
Nominal speed n_N	1/min	4000	4400	4500	4225
Nominal torque M_N	Nm	0.14	0.13	0.22	0.22
Continuous holding torque M_{d0}	Nm	0.16	0.16	0.25	0.24
Max. torque M_{max}	Nm	0.3	0.4	0.6	0.8

		RECM 372		RECM 374		RECM 375		RECM 377	
									
RECM...		**372/2**	**372/4**	**374/2**	**374/4**	**375/2**	**375/4**	**377/2**	**377/4**
Flange dimension	mm	66							
Shaft diameter	mm	8							
DC bus voltage U_{DC}	V	24 / 48 / 325				48 / 60 / 325			
Nominal power P_N	W	120	120 ... 130	180 ... 190	160 ... 200	250 ... 260	310 ... 320	350 ... 370	340 ... 370
Nominal speed n_N	1/min	4800 ... 4850	4300 ... 4350	5450 ... 5800	4250 ... 4400	5000 ... 5100	4350 ... 4500	5000 ... 5300	4100 ... 4450
Nominal torque M_N	Nm	0.24	0.28	0.38	0.37 ... 0.44	0.48	0.68	0.67	0.80
Continuous holding torque M_{d0}	Nm	0.31	0.33	0.53	0.58	0.81	0.88	1.08	1.09
Max. torque M_{max}	Nm	0.70	0.70	1.40	1.40	2.10	2.10	2.80	2.80

Motor types

Shaft model		**Centring collar**	**Size** (Flange dimension)	**Length** (stator package)	**Number of pole pairs**	**Options**
RECM 34•						
Smooth	Ø 6 mm (without gearbox)	Ø 25 mm	4 (42 mm)	3 (25 mm)	3	Planetary gear PM42
				5 (50 mm)	4	
RECM 37•						
Smooth	Ø 8 mm (without gearbox)	Ø 40 mm	7 (66 mm)	2 (18 mm)	2	Planetary gear PLE 60
				4 (36 mm)	4	Planetary gear LM 62
				5 (54 mm)		Spur wheel gear HL [1]
				7 (72 mm)		Position capture [2]
						Holding brake [1]

[1] Spur wheel gear HL cannot be combined with holding brake

[2] Encoder or resolver

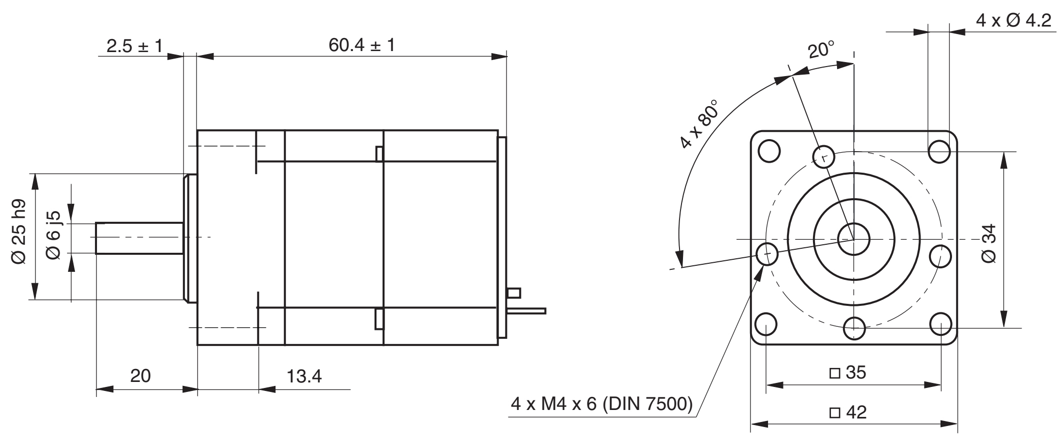
gearbox

Gearbox type	**Shaft model**		**Gear stages**	**Gear ratio**
RECM 34•				
Planetary gear PM42	Parallel key	Ø 8 mm	1 / 2 / 3	7 / 25 / 46 / 93 / 169 / 308
RECM 37•				
Planetary gear PM62	smooth	Ø 14 mm	1 / 2 / 3	7 / 16 / 25 / 93 / 115 / 308
Planetary gear PLE 60	Parallel key	Ø 14 mm	2 / 3	16 / 40 / 60 / 120
Spur wheel gear HL 372 and 374		Ø 10 mm	2 / 3 / 4	7 / 18 / 38 / 54 / 115

RECM34•

RECM 343/3

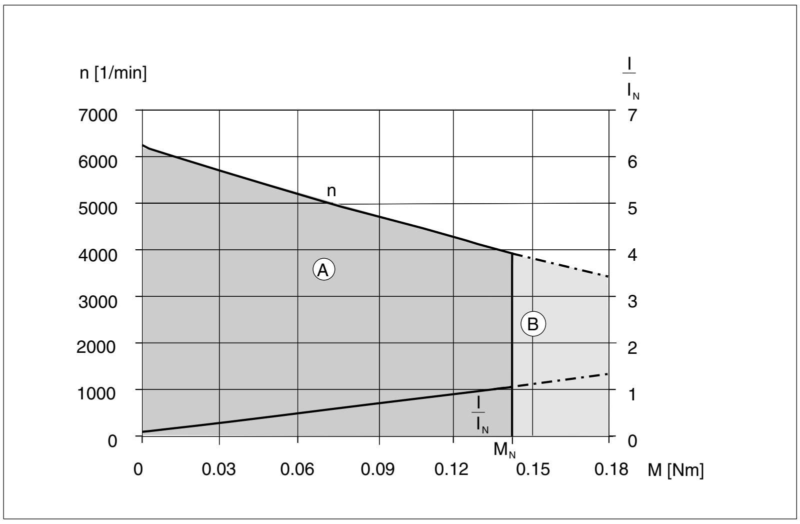
Dimensional drawing



Dimensional drawing RECM 343/3

Technical Data			
DC bus voltage U_{DC}	**V**	**24**	**48**
Number of pole pairs p		3	3
Nominal power P_N	W	56.5	56.5
Nominal torque M_N	Nm	0.14	0.14
Nominal speed n_N	1/min	4000	4000
Nominal current I_N	A	3.1	1.55
Nominal current $\hat{I}_N$	A	3.8	1.9
No-load speed n_0	1/min	6250	6250
No-load current I_0	A	0.28	0.14
Continuous holding torque M_{d0}	Nm	0.16	0.16
Continuous holding current I_{d0}	A	3.55	1.8
Max. continuous holding current $\hat{I}_{d0}$	A	4.35	2.2
Max. torque M_{max}	Nm	0.3	0.3
Max. current I_{max}	A	10	5.0
Detent torque M_S	Nm	0.028	0.028
Torque constant ($M_{d0}/\hat{I}_{d0}$) k_M	Nm/A	0.044	0.087
Generator voltage constant k_{Ett}	mV/(1/min)	2.72	5.33
Terminal resistance R_{tt}	Ω	1.05	4.05
Terminal inductivity L_{tt}	mH	0.85	3.27
Rotor inertia J_R	g cm^2	62	62
Heat resistance (winding/surface) R_{th1}	K/W	0.75	0.75
Ambient temperature	°C	40	40
Max. permissible radial shaft load F_q	N	50	50
Max. permissible axial shaft load F_a	N	20	20
Mass m	kg	0.35	0.35
Vibration strain as per DIN EN 60068-2-6	m/s²	20	
Degree of protection as per DIN EN 60592		IP 41	IP 41
Heat class as per DIN EN 60034-1		130 (B)	130 (B)

Characteristic curves

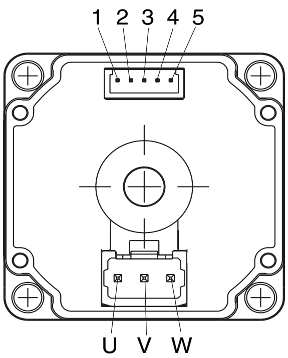


Torque characteristic RECM 343/3

(A) S1: continuous operation

(B) S2 … S9: short-term operation

Motor connection



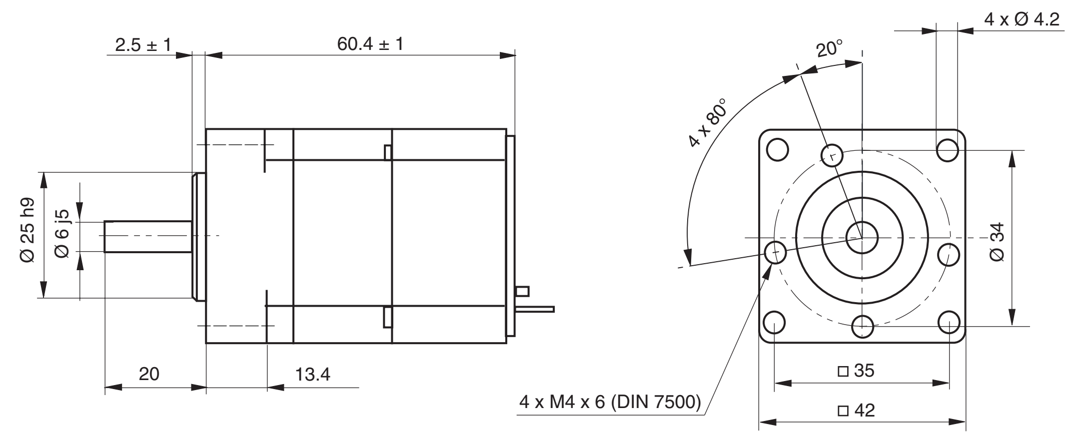
Pin	Signal connector
1	Power supply +4 V … +24 V
2	Power supply GND
3	Hall U
4	Hall V
5	Hall W

Pin	Motor plug
U	Motor
V	Motor
W	Motor

The pull-up resistance is not integrated. The maximum current at the Hall sensors is 30 mA.

RECM 343/4

Dimensional drawing

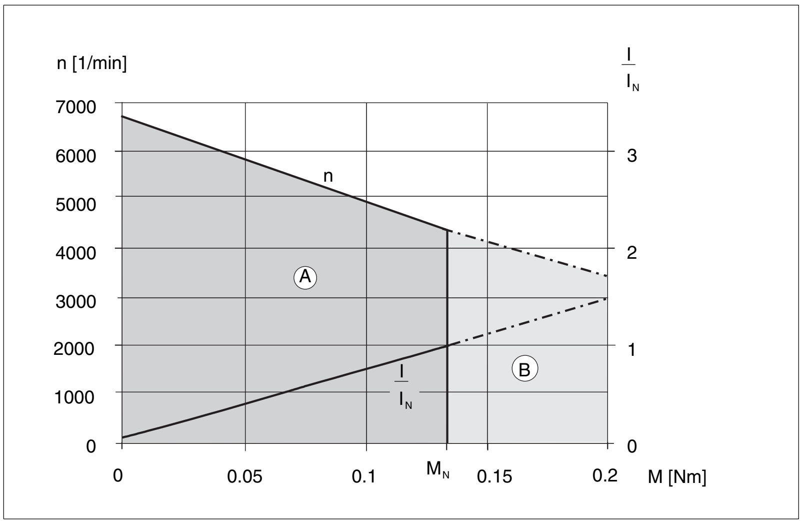


Dimensional drawing RECM 343/4

Technical Data

DC bus voltage U_{DC}	V	24	48
Number of pole pairs p		4	4
Nominal power P_N	W	59.9	59.9
Nominal torque M_N	Nm	0.13	0.13
Nominal speed n_N	1/min	4400	4400
Nominal current I_N	A	3.3	1.65
Nominal current $\hat{I}_N$	A	4.05	2.05
No-load speed n_0	1/min	6800	6800
No-load current I_0	A	0.22	0.11
Continuous holding torque M_{d0}	Nm	0.16	0.16
Continuous holding current I_{d0}	A	4.3	2.2
Max. continuous holding current $\hat{I}_{d0}$	A	5.30	2.7
Max. torque M_{max}	Nm	0.4	0.4
Max. current I_{max}	A	10.5	5.3
Detent torque M_S	Nm	0.007	0.007
Torque constant ($M_{d0}/\hat{I}_{d0}$) k_M	Nm/A	0.039	0.079
Generator voltage constant k_{Ett}	mV/(1/min)	2.6	5.2
Terminal resistance R_{tt}	Ω	0.83	3.32
Terminal inductivity L_{tt}	mH	0.65	2.6
Rotor inertia J_R	g cm^2	62	62
Heat resistance (winding/surface) R_{th1}	K/W	0.75	0.75
Ambient temperature	°C	40	40
Max. permissible radial shaft load F_q	N	50	50
Max. permissible axial shaft load F_a	N	20	20
Mass m	kg	0.35	0.35
Vibration strain as per DIN EN 60068-2-6	m/s²	20	
Degree of protection as per DIN EN 60592		IP 41	IP 41
Heat class as per DIN EN 60034-1		130 (B)	130 (B)

Characteristic curves

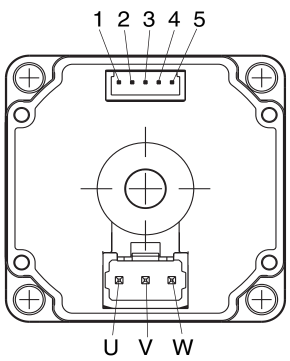


Torque characteristic RECM 343/4

(A) S1: continuous operation

(B) S2 … S9: short-term operation

Motor connection



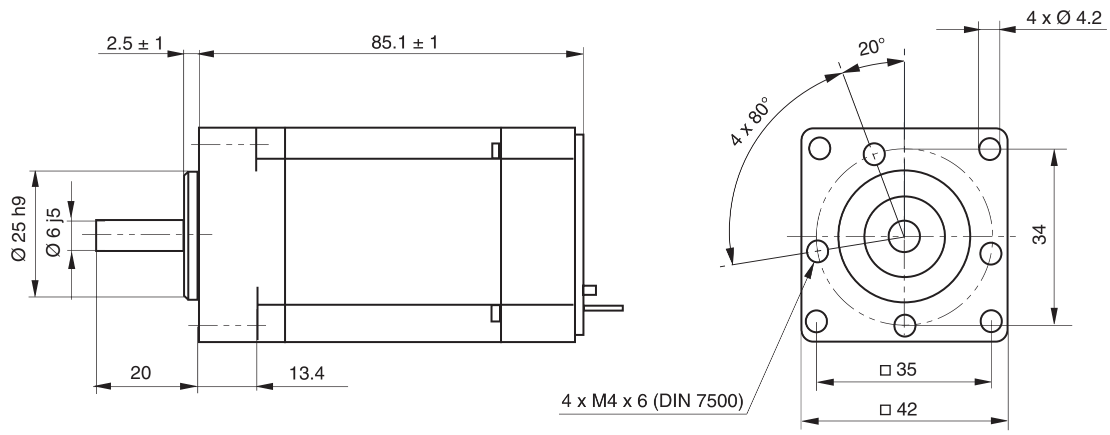
Pin	Signal connector
1	Power supply +4 V … +24 V
2	Power supply GND
3	Hall U
4	Hall V
5	Hall W

Pin	Motor plug
U	Motor
V	Motor
W	Motor

The pull-up resistance is not integrated. The maximum current at the Hall sensors is 30 mA.

RECM 345/3

Dimensional drawing

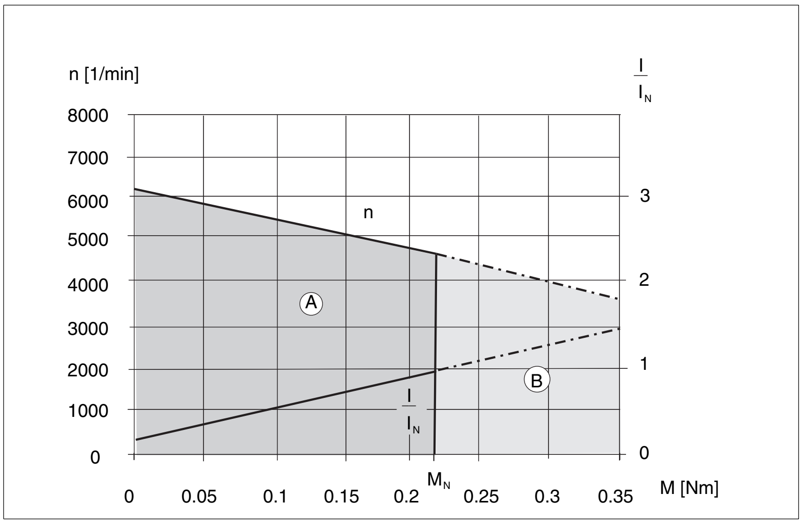


Dimensional drawing RECM 345/3

Technical Data

DC bus voltage U_{DC}	V	24	48
Number of pole pairs p		3	3
Nominal power P_N	W	103.7	103.7
Nominal torque M_N	Nm	0.22	0.22
Nominal speed n_N	1/min	4500	4500
Nominal current I_N	A	4.82	2.41
Nominal current $\hat{I}_N$	A	5.9	2.9
No-load speed n_0	1/min	6250	6250
No-load current I_0	A	0.44	0.22
Continuous holding torque M_{d0}	Nm	0.25	0.25
Continuous holding current I_{d0}	A	5.5	2.7
Max. continuous holding current $\hat{I}_{d0}$	A	6.8	3.4
Max. torque M_{max}	Nm	0.6	0.6
Max. current I_{max}	A	14.5	7.2
Detent torque M_S	Nm	0.054	0.054
Torque constant ($M_{d0}/\hat{I}_{d0}$) k_M	Nm/A	0.046	0.091
Generator voltage constant k_{Ett}	mV/(1/min)	2.8	5.8
Terminal resistance R_{tt}	Ω	0.46	2.2
Terminal inductivity L_{tt}	mH	0.43	1.85
Rotor inertia J_R	g cm^2	123	123
Heat resistance (winding/surface) R_{th1}	K/W	0.46	0.46
Ambient temperature	°C	40	40
Max. permissible radial shaft load F_q	N	50	50
Max. permissible axial shaft load F_a	N	20	20
Mass m	kg	0.5	0.5
Vibration strain as per DIN EN 60068-2-6	m/s²	20	
Degree of protection as per DIN EN 60592		IP 41	IP 41
Heat class as per DIN EN 60034-1		130 (B)	130 (B)

Characteristic curves

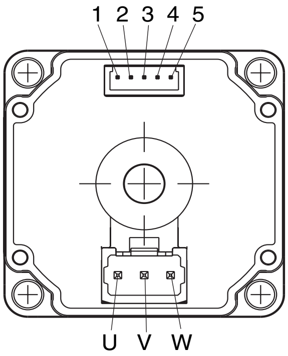


Torque characteristic RECM 345/3

(A) S1: continuous operation

(B) S2 … S9: short-term operation

Motor connection



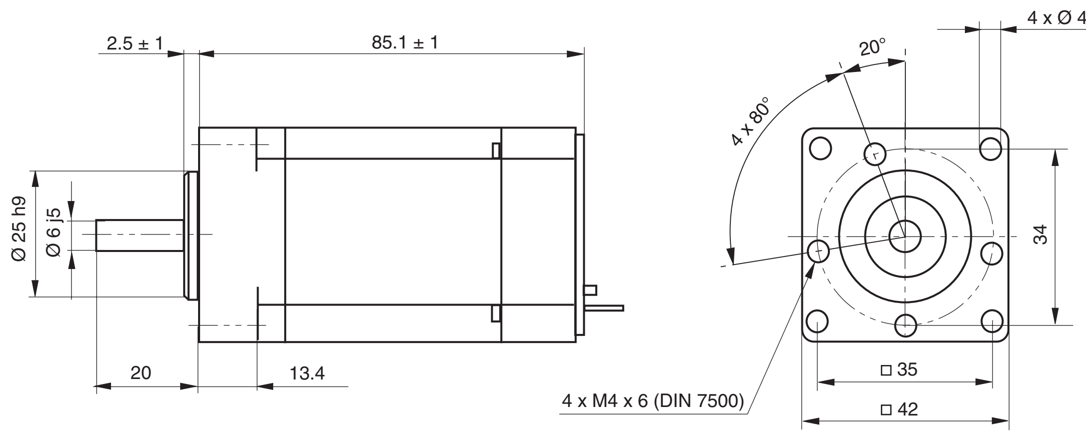
Pin	Signal connector
1	Power supply +4 V … +24 V
2	Power supply GND
3	Hall U
4	Hall V
5	Hall W

Pin	Motor plug
U	Motor
V	Motor
W	Motor

The pull-up resistance is not integrated. The maximum current at the Hall sensors is 30 mA.

RECM 345/4

Dimensional drawing

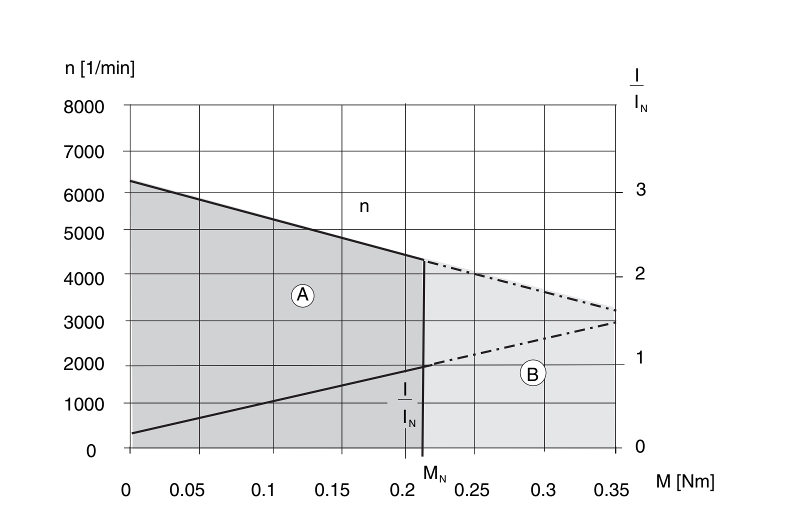


Dimensional drawing RECM 345/4

Technical Data

DC bus voltage U_{DC}	V	24	48
Number of pole pairs p		4	4
Nominal power P_N	W	95.1	95.1
Nominal torque M_N	Nm	0.22	0.22
Nominal speed n_N	1/min	4225	4225
Nominal current I_N	A	4.62	2.31
Nominal current $\hat{i}_N$	A	5.66	2.85
No-load speed n_0	1/min	6350	6350
No-load current I_0	A	0.41	0.21
Continuous holding torque M_{d0}	Nm	0.24	0.24
Continuous holding current I_{d0}	A	5.2	2.6
Max. continuous holding current $\hat{i}_{d0}$	A	6.4	3.2
Max. torque M_{max}	Nm	0.8	0.8
Max. current I_{max}	A	17.5	8.8
Detent torque M_S	Nm	0.009	0.009
Torque constant ($M_{d0}/\hat{i}_{d0}$) k_M	Nm/A	0.047	0.093
Generator voltage constant k_{Ett}	mV/(1/min)	2.85	5.44
Terminal resistance R_{tt}	Ω	0.48	1.92
Terminal inductivity L_{tt}	mH	0.38	1.38
Rotor inertia J_R	g cm^2	123	123
Heat resistance (winding/surface) R_{th1}	K/W	0.46	0.46
Ambient temperature	°C	40	40
Max. permissible radial shaft load F_q	N	50	50
Max. permissible axial shaft load F_a	N	20	20
Mass m	kg	0.5	0.5
Vibration strain as per DIN EN 60068-2-6	m/s²	20	
Degree of protection as per DIN EN 60592		IP 41	IP 41
Heat class as per DIN EN 60034-1		130 (B)	130 (B)

Characteristic curves

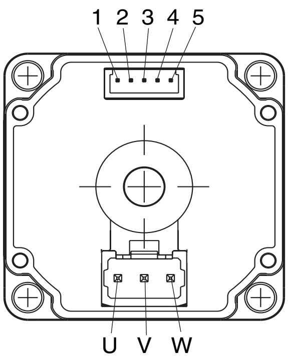


Torque characteristic RECM 345/4

(A) S1: continuous operation

(B) S2 … S9: short-term operation

Motor connection



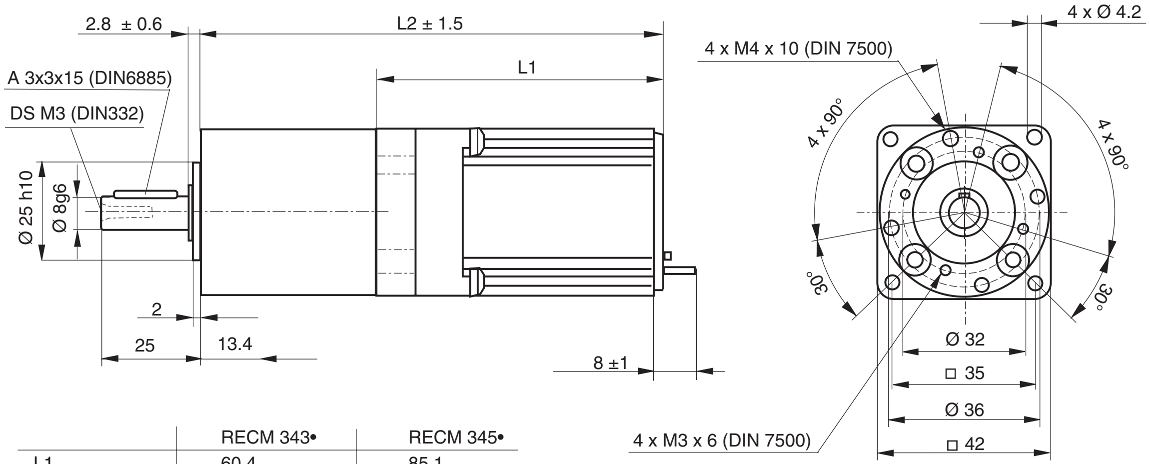
Pin	Signal connector
1	Power supply +4 V … +24 V
2	Power supply GND
3	Hall U
4	Hall V
5	Hall W

Pin	Motor plug
U	Motor
V	Motor
W	Motor

The pull-up resistance is not integrated. The maximum current at the Hall sensors is 30 mA.

RECM 34• options

RECM 34• with planetary gearbox PM42



	RECM 343•	RECM 345•
L1	60.4	85.1
L2 1-stage	110	135
L2 2-stage	123	148
L2 3-stage	136	161

Dimensional drawing RECM 34• with planetary gear PM42

Technical Data

Gear ratio		7	25	46	93	169	308
Gear stages		1	2	2	3	3	3
Max. continuous torque	Nm	3	7.5	7.5	15	15	15
Efficiency	%	80	75	75	70	70	70
Permissible radial force	N	160	230	230	300	300	300
Permissible axial force	N	50	80	80	110	110	110
Housing and teeth		Steel					
Bearings		Ball bearing					
Drive shaft		With parallel key according to DIN 6885					
Seal at shaft exit		Shaft seal ring IP54					
Max. recommended input speed	1/min	3000					
Operating temperature	°C	-30 … 140					
Expected service life	h	average 2500, depending on load profile					

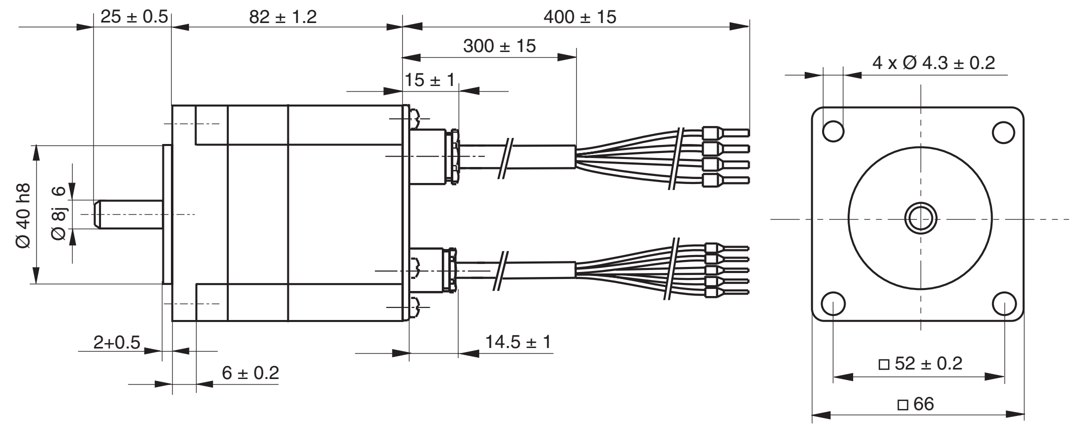
RECM 34• type code

Example:	**RECM**	**3**	**4**	**3**	**/**	**4**	**D**	**024**	**5**	**S**	**H**	**0**	**C**	**B**	**000**	**0**	**0**	**00**	**000**	**00**
Product family RECM = Reversible Electronic Commutated Motor	**RECM**	3	4	3	/	4	D	024	5	S	H	0	C	B	000	0	0	00	000	00
Number of phases 3 = 3 phase	RECM	**3**	4	3	/	4	D	024	5	S	H	0	C	B	000	0	0	00	000	00
Motor size 4 = 42 mm	RECM	3	**4**	3	/	4	D	024	5	S	H	0	C	B	000	0	0	00	000	00
Motor length 3 = stator package 25 mm 5 = stator package 50 mm	RECM	3	4	**3**	**/**	4	D	024	5	S	H	0	C	B	000	0	0	00	000	00
Number of pole pairs 3 = 3 pole pairs 4 = 4 pole pairs	RECM	3	4	3	/	**4**	**D**	024	5	S	H	0	C	B	000	0	0	00	000	00
Type of DC bus voltage D = DC	RECM	3	4	3	/	4	**D**	024	5	S	H	0	C	B	000	0	0	00	000	00
DC bus voltage 024 = 24 V 048 = 48 V	RECM	3	4	3	/	4	D	**024**	5	S	H	0	C	B	000	0	0	00	000	00
Winding type 5 = medium speed of rotation	RECM	3	4	3	/	4	D	024	**5**	S	H	0	C	B	000	0	0	00	000	00
Winding circuit S = star	RECM	3	4	3	/	4	D	024	5	**S**	H	0	C	B	000	0	0	00	000	00
Feedback System H = Hall sensor	RECM	3	4	3	/	4	D	024	5	S	**H**	0	C	B	000	0	0	00	000	00
Resolution of feedback system 0 = Standard	RECM	3	4	3	/	4	D	024	5	S	H	**0**	C	B	000	0	0	00	000	00
Electrical connections C = terminal bar	RECM	3	4	3	/	4	D	024	5	S	H	0	**C**	B	000	0	0	00	000	00
Electrical connections - position B = connection rear	RECM	3	4	3	/	4	D	024	5	S	H	0	C	**B**	000	0	0	00	000	00
Electrical connections - braided wires/cable length 000 = 0	RECM	3	4	3	/	4	D	024	5	S	H	0	C	B	**000**	0	0	00	000	00
Shaft model 0 = smooth shaft without gearbox K = gearbox with parallel key	RECM	3	4	3	/	4	D	024	5	S	H	0	C	B	000	**0**	0	00	000	00
Holding torque and holding brake 0 = min. holding torque, without brake 9 = max. holding torque, without brake	RECM	3	4	3	/	4	D	024	5	S	H	0	C	B	000	0	**0**	00	000	00
Gearbox type 00 = without gearbox QX = planetary gear PM42	RECM	3	4	3	/	4	D	024	5	S	H	0	C	B	000	0	0	**00**	000	00
Gear ratio 000 = without gearbox (standard) with planetary gear PM42 (gearbox type QX): 007 = 7:1, 025 = 25:1, 046 = 46:1, 093 = 93:1, 169 = 169:1, 308 = 308:1	RECM	3	4	3	/	4	D	024	5	S	H	0	C	B	000	0	0	0	**000**	00
Degree of protection 00 = IP41	RECM	3	4	3	/	4	D	024	5	S	H	0	C	B	000	0	0	00	000	**00**

RECM 37•

RECM 372/2

Dimensional drawing

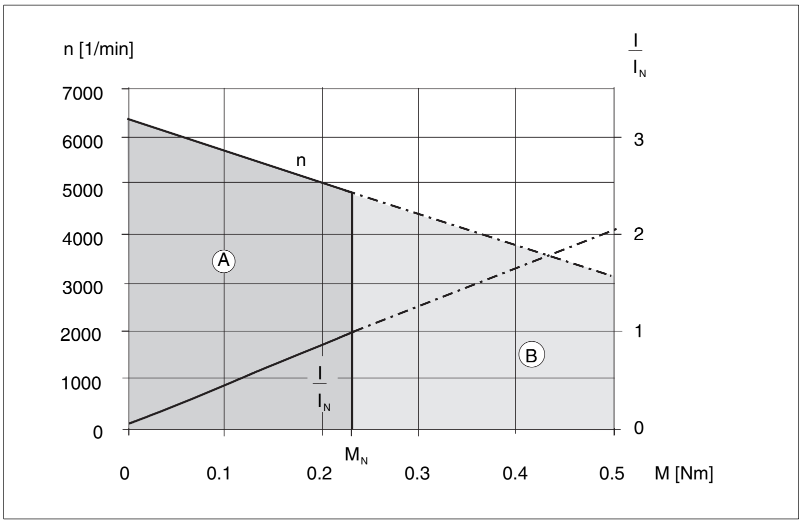


Dimensional drawing RECM 372/2

Technical Data

DC bus voltage U_{DC}	V	24	48	325
Number of pole pairs p		2	2	2
Nominal power P_N	W	120	120	120
Nominal torque M_N	Nm	0.24	0.24	0.24
Nominal speed n_N	1/min	4850	4850	4800
Nominal current I_N	A	7.0	3.49	0.5
Nominal current $\hat{I}_N$	A	8.5	4.27	0.6
No-load speed n_0	1/min	6400	6400	6300
No-load current I_0	A	0.74	0.37	0.05
Continuous holding torque M_{d0}	Nm	0.31	0.31	0.31
Continuous holding current I_{d0}	A	8.6	4.37	0.6
Max. continuous holding current $\hat{I}_{d0}$	A	10.5	5.34	0.8
Max. torque M_{max}	Nm	0.70	0.70	0.70
Max. current I_{max}	A	20.6	10.3	1.5
Detent torque M_S	Nm	0.053	0.053	0.053
Torque constant ($M_{d0}/\hat{I}_{d0}$) k_M	Nm/A	0.029	0.057	0.387
Generator voltage constant k_{Ett}	mV/(1/min)	2.602	5.203	35.515
Terminal resistance R_{tt}	Ω	0.19	0.70	28.86
Terminal inductivity L_{tt}	mH	0.787	3.148	146.645
Rotor inertia J_R	g cm^2	170	170	170
Heat resistance (winding/surface) R_{th1}	K/W	1.25	1.25	1.25
Ambient temperature	°C	-25 ... 40°	-25 ... 40	-25 ... 40
Max. permissible radial shaft load F_q	N	80	80	80
Max. permissible axial shaft load F_a	N	30	30	30
Mass m	kg	1.05	1.05	1.05
Vibration strain as per DIN EN 60068-2-6	m/s²	20		
Degree of protection as per DIN EN 60592		IP 41	IP 41	IP 41
Heat class as per DIN EN 60034-1		155 (F)	155 (F)	155 (F)

Characteristic curves

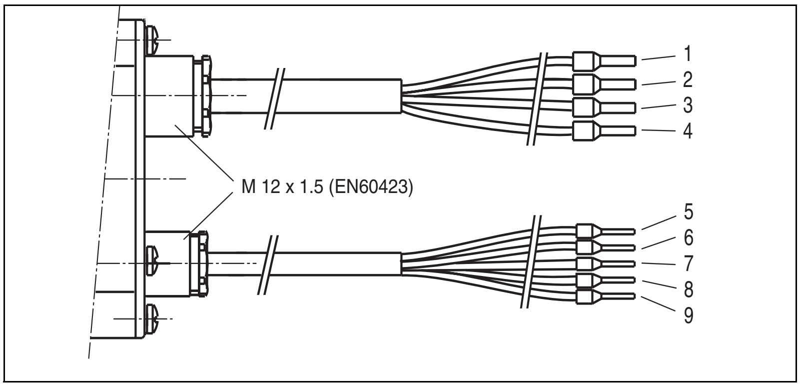


Torque characteristic RECM 372/2

(A) S1: continuous operation

(B) S2 ... S9: Short-term operation

Motor connection



Terminal assignment

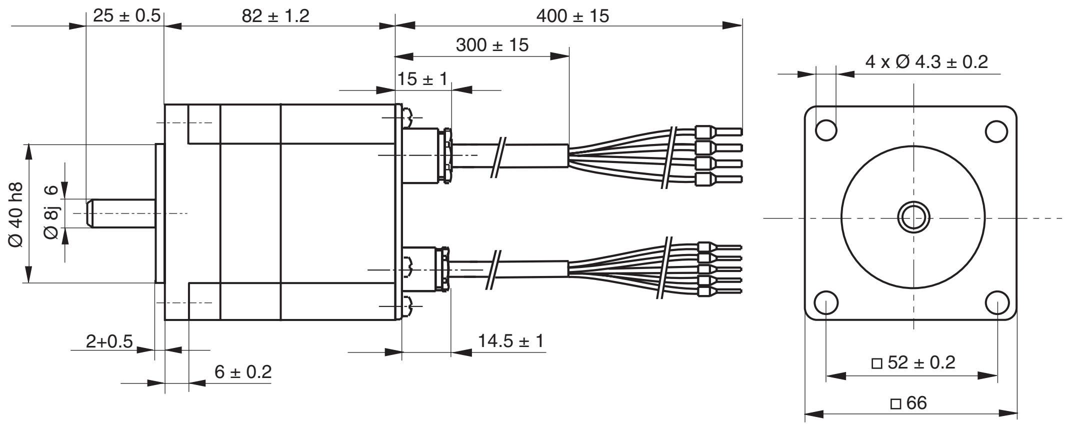
Pin	Motor cable	Colour
1	U	Orange (OR)
2	V	black (BK)
3	W	white (WS)
4	PE	yellow/green (GN/YE)

Pin	Motor cable	Colour
5	Power supply 5 V … 18 V	red (RD)
6	Power supply GND	blue (BU)
7	Hall U	orange (OR)
8	Hall V	black (BK)
9	Hall W	white (WH)

The pull-up resistance is not integrated. The maximum current at the Hall sensors is 30 mA.

RECM 372/4

Dimensional drawing

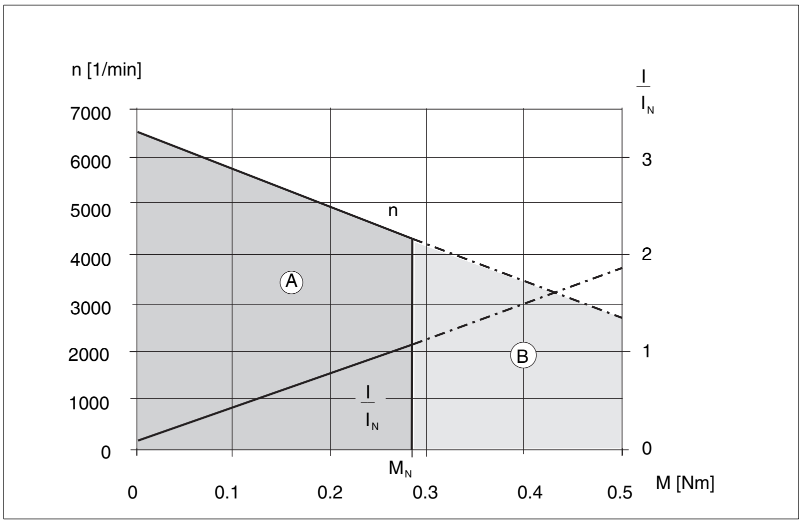


Dimensional drawing RECM 372/4

Technical Data

DC bus voltage U_{DC}	**V**	**24**	**48**	**325**
Number of pole pairs p		4	4	4
Nominal power P_N	W	130	130	120
Nominal torque M_N	Nm	0.28	0.28	0.28
Nominal speed n_N	1/min	4350	4350	4300
Nominal current I_N	A	8.1	4.03	0.6
Nominal current $\hat{I}_N$	A	9.9	4.93	0.7
No-load speed n_0	1/min	6500	6500	6450
No-load current I_0	A	0.63	0.31	0.05
Continuous holding torque M_{d0}	Nm	0.33	0.33	0.33
Continuous holding current I_{d0}	A	9.1	4.70	0.7
Max. continuous holding current $\hat{I}_{d0}$	A	11.2	5.76	0.9
Max. torque M_{max}	Nm	0.70	0.70	0.70
Max. current I_{max}	A	20.7	10.3	1.5
Detent torque M_S	Nm	0.015	0.015	0.015
Torque constant ($M_{d0}/\hat{I}_{d0}$) k_M	Nm/A	0.030	0.057	0.386
Generator voltage constant k_{Ett}	mV/(1/min)	2.583	5.166	35.091
Terminal resistance R_{tt}	Ω	0.17	0.54	21.38
Terminal inductivity L_{tt}	mH	0.619	2.477	114.269
Rotor inertia J_R	g cm^2	170	170	170
Heat resistance (winding/surface) R_{th1}	K/W	1.25	1.25	1.25
Ambient temperature	°C	-25 ... 40	-25 ... 40	-25 ... 40
Max. permissible radial shaft load F_q	N	80	80	80
Max. permissible axial shaft load F_a	N	30	30	30
Mass m	kg	1.05	1.05	1.05
Vibration strain as per DIN EN 60068-2-6	m/s²	20		
Degree of protection as per DIN EN 60592		IP 41	IP 41	IP 41
Heat class as per DIN EN 60034-1		155 (F)	155 (F)	155 (F)

Characteristic curves

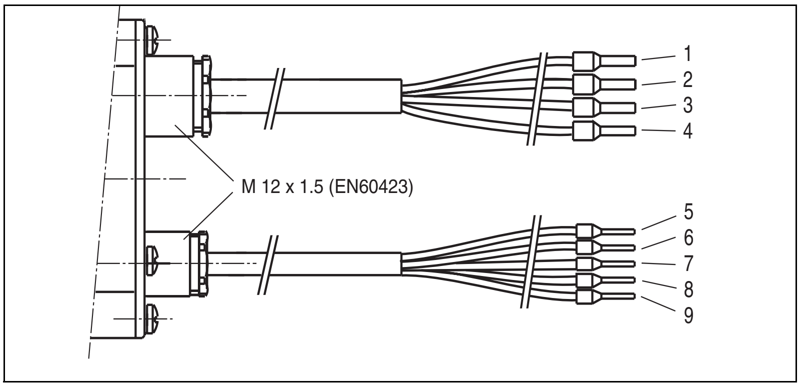


Torque characteristic RECM 372/4

(A) S1: continuous operation

(B) S2 ... S9: Short-term operation

Motor connection



Terminal assignment

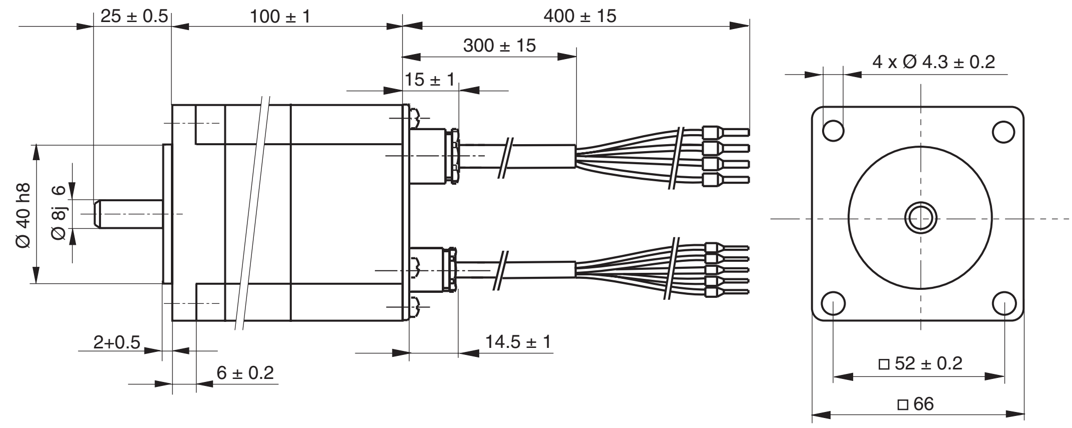
Pin	Motor cable	Colour
1	U	orange (OR)
2	V	black (BK)
3	W	white (WS)
4	PE	yellow/green (GN/YE)

Pin	Motor cable	Colour
5	Power supply 5 V … 18 V	red (RD)
6	Power supply GND	blue (BU)
7	Hall U	orange (OR)
8	Hall V	black (BK)
9	Hall W	white (WH)

The pull-up resistance is not integrated. The maximum current at the Hall sensors is 30 mA.

RECM 374/2

Dimensional drawing

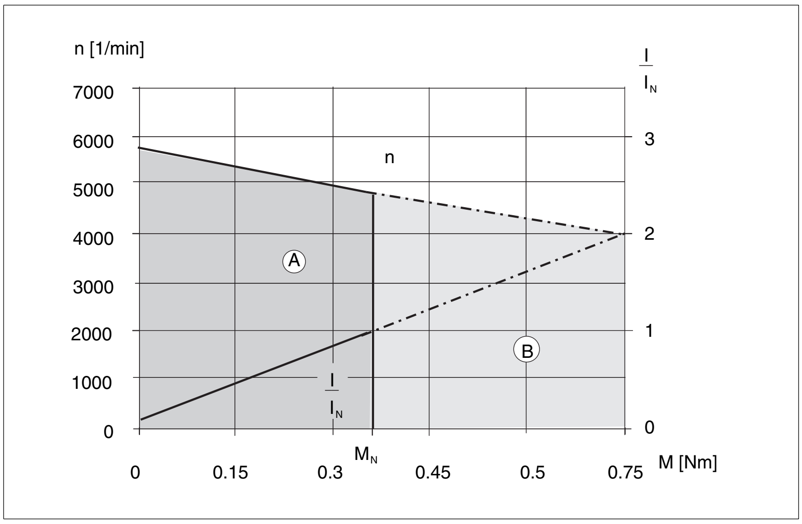


Dimensional drawing RECM 374/2

Technical Data

DC bus voltage U_{DC}	V	24	48	325
Number of pole pairs p		2	2	2
Nominal power P_N	W	190	190	180
Nominal torque M_N	Nm	0.38	0.38	0.38
Nominal speed n_N	1/min	4750	4750	4500
Nominal current I_N	A	9.7	4.84	0.6
Nominal current $\hat{I}_N$	A	11.9	5.93	0.8
No-load speed n_0	1/min	5800	5800	5450
No-load current I_0	A	1.20	0.60	0.08
Continuous holding torque M_{d0}	Nm	0.53	0.53	0.53
Continuous holding current I_{d0}	A	13.1	6.87	1.0
Max. continuous holding current $\hat{I}_{d0}$	A	16.1	8.41	1.2
Max. torque M_{max}	Nm	1.40	1.40	1.40
Max. current I_{max}	A	37.1	18.5	2.6
Detent torque M_S	Nm	0.106	0.106	0.106
Torque constant ($M_{d0}/\hat{I}_{d0}$) k_M	Nm/A	0.033	0.064	0.446
Generator voltage constant k_{Ett}	mV/(1/min)	2.891	5.781	41.296
Terminal resistance R_{tt}	Ω	0.12	0.39	15.55
Terminal inductivity L_{tt}	mH	0.389	1.557	79.430
Rotor inertia J_R	g cm^2	340	340	340
Heat resistance (winding/surface) R_{th1}	K/W	0.63	0.63	0.63
Ambient temperature	°C	-25 ... 40	-25 ... 40	-25 ... 40
Max. permissible radial shaft load F_q	N	80	80	80
Max. permissible axial shaft load F_a	N	30	30	30
Mass m	kg	1.4	1.4	1.4
Vibration strain as per DIN EN 60068-2-6	m/s²	20		
Degree of protection as per DIN EN 60592		IP 41	IP 41	IP 41
Heat class as per DIN EN 60034-1		155 (F)	155 (F)	155 (F)

Characteristic curves

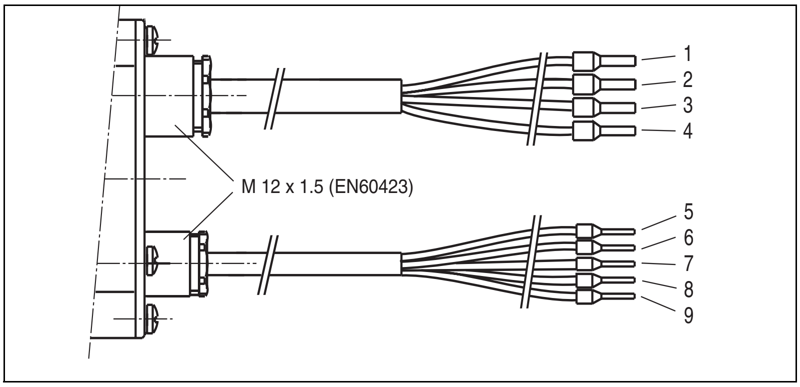


Torque characteristic RECM 374/2

(A) S1: continuous operation

(B) S2 ... S9: Short-term operation

Motor connection



Terminal assignment

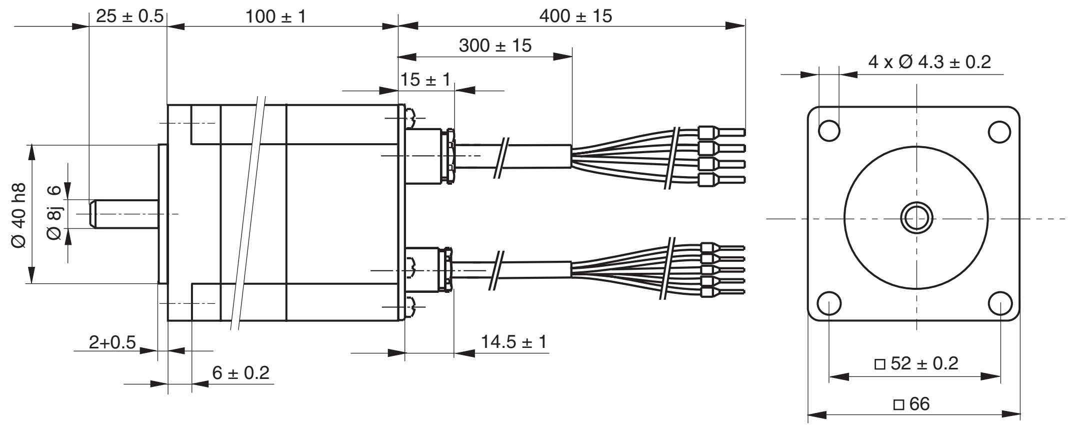
Pin	Motor cable	Colour
1	U	orange (OR)
2	V	black (BK)
3	W	white (WS)
4	PE	yellow/green (GN/YE)

Pin	Motor cable	Colour
5	Power supply 5 V … 18 V	red (RD)
6	Power supply GND	blue (BU)
7	Hall U	orange (OR)
8	Hall V	black (BK)
9	Hall W	white (WH)

The pull-up resistance is not integrated. The maximum current at the Hall sensors is 30 mA.

RECM 374/4

Dimensional drawing

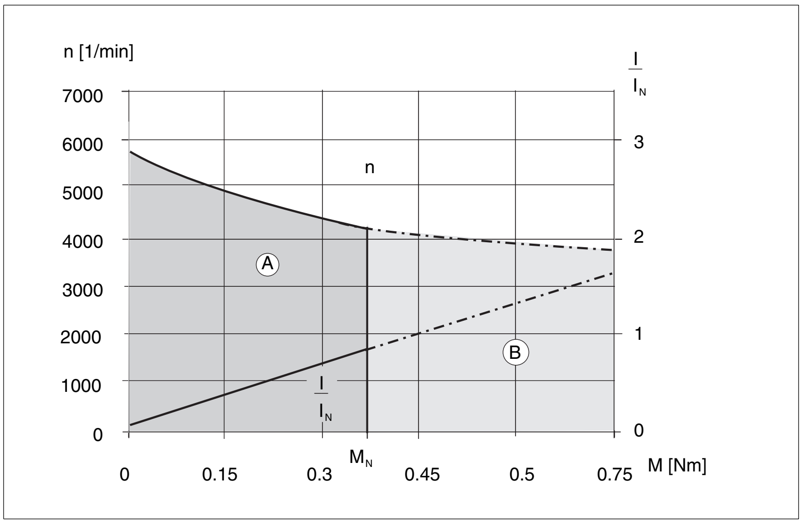


Dimensional drawing RECM 374/4

Technical Data

DC bus voltage U_{DC}	V	24	48	325
Number of pole pairs p		4	4	4
Nominal power P_N	W	160	200	200
Nominal torque M_N	Nm	0.37	0.44	0.44
Nominal speed n_N	1/min	4250	4350	4400
Nominal current I_N	A	9.2	5.54	0.8
Nominal current $\hat{i}_N$	A	11.3	6.78	1.0
No-load speed n_0	1/min	5800	5800	5850
No-load current I_0	A	0.63	0.46	0.07
Continuous holding torque M_{d0}	Nm	0.58	0.58	0.58
Continuous holding current I_{d0}	A	11.9	7.29	1.2
Max. continuous holding current $\hat{i}_{d0}$	A	14.5	8.92	1.4
Max. torque M_{max}	Nm	1.40	1.40	1.40
Max. current I_{max}	A	36.5	18.3	2.7
Detent torque M_S	Nm	0.030	0.030	0.030
Torque constant $(M_{d0}/\hat{i}_{d0})$ k_M	Nm/A	0.040	0.065	0.406
Generator voltage constant k_{Ett}	mV/(1/min)	2.924	5.848	38.990
Terminal resistance R_{tt}	Ω	0.11	0.28	9.85
Terminal inductivity L_{tt}	mH	0.318	1.272	56.514
Rotor inertia J_R	g cm^2	340	340	340
Heat resistance (winding/surface) R_{th1}	K/W	0.63	0.63	0.63
Ambient temperature	°C	-25 ... 40	-25 ... 40	-25 ... 40
Max. permissible radial shaft load F_q	N	80	80	80
Max. permissible axial shaft load F_a	N	30	30	30
Mass m	kg	1.4	1.4	1.4
Vibration strain as per DIN EN 60068-2-6	m/s²	20		
Degree of protection as per DIN EN 60592		IP 41	IP 41	IP 41
Heat class as per DIN EN 60034-1		155 (F)	155 (F)	155 (F)

Characteristic curves

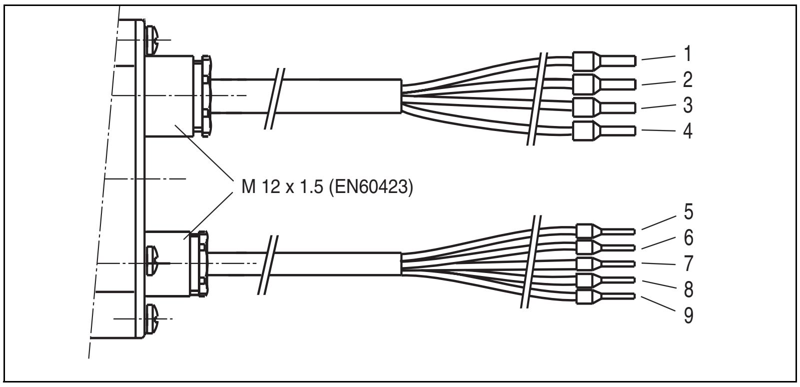


Torque characteristic RECM 374/4

(A) S1: continuous operation

(B) S2 ... S9: Short-term operation

Motor connection



Terminal assignment

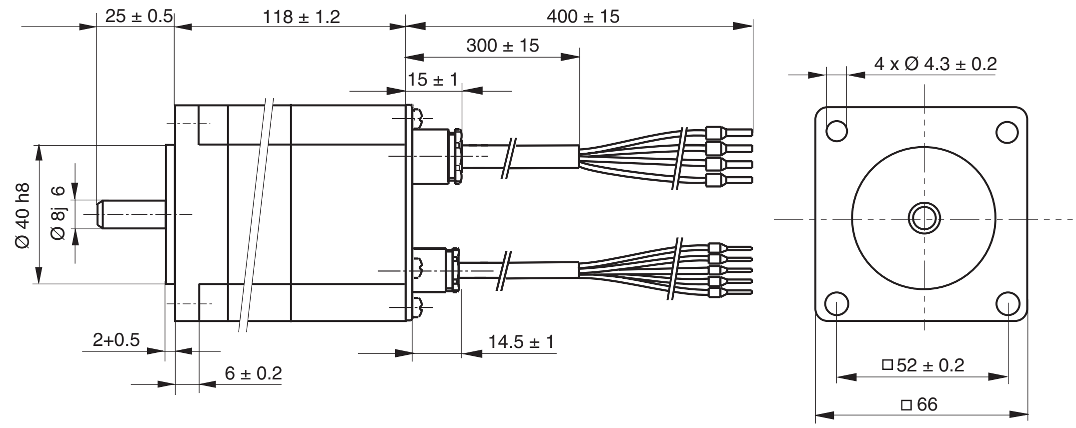
Pin	Motor cable	Colour
1	U	orange (OR)
2	V	black (BK)
3	W	white (WS)
4	PE	yellow/green (GN/YE)

Pin	Motor cable	Colour
5	Power supply 5 V … 18 V	red (RD)
6	Power supply GND	blue (BU)
7	Hall U	orange (OR)
8	Hall V	black (BK)
9	Hall W	white (WH)

The pull-up resistance is not integrated. The maximum current at the Hall sensors is 30 mA.

RECM 375/2

Dimensional drawing

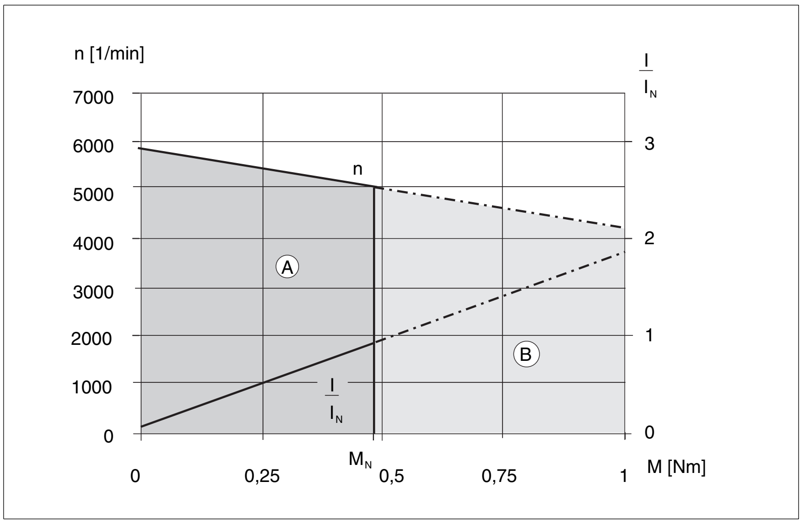


Dimensional drawing RECM 375/2

Technical Data

DC bus voltage U_{DC}	V	48	60	325
Number of pole pairs p		2	2	2
Nominal power P_N	W	250	260	250
Nominal torque M_N	Nm	0.48	0.48	0.48
Nominal speed n_N	1/min	5000	5100	5000
Nominal current I_N	A	6.37	5.4	0.9
Nominal current $\hat{i}_N$	A	7.8	6.6	1.2
No-load speed n_0	1/min	5900	6050	5900
No-load current I_0	A	0.91	0.76	0.13
Continuous holding torque M_{d0}	Nm	0.81	0.81	0.81
Continuous holding current I_{d0}	A	10.51	9.0	1.7
Max. continuous holding current $\hat{i}_{d0}$	A	12.87	11.0	2.1
Max. torque M_{max}	Nm	2.10	2.10	2.10
Max. current I_{max}	A	28.2	23.2	4.2
Detent torque M_S	Nm	0.158	0.158	0.158
Torque constant ($M_{d0}/\hat{I}_{d0}$) k_M	Nm/A	0.063	0.073	0.382
Generator voltage constant k_{Ett}	mV/(1/min)	5.699	6.938	38.405
Terminal resistance R_{tt}	Ω	0.22	0.31	7.33
Terminal inductivity L_{tt}	mH	0.925	1.371	42.011
Rotor inertia J_R	g cm^2	510	510	510
Heat resistance (winding/surface) R_{th1}	K/W	0.42	0.42	0.42
Ambient temperature	°C	-25 ... 40	-25 ... 40	-25 ... 40
Max. permissible radial shaft load F_q	N	80	80	80
Max. permissible axial shaft load F_a	N	30	30	30
Mass m	kg	1.7	1.7	1.7
Vibration strain as per DIN EN 60068-2-6	m/s²	20		
Degree of protection as per DIN EN 60592		IP 41	IP 41	IP 41
Heat class as per DIN EN 60034-1		155 (F)	155 (F)	155 (F)

Characteristic curves

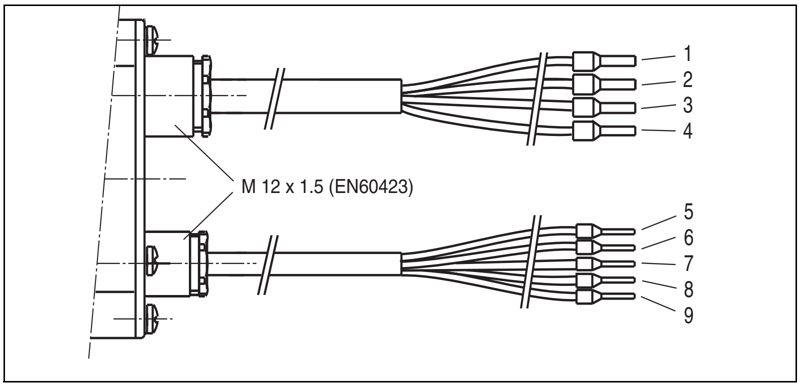


Torque characteristic RECM 375/2

(A) S1: continuous operation

(B) S2 ... S9: Short-term operation

Motor connection



Terminal assignment

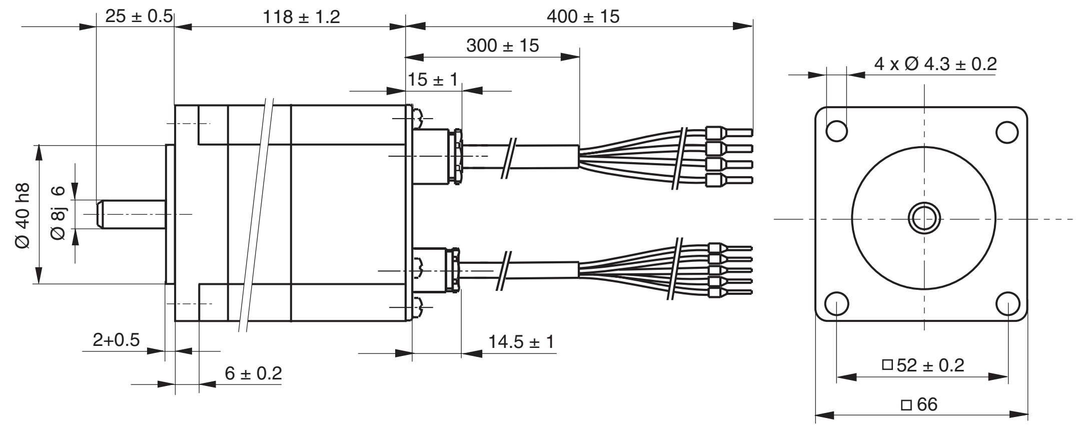
Pin	Motor cable	Colour
1	U	orange (OR)
2	V	black (BK)
3	W	white (WS)
4	PE	yellow/green (GN/YE)

Pin	Motor cable	Colour
5	Power supply 5 V … 18 V	red (RD)
6	Power supply GND	blue (BU)
7	Hall U	orange (OR)
8	Hall V	black (BK)
9	Hall W	white (WH)

The pull-up resistance is not integrated. The maximum current at the Hall sensors is 30 mA.

RECM 375/4

Dimensional drawing

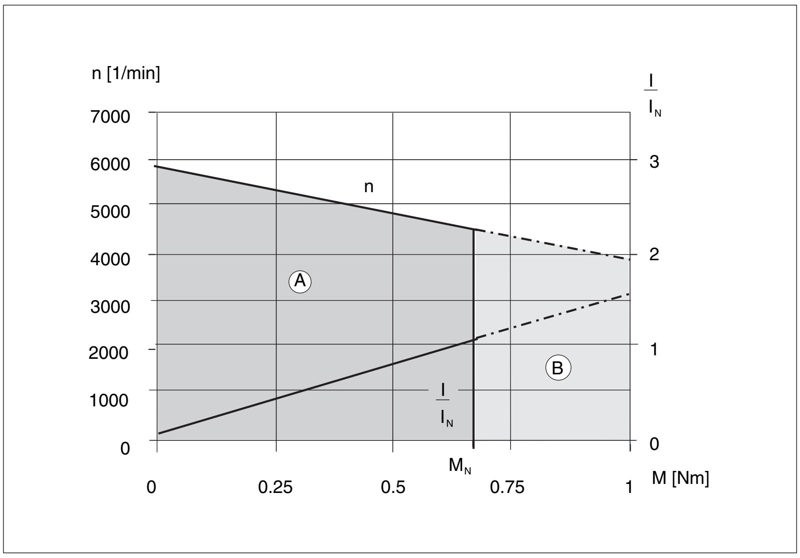


Dimensional drawing RECM 375/4

Technical Data

DC bus voltage U_{DC}	V	48	60	325
Number of pole pairs p		4	4	4
Nominal power P_N	W	310	310	320
Nominal torque M_N	Nm	0.68	0.68	0.68
Nominal speed n_N	1/min	4350	4350	4500
Nominal current I_N	A	8.42	6.7	1.3
Nominal current $\hat{i}_N$	A	10.31	8.2	1.6
No-load speed n_0	1/min	5850	5850	6050
No-load current I_0	A	0.63	0.51	0.10
Continuous holding torque M_{d0}	Nm	0.88	0.88	0.88
Continuous holding current I_{d0}	A	11.10	9.1	1.9
Max. continuous holding current $\hat{i}_{d0}$	A	13.59	11.1	2.3
Max. torque M_{max}	Nm	2.10	2.10	2.10
Max. current I_{max}	A	27.4	21.9	4.2
Detent torque M_S	Nm	0.045	0.045	0.045
Torque constant (M_{d0}/$\hat{i}_{d0}$) k_M	Nm/A	0.065	0.079	0.379
Generator voltage constant k_{Ett}	mV/(1/min)	5.848	7.311	38.015
Terminal resistance R_{tt}	Ω	0.18	0.25	5.52
Terminal inductivity L_{tt}	mH	0.778	1.215	32.854
Rotor inertia J_R	g cm^2	510	510	510
Heat resistance (winding/surface) R_{th1}	K/W	0.42	0.42	0.42
Ambient temperature	°C	-25 ... 40	-25 ... 40	-25 ... 40
Max. permissible radial shaft load F_q	N	80	80	80
Max. permissible axial shaft load F_a	N	30	30	30
Mass m	kg	1.7	1.7	1.7
Vibration strain as per DIN EN 60068-2-6	m/s²	20		
Degree of protection as per DIN EN 60592		IP 41	IP 41	IP 41
Heat class as per DIN EN 60034-1		155 (F)	155 (F)	155 (F)

Characteristic curves

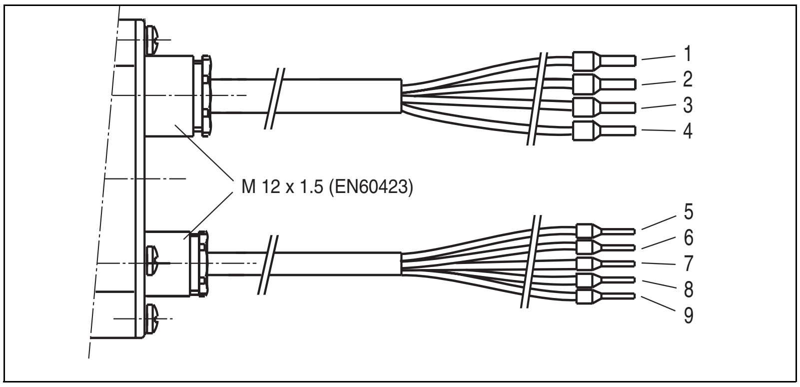


Torque characteristic RECM 375/4

(A) S1: continuous operation

(B) S2 ... S9: Short-term operation

Motor connection



Terminal assignment

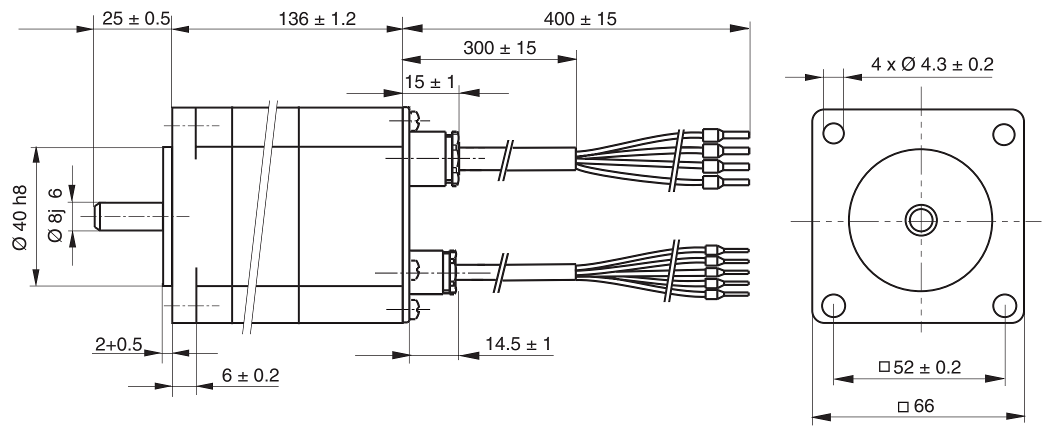
Pin	Motor cable	Colour
1	U	orange (OR)
2	V	black (BK)
3	W	white (WS)
4	PE	yellow/green (GN/YE)

Pin	Motor cable	Colour
5	Power supply 5 V … 18 V	red (RD)
6	Power supply GND	blue (BU)
7	Hall U	orange (OR)
8	Hall V	black (BK)
9	Hall W	white (WH)

The pull-up resistance is not integrated. The maximum current at the Hall sensors is 30 mA.

RECM 377/2

Dimensional drawing

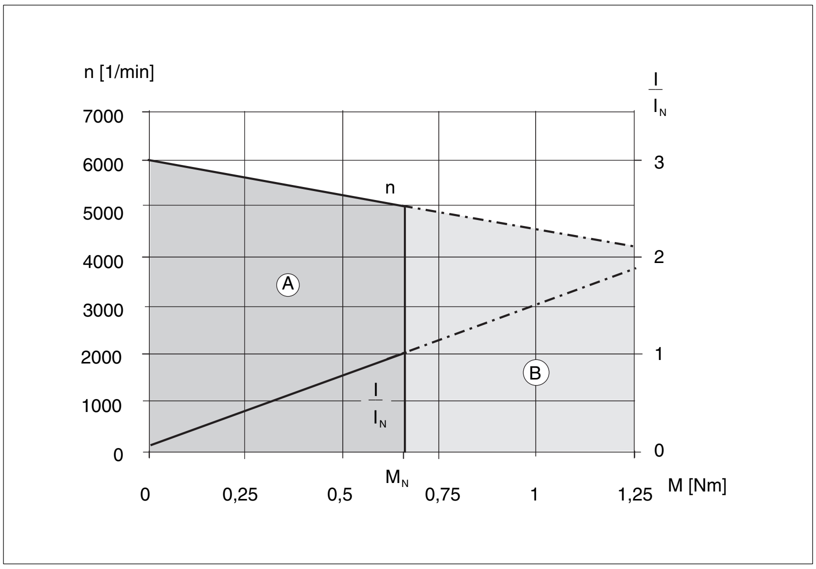


Dimensional drawing RECM 377/2

Technical Data

DC bus voltage U_{DC}	V	48	60	325
Number of pole pairs p		2	2	2
Nominal power P_N	W	350	370	360
Nominal torque M_N	Nm	0.67	0.67	0.67
Nominal speed n_N	1/min	5000	5300	5200
Nominal current I_N	A	8.91	8.0	1.4
Nominal current $\hat{i}_N$	A	10.92	9.8	1.8
No-load speed n_0	1/min	6000	6350	6250
No-load current I_0	A	1.24	1.12	0.20
Continuous holding torque M_{d0}	Nm	1.08	1.08	1.08
Continuous holding current I_{d0}	A	14.33	13.0	2.5
Max. continuous holding current $\hat{i}_{d0}$	A	17.55	15.9	3.1
Max. torque M_{max}	Nm	2.80	2.80	2.80
Max. current I_{max}	A	38.2	32.4	5.9
Detent torque M_S	Nm	0.211	0.211	0.211
Torque constant ($M_{d0}/\hat{i}_{d0}$) k_M	Nm/A	0.062	0.068	0.352
Generator voltage constant k_{Ett}	mV/(1/min)	5.616	6.607	36.341
Terminal resistance R_{tt}	Ω	0.16	0.21	5.08
Terminal inductivity L_{tt}	mH	0.643	0.891	26.940
Rotor inertia J_R	g cm^2	680	680	680
Heat resistance (winding/surface) R_{th1}	K/W	0.31	0.31	0.31
Ambient temperature	°C	-25 ... 40	-25 ... 40	-25 ... 40
Max. permissible radial shaft load F_q	N	80	80	80
Max. permissible axial shaft load F_a	N	30	30	30
Mass m	kg	2.05	2.05	2.05
Vibration strain as per DIN EN 60068-2-6	m/s²	20		
Degree of protection as per DIN EN 60592		IP 41	IP 41	IP 41
Heat class as per DIN EN 60034-1		155 (F)	155 (F)	155 (F)

Characteristic curves

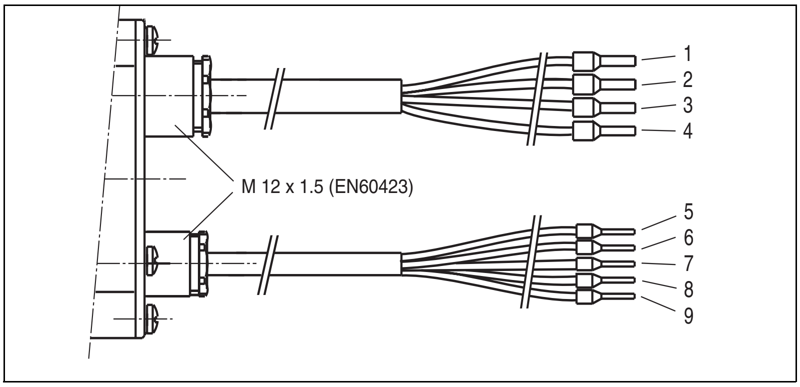


Torque characteristic RECM 377/2

(A) S1: continuous operation

(B) S2 ... S9: Short-term operation

Motor connection



Terminal assignment

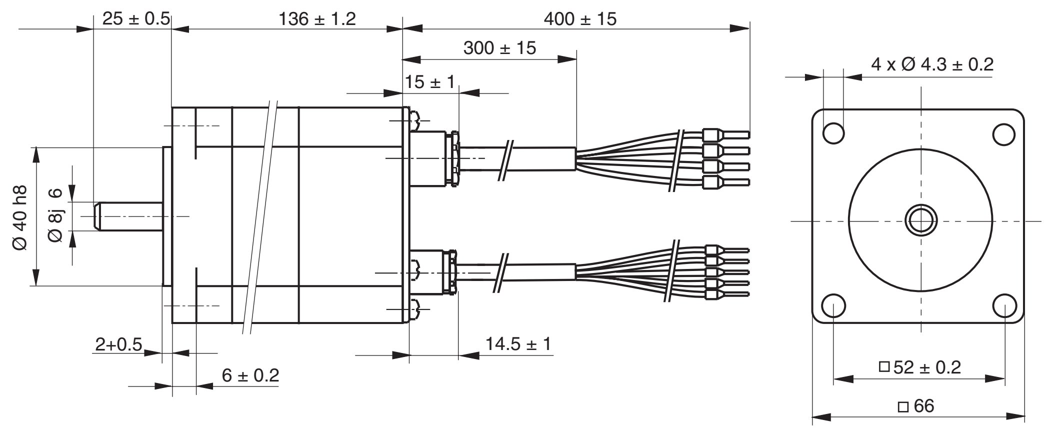
Pin	Motor cable	Colour
1	U	orange (OR)
2	V	black (BK)
3	W	white (WS)
4	PE	yellow/green (GN/YE)

Pin	Motor cable	Colour
5	Power supply 5 V … 18 V	red (RD)
6	Power supply GND	blue (BU)
7	Hall U	orange (OR)
8	Hall V	black (BK)
9	Hall W	white (WH)

The pull-up resistance is not integrated. The maximum current at the Hall sensors is 30 mA.

RECM 377/4

Dimensional drawing

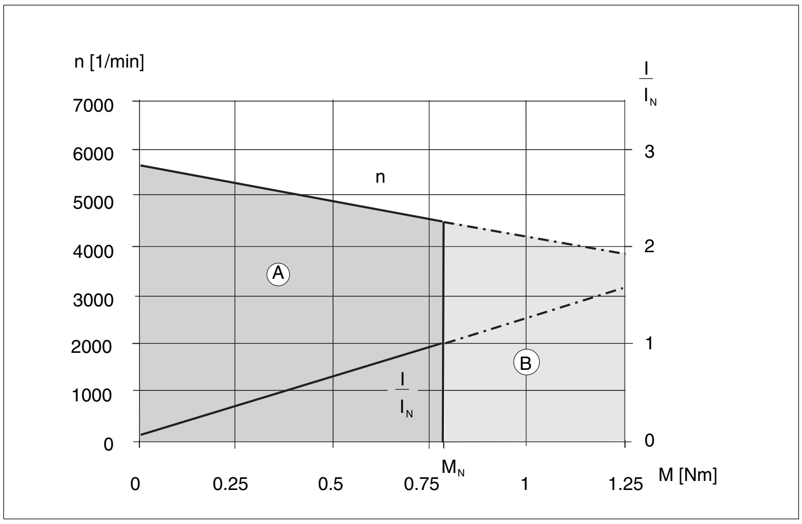


Dimensional drawing RECM 377/4

Technical Data

DC bus voltage U_{DC}	V	48	60	325
Number of pole pairs p		4	4	4
Nominal power P_N	W	370	360	340
Nominal torque M_N	Nm	0.80	0.80	0.80
Nominal speed n_N	1/min	4450	4350	4100
Nominal current I_N	A	9.94	7.7	1.3
Nominal current $\hat{i}_N$	A	12.17	9.4	1.5
No-load speed n_0	1/min	5850	5750	5400
No-load current I_0	A	0.83	0.64	0.10
Continuous holding torque M_{d0}	Nm	1.09	1.09	1.09
Continuous holding current I_{d0}	A	13.69	11.0	2.0
Max. continuous holding current $\hat{i}_{d0}$	A	16.76	13.5	2.4
Max. torque M_{max}	Nm	2.80	2.80	2.80
Max. current I_{max}	A	36.5	28.8	5.0
Detent torque M_S	Nm	0.060	0.060	0.060
Torque constant ($M_{d0}/\hat{i}_{d0}$) k_M	Nm/A	0.065	0.081	0.453
Generator voltage constant k_{Ett}	mV/(1/min)	5.848	7.408	42.888
Terminal resistance R_{tt}	Ω	0.15	0.21	5.08
Terminal inductivity L_{tt}	mH	0.577	0.849	29.949
Rotor inertia J_R	g cm^2	680	680	680
Heat resistance (winding/surface) R_{th1}	K/W	0.31	0.31	0.31
Ambient temperature	°C	-25°C...40°C	-25°C...40°C	-25°C...40°C
Max. permissible radial shaft load F_q	N	80	80	80
Max. permissible axial shaft load F_a	N	30	30	30
Mass m	kg	2.05	2.05	2.05
Vibration strain as per DIN EN 60068-2-6	m/s²	20		
Degree of protection as per DIN EN 60592		IP 41	IP 41	IP 41
Heat class as per DIN EN 60034-1		155 (F)	155 (F)	155 (F)

Characteristic curves

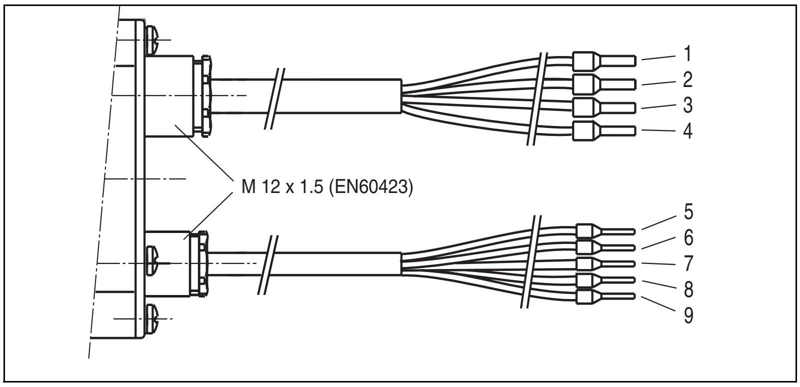


Torque characteristic RECM 377/4

(A) S1: continuous operation

(B) S2 ... S9: Short-term operation

Motor connection



Terminal assignment

Pin	Motor cable	Colour
1	U	orange (OR)
2	V	black (BK)
3	W	white (WS)
4	PE	yellow/green (GN/YE)

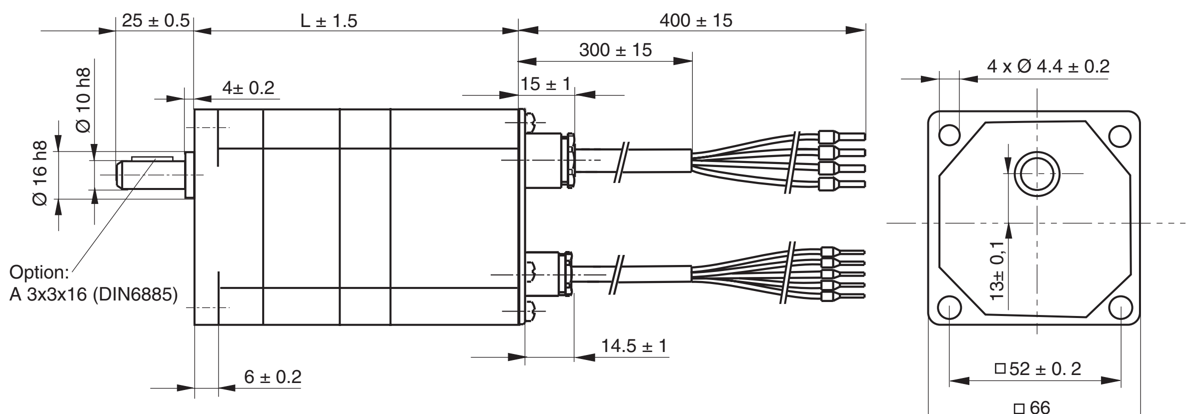
Pin	Motor cable	Colour
5	Power supply 5 V … 18 V	red (RD)
6	Power supply GND	blue (BU)
7	Hall U	orange (OR)
8	Hall V	black (BK)
9	Hall W	white (WH)

The pull-up resistance is not integrated. The maximum current at the Hall sensors is 30 mA.

RECM 37• options

RECM 37• with spurwheel gearbox HL

Dimensional drawing



	RECM 372•	RECM 374•
L	130	148

Dimensional drawing of RECM 37• with spur wheel gear HL

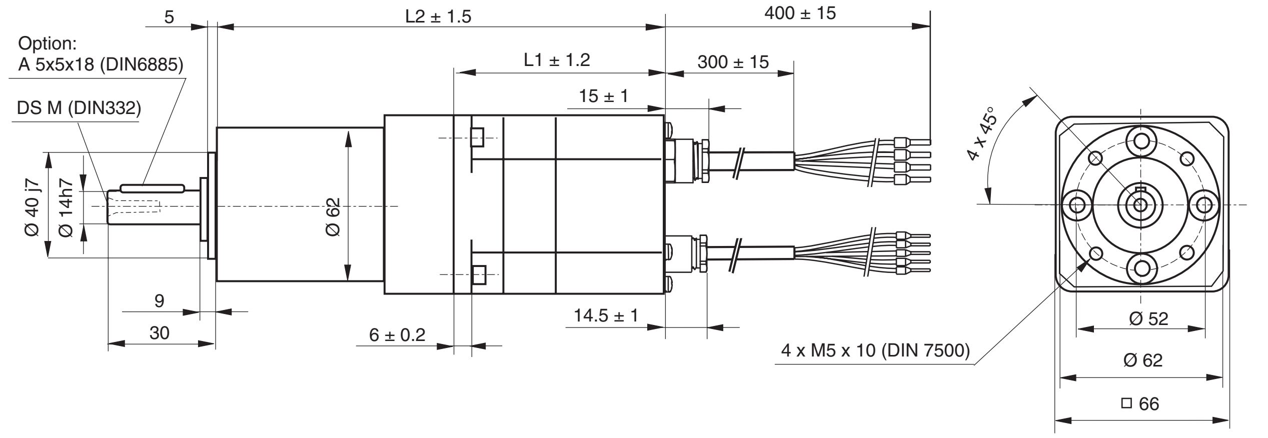
Technical Data

Gear ratio		7	18	38	54	115
Gear stages		2	3	3	4	4
Max. continuous torque	Nm	2.5	3.5	6	6	8
Efficiency	%	85	80	80	75	75
Permissible radial force	N	200	200	200	200	200
Permissible axial force	N	10	10	10	10	10
Housing and teeth		Steel				
Drive shaft		Hardened smooth or with feather key DIN 6885				
Seal at shaft exit		Shaft seal ring IP54				
Max. recommended input speed	1/min	2500				
Maximum torsional backlash	°	< 1.5	< 1			
Operating temperature	°C	-15 … +65				
Expected service life	h	average 2500, depending on load profile				

Note: The HL spur wheel gear cannot be combined with the holding brake.

RECM 37• with planetary gearbox PM62

Dimensional drawing



	RECM 372•	RECM 374•	RECM 375•	RECM 377•
L1	82	100	118	136
L2 1-stage	173	191	209	227
L2 2-stage	189	207	225	243
L2 3-stage	205	223	241	259

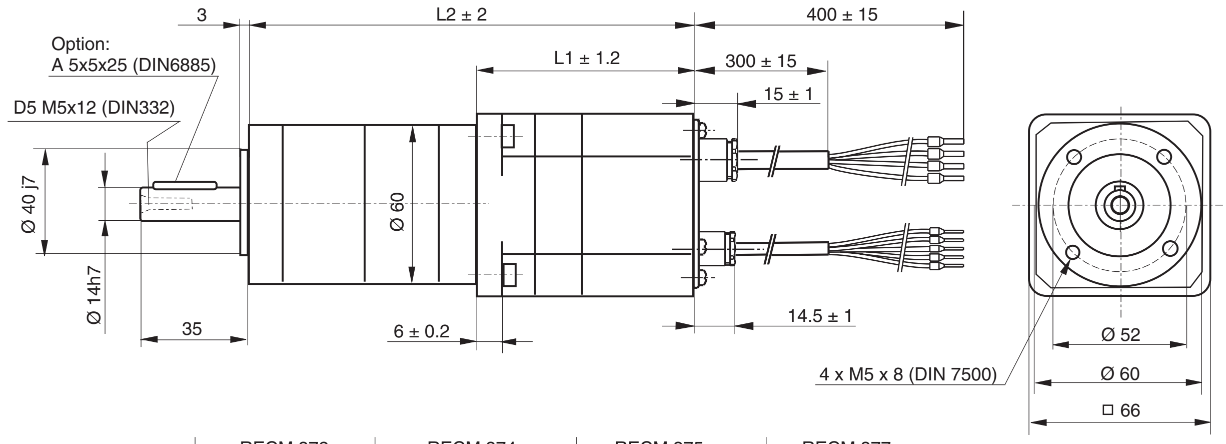
Dimensional drawing RECM 37• with planetary gear PM62

Technical Data

Gear ratio		**7**	**16**	**25**	**93**	**115**	**308**
Gear stages		1	2	2	3	3	3
Max. continuous torque	Nm	8	25	25	50	50	50
Efficiency	%	80	75	75	70	70	70
Permissible radial force	N	240	360	360	520	520	520
Permissible axial force	N	50	70	70	120	120	120
Housing and teeth		Steel					
Drive shaft		Hardened smooth or with feather key DIN 6885					
Seal at shaft exit		Shaft seal ring IP54					
Max. recommended input speed	1/min	2500					
Maximum torsional backlash	°	1.0	1.5		2.0		
Operating temperature	°C	-30 … +140					
Expected service life	h	average 3500, depending on load profile					

RECM 37• with planetary gearbox PLE60

Dimensional drawing



	RECM 372•	RECM 374•	RECM 375•	RECM 377•
L1	82	100	118	136
L2 1-stage	157	175	193	211
L2 2-stage	169	187	205	223
L2 3-stage	182	200	218	236

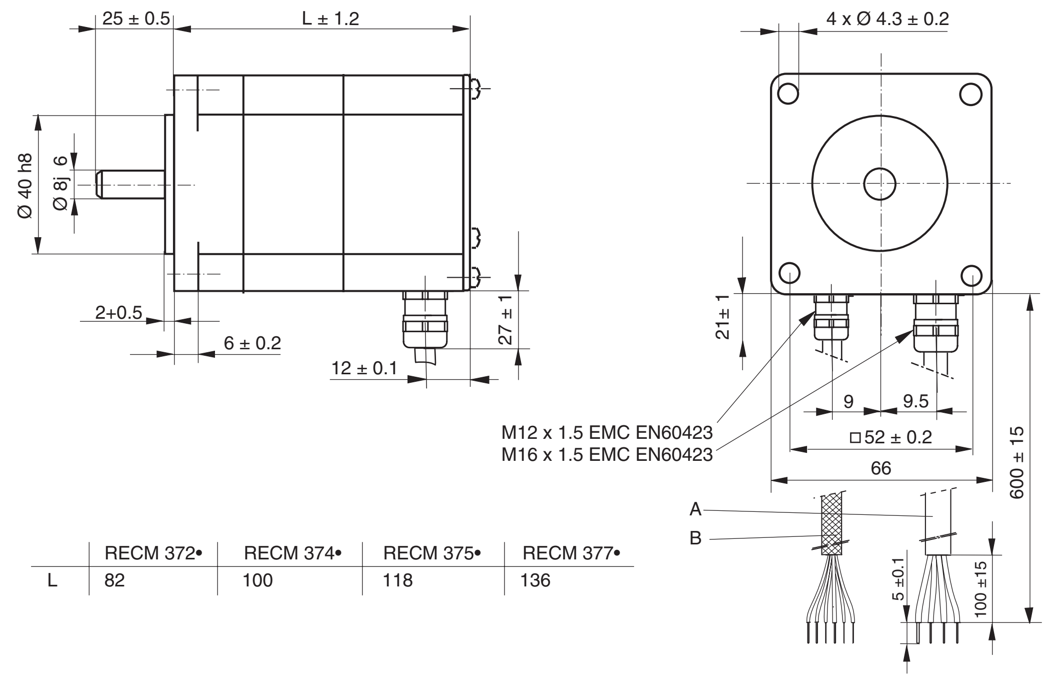
Dimensional drawing RECM 37• with planetary gear PLE 60

Technical Data

Gear ratio		**16**	**40**	**60**	**120**
Gear stages		2	2	3	3
Max. continuous torque	Nm	44	44	40	40
Efficiency	%	94	94	90	90
Permissible radial force	N	500	500	500	500
Permissible axial force	N	600	600	600	600
Housing and teeth		Steel			
Bearings		Roller bearing			
Drive shaft		Hardened smooth or with feather key DIN 6885			
Seal at shaft exit		Shaft sealing ring IP54			
Max. recommended input speed	1/min	3000			
Maximum torsional backlash	°	0.58		0.67	
Operating temperature	°C	-25 … +120			
Expected service life	h	average 10000, depending on load profile			

RECM 37• with encoder

Dimensional drawing



	RECM 372•	RECM 374•	RECM 375•	RECM 377•
L	82	100	118	136

Dimensional drawing RECM 37• with encoder

(A) Motor connection, Helucabel JZ-602-CY, 4 x AWG 18
motor U black 1 (BK1)
motor V black 2 (BK2)
motor W black 3 (BK3)
PE earth green/yellow (GN/YE)

(B) Encoder connection

Encoder

The RECM 37• motors can be supplied with a digital encoder as an option. This encoder is an optical incremental encoder with the following features:

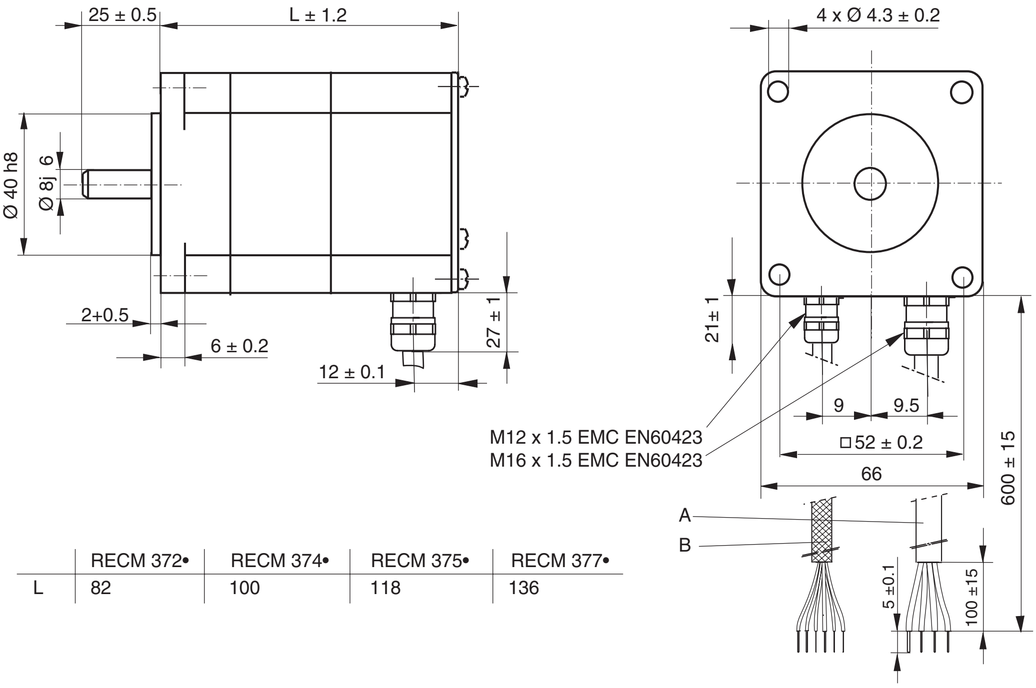
- Encoder integrated in motor
- Second shaft end available on request
- Line count 500 / 1000 / 1024
- With 4 or 8-pin commutation signals
- Hall sensor connections included in encoder connection

Technical Data

Output signals		5V Open Collector or RS 422
Operating temperature	°C	-40°C ... +120°C
Max. speed	1/min	12000 1/min

RECM 37• with resolver

Dimensional drawing



	RECM 372•	RECM 374•	RECM 375•	RECM 377•
L	82	100	118	136

Dimensional drawing RECM 37• with resolver

(A) Motor connection, Helucabel JZ-602-CY, 4 x AWG 18

(B) Resolver connection Unitronic-LIYC (TP) 6 x AWG 26

Resolver

The RECM 37• motors can be supplied with an analogue resolver as an option. This resolver is a magnetic encoder with the following features:

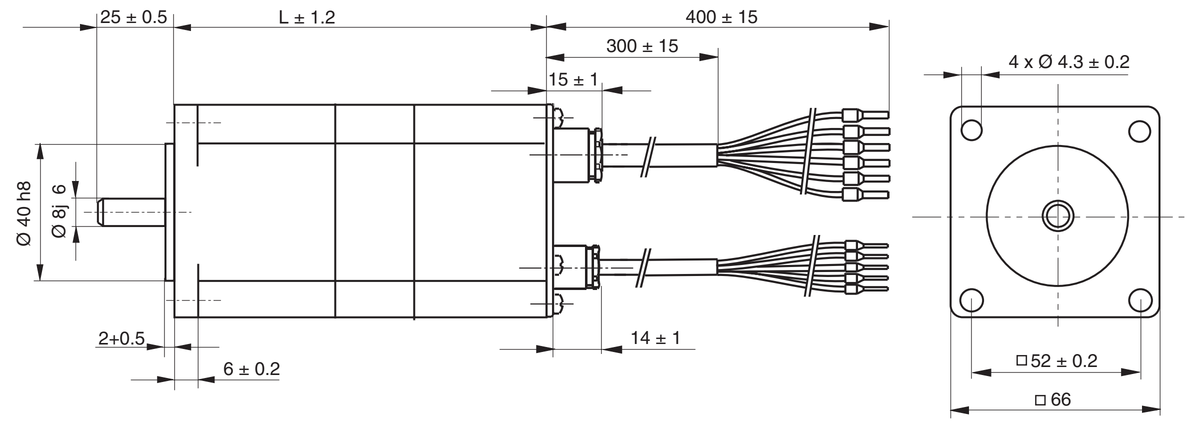
- Resolver integrated in motor
- Second shaft end available on request
- Number of pole pairs p=1
- Hall sensor connections included in resolver connection

Technical Data

Output signals		5V Open Collector or RS 422
Operating temperature	°C	-40°C ... +120°C
Max. speed	1/min	12000 1/min

RECM 37• with holding brake

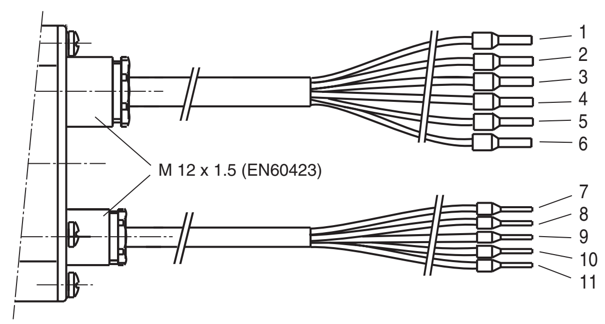
Dimensional drawing



	RECM 372•	RECM 374•	RECM 375•	RECM 377•
L	116	134	152	170

Dimensional drawing RECM 37• with holding brake

Motor connection



Terminal assignment RECM 37• with holding brake

Pin	Connection	Wire colour as per DIN IEC 757	Wire colour
Motor cable			
1	U	OR	orange
2	V	BK	black
3	W	Ws	white
4	PE	GN/YE	yellow/green
Holding brake cable			
5	Power supply 24 V	RD	red
6	Power supply GND	BU	blue
Signal cable			
7	Power supply 5 … 18 V	RD	red
8	Power supply GND	BU	blue
9	Hall U	OR	orange
10	Hall V	BK	black
11	Hall W	WH	white

The pull-up resistance is not integrated. The maximum current at the Hall sensors is 30 mA.

Holding brake

The RECM 37• motors can be supplied with a holding brake as an option. The holding brake is an electromagnetic sprung brake for holding the motor axis.
Features:

- Brake integrated in motor
- Holds the motor in position at standstill (no service brake)
- For safety after switching off the motor current, e.g. on EMERGENCY STOP (current = open, no current = closed)

Note: the holding brake cannot be combined with the HL spur wheel gear.

Technical Data

Rated currency	V	24 V
Rated Power	W	7.5 W
Ambient temperature	°C	-5°C ... +120°C
Holding torque M_H	Nm	1.1 Nm
Max. speed	1/min	10.000 1/min
Mass	kg	0.23 kg

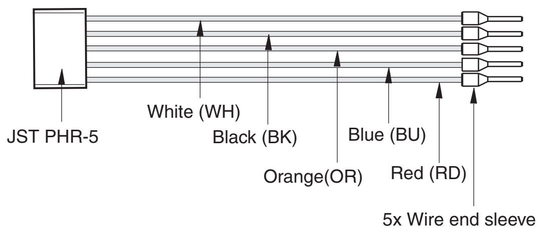
RECM 37• type code

Example:	**RECM**	**3**	**7**	**2**	**/**	**4**	**D**	**024**	**5**	**S**	**H**	**0**	**A**	**B**	**100**	**0**	**M**	**00**	**000**	**00**
Product family RECM = Reversible Electronic Commutated Motor	**RECM**	3	7	2	/	4	D	024	5	S	H	0	A	B	100	0	M	00	000	00
Number of phases 3 = 3 phase	RECM	**3**	7	2	/	4	D	024	5	S	H	0	A	B	100	0	M	00	000	00
Motor size 7 = 65 mm	RECM	3	**7**	2	/	4	D	024	5	S	H	0	A	B	100	0	M	00	000	00
Motor length 2 = stator package 18 mm 4 = stator package 36 mm 5 = stator package 54 mm 7 = stator package 72 mm	RECM	3	7	**2**	**/**	4	D	024	5	S	H	0	A	B	100	0	M	00	000	00
Number of pole pairs 2 = 2 pole pairs 4 = 4 pole pairs	RECM	3	7	2	/	**4**	**D**	024	5	S	H	0	A	B	100	0	M	00	000	00
Type of DC bus voltage D = DC	RECM	3	7	2	/	4	**D**	024	5	S	H	0	A	B	100	0	M	00	000	00
DC bus voltage 024 = 24 V 048 = 48 V 060 = 60 V 325 = 325 V	RECM	3	7	2	/	4	D	**024**	5	S	H	0	A	B	100	0	M	00	000	00
Winding type 5 = medium speed of rotation	RECM	3	7	2	/	4	D	024	**5**	S	H	0	A	B	100	0	M	00	000	00
Winding circuit S = star	RECM	3	7	2	/	4	D	024	5	**S**	H	0	A	B	100	0	M	00	000	00
Feedback System E = encoder H = Hall sensor R = resolver	RECM	3	7	2	/	4	D	024	5	S	**H**	0	A	B	100	0	M	00	000	00
Resolution of feedback system 0 = standard	RECM	3	7	2	/	4	D	024	5	S	H	**0**	A	B	100	0	M	00	000	00
Electrical connections A = braided wires	RECM	3	7	2	/	4	D	024	5	S	H	0	**A**	B	100	0	M	00	000	00
Electrical connections - position B = connection rear	RECM	3	7	2	/	4	D	024	5	S	H	0	A	**B**	100	0	M	00	000	00
Electrical connections - braided wires/cable length 040 = 400 mm	RECM	3	7	2	/	4	D	024	5	S	H	0	A	B	**100**	0	M	00	000	00
Shaft model 0 = smooth shaft, without gearbox K = gearbox with parallel key S = gearbox with smooth shaft	RECM	3	7	2	/	4	D	024	5	S	H	0	A	B	100	**0**	M	00	000	00
Holding torque and holding brake1) 0 = min. holding torque, without brake B = min. holding torque, with brake 9 = max. holding torque, without brake M = max. holding torque, with brake	RECM	3	7	2	/	4	D	024	5	S	H	0	A	B	100	0	**M**	00	000	00
Gearbox type 00 = without gearbox 1V = spur wheel gear HL 1) QY = planetary gear PM62 A2 = planetary gear PLE60	RECM	3	7	2	/	4	D	024	5	S	H	0	A	B	100	0	M	**00**	000	00
Gear ratio 000 = without gearbox with spur wheel gear HL (gearbox type 1V) 007=7:1, 018 = 18:1, 038 = 38:1, 054 = 54:1, 115 = 115:1 with planetary gear PM62 (gearbox type QY): 007 = 7:1, 016 = 16:1, 025 = 25:1, 093 = 93:1, 115 = 115:1, 308 = 308:1 with planetary gear PLE60 (gearbox type: A2) 016 = 16:1, 040 = 40:1, 060 = 60:1, 120 = 120:1	RECM	3	7	2	/	4	D	024	5	S	H	0	A	B	100	0	M	00	**000**	00
Degree of protection 00 = IP41	RECM	3	7	2	/	4	D	024	5	S	H	0	A	B	100	00	M	0	000	**00**

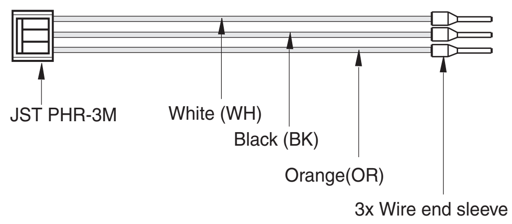
(1)The holding brake cannot be combined with the HL spur wheel gear.

Accessories

Motor cable for RECM 34• motors



Connector cable for Hall sensors for RECM 34•



Connector cable for motor power supply for RECM 34•

Order data – general overview			
Designation	**Description**		**Order number**
Motor cable for RECM34•			
Connector cable for Hall sensors	Sensor line in wire version, motor side with 5-pin flat connector and wire-end ferrules at the free end for connecting the Hall sensors.	0.3 m	**139103112**
Connector cable for Hall sensors		3 m	**139103278**
Connector cable for motor power supply	Motor line in wire version, motor side with 3-pin flat connector and wire-end ferrules at the free end for connecting the motor power supply.	0.3 m	**139103111**
Connector cable for motor power supply		3 m	**139103279**
Adapter plate	For mounting on top-hat rail		**MNA 3MF DINR1**
EMC kit	For shield connection of shielded lines		**MNA 3CS 013**
Braking Resistor Controller UBC	For connection of a braking resistor to protect the device from overvoltage.		**ACC3EA001**
Holding brake controller	TL-HBC VW3M3103		**0162501532010**
Connector set with spring-tension terminals	2, 4, 6, and 10-pin spring connectors		**MNA 3CS 007**

Power supply units for BLV

Power supply units can be purchased from Telemecanique (www.telemecanique.com).

The stabilised power supply units of the ABL1 and ABL2 series are suitable.

Conversion tables

Rotor inertia

	lb·in^2	lb·ft^2	lb·in·s^2	lb·ft·s^2 slug·ft^2	kg·cm^2	kg·cm·s^2	g·cm^2	g·cm·s^2	oz·in^2	oz·in·s^2
lb·in^2	–	6.94 x 10^{-3}	2.59 x 10^{-3}	2.15 x 10^{-4}	2.926	2.98 x 10^{-3}	2.92 x 10^{3}	2.984	16	4.14 x 10^{-2}
lb·ft^2	144	–	0.3729	3.10 x 10^{-2}	421.40	0.4297	4.21 x 10^{5}	429.71	2304	5.967
lb·in·s^2	386.08	2.681	–	8.33 x 10^{-2}	1.129 x 10^{3}	1.152	1.129 x 10^{6}	1.152 x 10^{3}	6.177 x 10^{3}	16
lb·ft·s^2 slug·ft^2	4.63 x 10^{3}	32.17	12	–	1.35 x 10^{4}	13.825	1.355 x 10^{7}	1.38 x 10^{4}	7.41 x 10^{4}	192
kg·cm^2	0.3417	2.37 x 10^{-3}	8.85 x 10^{-4}	7.37 x 10^{-6}	–	1.019 x 10^{-3}	1000	1.019	5.46	1.41 x 10^{-2}
kg·cm·s^2	335.1	2.327	0.8679	7.23 x 10^{-2}	980.66	–	9.8 x 10^{5}	1000	5.36 x 10^{3}	13.887
g·cm^2	3.417 x 10^{-4}	2.37 x 10^{-6}	8.85 x 10^{-7}	7.37 x 10^{-8}	1 x 10^{-3}	1.01 x 10^{-6}	–	1.01 x 10^{-3}	5.46 x 10^{-3}	1.41 x 10^{-6}
g·cm·s^2	0.335	2.32 x 10^{-3}	8.67 x 10^{-4}	7.23 x 10^{-5}	0.9806	1 x 10^{-3}	980.6	–	5.36	1.38 x 10^{-2}
oz·in^2	0.0625	4.3 x 10^{-4}	1.61 x 10^{-6}	1.34 x 10^{-6}	0.182	1.86 x 10^{-4}	182.9	0.186	–	2.59 x 10^{-3}
oz·in·s^2	24.3	0.1675	6.25 x 10^{-2}	5.20 x 10^{-3}	70.615	7.20 x 10^{-2}	7.06 x 10^{4}	72	386.08	–

Torque

	lb·in	lb·ft	oz·in	Nm	kg·m	kg·cm	g·cm	dyne·cm
lb·in	–	8.333 x 10^{-2}	16	0.113	1.152 x 10^{-2}	1.152	1.152 x 10^{3}	1.129 x 10^{6}
lb·ft	12	–	192	1.355	0.138	13.825	1.382 x 10^{4}	1.355 x 10^{7}
oz·in	6.25 x 10^{-2}	5.208 x 10^{-3}	–	7.061 x 10^{-3}	7.200 x 10^{-4}	7.200 x 10^{-2}	72.007	7.061 x 10^{4}
Nm	8.850	0.737	141.612	–	0.102	10.197	1.019 x 10^{4}	1 x 10^{7}
kg·m	86.796	7.233	1.388 x 10^{3}	9.806	–	100	1 x 10^{5}	9.806 x 10^{7}
kg·cm	0.8679	7.233 x 10^{-2}	13.877	9.806 x 10^{-2}	10^{-2}	–	1000	9.806 x 10^{5}
g·cm	8.679 x 10^{-4}	7.233 x 10^{-5}	1.388 x 10^{-2}	9.806 x 10^{-5}	1 x 10^{-5}	1 x 10^{-3}	–	980.665
dyne·cm	8.850 x 10^{-7}	7.375 x 10^{-8}	1.416 x 10^{-5}	10^{-7}	1.019 x 10^{-8}	1.0197 x 10^{-6}	1.019 x 10^{-6}	–

Power

	H.P.	W
H.P.	–	745.7
W	1.31 x 10^{-3}	–

Length

	in	ft	yd	m	cm	mm
in	–	0.0833	0.028	0.0254	2.54	25.4
ft	12	–	0.333	0.3048	30.48	304.8
yd	36	3	–	0.914	91.44	914.4
m	39.37	3.281	1.09	–	100	1000
cm	0.3937	0.03281	1.09 x 10^{-2}	0.01	–	10
mm	0.03937	0.00328	1.09 x 10^{-3}	0.001	0.1	–

Speed

	1/min (1/min)	rad/sec	deg./sec
1/min (1/min)	–	0.105	6.0
rad/sec	9.55	–	57.30
deg./sec	0.167	1.745 x 10^{-2}	–

Mass

	lb	oz	slug	kg	g
lb	–	16	0.0311	0.453592	453.592
oz	6.35 x 10^{-2}	–	1.93 x 10^{-3}	0.028349	28.35
slug	32.17	514.8	–	14.5939	1.459 x 10^{4}
kg	2.20462	35.274	0.0685218	–	1000
g	2.205 x 10^{-3}	3.527 x 10^{-3}	6.852 x 10^{-5}	0.001	–

Temperature

	°F	°C
°F	–	(ϑ - 32) x $^5/_9$
°C	ϑ ¾ $^9/_5$ + 32	–

Force

	lb	oz	gf	dyne	N
lb	–	16	453.592	4.448 x 10^{5}	4.4482
oz	0.0625	–	28.35	2.780 x 10^{4}	0.27801
gf	2.205 x 10^{-3}	0.03527	–	980.665	N.A.
dyne	2.248 x 10^{-6}	3.59 x 10^{-6}	1.02 x 10^{-3}	–	0.0001
N	0.22481	3.5967	N.A.	100.000	–

Example for conversion:
Conversion of 10 inches to metres. Search for "in" (inches) in the left column of the "length" table and "m" (metres) in the header row. The table cell at the intersection of column and row shows the conversion factor: "0.0254". Multiply 10 inches by 0.0254 and the answer is the value in metres: 10 in x 0.0254 = 0.254 m.

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