Automation and control

Soft starters and variable speed drives

Catalogue

2007/2008

a brand of Schneider Electric

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N° 802625 - MKTED204072EN

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..... all Automation & Control functions

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Filtered rectified power supplies and transformers

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Safety solutions using Preventa
N° 816630 - MKTED206051EN

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Safety monitors and controllers on AS-Interface

Switches, light curtains, mats

Emergency stops, control stations, enabling switches, foot switches, beacons & indicator banks

Optimum and universal controllers

Switch disconnectors, thermal-magnetic motor circuit breakers, enclosed D.O.L. starters

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Interfaces, I/O splitter boxes and power supplies
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Discrete interfaces
Pre-wired interfaces
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Modules for automation island
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power distribution, digital I/O, analogs and application-specific

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AS-Interface cabling system
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AS-Interface power supplies

Motor controllers, enclosures, variable speed drives

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Software to design and install AS-Interface system, safety monitors and controllers on AS-Interface programming software

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Ethernet communication services

Connecting Ethernet devices

Transparent Ready partners

CANopen
in machines & installations
N° 813350 - MKTED205101EN

CANopen implementations

Telemecanique devices

Infrastructure, wiring system

CANopen partners

Soft starters and variable speed drives

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Soft starters for asynchronous motors

Applications		Starting simple machines	Soft starting and deceleration of simple machines
			
Power range for 50…60 Hz supply (kW)		**0.37…11**	**0.75…75**
	Single phase 110…230 V (kW)	0.37…2.2	–
	3-phase 200…240 V (kW)	–	0.75…7.5
	3-phase 200…480 V (kW)	0.37…11	–
	3-phase 230…415 V (kW)	–	–
	3-phase 208…690 V (kW)	–	–
	3-phase 230…690 V (kW)	–	7.5…75
	3-phase 380…415 V (kW)	–	1.5…15
	3-phase 400 V (kW)	–	22…45
Drive	Output frequency	–	
	Type of control	–	
	Transient overtorque	–	
Functions			
Number of functions		1	
Number of preset speeds		–	
Number of I/O	Analog inputs	–	
	Logic inputs	–	
	Analog outputs	–	
	Logic outputs	–	
	Relay outputs	–	
Communication	Integrated	–	
	Available as an option	Combined with TeSys U controller-starter	
Standards and certifications		IEC/EN 60947-4/2 CE, UL, CSA, C-Tick, CCC, GOST	
References		**ATS 01N1●●FT**	**ATS 01N2●●●●**
Pages		1/8	

Soft starting and deceleration of pumping and ventilation machines

3…900	
–	–
–	–
–	–
3…710	–
–	3…900
–	–
–	–
–	–

–
TCS (Torque Control System)
–

36
–
1 PTC probe
4
1
2
3

Modbus
Fipio, Profibus DP, DeviceNet, Ethernet TCP/IP

IEC/EN 60947-4-2, EMC class A or B CE, UL, CSA, DNV, C-Tick, GOST, CCC, NOM 117, SEPRO, TCF

ATS 48●●●Q	**ATS 48●●●Y**
1/40 to 1/43	

Soft starters for asynchronous motors
Altistart 01

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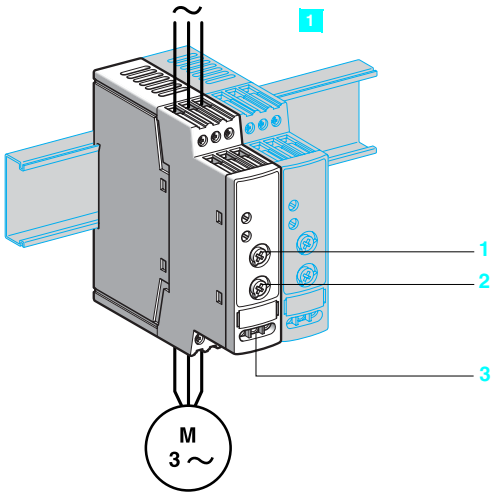

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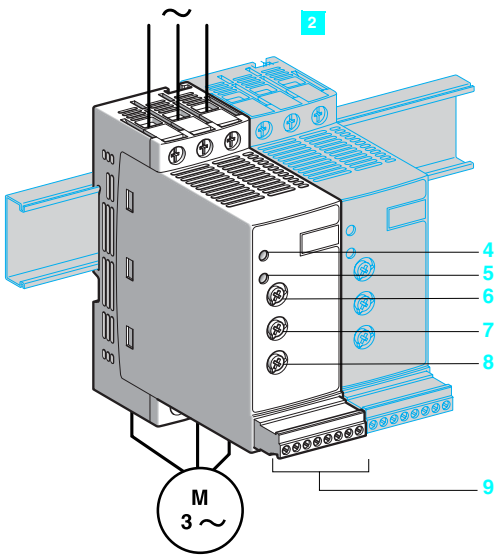


Presentation

The Altistart 01 soft starter operates either as a torque limiter on starting, or as a soft start/soft stop unit for asynchronous motors.
Using the Altistart 01 starter enhances the starting performance of asynchronous motors by allowing them to start gradually, smoothly and in a controlled manner. It prevents mechanical shocks, which lead to wear and tear, and subsequent maintenance work and production downtime.
The Altistart 01 limits the starting torque and current peaks on starting on machines which do not require a high starting torque.
It is designed for the following simple applications:
- Conveyors
- Conveyor belts
- Pumps
- Fans
- Compressors
- Automatic doors and gates
- Small cranes
- Belt-driven machinery, etc.

The Altistart 01 is compact, easy to install and can be mounted side-by-side. It complies with standards IEC/EN 60947-4-2, carries UL, CSA, C-Tick, CCC and GOST certifications and CE marking.
The Altistart 01 soft start/soft stop unit offer comprises 3 ranges:

■ 1 **ATS 01N1●●●** soft starters
□ Control one phase of the motor power supply (single phase or three phase) to limit the starting torque
□ Internal bypass relay
□ Motor power ratings ranging from 0.37 kW to 11 kW
□ Motor supply voltages ranging from 110 V to 480 V, 50/60 Hz. An external power supply is required for controlling the starter.
A contactor is always required to switch off the motor.

■ 2 **ATS 01N2●●●** soft start/soft stop units
□ Control two phases of the motor power supply to limit the starting current and for deceleration
□ Internal bypass relay
□ Motor power ratings ranging from 0.75 kW to 75 kW
□ The motor supply voltages are as follows: 230 V, 400 V, 480 V and 690 V, 50/60 Hz
The use of a line contactor is not necessary on machines where electrical isolation is not required.

■ **ATSU 01N2●●●** soft start/soft stop units
See pages 1/20 and 1/27.

Description

■ Altistart 01 soft starters (ATS 01N1●●●) are equipped with:
□ A potentiometer 1 for setting the starting time
□ A potentiometer 2 for adjusting the start voltage threshold according to the motor load
□ Two inputs 3:
- One 24 V ⎓ input or one 110…240 V ∿ for powering the control part that controls the motor

■ Altistart 01 soft start/soft stop units (ATS 01N2●●●) are equipped with:
□ A potentiometer 6 for setting the starting time
□ A potentiometer 8 for setting the deceleration time
□ A potentiometer 7 for adjusting the start voltage threshold according to the motor load
□ 1 green LED 4 to indicate that the unit is switched on
□ 1 yellow LED 5 **to indicate that the motor is powered at nominal voltage, if it is connected to the starter**
□ A connector 9:
- 2 logic inputs for Run/Stop commands
- 1 logic input for the BOOST function
- 1 logic output to indicate the end of starting
- 1 relay output to indicate the motor has reached a standstill at the end of the deceleration stage

Characteristics: pages 1/6 and 1/7 | References: page 1/8 | Dimensions: page 1/9 | Schemes: pages 1/10 to 1/17

Soft starters for asynchronous motors
Altistart 01

Description *(continued)*

Equivalence table for contact references

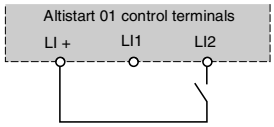
Functions	ATS 01N2●●LU/QN/RT	ATS 01N2●●LY	ATS 01N2●●Q
Relay outputs	R1A	04	04
	R1C	05	05
External power supply 0 V	C0M	–	–
Stop command	LI1	02	02
Run command	LI2	03	03
Control section power supply	LI + (+ 24 V positive logic)	01 (0 V negative logic)	01 (0 V negative logic)
BOOST	BOOST	–	–
End of starting	LO1	–	–
115 V external power supply	–	06	–
	–	07	–

Functions

■ 2-wire control

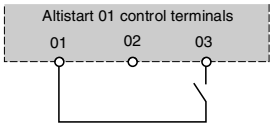
The run and stop commands are controlled by a single logic input. State 1 of logic input LI2 controls starting and state 0 controls stopping.

ATS 01N2●●LU/QN/RT



Wiring diagram for 2-wire control

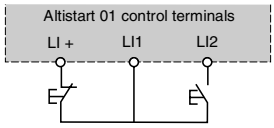
ATS 01N2●●LY/Q



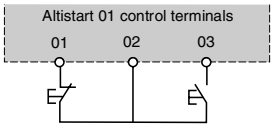
Wiring diagram for 2-wire control

■ 3-wire control

The run and stop commands are controlled by 2 different logic inputs.
Stopping is achieved when logic input LI1 opens (state 0).
The pulse on input LI2 is stored until input LI1 opens.



Wiring diagram for 3-wire control



Wiring diagram for 3-wire control

■ Starting time

Controlling the starting time means that the time of the voltage ramp applied to the motor can be adjusted to obtain a gradual starting time, dependent on the motor load.

■ Voltage boost function via logic input

Activating the BOOST logic input enables the function for supplying a starting overtorque capable of overcoming any mechanical friction.
When the input is at state 1, the function is active (input connected to the + 24 V) and the starter applies a fixed voltage to the motor for a limited time before starting.

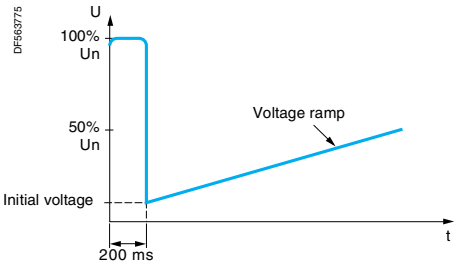
■ End of starting

□ Application function via logic output LO1

Soft start/soft stop units ATS 01N206●● to ATS 01N232●● are equipped with an open collector logic output LO, which indicates the end of starting when the motor has reached nominal speed.

□ Application function via an option

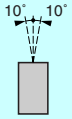
For ATS 01N2●●LY/Q soft start/soft stop units, end of starting information can be obtained by adding the option LAD 8N11 with N/O+N/C contacts.
The option can be connected easily to the bypass contactor of the electronic(s) unit without dismantling the product.



Application of a voltage boost equal to 100% of the nominal motor voltage

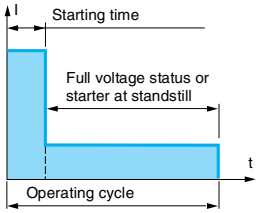
Soft starters for asynchronous motors
Altistart 01

Environment characteristics

Type of starter			ATS 01N1●●FT, ATS 01N2●●LU *(1)*, ATS 01N2●●QN, ATS 01N2●●RT	ATS 01N2●●LY and ATS 01N2●●Q
Conforming to standards			Altistart 01 electronic starters have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control devices (IEC, EN), in particular standard IEC/EN 60947-4-2	
Electromagnetic compatibility EMC	Conducted and radiated emissions		CISPR 11 level B, IEC 60947-4-2, level B	CISPR 11 level B (only with Bypass), IEC 60947-4-2, level B
	Harmonics		IEC 1000-3-2, IEC 1000-3-4	
	EMC immunity		EN 50082-2, EN 50082-1	
	Electrostatic discharge		IEC 61000-4-2 level 3	
	Immunity to radiated radio-electrical interference		IEC 61000-4-3 level 3	
	Immunity to electrical transients		IEC 61000-4-4 level 4	
	Voltage/current impulse		IEC 61000-4-5 level 3	
	Immunity to conducted interference caused by radio-electrical fields		IEC 61000-4-6 level 3	
	Micro-cuts and voltage fluctuation		IEC 61000-4-11	
	Damped oscillating waves		IEC 61000-4-12 level 3	
CE marking			Bear CE marking in accordance with the European low voltage directives IEC/EN 60947-4-2	
Product certifications			UL, CSA, C-Tick, CCC and GOST B44.1-96/ASME A17.5 for starter wired to the motor delta terminal	
Degree of protection			IP 20	IP 20 on front panel
Degree of pollution			2 conforming to IEC/EN 60947-4-2	3 conforming to IEC 60664-1 and UL 508
Vibration resistance			1.5 mm peak to peak from 3 to 13 Hz, 1 gn from 13 to 150 Hz conforming to IEC/EN 60068-2-6	2 gn
Shock resistance			15 gn for 11 ms conforming to IEC/EN 60068-2-27	8 gn for 11 ms conforming to IEC/EN 60068-2-27
Relative humidity			5...95% without condensation or dripping water, conforming to IEC/EN 60068-2-3	
Ambient air temperature around the device	Storage	°C	- 25…+ 70 conforming to IEC/EN 60947-4-2	- 25…+ 70 conforming to IEC/EN 60947-4-2
	Operation	°C	- 10…+ 40 without derating, up to 50°C with current derating of 2% per °C above 40°C	0…+ 55
Maximum operating altitude		m	1000 without derating (above this, derate the current by 2.2% per additional 100 m)	2000 without derating (above this, derate the current by 0.5% per additional 100 m)
Operating position Maximum permanent angle in relation to the normal vertical mounting position				

Electrical characteristics

Type of starter	ATS		01N1●●FT	01N2●●LU	01N2●●QN	01N2●●RT	01N2●●LY	01N2●●Q
Category of use	Conforming to IEC 60947-4-2		Ac-53b					
Rated operating voltage	Three-phase voltage	V	110 - 15% to 480 + 10%	200 - 15% to 240 + 10%	380 - 15% to 415 + 10%	440 - 15% to 480 + 10%	230 - 15% to 690 + 10%	400 -15…+ 10%
Frequency		Hz	50 - 5% to 60 + 5%					
Output voltage			Maximum 3-phase voltage equal to line supply voltage.					
Control power supply voltage		V	∿ 110...220 ± 10% ⎓ 24 ± 10%	Built into the starter			∿ 110 ± 10%	Built into the starter
Rated operating current		A	3...25	6...32			32...85	
Adjustable starting time		s	1...5	1...10			1...25	
Adjustable deceleration time		s	–	1...10			1...25	
Starting torque		%	30...80% of starting torque of motor connected directly on the line supply					

Type of starter	ATS		01N1●●FT		01N206●● to 01N222●●			01N232●●			01N2●●LY, 01N2●●Q	
Use												
	Starting time	s	1	5	1	5	10	1	5	10	1	12
	Maximum number of cycles per hour		100	20	100	20	10	50	10	5	360	30

(1) For the 230...415 V range, ATS 01N2●●LV starters can be connected to the motor delta terminals to reduce the starter rating.

Presentation: pages 1/4 and 1/5 | References: page 1/8 | Dimensions: page 1/9 | Schemes: pages 1/10 to 1/17

Soft starters for asynchronous motors
Altistart 01

Electrical characteristics (continued)

Type of starter		ATS 01N1		03FT	06FT	09FT	12FT	25FT
Control power supply consumption				⎓ 24 V, 25 mA, ∿ 110 V, 30 mA ∿ 240 V, 65 mA		⎓ 24 V, 30 mA, ∿ 110 V, 35 mA, ∿ 240 V, 80 mA		
Power dissipated	At full load at end of starting		W	4	1	1	1	1
	In transient state		W	19	31	46	61	126
Current at nominal load (1)			A	15	30	45	60	125
Type of starter		ATS 01N2		06LU/QN/RT	09LU/QN/RT	12LU/QN/RT	22LU/QN/RT	32LU/QN/RT
Power dissipated	At full load at end of starting		W	4	4	4	4.5	4.5
	In transient state		W	64	94	124	224.5	324.5
Current at nominal load (1)			A	30	45	60	110	160
Type of starter		ATS 01N2		30LY/Q	44LY/Q	72LY/Q	85LY/Q	
Power dissipated	At full load at end of starting		W	22	22	23	23	
	In transient state		W	184	268	436	514	
Current at nominal load (1)			A	90	132	216	255	

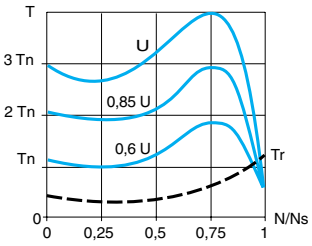
Type of starter	ATS 01N2	●●LU/QN/RT	●●LY/Q
Logic input power supply: For LI1, LI2 and BOOST only (electrically isolated between power and control) **LI +, COM**		24 V power supply Max. current available 10 mA. No short-circuit and overload protection	–
Logic inputs **LI1, LI2, BOOST (01, 02, 03 for ATS 01N2●● LY/Q)** Stop, run and boost on start-up functions		Logic inputs with impedance 27 kΩ 24 V power supply (U max. 40 V) Max. current consumption 8 mA State 0 if U < 5 V and I < 0.2 mA State 1 if U > 13 V and I > 0.5 mA	Input with internal control relay, internal 24 V power supply Max. current 8 mA State 0 if I < = 3 mA State 1 if I > = 10 mA
Logic output LO1 End of starting signal		Open collector logic output External 24 V power supply (min. 6 V, max. 30 V) Max. current 200 mA	–
Relay outputs **R1A R1C (04, 05 for ATS 01N2●● LY/Q)**		Normally open (N/O) contact Minimum switching capacity: 10 mA for ⎓ 6 V Max. switching capacity on inductive load (cos φ = 0.5 and L/R = 20 ms): 2 A for ∿ 250 V or ⎓ 30 V (AC-15) Max. operating voltage 440 V	Operating category AC-15: Ie 3 A, Ue 250 V, DC-13: Ie 2 A, Ue 24 V, Minimum switching capacity: 10 mA for ⎓ 17 V Maximum operating voltage 250 V
LED signalling Green LED		Starter powered up	
Yellow LED		Nominal voltage reached	

(1) Acceleration current complying with the maximum conditions of use (see page 1/6).

Connections (Maximum connection capacity and tightening torque)

Type of starter		ATS		01N103FT, 01N106FT	01N109FT, 01N112FT, 01N125FT, 01N206●● to 01N232●●	01N2●●LY and 01N2●●Q
Power circuit				Cage type connector	Connection via Ø 4 mm screw clamp	
Flexible wire without cable end	1 conductor		mm²	2.5 14 AWG	1.5…10 8 AWG	6...25
	2 conductors		mm²	1 17 AWG	1.5…6 10 AWG	6...25
Flexible wire with cable end	1 conductor		mm²	2.5 14 AWG	1…6 10 AWG	4...25
	2 conductors		mm²	0.75 18 AWG	1…6 10 AWG	4...16
Rigid wire	1 conductor		mm²	2.5 14 AWG	1…10 8 AWG	6...35
	2 conductors		mm²	1 17 AWG	1…6 10 AWG	6...25
Tightening torque			N.m	0.8	1.9…2.5	5
Control circuit				Cage type connector	Screw connector	
Flexible wire without cable end	1 conductor		mm²	2.5 14 AWG	0.5…2.5 14 AWG	0.75...1.5
	2 conductors		mm²	1 17 AWG	0.5…1.5 16 AWG	0.75...1.5
Flexible wire with cable end	1 conductor		mm²	2.5 14 AWG	0.5…1.5 16 AWG	0.75...1.5
	2 conductors		mm²	0.75 18 AWG	0.5…1.5 16 AWG	0.75...1.5
Rigid wire	1 conductor		mm²	2.5 14 AWG	0.5…2.5 14 AWG	0.75...1.5
	2 conductors		mm²	1 17 AWG	0.5…1 17 AWG	0.75...1.5
Earth connection				–	–	Tinned connector. Fixed using Ø 6 screws
Tightening torque			N.m	0.8	0.5	0.7

Torque characteristics (typical curves)



The diagram opposite shows the torque/speed characteristic of a cage motor in relation to the supply voltage.
The torque varies in line with the square of the voltage at a fixed frequency.
The gradual increase in the voltage prevents the instantaneous current peak on power-up.

Presentation: pages 1/4 and 1/5
References: page 1/8
Dimensions: page 1/9
Schemes: pages 1/10 to 1/17

Soft starters for asynchronous motors
Altistart 01

DF563901

ATS 01N103FT

Soft starters for 0.37 to 11 kW motors

Motor						Starter		
Motor power *(1)*						Nominal current	Reference *(2)*	Weight
Single phase	3-phase							
230 V	210 V	230 V	230 V	400 V	460 V			
kW	*HP*	kW	*HP*	kW	*HP*	A		kg
Single phase 110…230 V or 3-phase 110…480 V supply voltage, 50/60 Hz								
0.37	–	0.37	*0.5*	1.1	*0.5*	3	**ATS 01N103FT**	0.160
	–	0.55	–	–	*1.5*			
0.75	*0.5*	0.75	*1*	2.2	*2*	6	**ATS 01N106FT**	0.160
	–	1.1	*1.5*	3	*3*			
1.1	*1*	1.5	*2*	4	*5*	9	**ATS 01N109FT**	0.280
1.5	*1.5*	2.2	*3*	5.5	*7.5*	12	**ATS 01N112FT**	0.280
2.2	*2*	3	*5*	7.5	*10*	25	**ATS 01N125FT**	0.350
	3	4	*7.5*	9	*15*			
		5.5		11				

DF563902

ATS 01N212QN

Soft start/soft stop units for 0.75 to 15 kW motors *(3)*

Motor		Starter		
Motor power *(1)*		Nominal current	Reference *(2)*	Weight
kW	*HP*	A		kg
3-phase supply voltage: 200…240 V 50/60 Hz				
0.75/1.1	*1/1.5*	6	**ATS 01N206LU**	0.420
1.5	*2*	9	**ATS 01N209LU**	0.420
2.2/3	*3/–*	12	**ATS 01N212LU**	0.420
4/5.5	*5/7.5*	22	**ATS 01N222LU**	0.560
7.5	*10*	32	**ATS 01N232LU**	0.560
3-phase supply voltage: 380…415 V 50/60 Hz				
1.5/2.2/3	–	6	**ATS 01N206QN**	0.420
4	–	9	**ATS 01N209QN**	0.420
5.5	–	12	**ATS 01N212QN**	0.420
7.5/11	–	22	**ATS 01N222QN**	0.560
15	–	32	**ATS 01N232QN**	0.560
3-phase supply voltage: 440…480 V 50/60 Hz				
–	*2/3*	6	**ATS 01N206RT**	0.420
–	*5*	9	**ATS 01N209RT**	0.420
–	*7.5*	12	**ATS 01N212RT**	0.420
–	*10/15*	22	**ATS 01N222RT**	0.560
–	*20*	32	**ATS 01N232RT**	0.560

DF563903

ATS 01N230LY

Soft start/soft stop units for 15 to 75 kW motors

3-phase supply voltage: 230…690 V 50/60 Hz

Motor							Starter		
Motor power *(1)*							Nominal current	Reference *(2)*	Weight
230 V	230 V	400 V	400 V	460 V	575 V	690 V			
kW	*HP*	kW	*HP*	*HP*	*HP*	kW	A		kg
7.5	*10*	*15*	*15*	*20*	*30*	30	32	**ATS 01N230LY**	2.400
11	*15*	*22*	*25*	*30*	*40*	37	44	**ATS 01N244LY**	2.400
18.5	*25*	37	*40*	*50*	*60*	55	72	**ATS 01N272LY**	3.800
22	*30*	45	*50*	*60*	*75*	75	85	**ATS 01N285LY**	3.800

3-phase supply voltage: 400 V 50/60 Hz *(3)*

Motor		Starter		
Motor power *(1)*		Nominal current	Reference *(2)*	Weight
kW	*HP*	A		kg
22	*25*	44	**ATS 01N244Q**	2.400
37	*40*	72	**ATS 01N272Q**	3.800
45	*50*	85	**ATS 01N285Q**	3.800

(1) Standard power ratings of motors, HP power ratings indicated according to standard UL 508.
(2) For thermal protection of the motor, please use a thermal circuit-breaker GV● ME or GV7 RE (see combinations pages 1/18 and 1/19).
(3) Control power supply built into the starter.

Presentation: pages 1/4 and 1/5
Characteristics: pages 1/6 and 1/7
Dimensions: page 1/9
Schemes: pages 1/10 to 1/17

Soft starters for asynchronous motors
Altistart 01

References *(continued)*

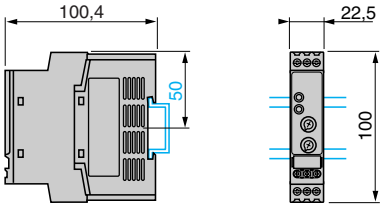
Accessories

Description	Used for starter	Reference	Weight kg
Plate for quick mounting on DIN rail	ATS 01N230LY, ATS 01N244●	**VY1 H4101**	–
Adaptor for mounting on ⊔ DZ5 MB rail	ATS 01N103FT, ATS 01N106FT	**RHZ 66**	0.005
Auxiliary contact, provides information that the motor is at full voltage	ATS 01N2●●●LY, ATS 01N2●●●Q	**LAD 8N11**	–

Dimensions

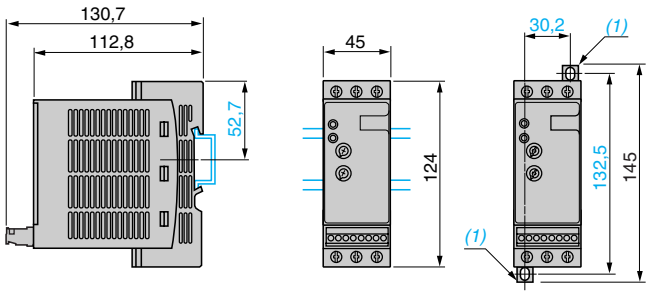
ATS 01N103FT, ATS 01N106FT

Mounting on ⊓ (35 mm) rail or ⊔ rail with adaptor RHZ 66



ATS 01N109FT, ATS 01N112FT, ATS 01N125FT

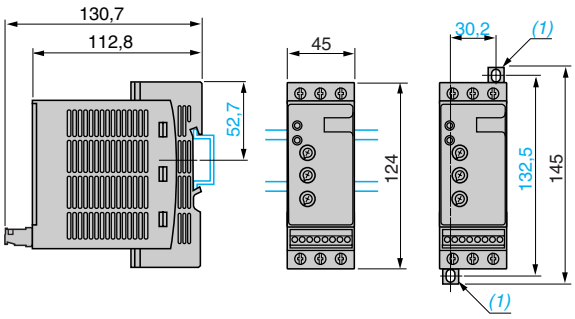
Mounting on ⊓ (35 mm) rail | **Screw fixing**



(1) Retractable fixings

ATS 01N206●● to ATS 01N212●●

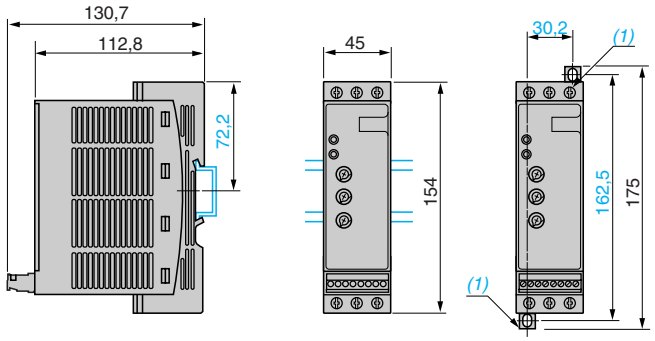
Mounting on ⊓ (35 mm) rail | **Screw fixing**



(1) Retractable fixings

ATS 01N222●● to ATS 01N232●●

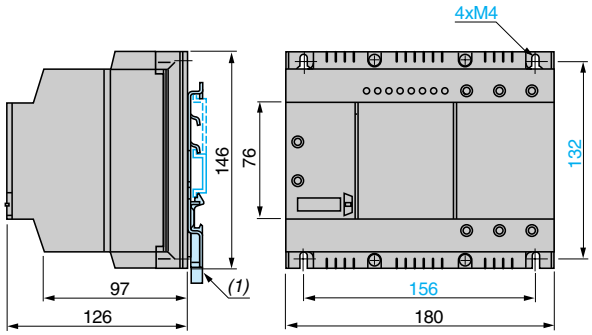
Mounting on ⊓ (35 mm) rail | **Screw fixing**



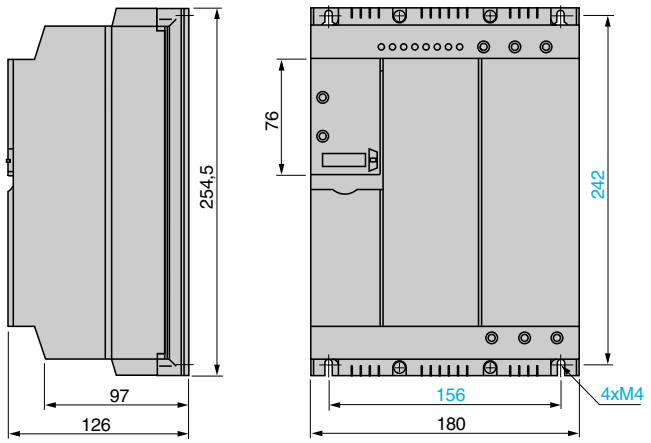
(1) Retractable fixings

ATS 01N230LY, ATS 01N244LY, ATS 01N244Q

Quick mounting on ⊓ rail (35 or 70 mm) using plate VY1 H4101 *(1)*

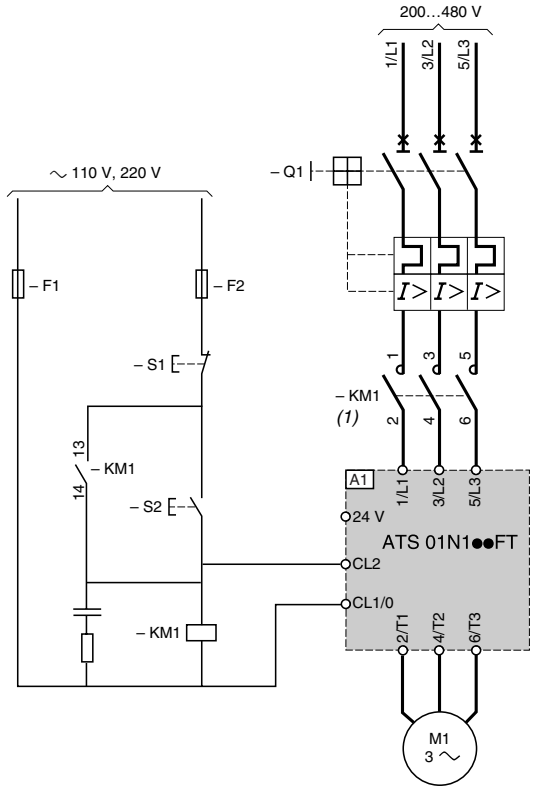


ATS 01N272LY, ATS 01N285LY, ATS 01N272Q, ATS 01N285Q



Soft starters for asynchronous motors
Altistart 01
For 0.37 to 11 kW motors

ATS 01N1●●FT soft starters
Single-phase or 3-phase power supply



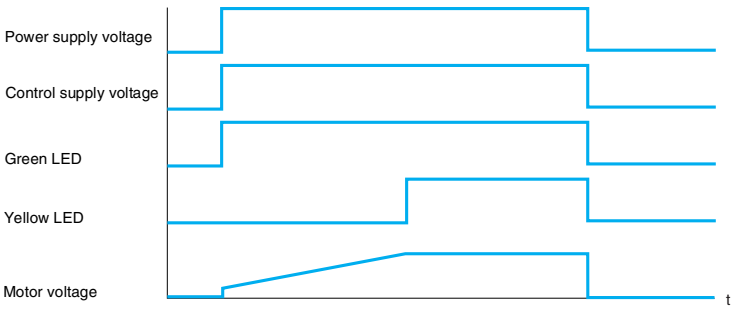
Note : *For single-phase motors, use the ATS 01N1●●FT without connecting the 2nd phase 3/L2, 4/T2.*
Wait 5 seconds after switching the soft starter off before switching it on again.

(1) A line contactor must be used in the sequence.

Compatible components (for full references, see pages 1/18 and 1/19 or refer to our catalogue: “Motor starter solutions - Control and protection components”.)

Code	Description
A1	Soft starter
Q1	GV2 ME circuit-breaker
KM1	LC1 ●●● + LA4 DA2U
F1, F2	Control protection fuses
S1, S2	XB4 B or XB5 B pushbuttons

Function chart

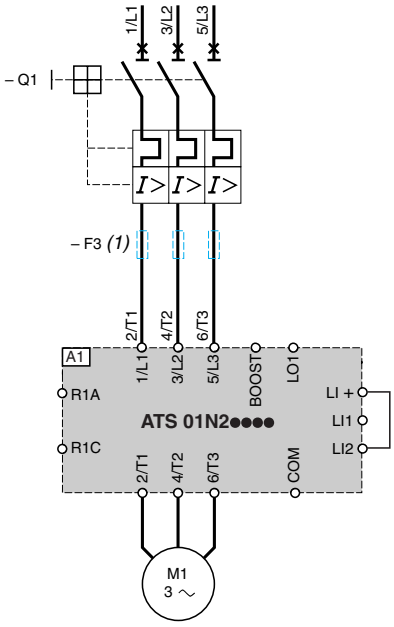


Soft starters for asynchronous motors
Altistart 01
For 0.75 to 15 kW motors

ATS 01N2●●LU/QN/RT soft start/soft stop units

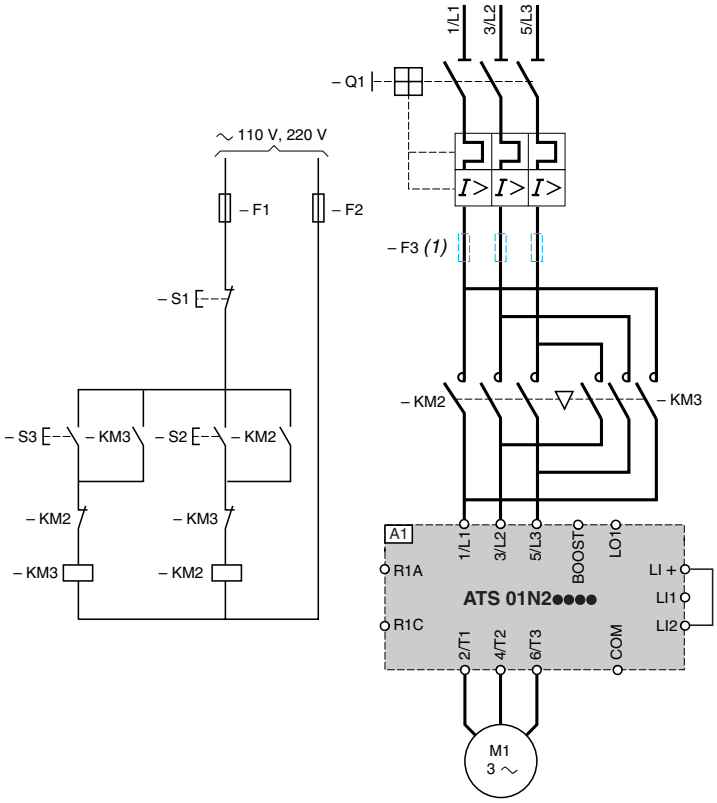
Manual control without deceleration (freewheel), with GV2 and GV3 motor circuit-breakers

ATS 01N206●● to ATS 01N232●●



Automatic control with reversal of operating direction, without deceleration (freewheel)

ATS 01N206●● to ATS 01N232●●



(1) For type 2 coordination.

Compatible components (for full references, see pages 1/18 and 1/19 or refer to our catalogue: "Motor starter solutions - Control and protection components".)

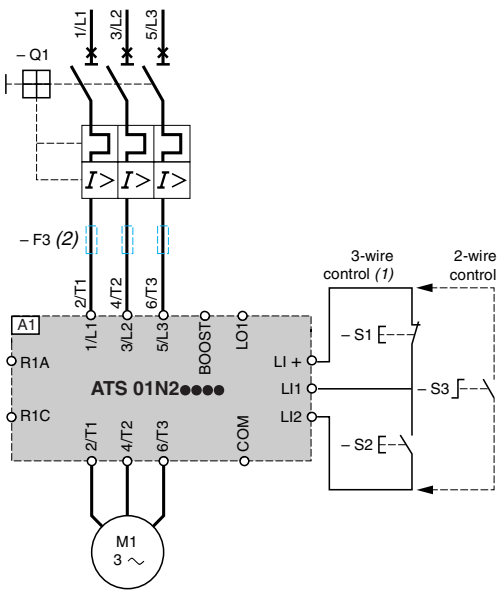
Code	Description
A1	Soft start/soft stop unit
Q1	GV2 ME circuit-breaker
KM1, KM2, KM3	LC1 ●●● + LA4 DA2U
F1, F2	Control protection fuses
F3	3 fast-acting fuses
S1, S2, S3	XB4 B or XB5 B pushbuttons

Soft starters for asynchronous motors
Altistart 01
For 0.75 to 15 kW motors

ATS 01N2●●LU/QN/RT soft start/soft stop units

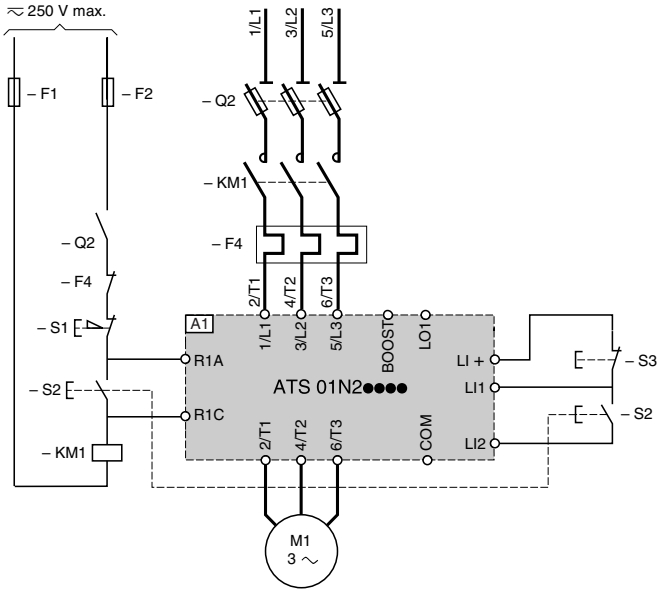
Automatic control with or without deceleration (freewheel), without contactor

ATS 01N206●● to ATS 01N232●●



Automatic control with or without deceleration (freewheel), with contactor

ATS 01N206●● to ATS 01N232●●



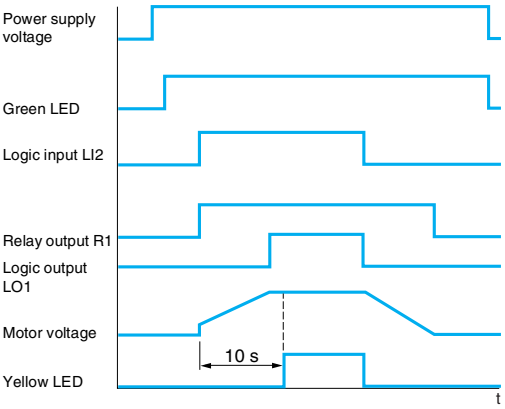
(1) Use shielded wires above 1 m.
(2) For type 2 coordination.

Compatible components (for full references, see pages 1/18 and 1/19 or refer to our catalogue: "Motor starter solutions - Control and protection components".)

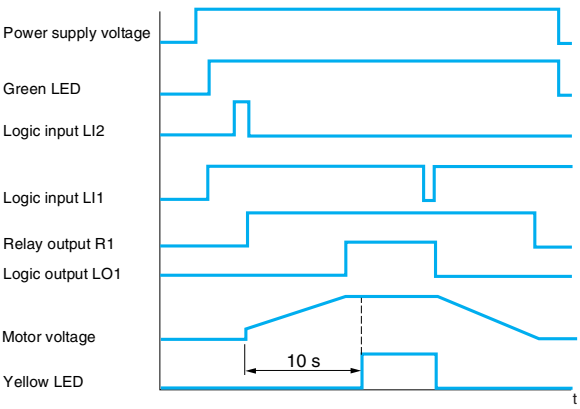
Code	Description
A1	Soft start/soft stop unit
Q1	GV2 ME circuit-breaker
Q2	Fuse switches
F4	Thermal overload relay
KM1	LC1 ●●● + LA4 DA2U
F1, F2	Control protection fuses
F3	3 fast-acting fuses
S1, S2, S3	XB4 B or XB5 B pushbuttons

Function charts

2-wire control with deceleration

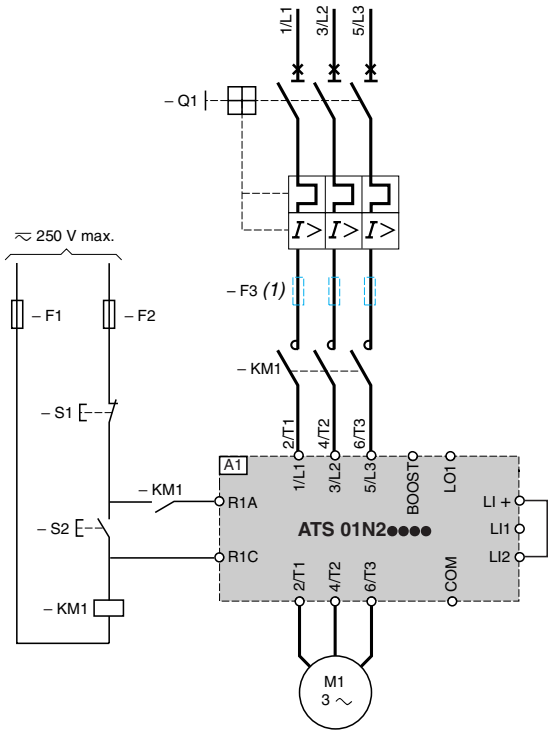


3-wire control with deceleration



Soft starters for asynchronous motors
Altistart 01
For 0.75 to 15 kW motors

ATS 01N2●●LU/QN/RT soft start/soft stop units
Automatic control without deceleration (freewheel), with a maintaining function
ATS 01N206●● to ATS 01N232●●



(1) For type 2 coordination.

Compatible components (for full references, see pages 1/18 and 1/19 or refer to our catalogue: "Motor starter solutions - Control and protection components".)

Code	Description
A1	Soft start/soft stop unit
Q1	GV2 ME circuit-breaker
KM1	LC1 ●●● + LA4 DA2U
F1, F2	Control protection fuses
F3	3 fast-acting fuses
S1, S2	XB4 B or XB5 B pushbuttons

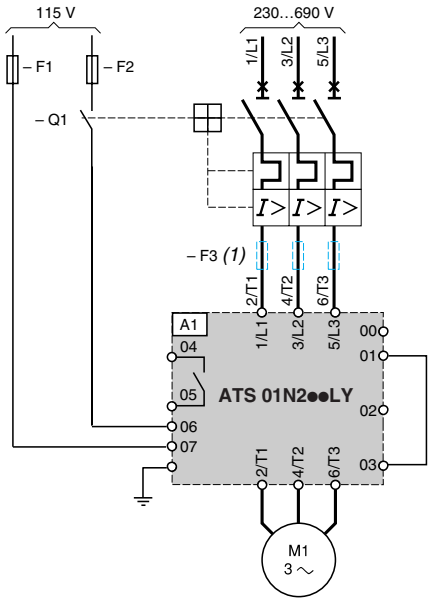
Soft starters for asynchronous motors
Altistart 01
For 15 to 75 kW motors

1
1.1

ATS 01N2●●LY and ATS 01N2●●Q soft start/soft stop units (compatible components, see page 1/15)

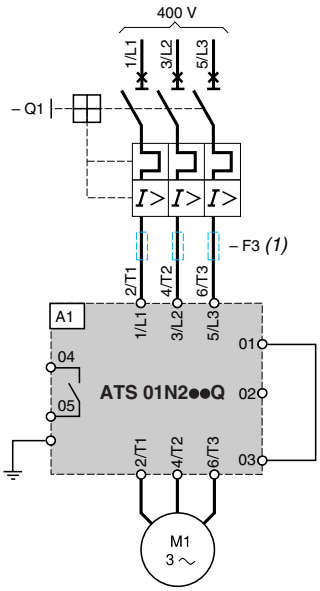
Manual control without deceleration (freewheel), with GV3 and GV7 motor circuit-breakers

ATS 01N230LY to ATS 01N285LY



(1) For type 2 coordination.

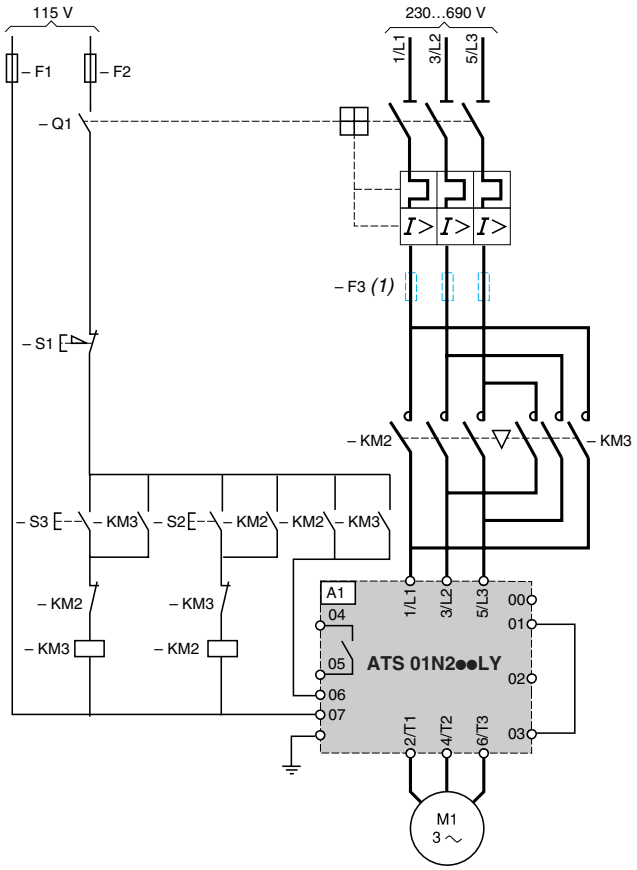
ATS 01N244Q to ATS 01N285Q



(1) For type 2 coordination.

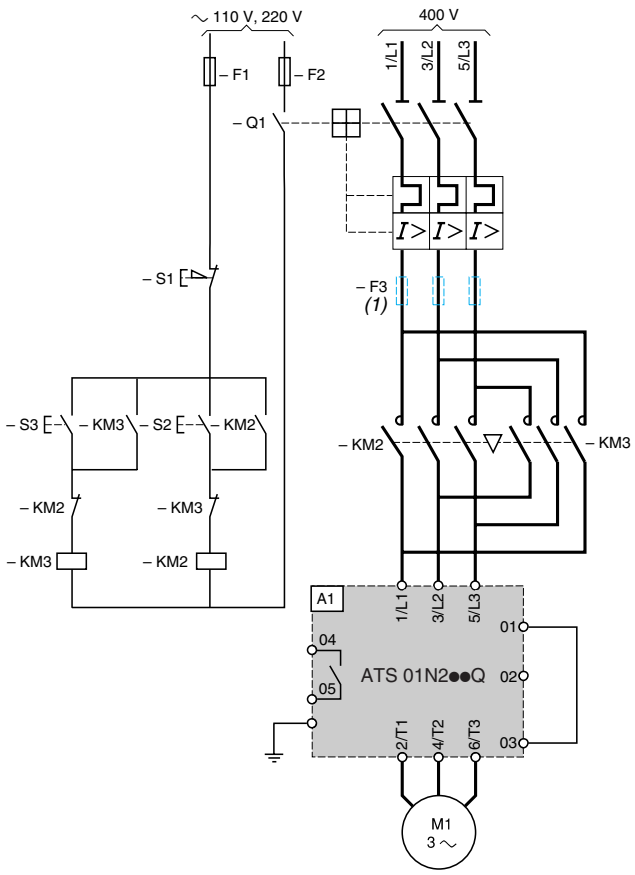
Automatic control with reversal of operating direction, without deceleration (freewheel)

ATS 01N230LY to ATS 01N285LY



(1) For type 2 coordination.

ATS 01N244Q to ATS 01N285Q



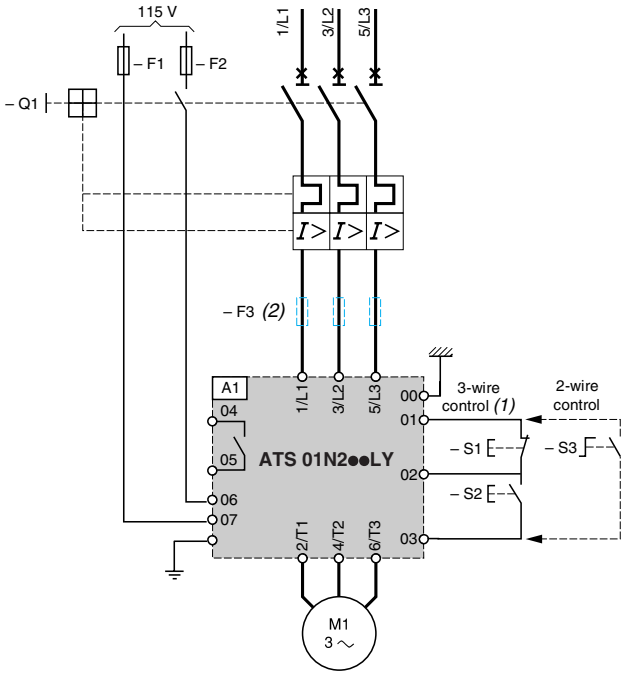
(1) For type 2 coordination.

Soft starters for asynchronous motors
Altistart 01
For 15 to 75 kW motors

ATS 01N2●●LY and ATS 01N2●●Q soft start/soft stop units

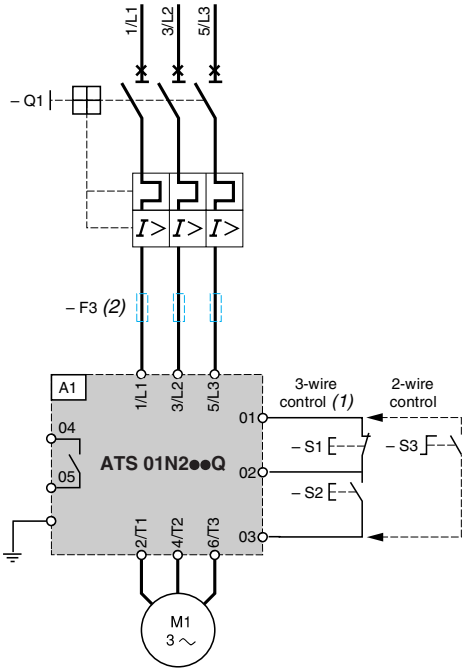
Automatic control with or without deceleration (freewheel), without contactor

ATS 01N230LY to ATS 01N285LY



(1) Use shielded wires above 1 m.
(2) For type 2 coordination.

ATS 01N244Q to ATS 01N285Q



(1) Use shielded wires above 1 m.
(2) For type 2 coordination.

Compatible components (for full references, see pages 1/18 and 1/19 or refer to our catalogue: “Motor starter solutions - Control and protection components”.)

Code	Description
A1	Soft start/soft stop unit
Q1	GV3 or GV7 circuit-breaker
KM2, KM3	LC1 ●●● + LA4 DA2U
F1, F2	Control protection fuses
F3	3 fast-acting fuses
S1, S2, S3	XB4 B or XB5 B pushbuttons

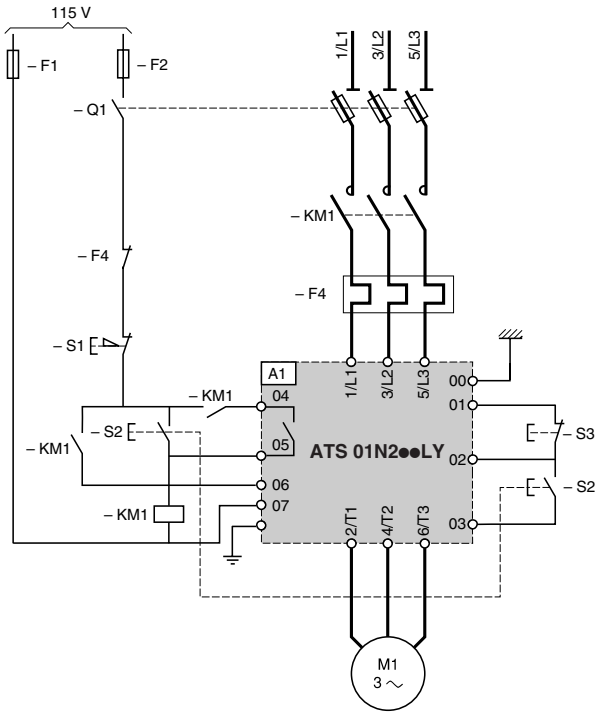
Soft starters for asynchronous motors
Altistart 01
For 15 to 75 kW motors

1
1.1

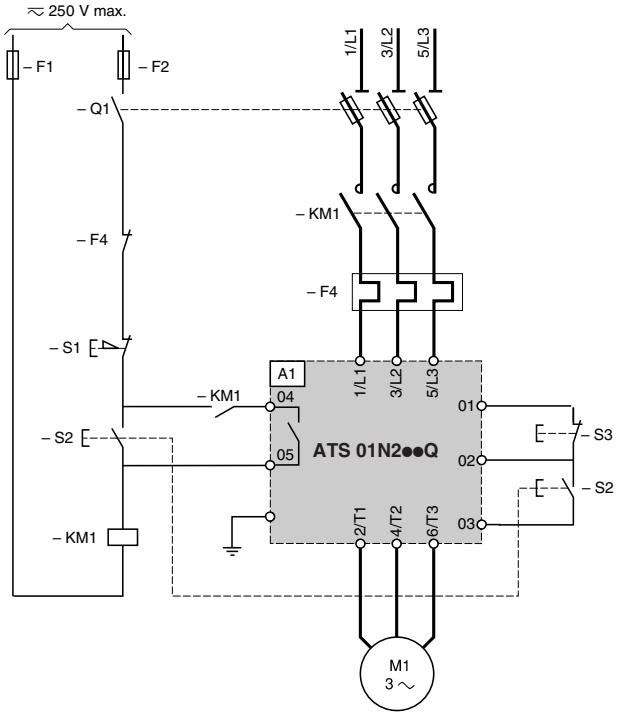
ATS 01N2●●LY and ATS 01N2●●Q soft start/soft stop units *(continued)*

Automatic control with or without deceleration (freewheel), with contactor

ATS 01N230LY to ATS 01N285LY



ATS 01N244Q to ATS 01N285Q



Compatible components (for full references, see pages 1/18 and 1/19 or refer to our catalogue: “Motor starter solutions - Control and protection components”.)

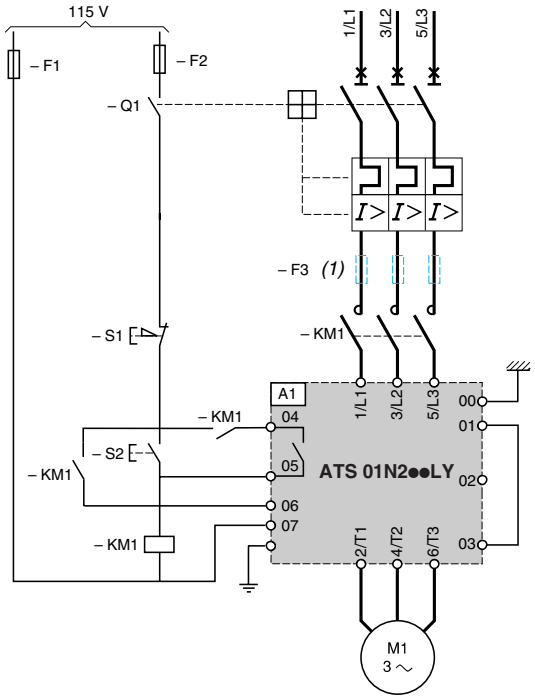
Code	Description
A1	Soft start/soft stop unit
Q1	GK1 disconnector
KM1	LC1 ●●● + LA4 DA2U
F1, F2	Control protection fuses
F4	LRD thermal overload relay
S1, S2, S3	XB4 B or XB5 B pushbuttons

Soft starters for asynchronous motors
Altistart 01
For 15 to 75 kW motors

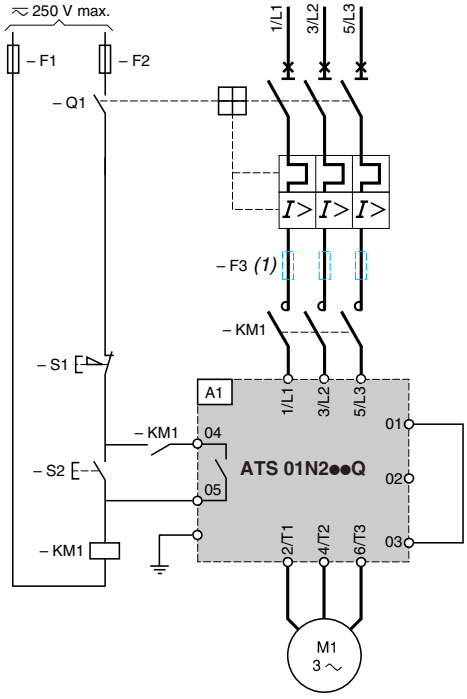
ATS 01N2●●LY and ATS 01N2●●Q soft start/soft stop units (continued)

Automatic control without deceleration (freewheel), with a maintaining function

ATS 01N230LY to ATS 01N285LY



ATS 01N244Q to ATS 01N285Q



(1) For type 2 coordination.

Compatible components (for full references, see pages 1/18 and 1/19 or refer to our catalogue: "Motor starter solutions - Control and protection components".)

Code	Description
A1	Soft starter
Q1	GV3 circuit-breaker
KM1	LC1 ●●● + LA4 DA2U
F1, F2	Control protection fuses
F3	3 fast-acting fuses
S1, S2	XB4 B or XB5 B pushbuttons

Soft starters for asynchronous motors

Altistart 01

400 V power supply, type 1 coordination

1

1.1

Components to be combined in accordance with standards IEC 60947-1 and IEC 60947-4-2

Combine either circuit-breaker (light blue columns), contactor, starter, or switch/fuse (dark blue columns), contactor, starter

Motor		Starter	Type of circuit-breaker		Type of contactor	Type of switch or switch disconnector (base unit)	Am fuses		I²t	Thermal overload relay
		Class 10	Telemecanique	Rating			Reference	Rating		
kW	A			A				A	A² s	
M1		A1	Q1		KM1, KM2, KM3	Q2				F4
0.37	0.98	ATS 01N103FT	GV2 ME05	1	LC1 K06 or LC1 D09	LS1 D2531	DF2 CA02	2	265	LR2 K0306 LRD 05
0.55	1.5	ATS 01N103FT	GV2 ME06	1.6	LC1 K06 or LC1 D09	LS1 D2531	DF2 CA02	2	265	LR2 K0307 LRD 06
0.75	2	ATS 01N103FT	GV2 ME07	2.5	LC1 K06 or LC1 D09	LS1 D2531	DF2 CA02	2	265	LR2 K0308 LRD 07
1.1	2.5	ATS 01N103FT	GV2 ME08	4	LC1 K06 or LC1 D09	LS1 D2531	DF2 CA04	4	265	LR2 K0308 LRD 08
		ATS 01N206QN	GV2 ME08	4	LC1 K06 or LC1 D09	LS1 D2531	DF2 CA04	4	265	LR2 K0308 LRD 08
1.5	3.5	ATS 01N106FT	GV2 ME08	4	LC1 K06 or LC1 D09	LS1 D2531	DF2 CA06	6	265	LR2 K0310 LRD 08
		ATS 01N206QN	GV2 ME08	4	LC1 K06 or LC1 D09	LS1 D2531	DF2 CA06	6	265	LR2 K0310 LRD 08
2.2	5	ATS 01N106FT	GV2 ME10	6.3	LC1 K06 or LC1 D09	LS1 D2531	DF2 CA08	8	265	LR2 K0312 LRD 10
		ATS 01N206QN	GV2 ME10	6.3	LC1 K09 or LC1 D09	LS1 D2531	DF2 CA08	8	265	LR2 K0312 LRD 10
3	6.5	ATS 01N106FT	GV2 ME14	9	LC1 K09 or LC1 D09	LS1 D2531	DF2 CA12	12	265	LR2 K0314 LRD 12
		ATS 01N206QN	GV2 ME14	9	LC1 K09 or LC1 D09	LS1 D2531	DF2 CA12	12	265	LR2 K0314 LRD 12
4	8.4	ATS 01N109FT	GV2 ME14	9	LC1 K09 or LC1 D09	LS1 D2531	DF2 CA12	12	610	LR2 K0316 LRD 14
		ATS 01N209QN	GV2 ME14	9	LC1 K09 or LC1 D09	LS1 D2531	DF2 CA12	12	610	LR2 K0316 LRD 14
5.5	11	ATS 01N112FT	GV2 ME16	13	LC1 K12 or LC1 D12	LS1 D2531	DF2 CA16	16	610	LR2 K0321 LRD 16
		ATS 01N212QN	GV2 ME16	13	LC1 K12 or LC1 D12	LS1 D2531	DF2 CA16	16	610	LR2 K0321 LRD 16
7.5	14.8	ATS 01N125FT	GV2 ME20	17	LC1 D18	LS1 D2531	DF2 CA20	20	6050	LRD 21
		ATS 01N222QN	GV2 ME20	17	LC1 D18	LS1 D2531	DF2 CA20	20	6050	LRD 21
9	18.1	ATS 01N125FT	GV2 ME21	21	LC1 D25	LS1 D2531	DF2 CA25	25	6050	LRD 21
		ATS 01N222QN	GV2 ME21	21	LC1 D25	LS1 D2531	DF2 CA25	25	6050	LRD 21
11	21	ATS 01N125FT	GV2 ME22	23	LC1 D25	LS1 D2531	DF2 CA25	25	6050	LRD 22
		ATS 01N222QN	GV2 ME22	23	LC1 D25	LS1 D2531	DF2 CA25	25	6050	LRD 22
15	28.5	ATS 01N232QN	GV2 ME32	32	LC1 D32	GK1 EM	DF2 EA40	40	7200	LRD 3353
18.5	35	ATS 01N244Q	GV3 ME40	40	LC1 D38	GK1 EM	DF2 EA40	40	8000	LRD 3355
22	42	ATS 01N244Q	GV3 ME63	63	LC1 D50	GK1 FM	DF2 FA63	63	8000	LRD 3357
30	57	ATS 01N272Q	GV3 ME63	63	LC1 D65	GK1 FM	DF2 FA63	63	9000	LRD 3359
37	69	ATS 01N272Q	GV3 ME80	80	LC1 D80	GK1 FM	DF2 FA80	80	9000	LRD 3363
45	81	ATS 01N285Q	GV7 RE100	100	LC1 D95	GK1 FM	DF2 FA100	100	9000	LRD 3365

Presentation: pages 1/4 and 1/5 | Characteristics: pages 1/6 and 1/7 | References: page 1/8 | Dimensions: page 1/9 | Schemes: pages 1/10 to 1/17

Soft starters for asynchronous motors

Altistart 01

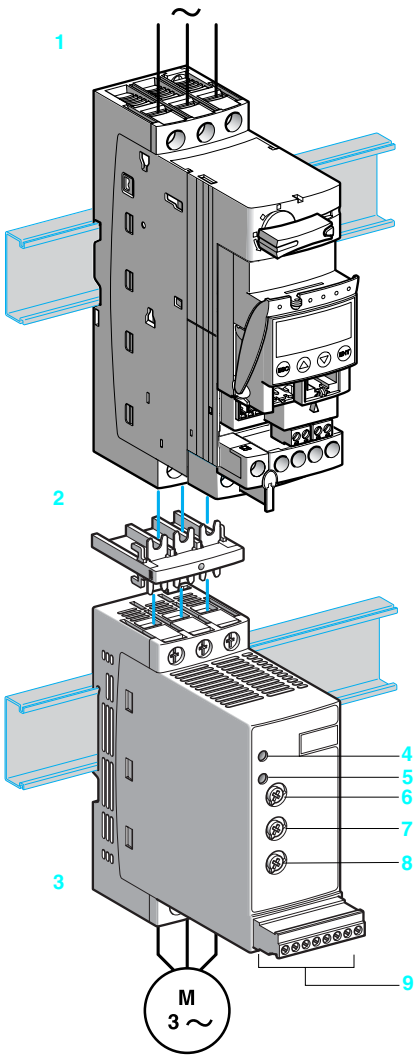
690 V power supply, type 1 coordination

Components to be combined in accordance with standards IEC 60947-1 and IEC 60947-4-2

Combine either circuit-breaker (light blue columns), contactor, starter, or switch/fuse (dark blue columns), contactor, starter

Motor		Starter	Type of circuit-breaker		Type of contactor	Type of switch or switch disconnector (base unit)	Am fuses		I^2t	Thermal overload relay
		Class 10	Telemecanique	Rating			Reference	Rating		
kW	A			A				A	A^2 s	
M1		A1	Q1		KM1	Q2				F4
30	33	**ATS 01N230LY**	**GV3 ME40 + GV3 A01**	25…40	**LC1 D50**	**GK1 EM**	**DF2 EA40**	40	7200	**LRD 3355**
37	40	**ATS 01N244LY**	**GV3 ME63 + GV3 A01**	40…63	**LC1 D65**	**GK1 FM**	**DF2 FA63**	63	8000	**LRD 3359**
55	58	**ATS 01N272LY**	**GV3 ME80 + GV3 A01**	56…80	**LC1 D115**	**GK1 FM**	**DF2 FA80**	80	9000	**LRD 3363**
75	75.7	**ATS 01N285LY**	**GV7 RE100 + GV7 AE11**	60…100	**LC1 D150**	**GK1 FM**	**DF2 FA100**	100	9000	**LRD 3365**

Soft starters for asynchronous motors
Altistart U01 and TeSys U



Presentation

The Altistart U01 is a soft start/soft stop unit for asynchronous motors. It is designed primarily for combinations with **TeSys U** controller-starters.

When combined with a **TeSys U** 1 controller by means of a connector 2, the Altistart U01 3 is a power option which provides the “Soft start/soft stop” function. The result is a unique, innovative motor starter.

Using the Altistart U01 starter enhances the starting performance of asynchronous motors by allowing them to start gradually, smoothly and in a controlled manner. It prevents mechanical shocks, which lead to wear and tear, and limits the amount of maintenance work and production downtime.
The Altistart U01 limits the starting torque and current peaks on starting, on machines which do not require a high starting torque.

The Altistart U01 is designed for the following simple applications:
- Conveyors
- Conveyor belts
- Pumps
- Fans
- Compressors
- Automatic doors and gates
- Small cranes
- Belt-driven machines, etc.

The Altistart U01 is compact and easy to install. It complies with standards IEC/EN 60947-4-2, carries UL, CSA, C-Tick, CCC and GOST certifications and CE marking.

■ **ATSU 01N2●●LT soft start/soft stop units**
□ Control two phases of the motor power supply to limit the starting current and for deceleration
□ Internal bypass relay
□ Motor power ratings ranging from 0.75 kW to 15 kW
□ Motor supply voltages ranging from 200 V to 480 V, 50/60 Hz.
An external power supply is required for controlling the starter.

Description

■ Altistart U01 soft start/soft stop units are equipped with:
□ A potentiometer for setting the starting time 6
□ A potentiometer for setting the deceleration time 8
□ A potentiometer for adjusting the start voltage threshold according to the motor load 7
□ 1 green LED 4 to indicate that the unit is switched on
□ 1 yellow LED 5 **to indicate that the motor is powered at nominal voltage, if it is connected to the starter**
□ A connector 9:
- 2 logic inputs for Run/Stop commands
- 1 logic input for the BOOST function
- 1 logic output to indicate the end of starting
- 1 relay output to indicate the starter has a power supply fault or the motor has reached a standstill at the end of the deceleration stage

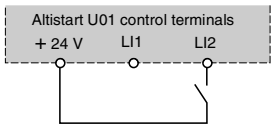
Characteristics: pages 1/22 and 1/23
References: page 1/24
Dimensions: page 1/25
Schemes: pages 1/26 to 1/29

Description of a TeSys U controller-starter

Please consult the “TeSys U starters - open version” catalogue.

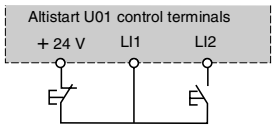
ATSU 01N2●●●LT soft start unit functions

■ 2-wire control
The run and stop commands are controlled by a single logic input. State 1 of logic input LI2 controls starting and state 0 controls stopping.



Wiring diagram for 2-wire control

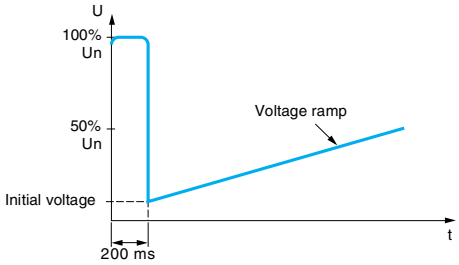
■ 3-wire control
The run and stop commands are controlled by 2 different logic inputs.
Stopping is achieved when logic input LI1 opens (state 0).
The pulse on input LI2 is stored until input LI1 opens.



Wiring diagram for 3-wire control

■ Starting time
Controlling the starting time means that the time of the voltage ramp applied to the motor can be adjusted to obtain a gradual starting time, dependent on the motor load.

■ Voltage boost function via logic input
Activating the BOOST logic input enables the function for supplying a starting overtorque capable of overcoming any mechanical friction.
When the input is at state 1, the function is active (input connected to the + 24 V) and the starter applies a fixed voltage to the motor for a limited time before starting.

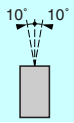


Application of a voltage boost equal to 100% of the nominal motor voltage

■ End of starting
□ Application function for logic output LO1
ATSU 01N2●●LT soft start/soft stop units are equipped with an open collector logic output LO, which indicates the end of starting when the motor has reached nominal speed.

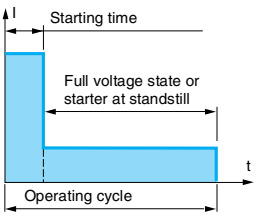
Soft starters for asynchronous motors
Altistart U01 and TeSys U

Environmental characteristics

Type of starter			ATSU 01N2●●LT
Conformity to standards			Altistart U01 electronic starters have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control devices (IEC, EN), in particular standard IEC/EN 60947-4-2.
Electromagnetic compatibility EMC			
	Conducted and radiated emissions		CISPR 11 level B, IEC 60947-4-2, level B
	Harmonics		IEC 1000-3-2, IEC 1000-3-4
	EMC immunity		EN 50082-2, EN 50082-1
	Electrostatic discharge		IEC 61000-4-2 level 3
	Immunity to radiated radio-electrical interference		IEC 61000-4-3 level 3
	Immunity to electrical transients		IEC 61000-4-4 level 4
	Voltage/current impulse		IEC 61000-4-5 level 3
	Conducted and radiated emissions		IEC 61000-4-6 level 3
	Immunity to conducted interference caused by radio-electrical fields		IEC 61000-4-11
	Damped oscillating waves		IEC 61000-4-12 level 3
CE marking			The starters carry CE marking in accordance with the European low voltage directives IEC/EN 60947-4-2.
Product certifications			UL, CSA, C-Tick, CCC and GOST
Degree of protection			IP 20
Degree of pollution			2 conforming to IEC/EN 60947-4-2
Vibration resistance			1.5 mm peak to peak from 3 to 13 Hz, 1 gn from 13 to 150 Hz, conforming to IEC/EN 60068-2-6
Shock resistance			15 gn for 11 ms conforming to IEC/EN 60068-2-27
Relative humidity			5…95% without condensation or dripping water conforming to IEC 60068-2-3
Ambient temperature around the unit	Storage	°C	- 25…+ 70 conforming to IEC/EN 60947-4-2
	Operation	°C	- 10…+ 40 without derating, up to 50°C with current derating of 2% per °C above 40°C
Maximum operating altitude		m	1000 without derating (above this, derate the current by 2.2% per additional 100 m)
Operating position Maximum permanent angle in relation to the normal vertical mounting position			

Electrical characteristics

Type of starter			ATSU 01N2●●LT				
Category of use	Conforming to IEC 60947-4-2		Ac-53b				
Rated operating voltage	3-phase ∿ voltage	V	200 - 15% to 480 + 10%				
Frequency		Hz	50 - 5% to 60 + 5%				
Output voltage			Maximum 3-phase voltage equal to line supply voltage				
Control supply voltage			24 V ⎓, 100 mA ± 10%				
Rated operating current		A	6...32				
Adjustable starting time		s	1...10				
Adjustable deceleration time		s	1...10				
Starting torque		%	30.... 80% of DOL motor starting torque				
Type of starter	**ATSU**		**01N206LT**	**01N209LT**	**01N212LT**	**01N222LT**	**01N232LT**
Control power supply consumption			24 V ⎓, 65 mA			24 V ⎓, 100 mA	
Power dissipated	At full load at end of starting	W	1.5	1.5	1.5	2.5	2.5
	In transient state at 5 times the rated operating current	W	61.5	91.5	121.5	222.5	322.5

Type of starter			ATSU 01N206LT to ATSU 01N222LT			ATSU 01N232LT		
Use								
	Starting time	s	1	5	10	1	5	10
	Maximum number of cycles per hour		100	20	10	50	10	5

Presentation: pages 1/20 and 1/21
References: page 1/24
Dimensions: page 1/25
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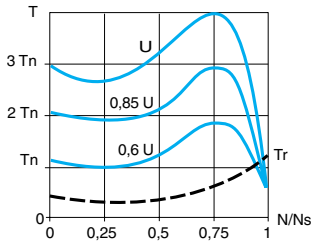
Electrical characteristics (continued)

Logic input power supply (electrically isolated between power and control) **+ 24 V, COM**			24 V ± 10% Isolated Max. current 100 mA
Logic inputs **LI1, LI2, BOOST** Stop, run and boost on start-up functions			Logic inputs with impedance 27 kΩ; 24 V power supply (U max 40 V) Max. current 8 mA State 0 if U < 5 V and I < 0.2 mA State 1 if U > 13 V and I > 0.5 mA
Logic output LO1 End of starting signal			Open collector logic output: External 24 V power supply (minimum 6 V, maximum 30 V) Max. current 200 mA
Relay output **R1A R1C**			Normally open (N/O) contact Minimum switching capacity: 10 mA for 6 V ⎓ Maximum switching capacity on inductive load (cos φ = 0.5 and L/R = 20 ms): 2 A for 250 V ∿ or 30 V ⎓ (AC-15) Maximum operating voltage 440 V
LED signalling	Green LED		Starter powered up
	Yellow LED		Nominal voltage reached

Connections (maximum connection capacity and tightening torque)

Power circuit			Connection to Ø 4 mm screw clamps	
Flexible wire without cable end	1 conductor	**mm²**	1.5…10	8 AWG
	2 conductors	**mm²**	1.5…6	10 AWG
Flexible wire with cable end	1 conductor	**mm²**	1…6	10 AWG
	2 conductors	**mm²**	1…6	10 AWG
Rigid wire	1 conductor	**mm²**	1…10	8 AWG
	2 conductors	**mm²**	1…6	10 AWG
Tightening torque		**N.m**	1.9…2.5	
Control circuit			Screw connector	
Flexible wire without cable end	1 conductor	**mm²**	0.5…2.5	14 AWG
	2 conductors	**mm²**	0.5…1.5	16 AWG
Flexible wire with cable end	1 conductor	**mm²**	0.5…1.5	16 AWG
	2 conductors	**mm²**	0.5…1.5	16 AWG
Rigid wire	1 conductor	**mm²**	0.5…2.5	14 AWG
	2 conductors	**mm²**	0.5…1	17 AWG
Tightening torque		**N.m**	0.5	

Torque characteristics (typical curves)



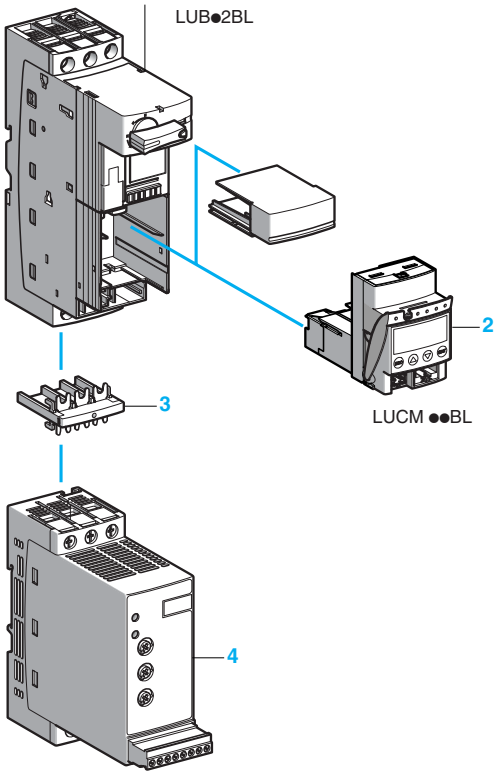
The diagram opposite shows the torque/speed characteristic of a cage motor in relation to the supply voltage.
The torque varies in line with the square of the voltage at a fixed frequency. The gradual increase in the voltage prevents the instantaneous current peak on power-up.

Soft starters for asynchronous motors
Altistart U01 and TeSys U

DF531714

ATSU 01N222LT

DF510362



ATSU 01N2●●LT

Soft start/soft stop units for 0.75 to 15 kW motors
(can be combined with the TeSys U starter)

Motor power *(1)*				Starter		
230 V	230 V	400 V	460 V	Nominal current	Reference	Weight
kW	*HP*	kW	*HP*	A		kg
3-phase supply voltage: 200…480 V 50/60 Hz						
0.75 1.1	*1* *1.5*	1.5 2.2 3	*2* *3*	6	**ATSU 01N206LT**	0.340
1.5 –	*2* –	– 4	*5* –	9	**ATSU 01N209LT**	0.340
2.2 3	*3* –	5.5 –	*7.5* –	12	**ATSU 01N212LT**	0.340
4 5.5	*5* *7.5*	7.5 11	*10* *15*	22	**ATSU 01N222LT**	0.490
7.5	*10*	15	*20*	32	**ATSU 01N232LT**	0.490

Accessorie

Description	Used for starter	Reference	Weight kg
Power connector between ATSU 01N2●●LT and TeSys U	ATSU 01N2●●LT	**VW3 G4104**	0.020

TeSys U starter and soft start unit combinations

Numerous possibilities for combinations and options are offered.
Please consult the “TeSys U Starters-open version” specialist catalogue.

Motor power Voltage			Soft starter	TeSys U	
				Power base	Control unit *(2)*
230 V kW/*HP*	400 V kW	460 V *HP*			
0.75/*1*	1.5	*2*	ATSU 01N206LT	LUB 12	LUC● 05BL
1.1/*1.5*	2.2/3	*3*	ATSU 01N206LT	LUB 12	LUC● 12BL
1.5/*2*	–	–	ATSU 01N209LT	LUB 12	LUC● 12BL
–	4	*5*	ATSU 01N209LT	LUB 12	LUC● 12BL
2.2/*3*	–	–	ATSU 01N212LT	LUB 12	LUC● 12BL
3/–	5.5	*7.5*	ATSU 01N212LT	LUB 32	LUC● 18BL
4/*5*	7.5	*10*	ATSU 01N222LT	LUB 32	LUC● 18BL
5.5/*7.5*	11	*15*	ATSU 01N222LT	LUB 32	LUC● 32BL
7.5/*10*	15	*20*	ATSU 01N232LT	LUB 32	LUC● 32BL

Example of a starter-motor combination with:
1 non-reversing power base for DOL starting (LUB●2BL)
2 control unit (LUCM ●●BL)
3 power connector (VW3 G4104)
4 Altistart U01soft start/soft stop unit (ATSU 01N2●●LT)

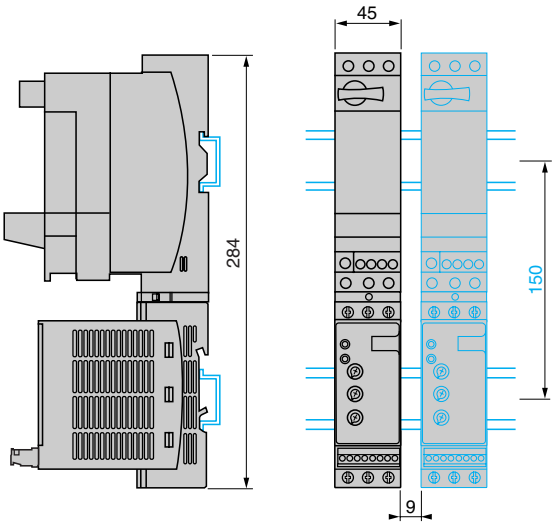
(1) Standard motor power ratings, HP power ratings indicated according to standard UL 508.
(2) Depending on the configuration of the chosen TeSys U starter, replace the ● with A for standard, B for expandable, and M for multifunction.

Presentation: pages 1/20 and 1/21
Characteristics: pages 1/22 and 1/23
Dimensions: page 1/25
Schemes: pages 1/26 to 1/29

Soft starters for asynchronous motors
Altistart U01 and TeSys U

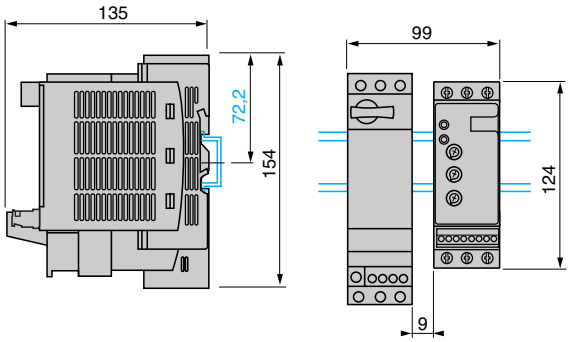
TeSys U combination (non-reversing power base) and ATSU 01N206LT to ATSU 01N212LT

Mounting on ⊓ (35 mm) rail with VW3 G4104 connector



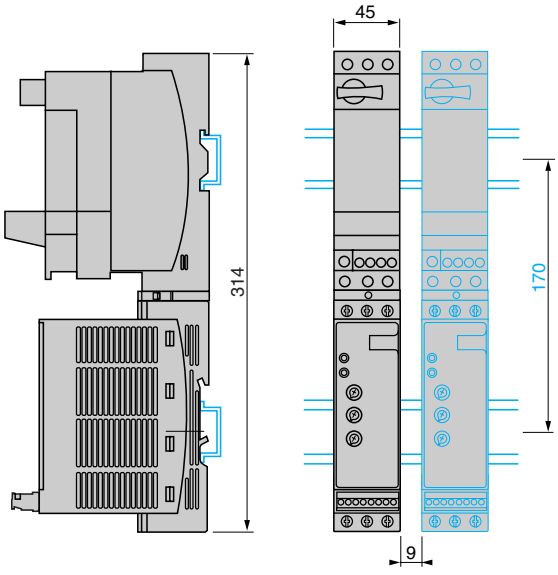
TeSys U combination (non-reversing or reversing power base) and ATSU 01N206LT to ATSU 01N212LT

Side by side mounting



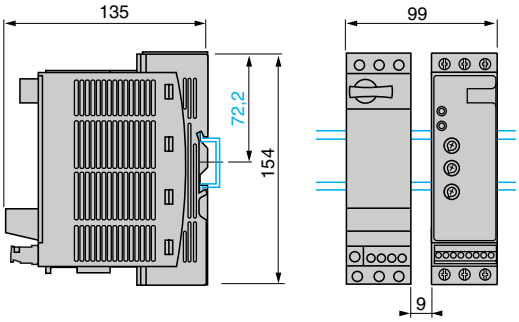
TeSys U combination (non-reversing power base) and ATSU 01N222LT to ATSU 01N232LT

Mounting on ⊓ (35 mm) rail with VW3 G4104 connector

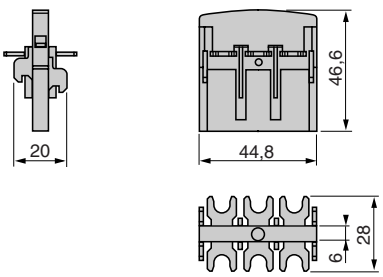


TeSys U combination (non-reversing or reversing power base) and ATSU 01N222LT to ATSU 01N232LT

Side by side mounting



VW3 G4104 connector



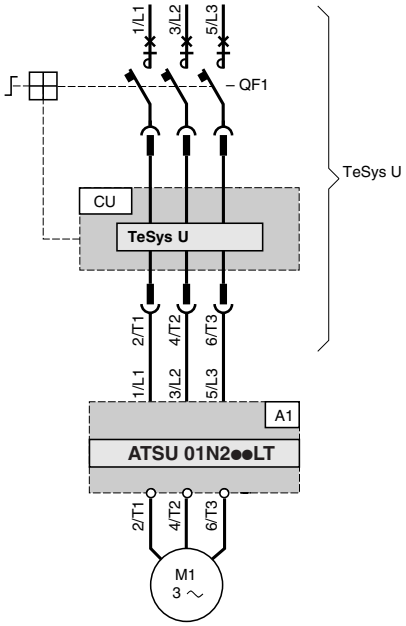
Soft starters for asynchronous motors

Altistart U01 and TeSys U

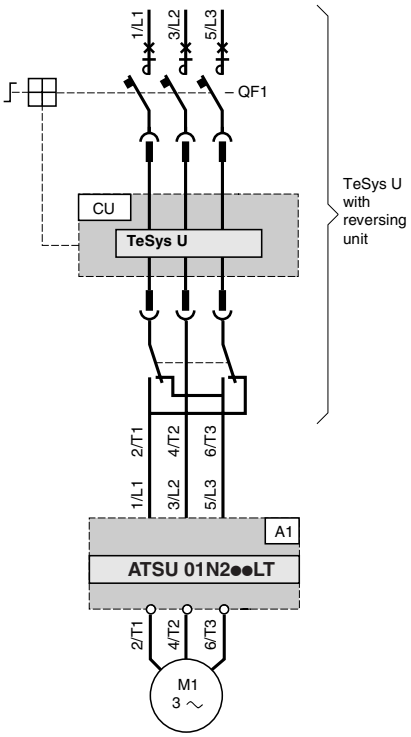
For 0.75 to 15 kW motors

ATSU 01N2●●LT soft start/soft stop units

Power wiring



Power wiring with reversing unit



Compatible components (For full references, see pages 1/18 and 1/19 or refer to our catalogue: “Motor starter solutions - Control and protection components”)

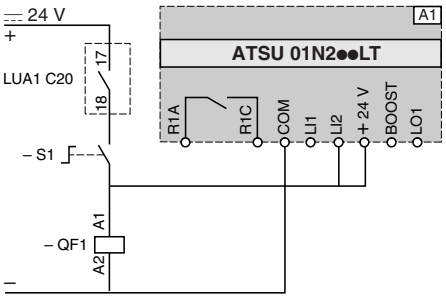
Code	Description
A1	Soft start/soft stop unit
QF1	TeSys U controller-starter
CU	TeSys U control unit

Soft starters for asynchronous motors
Altistart U01 and TeSys U
For 0.75 to 15 kW motors

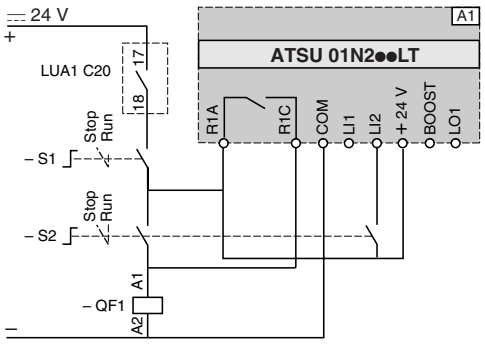
ATSU 01N2●●LT soft start/soft stop units *(continued)*

Automatic 2-wire control

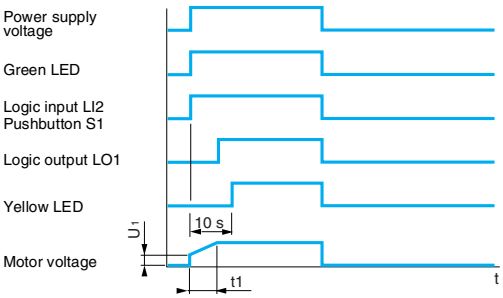
Without deceleration

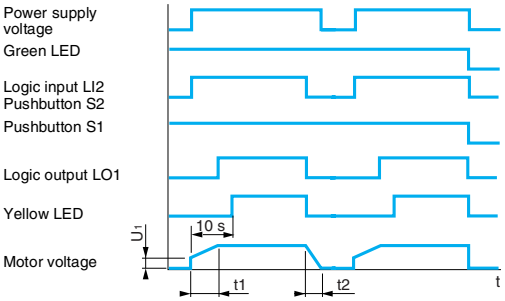


With and without deceleration



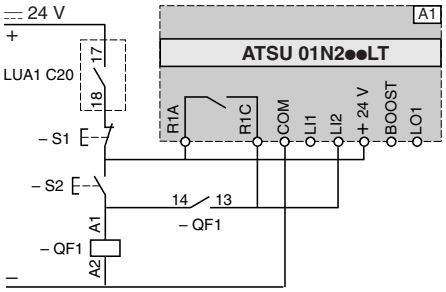
Functional diagrams



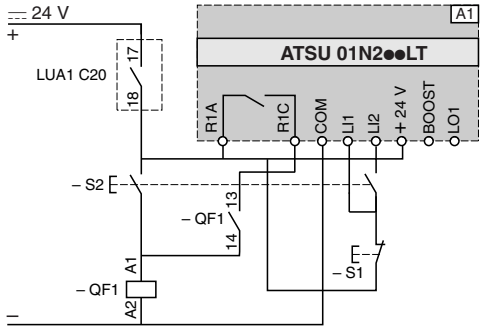


Automatic 3-wire control

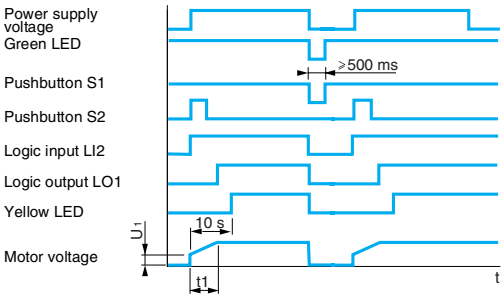
Without deceleration

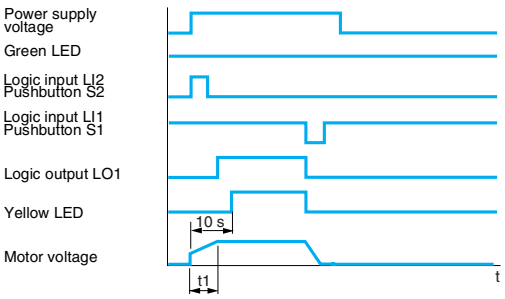


With deceleration



Functional diagrams





A1: Soft start/soft stop unit
S1, S2: XB4 B or XB5 B pushbuttons
QF1: TeSys U controller-starter
t1: Acceleration time can be controlled by a potentiometer
t2: Deceleration time can be controlled by a potentiometer
U_1: Starting time can be controlled by a potentiometer

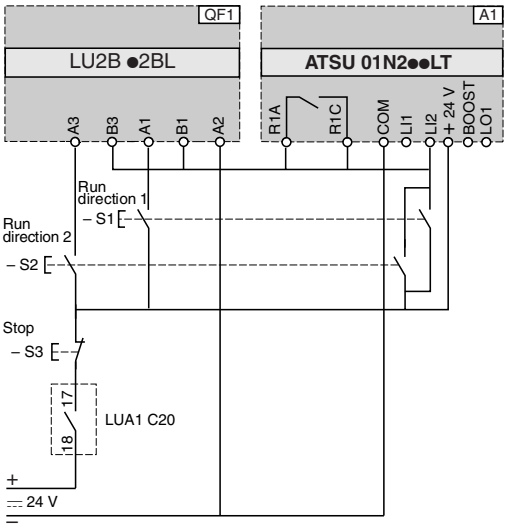
Presentation: pages 1/20 and 1/21
Characteristics: pages 1/22 and 1/23
References: page 1/24
Dimensions: page 1/25

Soft starters for asynchronous motors
Altistart U01 and TeSys U
For 0.75 to 15 kW motors

ATSU 01N2●●LT soft start/soft stop units *(continued)*

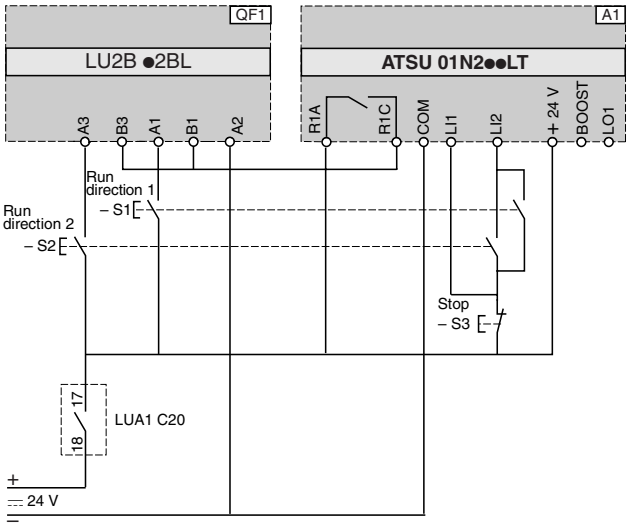
Automatic 3-wire control, with reversing unit

Without deceleration



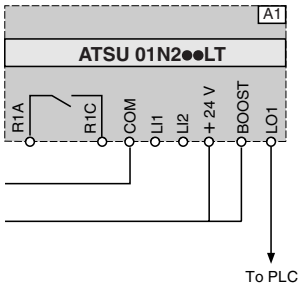
QF1: TeSys U controller-starter with reversing unit
A1: Soft start/soft stop unit
S1, S2, S3: XB4 B or XB5 B pushbuttons
S3: minimum depression time 500 ms

With deceleration



QF1: TeSys U controller-starter with reversing unit
A1: Soft start/soft stop unit
S1, S2, S3: XB4 B or XB5 B pushbuttons

Boost on starting and end of starting signal



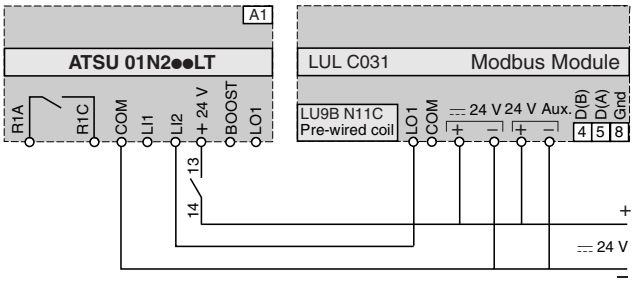
A1: Soft start/soft stop unit

Soft starters for asynchronous motors
Altistart U01 and TeSys U
For 0.75 to 15 kW motors

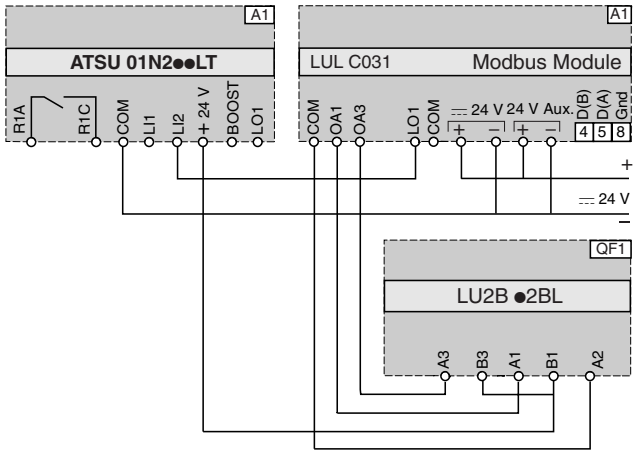
ATSU 01N2●●LT soft start/soft stop units *(continued)*

Automatic control with Modbus communication module, with and without deceleration

Without reversing unit



With reversing unit



Function	Register	Bit	Value
Powering down TeSys U and ATSU			
–	704	0	0
Automatic control without deceleration			
Run	700	0	1
Stop	704	0	0
Automatic control with deceleration			
Run	700	0	1
Soft stop	700	0	0

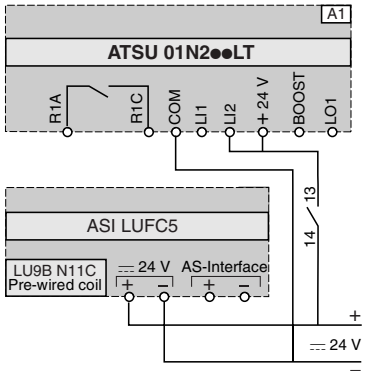
A1: Soft start/soft stop unit

Function	Register	Bit	Value
Powering up TeSys U and ATSU			
Forward	704	0	1
Reverse	704	1	1
Powering down TeSys U and ATSU			
Forward	704	0	0
Reverse	704	1	0
Automatic control without deceleration			
Run	700	0	1
Stop forward	704	0	0
Stop reverse	704	1	0
Automatic control with deceleration (forward or reverse)			
Run	700	0	1
Soft stop	700	0	0

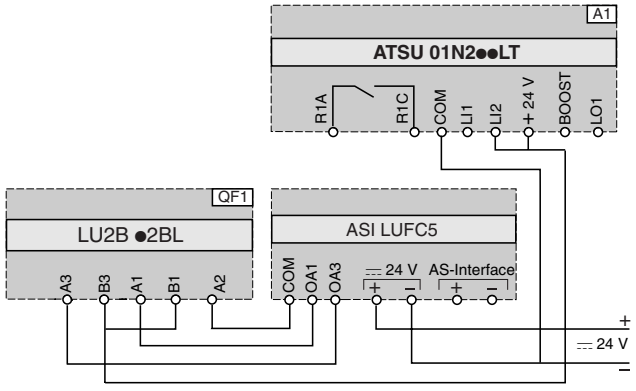
A1: Soft start/soft stop unit
QF1: TeSys U controller-starter with reversing unit

Automatic control with AS-Interface communication module, without deceleration

Without reversing unit



With reversing unit



Function	Bit	Value
Power-up and automatic control without deceleration		
Run	D0	1
Stop	D0	0

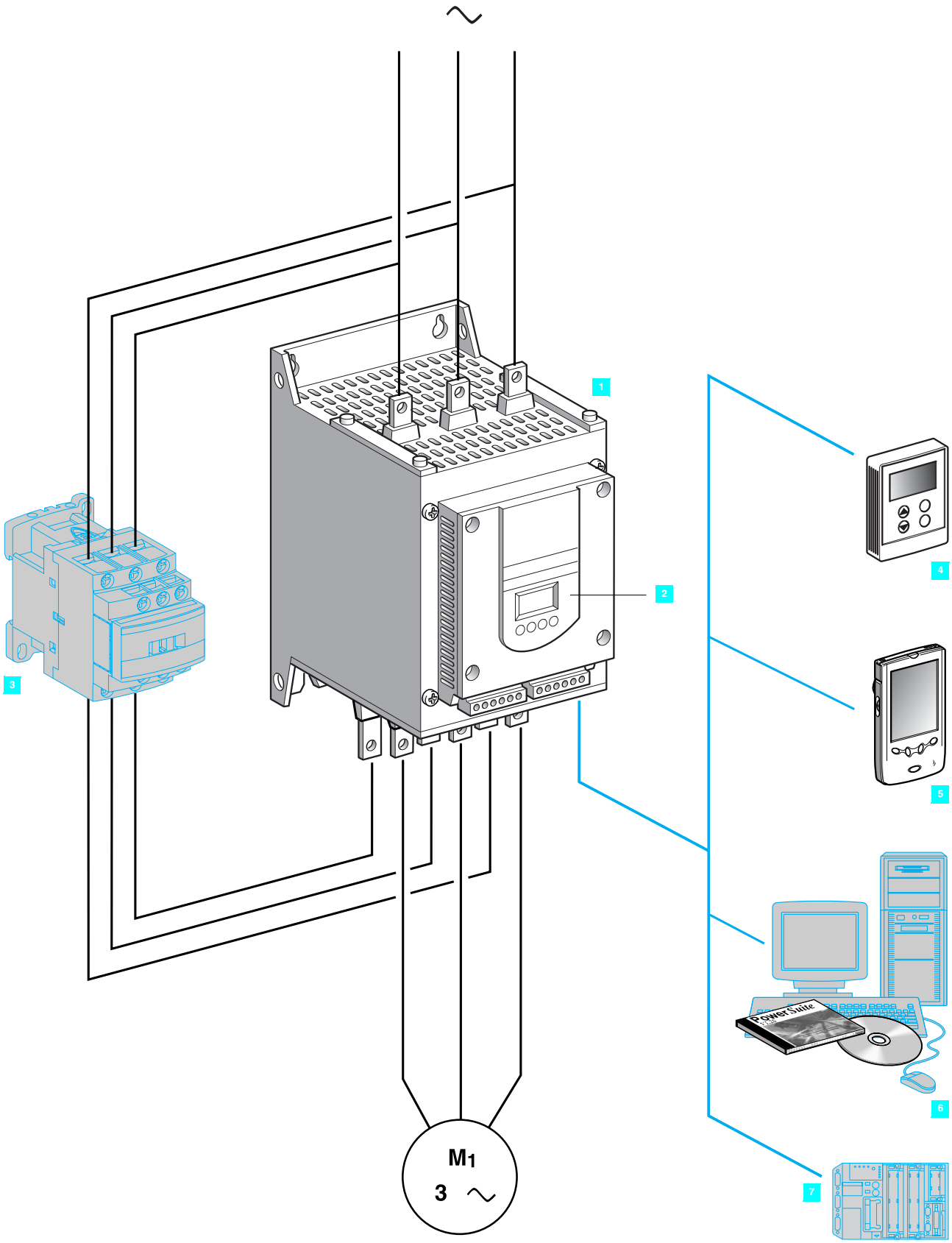
A1: Soft start/soft stop unit

Function	Bit	Value
Power-up and automatic control without deceleration		
Run forward	D0	1
Stop	D0	0
Run reverse	D1	1
Stop	D1	0

A1: Soft start/soft stop unit
QF1: TeSys U controller-starter with reversing unit

Presentation: pages 1/20 and 1/21
Characteristics: pages 1/22 and 1/23
References: page 1/24
Dimensions: page 1/25

Soft starters
for asynchronous motors
Altistart 48 soft start - soft stop units



Soft starters for asynchronous motors
Altistart 48 soft start - soft stop units

Applications

The Altistart 48 soft start - soft stop unit is a controller with 6 thyristors which is used for the torque-controlled soft starting and stopping of three-phase squirrel cage asynchronous motors in the power range between 4 and 1200 kW.

It offers soft starting and deceleration functions along with machine and motor protection functions as well as functions for communicating with control systems. These functions are designed for use in state-of-the-art applications in centrifugal machines, pumps, fans, compressors and conveyors, which are primarily to be found in the construction, food and beverages and chemical industries. The high-performance algorithms of the Altistart 48 contribute significantly to its robustness, safety and ease of setup.

The Altistart 48 soft start - soft stop unit is a cost-effective solution which can:
- reduce machine operating costs by reducing mechanical stress and improving machine availability,
- reduce the stress placed on the electrical distribution system by reducing line current peaks and voltage drops during motor starts.

The Altistart soft start - soft stop unit offer comprises 2 ranges:
- three-phase voltages 230 to 415 V, 50/60 Hz,
- three-phase voltages 208 to 690 V, 50/60 Hz.

In each voltage range, the Altistart soft start - soft stop units are dimensioned for standard and severe applications.

Functions

The Altistart 48 soft start - soft stop unit (1) is supplied ready for use in a standard application with motor protection class 10 (see page 1/73).
It comprises a built-in terminal (2) which can be used to modify programming, adjustment or monitoring functions in order to adapt and customise the application to meet individual customer requirements.

- **Drive performance functions**:
  - exclusive Altistart torque control (patented by Schneider Electric),
  - constant control of the torque supplied to the motor during acceleration and deceleration periods (significantly reducing pressure surges),
  - facility for adjusting the ramp and the starting torque,
  - the starter can be bypassed using a contactor (3) at the end of the starting period whilst maintaining electronic protection (by-pass function),
  - wide frequency tolerance for generator set power supplies,
  - the starter can be connected to the motor delta terminals in series with each winding.

- **Machine and motor protection functions**:
  - built-in motor thermal protection,
  - processing of information from PTC thermal probes,
  - monitoring of the starting time,
  - motor preheating function,
  - protection against underloads and overcurrents during continuous operation.

- **Functions facilitating the integration of the unit into control systems**:
  - 4 logic inputs, 2 logic outputs, 3 relay outputs and 1 analogue output,
  - plug-in I/O connectors,
  - function for configuring a second motor and easy-to-adapt settings,
  - display of electrical values, the state of the load and the operating time,
  - RS 485 serial link for connection to Modbus.

Options

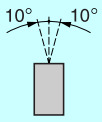
A remote terminal (4) can be mounted on the door of a wall-fixing or floor-standing enclosure.
PowerSuite advanced dialogue solutions:
- PowerSuite Pocket PC with PPC type terminal (5),
- PowerSuite software workshop (6).

A range of wiring accessories for connecting the starter to PLCs via a Modbus connection (7).
Bus communication and Ethernet, Fipio, DeviceNet and Profibus DP network communication options.

Characteristics: pages 1/32 to 1/35
References: pages 1/40 to 1/43
Dimensions: pages 1/48 to 1/53
Schemes: pages 1/54 to 1/59

Soft starters for asynchronous motors
Altistart 48 soft start - soft stop units

Environment characteristics

Conforming to standards			The electronic starters have been developed and performance tested in accordance with international standards, in particular with the starter product standard EN/IEC 60947-4-2
CE marking			Products have CE marking in accordance with the harmonised standard EN/IEC 60947-4-2.
Product certifications			UL, CSA, DNV, C-Tick, GOST, CCC, NOM 117, SEPRO, TCF
Degree of protection	ATS 48D17● to 48C11●		IP 20 (IP 00 in the absence of connections)
	ATS 48C14● to 48M12● *(1)*		IP 00
Vibration resistance			1.5 mm from 2 to 13 Hz, 1 gn from 13 to 200 Hz, conforming to IEC 60068-2-6
Shock resistance			15 gn for 11 ms, conforming to IEC 60068-2-27
Starter noise level *(2)*	ATS 48D32● to D47●	**dBA**	52
	ATS 48D62● to C11●	**dBA**	58
	ATS 48C14● to C17●	**dBA**	50
	ATS 48C21● to C32●	**dBA**	54
	ATS 48C41● to C66●	**dBA**	55
	ATS 48C79● to M12●	**dBA**	60
Fans	ATS 48D17● and D22●		Natural convection
	ATS 48D32● to M12●		Forced convection. The fans are activated automatically when a temperature threshold is reached. For flow rate: see page 1/53
Maximum ambient pollution			Level 3 , conforming to IEC 60664-1
Relative humidity			95 % without condensation or dripping water, conforming to IEC 60068-2-3
Ambient temperature around the device	Operation	**°C**	- 10...+ 40 without derating (between + 40 and + 60, derate the nominal current of the Altistart by 2 % for each °C)
	Storage	**°C**	- 25...+ 70, conforming to IEC 60947-4-2
Maximum operating altitude		**m**	1000 without derating (above this, derate the nominal current of the Altistart by 2.2 % for each additional 100 m). Limit to 2000 m
Operating position Maximum permanent angle in relation to the normal vertical mounting position			

Electrical characteristics

Operating category			AC-53a, Conforming to IEC 60947-4-2
Three-phase supply voltage	ATS 48●●●Q	**V**	230 - 15 % ...415 + 10 %
	ATS 48●●●Y	**V**	208 - 15 % ...690 + 10 %
Frequency		**Hz**	50/60 ± 5 % (automatic) 50 or 60 ± 20 % (must be set)
Nominal starter current	ATS 48●●●Q	**A**	17...1200
	ATS 48●●●Y	**A**	17...1200
Motor power	ATS 48●●●Q	**kW**	4...630
	ATS 48●●●Y	**kW/HP**	5,5...900 / 5...1200
Voltage indicated on the motor rating plate	ATS 48●●●Q	**V**	230...415
	ATS 48●●●Y	**V**	208...690
Starter control circuit supply voltage	ATS 48●●●Q	**V**	220 - 15 % to 415 + 10 %, 50 / 60 Hz
	ATS 48●●●Y	**V**	110 - 15 % to 230 + 10 %, 50 / 60 Hz
Maximum control circuit consumption (with fans operating)	ATS 48D17● to C17●	**W**	30
	ATS 48C21● to C32●	**W**	50
	ATS 48C41● to M12●	**W**	80
Relay output (2 configurable outputs)			3 relay outputs (R1, R2, R3), normally open contacts 1 "N/O" Minimum switching capacity: 10 mA for ⎓ 6 V Maximum switching capacity on inductive load: 1.8 A for ∿ 230 V and ⎓ 30 V (cos φ= 0.5 and L/R=20ms). Maximum nominal operating voltage ∿ 400 V Factory setting: R1 assigned as the "fault relay" (configurable) R2 assigned as the "end of starting relay" to control the starter bypass relay R3 assigned as "motor powered" (configurable)

(1) Protective covers can be fitted to the power terminals of ATS 48C14● to C32● starters (see page 1/45). ATS 48C41● to 48M12● starters have protection on the front panel and on the sides.

(2) Starters located 1 m away. The noise levels may change depending on the characteristics of the fans.

Presentation: pages 1/30 and 1/31 | References: pages 1/40 to 1/43 | Dimensions: pages 1/48 to 1/53 | Schemes: pages 1/54 to 1/59

Electrical characteristics (continued)

Logic inputs LI (2 configurable inputs)			4 logic inputs, impedance 4.3 kΩ, isolated: Stop, Run, LI3, LI4 + 24 V power supply (maximum 30 V) I max. 8 mA State 0 if U < 5 V and I < 2 mA State 1 if U > 11 V and I > 5 mA
Internal source available			1 x + 24 V output, isolated and protected against short-circuits and overloads Accuracy ± 25%. Max. current 200 mA
Logic outputs LO (configurable)			2 logic outputs LO1 and LO2 with 0 V common, compatible with level 1 PLC, according to standard IEC 65A-68 + 24 V power supply (minimum: + 12 V, maximum: + 30 V) Maximum output current: 200 mA if supplied externally
Analogue output AO (configurable)			Current output 0-20 mA or 4-20 mA Maximum load impedance: 500 Ω Accuracy ± 5% of the maximum value
Input for PTC probe			Total resistance of probe circuit 750 Ω at 25°C, according to IEC 60 738-A
Maximum I/O connection capacity			2.5 mm² (AWG 12)
Communication			RS 485 multidrop serial link integrated in the starter, for Modbus serial link, with RJ45 type connector Transmission speed 4800, 9600 or 19200 bps Maximum number of Altistart 48 connected: 18 Other uses: - connection to a remote terminal, - connection to a PC, - connection to other buses and networks via communication options.
Protection	Thermal		Built-in, starter and motor (calculated and/or thermal protection with PTC probes)
	Line protection		Phase failure, indicated by output relay
Current settings			The nominal motor current In can be adjusted from 0.4 to 1.3 times the starter nominal current. Adjustment of the maximum starting current from 1.5 to 7 times the motor In, limited to 5 times the starter nominal current.
Starting mode			By torque control with starter current limited to 5 In maximum Factory setting: 4 In for standard operation on 15 s torque ramp
Stopping mode	Freewheel stop		"Freewheel" stop (factory setting)
	Controlled stop on torque ramp		Programmed between 0.5 and 60 s (for pump applications)
	Braked stop		Controlled dynamically by the flux

Electromagnetic compatibility EMC *(1)*

	Standards	**Test levels**	**Examples (sources of interference)**
Summary of immunity tests carried out with the Altistart 48	**IEC 61000-4-2 level 3** Electrostatic discharge: - by contact, - in the air.	 6 kV 8 kV	 Contact off an electrically charged individual
	IEC 61000-4-3 level 3 Radiated electromagnetic fields	 10 V/m	 Equipment transmitting radio frequencies
	IEC 61000-4-4 level 4 Rapid electrical transients: - power supply cables, - control cables.	 4 kV 2 kV	 Opening/closing of a contactor
	IEC 61000-4-5 level 3 Shock wave: - phase/phase, - phase/earth.	 1 kV 2 kV	 -
	IEC 61000-4-12 level 3 Damped oscillating waves	 1 kV - 1 MHz	Oscillating circuit on the line supply
Radiated and conducted emissions	According to IEC 60947-4-2, class A, on all starters		
	According to IEC 60947-4-2, class B, on starters up to 170 A: ATS 48D17● to 48C17●. Must be bypassed at the end of starting		

(1) The starters conform to product standard IEC 60947-4-2, in particular with regard to EMC. This standard ensures a level of immunity for products and a level of emitted interference. In steady state, the interference emitted is below that required by the standard. During acceleration and deceleration phases, low level loads may be affected by low frequency interference (harmonics). To reduce this interference, connect chokes between the line supply and the Altistart 48 (see page 1/45).

Nota :

■ *Power factor correction capacitors can only be used upstream of the Altistart and only powered up at the end of starting.*
■ *The starter must be earthed to conform to the regulations concerning leakage currents (⩽ 30 mA). When the use of an upstream "residual current device" for protection is required by the installation standards, an AS-Interface type device must be used. Check its compatibility with the other protective devices. If the installation involves several starters on the same line supply, each starter must be earthed separately.*

1

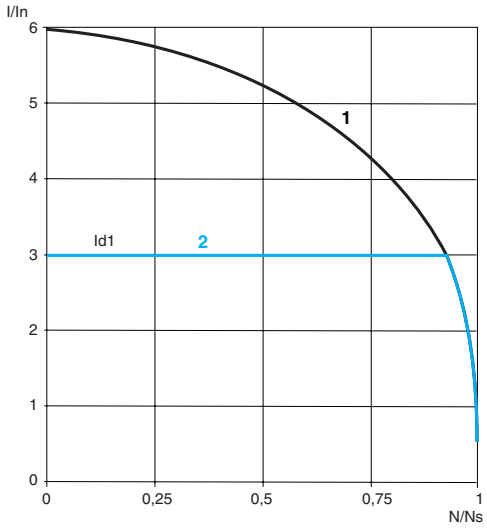
Torque characteristics

Curves indicating changes in the torque depending on the starting current of a three-phase asynchronous motor.
Curves 1: direct line starting.
Curves 2: starting in current limiting mode.
Torque curve Ts1 indicates the total torque range available depending on the limiting current Is1.
Limiting the starting current Is to a preset value Is1 will reduce the starting torque Ts1 to a value which is almost equal to the square of currents Is1/Is.
Example:
for motor characteristics: Ts = 3 Tn for Is = 6 In,
limit the current to Is1 = 3 In (0.5 Is)
resulting in a starting torque Ts1 = Ts x $(0.5)^2$ = 3 Tn x 0.25 = 0.75 Tn

1.3

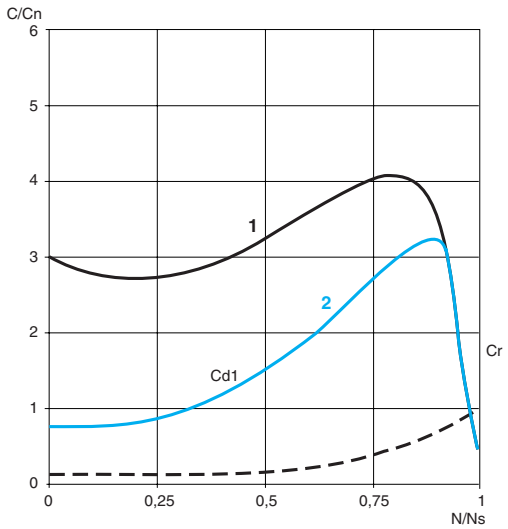
Starting current

1 Direct line starting current
2 Starting current limited to Is1



Starting torque

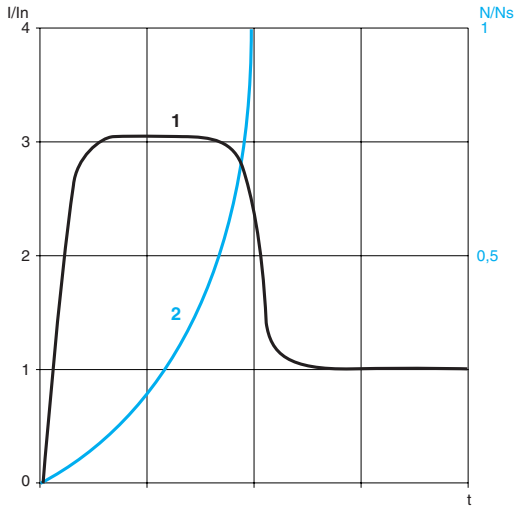
1 Direct line starting torque
2 Starting torque with current limited to Is1



Conventional starting using current limitation or voltage ramp

With current limitation Is1, the accelerating torque applied to the motor is equal to the motor torque Ts1 minus the resistive torque Tr.
The accelerating torque increases in the starting range as the speed changes and is at its highest at the end of acceleration (curve 2).
This characteristic means that the load is taken up very abruptly, which is not recommended for pump type applications.

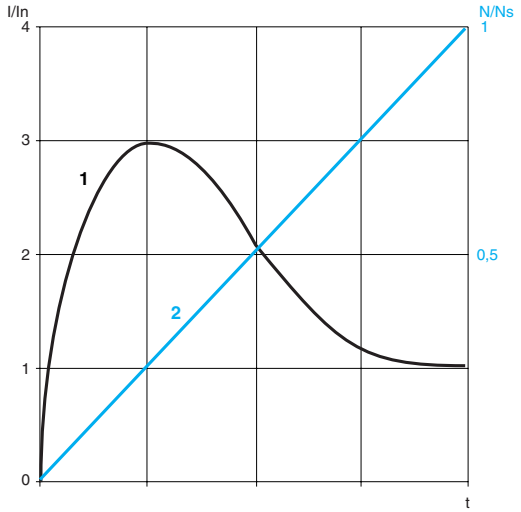
Example of speed curve for starting with current limitation
1 Current applied to the motor (I/In)
2 Motor speed N/Ns



Starting with the Altistart 48

Torque control on the Altistart 48 applies the torque to the motor during the entire starting phase if the current required (curve 1) does not exceed the limiting current.
The accelerating torque can be virtually constant over the entire speed range (curve 2).
It is possible to set the Altistart in order to obtain a high torque on starting for a rapid motor speed rise whilst limiting its temperature rise, and a lower accelerating torque at the end of starting for gradual loading.
This control function is ideal for centrifugal pumps or for machines with high resistive torque on starting.

Example of speed curve for starting with torque control
1 Current applied to the motor (I/In)
2 Motor speed N/Ns



Stopping with the Altistart 48

- Freewheel stop: the motor comes to a freewheel stop.
- Decelerated stop: this type of stop is ideal for pumps and can be used to effectively reduce pressure surges. Torque control on the Altistart 48 reduces the effect of hydraulic transients even if the load increases. This type of control makes adjustment easy.
- Braked stop: this type of stop is suitable for high inertia applications as it reduces the stopping time of the machine.

Presentation: pages 1/30 and 1/31 | References: pages 1/40 to 1/43 | Dimensions: pages 1/48 to 1/53 | Schemes: pages 1/54 to 1/59

Soft starters for asynchronous motors
Altistart 48 soft start - soft stop units

Selection criteria for an Altistart 48 soft start - soft stop unit

The Altistart 48 must be selected on the basis of 3 main criteria:

■ Two line power supply voltage ranges are available for selection:
□ three-phase a.c. voltage: 230 - 415 V,
□ three-phase a.c. voltage: 208 - 690 V.

■ The power and the nominal current indicated on the motor name plate.

■ The type of application and the operating cycle.
To simplify selection, the applications are categorised into 2 types:
□ standard applications,
□ severe applications.
Standard or severe applications define the limiting values of the current and the cycle for motor duties S1 and S4.

Standard application

In standard applications, the Altistart 48 is designed to provide:

■ Starting at 4 In for 23 seconds or at 3 In for 46 seconds from a cold state (corresponding to motor duty S1).

■ Starting at 3 In for 23 seconds or at 4 In for 12 seconds with a load factor of 50 % and 10 starts per hour or a an equivalent thermal cycle (corresponding to motor duty S4).
The motor thermal protection must conform to protection class 10 (see page 1/72).
Example: centrifugal pump.

Severe application

In severe applications, the Altistart 48 is designed to provide:

■ Starting at 4 In for 48 seconds or at 3 In for 90 seconds from a cold state (corresponding to S1 motor duty).

■ Starting at 4 In for 25 seconds with a load factor of 50 % and 5 starts per hour or a an equivalent thermal cycle (corresponding to S4 motor duty).
The motor thermal protection must conform to protection class 20 (see page 1/72).
Example: grinder.

Motor duties

S1 motor duty corresponds to starting followed by operation at constant load enabling the thermal equilibrium to be reached.
S4 motor duty corresponds to a cycle comprising starting, operation at constant load and an idle period.
This cycle is characterised by a load factor of 50 %.

Selecting the starter

Once the appropriate application has been selected from the following page, select the starter from pages 1/40 to 1/43 according to the supply voltage and the motor power.

Caution:
if the Altistart 48 is installed inside an enclosure, observe the mounting and derating recommendations (see page 1/53).

Soft starters for asynchronous motors

Altistart 48 soft start - soft stop units

Application areas

Depending on the type of machine, the applications are categorized as standard or severe based on the starting characteristics, which are given as examples only, in the table below.

Type of machine	Application	Functions performed by the Altistart 48	Starting current (% In)	Starting time (s)
Centrifugal pump	Standard	Deceleration (reduction in pressure surges) Protection against underloads or inversion of the phase rotation direction	300	5 to 15
Piston pump	Standard	Control of running dry and direction of rotation of the pump	350	5 to 10
Fan	Standard Severe if > 30 s	Detection of overloads caused by clogging or underloads (motor fan transmission broken) Braking torque on stopping	300	10 to 40
Cold compressor	Standard	Protection, even for special motors	300	5 to 10
Screw compressor	Standard	Protection against inversion of direction of phase rotation Contact for automatic draining on stopping	300	3 to 20
Centrifugal compressor	Standard Severe if > 30 s	Protection against inversion of direction of phase rotation Contact for automatic emptying on stopping	350	10 to 40
Piston compressor	Standard	Protection against inversion of direction of phase rotation Contact for automatic emptying on stopping	350	5 to 10
Conveyor, transporter	Standard	Overload control for detecting faults or underload control for detecting breaks	300	3 to 10
Lifting screw	Standard	Overload control for detecting hard spots or underload control for detecting breaks	300	3 to 10
Drag lift	Standard	Overload control for detecting jamming or underload control for detecting breaks	400	2 to 10
Lift	Standard	Overload control for detecting jamming or underload control for detecting breaks Constant starting with variable load	350	5 to 10
Circular saw, band saw	Standard Severe if > 30 s	Braking for fast stop	300	10 to 60
Pulper, butchery knife	Severe	Torque control on starting	400	3 to 10
Agitator	Standard	The current display indicates the density of the product	350	5 to 20
Mixer	Standard	The current display indicates the density of the product	350	5 to 10
Grinder	Severe	Braking to limit vibrations during stopping, overload control to detect jamming	450	5 to 60
Crusher	Severe	Braking to limit vibrations during stopping, overload control to detect jamming	400	10 to 40
Refiner	Standard	Torque control on starting and stopping	300	5 to 30
Press	Severe	Braking to increase the number of cycles	400	20 to 60

Soft starters for asynchronous motors
Altistart 48 soft start - soft stop units

Special uses

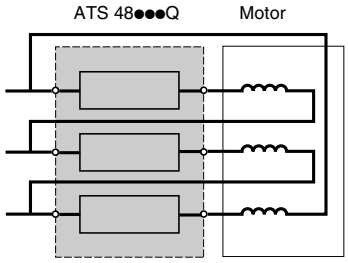
Other criteria can influence the selection of the Altistart 48:

Starter wired to the motor delta terminal
(see the recommended application diagram on page 1/56)

In addition to the most frequently encountered wiring layouts, where the starter is installed in the line supply of the motor and the motor is connected in star or delta configuration, the Altistart 48 ATS 48●●●Q can be wired to the motor delta terminal in series with each winding (see the application diagram below). The starter current is lower than the line current absorbed by the motor by a ratio of $\sqrt{3}$. This type of installation enables a starter with a lower rating to be used.

Example: for a 400 V/110 kW motor with a line current of 195 A (nominal current for the delta connection), the current in each winding is equal to $195/\sqrt{3}$, i.e. 114 A. Select the starter rating with a maximum permanent nominal current just above this current, i.e. 140A (ATS 48C14Q for a standard application).
To avoid making this calculation, simply use the table on page 1/41.

This type of installation only permits freewheel stopping and is not compatible with the cascade and preheating functions.



Starter wired in series with the motor windings

Note: the nominal current and limiting current settings as well as the current displayed during operation are on-line values (so do not have to be calculated by the user).

Caution: for this type of installation, observe the wiring scheme and the associated recommendations on page 1/56.

Starter bypassed by a contactor
(see the recommended application diagram on page 1/55)

The starter can be bypassed by a contactor at the end of starting (to limit the heat dissipated by the starter). The bypass contactor is controlled by the starter and the current measurements and protective mechanisms remain active when the starter is bypassed.
The starter is selected on the basis of the 3 main criteria and one of the following criteria:

■ If the starter is bypassed at the end of starting, the motor is always started from cold state and the starter can be oversized by one rating.
Example: select an ATS 48D17Q for an 11 kW motor in a standard 400 V application.

■ If the starter must be able to operate without the bypass contactor at the end of starting, it does not have to be derated.
Example: select an ATS 48D17Q for a 7.5 kW motor in a standard 400 V application.

Special uses (continued)

Motors in parallel

Motors may be connected in parallel provided that the power limit of the starter is not exceeded (the sum of the motor currents must not exceed the nominal current of the starter selected depending on the type of application). Provide thermal protection for each motor.

Brush motor

The Altistart 48 can operate with a bypassed rotor resistance motor or with a resistance lug. The starting torque is modified in accordance with the rotor resistance. If necessary, maintain a low resistance in order to obtain the required torque to overcome the resistive torque on starting.
A bypassed brush motor has a very low starting torque. A high stator current is required to obtain the sufficient starting torque.
Oversize the starter in order that the value of the limiting current is 7 times that of the nominal current.
Note: ensure that the starting torque of the motor, equal to 7 times the nominal current, is greater than the resistive torque.
Note: the Altistart 48 torque control enables excellent soft starting despite the limiting current being 7 times the nominal current required to start the motor.

Dahlander motor and 2-speed motor

The Altistart 48 can operate with a 2-speed motor. A motor demagnetisation period must elapse before changing from low speed to high speed in order to avoid antiphases between the line supply and the motor, which would generate very high currents.
Select the starter using the 3 main criteria.

Very long cable

Very long motor cables cause voltage drops due to the resistance of the cable. If the voltage drop is significant, it could affect the current consumption and the torque available. This must therefore be taken into account when selecting the motor and the starter.

Starters in parallel on the same line supply

If several starters are installed on the same line supply, line chokes should be installed between the transformer and the starter (see page 1/45).

Recommendations for use

Caution: do not use the Altistart 48 upstream of loads other than motors (for examples transformers and resistors are forbidden).
Do not connect power factor correction capacitors to the terminals of a motor controlled by an Altistart 48.

Soft starters

Altistart 48 soft start - soft stop units
Line voltage 230/415 V
Connection in the motor supply line


106762

ATS 48D17Q


106761

ATS 48C14Q


106758

ATS 48M12Q

For standard applications

Motor		Starter 230/415 V - 50/60 Hz				
Motor power *(1)*		Nominal current (IcL) *(2)*	Factory setting current *(4)*	Power dissipated at nominal load	Reference	Weight
230 V	400 V					
kW	kW	A	A	W		kg
4	7.5	17	14.8	59	**ATS 48D17Q**	4.900
5.5	11	22	21	74	**ATS 48D22Q**	4.900
7.5	15	32	28.5	104	**ATS 48D32Q**	4.900
9	18.5	38	35	116	**ATS 48D38Q**	4.900
11	22	47	42	142	**ATS 48D47Q**	4.900
15	30	62	57	201	**ATS 48D62Q**	8.300
18.5	37	75	69	245	**ATS 48D75Q**	8.300
22	45	88	81	290	**ATS 48D88Q**	8.300
30	55	110	100	322	**ATS 48C11Q**	8.300
37	75	140	131	391	**ATS 48C14Q**	12.400
45	90	170	162	479	**ATS 48C17Q**	12.400
55	110	210	195	580	**ATS 48C21Q**	18.200
75	132	250	233	695	**ATS 48C25Q**	18.200
90	160	320	285	902	**ATS 48C32Q**	18.200
110	220	410	388	1339	**ATS 48C41Q**	51.400
132	250	480	437	1386	**ATS 48C48Q**	51.400
160	315	590	560	1731	**ATS 48C59Q**	51.400
–	355	660	605	1958	**ATS 48C66Q**	51.400
220	400	790	675	2537	**ATS 48C79Q**	115.000
250	500	1000	855	2865	**ATS 48M10Q**	115.000
355	630	1200	1045	3497	**ATS 48M12Q**	115.000

For severe applications

Motor		Starter 230/415 V - 50/60 Hz				
Motor power *(1)*		Nominal current *(3)*	Factory setting current *(4)*	Power dissipated at nominal load	Reference	Weight
230 V	400 V					
kW	kW	A	A	W		kg
3	5.5	12	14.8	46	**ATS 48D17Q**	4.900
4	7.5	17	21	59	**ATS 48D22Q**	4.900
5.5	11	22	28.5	74	**ATS 48D32Q**	4.900
7.5	15	32	35	99	**ATS 48D38Q**	4.900
9	18.5	38	42	116	**ATS 48D47Q**	4.900
11	22	47	57	153	**ATS 48D62Q**	8.300
15	30	62	69	201	**ATS 48D75Q**	8.300
18.5	37	75	81	245	**ATS 48D88Q**	8.300
22	45	88	100	252	**ATS 48C11Q**	8.300
30	55	110	131	306	**ATS 48C14Q**	12.400
37	75	140	162	391	**ATS 48C17Q**	12.400
45	90	170	195	468	**ATS 48C21Q**	18.200
55	110	210	233	580	**ATS 48C25Q**	18.200
75	132	250	285	695	**ATS 48C32Q**	18.200
90	160	320	388	1017	**ATS 48C41Q**	51.400
110	220	410	437	1172	**ATS 48C48Q**	51.400
132	250	480	560	1386	**ATS 48C59Q**	51.400
160	315	590	605	1731	**ATS 48C66Q**	51.400
–	355	660	675	2073	**ATS 48C79Q**	115.000
220	400	790	855	2225	**ATS 48M10Q**	115.000
250	500	1000	1045	2865	**ATS 48M12Q**	115.000

(1) Value indicated on the motor rating plate.
(2) Corresponds to the maximum permanent current in class 10. IcL corresponds to the starter rating.
(3) Corresponds to the maximum permanent current in class 20.
(4) The factory setting current corresponds to the value of the nominal current of a standard 4-pole, 400 V, class 10 motor (standard application). Adjust the settings in accordance with the motor nominal current.

Presentation: pages 1/30 and 1/31
Characteristics: pages 1/32 to 1/35
Dimensions: pages 1/48 and 1/49
Schemes: pages 1/54 to 1/59

Soft starters

Altistart 48 soft start - soft stop units
Line voltage 230/415 V
Connection to the motor delta terminals

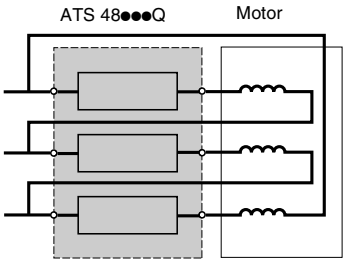


Figure 1
Special use:
starter connected to the motor delta terminal in series with each winding

For standard applications according to figure 1

Motor		Starter 230/415 V - 50/60 Hz				
Motor power *(1)*		Nominal current *(2)*	Factory setting current *(4)*	Power dissipated at nominal load	Reference	Weight
230 V	400 V					
kW	kW	A	A	W		kg
7.5	15	29	14.8	59	**ATS 48D17Q**	4.900
9	18.5	38	21	74	**ATS 48D22Q**	4.900
15	22	55	28.5	104	**ATS 48D32Q**	4.900
18.5	30	66	35	116	**ATS 48D38Q**	4.900
22	45	81	42	142	**ATS 48D47Q**	4.900
30	55	107	57	201	**ATS 48D62Q**	8.300
37	55	130	69	245	**ATS 48D75Q**	8.300
45	75	152	81	290	**ATS 48D88Q**	8.300
55	90	191	100	322	**ATS 48C11Q**	8.300
75	110	242	131	391	**ATS 48C14Q**	12.400
90	132	294	162	479	**ATS 48C17Q**	12.400
110	160	364	195	580	**ATS 48C21Q**	18.200
132	220	433	233	695	**ATS 48C25Q**	18.200
160	250	554	285	902	**ATS 48C32Q**	18.200
220	315	710	388	1339	**ATS 48C41Q**	51.400
250	355	831	437	1386	**ATS 48C48Q**	51.400
–	400	1022	560	1731	**ATS 48C59Q**	51.400
315	500	1143	605	1958	**ATS 48C66Q**	51.400
355	630	1368	675	2537	**ATS 48C79Q**	115.000
–	710	1732	855	2865	**ATS 48M10Q**	115.000
500	–	2078	1045	3497	**ATS 48M12Q**	115.000

For severe applications according to figure 1

Motor		Starter 230/415 V - 50/60 Hz				
Motor power *(1)*		Nominal current *(3)*	Factory setting current *(4)*	Power dissipated at nominal load	Reference	Weight
230 V	400 V					
kW	kW	A	A	W		kg
5.5	11	22	14.8	46	**ATS 48D17Q**	4.900
7.5	15	29	21	59	**ATS 48D22Q**	4.900
9	18.5	38	28.5	74	**ATS 48D32Q**	4.900
15	22	55	35	99	**ATS 48D38Q**	4.900
18.5	30	66	42	116	**ATS 48D47Q**	4.900
22	45	81	57	153	**ATS 48D62Q**	8.300
30	55	107	69	201	**ATS 48D75Q**	8.300
37	55	130	81	245	**ATS 48D88Q**	8.300
45	75	152	100	252	**ATS 48C11Q**	8.300
55	90	191	131	306	**ATS 48C14Q**	12.400
75	110	242	162	391	**ATS 48C17Q**	12.400
90	132	294	195	468	**ATS 48C21Q**	18.200
110	160	364	233	580	**ATS 48C25Q**	18.200
132	220	433	285	695	**ATS 48C32Q**	18.200
160	250	554	388	1017	**ATS 48C41Q**	51.400
220	315	710	437	1172	**ATS 48C48Q**	51.400
250	355	831	560	1386	**ATS 48C59Q**	51.400
–	400	1022	605	1731	**ATS 48C66Q**	51.400
315	500	1143	675	2073	**ATS 48C79Q**	115.000
355	630	1368	855	2225	**ATS 48M10Q**	115.000
–	710	1732	1045	2865	**ATS 48M12Q**	115.000

(1) Value indicated on the motor rating plate.
(2) Corresponds to the maximum permanent current in class 10.
(3) Corresponds to the maximum permanent current in class 20.
(4) For this type of connection, the factory setting current must be adjusted in accordance with the nominal motor current.

Presentation: pages 1/30 and 1/31
Characteristics: pages 1/32 to 1/35
Dimensions: pages 1/48 and 1/49
Schemes: pages 1/54 to 1/59

Soft starters

Altistart 48 soft start - soft stop units
Line voltage 208/690 V
Motor power in HP

ATS 48D17Y

ATS 48C14Y

ATS 48M12Y

For standard applications

Motor				Starter 208/690 V - 50/60 Hz				
Motor power (1)				Nominal current (IcL) (2)	Factory setting current (4)	Power dissipated at nominal load	Reference	Weight
208 V	230 V	460 V	575 V					
HP	HP	HP	HP	A	A	W		kg
3	5	10	15	17	14	59	ATS 48D17Y	4.900
5	7.5	15	20	22	21	74	ATS 48D22Y	4.900
7.5	10	20	25	32	27	104	ATS 48D32Y	4.900
10	–	25	30	38	34	116	ATS 48D38Y	4.900
–	15	30	40	47	40	142	ATS 48D47Y	4.900
15	20	40	50	62	52	201	ATS 48D62Y	8.300
20	25	50	60	75	65	245	ATS 48D75Y	8.300
25	30	60	75	88	77	290	ATS 48D88Y	8.300
30	40	75	100	110	96	322	ATS 48C11Y	8.300
40	50	100	125	140	124	391	ATS 48C14Y	12.400
50	60	125	150	170	156	479	ATS 48C17Y	12.400
60	75	150	200	210	180	580	ATS 48C21Y	18.200
75	100	200	250	250	240	695	ATS 48C25Y	18.200
100	125	250	300	320	302	902	ATS 48C32Y	18.200
125	150	300	350	410	361	1339	ATS 48C41Y	51.400
150	–	350	400	480	414	1386	ATS 48C48Y	51.400
–	200	400	500	590	477	1731	ATS 48C59Y	51.400
200	250	500	600	660	590	1958	ATS 48C66Y	51.400
250	300	600	800	790	720	2537	ATS 48C79Y	115.000
350	350	800	1000	1000	954	2865	ATS 48M10Y	115.000
400	450	1000	1200	1200	1170	3497	ATS 48M12Y	115.000

For severe applications

Motor				Starter 208/690 V - 50/60 Hz				
Motor power (1)				Nominal current (3)	Factory setting current (4)	Power dissipated at nominal load	Reference	Weight
208 V	230 V	460 V	575 V					
HP	HP	HP	HP	A	A	W		kg
2	3	7.5	10	12	14	46	ATS 48D17Y	4.900
3	5	10	15	17	21	59	ATS 48D22Y	4.900
5	7.5	15	20	22	27	74	ATS 48D32Y	4.900
7.5	10	20	25	32	34	99	ATS 48D38Y	4.900
10	–	25	30	38	40	116	ATS 48D47Y	4.900
–	15	30	40	47	52	153	ATS 48D62Y	8.300
15	20	40	50	62	65	201	ATS 48D75Y	8.300
20	25	50	60	75	77	245	ATS 48D88Y	8.300
25	30	60	75	88	96	252	ATS 48C11Y	8.300
30	40	75	100	110	124	306	ATS 48C14Y	12.400
40	50	100	125	140	156	391	ATS 48C17Y	12.400
50	60	125	150	170	180	468	ATS 48C21Y	18.200
60	75	150	200	210	240	580	ATS 48C25Y	18.200
75	100	200	250	250	302	695	ATS 48C32Y	18.200
100	125	250	300	320	361	1017	ATS 48C41Y	51.400
125	150	300	350	410	414	1172	ATS 48C48Y	51.400
150	–	350	400	480	477	1386	ATS 48C59Y	51.400
–	200	400	500	590	590	1731	ATS 48C66Y	51.400
200	250	500	600	660	720	2073	ATS 48C79Y	115.000
250	300	600	800	790	954	2225	ATS 48M10Y	115.000
350	350	800	1000	1000	1170	2865	ATS 48M12Y	115.000

(1) Value indicated on the motor rating plate.
(2) Corresponds to the maximum permanent current in class 10. IcL corresponds to the starter rating.
(3) Corresponds to the maximum permanent current in class 20.
(4) The factory setting current corresponds to the value of the nominal current of a standard motor according to NEC, 460 V, class 10 (standard application). Adjust the settings in accordance with the motor nominal current.

Presentation: pages 1/30 and 1/31
Characteristics: pages 1/32 to 1/35
Dimensions: pages 1/48 and 1/49
Schemes: pages 1/54 to 1/59

Soft starters

Altistart 48 soft start - soft stop units
Line voltage 208/690 V
Motor power in kW

For standard applications

Motor							Starter 208/690 V - 50/60 Hz				
Motor power *(1)*							Nominal current (IcL) *(2)*	Factory setting current *(4)*	Power dissipated at nominal load	Reference	Weight
230 V	400 V	440 V	500 V	525 V	660 V	690 V					
kW	kW	kW	kW	kW	kW	kW	A	A	W		kg
4	7.5	7.5	9	9	11	15	17	14	59	**ATS 48D17Y**	4.900
5.5	11	11	11	11	15	18.5	22	21	74	**ATS 48D22Y**	4.900
7.5	15	15	18.5	18.5	22	22	32	27	104	**ATS 48D32Y**	4.900
9	18.5	18.5	22	22	30	30	38	34	116	**ATS 48D38Y**	4.900
11	22	22	30	30	37	37	47	40	142	**ATS 48D47Y**	4.900
15	30	30	37	37	45	45	62	52	201	**ATS 48D62Y**	8.300
18.5	37	37	45	45	55	55	75	65	245	**ATS 48D75Y**	8.300
22	45	45	55	55	75	75	88	77	290	**ATS 48D88Y**	8.300
30	55	55	75	75	90	90	110	96	322	**ATS 48C11Y**	8.300
37	75	75	90	90	110	110	140	124	391	**ATS 48C14Y**	12.400
45	90	90	110	110	132	160	170	156	479	**ATS 48C17Y**	12.400
55	110	110	132	132	160	200	210	180	580	**ATS 48C21Y**	18.200
75	132	132	160	160	220	250	250	240	695	**ATS 48C25Y**	18.200
90	160	160	220	220	250	315	320	302	902	**ATS 48C32Y**	18.200
110	220	220	250	250	355	400	410	361	1339	**ATS 48C41Y**	51.400
132	250	250	315	315	400	500	480	414	1386	**ATS 48C48Y**	51.400
160	315	355	400	400	560	560	590	477	1731	**ATS 48C59Y**	51.400
–	355	400	–	–	630	630	660	590	1958	**ATS 48C66Y**	51.400
220	400	500	500	500	710	710	790	720	2537	**ATS 48C79Y**	115.000
250	500	630	630	630	900	900	1000	954	2865	**ATS 48M10Y**	115.000
355	630	710	800	800	–	–	1200	1170	3497	**ATS 48M12Y**	115.000

For severe applications

Motor							Starter 208/690 V - 50/60 Hz				
Motor power *(1)*							Nominal current *(3)*	Factory setting current *(4)*	Power dissipated at nominal load	Reference	Weight
230 V	400 V	440 V	500 V	525 V	660 V	690 V					
kW	kW	kW	kW	kW	kW	kW	A	A	W		kg
3	5.5	5.5	7.5	7.5	9	11	12	14	46	**ATS 48D17Y**	4.900
4	7.5	7.5	9	9	11	15	17	21	59	**ATS 48D22Y**	4.900
5.5	11	11	11	11	15	18.5	22	27	74	**ATS 48D32Y**	4.900
7.5	15	15	18.5	18.5	22	22	32	34	99	**ATS 48D38Y**	4.900
9	18.5	18.5	22	22	30	30	38	40	116	**ATS 48D47Y**	4.900
11	22	22	30	30	37	37	47	52	153	**ATS 48D62Y**	8.300
15	30	30	37	37	45	45	62	65	201	**ATS 48D75Y**	8.300
18.5	37	37	45	45	55	55	75	77	245	**ATS 48D88Y**	8.300
22	45	45	55	55	75	75	88	96	252	**ATS 48C11Y**	8.300
30	55	55	75	75	90	90	110	124	306	**ATS 48C14Y**	12.400
37	75	75	90	90	110	110	140	156	391	**ATS 48C17Y**	12.400
45	90	90	110	110	132	160	170	180	468	**ATS 48C21Y**	18.200
55	110	110	132	132	160	200	210	240	580	**ATS 48C25Y**	18.200
75	132	132	160	160	220	250	250	302	695	**ATS 48C32Y**	18.200
90	160	160	220	220	250	315	320	361	1017	**ATS 48C41Y**	51.400
110	220	220	250	250	355	400	410	414	1172	**ATS 48C48Y**	51.400
132	250	250	315	315	400	500	480	477	1386	**ATS 48C59Y**	51.400
160	315	355	400	400	560	560	590	590	1731	**ATS 48C66Y**	51.400
–	355	400	–	–	630	630	660	720	2073	**ATS 48C79Y**	115.000
220	400	500	500	500	710	710	790	954	2225	**ATS 48M10Y**	115.000
250	500	630	630	630	900	900	1000	1170	2865	**ATS 48M12Y**	115.000

(1) Value indicated on the motor rating plate.
(2) Corresponds to the maximum permanent current in class 10. IcL corresponds to the starter rating.
(3) Corresponds to the maximum permanent current in class 20.
(4) The factory setting current corresponds to the value of the nominal current of a standard motor according to NEC, 460 V, class 10 (standard application). Adjust the settings in accordance with the motor nominal current.

Presentation: pages 1/30 and 1/31
Characteristics: pages 1/32 to 1/35
Dimensions: pages 1/48 and 1/49
Schemes: pages 1/54 to 1/59

Soft starters for asynchronous motors

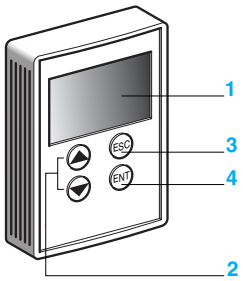
Altistart 48 soft start - soft stop units

Options: remote terminal, line chokes and DNV kits

Remote terminal

The terminal can be mounted on the door of a wall-fixing or floor-standing enclosure. It has the same signalling display and configuration buttons as the terminal integrated in the starter. A switch to lock access to the menu is located at the rear of the terminal.

The option comprises:
- the remote terminal
- a mounting kit containing a cover, screws and an IP 54 seal on the front panel
- a 3 m connecting cable with a 9-way SUB-D connector for connecting to the terminal and an RJ45 connector for connecting to the Altistart 48



1 Information is displayed in the form of codes or values in three "7-segment" displays
2 buttons for scrolling through the menus or modifying values
3 "ESC": button for exiting the menus (cannot be used for validation purposes)
4 "ENT": validation button for entering a menu or confirming the new value selected

Line chokes

The use of line chokes is recommended in particular when installing several electronic starters on the same line supply. The values of the chokes are defined for a voltage drop between 3% and 5% of the nominal line voltage.
Install the line choke between the line contactor and the starter.

DNV kits

These kits enable ATS 48D62● to 48M12● starters to meet the requirements of the DNV certification body.
Each kit consists of the fixing pins and all the parts necessary for mounting the starter (when mounting using the VW3 G48107 kit a sling must be used, which is not included).

ATS 48D17● to 48D47● starters are DNV certified and it is not necessary to add an optional kit.

References:
page 1/45

Dimension:
pages 1/50 to 1/52

Soft starters for asynchronous motors

Altistart 48 soft start - soft stop units

Options: remote terminal, line chokes, DNV kits, protective covers and documentation

106770

VW3 G48101

Remote terminal

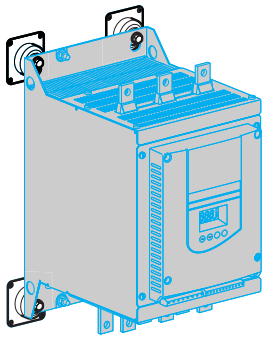
Description	Reference	Weight kg
Remote terminal	**VW3 G48101**	0.200

Line chokes

For starters	Value of the choke mH	Nominal current A	Degree of protection	Reference	Weight kg
ATS 48D17●	1.7	15	IP 20	**VZ1 L015UM17T**	2.100
ATS 48D22●	0.8	30	IP 20	**VZ1 L030U800T**	4.100
ATS 48D32● and 48D38●	0.6	40	IP 20	**VZ1 L040U600T**	5.100
ATS 48D47● and 48D62●	0.35	70	IP 20	**VZ1 L070U350T**	8.000
ATS 48D75● to 48C14●	0.17	150	IP 00	**VZ1 L150U170T**	14.900
ATS 48C17● to 48C25●	0.1	250	IP 00	**VZ1 L250U100T**	24.300
ATS 48C32●	0.075	325	IP 00	**VZ1 L325U075T**	28.900
ATS 48C41● and 48C48●	0.045	530	IP 00	**VZ1 L530U045T**	37.000
ATS 48C59● to 48M10●	0.024	1025	IP 00	**VZ1 LM10U024T**	66.000
ATS 48M12●	0.016	1435	IP 00	**VZ1 LM14U016T**	80.000

Nota : *line chokes with IP 00 degree of protection must be fitted with a protective bar to protect personnel against electrical contact.*

524102



VW3 G48106

DNV kits

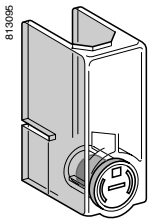
For starters	Reference	Weight kg
ATS 48D62● to 48C17●	**VW3 G48106**	0.600
ATS 48C21● to 48C32●	**VW3 G48107**	0.680
ATS 48C41● to 48C66●	**VW3 G48108**	3.400
ATS 48C79● to 48M12●	**VW3 G48109**	4.400

Protective covers for power terminals

To be used with tags closed

For starters	Number of covers per set	Reference	Weight kg
ATS 48C14● and ATS 48C17●	6 *(1)*	**LA9 F702**	0.250

813095



LA9 F702

Documentation

Description	Format	Reference	Weight kg
Altistart 48 user's manual	A5	**VVD ED 301066**	0.150
Modbus user's manual	A5	**VVD ED 302023**	0.150
International technical manual (ITM) *(2)*	CD-ROM	**DCI CD 398111**	0.150

(1) The starters have 9 unprotected power terminals.
(2) Library containing:
- manuals and quick reference guides for starters and speed drives,
- user's manuals for communication gateways.

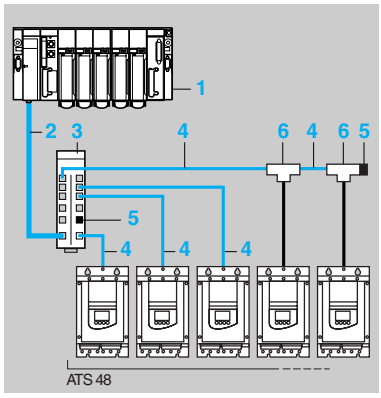
Presentation: page 1/44
Dimensions: pages 1/50 to 1/52

Soft starters
Altistart 48 soft start - soft stop units
Communication options

Modbus serial link

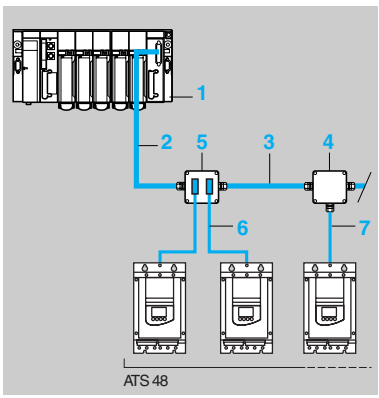
The Altistart 48 is connected directly to the Modbus bus via its RJ45 type connector port.
This port supports the RS 458 (2-wire) standard and the Modbus RTU protocol.
The communication function provides access to the configuration, adjustment, control and signalling functions of the starter.

Connections via splitter blocks and RJ45 type connectors



1 PLC *(1)*
2 Modbus cable depending on the type of controller or PLC
3 Modbus splitter block **LU9 GC3**
4 Modbus drop cable **VW3 A8 306 R●●**
5 Line terminators **VW3 A8 306 RC**
6 Modbus T-junction box **VW3 A8 306 TF●●** (with cable)

Connections via junction boxes



1 PLC *(1)*
2 Modbus cable depending on the type of controller or PLC
3 Modbus cable **TSX CSA ●00**
4 Junction box **TSX SCA 50**
5 Subscriber sockets **TSX SCA 62**
6 Modbus drop cable **VW3 A8 306**
7 Modbus drop cable **VW3 A8 306 D30**

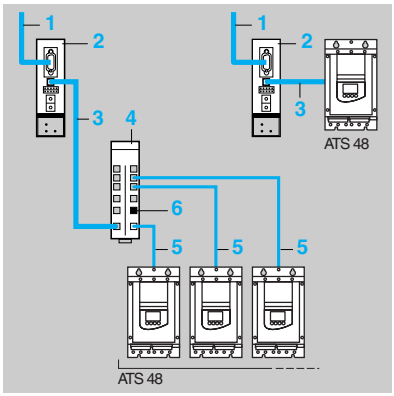
Connections via screw terminals

In this case, use a Modbus drop cable **VW3 A8 306 D30** and line terminators **VW3 A8 306 DRC**.

Other communication buses

The Altistart 48 can also be connected to Ethernet, Fipio, Profibus DP and DeviceNet networks via a module (bridge or gateway).
Communication on the network is used for:
- controlling
- monitoring and
- configuring the Modbus products connected to the network

Connection via modules



1 To network
2 Communication modules
3 Cables **VW3 A8 306 R●●**, **VW3 P07 306 R10** or **VW3 A8 306 D30**
4 Modbus splitter block **LU9 GC3**
5 Modbus drop cable **VW3 A8 306 R●●**
6 Line terminator **VW3 A8 306 RC**

(1) Please consult our "Modicon Premium automation platform" and "Modicon TSX Micro automation platform" catalogues.

References:
page 1/47

Soft starters
Altistart 48 soft start - soft stop units
Communication options

TSX SCA 50

TSX SCA 62

Modbus serial link

Connection accessories

Description			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 sockets 2 x female 15-way 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 8 RJ45 type connectors and 1 screw terminal			**LU9 GC3**	0.500
Line terminators *(1)*	For RJ45 connector	R = 120 Ω, C = 1 nF	**VW3 A8 306 RC**	0.200
		R = 150 Ω	**VW3 A8 306 R**	0.200
	For screw terminals	R = 120 Ω, C = 1 nF	**VW3 A8 306 DRC**	0.200
		R = 150 Ω	**VW3 A8 306 DR**	0.200
Modbus T-junction boxes		With integrated cable (0.3 m)	**VW3 A8 306 TF03**	–
		With integrated cable (1 m)	**VW3 A8 306 TF10**	–

Connecting cables

Description	Length m	Connectors	Reference	Weight kg
Cables for Modbus bus	3	1 RJ45 connector and one end stripped	**VW3 A8 306 D30**	0.150
	3	1 RJ45 connector and 1male 15-way SUB-D connector for TSX SCA 62	**VW3 A8 306**	0.150
	0.3	2 RJ45 connectors	**VW3 A8 306 R03**	0.050
	1	2 RJ45 connectors	**VW3 A8 306 R10**	0.050
	3	2 RJ45 connectors	**VW3 A8 306 R30**	0.150
Cables for Profibus DP	1	2 RJ45 connectors	**VW3 P07 306 R10**	0.050
RS 485 double shielded twisted pair cables	100	Supplied without connector	**TSX CSA 100**	–
	200	Supplied without connector	**TSX CSA 200**	–
	500	Supplied without connector	**TSX CSA 500**	–

Other communication buses

Description	Cables to be connected	Reference	Weight kg
Ethernet/Modbus bridge with 1 x Ethernet 10baseT port (RJ45 type)	VW3 A8 306 D30	**174 CEV 300 10** *(2)*	0.500
Fipio/Modbus gateway *(3)*	VW3 A8 306 R●●	**LUF P1**	0.240
DeviceNet/Modbus gateway *(3)*	VW3 A8 306 R●●	**LUF P9**	0.240
Profibus DP/Modbus gateway Parameters set using standard Profibus DP configurator, Hilscher Sycon type *(4)*	VW3 P07 306 R10	**LA9 P307**	0.240
Profibus DP/Modbus gateway Parameters set using ABC Configurator software *(3)*	VW3 A8 306 R●●	**LUF P7**	0.240

(1) Sold in lots of 2.
(2) Please consult our "Modicon Premium automation platform and PL7 software" catalogue.
(3) See pages 4/22 and 4/23.
(4) See pages 4/24 and 4/25.

LUF P1

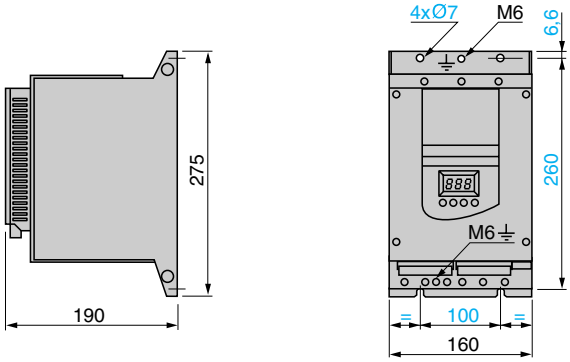
LA9 P307

Presentation:
page 1/46

Soft starters for asynchronous motors

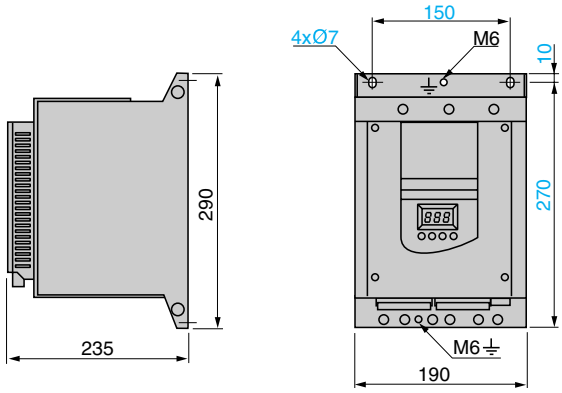
Altistart 48 soft start - soft stop units

ATS 48D17● to ATS 48D47●



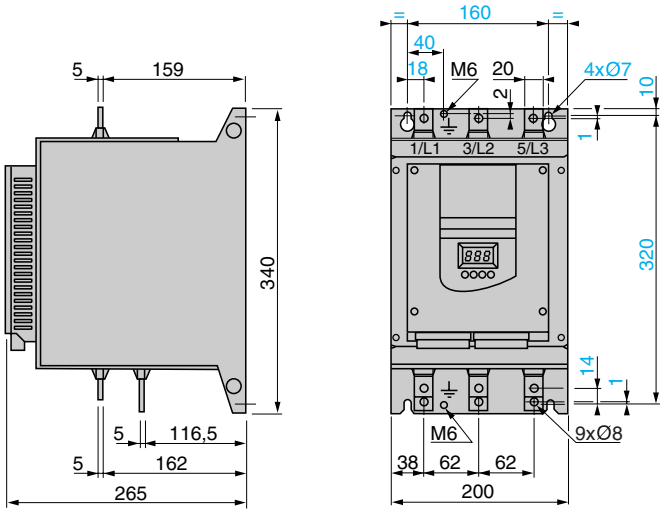
Maximum connection capacity:
Earth connections: 10 mm² (AWG 8)
Power terminals: 16 mm² (AWG 8)

ATS 48D62● to ATS 48C11●



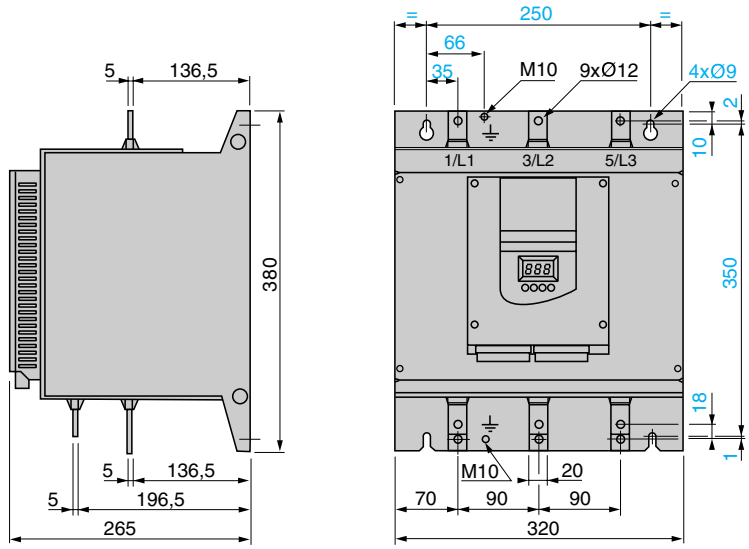
Maximum connection capacity:
Earth connections: 16 mm² (AWG 4)
Power terminals: 50 mm² (AWG 2/0)

ATS 48C14● to ATS 48C17●



Maximum connection capacity:
Earth connections: 120 mm² (busbar)
Power terminals: 95 mm² (AWG 2/0)

ATS 48C21● to ATS 48C32●



Maximum connection capacity:
Earth connections: 120 mm² (busbar)
Power terminals: 240 mm² (busbar)

Presentation:
pages 1/30 and 1/31

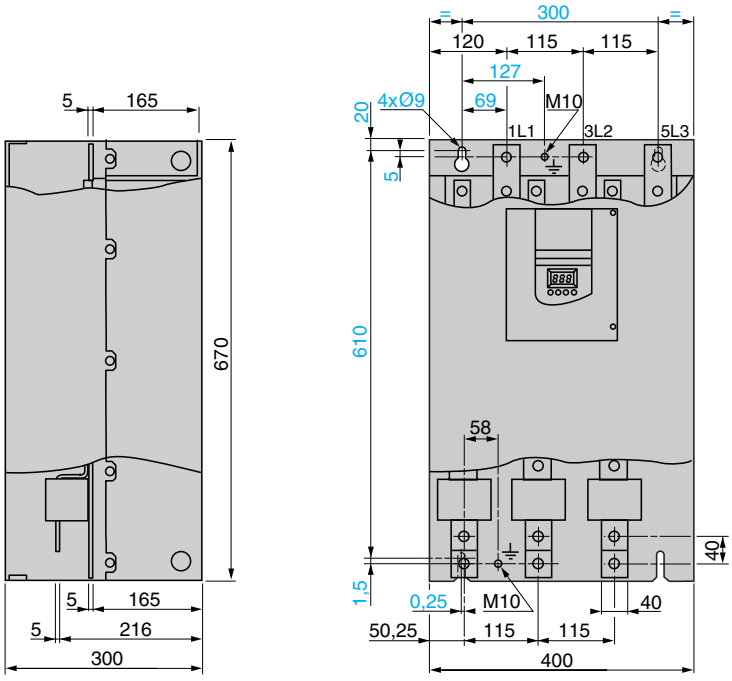
Characteristics:
pages 1/32 and 1/33

References:
pages 1/40 to 1/43

Schemes:
pages 1/54 to 1/59

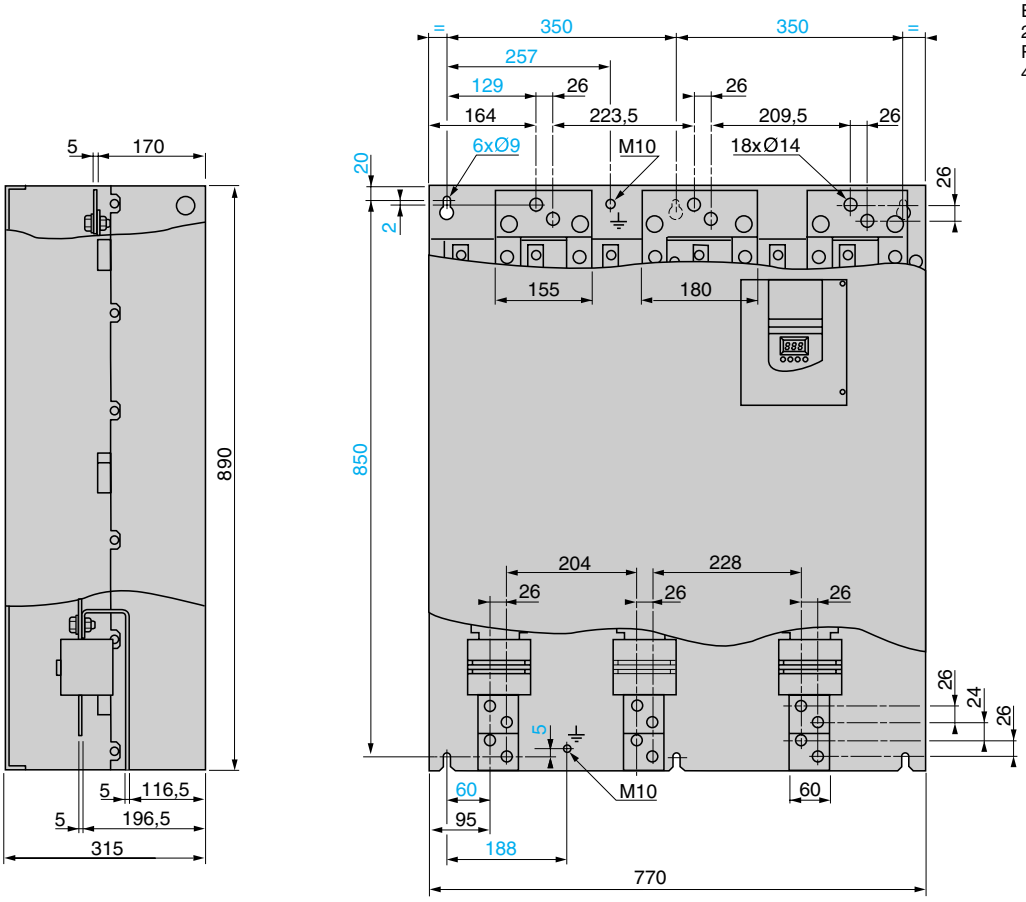
ATS 48C41● to C66●

Maximum connection capacity:
Earth connections:
240 mm² (busbar)
Power terminals:
2 x 240 mm² (busbar)



ATS 48C79● to M12●

Maximum connection capacity:
Earth connections:
2 x 240 mm² (busbar)
Power terminals:
4 x 240 mm² (busbar)



Soft starters for asynchronous motors

Altistart 48 soft start - soft stop units

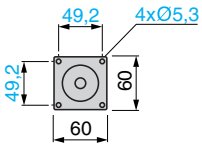
DNV Kits

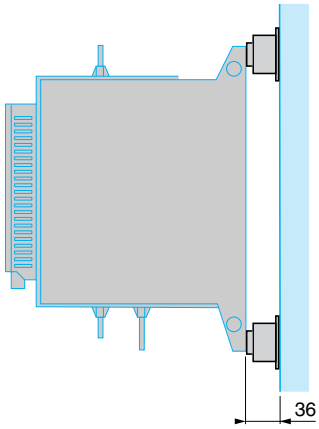
1

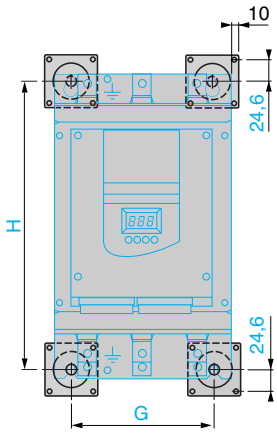
1.3

DNV Kits

VW3 G48106 for soft start/soft stop units ATS 48D62● to ATS 48C17●

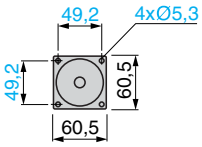


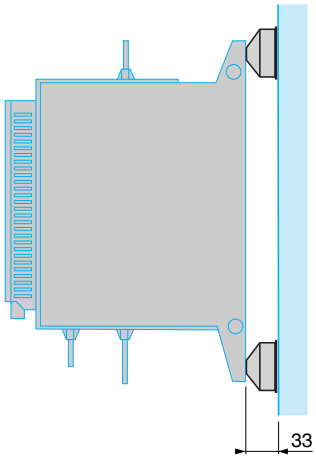


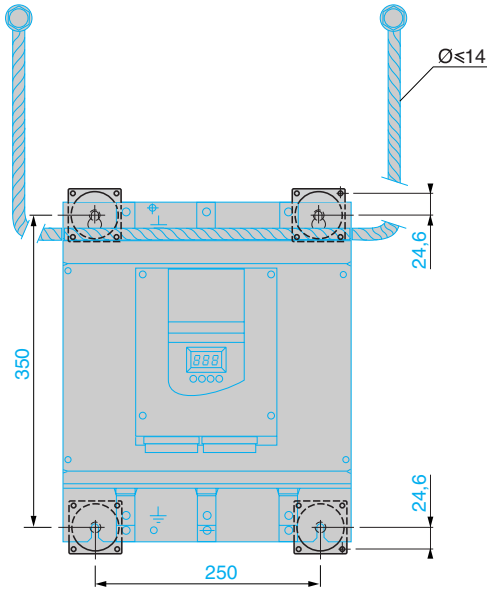


For ATS 48	G	H
D62● to C11●	150	270
C14● to C17●	160	320

VW3 G48107 for soft start/soft stop units ATS 48C21● to ATS 48C32●







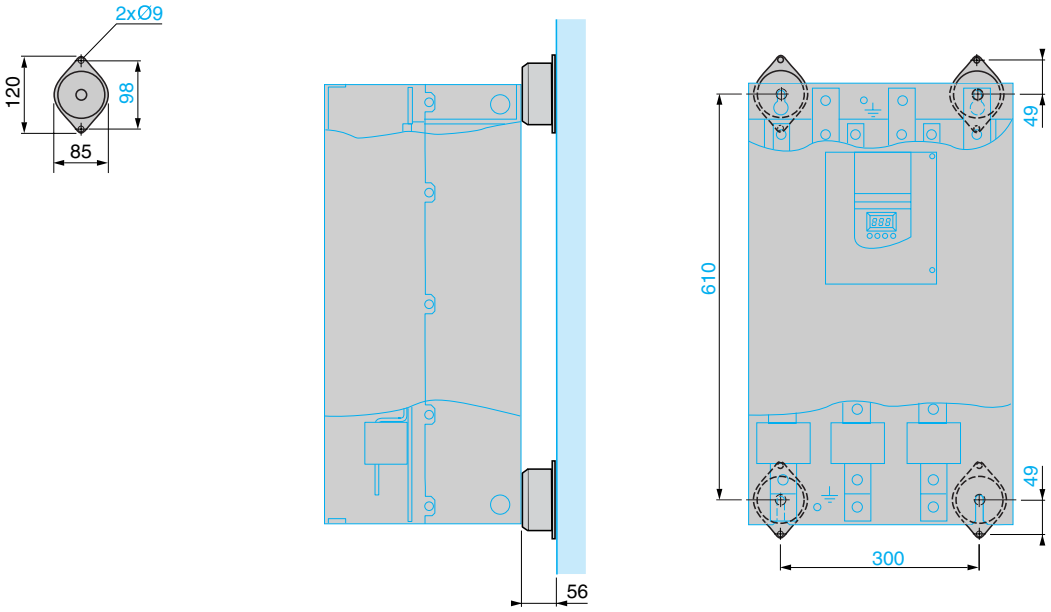
Soft starters for asynchronous motors

Altistart 48 soft start - soft stop units

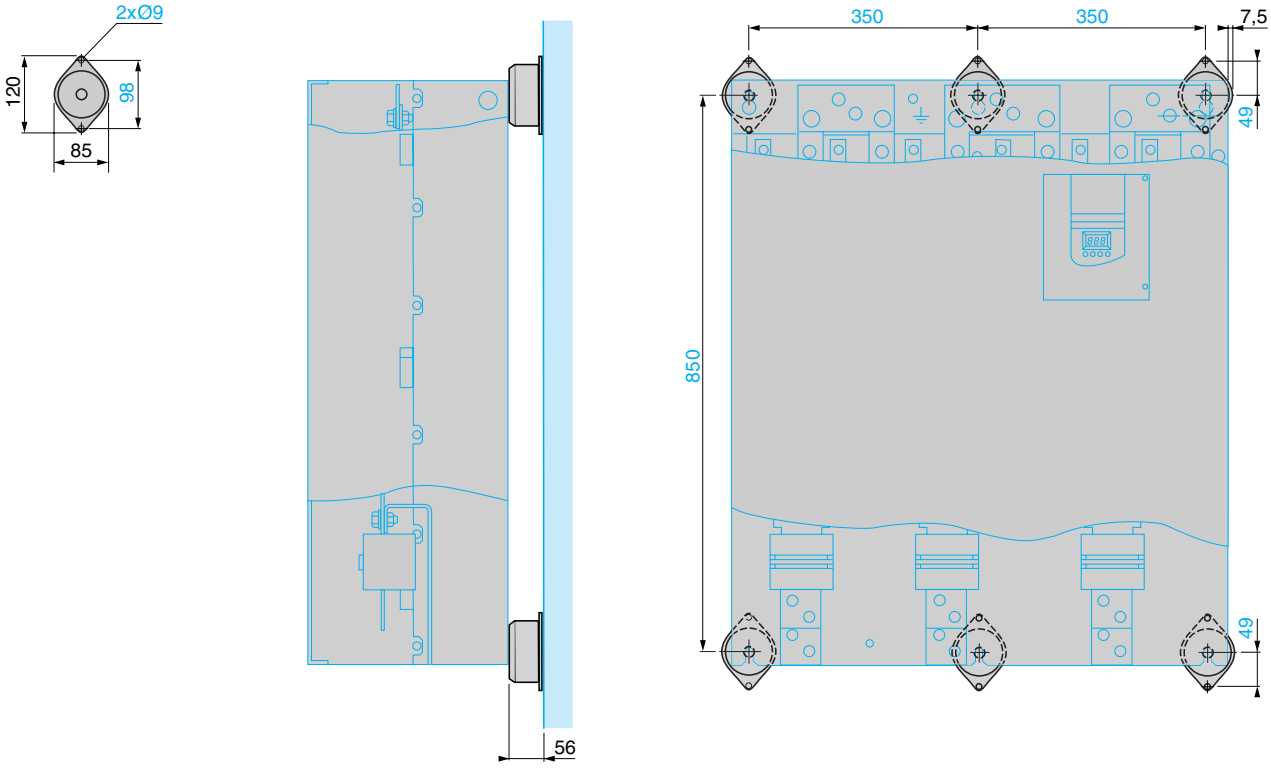
DNV Kits

DNV Kits (continued)

VW3 G48108 for soft start/soft stop units ATS 48C41● to ATS 48C66●



VW3 G48109 for soft start/soft stop units ATS 48C79● to ATS 48M12●



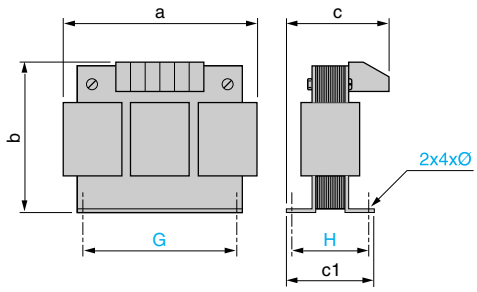
Soft starters for asynchronous motors

Altistart 48 soft start - soft stop units

Line chokes and remote terminal

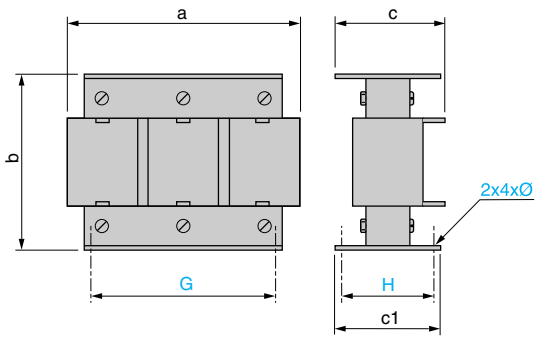
Line chokes

VZ1-L015UM17T to L070U350T



VZ1-	a	b	c	c1	G	H	Ø
L015UM17T	120	150	80	75	60/80.5	52	6
L030U800T	150	180	120	100	75/106.5	76	7
L040U600T	180	215	130	100	85/122	76	7
L070U350T	180	215	150	130	85/122	97	7

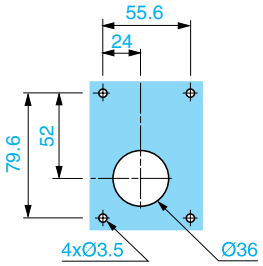
VZ1-L150U170T to LM14U016T

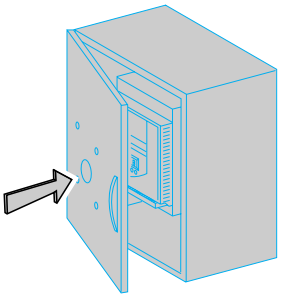


VZ1-	a	b	c	c1	G	H	Ø
L150U170T	270	240	170	140	105/181	96	11.5
L250U100T	270	240	220	160	105/181	125	11.5
L325U075T	270	240	240	175	105/181	138	11.5
L530U045T	380	410	225	140	310	95	9
LM10U024T	400	410	310	170	310	125	9
LM14U016T	420	490	340	170	310	125	9

Remote terminal

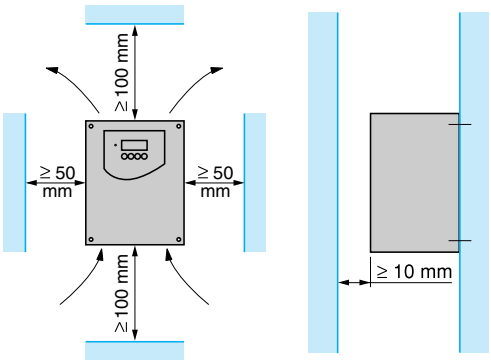
VW3 G48101





Soft starters for asynchronous motors
Altistart 48 soft start - soft stop units

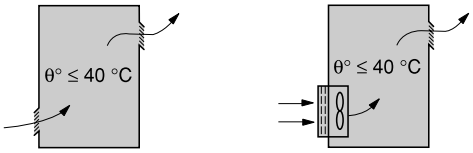
Mounting recommendations



- Install the Altistart vertically, at ± 10°.
- Do not place the Altistart close to or above heating elements.
- Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

Caution: the IP 00 version of the Altistart 48 must be fitted with a protective bar to protect personnel against electrical contact.
Protective covers are available for the ATS 48C14● to ATS 48C32●. They should be ordered separately, see page 1/45.

Mounting in a metal wall-fixing or floor-standing enclosure with degree of protection IP 23 or IP 54



- Observe the mounting recommendations above.
- To ensure proper air circulation in the starter:
  - fit ventilation grilles,
  - ensure that there is sufficient ventilation. If there is not, install forced ventilation with a filter ; the openings and/or fans must provide a flow rate at least equal to that of the starter fans (see the table below).
- Use special filters with IP 54 protection.

Fan flow rate depending on the starter rating

ATS 48 starter	Flow rate m³/hour
ATS48 D32● and D38●	14
ATS48 D47●	28
ATS48 D62● to C11●	86
ATS48 C14● and C17●	138
ATS48 C21● to C32●	280
ATS48 C41● to C66●	600
ATS48 C29● to M12●	1200

Metal wall-fixing or floor-standing enclosure with IP 54 degree of protection
For non-ventilated Altistart units (ATS 48D17● and 48D22●), install a fan ⩽ 50 mm below the starter to circulate the air inside the enclosure in order to avoid hot spots.

Calculating the size of the enclosure

Maximum thermal resistance Rth (°C/W)

$$Rth = \frac{\theta - \theta e}{P}$$

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

The starter/motor combinations on pages 1/40 and 1/41 can only be used in ambient temperatures ⩽ 40 °C.
For temperatures between 40 °C and 60 °C, derate the maximum permanent current of the starter by 2% for every degree above 40 °C.
Power dissipated by the starter: see pages 1/40 and 1/41.
If the starts are infrequent, it is advisable to bypass the Altistart at the end of starting in order to reduce heat dissipation.
The power dissipated will then be between 15 and 30 W.
Add the power dissipated by the other equipment components.

Effective exchange surface area of enclosure S (m²)

(sides + top + front panel if wall-mounted)

$$SS = \frac{K}{Rth}$$

K is the thermal resistance per m² of casing.

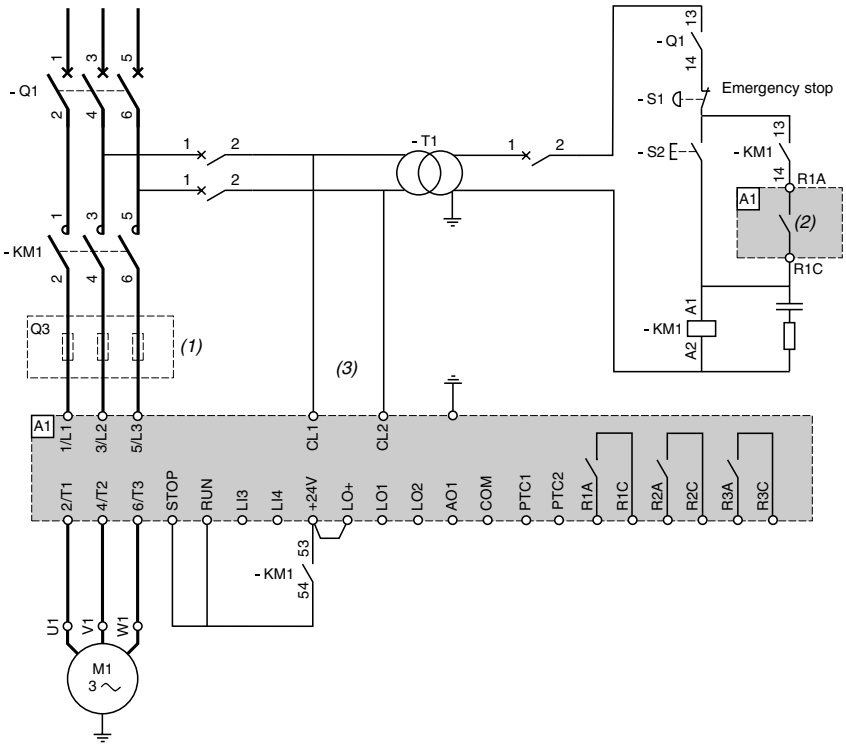
For ACM type metal enclosures: K = 0.12 with internal fan, K = 0.15 without fan.
Caution: do not use insulated enclosures as they have a poor level of conductivity.

Soft starters for asynchronous motors
Altistart 48 soft start - soft stop units

1

1.3

Recommended application diagram for non-reversing unit with line contactor, type 1 and type 2 coordinations



Select the components to connect, according to the descriptions on page 1/55, from the association tables on pages 1/60 to 1/69.

(1) For type 2 coordination (according to IEC 60947-4-2), install fast-acting fuses to ensure that the starter will be protected in the event of a short-circuit.

(2) Assign relay R1 as the "isolating relay". Beware of the operating limits of the contacts (see characteristics page 1/32), for example when connecting to high rating contactors.

(3) Insert a transformer if the line voltage is different to that defined for the control circuit (see characteristics page 1/32).

Types of coordination

The standard defines tests for different current levels which are designed to expose the device to extreme conditions.
Based on the state of the components after a short-circuit test, the standard defines 2 types of coordination.

- Type 1 coordination: damage to the contactor and the starter is acceptable under 2 conditions:
  - no risk is posed to the operator,
  - elements other than the contactor and the starter are not damaged.

Maintenance must be carried out after a short-circuit.

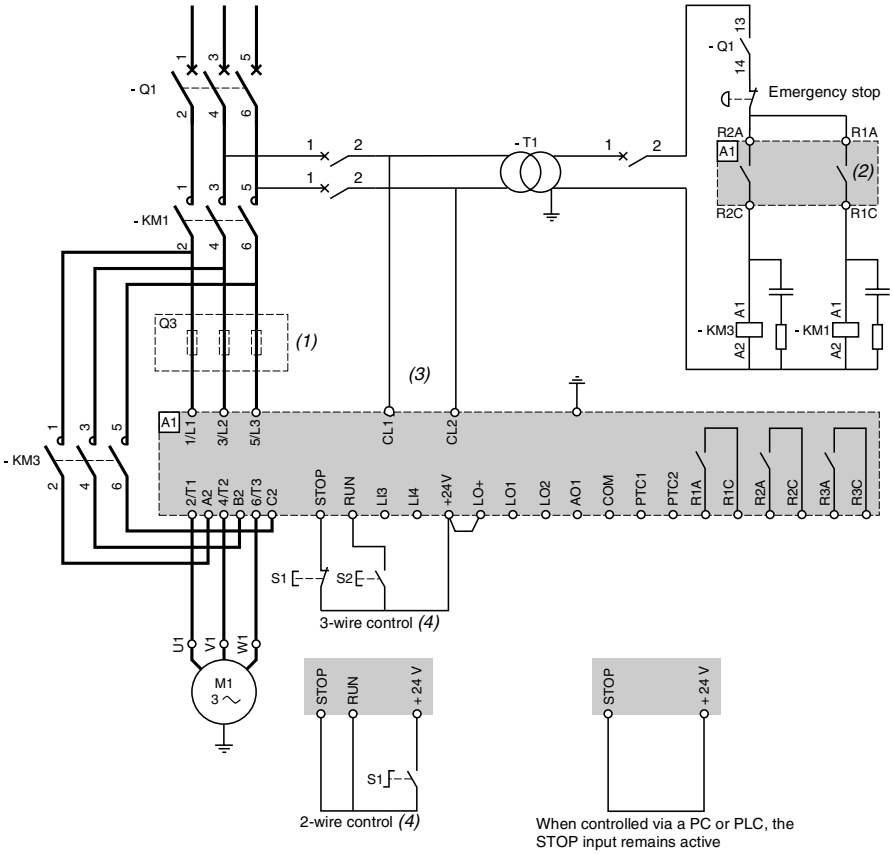
- Type 2 coordination: minor soldering of the contactor contacts is permissible if they can be separated easily. The starter must not be damaged beyond repair. The protection and control devices remain operational after type 2 coordination tests.

Once the fuses have been replaced, check the contactor.

Nota: *the starter will protect the motor and the cables against overloads. If this protection function is disabled, external thermal protection must be provided.*

Soft starters for asynchronous motors
Altistart 48 soft start - soft stop units

Recommended application diagram for non-reversing unit with starter line and bypass contactors, type 1 and type 2 coordinations



Select the components to connect, according to the descriptions below, from the association tables on pages 1/60 to 1/69.

(1) For type 2 coordination (according to IEC 60947-4-2), install fast-acting fuses to ensure that the starter will be protected in the event of a short-circuit.

(2) Assign relay R1 as the "isolating relay". Beware of the operating limits of the contacts (see characteristics page 1/32), for example when connecting to high rating contactors.

(3) Insert a transformer if the line voltage is different to that defined for the control circuit (see characteristics page 1/32).

(4) 2-wire or 3-wire control (see page 1/76).

Components to connect depending on the types of coordination and voltages

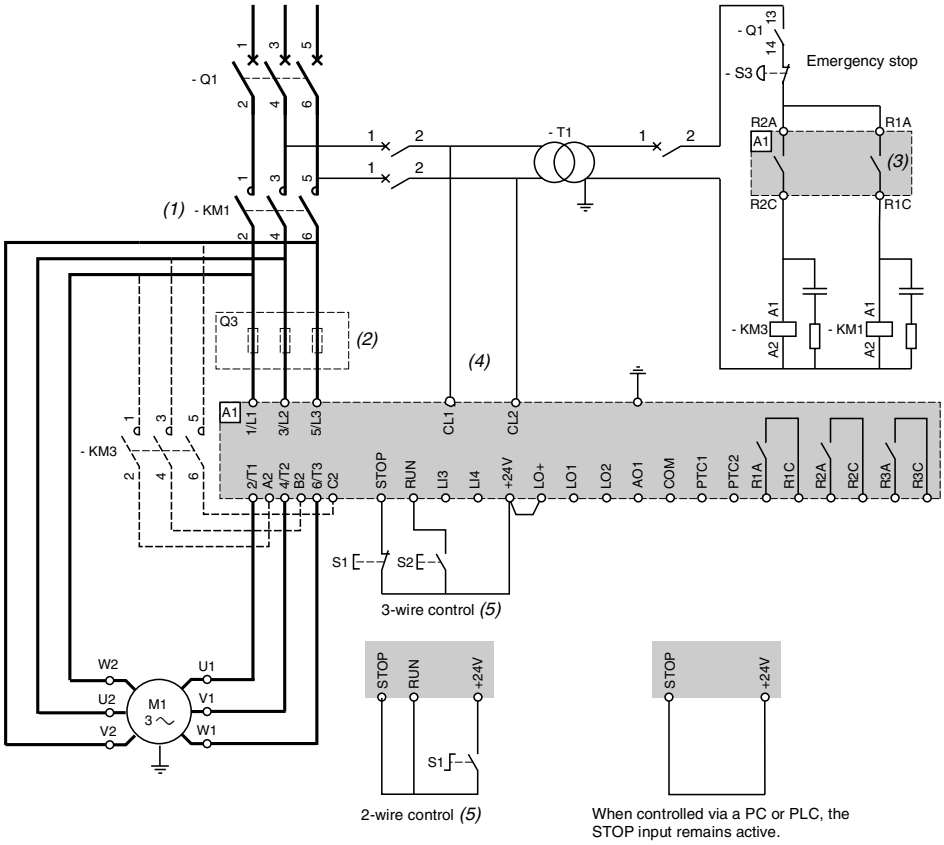
Designation	Description
M1	Motor
A1	Starter (standard applications and severe applications)
Q1	Circuit-breaker or switch/fuse
Q3	3 FA fuses
KM1, KM3	Contactors
S1, S2	Control (separate parts XB2 or XB2 M)

1

1.3

Recommended application diagram for connection to the motor delta terminals, non-reversing, freewheel stop, with starter line and bypass contactors, type 1 and type 2 coordinations

This type of wiring enables the starter rating to be reduced.
For ATS 48●●●Q variable speed drives.



Select the components to connect according to the descriptions on page 1/57 and the association tables on pages 1/60 to 1/69.

(1) A line contactor must be used in the sequence.

(2) For type 2 coordination (according to IEC 60947-4-2), install fast-acting fuses to ensure that the starter will be protected in the event of a short-circuit.

(3) R1 must be assigned as the "isolating relay" to control contactor KM1. Beware of the operating limits of the contacts (see characteristics page 1/32), for example when connecting to high rating contactors.

(4) Insert a transformer if the line voltage is different to that defined for the control circuit (see characteristics page 1/32).

(5) 2-wire and 3-wire controls (see page 1/76).

Types of coordination

The standard defines tests for different current levels which are designed to expose the device to extreme conditions.
Based on the state of the components after a short-circuit test, the standard defines 2 types of coordinations.

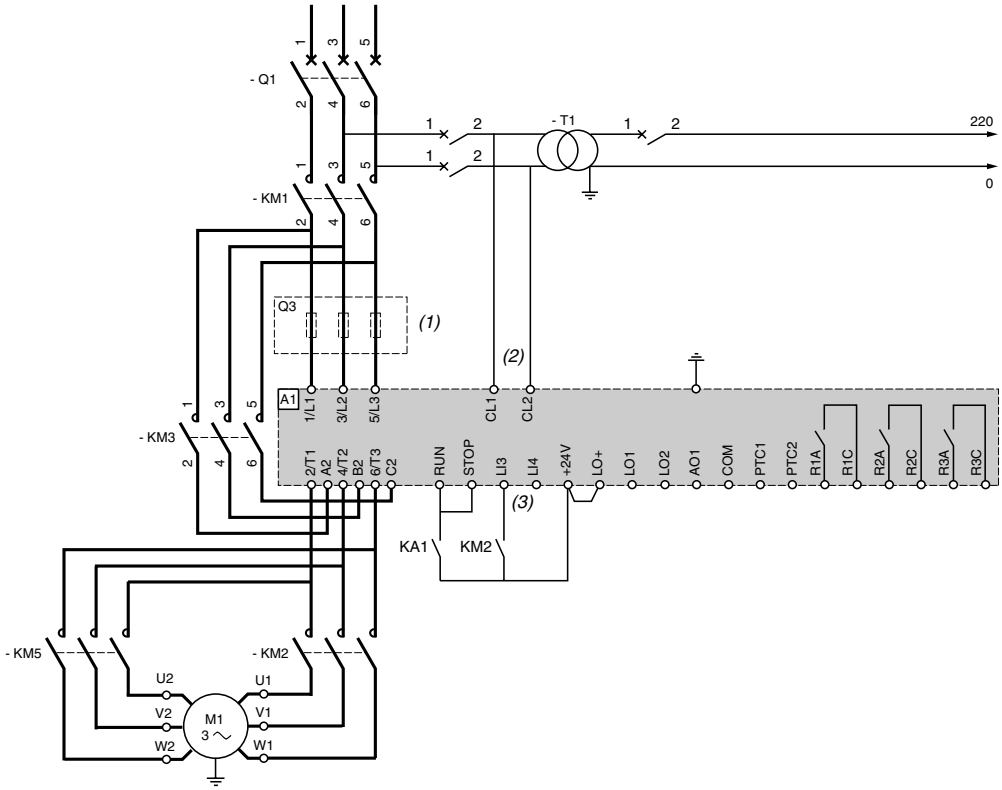
■ Type 1 coordination: damage to the contactor and the starter is acceptable under 2 conditions:
□ no risk is posed to the operator,
□ elements other than the contactor and the starter are not damaged.
Maintenance must be carried out after a short-circuit.

■ Type 2 coordination: minor soldering of the contactor contacts is permissible if they can be separated easily. The starter must not be damaged beyond repair. The protection and control devices remain operational after type 2 coordination tests.
Once the fuses have been replaced, check the contactor.

Nota: *the starter will protect the motor and the cables against overloads. If this protection function is disabled, external thermal protection must be provided.*

Soft starters for asynchronous motors
Altistart 48 soft start - soft stop units

Recommended application diagram for LSP/HSP motor, non-reversing with starter line and bypass contactors



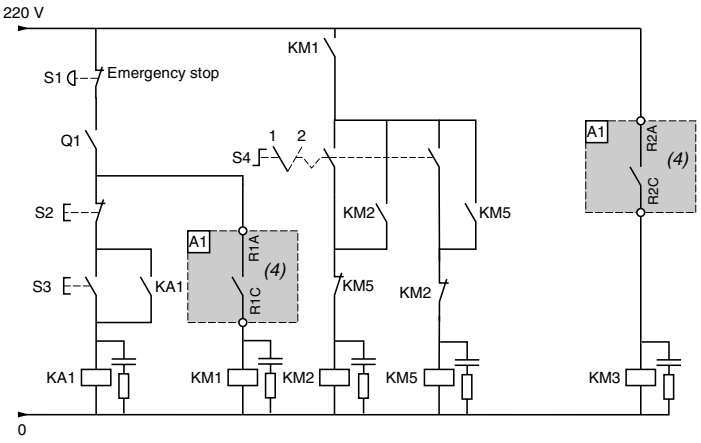
Select the components to connect, according to the descriptions below, from the association tables on pages 1/60 to 1/69.

(1) For type 2 coordination (according to IEC 60947-4-2), install fast-acting fuses to ensure that the starter will be protected in the event of a short-circuit.

(2) Insert a transformer if the line voltage is different to that defined for the control circuit (see page characteristics 1/32).

(3) Assign logic input LI3 to "activate the adjustment functions of the 2nd motor".

(4) Assign relay R1 as the "isolating relay". Beware of the operating limits of the contacts (see characteristics page 1/32), for example when connecting to high rating contactors.



S4 : 1 = low speed
S4 : 2 = high speed

Components to connect depending on the types of coordination and voltages

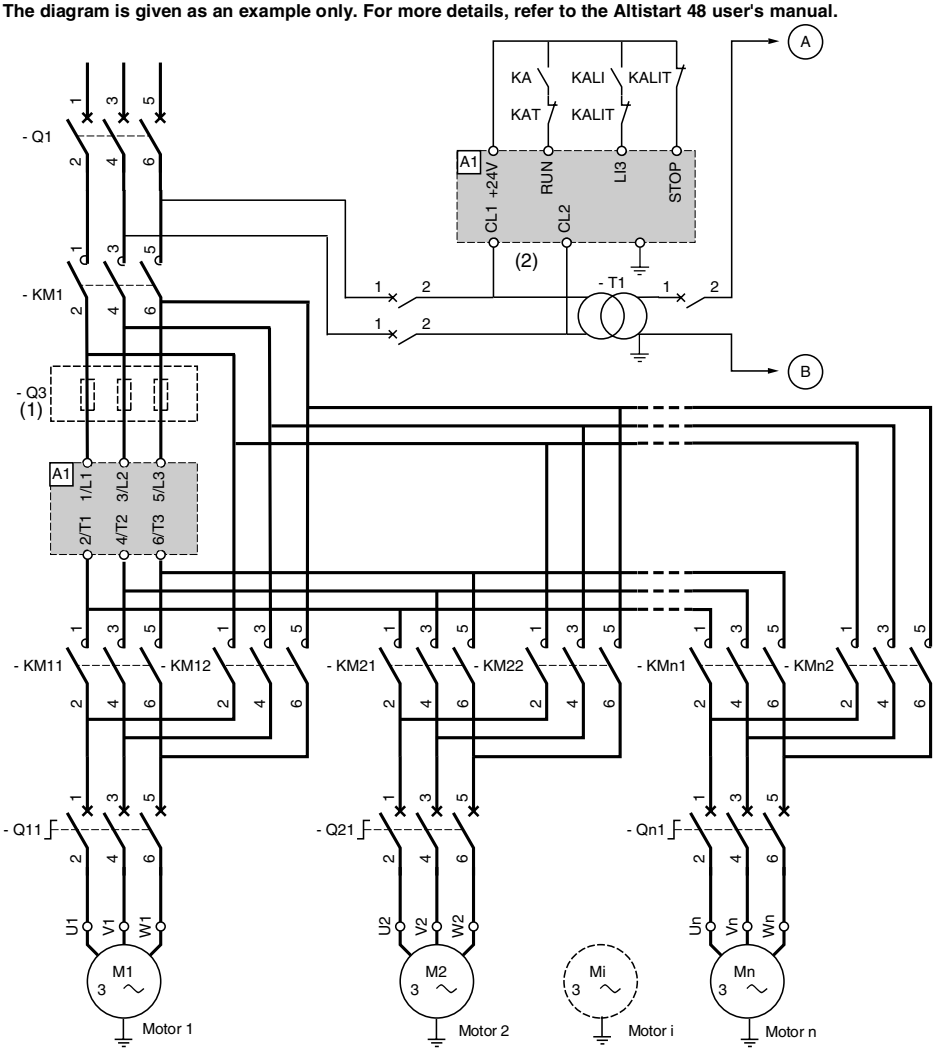
Designation	Description
M1	Motor
A1	Starter (standard applications and severe applications)
Q1	Circuit-breaker or switch/fuse
Q3	3 FA fuses
KM1, KM2, KM3, KM5, KA1	Contactors and relays
S1, S2, S3	Control (separate parts XB2 or XB2 M)

Presentation: pages 1/30 and 1/31 | Characteristics: pages 1/32 to 1/35 | References pages 1/40 to 1/43 | Dimensions: pages 1/48 to 1/53

Soft starters for asynchronous motors
Altistart 48 soft start - soft stop units

Recommended application diagram for starting and decelerating several motors cascaded with a single Altistart 48, non-reversing and line contactor

The diagram is given as an example only. For more details, refer to the Altistart 48 user's manual.



Select the components to connect, according to the designations below, from the association tables on pages 1/60 to 1/69.

(1) For type 2 coordination (according to IEC 60947-4-2), install fast-acting fuses to ensure that the starter will be protected in the event of a short-circuit.
(2) Insert a transformer if the line voltage is different to that defined for the control circuit (see page characteristics 1/32).

Important:
- One Altistart 48 logic input must be configured as a "cascading" input.
- In the event of a fault, it will not be possible to decelerate or brake any motors that may be running at that time.
- Adjust the thermal protection of each circuit-breaker Q_{n1} for the corresponding nominal motor current.

Components to connect depending on the types of coordination and voltages

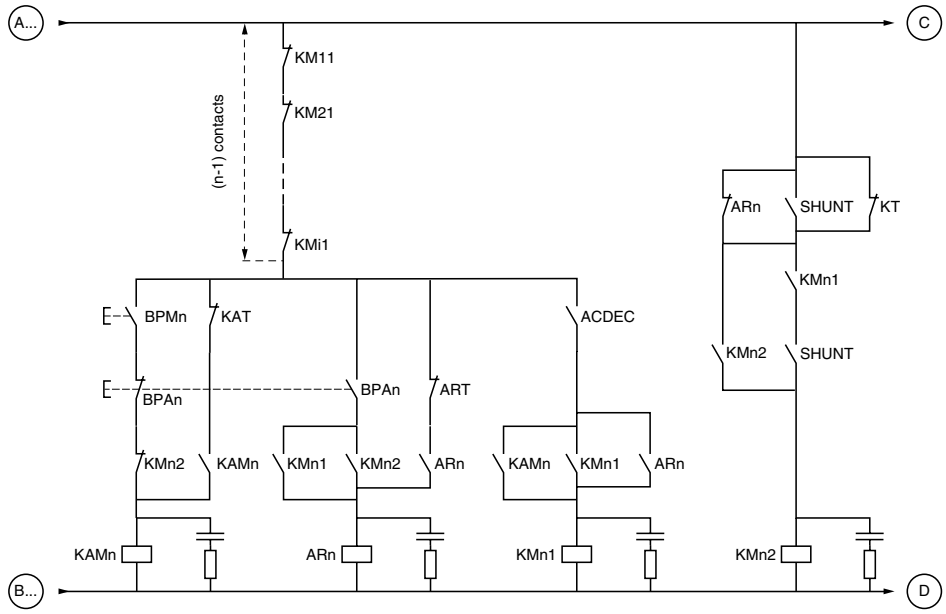
Designation	Description
M1, M2, Mi, Mn	Motors
A1	Starter (standard applications and severe applications)
KM1, KM2, ..., KMi, KMn	Contactors
Q1	Circuit-breaker or switch/fuse
Q3	3 FA fuses
Q11, Q21, ..., Qn1	Thermal magnetic circuit-breakers
KA, KAT, KALI, KALIT	Control (separate parts XB2 or XB2 M)

Presentation: pages 1/30 and 1/31
Characteristics: pages 1/32 to 1/35
References: pages 1/40 to 1/43
Dimensions: pages 1/48 to 1/53

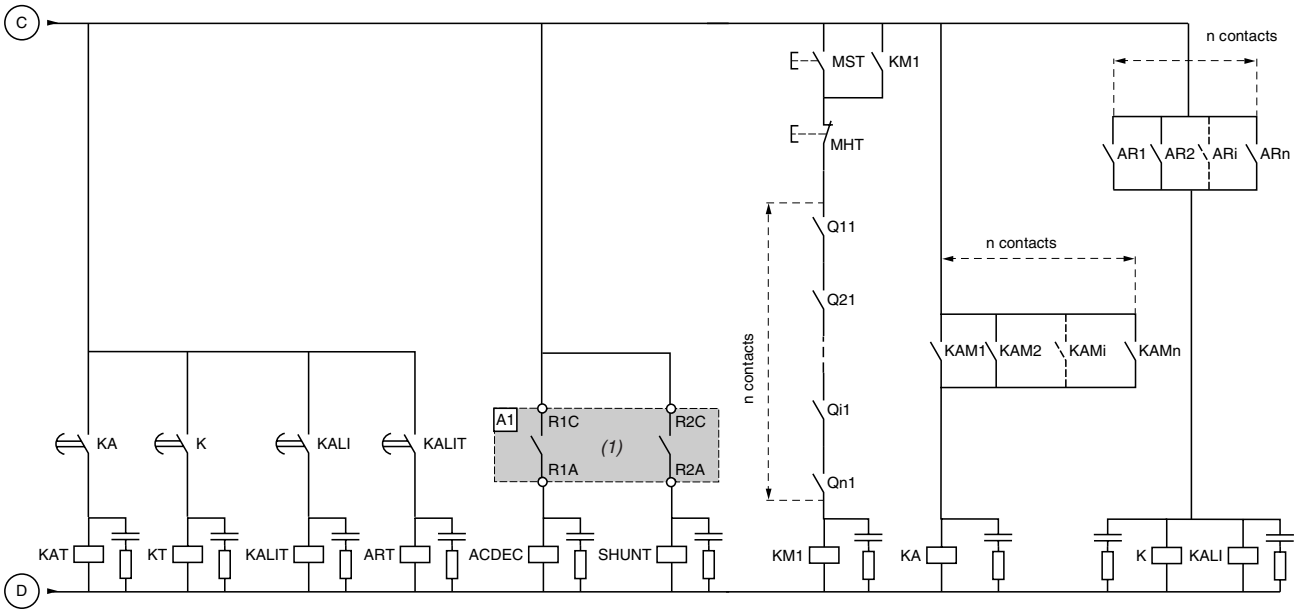
Soft starters for asynchronous motors
Altistart 48 soft start - soft stop units

Recommended application diagram for starting and decelerating several motors cascaded with a single Altistart 48, non-reversing and line contactors (continued)

Motor n control



Cascade control



(1) Assign relay R1 as the "isolating relay". Beware of the operating limits of the contacts (see Characteristics page 1/32), for example when connecting to high rating contactors.

BPMn: "Run" button motor n

BPAn: "Stop" button motor n

MST: General "Run" button

MHT: General "Stop" button

Soft starters for asynchronous motors

Altistart 48 soft start - soft stop units

230 V power supply, type 1 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/54 to 1/59)

Combine either circuit-breaker (light blue columns), contactor, starter, or switches/fuse (dark blue columns), contactor, starter

Motor		Starter (1)		Type of circuit-breaker		Type of contactor	Type of switch or switch disconnector (bare unit)	Am fuses			
		Class 10 Standard applications	Class 20 Severe applications	Telemecanique *Merlin Gerin*	Rating			Unit reference (3)		Size	Rating
								Without striker	With striker		
kW	A				A						A
M1		A1		Q1		KM1, KM2, KM3					
3	11.5	–	**ATS 48D17●**	**GV2 L20**	18	**LC1 D18**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
				NS80H MA	12.5	**LC1 D18**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
4	14.5	**ATS 48D17●**	**ATS 48D22●**	**GV2 L20**	18	**LC1 D18**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
				NS80H MA	25	**LC1 D18**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
5.5	20	**ATS 48D22●**	**ATS 48D32●**	**GV2 L22**	25	**LC1 D25**	**LS1 D32**	**DF2 CA25**	–	10 x 38	25
				NS80H MA	25	**LC1 D25**	**LS1 D32**	**DF2 CA25**	–	10 x 38	25
7.5	27	**ATS 48D32●**	**ATS 48D38●**	**GV2 L32**	32	**LC1 D32**	**GK1 EK**	**DF2 EA32**	**DF3 EA32**	14 x 51	32
				NS80H MA	50	**LC1 D32**	**GK1 EK**	**DF2 EA32**	**DF3 EA32**	14 x 51	32
9	32	**ATS 48D38●**	**ATS 48D47●**	**GK3 EF40**	40	**LC1 D38**	**GK1 EK**	**DF2 EA40**	**DF3 EA40**	14 x 51	40
				NS80H MA	50	**LC1 D38**	**GK1 EK**	**DF2 EA40**	**DF3 EA40**	14 x 51	40
11	39	**ATS 48D47●**	**ATS 48D62●**	**GK3 EF65**	65	**LC1 D50**	**GK1 FK**	**DF2 FA50**	**DF3 FA50**	22 x 58	50
				NS80H MA	50	**LC1 D50**	**GK1 FK**	**DF2 FA50**	**DF3 FA50**	22 x 58	50
15	52	**ATS 48D62●**	**ATS 48D75●**	**GK3 EF65**	65	**LC1 D65**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
				NS80H MA	80	**LC1 D65**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
18.5	64	**ATS 48D75●**	**ATS 48D88●**	**GK3 EF80**	80	**LC1 D80**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
				NS80H MA	80	**LC1 D80**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
22	75	**ATS 48D88●**	**ATS 48C11●**	***NS100● MA*** (2)	100	**LC1 D115**	**GK1 FK**	**DF2 FA100**	**DF3 FA100**	22 x 58	100
30	103	**ATS 48C11●**	**ATS 48C14●**	***NS160● MA*** (2)	150	**LC1 D115**	**GK1 FK**	**DF2 FA125**	**DF4 FA125**	22 x 58	125
37	126	**ATS 48C14●**	**ATS 48C17●**	***NS160● MA*** (2)	150	**LC1 D150**	**GS1 L**	**DF2 GA1161**	**DF4 GA1161**	0	160
45	150	**ATS 48C17●**	**ATS 48C21●**	***NS250● MA*** (2)	220	**LC1 F185**	**GS1 N**	**DF2 HA1201**	**DF4 HA1201**	1	200
55	182	**ATS 48C21●**	**ATS 48C25●**	***NS250● MA*** (2)	220	**LC1 F225**	**GS1 N**	**DF2 HA1201**	**DF4 HA1201**	1	200
75	240	**ATS 48C25●**	**ATS 48C32●**	***NS400● MA*** (2)	320	**LC1 F265**	**GS1 QQ**	**DF2 JA1251**	**DF4 JA1251**	2	250
90	295	**ATS 48C32●**	**ATS 48C41●**	***NS400● MA*** (2)	320	**LC1 F330**	**GS1 QQ**	**DF2 JA1311**	**DF4 JA1311**	2	315
110	356	**ATS 48C41●**	**ATS 48C48●**	***NS630● MAE*** (2)	500	**LC1 F400**	**GS1 S**	**DF2 KA1401**	**DF4 KA1401**	3	400
132	425	**ATS 48C48●**	**ATS 48C59●**	***NS630● MAE*** (2)	500	**LC1 F500**	**GS1 S**	**DF2 KA1501**	**DF4 KA1501**	3	500
160	520	**ATS 48C59●**	**ATS 48C66●**	***NS630b● (2) Micrologic 5.0***	630	**LC1 F630**	**GS1 S**	**DF2 KA1631**	**DF4 KA1631**	3	630
				C801● (2) STR35 ME	800	**LC1 F630**	**GS1 S**	**DF2 KA1631**	**DF4 KA1631**	3	630
–	–	**ATS 48C66●**	**ATS 48C79●**	***NS800● (2) Micrologic 5.0***	800	**LC1 F800**	**GS1 S**	**DF2 KA1631**	**DF4 KA1631**	3	630
				C801● (2) STR35 ME	800	**LC1 F800**	**GS1 S**	**DF2 KA1631**	**DF4 KA1631**	3	630
220	700	**ATS 48C79●**	**ATS 48M10●**	***NS800● (2) Micrologic 5.0***	800	**LC1 F800**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
				C801● (2) STR35 ME	800	**LC1 F800**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
250	800	**ATS 48M10●**	**ATS 48M12●**	***NS1000● (2) Micrologic 5.0***	***1000***	**LC1 BM33**	**GS1 V**	**DF2 LA1101**	**DF4 LA1101**	4	1000
				C1001● (2) STR35 ME	1000	**LC1 BM33**	**GS1 V**	**DF2 LA1101**	**DF4 LA1101**	4	1000
355	1115	**ATS 48M12●**	–	***NS1250● (2) Micrologic 5.0***	1250	**LC1BP33**	–	**DF2 LA1251**	**DF4 LA1251**	4	1250
				C1251● (2) STR35 ME	1250	**LC1BP33**	–	**DF2 LA1251**	**DF4 LA1251**	4	1250

(1) Replace ● with Q or Y according to the starter voltage range.
(2) Replace ● with N, H or L, according to the breaking capacity (see table below).
(3) DF2 CA, DF● EA, DF● FA: sold in lots of 20.
DF● GA, DF● KA: sold in lots of 3.
DF● LA: sold singly.

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	Iq (kA)
ATS 48D17● to ATS 48C32●	**50**
ATS 48C41● to ATS 48M12●	**70**

Breaking capacity of circuit-breakers according to standard IEC 60947-2

230 V	Icu (kA)
GV2 L20, GK3 EF40, NS80	100
GV2 L22, GV2 L32, GK3 EF65, GK3 EF80	50

230 V	Icu (kA)		
	N	H	L
NS100, NS160, NS250, NS400, NS630	85	100	150
NS800, NS1000	50	70	150
NS1250	50	70	–
C801, C1001	85	100	150
C1251	85	100	–

Presentation: pages 1/30 and 1/31 | Characteristics: pages 1/32 to 1/35 | References: pages 1/40 to 1/43 | Dimensions: pages 1/48 to 1/53 | Schemes: pages 1/54 to 1/59

Soft starters for asynchronous motors

Altistart 48 soft start - soft stop units

230 V power supply, type 2 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/54 to 1/59) circuit-breakers, contactors, fast-acting fuses, starters

Combination: circuit-breaker, contactor, starter

Motor		Starter (1)		Type of circuit-breaker		Type of contactor
		Class 10	Class 20	Telemecanique	Rating	
kW	A	Standard applications	Severe applications	*Merlin Gerin*	A	
M1		A1		Q1		KM1, KM2, KM3
3	11.5	–	**ATS 48D17●**	**GV2 L20**	18	**LC1 D40**
				NS80H MA	12.5	**LC1 D40**
4	14.5	**ATS 48D17●**	**ATS 48D22●**	**GV2 L20**	18	**LC1 D40**
				NS80H MA	25	**LC1 D40**
5.5	20	**ATS 48-D22●**	**ATS 48D32●**	**GV2 L22**	25	**LC1 D40**
				NS80H MA	25	**LC1 D40**
7.5	27	**ATS 48D32●**	**ATS 48D38●**	**GV2 L32**	32	**LC1 D80**
				NS80H MA	50	**LC1 D80**
9	32	**ATS 48D38●**	**ATS 48D47●**	**GK3 EF40**	40	**LC1 D80**
				NS80H MA	50	**LC1 D80**
11	39	**ATS 48D47●**	**ATS 48D62●**	**GK3 EF65**	65	**LC1 D80**
				NS80H MA	50	**LC1 D80**
15	52	**ATS 48D62●**	**ATS 48D75●**	**GK3 EF65**	65	**LC1 D80**
				NS80H MA	80	**LC1 D80**
18.5	64	**ATS 48D75●**	**ATS 48D88●**	**GK3 EF80**	80	**LC1 D80**
				NS80H MA	80	**LC1 D80**
22	75	**ATS 48D88●**	**ATS 48C11●**	***NS100● MA*** (2)	100	**LC1 D115**
30	103	**ATS 48C11●**	**ATS 48C14●**	***NS160● MA*** (2)	150	**LC1 D115**
37	126	**ATS 48C14●**	**ATS 48C17●**	***NS160● MA*** (2)	150	**LC1 D150**
45	150	**ATS 48C17●**	**ATS 48C21●**	***NS250● MA*** (2)	220	**LC1 F185**
55	182	**ATS 48C21●**	**ATS 48C25●**	***NS250● MA*** (2)	220	**LC1 F225**
75	240	**ATS 48C25●**	**ATS 48C32●**	***NS400● MA*** (2)	320	**LC1 F265**
90	295	**ATS 48C32●**	**ATS 48C41●**	***NS400● MA*** (2)	320	**LC1 F330**
110	356	**ATS 48C41●**	**ATS 48C48●**	***NS630● MAE*** (2)	500	**LC1 F400**
132	425	**ATS 48C48●**	**ATS 48C59●**	***NS630● MAE*** (2)	500	**LC1 F500**
160	520	**ATS 48C59●**	**ATS 48C66●**	***NS630bL Micrologic 5.0***	630	**LC1 F630**
200	626	**ATS 48C66●**	**ATS 48C79●**	***NS800L Micrologic 5.0***	800	**LC1 F800**
220	700	**ATS 48C79●**	**ATS 48M10●**	***NS800L Micrologic 5.0***	800	**LC1 F800**
250	800	**ATS 48M10●**	**ATS 48M12●**	***NS1000L Micrologic 5.0***	1000	**LC1 BM33**
355	1115	**ATS 48M12●**	–	***NS1250● (2) Micrologic 5.0*** (3)	1250	**LC1 BP33**

(1) Replace ● with Q or Y according to the starter voltage range.
(2) Replace ● with N, H or L, according to the breaking capacity (see the breaking capacity table on the previous page).
(3) Type 2 coordination is only possible if the fast-acting fuses remain in the motor supply circuit and are not bypassed at the end of starting.

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	Iq (kA)
ATS 48D17● to ATS 48C79●	**50**
ATS 48M10● and ATS 48M12●	**85**

Fast-acting fuse (essential for type 2 coordination), starter combinations

Starter	Fast-acting fuses with micro-contact			
Reference	Unit reference (4)	Size	Rating A	I^2t $kA^2.s$
A1	Q3			
ATS 48D17●	**DF3 ER50**	14 x 51	50	2.3
ATS 48D22● and ATS 48D32●	**DF3 FR80**	22 x 58	80	5.6
ATS 48D38● and ATS 48D47●	**DF3 FR100**	22 x 58	100	12
ATS 48D62● and ATS 48D75●	**DF4 00125**	00	125	45
ATS 48D88● and ATS 48C11●	**DF4 00160**	00	160	82
ATS 48C14● and ATS 48C17●	**DF4 30400**	30	400	120
ATS 48C21● to ATS 48C32●	**DF4 31700**	31	700	490
ATS 48D75●	**DF4 33800**	33	800	490
ATS 48C48● and ATS 48C59●	**DF4 331000**	33	1000	900
ATS 48C66●	**DF4 2331400**	2 x 33	1400	1200
ATS 48C79●	**DF4 441600**	44	1600	1600
ATS 48M10● and ATS 48M12●	**DF4 442200**	44	2200	4100

(4) DF3 ER, DF3 FR: sold in lots of 10
DF4: sold singly.

Soft starters for asynchronous motors

Altistart 48 soft start - soft stop units

380 V, 400 V or 415 V power supply, type 1 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/54 to 1/59)

Combine either circuit-breaker (light blue columns), contactor, starter, or switch/fuse (dark blue columns), contactor, starter

Motor		Starter (1)		Type of circuit-breaker		Type of contactor	Type of switch or switch disconnector (bare unit)	Am fuses			
		Class 10	Class 20	Telemecanique *Merlin Gerin*	Rating			Unit reference (3)		Size	Rating
kW	A	Standard applications	Severe applications		A			Without striker	With striker		A
M1		A1		Q1		KM1, KM2, KM3					
5.5	11	–	ATS 48D17●	GV2 L20	18	LC1 D18	LS1 D32	DF2 CA16	–	10 x 38	16
				NS80H MA	12.5	LC1 D18	LS1 D32	DF2 CA16	–	10 x 38	16
7.5	14.8	ATS 48D17●	ATS 48D22●	GV2 L20	18	LC1 D18	LS1 D32	DF2 CA16	–	10 x 38	16
				NS80H MA	25	LC1 D18	LS1 D32	DF2 CA16	–	10 x 38	16
11	21	ATS 48D22●	ATS 48D32●	GV2 L22	25	LC1 D25	LS1 D32	DF2 CA25	–	10 x 38	25
				NS80H MA	25	LC1 D25	LS1 D32	DF2 CA25	–	10 x 38	25
15	28.5	ATS 48D32●	ATS 48D38●	GV2 L32	32	LC1 D32	GK1 EK	DF2 EA32	DF3 EA32	14 x 51	32
				NS80H MA	50	LC1 D32	GK1 EK	DF2 EA32	DF3 EA32	14 x 51	32
18.5	35	ATS 48D38●	ATS 48D47●	GK3 EF40	40	LC1 D38	GK1 EK	DF2 EA40	DF3 EA40	14 x 51	40
				NS80H MA	50	LC1 D38	GK1 EK	DF2 EA40	DF3 EA40	14 x 51	40
22	42	ATS 48D47●	ATS 48D62●	GK3 EF65	65	LC1 D50	GK1 FK	DF2 FA50	DF3 FA50	22 x 58	50
				NS80H MA	50	LC1 D50	GK1 FK	DF2 FA50	DF3 FA50	22 x 58	50
30	57	ATS 48D62●	ATS 48D75●	GK3 EF65	65	LC1 D65	GK1 FK	DF2 FA80	DF3 FA80	22 x 58	80
				NS80H MA	80	LC1 D65	GK1 FK	DF2 FA80	DF3 FA80	22 x 58	80
37	69	ATS 48D75●	ATS 48D88●	GK3 EF80	80	LC1 D80	GK1 FK	DF2 FA80	DF3 FA80	22 x 58	80
				NS80H MA	80	LC1 D80	GK1 FK	DF2 FA80	DF3 FA80	22 x 58	80
45	81	ATS 48D88●	ATS48C11●	*NS100● MA* (2)	100	LC1 D115	GK1 FK	DF2 FA100	DF3 FA100	22 x 58	100
55	100	ATS 48C11●	ATS 48C14●	*NS160● MA* (2)	150	LC1 D115	GK1 FK	DF2 FA125	DF4 FA125	22 x 58	125
75	131	ATS 48C14●	ATS 48C17●	*NS160● MA* (2)	150	LC1 D150	GS1 L	DF2 GA1161	DF4 GA1161	0	160
90	162	ATS 48C17●	ATS 48C21●	*NS250● MA* (2)	220	LC1 F185	GS1 N	DF2 HA1201	DF4 HA1201	1	200
110	195	ATS 48C21●	ATS 48C25●	*NS250● MA* (2)	220	LC1 F225	GS1 N	DF2 HA1201	DF4 HA1201	1	200
132	233	ATS 48C25●	ATS 48C32●	*NS400● MA* (2)	320	LC1 F265	GS1 QQ	DF2 JA1251	DF4 JA1251	2	250
160	285	ATS 48C32●	ATS 48C41●	*NS400● MA* (2)	320	LC1 F330	GS1 QQ	DF2 JA1311	DF4 JA1311	2	315
220	388	ATS 48C41●	ATS 48C48●	*NS630● MAE* (2)	500	LC1 F400	GS1 S	DF2 KA1401	DF4 KA1401	3	400
250	437	ATS 48C48●	ATS 48C59●	*NS630● MAE* (2)	500	LC1 F500	GS1 S	DF2 KA1501	DF4 KA1501	3	500
315	560	ATS 48C59●	ATS 48C66●	*NS630b● (2) Micrologic 5.0*	630	LC1 F630	GS1 S	DF2 KA1631	DF4 KA1631	3	630
				C801● (2) STR35ME	800	LC1 F630	GS1 S	DF2 KA1631	DF4 KA1631	3	630
355	605	ATS 48C66●	ATS 48C79●	*NS800● (2) Micrologic 5.0*	800	LC1 F800	GS1 V	DF2 LA1631	DF4 LA1631	4	630
				C801● (2) STR35ME	800	LC1 F800	GS1 V	DF2 LA1631	DF4 LA1631	4	630
400	675	ATS 48C79●	ATS 48M10●	*NS800● (2) Micrologic 5.0*	800	LC1 F800	GS1 V	DF2 LA1801	DF4 LA1801	4	800
				C801● (2) STR35ME	800	LC1 F800	GS1 V	DF2 LA1801	DF4 LA1801	4	800
500	855	ATS 48M10●	ATS 48M12●	*NS1000● (2) Micrologic 5.0*	1000	LC1 BM33	GS1 V	DF2 LA1101	DF4 LA1101	4	1000
				C1001● (2) STR35ME	1000	LC1 BM33	GS1 V	DF2 LA1101	DF4 LA1101	4	1000
630	1045	ATS48M12●	–	*NS1250● (2) Micrologic 5.0*	1250	LC1 BP33	–	DF2 LA1251	DF4 LA1251	4	1250
				C1251● (2) STR35ME	1250	LC1 BP33	–	DF2 LA1251	DF4 LA1251	4	1250

(1) Replace ● with Q or Y according to the starter voltage range.
(2) Replace ● with N, H or L, according to the breaking capacity (see table below).
(3) DF2 CA, DF● EA, DF● FA: sold in lots of 20.
DF● GA, DF● KA: sold in lots of 3.
DF● LA: sold singly.

Maximum prospective short-circuit current of the starter according to IEC 60947-4-2

Starter	Iq (kA)
ATS 48D17● to ATS 48C32●	50
ATS 48C41● to ATS 48M12●	70

Breaking capacity of circuit-breakers according to standard IEC 60947-2

380 V, 400 V, 415 V	Icu (kA)
GV2 L20, GV2 L22, GV2 L32, GK3 EF40	50
GK3 EF65, GK3 EF80	35
NS80	70

380 V, 400 V, 415 V	Icu (kA)		
	N	H	L
NS100	25	70	150
NS160, NS250	36	70	150
NS400, NS630	45	70	150
NS800, NS1000, C801, C1001	50	70	150
NS1250, C1251	50	70	–

Presentation: pages 1/30 and 1/31
Characteristics: pages 1/32 to 1/35
References: pages 1/40 to 1/43
Dimensions: pages 1/48 to 1/53
Schemes: pages 1/54 to 1/59

Soft starters for asynchronous motors

Altistart 48 soft start - soft stop units

380 V, 400 V or 415 V power supply, type 2 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/54 to 1/59) circuit-breakers, contactors, fast-acting fuses, starters

Combination: circuit-breaker, contactor, starter

Motor		Starter *(1)*		Type of circuit-breaker		Type of contactor
		Class 10	Class 20	Telemecanique	Rating	
kW	A	Standard applications	Severe applications	*Merlin Gerin*	A	
M1		A1		Q1		KM1, KM2, KM3
5.5	11	–	**ATS 48D17●**	**GV2 L20**	18	**LC1 D40**
				NS80H MA	12.5	**LC1 D40**
7.5	14.8	**ATS 48D17●**	**ATS 48D22●**	**GV2 L20**	18	**LC1 D40**
				NS80H MA	25	**LC1 D40**
11	21	**ATS 48D22●**	**ATS 48D32●**	**GV2 L22**	25	**LC1 D40**
				NS80H MA	25	**LC1 D40**
15	28.5	**ATS 48D32●**	**ATS 48D38●**	**GV2 L32**	32	**LC1 D80**
				NS80H MA	50	**LC1 D80**
18.5	35	**ATS 48D38●**	**ATS 48D47●**	***NS80H MA***	50	**LC1 D80**
22	42	**ATS 48D47●**	**ATS 48D62●**	***NS80H MA***	50	**LC1 D80**
30	57	**ATS 48D62●**	**ATS 48D75●**	***NS80H MA***	80	**LC1 D80**
37	69	**ATS 48D75●**	**ATS 48D88●**	***NS80H MA***	80	**LC1 D80**
45	81	**ATS 48D88●**	**ATS 48C11●**	***NS100● MA*** *(2)*	100	**LC1 D115**
55	100	**ATS 48C11●**	**ATS 48C14●**	***NS160● MA*** *(2)*	150	**LC1 D115**
75	131	**ATS 48C14●**	**ATS 48C17●**	***NS160● MA*** *(2)*	150	**LC1 D150**
90	162	**ATS 48C17●**	**ATS 48C21●**	***NS 250● MA*** *(2)*	220	**LC1 F185**
110	195	**ATS 48C21●**	**ATS 48C25●**	***NS 250● MA*** *(2)*	220	**LC1 F225**
132	233	**ATS 48C25●**	**ATS 48C32●**	***NS400● MA*** *(2)*	320	**LC1 F265**
160	285	**ATS 48C32●**	**ATS 48C41●**	***NS400● MA*** *(2)*	320	**LC1 F330**
220	388	**ATS 48C41●**	**ATS 48C48●**	***NS630● MAE*** *(2)*	500	**LC1 F500**
250	437	**ATS 48C48●**	**ATS 48C59●**	***NS630● MAE*** *(2)*	500	**LC1 F500**
315	560	**ATS 48C59●**	**ATS 48C66●**	***NS630bL Micrologic 5.0***	630	**LC1 F630**
355	605	**ATS48C66●**	**ATS48C79●**	***NS800L Micrologic 5.0***	800	**LC1 F800**
400	675	**ATS48C79●**	**ATS48M10●**	***NS800L Micrologic 5.0***	800	**LC1 F800**
500	855	**ATS48M10●**	**ATS48M12●**	***NS1000L Micrologic 5.0***	1000	**LC1 BM33**
630	1045	**ATS48M12●**	–	***NS1250● (2) Micrologic 5.0*** *(3)*	1250	**LC1 BP33**

(1) Replace ● with Q or Y according to the starter voltage range.
(2) Replace ● with N, H or L, according to the breaking capacity (see the breaking capacity table on the previous page).
(3) Type 2 coordination is only possible if the fast-acting fuses remain in the motor supply circuit and are not bypassed at the end of starting.

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	Iq (kA)
ATS 48D17●	**50**
ATS 48D22● to ATS 48D47●	**40**
ATS 48D62● to ATS 48C79●	**50**
ATS 48M10● and ATS 48M12●	**85**

Fast-acting fuse (essential for type 2 coordination), starter combinations

Starter	Fast-acting fuses with micro-contact			
Reference	Unit reference *(4)*	Size	Rating A	I²t kA².s
A1	Q3			
ATS 48D17●	**DF3 ER50**	14 x 51	50	2.3
ATS 48D22● and ATS 48D32●	**DF3 FR80**	22 x 58	80	5.6
ATS 48D38● and ATS 48D47●	**DF3 FR100**	22 x 58	100	12
ATS 48D62● and ATS 48D75●	**DF4 00125**	00	125	45
ATS 48D88● and ATS 48C11●	**DF4 00160**	00	160	82
ATS 48C14● and ATS 48C17●	**DF4 30400**	30	400	120
ATS 48C21● to ATS 48C32●	**DF4 31700**	31	700	490
ATS 48D75●	**DF4 33800**	33	800	490
ATS 48C48● and ATS 48C59●	**DF4 331000**	33	1000	900
ATS 48C66●	**DF4 2331400**	2 x 33	1400	1200
ATS 48C79●	**DF4 441600**	44	1600	1600
ATS 48M10● and ATS 48M12●	**DF4 442200**	44	2200	4100

(4) DF3 ER, DF3 FR: sold in lots of 10.
DF4: sold singly.

Soft starters for asynchronous motors

Altistart 48 soft start - soft stop units
440 V power supply, type 1 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/54 to 1/59)

Combine either circuit-breaker (light blue columns), contactor, starter, or switch/fuse (dark blue columns), contactor, starter

Motor		Starter		Type of circuit-breaker		Type of contactor	Type of switch or switch disconnector (bare unit)	Am fuses			
		Class 10 Standard applications	Class 20 Severe applications	Telemecanique *Merlin Gerin*	Rating			Unit reference (2)		Size	Rating
								Without striker	With striker		
kW	A				A						A
M1		A1		Q1		KM1, KM2, KM3					
5.5	10.4	–	**ATS 48D17Y**	***NS100● MA*** *(1)* ***NS80H MA***	12.5	**LC1 D12**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
7.5	13.7	**ATS 48D17Y**	**ATS 48D22Y**	***NS100● MA*** *(1)* ***NS80H MA***	25	**LC1 D18**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
11	20.1	**ATS 48D22Y**	**ATS 48D32Y**	***NS100● MA*** *(1)* ***NS80H MA***	25	**LC1 D25**	**GK1 EK**	**DF2 EA25**	**DF3 EA25**	14 x 51	25
15	26.5	**ATS 48D32Y**	**ATS 48D38Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D32**	**GK1 EK**	**DF2 EA32**	**DF3 EA32**	14 x 51	32
18.5	32.8	**ATS 48D38Y**	**ATS 48D47Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D40**	**GK1 EK**	**DF2 EA40**	**DF3 EA40**	14 x 51	40
22	39	**ATS 48D47Y**	**ATS 48D62Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D40**	**GK1 FK**	**DF2 FA50**	**DF3 FA50**	22 x 58	50
30	52	**ATS 48D62Y**	**ATS 48D75Y**	***NS80H MA***	80	**LC1 D65**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
37	64	**ATS 48D75Y**	**ATS 48D88Y**	***NS80H MA***	80	**LC1 D65**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
45	76	**ATS 48D88Y**	**ATS 48C11Y**	***NS100● MA*** *(1)*	100	**LC1 D115**	**GK1 FK**	**DF2 FA100**	**DF3 FA100**	22 x 58	100
55	90	**ATS 48C11Y**	**ATS 48C14Y**	***NS100● MA*** *(1)*	100	**LC1 D115**	**GS1 L**	**DF2 GA1121**	**DF4 GA1121**	0	125
75	125	**ATS 48C14Y**	**ATS 48C17Y**	***NS160● MA*** *(1)*	150	**LC1 D150**	**GS1 L**	**DF2 GA1161**	**DF4 GA1161**	1	160
90	150	**ATS 48C17Y**	**ATS 48C21Y**	***NS250● MA*** *(1)*	220	**LC1 F185**	**GS1 N**	**DF2 HA1201**	**DF4 HA1201**	1	200
110	178	**ATS 48C21Y**	**ATS 48C25Y**	***NS250● MA*** *(1)*	220	**LC1 F225**	**GS1 N**	**DF2 HA1251**	**DF4 HA1251**	1	250
132	215	**ATS 48C25Y**	**ATS 48C32Y**	***NS250● MA*** *(1)*	220	**LC1 F265**	**GS1 QQ**	**DF2 JA1311**	**DF4 JA1311**	2	315
160	256	**ATS 48C32Y**	**ATS 48C41Y**	***NS400● MA*** *(1)*	320	**LC1 F265**	**GS1 QQ**	**DF2 JA1401**	**DF4 JA1401**	2	315
220	353	**ATS 48C41Y**	**ATS 48C48Y**	***NS630● MAE*** *(1)*	500	**LC1 F400**	**GS1 S**	**DF2 KA1501**	**DF4 KA1501**	3	500
250	401	**ATS 48C48Y**	**ATS 48C59Y**	***NS630● MAE*** *(1)*	500	**LC1 F400**	**GS1 S**	**DF2 KA1501**	**DF4 KA1501**	3	500
355	549	**ATS 48C59Y**	**ATS 48C66Y**	***NS630b● (1) Micrologic 5.0***	630	**LC1 F630**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
400	611	**ATS 48C66Y**	**ATS 48C79Y**	***NS630b● (1) Micrologic 5.0***	630	**LC1 F630**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
500	780	**ATS 48C79Y**	**ATS 48M10Y**	***NS800● (1) Micrologic 5.0***	800	**LC1 BM33**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
				C801● (1) STR35ME	800	**LC1 BM33**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
630	965	**ATS 48M10Y**	**ATS 48M12Y**	***NS1000● (1) Micrologic 5.0***	1000	**LC1 BP33**	**GS1 V**	**DF2 LA1101**	**DF4 LA1101**	4	1000
				C1001L STR35ME	1000	**LC1 BP33**	**GS1 V**	**DF2 LA1101**	**DF4 LA1101**	4	1000
710	1075	**ATS 48M12Y**	–	***NS1250● (1) Micrologic 5.0***	1250	**LC1 BP33**	–	**DF2 LA1251**	–	4	1250
				C1251● (1) STR35ME	1250	**LC1 BP33**	–	**DF2 LA1251**	–	4	1250

(1) Replace ● with N, H or L, according to the breaking capacity (see table below).
(2) DF2 CA, DF● EA, DF● FA: sold in lots of 20.
DF● GA, DF● KA: sold in lots of 3.
DF● LA: sold in lots of 1.

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	Iq (kA)
ATS 48D17Y to ATS 48C32Y	**50**
ATS 48C41Y to ATS 48M12Y	**70**

Breaking capacity of circuit-breakers according to standard IEC 60947-2

440 V	Icu (kA)
GV2 L20, GV2 L22, GV2 L32	20
GK3 EF40	30
GK3 EF65, GK3 EF80	25
NS80	65

440 V	Icu (kA)		
	N	H	L
NS100	25	65	130
NS160, NS250	35	65	130
NS400, NS630	42	65	130
NS800, NS1000	50	65	130
NS1250	50	65	–
C801, C1001	42	65	150
C1251	42	65	–

Soft starters for asynchronous motors

Altistart 48 soft start - soft stop units
440 V power supply, type 2 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/54 to 1/59) circuit-breakers, contactors, fast-acting fuses, starters

Combination: circuit-breaker, contactor, starter

Motor		Starter		Type of circuit-breaker		Type of contactor
		Class 10	Class 20	Telemecanique	Rating	
kW	A	Standard applications	Severe applications	*Merlin Gerin*	A	
M1		A1		Q1		KM1, KM2, KM3
5.5	10.4	–	**ATS 48D17Y**	***NS80H MA***	12.5	**LC1 D40**
				NS100● MA *(1)*	12.5	**LC1 D80**
7.5	13.7	**ATS 48D17Y**	**ATS 48D22Y**	***NS80H MA***	25	**LC1 D40**
				NS100● MA *(1)*	25	**LC1 D80**
11	20.1	**ATS 48D22Y**	**ATS 48D32Y**	***NS80H-MA***	25	**LC1 D40**
				NS100● MA *(1)*	25	**LC1 D80**
15	26.5	**ATS 48D32Y**	**ATS 48D38Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D80**
18.5	32.8	**ATS 48D38Y**	**ATS 48D47Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D80**
22	39	**ATS 48D47Y**	**ATS 48D62Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D80**
30	52	**ATS 48D62Y**	**ATS 48D75Y**	***NS100● MA*** *(1)*	100	**LC1 D80**
				NS80H MA	80	**LC1 D80**
37	64	**ATS 48D75Y**	**ATS 48D88Y**	***NS100● MA*** *(1)*	100	**LC1 D80**
				NS80H MA	80	**LC1 D80**
45	76	**ATS 48D88Y**	**ATS 48C11Y**	***NS100● MA*** *(1)*	100	**LC1 D115**
55	90	**ATS 48C11Y**	**ATS 48C14Y**	***NS100● MA*** *(1)*	100	**LC1 D115**
75	125	**ATS 48C14Y**	**ATS 48C17Y**	***NS160● MA*** *(1)*	150	**LC1 D150**
90	150	**ATS 48C17Y**	**ATS 48C21Y**	***NS160● MA*** *(1)*	150	**LC1 D150**
110	178	**ATS 48C21Y**	**ATS 48C25Y**	***NS250● MA*** *(1)*	220	**LC1 F185**
132	215	**ATS 48C25Y**	**ATS 48C32Y**	***NS400● MA*** *(1)*	320	**LC1 F265**
160	256	**ATS 48C32Y**	**ATS 48C41Y**	***NS400● MA*** *(1)*	320	**LC1 F265**
220	353	**ATS 48C41Y**	**ATS 48C48Y**	***NS630● MAE*** *(1)*	500	**LC1 F400**
250	401	**ATS 48C48Y**	**ATS 48C59Y**	***NS630● MAE*** *(1)*	500	**LC1 F500**
355	549	**ATS 48C59Y**	**ATS 48C66Y**	***NS630bL Micrologic 5.0***	630	**LC1 F630**
400	611	**ATS 48C66Y**	**ATS 48C79Y**	***NS800L Micrologic 5.0***	800	**LC1 F800**
500	780	**ATS 48C79Y**	**ATS 48M10Y**	***NS800L Micrologic 5.0***	800	**LC1 F800**
630	965	**ATS 48M10Y**	**ATS 48M12Y**	***NS1000L Micrologic 5.0***	1000	**LC1 BP33**
710	1075	**ATS 48M12Y**	–	***NS1250● (1) Micrologic 5.0*** *(2)*	1250	**LC1 BP33**

(1) Replace ● with N, H or L, according to the breaking capacity (see the breaking capacity table on the previous page).
(2) Type 2 coordination is only possible if the fast-acting fuses remain in the motor supply circuit and are not bypassed at the end of starting.

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	Iq (kA)
ATS 48D17Y	**50**
ATS 48D22Y to ATS 48D47Y	**20**
ATS 48D62Y and ATS 48D75Y	**50**
ATS 48D88Y ATS 48C41Y	**40**
ATS 48C11Y to ATS 48C32Y	**50**
ATS 48C48Y to ATS 48C79Y	**50**
ATS 48M10Y and ATS 48M12Y	**85**

Fast-acting fuse (essential for type 2 coordination), starter combinations

Starter	Fast-acting fuses with micro-contact			
Reference	Unit reference *(3)*	Size	Rating	I²t
			A	kA².s
A1	Q3			
ATS 48D17Y	**DF3 ER50**	14 x 51	50	2.3
ATS 48D22Y and ATS 48D32Y	**DF3 FR80**	22 x 58	80	5.6
ATS 48D38Y and ATS 48D47Y	**DF3 FR100**	22 x 58	100	12
ATS 48D62Y and ATS 48D75Y	**DF4 00125**	00	125	45
ATS 48D88Y and ATS 48C11Y	**DF4 00160**	00	160	82
ATS 48C14Y and ATS 48C17Y	**DF4 30400**	30	400	120
ATS 48C21Y to ATS 48C32Y	**DF4 31700**	31	700	490
ATS 48C41Y	**DF4 33800**	33	800	490
ATS 48C48Y and ATS 48C59Y	**DF4 331000**	33	1000	900
ATS 48C66Y	**DF4 2331400**	2 x 33	1400	1200
ATS 48C79Y	**DF4 441600**	44	1600	1600
ATS 48M10Y and ATS 48M12Y	**DF4 442200**	44	2200	4100

(3) DF3 ER, DF3 FR: sold in lots of 10
DF4: sold singly.

Soft starters for asynchronous motors

Altistart 48 soft start - soft stop units
500 V power supply, type 1 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/54 to 1/59)

Combine either circuit-breaker (light blue columns), contactor, starter, or switch/fuse (dark blue columns), contactor, starter

Motor		Starter		Type of circuit-breaker		Type of contactor	Type of switch or switch disconnector (bare unit)	Am fuses			
		Class 10 Standard applications	Class 20 Severe applications	Telemecanique *Merlin Gerin*	Rating			Unit reference (2)		Size	Rating
								Without striker	With striker		
kW	A				A						A
M1		A1		Q1		KM1, KM2, KM3					
7.5	12	–	**ATS 48D17Y**	***NS100● MA*** *(1)* ***NS80H MA***	12.5	**LC1 D12**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
9	14	**ATS 48D17Y**	**ATS 48D22Y**	***NS100● MA*** *(1)* ***NS80H MA***	25	**LC1 D18**	**LS1 D32**	**DF2 CA16**	–	10 x 38	16
11	18.4	**ATS 48D22Y**	**ATS 48D32Y**	***NS100● MA*** ***(1)*** ***NS80H MA***	25	**LC1 D25**	**GK1 EK**	**DF2 EA25**	**DF3 EA25**	14 x 51	25
18.5	28.5	**ATS 48D32Y**	**ATS 48D38Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D32**	**GK1 EK**	**DF2 EA32**	**DF3 EA32**	14 x 51	32
22	33	**ATS 48D38Y**	**ATS 48D47Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D40**	**GK1 EK**	**DF2 EA40**	**DF3 EA40**	14 x 51	40
30	45	**ATS 48D47Y**	**ATS 48D62Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D50**	**GK1 FK**	**DF2 FA50**	**DF3 FA50**	22 x 58	50
37	55	**ATS 48D62Y**	**ATS 48D75Y**	***NS100● MA*** *(1)*	100	**LC1 D65**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
45	65	**ATS 48D75Y**	**ATS 48D88Y**	***NS100● MA*** *(1)*	100	**LC1 D80**	**GK1 FK**	**DF2 FA80**	**DF3 FA80**	22 x 58	80
55	80	**ATS 48D88Y**	**ATS 48C11Y**	***NS100● MA*** *(1)*	100	**LC1 D80**	**GK1 FK**	**DF2 FA100**	**DF3 FA100**	22 x 58	100
75	105	**ATS 48C11Y**	**ATS 48C14Y**	***NS160● MA*** *(1)*	150	**LC1 D115**	**GS1 L**	**DF2 GA1121**	**DF4 GA1121**	0	125
90	130	**ATS 48C14Y**	**ATS 48C17Y**	***NS160● MA*** *(1)*	150	**LC1 D150**	**GS1 L**	**DF2 GA1161**	**DF4 GA1161**	0	160
110	156	**ATS 48C17Y**	**ATS 48C21Y**	***NS250● MA*** *(1)*	220	**LC1 F185**	**GS1 N**	**DF2 HA1201**	**DF4 HA1201**	1	200
132	207	**ATS 48C21Y**	**ATS 48C25Y**	***NS250● MA*** *(1)*	220	**LC1 F265**	**GS1 N**	**DF2 HA1251**	**DF4 HA1251**	1	250
160	257	**ATS 48C25Y**	**ATS 48C32Y**	***NS400● MA*** *(1)*	320	**LC1 F265**	**GS1 QQ**	**DF2 JA1311**	**DF4 JA1311**	2	315
220	310	**ATS 48C32Y**	**ATS 48C41Y**	***NS630● MAE*** *(1)*	500	**LC1 F400**	**GS1 QQ**	**DF2 JA1401**	**DF4 JA1401**	2	400
250	360	**ATS 48C41Y**	**ATS 48C48Y**	***NS630● MAE*** *(1)*	500	**LC1 F400**	**GS1 S**	**DF2 KA1501**	**DF4 KA1501**	3	500
315	460	**ATS 48C48Y**	**ATS 48C59Y**	***NS630● MAE*** *(1)*	500	**LC1 F500**	**GS1 S**	**DF2 KA1631**	**DF4 KA1631**	3	630
400	540	**ATS 48C59Y**	**ATS 48C66Y**	***NS630b●*** *(1)* ***Micrologic 5.0***	630	**LC1 F630**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
450	630	**ATS 48C66Y**	**ATS 48C79Y**	***NS630b●*** *(1)* ***Micrologic 5.0***	630	**LC1 F800**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
500	680	**ATS 48C79Y**	**ATS 48M10Y**	***NS800● MA*** *(1)* ***Micrologic 5.0***	800	**LC1 BL33**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
				C1001● (1) ***STR35 ME***	1000	**LC1 BL33**	**GS1 V**	**DF2 LA1801**	**DF4 LA1801**	4	800
630	850	**ATS 48M10Y**	**ATS 48M12Y**	***NS1000●*** *(1)* ***Micrologic 5.0***	1000	**LC1 BP33**	**GS1 V**	**DF2 LA1101**	**DF4 LA1101**	4	1000
				C1001● *(1)* ***STR35 ME***	1000	**LC1 BP33**	**GS1 V**	**DF2 LA1101**	**DF4 LA1101**	4	1000
800	1100	**ATS 48M12Y**	–	***NS1250●*** *(1)* ***Micrologic 5.0***	1250	**LC1 BP33**	–	**DF2 LA1251**	–	4	1250
				C1251● *(1)* ***STR35 ME***	1250	**LC1 BP33**	–	**DF2 LA1251**	–	4	1250

(1) Replace ● with N, H or L, according to the breaking capacity (see table below).
(2) DF2 CA, DF● EA, DF● FA: sold in lots of 20.
DF● GA, DF● KA: sold in lots of 3.
DF● LA: sold singly.

Breaking capacity of circuit-breakers according to standard IEC 60947-2

500 V	Icu (kA)		
	N	H	L
GV2 L20, GV2 L22, GV2 L32	10		
GK3 EF40	20		
GK3 EF65, GK3 EF80	15		
NS80	25		
NS100	18	50	100
NS160, NS250, NS630	30	50	70
NS400	30	50	100
NS800, NS1000, C801, C1001	40	50	100
NS1250, C1251	40	50	–

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	Iq (kA)
ATS 48D17Y to ATS 48C32Y	**50**
ATS 48C41Y to ATS 48M12Y	**70**

Soft starters for asynchronous motors

Altistart 48 soft start - soft stop units
500 V power supply, type 2 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/54 to 1/59) **circuit-breakers, contactors, fast-acting fuses, starters**

Combination: circuit-breaker, contactor, starter

Motor		Starter		Type of circuit-breaker		Type of contactor
		Class 10	Class 20	Telemecanique	Rating	
kW	A	Standard applications	Severe applications	*Merlin Gerin*	A	
M1		A1		Q1		KM1, KM2, KM3
7.5	12	–	**ATS 48D17Y**	***NS80H MA***	12.5	**LC1 D40**
				NS100● MA *(1)*	12.5	**LC1 D80**
9	14	**ATS 48D17Y**	**ATS 48D22Y**	***NS80H MA***	25	**LC1 D40**
				NS100● MA *(1)*	25	**LC1 D80**
11	18.4	**ATS 48D22Y**	**ATS 48D32Y**	***NS80H MA***	25	**LC1 D40**
				NS100● MA *(1)*	25	**LC1 D80**
18.5	28.5	**ATS 48D32Y**	**ATS 48D38Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D80**
22	33	**ATS 48D38Y**	**ATS 48D47Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D80**
30	45	**ATS 48D47Y**	**ATS 48D62Y**	***NS100● MA*** *(1)* ***NS80H MA***	50	**LC1 D80**
37	55	**ATS 48D62Y**	**ATS 48D75Y**	***NS100● MA*** *(1)*	100	**LC1 D80**
45	65	**ATS 48D75Y**	**ATS 48D88Y**	***NS100● MA*** *(1)*	100	**LC1 D80**
55	80	**ATS 48D88Y**	**ATS 48C11Y**	***NS100● MA*** *(1)*	100	**LC1 D115**
75	105	**ATS 48C11Y**	**ATS 48C14Y**	***NS160● MA*** *(1)*	150	**LC1 D115**
90	130	**ATS 48C14Y**	**ATS 48C17Y**	***NS160● MA*** *(1)*	150	**LC1 D150**
110	156	**ATS 48C17Y**	**ATS 48C21Y**	***NS250● MA*** *(1)*	220	**LC1 F185**
132	207	**ATS 48C21Y**	**ATS 48C25Y**	***NS250● MA*** *(1)*	220	**LC1 F265**
160	257	**ATS 48C25Y**	**ATS 48C32Y**	***NS400● MA*** *(1)*	320	**LC1 F400**
220	310	**ATS 48C32Y**	**ATS 48C41Y**	***NS400● MA*** *(1)*	320	**LC1 F400**
250	360	**ATS 48C41Y**	**ATS 48C48Y**	***NS630● MAE*** *(1)*	500	**LC1 F500**
315	460	**ATS 48C48Y**	**ATS 48C59Y**	***NS630● MAE*** *(1)*	500	**LC1 F500**
400	540	**ATS 48C59Y**	**ATS 48C66Y**	***NS630bL Micrologic 5.0***	630	**LC1 F630**
450	630	**ATS 48C66Y**	**ATS 48C79Y**	***NS630bL Micrologic 5.0***	630	**LC1 F800**
500	680	**ATS 48C79Y**	**ATS 48M10Y**	***NS800L Micrologic 5.0***	800	**LC1 BL33**
630	850	**ATS 48M10Y**	**ATS 48M12Y**	***NS1000L Micrologic 5.0***	1000	**LC1 BP33**
800	1100	**ATS 48M12Y**	–	***NS1250● (1) Micrologic 5.0*** *(2)*	1250	**LC1 BP33**

(1) Replace ● with N, H or L, according to the breaking capacity (see the breaking capacity table on the previous page).

(2) Type 2 coordination is only possible if the fast-acting fuses remain in the motor supply circuit and are not bypassed at the end of starting.

Fast-acting fuse (essential for type 2 coordination), starter combinations

Starter	Fast-acting fuses with micro-contact			
Reference	Unit reference *(3)*	Size	Rating A	I^2t $kA^2.s$
A1	Q3			
ATS 48D17Y	**DF3 ER50**	14 x 51	50	2.3
ATS 48D22Y and ATS 48D32Y	**DF3 FR80**	22 x 58	80	5.6
ATS 48D38Y and ATS 48D47Y	**DF3 FR100**	22 x 58	100	12
ATS 48D62Y and ATS 48D75Y	**DF4 00125**	00	125	45
ATS 48D88Y and ATS 48C11Y	**DF4 00160**	00	160	82
ATS 48C14Y and ATS 48C17Y	**DF4 30400**	30	400	120
ATS 48C21Y to ATS 48C32Y	**DF4 31700**	31	700	490
ATS 48C41Y	**DF4 33800**	33	800	490
ATS 48C48Y and ATS 48C59Y	**DF4 331000**	33	1000	900
ATS 48C66Y	**DF4 2331400**	2 x 33	1400	1200
ATS 48C79Y	**DF4 441600**	44	1600	1600
ATS 48M10Y and ATS 48M12Y	**DF4 442200**	44	2200	4100

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	Iq (kA)
ATS 48D17Y	**50**
ATS 48D22Y to ATS 48D47Y	**20**
ATS 48D62Y and ATS 48D75Y	**50**
ATS 48D88Y	**40**
ATS 48C11Y to ATS 48C32Y	**50**
ATS 48C41Y	**40**
ATS 48C48Y to ATS 48C79Y	**50**
ATS 48M10Y and ATS 48M12Y	**85**

(3) DF3 ER, DF3 FR: sold in lots of 10
DF4: sold singly.

Soft starters for asynchronous motors

Altistart 48 soft start - soft stop units
690 V power supply, type 1 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/54 to 1/59)

Combine either circuit-breaker (light blue columns), contactor, starter, or switch/fuse (dark blue columns), contactor, starter

Motor		Starter		Type of circuit-breaker		Type of contactor	Type of switch or switch disconnector (bare unit)	Am fuses			
		Class 10 Standard applications	Class 20 Severe applications	Telemecanique *Merlin Gerin*	Rating			Unit reference (2)		Size	Rating
								Without striker	With striker		
kW	A				A						A
M1		A1		Q1		KM1, KM2, KM3					
11	12.1	–	**ATS 48D17Y**	***NS100● MA*** *(1)* ***NS80H MA***	12.5 12.5	**LC1 D18**	**GK1 FK**	**DF2 FA16**	**DF3 FA16**	22 x 58	16
15	16.5	**ATS 48D17Y**	**ATS 48D22Y**	***NS100● MA*** *(1)* **NS80H MA**	25 25	**LC1 D25**	**GK1 FK**	**DF2 FA20**	**DF3 FA20**	22 x 58	20
18.5	20.2	**ATS 48D22Y**	**ATS 48D32Y**	***NS100● MA*** *(1)* **NS80H MA**	50 50	**LC1 D32**	**GK1 FK**	**DF2 FA25**	**DF3 FA25**	22 x 58	25
22	24.2	**ATS 48D32Y**	**ATS 48D38Y**	***NS100● MA*** *(1)* **NS80H MA**	50 50	**LC1 D40**	**GK1 FK**	**DF2 FA32**	**DF3 FA32**	22 x 58	32
30	33	**ATS 48D38Y**	**ATS 48D47Y**	***NS100● MA*** *(1)* **NS80H MA**	50 50	**LC1 D40**	**GK1 FK**	**DF2 FA40**	**DF3 FA40**	22 x 58	40
37	40	**ATS 48D47Y**	**ATS 48D62Y**	***NS100● MA*** *(1)* **NS80H MA**	50 50	**LC1 D65**	**GK1 FK**	**DF2 FA50**	**DF3 FA50**	22 x 58	50
45	49	**ATS 48D62Y**	**ATS 48D75Y**	***NS100● MA*** *(1)*	100	**LC1 D80**	–	–	–	–	–
55	58	**ATS 48D75Y**	**ATS 48D88Y**	***NS100● MA*** *(1)*	100	**LC1D-115**	–	–	–	–	–
75	75.5	**ATS 48D88Y**	**ATS 48C11Y**	***NS100● MA*** *(1)*	100	**LC1D-115**	–	–	–	–	–
90	94	**ATS 48C11Y**	**ATS 48C14Y**	***NS160● MA*** *(1)*	150	**LC1D-150**	–	–	–	–	–
110	113	**ATS 48C14Y**	**ATS 48C17Y**	***NS160● MA*** *(1)*	150	**LC1D-150**	–	–	–	–	–
160	165	**ATS 48C17Y**	**ATS 48C21Y**	***NS250● MA*** *(1)*	220	**LC1F-265**	–	–	–	–	–
200	203	**ATS 48C21Y**	**ATS 48C25Y**	***NS400● MA*** *(1)*	320	**LC1F-330**	–	–	–	–	–
250	253	**ATS 48C25Y**	**ATS 48C32Y**	***NS400● MA*** *(1)*	320	**LC1F-400**	–	–	–	–	–
315	321	**ATS 48C32Y**	**ATS 48C41Y**	***NS630● MAE*** *(1)*	500	**LC1F-500**	–	–	–	–	–
400	390	**ATS 48C41Y**	**ATS 48C48Y**	***NS630● MAE*** *(1)*	500	**LC1 F630**	–	–	–	–	–
500	490	**ATS 48C48Y**	**ATS 48C59Y**	***NS630b● (1)*** ***Micrologic 5.0***	630	**LC1 BL33**	–	–	–	–	–
				C801● (1) ***STR35 ME***	800	**LC1 BL33**	–	–	–	–	–
560	549	**ATS 48C59Y**	**ATS 48C66Y**	***NS630b● (1)*** ***Micrologic 5.0***	630	**LC1 BL33**	–	–	–	–	–
				C801● (1) ***STR35 ME***	800	**LC1 BL33**	–	–	–	–	–
630	605	**ATS 48C66Y**	**ATS 48C79Y**	***NS800● (1)*** ***Micrologic 5.0***	800	**LC1 BP33**	–	–	–	–	–
				C801● (1) ***STR35 ME***	800	**LC1 BP33**	–	–	–	–	–
710	694	**ATS 48C79Y**	**ATS 48M10Y**	***NS800● (1)*** ***Micrologic 5.0***	800	**LC1 BP33**	–	–	–	–	–
				C801● (1) ***STR35 ME***	800	**LC1 BP33**	–	–	–	–	–
900	880	**ATS 48M10Y**	**ATS 48M12Y**	***NS1000● (1)*** ***Micrologic 5.0***	1000	**LC1 BR33**	–	–	–	–	–
				C1001L ***STR35 ME***	1000	**LC1 BR33**	–	–	–	–	–
950	1000	**ATS 48M12Y**	–	***NS1250● (1)*** ***Micrologic 5.0***	1250	**LC1 BR33**	–	–	–	–	–
				C1251● (1) ***STR35 ME***	1250	**LC1 BR33**	–	–	–	–	–

(1) Replace ● with N, H or L, according to the breaking capacity (see table below).
(2) DF● FA: sold in lots of 10.

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	Iq (kA)
ATS 48D17Y and ATS 48C32Y	**50**
ATS 48C41Y to ATS 48M12Y	**70**

Breaking capacity of circuit-breakers according to standard IEC 60947-2

690 V	Icu (kA)
GV2 L20, GV2 L22, GV2 L32	4
GK3 EF40, GK3 EF65, GK3 EF80, NS80	6

690 V	Icu (kA)		
	N	H	L
NS100	8	10	75
NS160, NS250	8	10	20
NS400	10	20	75
NS630	10	20	35
NS800, NS1000	30	42	25
NS1250	30	42	–
C801, C1001	25	40	60
C1251	25	40	–

Presentation: pages 1/30 and 1/31
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Soft starters for asynchronous motors

Altistart 48 soft start - soft stop units
690 V power supply, type 2 coordination

Components for use together in accordance with standards IEC 60947-4-1 and IEC 60947-4-2 (see schemes on pages 1/54 to 1/59) **circuit-breakers, contactors, fast-acting fuses, starters**

Combination: circuit-breaker, contactor, starter

Motor		Starter		Type of circuit-breaker		Type of contactor
		Class 10	Class 20	Telemecanique	Rating	
kW	A	Standard applications	Severe applications	*Merlin Gerin*	A	
M1		A1		Q1		KM1, KM2, KM3
11	12.1	–	**ATS 48D17Y**	***NS100● MA*** *(1)*	12.5	**LC1 D80**
15	16.5	**ATS 48D17Y**	**ATS 48D22Y**	***NS100● MA*** *(1)*	25	**LC1 D80**
18.5	20.2	**ATS 48D22Y**	**ATS 48D32Y**	***NS100● MA*** *(1)*	50	**LC1 D80**
22	24.2	**ATS 48D32Y**	**ATS 48D38Y**	***NS100● MA*** *(1)*	50	**LC1 D80**
30	33	**ATS 48D38Y**	**ATS 48D47Y**	***NS100● MA*** *(1)*	50	**LC1 D80**
37	40	**ATS 48D47Y**	**ATS 48D62Y**	***NS100● MA*** *(1)*	50	**LC1 D80**
45	49	**ATS 48D62Y**	**ATS 48D75Y**	***NS100● MA*** *(1)*	100	**LC1 D115**
55	58	**ATS 48D75Y**	**ATS 48D88Y**	***NS100● MA*** *(1)*	100	**LC1 D115**
75	75.5	**ATS 48D88Y**	**ATS 48C11Y**	***NS100● MA*** *(1)*	100	**LC1 D115**
90	94	**ATS 48C11Y**	**ATS 48C14Y**	***NS400● MA*** *(1)*	320	**LC1 F265**
110	113	**ATS 48C14Y**	**ATS 48C17Y**	***NS400● MA*** *(1)*	320	**LC1 F265**
160	165	**ATS 48C17Y**	**ATS 48C21Y**	***NS 400● MA*** *(1)*	320	**LC1 F265**
200	203	**ATS 48C21Y**	**ATS 48C25Y**	***NS400● MA*** *(1)*	320	**LC1 F400**
250	253	**ATS 48C25Y**	**ATS 48C32Y**	***NS400● MA*** *(1)*	320	**LC1 F500**
315	321	**ATS 48C32Y**	**ATS 48C41Y**	***NS630● MAE*** *(1)*	500	**LC1 F500**
400	390	**ATS 48C41Y**	**ATS 48C48Y**	***NS630● MAE*** *(1)*	500	**LC1 F630**
500	490	**ATS 48C48Y**	**ATS 48C59Y**	***NS630bL Micrologic 5.0***	630	**LC1 BL33**
560	549	**ATS 48C59Y**	**ATS 48C66Y**	***NS630bL Micrologic 5.0***	630	**LC1 BL33**
630	605	**ATS 48C66Y**	**ATS 48C79Y**	***NS800L Micrologic 5.0***	800	**LC1 BP33**
710	694	**ATS 48C79Y**	**ATS 48M10Y**	***NS800L Micrologic 5.0***	800	**LC1 BP33**
900	880	**ATS 48M10Y**	**ATS 48M12Y**	***NS1000L Micrologic 5.0***	1000	**LC1 BR33**
950	1000	**ATS 48M12Y**	–	***NS1250● (1) Micrologic 5.0*** *(2)*	1250	**LC1 BR33**

(1) Replace ● with N, H or L, according to the breaking capacity (see the breaking capacity table on the previous page).

(2) Type 2 coordination is only possible if the fast-acting fuses remain in the motor supply circuit and are not bypassed at the end of starting.

Fast-acting fuse (essential for type 2 coordination), starter combinations

Starter	Fast-acting fuses with micro-contact			
reference	Unit reference *(3)*	Size	Calibre A	I^2t $kA^2.s$
A1	Q3			
ATS 48D17Y	**DF3 ER50**	14 x 51	50	2.3
ATS 48D22Yand ATS 48D32Y	**DF3 FR80**	22 x 58	80	5.6
ATS 48D38Y and ATS 48D47Y	**DF3 FR100**	22 x 58	100	12
DF3 ER50	**DF4 00125**	00	125	45
ATS 48D88Y and ATS 48C11Y	**DF4 00160**	00	160	82
ATS 48C14Y and ATS 48C17Y	**DF4 30400**	30	400	120
ATS 48C21Y to ATS 48C32Y	**DF4 31700**	31	700	490
ATS 48C41Y	**DF4 33800**	33	800	490
ATS 48C48Y and ATS 48C59Y	**DF4 331000**	33	1000	900
ATS 48D17Y	**DF4 2331400**	2 x 33	1400	1200
ATS 48C79Y	**DF4 441600**	44	1600	1600
ATS 48M10Y and ATS 48M12Y	**DF4 442200**	44	2200	4100

Maximum prospective short-circuit current of the starter according to standard IEC 60947-4-2

Starter	Iq (kA)
ATS 48D17Y	**50**
ATS 48M10Y and ATS 48M12Y	**15**
ATS 48M10Y and ATS 48M12Y	**20**
ATS 48D62Y and ATS 48D75Y	**50**
ATS 48D88Y	**20**
ATS 48C11Y to ATS 48C32Y	**50**
ATS 48C41Y	**25**
ATS 48C48Y to ATS 48C79Y	**50**
ATS 48M10Y and ATS 48M12Y	**85**

(3) DF3 ER, DF3 FR: sold in lots of 10
DF4: sold singly.

Soft starters
Altistart 48 soft start - soft stop units

Summary of functions

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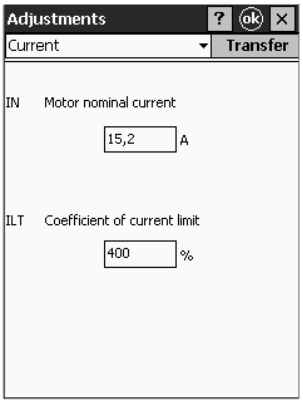


Current setting with PowerSuite on PPC

Starter factory setting

The starter is supplied ready for use in most applications. The main functions enabled and the default function values are as follows:

- nominal motor current (depends on the starter rating),
- limiting current: 400%,
- acceleration ramp time: 15 s,
- initial starting torque: 20%,
- selection of the type of stop: freewheel stop,
- motor thermal protection: class 10,
- time before restarting: 2 s,
- motor phase loss threshold: 10%,
- line frequency: automatic,
- RUN and STOP logic inputs: 2-wire or 3-wire control via wiring,
- logic input LI3: forced freewheel stop,
- logic input LI4: local mode control (serial link disabled),
- logic output LO1: thermal motor alarm,
- logic output LO2: motor powered,
- relay output R1: fault relay,
- relay output R3: motor powered,
- analogue output: motor current.

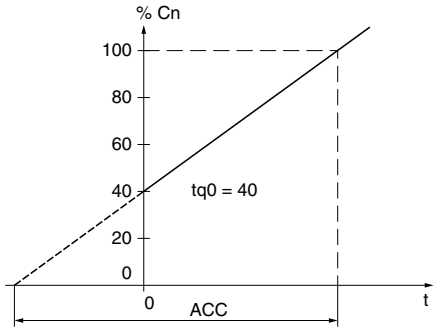
Adjustment functions

■ **Nominal motor current** (maximum permanent current)
The nominal current of the starter can be adapted to the nominal motor current indicated on the rating plate.
Adjustment range: 0.4 to 1.3 times the starter nominal current.

■ **Limiting current**
The maximum starting current can be adjusted.
Adjustment range: 150% to 700% of the nominal motor current set and limited to 500% of the maximum permanent current defined for the starter rating.

■ **Acceleration ramp time**
During the starting phase, the Altistart 48 applies a torque ramp to the motor. The time (ACC) set corresponds to the time taken by the ramp to reach the nominal torque (starting at 0). Adjustment range: 1 to 60 s.

■ **Initial starting torque**
The initial torque tq0 applied to the motor can be used to instantly overcome any resistive starting torque. Adjustment range: 0 to 100% of the nominal motor torque.

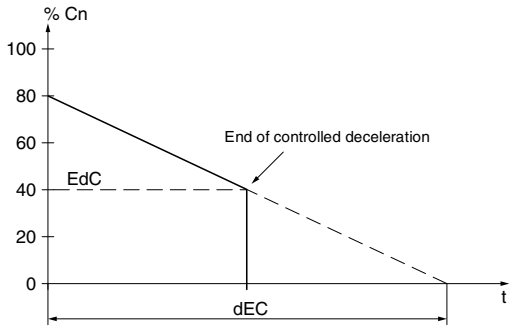


Acceleration ramp during time ACC with initial starting torque tq0 = 40% of the nominal motor torque

■ **Selection of the type of stop**
Three types of stops are available for selection:

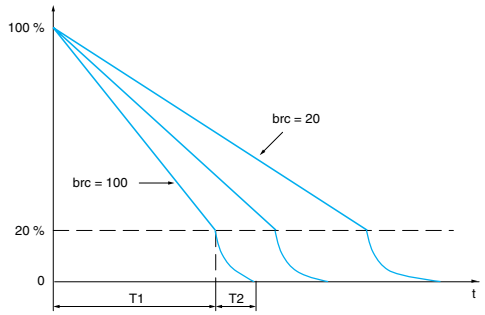
□ **Freewheel motor stop**

□ **Motor stop by deceleration via torque control (pump application)** This type of stop enables a centrifugal pump to be decelerated gradually on a ramp in order to avoid a sudden stop. It can be used to dampen the hydraulic transient in order to significantly reduce pressure surges.
The deceleration ramp time (dEC) can be adjusted.
During deceleration, the pump flow rate decreases and becomes negligible at a certain speed. To continue to decelerate would serve no purpose. A torque threshold (EdC) can be set at which the motor will change to freewheel stop mode, avoiding the unnecessary heating of the motor and the pump.



Decelerated stop by torque control during time dEC with threshold Edc for changing to freewheel stop mode
Edc = 40% of nominal motor torque

□ **Dynamic braking motor stop (application: stopping high inertia machines)**
This type of stop will decelerate the motor if there is considerable inertia.
The braking torque level (brc) can be adjusted. The dynamic braking time (T1) corresponds to the time taken to decelerate from 100% to 20% of the nominal motor speed. To improve braking at the end of deceleration, the starter injects a d.c. current for an adjustable period of time (T2).



Dynamic braking stops for different braking torque levels brc

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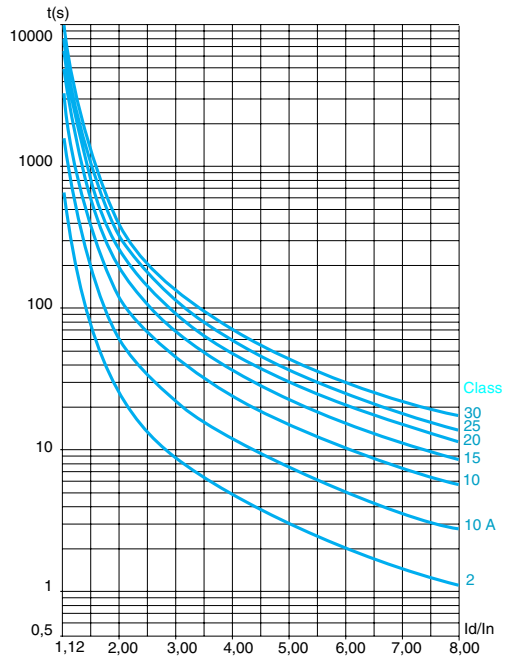
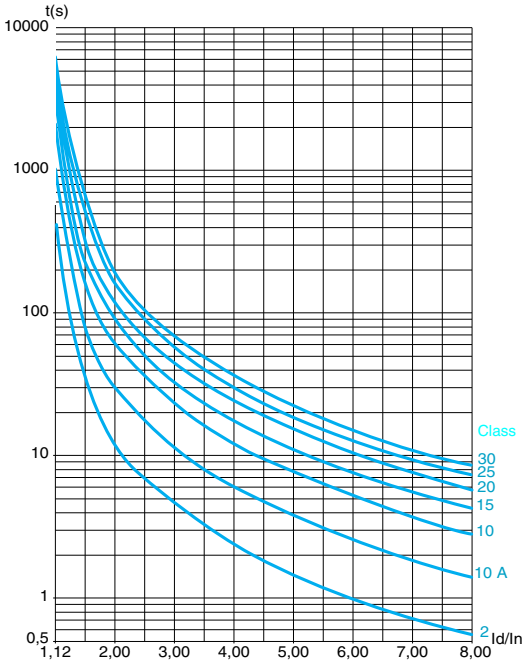


Motor thermal protection curves (cold)



Motor thermal protection curves (warm)

Protection functions

The Altistart 48 offers functions for protecting the motor and the machine.

■ Calculated motor thermal protection

The starter continuously calculates the temperature rise of the motor based on the nominal current which has been set and the actual current absorbed. In order to adapt the Altistart to individual motors and applications, several protection classes are offered in accordance with standard IEC 60947-4-2:
class 30, class 25, class 20 (severe application), class 15, class 10 (standard application), class 10 A, sub-class 2.
Different protection classes are defined for the starting capacities of the motor:
- cold start without thermal fault (corresponding to a stabilised motor thermal state, motor switched off),
- warm start without thermal fault (corresponding to a stabilised motor thermal state, at nominal power).

The motor thermal protection function can be disabled.
After the motor has stopped or the starter has been switched off, the thermal state is calculated even if the control circuit is not energised. The Altistart thermal control prevents the motor from restarting if the temperature rise is too high. If special motors are used which do not have thermal protection via curves, provide external thermal protection via probes or thermal overload relays.
The starter is factory-set to protection class 10.
The tripping curves are based on the relationship between the starting current Is and the (adjustable) nominal motor current In.

Trip time (cold)

Trip time for a standard application (class 10)			Trip time for a severe application (class 20)		
Is = 3 In	Is = 4 In	Is = 5 In	Is = 3.5 In	Is = 4 In	Is = 5 In
46 s	23 s	15 s	63 s	48 s	29 s

Trip time (warm)

Trip time for a standard application (class 10)			Trip time for a severe application (class 20)		
Is = 3 In	Is = 4 In	Is = 5 In	Is = 3.5 In	Is = 4 In	Is = 5 In
23 s	12 s	7.5 s	32 s	25 s	15 s

■ Reset motor thermal state

Activating the function resets the motor thermal state calculated by the starter to zero.

■ Motor thermal protection with PTC probes

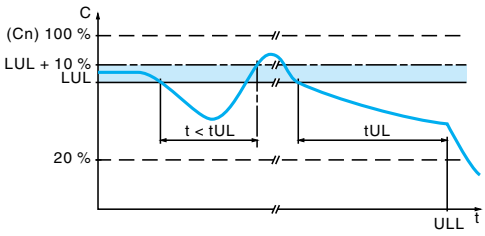
The starter integrates the processing of PTC probes, thus avoiding the use of an external device. The "PTC probe thermal overshoot" fault or alarm can be indicated using a configurable logic output or displayed via the serial link. The function can be disabled.
Note: the "PTC probe protection" and "calculated motor thermal protection" functions are independent and can be active simultaneously.

■ Starter ventilation

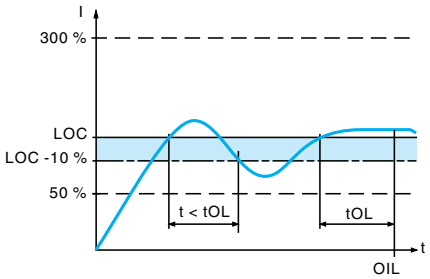
The cooling fan on the starter is switched on as soon as the heatsink temperature reaches 50 °C. It is switched off when the temperature returns to 40 °C.

■ Starter thermal protection

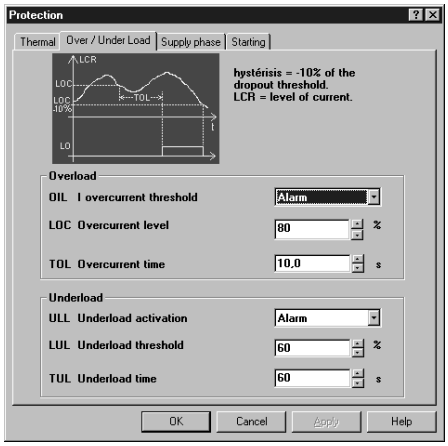
The starter is protected against thermal overloads by an analogue thermal probe.



Motor underload detection (ULL)



Motor overcurrent detection (OIL)



Configuring the starter overload and underload with PowerSuite on a PC

Protection functions (continued)

■ Motor underload protection

The starter detects a motor underload if the motor torque falls below a preset torque threshold (LUL) for a specific (adjustable) period of time (tUL).
The motor underload threshold can be set between 20% and 100% of the nominal motor torque. The permissible underload duration can be set between 1 and 60 s.
The detection function can trigger an alarm or a fault. The detection function can be disabled. The "motor underload detected" alarm can be indicated by a configurable logic output and/or displayed via the serial link in the state of the starter.
The "motor underload detected" fault (ULF) locks the starter and can be displayed via the serial link.

■ Excessive acceleration time protection

This protection function can be used to detect a start which takes place in adverse conditions. Examples of such conditions include a locked rotor or a motor unable to reach its nominal rotation speed.
If the start duration is greater than the value set (between 10 and 999 s), the drive changes to fault mode. The function can be disabled.

■ Current overload protection

The starter detects a current overload if the motor current exceeds a preset overcurrent threshold (LOC) for a specific (adjustable) period of time (tOL).
The overcurrent threshold can be set between 50% and 300% of the nominal motor current.
The permissible overcurrent duration can be set between 0.1 and 60 s.
This function is only active in steady state.
The detection function can trigger an alarm or a fault. It can also be disabled.
The "current overload detected" alarm can be indicated by a configurable logic output and/or displayed via the serial link.
The "current overload detected" fault (OLC) locks the starter and can be displayed via the serial link in the state of the starter.

■ Protection against line phase inversion

This function can be used to detect the direction of rotation of the motor phases and, if it is enabled, to indicate a fault when the direction of rotation is reversed.

■ Time before restarting

This function can be used to avoid several consecutive starts which may cause:
- the thermal overheating of the application, which is not permitted,
- a thermal fault which will require maintenance work to be carried out,
- overcurrents (if the direction of rotation is reversed) or repeats (run/stop commands).

Following a stop command, the motor can only restart once the preset time delay has elapsed.
The motor is restarted once the time delay has elapsed if a run command is still valid or if a new run command is sent.
Adjustment range: 0 to 999 s.

■ Motor phase loss detection

The function is used to adjust the sensitivity of the protection function in order to detect a loss of current or a low current in one of the three motor phases for at least 0.5 s or in all three motor phases for at least 0.2 s. The value of the minimum current level can be set between 5% and 10% of the starter nominal current.

■ Automatic restart

After locking on a fault, the function permits up to six restart attempts at intervals of 60 s if the fault has disappeared and the run commands are still present. After the sixth attempt, the starter will remain locked and the fault will have to be reset before a restart is permitted.
If the function is active, the fault relay remains activated if line phase loss, motor phase loss or line frequency out of tolerance faults are detected. This function can only be used in 2-wire control.

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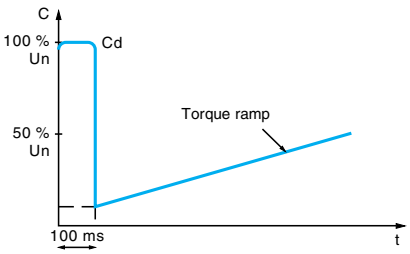


Application of a voltage boost equal to 100% of the nominal motor voltage

Advanced adjustment functions

■ **Torque limit**
Designed primarily for high inertia and constant torque conveyor applications, the function restricts the torque ramp reference to the preset value.
For example, the function can be used to limit the torque to a constant value throughout the starting period.
Adjustment range: 10% to 200% of the nominal motor torque.

■ **Voltage boost level**
The function can be used to avoid any "starting" torque (phenomenon caused by friction on stopping or by mechanical play). When a run command is sent, the starter applies a fixed voltage to the motor for a limited period of time before starting. The function can be disabled.
The voltage setting value varies between 50% and 100% of the nominal motor voltage.

■ **Connecting the starter to the motor delta terminal**
ATS48●●●Q starters connected to motors with delta terminals can be wired in series in the motor windings. This type of connection reduces the current in the starter by a ratio of $\sqrt{3}$, which enables a lower rating starter to be used. The nominal current and limiting current settings as well as the current displayed during operation are on-line values and are indicated on the motor. For this application, the braking or decelerating stop functions are inactive. Only freewheel stopping is possible.
The adjustment range of the nominal motor current and the limiting current are multiplied by $\sqrt{3}$ if the function is selected.
This function is not compatible with the following functions: motor phase loss detection, motor preheating, cascade, decelerated stop and dynamic braking.
Use the scheme recommended on page 1/56 for this type of configuration.

■ **Test on low power motor**
This function can be used to test a starter on a motor whose power is very much lower that of the starter. It can be used, for example, to check the electrical wiring of a device.
The function is automatically cancelled when the starter is switched off.
The next time the starter is switched on, the starter returns to its initial configuration.

■ **Activation of the cascade function**
This function can be used to start and decelerate several cascaded motors with a single starter.
In order to gain maximum benefit from torque control, it is advisable to use motors with powers between 0.5 and 1 times the power of the motor.
The wiring diagram for the cascaded motor function is shown on page 1/58.
This function is not compatible with the following functions: motor preheating and connection to the motor delta terminal.

■ **Line frequency**
The following frequencies can be selected for the function:
- 50 Hz. The frequency fault monitoring tolerance is ± 20%,
- 60 Hz. The frequency fault monitoring tolerance is ± 20%,
- automatic detection of the line frequency by the starter. The frequency fault monitoring tolerance is ± 6%.

□ 50 Hz and 60 Hz are recommended if the power supply is provided by a generating set, given their high tolerance.

■ **Reset kWh or the operating time**
Sets the value of the power in kW/h or the operating time value to 0. The calculation of the values is updated once the reset command has been sent.

■ **Return to factory settings**
The function can be used to reset each setting to its initial value (starter factory setting, see page 1/70).

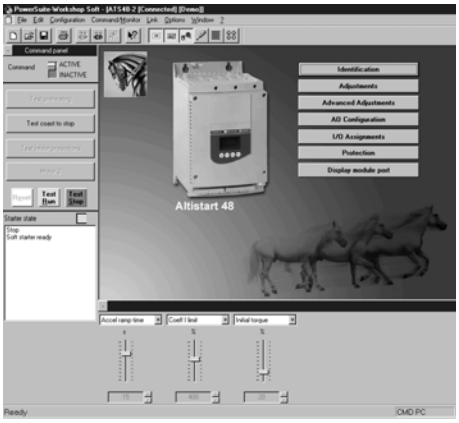
2nd motor adjustment functions

In order to access the 2nd motor adjustment functions, one logic input must be assigned to the second set of motor parameters function. The adjustment functions and ranges are identical for both sets of motor parameters.
The settings are as follows (see page 1/71):
- nominal motor current,
- limiting current,
- acceleration ramp time,
- initial starting torque,
- deceleration ramp time,
- threshold for changing to freewheel stop mode at the end of deceleration,
- maximum torque limit.

Communication functions

The Altistart 48 is supplied with an RS 485 multidrop serial link with Modbus protocol as standard. The serial link is configured in the Communication menu using:
□ the address of the starter, which can be set between 0 and 31,
□ the communication speed, which can be set at: 4800, 9600 or 19200 bps,
□ the format of the communication data. The following formats can be selected:
- 8 data bits, odd parity, 1 stop bit,
- 8 data bits, even parity, 1 stop bit,
- 8 data bits, no parity, 1 stop bit,
- 8 data bits, no parity, 2 stop bits.

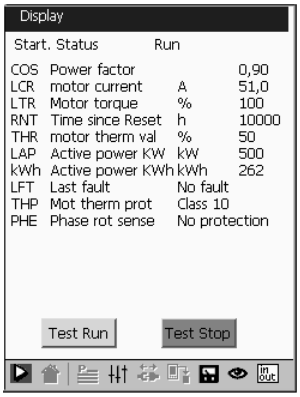
□ the time-out, which can be set between 1 and 60 s.



Displaying the commands and settings with PowerSuite on PC

PowerSuite advanced dialogue solutions

The PowerSuite advanced dialogue solutions (see pages 3/2 and 3/3) offer the following advantages:
□ connection to the Altistart 48 and access to the adjustment, monitoring and control functions,
□ display of messages in plain text in 5 languages (English, French, German, Spanish and Italian),
□ preparation and saving of settings to hard disk,
□ comparison and editing of settings using office automation tools,
□ downloading of starter settings to the PC and uploading from the PC to the starter.



Monitoring the parameters with PowerSuite on PPC

Application monitoring functions

The monitoring functions provide the following information:
■ Cosine φ, displayed between 0.00 and 1.00.
■ Motor thermal state: 100% corresponds to the thermal state of the motor consuming the permanently set nominal current.
■ Motor current: displayed in amperes between 0 and 999 A and in kilo amperes between 1000 and 9999 A.
■ The operating time corresponding to the total number of starter operating hours during heating, acceleration, steady state, deceleration, braking and continuous bypass operation. It is displayed in hours between 0 and 999 hours and in kilo-hours between 1000 and 65536 hours.
■ The active power is displayed between 0 and 255%, where 100% corresponds to the power at the set nominal current and at full voltage.
■ The motor torque is displayed between 0 and 255%, where 100% corresponds to the nominal torque.
■ The active power consumed is displayed in kW. The line voltage value must be configured. The accuracy of this setting will depend on the error between the voltage configured and the actual voltage.
■ Power in kWh displayed with PowerSuite.
■ The following starter states are shown in the display of the current state:
□ starter without run command and power not supplied,
□ starter without run command and power supplied,
□ acceleration/deceleration in progress,
□ steady state operation,
□ braking in progress,
□ starter in current limiting mode,
□ starting time delay not elapsed.
■ Last fault. Displays the last fault which occurred.
■ Phase rotation direction. Displays the direction of rotation (direct or indirect).
■ Terminal locking code
□ An access code can be used to protect access to the adjustment and configuration parameters of the starter. Only the monitoring parameters will then be visible.

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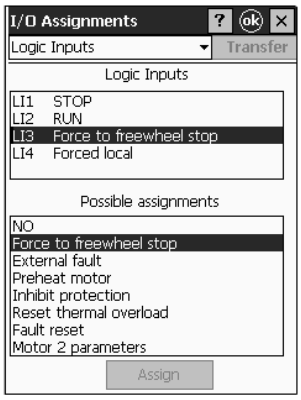


Assigning the logic inputs with PowerSuite on PPC

1.3

Logic input application functions

The starter has 4 logic inputs:

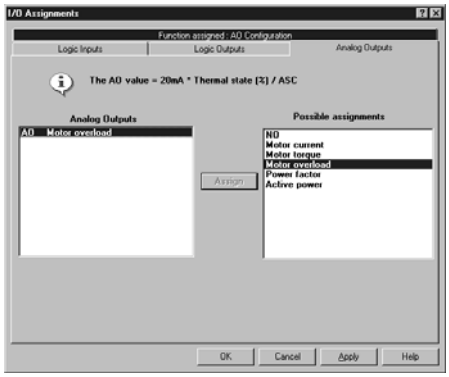
■ **2 logic inputs (RUN and STOP) are reserved for run/stop commands** which can be sent in the form of stay-put contacts or as pulsed contacts.
□ **2-wire control**: starting and stopping are controlled by a single logic input. State 1 of the logic input controls starting and state 0 controls stopping.
□ **3-wire control**: starting and stopping are controlled by 2 separate logic inputs. A stop is obtained on opening (state 0) the STOP input.
The pulse on the RUN input is stored until the stop input opens.

■ **2 logic inputs (LI3 and LI4) can be configured with the following functions**:
□ **Freewheel stop**: when combined with a braked stop or decelerated stop command, activating the logic input will stop the motor in freewheel mode.
□ **External fault**: enables the starter to detect an external user fault (level, pressure, etc). When the contact is open, the starter changes to fault mode.
□ **Motor preheating**: used to prevent the motor from freezing or to prevent temperature variations which may cause condensation. When the logic input is activated, an adjustable current flows through the motor after a time delay which can be set between 0 and 999 s. This current heats the motor without causing it to rotate. This function is not compatible with the following functions: connection to the motor delta terminal and cascading.
□ **Force to local control mode**: if a serial link is used, this function can be used to change from line mode (control via serial link) to local mode (control via the terminal).
□ **Inhibit all protection**: enables the forced operation of the starter in an emergency by overriding the main faults (smoke extraction system for example).
Warning: this type of use invalidates the starter warranty.
□ **Reset motor thermal fault**: enables the fault to be reset remotely.
□ **Activation of the cascade function**: in this case, the motor thermal protection is disabled and relay R1 is configured as the fault isolation relay. Can be used to start and decelerate several motors one after the other with a single starter (see application diagram on pages 1/58 and 1/59).
□ **Reset all faults**: enables all faults to be reset remotely.
□ **Second set of motor parameters**: enables a second set of parameters to be selected to start and decelerate two different motors with a single starter.

Logic output application functions

The starter has 2 logic outputs (LO1 and LO2) which, depending on their configuration, can be used for remote indication of the following states or events:

- Motor thermal alarm: indicates that the motor thermal state has exceeded the alarm threshold and can be used for example to avoid starting a motor if the thermal reserve is insufficient.
- Motor powered: indicates that there may be current in the motor.
- Motor overcurrent alarm: the motor current is higher than the threshold set.
- Motor underload alarm: the motor torque is lower than the threshold set.
- Motor PTC probe alarm: indicates that the thermal state monitored by the PTC motor probe has been exceeded.
- Second set of motor parameters activated



Assigning the analogue output with PowerSuite on PC

Relay and analogue output application functions

The starter has 3 relays, 2 of which are configurable.

- **End of starting relay R2**: cannot be configured.

The end of starting relay controls the bypass contactor on the starter. It is activated when the motor has completed the starting phase. It is deactivated when a stop command is sent and in the event of a fault. The starter regains control when a braking or deceleration command is sent.

- **Relay R1 application functions**

Relay R1 can be configured as follows:

□ fault relay: relay R1 is activated when the starter is powered and there are no faults. It is deactivated when a fault occurs and the motor switches to freewheel mode,

□ isolating relay: the contact of relay R1 closes when a run command is sent and re-opens when a stop command is sent, at the end of deceleration on a decelerated stop or in the event of a fault. The line contactor is deactivated and the motor is isolated from the line supply (see application diagram page 1/55).

- **Relay R3 application functions**

Relay R3 is configured to indicate the same states or events as logic outputs LO1 or LO2 (see above).

- **Analogue current output AO application functions**

□ the analogue output AO provides an image of the following values:
motor current, motor torque, motor thermal state, cosine φ, active power.

□ the following settings are associated with the analogue output:
- the type of signal supplied: 0-20 mA or 4-20 mA,
- the scale setting of the signal. The function associates the maximum amplitude of the analogue output (20 mA) with a percentage of the nominal value of the parameter, which can be set between 50% and 500%.

Function compatibility table

Functions	Decelerating stop	Dynamic braking stop	Forced freewheel stop	Thermal protection	Motor phase loss detection	Connection to the motor delta terminal	Tests on low power motor	Cascaded motors	Motor preheating
Decelerating stop									
Dynamic braking stop									
Forced freewheel stop									
Thermal protection									*(1)*
Motor phase loss detection						*(1)*			*(1)*
Connection to the motor delta terminal					*(1)*				
Tests on low power motor									
Cascaded motors									
Motor preheating				*(2)*	*(1)*				

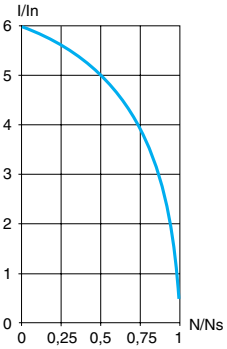
Compatible functions
Incompatible functions
Not applicable

(1) Motor phase loss not detected.

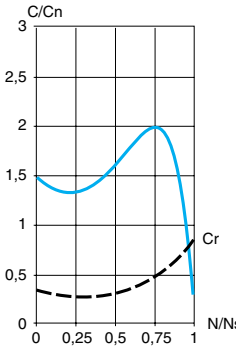
(2) Thermal protection is not provided during motor preheating.

Soft starters
Conventional starting of three-phase asynchronous motors

Direct starting



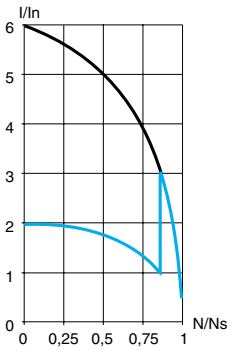
Starting current



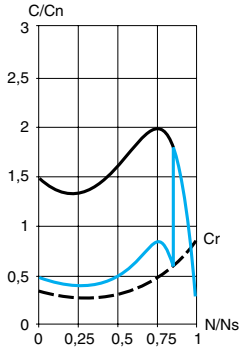
Starting torque

- Starting current: 4 to 8 times the nominal current.
- Starting torque: 0.5 to 1.5 times the nominal torque.
- Characteristics:
  - motor with 3 terminals, low and medium power,
  - on-load starting,
  - high current peak and voltage drop,
  - simple device,
  - sudden starting for the mechanism.
- No parameter adjustment.

"Star-delta" starting



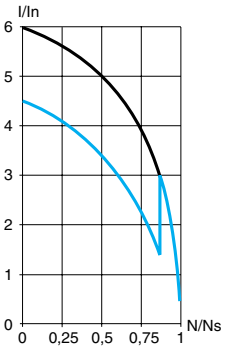
Starting current



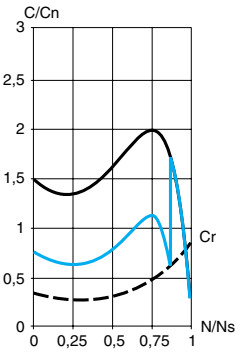
Starting torque

- Starting current: 1.8 to 2.6 times the nominal current.
- Starting torque: 0.5 times the nominal torque.
- Characteristics:
  - motor with 6 terminals,
  - no-load or low resistive torque starting,
  - high current peaks and torque when changing to "star-delta" mode,
  - a device requiring maintenance,
  - subject to mechanical stress when starting.
- No parameter adjustment.

Rheostatic stator starting



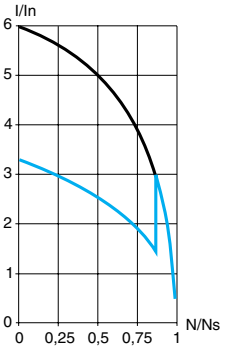
Starting current



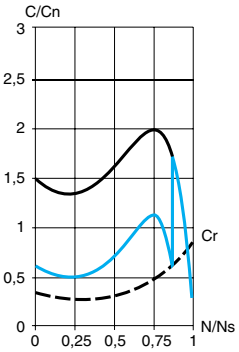
Starting torque

- Starting current: 4.5 times the nominal current.
- Starting torque: 0.5 to 0.75 times the nominal torque.
- Characteristics:
  - motor with 3 terminals, high power,
  - starting with increasing resistive torque,
  - high current peak,
  - a large, bulky device requiring maintenance,
  - subject to mechanical stress when starting.
- No parameter adjustment.

Auto transformer starting



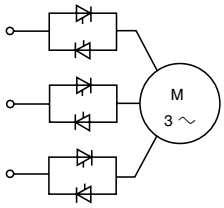
Starting current



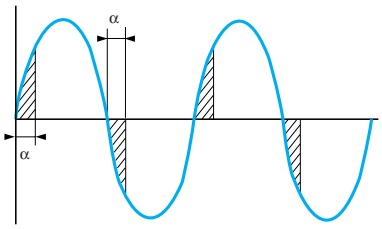
Starting torque

- Starting current: 1.7 to 4 times the nominal current.
- Starting torque: 0.4 to 0.85 times the nominal torque.
- Characteristics:
  - motor with 3 terminals, high power,
  - large voltage drop and current peak when connected at full voltage,
  - a complex, bulky device requiring maintenance,
  - subject to mechanical stress when starting.
- No parameter adjustment.

Conventional electronic starting with variable voltage and current limiting



Schematic diagram



Firing angle

■ A controller with 6 thyristors connected head to tail in each line phase is used to power the three-phase asynchronous motor by gradually increasing the voltage on start-up.

□ Depending on the firing time and angle of the thyristors, it can be used to supply a voltage which will gradually increase at a fixed frequency.

□ The gradual increase in the output voltage can either be controlled by the acceleration ramp, or by the value of the limiting current, or linked to both parameters.

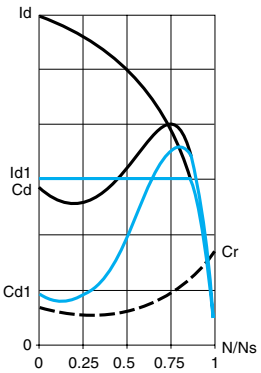


Figure 1

■ Figure 1 shows the behaviour of the torque in relation to the starting current.
■ Limiting the starting current Is to a preset value Is1 will reduce the starting torque Ts1 to a value which is almost equal to the ratio of the square of currents Is and Is1.
Example
On a motor with the following characteristics: Ts = 2 Tn for Is = 6In, current limiting at Is1= 3 In or 0.5 Is results in a starting torque: $Ts1 = Ts \times (0.5)^2 = 2\,Tn \times 0.25 = 0.5\,Tn$.

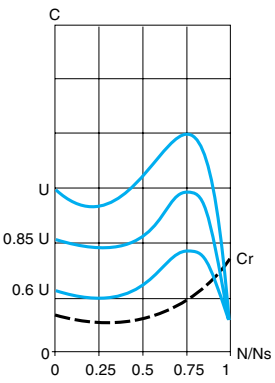


Figure 2

■ Figure 2 shows the torque/speed characteristic of a squirrel cage motor in relation to the supply voltage.
The torque varies like the square of the voltage at a fixed frequency. The gradual increase in the voltage prevents the instantaneous current peak on power-up.

Advantages of starting with the Altistart 48

■ Conventional electronic starting
■ To rectify problems caused by:
- mechanical stress when starting,
- hydraulic transients during acceleration and deceleration in pump applications.

Conventional electronic starting requires the use of several current limits or the switching of several voltage ramps.
The settings become complicated and must be modified every time the load changes.

■ Starting with the Altistart 48
■ The Altistart 48 torque control enables starting without mechanical stress and the smooth control of hydraulic transients with a single acceleration ramp.
■ The settings are simple and effective, whatever the load.

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Selection guide: motor starters with variable speed drives. . . . . page 2/4

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Variable speed drives for asynchronous motors

2

Type of machine			Simple machines		Pumps and fans (Building (HVAC) *(1)*
					
Power range for 50…60 Hz (kW) supply			**0.18…2.2**	**0.18…15**	**0.75…75**
	Single phase 100…120 V (kW)		0.18…0.75	–	–
	Single phase 200…240 V (kW)		0.18…2.2	0.18…2.2	–
	Three phase 200…230 V (kW)		0.18…2.2	–	–
	Three phase 200…240 V (kW)		–	0.18…15	0.75…30
	Three phase 380…480 V (kW)		–	–	0.75…75
	Three phase 380…500 V (kW)		–	0.37…15	–
	Three phase 525…600 V (kW)		–	0.75…15	–
Drive	Output frequency		0.5…200 Hz	0.5…500 Hz	0.5…200 Hz
	Type of control	Asynchronous motor	Sensorless flux vector control		Sensorless flux vector control, voltage/frequency ratio (2 points), energy saving ratio
		Synchronous motor	–		–
	Transient overtorque		150…170% of the nominal motor torque	180% of the nominal motor torque for 2 seconds	110% of the nominal motor torque
Functions					
Number of functions			26	50	50
Number of preset speeds			4	16	7
Number of I/O	Analog inputs		1	3	2
	Logic inputs		4	6	3
	Analog outputs		–	1	1
	Logic outputs		1	–	–
	Relay outputs		1	2	2
Communication	Embedded		–	Modbus and CANopen	Modbus
	Available as an option		–	Ethernet TCP/IP, DeviceNet, Fipio, Profibus DP	LONWORKS, METASYS N2, APOGEE FLN, BACnet
Cards (available as an option)			–	–	–
Standards and certifications			IEC/EN 61800-5-1, IEC/EN 61800-3 (environments 1 and 2)		
			EN 55011: Group 1, class A and class B CE, UL, CSA, C-Tick, N998	EN 55011: Group 1, class A and class B with option card, CE, UL, CSA, C-Tick, N998	EN 55011: Group 1, class A and class B with option card, CE, UL, CSA, C-Tick, NOM 117
References			**ATV 11**	**ATV 31**	**ATV 21**
Pages			2/14 to 2/17	2/112 to 2/115	2/48 and 2/49

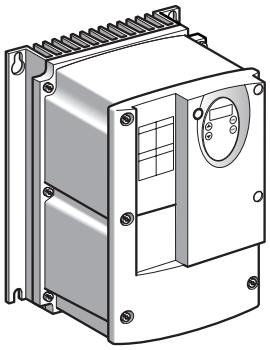
(1) Heating Ventilation Air Conditioning

Pumps and fans (Industry)	Complex machines
	  
0.37…630	**0.37…500**
–	–
0.37…5.5	0.37…5.5
–	–
0.75…90	0.37…75
0.75…630	0.75…500
–	–
–	–
0,5…1000 Hz up to 37 kW, 0.5…500 Hz from 45 to 630 kW	1…1600 Hz up to 37 kW, 1…500 Hz from 45 to 500 kW
Sensorless flux vector control, voltage/frequency ratio (2 or 5 points), energy saving ratio	Flux vector control with or without sensor, voltage/frequency ratio (2 or 5 points), ENA System
–	Vector control without speed feedback
120…130% of the nominal motor torque for 60 seconds	220% of the nominal motor torque for 2 seconds 170% for 60 seconds
> 100	> 150
8	16
2…4	2…4
6…20	6…20
1…3	1…3
0…8	0…8
2…4	2…4
Modbus and CANopen	
Ethernet TCP/IP, Fipio, Modbus Plus, INTERBUS, Profibus DP, Modbus/Uni-Telway, DeviceNet, LONWORKS, METASYS N2, APOGEE FLN, BACnet	Ethernet TCP/IP, Fipio, Modbus Plus, INTERBUS, Profibus DP, Modbus/Uni-Telway, DeviceNet
I/O extension cards, “Controller Inside” programmable card, multi-pump cards	Encoder interface cards, I/O extension cards, “Controller Inside” programmable card
IEC/EN 61800-5-1, IEC/EN 61800-3 (environments 1 and 2, C1 to C3), EN 55011, IEC/EN 61000-4-2/4-3/4-4/4-5/4-6/4-11 CE, UL, CSA, DNV, C-Tick, NOM 117, GOST	
ATV 61	**ATV 71**
2/172 to 2/175	2/360 to 2/363

Variable speed drives for asynchronous motors

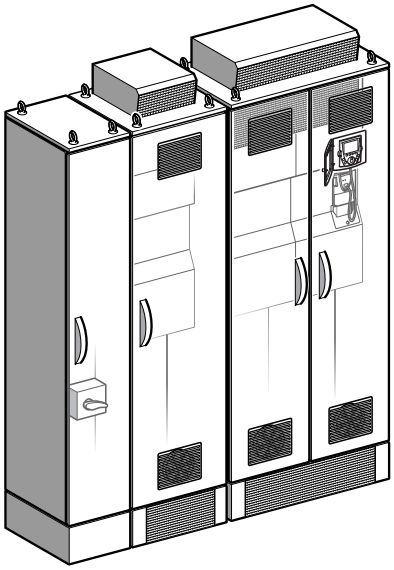
Motor starters with variable speed drives

Type of machine		Simple machines	



Power range for 50…60 Hz supply (kW)		**0.18…15**	
	Single phase 200…240 V (kW)	0.18…2,2	
	3-phase 380…500 V (kW)	0.37…15	
Control and protection functions associated with the drive		Enclosure can be customized by the user	Drive kit to be fixed at the back of the floor-standing or wall-mounted enclosure
Type of control		Sensorless flux vector control	
Communication	Embedded	Modbus, CANopen	
	Available as an option	–	
Degree of protection		IP 55	IP 00
Dialogue		Via integrated or remote display terminal	
PowerSuite software workshop		Compatible	
References		**ATV 31C**	**ATV 31K**
Pages		2/113	2/114

High-power machines



110…630	**90…500**
–	
110…630 (380…480 V)	90…500 (380…480 V)
Switch and fast-acting fuses	
Sensorless flux vector control, voltage/frequency ratio (2 or 5 points), energy saving ratio	Sensor/sensorless flux vector control, voltage/frequency ratio, ENA system
Modbus, CANopen	
Ethernet TCP/IP, Fipio, Modbus Plus, INTERBUS, Profibus DP, Modbus/Uni-Telway, DeviceNet, LONWORKS, METASYS N2, APOGEE FLN, BACnet	Ethernet TCP/IP, Fipio, Modbus Plus, INTERBUS, Profibus DP, Modbus/Uni-Telway, DeviceNet
IP 54	
Via remote display terminal	
Compatible	
ATV 61E	**ATV 71E**
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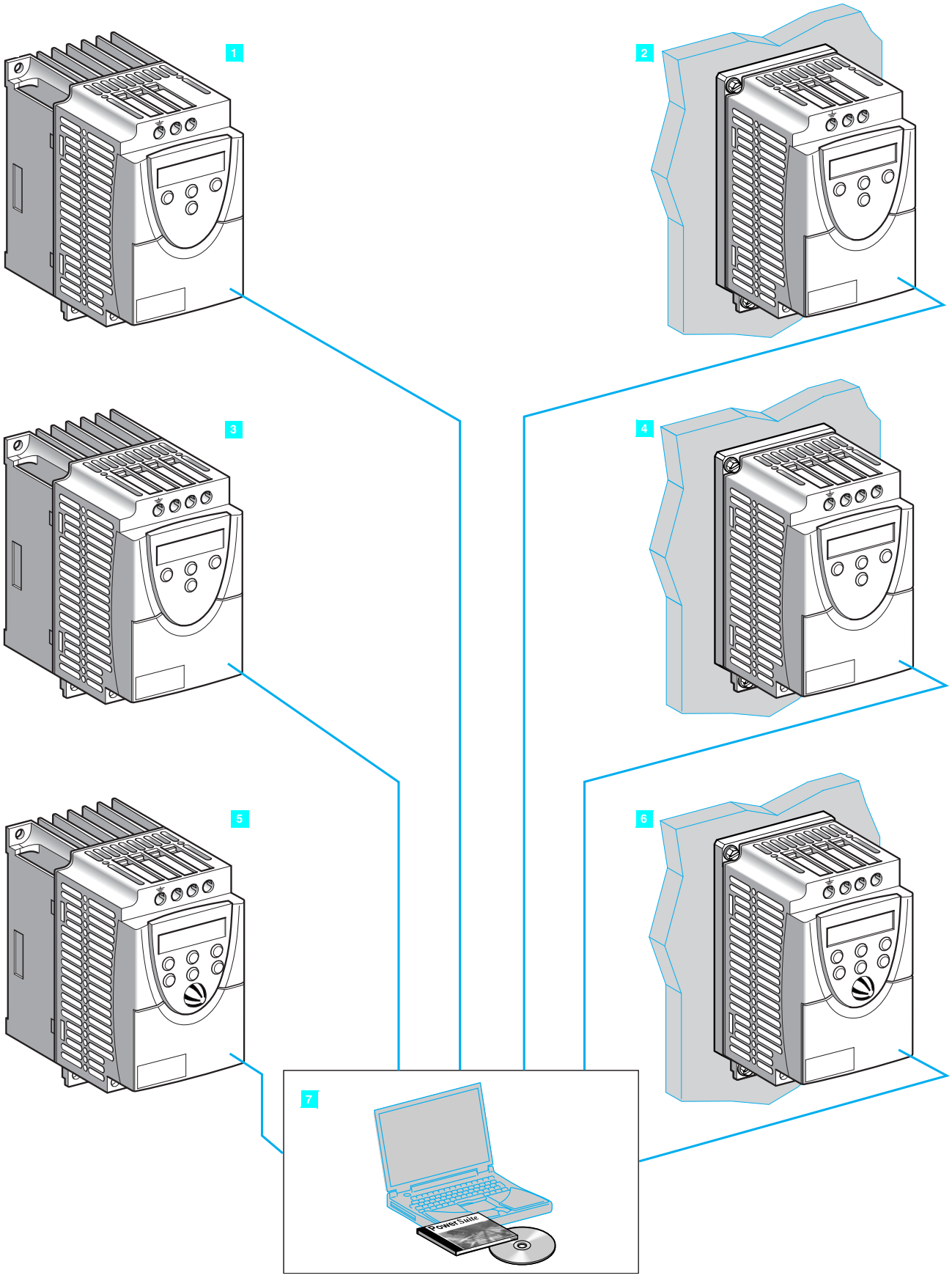
Variable speed drives for asynchronous motors
Altivar 11



Variable speed drives for asynchronous motors
Altivar 11

Applications
The Altivar 11 drive is a frequency inverter for 3-phase 0.18kW to 2.2kW squirrel cage asynchronous motors.
There are three types of power supply:
- 100 V to 120 V single phase
- 200 V to 240 V single phase
- 200 V to 230 V three phase

The Altivar 11 includes special features for local markets (Europe range, America range, Asia range) and has functions suitable for the most common applications, including:
- Horizontal materials handling (small conveyors,...etc.)
- Ventilation, pumping, access controls, automatic doors
- Special machines (mixers, washing machines, juice extractors, etc.)

Functions
The main functions integrated in the Altivar 11 drive are:
- Starting and speed control
- Reversal of the direction of operation
- Acceleration, deceleration, stopping
- Motor and drive protection
- 2-wire/3-wire control
- 4 preset speeds
- Saving the configuration in the drive
- DC injection on stopping
- Ramp switching
- Catch on the fly
- Local controls (Asia range only)

Several functions can be assigned to one logic input.

Standard versions
The Altivar 11 offer comprises 3 ranges designed for 3 different markets:
- **Europe range: ATV 11●U●●M2E** (1, 2)
  - Power supply: 240 V single phase
  - Positive logic operation
  - Integrated class B EMC filter
- **America range: ATV 11●U●●●●U** (1, 2, 3, 4)
  - Power supply: 120V single phase, 240V single phase or 230V three phase
  - Positive logic operation
  - Complies with current requirements stipulated in standard NEC 1999 208V
- **Asia range: ATV 11●U●●●●A** (5, 6)
  - Power supply: 120V single phase, 240V single phase or 230V three phase
  - Positive or negative logic operation
  - Local controls: Run and Stop keys and potentiometer

Altivar 11 drives are supplied either with a heatsink (1, 3, 5) for normal environments and ventilated enclosures, or on a base plate (2, 4, 6) for mounting on a machine frame, where this frame's earth allows the heat to be dissipated.
Electromagnetic compatibility (EMC)
The incorporation of EMC filters in **ATV 11●U●●M2E** drives simplifies installation and provides an economical means of meeting CE marking requirements.
ATV 11●U●●●●U and **ATV 11●U●●●●A** drives are available without EMC filter. Filters are available as an option and can be installed by the user if conformity to EMC standards is required.

Options
The drive only communicates, in point-to-point mode, with the following tools and software:
- PowerSuite software workshop:
  - PowerSuite software for configuring the drive (7)
  - Converter for connection to a PC

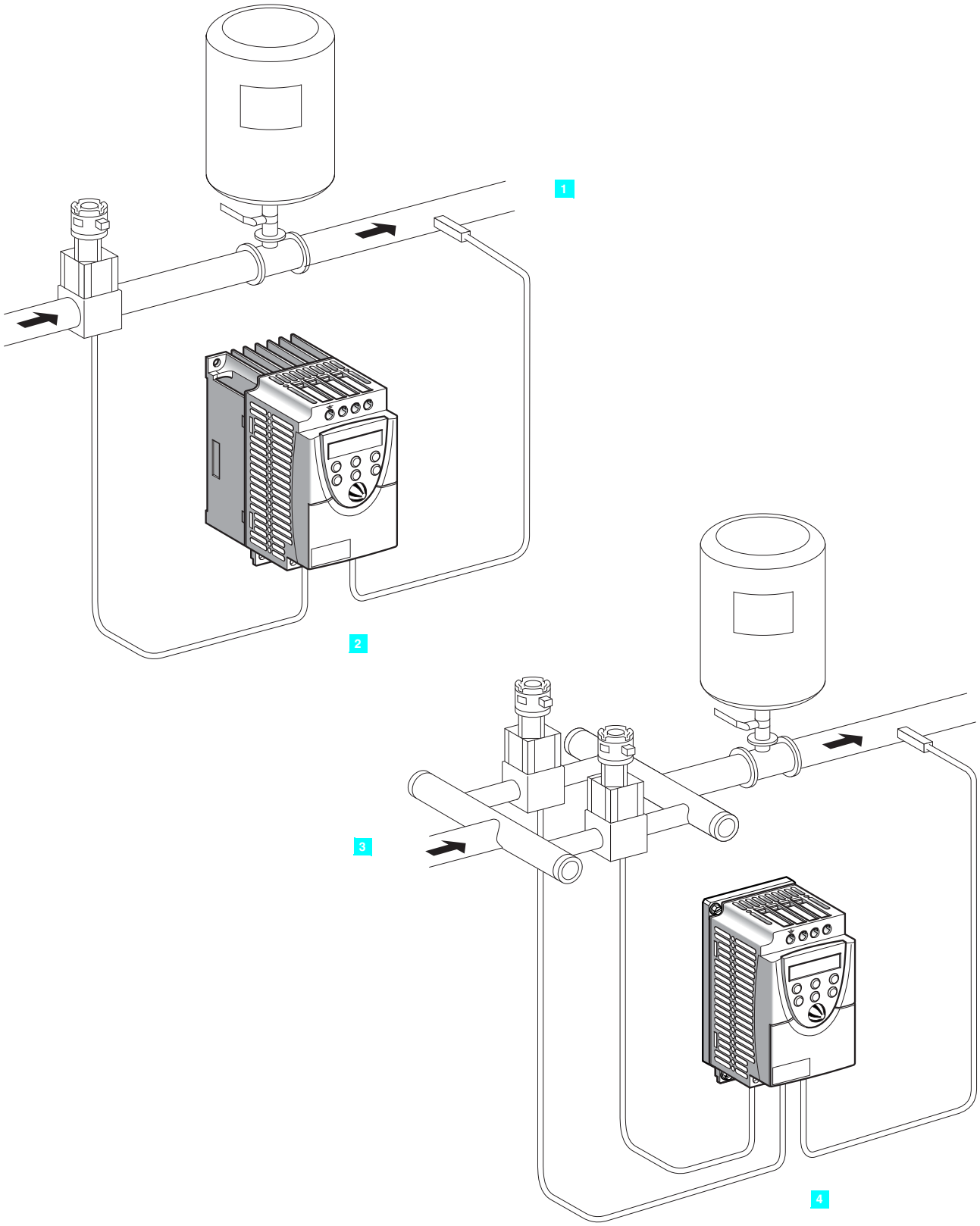
The following options can be used with the Altivar 11 drive:
- Braking unit connected to the drive's DC bus
- Braking resistors, to dissipate the energy returned to the drive when the motor is operating as a generator
- EMC radio interference input filters
- Plates for mounting on ⊓ rail
- Adaptor plate for replacing an Altivar 08 drive
- Plate for EMC mounting and earthing the cable shielding

Characteristics: pages 2/10 to 2/13 | References: pages 2/14 to 2/19 | Dimensions: pages 2/20 and 2/21 | Schemes: pages 2/22 and 2/23 | Functions: pages 2/24 to 2/35

Variable speed drives for asynchronous motors

Altivar 11

Pump range



Variable speed drives for asynchronous motors

Altivar 11

Pump range

Applications

The Altivar 11 pump range drives are designed to control asynchronous motors used in water pumping applications:

- Fire booster
- Water supply
- Booster stations
- Irrigation
- Industrial water booster

The 9 Altivar 11 pump range models **ATV 11●U●●M2E347** can be used in any of the geographical areas: Europe, America and Asia.
Their main characteristics are as follows:

- Frequency inverter for 3-phase squirrel cage asynchronous motors rated between 0.18kW to 2.2kW
- Power supply: 200 V to 240 V single phase
- Integrated class B EMC filter
- Positive or negative logic operation
- Local controls: Run and Stop keys and potentiometer for local pump control and flow regulator adjustment
- Available with heatsink (2) for normal environments and ventilated enclosures, or on a base plate (4) for mounting on a machine frame, where this frame's earth allows the heat to be dissipated.

Functions

The main functions integrated in the Altivar 11 pump range drive are:

- Single variable: For controlling a variable speed pump (1)
- Single variable with auxiliary pump: For controlling one variable speed pump and one fixed speed pump (3)
- Underload
- Overload
- Sleep/wake-up
- PI feedback supervision
- Detection of no-load operation
- Quick start
- Automatic restart on underload and overload fault
- PI reference adjustment range for the end user
- Parameter protection by confidential code

Electromagnetic compatibility (EMC)

The incorporation of EMC filters in **ATV 11●U●●M2E347** drives simplifies installation and provides an economical means of meeting CE marking requirements.

Options

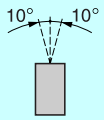
The following options can be used with the Altivar 11 pump range drive:

- Plates for mounting on ⊓ rail
- Plate for EMC mounting and earthing the cable shielding

Characteristics: pages 2/10 to 2/13 | References: pages 2/14 to 2/19 | Dimensions: pages 2/20 and 2/21 | Schemes: pages 2/22 and 2/23 | Functions: pages 2/24 to 2/35

Variable speed drives for asynchronous motors
Altivar 11

Environmental characteristics

Conformity to standards			Altivar 11 drives have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control devices (IEC, EN), in particular: EN 50178, EMC immunity and EMC conducted and radiated emissions
EMC immunity			■ 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 (power section access) ■ IEC/EN 61800-3, environments 1 and 2
EMC conducted and radiated emissions for drives	All		■ IEC/EN 61800-3, environments: 2 (industrial supply) and 1 (public supply) in restricted distribution
	ATV 11●U05M2E to ATV 11●U18M2E ATV 11●U05M2E347 to ATV 11●U18M2E347		■ EN 55011, EN 55022 class B, 2 to 12 kHz for motor cable lengths ⩽ 5 m and class A (group 1), 2 to 16 kHz for lengths y 10 m
	ATV 11●U29M2E to ATV 11●U41M2E ATV 11●U29M2E347 to ATV 11●U41M2E347		■ EN 55011, EN 55022 class B, 4 to 16 kHz for motor cable lengths ⩽ 5 m and class A (group 1), 4 to 16 kHz for lengths y 10 m
EMC conducted emissions for drives	ATV 11HU05M2E to ATV 11HU41M2E ATV 11HU05M2E347 to ATV 11HU41M2E347		■ With additional EMC filter: EN 55011, EN 55022 class B, 2 to 16 kHz for motor cable lengths ⩽ 20 m and class A (group 1), 2 to 16 kHz for lengths y 50 m
	ATV 11HU05●●U to ATV 11HU41●●U ATV 11HU05●●A to ATV 11HU41●●A		■ With additional EMC filter: EN 55011, class B, 2 to 16 kHz for motor cable lengths ⩽ 5 m and class A (group 1), 2 to 16 kHz for lengths y 20 m
CE marking			The drives have CE marking in accordance with the European directives on low voltage (73/23/EEC and 93/68/EEC) and EMC (89/336/EEC).
Product certifications			UL, CSA, N998 and C-TICK
Degree of protection			IP 20
Vibration resistance	Drive without ⊓ rail option		Conforming to IEC/EN 60068-2-6: - 1.5 mm peak from 3 to 13 Hz - 1 gn from 13 to 200 Hz
Shock resistance			15 gn for 11 ms conforming to IEC/EN 60068-2-27
Relative humidity		**%**	5…93 without condensation or dripping water conforming to IEC 60068-2-3
Ambient temperature around the unit	Storage	**°C**	- 25…+ 65
	Operation	**°C**	- 10…+ 40 - 10…+ 50: by removing the protective cover from the top of the drive Up to +60 with current derating of 2.2% per °C above 50°C
Maximum operating altitude		**m**	1000 without derating (above this, derate the current by 1% per additional 100 m)
Operating position Maximum permanent angle in relation to the normal vertical mounting position			

Drive characteristics

Output frequency range		**Hz**	0…200
Switching frequency	ATV 11●U●●●●E/A/U		2…16 kHz *(1)*
	ATV 11●U●●M2E347		2…12 kHz *(1)*
Speed range			1…20
Transient overtorque			150…170% of the nominal motor torque
Braking torque			■ 20% of nominal motor torque without braking resistor at no-load with the "deceleration ramp adaptation" function enabled ■ 80% of the nominal motor torque with braking resistor (available as an option) at no-load ■ Up to 150% of the nominal motor torque with braking resistor (available as an option) at high inertia
Maximum transient current			■ 150% of the nominal drive current for 60 seconds for range E, A and E347 drives ■ 137..150% for range U drives
Voltage/frequency ratio			Sensorless flux vector control with PWM type motor control signal *(2)* Factory-set for most constant torque applications
Frequency loop gains			Factory-set with the speed loop stability and gain Possible correction for machines with high resistive torque or high inertia, or for machines with fast cycles
Slip compensation			Preset in factory, depending on the drive rating (adjustment possible)

(1) If operation above 4 kHz needs to be continuous, the nominal drive current should be derated by 10% for 8 kHz, 20% for 12 kHz and for E, A and U ranges, 30% for 16 kHz.
(2) Pulse width modulation

Electrical characteristics

Power supply	Voltage	**V**	200 - 15% to 240 +10% single phase for ATV 11●U●●M2● 200 - 15% to 240 +10% single phase for ATV 11●U●●M2E347 200 - 15% to 230 + 15% three phase for ATV 11●U●●M3● 100 - 15% to 120 +10% single phase for ATV 11●U●●F1●
	Frequency	**Hz**	50 ± 5% or 60 ± 5%
	Isc	**A**	≤ 1000 (prospective short-circuit current at the connection point) for single phase power supply ≤ 5000 (prospective short-circuit current at the connection point) for three phase power supply
Output voltage			Maximum three phase voltage equals: - the line supply voltage for ATV 11●U●●M●● - double the line supply voltage for ATV 11●U●●F1●
Maximum connection capacity of the power supply, the motor and the braking unit	ATV 11●U05●●●, ●U09●●●, ●U12M●●, ●U18M●● drives ATV 11HU05M2E347, ●U09M2E347, ●U12M2E347, ●U18M2E347 drives		1.5 mm² (AWG 14)
	ATV 11HU18F1●, HU29●●●, HU41●●●,HU29M2E347, HU41M2E347 drives		4 mm² (AWG 10)
Maximum length of motor cables		**m**	50, shielded cable 100, unshielded cable
Electrical isolation			Electrical isolation between power and control (inputs, outputs, power supplies)
Available internal supplies			Short-circuit and overload protection: - One +5 V (0/+5%) supply for the reference potentiometer (2.2 to 10 kΩ), maximum current 10 mA - One + 15 V (± 15%) supply for the control inputs, maximum current 100 mA
Analog input AI1			1 configurable analog input Max. sampling time: 20 ms, resolution 0.4%, linearity ± 5%: - Voltage 0-5 V (internal power supply only) or 0-10 V, impedance 40 kΩ - Current 0-20 mA or 4-20 mA (without addition of a resistor), impedance 250 Ω
Logic inputs LI			4 assignable logic inputs, impedance 5 kΩ + 15V internal or 24V external power supply (min. 11 V, max. 30 V) Factory-set with 2-wire control in “transition” mode for machine safety reasons on the Europe and America ranges: - LI1: Forward - LI2: Reverse - LI3/LI4: 4 preset speeds - Local controls for the Asia range and the pump range Multiple assignment makes it possible to mix several functions on one input (for example, LI1 assigned to forward and preset speed 2, LI3 assigned to reverse and preset speed 3)
	Positive logic E/U/A/E347 ranges		State 0 if < 5 V, state 1 if > 11 V Max. sampling time: 20 ms
	Negative logic A/E347 ranges		Available by programming only on the Asia range and pump ranges State 0 if > 11 V or logic input not wired, state 1 if < 5 V Max. sampling time: 20 ms
DO Output			Factory setting: - PWM *(1)* open collector output at 2 kHz. Can be used for electromagnetic galvanometer - Max. current 10 mA - Output impedance 1 kΩ, linearity ± 1%, max. sampling time 20 ms Assignable as logic output: - Open collector logic output, output impedance 100 Ω, 50 mA max. - Internal voltage (see Available internal supplies above) - External voltage 30 V max.: 30 mA
Relay outputs RA-RC			1 protected relay logic output (default open contact). Minimum switching capacity: 10 mA for 24 V ⎓ Maximum switching capacity: - On resistive load (cos φ = 1 and L/R = 0 ms): 5 A for 250 V ∿ or 30 V ⎓ - On inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 V ∿ or 30 V ⎓
Maximum I/O connection capacity			1.5 mm² (AWG 14)

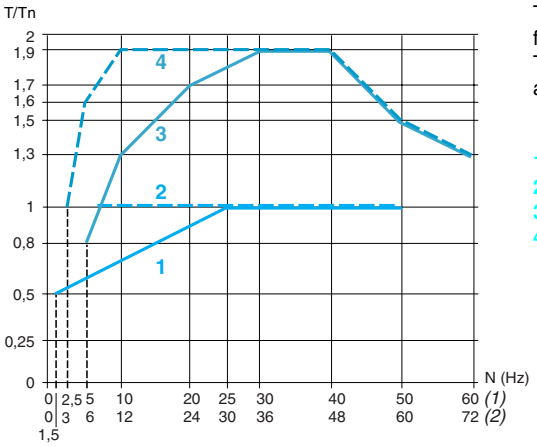
(1) Pulse width modulation

Presentation: pages 2/6 to 2/9 | References: pages 2/14 to 2/19 | Dimensions: pages 2/20 and 2/21 | Schemes: pages 2/22 and 2/23 | Functions: pages 2/24 to 2/35

Electrical characteristics (continued)

Acceleration and deceleration ramps		Ramp profiles: linear from 0 to 99.9 s Automatic adaptation of deceleration ramp time if braking capacities exceeded, possible inhibition of this adaptation (use of braking resistor unit)
Braking to a standstill		By DC injection: automatically as soon as the estimated output frequency drops to < 0.2 Hz, period adjustable from 0.1 to 30 s or continuous, current adjustable from 0 to 1.2 In
Main drive protection and safety features		■ Thermal protection against overheating ■ Protection against short-circuits between output phases ■ Overcurrent protection between output phases and earth on power-up only ■ Line supply overvoltage and undervoltage safety features ■ Input phase loss safety feature, for three phase supply
Motor protection (see page 2/31)		Thermal protection integrated in drive by continuous calculation of I^2t. Thermal memory reset when powered off.
Insulation resistance to earth	**MΩ**	> 500 (electrical isolation)
Frequency resolution		Display units: 0.1 Hz Analog inputs: 10-bit A/D converter
Time constant for reference change	**ms**	5

Torque characteristics (typical curves)



The curves opposite define the available continuous torque and transient overtorque for both force-cooled and self-cooled motors.
The only difference is in the ability of the motor to provide a high continuous torque at less than half the nominal speed.

1 Self-cooled motor: continuous useful torque
2 Force-cooled motor: continuous useful torque
3 Transient overtorque in factory settings (UFR = 50), with motor characteristics
4 Transient overtorque at UFR = 100 and motor characteristics

(1) 50 Hz nominal supply frequency
(2) 60 Hz nominal supply frequency

Special uses

Use with a motor with a different power rating to that of the drive

The device can power any motor which has a lower rating than that for which the drive was designed.
For motor ratings slightly higher than that of the drive, check that the current taken does not exceed the continuous output current of the drive.

Connecting motors in parallel

The rating of the drive must be greater than or equal to the sum of the currents of the motors to be connected to the drive. In this case, it is necessary to provide external thermal protection for each motor using probes or thermal overload relays.
If the number of motors connected in parallel is greater than or equal to 3, it is advisable to install a three phase choke between the drive and the motors.

Note: *For choke product references, please consult your Regional Sales Office.*

Switching the motor at the drive output

The drive can be switched when locked.
The “catch-on-the-fly” (automatic catching a spinning load) function must be configured for this type of use.

Variable speed drives for asynchronous motors
Altivar 11

Combinations for customer assembly

Function: To protect persons and equipment from any level of overcurrent which may be encountered (overload or short-circuit).
The combinations shown below correspond to type 1 coordination:

Standard power ratings of three phase 4-pole 50/60 Hz motors	Speed drive Reference *(1)*	Circuit-breaker			Contactor
		Telemecanique *(2)*	Adjustment range	Maximum short-circuit current Icu	Reference
		Merlin Gerin	Rating		
kW			A	kA	
M1	A1	Q1			KM1
Single phase supply voltage: 100…120 V 50/60 Hz					
0.18	ATV 11HU05F1●	GV2 ME14	6...10	> 50	LC1 K09
		DT40	10	6	LC1 K09
0.37	ATV 11●U09F1●	GV2 ME14	6...10	> 50	LC1 K09
		DT40	16	6	LC1 K09
0.75	ATV 11HU18F1●	GV2 ME21	17...23	> 15	LC1 D25
		DT40	20	6	LC1 D25
Single phase supply voltage: 200…240 V 50/60 Hz					
0.18	ATV 11HU05M2●, ATV 11HU05M2E347	GV2 ME08	2.5...4	> 50	LC1 K09
		DT40	6	6	LC1 K09
0.37	ATV 11●U09M2●, ATV 11●U09M2E347	GV2 ME14	6...10	> 50	LC1 K09
		DT40	10	6	LC1 K09
0.55	ATV 11●U12M2E, ATV 11●U12M2E347	GV2 ME14	6...10	> 50	LC1 K09
		DT40	10	6	LC1 K09
0.75	ATV 11●U18M2●, ATV 11●U18M2E347	GV2 ME16	9...14	> 15	LC1 K12
		DT40	16	6	LC1 K12
1.5	ATV 11HU29M2E, ATV 11HU29M2E347	GV2 ME20	13...18	> 15	LC1 D18
		DT40	20	6	LC1 D18
1.5	ATV 11HU29M2U, ATV 11HU29M2A	GV2 ME21	17...23	> 15	LC1 D25
		DT40	20	6	LC1 D25
2.2	ATV 11HU41M2●, ATV 11HU41M2E347	GV2 ME32	24...32	> 10	LC1 D32
		DT40	32	6	LC1 D32
Three phase supply voltage: 200…230 V 50/60 Hz					
0.18	ATV 11HU05M3●	GV2 ME07	1.6...2.5	> 50	LC1 K06
		DT40	6	6	LC1 K06
0.37	ATV 11●U09M3●	GV2 ME08	2.5...4	> 50	LC1 K06
		DT40	6	6	LC1 K06
0.75	ATV 11●U18M3●	GV2 ME14	6...10	> 50	LC1 K09
		DT40	10	6	LC1 K09
1.5	ATV 11HU29M3●	GV2 ME16	9...14	> 15	LC1 K12
		DT40	16	6	LC1 K12
2.2	ATV 11HU41M3●	GV2 ME20	13...18	> 15	LC1 D18
		DT40	20	6	LC1 D18

Combinations of circuit-breakers and add-on modules

DT40	*Vigi TG40*		
Rating (A)	Rating (A)	Type *(3)*	Sensitivity
6	25	A “si”	30 mA
10	25	A “si”	30 mA
16	25	A “si”	30 mA
20	25	A “si”	30 mA
32	40	A “si”	30 mA

Recommendations for special uses:
- All RH10/RH21/RH99/RHU residual current protection devices with separate sensors are compatible as long as the type and sensitivity of the add-on modules given in the table above are observed.
- It is advisable to connect one residual current differential safety device per drive. In this case, a type B device must not be located downstream of a type A or AC device.

(1) Replace the dots in the reference according to the type of drive required (see pages 2/14 to 2/16).
(2) Replace “ME” with “P” for rotary knob control.
Type 2 coordination is provided by combining a GV2 circuit-breaker with an LC1 D●● contactor.
(3) For additional protection against direct contact, with a three phase power supply and access to the DC bus terminals (PA+/PC -), the add-on module must be type B with a sensitivity of 30 mA.

Variable speed drives for asynchronous motors

Altivar 11

ATV 11●●●●●●E Europe range

ATV 11 HU18M2E

Europe range drives with heatsink

(frequency range from 0 to 200 Hz)

Motor	Line supply	Altivar 11				
Power indicated on plate	Max. line current *(1)*	Continuos output current *(2)*	Max. transient current *(3)*	Power dissipated at nominal load	Reference *(4)*	Weight
kW	A	A	A	W		kg
Single phase supply voltage: 200…240 V 50/60 Hz						
0.18	2.9	1.1	1.6	12	**ATV 11HU05M2E**	0.900
0.37	5.3	2.1	3.1	20.5	**ATV 11HU09M2E**	1.000
0.55	6.3	3	4.5	29	**ATV 11HU12M2E**	1.100
0.75	8.6	3.6	5.4	37	**ATV 11HU18M2E**	1.100
1.5	14.8	6.8	10.2	72	**ATV 11HU29M2E,** *(5)*	1.800
2.2	20.8	9.6	14.4	96	**ATV 11HU41M2E** *(5)*	1.800

ATV 11 PU18M2E

Europe range drives on base plate

(frequency range from 0 to 200 Hz)

Motor	Line supply	Altivar 11				
Power indicated on plate	Max. line current *(1)*	Continuos output current *(2)*	Max. transient current *(3)*	Power dissipated at nominal load	Reference *(4)*	Weight
kW	A	A	A	W		kg
Single phase supply voltage: 200…240 V 50/60 Hz						
0.37	5.3	2.1	3.1	20.5	**ATV 11PU09M2E**	0.900
0.55	6.3	3	4.5	29	**ATV 11PU12M2E**	0.900
0.75	8.6	3.6	5.4	37	**ATV 11PU18M2E**	0.900

ATV 11 HU41M2E

(1) The line current value is given for a prospective line Isc of 1kA and a line voltage of 230V.
(2) The current value is given for a switching frequency of 4 kHz. If operation above 4 kHz needs to be continuous, the nominal drive current should be derated by 10% for 8 kHz, 20% for 12 kHz and 30% for 16 kHz.
(3) For 60 seconds.
(4) Drive equipped with an integrated EMC filter which cannot be disconnected.
(5) With integrated fan.

Variable speed drives for asynchronous motors

Altivar 11

ATV 11●●●●●●U America range

ATV 11HU18M2U

ATV 11PU18M2U

ATV 11HU41M2U

ATV 11HU41M3U

Drives with heatsink (frequency range from 0 to 200 Hz)

Motor	Line supply	Altivar 11				
Power indicated on plate	Max. line current *(1)*	Continous output current *(2)*	Max. transient current *(3)*	Power dissipated at nominal load	Reference *(4)*	Weight
kW/*HP*	A	A	A	W		kg
Single phase supply voltage: 100…120 V 50/60 Hz						
0.18/*0.25*	6	1.6 *(6)*	2.4	14.5	**ATV 11HU05F1U**	0.900
0.37/*0.5*	9	2.4 *(6)*	3.6	23	**ATV 11HU09F1U**	1.000
0.75/*1*	18	4.6 *(6)*	6.3	43	**ATV 11HU18F1U** *(5)*	1.800
Single phase supply voltage: 200…240 V 50/60 Hz						
0.18/*0.25*	3.3	1.6	2.4	14.5	**ATV 11HU05M2U**	0.900
0.37/*0.5*	6	2.4	3.6	23	**ATV 11HU09M2U**	1.000
0.75/*1*	9.9	4.6	6.3	43	**ATV 11HU18M2U** *(5)*	1.100
1.5/*2*	17.1	7.5	11.2	77	**ATV 11HU29M2U** *(5)*	1.800
2.2/*3*	24.1	10.6	15	101	**ATV 11HU41M2U** *(5)*	1.800
Three phase supply voltage: 200…230 V 50/60 Hz						
0.18/*0.25*	1.8	1.6	2.4	13.5	**ATV 11HU05M3U**	0.900
0.37/*0.5*	3.6	2.4	3.6	24	**ATV 11HU09M3U**	1.000
0.75/*1*	6.3	4.6	6.3	38	**ATV 11HU18M3U** *(5)*	1.100
1.5/*2*	11	7.5	11.2	75	**ATV 11HU29M3U** *(5)*	1.800
2.2/*3*	15.2	10.6	15	94	**ATV 11HU41M3U** *(5)*	1.800

Drives on base plate (frequency range from 0 to 200 Hz)

Motor	Line supply	Altivar 11				
Power indicated on plate	Max. line current *(1)*	Continous output current *(2)*	Max. transient current *(3)*	Power dissipated at nominal load	Reference *(4)*	Weight
kW/*HP*	A	A	A	W		kg
Single phase supply voltage: 100…120 V 50/60 Hz						
0.37/*0.5*	9	2.4	3.6	23	**ATV 11PU09F1U**	0.900
Single phase supply voltage: 200…240 V 50/60 Hz						
0.37/*0.5*	6	2.4	3.6	23	**ATV 11PU09M2U**	0.900
0.75/*1*	9.9	4.6	6.3	43	**ATV 11PU18M2U**	0.900
Three phase supply voltage: 200…230 V 50/60 Hz						
0.37/*0.5*	3.6	2.4	3.6	24	**ATV 11PU09M3U**	0.900
0.75/*1*	6.3	4.6	6.3	38	**ATV 11PU18M3U**	0.900

(1) The line current value is given for the measurement conditions indicated in the table below:

Drive power rating	Prospective Isc	Line voltage
ATV 11●UF1U	1 kA	100 V
ATV 11●UM2U	1 kA	208 V
ATV 11●UM3U	5 kA	208 V

(2) The current value is given for a switching frequency of 4kHz. If operation above 4 kHz needs to be continuous, the nominal drive current should be derated by 10% for 8 kHz, 20% for 12 kHz and 30% for 16 kHz.
(3) For 60 seconds.
(4) Drive supplied without an EMC filter. To order an EMC filter separately, see page 2/19.
(5) With integrated fan.
(6) Current given for the power supply for a 230V three phase motor.

Variable speed drives for asynchronous motors

Altivar 11

ATV 11●●●●●●A Asia range

ATV 11HU18M2A

ATV 11PU18M2A

ATV 11HU41M2A

ATV 11HU41M3A

Drives with heatsink (frequency range from 0 to 200 Hz)

Motor	Line supply	Altivar 11				
Power indicated on plate	Max. line current *(1)*	Continuos output current *(2)*	Max. transient current *(3)*	Power dissipated at nominal load	Reference *(4)*	Weight
kW	A	A	A	W		kg
Single phase supply voltage: 100…120 V 50/60 Hz						
0.18	6	1.4 *(6)*	2.1	14	**ATV 11HU05F1A**	0.900
0.37	9	2.4 *(6)*	3.6	25	**ATV 11HU09F1A**	1.000
0.75	18	4 *(6)*	6	40	**ATV 11HU18F1A** *(5)*	1.800
Single phase supply voltage: 200…240 V 50/60 Hz						
0.18	3.3	1.4	2.1	14	**ATV 11HU05M2A**	0.900
0.37	6	2.4	3.6	25	**ATV 11HU09M2A**	1.000
0.75	9.9	4	6	40	**ATV 11HU18M2A**	1.100
1.5	17.1	7.5	11.2	78	**ATV 11HU29M2A** *(5)*	1.800
2.2	24.1	10	15	97	**ATV 11HU41M2A** *(5)*	1.800
Three phase supply voltage: 200…230 V 50/60 Hz						
0.18	1.8	1.4	2.1	13.5	**ATV 11HU05M3A**	0.900
0.37	3.6	2.4	3.6	24	**ATV 11HU09M3A**	1.000
0.75	6.3	4	6	38	**ATV 11HU18M3A**	1.100
1.5	11	7.5	11.2	75	**ATV 11HU29M3A** *(5)*	1.800
2.2	15.2	10	15	94	**ATV 11HU41M3A** *(5)*	1.800

Drives on base plate (frequency range from 0 to 200 Hz)

Motor	Line supply	Altivar 11				
Power indicated on plate	Max. line current *(1)*	Continuos output current *(2)*	Max. transient current *(3)*	Power dissipated at nominal load	Reference *(4)*	Weight
kW	A	A	A	W		kg
Single phase supply voltage: 100…120 V 50/60 Hz						
0.37	9	2.4	3.6	25	**ATV 11PU09F1A**	0.900
Single phase supply voltage: 200…240 V 50/60 Hz						
0.37	6	2.4	3.6	25	**ATV 11PU09M2A**	0.900
0.75	9.9	4	6	40	**ATV 11PU18M2A**	0.900
Three phase supply voltage: 200…230 V 50/60 Hz						
0.37	3.6	2.4	3.6	24	**ATV 11PU09M3A**	0.900
0.75	6.3	4	6	38	**ATV 11PU18M3A**	0.900

(1) The line current value is given for the measurement conditions indicated in the table below:

Drive power rating	Prospective Isc	Line voltage
ATV 11●UF1A	1 kA	100 V
ATV 11●UM2A	1 kA	200 V
ATV 11●UM3A	5 kA	200 V

(2) The current value is given for a switching frequency of 4kHz. If operation above 4 kHz needs to be continuous, the nominal drive current should be derated by 10% for 8 kHz, 20% for 12 kHz and 30% for 16 kHz.
(3) For 60 seconds.
(4) Drive supplied without an EMC filter, to order an EMC filter separately see page 2/19.
(5) With integrated fan.
(6) Current given for the power supply for a 230V three phase motor.

Variable speed drives for asynchronous motors

Altivar 11

ATV 11●●●●●●E347 pump range

ATV 11 HU18M2E347

Pump range drives with heatsink

(frequency range from 0 to 200 Hz)

Motor	Line supply	Altivar 11				
Power indicated on plate	Max. line current *(1)*	Continuos output current *(2)*	Max. transient current *(3)*	Power dissipated at nominal load	Reference *(4)*	Weight
kW	A	A	A	W		kg
Single phase supply voltage: 200…240 V 50/60 Hz						
0.18	2.9	1.1	1.6	12	**ATV 11HU05M2E347**	0.900
0.37	5.3	2.1	3.1	20.5	**ATV 11HU09M2E347**	1.000
0.55	6.3	3	4.5	29	**ATV 11HU12M2E347**	1.100
0.75	8.6	3.6	5.4	37	**ATV 11HU18M2E347**	1.100
1.5	14.8	6.8	10.2	72	**ATV 11HU29M2E347** *(5)*	1.800
2.2	20.8	9.6	14.4	96	**ATV 11HU41M2E347** *(5)*	1.800

ATV 11PU18M2E347

Pump range drives on base plate

(frequency range from 0 to 200 Hz)

Motor	Line supply	Altivar 11				
Power indicated on plate	Max. line current *(1)*	Continuos output current *(2)*	Max. transient current *(3)*	Power dissipated at nominal load	Reference *(4)*	Weight
kW	A	A	A	W		kg
Single phase supply voltage: 200…240 V 50/60 Hz						
0.37	5.3	2.1	3.1	20.5	**ATV 11PU09M2E347**	0.900
0.55	6.3	3	4.5	29	**ATV 11PU12M2E347**	0.900
0.75	8.6	3.6	5.4	37	**ATV 11PU18M2E347**	0.900

(1) The line current value is given for a prospective line Isc of 1kA and a line voltage of 230V.
(2) The current value is given for a switching frequency of 4kHz. If operation above 4 kHz needs to be continuous, the nominal drive current should be derated by 10% for 8 kHz, 20% for 12 kHz.
(3) For 60 seconds.
(4) Drive equipped with an integrated EMC filter which cannot be disconnected.
(5) With integrated fan.

Variable speed drives for asynchronous motors
Altivar 11

VW3 A5870●

VW3 A5873●

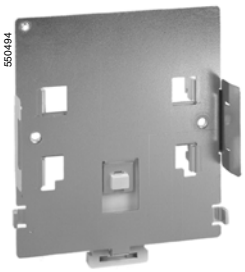
Options

Description	For drives	Reference	Weight kg
PowerSuite software workshop	All ratings, E/U/A ranges	**See page 3/4**	–
Converter, supplied without cable or CD-Rom, for communicating with the PowerSuite software workshop	All ratings, E/U/A ranges	**VW3 A11301**	0.070
EMC input filters	ATV 11HU05M2E, HU09M2E ATV 11HU12M2E, HU18M2E ATV 11HU05F1U/A, HU09F1U/A ATV 11HU05M2U/A, U09M2U/A ATV 11HU18M2U/A	**VW3 A11401**	0.650
	ATV 11HU29M2E, HU41M2E ATV 11HU18F1U/A, HU29M2U/A ATV 11HU41M2U/A	**VW3 A11402**	0.850
	ATV 11HU05M3U/A, HU09M3U/A ATV 11HU18M3U/A	**VW3 A11403**	0.650
	ATV 11HU29M3U/A, HU41M3U/A	**VW3 A11404**	0.850
Braking unit connected to the DC bus	All ratings, E/U/A ranges	**VW3 A11701**	0.250

Description	Ohmic value	Power W	For drives	Reference	Weight kg
Braking resistors Not protected (IP 00) *(3)*	100 Ω	32	ATV 11HU05●●● *(1)* ATV 11●U09●●● *(1)* ATV 11●U12M2E *(1)* ATV 11●U18●●● *(1)* ATV 11HU29●●● *(2)*	**VW3 A58702**	0.600
	68 Ω	32	ATV 11HU41●●● *(2)*	**VW3 A58704**	0.600
Braking resistors Protected (IP 30) *(3)*	100 Ω	32	ATV 11HU05●●● *(1)* ATV 11●U09●●● *(1)* ATV 11●U12M2E *(1)* ATV 11●U18●●● *(1)* ATV 11HU29●●● *(2)*	**VW3 A58732**	2.000
	68 Ω	32	ATV 11HU41●●● *(2)*	**VW3 A58733**	2.000

(1) Minimum value of the resistor to be connected: 75 ohms.
(2) Minimum value of the resistor to be connected: 51 ohms.
(3) If a resistor other than those specified is being used, add a thermal protection device.

Variable speed drives for asynchronous motors
Altivar 11



VW3 A11852

Accessories

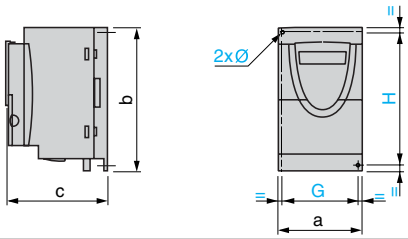
Description	For drives	Reference	Weight kg
Plates for mounting on ⊓ rail **(35 mm wide)**	ATV 11HU05●●● ATV 11HU09●●● ATV 11HU12M2E ATV 11HU18M●● ATV 11HU05M2E347 ATV 11HU09M2E347 ATV 11HU12M2E347 ATV 11HU18M2E347	**VW3 A11851**	0.220
	ATV 11HU18F1● ATV 11HU29●●● ATV 11HU41●●● ATV 11HU29M2E347 ATV 11HU41M2E347	**VW3 A11852**	0.300
Adaptor plate for replacing an Altivar 08 drive	ATV 11HU05M2● ATV 11●U09M2● ATV 11●U12M2E ATV 11●U18M2●	**VW3 A11811**	0.220
Plate for EMC mounting	All ratings	**VW3 A11831**	0.100
Fan kit *(1)*	ATV 11HU18F1● ATV 11HU18M●U ATV 11HU29●●● ATV 11HU41●●● ATV 11HU29M2E347 ATV 11HU41M2E347	**VW3 A11821**	0.070

(1) "Low noise" fan

Presentation: pages 2/6 to 2/9
Characteristics: pages 2/10 to 2/13
Dimensions: pages 2/20 and 2/21
Schemes: pages 2/22 and 2/23
Functions: pages 2/24 to 2/35

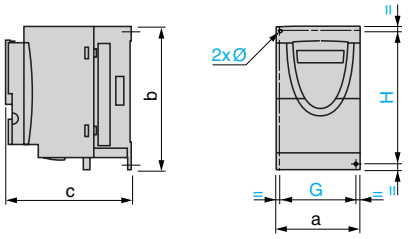
Variable speed drives for asynchronous motors
Altivar 11

ATV 11HU05●●E/U/A/E347
ATV 11PU●●●●E/U/A/E347



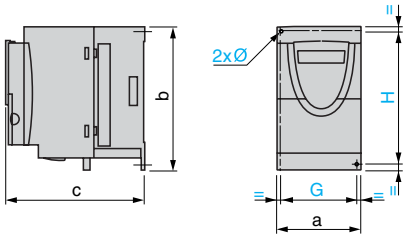
ATV 11	a	b	c	G	H	Ø
HU05●●E/U, PU●●●●E/U	72	142	101	60±1	131±1	4
HU05●●A/E347 PU●●●●A/E347	72	142	108	60±1	131±1	4

ATV 11HU09●●U/A/E347



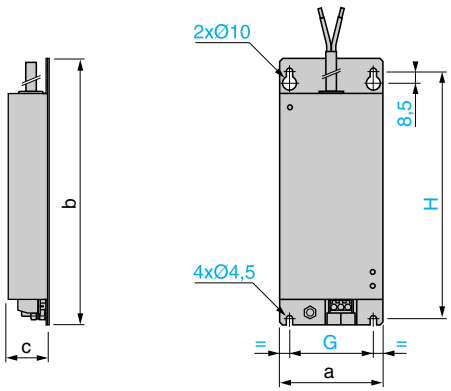
ATV 11	a	b	c	G	H	Ø
HU09●●U	72	142	125	60±1	131±1	4
HU09●●A/E347	72	142	132	60±1	131±1	4

ATV 11HU12M2E347
ATV 11HU18M●U/A/E347



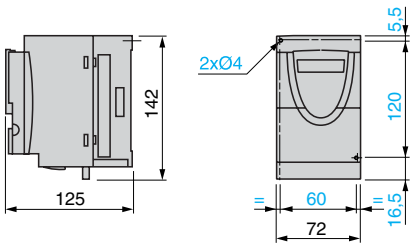
ATV 11	a	b	c	G	H	Ø
HU18M●U	72	147	138	60±1	131±1	4
HU12M2E347 HU18M●A/E347	72	142	145	60±1	131±1	4

EMC input filters VW3 A11401 to A11404

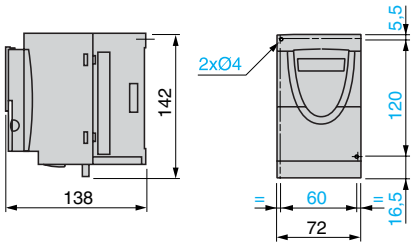


VW3	a	b	c	G	H
A11401	75	194	30	61	180
A11402	117	184	40	97	170
A11403	75	194	40	61	180
A11404	117	190	40	97	170

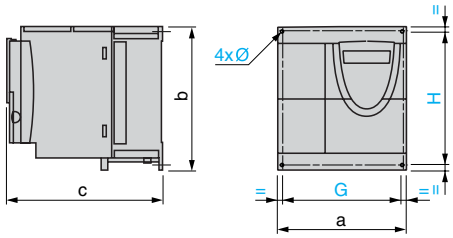
ATV 11HU09M2E



ATV 11HU12M2E, ATV 11HU18M2E

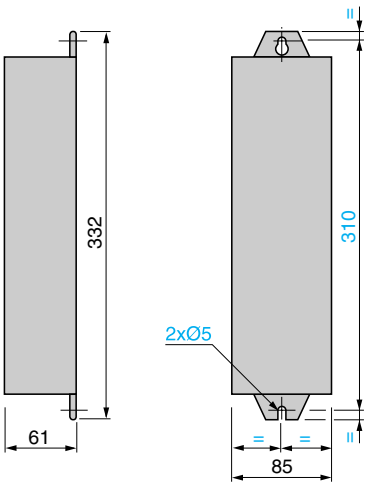


ATV 11HU18F1U/A, ATV 11HU29M●E/U/A, ATV 11HU41M●E/U/A



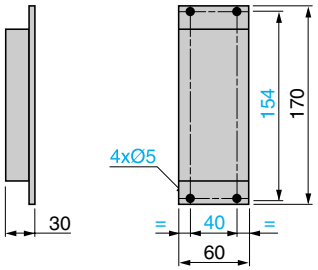
ATV 11	a	b	c	G	H	Ø
HU18F1U, HU29M●E/U, HU41M●E/U	117	142	156	106±0.5	131±1	4
HU18F1A, HU29M●A/E347, HU41M●A/E347	117	142	163	106±0.5	131±1	4

Protected braking resistors VW3 A58732 and A58733



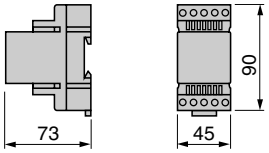
Non protected braking resistors VW3 A58702 and A58704

(2-wire output, length 0.5 m)

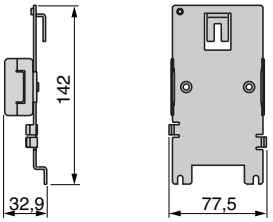


Braking unit VW3 A11701

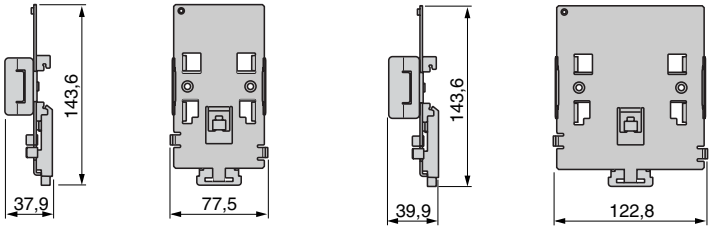
(for mounting on AM1-ED rail)



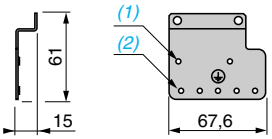
ATV 08 adaptor plate: VW3 A11811



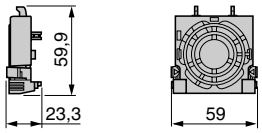
Plates for mounting on ⊓ rail VW3 A11851 and A11852



EMC plate VW3 A11831



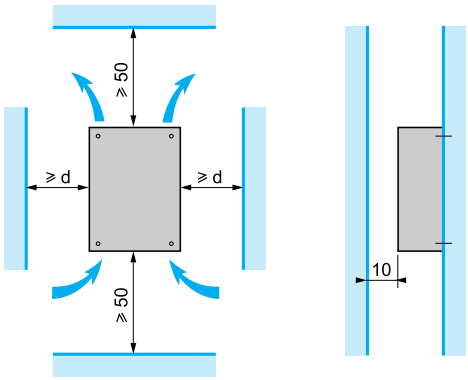
Fan kit VW3 A11821



(1) 2 screws supplied for fixing the plate.
(2) 5 x Ø M4 screws for fixing the EMC clamps.

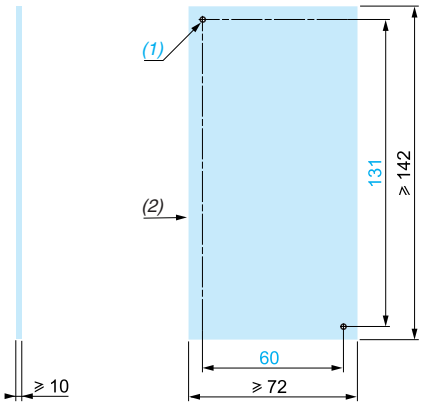
Mounting recommendations

- Install the unit vertically, at ± 10°.
- Do not place it close to heating elements.
- Leave sufficient free space to ensure that the air required for cooling purposes can circulate, by natural convection or by ventilation, from the bottom to the top of the unit.
- Free space in front of unit: 10 mm minimum.



-10°C to 40°C
d ≥ 50 mm: No special precautions.
d = 0 (mounted side by side): Remove the protective cover from the top of the drive.
40°C to 50°C
d ≥ 50 mm: Remove the protective cover from the top of the drive.
50°C to 60°C
d ≥ 50 mm: Remove the protective cover from the top of the drive, and derate the nominal drive current by 2.2% for every °C above 50°C.

Recommendations for mounting on a machine frame (specific to ATV 11PU ●●●●E/U/A/E347 drives)



ATV 11P●●●E/U/A/E347 drives can be mounted on (or in) a steel or aluminium machine frame, observing the following conditions:

- Maximum ambient temperature: 40°C
- Vertical mounting at ± 10°
- The drive must be mounted at the centre of a support (frame) which is a minimum of 10 mm thick and with a minimum square cooling area (S) of 0.12 m^2 for steel and 0.09 m^2 for aluminium, exposed to the open air.
- Support area for the drive (min 142 x 72) machined on the frame with a surface smoothness of 100 µm max and unevenness of 3.2 µm max.
- De-burr the tapped holes.
- Coat the whole drive support area with thermal contact grease (or equivalent).

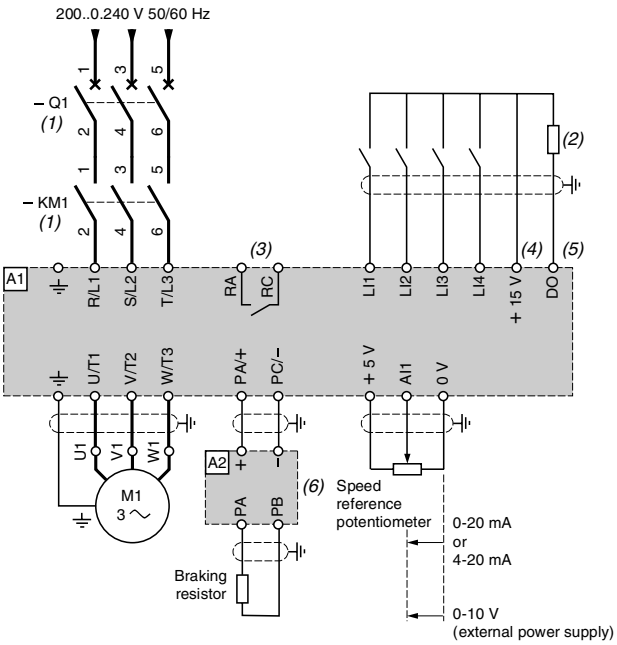
When the operating conditions are close to the maximum limits (power, cycle and temperature) this type of use must be checked beforehand, by monitoring the thermal state of the drive.

(1) 2 x Ø M4 tapped holes
(2) Minimum machined area

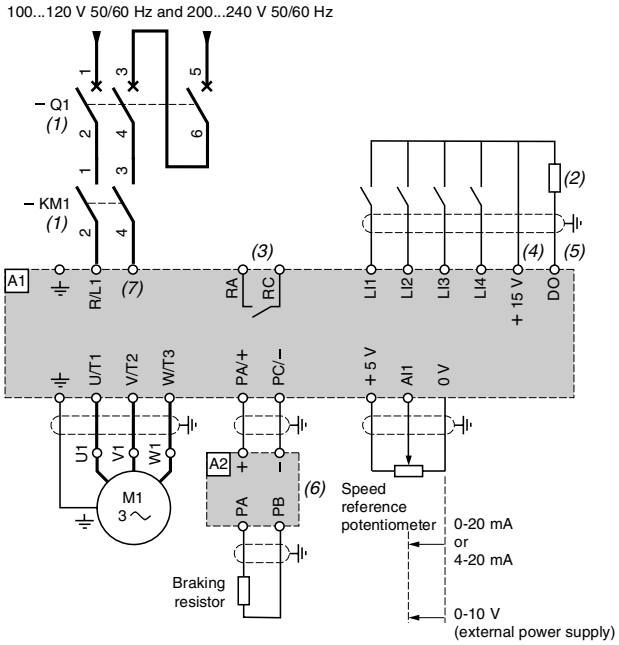
Variable speed drives for asynchronous motors
Altivar 11

Schemes with contactor

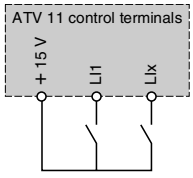
Three phase power supply ATV 11●●●●M3●



Single phase power supply ATV 11●●●●F1● and ATV 11●●●●M2●

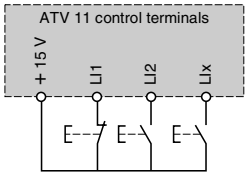


2-wire control



LI1: Forward
LIx: Reverse

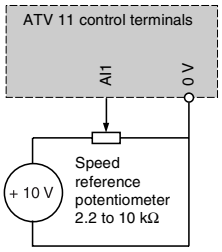
3-wire control



LI1: Stop
LI2: Forward
LIx: Reverse

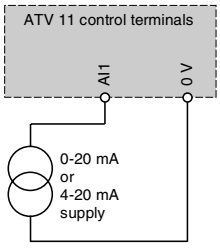
Analog voltage input

External 10 V



Analog current input

0-20 mA or 4-20 mA

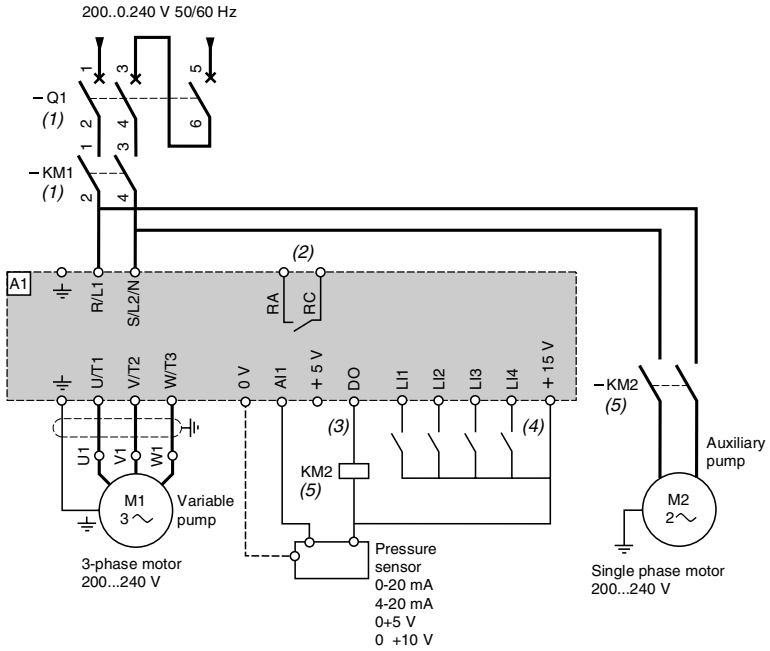


Note: *Install interference suppressors on all inductive circuits near the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

(1) For combinations of KM1 and Q1 components, see the table on page 2/13.
(2) Galvanometer or low level relay.
(3) Fault relay contact: for remote signalling of drive status
(4) Internal +15 V. If an external +24 V supply is used, connect the 0 V on the external supply to the COM terminal, do not use the + 15 terminal on the drive, and connect the common of the LI inputs to the +24 V of the external supply.
(5) DO output: can be configured as analog or logic output. Internal voltage +15 V or external +24 V.
(6) Braking unit VW3 A11701, if braking resistor VW3 A587●● is used.
(7) N for ATV 11●●●●F1●, S/L2 for ATV 11●●●●M2●.

ATV11 pump range schemes

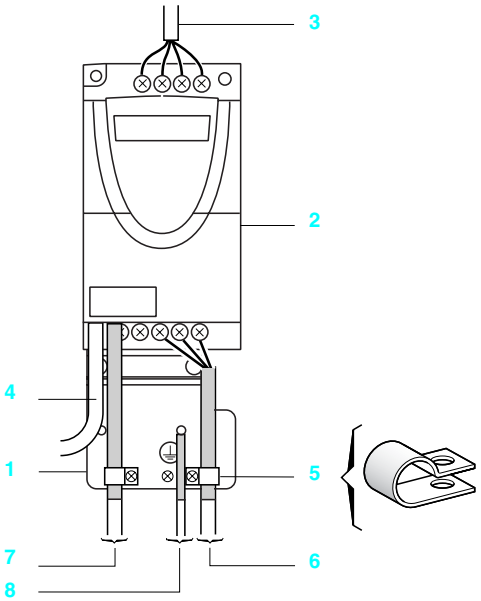
Single phase power supply ATV 11●U●●M2E347 for single variable pump with auxiliary pump



Note: *Install interference suppressors on all inductive circuits near the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting.*

(1) For combinations of KM1 and Q1 components, see the table on page 2/13.
(2) Fault relay contact: for remote signalling of drive status
(3) DO output: can be configured as analog or logic output. Internal voltage +15 V or external +24 V.
(4) Internal +15 V. If an external +24 V supply is used, connect the 0 V on the external supply to the COM terminal, do not use the + 15 V terminal on the drive, and connect the common of the LI inputs to the +24 V of the external supply.
*(5) KM2: contactor **ABS 2SA01MB**, please consult our "Interfaces, I/O splitter boxes and power supplies" catalogue.*

Electromagnetic compatibility: Connections to meet the requirements of EMC standards



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

1 Plate VW3 A11831 to be mounted on the drive
2 Altivar 11
3 Unshielded power supply cable
4 Unshielded cable for fault relay contacts output
5 Fix and earth the shielding of cables 6 and 7 as close as possible to the drive:
- Strip the shielding
- Use cable clamps of an appropriate size on the parts from which the shielding has been stripped, to attach them to the plate
- The shielding must be clamped tightly enough to the plate to ensure good contact
- Types of clamp: non-oxidizing metal
6 Shielded cable *(1)* for connecting the motor
7 Shielded cable *(1)* for connecting the control/signalling system. For applications requiring several conductors, use cables with a small cross-section (0.5 mm²).
8 PE cable (green-yellow)

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

(1) The shielding of cables 6 and 7 must be connected to earth at both ends. The shielding must be continuous and if intermediate terminals are used, they must be in EMC metal boxes.

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Summary of functions

Drive factory setting
Presentation page 2/25

Functions of the display and keys
Presentation page 2/25

Application functions
Operating speed range page 2/26
Acceleration and deceleration ramp times page 2/26
Second ramp page 2/26
Deceleration ramp adaptation page 2/26
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PI regulator page 2/27
Three additional high speeds page 2/27
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Analog or logic output DO page 2/28
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2-wire control page 2/29
3-wire control page 2/29
Automatic DC injection page 2/29
Switching frequency, noise reduction page 2/29
Fault relay, unlocking page 2/30
Fault reset page 2/30
Automatic restart page 2/30
Automatic catching of a spinning load with speed detection page 2/30
Controlled stop on loss of line supply page 2/31
Freewheel stop page 2/31
Drive thermal protection page 2/31
Motor thermal protection page 2/31
Monitoring page 2/31
Parameter protection by confidential code page 2/31

Incompatible functions
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Functions specific to the Asia range ATV 11●U●●●A
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Logic inputs page 2/32

Functions specific to the pump range ATV 11●U●●M2E347
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Control in single variable mode with auxiliary pump page 2/33
Underload page 2/34
Overload page 2/34
Sleep/Wake-up page 2/34
PI feedback supervision page 2/34
No-load operation detection page 2/35
Quick start page 2/35
Automatic restart on underload and overload fault page 2/35
PI reference adjustment range for the end user page 2/35
Local control page 2/35

Variable speed drives for asynchronous motors
Altivar 11

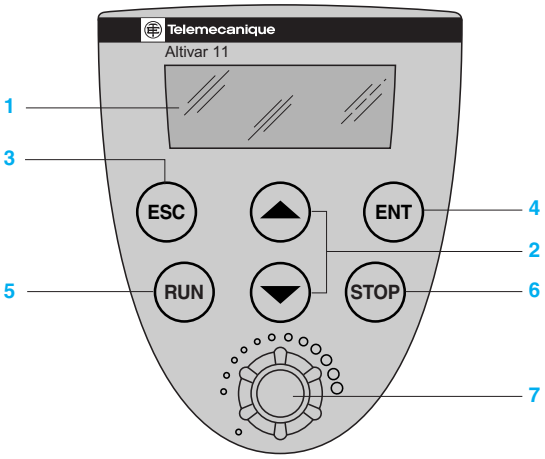
Drive factory setting

To facilitate installation of the drive, the functions have been programmed to be suitable for the most common applications.

Drive functions and I/O:

- ■ 2-wire control on transition:
- □ Logic input LI1: Forward
- □ Logic input LI2: Reverse
- ■ Preset speeds:
- □ Logic input LI3: Preset speeds
- □ Logic input LI4: Preset speeds
- ■ Analog input AI1: 0-5 V speed reference
- ■ Analog/logic output DO: Motor frequency (analog)
- ■ Deceleration ramp adaptation
- ■ Automatic DC injection for 0.5 s to standstill

Functions of the display and keys



1 Information is displayed in the form of codes or values in three 7-segment displays
2 Buttons for scrolling through the menus or modifying values
3 “ESC”: Button for exiting the menus (no confirmation)
4 “ENT”: Validation button for entering a menu or confirming the new value selected

Only on the Asia and pump ranges:

5 “RUN”: Local control of motor operation
6 “STOP”: Local control of motor stopping
7 Speed reference potentiometer

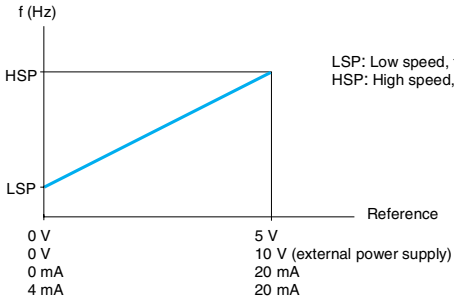
2

2.1

Application functions

■ Operating speed range

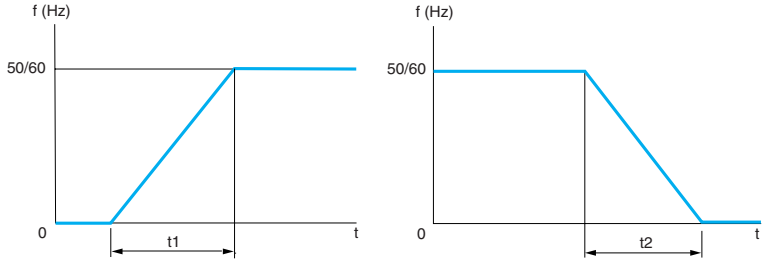
Used to determine the 2 frequency limits which define the speed range permitted by the machine under actual operating conditions.



LSP: Low speed, from 0 to HSP, factory setting 0
HSP: High speed, from LSP to 200 Hz, factory setting 50/60 Hz

■ Acceleration and deceleration ramp times

This function is used to define acceleration and deceleration ramp times according to the application and the machine dynamics.

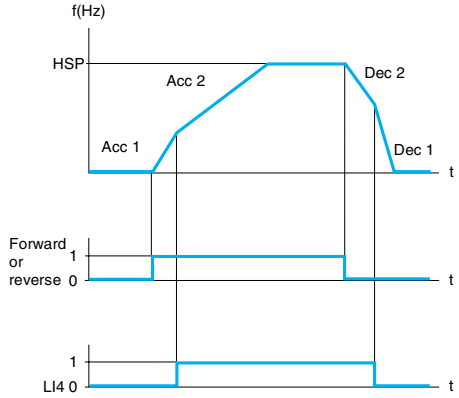


Linear acceleration ramp
Adjustment of t1: 0 to 99.9 s, factory setting 3 s.

Linear deceleration ramp
Adjustment of t2: 0 to 99.9 s, factory setting 3 s.

■ Second ramp

This function is used to switch two acceleration and deceleration ramp times, which can be adjusted separately.
Enabled by means of 1 reassignable logic input.
It is suitable for machines with fast continuous speed correction and high speed lathes with acceleration and deceleration limiting above certain speeds.



Acceleration 1 (Acc 1) and deceleration 1 (Dec 1):
- Adjustment 0 to 99.9 s
- Factory setting 3 s

Acceleration 2 (Acc 2) and deceleration 2 (Dec 2):
- Adjustment 0 to 99.9 s
- Factory setting 5 s

HSP: High speed

Example of switching using logic input LI4

■ Deceleration ramp adaptation

This function is used to automatically increase the deceleration time if the initial setting is too low when the load inertia is taken into account. It prevents the drive locking if there is an "**overvoltage on deceleration**" fault.
If this function is disabled, an appropriate braking unit and resistor can be used.

Variable speed drives for asynchronous motors
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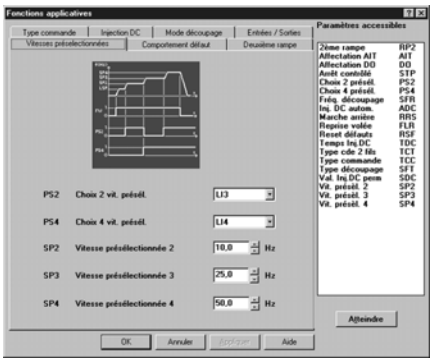
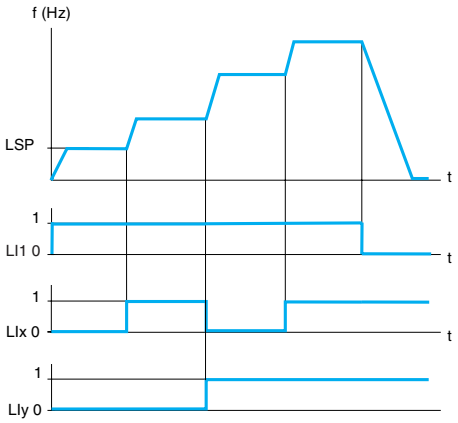


Adjusting the preset speeds using the PowerSuite software workshop for PC

■ Preset speeds

This is used to switch preset speed references.
Choice of two or four preset speeds.
It is enabled by means of 1 or 2 logic inputs.
The preset speeds are adjustable in increments of 0.1 Hz from 0 Hz to 200 Hz.
They take priority over the reference given by the analog input, or for the Asia range, on the drive's potentiometer.



The speed obtained with inputs LIx and LIy at state 0 is LSP or the speed reference, depending on the level of analog input AI1.

Factory settings:

1st speed: LSP (low speed or reference)

2nd speed: 10 Hz

3rd speed: 25 Hz

4th speed: 50 Hz

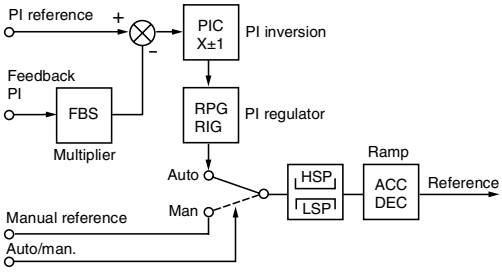
Example of operation with 4 preset speeds

■ Limiting low speed operating time

The motor is stopped automatically after a period of operation at low speed (LSP).
This time can be set between 0.1 and 999 seconds (0 corresponds to an unlimited time).
The motor restarts if the frequency reference is greater than the low speed threshold (LSP) and if a run command is still present.
Function suitable for automatic Stops/Starts.

■ PI regulator

Used for simple control of a flow rate or a pressure with a sensor which supplies a feedback signal adapted to the drive.
This function is suitable for pumping and ventilation applications.



ACC: Acceleration
DEC: Deceleration
FBS: PI feedback multiplication coefficient
HSP: High speed
PIC: Reversal of the direction of correction of the PI regulator
LSP: Low speed
RIG: PI regulator integral gain
RPG: PI regulator proportional gain

PI regulator

□ **PI reference:**
- Internal reference representing 0.1 to 100% of the maximum frequency reference (HSP).
- Regulation reference selected from all the possible types of regulation reference.
- 2 or 4 preset PI references adjustable from 0.1 to 100% of the maximum frequency (HSP). These require the use of 1 or 2 logic inputs respectively.
- Manual reference given by the potentiometer on the front panel (only on the Asia range).

□ **PI feedback**
- Analog input AI1

□ **Auto/Man.**
- Logic input LI for switching operation to speed reference (Man) or PI regulation (Auto).

During operation in automatic mode, it is possible to adapt the process feedback, to correct inverse PI and to adjust the proportional and integral gains.
The motor speed is limited to between LSP and HSP.

■ Three additional high speeds

These three additional high speeds are defined by HS2, HS3 and HS4.
Used to select 2 or 4 high speeds (HSP/HS2 or HSP/HS2/HS3/HS4).
Enabling 2 or 4 high speeds requires the use of 1 or 2 logic inputs respectively.

■ 2nd current limit

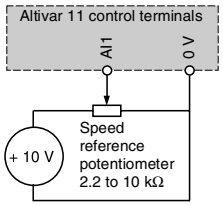
A second current limit can be configured between 0.5 and 1.5 times the nominal drive current.
Used to limit the torque and the temperature rise of the motor.
The switch between the two current limits is enabled via a logic input.

2

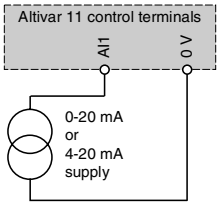
2.1

■ **Configuration of analog input AI1**
This is used to modify the characteristics, for either voltage or current, of analog input AI1.
Factory setting: 0-5 V (internal power supply only)
Other possible values via external power supplies: 0-10 V, 0-20 mA, 4-20 mA

Analog voltage input
Use with external 10 V



Analog current input
0-20 mA or 4-20 mA use



■ **Analog or logic output DO**
Output DO can be programmed to be a logic output or an analog output. It enables remote signalling of the following information as required:
- Frequency threshold reached (logic output)
- Reference reached (logic output)
- Current threshold reached (logic output)
- Current in the motor (analog output)
- Motor frequency (analog output)

Diagram with internal power supply

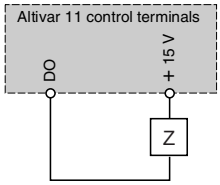
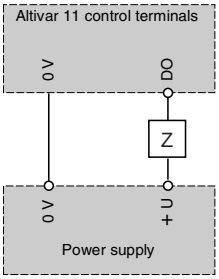


Diagram with external power supply



If DO is a logic output, Z is a relay or low level input.
If DO is an analog output, Z can be a galvanometer, for example.
For a galvanometer with resistance R, the maximum voltage supplied will be:

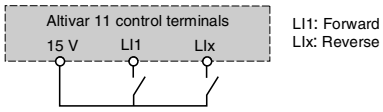
$$U \times \frac{R(\Omega)}{R(\Omega) + 1000(\Omega)}$$

■ **Direction of operation**: **forward/reverse**
In 2-wire control, forward operation cannot be reassigned to any logic input other than LI1.
In 3-wire control, stopping cannot be reassigned to any logic input other than LI1, and forward operation cannot be reassigned to any logic input other than LI2.
Reverse operation can be disabled for applications with a single direction of motor rotation, by not assigning any logic input to reverse operation.

Variable speed drives for asynchronous motors
Altivar 11

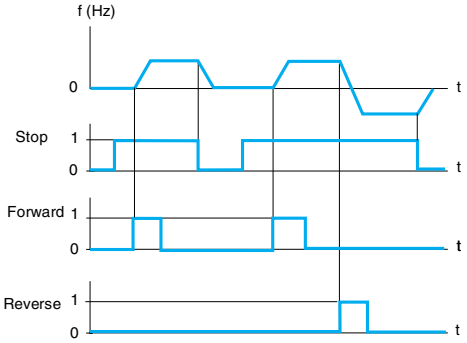
■ 2-wire control
This function is used to control the direction of operation by means of a stay-put contact.
Run (forward or reverse) and stop commands are controlled by the same logic input.
It is enabled by means of 1 or 2 logic inputs (one or two directions).
This function is suitable for all non-reversing and reversing applications.

3 operating modes are possible:
- □ Detection of the state of the logic inputs
- □ Detection of a change in state of the logic inputs
- □ Detection of the state of the logic inputs with forward operation always having priority over reverse

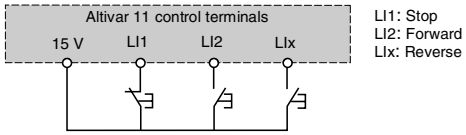


Wiring diagram for 2-wire control

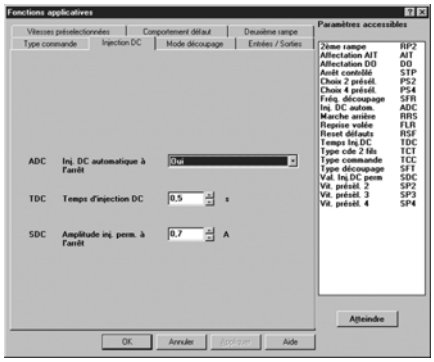
■ 3-wire control
This function is used to control the operating direction and stopping by means of pulsed contacts.
Run (forward or reverse) and stop commands are controlled by 2 different logic inputs.
It is enabled by means of 2 or 3 logic inputs (non-reversing or reversing).
This function is suitable for all non-reversing and reversing applications.



Example of operation with 3-wire control



Wiring diagram for 3-wire control



Adjusting the "DC injection" function using the PowerSuite software workshop for PC

■ Automatic DC injection
This function enables DC injection to standstill, which is adjustable from 0 to 1.2 times the value of the drive nominal current (preset at 0.7 In), as soon as operation is no longer controlled and the motor speed is zero:
- □ either for a period of time, which is adjustable from 0.1 to 30 s,(preset 0.5 s),
- □ or continuously.

Factory setting: Function active with DC injection for 0.5 s.
In 3-wire control, DC injection is only active if logic output LI1 is active (stop).

■ Switching frequency, noise reduction
Switching the intermediate DC voltage at high frequency is useful for supplying the motor with a current wave having little harmonic distortion.
There are 3 switching frequency ranges:
- □ Random switching frequency around 2 or 4 kHz (avoids resonance)
- □ Fixed low frequency that can be set at 2 or 4 kHz
- □ Fixed high frequency that can be set at 8, 12 or 16 kHz

Factory setting: Low frequency set at 4 kHz.
This function is suitable for all applications which require low motor noise.

■ **Fault relay, unlocking**
The fault relay is energized when the drive is powered up and is not faulty.
It opens in the event of a fault or when the drive is powered down.
The drive can be unlocked after a fault in one of the following ways:
□ By powering down the drive until the display disappears completely, then powering back up
□ By activating the logic input associated with the “fault reset” function, if the function is enabled
□ By enabling the “automatic restart” function

■ **Fault reset**
This is used to clear the stored fault and restart the drive if the cause of the fault has disappeared.
The fault is cleared by a transition of the logic input LI which is assigned to this function.
Factory setting: Function inactive.
The restart conditions after a reset are the same as those of a normal power-up.
The following faults can be reset: drive thermal overload, motor thermal overload, line supply overvoltage, overvoltage on deceleration, overspeed, input phase loss *(1)*, line supply undervoltage *(2)*.

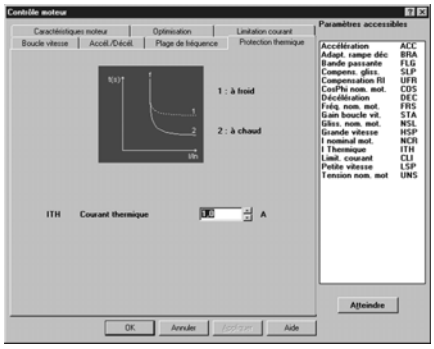
■ **Automatic restart**
This function enables the drive to be restarted automatically after it has locked in fault mode, provided the relevant fault has disappeared and the other operating conditions permit a restart.
This restart is performed by a series of automatic attempts separated by increasingly longer waiting periods of: 1 s, 5 s, 10 s, then 1 min for the following periods.
If the drive has not restarted after 6 minutes, it locks and the procedure is abandoned until the drive is powered down and back up again.
Factory setting: Function inactive

A restart is authorized with the following faults: drive thermal overload, motor thermal overload, line supply overvoltage, overvoltage on deceleration, input phase loss *(1)*, line supply undervoltage *(2)*.
If the function is enabled, the drive's safety relay remains activated until one of these faults appears.
This function requires the speed reference and the direction of operation to be maintained, and is only compatible with 2-wire level control.
This function is suitable for machines or installations which are in continuous operation or are not monitored, and where a restart will not endanger equipment or personnel in any way.

■ **Automatic catching of a spinning load with speed detection** (“catch on the fly”)
This function is used to restart the motor smoothly after one of the following events:
□ Loss of line supply or power off
□ Fault reset or automatic restart
□ Freewheel stop triggered by a fault
On restarting, the effective speed of the motor is detected in order to restart on the ramp at this speed and return to the reference speed. The speed detection time can be up to 1 s depending on the initial deviation.
Factory setting: Function inactive

This function requires the activation of 2-wire level control and is not compatible with the continuous DC injection braking function.
This function is suitable for machines for which the loss of motor speed is negligible during the power failure (machines with high inertia).

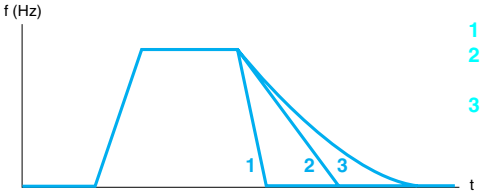
(1) The “line supply phase loss” fault is only accessible on drives with a three-phase power supply, if monitoring of the fault has been enabled (factory setting: enabled).
(2) The drive will restart as soon as the undervoltage fault disappears, regardless of whether the function is active.



Adjusting the thermal protection using the PowerSuite software workshop for PC

■ **Controlled stop on loss of line supply**
This is used to define the drive stopping modes on a “loss of line supply” fault.

Three stopping modes are available for selection:
□ Freewheel stop: The drive locks and the motor stops in accordance with the inertia and the resistive torque
□ Normal stop: Stop with valid deceleration ramp time (deceleration 1 or 2).
□ Fast stop: The stopping time depends on the inertia and the braking capability of the drive.
Factory setting: Freewheel stop



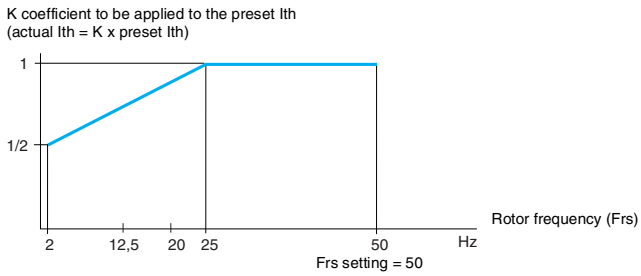
1 Fast stop
2 Normal stop on deceleration ramp
3 Freewheel stop

■ **Freewheel stop**
This function enables freewheel stopping of the motor by resistive torque. The motor power supply is cut.
Stop when the assigned logic input is not connected (state 0, contact open).

■ **Drive thermal protection**
Direct protection by thermistor, integrated in the drive’s power module. This protects the components, even in the event of poor ventilation or excessive ambient temperature.
When the fault is detected, it locks the drive.

■ **Motor thermal protection**
The theoretical temperature rise of the motor is continuously calculated to provide thermal protection.
The drive is locked on a fault if this temperature rise exceeds 118% of the nominal temperature rise.
This function is suitable for applications with self-cooled motors and thermal derating based on the rotor frequency.

Note: *The thermal state of the motor is not stored when the drive is powered down.*



■ **Monitoring**
The display shows the state of the drive or, if selected, one of the following values:
□ Frequency reference
□ Output frequency applied to the motor
□ Motor current
□ Line voltage
□ Motor thermal state
□ Drive thermal state

■ **Parameter protection by confidential code**
This function enables the drive configuration to be protected using an access code.

Incompatible functions

The choice of the last function configured is enabled, whatever the configuration of the previous functions.
Application functions can be assigned to the same logic input, in which case one logic input enables a number of functions (for example: direction of operation and second ramp).

A check must be carried out to ensure that the functions are compatible.

■ **Direction of operation and 2-wire control**: Forward operation can only be assigned to LI1.

■ **Direction of operation and 3-wire control**: Forward operation can only be assigned to LI2.

■ **Automatic restart**: This function requires the configuration of 2-wire level control. Changing the configuration of the type of control disables automatic restart.

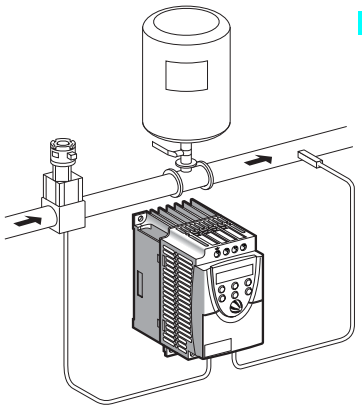
■ **Automatic catching a spinning load with speed detection**:
□ Requires the configuration of 2-wire level control. Changing the configuration of the type of control disables automatic catching a spinning load.
□ Is not compatible with continuous DC injection braking to a standstill. Configuring this function disables automatic catching a spinning load.

Functions specific to the Asia range ATV 11●U●●●●A

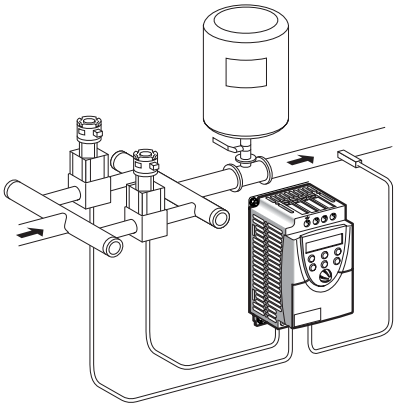
■ **Local control**
The keypad on the Asia range has two additional keys (RUN and STOP) and a potentiometer (speed reference).
□ The keys and the potentiometer are active if local control is enabled.
□ The logic and analog inputs are inactive if local control is enabled.
□ **Reverse**: If local control is active, the reverse function is not visible.
Factory setting: Function active

■ **Logic inputs**
It is possible to choose the active level of the logic input.
Positive logic: The inputs are active if the signal is ≥ 11 V.
Negative logic: The inputs are active if the signal is ≤ 5 V.
Factory setting: Positive logic

Variable speed drives for asynchronous motors
Altivar 11 pump range



Single variable mode



Single variable mode with auxiliary pump

Functions specific to the pump range ATV 11●U●●M2E347

The main objective here is to control a complete pumping installation using a single drive, **ATV 11●U●●M2E347**, by ensuring constant pressure in the system whatever the flow rate.
The Altivar 11 pump range has 11 supplementary functions designed for water pumping applications:

- Control in single variable mode
- Control in single variable mode with auxiliary pump
- Underload
- Overload
- Sleep
- Wake-up
- PI feedback supervision
- No-load operation detection
- Quick start
- Automatic restart on underload and overload faults
- PI reference adjustment range for the end user

■ Control in single variable mode

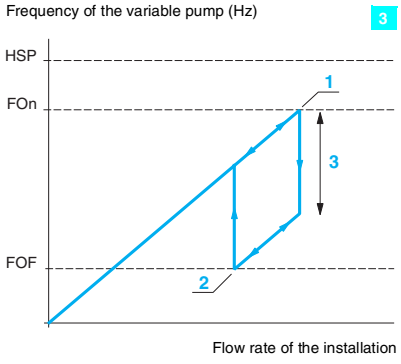
The system is operated using a single variable speed pump (1).
A PI regulator controls the variable speed pump.
A pressure sensor provides the “PI feedback” information required for system feedback.

■ Control in single variable mode with auxiliary pump

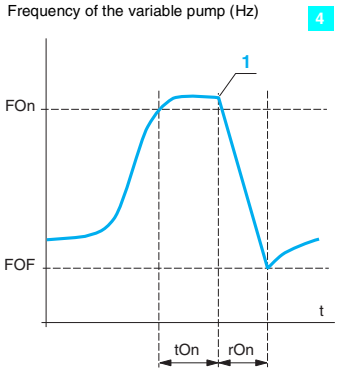
The system is operated using a fixed speed pump, called the auxiliary pump, and a variable speed pump, which is unable to provide the full flow range required on its own (2).
The auxiliary pump's starting and stopping are controlled by the DO logic output according to the PI regulator output (variable pump frequency reference) with a hysteresis effect as shown in the diagram below (3).

Auxiliary pump starting (4)
If the variable pump control frequency exceeds the threshold (FOn) for longer than a time period (tON), the auxiliary pump is put into operation 1. The variable pump reference decreases linearly until it reaches the threshold (FOF).
In order to reduce the effect of overpressure caused by the starting of the auxiliary pump, the deceleration time of the variable pump (rOn) must be set to the time that the auxiliary pump takes to reach its nominal speed.

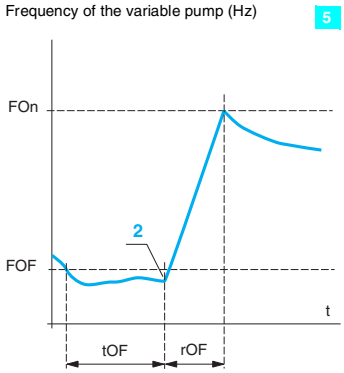
Auxiliary pump stopping (5)
Conversely if the variable pump control frequency falls below the threshold (FOF) for a period (tOF), the auxiliary pump is stopped 2 and the variable pump reference increases linearly until it reaches the threshold (FOn). The acceleration time (rOF) is set to the stopping time of the auxiliary pump in order to minimize the effect of underpressure.



Single variable mode with auxiliary pump: hysteresis



Auxiliary pump start



Auxiliary pump stop

1 Auxiliary pump starting
2 Auxiliary pump stopping
3 Frequency range corresponding to the auxiliary pump flow rate
FOn: Starting frequency of the auxiliary pump
FOF: Stopping frequency of the auxiliary pump

Presentation: pages 2/6 to 2/9
Characteristics: pages 2/10 to 2/13
References: pages 2/14 to 2/19
Schemes: pages 2/22 and 2/23

2

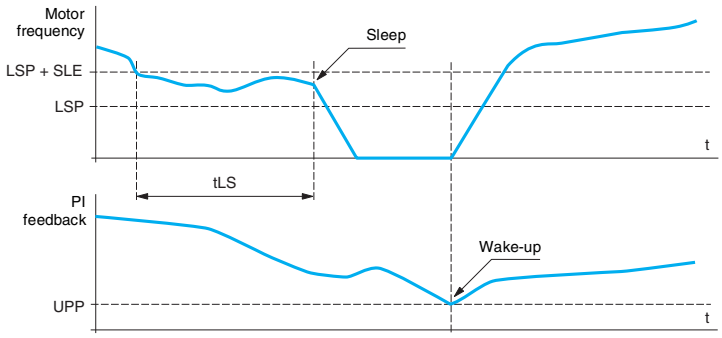
2.1

■ **Underload**
This function stops the motor when it is underloaded. The function is active in steady state.
If the current is below an underload threshold for an adjustable period of time, the drive locks in an underload fault.
The current threshold can be set to between 20% and 100% of the nominal motor current value.
An hysteresis of 10% is applied to this threshold to conform the end of the underload state.
The time delay is adjustable up to 100 s. When this parameter is at 0, the function is disabled.

■ **Overload**
This function stops the motor when it is overloaded. The function is active in steady state.
If the motor current is greater than an overload threshold for an adjustable time period, the drive locks in an overload fault.
The overload threshold can be set to between 70% and 150% of the nominal motor current.
An hysteresis of 10% is applied to this threshold to confirm the end of the overload state.
The time delay is adjustable up to 100 s. When this parameter is at 0, the function is disabled.

■ **Sleep/Wake-up**
Allows the variable pump to come to a complete stop when the flow rate is considered too low, below an adjustable “sleep threshold” (LSP+ SLE) and time delay (tLS).

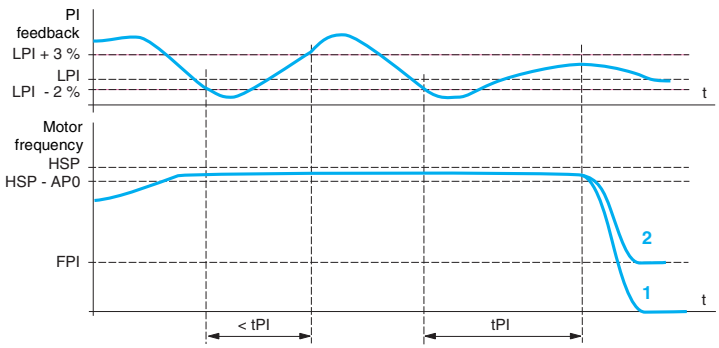
When the system is in “sleep” state, if the PI feedback value, showing the pressure downstream of the pump, falls below a “wake up” threshold (UPP), the variable pump is restarted.



Sleep/Wake-up functions

LSP: Low speed
SLE: Sleep threshold offset
UPP: Wake-up threshold
tLS: Sleep threshold operating time

■ **PI feedback supervision**
Once the variable pump is running at maximum speed and at the same time the PI feedback is lower than the supervision threshold (LPI) at the end of a time delay (tPI), the drive switches to fallback mode. There are two possible scenarios (see graphs below):
□ The drive performs a freewheel stop and displays a specific fault code 1
□ Configurable fixed speed operation with display of a specific fault code 2
The drive reverts to regulation mode when the PI feedback returns to the supervision threshold (LPI).



PI feedback supervision

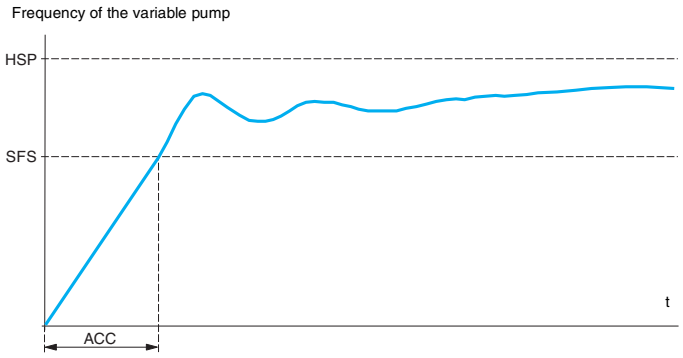
LPI: PI feedback supervision threshold
HSP: High speed
FPI: Fallback speed
APO: Maximum speed detection hysteresis
tPI: PI feedback supervision function time delay

In single variable mode with auxiliary pump, this function is active when both pumps are operating.

■ **No-load operation detection**
This function is used in applications where zero flow cannot be detected by the sleep function alone. It is active when the auxiliary pump is stopped and the variable pump motor frequency reference is below a configured threshold.

It consists of periodically forcing the motor frequency reference to a low value:
□ If the request is still present, it results in an increase in the PI error and the drive reverts to regulation in line with the previous reference.
□ If the request is no longer present (zero flow), the PI error will not change, which is characteristic of no-load operation. The variable pump motor is stopped.

■ **Quick start**
The quick start function aims to overcome the problems associated with the high regulation gains that are necessary at start-up but inappropriate for regulation.
The drive accelerates linearly on a ramp (ACC) until its speed reaches the configured quick start threshold (SFS).
Once it reaches this threshold (SFS), PI regulation begins.



Quick start

HSP: High speed
SFS: Quick start threshold
ACC: Acceleration ramp time

■ **Automatic restart on underload and overload faults**
Generally, the user can set a parameter to activate an automatic restart on a fault, if the cause(s) of the fault no longer exist(s).
In the case of underload and overload faults, an adjustable period of 1 s to 6 min 16 s can be used to delay the restart.

■ **PI reference adjustment range for the end user**
This function allows the end user to set the PI regulator reference to increase or reduce the rate of flow.
Adjustment by the user is either by modifying the PI regulator reference parameter, or by manual control of the potentiometer, accessible on the drive's front panel.
The installer has access to two PI reference limit parameters, which can be used to define a user's range of action.

■ **Local control**
The keypad on the pump range has two additional keys (RUN and STOP) and a potentiometer (speed reference).
The keys and the potentiometer are active if local control is enabled.

Variable speed drives for asynchronous motors
Altivar 21

100074-50-M

Ventilation application

104273-50-M

Air conditioning application

62822-50-M

Pumping application

Applications

The Altivar 21 drive is a frequency inverter for 0.75 kW to 75 kW three-phase asynchronous motors.
It has been designed for state-of-the-art applications in heating, ventilation and air conditioning (HVAC) in the service industry:
- Ventilation
- Air conditioning
- Pumping

The Altivar 21 drive considerably improves building management by:
- Providing a significant energy saving
- Simplifying circuits by removing valves and flow control gates
- Reducing noise pollution
- Offering flexibility and ease of adjustment for installations

The Altivar 21 drive was designed to ensure electromagnetic compatibility and to reduce current harmonics.
Its various design versions make it possible to reduce installation costs by offering EMC class A or class B filters with the following advantages:
- More compact size
- Simplified wiring, thus reduced cost

The Altivar 21 drive is easily integrated into building management as it offers several communication cards:
- LonWorks
- BACnet
- METASYS N2
- APOGEE FLN

Functions

The Altivar 21 drive makes immediate operation of your applications possible as well as allowing settings to be changed quickly via the “Quick menu”.

Functions designed specifically for pumping and ventilation applications

The Altivar 21 drive combines all the functions that your applications require:
- Energy saving ratio, quadratic voltage/frequency ratio
- Automatic catching of a spinning load with speed detection
- Adaptation of current limiting according to speed
- Noise and resonance suppression by means of the switching frequency, which is adjustable up to 16 kHz during operation
- Preset speeds
- Integrated PID regulator with preset references and automatic/manual (“Auto/Man.”) mode
- Electricity and service hours meter
- Switching of command channels (references and run command) using the LOC/REM key
- Sleep/wake-up function
- Automatic ramp adaptation
- Ramp switching
- Reference calibration and limitation
- Switching of two motor rating plates

Protection functions

The Altivar 21 drive combines all the protection functions that your applications require:
- Motor and drive thermal protection, PTC thermal probe management
- Protection against overloads and overcurrents in continuous operation
- Machine mechanical protection via jump frequency function
- Protection of the installation by means of underload and overload detection
- Protection via multiple fault management and configurable alarms

Service continuity

Installation safety is assured by means of the forced operation function with inhibition of faults, direction of operation and configurable references.

Characteristics: pages 2/38 to 2/43 | References: pages 2/48 and 2/49 | Dimensions: pages 2/58 to 2/61 | Schemes: pages 2/62 to 2/65 | Functions: pages 2/80 to 2/99

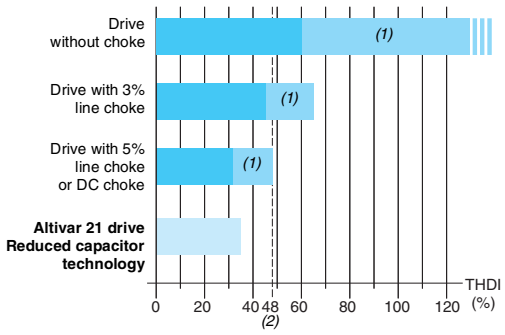
Variable speed drives for asynchronous motors
Altivar 21

ATV 21HD75N4

ATV 21H075M3X

ATV 21WD18N4,
ATV 21WD18N4C

ATV 21W075N4,
ATV 21W075N4C



THDI: Total current harmonic distortion
(1) Typical use
(2) Maximum THDI conforming to standard IEC/EN 61000-3-12

Reduced capacitor technology: reduction of current harmonics

Flexibility and user-friendliness

The Altivar 21 drive has an integrated 7-segment display terminal. This terminal is used to identify and determine the active command channels (run command and speed reference).

It is also enables:
- Direct access to the last five modified parameters
- Identification of the different factory-set parameters in the form of a list in a menu
- Backup of the customer configuration

The Altivar 21 drive offers a quick setup function in the form of its “Quick menu”, which includes the 10 key parameters for your installation (acceleration, deceleration, motor parameters, etc.).

A comprehensive offer

The Altivar 21 range of variable speed drives extends across a range of motor power ratings from 0.75 kW to 75 kW with the following types of power supply:
- 200…240 V three-phase, 0.75 kW to 30 kW, UL type 1/IP 20, (**ATV 21H●●●M3X**)
- 380…480 V three-phase, 0.75 kW to 75 kW, UL Type 1/IP 20, (**ATV 21H●●●N4**)
- 380…480 V three-phase, 0.75 kW to 75 kW, IP 54, (**ATV 21W●●●N4** and **ATV 21W●●●N4C**)

The Altivar 21 drive integrates the Modbus protocols as standard as well as numerous functions. With the communication cards offered (LonWorks, METASYS N2, APOGEE FLN and BACnet) the Altivar 21 is the ideal drive for the building market (HVAC).

The entire range conforms to international standards IEC/EN61800-5-1, IEC/EN61800-2, IEC/EN61800-3. It is UL, CSA, C-Tick and NOM 117 certified and has been developed to meet the requirements of directives regarding protection of the environment (RoHS, WEEE, etc.) as well as those of the European Directives to obtain the CE mark.

Electromagnetic compatibility EMC

The incorporation of EMC filters in **ATV 21●●●●N4** drives and the recognition of EMC requirements simplifies installation and provides an economical means of ensuring machines meet CE marking requirements.

ATV 21W●●●N4C drives have integrated class B EMC filters, which make them compliant with the requirements of EN 55011 (class B group 1) and IEC/EN 61800-3 (category C1) standards.

ATV 21H●●●M3X drives have been designed without an EMC filter. Filters are available as an option and can be installed by the user to reduce emission levels (see pages 2/56 and 2/57).

Using technology based on a reduced capacitor, the Altivar 21 drive is operational straight away and without disturbance. There is no point adding options to deal with the current harmonics to obtain a THDI *(1)* of less than 35%.
This THDI value is considerably less than the THDI of 48% imposed by the IEC/EN 61000-3-12 standard. The Altivar 21 drive removes the need and the cost of adding a line choke or a DC choke.

Installation

Altivar 21 drives are compact UL Type 1/IP 20 or IP 54 products which meet electromagnetic compatibility requirements and reduce current harmonics.

This range reduces installation costs by optimizing the size of the enclosures (floor-standing, wall-mounted, etc.).
Altivar 21 drives are designed to operate in an enclosure in an ambient temperature of:
- - 40°C without derating
- Up to 50°C with derating (see curves on pages 2/71 to 2/75)

They can also be mounted side by side (see page 2/70).

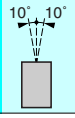
Altivar 21 drives can also be wall-mounted in compliance with UL type 1 requirements using kits **VW3 A31 8●●** and **VW3 A9 ●●●** (see page 2/50).

(1) THDI: Total current harmonic distortion

Characteristics: pages 2/38 to 2/43
References: pages 2/48 and 2/49
Dimensions: pages 2/58 to 2/61
Schemes: pages 2/62 to 2/65
Functions: pages 2/80 to 2/99

Variable speed drives for asynchronous motors
Altivar 21

Environmental characteristics

Conformity to standards			Altivar 21 drives have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control devices (IEC, EN), in particular: low voltage, IEC/EN 61800-5-1, 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 IEC/EN 61000-4-6 level 3 IEC/EN 61000-4-11 *(1)*
Conducted and radiated EMC emissions for drives			IEC/EN 61800-3, environments 1 and 2, category C1, C2 or C3
	ATV 21H●●●M3X		With additional EMC filter *(2)*: ■ EN 55011 class A group 1, IEC/EN 61800-3 category C2 or C3 ■ EN 55011 class B group 1, IEC/EN 61800-3 category C1
	ATV 21H●●●N4		EN 55011 class A group 1, IEC/EN 61800-3 category C2 or C3 With additional EMC filter *(2)*: ■ EN 55011 class B group 1, IEC/EN 61800-3 category C1
	ATV 21W●●●N4		EN 55011 class A group 1, IEC/EN 61800-3 category C2 or C3
	ATV 21W●●●N4C		EN 55011 class B group 1, IEC/EN 61800-3 category C1
CE marking			The drives have CE marking in accordance with the European directives on low voltage (73/23/EEC and 93/68/EEC) and EMC (89/336/EEC).
Product certifications			UL, CSA, C-Tick and NOM 117
Degree of protection			IEC/EN 61800-5-1, IEC/EN 60529
	ATV 21H●●●M3X ATV 21H●●●N4		IP 21 and IP 41 on upper part IP 20 without blanking plate on upper part of cover UL Type 1 with accessories VW3 A31 814…817 and VW3 A9 206…A9 208 (see page 2/50)
	ATV 21W●●●N4 ATV 21W●●●N4C		IP 54
Vibration resistance			1.5 mm peak to peak from 3…13 Hz, 1 gn from 13…200 Hz, conforming to IEC/EN 60068-2-6
Shock resistance			15 gn for 11 ms conforming to IEC/EN 60068-2-27
Maximum ambient pollution	ATV 21H075M3X…HD18M3X ATV 21H075N4…HD18N4 ATV 21W075N4…WD18N4 ATV 21W075N4C…WD18N4C		Degree 2 conforming to IEC/EN 61800-5-1
	ATV 21HD22M3X, HD30M3X ATV 21HD22N4…HD75N4 ATV 21WD22N4…WD75N4 ATV 21WD22N4C…WD75N4C		Degree 3 conforming to IEC/EN 61800-5-1
Environmental conditions	ATV 21H●●●M3X ATV 21●●●●N4 ATV 21W●●●N4C		IEC 60721-3-3 classes 3C1 and 3S2
Relative humidity			5…95% without condensation or dripping water conforming to IEC 60068-2-3
Ambient air temperature around the unit	Operation	**°C**	For ATV 21H●●●M3X and ATV 21H●●●N4 drives: -10…+40 without derating. Up to 50°C with derating, see the derating curves on pages 2/71 to 2/75. For ATV 21W●●●N4 and ATV 21W●●●N4C drives: -10…+40 without derating. Up to +50°C with derating, see the derating curves on pages 2/76 and 2/77.
	Storage	**°C**	-25…+70
Maximum operating altitude		**m**	1000 without derating 1000…3000 derating the current by 1% per additional 100 m. Limited to 2000 m for the “Corner Grounded” distribution network.
Operating position Maximum permanent angle in relation to the normal vertical mounting position			

(1) Drive behaviour according to the drive configurations (see pages 2/92, 2/93, 2/96 and 2/97).
(2) See table on page 2/57 to check permitted cable lengths.

Variable speed drives for asynchronous motors
Altivar 21

Drive characteristics

Output frequency range		**Hz**	0.5…200
Configurable switching frequency	ATV 21H075M3X…HD15M3X ATV 21H075N4…HD15N4	**kHz**	Nominal switching frequency: 12 kHz without derating in continuous operation. Adjustable during operation from 6…16 kHz Above 12 kHz, see the derating curves on pages 2/71 to 2/73.
	ATV 21HD18M3X…HD30M3X ATV 21HD18N4…HD75N4	**kHz**	Nominal switching frequency: 8 kHz without derating in continuous operation. Adjustable during operation from 6…16 kHz Above 8 kHz, see the derating curves on pages 2/72 to 2/75.
	ATV 21W075N4…WD15N4 ATV 21W075N4C…WD15N4C	**kHz**	Nominal switching frequency: 12 kHz without derating in continuous operation. Adjustable during operation from 6…16 kHz Above 12 kHz, see the derating curves on page 2/76.
	ATV 21WD18N4…WD75N4 ATV 21WD18N4C…WD75N4C	**kHz**	Nominal switching frequency: 8 kHz without derating in continuous operation. Adjustable during operation from 6…16 kHz Above 8 kHz, see the derating curves on pages 2/76 and 2/77.
Speed range			1…10
Speed accuracy	For a torque variation of 0.2 Tn to Tn		±10% of nominal slip, without speed feedback
Torque accuracy			±15%
Transient overtorque			120% of the nominal motor torque (typical value at ±10%) for 60 s
Maximum transient current			110% of the nominal drive current for 60 s (typical value)
Motor control profile	Asynchronous motor		Energy saving ratio Quadratic voltage/frequency ratio Constant voltage/frequency ratio Constant voltage/frequency ratio with automatic IR compensation Sensorless Flux Vector Control (FVC) (current vector)
	Synchronous motor		Current flux vector control without speed feedback
Frequency loop			PI regulator with adjustable structure for a speed response adapted to the machine (accuracy, speed)
Slip compensation			Automatic whatever the load. Can be suppressed or adjusted Not available with voltage/frequency ratios

Electrical power characteristics

Power supply	Voltage	**V**	200 - 15%...240 + 10% three-phase for ATV 21H●●●M3X 380 - 15%...480 + 10% three-phase for ATV 21●●●●N4 and ATV 21W●●●N4C
	Frequency	**Hz**	50 - 5%...60 + 5%
Signalling			1 red LED: LED lit indicates the presence of voltage on the drive DC bus
Output voltage			Maximum three-phase voltage equal to line supply voltage
Drive noise level			Conforming to directive 86-188/EEC
	ATV 21H075M3X…HU75M3X ATV 21H075N4…HD11N4	**dBA**	51
	ATV 21HD11M3X…HD18M3X ATV 21HD15N4, HD18N4	**dBA**	54
	ATV 21HD22M3X ATV 21HD22N4, HD30N4	**dBA**	59.9
	ATV 21HD30M3X	**dBA**	63.7
	ATV 21HD37N4, HD45N4	**dBA**	64
	ATV 21HD55N4, HD75N4	**dBA**	63.7
	ATV 21W075N4…WU22N4 ATV 21W075N4C…WU22N4C	**dBA**	48
	ATV 21WU30N4…WU75N4 ATV 21WU30N4C…WU75N4C	**dBA**	55
	ATV 21WD11N4, WD15N4 ATV 21WD11N4C, WD15N4C	**dBA**	57.4
	ATV 21WD18N4 ATV 21WD18N4C	**dBA**	60.2
	ATV 21WD22N4, WD30N4 ATV 21WD22N4C, WD30N4C	**dBA**	59.9
	ATV 21WD37N4, WD45N4 ATV 21WD37N4C, WD45N4C	**dBA**	64
	ATV 21WD55N4, WD75N4 ATV 21WD55N4C, WD75N4C	**dBA**	63.7
Electrical isolation			Between power and control (inputs, outputs, power supplies)

Connection cable characteristics

Type of cable for	Mounting in an enclosure		Single-strand IEC cable, ambient temperature 45°C, copper 90°C XLPE/EPR or copper 70°C PVC
	Mounting in an enclosure with a UL Type 1 kit		3-strand UL 508 cable except for choke (2-strand UL 508 cable), ambient temperature 40°C, copper 75°C PVC

Connection characteristics (terminals for the power supply and the motor)

Drive terminals		**L1/R, L2/S, L3/T**	**U/T1, V/T2, W/T3**
Maximum wire size and tightening torque	ATV 21H075M3X…HU22M3X	1.5 mm², AWG 14 1.4 Nm	
	ATV 21HU30M3X	2.5 mm², AWG 12 1.4 Nm	
	ATV 21HU40M3X	2.5 mm², AWG 10 1.4 Nm	
	ATV 21HU55M3X	6 mm², AWG 8 2.8 Nm	
	ATV 21HU75M3X	10 mm², AWG 8 2.8 Nm	
	ATV 21HD11M3X	16 mm², AWG 6 5 Nm	
	ATV 21HD15M3X	25 mm², AWG 4 5 Nm	
	ATV 21HD18M3X	35 mm², AWG 3 5 Nm	
	ATV 21HD22M3X	35 mm², AWG 2 12 Nm	
	ATV 21HD30M3X	70 mm², AWG 1/0 41 Nm	
	ATV 21H075N4…HU55N4	2 mm², AWG 14 1.4 Nm	
	ATV 21HU75N4	2 mm², AWG 12 2.8 Nm	
	ATV 21HD11N4	3.5 mm², AWG 10 2.8 Nm	
	ATV 21HD15N4	5.5 mm², AWG 8 5 Nm	
	ATV 21HD18N4	8 mm², AWG 8 5 Nm	
	ATV 21HD22N4	14 mm², AWG 6 12 Nm	
	ATV 21HD30N4	22 mm², AWG 4 12 Nm	
	ATV 21HD37N4, HD45N4	50 mm², AWG 1/0 24 Nm, 212 lb.in	
	ATV 21HD55N4, HD75N4	150 mm², 300 kcmil 41 Nm, 360 lb.in	
	ATV 21W075N4…WU55N4 ATV 21W075N4C…WU55N4C	1.5 mm², AWG 14 1.4 Nm	
	ATV 21WU75N4 ATV 21WU75N4C	2.5 mm², AWG 12 2.8 Nm	
	ATV 21WD11N4 ATV 21WD11N4C	4 mm², AWG 10 4 Nm	
	ATV 21WD15N4 ATV 21WD15N4C	6 mm², AWG 8 4 Nm	
	ATV 21WD18N4 ATV 21WD18N4C	10 mm², AWG 8 4 Nm	
	ATV 21WD22N4 ATV 21WD22N4C	16 mm², AWG 6 12 Nm	
	ATV 21WD30N4 ATV 21WD30N4C	25 mm², AWG 4 41 Nm	
	ATV 21WD37N4, WD45N4 ATV 21WD37N4C, WD45N4C	50 mm², AWG 1/0 8 Nm, 70.8 lb.in	50 mm², AWG 1/0 24 Nm, 212 lb.in
	ATV 21WD55N4, WD75N4 ATV 21WD55N4C, WD75N4C	150 mm², 250 kcmil 20 Nm, 177 lb.in	150 mm², 300 kcmil 41 Nm, 360 lb.in

Electrical control characteristics

Internal supplies available			Short-circuit and overload protection: ■ 1 x 10.5 V ⎓ ±5% supply for the reference potentiometer (1 to 10 kΩ), maximum current 10 mA ■ 1 x 24 V ⎓ supply (min. 21 V, max. 27 V), maximum current 200 mA
Analog inputs	VIA		Switch-configurable current or voltage analog input: ■ Voltage analog input 0...10 V ⎓, impedance 30 kΩ (max. safe voltage 24 V) ■ Current analog input X-Y mA by programming X and Y from 0 to 20 mA, with im pedance 242 Ω Max. sampling time: 2 ms ±0.5 ms Resolution: 11 bits Accuracy: ±0.6% for a temperature variation of 60°C Linearity: ±0.15% of the maximum value This analog input is also configurable as a logic input (see page 2/63).
	VIB		Voltage analog input, configurable as an analog input or as a PTC probe input. Voltage analog input: ■ 0...10 V ⎓, impedance 30 kΩ (max. safe voltage 24 V) ■ Max. sampling time: 2 ms ±0.5 ms ■ Resolution: 11 bits ■ Accuracy: ±0.6% for a temperature variation of 60°C ■ Linearity: ±0.15% of the maximum value PTC probe input: ■ 6 probes max. mounted in series ■ Nominal value < 1.5 kΩ ■ Trip resistance 3 kΩ, reset value 1.8 kΩ ■ Short-circuit protection < 50 Ω
Analog output	FM		1 switch-configurable voltage or current analog output: ■ Voltage analog output 0...10 V ⎓, minimum load impedance 470 Ω ■ Current analog output X-Y mA by programming X and Y from 0 to 20 mA, maximum load impedance 500 Ω Max. sampling time: 2 ms ±0.5 ms Resolution: 10 bits Accuracy: ±1% for a temperature variation of 60°C Linearity: ±0.2%
Configurable relay outputs	FLA, FLB, FLC		1 relay logic output, one “N/C” contact and one “N/O” contact with common point Minimum switching capacity: 3 mA for 24 V ⎓ Maximum switching capacity: ■ On resistive load (cos φ = 1): 5 A for 250 V ∿ or 30 V ⎓ ■ On inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 V ∿ or 30 V ⎓ Max. response time: 7 ms ±0.5 ms Electrical service life: 100,000 operations
	RY, RC		1 relay logic output, one “N/O” contact Minimum switching capacity: 3 mA for 24 V ⎓ Maximum switching capacity: ■ On resistive load (cos φ = 1): 5 A for 250 V ∿ or 30 V ⎓ ■ On inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 V ∿ or 30 V ⎓ Max. response time: 7 ms ±0.5 ms Electrical service life: 100,000 operations
Logic inputs	F, R, RES		3 programmable logic inputs, 24 V ⎓ , compatible with level 1 PLC, IEC 65A-68 standard Impedance: 3.5 kΩ Maximum voltage: 30 V Max. sampling time: 2 ms ±0.5 ms Multiple assignment makes it possible to configure several functions on one input
	Positive logic (Source)		State 0 if ⩽ 5 V or logic input not wired, state 1 if ⩾ 11 V
	Negative logic (Sink)		State 0 if ⩾ 16 V or logic input not wired, state 1 if ⩽ 10 V
Maximum I/O wire size and tightening torque			2.5 mm^2 (AWG 14) 0.6 Nm

2

2.2

Presentation: pages 2/36 and 2/37 | References: pages 2/48 and 2/49 | Dimensions: pages 2/58 to 2/61 | Schemes: pages 2/62 to 2/65 | Functions: pages 2/80 to 2/99

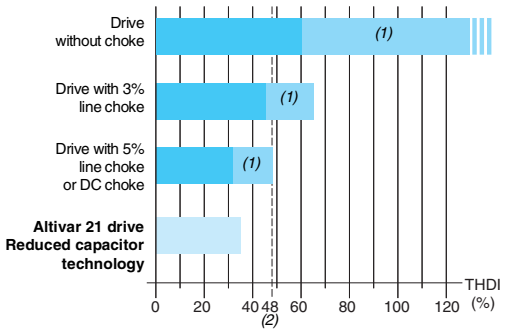
Electrical control characteristics (continued)

Acceleration and deceleration ramps			Ramp profiles: ■ Linear, can be adjusted separately from 0.01 to 3200 s ■ Automatic adaptation of acceleration and deceleration ramp times based on the load.
Braking to a standstill			By DC injection by a command on a programmable logic input. Period adjustable from 0 to 20s or continuous, current adjustable from 0 to In, frequency threshold adjustable from 0 to the maximum frequency.
Main drive protection and safety features			Thermal protection: ■ Against overheating ■ Of the power stage Protection against: ■ Short-circuits between motor phases ■ Input phase breaks ■ Overcurrents between output phases and earth ■ Overvoltages on the DC bus ■ A break on the control circuit ■ Exceeding the limit speed Safety function for: ■ Line supply overvoltage and undervoltage ■ Input phase loss
Motor protection (see page 2/95)			Thermal protection integrated in drive via continuous calculation of I^2t taking speed into account: ■ Memorization of the motor thermal state ■ Function can be modified via operator dialogue terminals, depending on the type of motor (force-cooled or self-cooled) Protection against motor phase breaks Protection with PTC probes
Dielectric strength	ATV 21H●●●M3X		Between earth and power terminals: 2830 V ⎓ Between control and power terminals: 4230 V ⎓
	ATV 21●●●●N4 ATV 21W●●●N4C		Between earth and power terminals: 3535 V ⎓ Between control and power terminals: 5092 V ⎓
Insulation resistance to earth			> 1 MΩ (electrical isolation) 500 V ⎓ for 1 minute
Frequency resolution	Display units	**Hz**	0.1
	Analog inputs	**Hz**	0.024/50 Hz (11 bits)

Communication port characteristics

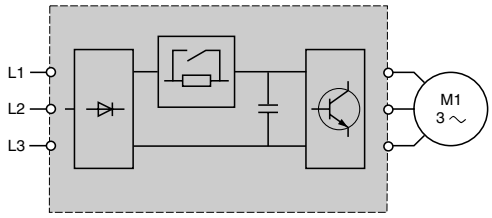
Protocol			Modbus
Structure	Connector		1 RJ45 connector
	Physical interface		2-wire RS 485
	Transmission mode		RTU
	Transmission speed		Configurable via the display terminal: 9600 bps or 19200 bps
	Format		Configurable via the terminal: - 8 bits, odd parity, 1 stop - 8 bits, even parity, 1 stop - 8 bits, no parity, 1 stop
	Polarization		No polarization impedances These should be provided by the wiring system (for example, in the master)
	Address		1 to 247, configurable via the display terminal
Services	Messaging		Read Holding Registers (03) 2 words maximum Write Single Register (06) Write Multiple Registers (16) 2 words maximum Read Device Identification (43)
	Communication monitoring		Can be inhibited. “Time out”, which can be set between 0.1 s and 100 s

Variable speed drives for asynchronous motors
Altivar 21
Reduction of current harmonics



THDI: Total current harmonic distortion
(1) Typical use
(2) Maximum THDI conforming to standard IEC/EN 61000-3-12

THDI based on the technologies used



Altivar 21

Reduced capacitor technology

Presentation

The traditional solutions for reducing current harmonics are as follows:
- Line chokes
- DC chokes

These solutions typically reduce the THDI *(1)* to a level less than 48% *(2)*. If a choke is not added, the THDI is generally between 60 and 130% (see diagram opposite).

Depending on their type, these external or internal chokes are most often offered as an option and have the following disadvantages:
- Increased cost
- Increased installation time
- Increased overall size
- Increased drive losses with a DC choke

In order to overcome these disadvantages, the Altivar 21 drive integrates new technology: **reduced capacitor technology**.

This integrated technology makes it possible to obtain a THDI *(1)* less than 35% without having to add a choke, offering the following advantages:
- Optimized technology through the reduction of current harmonics by decreasing the filter capacitors
- Greater reduction of current harmonics compared with traditional solutions, line chokes and DC chokes
- Quick setup
- Reduced costs

Example of current harmonic levels for ATV 21H●●●M3X drives *(3)*

Motor power		For ATV 21 drives	Line supply		Current harmonic levels																	THD *(4)*
			Line current	Line Isc	H1	H5	H7	H11	H13	H17	H19	H23	H25	H29	H31	H35	H37	H41	H43	H47	H49	
kW	*HP*		A	kA	A	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Three-phase supply voltage: 230 V 50 Hz																						
0.75	*1*	H075M3X	2.83	5	2.7	17.8	17.9	8.9	9.6	5.8	6.6	4.3	5.1	3.4	4.2	2.8	3.6	2.3	3.2	2	2.9	31.3
1.5	*2*	HU15M3X	5.29	5	5.03	17.7	18.2	8.7	9.8	5.7	6.9	4.1	5.4	3.3	4.5	2.7	4	2.4	3.7	2.3	3.7	31.6
2.2	*3*	HU22M3X	7.56	5	7.2	17.1	18	8.5	9.6	5.5	6.7	4	5.2	3.1	4.3	2.5	3.7	2.1	3.4	2	3.3	30.7
3	–	HU30M3X	10.31	5	9.68	17.6	18.6	8.5	10	5.4	7.3	4	5.9	3.4	5.3	3.9	5.8	9.3	12.2	7.8	1	32.4
4	*5*	HU40M3X	13.45	5	12.73	16.9	18.3	8.2	9.9	5.2	6.9	3.7	5.4	3	4.7	3.2	4.7	7.4	10	6.1	0.8	31.1
5.5	*7.5*	HU55M3X	18.09	22	17.27	17.1	17.8	8.7	9.5	5.7	6.5	4.1	5	3.2	4.1	2.6	3.5	2.2	3.1	1.9	2.8	30.7
7.5	*10*	HU75M3X	24.36	22	23.22	17.1	18	8.6	9.6	5.6	6.7	4.1	5.2	3.2	4.3	2.6	3.7	2.3	3.3	2.1	3.2	30.8
11	*15*	HD11M3X	35.7	22	33.4	18	19	8.6	10	5.6	7.9	4.3	6.9	4.3	7.2	7.1	11.3	11.3	4.3	3.8	0.6	35.5
15	*20*	HD15M3X	47.6	22	44.92	16.9	18.6	8.1	10	5.1	7.5	3.7	6.3	3.3	6.2	5.3	9.9	9.9	3	2.9	0.8	33.3
18.5	*25*	HD18M3X	57.98	22	54.96	16.5	18.4	7.9	10	4.9	7.1	3.4	5.8	2.7	5.5	4	8.9	9	3	2.3	1.4	32
22	*30*	HD22M3X	69.01	22	65.08	16.3	18.8	7.6	10	4.6	7.8	3.2	7.1	3.8	11.2	12.2	4.9	2.7	1.8	1.5	1.3	35
30	*40*	HD30M3X	93.03	22	88.51	16	18.3	7.5	9.9	4.4	6.9	2.9	5.8	2.9	8.3	8.9	4.8	1.9	2.3	1.1	1.6	32.1

(1) Total current harmonic distortion.
(2) Maximum total conforming to standard IEC/EN 61000-3-12.
(3) Example of current harmonic levels up to harmonic order 49 for a 230 V 50 Hz supply with reduced capacitor technology.
(4) Total harmonic distortion conforming to standard IEC/EN 61000-3-12.

Presentation: pages 2/36 and 2/37
Characteristics: pages 2/38 to 2/43
References: pages 2/48 and 2/49
Schemes: pages 2/62 to 2/65

Variable speed drives for asynchronous motors

Altivar 21

Reduction of current harmonics

Example of current harmonic levels for ATV 21H●●●N4 drives *(1)*

Motor power		For ATV 21 drives	Line supply		Current harmonic levels																	THD
			Line current	Line Isc	H1	H5	H7	H11	H13	H17	H19	H23	H25	H29	H31	H35	H37	H41	H43	H47	H49	*(2)*
kW	*HP*		A	kA	A	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Three-phase supply voltage: 400 V 50 Hz																						
0.75	*1*	H075N4	1.64	5	1.55	19.2	18.3	9.4	9.9	6.1	6.8	4.5	5.3	3.6	4.4	3	3.8	2.6	3.4	2.3	3.1	32.8
1.5	*2*	HU15N4	3.03	5	2.89	17.5	17.8	8.8	9.5	5.8	6.5	4.3	5	3.4	4.1	2.8	3.5	2.3	3	2	2.7	30.9
2.2	*3*	HU22N4	4.33	5	4.14	17.2	17.7	8.7	9.4	5.7	6.4	4.2	4.9	3.3	4	2.7	3.3	2.2	2.9	1.9	2.6	30.5
3	–	HU30N4	5.83	5	5.56	17.4	18.1	8.6	9.7	5.6	6.8	4.1	5.3	3.2	4.4	2.6	3.8	2.3	3.5	2.1	3.4	31.2
4	*5*	HU40N4	7.66	5	7.3	17	17.9	8.5	9.6	5.5	6.6	4	5.1	3.1	4.2	2.5	3.6	2.1	3.3	1.9	3.1	30.6
5.5	*7.5*	HU55N4	10.4	22	9.93	17.2	17.6	8.8	9.3	5.8	6.3	4.3	4.8	3.4	3.9	2.8	3.3	2.3	2.8	2	2.5	30.5
7.5	*10*	HU75N4	13.98	22	13.34	17.3	17.9	8.7	9.5	5.7	6.5	4.2	5	3.3	4.1	2.7	3.5	2.3	3.1	2	2.8	30.9
11	*15*	HD11N4	20.13	22	19.23	17	17.7	8.7	9.4	5.7	6.4	4.2	4.9	3.2	4	2.6	3.3	2.2	2.9	1.9	2.6	30.4
15	*20*	HD15N4	27.14	22	25.83	17.1	18.1	8.5	9.7	5.5	6.8	4	5.3	3.1	4.4	2.6	3.9	2.3	3.6	2.4	3.6	30.9
18.5	*25*	HD18N4	33.17	22	31.61	16.8	18	8.4	9.6	5.5	6.7	3.9	5.1	3	4.2	2.5	3.7	2.2	3.4	2.2	3.4	30.5
22	*30*	HD22N4	39.38	22	37.45	16.8	18.1	8.3	9.8	5.3	6.8	3.8	5.3	2.9	4.5	2.5	4.1	2.6	4.2	4.2	5.7	30.7
30	*40*	HD30N4	53.18	22	50.7	16.6	17.9	8.2	9.6	5.2	6.5	3.7	5	2.8	4	2.2	3.5	2.1	3.4	3.3	5.3	30
37	*50*	HD37N4	65.57	22	62.24	16.5	18.1	8.1	9.7	5.1	6.6	3.6	5.1	2.8	4.2	3	4.2	8.5	9.5	4.2	0.9	30.3
45	*60*	HD45N4	79.97	22	76.14	16.3	18.1	8.1	9.7	5.1	6.6	3.6	5.1	2.8	4.3	2.9	4.3	7.5	6.9	3.5	0.5	30.2
55	*75*	HD55N4	99.3	22	94.36	16	18.9	7.8	10	5.2	8.1	5	7.7	8.7	4.8	4	0.2	1.9	0.9	1.2	0.9	32.7
75	*100*	HD75N4	137.3	22	131.07	15.4	18.9	7.5	10	4.9	7.6	4.4	6.7	7.3	3	3.1	0.6	1.5	0.9	0.9	0.8	31.1

Example of current harmonic levels for ATV 21W●●●N4 and W●●●N4C drives *(1)*

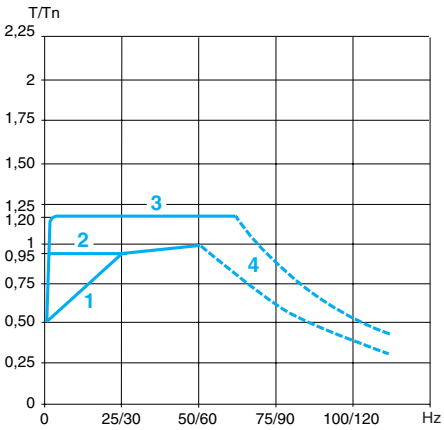
Three-phase supply voltage: 400 V 50 Hz

Motor power		For ATV 21 drives	Line supply		Current harmonic levels																	THD
			Line current	Line Isc	H1	H5	H7	H11	H13	H17	H19	H23	H25	H29	H31	H35	H37	H41	H43	H47	H49	*(2)*
kW	*HP*		A	kA	A	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
0.75	*1*	W075N4 W075N4C	1.64	5	1.55	19.2	18.3	9.4	9.9	6.1	6.8	4.5	5.3	3.6	4.4	3.0	3.8	2.6	3.4	2.3	3.1	32.8
1.5	*2*	WU15N4 WU15N4C	3.03	5	2.89	17.5	17.8	8.8	9.5	5.8	6.5	4.3	5.0	3.4	4.1	2.8	3.5	2.3	3.0	2.0	2.7	30.9
2.2	*3*	WU22N4 WU22N4C	4.33	5	4.14	17.2	17.7	8.7	9.4	5.7	6.4	4.2	4.9	3.3	4.0	2.7	3.3	2.2	2.9	1.9	2.6	30.5
3	–	WU30N4 WU30N4C	5.83	5	5.56	17.4	18.1	8.6	9.7	5.6	6.8	4.1	5.3	3.2	4.4	2.6	3.8	2.3	3.5	2.1	3.4	31.2
4	*5*	WU40N4 WU40N4C	7.66	5	7.30	17.0	17.9	8.5	9.6	5.5	6.6	4.0	5.1	3.1	4.2	2.5	3.6	2.1	3.3	1.9	3.1	30.6
5.5	*7.5*	WU55N4 WU55N4C	10.40	22	9.93	17.2	17.6	8.8	9.3	5.8	6.3	4.3	4.8	3.4	3.9	2.8	3.3	2.3	2.8	2.0	2.5	30.5
7.5	*10*	WU75N4 WU75N4C	13.98	22	13.34	17.3	17.9	8.7	9.5	5.7	6.5	4.2	5.0	3.3	4.1	2.7	3.5	2.3	3.1	2.0	2.8	30.9
11	*15*	WD11N4 WD11N4C	20.17	22	19.23	17.2	18.0	8.6	9.6	5.6	6.7	4.1	5.2	3.2	4.3	2.6	3.7	2.3	3.3	2.1	3.1	30.9
15	*20*	WD15N4 WD15N4C	27.07	22	25.85	16.9	17.8	8.5	9.5	5.6	6.5	4.0	5.0	3.1	4.1	2.5	3.5	2.1	3.1	1.9	2.8	30.4
18.5	*25*	WD18N4 WD18N4C	33.22	22	31.62	16.9	18.0	8.4	9.7	5.4	6.7	3.9	5.2	3.0	4.4	2.5	3.8	2.3	3.6	2.6	3.8	30.7
22	*30*	WD22N4 WD22N4C	39.38	22	37.45	16.8	18.1	8.3	9.8	5.3	6.8	3.8	5.3	2.9	4.5	2.5	4.1	2.6	4.2	4.2	5.7	30.7
30	*40*	WD30N4 WD30N4C	53.18	22	50.70	16.6	17.9	8.2	9.6	5.2	6.5	3.7	5.0	2.8	4.0	2.2	3.5	2.1	3.4	3.3	5.3	30.0
37	*50*	WD37N4 WD37N4C	65.57	22	62.24	16.5	18.1	8.1	9.7	5.1	6.6	3.6	5.1	2.8	4.2	3.0	4.2	8.5	9.5	4.2	0.9	30.3
45	*60*	WD45N4 WD45N4C	79.97	22	76.14	16.3	18.1	8.1	9.7	5.1	6.6	3.6	5.1	2.8	4.3	2.9	4.3	7.5	6.9	3.5	0.5	30.2
55	*75*	WD55N4 WD55N4C	99.30	22	94.36	16.0	18.9	7.8	10.0	5.2	8.1	5.0	7.7	8.7	4.8	4.0	0.2	1.9	0.9	1.2	0.9	32.7
75	*100*	WD75N4 WD75N4C	137.30	22	131.07	15.4	18.9	7.5	10.0	4.9	7.6	4.4	6.7	7.3	3.0	3.1	0.6	1.5	0.9	0.9	0.8	31.1

(1) Example of current harmonic levels up to harmonic order 49 for a 400 V 50 Hz supply with reduced capacitor technology.
(2) Total harmonic distortion conforming to standard IEC/EN 61000-3-12.

Presentation: pages 2/36 and 2/37
Characteristics: pages 2/38 to 2/43
References: pages 2/48 and 2/49
Schemes: pages 2/62 to 2/65

Variable speed drives for asynchronous motors
Altivar 21



Open loop applications

Torque characteristics (typical curves)

The curves below define the available continuous torque and transient overtorque for both force-cooled and self-cooled motors. The only difference is in the ability of the motor to provide a high continuous torque at less than half the nominal speed.

Open loop applications

1 Self-cooled motor: continuous useful torque *(1)*
2 Force-cooled motor: continuous useful torque
3 Overtorque for 60 seconds maximum
4 Torque in overspeed at constant power *(2)*

Motor thermal protection

Altivar 21 drives feature thermal protection designed specifically for self-cooled or forced-cooled variable speed motors.

This motor thermal protection is designed for a maximum ambient temperature of 40°C around the motor. If the temperature around the motor exceeds 40°C, thermal protection should be provided directly by thermistor probes (PTC) integrated in the motor. The probes are managed directly by the drive.

(1) For power ratings ⩽ 250 W, motor derating is 20% instead of 50% at very low frequencies.
(2) The motor nominal frequency and the maximum output frequency can be adjusted from 10 to 200 Hz.
Check the mechanical overspeed characteristics of the selected motor with the manufacturer.

Presentation: pages 2/36 and 2/37
References: pages 2/48 and 2/49
Dimensions: pages 2/58 to 2/61
Schemes: pages 2/62 to 2/65
Functions: pages 2/80 to 2/99

Variable speed drives for asynchronous motors
Altivar 21

Special uses

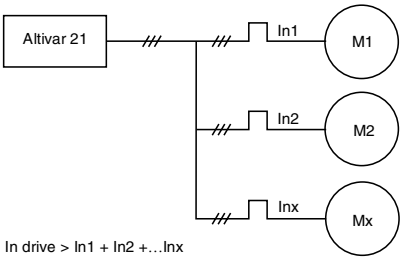
Using Altivar 21 drives with synchronous motors

Altivar 21 drives are also suitable for powering synchronous motors (sinusoidal electromotive force) in open loop mode and are used to achieve performance levels comparable to those associated with an asynchronous motor in sensorless flux vector control.
This drive/motor combination makes it possible to obtain remarkable speed accuracy and maximum torque even at zero speed. The design and construction of synchronous motors are such that they offer enhanced power density and high-speed performance in a compact unit. Drive control for synchronous motors does not cause stalling.

Connecting motors in parallel

One of the following motor control ratios must be used in order to connect motors in parallel:
- Quadratic voltage/frequency ratio
- Constant voltage/frequency ratio
- Constant voltage/frequency ratio with automatic IR compensation

The nominal current of the drive must be greater than or equal to the sum of the currents of the motors to be controlled.
In this case, provide external thermal protection for each motor using probe or thermal overload relays. For cable runs over a certain length, taking account of all the tap links, it is advisable either to install an output filter between the drive and the motors.



In drive > In1 + In2 +...Inx

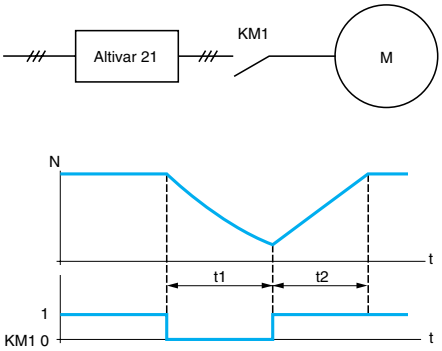
Connecting motors in parallel

If several motors are used in parallel, there are two possible scenarios:
- The motors have equal power ratings, in which case the torque characteristics will remain optimized after the drive has been configured
- The motors have different power ratings, in which case the torque characteristics will not be optimized for all the motors

Switching the motor at the drive output

The drive can be switched when locked or unlocked. If the drive is switched on-the-fly (drive unlocked), the motor is controlled and accelerates until it reaches the reference speed smoothly following the acceleration ramp. This use requires configuration of the automatic catching a spinning load ("catch on the fly") and the motor phase loss on output cut functions.

Typical applications:
- Loss of safety circuit at drive output
- Bypass function
- Switching of motors connected in parallel



KM1: Output contactor
t1: Deceleration without ramp (freewheel)
t2: Acceleration with ramp
N: Speed

Example of loss of output contactor

Test on a low power motor or without a motor

In a testing or maintenance environment the drive can be checked without having to switch to a motor with the same rating as the drive (particularly useful in the case of high power drives). This use requires deactivation of motor phase loss function.

Variable speed drives for asynchronous motors

Altivar 21

UL Type 1/IP 20 drives

PF106478-14-M

ATV 21H075M3X

PF106481-24-M

ATV 21HU75N4

PF106482-32-M

ATV 21HD75N4

UL Type 1/IP 20 drives without EMC filter

Motor		Line supply				Altivar 21			
Power indicated on plate *(1)*		Line current *(2)*		Apparent power	Maximum prospective line Isc	Max. continuous current *(1)*	Max. transient current for 60 s	Reference	Weight
		200 V	240 V	240 V		230 V			
kW	*HP*	A	A	kVA	kA	A	A		kg
Three phase supply voltage: 200…240 V 50/60 Hz									
0.75	*1*	3.3	2.7	1.8	5	4.6	5.1	**ATV 21H075M3X**	1.800
1.5	*2*	6.1	5.1	2.9	5	7.5	8.3	**ATV 21HU15M3X**	1.800
2.2	*3*	8.7	7.3	4.0	5	10.6	11.7	**ATV 21HU22M3X**	1.800
3	–	11.9	10.0	5.2	5	13.7	15.1	**ATV 21HU30M3X**	3.050
4	*5*	15.7	13.0	6.7	5	17.5	19.3	**ATV 21HU40M3X**	3.050
5.5	*7.5*	20.8	17.3	9.2	22	24.2	26.6	**ATV 21HU55M3X**	6.100
7.5	*10*	27.9	23.3	12.2	22	32.0	35.2	**ATV 21HU75M3X**	6.100
11	*15*	42.1	34.4	17.6	22	46.2	50.8	**ATV 21HD11M3X**	11.550
15	*20*	56.1	45.5	23.2	22	61	67.1	**ATV 21HD15M3X**	11.550
18.5	*25*	67.3	55.8	28.5	22	74.8	82.3	**ATV 21HD18M3X**	11.550
22	*30*	80.4	66.4	33.5	22	88	96.8	**ATV 21HD22M3X**	27.400
30	*40*	113.3	89.5	44.6	22	117	128.7	**ATV 21HD30M3X**	38.650

IP 20/UL Type 1 drives with an integrated class A EMC filter

Motor		Line supply				Altivar 21			
Power indicated on plate *(1)*		Line current *(2)*		Apparent power	Maximum prospective line Isc	Max. continuous current *(1)*	Max. transient current for 60 s	Reference	Weight
		380 V	480 V	380 V		380 V/460 V			
kW	*HP*	A	A	kVA	kA	A	A		kg
Three phase supply voltage: 380…480 V 50/60 Hz									
0.75	*1*	1.7	1.4	1.6	5	2.2	2.4	**ATV 21H075N4**	2.000
1.5	*2*	3.2	2.5	2.8	5	3.7	4	**ATV 21HU15N4**	2.000
2.2	*3*	4.6	3.6	3.9	5	5.1	5.6	**ATV 21HU22N4**	2.000
3	–	6.2	4.9	5.5	5	7.2	7.9	**ATV 21HU30N4**	3.350
4	*5*	8.1	6.4	6.9	5	9.1	10	**ATV 21HU40N4**	3.350
5.5	*7.5*	10.9	8.6	9.1	22	12	13.2	**ATV 21HU55N4**	3.350
7.5	*10*	14.7	11.7	12.2	22	16	17.6	**ATV 21HU75N4**	6.450
11	*15*	21.1	16.8	17.1	22	22.5	24.8	**ATV 21HD11N4**	6.450
15	*20*	28.5	22.8	23.2	22	30.5	33.6	**ATV 21HD15N4**	11.650
18.5	*25*	34.8	27.8	28.2	22	37	40.7	**ATV 21HD18N4**	11.650
22	*30*	41.6	33.1	33.2	22	43.5	47.9	**ATV 21HD22N4**	26.400
30	*40*	56.7	44.7	44.6	22	58.5	64.4	**ATV 21HD30N4**	26.400
37	*50*	68.9	54.4	52	22	79	86.9	**ATV 21HD37N4**	38.100
45	*60*	83.8	65.9	61.9	22	94	103.4	**ATV 21HD45N4**	38.100
55	*75*	102.7	89	76.3	22	116	127.6	**ATV 21HD55N4**	55.400
75	*100*	141.8	111.3	105.3	22	160	176	**ATV 21HD75N4**	55.400

(1) These values are given for a nominal frequency switching of 12 kHz up to ATV 21HD15M3X and up to ATV 21HD15N4 or 8 kHz for ATV 21HD18M3X…HD30M3X and ATV 21HD18N4...HD75N4 drives for use in continuous operation.
The switching frequency is adjustable from 6…16 kHz for all ratings.
Above 8 or 12 kHz, depending on the rating, the drive reduces the switching frequency itself in the event of an excessive temperature rise. For continuous operation above the nominal switching frequency, derate the nominal drive current (see derating curves on pages 2/71 to 2/75).

(2) Typical value for the indicated motor power and for the maximum prospective line Isc.

Presentation: pages 2/36 and 2/37 | Characteristics: pages 2/38 to 2/43 | Dimensions: pages 2/58 and 2/59 | Schemes: pages 2/62 to 2/65 | Functions: pages 2/80 to 2/99

Variable speed drives for asynchronous motors

Altivar 21

IP 54 drives

PF106476-26-M

ATV 21W075N4

IP 54 drives with an integrated class A EMC filter

Motor		Line supply				Altivar 21			
Power indicated on plate (1)		Line current (2)		Apparent power	Maximum prospective line Isc	Max. continuous current (1)	Max. transient current for 60 s	Reference	Weight
		380 V	480 V	380 V		380 V/460 V			
kW	HP	A	A	kVA	kA	A	A		kg
Three phase supply voltage: 380…480 V 50/60 Hz									
0.75	1	1.7	1.4	1.6	5	2.2	2.4	**ATV 21W075N4**	7.000
1.5	2	3.2	2.5	2.8	5	3.7	4	**ATV 21WU15N4**	7.000
2.2	3	4.6	3.6	3.9	5	5.1	5.6	**ATV 21WU22N4**	7.000
3	–	6.2	4.9	5.5	5	7.2	7.9	**ATV 21WU30N4**	9.650
4	5	8.1	6.4	6.9	5	9.1	10	**ATV 21WU40N4**	9.650
5.5	7.5	10.9	8.6	9.1	22	12	13.2	**ATV 21WU55N4**	9.650
7.5	10	14.7	11.7	12.2	22	16	17.6	**ATV 21WU75N4**	10.950
11	15	21.2	16.9	17.1	22	22.5	24.8	**ATV 21WD11N4**	30.300
15	20	28.4	22.6	23.2	22	30.5	33.6	**ATV 21WD15N4**	30.300
18.5	25	34.9	27.8	28.2	22	37	40.7	**ATV 21WD18N4**	37.400
22	30	41.6	33.1	33.2	22	43.5	47.9	**ATV 21WD22N4**	49.500
30	40	56.7	44.7	44.6	22	58.5	64.4	**ATV 21WD30N4**	49.500
37	50	68.9	54.4	52	22	79	86.9	**ATV 21WD37N4**	57.400
45	60	83.8	65.9	61.9	22	94	103.4	**ATV 21WD45N4**	57.400
55	75	102.7	89	76.3	22	116	127.6	**ATV 21WD55N4**	61.900
75	100	141.8	111.3	105.3	22	160	176	**ATV 21WD75N4**	61.900

PF106483-32-M

ATV 21WD18N4C

IP 54 drives with an integrated class B EMC filter

Motor		Line supply				Altivar 21			
Power indicated on plate (1)		Line current (2)		Apparent power	Maximum prospective line Isc	Max. continuous current (1)	Max. transient current for 60 s	Reference	Weight
		380 V	480 V	380 V		380 V/460 V			
kW	HP	A	A	kVA	kA	A	A		kg
Three phase supply voltage: 380…480 V 50/60 Hz									
0.75	1	1.7	1.4	1.6	5	2.2	2.4	**ATV 21W075N4C**	7.500
1.5	2	3.2	2.6	2.8	5	3.7	4	**ATV 21WU15N4C**	7.500
2.2	3	4.6	3.7	3.9	5	5.1	5.6	**ATV 21WU22N4C**	7.500
3	–	6.2	5	5.5	5	7.2	7.9	**ATV 21WU30N4C**	10.550
4	5	8.2	6.5	6.9	5	9.1	10	**ATV 21WU40N4C**	10.550
5.5	7.5	11	8.7	9.1	22	12	13.2	**ATV 21WU55N4C**	10.550
7.5	10	14.7	11.7	12.2	22	16	17.6	**ATV 21WU75N4C**	11.850
11	15	21.1	16.7	17.1	22	22.5	24.8	**ATV 21WD11N4C**	36.500
15	20	28.4	22.8	23.2	22	30.5	33.6	**ATV 21WD15N4C**	36.500
18.5	25	34.5	27.6	23.2	22	37	40.7	**ATV 21WD18N4C**	45.000
22	30	41.1	33.1	33.2	22	43.5	47.9	**ATV 21WD22N4C**	58.500
30	40	58.2	44.4	44.6	22	58.5	64.4	**ATV 21WD30N4C**	58.500
37	50	68.9	54.4	52	22	79	86.9	**ATV 21WD37N4C**	77.400
45	60	83.8	65.9	61.9	22	94	103.4	**ATV 21WD45N4C**	77.400
55	75	102.7	89	76.3	22	116	127.6	**ATV 21WD55N4C**	88.400
75	100	141.8	111.3	105.3	22	160	176	**ATV 21WD75N4C**	88.400

(1) These values are given for a nominal frequency switching of 12 kHz up to ATV 21WD15N4 and up to ATV 21WD15N4C or 8 kHz for ATV 21WD18N4…WD75N4 and ATV 21WD18N4C...WD75N4C drives for use in continuous operation.
The switching frequency is adjustable from 6…16 kHz for all ratings.
Above 8 or 12 kHz, depending on the rating, the drive reduces the switching frequency itself in the event of an excessive temperature rise. For continuous operation above the nominal switching frequency, derate the nominal drive current (see derating curves on pages 2/76 to 2/77).
(2) Typical value for the indicated motor power and for the maximum prospective line Isc.

2

2.2

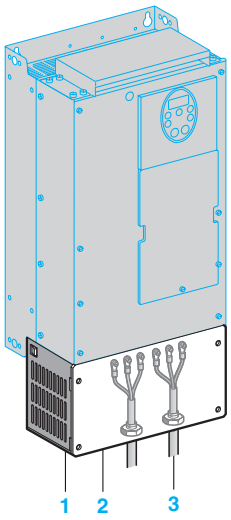
Presentation: pages 2/36 and 2/37
Characteristics: pages 2/38 to 2/43
Dimensions: page 2/60
Schemes: pages 2/62 to 2/65
Functions: pages 2/80 to 2/99

Variable speed drives for asynchronous motors

Altivar 21

Option: dialogue accessories

DF536067



UL Type 1 conformity kit

Kit for UL Type 1 conformity (mounting outside the enclosure)

When the drive is mounted directly on a wall outside the enclosure, this kit can be used to ensure UL Type 1 conformity when connecting the cables with a tube.
The shielding is connected inside the kit.

The kit consists of:
- All the mechanical parts 1 including a pre-cut plate 2 for connecting the tubes 3
- Fixing accessories
- A manual

References

For drives	Reference	Weight kg
ATV 21H075M3X...HU22M3X ATV 21H075N4...HU22N4	**VW3 A31 814**	0.500
ATV 21HU30M3X, HU40M3X ATV 21HU30N4...HU55N4	**VW3 A31 815**	0.500
ATV 21HU55M3X, HU75M3X ATV 21HU75N4, HD11N4	**VW3 A31 816**	0.900
ATV 21HD11M3X...HD18M3X ATV 21HD15N4, HD18N4	**VW3 A31 817**	1.200
ATV 21HD22M3X ATV 21HD22N4, HD30N4	**VW3 A9 206**	4.000
ATV 21HD37N4, HD45N4	**VW3 A9 207**	5.000
ATV 21HD30M3X ATV 21HD55N4, HD75N4	**VW3 A9 208**	7.000

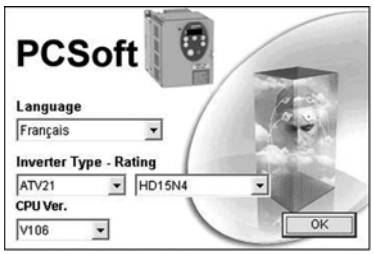
Kit for mounting on ⊔ rail

This kit allows easy installation of the ATV 21H075M3X...HU22M3X and ATV 21H075N4...HU22N4 drives by mounting them directly on a 35 mm wide ⊔ rail.

Reference

For drives	Reference	Weight kg
ATV 21H075M3X...HU22M3X ATV 21H075N4...HU22N4	**VW3 A31 852**	0.350

DF536065



PCSoft software workshop

PCSoft software workshop

This PC software workshop is a user-friendly tool for setting up Altivar 21 drives.

It includes different functions such as:
- Configuration preparation
- Setup
- Maintenance

It can be downloaded free of charge from the Internet at “www.telemecanique.com”.
It operates in the following PC environments and configurations:
- Microsoft Windows® 98, Microsoft Windows® 2000, Microsoft Windows® XP
- Pentium® 233 MHz or higher, hard disk with 10 MB available, 32 MB RAM
- 256 colour, 640 x 480 pixels or higher definition monitor

Connection

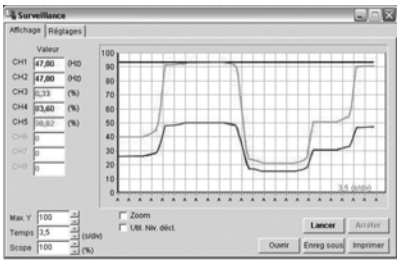
The PCSoft software workshop must be connected directly to the Modbus port on the drive using the PC serial port connection kit.

Note: *It is not possible to use the PCSoft software workshop and a communication option card simultaneously. To be able to use the PCSoft software workshop when the drive is equipped with a communication card, the network or communication bus must be deactivated.*

Reference

Description	Composition	Reference	Weight kg
PC serial port connection kit 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	**VW3 A8 106**	0.350

DF536066

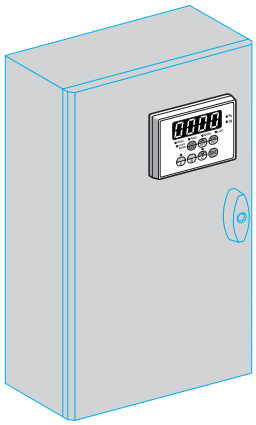


PCSoft software workshop “Monitoring” function

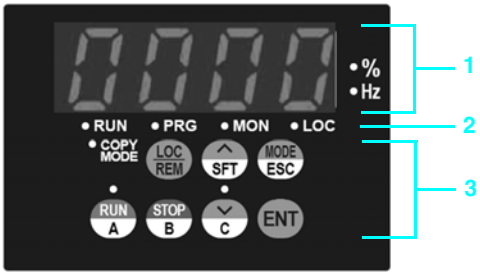
Dimensions:
pages 2/60 and 2/61

Variable speed drives for asynchronous motors
Altivar 21
Option: dialogue

DF535006



Terminal on enclosure door



Front panel of the remote display terminal

Remote display terminal

The Altivar 21 drive can be connected to a remote display terminal.
The display terminal can be mounted on the door of an enclosure with IP 50 protection on the front panel. The maximum operating temperature is 40°C.

Two types of operation are available:
■ REMOTE KEYPAD MODE: This provides access to the same functions as the integrated 7-segment terminal and can be used:
□ To control, adjust and configure the drive remotely
□ For remote display
■ COPY MODE: Configurations can be stored and downloaded (three configuration files can be stored).

Depending on the operating mode selected, the following keys have different functions:
■ ∧/SFT
■ MODE/ESC
■ RUN/A
■ STOP/B
■ ∨/C

Note: *It is not possible to use the remote display terminal and a communication option card simultaneously. To be able to use the remote display terminal when the drive is equipped with a communication card, the network or communication bus must be deactivated.*

Description

1 Display:
□ Four 7-segment displays visible at 5 m
□ Display of numeric values and codes
□ The display flashes when a value is stored
□ Unit rating of displayed value
□ The display flashes to indicate a fault on the drive
2 Display of drive status:
□ RUN: Run command is active or speed reference present
□ PRG: Drive in automatic mode
□ MON: Drive in monitoring mode
□ LOC: Drive in local mode
□ COPY MODE: COPY MODE selected
3 Use of keys:
□ LOC/REM: Switching of the drive command, locally or remotely
As a “local” command, the speed reference can be modified using the ∧ and ∨ keys; the LED located between these keys lights up.
□ ∧/SFT, depending on the operating mode selected:
- Vertical navigation in the menu or editing of values
- Access to functions for managing parameters (copy, comparison, protection) or to display terminal memories
□ MODE/ESC, depending on the operating mode selected:
- To adjust and program drive parameters, access to monitoring mode
- To abort a value or parameter to return to the previous state
□ RUN/A, depending on the operating mode selected:
- Local motor run command; LED indicates that the RUN key is active
- Copy terminal memory “A”
□ STOP/B, depending on the operating mode selected:
- Local control of motor stopping/drive fault clearing
- Copy terminal memory “B”
□ ∨/C, depending on the operating mode selected:
- Vertical navigation in the menu or editing of values
- Copy terminal memory “C”
□ ENT: Saves the current value or the selected function

Reference

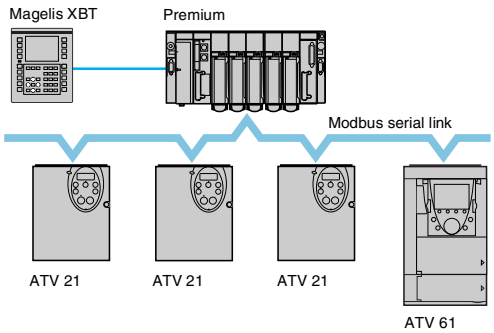
Description	Reference	Weight kg
Remote display terminal Supplied with: ■ 1 x 3.6 m cable with 2 RJ45 connectors ■ Seal and screws for IP 50 mounting on an enclosure door	**VW3 A21 101**	0.250

Dimensions:
page 2/61

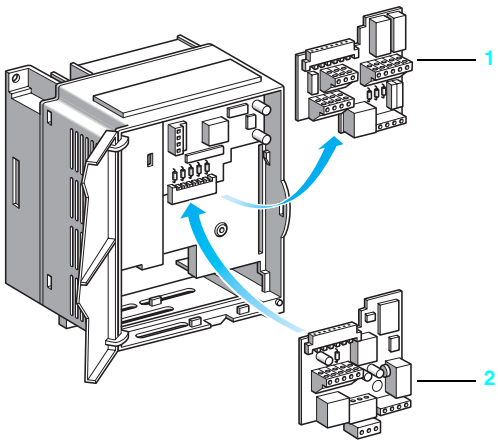
Variable speed drives for asynchronous motors

Altivar 21

Communication buses and networks



Example of configuration on the Modbus serial link



DF535010

Presentation

The Altivar 21 drive is designed to suit the configurations found in communicating installations created for buildings.

It includes the Modbus communication protocol as standard *(1)*.

The RJ45 Modbus port is located on the drive's control terminals. It is assigned to control and signaling by a PLC or by another type of controller.
It is also used to connect:
- The remote terminal
- A Magelis industrial HMI terminal

By substituting the I/O terminals 1 with one of the 4 communication cards 2 available as an option, the Altivar 21 drive can also be connected to other networks and communication buses in operation in the building (HVAC) *(2)*.
Each communication card contains I/O terminals.

Communication cards for building applications (HVAC):
- LonWorks
- METASYS N2
- APOGEE FLN
- BACnet

Note: *Connection to a network or communication bus via one of the four communication cards is incompatible with the use of the PCSoft software workshop or the remote display terminal. To be able to use the PCSoft software workshop or the remote display terminal, the network or communication bus must be deactivated. See pages 2/50 and 2/51.*

(1) Modbus communication protocol characteristics (see page 2/43)
(2) Heating Ventilation & Air Conditioning

Functions: page 2/53
Characteristics: pages 2/43 and 2/54
References: page 2/55

Variable speed drives for asynchronous motors
Altivar 21
Communication buses and networks

Functions

All the drive functions can be accessed via the network:
- Control
- Monitoring
- Adjustment
- Configuration

The speed command and reference may come from different control sources:
- I/O terminals
- Communication network
- Remote display terminal

The advanced functions of the Altivar 21 drive can be used to manage switching of these drive control sources according to the application requirements.

Communication is monitored according to criteria specific to each protocol.
The response of the drive in the event of a communication fault can be configured:
- Freewheel stop, stop on ramp or braked stop
- Maintain the last command received
- Ignore the fault

Presentation: page 2/52
Characteristics: pages 2/43 and 2/54
References: page 2/55

2

2.2

Characteristics of the VW3 A21 312 LONWORKS card

Structure	Connector	1 removable 3-way screw terminal
	Topology	TP/FT-10 (free topology)
	Transmission speed	78 kbps
Services	Functional profiles	LONMARK 6010: Variable Speed Motor Drive LONMARK 0000: Node Object
Diagnostics	Using LEDs	1 LED on the card: Service
	Using the graphic display terminal	Control word received Reference received
Description file		An xif file is supplied on the documentation CD-ROM or can be downloaded from the Internet at “www.telemecanique.com”.

Characteristics of the VW3 A21 313 METASYS N2 card

Structure	Connector	1 removable 4-way screw terminal
Diagnostics	Using LEDs	1 LED on the card: “COM” (network traffic)
	Using the graphic display terminal	Control word received Reference received

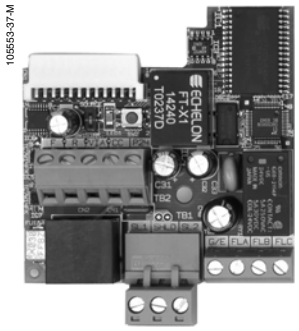
Characteristics of the VW3 A21 314 APOGEE FLN card

Structure	Connector	1 removable 4-way screw terminal
Diagnostics	Using LEDs	1 LED on the card: “COM” (network traffic)
	Using the graphic display terminal	Control word received Reference received

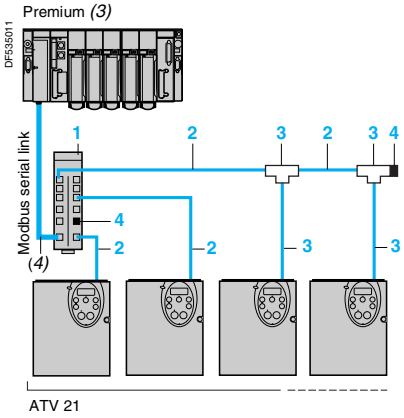
Characteristics of the VW3 A21 315 BACnet card

Structure	Connector	1 removable 4-way screw terminal
Diagnostics	Using LEDs	1 LED on the card: “COM” (network traffic)
	Using the graphic display terminal	Control word received Reference received

Variable speed drives for asynchronous motors
Altivar 21
Communication buses and networks



VW3 A21 312



Example of Modbus diagram, connections via splitter blocks and RJ45 connectors

Communication cards *(1) (2)*

Description	Use	Reference	Weight kg
LonWorks	The card is equipped with a removable 3-way screw terminal block	**VW3 A21 312**	0.200
METASYS N2	The card is equipped with a removable 4-way screw terminal block	**VW3 A21 313**	0.200
APOGEE FLN	The card is equipped with a removable 4-way screw terminal block	**VW3 A21 314**	0.200
BACnet	The card is equipped with a removable 4-way screw terminal block	**VW3 A21 315**	0.200

Connection accessories

Description	Item no.	Length m	Unit reference	Weight kg
Modbus serial link				
Modbus splitter block 10 RJ45 connectors and 1 screw terminal block	1	–	**LU9 GC3**	0.500
Cables for Modbus serial link equipped with 2 RJ45 connectors	2	0.3	**VW3 A8 306 R03**	0.025
		1	**VW3 A8 306 R10**	0.060
		3	**VW3 A8 306 R30**	0.130
Modbus T-junction boxes (with integrated cable)	3	0.3	**VW3 A8 306 TF03**	–
		1	**VW3 A8 306 TF10**	–
Line terminator For RJ45 connector *(5)*	4	–	**VW3 A8 306 RC**	0.010

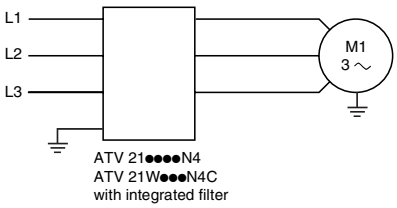
(1) The Altivar 21 drive can only take one communication card.
(2) The user manuals are supplied on CD-ROM or can be downloaded from the Internet at "www.telemecanique.com". The description file for the LonWorks communication card is also supplied on CD-ROM in xif format or can be downloaded from the Internet at "www.telemecanique.com".
(3) Please refer to the "Automation platform Modicon Premium and Unity - PL7 software" and "Automation platform Modicon TSX Micro and PL7 software" catalogues.
(4) Cable depending on the type of controller or PLC.
(5) Order in multiples of 2.

Presentation: page 2/52
Functions: page 2/53
Characteristics: pages 2/43 and 2/54

Variable speed drives for asynchronous motors

Altivar 21: EMC filters

Optional integrated filters and additional filters



ATV 21●●●●N4
ATV 21W●●●N4C
with integrated filter

Integrated EMC filters

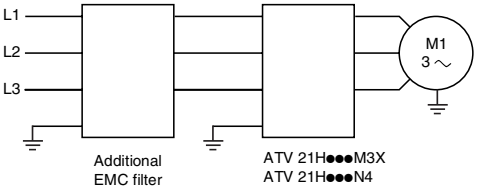
Altivar 21 drives, except for the ATV 21H●●●M3X, have built-in radio interference input filters to meet the requirements of the EMC standard for variable speed electrical power drive "products" IEC/EN 61800-3, edition 2, categories C1, C2 or C3 in environment 1 or 2 and to comply with the European directive on EMC (electromagnetic compatibility).

Drives	Maximum length of shielded cable *(1)* according to		Leakage current *(2)*
	EN 55011 class A Gr1 *(3)* IEC/EN 61800-3 *(3)*	EN 55011 class B Gr1 *(3)* IEC/EN 61800-3 *(3)*	
	m	m	mA
UL Type 1/IP 20 drives			
ATV 21H075N4…HU22N4	20	–	4.5
ATV 21HU30N4…HU55N4	5	–	5.8
ATV 21HU75N4, HD11N4	5	–	2.9
ATV 21HD15N4, HD18N4	5	–	4.8
ATV 21HD22N4, HD30N4	5	–	25.3
ATV 21HD37N4, HD45N4	20	–	21.5
ATV 21HD55N4, HD75N4	100	–	9.1
IP 54 drives			
ATV 21W075N4…WU22N4	5	–	4.5
ATV 21WU30N4…WU55N4	5	–	5.8
ATV 21WU75N4	5	–	2.9
ATV 21WD11N4, WD15N4	5	–	13.3
ATV 21WD18N4	5	–	9.4
ATV 21WD22N4, WD30N4	5	–	25.3
ATV 21WD37N4, WD45N4	20	–	21.5
ATV 21WD55N4, WD75N4	100	–	9.1
ATV 21W075N4C…WU22N4C	–	20	18,4
ATV 21WU30N4C…WU55N4C	–	20	42.8
ATV 21WU75N4C	–	20	37.2
ATV 21WD11N4C, WD15N4C	–	20	81
ATV 21WD18N4C	–	20	77.2
ATV 21WD22N4C, WD30N4C	–	20	84.5
ATV 21WD37N4C, WD45N4C	–	20	53.6
ATV 21WD55N4C, WD75N4C	–	20	56.9

Additional EMC input filters

Applications

Additional EMC input filters can be used to meet more stringent requirements and are designed to cut down conducted emissions on the line supply below the limits of standards EN 55011 group 1, class A or B and IEC/EN 61800-3 category C1, C2 or C3 (see page 2/38).
The additional EMC filters can be mounted beside or under the device. They act as a support for the drives and are attached to them via tapped holes.



Additional EMC filter

ATV 21H●●●M3X
ATV 21H●●●N4

Use according to the type of line supply

Use of these additional filters is only possible on TN (neutral connection) and TT (neutral to earth) type networks.

Standard IEC/EN 61800-3, appendix D2.1, states that on IT networks (isolated or impedance earthed neutral), filters can cause permanent insulation monitors to operate in a random manner.
In addition, the effectiveness of additional filters on this type of network depends on the type of impedance between neutral and earth, and therefore cannot be predicted.
In the case of a machine which needs to be installed on an IT network, the solution would be to insert an isolation transformer and place the machine locally on a TN or TT network.

(1) Maximum lengths for shielded cables connecting motors to drives for a switching frequency of 6 to 16 kHz. If motors are connected in parallel, it is the total length that should be taken into account.
(2) Maximum earth leakage current at 480 V 60 Hz on a TT network.
(3) See page 2/38.

Characteristics: pages 2/38 and 2/57
References: page 2/57
Dimensions: page 2/61
Schemes: page 2/63

Variable speed drives for asynchronous motors

Altivar 21: EMC filters

Option: additional input filters

General characteristics

EMC filter type			VW3 A31 404, 406…409	VW3 A4 406…408
Conformity to standards			EN 133200	
Degree of protection			IP 20 and IP 41 on upper part	
Maximum relative humidity			93% without condensation or dripping water conforming to IEC 68-2-3	
Ambient air temperature around the unit	Operation	°C	-10…+60	-10…+50
	Storage	°C	-25…+70	-40…+65
Maximum operating altitude		m	1000 without derating. 1000…3000 derating the current by 1% per additional 100 m. Limited to 2000 m for the "Corner Grounded" distribution network.	
Vibration resistance			1.5 mm peak to peak from 3…13 Hz, 1 gn peak from 13…150 Hz, in accordance with IEC 60068-2-6	
Shock resistance			15 gn for 11 ms conforming to IEC/EN 60068-2-27	
Maximum nominal voltage	50/60 Hz three-phase	V	240 +10% 480 +10%	

Connection characteristics

Maximum wire size and tightening torque	VW3 A31 404, 406		10 mm² (AWG 6) 1.8 Nm
	VW3 A31 407…409		25 mm² (AWG 2) 4.5 Nm
	VW3 A4 406, 407		50 mm² (AWG 0) 6 Nm
	VW3 A4 408		150 mm² (300 kcmil) 25 Nm

References

VW3 A31 406

For drives	Maximum length of shielded cable *(1)* according to		In *(2)*	Il *(3)*	Loss *(4)*	Reference	Weight
	EN 55011 class A Gr1 *(5)* IEC/EN 61800-3 *(5)*	EN 55011 class B Gr1 *(5)* IEC/EN 61800-3 *(5)*					
	m	m	A	mA	W		kg
Three-phase supply voltage: 200…240 V 50/60 Hz							
ATV 21H075M3X	20	20	15	6.7	0.47	**VW3 A31 404**	1.000
ATV 21HU15M3X	20	20	15	6.7	1.6	**VW3 A31 404**	1.000
ATV 21HU22M3X	20	20	15	6.7	3.3	**VW3 A31 404**	1.000
ATV 21HU30M3X	20	20	25	17.8	3.6	**VW3 A31 406**	1.650
ATV 21HU40M3X	20	20	25	17.8	6.2	**VW3 A31 406**	1.650
ATV 21HU55M3X	20	–	47	20.6	3.7	**VW3 A31 407**	3.150
ATV 21HU75M3X	20	–	47	20.6	6.8	**VW3 A31 407**	3.150
ATV 21HD11M3X	20	–	83	14.5	9.1	**VW3 A31 408**	5.300
ATV 21HD15M3X	20	–	83	14.5	16	**VW3 A31 408**	5.300
ATV 21HD18M3X	20	–	83	14.5	23.1	**VW3 A31 408**	5.300
ATV 21HD22M3X	100	–	90	40.6	27.1	**VW3 A4 406**	15.000
ATV 21HD30M3X	20	–	180	86.3	23.1	**VW3 A4 408**	40.000
Three-phase supply voltage: 380…480 V 50/60 Hz							
ATV 21H075N4	20	20	15	13.8	0.13	**VW3 A31 404**	1.000
ATV 21HU15N4	20	20	15	13.8	0.45	**VW3 A31 404**	1.000
ATV 21HU22N4	20	20	25	13.8	0.9	**VW3 A31 404**	1.000
ATV 21HU30N4	20	20	25	37	1	**VW3 A31 406**	1.650
ATV 21HU40N4	20	20	25	37	1.6	**VW3 A31 406**	1.650
ATV 21HU55N4	20	20	25	37	3	**VW3 A31 406**	1.650
ATV 21HU75N4	20	20	47	42.8	1.9	**VW3 A31 407**	3.150
ATV 21HD11N4	20	20	47	42.8	3.9	**VW3 A31 407**	3.150
ATV 21HD15N4	20	20	49	42.8	9.2	**VW3 A31 409**	4.750
ATV 21HD18N4	20	20	49	42.8	13.8	**VW3 A31 409**	4.750
ATV 21HD22N4	100	–	90	84.5	7.3	**VW3 A4 406**	15.000
ATV 21HD30N4	100	–	90	84.5	13.5	**VW3 A4 406**	15.000
ATV 21HD37N4	100	100	92	106	16	**VW3 A4 407**	17.000
ATV 21HD45N4	100	100	92	106	23	**VW3 A4 407**	17.000
ATV 21HD55N4	100	100	180	193	18	**VW3 A4 408**	40.000
ATV 21HD75N4	100	100	180	193	34	**VW3 A4 408**	40.000

(1) The filter selection tables give the maximum lengths for shielded cables connecting motors to drives for a switching frequency of 6 to 16 kHz. These limits are given as examples only as they vary depending on the stray capacitance of the motors and the cables used. If motors are connected in parallel, it is the total length that should be taken into account.

(2) Filter nominal current.

(3) Maximum earth leakage current at 230 V and at 480 V 60 Hz on a TT network.

(4) Via thermal dissipation.

(5) See page 2/38.

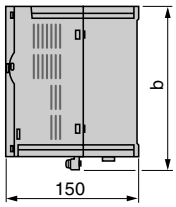
Presentation: page 2/56 Dimensions: page 2/61 Schemes: page 2/63

Variable speed drives for asynchronous motors

Altivar 21

UL Type 1/IP 20 drives

ATV 21H075M3X...HU40M3X, ATV 21H075N4...HU55N4



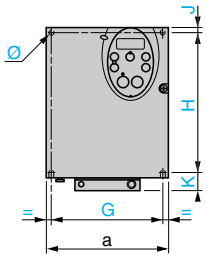
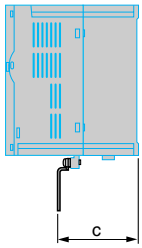
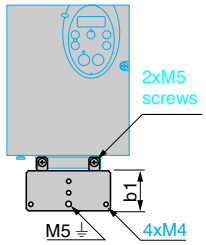


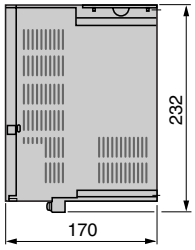
Plate for EMC mounting (supplied with the drive)





ATV 21H	a	b	b1	c	G	H	J	K	Ø
075M3X...U22M3X 075N4...U22N4	107	143	49	67.3	93	121.5	5	16.5	2xØ5
U30M3X, U40M3X U30N4...U55N4	142	184	48	88.8	126	157	6.5	20.5	4xØ5

ATV 21HU55M3X, HU75M3X, ATV 21HU75N4, HD11N4



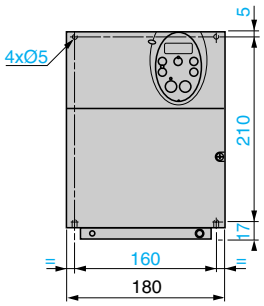
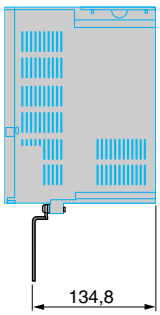
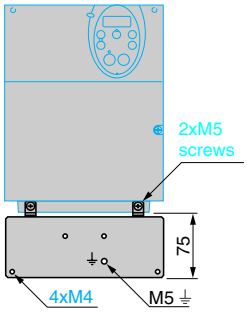
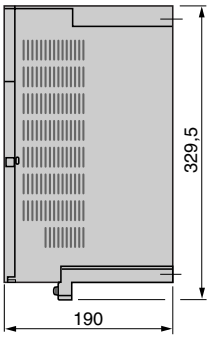


Plate for EMC mounting (supplied with the drive)





ATV 21HD11M3X...HD18M3X, ATV 21HD15N4, HD18N4



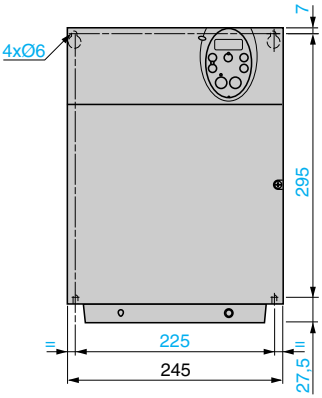
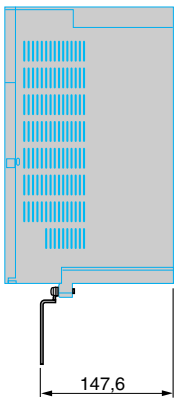
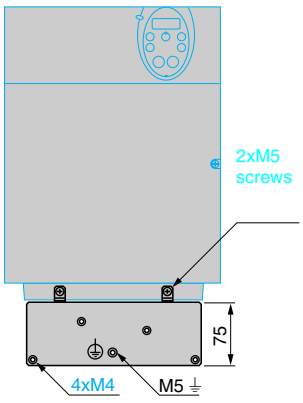


Plate for EMC mounting (supplied with the drive)





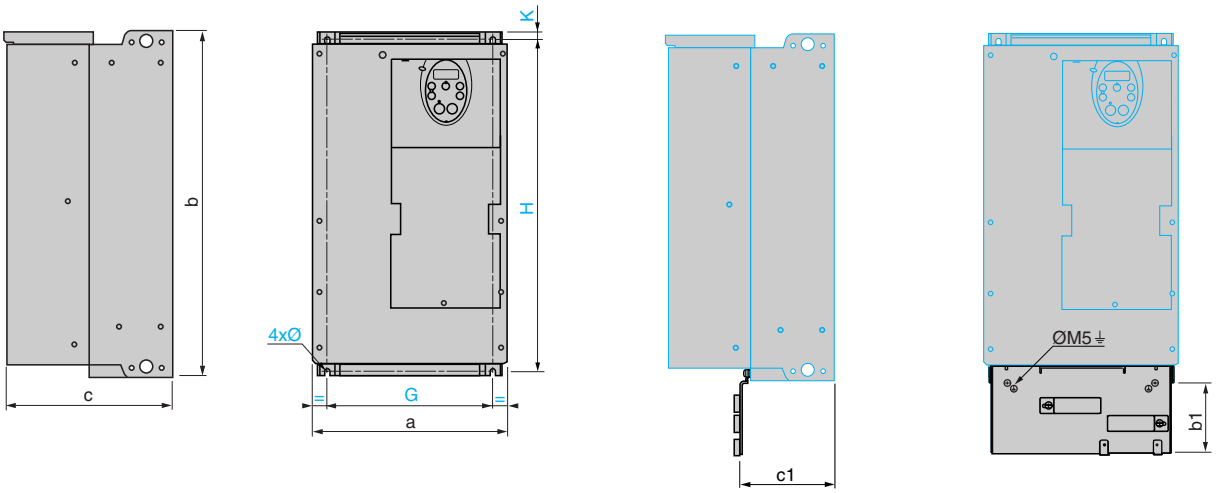
Variable speed drives for asynchronous motors

Altivar 21

UL Type 1/IP 20 drives

ATV 21HD22M3X, ATV 21HD22N4...HD45N4

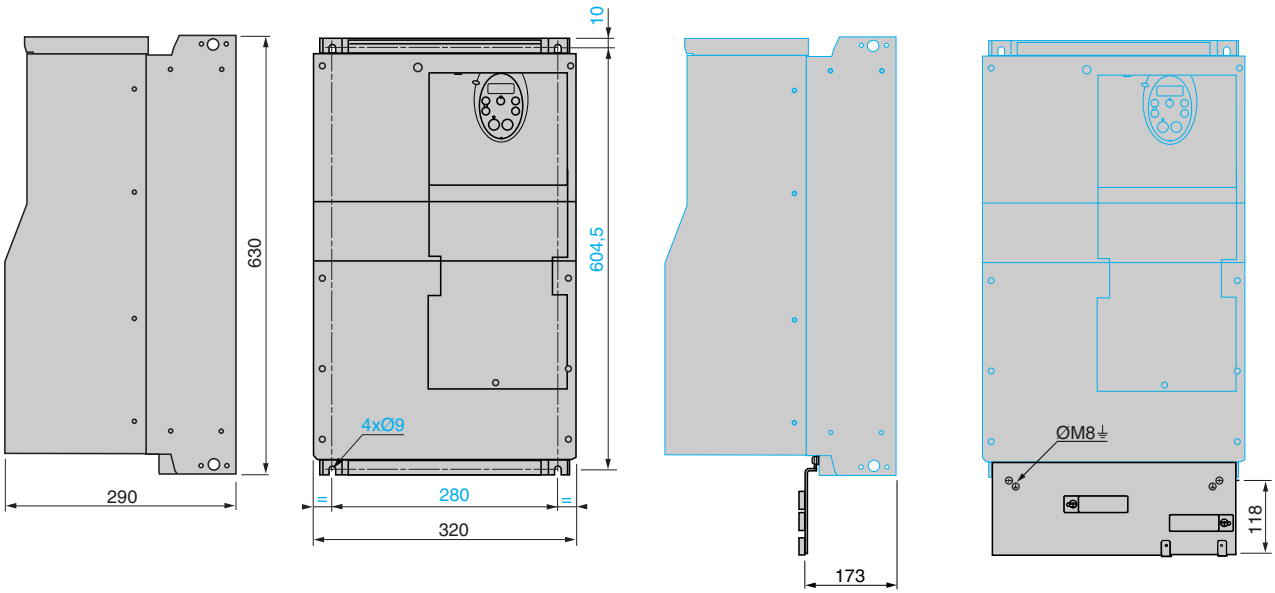
EMC mounting plate (supplied with drive)



ATV 21H	a	b	b1	c	c1	G	H	K	Ø
D22M3X D22N4, D30N4	240	420	122	214	120	206	403	10	6
D37N4, D45N4	240	550	113	244	127	206	529	10	6

ATV 21HD30M3X

EMC mounting plate (supplied with drive)

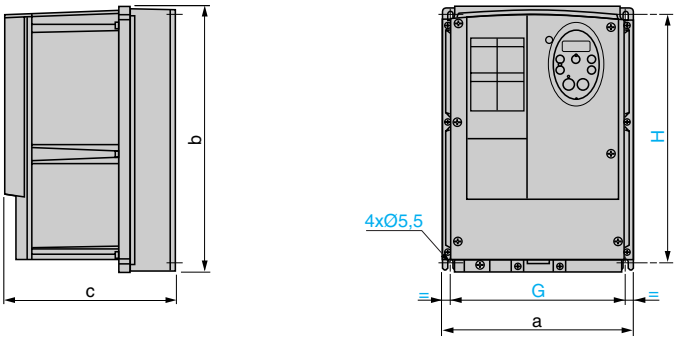


Variable speed drives for asynchronous motors

Altivar 21

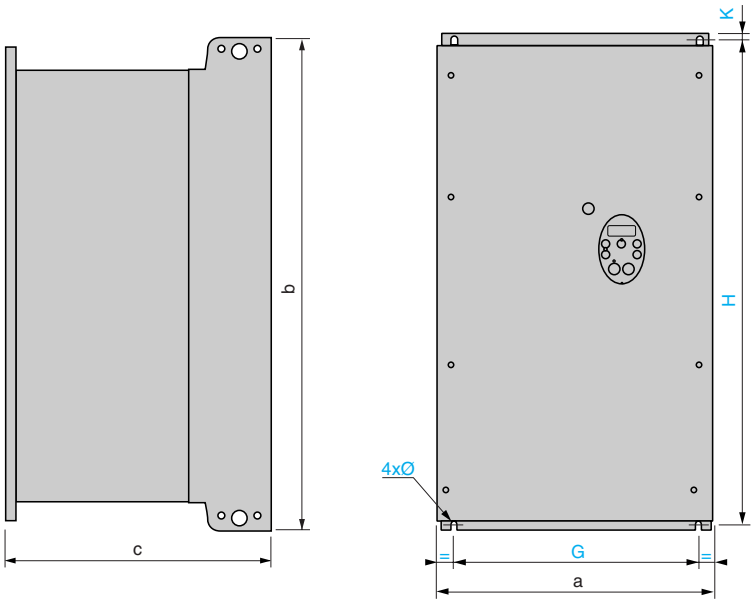
IP 54 drives and accessories

ATV 21W075N4…WU75N4, ATV 21W075N4C…WU75N4C



ATV 21W	a	b	c	G	H
075N4, U15N4 075N4C, U15N4C	215	297	192	197	277
U22N4…U75N4 U22N4C…U75N4C	230	340	208	212	318

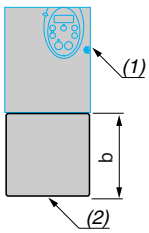
ATV 21WD11N4…WD75N4, ATV 21WD11N4C…WD75N4C



ATV 21W	a	b	c	G	H	K
D11N4, D15N4 D11N4C, D15N4C	290	560	315	250	544	8
D18N4 D18N4C	310	665	315	270	650	10
D22N4, D30N4 D22N4C, D30N4C	284	720	315	245	700	10
D37N4, D45N4 D37N4C, D45N4C	284	880	343	245	860	10
D55N4, D75N4 D55N4C, D75N4C	362	1000	364	300	975	10

UL Type 1 conformity kits

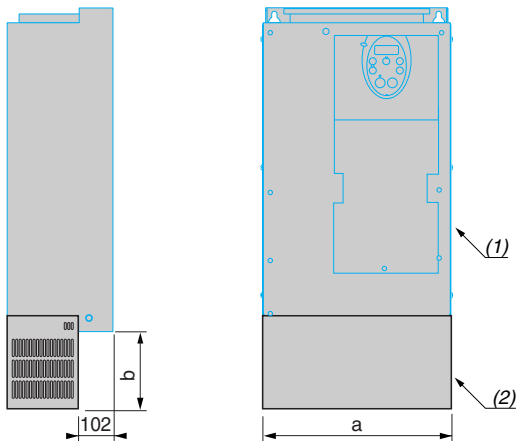
VW3 A31 814…817



VW3	b
A31 814, 815	68
A31 816	96
A31 817	99

(1) Drive
(2) Kit

VW3 A9 206…208



VW3	a	b
A9 206	240	59.9
A9 207	240	51.5
A9 208	320	136

(1) Drive
(2) Kit

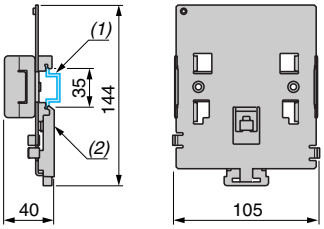
Variable speed drives for asynchronous motors

Altivar 21

Accessories, dialogue and additional EMC input filters

Kits for mounting on ⊓ rail

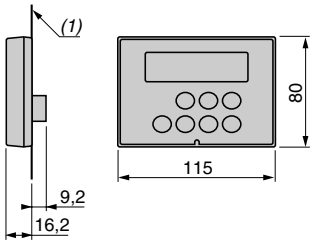
VW3 A31 852



(1) ⊓ rail
(2) Kit

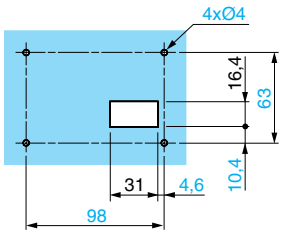
Remote display terminal

VW3 A21 101



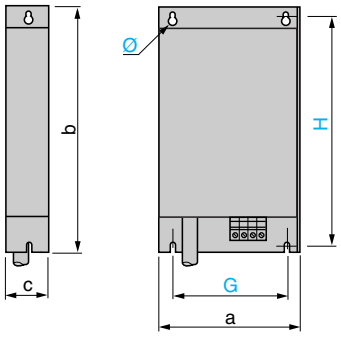
(1) Enclosure door

Cut-outs and drill holes

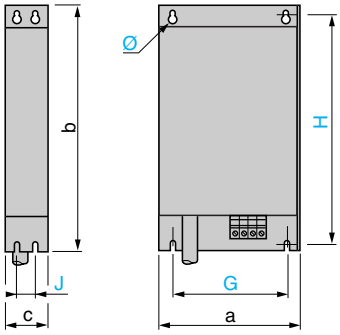


Additional EMC input filters

VW3 A31 404, 406...409



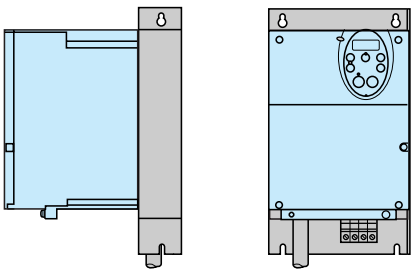
VW3 A4 406...408



VW3	a	b	c	G	H	J	Ø
A31 404	107	195	42	85	180	–	4.5
A31 406	140	235	50	120	215	–	4.5
A31 407	180	305	60	140	285	–	5.5
A31 408	245	395	80	205	375	–	5.5
A31 409	245	395	60	205	375	–	5.5
A4 406	240	522	79	200	502.5	40	9
A4 407	240	650	79	200	631	40	9
A4 408	320	750	119	280	725	80	9

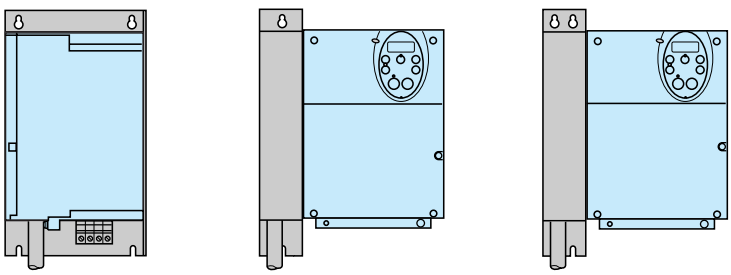
Mounting the filter under the drive

Front view



Mounting the filter next to the drive

Front view **Front view**

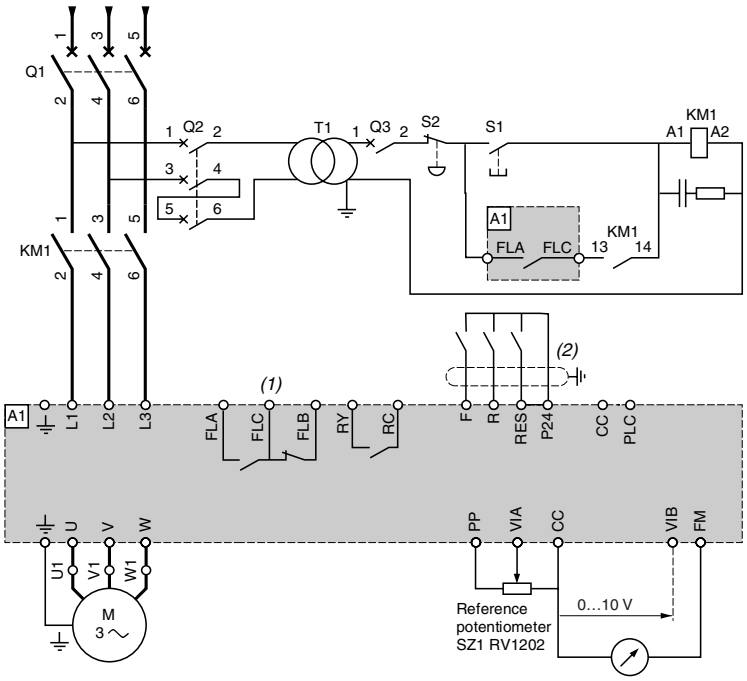


Presentation: pages 2/50, 2/51 and 2/56
Characteristics: page 2/57
References: pages 2/50, 2/51 and 2/57

Variable speed drives for asynchronous motors
Altivar 21

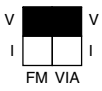
Recommended scheme for ATV 21H●●●M3X, ATV 21●●●●N4, ATV 21W●●●N4C

3-phase power supply

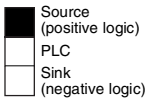


Switches (factory settings)

Voltage/current selection for analog I/O (FM and VIA)



Selection of logic type



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

Compatible comonents (for a complete list of references, please consult the “Motor starter solutions. Control and protection components” catalogue).

Ref.	Description
A1	ATV 21 drive, see pages 2/48 and 2/49
KM1	Contactor, see pages 2/66 to 2/69
Q1	Circuit breaker, see pages 2/66 to 2/69
Q2	GV2 L rated at twice the nominal primary current of T1
Q3	GB2 CB05
S1, S2	XB2 B or XA2 B pushbuttons
T1	100 VA transformer 220 V secondary

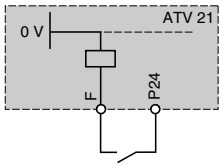
(1) Fault relay contacts for remote signalling of the drive status
(2) Connection of the common for the logic inputs depends on the positioning of the switch ("Source", "PLC", "Sink"), see page 2/63.

Variable speed drives for asynchronous motors
Altivar 21

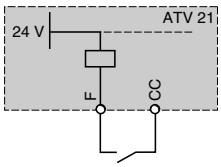
Examples of recommended schemes

Logic inputs according to the position of the logic type switch

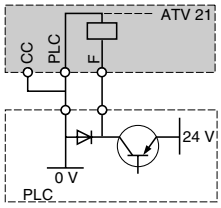
Source position

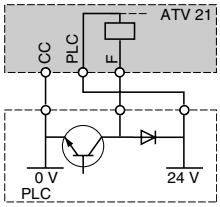


Sink position

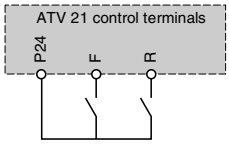


PLC position with PLC transistor outputs



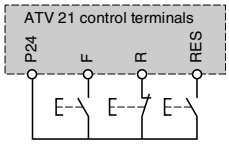


2-wire control



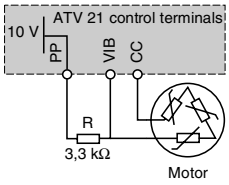
F: Forward
R: Preset speed

3-wire control



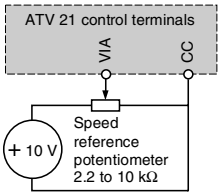
F: Forward
R: Stop
RES: Fault reset

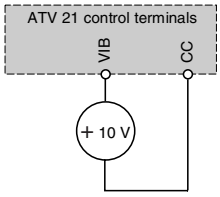
PTC probe



Voltage analog inputs

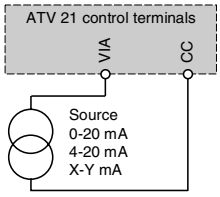
External + 10 V





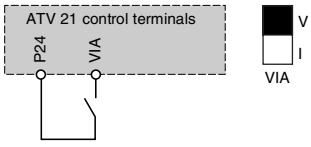
Analog input configured for current

0-20 mA, 4-20 mA, X-Y mA

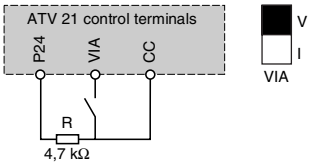


Analog input VIA configured as logic input

Positive logic (Source position)

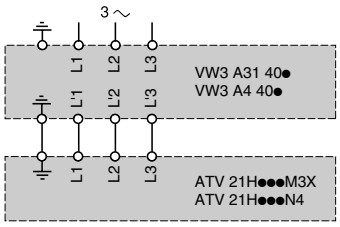


Negative logic (Sink position)



Additional EMC input filters VW3 A31 404, 406…409, VW3 A4 406…408

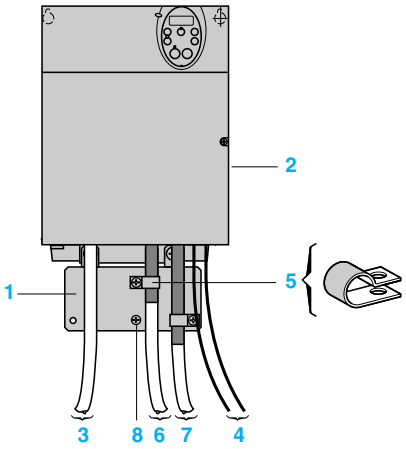
3-phase power supply



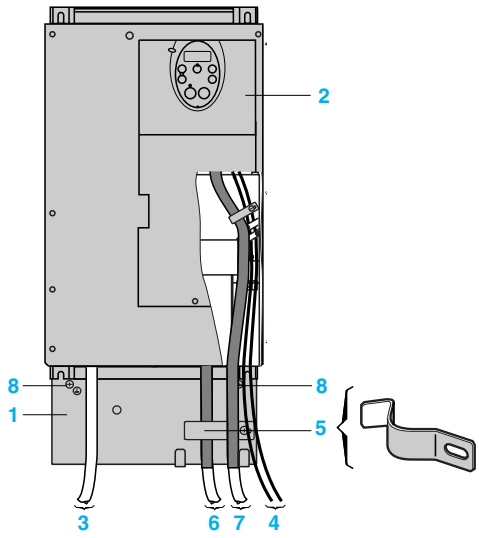
Variable speed drives for asynchronous motors

Altivar 21

Electromagnetic compatibility



ATV 21H075M3X...HD18M3X,
ATV 21H075N4...HD18N4



ATV 21HD22M3X, HD30M3X,
ATV 21HD22N4...HD75N4

Connections to meet the requirements of EMC standards

Principle

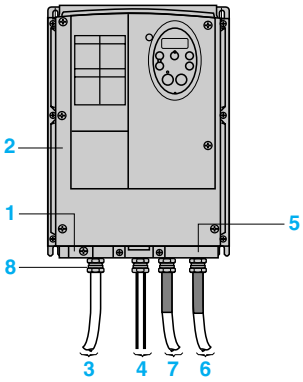
■ Earths between the drive, motor and cable shielding must have “high frequency” equipotentiality.
■ Use shielded cables with shielding connected to earth throughout 360° at both ends for the motor cable and the control-command cables. Conduit or metal ducting can be used for part of the shielding length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

Installation diagram for ATV 21H●●●M3X and ATV 21H●●●N4 drives

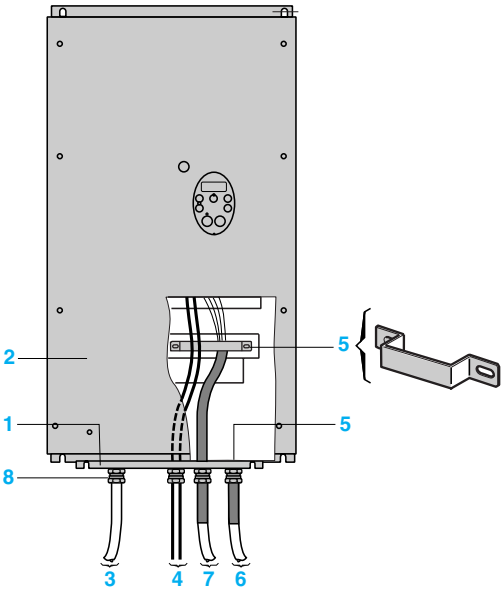
1 Steel plate to be mounted on the drive (earthed casing)
2 UL Type 1/IP 20 Altivar drive
3 Unshielded power supply wires or cable
4 Unshielded wires for the output of the fault relay contacts
5 Attach and earth the shielding of cables 6 and 7 as close as possible to the drive:
- Strip the shielding.
- Attach the cable to the metal plate 1 by tightening the clamp on the stripped part of the shielding.
The shielding must be clamped tightly enough to the metal plate to ensure good contact.
6 Shielded cable for connecting the motor
7 Shielded cable for connecting the control/signal wiring
For applications requiring several conductors, use cables with a small cross-section (0.5 mm^2).
For cables 6 and 7, the shielding must be earthed at both ends. The shielding must be continuous and intermediate terminals must be placed in EMC shielded metal boxes.
8 Earthing screw. Use this screw for the motor cable on low power rated drives, as the screw on the heatsink is inaccessible.

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

Variable speed drives for asynchronous motors
Altivar 21
Electromagnetic compatibility



ATV 21W075N4...WU75N4,
ATV 21W075N4C...WU75N4C



ATV 21WD11N4...WD30N4,
ATV 21WD11N4C...WD75N4C

Connections to meet the requirements of EMC standards (continued)

Installation diagram for ATV 21W ●●●N4, ATV 21W●●●N4C drives

1 Steel plate (earthed casing)
2 Altivar 21 IP 54 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 for cables 6 and 7 as close as possible to the drive:
- Strip the shielding.
- Attach the shielded cable to the cable gland 8ensuring it is fully in contact throughout 360°.
- Fold back the shielding and clamp it between the ring and the body of the cable gland.
Depending on the drive rating, the shielding of cable 7 can be earthed using a cable gland 8 or a cable clamp 5.
The shielding must be clamped tightly enough to the metal plate to ensure good contact.
6 Shielded cable for connecting the motor
7 Shielded cable for connecting the control/signal wiring
For applications requiring several conductors, use cables with a small cross-section (0.5 mm²).
For cables 6 and 7, the shielding must be connected to the earth at both ends.
The shielding must be continuous and intermediate terminals must be placed in EMC shielded metal boxes.
8 Metal cable gland (not supplied) for cables 6 and 7.
Standard cable gland (not supplied) for cables 3 and 4.

Note: *The HF equipotential earth connection between the drive, motor and cable shielding does not remove the need to connect the PE conductors (green-yellow) to the appropriate terminals on each unit.*

Operation on an IT system

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).
ATV 21●●●●N4 and ATV 21W●●●N4C drives have built-in EMC filters. These filters can be easily disconnected if using an IT system and subsequently reconnected if necessary.

Variable speed drives for asynchronous motors

Altivar 21

Motor starters: supply voltage 200…240 V

GV2 L08
+
LC1 D09●●
+
ATV 21H075M3X

Applications

Circuit-breaker/contactor/drive combinations can be used to ensure continuous service of the installation with optimum safety.
The type of circuit-breaker/contactor coordination selected can reduce maintenance costs in the event of a motor short-circuit by minimizing the time required to make the necessary repairs and the cost of replacement equipment.
The suggested combinations provide type 1 or type 2 coordination depending on the drive rating.
Type 2 coordination: A motor short-circuit will not damage the device or affect its settings. The motor starter should be able to operate once the electrical fault has been removed. The electrical isolation provided by the circuit-breaker will not be affected by the short-circuit. Welding of the contactor contacts is permissible if they can be separated easily.
Type 1 coordination: The electrical isolation provided by the circuit-breaker will not be affected by the incident and no other elements apart from the contactor are damaged as a result of the motor short-circuit.
The drive controls the motor, provides protection against short-circuits between the drive and the motor and protects the motor cable against overloads. The overload protection is provided by the drive's motor thermal protection. If this protection is removed, external thermal protection should be provided.
Before restarting the installation, the cause of the trip must be removed.

Motor starters for UL Type 1/IP 20 drives

Motor Power *(1)*		Drive Reference	Circuit-breaker Reference *(2)*	Rating	Im	Line contactor Reference *(3) (4)*
kW	***HP***			**A**	**A**	
Three-phase supply voltage: 200…240 V 50/60 Hz. Type 2 coordination						
0.75	*1*	**ATV 21H075M3X**	**GV2 L08**	4	–	**LC1 D09●●**
1.5	*2*	**ATV 21HU15M3X**	**GV2 L10**	6.3	–	**LC1 D09●●**
2.2	*3*	**ATV 21HU22M3X**	**GV2 L14**	10	–	**LC1 D09●●**
3	*–*	**ATV 21HU30M3X**	**GV2 L16**	14	–	**LC1 D09●●**
4	*5*	**ATV 21HU40M3X**	**GV2 L20**	18	–	**LC1 D09●●**
5.5	*7.5*	**ATV 21HU55M3X**	**GV2 L22**	25	–	**LC1 D09●●**
7.5	*10*	**ATV 21HU75M3X**	**GV2 L32**	32	–	**LC1 D18●●**
11	*15*	**ATV 21HD11M3X**	**NS80HMA50**	50	300	**LC1 D32●●**
15	*20*	**ATV 21HD15M3X**	**NS80HMA80**	80	480	**LC1 D40●●**
18.5	*25*	**ATV 21HD18M3X**	**NS100●MA100**	100	600	**LC1 D80●●**
22	*30*	**ATV 21HD22M3X**	**NS100●MA100**	100	600	**LC1 D80●●**
30	*40*	**ATV 21HD30M3X**	**NS160●MA150**	150	1350	**LC1 D115●●**
Three-phase supply voltage: 200…240 V 50/60 Hz. Type 1 coordination						
0.75	*1*	**ATV 21H075M3X**	**GV2 LE08**	4	–	**LC1 K06●●**
1.5	*2*	**ATV 21HU15M3X**	**GV2 LE10**	6.3	–	**LC1 K06●●**
2.2	*3*	**ATV 21HU22M3X**	**GV2 LE14**	10	–	**LC1 K06●●**
3	*–*	**ATV 21HU30M3X**	**GV2 LE16**	14	–	**LC1 K06●●**
4	*5*	**ATV 21HU40M3X**	**GV2 LE20**	18	–	**LC1 K06●●**
5.5	*7.5*	**ATV 21HU55M3X**	**GV2 LE22**	25	–	**LC1 D09●●**
7.5	*10*	**ATV 21HU75M3X**	**GV2 LE32**	32	–	**LC1 D18●●**
11	*15*	**ATV 21HD11M3X**	**NS80HMA50**	50	300	**LC1 D32●●**
15	*20*	**ATV 21HD15M3X**	**NS80HMA80**	80	480	**LC1 D40●●**
18.5	*25*	**ATV 21HD18M3X**	**NS100●MA100**	100	600	**LC1 D50●●**
22	*30*	**ATV 21HD22M3X**	**NS100●MA100**	100	600	**LC1 D80●●**
30	*40*	**ATV 21HD30M3X**	**NS160●MA150**	150	1350	**LC1 D115●●**

(1) Standard power ratings for 4-pole motors 50/60 Hz 230 V.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA●●, NS100●MA●●●: Products sold under the Merlin Gerin brand.
Breaking capacity of circuit-breakers according to standard IEC60947-2:

Circuit breaker	Icu (kA) for 240 V			
		N	**H**	**L**
GV2 L08…GV2 L20 GV2 LE08…GV2 LE20	100	–	–	–
GV2 L22, GV2 L32, GV2 LE22, GV2 LE32	50	–	–	–
NS80HMA	100	–	–	–
NS●●●●MA	–	85	100	150

(3) Composition of contactors:
LC1 K06, LC1 D09 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 K06	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 D09…D115	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 available between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.

Variable speed drives for asynchronous motors
Altivar 21
Motor starters: supply voltage 380…415 V


DF535088


103283-07-M


106485-30-M

NS80HMA50
+
LC1 D32●●
+
ATV 21HD22N4

Motor starters for UL Type 1/IP 20 drives (continued)

Motor Power (1)		Drive Reference	Circuit breaker Reference (2)	Rating	Im	Line contactor Reference (3) (4)
kW	HP			A	A	
Three-phase supply voltage: 380…415 V 50/60 Hz. Type 2 coordination						
0.75	1	ATV 21H075N4	GV2 L07	2.5	–	LC1 D09●●
1.5	2	ATV 21HU15N4	GV2 L08	4	–	LC1 D09●●
2.2	3	ATV 21HU22N4	GV2 L10	6.3	–	LC1 D09●●
3	–	ATV 21HU30N4	GV2 L10	6.3	–	LC1 D09●●
4	5	ATV 21HU40N4	GV2 L14	10	–	LC1 D09●●
5.5	7.5	ATV 21HU55N4	GV2 L16	14	–	LC1 D09●●
7.5	10	ATV 21HU75N4	GV2 L20	18	–	LC1 D09●●
11	15	ATV 21HD11N4	GV2 L22	25	–	LC1 D09●●
15	20	ATV 21HD15N4	GV2 L32	32	–	LC1 D18●●
18.5	25	ATV 21HD18N4	NS80HMA50	50	300	LC1 D32●●
22	30	ATV 21HD22N4	NS80HMA50	50	300	LC1 D32●●
30	40	ATV 21HD30N4	NS80HMA80	80	480	LC1 D40●●
37	50	ATV 21HD37N4	NS80HMA80	80	480	LC1 D80●●
45	60	ATV 21HD45N4	NS100●MA100	100	600	LC1 D115●●
55	75	ATV 21HD55N4	NS100●MA150	150	1350	LC1 D115●●
75	100	ATV 21HD75N4	NS100●MA220	220	1980	LC1 F185●●
Three-phase supply voltage: 380…415 V 50/60 Hz. Type 1 coordination						
0.75	1	ATV 21H075N4	GV2 LE07	2.5	–	LC1 K06●●
1.5	2	ATV 21HU15N4	GV2 LE08	4	–	LC1 K06●●
2.2	3	ATV 21HU22N4	GV2 LE10	6.3	–	LC1 K06●●
3	–	ATV 21HU30N4	GV2 LE10	6.3	–	LC1 K06●●
4	5	ATV 21HU40N4	GV2 LE14	10	–	LC1 K06●●
5.5	7.5	ATV 21HU55N4	GV2 LE16	14	–	LC1 K06●●
7.5	10	ATV 21HU75N4	GV2 LE20	18	–	LC1 K06●●
11	15	ATV 21HD11N4	GV2 LE22	25	–	LC1 D09●●
15	20	ATV 21HD15N4	GV2 LE32	32	–	LC1 D18●●
18.5	25	ATV 21HD18N4	NS80HMA50	50	300	LC1 D32●●
22	30	ATV 21HD22N4	NS80HMA50	50	300	LC1 D32●●
30	40	ATV 21HD30N4	NS80HMA80	80	480	LC1 D40●●
37	50	ATV 21HD37N4	NS80HMA80	80	480	LC1 D80●●
45	60	ATV 21HD45N4	NS100●MA100	100	600	LC1 D115●●
55	75	ATV 21HD55N4	NS100●MA150	150	1350	LC1 D115●●
75	100	ATV 21HD75N4	NS100●MA220	220	1980	LC1 D115●●

(1) Standard power ratings for 4-pole motors 50/60 Hz 400 V.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA●●, NS100●MA●●●: Products sold under the Merlin Gerin brand.
For references to be completed, replace the dot with the letter corresponding to the circuit-breaker breaking performance (N, H, L).
Breaking capacity of circuit-breakers according to standard IEC 60947-2:

Circuit breaker	Icu (kA) for 400 V			
		N	H	L
GV2 L07…L14	100	–	–	–
GV2 L16…L32	50	–	–	–
GV2 LE07…LE22	15	–	–	–
GV2 LE32	10	–	–	–
NS80HMA	70	–	–	–
NS100●MA	–	25	70	150

(3) Composition of contactors:
LC1 K06, LC1 D09 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
LC1 F185: 3 poles. To add auxiliary contacts or other accessories, please refer to the "Motor-starter solutions - Control and protection components" catalogue.
Replace ●● with the control circuit voltage reference indicated in the table below:

	Volts ∿	24	48	110	220	230	240
LC1 K06	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 D09…D115	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	–	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F185	50 Hz (LX1 coil)	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz (LX1 coil)	–	**E6**	**F6**	**M6**	–	**U6**
	40…400 Hz (LX9 coil)	–	**E7**	**F7**	**M7**	**P7**	**U7**

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

Variable speed drives for asynchronous motors
Altivar 21
Motor starters: supply voltage 380…415 V


DF535086


103279-08-M


PF106476-26-M

GV2 L07
+
LC1 D09●●
+
ATV 21W075N4

Motor starters for IP 54 drives

Motor		Drive	Circuit breaker			Line contactor
Power *(1)*		Reference	Reference *(2)*	Rating	Im	Reference *(3) (4)*
kW	*HP*			A	A	
Three-phase supply voltage: 380…415 V 50/60 Hz. Type 2 coordination						
0.75	*1*	**ATV 21W075N4** **ATV 21W075N4C**	**GV2 L07**	2.5	–	**LC1 D09●●**
1.5	*2*	**ATV 21WU15N4** **ATV 21WU15N4C**	**GV2 L08**	4	–	**LC1 D09●●**
2.2	*3*	**ATV 21WU22N4** **ATV 21WU22N4C**	**GV2 L10**	6.3	–	**LC1 D09●●**
3	–	**ATV 21WU30N4** **ATV 21WU30N4C**	**GV2 L10**	6.3	–	**LC1 D09●●**
4	*5*	**ATV 21WU40N4** **ATV 21WU40N4C**	**GV2 L14**	10	–	**LC1 D09●●**
5.5	*7.5*	**ATV 21WU55N4** **ATV 21WU55N4C**	**GV2 L16**	14	–	**LC1 D09●●**
7.5	*10*	**ATV 21WU75N4** **ATV 21WU75N4C**	**GV2 L20**	18	–	**LC1 D09●●**
11	*15*	**ATV 21WD11N4** **ATV 21WD11N4C**	**GV2 L22**	25	–	**LC1 D09●●**
15	*20*	**ATV 21WD15N4** **ATV 21WD15N4C**	**GV2 L32**	32	–	**LC1 D18●●**
18.5	*25*	**ATV 21WD18N4** **ATV 21WD18N4C**	**NS80HMA50**	50	300	**LC1 D25●●**
22	*30*	**ATV 21WD22N4** **ATV 21WD22N4C**	**NS80HMA50**	50	300	**LC1 D32●●**
30	*40*	**ATV 21WD30N4** **ATV 21WD30N4C**	**NS80HMA80**	80	480	**LC1 D40●●**
37	*50*	**ATV 21WD37N4** **ATV 21WD37N4C**	**NS80HMA80**	80	480	**LC1 D80●●**
45	*60*	**ATV 21WD45N4** **ATV 21WD45N4C**	**NS100●MA100**	100	600	**LC1 D80●●**
55	*75*	**ATV 21WD55N4** **ATV 21WD55N4C**	**NS100●MA150**	150	1350	**LC1 D115●●**
75	*100*	**ATV 21WD75N4** **ATV 21WD75N4C**	**NS100●MA150**	150	1350	**LC1 D115●●**

(1) Standard power ratings for 4-pole motors 50/60 Hz 400 V.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA●●, NS100●MA●●●: Products sold under the Merlin Gerin brand.
Breaking capacity of circuit-breakers according to standard IEC60947-2:

Circuit breaker	Icu (kA) for 400 V			
		N	H	L
GV2 L07…L14	100	–	–	–
GV2 L16…L32	50	–	–	–
NS80HMA	70	–	–	–
NS100●MA	–	25	70	150

(3) Composition of contactors:
LC1 D09 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 D09…D115	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 available between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.

Variable speed drives for asynchronous motors
Altivar 21
Motor starters: supply voltage 380…415 V


DF535088


103283-07-M


PF106483-32-M

NS80HMA50
+
LC1 D25●●
+
ATV 21WD18N4

Motor starters for IP 54 drives (continued)

Motor		Drive	Circuit breaker			Line contactor
Power *(1)*		Reference	Reference *(2)*	Rating	Im	Reference *(3) (4)*
kW	*HP*			A	A	
Three-phase supply voltage: 380…415 V 50/60 Hz. Type 1 coordination						
0.75	*1*	**ATV 21W075N4** **ATV 21W075N4C**	**GV2 LE07**	2.5	–	**LC1 K06●●**
1.5	*2*	**ATV 21WU15N4** **ATV 21WU15N4C**	**GV2 LE08**	4	–	**LC1 K06●●**
2.2	*3*	**ATV 21WU22N4** **ATV 21WU22N4C**	**GV2 LE10**	6.3	–	**LC1 K06●●**
3	–	**ATV 21WU30N4** **ATV 21WU30N4C**	**GV2 LE10**	6.3	–	**LC1 K06●●**
4	*5*	**ATV 21WU40N4** **ATV 21WU40N4C**	**GV2 LE14**	10	–	**LC1 K06●●**
5.5	*7.5*	**ATV 21WU55N4** **ATV 21WU55N4C**	**GV2 LE16**	14	–	**LC1 K06●●**
7.5	*10*	**ATV 21WU75N4** **ATV 21WU75N4C**	**GV2 LE20**	18	–	**LC1 K06●●**
11	*15*	**ATV 21WD11N4** **ATV 21WD11N4C**	**GV2 LE22**	25	–	**LC1 D09●●**
15	*20*	**ATV 21WD15N4** **ATV 21WD15N4C**	**GV2 LE32**	32	–	**LC1 D18●●**
18.5	*25*	**ATV 21WD18N4** **ATV 21WD18N4C**	**NS80HMA50**	50	300	**LC1 D25●●**
22	*30*	**ATV 21WD22N4** **ATV 21WD22N4C**	**NS80HMA50**	50	300	**LC1 D32●●**
30	*40*	**ATV 21WD30N4** **ATV 21WD30N4C**	**NS80HMA80**	80	480	**LC1 D40●●**
37	*50*	**ATV 21WD37N4** **ATV 21WD37N4C**	**NS80HMA80**	80	480	**LC1 D50●●**
45	*60*	**ATV 21WD45N4** **ATV 21WD45N4C**	**NS100●MA100**	100	600	**LC1 D80●●**
55	*75*	**ATV 21WD55N4** **ATV 21WD55N4C**	**NS100●MA150**	150	1350	**LC1 D80●●**
75	*100*	**ATV 21WD75N4** **ATV 21WD75N4C**	**NS100●MA150**	150	1350	**LC1 D115●●**

(1) Standard power ratings for 4-pole motors 50/60 Hz 400 V.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA●●, NS100pMA●●●: Products sold under the Merlin Gerin brand.
Breaking capacity of circuit-breakers according to standard IEC60947-2:

Circuit breaker	Icu (kA) for 400 V			
		N	H	L
GV2 LE07…LE14	100	–	–	–
GV2 LE16…LE22	15	–	–	–
GV2 LE32	10			
NS80HMA	70	–	–	–
NS100●MA	–	25	70	150

(3) Composition of contactors:
LC1 K06, LC1 D09 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 K06	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 D09…D115	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 available between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.

Variable speed drives for asynchronous motors

Altivar 21

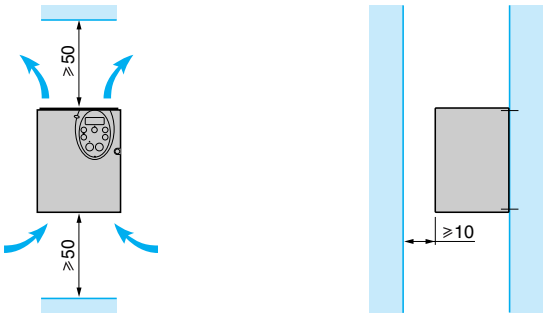
UL Type 1/IP 20 drives

Mounting recommendations

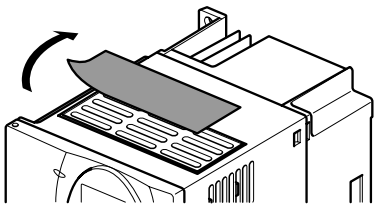
Depending on the conditions in which the drive is to be used, its installation will require certain precautions and the use of appropriate accessories.
Install the unit vertically:

- Do not place it close to heating elements.
- Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

ATV 21H●●●M3X, ATV 21H●●●N4

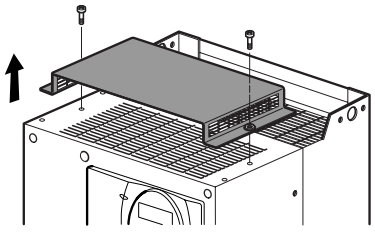


534963



Removing the protective blanking cover for:
ATV 21H075M3X...HD18M3X,
ATV 21H075N4...HD18N4

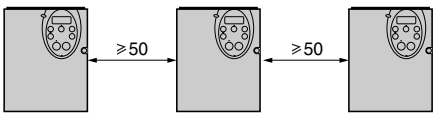
534964



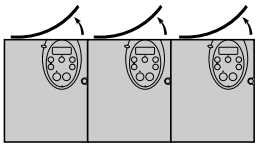
Removing the protective blanking cover for:
ATV 21HD22M3X, HD30M3X,
ATV 21HD22N4...HD75N4

Mounting types

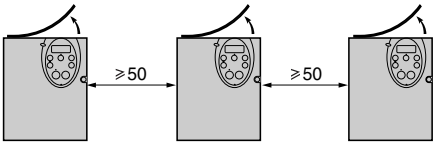
■ **Type A mounting**



■ **Type B mounting**



■ **Type C mounting**



By removing the protective blanking cover from the top of the drive, the degree of protection for the drive becomes IP 20. The protective blanking cover may vary according to the drive model, see opposite.

Variable speed drives for asynchronous motors

Altivar 21

UL Type 1/IP 20 drives

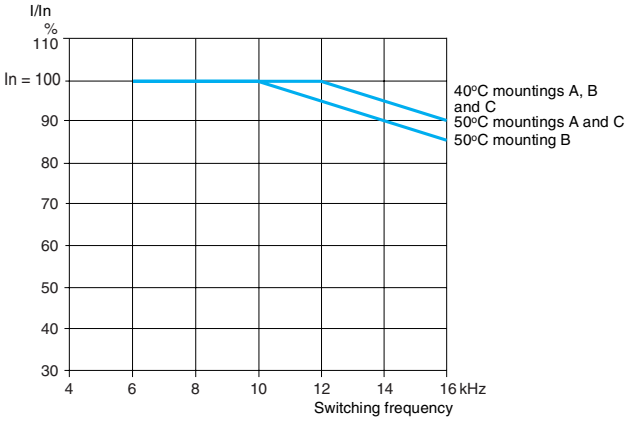
Mounting recommendations (continued)

Derating curves

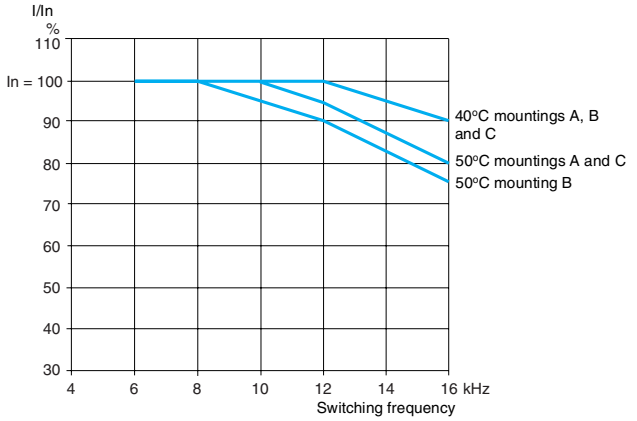
The derating curves for the drive nominal current (In) depend on the temperature, the switching frequency and the mounting type.

For intermediate temperatures (45°C for example), interpolate between 2 curves.

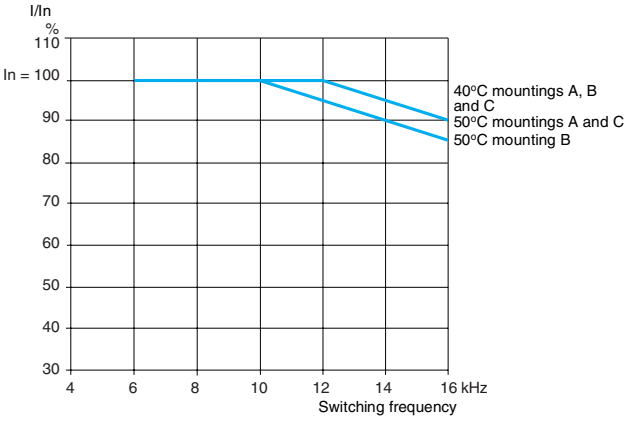
ATV 21H075M3X



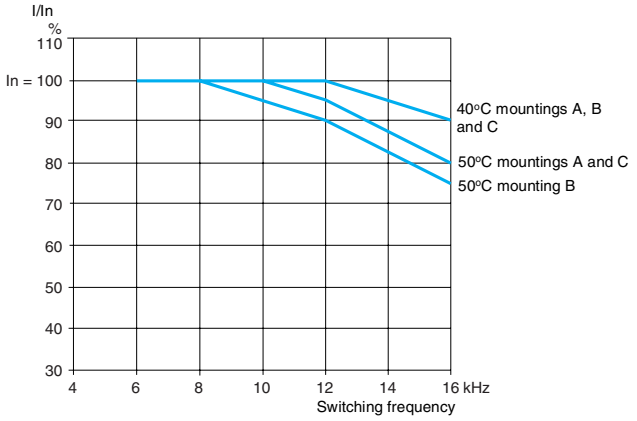
ATV 21HU15M3X, HU22M3X



ATV 21HU30M3X



ATV 21HU40M3X



Variable speed drives for asynchronous motors

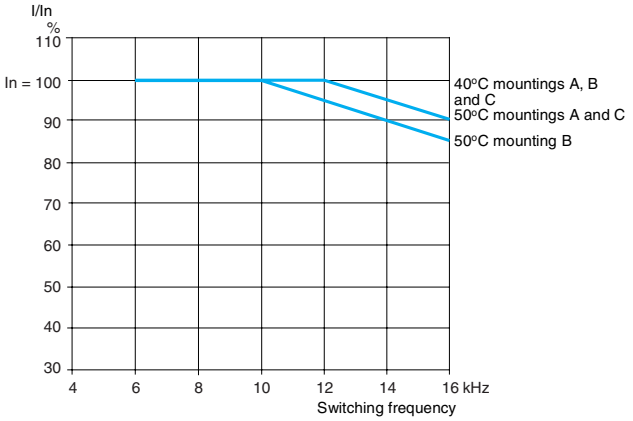
Altivar 21

UL Type 1/IP 20 drives

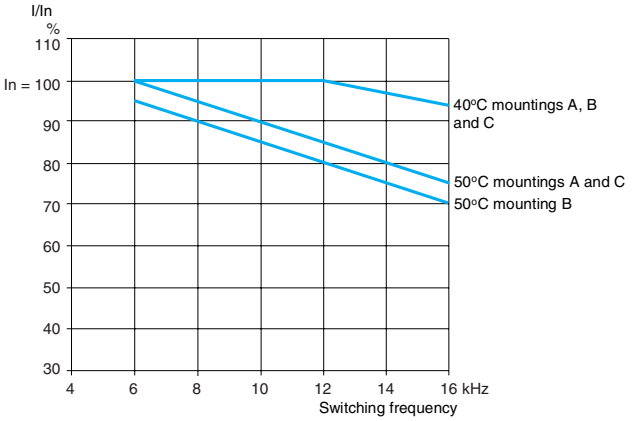
Mounting recommendations (continued)

Derating curves

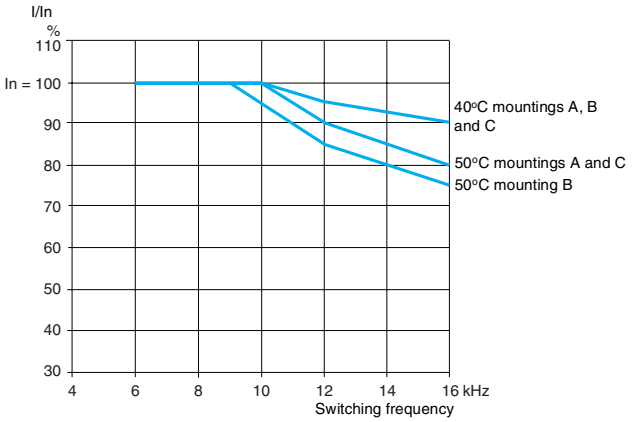
ATV 21HU55M3X...HD15M3X



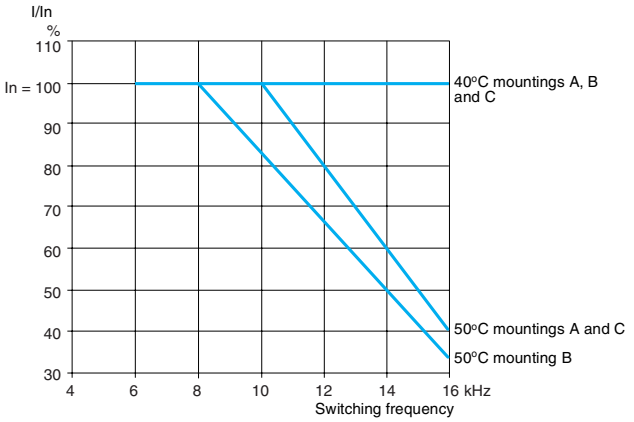
ATV 21HD18M3X



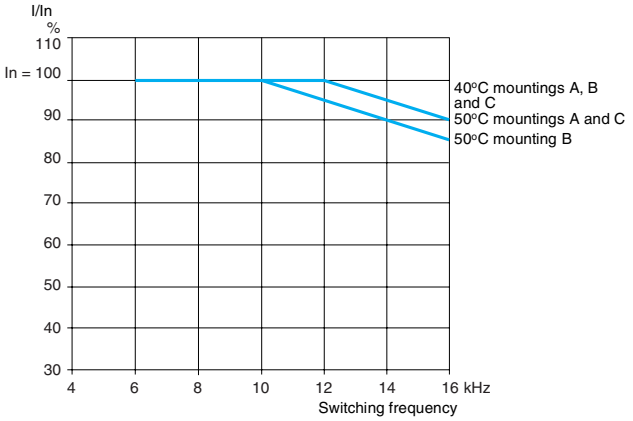
ATV 21HD22M3X



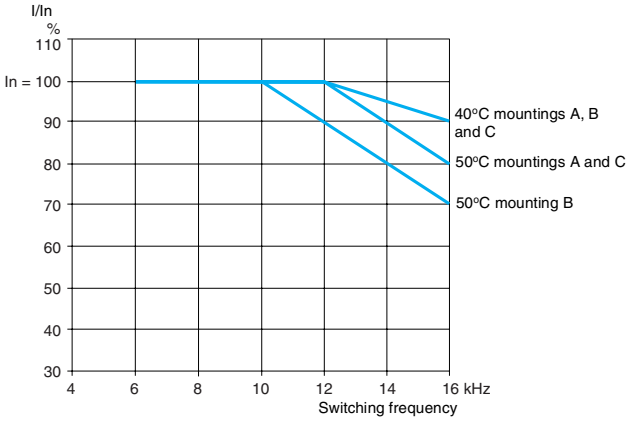
ATV 21HD30M3X



ATV 21H075N4, HU15N4



ATV 21HU22N4



Variable speed drives for asynchronous motors

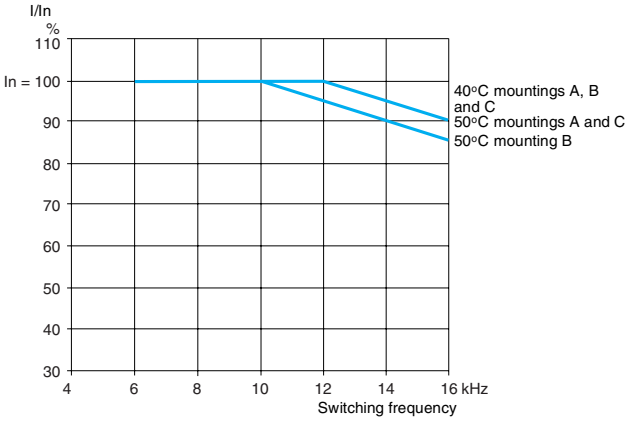
Altivar 21

UL Type 1/IP 20 drives

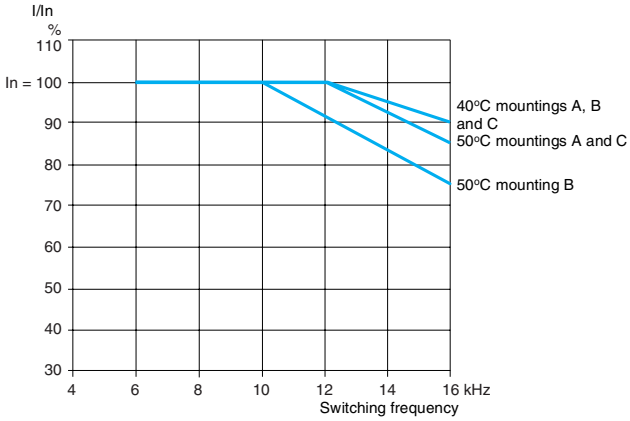
Mounting recommendations (continued)

Derating curves

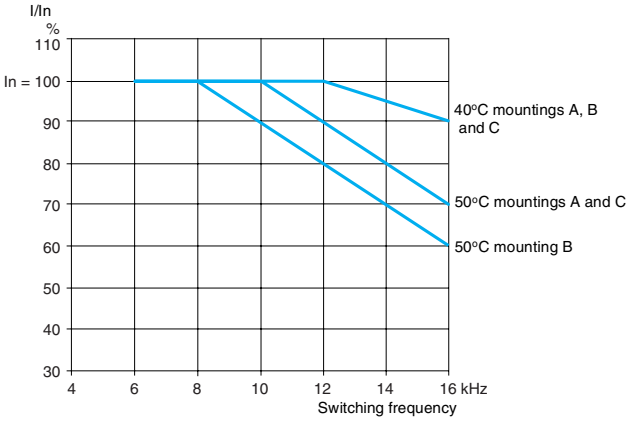
ATV 21HU30N4



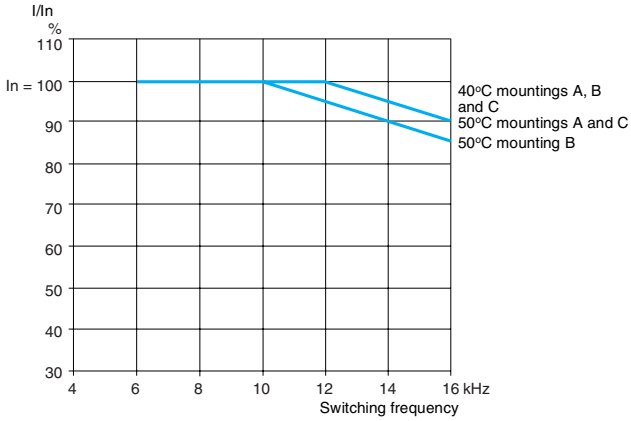
ATV 21HU40N4



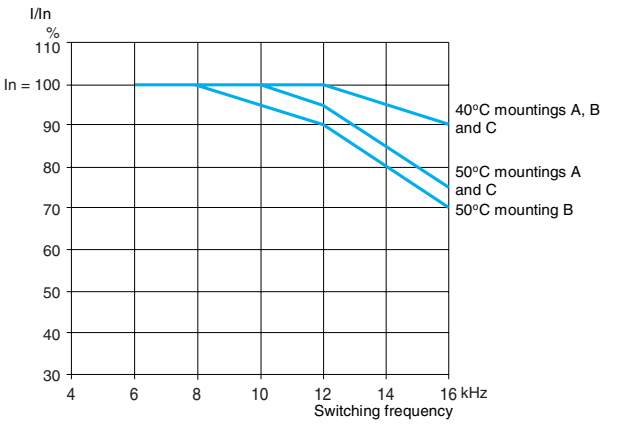
ATV 21HU55N4



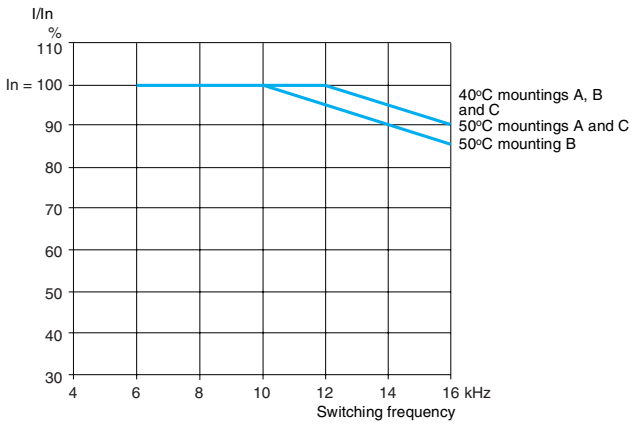
ATV 21HU75N4



ATV 21HD11N4



ATV 21HD15N4



Variable speed drives for asynchronous motors

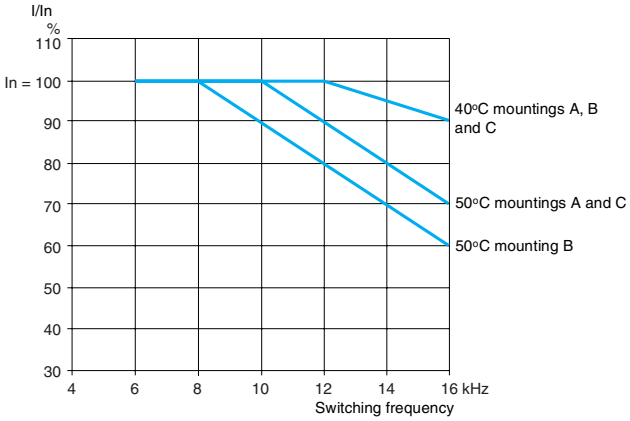
Altivar 21

UL Type 1/IP 20 drives

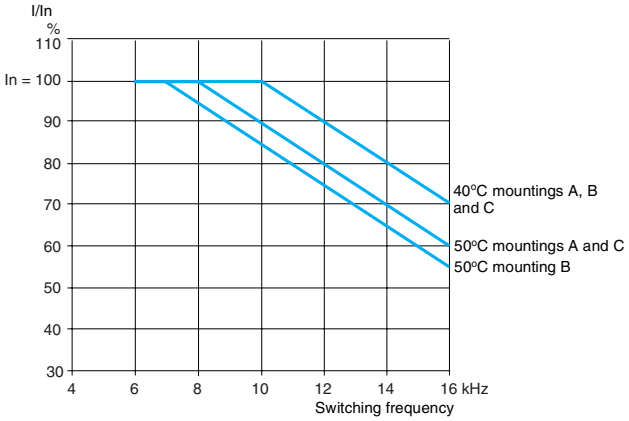
Mounting recommendations (continued)

Derating curves

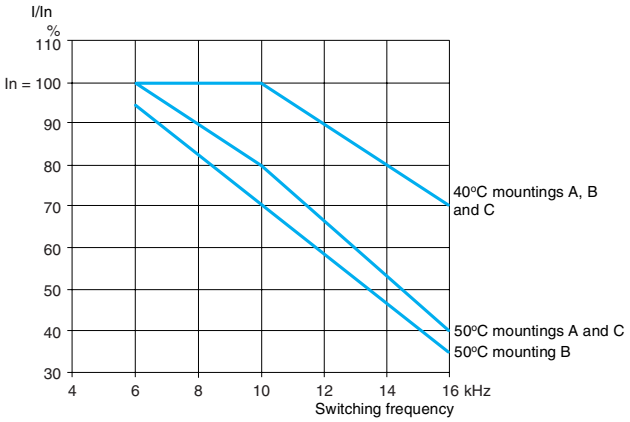
ATV 21HD18N4



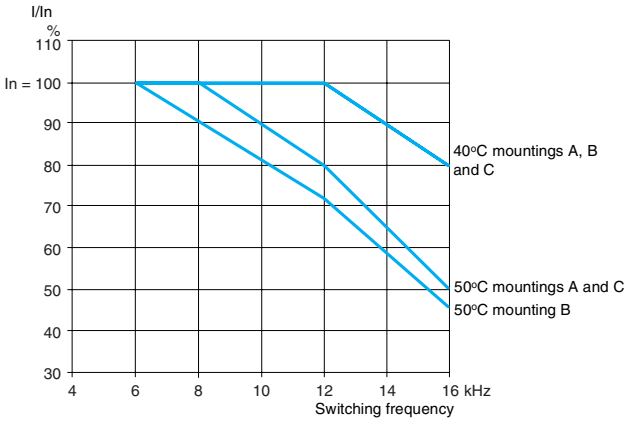
ATV 21HD22N4



ATV 21HD30N4



ATV 21HD37N4



Variable speed drives for asynchronous motors

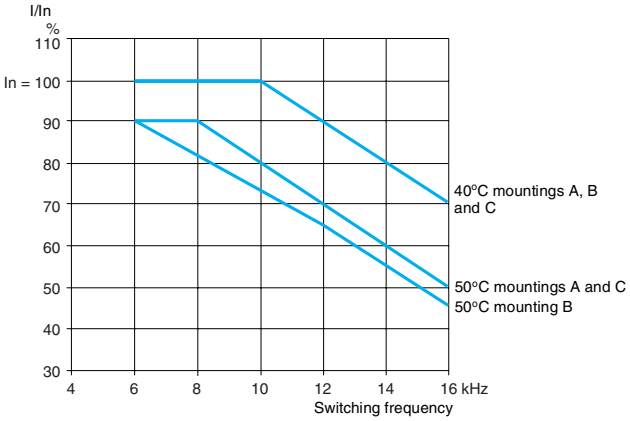
Altivar 21

UL Type 1/IP 20 drives

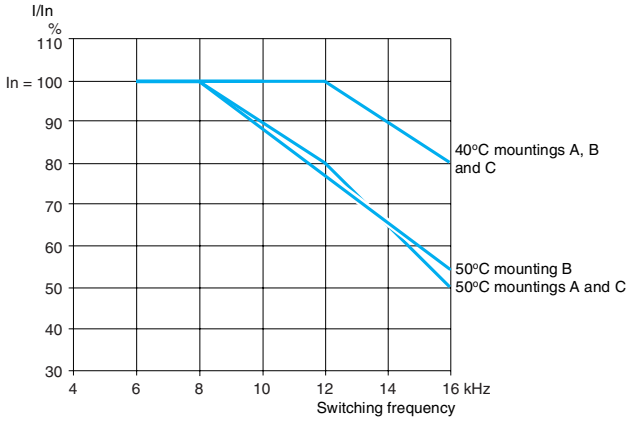
Mounting recommendations (continued)

Derating curves

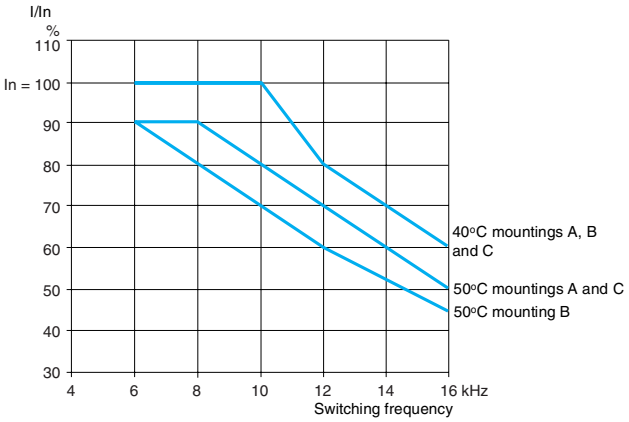
ATV 21HD45N4



ATV 21HD55N4



ATV 21HD75N4



2

2.2

Variable speed drives for asynchronous motors

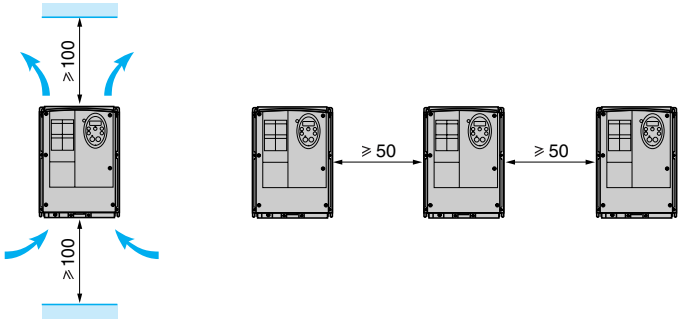
Altivar 21
IP 54 drives

Mounting recommendations (continued)

Depending on the conditions in which the drive is to be used, its installation will require certain precautions and the use of appropriate accessories.
Install the unit vertically:

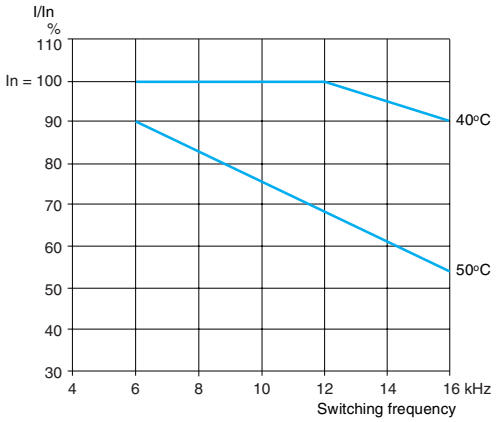
- Do not place it close to heating elements.
- Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

ATV 21W●●●N4, ATV 21W●●●N4C

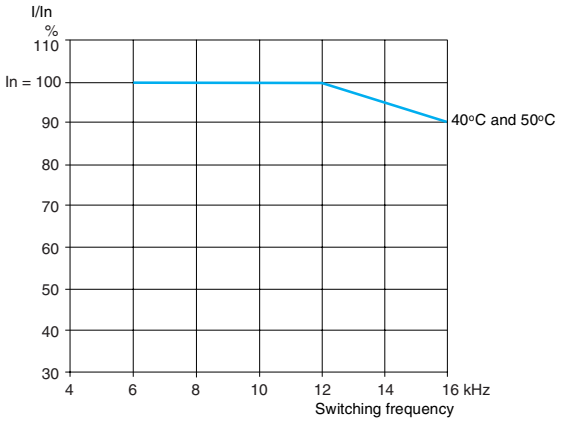


Derating curves

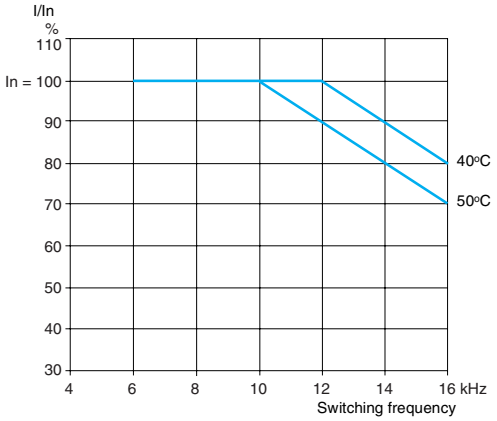
ATV 21W075N4...WU75N4, ATV 21W075N4C...WU75N4C



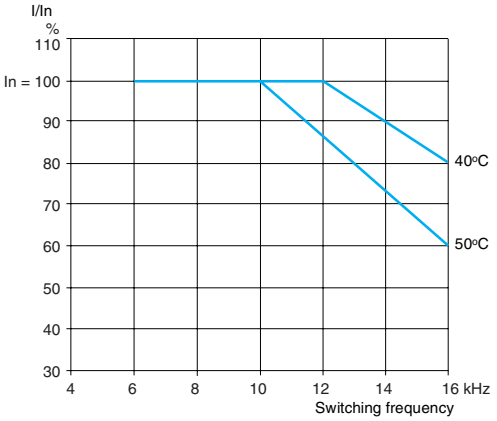
ATV 21WD11N4, ATV 21WD11N4C



ATV 21WD15N4, ATV 21WD15N4C



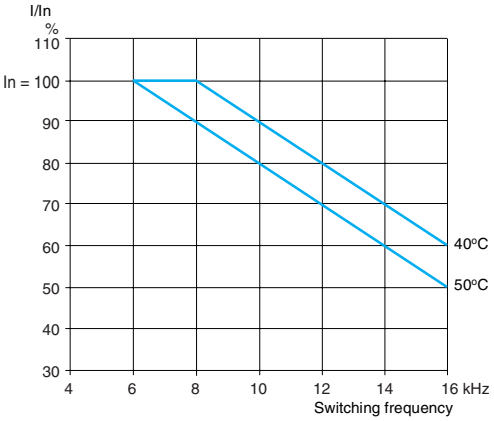
ATV 21WD18N4, ATV 21WD18N4C



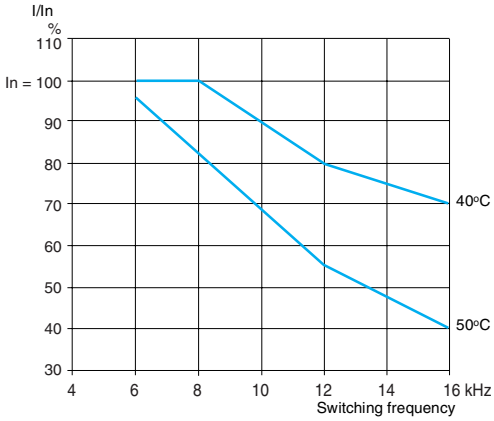
Mounting recommendations (continued)

Derating curves

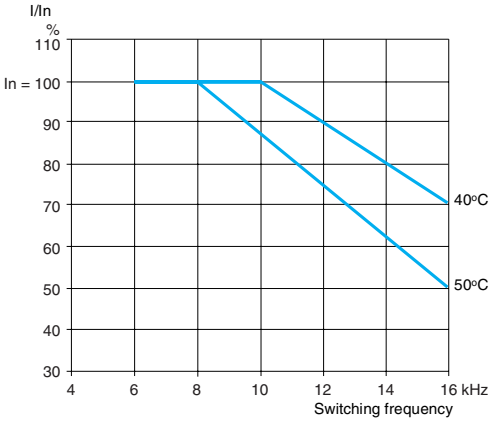
ATV 21WD22N4, ATV 21WD22N4C



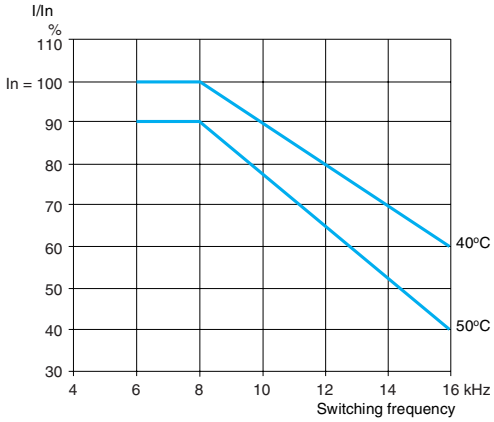
ATV 21WD30N4, ATV 21WD30N4C



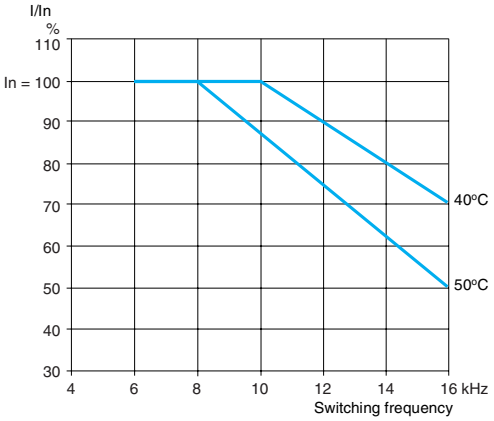
ATV 21WD37N4, ATV 21WD37N4C



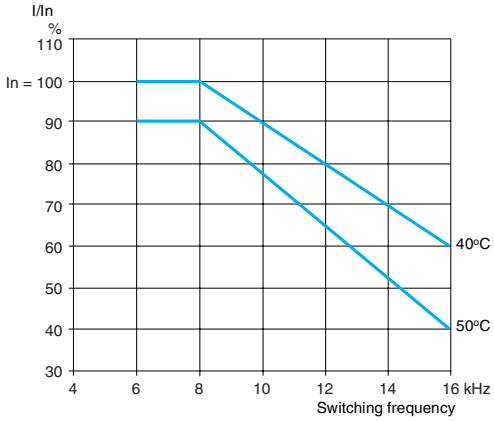
ATV 21WD45N4, ATV 21WD45N4C



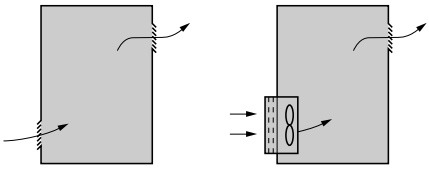
ATV 21WD55N4, ATV 21WD55N4C



ATV 21WD75N4, ATV 21WD75N4C



Variable speed drives for asynchronous motors
Altivar 21
UL Type 1/IP 20 drives



Specific recommendations for mounting in an enclosure *(1)*

Observe the mounting recommendations described on pages 2/70 to 2/75.
To ensure proper air circulation in the drive:
- Fit ventilation grilles.
- Ensure that there is sufficient ventilation. If there is not, install a forced ventilation unit with a filter. The openings and/or fans must provide a flow rate at least equal to that of the drive fans (see page 2/79).
- Use special filters with IP 54 protection.
- Remove the blanking cover from the top of the drive, see page 2/70.

Power dissipated inside the enclosure *(1)*

For drives	Dissipated power *(2)* W
Three-phase supply voltage: 200…240 V 50/60 Hz	
ATV 21H075M3X	63
ATV 21HU15M3X	101
ATV 21HU22M3X	120
ATV 21HU30M3X	146
ATV 21HU40M3X	193
ATV 21HU55M3X	249
ATV 21HU75M3X	346
ATV 21HD11M3X	459
ATV 21HD15M3X	629
ATV 21HD18M3X	698
ATV 21HD22M3X	763
ATV 21HD30M3X	1085
Three-phase supply voltage: 380…480 V 50/60 Hz	
ATV 21H075N4	55
ATV 21HU15N4	78
ATV 21HU22N4	103
ATV 21HU30N4	137
ATV 21HU40N4	176
ATV 21HU55N4	215
ATV 21HU75N4	291
ATV 21HD11N4	430
ATV 21HD15N4	625
ATV 21HD18N4	603
ATV 21HD22N4	626
ATV 21HD30N4	847
ATV 21HD37N4	976
ATV 21HD45N4	1253
ATV 21HD55N4	1455
ATV 21HD75N4	1945

(1) For ATV 21H●●●M3X and ATV 21H●●●N4 drives only.
(2) This value is given for operation at nominal load and for a switching frequency of 8 or 12 kHz depending on the rating.

Fan flow rate depending on the drive rating	
For drives	**Flow rate m³/hour**
ATV 21H075M3X	22
ATV 21HU15M3X	35
ATV 21HU22M3X	41
ATV 21HU30M3X	50
ATV 21HU40M3X	66
ATV 21HU55M3X	85
ATV 21HU75M3X	118
ATV 21HD11M3X	157
ATV 21HD15M3X	215
ATV 21HD18M3X	239
ATV 21HD22M3X	261
ATV 21HD30M3X	371
ATV 21H075N4	19
ATV 21HU15N4	27
ATV 21HU22N4	35
ATV 21HU30N4	47
ATV 21HU40N4	60
ATV 21HU55N4	74
ATV 21HU75N4	100
ATV 21HD11N4	147
ATV 21HD15N4	214
ATV 21HD18N4	206
ATV 21HD22N4	214
ATV 21HD30N4	290
ATV 21HD37N4	334
ATV 21HD45N4	429
ATV 21HD55N4	498
ATV 21HD75N4	666

Sealed metal enclosure (IP 54 degree of protection)

The 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.
This enables the drive to be used in an enclosure where the maximum internal temperature reaches 50°C.

Calculating the enclosure dimensions *(1)*

Maximum thermal resistance Rth (°C/W)

$$Rth = \frac{\theta - \theta e}{P}$$

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 drive: see page 2/78.
Add the power dissipated by the other equipment components.

Useful heat dissipation surface of enclosure S (m²)

(sides + top + front panel if wall-mounted)

$$S = \frac{K}{Rth}$$

K = enclosure thermal resistance per m²

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.*

(1) For ATV 21H●●●M3X and ATV 21H●●●N4 drives only.

Variable speed drives for asynchronous motors
Altivar 21

Summary of functions

Integrated 7-segment display terminal

Presentation page 2/82

Remote display terminal

Presentation page 2/82

Simplified start-up

Fan and centrifugal pump page 2/83

Quick Menu page 2/83

Operating modes

Default display mode page 2/84

Parameter adjustment mode page 2/84

Status monitoring mode page 2/84

Programming

Presentation page 2/85

Maintenance, diagnostics

Response to faults or alarms page 2/86

Fault log page 2/86

Identification of the software version page 2/86

Test functions page 2/86

Display of the I/O states page 2/86

Display of equipment maintenance alarms page 2/86

Controlling the drive via its I/O

Presentation page 2/87

Functions designed specifically for pumping and ventilation applications

Motor control profiles

- Energy saving ratio page 2/87
- Quadratic ratio (Kn^2) page 2/87

PID regulator

- Preset PID references page 2/87
- PID feedback page 2/88
- PID feedback supervision page 2/88
- Sleep/Wake-up page 2/88
- Alarms page 2/88
- Auto/Man. page 2/88

Forced operation page 2/88

Other application functions

2-wire control page 2/89

3-wire control page 2/89

Acceleration and deceleration ramps

- Time page 2/89
- Automatic adaptation page 2/89
- Switching page 2/90

Preset speeds page 2/90

Limiting low speed operating time page 2/91

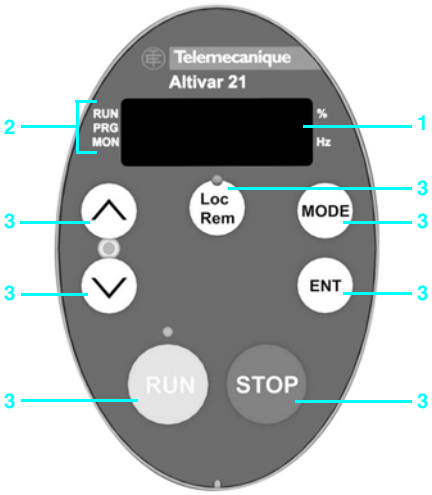
Variable speed drives for asynchronous motors
Altivar 21

Summary of functions (continued)

Other application functions (continued)

Motor control types	
- Sensorless flux vector control	page 2/91
- 2-point vector control	page 2/91
- Voltage/frequency ratio	page 2/91
- Synchronous motor	page 2/91
Auto-tuning	page 2/91
Switching frequency, noise reduction	page 2/91
+/- speed	
- Presentation	page 2/92
- Reference saving	page 2/92
Automatic catching of a spinning load with speed detection	page 2/92
Undervoltage management	page 2/93
Switching of 2 motor ratings	page 2/93
Current limit	page 2/94
Stop types	
- Freewheel stop	page 2/94
- Stop on ramp	page 2/94
- DC injection stop	page 2/94
Motor thermal protection	page 2/95
Drive thermal protection	page 2/96
IGBT thermal protection	page 2/96
Machine protection	page 2/96
Configuring the drive's fault response	page 2/96
Resetting resettable faults	page 2/97
General reset (disables all faults)	page 2/97
Automatic restart	page 2/97
PTC probe protection	page 2/98
IGBT testing	page 2/98
Resetting operating time to zero	page 2/98
External fault	page 2/98
Forced local mode	page 2/98

Variable speed drives for asynchronous motors
Altivar 21



Integrated 7-segment display terminal

Integrated 7-segment display terminal

The Altivar 21 drive has an integrated 7-segment display terminal.
This can be used to:
- Display status and faults
- Access and modify parameters
- Check your installation easily in local mode using the Loc/Rem key 3.

Description

1 Display:
- Four 7-segment displays visible at 5 m
- Display of numeric values and codes
- The display flashes when a value is stored
- Unit rating of displayed value
- The display flashes to indicate a fault on the drive

2 Display of drive status:
- RUN: Run command is active or speed reference present
- PRG: Drive in automatic mode
- MON: Drive in monitoring mode
- Loc: Drive in local mode

3 Use of keys:
- Loc/Rem: Switching of the drive command, locally or remotely.

As a “local” command, the speed reference can be modified using the ∧ and ∨ keys; the LED located between these keys lights up.
- ∧ and ∨: Vertical navigation in the menu, editing of values or speed reference depending on the mode selected
- MODE: Selection of one of the following modes:
  - Default display mode
  - Adjustment mode
  - Status monitoring mode
- RUN: Local motor run command; LED indicates that the RUN key is active
- STOP: Local control of motor stopping/drive fault clearing
- ENT: Saves the current value or the selected function

Remote display terminal

A remote display terminal is available as an option. It can be mounted on an enclosure door and allows access to the same functions as the integrated 7-segment terminal.
It is also possible to download and store 3 configuration files using its “COPY MODE” (see page 2/51).

Variable speed drives for asynchronous motors
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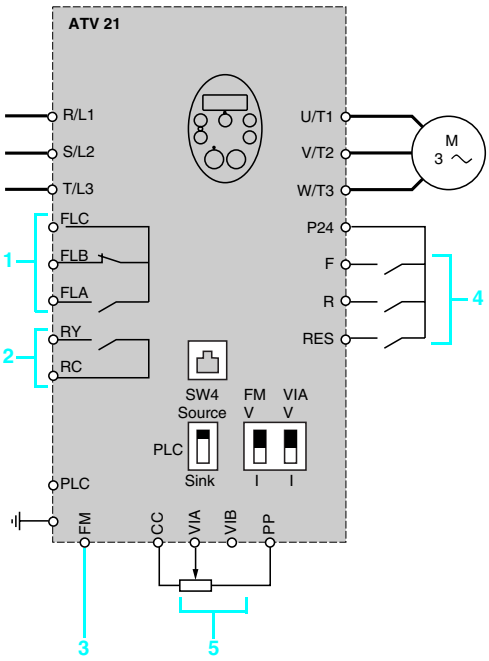


Factory-set configuration

Simplified start-up

Fan and centrifugal pump

The Alitvar 21 drive is factory-configured to allow a simplified start-up, without the need for any adjustment.

The following conditions must be met to be able to use this simplified start-up function:

- The drive load must be a fan or a centrifugal pump
- The motor rating must match the drive rating
- Connection must be according to the diagram opposite:
  - 1 FLA, FLB and FLC for the fault relay
  - 2 RY and RC for the low speed reached relay
  - 3 FM for the analog output
  - 4 F, R and RES for the logic inputs:
    - F for forward operation
    - R for preset speed
    - RES for fault reset
  - 5 VIA and VIB for the analog inputs:
    - VIA for the speed reference 0...10 V
    - VIB is not assigned

Quick Menu

The Quick Menu is used to:

- Access the essential parameters of your application quickly
- Enter the motor rating plate data (nominal voltage, nominal frequency, thermal current, etc.), so that the motor parameters can be adjusted quickly, thereby benefiting from optimum motor performance
- Protect the motor by setting the drive's integrated electronic thermal overload relay

Parameters which can be accessed in the Quick Menu (AUF):

Parameter	Description
AU1	Automatic acceleration/deceleration
ACC	Acceleration
dEC	Deceleration
LL	Low speed
UL	High speed
tHr	Motor thermal current
FM	Analog output
Pt	U/F Profile
uL	Nominal motor frequency
uLu	Nominal motor voltage

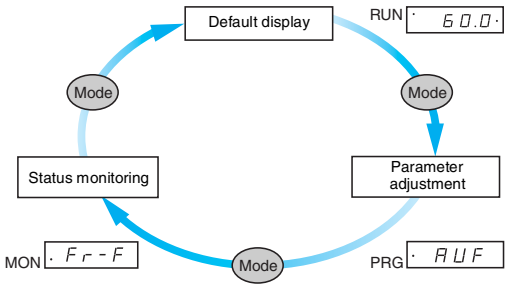
2

2.2

Operating modes

The Altivar 21 drive has the following operating modes:
- Default display mode
- Parameter adjustment mode
- Status monitoring mode

It is easy to switch between these different modes simply by using the "MODE" key:



Default display mode

This mode is automatically activated on power-up.
It is used to display a drive variable (current, speed, etc.), alarms and faults.

Parameter adjustment mode

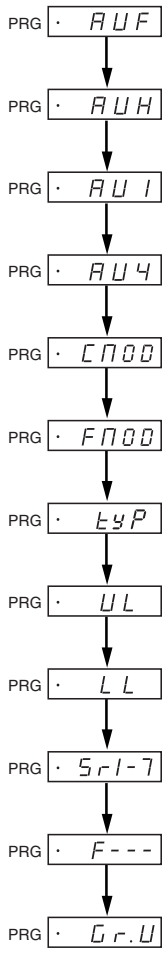
This mode provides a simple start-up function for the drive via direct access to the standard parameters:
- Acceleration
- Deceleration
- Macro-configuration
- Control mode
- Motor rating plate
- Etc.

The standard parameters are identified by an alphanumerical code (ACC, dEC, etc.)

This mode also provides access to the advanced parameters required for setting up and optimizing advanced functions.
These parameters are identified by a numerical code (F100 to F900).

Status monitoring mode

This mode is used to display all the drive variables, such as the I/O state, most recent faults, etc.



Main menus of the integrated 7-segment display terminal

Programming

The main menus accessible from the integrated 7 segments terminal are described in the table below:

Menu type	Function
AUF	Accessing the Quick Menu
AUH	Accessing the most recently modified parameters
AU1	Selecting the ramp type (fixed or automatically adapted)
AU4	Selecting the macro-configurations
CMOD	Selecting the command channel
FMOD	Selecting the reference channel
tyP	Selecting the factory settings or the customer configuration
UL	Setting high speed
LL	Setting low speed
Sr1-7	Accessing preset speeds
F---	Accessing advanced parameters
Gr.U	Accessing parameters that are different to the factory settings

2

2.2

Maintenance, diagnostics

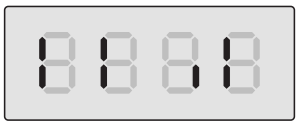
New functions have been added to the Altivar 21 drive to enable it to provide quick and simple maintenance, ultimately boosting productivity:

■ **Response to faults or alarms**
It is possible to use the alarm management or drive operation configuration functions to take corrective measures before stopping the machine.

■ **Fault log**
When a fault occurs, values such as speed, current, thermal state and timer are saved and restored in the fault log.
The last 4 faults are stored.

■ **Identification of the software version**
It is possible to display the relevant serial numbers and software versions, thereby helping to manage the equipment base.

■ **Test functions**
The Altivar 21 drive includes the following test functions:
□ Identifying any motor short-circuit before start-up
□ Running, via the 7-segment display terminal, the remote display terminal or the PC software, automatic procedures during maintenance operations aimed at testing:
- the motor
- the drive power components

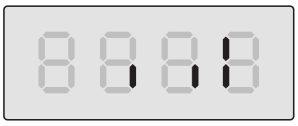


Example of the I/O state display


State 1


State 0

■ **Display of the I/O states**
It is possible to display the activation or deactivation state of each input/output.
1 VIA: State 1
2 RES: State 1
3 R: State 0
4 F: State 1



Example of alarms display


Alarm activated


Alarm deactivated

■ **Displaying equipment maintenance alarms**
Three alarms show if it is necessary to replace the drive or some of its components.

The drive automatically calculates their service lives by configuring their average annual operating temperature.
1 Drive: Alarm deactivated
2 Capacitor: Alarm deactivated
3 Fan: Alarm activated

Controlling the drive via its I/O

Control signals are transmitted via cable to the I/O. Functions are assigned to logic inputs, analog inputs, etc.
A logic input can be assigned to more than one function. This means that two functions can be controlled using a single signal, thereby limiting the number of inputs required.

The Altivar 21 drive I/O can be configured independently from each other. For instance:
□ A time delay can be applied when it comes to reading the logic inputs, so as to avoid any bounce-back from certain switches.
□ Transforming incoming signals on the analog inputs can help the drive fully adapt to the control devices and applications:
- Minimum and maximum values for the input signal
- Input filtering in order to eliminate unwanted interference from the signals received
- Magnifying glass effect through delinearizing the input signal in order to increase the precision with small amplitude signals
- “Pedestal” and “Deadband” functions for signals in order to prevent low speed operations which can have an adverse effect on the application

□ Transforming analog outputs which transfer information sent by the drive to other devices (display units, drives, PLCs, etc.):
- voltage or current output signal
- minimum and maximum values for the output signal
- output signal filtering

Logic outputs can be delayed on activation and deactivation. The output state can also be configured when the signal is active.

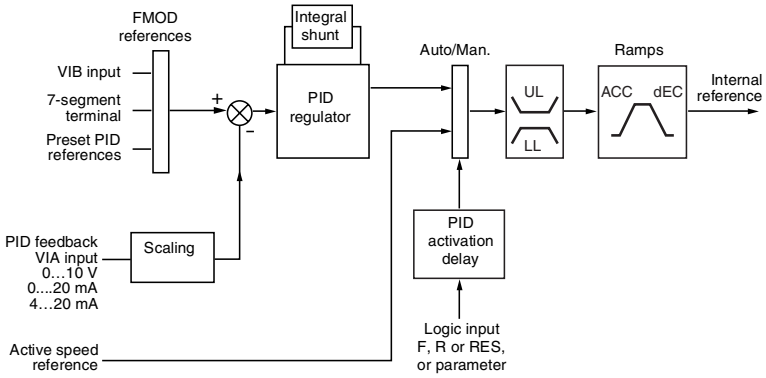
Functions designed specifically for pumping and ventilation applications

■ **Motor control profiles**

□ **Energy saving ratio**
This type of command makes it possible to optimize the energy consumed based on the load applied to the machine.

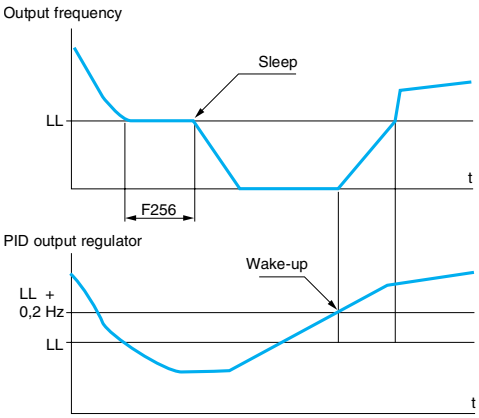
□ **Quadratic ratio (Kn^2)**
This type of command is optimized for centrifugal pumps and fans.

■ **PID regulator**
This can be used to regulate a process with a reference and feedback given by a sensor.
Function suitable for regulation in buildings.



ACC: Acceleration, dEC: Deceleration, LL: Low speed, UL: High speed.

□ **Preset PID references**
2 to 7 PID references are available.



LL: Low speed

Example of the "sleep/wake-up" function in operation

■ **PID regulator (continued)**

□ **PID feedback**

PID feedback can be assigned to the VIA analog input. It can also be transmitted by a communication network (network AI).

The following 4 functions can be used in combination with the PID regulator:

□ **PID feedback supervision**

□ **Sleep/Wake-up**

This function supplements the PID regulator, in order to avoid prolonged operation at excessively low speeds when neither useful nor desirable.
It stops the motor after a period of operation at reduced speed. This duration (parameter F256) and speed (parameter LL) can be adjusted.
It restarts the motor if the PID error or feedback exceeds an adjustable threshold (parameter LL +0.2 Hz).

□ **Alarms**

Minimum and maximum PID regulator feedback monitoring thresholds and PID regulator error monitoring threshold.

□ **Auto/Man.**

This can be used to switch from speed regulation mode (Man.) to PID regulation mode (Auto). A logic input or command word bit is used for switching.

Speed regulation mode (Man.)

The manual reference is transmitted via the terminals (analog inputs, preset speeds, etc.).
With manual switching, the speed reference changes according to the ACC and dEC ramp times.

PID regulation mode (Auto)

In automatic mode it is possible to:
- Adapt the references and feedback to the process (transformation)
- Adjust the proportional, integral and derivative gains
- Shunt the integral
- Use the “alarm” on the logic output or display it on the 7-segment display terminal or the remote display terminal, if the threshold is exceeded (Max. feedback, Min. feedback and PID error)
- Display the PID reference, PID feedback, PID error and PID output on the display terminal and assign them to an analog output
- Apply a ramp to the PID output

The motor speed is limited to low speed (LL) and high speed (UL).

■ **Forced operation**

Combined with the function of inhibiting all faults, this function makes it possible to force the running order in a particular direction and the reference to a configured value.

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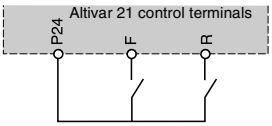
Other application functions

■ 2-wire control

This function is used to control the direction of operation by means of a stay-put contact.
It is enabled by means of 1 or 2 logic inputs (non-reversing and preset speed).

This function is suitable for all non-reversing applications, by detection of the logic input state.



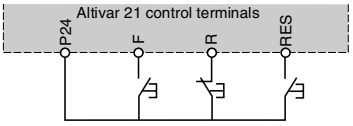
F: Forward
R: Preset speed

Wiring diagram for 2-wire control

■ 3-wire control

This function is used to control the operating and stopping direction by means of pulsed contacts. It is enabled by means of 2 or 3 logic inputs.

This function is suitable for all non-reversing applications and stopping.



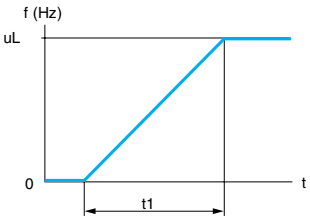
F: Forward
R: Stop
RES: Fault reset

Wiring diagram for 3-wire control

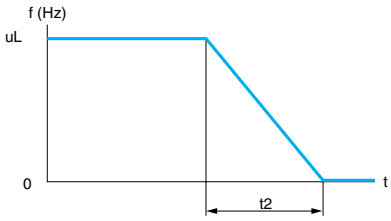
■ Ramps

□ Acceleration and deceleration ramp times

This function is used to define acceleration and deceleration ramp times according to the application and the machine dynamics.



Linear acceleration ramp



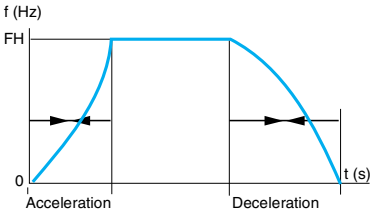
Linear deceleration ramp

uL: Nominal motor frequency
t1: Acceleration time
t2: Deceleration time
t1 and t2 can be set independently from 0.01 to 3200 s (according to one of the following ramp increments: 0.01 s, 0.1 s or 1 s);
Factory setting: 10 s.

□ Automatic adaptation of acceleration and deceleration ramps

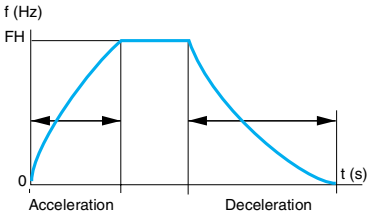
This function can be used to adapt the acceleration and deceleration ramps automatically based on the load.
The acceleration and deceleration times are reduced for low loads and increased for high loads.

Low load



FH: Maximum output frequency

High load



FH: Maximum output frequency

Presentation: pages 2/36 and 2/37
Characteristics: pages 2/38 to 2/43
References: pages 2/48 and 2/49
Dimensions: pages 2/58 to 2/61
Schemes: pages 2/62 to 2/65

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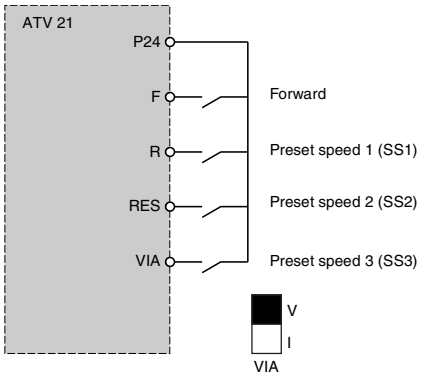
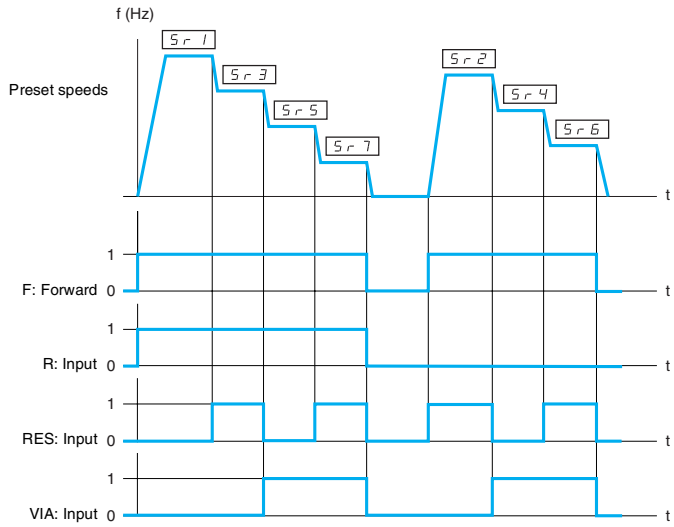
■ **Ramps (continued)**
□ **Ramp switching**
This function is used to switch two acceleration and deceleration ramp times, which can be adjusted separately.
Ramp switching can be enabled by:
- a logic input
- a frequency threshold
- a command word bit

This function is suitable for all machines with fast steady state speed correction.

■ **Preset speeds**
This can be used to switch preset speed references.
Choice of seven preset speeds.
Enabled by logic inputs, R and RES, and by VIA configured as a logic input.
The preset speeds are adjustable in increments of 0.1 Hz, from low speed to high speed.

This function is suitable for machines with several operating speeds.





Example of operation with 7 preset speeds

■ **Limiting low speed operating time**
The motor is stopped automatically after a period of operation at low speed (LL) with a zero reference and a run command present.
This time can be set between 0.1 and 600 seconds (0 corresponds to an unlimited time). Factory setting 0 s. The motor restarts automatically on the ramp when the reference reappears or if the run command is interrupted and then re-established.

Function suitable for automatic Stops/Starts.

■ **Motor control types**
□ **Sensorless flux vector control**
This control type can be used with a single motor or motors connected in parallel.

□ **2-point vector control**
The zone for operating at constant power can be optimized by defining an additional point in the control profile.
This function should be used with motors offering a two-part defluxing zone.
It can be used to limit the voltage at the motor terminals when the motor is being powered by a high line supply.

□ **Voltage/frequency ratio**
This control type is particularly suitable for special motors (high-speed motors, synchronized asynchronous motors, etc.). The ratio can be adjusted by 2 points and used to achieve output frequencies of up to 200 Hz.

□ **Synchronous motor**
This control type is exclusively reserved for controlling open loop synchronous permanent magnet motors with sinusoidal electromotive force (EMF).

■ **Auto-tuning**
Auto-tuning can be performed:
□ Using a dialogue tool (integrated 7-segment display terminal, remote display terminal or PC software)
□ Via a communication network

■ **Switching frequency, noise reduction**
The switching frequency setting permits a reduction in the noise generated by the motor for any application requiring a low level of noise.
The switching frequency is modulated randomly in order to avoid resonance. This function can be disabled if it causes instability.
Switching the intermediate DC voltage at high frequency is useful for supplying the motor with a current wave having little harmonic distortion.
The switching frequency is adjustable during operation to reduce the noise generated by the motor.
Value: 6 to 16 kHz

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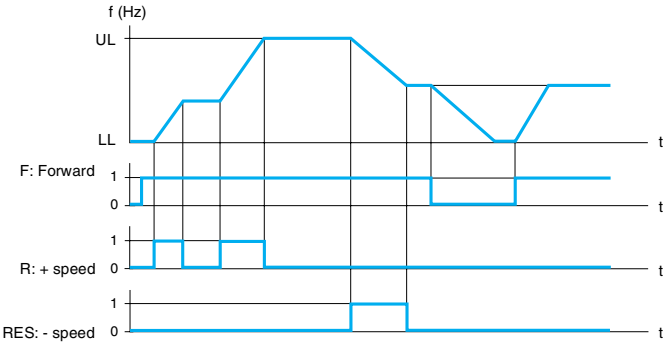
■ **+/- speed**
Used to increase or decrease a speed reference by means of 1 or 2 logic inputs, with or without the last reference being saved (motorized potentiometer function).
This function is suitable for centralized control of a machine with several sections operating in one direction.

Two logic inputs are required in addition to the operating direction for +/- speed control.



LL: Low speed, UL: High speed

□ **Reference saving**
This function is associated with +/- speed control.
This can be used for reading and saving the last speed reference prior to the loss of the run command or line supply. The saved reference is applied at the next run command.

■ **Automatic catching of a spinning load with speed detection** (“catch on the fly”)
This function is used to restart the motor smoothly after one of the following events, provided the run command is still present:
□ loss of line supply or power off
□ fault reset or automatic restart
□ freewheel stop

On disappearance of the event, the effective speed of the motor is detected in order to restart on a ramp at this speed and return to the speed reference. The speed detection time can reach 0.5 s.

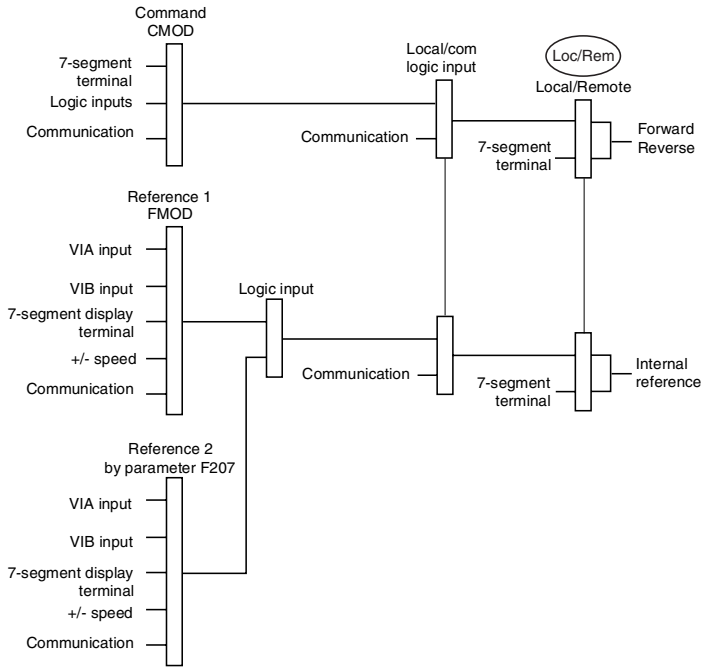
This function is suitable for machines which exhibit low motor speed loss during a power failure (high-inertia machines such as centrifuges, etc.).

■ **Undervoltage management**
Depending on the application, it is possible to configure the Altivar 21's response to undervoltages or power failures.
If the drive locks as a result, management of the fault relay can be configured (open or not). If the fault relay does not open an alarm is shown.

The Altivar 21 drive can also be configured to prevent the drive locking (using an alarm):
□ Controlled stop according to the type of stop configured
□ Deceleration based on a ramp which it automatically adapts to maintain the DC bus voltage, thereby preventing the drive from locking in fault mode
□ Instant IGBT (inverter bridge) loss followed by power supplied to the motor as soon as the line voltage has reappeared. This function can be used to prevent the Altivar 21 drive being reinitialized.

■ **Switching of 2 motor ratings**
This function is used to switch two sets of 10 motor parameters:
□ All or some of the motor parameters can be switched on stopping
□ Some of these parameters can be switched during operation
A logic input or command word bit is used to switch the sets.

Command and reference switching via logic input
This function is used to switch commands (terminal, logic inputs) and references (speed, PID, etc.) via a logic input.



Example of command and reference switching

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■ **Current limit**
A second current limit can be configured up to 1.1 times the drive nominal current and it can be used to limit the rise in motor temperature and the torque.
Switching between the two current limits can be enabled via:
□ a logic input
□ a command word bit

■ **Stop types**
□ **Freewheel stop**
This function stops the motor by resistive torque if the motor power supply is cut.

A freewheel stop is achieved:
- by configuring a normal stop command as a freewheel stop (on disappearance of a run command or appearance of a stop command)
- by enabling a logic input
- by activating a command word bit

□ **Stop on ramp**
This stops the motor according to the deceleration ramp
A stop on ramp is achieved:
- by enabling a logic input
- by activating a command word bit

□ **DC injection stop**
This can be used to brake high-inertia machines at low speed or maintain torque on stopping.
A DC injection stop is achieved:
- by configuring a normal stop as a DC injection stop (on disappearance of a run command or appearance of a stop command)
- by enabling a logic input
- by activating a command word bit

The DC value and the standstill braking time are adjustable.

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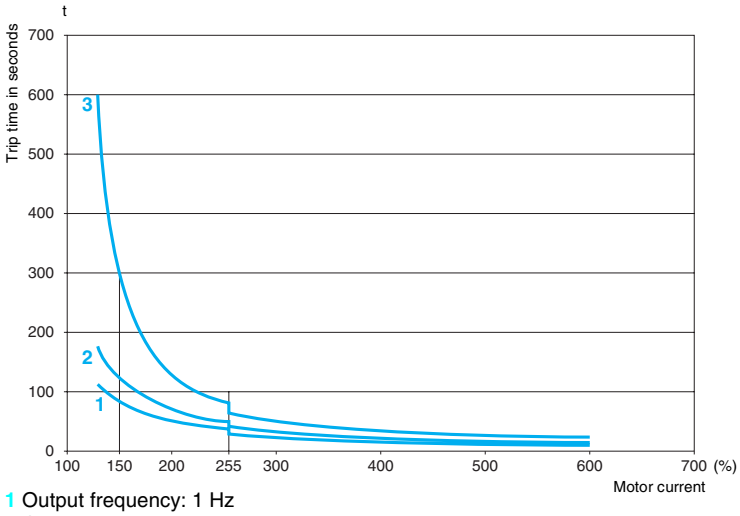
■ **Motor thermal protection**
Motor thermal protection is provided by the drive:
□ directly, through PTC probes located in the motor windings
□ indirectly, via the integrated thermal relay. Indirect thermal protection is implemented via continuous calculation of its theoretical temperature rise.

The microprocessor calculates the theoretical temperature rise of the motor based on various elements:
□ the operating frequency
□ the current taken by the motor
□ the operating time
□ the maximum ambient temperature around the motor (40°C)
□ the type of motor ventilation (self-cooled or force-cooled)

Thermal protection is adjustable from 0.5 to 1.1 times the nominal current, depending on the drive type. It must be adjusted to the nominal current indicated on the motor rating plate.

Note: *The motor thermal state memory returns to zero when the drive control part is switched off.*



1 Output frequency: 1 Hz
2 Output frequency: 10 Hz
3 Output frequency: 30 Hz and above

Motor thermal protection curves

□ Self-cooled motors:
The tripping curves vary with the motor frequency.

□ Force-cooled motors:
Only the 30 Hz and higher tripping curve should be considered, whatever the motor frequency.

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2.2

■ **Drive thermal protection**
The drive thermal protection is provided by a PTC probe mounted on the heatsink or integrated with the power module.

■ **IGBT thermal protection**
The drive manages the switching frequency intelligently according to the IGBT temperature.
If the drive's current rating is exceeded (e.g.: current higher than the nominal drive current for a zero stator frequency), an alarm is displayed and a timer increases for as long the alarm is present.

■ **Machine protection**
This is used to detect under- and/or overload.

■ **Configuring the drive's fault response (fault management)**
Different responses can be configured for the drive in the event of a resettable fault occurring:
- freewheel stop
- drive switches to the fallback speed
- drive maintains the speed at which it was operating when the fault occurred until the fault disappears
- stop on ramp
- DC injection stop
- no stop (alarm activated)

List of resettable faults:
- external fault
- output phase loss
- auto-tuning fault
- loss of 4-20mA
- PTC probe
- drive overheating
- motor overload if the thermal state is less than 100%
- line overvoltage
- current limit
- IGBT overheating
- communication faults (Modbus and other communication networks)
- PI supervision

■ **Resetting resettable faults**
This can be used to remove the last fault using a logic input, command word bit or the STOP/RESET key on the display terminal.
The restart conditions after a reset to zero are the same as those of a normal power-up.
List of resettable faults, see “Configuring the drive’s fault response”.
Line supply undervoltage and input phase loss faults are reset automatically when the line supply is restored.

Function suitable for applications where drives are difficult to access, such as when a drive is placed on a moving part.

■ **General reset (inhibits all faults)**
This function inhibits all faults, including thermal protection (forced operation), which can destroy the drive.

This function is suitable for applications where restarting is vital (smoke extraction system, machines with hardening products that need to be removed).
The function is enabled by a logic input.

Fault monitoring is active if the logic input is at state 1.
All faults are reset on a change of state ↓ of the logic input.

Note: *Use of this function invalidates the guarantee.*

■ **Automatic restart**
This function enables the drive to be restarted automatically after it has locked in fault mode, provided the relevant fault has disappeared and that the other operating conditions permit a restart.
This restart is performed by a series of automatic attempts separated by increasingly longer waiting periods of 1, 2, 3 s, then 10 s, up to the 10th attempt.
If the drive has not restarted after the configured time, it will lock and the procedure is abandoned until it has been powered off and on again.

The faults which permit this type of restart are:
□ line overvoltage
□ motor thermal overload
□ drive thermal overload
□ DC bus overvoltage
□ line phase failure
□ external fault
□ loss of 4-20mA
□ PTC probe
□ serial link
□ current limit
□ output phase loss
□ line voltage too low. For this fault, the function is always active, even if it is not configured.
□ PI supervision,
□ fault caused by Modbus or other communication networks. These faults are reset automatically as soon as the command word or frequency reference is sent to the drive.
For these types of fault, the relay configured as a fault relay remains activated if the function is configured. The speed reference and direction of operation must be maintained for this function.

This function is suitable for machines or installations which are in continuous operation or are not monitored, and where a restart will not endanger equipment or personnel in any way.

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■ **PTC probe protection**
The probes can be connected directly to the drive control card or to the communication cards.
The way in which a temperature fault is recorded by the drive can be configured by default or as an alarm.

■ **IGBT testing**
When enabled, this function tests every IGBT and the motor connections in order to detect a short-circuit or an open circuit. This test is run every time the drive is powered on and before each motor start.

■ **Resetting operating time to zero**
The drive operating and power-up time can be reset.

■ **External fault**
This function can lead to the drive locking if a fault occurs in the machine. This fault is flagged on the drive display unit. The fault is flagged if the signal is at 1 or at 0, according to the function configuration.

■ **Forced local mode**
Forced local mode imposes control via the logic input and prohibits all other control modes.
Switching to forced local mode may be activated via:
□ a logic input
□ a function key on the display terminal

The following references and commands are available for forced local mode:
□ references VIA, VIB, and command via logic inputs
□ reference and command via the display terminal

Function compatibility table

■ **Configurable I/O**

The table below lists the incompatibilities between the functions and shows the priority functions.
Stop functions have priority over run commands.
The selection of functions is limited:
- by the number of drive I/O which can be reassigned
- by the incompatibility of certain functions with one another

Functions	PID regulator	Preset speeds	+/- speed	Freewheel stop	DC injection stop	Forced operation
PID regulator			⊖			→
Preset speeds			⊖			→
+/- speed	⊖	⊖				⊖
Freewheel stop					←	→
DC injection stop				↑		⊖
Forced operation	↓	↓	⊖	↓	⊖	

⊖ Incompatible functions

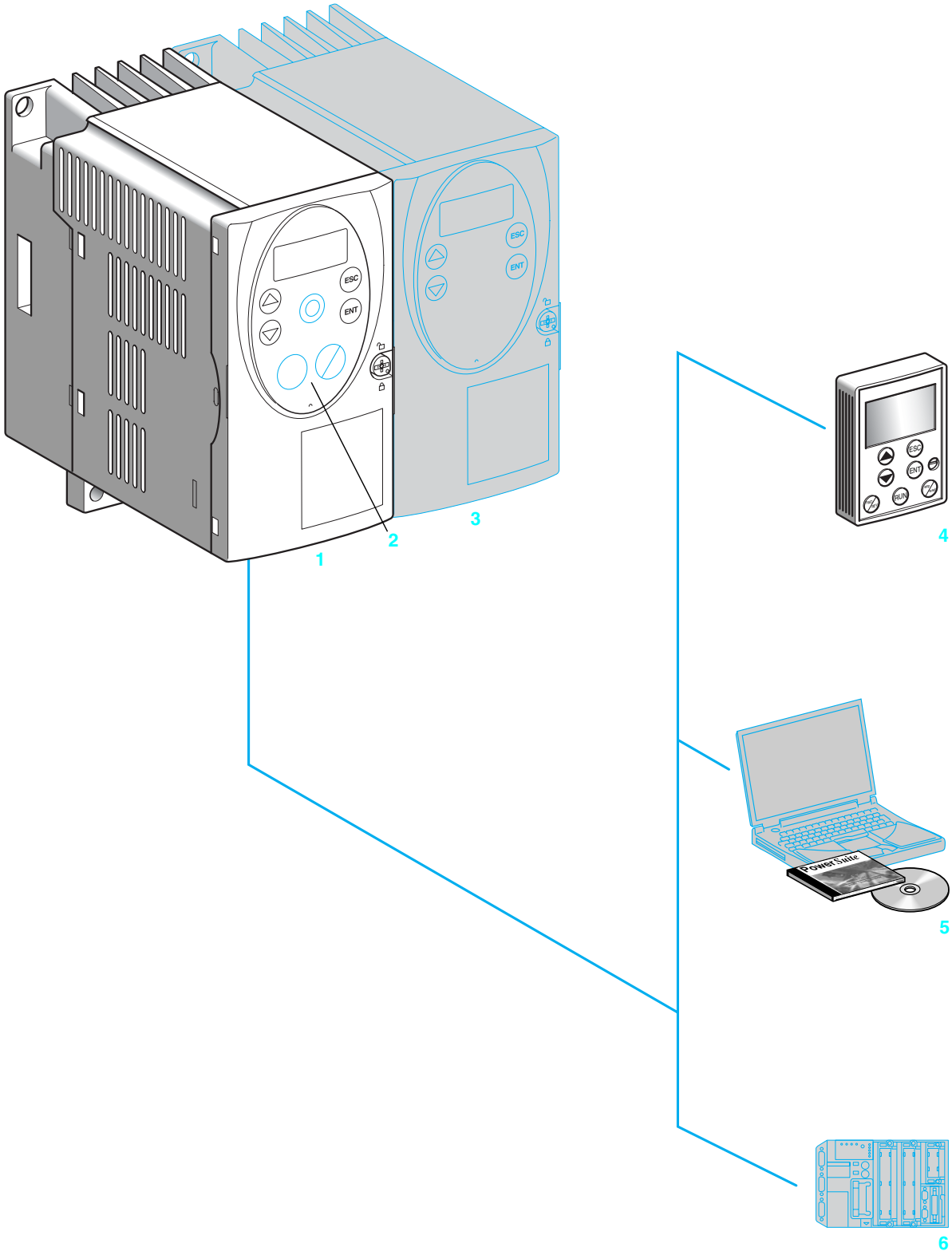
Compatible functions

Not applicable

Priority functions (functions which cannot be active at the same time)

← The arrow indicates which function has priority.
For example, the Freewheel stop function has priority over the DC injection stop function.

Variable speed drives for asynchronous motors
Altivar 31



Variable speed drives for asynchronous motors
Altivar 31

Applications

The Altivar 31 drive is a frequency inverter for 3-phase squirrel cage asynchronous motors. The Altivar 31 is robust, compact and easy to set up. It conforms to EN 50178, IEC/EN 61800-2 and IEC/EN 61800-3 standards, UL and CSA certification and the relevant European directives (CE marking).

It incorporates functions that are suitable for the most common applications, including:
- Materials handling (small conveyors, hoists, etc)
- Packing and packaging machines
- Specialist machines (mixers, kneaders, textile machines, etc.)
- Pumps, compressors, fans

Altivar 31 drives communicate on Modbus and CANopen industrial buses. Both these protocols are integrated as standard in the drive.

Altivar 31 drives are supplied with a heatsink for normal environments and ventilated enclosures. Several units can be mounted side-by-side 3, to save space.

Drives are available for motor ratings ranging from 0.18 kW to 15 kW, with four types of power supply:
- 200 V to 240 V single phase, 0.18 kW to 2.2 kW
- 200 V to 240 V three phase, 0.18 kW to 15 kW
- 380 V to 500 V three phase, 0.37 kW to 15 kW
- 525 V to 600 V three phase, 0.75 kW to 15 kW

Altivar 31 drives are available with a choice of two different human-machine interfaces:
- 1 **ATV 31H●●●●** with displays and menu navigation keys
- 2 **ATV 31H●●●●A** with displays, menu navigation keys and local control (Run/Stop and speed reference set by a potentiometer).

Electromagnetic compatibility EMC

The incorporation of EMC filters in **ATV 31H●●●M2** and **ATV 31H●●●N4** drives simplifies installation and provides an economical means of ensuring machines meet CE marking requirements
ATV 31H●●●M3X and **ATV 31H●●●S6X** drives are available without EMC filter. Filters are available as an option and can be installed by the user if conformity to EMC standards is required (see pages 2/120 and 2/121).

Functions

The Altivar 31 drive has six logic inputs, three analog inputs, one logic/analog output and two relay outputs.
The main functions integrated in the drive are as follows:
- Motor and drive protection
- Linear, S, U or customized acceleration and deceleration ramps
- +/- speed
- 16 preset speeds
- PI regulator and references
- 2-wire/3-wire control
- Brake sequence
- Automatic catching a spinning load with speed detection and automatic restart
- Fault configuration and stop type configuration
- Saving the configuration in the drive

Several functions can be assigned to one logic input.

Options and accessories

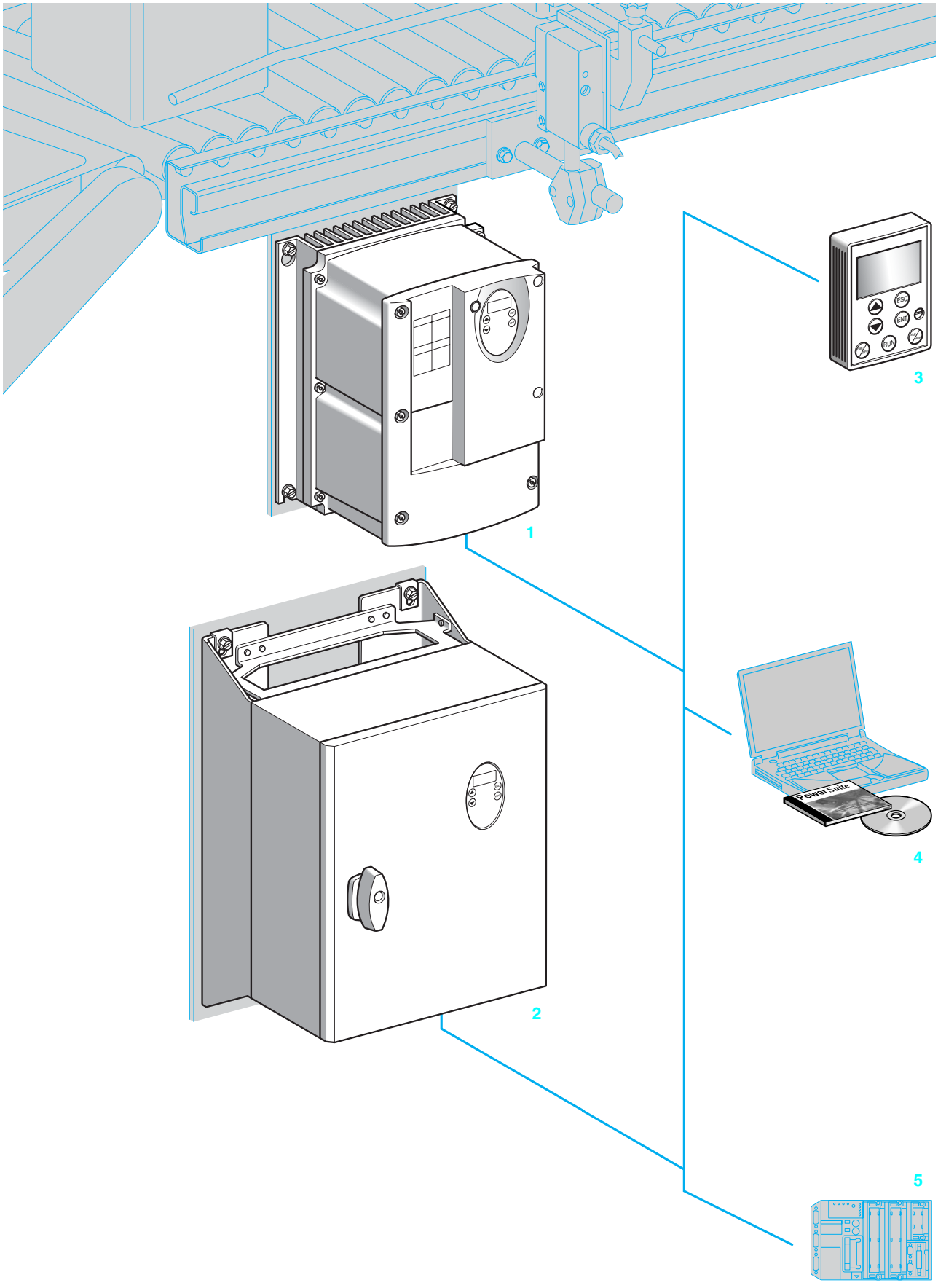
The following options and accessories can be used with the Altivar 31 drive:
- Braking resistors
- Line chokes
- EMC radio interference input filters and output filters
- Plates for mounting on ⊓ rail
- UL Type 1 conformity kit
- Adaptor plate for replacing an Altivar 28 drive

Various dialogue and communication options 4, 5 and 6 can be used with the drive, see pages 2/106 and 2/107.

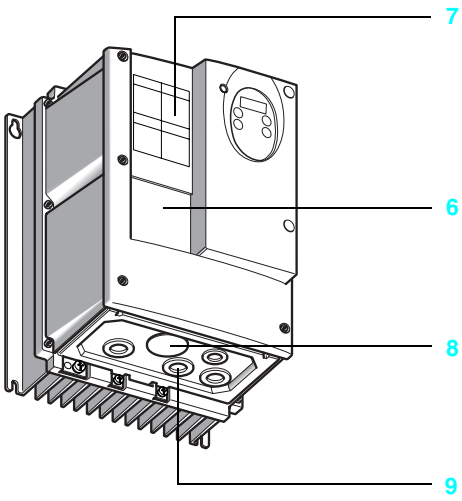
Variable speed drives for asynchronous motors

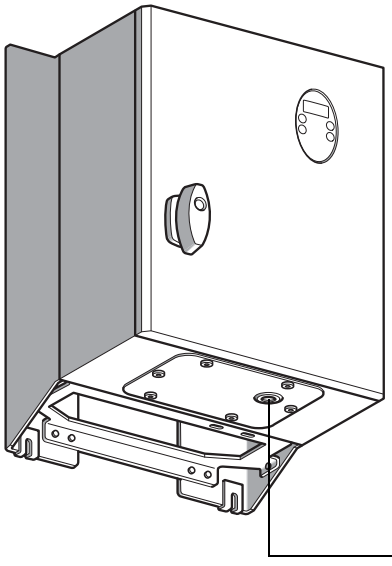
Altivar 31

Enclosed drives



Variable speed drives for asynchronous motors
Altivar 31
Enclosed drives





Applications

The enclosed Altivar 31 drive is suitable for applications requiring an IP 55 degree of protection in a hostile environment.

This enclosed range of drives is available for motor ratings between 0.18 kW and 15 kW, with two types of power supply:
- 200 V to 240 V single phase, 0.18 kW and 2.2 kW
- 380 V to 500 V three phase, 0.37 kW and 15 kW

Up to 2.2 kW in single phase supply and 4 kW in three phase supply, the drive is supplied in a customizable enclosure suitable for ready-to-use motor starter applications. Above these power ratings, the drive is supplied in a standard enclosure.

These enclosures can be installed next to the motor.

Customizable enclosed drive (0.18 kW to 4 kW)

This range allows full customization of the human-machine interface part of the enclosure.
The IP 55 enclosure includes:
- A drive 1 with external heatsink
- Removable covers 6 to 9 for adding the following components:

6 Vario switch disconnector or GV2 circuit-breaker
7 3 buttons and/or LEDs with plastic flange (Ø 22) and 1 speed reference potentiometer
8 1 blanking plug for the RJ45 connector with IP 55 cable
9 Cable glands for cable routing

The combinations (circuit-breaker, contactor, drive) required for the motor starter function can be found on pages 2/138.
Example references:
- 3-pole Vario switch disconnector (V●● + KC● 1●Z)
- Selector switch with 3 fixed positions XB5 D33
- LED XB5 AV●●
- 2.2 kΩ potentiometer VW3 A58866

These references can be found in our specialist "Motor starter solutions-Control and protection components" and "Components for Human-Machine Interfaces" catalogues.
All components must be ordered separately and wired by the customer.

Standard enclosed drive (5.5 kW to 15 kW)

This enclosure includes a drive 2 with external heatsink and fans and a blanking plug 10 for the RJ45 connector with IP 55 cable.

The combinations (circuit-breaker, contactor, drive) required for the motor starter function can be found on page 2/138.

Electromagnetic compatibility EMC

The incorporation of EMC filters in **ATV 31C●●●M2** and **ATV 31C●●●N4** enclosed drives simplifies installation and provides an economical means of ensuring machines meet CE marking requirements.

Options and accessories

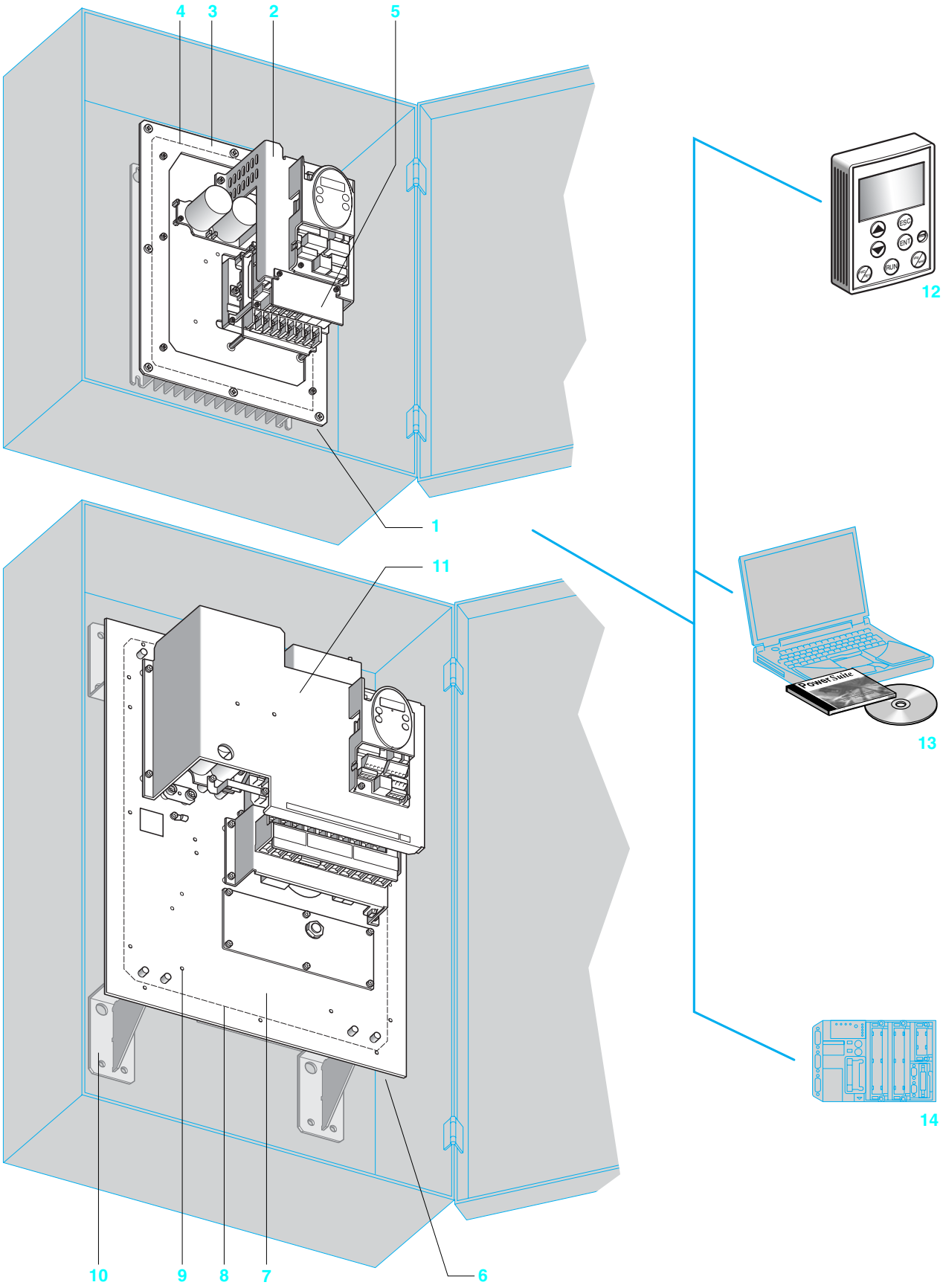
The following options and accessories can be used with the enclosed Altivar 31 drive:
- Braking resistors
- Line chokes
- Output filters and motor chokes
- IP 55 cables equipped with RJ45 connectors for control via Modbus

Various dialogue and communication options 3, 4, 5 can be used with the drive (see pages 2/106 and 2/107).

Variable speed drives for asynchronous motors

Altivar 31

Drive kits



Variable speed drives for asynchronous motors
Altivar 31
Drive kits

Applications

The drive kit is another standard solution available in the Altivar 31 drives offer.
The drive kit comprises:
- Altivar 31 drive elements (heatsink, power and control subassemblies)
- EMC filter
- Mechanical adaptors
- Seals required for use in difficult environments (IP 55)

The kit is mounted on a metal mounting support with no flange or protective cover.
The Altivar 31 drive kit can be built into a floor-standing or wall-mounted enclosure or mounted on a machine frame.

The drive kit is available for motor ratings between 0.18 kW and 15 kW, with two types of power supply:
- 200 V to 240 V single phase, 0.18 kW to 2.2 kW
- 380 V to 500 V three phase, 0.37 kW to 15 kW

Electromagnetic compatibility EMC

The incorporation of EMC filters in **ATV 31K●●●M2** and **ATV 31K●●●N4** drives simplifies installation and provides an economical means of ensuring machines meet CE marking requirements. They are sized to conform to standard IEC/EN61800-3, domestic and industrial environments.

Description

- Drive kit for power ratings ⩽ 4 kW 1

The Altivar 31 drive components (heatsink, power and control subassemblies) are held in place by mechanical adaptors 2 and protective fittings.
The unit is supported by a metal plate 3 mounted on the heatsink.
A seal 4 is attached all around the plate.
Once the support has been cut out, the drive kit is mounted on the base of the floor-standing or wall-mounted enclosure by means of this plate.
The power terminals 5 are protected (IP 20).

- Drive kit for power ratings ⩾ 5.5 kW 6

The Altivar 31 drive components (heatsink, power and control subassemblies) are held in place by mechanical adaptors 11 and protective fittings.
The metal support plate 7 for the components is equipped with brackets 10 for mounting in a floor-standing or wall-mounted enclosure.
A seal 8 is attached all around the plate.
Two fans are installed behind the plate under the heatsink.
Additional mounting holes 9 are provided for mounting components (GV2 circuit-breaker, Vario switch disconnector, contactor, additional plate, etc.).

Drive kits are supplied with:
- A cutting and drilling template
- A user's manual with installation instructions and safety precautions.

Options and accessories

The following options and accessories can be used with the Altivar 31 drive kit:
- Braking resistors
- Line chokes
- Output filters and motor chokes

Various dialogue and communication options 12, 13, 14 can be used with the drive (see pages 2/106 and 2/107).

Variable speed drives for asynchronous motors
Altivar 31
Dialogue options

Presentation

The Altivar 31 drive communicates with the following options:
- Remote display terminal
- PowerSuite software workshop
- Ethernet/Modbus bridge
- Communication gateways

The communication function provides access to the drive's configuration, adjustment, control and signalling functions.

Remote terminal

The Altivar 31 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 drive, see page 2/141.

It can be used:
- To control, adjust and configure the drive remotely
- For visible remote signalling
- To save and download configurations; 4 configuration files can be saved.

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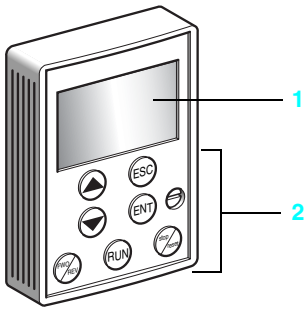

Description

1 Display
- Four 7-segment displays visible at 5 m
- Displays numeric values and codes
- The display flashes when a value is stored.
- The display flashes to indicate a fault on the drive.

2 Use of keys:
- Navigation arrows and ENT, ESC for settings and configurations
- FWD/REV key: reverses the direction of rotation of the motor
- RUN key: motor run command
- STOP/RESET key: motor stop command or drive fault reset

Variable speed drives for asynchronous motors
Altivar 31
Communication options

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PowerSuite software workshop

PowerSuite software workshop

The PowerSuite software workshop offers the following advantages:
- Messages can be displayed in plain text and in multiple languages
- Work can be prepared in the design office without connecting the drive to the PC
- Configurations and settings can be saved to floppy disk or hard disk and downloaded to the drive
- Settings can be printed out
- Altivar 28 files can be read and imported into the Altivar 31

See pages 3/2 to 3/5.

Ethernet/Modbus bridge

The Altivar 31 can be connected to an Ethernet network via an Ethernet/Modbus bridge.
Ethernet communication is primarily intended for the following applications:
- Coordination between PLCs
- Local or centralized supervision
- Communication with production management software
- Communication with remote I/O
- Communication with industrial control products

See pages 2/124 and 2/125.

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Communication gateways

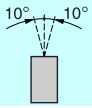
Communication gateways

The Altivar 31 can connect to other communication buses by means of the following gateways:
- Fipio/Modbus
- DeviceNet/Modbus
- Profibus DP/Modbus

See pages 2/124 and 2/125.

Variable speed drives for asynchronous motors
Altivar 31

Environmental characteristics

Conformity to standards			Altivar 31 drives have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control devices (IEC, EN), in particular: low-voltage EN 50178, EMC immunity and EMC conducted and radiated emissions.
EMC immunity			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 (power part) IEC/EN 61800-3, environments 1 and 2
EMC conducted and radiated emissions for drives			
	All drives		IEC/EN 61800-3, environments: 2 (industrial supply) and 1 (public supply), restricted distribution
	ATV 31H018M2...HU15M2, ATV 31C018M2...CU15M2, ATV 31H037N4...HU40N4, ATV 31C037N4...CU40N4		EN 55011 class A group 1, EN 61800-3 category C2 With additional EMC filter: ■ EN 55022 class B group 1, EN 61800-3 category C1
	ATV 31HU22M2, ATV 31CU22M2, ATV 31HU55N4...HD15N4, ATV 31CU55N4...CD15N4		EN 55011 class A group 2, EN 61800-3 category C3 With additional EMC filter *(1)* : ■ EN 55022 class A group 1, EN 61800-3 category C2 ■ EN 55022 class B group 1, EN 61800-3 category C1
	ATV 31H018M3X...HD15M3X, ATV 31H075S6X....HD15S6X		With additional EMC filter *(1)*: ■ EN 55011 class A group 1, EN 61800-3 category C2 ■ EN 55022 class B group 1, EN 61800-3 category C1
CE marking			The drives carry CE marking in accordance with the European low voltage (73/23/EEC and 93/68/EEC) and EMC (89/336/EEC) directives
Product certifications	All drives		C-Tick
	ATV 31H/K●●●●●, ATV 31H●●●●●X, ATV 31C●●●M2, ATV 31C037N4…CU40N4		UL, CSA, N998
Degree of protection	ATV 31H●●●M2, ATV 31H●●●N4, ATV 31H●●●M3X, ATV 31H●●●S6X		IP 31 and IP 41 on upper part and IP 21 on connection terminals IP 20 without cover plate on upper part of cover
	ATV 31C●●●M2, ATV 31C●●●N4		IP 55
Degree of pollution			2
Climatic treatment			TC
Vibration resistance	Drive without rail option ⌐¯¬		Conforming to IEC/EN 60068-2-6: 1.5 mm peak to peak from 3 to 13 Hz, 1 gn from 13 to 150 Hz
Shock resistance			15 gn for 11 ms conforming to IEC/EN 60068-2-27
Relative humidity		**%**	5…95 without condensation or dripping water, conforming to IEC 60068-2-3
Ambient temperature around the unit	Storage	**°C**	- 25…+ 70
	Operation		
	ATV 31H●●●	**°C**	-10…+50 without derating, with protective cover on top of the drive -10…+60 with derating, without protective cover on top of the drive (see derating curves, page 2/134)
	ATV 31C/K●●●	**°C**	-10…+40 without derating
Maximum operating altitude		**m**	1000 without derating (above this, derate the current by 1% per additional 100 m)
Operating position Maximum permanent angle in relation to the normal vertical mounting position			

Drive characteristics

Output frequency range		**Hz**	0…500
Switching frequency		**kHz**	2…16 adjustable during operation
Speed range			1…50
Transient overtorque			170 to 200% of nominal motor torque (typical value)
Braking torque	With braking resistor		100% of nominal motor torque continuously and up to 150% for 60 s
	Without braking resistor		Value of nominal motor torque (typical value) according to ratings: 30% for > ATV 31●U15●● 50% for ⩽ ATV 31●U15●● 100% for ⩽ ATV 31●075●● 150% for ⩽ ATV 31●018M2
Maximum transient current			150% of the nominal drive current for 60 seconds (typical value)
Voltage/frequency ratio			Sensorless flux vector control with PWM *(Pulse Width Modulation)* type motor control signal Factory-set for most constant torque applications Possible options: specific ratios for pumps and fans, energy saving or constant torque U/f for special motors
Frequency loop gain			Factory-set with the speed loop stability and gain Possible options for machines with high resistive torque or high inertia, or for machines with fast cycles
Slip compensation			Automatic whatever the load. Can be suppressed or adjusted

(1) See table on page 2/121 to check permitted cable lengths.

Electrical characteristics

Power supply	Voltage	**V**	200 -15% … 240 +10% single phase for ATV 31●●●●M2 200 -15% … 240 +10% 3-phase for ATV 31●●●●M3X 380 -15% … 500 +10% 3-phase for ATV 31●●●●N4 525 -15% … 600 +10% 3-phase for ATV 31●●●●S6X
	Frequency	**Hz**	50 -5% … 60 +5%
Prospective short-circuit current ISC	For drives		
	ATV 31●●●●M2	**A**	≤ 1000 (ISC at connection point) for single phase power supply
	ATV 31H018M3X…HU40M3X, ATV 31H/C/K037N4…H/C/KU40N4, ATV 31H075S6X…HU40S6X	**A**	≤ 5000 (ISC at connection point) for 3-phase power supply
	ATV 31HU55M3X…HD15M3X, ATV 31HU55N4…HD15N4, ATV 31CU55N4…CD15N4, ATV 31KU55N4…KD15N4, ATV 31HU55S6X…HD15S6X	**A**	≤ 22000 (ISC at connection point) for 3-phase power supply
Output voltage			Maximum 3-phase voltage equal to line supply voltage
Maximum connection capacity and tightening torque of the power supply terminals, motor, braking module and DC bus	For drives		
	ATV 31H/C/K018M2…H/C/K075M2, ATV 31H018M3X…HU15M3X		2.5 mm² (AWG 14) 0.8 Nm
	ATV 31H/C/KU11M2…H/C/KU22M2, ATV 31HU22M3X…HU40M3X, ATV 31H/C/K037N4…H/C/KU40N4, ATV 31H075S6X…HU40S6X		5 mm² (AWG 10) 1.2 Nm
	ATV 31HU55M3X, HU75M3X, ATV 31H/C/KU55N4, H/C/KU75N4, ATV 31HU55S6X, HU75S6X		16 mm² (AWG 6) 2.2 Nm
	ATV 31HD11M3X, HD15M3X, ATV 31H/C/KD11N4, H/C/KD15N4, ATV 31HD11S6X, HD15S6X		25 mm² (AWG 3) 4 Nm
Electrical isolation			Electrical isolation between power and control (inputs, outputs, power supplies)
Internal supplies available			Short-circuit and overload protection: ■ One +10 V (0/+8%) supply for the reference potentiometer (2.2 to 10 kΩ), maximum current 10 mA ■ One +24 V supply (min. 19 V, max. 30 V) for logic inputs, maximum current 100 mA
Configurable analog inputs	AI1		Analog voltage input 0 to +10V, impedance 30 kΩ,maximum safe voltage 30 V
	AI2		Analog bipolar voltage input ±10 V, impedance 30 kΩ, maximum safe voltage 30 V
	AI3		Analog current input X-Y mA by programming X and Y from 0 to 20 mA, with impedance 250Ω
			AIP: potentiometer reference for ATV 31●●●●●●A only Max. sampling time: 8 ms 10-bit resolution Precision ± 4.3% Linearity ± 0.2% of maximum value Use: ■ 100 m maximum with shielded cable ■ 25 m maximum with unshielded cable
Analog voltage or current outputs configurable as logic outputs			2 assignable analog outputs AOV and AOC These outputs cannot be used at the same time
	AOV		Analog voltage output 0..+10 V, minimum load impedance 470 Ω 8-bit resolution, precision ±1%, linearity ±0.2%
	AOC		Analog current output 0…20 mA, maximum load impedance 800 Ω 8-bit resolution, precision ±1%, linearity ±0.2% This AOC analog output can be configured as a 24 V logic output, max. 20 mA, minimum load impedance 1.2 kΩ Max. sampling time: 8 ms
Configurable relay outputs	R1A, R1B, R1C		1 relay logic output, one "N/C" contact and one "N/O" contact with common point. Minimum switching capacity: 10 mA for ⎓ 5 V Maximum switching capacity: ■ on resistive load (cos φ = 1 and L/R = 0 ms): 5 A for ∿ 250 V or ⎓ 30 V, ■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for ∿ 250 V or ⎓ 30 V Max. sampling time: 8 ms Switching: 100,000 operations
	R2A, R2B		1 relay logic output, one "N/C" contact, contact open on fault. Minimum switching capacity: 10 mA for ⎓ 5 V Maximum switching capacity: ■ on resistive load (cos φ = 1 and L/R = 0 ms): 5 A for ∿ 250 V or ⎓ 30 V, ■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for ∿ 250 V or ⎓ 30 V Max. sampling time: 8 ms Switching: 100,000 operations

Presentation: pages 2/100 to 2/107 | References: pages 2/112 to 2/115 | Dimensions: pages 2/126 to 2/131 | Schemes: pages 2/132 to 2/135 | Functions: pages 2/140 to 2/157

Electrical characteristics (continued)

Logic inputs LI	LI1…LI6		6 programmable logic inputs Impedance 3.5 kΩ + 24 V internal or 24 V external power supply (min. 19 V, max. 30 V) Max. current: 100 mA Max. sampling time: 4 ms Multiple assignment makes it possible to configure several functions on one input (example: LI1 assigned to forward and preset speed 2, LI3 assigned to reverse and preset speed 3)
	Positive logic		State 0 if < 5 V or logic input not wired, state 1 if > 11 V
	Negative logic		State 0 if > 19 V or logic input not wired, state 1 if < 13 V
	CLI position		Connection to PLC output (see diagram, page 2/132)
Maximum I/O connection capacity and tightening torque			2.5 mm^2 (AWG 14) 0.6 Nm
Acceleration and deceleration ramps			Ramp profiles: ■ Linear, can be adjusted separately from 0.1 to 999.9 s ■ S, U or customized Automatic adaptation of deceleration ramp time if braking capacities are exceeded, possible inhibition of this adaptation (use of braking resistor)
Braking to a standstill			By d.c. injection: ■ by a signal on a programmable logic input ■ automatically as soon as the estimated output frequency drops to < 0.5 Hz, period adjustable from 0 to 30 s or continuous, current adjustable from 0 to 1.2 In
Main protection and safety features of the drive			Thermal protection against overheating Protection against short-circuits between motor phases Protection against input phase breaks Protection against motor phase breaks Protection against overcurrent between output phases and earth Line supply overvoltage and undervoltage safety circuits Line supply phase loss safety function, for 3-phase supply
Motor protection (see page 2/153)			Thermal protection integrated in the drive by continuous calculation of the I^2t
Dielectric strength	Between earth and power terminals		2040 V ⎓ for ATV 31●●●●M2 and M3X, 2410 V ⎓ for ATV 31●●●●N4, 2550 V ⎓ for ATV 31●●●●S6X
	Between control and power terminals		2880 V ∿ for ATV 31●●●●M2 and M3X, 3400 V ∿ for ATV 31●●●●N4, 3600 V ∿ for ATV 31●●●●S6X
Insulation resistance to earth			> 500 MΩ (electrical isolation) 500 V ⎓ for 1 minute
Signalling			1 red LED on front: LED lit indicates the presence of drive voltage Display coded by four 7-segment display units displaying the CANopen bus status (RUN and ERR).
Frequency resolution	Display units	**Hz**	0.1
	Analog inputs	**Hz**	0.1 …100 Hz (calculate (high speed – low speed)/1024)
Time constant for reference change		**ms**	5
Communication			Modbus and CANopen are integrated into the drive and available via an RJ45 connector
	Modbus		RS 485 multidrop serial link Modbus in RTU mode Services supported: decimal function codes 03, 06, 16, 23 and 43 Broadcasting Number of addresses: drive address can be configured via the integrated terminal from 1 to 247 Maximum number of Altivar 31 drives connected: 31 Transmission speed: 4800, 9600 or 19200 bps Used for connecting: ■ the remote terminal (option) ■ the PowerSuite software workshop ■ a PLC ■ a microprocessor card ■ a PC
	CANopen		To connect the ATV31 drive on the CANopen bus, use the VW3 CANTAP2 adapter Services supported: ■ Implicit exchange of Process Data Object - 2 PDOs depending on DSP 402 velocity mode - 2 configurable PDOs (data and transmission type) - PDOs can be exchanged between slaves. ■ Explicit exchange of Service Data Object - 1 receive SDO and 1 transmit SDO ■ Boot-up messages, emergency messages, node guarding and producer and consumer heartbeat, sync and NMT Number of addresses: drive address can be configured via the integrated terminal from 1 to 127 Maximum number of Altivar 31 drives connected: 127 Transmission speed: 10, 20, 50, 125, 250, 500 kbps or 1 Mbps

Presentation: pages 2/100 to 2/107
References: pages 2/112 to 2/115
Dimensions: pages 2/126 to 2/131
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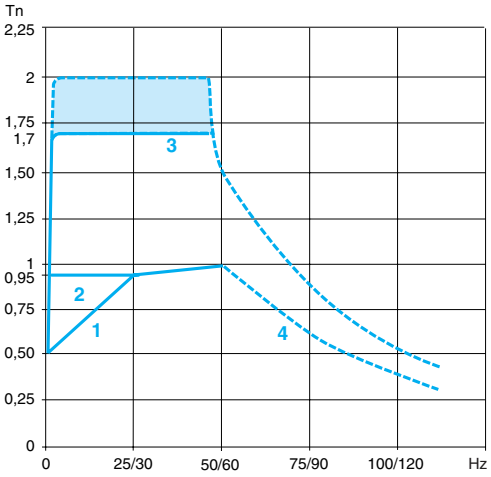
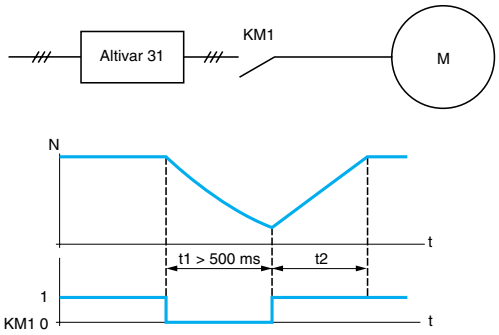


1 Self-cooled motor: continuous useful torque *(1)*
2 Force-cooled motor: continuous useful torque
3 Transient overtorque 1.7 to 2 Tn
4 Torque in overspeed at constant power *(2)*



KM1: contactor
t1: KM1 opening time (motor freewheeling)
t2: acceleration with ramp
N: speed

Example of breaking of downstream contactor

Torque characteristics (typical curves)

The curves opposite define the available continuous torque and transient overtorque for both force-cooled and self-cooled motors. The only difference is in the ability of the motor to provide a high continuous torque at less than half the nominal speed.

Special uses

Use with a motor with a different rating to that of the drive

The device can supply any motor which has a power rating lower than that for which it is designed.
For motor ratings slightly higher than that of the drive, check that the current taken does not exceed the continuous output current of the drive.

Test on a low power motor or without a motor

In a testing or maintenance environment the drive can be checked without having to switch to a motor with the same rating as the drive (particularly useful in the case of high power drives). This use requires deactivation of motor phase loss detection.

Connecting motors in parallel

The nominal current of the drive must be greater than or equal to the sum of the currents of the motors to be controlled.
In this case, external thermal protection must be provided for each motor using probes or LRD thermal bimetal overload relays designed for 1.2 times the nominal current of the motor.
If the number of motors connected in parallel is greater than or equal to 3, it is advisable to install a motor choke between the drive and the motors.

Switching the motor at the drive output

The drive can be switched when locked or unlocked. If the drive is switched on-the-fly (drive unlocked), the motor is controlled and accelerates until it reaches the reference speed smoothly following the acceleration ramp.
This use requires configuration of automatic catching a spinning load ("catch on-the-fly"), activation of the function which manages the presence of a downstream contactor and addition of ferrite suppressors at the drive output, see page 2/123.

Typical applications: loss of safety circuit at drive output, bypass function, switching of motors connected in parallel

Operating recommendations: synchronize the control of the downstream contactor with that of a freewheel stop request sent by the drive on a logic input.

(1) For power ratings ≤ 250 W, the motor is derated to a lesser extent (20% instead of 50% at very low frequencies).
(2) The nominal motor frequency and the maximum output frequency can be adjusted from 40 to 500 Hz.
***Note**: Check the mechanical overspeed characteristics of the selected motor with the manufacturer.*

2
2.3

Variable speed drives for asynchronous motors

Altivar 31

Drives with heatsink


531248

ATV 31H037M2


531249

ATV 31HU40M3X


531250

ATV 31HU75N4


531251

ATV 31HD15N4A

Motor		Line supply				Altivar 31				
Power indicated on rating plate *(1)*		Line current *(2)*		Apparent power	Max. prospective line Isc *(4)*	Nominal current	Max. transient current for 60 s	Power dissipated at nominal load	Reference *(5)*	Weight
		at U1	at U2 *(3)*			4 kHz				
kW	*HP*	A	A	kVA	kA	A	A	W		kg
Single phase supply voltage: 200…240 V 50/60 Hz, with integrated EMC filters										
0.18	*0.25*	3.0	2.5	0.6	1	1.5	2.3	24	**ATV 31H018M2** *(6)*	1.500
0.37	*0.5*	5.3	4.4	1	1	3.3	5	41	**ATV 31H037M2** *(6)*	1.500
0.55	*0.75*	6.8	5.8	1.4	1	3.7	5.6	46	**ATV 31H055M2** *(6)*	1.500
0.75	*1*	8.9	7.5	1.8	1	4.8	7.2	60	**ATV 31H075M2** *(6)*	1.500
1.1	*1.5*	12.1	10.2	2.4	1	6.9	10.4	74	**ATV 31HU11M2** *(6)*	1.800
1.5	*2*	15.8	13.3	3.2	1	8	12	90	**ATV 31HU15M2** *(6)*	1.800
2.2	*3*	21.9	18.4	4.4	1	11	16.5	123	**ATV 31HU22M2** *(6)*	3.100
3-phase supply voltage: 200…240 V 50/60 Hz, without EMC filters *(7)*										
0.18	*0.25*	2.1	1.9	0.7	5	1.5	2.3	23	**ATV 31H018M3X** *(6)*	1.300
0.37	*0.5*	3.8	3.3	1.3	5	3.3	5	38	**ATV 31H037M3X** *(6)*	1.300
0.55	*0.75*	4.9	4.2	1.7	5	3.7	5.6	43	**ATV 31H055M3X** *(6)*	1.300
0.75	*1*	6.4	5.6	2.2	5	4.8	7.2	55	**ATV 31H075M3X** *(6)*	1.300
1.1	*1.5*	8.5	7.4	3	5	6.9	10.4	71	**ATV 31HU11M3X** *(6)*	1.700
1.5	*2*	11.1	9.6	3.8	5	8	12	86	**ATV 31HU15M3X** *(6)*	1.700
2.2	*3*	14.9	13	5.2	5	11	16.5	114	**ATV 31HU22M3X** *(6)*	1.700
3	–	19.1	16.6	6.6	5	13.7	20.6	146	**ATV 31HU30M3X** *(6)*	2.900
4	*5*	24.2	21.1	8.4	5	17.5	26.3	180	**ATV 31HU40M3X** *(6)*	2.900
5.5	*7.5*	36.8	32	12.8	22	27.5	41.3	292	**ATV 31HU55M3X** *(6)*	6.400
7.5	*10*	46.8	40.9	16.2	22	33	49.5	388	**ATV 31HU75M3X** *(6)*	6.400
11	*15*	63.5	55.6	22	22	54	81	477	**ATV 31HD11M3X** *(6)*	10.500
15	*20*	82.1	71.9	28.5	22	66	99	628	**ATV 31HD15M3X** *(6)*	10.500
3-phase supply voltage: 380…500 V 50/60 Hz, with integrated EMC filters										
0.37	*0.5*	2.2	1.7	1.5	5	1.5	2.3	32	**ATV 31H037N4** *(6)*	1.800
0.55	*0.75*	2.8	2.2	1.8	5	1.9	2.9	37	**ATV 31H055N4** *(6)*	1.800
0.75	*1*	3.6	2.7	2.4	5	2.3	3.5	41	**ATV 31H075N4** *(6)*	1.800
1.1	*1.5*	4.9	3.7	3.2	5	3	4.5	48	**ATV 31HU11N4** *(6)*	1.800
1.5	*2*	6.4	4.8	4.2	5	4.1	6.2	61	**ATV 31HU15N4** *(6)*	1.800
2.2	*3*	8.9	6.7	5.9	5	5.5	8.3	79	**ATV 31HU22N4** *(6)*	3.100
3	–	10.9	8.3	7.1	5	7.1	10.7	125	**ATV 31HU30N4** *(6)*	3.100
4	*5*	13.9	10.6	9.2	5	9.5	14.3	150	**ATV 31HU40N4** *(6)*	3.100
5.5	*7.5*	21.9	16.5	15	22	14.3	21.5	232	**ATV 31HU55N4** *(6)*	6.500
7.5	*10*	27.7	21	18	22	17	25.5	269	**ATV 31HU75N4** *(6)*	6.500
11	*15*	37.2	28.4	25	22	27.7	41.6	397	**ATV 31HD11N4** *(6)*	11.000
15	*20*	48.2	36.8	32	22	33	49.5	492	**ATV 31HD15N4** *(6)*	11.000
3-phase supply voltage: 525…600 V 50/60 Hz, without EMC filters										
0.75	*1*	2.8	2.4	2.5	5	1.7	2.6	36	**ATV 31H075S6X**	1.700
1.5	*2*	4.8	4.2	4.4	5	2.7	4.1	48	**ATV 31HU15S6X**	1.700
2.2	*3*	6.4	5.6	5.8	5	3.9	5.9	62	**ATV 31HU22S6X**	2.900
4	*5*	10.7	9.3	9.7	5	6.1	9.2	94	**ATV 31HU40S6X**	2.900
5.5	*7.5*	16.2	14.1	15	22	9	13.5	133	**ATV 31HU55S6X**	6.200
7.5	*10*	21.3	18.5	19	22	11	16.5	165	**ATV 31HU75S6X**	6.200
11	*15*	27.8	24.4	25	22	17	25.5	257	**ATV 31HD11S6X**	10.000
15	*20*	36.4	31.8	33	22	22	33	335	**ATV 31HD15S6X**	10.000

(1) These power ratings are for a maximum switching frequency of 4 kHz, in continuous operation. The switching frequency is adjustable from 2 to 16 kHz.
Above 4 kHz, derate the nominal drive current. The nominal motor current should not exceed this value: see derating curves on page 2/134.
(2) Typical value for a 4-pole motor and a maximum switching frequency of 4 kHz, with no additional line choke, for the max. prospective line current.
(3) Nominal supply voltages, min. U1, max. U2 (200-240 V; 380-500 V; 525-600 V).
(4) If line Isc is greater than the values in the table, add line chokes, see page 2/119.
*(5) To order a drive intended for wire guiding applications, add a **T** to the end of the reference for the selected drive.*
*Example: **ATV 31H018M2T**.*
*(6) To order a drive with potentiometer, add an **A** to the end of the reference for the selected drive.*
*Example: **ATV 31H018M2A**.*
(7) Optional EMC filter, see page 2/121.

Presentation: pages 2/100 to 2/107
Characteristics: pages 2/108 to 2/111
Dimensions: pages 2/126 and 2/127
Schemes: pages 2/132 to 2/135
Functions: pages 2/140 to 2/157

Variable speed drives for asynchronous motors

Altivar 31

Enclosed drives

531252

ATV 31CU22M2

534445

ATV 31CU75N4

Enclosed drives (frequency range from 0.5 to 500 Hz)

Motor		Line supply				Altivar 31				
Power indicated on rating plate (1)		Line current (2)		Apparent power	Max. prospective line Isc (3)	Nominal current	Max. transient current for 60 s	Power dissipated at nominal load	Reference (4)	Weight
		at U1	at U2			4 kHz				
kW	HP	A	A	KVA	kA	A	A	W		kg
Single phase supply voltage: 200…240 V (5) 50/60 Hz with integrated EMC filters										
0.18	0.25	3	2.5	0.6	1	1.5	2.3	24	**ATV 31C018M2** (6)	6.300
0.37	0.5	5.3	4.4	1	1	3.3	5	41	**ATV 31C037M2** (6)	6.300
0.55	0.75	6.8	5.8	1.4	1	3.7	5.6	46	**ATV 31C055M2** (6)	6.300
0.75	1	8.9	7.5	1.8	1	4.8	7.2	60	**ATV 31C075M2** (6)	6.300
1.1	1.5	12.1	10.2	2.4	1	6.9	10.4	74	**ATV 31CU11M2** (6)	8.800
1.5	2	15.8	13.3	3.2	1	8	12	90	**ATV 31CU15M2** (6)	8.800
2.2	3	21.9	18.4	4.4	1	11	16.5	123	**ATV 31CU22M2** (6)	10.700
3-phase supply voltage: 380…500 V (5) 50/60 Hz with integrated EMC filters										
0.37	0.5	2.2	1.7	1.5	5	1.5	2.3	32	**ATV 31C037N4** (6)	8.800
0.55	0.75	2.8	2.2	1.8	5	1.9	2.9	37	**ATV 31C055N4** (6)	8.800
0.75	1	3.6	2.7	2.4	5	2.3	3.5	41	**ATV 31C075N4** (6)	8.800
1.1	1.5	4.9	3.7	3.2	5	3	4.5	48	**ATV 31CU11N4** (6)	8.800
1.5	2	6.4	4.8	4.2	5	4.1	6.2	61	**ATV 31CU15N4** (6)	8.800
2.2	3	8.9	6.7	5.9	5	5.5	8.3	79	**ATV 31CU22N4** (6)	10.700
3	–	10.9	8.3	7.1	5	7.1	10.7	125	**ATV 31CU30N4** (6)	10.700
4	5	13.9	10.6	9.2	5	9.5	14.3	150	**ATV 31CU40N4** (6)	10.700
5.5	7.5	21.9	16.5	15.0	22	14.3	21.5	232	**ATV 31CU55N4**	23.600
7.5	10	27.7	21.0	18.0	22	17.0	25.5	269	**ATV 31CU75N4**	23.600
11	15	37.2	28.4	25.0	22	27.7	41.6	397	**ATV 31CD11N4**	32.500
15	20	48.2	36.8	32.0	22	33.0	49.5	492	**ATV 31CD15N4**	32.500

Ready-assembled enclosed drives (frequency range from 0.5 to 500 Hz)

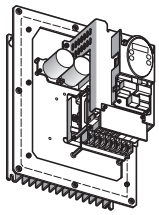
Please consult your Regional Sales Office.

(1) These power ratings are for a maximum switching frequency of 4 kHz, in continuous operation. The switching frequency is adjustable from 2 to 16 kHz.
Above 4 kHz, derate the nominal drive current. The nominal motor current should not exceed this value: see derating curves on page 2/134.
(2) Typical value for a 4-pole motor and a maximum switching frequency of 4 kHz, with no additional line choke, for the max. prospective line current.
(3) If line Isc is greater than the values in the table, add line chokes, see page 2/119.
*(4) To order a drive intended for wire guiding applications, add a **T** to the end of the reference for the selected drive.*
*Example: **ATV 31C018M2T**.*
(5) Nominal supply voltages, min. U1, max. U2 (200-240 V; 380-500 V).
(6) ATV 31C18M2 to ATV 31CU40N4 drives are supplied in customizable enclosures for ready-to-use motor starter applications.

Variable speed drives for asynchronous motors

Altivar 31

Drive kits



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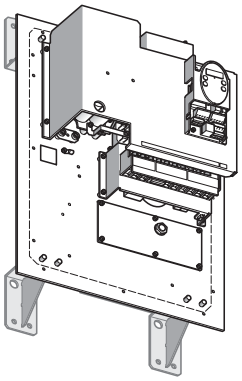
ATV 31K●●●M2



DF531255

ATV 31K●●●N4

Drive kits (frequency range from 0.5 to 500 Hz)

Motor		Line supply				Altivar 31				
Power indicated on rating plate *(1)*		Line current *(2)*		Apparent power	Max. prospective line Isc *(3)*	Nominal current	Max. transient current for 60 s	Power dissipated at nominal load	Reference *(4)*	Weight
		at U1	at U2			4 kHz				
kW	*HP*	A	A	KVA	kA	A	A	W		kg
Single phase supply voltage: 200…240 V *(5)* **50/60 Hz with integrated filters**										
0.18	*0.25*	3	2.5	0.6	1	1.5	2.3	24	**ATV 31K018M2**	6.300
0.37	*0.5*	5.3	4.4	1	1	3.3	5	41	**ATV 31K037M2**	6.300
0.55	*0.75*	6.8	5.8	1.4	1	3.7	5.6	46	**ATV 31K055M2**	6.300
0.75	*1*	8.9	7.5	1.8	1	4.8	7.2	60	**ATV 31K075M2**	6.300
1.1	*1.5*	12.1	10.2	2.4	1	6.9	10.4	74	**ATV 31KU11M2**	8.800
1.5	*2*	15.8	13.3	3.2	1	8	12	90	**ATV 31KU15M2**	8.800
2.2	*3*	21.9	18.4	4.4	1	11	16.5	123	**ATV 31KU22M2**	10.700
3-phase supply voltage: 380…500 V *(5)* **50/60 Hz with integrated filters**										
0.37	*0.5*	2.2	1.7	1.5	5	1.5	2.3	32	**ATV 31K037N4**	8.800
0.55	*0.75*	2.8	2.2	1.8	5	1.9	2.9	37	**ATV 31K055N4**	8.800
0.75	*1*	3.6	2.7	2.4	5	2.3	3.5	41	**ATV 31K075N4**	8.800
1.1	*1.5*	4.9	3.7	3.2	5	3	4.5	48	**ATV 31KU11N4**	8.800
1.5	*2*	6.4	4.8	4.2	5	4.1	6.2	61	**ATV 31KU15N4**	8.800
2.2	*3*	8.9	6.7	5.9	5	5.5	8.3	79	**ATV 31KU22N4**	10.700
3	–	10.9	8.3	7.1	5	7.1	10.7	125	**ATV 31KU30N4**	10.700
4	*5*	13.9	10.6	9.2	5	9.5	14.3	150	**ATV 31KU40N4**	10.700
5.5	*7.5*	21.9	16.5	15	22	14.3	21.5	232	**ATV 31KU55N4**	16.500
7.5	*10*	27.7	21	18	22	17	25.5	269	**ATV 31KU75N4**	16.500
11	*15*	37.2	28.4	25	22	27.7	41.6	397	**ATV 31KD11N4**	23.000
15	*20*	48.2	36.8	32	22	33	49.5	492	**ATV 31KD15N4**	23.000

(1) These power ratings are for a maximum switching frequency of 4 kHz, in continuous operation. The switching frequency is adjustable from 2 to 16 kHz.
Above 4 kHz, derate the nominal drive current. The nominal motor current should not exceed this value: see derating curves on page 2/134.
(2) Typical value for a 4-pole motor and a maximum switching frequency of 4 kHz, with no additional line choke, for the max. prospective line current.
(3) If line Isc is greater than the values in the table, add line chokes (see page 2/119).
*(4) To order a drive intended for wire guiding applications, add a **T** to the end of the reference for the selected drive.*
*Example: **ATV 31K018M2T**.*
(5) Nominal supply voltages, min. U1, max. U2 (200-240 V; 380-500 V).

Variable speed drives for asynchronous motors
Altivar 31
Accessories

Plates for mounting on ⊓ rail

Description	For drives	Reference	Weight kg
Plate for mounting on ⊓ rail, width 35 mm	ATV 31H018M2, ATV 31H037M2, ATV 31H055M2, ATV 31H075M2, ATV 31H018M3X, ATV 31H037M3X, ATV 31H055M3X, ATV 31H075M3X	**VW3 A11851**	0.200
	ATV 31HU11M2, ATV 31HU15M2, ATV 31HU11M3X, ATV 31HU15M3X, ATV 31HU22M3X, ATV 31H037N4, ATV 31H055N4, ATV 31H075N4, ATV 31HU11N4, ATV 31HU15N4, ATV 31H075S6X, ATV 31HU15S6X	**VW3 A31852**	0.220

UL Type 1 conformity kits *(1)*

Description	For drives	Reference	Weight kg
Mechanical device for fixing to the underside of the Altivar 31	ATV 31H018M2, ATV 31H037M2, ATV 31H055M2, ATV 31H075M2	**VW3 A31812**	0.400
	ATV 31H018M3X, ATV 31H037M3X, ATV 31H055M3X, ATV 31H075M3X	**VW3 A31811**	0.400
	ATV 31HU11M3X, ATV 31HU15M3X	**VW3 A31813**	0.400
	ATV 31HU11M2, ATV 31HU15M2, ATV 31HU22M3X, ATV 31H037N4, ATV 31H055N4, ATV 31H075N4, ATV 31HU11N4, ATV 31HU15N4, ATV 31H075S6X, ATV 31HU15S6X	**VW3 A31814**	0.500
	ATV 31HU22M2, ATV 31HU30M3X, ATV 31HU40M3X, ATV 31HU22N4, ATV 31HU30N4, ATV 31HU40N4, ATV 31HU22S6X, ATV 31HU40S6X	**VW3 A31815**	0.500
	ATV 31HU55M3X, ATV 31HU75M3X, ATV 31HU55N4, ATV 31HU75N4, ATV 31HU55S6X, ATV 31HU75S6X	**VW3 A31816**	0.900
	ATV 31HD11M3X, ATV 31HD15M3X, ATV 31HD11N4, ATV 31HD15N4, ATV 31HD11S6X, ATV 31HD15S6X	**VW3 A31817**	1.200

Altivar 28 substitution kits

Description	For drives	Reference	Weight kg
Mechanical adapters allowing an ATV 31 to be used in place of an ATV 28 of the same rating (using the same fixing holes)	ATV 31H018M2, ATV 31H037M2, ATV 31H055M2, ATV 31H075M2, ATV 31H018M3X, ATV 31H037M3X, ATV 31H055M3X, ATV 31H075M3X	**VW3 A31821**	–
	ATV 31HU11M2, ATV 31HU15M2, ATV 31HU11M3X, ATV 31HU15M3X, ATV 31HU22M3X, ATV 31H037N4, ATV 31H075N4, ATV 31HU15N4, ATV 31H075S6X, ATV 31HU15S6X	**VW3 A31822**	–
	ATV 31HU55N4, ATV 31HU75N4, ATV 31HU55M3X, ATV 31HU75M3X, ATV 31HU55S6X, ATV 31HU75S6X	**VW3 A31823**	–

Remote terminal

Description	Reference	Weight kg
For ATV31 drives of all ratings, assembly comprising: - terminal, cable fitted with 2 connectors - seal and screws for IP 65 mounting on an enclosure door	**VW3 A31101**	–

VW3 A31101

Documentation

Description		Reference	Weight kg
Simplified user's manual for ATV 31 and **CD-ROM,** comprising: - Variables user's manual - Modbus and CANopen user's manual		Supplied with the drive	–
International Technical Manual (MIT)	CD-ROM	**DCI CD39811**	0.150

(1) This device can be used to connect cables directly to the drive via tubes or cable gland.

Variable speed drives for asynchronous motors

Altivar 31

Options: braking resistors

Presentation

The resistor enables the Altivar 31 drive to operate while braking to a standstill or during slowdown braking, by dissipating the braking energy.
Two types of resistors are available:
■ Enclosed model (IP 20 casing) designed to comply with EMC regulations and protected by a temperature-controlled switch or thermal overload relay.
It enables maximum transient braking torque.
The resistors are designed to be mounted on the outside of the enclosure, but should not inhibit natural cooling. Air inlets and outlets must not be obstructed, even partially. The air must be free of dust, corrosive gas and condensation.
■ Non-protected model (IP 00) for lower power ratings only.

Applications

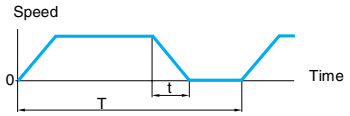
Machines with high inertia, driving loads and machines with fast cycles.

Characteristics

Type of braking resistor			VW3 A58702 to VW3 A58704	VW3 A7 701 to VW3 A7 705
Ambient temperature around the device	Operation	°C	40	0…+ 50
	Storage			- 25…+ 70
Degree of protection of enclosure			IP 00	IP 20
Thermal protection			None	Via temperature controlled switch or via the drive
Temperature controlled switch *(1)*	Tripping temperature	°C	–	120
	Max. voltage - max. current		–	250 V ∿ -1 A
	Min. voltage - min. current		–	24 V ⎓ -0.1 A
	Maximum contact resistance	mΩ	–	60
Load factor of the dynamic brake transistors			The value of the average power that can be dissipated at 40°C from the resistor into the casing is determined for a load factor during braking that corresponds to the majority of common application. The dynamic brake transistor is designed so that it can tolerate: - continuous nominal motor power, - 150 % of the nominal motor power for 60 s.	

(1) The contact should be connected in sequence (used for signalling or controlling the line contactor).

Load factor and determining the nominal power

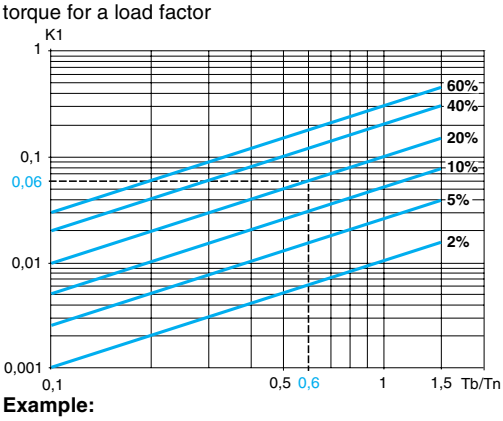


Load factor: $\frac{t}{T}$

t: Braking time in s
T: Cycle time in s

The value of the average power that can be dissipated at 40°C from the resistor into the casing is determined for a load factor during braking that corresponds to the majority of common applications. This load factor is defined in the table above.
For a specific application (e.g. handling), the nominal resistor power has to be redefined by taking account of the new load factor.

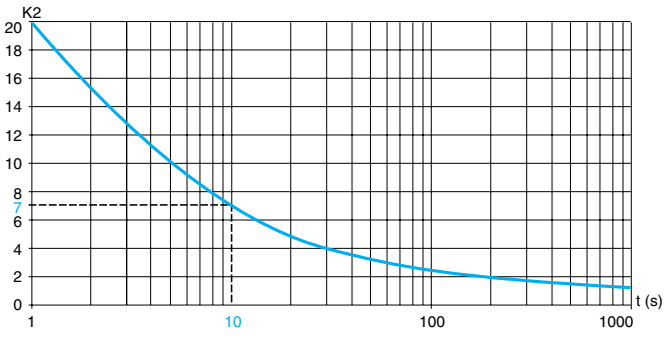
Chart 1
Graph of the average power as a function of the braking torque for a load factor



Example:
Motor of power Pm = 4 kW
Motor efficiency η = 0.85
Braking torque Tb = 0.6 Tn
Braking time t = 10 s
Cycle time t = 50 s
Load factor Lf = $\frac{t}{T}$ = 20%

Use chart 1 to determine the coefficient K1 corresponding to a braking torque of 0.6 Tn and a load factor of 20%. K1 = 0.06

Chart 2
Permissible resistor overload as a function of time (characteristic curve)



Use chart 2 to determine the coefficient K2 corresponding to a braking time of 10 seconds.
K2 = 7

The nominal resistor power (Pn) must be greater than:

$$Pn = Pm \times K1 \times \eta(1 + \frac{1}{K2 \times fm}) = 4.10^3 \times 0,06 \times 0,8(1 + \frac{1}{7 \times 0,2}) = 350\ W$$

Variable speed drives for asynchronous motors

Altivar 31

Options: braking resistors

531231

VW3 A58702

531232

VW3 A7 701

For drives	Minimum resistor value *(1)*	Ohmic value	Average power available at 40°C *(2)*	Average power available at 50°C	Reference	Weight
	Ω	Ω	W	W		kg
Non-protected braking resistors						
ATV 31H/C/K018M2, ATV 31H/C/K037M2, ATV 31H/C/K055M2, ATV 31H/C/K075M2 ATV 31H/C/KU11M2, ATV 31H/C/KU15M2, ATV 31H018M3X, ATV 31H037M3X, ATV 31H055M3X, ATV 31H075M3X, ATV 31HU11M3X, ATV 31HU15M3X, ATV 31H/C/K037N4, ATV 31H/C/K055N4, ATV 31H/C/K075N4, ATV 31H/C/KU11N4, ATV 31H/C/KU15N4, ATV 31H/C/KU22N4, ATV 31H075S6X, ATV 31HU15S6X, ATV31HU22S6X	40 40 27 40 40 27 80 80 54 54 96 64	100	32 32	28 28	**VW3 A58702**	0.600
ATV 31H/C/KU30N4, ATV 31H/C/KU40N4, ATV 31HU40S6X	55 36 44	100	40	35	**VW3 A58703**	0.850
ATV 31H/C/KU22M2, ATV 31HU22M3X, ATV 31HU30M3X	25 25 16	68	32	28	**VW3 A58704**	0.600
Protected braking resistors						
ATV 31H/C/K018M2, ATV 31H/C/K037M2, ATV 31H/C/K055M2, ATV 31H/C/K075M2, ATV 31H/C/KU11M2, ATV 31H/C/KU15M2, ATV 31H018M3X, ATV 31H037M3X, ATV 31H055M3X, ATV 31H075M3X, ATV 31HU11M3X, ATV 31HU15M3X, ATV 31H/C/K037N4, ATV 31H/C/K055N4, ATV 31H/C/K075N4, ATV 31H/C/KU11N4, ATV 31H/C/KU15N4, ATV 31H/C/KU22N4	40 40 27 40 40 27 80 80 54 54	100	58	50	**VW3 A7 701**	2.000
ATV 31H/C/KU22M2, ATV 31HU22M3X, ATV 31HU30M3X	25 25 16	60	115	100	**VW3 A7 702**	2.400
ATV 31H/C/KU30N4, ATV 31H/C/KU40N4	55 36	100	58	50	**VW3 A7 701**	2.000
ATV 31H/C/KU55N4, ATV 31H/C/KU75N4, ATV 31HU55S6X, ATV 31HU75S6X	29 19 34 23	60	115	100	**VW3 A7 702**	2.400
ATV 31HU40M3X, ATV 31H/C/KD11N4, ATV 31H/C/KD15N4, ATV 31HD11S6X, ATV 31HD15S6X	16 20 24	28	231	200	**VW3 A7 703**	3.500
ATV 31HU55M3X, ATV 31HU75M3X	8	15	1154	1000	**VW3 A7 704**	11.000
ATV 31HD11M3X, ATV 31HD15M3X	5	10 *(3)*	1154	1000	**VW3 A7 705**	11.000

(1) Depends on the drive rating.
(2) Power that can be dissipated by the resistor at the maximum temperature of 115°C, corresponding to a maximum temperature rise of 75°C in a 40°C environment.
(3) Ohmic value obtained as a function of the connection described in the resistor operating instructions.

Dimensions:
pages 2/129 and 2/130

Schemes :
page 2/132

Variable speed drives for asynchronous motors

Altivar 31

Options: line chokes

Presentation

Line chokes provide improved protection against overvoltages on the line supply and reduce the current harmonics produced by the drive.

The recommended chokes can be used to 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 between 3% and 5% of the nominal line voltage. Values higher than this will cause loss of torque.

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

The prospective short-circuit current at the point of connection of the drive must not exceed the maximum value indicated in the reference tables. The use of chokes allows connection to the following line supplies:
- Max. Isc 22 kA for 200/240 V
- Max. Isc 65 kA for 380/500 V and 525/600V

Characteristics

Type of line choke			VZ1 L004 M010	VZ1 L007 UM50	VZ1 L018 UM20	VW3 A4 551	VW3 A4 552	VW3 A4 553	VW3 A4 554	VW3 A4 555
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						IP 10	
Inductance value		**mH**	10	5	2	10	4	2	1	0.5
Nominal current		**A**	4	7	18	4	10	16	30	60
Loss		**W**	17	20	30	45	65	75	90	80

Dimensions:
page 2/130

Schemes:
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Variable speed drives for asynchronous motors

Altivar 31

Options: line chokes

803687

VW3 A 455●

Line chokes

Altivar 31	Line current without choke		Line current with choke		Choke	
					Reference	Weight
	U min. *(1)*	U max. *(1)*	U min. *(1)*	U max. *(1)*		
	A	A	A	A		kg
Single phase supply voltage: 200…240 V 50/60 Hz						
ATV 31H/C/K018M2	3.0	2.5	2.1	1.8	**VZ1 L004M010**	0.630
ATV 31H/C/K037M2	5.3	4.4	3.9	3.3		
ATV 31H/C/K055M2	6.8	5.8	5.2	4.3	**VZ1 L007UM50**	0.880
ATV 31H/C/K075M2	8.9	7.5	7.0	5.9		
ATV 31H/C/KU11M2	12.1	10.2	10.2	8.6	**VZ1 L018UM20**	1.990
ATV 31H/C/KU15M2	15.8	13.3	13.4	11.4		
ATV 31H/C/KU22M2	21.9	18.4	19.2	16.1		
Three phase supply voltage: 200…240 V 50/60 Hz						
ATV 31H018M3X	2.1	1.9	1	0.9	**VW3 A4 551**	1.500
ATV 31H037M3X	3.8	3.3	1.9	1.6		
ATV 31H055M3X	4.9	4.2	2.5	2.2		
ATV 31H075M3X	6.4	5.6	3.3	2.9		
ATV 31HU11M3X	8.5	7.4	4.8	4.2	**VW3 A4 552**	3.000
ATV 31HU15M3X	11.1	9.6	6.4	5.6		
ATV 31HU22M3X	14.9	13	9.2	8	**VW3 A4 553**	3.500
ATV 31HU30M3X	19.1	16.6	12.3	10.7		
ATV 31HU40M3X	24.2	21.1	16.1	14	**VW3 A4 554**	6.000
ATV 31HU55M3X	36.8	32	21.7	19		
ATV 31HU75M3X	46.8	40.9	29	25.2		
ATV 31HD11M3X	63.5	55.6	41.6	36.5	**VW3 A4 555**	11.000
ATV 31HD15M3X	82.1	71.9	55.7	48.6		
Three phase supply voltage: 380…500 V 50/60 Hz						
ATV 31H/C/K037N4	2.2	1.7	1.1	0.9	**VW3 A4 551**	1.500
ATV 31H/C/K055N4	2.8	2.2	1.4	1.2		
ATV 31H/C/K075N4	3.6	2.7	1.8	1.5		
ATV 31H/C/KU11N4	4.9	3.7	2.6	2		
ATV 31H/C/KU15N4	6.4	4.8	3.4	2.6		
ATV 31H/C/KU22N4	8.9	6.7	5	4.1	**VW3 A4 552**	3.000
ATV 31H/C/KU30N4	10.9	8.3	6.5	5.2		
ATV 31H/C/KU40N4	13.9	10.6	8.5	6.6		
ATV 31H/C/KU55N4	21.9	16.5	11.7	9.3	**VW3 A4 553**	3.500
ATV 31H/C/KU75N4	27.7	21	15.4	12.1		
ATV 31H/C/KD11N4	37.2	28.4	22.5	18.1	**VW3 A4 554**	6.000
ATV 31H/C/KD15N4	48.2	36.8	29.6	23.3		
Three phase supply voltage: 525…600 V 50/60 Hz						
ATV 31H075S6X	2.5	2.4	1.4	1.4	**VW3 A4 551**	1.500
ATV 31HU15S6X	4.4	4.2	2.4	2.3		
ATV 31HU22S6X	5.8	5.6	3.8	3.6		
ATV 31HU40S6X	9.7	9.3	6	5.8	**VW3 A4 552**	3.000
ATV 31HU55S6X	14.7	14.1	7.8	7.5		
ATV 31HU75S6X	19.3	18.5	11	10.7	**VW3 A4 553**	3.500
ATV 31HD11S6X	25.4	24.4	15	14.4		
ATV 31HD15S6X	33.2	31.8	21.1	20.6	**VW3 A4 554**	6.000

(1) Nominal supply voltage:

For drives	Nominal voltage	
	U min.	U max.
ATV 31●●●●M2 ATV 31H●●●M3X	200	240
ATV 31●●●●N4	380	500
ATV 31H●●●S6X	525	600

Dimensions: page 2/130

Schemes : page 2/132

Variable speed drives for asynchronous motors

Altivar 31

Options: additional EMC input filters

Presentation

Function

The Altivar 31 has built-in radio interference input filters to meet EMC “product” standards for variable speed drives (IEC/EN 61800-3) and to comply with the European EMC (electromagnetic compatibility) directive.

The additional filters enable the drives to meet more stringent requirements: they are designed to reduce conducted emissions on the line supply below the limits of standards EN 55011 class A or EN 55022 class B (see page 2/121).

These additional filters are mounted underneath ATV 31H drives. They can be mounted on the side of ATV 31C and K drives. They have tapped holes for mounting and act as supports for the drives.

Use according to the type of network

Use of these additional filters is only possible on TN (neutral connection) and TT (neutral to earth) type networks.

Standard IEC 61800-3, appendix D2.1, states that on IT networks (isolated or impedance earthed neutral), filters can cause permanent insulation monitors to operate in a random manner.

In addition, the effectiveness of additional filters on this type of network depends on the type of impedance between neutral and earth, and therefore cannot be predicted.

If a machine is to be installed on an IT network, one solution is to insert an isolation transformer and connect the machine locally on a TN or TT network.

Characteristics

Conformity to standards			EN 133200
Degree of protection			IP 21 and IP 41 on upper part
Maximum relative humidity			93% without condensation or dripping water conforming to IEC 68-2-3
Ambient air temperature around the device	Operation	**°C**	- 10…+ 60
	Storage	**°C**	- 25…+ 70
Maximum operating altitude	Without derating	**m**	1000 (above this, derate the current by 1% per additional 100 m)
Vibration resistance	Conforming to IEC 60068-2-6		1.5 mm peak to peak from 3 to 13 Hz 1 gn peak from 13 to 150 Hz
Shock resistance	Conforming to IEC 60068-2-27		15 gn for 11 ms
Maximum nominal voltage	50/60 Hz single phase	**V**	240 + 10%
	50/60 Hz three phase	**V**	240 + 10% 500 + 10%

Schemes:
page 2/133

Variable speed drives for asynchronous motors

Altivar 31

Options: additional EMC input filters

105586

VW3 A31405

Additional EMC input filters

For drives	Filter						
Reference	Maximum length of shielded cable *(1)*		In *(2)*	Il *(3)*	Loss *(4)*	Reference	Weight
	EN 55011 Class A	EN 55022 Class B					
	m	m	A	mA	W		kg
Single phase supply voltage: 200…240 V 50/60 Hz							
ATV 31H/C/K018M2 ATV 31H/C/K037M2 ATV 31H/C/K055M2 ATV 31H/C/K075M2	50	20	9	100	3.7	**VW3 A31401**	0.600
ATV 31H/C/KU11M2 ATV 31H/C/KU15M2	50	20	16	150	6.9	**VW3 A31403**	0.775
ATV 31H/C/KU22M2	50	20	22	80	7.5	**VW3 A31405**	1.130
Three phase supply voltage: 200…240 V 50/60 Hz							
ATV 31H018M3X ATV 31H037M3X ATV 31H055M3X ATV 31H075M3X	5	–	7	7	2.6	**VW3 A31402**	0.650
ATV 31HU11M3X ATV 31HU15M3X ATV 31HU22M3X	5	–	15	15	9.9	**VW3 A31404**	1.000
ATV 31HU30M3X ATV 31HU40M3X	5	–	25	35	15.8	**VW3 A31406**	1.650
ATV 31HU55M3X ATV 31HU75M3X	5	–	47	45	19.3	**VW3 A31407**	3.150
ATV 31HD11M3X ATV 31HD15M3X	5	–	83	15	35.2	**VW3 A31408**	5.300
Three phase supply voltage: 380…500 V 50/60 Hz							
ATV 31H/C/K037N4 ATV 31H/C/K055N4 ATV 31H/C/K075N4 ATV 31H/C/KU11N4 ATV 31H/C/KU15N4	50	20	15	15	9.9	**VW3 A31404**	1.000
ATV 31H/C/KU22N4 ATV 31H/C/KU30N4 ATV 31H/C/KU40N4	50	20	25	35	15.8	**VW3 A31406**	1.650
ATV 31H/C/KU55N4 ATV 31H/C/KU75N4	50	20	47	45	19.3	**VW3 A31407**	3.150
ATV 31H/C/KD11N4 ATV 31H/C/KD15N4	50	20	49	45	27.4	**VW3 A31409**	4.750

(1) The filter selection tables give the maximum lengths for shielded cables connecting motors to drives for a switching frequency of 2 to 16 kHz. These limits are given as examples only as they vary depending on the stray capacitance of the motors and the cables used. If motors are connected in parallel, it is the total length that should be taken into account.
(2) In: Nominal filter current.
(3) Il: Maximum earth leakage current at 50 Hz.
(4) Via heat dissipation, at the nominal filter current (In).

Dimensions:
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Schemes:
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Variable speed drives for asynchronous motors

Altivar 31

Options: Output filters and motor chokes

Presentation

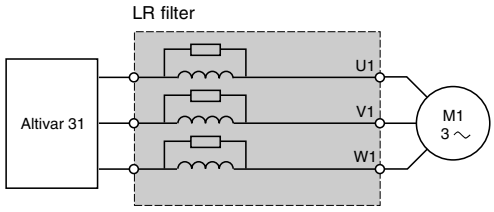
By inserting an output filter between the drive and the motor, it is possible to:
- Limit the dv/dt at the motor terminals (500 to 1500 V/µs), for cables longer than 50 m
- Filter interference caused by opening a contactor placed between the filter and the motor
- Reduce the motor earth leakage current

When using a downstream contactor between the drive and the motor, ferrite suppressors should be attached to each motor cable for certain drive ratings supplied with a single phase or 3-phase 200 V supply.

Description

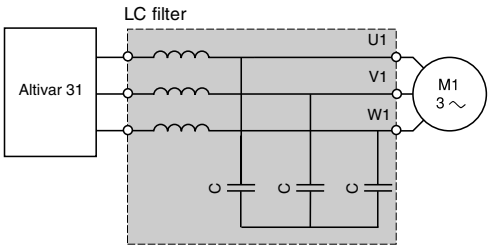
LR filter cell

This cell comprises 3 high frequency chokes and 3 resistors.



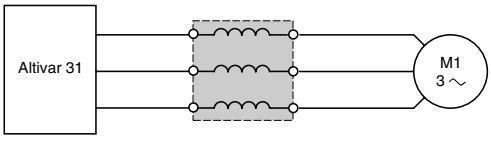
LC filter cell

This cell comprises 3 high frequency chokes and 3 capacitors.

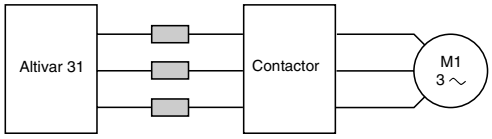


Motor choke

For standard motor cables longer than 100 m (50 m for shielded cables), a choke can be used to limit overvoltages at the motor terminals.



Ferrite suppressor for downstream contactor opening



Characteristics *(1)*

			LR filter cells *(2)*	LC filter cells		Motor chokes	
			VW3 A5845●	VW3 A66412		VW3 A4 552 …A4 555	VW3 A4 556
Drive switching frequency		**kHz**	0.5…4 Max.	2 or 4	12	4	
Length of motor cable	Shielded cables	**m**	⩽ 100	⩽ 100	⩽ 50	⩽ 100	
	Unshielded cables	**m**	–	⩽ 200	⩽ 100	–	
Degree of protection			IP 20	IP 00	IP 00	IP 20	IP 00

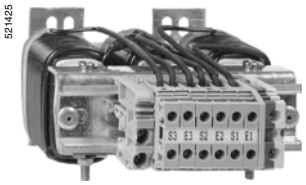
(1) Filter performance is ensured if the cable lengths between the motor and the drive given in the table above are not exceeded.
For an application with several motors connected in parallel, the cable length must include all tap-offs. If a cable longer than that recommended is used, the filters may overheat.
(2) For frequencies greater than 4 kHz or cable lengths longer than 100 metres, please consult your Regional Sales Office.

Dimensions:
pages 2/130 and 2/131

Variable speed drives for asynchronous motors

Altivar 31

Options: Output filters and motor chokes



VW3 A58451

LR filter cells

For drives	Loss	Nominal current	Reference	Weight
	W	A		kg
ATV 31H/C/K018M2 ATV 31H/C/K037M2 ATV 31H/C/K055M2 ATV 31H/C/K075M2 ATV 31H/C/KU11M2 ATV 31H/C/KU15M2 ATV 31H018M3X ATV 31H037M3X ATV 31H055M3X ATV 31H075M3X ATV 31HU11M3X ATV 31HU15M3X ATV 31H/C/K037N4 ATV 31H/C/K055N4 ATV 31H/C/K075N4 ATV 31H/C/KU11N4 ATV 31H/C/KU15N4 ATV 31H/C/KU22N4 ATV 31H/C/KU30N4 ATV 31H/C/KU40N4 ATV 31H/C/KD11N4 ATV 31H/C/KD15N4 ATV 31H075S6X ATV 31HU15S6X, ATV 31HU22S6X ATV 31HU40S6X, ATV 31HU55S6X	150	10	**VW3 A58451**	7.400
ATV 31H/C/KU22M2 ATV 31HU22M3X, ATV 31HU30M3X ATV 31H/C/KU55N4 ATV 31HU75S6X	180	16	**VW3 A58452**	7.400
ATV 31HU40M3X…HU75M3X ATV 31H/C/KU75N4 ATV 31HD11S6X, ATV 31HD15S6X	220	33	**VW3 A58453**	12.500

LC filter cells

For drives	Reference	Weight kg
ATV 31HD11M3X ATV 31HD15M3X	**VW3 A66412**	3.500

Motor chokes

For drives	Loss	Nominal current	Reference	Weight
	W	A		kg
ATV 31H/C/KU22N4 ATV 31H/C/KU30N4 ATV 31H/C/KU40N4 ATV 31HU40S6X, ATV 31HU55S6X	65	10	**VW3 A4 552**	3.000
ATV 31H/C/KU22M2, ATV 31HU22M3X ATV 31HU30M3X, ATV 31H/C/KU55N4 ATV 31HU75S6X	75	16	**VW3 A4 553**	3.500
ATV 31HU40M3X…HU75M3X ATV 31H/C/KU75N4 ATV 31H/C/KD11N4 ATV 31HD11S6X ATV 31HD15S6X	90	30	**VW3 A4 554**	6.000
ATV 31H/C/KD15N4	80	60	**VW3 A4 555**	11.000
ATV 31HD11M3X ATV 31HD15M3X	–	100	**VW3 A4 556**	16.000

Ferrite suppressors for downstream contactor opening

For drives	Sold in lots of	Unit reference	Weight kg
ATV 31H018M2 ATV 31H037N4	3	**VW3 A31451**	–
ATV 31H037M2 ATV 31H018M3X, ATV 31H037M3X ATV 31H055N4, ATV 31H075N4	3	**VW3 A31452**	–
ATV 31H055M2, ATV 31H075M2 ATV 31HU11M2…HU22M2 ATV 31H055M3X…ATV 31HU22M3X ATV 31HU11N4…HU22N4	3	**VW3 A31453**	–

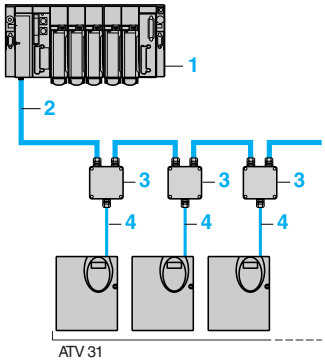
Dimensions:
pages 2/130 and 2/131

Variable speed drives for asynchronous motors
Altivar 31
Communication options

Modbus and CANopen communication buses

The Altivar 31 can connect directly to Modbus and CANopen buses by means of an RJ45 connector, which supports both protocols.
The communication function provides access to the drive's configuration, adjustment, control and monitoring functions.

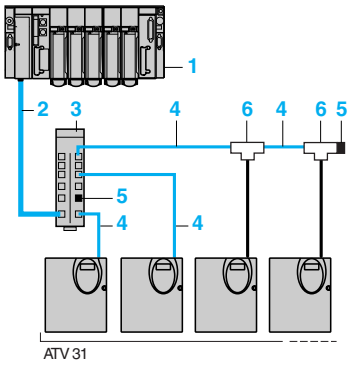
CANopen



1 PLC *(1)*
2 CANopen trunk cable
3 CANopen tap junctions **VW3 CAN TAP2**
4 CANopen drop cables **VW3 CAN CA RR●●**

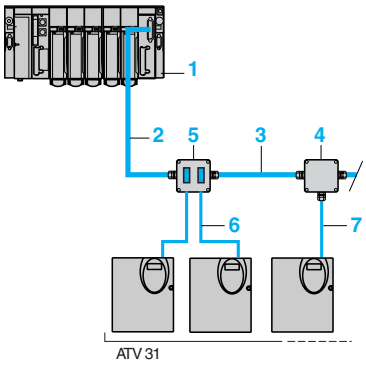
Modbus

Connection via splitter boxes and RJ45 connectors



1 PLC *(1)*
2 Modbus cable (depending on the type of controller or PLC)
3 Modbus splitter block **LU9 GC3**
4 Modbus drop cables **VW3 A8 306 R●●**
5 Line terminators **VW3 A8 306 RC**
6 Modbus T-junction boxes **VW3 A8 306 TF●●** (with cable)

Connection via junction boxes



1 PLC *(1)*
2 Modbus cable (depending on the type of controller or PLC)
3 Modbus cable **TSX CSA●00**
4 T-junction box **TSX SCA 50**
5 Subscriber socket **TSX SCA 62**
6 Modbus drop cable **VW3 A8 306**
7 Modbus drop cable **VW3 A8 306 D30**

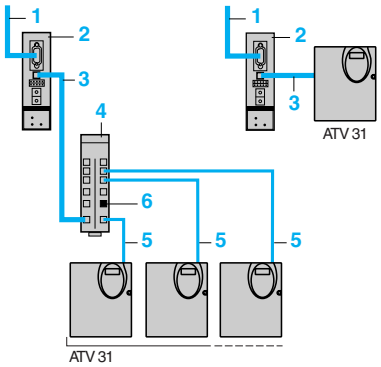
Connection via screw terminals

Use a Modbus drop cable **VW3 A8 306 D30** and line terminators **VW3 A8 306 DRC**.

Other communication buses

The Altivar 31 can also connect to the following networks via a module (bridge or gateway):
- Ethernet
- Fipio
- Profibus DP
- DeviceNet

The communication function provides access to the drive's configuration, adjustment, control and monitoring functions.



1 To network
2 Communication modules
3 **VW3 A8 306 R●●**, **VW3 P07 306 R10** or **VW3 A8 306 D30** cables, depending on the type of module
4 Modbus splitter block **LU9 GC3**
5 Modbus drop cables **VW3 A8 306 R●●**
6 Line terminator **VW3 A8 306 RC**

(1) Please consult the specialist "Automation platform Modicon Premium and Unity - PL7 software" and "Automation platform Modicon TSX Micro and PL7 software" catalogues.

Variable speed drives for asynchronous motors
Altivar 31
Communication options


563028

TSX SCA 50


563029

TSX SCA 62

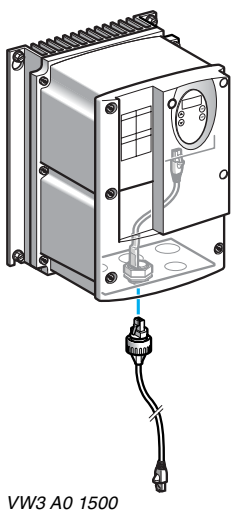
Modbus and CANopen communication buses

Connection accessories

Description			Unit reference	Weight kg
Tap junction for CANopen bus			**VW3 CAN TAP2**	–
Modbus junction box 3 screw terminals, RC line terminator To be connected using cable VW3 A8 306 D30			**TSX SCA 50**	0.520
Modbus subscriber socket 2 female 15-way 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 block			**LU9 GC3**	0.500
Modbus line terminators *(1) (2)*	For RJ45 connector	R = 120 Ω, C = 1 nf	**VW3 A8 306 RC**	0.200
		R = 150 Ω	**VW3 A8 306 R**	0.200
	For screw terminals	R = 120 Ω, C = 1 nf	**VW3 A8 306 DRC**	0.200
		R = 150 Ω	**VW3 A8 306 DR**	0.200
Modbus T-junction boxes		With integrated cable (0.3 m)	**VW3 A8 306 TF03**	–
		With integrated cable (1 m)	**VW3 A8 306 TF10**	–

Connection cables

Description	Length m	Connectors	Reference	Weight kg
Cables for CANopen bus	0.3	2 RJ45 connectors	**VW3 CAN CA RR03**	0.050
	1	2 RJ45 connectors	**VW3 CAN CA RR1**	0.500
Cables for Modbus bus	3	1 RJ45 connector and one stripped end	**VW3 A8 306 D30**	0.150
	3	1 RJ45 connector and 1 male 15-way SUB-D connector for TSX SCA 62	**VW3 A8 306**	0.150
	0.3	2 RJ45 connectors	**VW3 A8 306 R03**	0.050
	1	2 RJ45 connectors	**VW3 A8 306 R10**	0.050
	3	2 RJ45 connectors	**VW3 A8 306 R30**	0.150
Internal IP 55 cable for Modbus bus For the remote location of the drive's RJ45 port on the enclosure to maintain IP 55 protection	0.3	1 RJ45 connector and 1 IP 55 RJ45 connection base	**VW3 A0 1500**	0.050
IP 55 cable for Modbus bus For connecting an enclosed drive equipped with a VW3 A0 1500 cable	3	1 RJ45 connector 1 IP 55 RJ45 connector	**VW3 A0 1501**	0.130
Cables for Profibus DP gateway LA9 P307	1	2 RJ45 connectors	**VW3 P07 306 R10**	0.050
RS 485 double shielded twisted pair Modbus cables	100	Supplied without connector	**TSX CSA 100**	–
	200	Supplied without connector	**TSX CSA 200**	–
	500	Supplied without connector	**TSX CSA 500**	–


534396

VW3 A0 1500
+
VW3 A0 1501

Other communication buses

Description	Cables to be connected	Reference	Weight kg
Ethernet/Modbus bridge with 1 x Ethernet 10baseT port (RJ45 type)	VW3 A8 306 D30	**174 CEV 300 20** *(3)*	0.500
Fipio/Modbus gateway *(4)*	VW3 A8 306 R●●	**LUF P1**	0.240
DeviceNet/Modbus gateway *(4)*	VW3 A8 306 R●●	**LUF P9**	0.240
Profibus DP/Modbus gateway Parameters set using standard Profibus DP configurator *(5)*	VW3 P07 306 R10	**LA9 P307**	0.240
Profibus DP/Modbus gateway Parameters set using ABC Configurator software *(4)*	VW3 A8 306 R●●	**LUF P7**	0.240


563031

LUF P1


563032

LA9 P307

(1) Depends on the bus architecture (see page 4/12).
(2) Sold in lots of 2.
(3) Please consult the specialist "Automation platform Modicon Premium and Unity - PL7 software" catalogue.
(4) See pages 4/22 and 4/23.
(5) See pages 4/24 and 4/25.

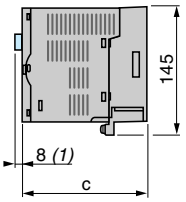
Variable speed drives for asynchronous motors

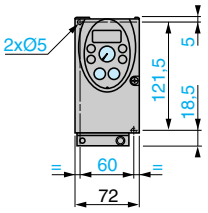
Altivar 31

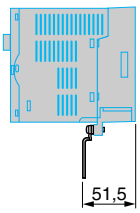
Drives with heatsink

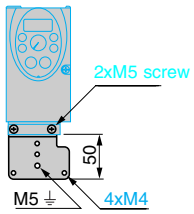
ATV 31H0●●M2/M2A, ATV 31H0●●M3X/M3XA

Plate for EMC mounting (supplied with the drive)







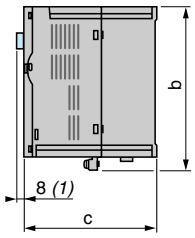


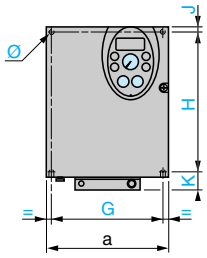
ATV31H	c
018M3X, 037M3X	120
055M3X, 075M3X	130
018M2, 037M2	140
055M2, 075M2	145

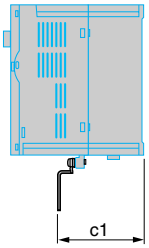
*(1) Only for drives whose reference ends in **A**.*

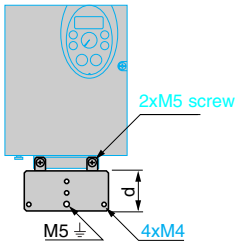
ATV 31HU●●M2/M2A, ATV 31HU11M3X/M3XA to ATV 31HU40M3X/M3XA, ATV 31H037N4/N4A to ATV 31HU40N4/N4A, ATV 31H075S6X to ATV 31HU40S6X

Plate for EMC mounting (supplied with the drive)









ATV 31H	a	b	c	c1	d	G	H	J	K	Ø
U1●M3X	105	143	130	67.3	49	93	121.5	5	16.5	2x5
U1●M2, U22M3X 037N4 to U15N4 075S6X, U15S6X	107	143	150	67.3	49	93	121.5	5	16.5	2x5
U22M2, HU●0M3X U22N4 to U40N4 U22S6X, U40S6X	142	184	150	88.8	48	126	157	6.5	20.5	4x5

*(1) Only for drives whose reference ends in **A**.*

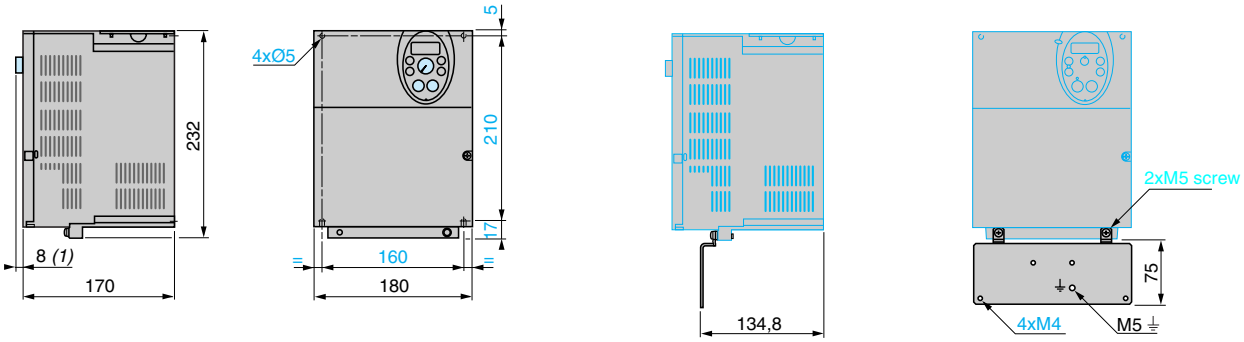
Variable speed drives for asynchronous motors

Altivar 31

Drives with heatsink, enclosed drives

ATV 31HU55M3X/M3XA, ATV 31HU75M3X/M3XA, ATV 31HU55N4/N4A, ATV 31HU75N4/N4A, ATV 31HU55S6X, ATV 31HU75S6X

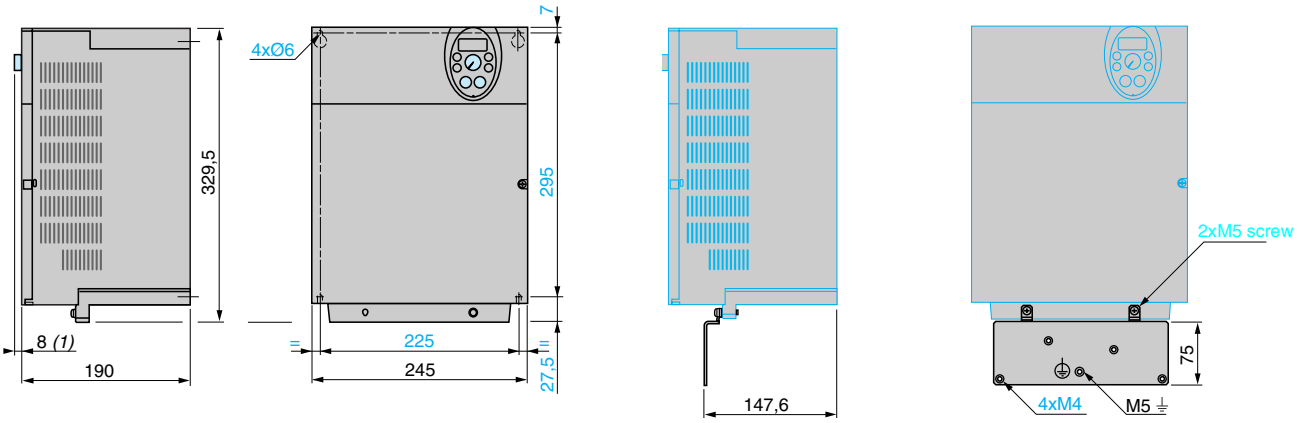
Plate for EMC mounting (supplied with the drive)



(1) Only for drives whose reference ends in ***A****.*

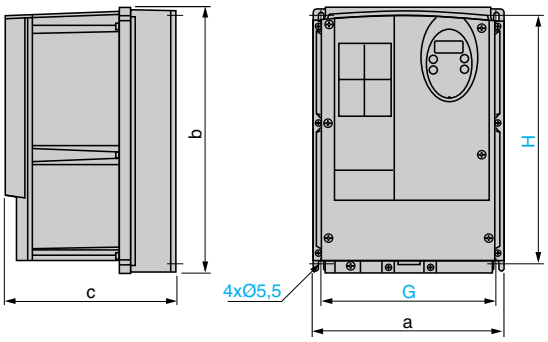
ATV 31HD1●M3X/M3XA, ATV 31HD1●N4/N4A, ATV 31HD1●S6X

Plate for EMC mounting (supplied with the drive)



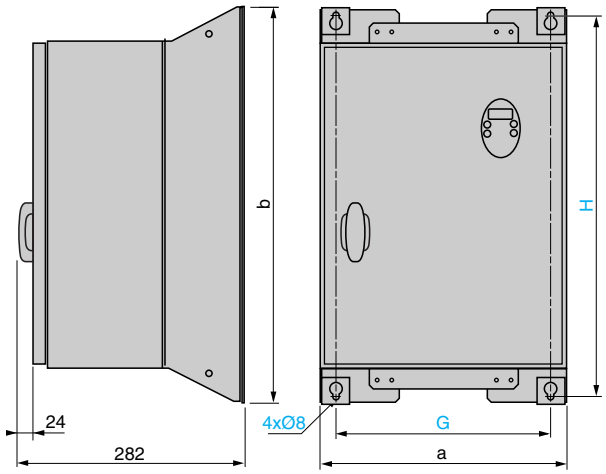
(1) Only for drives whose reference ends in ***A****.*

ATV 31C●●●M2, ATV 31C037N4 to ATV 31CU40N4



ATV 31C	a	b	c	G	H
0●●M2	210	240	163	192	218
U11M2, U15M2, 0●●N4,U11N4, U15N4	215	297	192	197	277
U22M2, U22N4…U40N4	230	340	208	212	318

ATV 31CU55N4 to ATV 31CD15N4



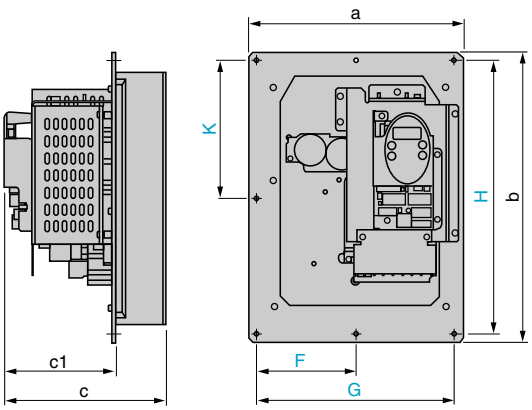
ATV 31C	a	b	G	H
U55N4, U75N4	320	512	279	480
D11N4, D15N4	440	625	399	594

Presentation: pages 2/100 to 2/107
Characteristics: pages 2/108 to 2/111
References: page 2/112 and 2/113
Schemes: pages 2/132 to 2/135
Functions: pages 2/140 to 2/157

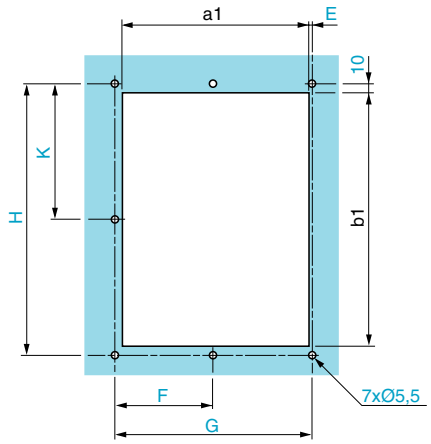
2

2.3

ATV 31K018M2 to KU22M2, ATV 31K037N4 to KU40N4



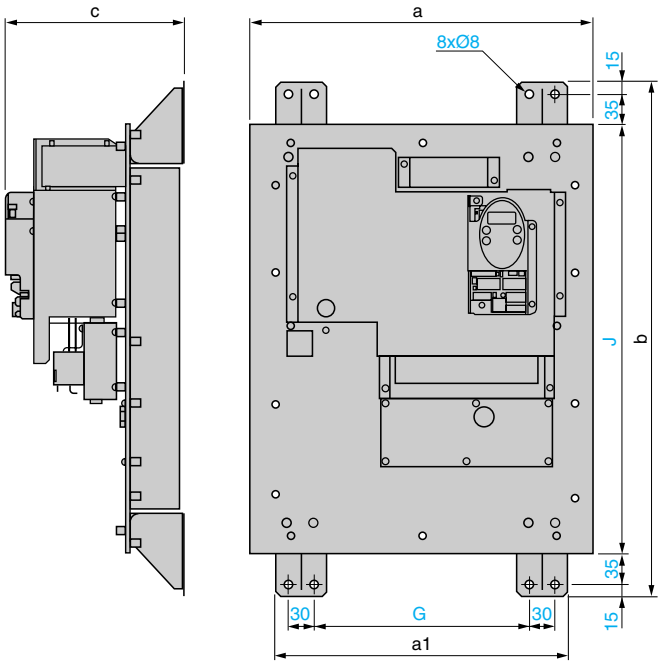
Cut-outs and drill holes



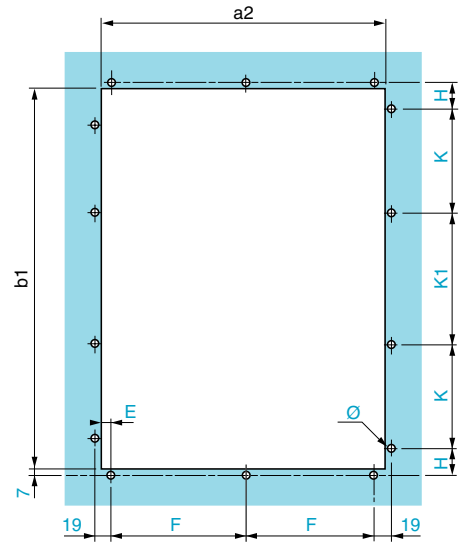
ATV 31K	a	a1	b	b1	c	c1	E	F	G	H	K
018M2…075M2	254	214	280	240	153	123	10	117	234	260	130
U11M2, U15M2, 037N4…U15N4	250	219	337	297	186	127	1	115	230	317	158.5
U22M2, U22N4…U40N4	265	234	380	340	209	134	1	122.5	245	360	180

Note: *product supplied with drilling template.*

ATV 31KU55N4 to ATV 31KD15N4



Cut-outs and drill holes



ATV 31K	a	a1	a2	b	b1	c	E	F	G	H	J	K	K1	Ø
U55N4, U75N4	400	340	334	600	444	243	12	155	250	49	500	180	0	12 x 6
D11N4, D15N4	450	370	386	700	546	267	13	180	280	39	600	150	180	14 x 6

Note: *product supplied with drilling template.*

Variable speed drives for asynchronous motors

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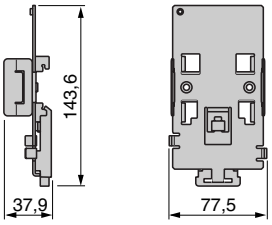
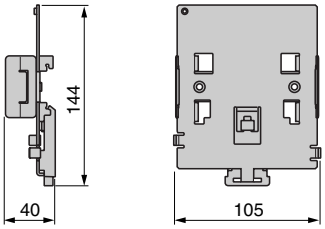
Accessories and braking resistors

Plates for mounting on ⊓ rail

VW3 A11851

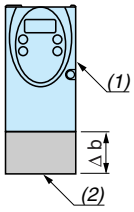


VW3 A31852



UL Type 1 conformity kits

VW3 A31811 to VW3 A31817



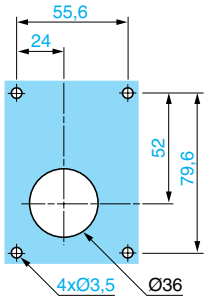
VW3	Δ b
A31811 to A31815	68
A31816	96
A31817	99

(1) Drive
*(2) **VW3 A3181●** kit*

Remote terminal

VW3 A31101

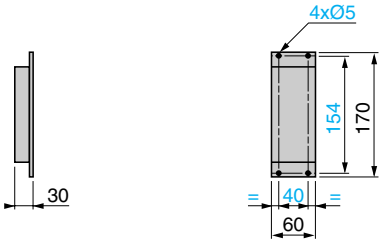
Cut-outs and drill holes



Bare braking resistors

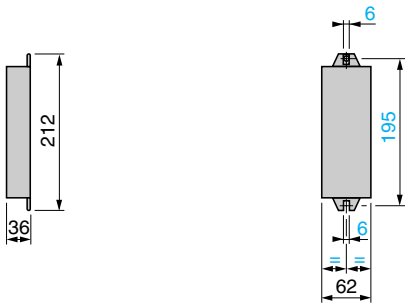
VW3 A58702 and VW3 A58704

2-wire output, length 0.5 m



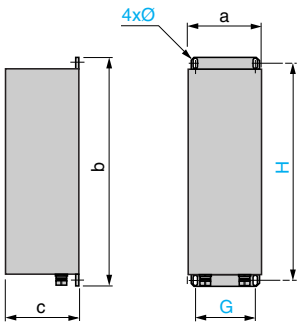
VW3 A58703

2-wire output, length 0.5 m



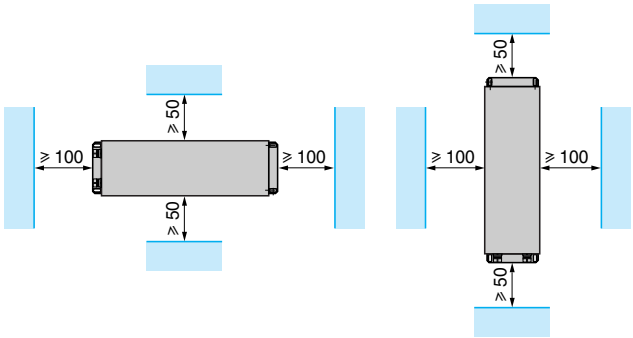
Protected braking resistors

VW3 A7 701 à VW3 A7 703



VW3	a	b	c	G	H	Ø
A7 701	95	293	95	70	275	6 x 12
A7 702	95	293	95	70	375	6 x 12
A7 703	140	393	120	120	375	6 x 12

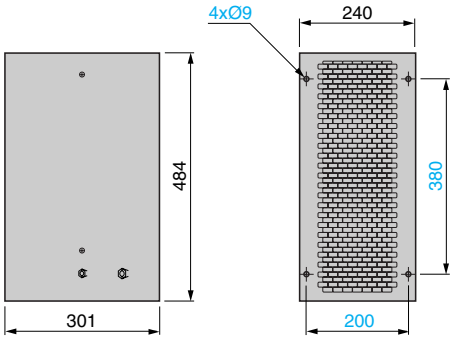
Mounting recommendations



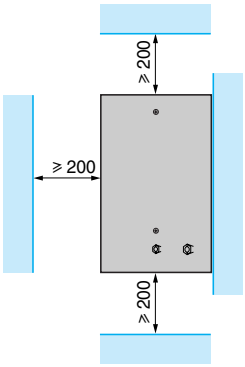
2

Protected braking resistors (continued)

VW3 A7 704 et VW3 A7 705



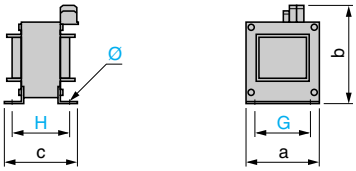
Mounting recommendations



2.3

Line chokes

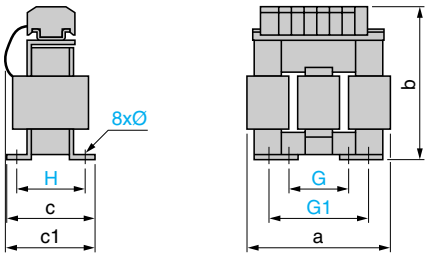
VZ1 L●●●●●●●



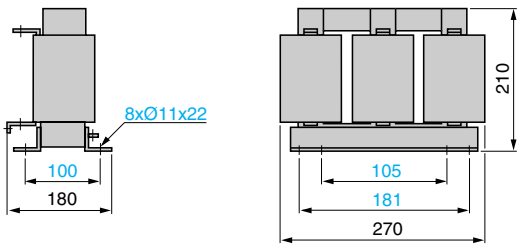
VZ1	a	b	c	G	H	Ø
L004M010	60	100	80	50	44	4 x 9
L007UM50	60	100	95	50	60	4 x 9
L018UM20	85	120	105	70	70	5 x 11

Line chokes and motor chokes

VW3 A4 551 to VW3 A4 555



VW3 A4 556



VW3	a	b	c	c1	G	G1	H	Ø
A4 551	100	135	55	60	40	60	42	6 x 9
A4 552 and A4 553	130	155	85	90	60	80.5	62	6 x 12
A4 554	155	170	115	135	75	107	90	6 x 12
A4 555	180	210	125	165	85	122	105	6 x 12

Variable speed drives for asynchronous motors

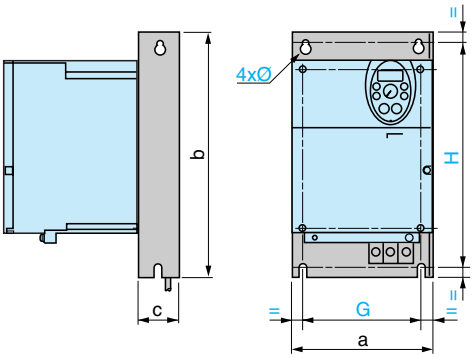
Altivar 31

EMC filters and output filters

Additional EMC input filters

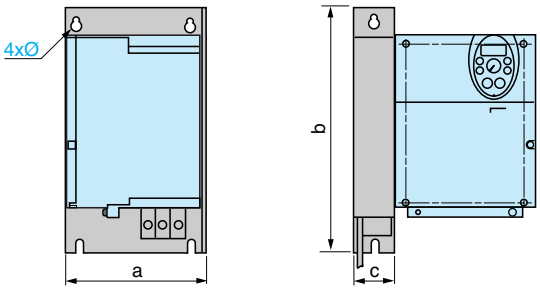
Mounting the filter under the drive

Front view



Mounting the filter next to the drive

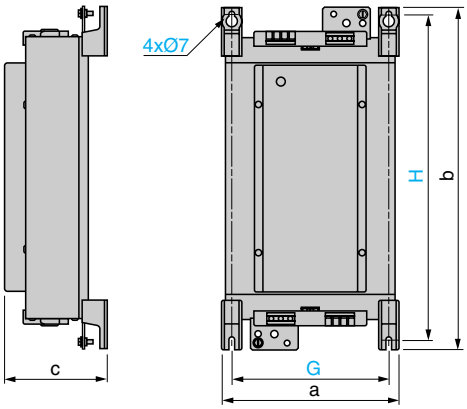
Front view



VW3	a	b	c	G	H	Ø
A31401, A31402	72	195	37	52	180	4.5
A31403	107	195	35	85	180	4.5
A31404	107	195	42	85	180	4.5
A31405	140	235	35	120	215	4.5
A31406	140	235	50	120	215	4.5
A31407	180	305	60	140	285	5.5
A31408	245	395	80	205	375	5.5
A31409	245	395	60	205	375	5.5

LR filter cells

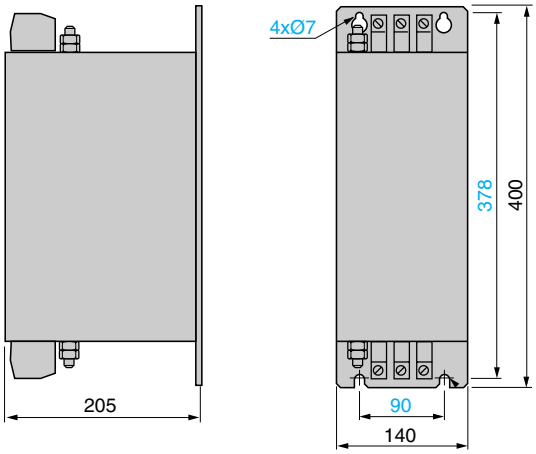
VW3 A58451 to VW3 A58453



VW3	a	b	c	G	H
A58451 A58452	169.5	340	123	150	315
A58453	239	467.5	139.5	212	444

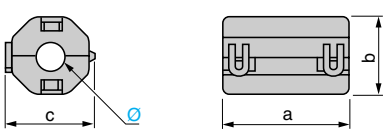
LC filter cell

VW3 A66412



Ferrite suppressors for downstream contactor opening

VW3 A31451 to VW3 A31453

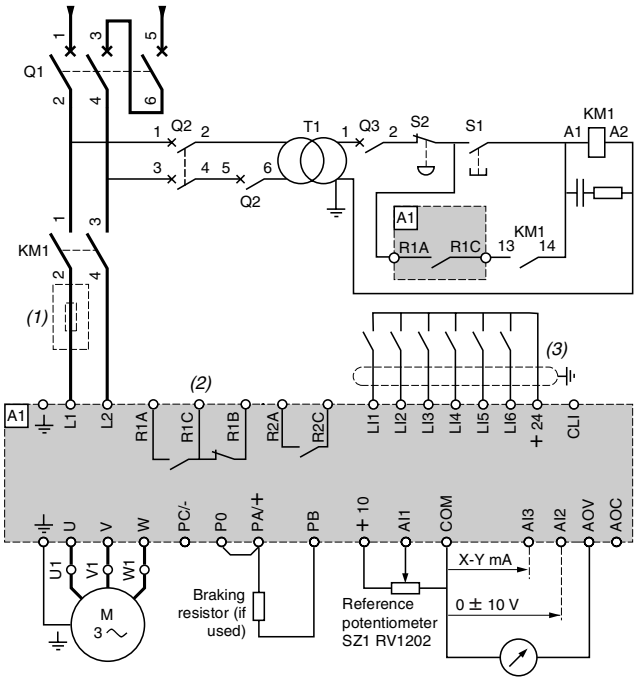


VW3	a	b	c	Ø
A31451	33.5	33	33	13
A31452	33	21.5	22.5	9
A31453	30	19	19	6

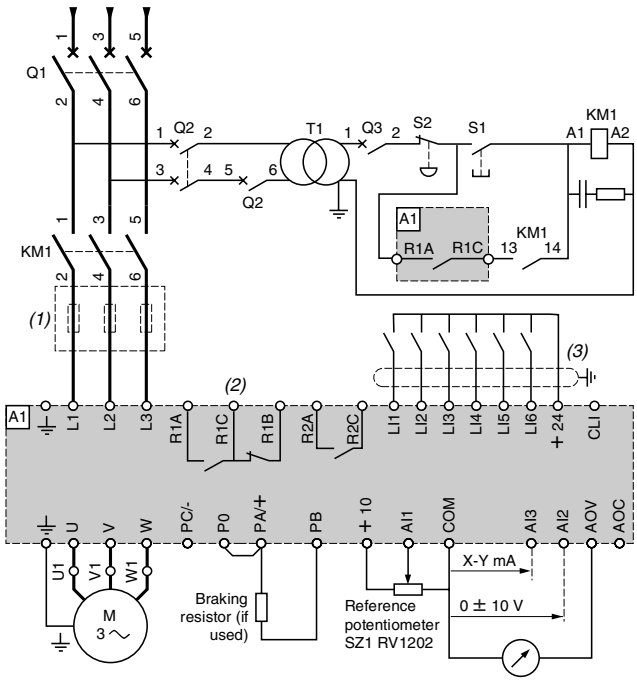
Presentation: pages 2/100 to 2/107
Characteristics: pages 2/120 and 2/122
References: pages 2/121 and 2/123
Schemes: pages 2/132 to 2/135
Functions: pages 2/140 to 2/157

Variable speed drives for asynchronous motors
Altivar 31

ATV 31●●●●M2
Single phase power supply



ATV 31●●●●M3X, ATV 31●●●●N4, ATV 31●●●●S6X
Three phase power supply



(1) Line choke (single phase or three phase)
(2) Fault relay contacts for remote signalling of the drive status
(3) Connection of the common for the logic inputs depends on the position of the switch (see diagrams below).

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

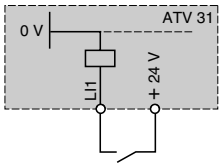
Compatible components (for a complete list of references, please consult the specialist catalogue “Motor starter solutions. Control and protection components”).

Ref.	Description
Q1	GV2 L or Compact NS (see pages 2/136 to 2/139)
KM1	LC1 ●●● + LA4 DA2U (see pages 2/136 to 2/139)
S1, S2	XB2 B or XA2 B pushbuttons
T1	100 VA transformer 220 V secondary
Q2	GV2 L rated at twice the nominal primary current of T1
Q3	GB2 CB05

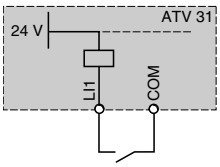
Examples of recommended circuit diagrams

Logic input switches

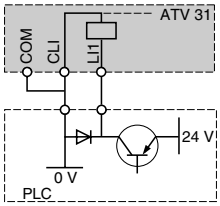
Source position

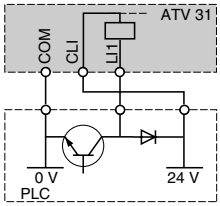


Sink position



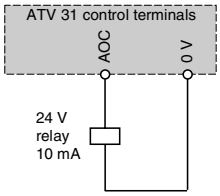
CLI position with PLC transistor outputs



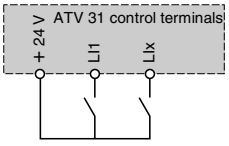


AOC output

Wired as logic output

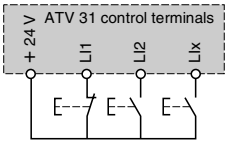


2-wire control



LI1: Forward
LIx: Reverse

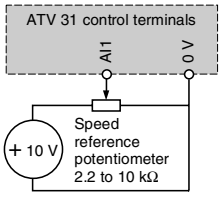
3-wire control



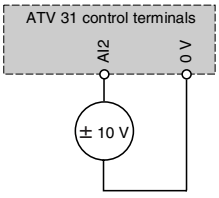
LI1: Stop
LI2: Forward
LIx: Reverse

Analog voltage inputs

+ 10 V external

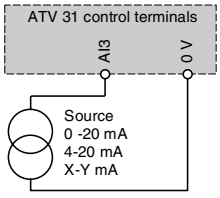


± 10 V external



Analog current input

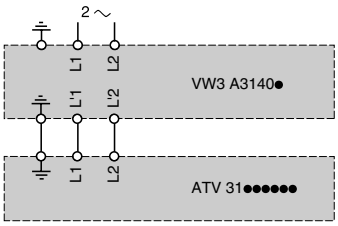
0-20 mA, 4-20 mA, X-Y mA



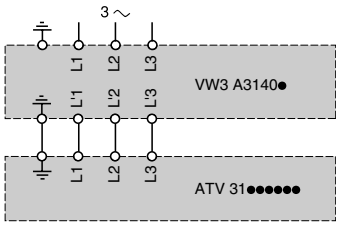
Schemes

A3140● additional EMC input filters

Single phase power supply



Three phase power supply

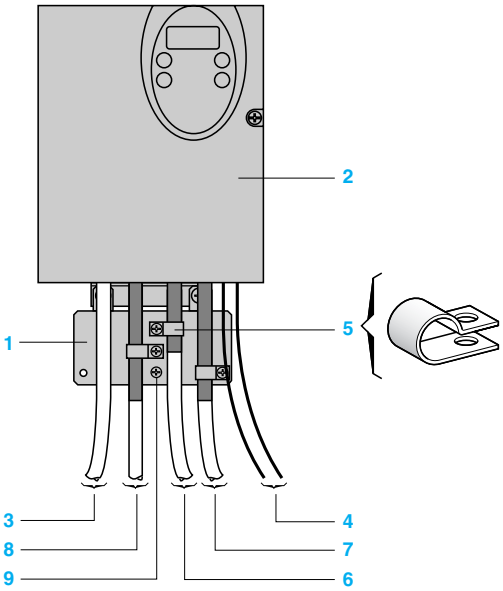


Connections to meet the requirements of EMC standards

Principle

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

Installation diagram for ATV 31H●●● drives



1 Steel plate supplied with the drive, to be mounted on it (earthed casing)
2 Altivar 31
3 Unshielded power supply wire or cable
4 Unshielded wires for the output of the safety relay contacts.
5 Attach and earth the shielding of cables 6, 7 and 8 as close as possible to the drive:
- Strip the shielding.
- Use cable clamps of an appropriate size on the parts from which the shielding has been stripped, to attach them to the steel plate 1.
The shielding must be clamped tightly enough to the steel plate to ensure good contact.
Cable clamps must be made from stainless steel.
6 Shielded cable for connecting the motor
7 Shielded cable for connecting the control/signal wiring. For applications requiring several conductors, use cables with a small cross-section (0.5 mm^2).
8 Shielded cable for connecting the braking resistor
9 Earthing screw for the motor cable with low ratings, as the screw on the heatsink is inaccessible.

6, 7, 8 The shielding must be earthed at both ends. The shielding must be continuous and any intermediate terminals must be in EMC shielded metal boxes.

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

Operation on an IT system

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).

ATV 31●●●●M2 and N4 drives have built-in EMC filters. There are two ways of isolating these filters from earth for operation on an IT system depending on the rating:
- ATV 31H018M2 to ATV 31HU22M2 and ATV 31H037N4 to ATV 31HU40N4, remove a jumper to disconnect the filter
- ATV 31HU55N4 to ATV 31HD15N4, move the wire with the cable tag to disconnect the filter

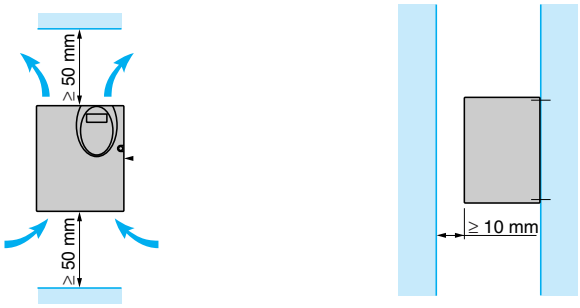
2

2.3

Depending on the conditions in which the drive is to be used, its installation will require certain precautions and the use of appropriate accessories.

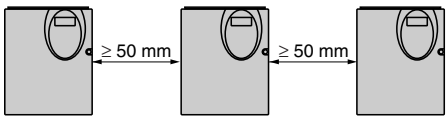
Mounting recommendations for ATV 31H drives

- Install the unit vertically, at ± 10°.
- Do not place it close to heating elements.
- Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

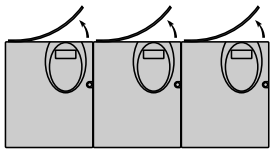


Mounting types

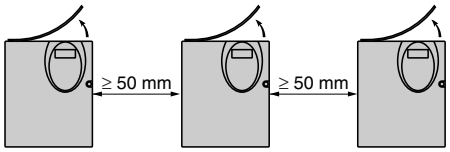
Type A mounting

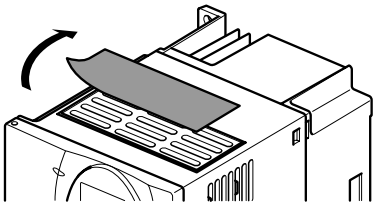


Type B mounting



Type C mounting

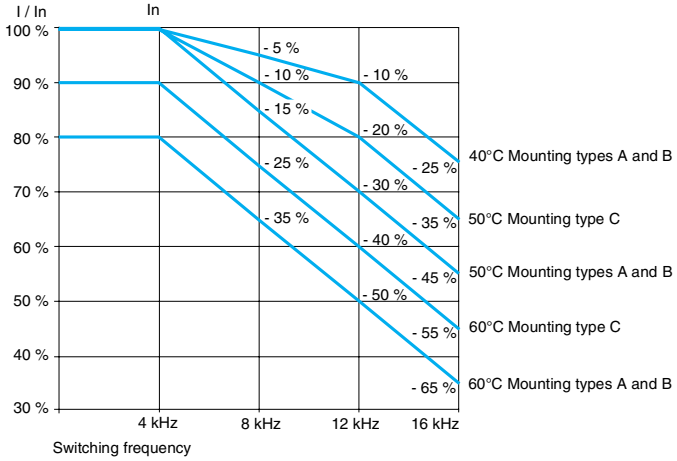




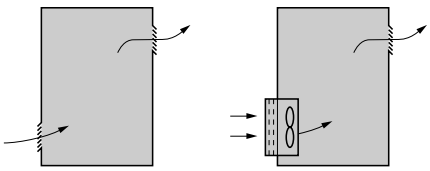
Removing the protective cover

Removing the protective cover from the top of the drive (as shown opposite) changes the degree of protection to IP 20.

Derating curves for the nominal drive current (In) as a function of temperature, switching frequency and mounting type.



For intermediate temperatures (55°C for example), interpolate between 2 curves.



Specific recommendations for mounting ATV 31 drives in a wall-mounted or floor-standing enclosure

Follow the mounting recommendations on the opposite page.
To ensure proper air circulation in the drive:
- Fit ventilation grilles
- Ensure that there is sufficient ventilation. If there is not, install a forced ventilation unit with a filter. The openings and/or fans must provide a flow rate at least equal to that of the drive fans (see the table below)
- Use special filters with IP 54 protection
- Remove the protective cover from the top of the drive

Fan flow rate depending on the drive rating

ATV 31	Flow rate m^3/min
H018M2, H037M2, H055M2, H018M3X, H037M3X, H055M3X, H037N4, H055N4, H075N4, HU11N4, H075S6X, HU15N6X	0.3
H075M2, HU11M2, HU15M2, H075M3X, HU11M3X, HU15M3X, HU15N4, HU22N4, HU22S6X, HU40N6X	0.55
HU22M2, HU22M3X, HU30M3X, HU40M3X, HU30N4, HU40N4, HU55S6X, HU75S6X	1.55
HU55M3X, HU55N4, HU75N4, HD11S6X	1.7
HU75M3X, HD11M3X, HD11N4, HD15N4, HD15S6X	2.8
HD15M3X	3.6

Metal wall-mounted or floor-standing enclosure (IP 54 degree of protection)

The drive must be mounted in a dust and damp proof enclosure in certain environmental conditions: dust, corrosive gases, high humidity with risk of condensation and dripping water, splashing liquid, etc.
This enables the drive to be used in an enclosure where the maximum internal temperature can reach 50°C.

Calculating the size of the enclosure

Maximum thermal resistance Rth (°C/W)

$$Rth = \frac{\theta° - \theta e}{P}$$

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 drive: see page 2/112.
Add the power dissipated by the other equipment components.

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

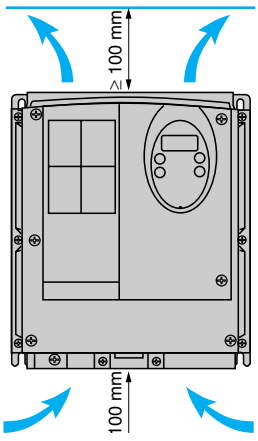
(sides + top + front panel if wall-mounted)

$$S = \frac{K}{Rth}$$

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.*



Mounting recommendations for ATV 31 enclosed drives

Install the unit vertically, at ± 10°.
Do not place it close to heating elements.
Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

Variable speed drives for asynchronous motors
Altivar 31
Motor starters

GV2 L
+
LC1 K
+
ATV 31H●●●●●●

Applications

The combinations listed below can be used to assemble a complete motor starter comprising a circuit-breaker, a contactor and an Altivar 31 variable speed drive.
The circuit-breaker provides protection against accidental short-circuits, isolation and padlocking, if required.
The contactor controls and manages any safety features and isolates the motor on stopping.
The Altivar 31 drive is protected electronically against short-circuits between phases and between phase and earth; it therefore ensures continuity of service and thermal protection of the motor.

Motor starter for ATV 31H drive

Variable speed drive Reference	Standard power rating of 4-pole motors 50/60 Hz *(1)*		Circuit-breaker *(2)*		Max. prosp. line Isc	Contactor *(3)* Add the voltage reference to the basic reference to obtain the full reference *(4)*
			Reference	Rating		
	kW	*HP*		A	kA	
Single phase supply voltage: 200…240 V						
ATV 31H018M2	0.18	*0.25*	**GV2 L08**	4	1	**LC1 K0610●●**
ATV 31H037M2	0.37	*0.5*	**GV2 L10**	6.3	1	**LC1 K0610●●**
ATV 31H055M2	0.55	*0.75*	**GV2 L14**	10	1	**LC1 K0610●●**
ATV 31H075M2	0.75	*1*	**GV2 L14**	10	1	**LC1 K0610●●**
ATV 31HU11M2	1.1	*1.5*	**GV2 L16**	14	1	**LC1 K0610●●**
ATV 31HU15M2	1.5	*2*	**GV2 L20**	18	1	**LC1 K0610●●**
ATV 31HU22M2	2.2	*3*	**GV2 L22**	25	1	**LC1 D09●●**
Three phase supply voltage: 200…240 V						
ATV 31H018M3X	0.18	*0.25*	**GV2 L07**	2.5	5	**LC1 K0610●●**
ATV 31H037M3X	0.37	*0.5*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31H055M3X	0.55	*0.75*	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31H075M3X	0.75	*1*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31HU11M3X	1.1	*1.5*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31HU15M3X	1.5	*2*	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31HU22M3X	2.2	*3*	**GV2 L20**	18	5	**LC1 K0610●●**
ATV 31HU30M3X	3	–	**GV2 L22**	25	5	**LC1 D09●●**
ATV 31HU40M3X	4	*5*	**GV2 L22**	25	5	**LC1 D09●●**
ATV 31HU55M3X	5.5	*7.5*	**NS80HMA**	50	22	**LC1 D32●●**
ATV 31HU75M3X	7.5	*10*	**NS80HMA**	50	22	**LC1 D32●●**
ATV 31HD11M3X	11	*15*	**NS80HMA**	80	22	**LC1 D40●●**
ATV 31HD15M3X	15	*20*	**NS100HMA**	100	22	**LC1 D40●●**
Three phase supply voltage: 380…500 V						
ATV 31H037N4	0.37	*0.5*	**GV2 L07**	2.5	5	**LC1 K0610●●**
ATV 31H055N4	0.55	*0.75*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31H075N4	0.75	*1*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31HU11N4	1.1	*1.5*	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31HU15N4	1.5	*2*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31HU22N4	2.2	*3*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31HU30N4	3	–	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31HU40N4	4	*5*	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31HU55N4	5.5	*7.5*	**GV2 L22**	25	22	**LC1 D09●●**
ATV 31HU75N4	7.5	*10*	**GV2 L32**	32	22	**LC1 D18●●**
ATV 31HD11N4	11	*15*	**NS80HMA**	50	22	**LC1 D32●●**
ATV 31HD15N4	15	*20*	**NS80HMA**	50	22	**LC1 D32●●**

(1) The HP values given are NEC-compliant (National Electrical Code).
(2) NS●●HMA: Product sold under the Merlin Gerin brand
(3) Composition of contactors:
LC1-K06: 3 poles + 1 "N/O" auxiliary contact
LC1-D09/D18/D32/D40: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact
(4) Usual control circuit voltages

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.

Variable speed drives for asynchronous motors

Altivar 31

Motor starters

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GV2 L
+
LC1 K
+
ATV 31H●●●●●●

Motor starter for ATV 31H drive (continued)

Variable speed drive Reference	Standard power rating of 4-pole motors 50/60 Hz *(1)*		Circuit-breaker *(2)*		Max. prosp. line Isc	Contactor *(3)* Add the voltage reference to the basic reference to obtain the full reference *(4)*
			Reference	Rating		
	kW	*HP*		A	kA	
Three phase supply voltage: 525…600 V						
ATV 31H075S6X	0.75	*1*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31HU15S6X	1.5	*2*	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31HU22S6X	2.2	*3*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31HU40S6X	4	*5*	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31HU55S6X	5.5	*7.5*	**GV2 L20**	18	22	**LC1 K0610●●**
ATV 31HU75S6X	7.5	*10*	**GV2 L22**	25	22	**LC1 K0610●●**
ATV 31HD11S6X	11	*15*	**GV2 L32**	32	22	**LC1 D09●●**
ATV 31HD15S6X	15	*20*	**NS80HMA**	32	22	**LC1 D09●●**

(1) The HP values given are NEC-compliant (National Electrical Code).
(2) NS80HMA: Product sold under the Merlin Gerin brand
(3) Composition of contactors:
LC1-K06 : 3 poles + 1 "N/O" auxiliary contact
LC1-D09: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact
(4) Usual control circuit voltages

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.

Variable speed drives for asynchronous motors

Altivar 31

Motor starters

GV2 L
+
LC1 K
+
ATV 31C●●●●●

Applications

The combinations listed below can be used to assemble a complete motor starter comprising a circuit-breaker, a contactor and an Altivar 31 variable speed drive.
The circuit-breaker provides protection against accidental short-circuits, isolation and padlocking, if required.
The contactor controls and manages any safety features and isolates the motor on stopping.
The Altivar 31 drive is protected electronically against short-circuits between phases and between phase and earth; it therefore ensures continuity of service and thermal protection of the motor.

Motor starter for ATV 31C drive

Variable speed drive Reference	Standard power rating for 4-pole motors 50/60 Hz *(1)*		Circuit-breaker *(2)*		Max. prosp. line Isc	Contactor *(3)* Add the voltage reference to the basic reference to obtain the full reference *(4)*
			Reference	Rating		
	kW	*HP*		A	kA	
Single phase supply voltage: 200…240 V						
ATV 31C018M2	0.18	*0.25*	**GV2 L08**	4	1	**LC1 K0610●●**
ATV 31C037M2	0.37	*0.5*	**GV2 L10**	6.3	1	**LC1 K0610●●**
ATV 31C055M2	0.55	*0.75*	**GV2 L14**	10	1	**LC1 K0610●●**
ATV 31C075M2	0.75	*1*	**GV2 L14**	10	1	**LC1 K0610●●**
ATV 31CU11M2	1.1	*1.5*	**GV2 L16**	14	1	**LC1 K0610●●**
ATV 31CU15M2	1.5	*2*	**GV2 L20**	18	1	**LC1 K0610●●**
ATV 31CU22M2	2.2	*3*	**GV2 L22**	25	1	**LC1 D09●●**
Three phase supply voltage: 380…500 V						
ATV 31C037N4	0.37	*0.5*	**GV2 L07**	2.5	5	**LC1 K0610●●**
ATV 31C055N4	0.55	*0.75*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31C075N4	0.75	*1*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31CU11N4	1.1	*1.5*	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31CU15N4	1.5	*2*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31CU22N4	2.2	*3*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31CU30N4	3	–	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31CU40N4	4	*5*	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31CU55N4	5.5	*7.5*	**GV2 L22**	25	22	**LC1 D09●●**
ATV 31CU75N4	7.5	*10*	**GV2 L32**	32	22	**LC1 D18●●**
ATV 31CD11N4	11	*15*	**NS80HMA**	50	22	**LC1 D32●●**
ATV 31CD15N4	15	*20*	**NS80HMA**	50	22	**LC1 D32●●**

(1) The HP values given are NEC-compliant (National Electrical Code).
(2) NS80HMA: Product sold under the Merlin Gerin brand
(3) Composition of contactors:
LC1 K06: 3 poles + 1 "N/O" auxiliary contact
LC1 D09/D18/D32: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact
(4) Usual control circuit voltages

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.

Variable speed drives for asynchronous motors
Altivar 31
Motor starters

Applications

The combinations listed below can be used to assemble a complete motor starter comprising a circuit-breaker, a contactor and an Altivar 31 variable speed drive.
The circuit-breaker provides protection against accidental short-circuits, isolation and padlocking, if required.
The contactor controls and manages any safety features and isolates the motor on stopping.
The Altivar 31 drive is protected electronically against short-circuits between phases and between phase and earth; it therefore ensures continuity of service and thermal protection of the motor.

Motor starter for ATV 31K drive

Variable speed drive Reference	Standard power rating for 4-pole motors 50/60 Hz (1)		Circuit-breaker (2)		Max. prosp. line Isc	Contactor (3) Add the voltage reference to the basic reference to obtain the full reference (4)
			Reference	Rating		
	kW	HP		A	kA	
Single phase supply voltage: 200…240 V						
ATV 31K018M2	0.18	*0.25*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31K037M2	0.37	*0.5*	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31K055M2	0.55	*0.75*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31K075M2	0.75	*1*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31KU11M2	1.1	*1.5*	**GV2 L14**	14	22	**LC1 K0610●●**
ATV 31KU15M2	1.5	*2*	**GV2 L20**	18	22	**LC1 K0610●●**
ATV 31KU22M2	2.2	*3*	**GV2 L22**	25	22	**LC1 D09●●**
Three phase supply voltage: 380…500 V						
ATV 31K037N4	0.37	*0.5*	**GV2 L07**	2.5	5	**LC1 K0610●●**
ATV 31K055N4	0.55	*0.75*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31K075N4	0.75	*1*	**GV2 L08**	4	5	**LC1 K0610●●**
ATV 31KU11N4	1.1	*1.5*	**GV2 L10**	6.3	5	**LC1 K0610●●**
ATV 31KU15N4	1.5	*2*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31KU22N4	2.2	*3*	**GV2 L14**	10	5	**LC1 K0610●●**
ATV 31KU30N4	3	–	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31KU40N4	4	*5*	**GV2 L16**	14	5	**LC1 K0610●●**
ATV 31KU55N4	5.5	*7.5*	**GV2 L22**	25	22	**LC1 D09●●**
ATV 31KU75N4	7.5	*10*	**GV2 L32**	32	22	**LC1 D18●●**
ATV 31KD11N4	11	*15*	**NS80 HMA**	50	22	**LC1 D32●●**
ATV 31KD15N4	15	*20*	**NS80 HMA**	50	22	**LC1 D32●●**

(1) The HP values given are NEC-compliant (National Electrical Code).
(2) NS80HMA: Product sold under the Merlin Gerin brand
(3) Composition of contactors:
LC1 K06: 3 poles + 1 "N/O" auxiliary contact
LC1 D09/D18/D32: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact
(4) Usual control circuit voltages

AC control circuit

	Volts ∿	24	48	110	220/230	230	230/240
LC1-K	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
	Volts ∿	**24**	**48**	**110**	**220**	**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.

Variable speed drives for asynchronous motors
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PowerSuite for PC welcome screen

Summary of functions

Drive factory setting

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Functions of the display and keys

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Compatibility of functions

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Variable speed drives for asynchronous motors
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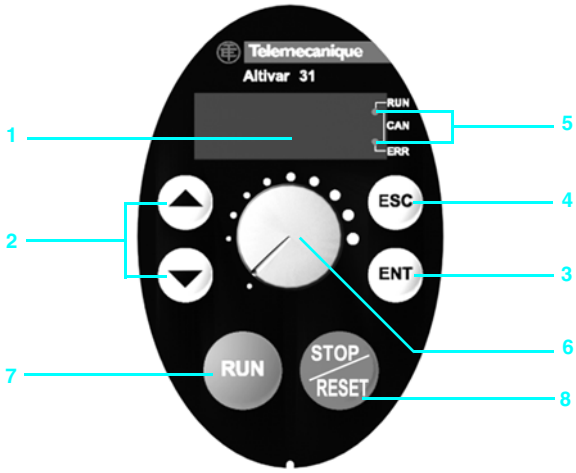
Drive factory setting

The drive is supplied ready for use in most applications, with the following functions and settings:

- ■ Nominal motor frequency: 50 Hz
- ■ Motor voltage: 230 V (ATV 31H●●●M2 and M3X), 400 V (ATV 31H●●●N4) or 600 V (ATV 31H●●●S6X)
- ■ Linear ramp times: 3 seconds
- ■ Low speed (LSP): 0 Hz, high speed (HSP): 50 Hz
- ■ Normal stop mode on deceleration ramp
- ■ Stop mode in the event of a fault: Freewheel
- ■ Motor thermal current = nominal drive current
- ■ Standstill injection braking current = 0.7 x nominal drive current, for 0.5 seconds
- ■ Constant torque operation, with sensorless flux vector control
- ■ Logic inputs:
- □ 2 directions of operation (LI1, LI2), 2-wire control
- □ 4 preset speeds (LI3, LI4): LSP (low speed), 10 Hz, 15 Hz, 20 Hz
- ■ Analog inputs:
- □ AI1 speed reference (0 +10 V)
- □ AI2 (0 ± 10 V) summing of AI1
- □ AI3 (4-20 mA) not configured
- ■ Relay R1: fault relay
- ■ Relay R2: not assigned
- ■ Analog output AOC: 0-20 mA, image of the motor frequency
- ■ Automatic adaptation of the deceleration ramp in the event of excessive braking
- ■ Switching frequency 4 kHz, random frequency

Functions of the display and keys



1 Information is displayed in the form of codes or values in four 7-segment displays
2 Buttons for scrolling through the menus or modifying values.
3 ENT: Validation button for entering a menu or confirming the new value selected.
4 ESC: Button for exiting the menus (no confirmation)
5 2 diagnostic LEDs for the CANopen bus

■ For ATV 31H●●●M2A, ATV 31H●●●M3XA and ATV 31H●●●N4A drives only:
6 Speed reference potentiometer
7 RUN: Local control of motor operation
8 STOP/RESET: Controls motor stopping locally and resets any faults

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Remote display terminal

■ **Remote display terminal option**

The remote display terminal can be mounted on the door of a wall-fixing or floor-standing enclosure.
It comprises an LCD display with programming and control keys and a switch for locking access to the menus.
Drive control keys:
- FWD/RV: reversal of the direction of rotation
- RUN: motor run command
- STOP/RESET: motor stop command or fault reset

The speed reference is given by the remote display terminal. Only the freewheel, fast stop and DC injection stop commands remain active on the terminals. If the drive/operator terminal link is broken, the drive locks in fault mode.
Its subsequent action depends on the control and reference channel programming.

Note: *Protection via customer confidential code has priority over the switch.*

■ **Menu access levels**

There are 3 access levels:
- Level 1: access to standard functions. Significantly, this level is interchangeable with the Altivar 28.
- Level 2: access to advanced application functions.
- Level 3: access to advanced application functions and management of mixed control modes.

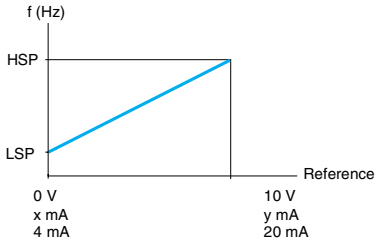
■ **Menu access code**

Enables the drive configuration to be protected using an access code.
When access is locked using a code, only the adjustment and monitoring parameters can be accessed.

Application functions

■ **Operating speed range**

Used to determine the 2 frequency limits which define the speed range permitted by the machine under actual operating conditions for all applications with or without overspeed.



LSP: low speed, from 0 to HSP, factory setting 0
HSP: high speed, from LSP to f max., factory setting 50 Hz
x : configurable between 0 and 20 mA, factory setting 4 mA
y: configurable between 4 and 20 mA, factory setting 20 mA

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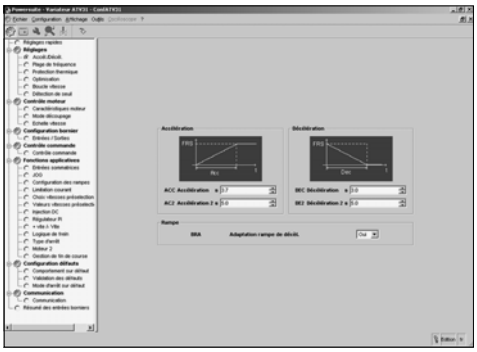
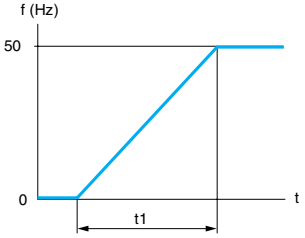


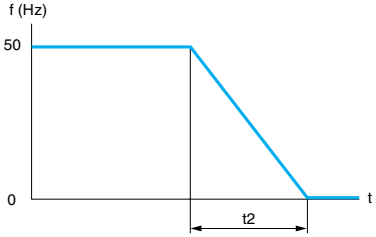
Ramp adjustment with PowerSuite for PC

■ **Acceleration and deceleration ramp times**

Used to define acceleration and deceleration ramp times according to the application and the machine dynamics.



Linear acceleration ramp



Linear deceleration ramp

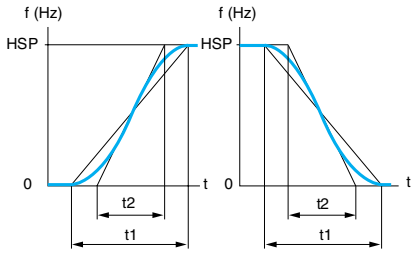
t1: acceleration time
t2: deceleration time
t1 and t2 can be set independently between 0.1 and 999.9 s, factory setting: 3 s

Variable speed drives for asynchronous motors
Altivar 31

■ Acceleration and deceleration ramp profile

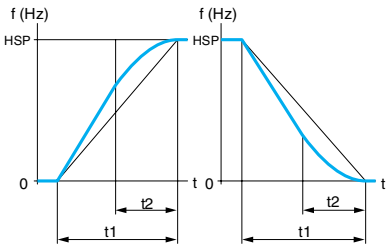
Used to gradually increase the output frequency starting from a speed reference, following a linear ratio or a preset ratio.
□ For applications such as material handling, packaging, transportation of people: the use of S ramps takes up mechanical play and eliminates jolts, and limits “non-following” of speed during rapid transient operation of high inertia machines.
□ For pumping applications (installation with centrifugal pump and non-return valve): valve closing can be controlled more accurately if U ramps are used.
□ Selecting “linear”, “S”, “U” or customized profiles assigns both the acceleration and deceleration ramps.

S ramps



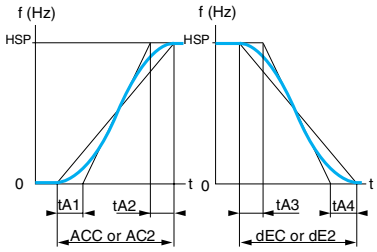
HSP: high speed
t1: ramp time set
t2 = 0.6 x t1
The curve coefficient is fixed.

U ramps



HSP: high speed
t1: ramp time set
t2 = 0.5 x t1
The curve coefficient is fixed.

Customized ramps

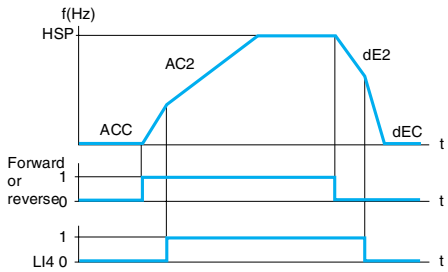


HSP: high speed
tA1: can be set between 0 and 100% (of ACC or AC2)
tA2: can be set between 0 and (100% - tA1) (of ACC or AC2)
tA3: can be set between 0 and 100% (of dEC or dE2)
tA4: can be set between 0 and (100% - tA3) (of dEC or dE2)
ACC: acceleration ramp 1 time
AC2: acceleration ramp 2 time
dEC: deceleration ramp 1 time
dE2: deceleration ramp 2 time

■ Ramp switching

Used to switch 2 acceleration and deceleration ramp times, which can be adjusted separately.
Ramp switching can be enabled by:
□ a logic input
□ a frequency threshold
□ a combination of logic input and frequency threshold

Function suitable for:
□ material handling with smooth starting and approach
□ machines with fast steady state speed correction



Acceleration 1 (ACC) and deceleration 1 (dEC):
- adjustment 0.1 to 999.9 s
- factory setting 3 s
Acceleration 2 (AC2) and deceleration 2 (dE2):
- adjustment 0.1 to 999.9 s
- factory setting 5 s
HSP: high speed

Example of switching using logic input LI4

Variable speed drives for asynchronous motors
Altivar 31

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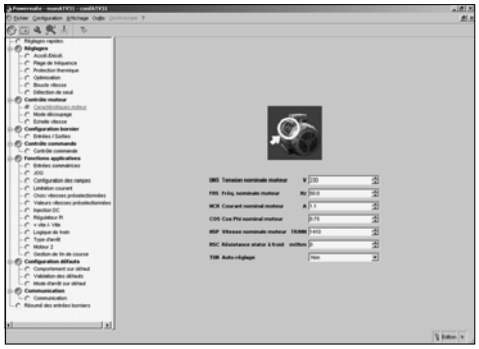
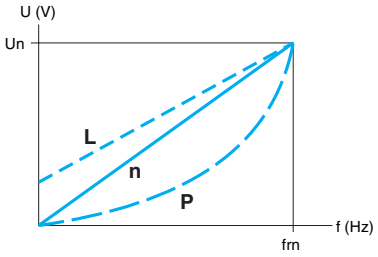


Adjustment of the voltage/frequency ratio with PowerSuite for PC

■ **Automatic adaptation of deceleration ramp**
Used to automatically adapt the deceleration ramp if the initial setting is too low when the load inertia is taken into account. This function avoids the drive locking in the event of an **excessive braking** fault.
Function suitable for all applications not requiring precise stopping and not using braking resistors.
Automatic adaptation must be cancelled if the machine has position control with stopping on a ramp and a braking resistor installed. This function is automatically disabled if the brake sequence is configured.

■ **Voltage/frequency ratio**
□ Motor and power supply characteristics
Used to determine the limit values for the voltage/frequency ratio according to the line supply, the motor and the application.
The following values should be set for variable or constant torque applications with or without overspeed:
- the base frequency corresponding to the supply
- the nominal motor frequency (in Hz) given on the motor rating plate
- the nominal motor voltage (in V) given on the motor rating plate
- the maximum output frequency of the drive (in Hz)

□ Type of voltage/frequency ratio
Used to adapt the voltage/frequency ratio to the application in order to optimize performance for the following applications:
- Constant torque applications (machines with average loads operating at low speed) with motors connected in parallel or special motors (e.g.: resistive cage motor): ratio **L**
- Variable torque applications (pumps, fans): ratio **P**
- Machines with heavy loads operating at low speed, machines with fast cycles, with (sensorless) flux vector control: ratio **n**
- Energy saving, for machines with slow speed and torque variations: ratio **nLd**
  Voltage is automatically reduced to a minimum according to the necessary torque.



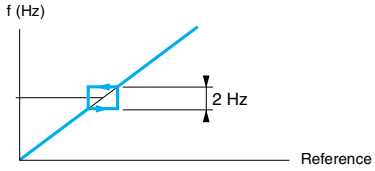
Un: Nominal motor voltage
frn: Nominal motor frequency

■ **Auto-tuning**
Auto-tuning may be performed:
voluntarily by the operator using dialogue tools via local control mode or the serial link
□ each time the drive is switched on
□ on each run command
□ by enabling a logic input
Auto-tuning is used to optimize application performance.

■ **Switching frequency, noise reduction**
The switching frequency setting permits a reduction in the noise generated by the motor.
The switching frequency is modulated randomly in order to avoid resonance. This function can be disabled if it causes instability.
Switching the intermediate DC voltage at high frequency is useful for supplying the motor with a current wave having little harmonic distortion. The switching frequency is adjustable during operation to reduce the noise generated by the motor.
Value: 2 to 16 kHz, with a factory setting of 4 kHz.
For all applications which require low motor noise.

Variable speed drives for asynchronous motors
Altivar 31

■ Skip frequencies
This function suppresses one or two critical speeds that may cause mechanical resonance.
It is possible to prohibit the prolonged operation of the motor on 1 or 2 frequency bands (with a bandwidth of ± 1 Hz), which can be set within the operating range.
Function suitable for lightweight machines, bulk product conveyors with unbalanced motor, fans and centrifugal pumps.



Motor speed change depending on the skip frequency reference

■ Speed reference
The speed reference can have different sources depending on the drive configuration:
- references provided by 3 analog inputs
- the potentiometer reference (for ATV 31●●●A drives only)
- the +/- speed function via logic input, using the keypad or remote display terminal keys
- the remote display terminal reference
- speed references provided by the communication bus or networks

These different sources are managed by programming the reference functions and channels.

■ Analog inputs
There are 3 analog inputs:
- 2 voltage inputs:
  - 0-10 V (AI1)
  - ± 10 V (AI2)
- 1 current input:
  - X-Y mA (AI3) where X is configurable between 0 and 20 mA, and Y is configurable between 4 and 20 mA.

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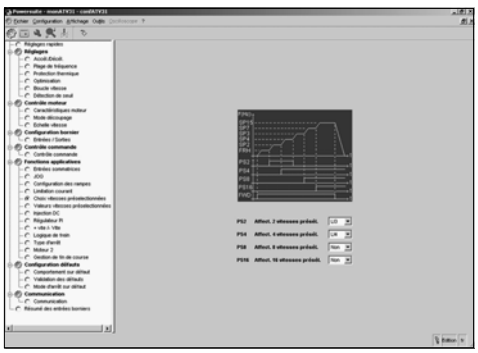
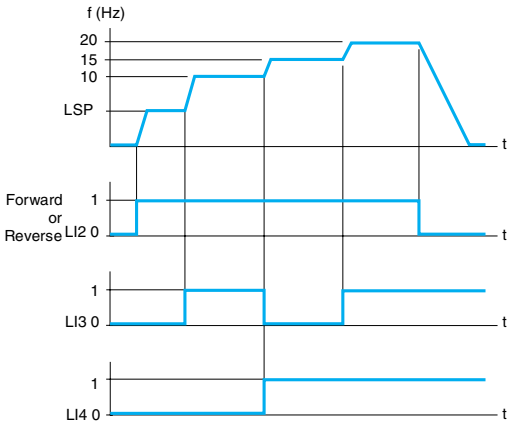


Adjustment of preset speeds with PowerSuite for PC

■ Preset speeds
Used to switch preset speed references.
Choose between two, four, eight or sixteen preset speeds.
Enabled by means of 1, 2, 3 or 4 logic inputs.
The preset speeds can be adjusted in increments of 0.1 Hz from 0 Hz to 500 Hz.
Function suitable for material handling and machines with several operating speeds.



The speed obtained with inputs LI3 and LI4 at state 0 is LSP or the speed reference, depending on the level of analog inputs AI1, AI2 and AI3.

Factory settings:

1st speed: LSP (low speed or speed reference)

2nd speed: 10 Hz

3rd speed: 15 Hz

4th speed: 20 Hz (high speed)

Example of operation with 4 preset speeds and 2 logic inputs

Variable speed drives for asynchronous motors
Altivar 31

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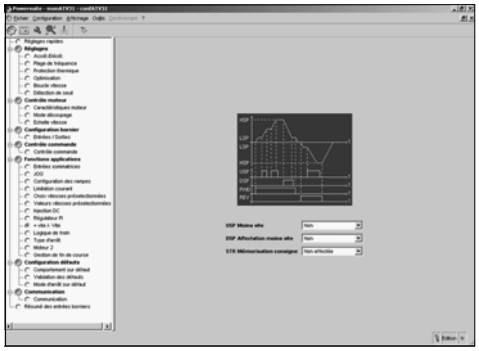
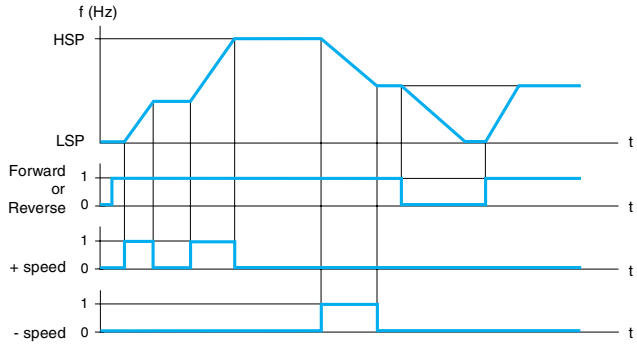


Adjustment of the "+/- speed" function with PowerSuite for PC

■ +/- speed

Used to increase or decrease a speed reference by means of 1 or 2 logic inputs, with or without the last reference being saved (motorized potentiometer function).
This function is suitable for centralized control of a machine with several sections operating in one direction or for control by a pendant control station of a handling crane with two operating directions.

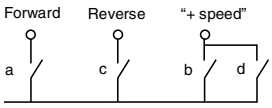
Two types of operation are available:
□ Use of single action buttons: two logic inputs are required in addition to the operating direction(s).
The input assigned to the "+ speed" command increases the speed, the input assigned to the "- speed" command decreases the speed.



Example of "+/- speed" with 2 logic inputs, single action buttons and reference saving

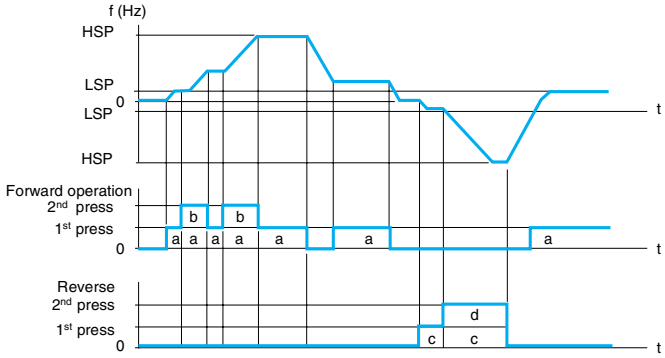
□ Use of double action buttons (only one logic input assigned to "+ speed" is necessary):

Logic inputs:



a and c: 1st press
b and d: 2nd press

	Released (- speed)	1st press (speed maintained)	2nd press (+ speed)
Forward button	–	a	a and b
Reverse button	–	c	c and d



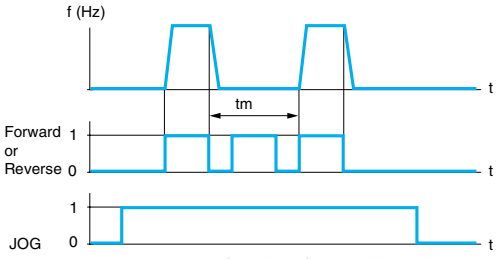
LSP: low speed, HSP: high speed

Example with double action buttons and 1 logic input

Note: *This type of "+/- speed" control is incompatible with 3-wire control.*

■ Save reference

This function is associated with "+/- speed" control.
Enables the reading and saving of the last speed reference prior to the loss of the run command or line supply. The saved reference is applied at the next run command.



Speed reference: can be adjusted from 0 to 10 Hz, factory setting 10 Hz.

tm: fixed time of 0.5 s, minimum time between 2 pulses

Example of jog operation

■ Jog operation

Used for pulse operation with minimum ramp times (0.1 s), limited speed reference and minimum time between 2 pulses.
Enabled by a logic input and pulses given by the operating direction command.

This function is suitable for machines with product insertion in manual mode (example: gradual movement of the mechanism during maintenance operations).

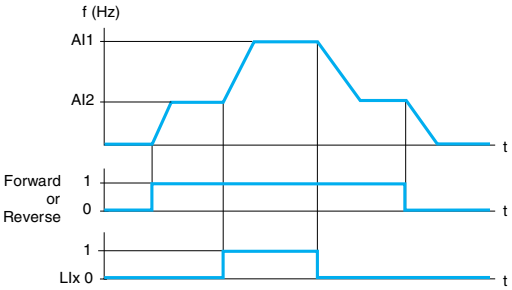
■ Control and reference channels

There are several control and reference channels which can be independent.
Commands (forward, reverse, etc.) and speed references can be sent using the following methods:

- □ terminals (logic and analog inputs)
- □ keypad for ATV 31●●●A only (RUN/STOP and potentiometer)
- □ ATV 31 keypad
- □ via the serial link
  - remote display terminal
  - Modbus control word
  - CANopen control word

The control and speed reference channels can be separate.
Example: speed reference issued by CANopen and command issued by the remote display terminal.

Note: *The Stop keys on the keypad and the remote display terminal may retain priority. The summing inputs and PI regulator functions only apply to one reference channel.*



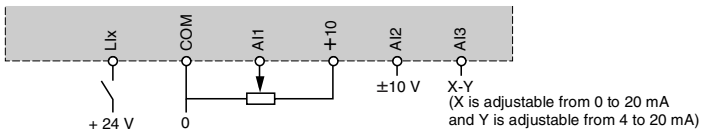
Example of reference switching

■ Reference switching

Switching between 2 speed references can be enabled via:

- □ a logic input
- □ a bit in a Modbus or CANopen control word

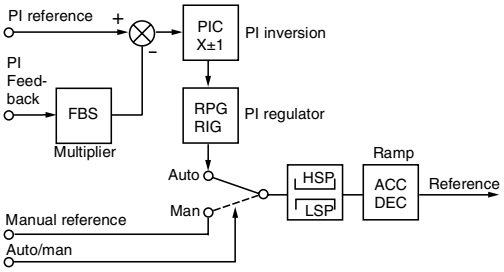
Reference 1 is active if the logic input (or control word bit) is at 0, reference 2 is active if the logic input (or control word bit) is at 1.
The reference can be switched with the motor running.



Connection diagram for reference switching

■ Summing inputs

Used to add up 2 or 3 speed references from different sources.
The references to be added together are selected from all the possible types of speed reference.
Example:
Reference 1 sent by AI1
Reference 2 sent by AI2
Reference 3 sent by AIP
Drive speed reference: reference 1 + reference 2 + reference 3.



ACC: Acceleration
DEC: Deceleration
FBS: PI feedback multiplication coefficient
HSP: High speed
PIC: Reversal of the direction of correction of the PI regulator
LSP: Low speed
RIG: PI regulator integral gain
RPG: PI regulator proportional gain

PI regulator

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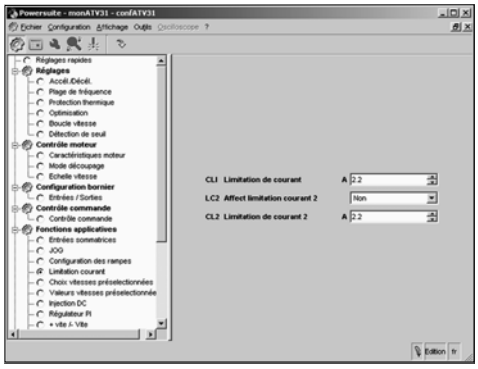

Configuration of current switching with PowerSuite for PC

■ PI regulator

Used for simple control of a flow rate or a pressure with a sensor which supplies a feedback signal adapted to the drive.
This function is suitable for pumping and ventilation applications.

- **PI reference:**
  - internal regulator reference, adjustable from 0 to 100
  - regulation reference selected from all the possible types of regulation reference
  - preset PI references
- **2 or 4 preset PI references**, adjustable from 0 to 100, require the use of 1 or 2 logic inputs respectively
- **Manual reference**
  - speed reference selected from all the possible types of speed reference
- **PI feedback:**
  - analog input AI1, AI2 or AI3
- **Auto/Man:**
  - logic input LI for switching operation to speed reference (Man) or PI regulation (Auto).

During operation in automatic mode it is possible to adapt the process feedback, to correct inverse PI, to adjust the proportional and integral gain and to apply a ramp (time = ACC - DEC) for establishing the PI action on starting and stopping.
The motor speed is limited to between LSP and HSP.

Note: *The PI function is incompatible with the preset speeds and JOG functions. The PI reference can also be transmitted on line via the Modbus RS 485 serial link or via the CANopen bus.*

■ Current limit switching

A 2nd current limit can be configured between 0.25 and 1.5 times the nominal drive current.
Used to limit the torque and the temperature rise of the motor.
Switching between 2 current limits can be enabled via:
- a logic input
- a bit in a Modbus or CANopen control word

■ Limiting low speed operating time

The motor is stopped automatically after a period of operation at low speed (LSP) with a zero reference and a run command present.
This time can be set between 0.1 and 999.9 seconds (0 corresponds to an unlimited time). Factory setting: 0 s. The motor restarts automatically on the ramp when the reference reappears or if the run command is interrupted and then re-established.
This function is suitable for automatic stopping/starting on pressure-regulated pumps.

■ Motor switching

Allows two motors with different powers to be supplied successively by the same drive. Switching must take place with the drive stopped and locked, using an appropriate sequence at the drive output.
The function can be used to adapt the motor parameters. The following parameters are switched automatically:
- nominal motor voltage
- nominal motor frequency
- nominal motor current
- nominal motor speed
- motor cosine Phi
- selection of the type of voltage/frequency ratio for motor 2
- IR compensation, motor 2
- motor frequency loop gain
- motor stability
- motor slip compensation

Motor thermal protection is disabled by this function.
Motor switching can be enabled by:
- a logic input
- a bit in a Modbus or CANopen control word

With hoisting applications, this function enables a single drive to be used for vertical and horizontal movements.

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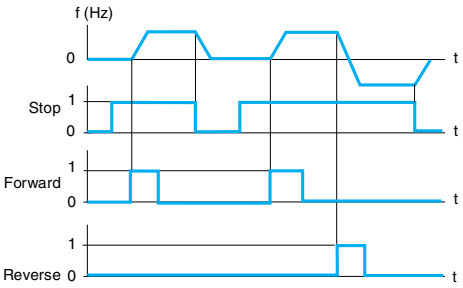
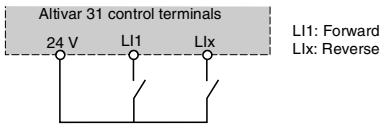


Example of operation with 3-wire control

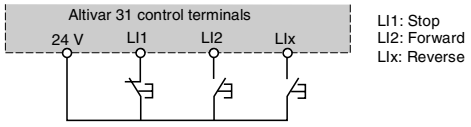
■ Control mode switching
Control channel switching provides a choice of 2 operating modes. Switching can be enabled by:
- a logic input
- a bit in a Modbus or CANopen control word

■ 2-wire control
Used to control the direction of operation by means of a stay-put contact.
Enabled by means of 1 or 2 logic inputs (one or two directions).
This function is suitable for all non-reversing and reversing applications.
3 operating modes are possible:
- detection of the state of the logic inputs
- detection of a change in state of the logic inputs
- detection of the state of the logic inputs with forward operation always having priority over reverse



Wiring diagram for 2-wire control

■ 3-wire control
Used to control the operating direction and stopping by means of pulsed contacts.
Enabled by means of 2 or 3 logic inputs (non-reversing or reversing).
This function is suitable for all non-reversing and reversing applications.



Wiring diagram for 3-wire control

■ Forced local mode
Forced local mode imposes control via the terminals or operator terminal and prohibits all other control modes.
The following references and commands are available for forced local mode:
- references AI1, or AI2, or AI3 and control via logic inputs
- reference and control via RUN/STOP keys and potentiometer (ATV 31●●●A drives only)
- reference and control via the remote display terminal

The changeover to forced local mode is enabled by a logic input.

■ Freewheel stop
This function stops the motor by resistive torque if the motor power supply is cut.
A freewheel stop is achieved:
- by configuring a normal stop command as a freewheel stop (on disappearance of a run command or appearance of a stop command)
- by enabling a logic input

■ Fast stop
Used to achieve a braked stop with an acceptable deceleration ramp time (divided by 2 to 10) for the drive/motor unit to avoid locking on an excessive braking fault.
Used for conveyors with emergency stop electrical braking.
A fast stop is achieved:
- by configuring a normal stop as a fast stop (on disappearance of a run command or appearance of a stop command)
- by enabling a logic input

■ DC injection stop
Used to brake (at low speed) high inertia fans, or to maintain torque on stopping in the case of fans located in an airflow.
A DC injection stop is achieved:
- by configuring a normal stop as a DC injection stop (on disappearance of a run command or appearance of a stop command)
- by enabling a logic input

The DC value and the standstill braking time are adjustable.

Presentation: pages 2/100 to 2/107
Characteristics: pages 2/108 to 2/111
References: pages 2/112 to 2/115
Dimensions: pages 2/126 to 2/131
Schemes: pages 2/132 to 2/135

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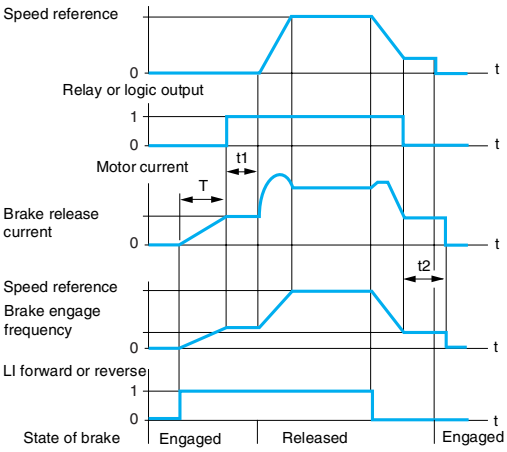

Accessible settings:
t1: Brake release time delay
t2: Brake engage time delay

Brake control

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Monitoring the different parameters with PowerSuite for PC

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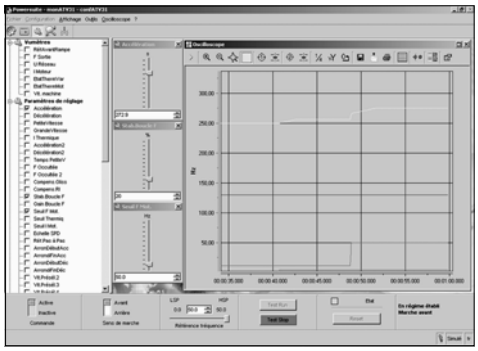

Monitoring the different parameters with the oscilloscope function in PowerSuite for PC

■ Brake control

Used to manage control of an electromagnetic brake in synchronization with the starting and stopping of the motor to avoid jolts and load veering.
The brake control sequence is managed by the drive.
Values that can be adjusted for releasing the brake: current threshold and time delay
Values that can be adjusted for engaging the brake: frequency threshold and time delay
Enabled: by relay logic output R2 or logic output AOC assigned to brake control.
Function suitable for material handling applications with movements equipped with electromagnetic brakes (hoisting) and machines requiring a parking brake (unbalanced machines).

□ Principle:

- Vertical lifting movement:

Maintains motor torque in an upward direction when the brake is being released and engaged, in order to hold the load, and start smoothly as soon as the brake is released.

- Horizontal lifting movement:

Synchronizes brake release with the build-up torque on starting and brake engage at zero speed on stopping, in order to prevent jerking.
Recommended settings for brake control for a vertical lifting application (for a horizontal lifting application set the current threshold to zero):

- Brake release current: Adjust the brake release current to the nominal current indicated on the motor. If, during testing, the torque is insufficient, increase the brake release current (the maximum value is imposed by the drive).
- Acceleration time: For lifting applications it is advisable to set the acceleration ramps to more than 0.5 seconds. Ensure that the drive does not change to current limiting.

The same recommendation applies for deceleration.
Note: For a lifting movement, a braking resistor should be used. Ensure that the settings and configurations selected cannot cause a drop or a loss of control of the lifted load.

- Brake release time delay t1: Adjust according to the type of brake. It is the time required for the mechanical brake to release.
- Brake engage frequency: Set to twice the nominal slip then adjust according to the result.
- Brake engage time delay t2: Adjust according to the type of brake. It is the time required for the mechanical brake to engage.

■ Management of limit switch

Used to manage the operation of one or two limit switches (with 1 or 2 operating directions).
Each limit (forward, reverse) is associated with a logic input. The type of stop that occurs on detection of a limit can be configured as normal, freewheel or fast.
Following a stop, the motor is permitted to restart in the opposite direction only.

■ Monitoring

The following data can be displayed:
□ frequency reference
□ internal PI reference
□ frequency reference (absolute value)
□ output frequency applied to the motor (value signed in two's complement)
□ output value in customer units
□ current in the motor
□ motor power: 100% = nominal power
□ line voltage
□ motor thermal state:
100% : nominal thermal state, 118%: motor overload threshold
□ drive thermal state:
100% : nominal thermal state, 118%: drive overload threshold
□ motor torque: 100% = nominal torque
□ last fault
□ operating time
□ auto-tuning status
□ configuration and state of logic inputs
□ configuration of analog inputs

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Fault management with PowerSuite for PC

■ Fault management
There are different modes of operation on a resettable fault:
- freewheel stop
- drive switches to the fallback speed
- the drive maintains the speed at which it was operating when the fault occurred until the fault disappears
- stop on ramp
- fast stop

The detected resettable faults are as follows:
- drive overheating
- motor overheating
- CANopen bus fault
- Modbus serial link failure
- external faults
- loss of 4-20 mA signal

■ Fault reset
Used to clear the last fault by means of a logic input.
The restart conditions after a reset to zero are the same as those of a normal power-up.
Resets the following faults: overvoltage, overspeed, external fault, drive overheating, motor phase loss, DC bus overvoltage, loss of 4-20 mA reference, load veering, motor overload if the thermal state is less than 100%, serial link fault.
Line supply undervoltage and line supply phase loss faults are reset automatically when the line supply is restored.
Function suitable for applications where the drives are difficult to access, for example on moving parts in material handling systems.

■ General reset (disables all faults)
This function can be used to inhibit all faults, including thermal protection (forced operation), and may cause irreparable damage to the drive.
This invalidates the warranty.

Function suitable for applications where restarting can be vital (conveyor in a furnace, smoke extraction system, machines with hardening products that need to be removed).
The function is enabled by a logic input.
Fault monitoring is active if the logic input is at state 1.
All faults are reset on a change of state ⊥ of the logic input.

■ Controlled stop on loss of line supply
Used to control motor stopping on a loss of line supply.
Function suitable for material handling, machines with high inertia, continuous product processing machines.
Type of stop possible:
- locking of the drive and freewheel stop
- stop which uses the mechanical inertia to maintain the drive power supply as long as possible
- stop on ramp
- fast stop (depends on the inertia and the braking ability of the drive)

■ Stop mode in the event of a fault
The type of stop that occurs on detection of a fault can be configured as normal, freewheel or fast for the following faults:
- external fault (detection enabled by a logic input or a bit in a Modbus or CANopen control word)
- motor phase loss fault

If a downstream contactor is being used between the drive and the motor, the motor phase loss fault should be inhibited.

■ **Automatic catching of a spinning load with speed detection** (“catch on the fly”)
Used to restart the motor smoothly after one of the following events, provided the run command is still present:
□ loss of line supply or simple switch off
□ fault reset or automatic restart
□ freewheel stop

On disappearance of the event, the effective speed of the motor is detected in order to restart on a ramp at this speed and return to the reference speed. The speed detection time can be up to 1 s depending on the initial deviation.
This function is automatically disabled if the brake sequence is configured.
This function is suitable for machines where the speed loss is negligible during the time over which the line supply is lost (machines with high inertia), fans and pumps driven by a residual flow, etc.

■ **Automatic restart**
Enables the drive to be restarted automatically after locking following a fault if this fault has disappeared and if the other operating conditions permit a restart.
This restart is performed by a series of automatic attempts separated by increasingly longer wait periods of 1 s, 5 s, 10 s then 1 minute for the rest.
The whole restart procedure can last anywhere between 5 minutes and an unlimited time.
If the drive has not restarted after the configured time, it will lock and the procedure is abandoned until it has been switched off and on again.

The faults which permit this type of restart are:
□ line supply overvoltage
□ motor thermal overload
□ drive thermal overload
□ DC bus overvoltage
□ failure of a line supply phase
□ external fault
□ loss of 4-20 mA reference
□ CANopen bus fault
□ Modbus serial link fault
□ line supply voltage too low. For this fault, the function is always active, even if it is not configured.
For these types of fault, the relay configured as a fault relay remains activated if the function is configured. The speed reference and direction of operation must be maintained for this function.
This function is suitable for machines or installations which are in continuous operation or are not monitored, and where a restart will not endanger equipment or personnel in any way.

■ **Derated operation in the event of an undervoltage**
The line voltage monitoring threshold is lowered to 50% of the motor voltage.
In this case, a line choke must be used and the performance of the drive cannot be guaranteed.

■ **Fault relay, unlocking**
The fault relay is energized when the drive is powered up and is not faulty.
It contains a “C/O common point contact.
The drive can be unlocked after a fault in one of the following ways:
□ by powering down until the ON LED extinguishes, then switching the power back on
□ by assigning a logic input to the reset faults function
□ by the automatic restart function, if it has been configured

■ **Operating time reset to zero**
The drive operating time can be reset to zero.

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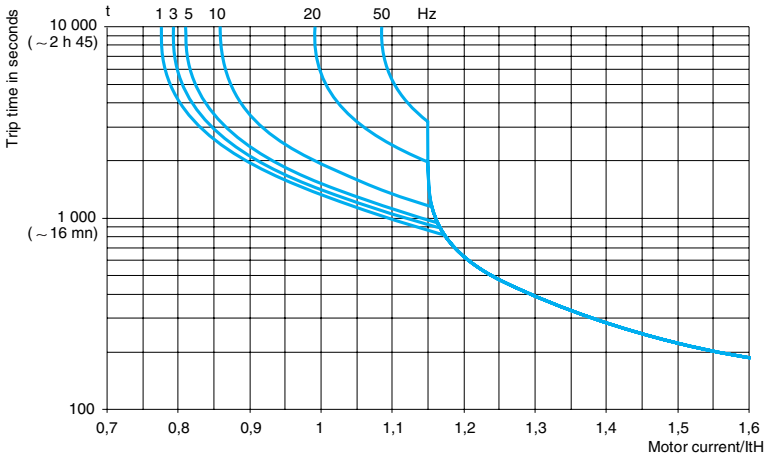
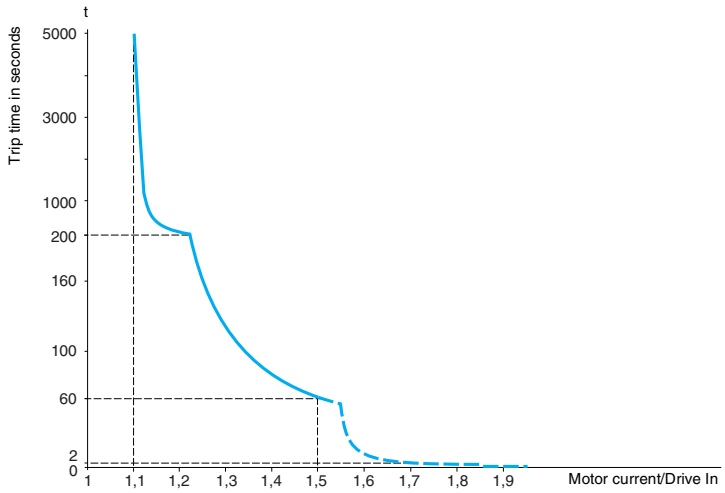
■ **Motor thermal protection**
Indirect motor thermal protection is implemented via continuous calculation of its theoretical temperature rise.
Thermal protection can be adjusted from 0.2 to 1.5 times the nominal drive current.
This function is suitable for applications with self-cooled motors.



Motor thermal protection curves

■ **Drive thermal protection**
Thermal protection, by a PTC probe mounted on the heatsink or integrated in the power module, ensures that the drive is protected in the event of poor ventilation or excessive ambient temperatures.
Locks the drive in the event of a fault.



■ **R1/R2 relay configuration**
The following states are signalled when the relay is powered on:
- drive fault
- drive running
- frequency threshold reached
- high speed reached
- current threshold reached
- frequency reference reached
- motor thermal threshold reached
- brake sequence (R2 only)

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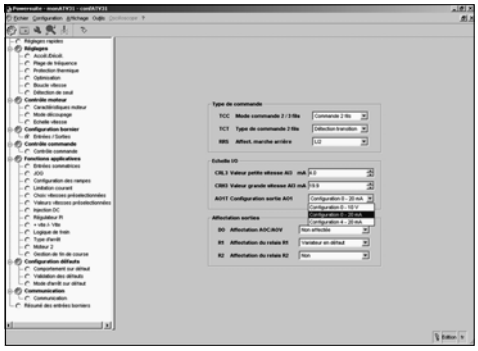

Configuration of AOC/AOV outputs with PowerSuite for PC

■ **AOC/AOV analog outputs**

The same data is available on analog outputs AOC and AOV.
The following assignments are possible:
- □ motor current
- □ motor frequency
- □ motor torque
- □ power supplied by the drive
- □ drive fault
- □ frequency threshold reached
- □ high speed reached
- □ current threshold reached
- □ frequency reference reached
- □ motor thermal threshold reached
- □ brake sequence

The adjustment of analog outputs AOC/AOV is used to modify the characteristics of the current analog output AOC or the voltage analog output AOV.
AOC: can be set as 0-20 mA or 4-20 mA
AOV: can be set at 0-10 V

■ **Saving and retrieving the configuration**

A configuration can be saved to the EEPROM. This function is used to store a configuration in addition to the current configuration.
Retrieving this configuration clears the current configuration.

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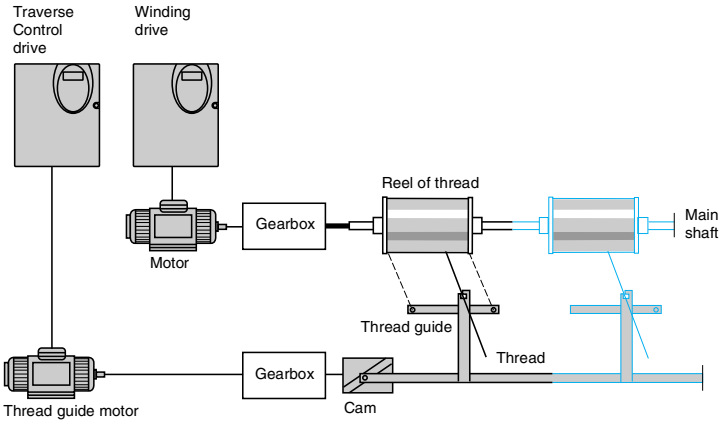
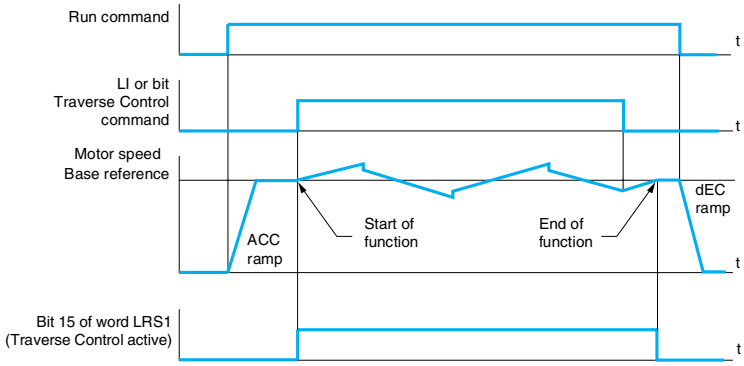
Spooling functions (in textile applications)
Function only available with ATV 31●●●●T drives

■ **Traverse Control**

Function for winding reels of thread



The cam rotation speed must follow a precise profile to ensure a steady, compact, linear reel is obtained.



The function starts when the drive has reached its base reference and the Traverse Control command has been enabled. When the Traverse Control command is no longer enabled, the drive returns to its base reference following the drive ACC or dEC ramp. As soon as this reference is reached, the function stops.

Function parameters

Using certain parameters, it is possible to define the cycle of frequency variations around the base reference, see opposite.

The Traverse Control (thread control) command can be assigned by a logic input or a bit in a Modbus or CANopen control word.

Reel management

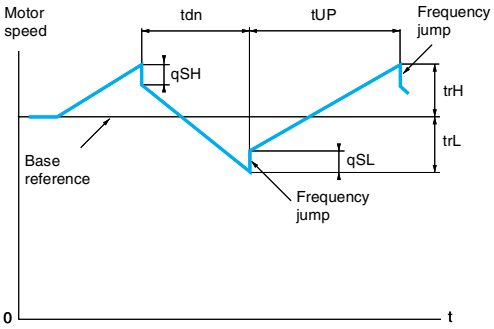
Various parameters are used to manage the reel, such as the reel making time, the decrease in the base reference, reel changes, etc.

Main parameters necessary for reel management:

■ tbO: time taken to make a reel, in minutes. This parameter is intended to signal the end of winding. When the Traverse Control operating time since the command reaches the value of tbO, the logic output or one of the drive relays changes to state 1, to signal the end of the reel.

■ dtF: decrease in the base reference. In certain cases, the base reference has to be reduced as the reel increases in size.

■ rtr: reinitialize Traverse Control. As long as this parameter remains at 1, the Traverse Control function is disabled and the speed is the same as the base reference. This command is used primarily when changing reels.



tdn: Traverse Control deceleration time, in seconds
tUP: Traverse Control acceleration time, in seconds
trH: Traverse frequency high, in Hertz
trL: Traverse frequency low, in Hertz
qSH: Quick step high, in Hertz
qSL: Quick step low, in Hertz

Definition of the cycle of frequency variations around the base reference

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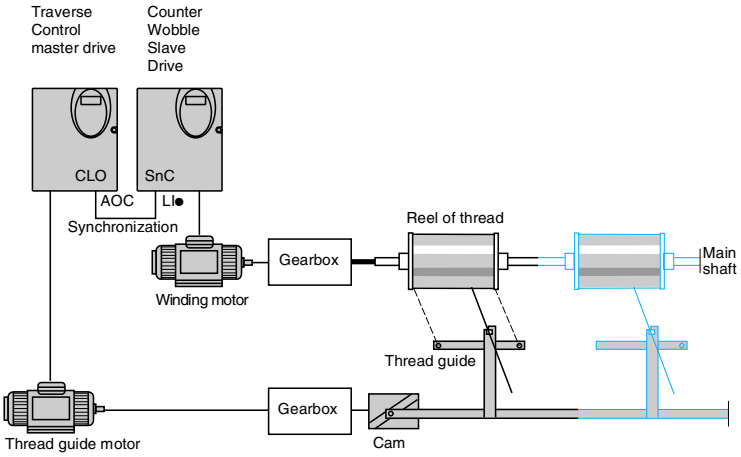
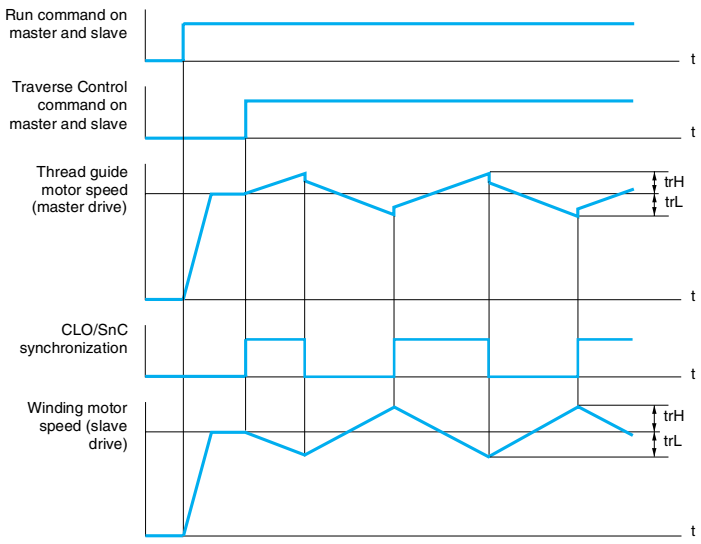
■ Counter Wobble



The Counter Wobble function is used in certain applications to obtain a constant thread tension when the Traverse Control function is producing considerable variations in speed on the thread guide motor.

Two special drives, a master (Traverse Control) and a slave (Counter Wobble), are necessary for this function.

The master drive controls the speed of the thread guide, while the slave drive controls the winding speed. The function assigns the slave a speed profile, which is in antiphase to that of the master. This means that synchronization is required, using one of the master's logic outputs (AOC) and one of the slave's logic inputs (LI●).



For the function to start, the following conditions must be met:
- base reference of the motor speeds of the master and slave drives reached
- "thread control" (trC) input activated
- synchronization signal present

Variable speed drives for asynchronous motors
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Function compatibility table

■ **Configurable I/O**
Functions which are not listed in this table are fully compatible.
Stop functions have priority over run commands.
The selection of functions is limited:
- by the number of drive I/O
- by the incompatibility of certain functions with one another

Functions	Summing inputs	+/- speed	Limit switch manage-ment	Preset speeds	PI regulator	Jog operation	Brake sequence	DC injection stop	Fast stop	Freewheel stop
Summing inputs		⊖		↑	⊖	↑				
+/- speed	⊖			⊖	⊖	⊖				
Management of limit switch					⊖					
Preset speeds	←	⊖			⊖	↑				
PI regulator	⊖	⊖	⊖	⊖		⊖	⊖			
Jog operation	←	⊖		←	⊖		⊖			
Brake sequence					⊖	⊖		⊖		
DC injection stop							⊖			↑
Fast stop										↑
Freewheel stop								←	←	

⊖ Incompatible functions
Compatible functions
Not applicable

Priority functions (functions which cannot be active at the same time)
← The arrow indicates which function has priority
↑ Example: the Freewheel stop function has priority over the Fast stop function

Variable speed drives for asynchronous motors
Altivar 61

522835

Ventilation application

Applications

The Altivar 61 drive is a frequency inverter for 3-phase asynchronous motors rated between 0.75 kW and 630 kW.
The drive has been designed for state-of-the-art applications in heating, ventilation and air conditioning (HVAC) in industrial and commercial buildings:
- Ventilation
- Air conditioning
- Pumping

The Altivar 61 can reduce operating costs in buildings by optimizing energy consumption whilst improving user comfort.
Its numerous integrated options enable it to be adapted to and incorporated into electrical installations, sophisticated control systems and building management systems.
The need for electromagnetic compatibility and a reduction in harmonics were taken into account at the outset of designing the drive.
Depending on its design characteristics, each type (UL Type 1/IP 20 and/or UL Type 12/IP 54) either has built-in class A or class B EMC filters and DC chokes, or these items are available as optional accessories.

522836

Air conditioning application

Functions

With its macro-configurations and “Simply Start” menu, the Altivar 61 drive can be used to start up your applications without delay and to make adjustments in virtually no time using user-friendly dialogue tools.

Functions designed specifically for pumping and ventilation applications

- Energy saving ratio, 2-point or 5-point quadratic ratio
- Automatic catching of a spinning load with speed detection
- Adaptation of current limiting according to speed
- Noise and resonance suppression by means of the switching frequency which, depending on the power rating, can be set to up to 16 kHz during operation, by modulating the switching frequency and by the frequency jump.
- Preset speeds
- Integrated PID regulator, with preset PID references and automatic/manual (“Auto/Man.”) mode
- Electricity and service hours meter
- Detection of absence of fluid, detection of zero flow rate, limiting of flow rate
- Sleep function, wake-up function
- Customer settings with display of physical values: bar, l/s, °C, etc.

522834

Pumping application

Protection functions

- Motor and drive thermal protection, PTC thermal probe management
- Protection against overloads and overcurrents in continuous operation
- Machine mechanical protection via jump frequency function, phase rotation
- Protection of the installation by means of underload, overload and zero flow detection
- Protection via multiple fault management and configurable alarm groups

Safety functions

- Machine safety by means of the integrated “Power Removal” function

This function prevents the motor starting accidentally; it meets the requirements of machine safety standard EN 954-1, category 3 and those of operational safety standard IEC/EN 61508, SIL2 (safety control/signalling applied to processes and systems).

- Installation safety by means of the function for forced operation with inhibition of faults, direction of operation and configurable references.

Flexibility and user-friendliness

The Altivar 61 has numerous configurable logic and analog inputs and outputs in order that it can be optimised for your applications.
It supports the Modbus and CANopen protocols as standard in order to increase the performance of your control systems. It also supports the industry’s major communication buses and can be integrated easily into building management (HVAC) systems via option cards.
Furthermore, it features multi-pump cards, enabling it to provide flexible and user-friendly management of multiple pumps.

Characteristics: pages 2/162 to 2/169
References: pages 2/172 to 2/175
Dimensions: pages 2/252 to 2/273
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Variable speed drives for asynchronous motors
Altivar 61

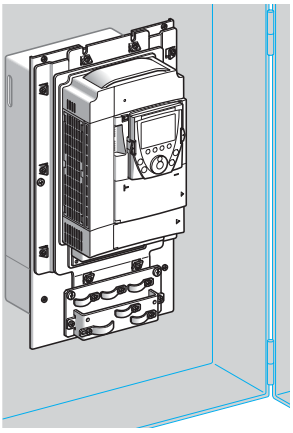
534483

ATV 61HC31N4,
ATV 61HD37M3X, ATV 61HU22N4

534628

ATV 61W075N4,
ATV 61W075N4C

532235



ATV 61HU75N4 flush-mounted

A comprehensive offer

The Altivar 61 range of variable speed drives extends across a range of motor power ratings from 0.75 kW to 630 kW with three types of power supply:
■ 200…240 V 3-phase, 0.75 kW to 90 kW, UL Type 1/IP 20, (**ATV 61H●●●M3**, **ATV 61H●●●M3X**)
■ 380…480 V 3-phase, 0.75 kW to 630 kW, UL Type 1/IP 20, (**ATV 61H●●●N4**)
■ 380…480 V 3-phase, 0.75 kW to 90 kW, UL Type 12/IP 54, (**ATV 61W●●●N4**, **ATV 61W●●●N4C**),

Altivar 61 UL Type 1/IP 20 drives can also be used in conjunction with motors rated between 0.37 kW and 5.5 kW on a single phase 200…240 V supply (derating is required).

The Altivar 61 drive integrates the Modbus and CANopen protocols as standard as well as numerous functions. These functions can be extended using communication, I/O extension and multi-pump option cards and a "Controller Inside" programmable card (see page 2/161).

Other external options, such as braking resistors, resistance braking units and filters, are available to complement this offer (see page 2/161).

The entire range conforms to international standards IEC/EN 61800-5-1, IEC/EN 61800-2, IEC/EN 61800-3, is UL, CSA, DNV, C-Tick, NOM 117 and GOST certified and has been developed to meet the requirements of the directives regarding protection of the environment (RoHS, WEEE, etc) as well of those of the European Directives governing the issuing of the CE marking.

The Altivar 61 drive can be inserted in an installation's safety system. It integrates the "Power Removal" safety function which prevents the motor from restarting unintentionally.

Electromagnetic compatibility EMC

The incorporation of EMC filters in **ATV 61H●●●M3** and **ATV 61●●●●N4** drives and the recognition of EMC requirements simplifies machine installation and provides a very economical means of meeting CE marking requirements.

ATV 61W●●●N4C drives feature integrated class B EMC filters, enabling them to meet the requirements of the EN 55011 (class B group 1) and IEC/EN 61800-3 (category C1) standards.

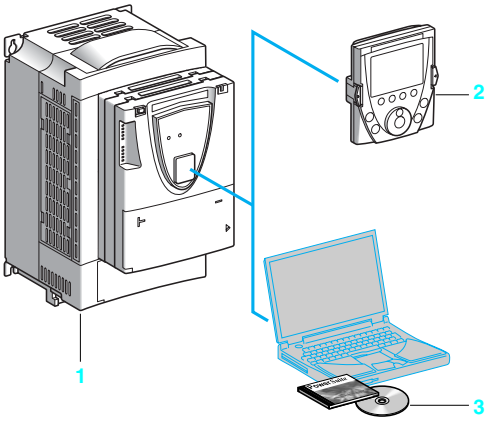
ATV 61H●●●M3X drives have been designed without an EMC filter. Filters are available as an option and can be installed by the user to reduce emission levels, see pages 2/236 to 2/239.

Installation

The Altivar 61 drive has been designed to optimize the size of enclosures (floor-standing, wall-mounted, etc):
■ The power part, with IP 54 degree of protection, can be easily mounted outside the enclosure using the kit for flush-mounting in a dust and damp proof enclosure (**VW3 A9 5●●**, see page 2/180); this type of mounting can be used to limit the temperature rise inside the enclosure or to reduce the size of enclosure required.
■ Ambient temperature inside the enclosure:
□ 50°C without derating corresponding to the drive rating
□ Up to 60°C using the control card fan kit VW3 **A9 4●●** corresponding to the drive rating and, if necessary, by derating the output current (see page 2/177)
■ Mounting side-by-side (see pages 2/302, 2/304 and 2/308)

The Altivar 61 drive can also be wall-mounted in compliance with the requirements for UL Type 1 using kit **VW3 A9 2●●**, and in compliance with the requirements for IP 21 or IP 31 using kit **VW3 A9 1●●** (see pages 2/178 and 2/179).

Variable speed drives for asynchronous motors
Altivar 61



Dialogue tools

The Altivar 61 drive 1 is supplied with a remote graphic display terminal 2:
- The navigation button provides a quick and easy means of accessing the drop-down menus.
- The graphic screen displays 8 lines of 24 characters of plain text.
- The advanced functions on the display unit provide access to the more complex drive functions.
- The display screens, menus and parameters can all be customized for the user or the machine.
- Online help screens are available.
- Configurations can be stored and downloaded: four configuration files can be stored.
- The drive can be connected to several other drives via a multidrop link.
- It can be located remotely on an enclosure door with IP 54 or IP 65 degree of protection and a standard feature of UL Type 12/IP54 drives.
- It is supplied with 6 languages installed as standard (English, French, German, Italian, Spanish and Chinese). Other languages can be loaded to the flash memory.

Up to 45 kW at 200…240 V and 75 kW at 380…480 V, the Altivar 61 drive can be controlled using an integrated 7-segment display terminal (see pages 2/172 and 2/173).

The PowerSuite software workshop 3 can be used to configure, adjust and debug the Altivar 61 in just the same way as all other Telemecanique speed drives and starters. It can be used via a direct, Ethernet, modem or wireless Bluetooth® connection.

Quick programming

Macro-configuration

The Altivar 61 offers quick and easy programming using macro-configurations corresponding to different applications or uses: start-stop, pumping and ventilation, general use, connection to communication networks, PID regulator.
Each of these configurations is still fully modifiable.

“Simply Start” menu

In just a few steps, the “Simply Start” menu can be used to ensure the application operates correctly, obtain maximum motor performance and ensure motor protection.

The architecture, the hierarchical parameter structure and the direct access functions all serve to make programming quick and easy, even for more complex functions.

534783

RUN	Term	+50.00Hz	5.4A
1.1 SIMPLY START			
2/3 wire control	**:**		**2 wire**
Macro-configuration	:		Pumps.Fans
Standard mot. Freq.	:		50Hz IEC
Rated motor power	:		2.2kW
Rated motor volt.	:		400V
Code	<<	>>	Quick

Simply Start menu

533523

SCF1	Term	+50.00Hz	0.0A
FAULT HISTORY			
Short circuit			
Overcurrent			
External FLT			
Overvoltage			
Undervoltage			
Help			Quick

Fault log

522162

SCF1	Term	+50.00Hz	0.0A
MOTOR SHORT CIRCUIT			
Check the connection cables and the motor insulation.			
Perform the diagnostic test.			
			Quick

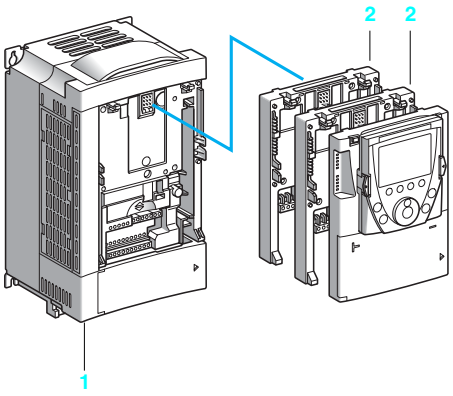
Troubleshooting screen

Services

The Altivar 61 has numerous built-in maintenance, monitoring and diagnostic functions:
- Drive test functions with diagnostic screen on the remote graphic display terminal
- I/O maps
- Communication maps for the different ports
- Oscilloscope function that can be viewed using the PowerSuite software workshop
- Management of the drive installed base via processors with flash memory
- Remote use of these functions by connecting the drive to a modem via the Modbus port
- Identification of all the drive’s component parts as well as the software versions
- Fault logs with display of the value of up to 16 variables on occurrence of a fault
- Display terminal languages loaded in the flash memory
- A message of up to 5 lines of 24 characters can be stored in the drive.

Characteristics: pages 2/162 to 2/169
References: pages 2/172 to 2/175
Dimensions: pages 2/252 to 2/273
Schemes: pages 2/274 to 2/291
Functions: pages 2/312 to 2/339

Variable speed drives for asynchronous motors
Altivar 61



Options

The Altivar 61 drive 1 can integrate up to two option cards simultaneously*(1)*:
- I/O extension cards 2 (see pages 2/192 and 2/193)
- Communication cards 2 for use in industrial applications or for HVAC (see pages 2/206 to 2/215)
- Multi-pump cards 2 for the management of multiple pumps (see pages 2/194 to 2/197)
- "Controller Inside" programmable card 2. This card is used to adapt the drive to specific applications quickly and progressively, by decentralizing the control system functions (programming in IEC 61131-3 compliant languages) (see pages 2/198 to 2/205).

External options can be associated with the Altivar 61:
- Braking units and resistors, see pages 2/216 to 2/223
- DC chokes, line chokes and passive filters, to reduce current harmonics (see pages 2/224 to 2/235)
- Additional EMC input filters (see pages 2/236 to 2/239)
- Motor chokes and sinus filters for long cable runs or to remove the need for shielding (see pages 2/240 to 2/245)

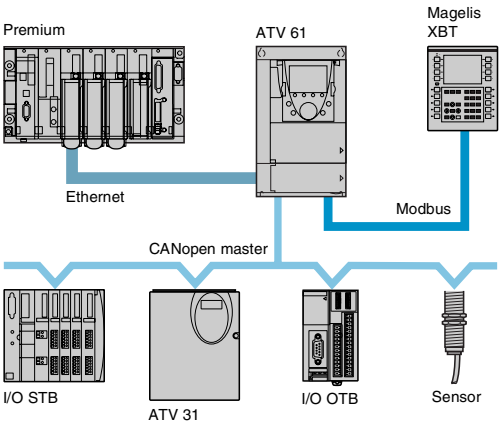
Note: *Please refer to the compatibility summary tables to determine which options are available for individual drives (see pages 2/246 to 2/251).*

Integration into control systems and building management systems

The Altivar 61 integrates a combined Modbus or CANopen port for adjustment, supervision and configuration. A second port is available for connecting a Magelis terminal for machine dialogue.

The Altivar 61 drive can also be connected to other communication networks using the communication cards (see pages 2/206 to 2/215). All communication protocols designed for use in industrial applications (Ethernet TCP/IP, Fipio, Modbus, Modbus Plus, Uni-Telway, Profibus DP, DeviceNet and INTERBUS) or in building management systems (LONWorks, METASYS N2, APOGEE FLN, BACnet) are available.

The option of powering the control part separately enables communication to be maintained (monitoring, diagnostics) even if there is no power supply to the power part.



Example of a drive equipped with a communication card and a "Controller Inside" programmable card

The "Controller Inside" programmable card transforms the drive into an automation island:
- The card integrates its own I/O; it can also manage those of the drive and an I/O extension card.
- It contains onboard application programs developed in IEC 61131-3 compliant languages, which reduce the control system's response time.
- Its CANopen master port enables control of other drives and dialogue with I/O modules and sensors.

The two multi-pump cards enable the drive to be adapted for pump applications.
The **VW3 A3 502** multi-pump card ensures the compatibility of pump applications developed for an Altivar 38 drive with an Altivar 61 drive.
The **VW3 A3 503** multi-pump card enables all multi-pump applications to be supported.
Multi-pump cards feature their own I/O. They can manage I/O on the drive as well as those on I/O extension cards. They can also make use of drive parameters such as those for speed, current, torque, etc.

(1) The Altivar 61 cannot support more than one option card with the same reference. Please refer to the compatibility tables summarizing the possible combinations for drives, options and accessories on pages 2/246 to 2/251.

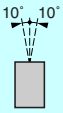
Variable speed drives for asynchronous motors
Altivar 61

Environmental characteristics

Conformity to standards			Altivar 61 drives have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control devices (IEC, EN), in particular: low voltage, IEC/EN 61800-5-1, 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 IEC/EN 61000-4-6 level 3 IEC/EN 61000-4-11 *(1)*
Conducted and radiated EMC em issions for drives			IEC/EN 61800-3, environments 1 and 2, categories C1, C2, C3
	ATV 61H075M3…HU22M3 ATV 61H075N4…HU40N4		EN 55011 class A group 1, IEC/EN 61800-3 category C2 With additional EMC filter *(2)*: ■ EN 55011 class B group 1, IEC/EN 61800-3 category C1
	ATV 61HU30M3…HU75M3 ATV 61HU55N4…HC63N4		EN 55011 class A group 2, IEC/EN 61800-3 category C3 With additional EMC filter *(2)*: ■ EN 55011 class A group 1, IEC/EN 61800-3 category C2 ■ EN 55011 class B group 1, IEC/EN 61800-3 category C1
	ATV 61H●●●M3X		With additional EMC filter *(2)*: ■ EN 55011 class A group 1, IEC/EN 61800-3 category C2 ■ EN 55011 class B group 1, IEC/EN 61800-3 category C1
	ATV 61W075N4…WD90N4		EN 55011 class A group 1, IEC/EN 61800-3 category C2
	ATV 61W075N4C…WD90N4C		EN 55011 class B group 1, IEC/EN 61800-3 category C1
CE marking			The drives have CE marking in accordance with the European directives on low voltage (73/23/EEC and 93/68/EEC) and EMC (89/336/EEC).
Product certifications			UL, CSA, DNV, C-Tick, NOM 117 and GOST
Degree of protection			IEC/EN 61800-5-1, IEC/EN 60529
	ATV 61H●●●M3 ATV 61HD11M3X…HD45M3X ATV 61H075N4…HD75N4		IP 21 and IP 41 on upper part IP 20 without blanking plate on upper part of cover IP 54 on the lower part (heatsink) IP 21 with accessory VW3 A9 1●●, UL Type 1 with accessory VW3 A9 2●●, see pages 2/178 and 2/179
	ATV 61HD55M3X…HD90M3X ATV 61HD90N4…HC31N4		IP 00, IP 41 on the upper part and IP 30 on the front panel and side parts IP 54 on the lower part (heatsink) IP 31 with accessory VW3 A9 1●●, UL Type 1 with accessory VW3 A9 2●●, see pages 2/178 and 2/179
	ATV 61HC40N4…HC63N4		IP 00, IP 41 on the upper part and IP 30 on the front panel and side parts IP 31 with accessory VW3 A9 1●●, see page 2/179
	ATV 61W075N4…WD90N4 ATV 61W075N4C…WD90N4C		UL Type 12/IP 54
Vibration resistance	ATV 61H●●●M3 ATV 61HD11M3X…HD45M3X ATV 61H075N4…HD75N4 ATV 61W075N4…WD75N4 ATV 61W075N4C…WD75N4C		1.5 mm peak to peak from 3…13 Hz, 1 gn from 13…200 Hz, conforming to IEC/EN 60068-2-6
	ATV 61HD55M3X…HD90M3X ATV 61HD90N4…HC63N4 ATV 61WD90N4 ATV 61WD90N4C		1.5 mm peak to peak from 3…10 Hz, 0.6 gn from 10…200 Hz, conforming to IEC/EN 60068-2-6
Shock resistance	ATV 61H●●●M3 ATV 61HD11M3X…HD45M3X ATV 61H075N4…HD75N4 ATV 61W075N4…WD75N4 ATV 61W075N4C…WD75N4C		15 gn for 11 ms conforming to IEC/EN 60068-2-27
	ATV 61HD55M3X…HD90M3X ATV 61HD90N4…HC16N4 ATV 61WD90N4 ATV 61WD90N4C		7 gn for 11 ms conforming to IEC/EN 60068-2-27
	ATV 61HC22N4…HC63N4		4 gn for 11 ms conforming to IEC/EN 60068-2-27

(1) Drive behaviour according to the drive configurations, see pages 2/330, 2/331, 2/337 and 2/338.
(2) See table on page 2/238 to check permitted cable lengths.

Environmental characteristics (continued)

Maximum ambient pollution	ATV 61H●●●M3 ATV 61HD11M3X, HD15M3X ATV 61H075N4…HD18N4 ATV 61W075N4…WD15N4 ATV 61W075N4C…WD15N4C		Degree 2 conforming to IEC/EN 61800-5-1
	ATV 61HD18M3X…HD90M3X ATV 61HD22N4…HC63N4 ATV 61WD18N4…WD90N4 ATV 61WD18N4C…WD90N4C		Degree 3 conforming to IEC/EN 61800-5-1
Environmental conditions	ATV 61H●●●M3, ATV 61H●●●M3X, ATV 61●●●●N4, ATV 61W●●●N4C		IEC 60721-3-3 classes 3C1 and 3S2
	ATV 61H●●●M3S337, ATV 61HD11M3X337…HD45M3X337, ATV 61HD55M3X…HD90M3X, ATV 61H075N4S337…HD75N4S337, ATV 61HD90N4…HC63N4, ATV 61W●●●N4A24		IEC 60721-3-3 class 3C2
Relative humidity			5…95% without condensation or dripping water conforming to IEC 60068-2-3
Ambient temperature around the unit	Operation	**°C**	For ATV 61H●●●●● drives: - 10…+ 50 without derating, depending on the rating. Up to + 60°C with derating (and with the VW3 A9 4●● control card fan kit, depending on the ratings). For ATV 61W●●●●● drives: - 10…+ 40 without derating. See derating curves on pages 2/303 to 2/309.
	Storage	**°C**	- 25…+ 70
Maximum operating altitude		**m**	1000 without derating 1000…3000 derating the current by 1% per additional 100 m. Limited to 2000 m for the “Corner Grounded” distribution network
Operating position Maximum permanent angle in relation to the normal vertical mounting position			

Drive characteristics

Output frequency range	ATV 61H●●●M3 ATV 61HD11M3X…HD37M3X ATV 61H075N4…HD37N4	**Hz**	0.5…1000
	ATV 61HD45M3X…HD90M3X ATV 61HD45N4…HC63N4 ATV 61W075N4…WD90N4 ATV 61W075N4C…WD90N4C	**Hz**	0.5…500
Configurable switching frequency	ATV 61H●●●M3, ATV 61HD11M3X…HD45M3X, ATV 61H075N4…HD75N4	**kHz**	Nominal switching frequency: 12 kHz without derating in continuous operation. Adjustable during operation from 1…16 kHz Above 12 kHz, see derating curves on pages 2/302 and 2/303.
	ATV 61HD55M3X	**kHz**	Nominal switching frequency: 2.5 kHz without derating in continuous operation. Adjustable during operation from 2.5…12 kHz Above 2.5 kHz, see derating curves on pages 2/304 and 2/305.
	ATV 61HD75M3X, HD90M3X	**kHz**	Nominal switching frequency: 2.5 kHz without derating in continuous operation. Adjustable during operation from 2.5…8 kHz Above 2.5 kHz, see derating curves on pages 2/304 and 2/305.
	ATV 61HD90N4	**kHz**	Nominal switching frequency: 4 kHz without derating in continuous operation. Adjustable during operation from 2…8 kHz Above 4 kHz, see derating curves on pages 2/304 and 2/305.
	ATV 61HC11N4…HC63N4	**kHz**	Nominal switching frequency: 2.5 kHz without derating in continuous operation. Adjustable during operation from 2…8 kHz Above 2.5 kHz, see derating curves on pages 2/304 to 2/307.
	ATV 61W075N4…WD15N4 ATV 61W075N4C…WD15N4C		Nominal switching frequency: 8 kHz without derating in continuous operation. Adjustable during operation from 2…16 kHz Above 8 kHz, see derating curves on pages 2/308 and 2/309.
	ATV 61WD18N4…WD90N4 ATV 61WD18N4C…WD90N4C		Nominal switching frequency: 4 kHz without derating in continuous operation. Adjustable during operation from 2…16 kHz Above 4 kHz, see derating curves on pages 2/308 and 2/309.
Speed range			1…100 in open loop mode, without speed feedback
Speed accuracy	For a torque variation of 0.2 Tn to Tn		± 10% of nominal slip, without speed feedback
Torque accuracy			± 15% in open loop mode, without speed feedback
Transient overtorque			130% of the nominal motor torque (typical value at ± 10%) for 60 s
Braking torque			30% of the nominal motor torque without braking resistor (typical value) Up to 130 % with braking resistor installed as an option, see page 2/219
Maximum transient current	ATV 61H●●●M3 ATV 61H●●●M3X ATV 61H●●●N4		120% of the nominal drive current for 60 s (typical value)
	ATV 61W●●●N4 ATV 61W●●●N4C		110% of the nominal drive current for 60 s (typical value)
Motor control profile	Asynchronous motor		Sensorless Flux Vector Control (FVC) (voltage vector) Voltage/frequency ratio (2 or 5 points) Energy saving ratio
	Synchronous motor		Vector control without speed feedback
Frequency loop			PI regulator with adjustable structure for a speed response adapted to the machine (accuracy, speed)
Slip compensation			Automatic whatever the load. Can be suppressed or adjusted Not available in voltage/frequency ratio

2

2.4

Presentation: pages 2/158 to 2/161
References: pages 2/172 to 2/175
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Electrical power characteristics

Power	Voltage	**V**	200 - 15%...240 + 10% single phase for ATV 61H075M3...HU75M3 200 - 15%...240 + 10% 3-phase for ATV 61H●●●M3 and ATV 61H●●●M3X 380 - 15%...480 + 10% 3-phase for ATV 61●●●●N4 and ATV 61W●●●N4C
	Frequency	**Hz**	50 - 5%...60 + 5%
Signalling			1 red LED: LED lit indicates the presence of drive voltage
Output voltage			Maximum 3-phase voltage equal to line supply voltage
Drive noise level			Conforming to directive 86-188/EEC
	ATV 61H075M3, HU15M3 ATV 61H075N4…HU22N4 ATV 61W075N4…WU30N4 ATV 61W075N4C…WU30N4C	**dBA**	43
	ATV 61HU22M3…HU40M3 ATV 61HU30N4, HU40N4 ATV 61WU40N4, WU55N4 ATV 61WU40N4C, WU55N4C	**dBA**	54.5
	ATV 61HU55M3 ATV 61HU55N4, HU75N4 ATV 61WU75N4, WD11N4 ATV 61WU75N4C, WD11N4C	**dBA**	55.6
	ATV 61HU75M3 ATV 61HD11N4 ATV 61WD15N4 ATV 61WD15N4C	**dBA**	57.4
	ATV 61HD11M3X, HD15M3X ATV 61HD15N4, HD18N4 ATV 61WD18N4, WD22N4 ATV 61WD18N4C, WD22N4C	**dBA**	60.2
	ATV 61HD18M3X, HD22M3X ATV 61HD22N4 ATV 61WD30N4 ATV 61WD30N4C	**dBA**	59.9
	ATV 61HD30M3X…HD45M3X, ATV 61HD30N4, HD37N4 ATV 61WD37N4, WD45N4 ATV 61WD37N4C, WD45N4C	**dBA**	64
	ATV 61HD45N4…HD75N4 ATV 61WD55N4…WD90N4 ATV 61WD55N4C…WD90N4C	**dBA**	63.7
	ATV 61HD55M3X, HD75M3X ATV 61HD90N4, HC11N4	**dBA**	60.5
	ATV 61HD90M3X ATV 61HC13N4	**dBA**	69.5
	ATV 61HC16N4, HC22N4	**dBA**	66
	ATV 61HC25N4, HC31N4	**dBA**	68
	ATV 61HC40N4, HC50N4	**dBA**	70
	ATV 61HC63N4	**dBA**	71
Electrical isolation			Between power and control (inputs, outputs, power supplies)

2

2.4

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Connection cable characteristics

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
	Mounting in an enclosure with an IP 21 or IP 31 kit		3-strand IEC cable, ambient temperature 40°C, copper 70°C PVC
	Mounting in an enclosure with a UL Type 1 kit		3-strand UL 508 cable except for choke (2-strand UL 508 cable), ambient temperature 40°C, copper 75°C PVC

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

Drive terminals		**L1/R, L2/S, L3/T, U/T1, V/T2, W/T3**	**PC/-, PO, PA/+**	**PA, PB**
Maximum wire size and tightening torque	ATV 61H075M3…HU40M3 ATV 61H075N4…HU40N4	4 mm², AWG 10 1.4 Nm, 12.3 lb.in		
	ATV 61HU55M3 ATV 61HU55N4, HU75N4	6 mm², AWG 8 3 Nm, 26.5 lb.in		
	ATV 61HU75M3 ATV 61HD11N4	16 mm², AWG 4 3 Nm, 26.5 lb.in		
	ATV 61HD11M3X, HD15M3X ATV 61HD15N4, HD18N4	35 mm², AWG 2 5.4 Nm, 47.7 lb.in		
	ATV 61HD18M3X, HD22M3X ATV 61HD22N4…HD37N4	50 mm², AWG 1/0 12 Nm, 102.2 lb.in		
	ATV 61HD30M3X…HD45M3X ATV 61HD45N4…HD75N4	150 mm², 300 MCM 41 Nm, 360 lb.in		
	ATV 61HD55M3X, HD75M3X	2 x 100 mm², 2 x 250 MCM M10, 24 Nm, 212 lb.in	2 x 100 mm², 2 x 250 MCM M12, 41 Nm, 360 lb.in	60 mm², 250 MCM M8, 12 Nm, 106 lb.in
	ATV 61HD90M3X	2 x 100 mm², 2 x 250 MCM M10, 24 Nm, 212 lb.in	2 x 150 mm², 2 x 250 MCM M12, 41 Nm, 360 lb.in	60 mm², 250 MCM M8, 12 Nm, 106 lb.in
	ATV 61HD90N4, HC11N4	2 x 100 mm², 2 x 250 MCM M10, 24 Nm, 212 lb.in	2 x 100 mm², 2 x 250 MCM M12, 41 Nm, 360 lb.in	60 mm², 250 MCM M8, 12 Nm, 106 lb.in
	ATV 61HC13N4	2 x 100 mm², 2 x 250 MCM M10, 24 Nm, 212 lb.in	2 x 150 mm², 2 x 250 MCM M12, 41 Nm, 360 lb.in	60 mm², 250 MCM M8, 12 Nm, 106 lb.in
	ATV 61HC16N4	2 x 120 mm², 2 x 250 MCM M10, 24 Nm, 212 lb.in	2 x 120 mm², 2 x 250 MCM M10, 24 Nm, 212 lb.in	120 mm², 250 MCM M10, 24 Nm, 212 lb.in
	ATV 61HC22N4	2 x 150 mm², 2 x 350 MCM M12, 41 Nm, 360 lb.in	2 x 150 mm², 2 x 350 MCM M12, 41 Nm, 360 lb.in	120 mm², 250 MCM M10, 24 Nm, 212 lb.in
	ATV 61HC25N4, HC31N4	4 x 185 mm², 3 x 350 MCM M12, 41 Nm, 360 lb.in	4 x 185 mm², 3 x 350 MCM M12, 41 Nm, 360 lb.in	–
	ATV 61HC40N4	4 x 185 mm², 4 x 500 MCM M12, 41 Nm, 360 lb.in	8 x 185 mm², 4 x 500 MCM M12, 41 Nm, 360 lb.in	–
	ATV 61HC50N4	**R/L1.1, S/L2.1, T/L3.1, R/L1.2, S/L2.2, T/L3.2** 2 x 2 x 185 mm², 4 x 500 MCM M12, 41 Nm, 360 lb.in **U/T1, V/T2, W/T3** 4 x 185 mm², 4 x 500 MCM M12, 41 Nm, 360 lb.in	8 x 185 mm², 4 x 500 MCM M12, 41 Nm, 360 lb.in	–
	ATV 61HC63N4	**R/L1.1, S/L2.1, T/L3.1, R/L1.2, S/L2.2, T/L3.2** 2 x 4 x 185 mm², 5 x 500 MCM M12, 41 Nm, 360 lb.in **U/T1, V/T2, W/T3** 6 x 185 mm², 5 x 500 MCM M12, 41 Nm, 360 lb.in	8 x 185 mm², 5 x 500 MCM M12, 41 Nm, 360 lb.in	–
	ATV 61W075N4…WU55N4 ATV 61W075N4C…WU55N4C	4 mm², AWG 8 1.4 Nm, 12.3 lb.in		
	ATV 61WU75N4, WD11N4 ATV 61WU75N4C, WD11N4C	6 mm², AWG 6 3 Nm, 26.5 lb.in		
	ATV 61WD15N4 ATV 61WD15N4C	16 mm², AWG 4 3 Nm, 26.5 lb.in		
	ATV 61WD18N4, WD22N4 ATV 61WD18N4C, WD22N4C	35 mm², AWG 2 5.4 Nm, 47.7 lb.in		
	ATV 61WD30N4 ATV 61WD30N4C	50 mm², AWG 1/0 24 Nm, 212 lb.in		
	ATV 61WD37N4, WD45N4 ATV 61WD37N4C, WD45N4C	50 mm², AWG 1/0 24 Nm, 212 lb.in		
	ATV 61WD55N4 ATV 61WD55N4C	150 mm², 300 kcmil 41 Nm, 360 lb.in		
	ATV 61WD75N4 ATV 61WD75N4C	150 mm², 300 kcmil 41 Nm, 360 lb.in		
	ATV 61WD90N4 ATV 61WD90N4C	150 mm², 300 kcmil 41 Nm, 360 lb.in		

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Electrical control characteristics

Internal supplies available			Short-circuit and overload protection: ■ 1 x 10.5 V ⎓ ± 5% supply for the reference potentiometer (1 to 10 kΩ), maximum current 10 mA ■ 1 x 24 V ⎓ supply (min. 21 V, max. 27 V), maximum current 200 mA.
External + 24 V power supply *(1)* (not supplied)			24 V ⎓ (min. 19 V, max. 30 V) Power 30 W
Analog inputs	AI1-/AI1+		1 bipolar differential analog input ± 10 V ⎓ (maximum safe voltage 24 V) Max. sampling time: 2 ms ± 0.5 ms Resolution: 11 bits +1 sign bit Accuracy: ± 0.6% for a temperature variation of 60°C Linearity: ± 0.15% of the maximum value
	AI2		1 software-configurable current or voltage analog input: ■ voltage analog input 0...10 V ⎓, impedance 30 kΩ (max. safe voltage 24 V) ■ current analog input X-Y mA by programming X and Y from 0 to 20 mA, with impedance 242 Ω Max. sampling time: 2 ms ± 0.5 ms Resolution: 11 bits Accuracy: ± 0.6% for a temperature variation of 60°C Linearity: ± 0.15% of the maximum value
	Other inputs		See option cards
Configurable voltage and current analog outputs	AO1		1 analog output configurable for voltage or current: ■ voltage analog output 0...10 V ⎓, minimum load impedance 470 Ω ■ current analog output X-Y mA by programming X and Y from 0 to 20 mA, maximum load impedance 500 Ω Max. sampling time: 2 ms ± 0.5 ms Resolution: 10 bits Accuracy: ± 1% for a temperature variation of 60°C Linearity: ± 0.2%
	Other outputs		See option cards
Configurable relay outputs	R1A, R1B, R1C		1 relay logic output, one “N/C” contact and one “N/O” contact with common point Minimum switching capacity: 3 mA for 24 V ⎓ Maximum switching capacity: ■ on resistive load (cos φ = 1): 5 A for 250 V ∿ or 30 V ⎓ ■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 V ∿ or 30 V ⎓ Max. response time: 7 ms ± 0.5 ms Electrical service life: 100,000 operations
	R2A, R2B		1 relay logic output, one “N/O” contact Minimum switching capacity: 3 mA for 24 V ⎓ Maximum switching capacity: ■ on resistive load (cos φ = 1): 5 A for 250 V ∿ or 30 V ⎓ ■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 V ∿ or 30 V ⎓ Max. response time: 7 ms ± 0.5 ms Electrical service life: 100,000 operations
	Other outputs		See option cards
Logic inputs LI	LI1...LI5		5 programmable logic inputs, 24 V ⎓ , compatible with level 1 PLC, IEC 65A-68 standard Impedance: 3.5 kΩ Maximum voltage: 30 V Max. sampling time: 2 ms ± 0.5 ms Multiple assignment makes it possible to configure several functions on one input (example: LI1 assigned to forward and preset speed 2, LI3 assigned to reverse and preset speed 3)
	LI6		1 logic input, configurable by a switch as a logic input or as an input for PTC probes Logic input, characteristics identical to inputs LI1...LI5 Input for a maximum of 6 PTC probes mounted in series: ■ nominal value < 1.5 kΩ ■ trip resistance 3 kΩ, reset value 1.8 kΩ ■ short-circuit protection < 50 Ω
	Positive logic (Source)		State 0 if ⩽ 5 V or logic input not wired, state 1 if ⩾ 11 V
	Negative logic (Sink)		State 0 if ⩾ 16 V or logic input not wired, state 1 if ⩽ 10 V
	Other inputs		See option cards
Safety input	PWR		1 input for the Power Removal safety function: ■ Power supply: 24 V ⎓ (max. 30 V) ■ Impedance: 1.5 kΩ ■ State 0 if < 2 V, state 1 if > 17 V
Maximum I/O wire size and tightening torque			2.5 mm² (AWG 14) 0.6 Nm

(1) Please consult our specialist catalogue “Power supplies, splitter blocks and interfaces”.

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Electrical control characteristics (continued)

Acceleration and deceleration ramps			Ramp profiles: ■ linear, can be adjusted separately from 0.01 to 9000 s ■ S, U or customized Automatic adaptation of deceleration ramp time if braking capacities exceeded, possible inhibition of this adaptation (use of braking resistor).
Braking to a standstill			By DC injection: ■ by a command on a programmable logic input ■ automatically as soon as the estimated output frequency drops to < 0.1 Hz, period adjustable from 0 to 60 s or continuous, current adjustable from 0 to 1.2 In (in open loop mode only).
Main drive protection and safety features			Thermal protection: ■ against overheating ■ of the power stage Protection against: ■ short-circuits between motor phases ■ input phase breaks ■ overcurrents between output phases and earth ■ overvoltages on the DC bus ■ a break on the control circuit ■ exceeding the limit speed Safety function for: ■ line supply overvoltage and undervoltage ■ input phase loss, in 3-phase
Motor protection (see page 2/336)			Thermal protection integrated in drive via continuous calculation of I^2t taking speed into account: ■ The motor thermal state is saved when the drive is powered down. ■ Function can be modified via operator dialogue terminals, depending on the type of motor (force-cooled or self-cooled). Protection against motor phase breaks Protection with PTC probes
Dielectric strength	ATV 61H●●●M3 ATV 61H●●●M3X		Between earth and power terminals: 2830 V ⎓ Between control and power terminals: 4230 V ⎓
	ATV 61●●●●N4 ATV 61W●●●N4C		Between earth and power terminals: 3535 V ⎓ Between control and power terminals: 5092 V ⎓
Insulation resistance to earth			> 1 MΩ (electrical isolation) 500 V ⎓ for 1 minute
Frequency resolution	Display units	**Hz**	0.1
	Analog inputs	**Hz**	0.024/50 Hz (11 bits)

Operational safety characteristics

Protection	Of the machine		Power Removal (PWR) safety function which forces stopping and/or prevents the motor from restarting unintentionally, 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 the motor from restarting unintentionally, conforming to IEC/EN 61508 level SIL2 and draft standard IEC/EN 61800-5-2.
Response time		**ms**	⩽ 100 in STO (Safe Torque Off)

Communication port characteristics

Modbus protocol

Type of connection		Modbus RJ45 terminal port	Modbus RJ45 network port
Structure	Physical interface	2-wire RS 485	
	Transmission mode	RTU	
	Transmission speed	Configurable via the display terminal or the PowerSuite software workshop: 9600 bps or 19200 bps	Configurable via the display terminal or the PowerSuite software workshop: 4800 bps, 9600 bps, 19200 bps or 38.4 Kbps
	Format	Fixed = 8 bits, even parity, 1 stop	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 should be provided by the wiring system (for example, in the master)	
	Address	1 to 247, configurable via the terminal or the PowerSuite software workshop. 3 addresses can be configured in order to access the data of the drive, the “Controller Inside” programmable card, the multi-pump card and the communication card respectively. These 3 addresses are identical for the terminal and network ports.	
Services	Functional profiles	CiA DSP 402: “Device Profile Drives and Motion Control”. I/O profile	
	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	Can be inhibited. “Time out”, which can be set between 0.1 s and 30 s	
Diagnostics	Via LED on ATV 61H●●●M3Z, ATV 61HD11M3XZ…HD45M3Z, ATV 61H075N4Z…HD75N4Z	An activity LED on integrated 7-segment display terminal. One LED for each port.	
	With graphic display terminal	One activity LED Control word received Reference received For each port: ■ Number of frames received ■ Number of incorrect frames.	

CANopen protocol

Structure	Connector	9-way male SUB-D connector on CANopen adapter. This connects to the RJ45 Modbus network port.
	Network management	Slave
	Transmission speed	20 kbps, 50 kbps, 125 kbps, 250 kbps, 500 kbps or 1 Mbps
	Address (Node ID)	1 to 127, configurable via the terminal or the PowerSuite software workshop.
Services	Number of PDOs	3 receive and 3 transmit (PDO1, PDO2 and PDO3)
	PDO modes	Event-triggered, Time-triggered, Remotely-requested, Sync (cyclic), Sync (acyclic)
	PDO linking	Yes
	PDO mapping	Configurable (PDO1 and PDO2)
	Number of SDOs	1 server
	Emergency	Yes
	CANopen application layer	CiA DS 301, V 4.02
	Functional profiles	CiA DSP 402: “Device Profile Drives and Motion Control”. I/O profile
	Communication monitoring	Node Guarding, Heartbeat
Diagnostics	Via LED on ATV 61H●●●M3Z, ATV 61HD11M3XZ…HD45M3XZ, ATV 61H075N4Z…HD75N4Z	2 LEDs: “RUN” and “ERROR” on integrated 7-segment display terminal
	With graphic display terminal and PowerSuite software workshop	2 LEDs: “RUN” and “ERROR” Control word received Reference received Display of received PDOs Display of transmitted PDOs State of NMT chart Received PDOs counter Transmitted PDOs counter Reception error counter Transmission error counter
Description file		A single eds file is supplied for the whole range on the CD-ROM containing the documentation or on the website: www.telemecanique.com. It contains the description of the drive parameters.

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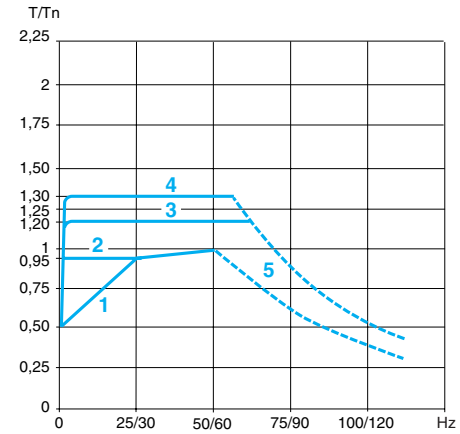
Variable speed drives for asynchronous motors
Altivar 61



Open loop applications

Torque characteristics (typical curves)

The curves opposite define the available continuous torque and transient overtorque for both force-cooled and self-cooled motors. The only difference is in the ability of the motor to provide a high continuous torque at less than half the nominal speed.

Open loop applications

1 Self-cooled motor: continuous useful torque *(1)*
2 Force-cooled motor: continuous useful torque
3 Overtorque for 60 seconds maximum for ATV 61W●●●●●
(UL Type 12/IP 54 drives)
4 Overtorque for 60 seconds maximum for ATV 61H●●●●●
(UL Type 1/IP 20 drives)
5 Torque in overspeed at constant power *(2)*

Motor thermal protection

Altivar 61 drives feature thermal protection designed specifically for self-cooled or force-cooled variable speed motors. The drive calculates the motor thermal state even when it is switched off.

This motor thermal protection is designed for a maximum ambient temperature of 40°C around the motor. If the temperature around the motor exceeds 40°C, thermal protection should be provided directly by thermistor probe (PTC) integrated in the motor. The probes are managed directly by the drive.

(1) For power ratings ⩽ 250 W, motor derating is 20% instead of 50% at very low frequencies.
(2) The motor nominal frequency and the maximum output frequency can be adjusted from 10 to 500 Hz or 1000 Hz, depending on the rating.
Check the mechanical overspeed characteristics of the selected motor with the manufacturer.

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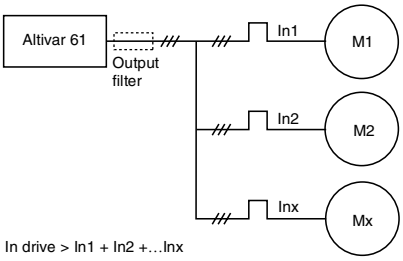
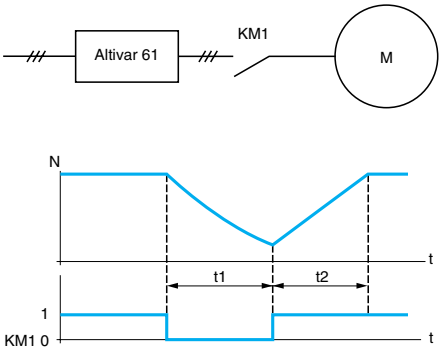
Variable speed drives for asynchronous motors
Altivar 61



In drive > In1 + In2 +...Inx

Connecting motors in parallel



KM1: Output contactor
t1: deceleration without ramp (freewheel)
t2: acceleration with ramp
N: Motor speed

Example of loss of output contactor

Special uses

Using Altivar 61 drives with synchronous motors

Altivar 61 drives are also suitable for powering synchronous motors (sinusoidal electromotive force) in open loop mode and are used to achieve performance levels comparable to those associated with an asynchronous motor in sensorless flux vector control.
This drive/motor combination makes it possible to obtain remarkable speed accuracy and maximum torque even at zero speed. The design and construction of synchronous motors are such that they offer enhanced power density and high-speed performance in a compact unit. Drive control for synchronous motors does not cause stalling.

Connecting motors in parallel

The nominal current of the drive must be greater than or equal to the sum of the currents of the motors to be controlled.
In this case, provide external thermal protection for each motor using probe or thermal overload relays. For cable runs over a certain length, taking account of all the tap links, it is advisable either to install an output filter between the drive and the motors or to use the overvoltage limitation function.

If several motors are used in parallel, there are 2 possible scenarios:
■ The motors have equal power ratings, in which case the torque characteristics will remain optimized after the drive has been configured
■ The motors have different power ratings, in which case the torque characteristics will not be optimized for all the motors.

Switching the motor at the drive output

The drive can be switched when locked or unlocked. If the drive is switched on-the-fly (drive unlocked), the motor is controlled and accelerates until it reaches the reference speed smoothly following the acceleration ramp. This use requires configuration of the automatic catching a spinning load ("catch on the fly") and the motor phase loss on output cut functions.

Typical applications: loss of safety circuit at drive output, bypass function, switching of motors connected in parallel.
On new installations, it is recommended that the Power Removal safety function is used.

Test on a low power motor or without a motor

In a testing or maintenance environment the drive can be checked without having to switch to a motor with the same rating as the drive (particularly useful in the case of high power drives). This use requires deactivation of motor phase loss function.

Variable speed drives for asynchronous motors

Altivar 61

Supply voltage 200…240V 50/60 Hz

DF534520

ATV 61H075M3

DF534521

ATV 61HU22M3Z

DF534522

ATV 61HD37M3X

UL Type 1/IP 20 drives

Motor		Line supply				Altivar 61			
Power indicated on plate *(1)*		Line current *(2)*		Apparent power	Maximum prospective line Isc	Max. continuous current *(1)*	Max. transient current for 60 s	Reference *(3)*	Weight
		200 V	240 V	240 V		230 V			
kW	*HP*	A	A	kVA	kA	A	A		kg
Single phase supply voltage: 200…240 V 50/60 Hz									
0.37	*0.5*	6.9	5.8	1.4	5	3	3.6	**ATV 61H075M3** *(4)*	3.000
0.75	*1*	12	9.9	2.4	5	4.8	5.7	**ATV 61HU15M3** *(4)*	3.000
1.5	*2*	18.2	15.7	3.7	5	8	9.6	**ATV 61HU22M3** *(4)*	3.000
2.2	*3*	25.9	22.1	5.3	5	11	13.2	**ATV 61HU30M3** *(4)*	4.000
3	–	25.9	22	5.3	5	11	13.2	**ATV 61HU40M3** *(4) (5)*	4.000
4	*5*	34.9	29.9	7	5	13.7	16.4	**ATV 61HU55M3** *(4) (5)*	4.000
5.5	*7.5*	47.3	40.1	9.5	22	27.5	33	**ATV 61HU75M3** *(4) (5)*	5.500
Three phase supply voltage: 200…240 V 50/60 Hz									
0.75	*1*	6.1	5.3	2.2	5	4.8	5.7	**ATV 61H075M3** *(4)*	3.000
1.5	*2*	11.3	9.6	4	5	8	9.6	**ATV 61HU15M3** *(4)*	3.000
2.2	*3*	15	12.8	5.3	5	11	13.2	**ATV 61HU22M3** *(4)*	4.000
3	–	19.3	16.4	6.8	5	13.7	16.4	**ATV 61HU30M3** *(4)*	4.000
4	*5*	25.8	22.9	9.5	5	17.5	21	**ATV 61HU40M3** *(4)*	4.000
5.5	*7.5*	35	30.8	12.8	22	27.5	33	**ATV 61HU55M3** *(4)*	5.500
7.5	*10*	45	39.4	16.4	22	33	39.6	**ATV 61HU75M3** *(4)*	7.000
11	*15*	53.3	45.8	19	22	54	64.8	**ATV 61HD11M3X** *(4) (6)*	16.000
15	*20*	71.7	61.6	25.6	22	66	79.2	**ATV 61HD15M3X** *(4) (6)*	16.000
18.5	*25*	77	69	28.7	22	75	90	**ATV 61HD18M3X** *(4) (6)*	30.000
22	*30*	88	80	33.3	22	88	105.6	**ATV 61HD22M3X** *(4) (6)*	30.000
30	*40*	124	110	45.7	22	120	144	**ATV 61HD30M3X** *(4) (6)*	37.000
37	*50*	141	127	52.8	22	144	172.8	**ATV 61HD37M3X** *(4) (6)*	37.000
45	*60*	167	147	61.1	22	176	211.2	**ATV 61HD45M3X** *(4) (6)*	37.000
55	*75*	200	173	71.9	35	221	265.2	**ATV 61HD55M3X** *(6) (7) (8)*	59.000
75	*100*	271	232	96.4	35	285	342	**ATV 61HD75M3X** *(6) (7) (8)*	72.000
90	*125*	336	288	119.7	35	359	431	**ATV 61HD90M3X** *(6) (7) (8)*	72.000

(1) These values are for a nominal switching frequency of 12 kHz up to ATV 61HD45M3X or of 2.5 kHz for ATV 61HD55M3X…HD90M3X drives for use in continuous operation.
The switching frequency is adjustable from 1…16 kHz up to ATV 61HD45M3X, from 2.5…12 kHz for ATV 61HD55M3X and from 2.5…8 kHz for ATV 61HD75M3X, HD90M3X drives.
Above 2.5 or 12 kHz, depending on the rating, the drive reduces the switching frequency itself in the event of an excessive temperature rise. For continuous operation above the nominal switching frequency, derate the nominal drive current, see derating curves on pages 2/302 to 2/305.

(2) Typical value for the indicated motor power and for the maximum prospective line Isc.

(3) The ATV 61HD55M3X…HD90M3X drives come in a reinforced version as standard, enabling them to operate in particular environmental conditions (see the enviromental conditions on page 2/163).
To order the reinforced version of the ATV 61H●●●M3 and ATV 61HD11M3X...HD45M3X drives, add at the end of the reference:
*- **S337** for ATV 61H●●●M3. Example: ATV 61H075M3 becomes **ATV 61H075M3S337**.*
*- **337** for ATV 61H●●●M3X. Example: ATV 61HD11M3X becomes **ATV 61HD11M3X337**.*
If a reinforced version of the drive is supplied, it must come with a remote graphic display terminal.

(4) All drives come with a remote graphic display terminal as standard.
*The ATV 61H●●●M3 and ATV 61HD11M3X...ATV 61HD45M3X drives can be ordered without a graphic display terminal. In this case, add a **Z** at the end of the reference. They will then come equipped with an integrated 7-segment display terminal.*
*Example: ATV 61H075M3 without a graphic display terminal becomes **ATV 61H075M3Z**.*

(5) A line choke must be used, see page 2/230.

(6) Drive supplied without EMC filter. EMC filters are available as an option, see page 2/238.

(7) Drive supplied as standard with a DC choke, which must be used when connecting the drive to the 3-phase supply.
For connections to the DC bus, the drive can be ordered without a DC choke by adding D at the end of the reference.
*Example: ATV 61HD55M3X becomes **ATV 61HD55M3XD.***

(8) Drive supplied without plate for EMC mounting. It is included in the UL Type 1 or IP 31 conformity kits, to be ordered separately, see pages 2/178 and 2/179.

***Note:** Consult the tables summarizing the possible combinations between drives, options and accessories, see pages 2/246 to 2/249.*

Variable speed drives for asynchronous motors

Altivar 61

Supply voltage 380…480V 50/60 Hz


DF534523

ATV 61HU22N4


DF534524

ATV 61HU40N4Z


DF534664

ATV 61HC31N4

UL Type 1/IP 20 drives

Motor		Line supply				Altivar 61				
Power indicated on plate *(1)*		Line current *(2)*		Apparent power	Maximum prospective line Isc	Max. continuous current *(1)*		Max. transient current for 60 s	Reference *(3)*	Weight
		380 V	480 V	380 V		380 V	460 V			
kW	*HP*	A	A	kVA	kA	A	A	A		kg
Three phase supply voltage: 380…480 V 50/60 Hz										
0.75	*1*	3.7	3	2.4	5	2.3	2.1	2.7	**ATV 61H075N4** *(4)*	3.000
1.5	*2*	5.8	5.3	3.8	5	4.1	3.4	4.9	**ATV 61HU15N4** *(4)*	3.000
2.2	*3*	8.2	7.1	5.4	5	5.8	4.8	6.9	**ATV 61HU22N4** *(4)*	3.000
3	–	10.7	9	7	5	7.8	6.2	9.3	**ATV 61HU30N4** *(4)*	4.000
4	*5*	14.1	11.5	9.3	5	10.5	7.6	12.6	**ATV 61HU40N4** *(4)*	4.000
5.5	*7.5*	20.3	17	13.4	22	14.3	11	17.1	**ATV 61HU55N4** *(4)*	5.500
7.5	*10*	27	22.2	17.8	22	17.6	14	21.1	**ATV 61HU75N4** *(4)*	5.500
11	*15*	36.6	30	24.1	22	27.7	21	33.2	**ATV 61HD11N4** *(4)*	7.000
15	*20*	48	39	31.6	22	33	27	39.6	**ATV 61HD15N4** *(4)*	16.000
18.5	*25*	45.5	37.5	29.9	22	41	34	49.2	**ATV 61HD18N4** *(4)*	16.000
22	*30*	50	42	32.9	22	48	40	57.6	**ATV 61HD22N4** *(4)*	30.000
30	*40*	66	56	43.4	22	66	52	79.2	**ATV 61HD30N4** *(4)*	37.000
37	*50*	84	69	55.3	22	79	65	94.8	**ATV 61HD37N4** *(4)*	37.000
45	*60*	104	85	68.5	22	94	77	112.8	**ATV 61HD45N4** *(4)*	44.000
55	*75*	120	101	79	22	116	96	139.2	**ATV 61HD55N4** *(4)*	44.000
75	*100*	167	137	109.9	22	160	124	192	**ATV 61HD75N4** *(4)*	44.000
90	*125*	166	143	109.3	35	179	179	214.8	**ATV 61HD90N4** *(5)* *(6)*	60.000
110	*150*	202	168	133	35	215	215	258	**ATV 61HC11N4** *(5)* *(6)*	68.000
132	*200*	239	224	157.3	35	259	259	310.8	**ATV 61HC13N4** *(5)* *(6)*	74.000
160	*250*	289	275	190.2	50	314	314	376.8	**ATV 61HC16N4** *(5)* *(6)*	80.000
200	*300*	357	331	235	50	427	427	512.4	**ATV 61HC22N4** *(5)* *(6)*	110.000
220	*350*	396	383	260.6	50					
250	*400*	444	435	292.2	50	481	481	577.2	**ATV 61HC25N4** *(5)* *(6)*	140.000
280	*450*	494	494	325.1	50	616	616	739.2	**ATV 61HC31N4** *(5)* *(6)*	140.000
315	*500*	555	544	365.3	50					
355	–	637	597	419.3	50	759	759	910.8	**ATV 61HC40N4** *(5)* *(6)*	215.000
400	*600*	709	644	466.6	50					
500	*700*	876	760	576.6	50	941	941	1129.2	**ATV 61HC50N4** *(5)* *(6)*	225.000
560	*800*	978	858	643.6	50	1188	1188	1425.6	**ATV 61HC63N4** *(5)* *(6)*	300.000
630	*900*	1091	964	718	50					

(1) These values are for a nominal switching frequency of 12 kHz up to ATV 61HD75N4, of 4 kHz for ATV 61HD90N4 or of 2.5 kHz for ATV 61HC11N4…HC63N4 drives for use in continuous operation.
The switching frequency is adjustable from 1…16 kHz up to ATV 61HD75N4 and from 2…8 kHz for ATV 61HD90N4…ATV 61HC63N4 drives.
Above 2.5, 4 or 12 kHz, depending on the rating, the drive reduces the switching frequency itself in the event of an excessive temperature rise. For continuous operation above the nominal switching frequency, derate the nominal drive current, see derating curves on pages 2/302 to 2/307.

(2) Typical value for the indicated motor power and for the maximum prospective line Isc.

(3) The ATV 61HD90N4…HC63N4 drives come in a reinforced versions as standard, enabling them to operate in particular environmental conditions(see the environmental conditions on page 2/163).
*To order the reinforced version of the ATV 61H075N4...HD75N4 drives, add **S337** at the end of the reference. Example: ATV 61H075N4 becomes **ATV 61H075N4S337**.*
If a reinforced version of the drive is supplied, it must come with a remote graphic display terminal.
The ATV 61HD90N4…HC63N4 drives come in the reinforced version as standard.

(4) All drives come with a remote graphic display terminal as standard.
*The ATV 61H075N4...ATV 61HD75N4 drives can be ordered without a graphic display terminal. In this case, add a **Z** at the end of the reference. They will then come equipped with an integrated 7-segment display terminal.*
*Example: ATV 61H075N4 without a graphic display terminal becomes **ATV 61H075N4Z**.*

(5) Drive supplied as standard with a DC choke, which must be used when connecting the drive to the 3-phase supply.
For connections to the DC bus, the drive can be ordered without a DC choke by adding D at the end of the reference.
*Example: ATV 61HD90N4 becomes **ATV 61HD90N4D.***

(6) Drive supplied without plate for EMC mounting. Depending on the rating, the plate is included in the UL Type 1 conformity kit and/or in the IP 31 conformity kit, to be ordered separately:
- for ATV 61HD90N4…ATV 61HC31N4 drives, order the UL Type 1 or IP 31 conformity kit, see pages 2/178 and 2/179,
- for ATV 61HC40N4…HC63N4 drives, order the IP 31 conformity kit, see page 2/179.

***Note:** Consult the tables summarizing the possible combinations between drives, options and accessories, see pages 2/246 to 2/249.*

Variable speed drives for asynchronous motors

Altivar 61

Supply voltage 380…480V 50/60 Hz

ATV 61W075N4

UL Type 12/IP 54 drives with an integrated class A EMC filter

Motor		Line supply				Altivar 61				
Power indicated on plate *(1)*		Line current *(2)*		Apparent power	Maximum prospective line Isc	Max. continuous current *(1)*		Max. transient current for 60 s	Reference *(3) (4) (5)*	Weight
		380 V	480 V	380 V		380 V	460 V			
kW	*HP*	A	A	kVA	kA	A	A	A		kg
Three phase supply voltage: 380…480 V 50/60 Hz										
0.75	*1*	1.8	1.5	1.2	5	2.3	2.1	2.5	**ATV 61W075N4**	13.000
1.5	*2*	3.5	3	2.3	5	4.1	3.4	4.5	**ATV 61WU15N4**	13.000
2.2	*3*	5	4.1	3.3	5	5.1	4.8	5.6	**ATV 61WU22N4**	13.000
3	–	6.7	5.6	4.4	5	7.2	6.2	7.9	**ATV 61WU30N4**	14.000
4	*5*	8.8	7.4	5.8	5	9.1	7.6	10	**ATV 61WU40N4**	16.000
5.5	*7.5*	11.4	9.2	7.5	22	12	11	13.2	**ATV 61WU55N4**	16.000
7.5	*10*	15.8	13.3	10.4	22	16	14	17.6	**ATV 61WU75N4**	22.000
11	*15*	21.9	17.8	14.4	22	22.5	21	24.7	**ATV 61WD11N4**	22.000
15	*20*	30.5	25.8	20	22	30.5	27	33.5	**ATV 61WD15N4**	28.000
18.5	*25*	37.5	32.3	24.7	22	37	34	40.7	**ATV 61WD18N4**	36.000
22	*30*	43.6	36.6	28.7	22	43.5	40	47.8	**ATV 61WD22N4**	36.000
30	*40*	56.7	46.2	37.3	22	58.5	52	64.3	**ATV 61WD30N4**	51.000
37	*50*	69.5	56.8	45.7	22	71.5	65	78.6	**ATV 61WD37N4**	64.000
45	*60*	85.1	69.6	56	22	85	77	93.5	**ATV 61WD45N4**	65.000
55	*75*	104.8	87	69	35	103	96	113.3	**ATV 61WD55N4**	92.000
75	*100*	140.3	113.8	92.3	35	137	124	150.7	**ATV 61WD75N4**	92.000
90	*125*	171.8	140.9	113	35	163	156	179.3	**ATV 61WD90N4**	92.000

(1) These values are given for the nominal frequency switching of 8 kHz up to ATV 61WD15N4, or of 4 kHz for ATV 61WD18N4…WD90N4 drives for use in continuous operation.
The switching frequency is adjustable from 2…16 kHz for all ratings.
Above 4 or 8 kHz, depending on the rating, the drive will reduce the switching frequency itself in the event of an excessive temperature rise. For continuous operation above the nominal switching frequency, derate the nominal drive current, see derating curves on pages 2/308 and 2/309.

(2) Typical value for the indicated motor power and for the maximum prospective line Isc.

*(3) ATV 61W●●●N4 drives can be can be ordered with a 24 V ⎓ power supply, thus allowing an additional consumption of 250 mA. In this case, add **A24** at the end of the reference.*
*For example: ATV 61W075N4 becomes **ATV 61W075N4A24.***
*These **ATV 61W●●●N4A24** drives also have the reinforced version treatment, enabling them to operate in particular environmental conditions (see environmental conditions on page 2/163).*

(4) Drives supplied with a European version EMC plate fitted, for IP 54 conformity.

*(5) To obtain UL Type 12 conformity, add **U** at the end of the reference.*
*Example: ATV 61W075N4 becomes **ATV 61W075N4U.***

***Note:** Consult the tables summarizing the possible combinations between drives, options and accessories, see pages 2/250 and 2/251.*

Variable speed drives for asynchronous motors

Altivar 61

Supply voltage 380…480V 50/60 Hz

DF534566

ATV 61WD30N4C

UL Type 12/IP 54 drives with an integrated class B EMC filter

Motor		Line supply				Altivar 61				
Power indicated on plate *(1)*		Line current *(2)*		Apparent power	Maximum prospective line Isc	Max. continuous current *(1)*		Max. transient current for 60 s	Reference *(3) (4)*	Weight
		380 V	480 V	380 V		380 V	460 V			
kW	*HP*	A	A	kVA	kA	A	A	A		kg
Three phase supply voltage: 380…480 V 50/60 Hz										
0.75	*1*	1.8	1.5	1.2	5	2.3	2.1	2.5	**ATV 61W075N4C**	19.000
1.5	*2*	3.5	3	2.3	5	4.1	3.4	4.5	**ATV 61WU15N4C**	19.000
2.2	*3*	5	4.1	3.3	5	5.1	4.8	5.6	**ATV 61WU22N4C**	20.000
3	–	6.7	5.6	4.4	5	7.2	6.2	7.9	**ATV 61WU30N4C**	20.000
4	*5*	8.8	7.4	5.8	5	9.1	7.6	10	**ATV 61WU40N4C**	23.000
5.5	*7.5*	11.4	9.2	7.5	22	12	11	13.2	**ATV 61WU55N4C**	23.000
7.5	*10*	15.8	13.3	10.4	22	16	14	17.6	**ATV 61WU75N4C**	32.000
11	*15*	21.9	17.8	14.4	22	22.5	21	24.7	**ATV 61WD11N4C**	32.000
15	*20*	30.5	25.8	20	22	30.5	27	33.5	**ATV 61WD15N4C**	40.000
18.5	*25*	37.5	32.3	24.7	22	37	34	40.7	**ATV 61WD18N4C**	51.000
22	*30*	43.6	36.6	28.7	22	43.5	40	47.8	**ATV 61WD22N4C**	50.000
30	*40*	56.7	46.2	37.3	22	58.5	52	64.3	**ATV 61WD30N4C**	68.000
37	*50*	69.5	56.8	45.7	22	71.5	65	78.6	**ATV 61WD37N4C**	85.000
45	*60*	85.1	69.6	56	22	85	77	93.5	**ATV 61WD45N4C**	85.000
55	*75*	104.8	87	69	35	103	96	113.3	**ATV 61WD55N4C**	119.000
75	*100*	140.3	113.8	92.3	35	137	124	150.7	**ATV 61WD75N4C**	119.000
90	*125*	171.8	140.9	113	35	163	156	179.3	**ATV 61WD90N4C**	119.000

(1) These values are given for the nominal frequency switching of 8 kHz up to ATV 61WD15N4C, or of 4 kHz for ATV 61WD18N4C…WD90N4C drives for use in continuous operation.
The switching frequency is adjustable from 2…16 kHz for all ratings.
Above 4 or 8 kHz, depending on the rating, the drive will reduce the switching frequency itself in the event of an excessive temperature rise. For continuous operation above the nominal switching frequency, derate the nominal drive current, see derating curves on pages 2/308 and 2/309.

(2) Typical value for the indicated motor power and for the maximum prospective line Isc.

(3) Drives supplied with a European version EMC plate fitted, for IP 54 conformity.

*(4) To obtain UL Type 12 conformity, add **U** at the end of the reference.*
*Example: ATV 61W075N4C becomes **ATV 61W075N4CU.***

***Note:** Consult the tables summarizing the possible combinations between drives, options and accessories, see pages 2/250 and 2/251.*

Variable speed drives for asynchronous motors
Altivar 61
Option: accessories

Adapter for 115 V ∿ logic inputs

This adapter is used to connect 115 V ∿ logic signals to the logic inputs on the drive or an I/O extension card.

7 logic inputs with capacitive impedance at 60 Hz of 0.22 µF are available for connecting the logic signals:
- Max. current: 200 mA
- Response time: 5 ms to change from state 0 to state 1, 20 ms to change from state 1 to state 0
- Logic state 0 for a voltage below 20 V, logic state 1 for a voltage between 70 V and 132 V

The power supply must be provided by a 115 V ∿ external power supply (min. 70 V, max. 132 V).

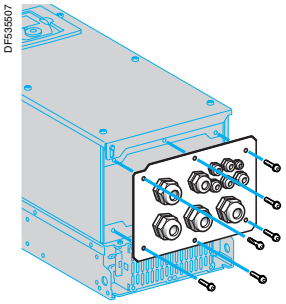
References

Description	Reference	Weight kg
Adapter for 115 V ∿ logic inputs	**VW3 A3 101**	–

Ready-assembled IP 54 base plate (for ATV 61W●●●N4 and ATV 61W●●●N4C)

This plate can be used to increase the number of cable connections supported by the drive as standard from 3 to 11.

It is supplied with:
- A metal cable gland for the motor cable
- A special plastic cable gland for the network cable
- Plastic cable glands for the connection of the control cable or options such as communication cards, etc.



Ready-assembled IP 54 base plate

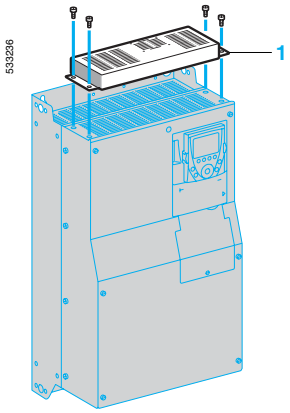
References

For drive	Type of cable gland			Reference	Weight kg
	Metal	Plastic	Plastic for network cable		
ATV 61W075N4 ...WU55N4 ATV 61W075N4C ...WU55N4C	1 (ISO 25)	1 (ISO 12), 4 (ISO 16) 3 (ISO 20), 1 (ISO 25)	1 (ISO 32)	**VW3 A9 901**	–
ATV 61WU75N4, WD11N4 ATV 61WU75N4C, WD11N4C	1 (ISO 25)	1 (ISO 12), 4 (ISO 16) 3 (ISO 20), 1 (ISO 25)	1 (ISO 32)	**VW3 A9 902**	–
ATV 61WD15N4 ATV 61WD15N4C	1 (ISO 32)	1 (ISO 12), 4 (ISO 16) 1 (ISO 20), 3 (ISO 32)	1 (ISO 32)	**VW3 A9 903**	–
ATV 61WD18N4, WD22N4 ATV 61WD18N4C, WD22N4C	1 (ISO 32)	1 (ISO 12), 4 (ISO 16) 1 (ISO 20), 3 (ISO 32)	1 (ISO 32)	**VW3 A9 904**	–
ATV 61WD30N4 ATV 61WD30N4C	1 (ISO 40)	1 (ISO 12), 4 (ISO 16) 1 (ISO 20), 3 (ISO 40)	1 (ISO 32)	**VW3 A9 905**	–
ATV 61WD37N4, WD45N4 ATV 61WD37N4C, WD45N4C	1 (ISO 40)	1 (ISO 12), 4 (ISO 16) 1 (ISO 20), 3 (ISO 50)	1 (ISO 32)	**VW3 A9 906**	–
ATV 61WD55N4, WD75N4	1 (ISO 50)	1 (ISO 12), 4 (ISO 16) 1 (ISO 20), 1 (ISO 50) 1 (ISO 63)	1 (ISO 32)	**VW3 A9 907**	–
ATV 61WD90N4	1 (ISO 50)	1 (ISO 12), 4 (ISO 16) 1 (ISO 20), 2 (ISO 63)	1 (ISO 32)	**VW3 A9 908**	–
ATV 61WD55N4C, WD75N4C	1 (ISO 50)	1 (ISO 12), 4 (ISO 16) 1 (ISO 20), 1 (ISO 50) 2 (ISO 63)	1 (ISO 32)	**VW3 A9 909**	–
ATV 61WD90N4C	1 (ISO 50)	1 (ISO 12), 4 (ISO 16) 1 (ISO 20), 3 (ISO 63)	1 (ISO 32)	**VW3 A9 910**	–

Variable speed drives for asynchronous motors

Altivar 61

Option: accessories



Control card fan kit

Control card fan kit

This kit is required for ATV 61HD18M3X…HD45M3X and ATV 61HD22N4…HD75N4 drives.
It enables the drive to operate at an ambient temperature of 50°C to 60°C, for example, if it is mounted in an IP 54 enclosure. The circulation of air around the electronic cards prevents the formation of hot spots.
Check the derating to be applied to the drive nominal current, see derating curves on pages 2/302 to 2/307.

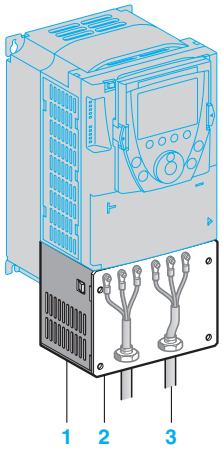
The kit 1 is mounted on the upper part of the drive. It is powered by the drive.
It consists of:
- A fan subassembly
- Fixing accessories
- A manual

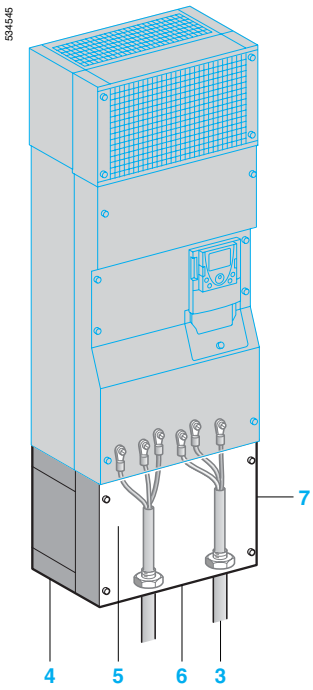
References

For drives	Reference	Weight kg
ATV 61HD18M3X, HD22M3X ATV 61HD22N4	**VW3 A9 404**	–
ATV 61HD30N4, HD37N4	**VW3 A9 405**	–
ATV 61HD30M3X…HD45M3X	**VW3 A9 406**	–
ATV 61HD45N4…HD75N4	**VW3 A9 407**	–

Dimensions:
page 2/257

Variable speed drives for asynchronous motors
Altivar 61
Option: accessories





UL Type 1 conformity kits

Kit for UL Type 1 conformity (mounting outside the enclosure)

When the drive is mounted directly on a wall outside the enclosure, this kit can be used to ensure UL Type 1 conformity when connecting the cables with a tube. The shielding is connected inside the kit.

For ATV 61H●●●M3, ATV 61HD11M3X…HD45M3X and ATV 61H075N4...HD75N4 drives, the kit consists of:
- All the mechanical parts 1 including a pre-cut plate 2 for connecting the tubes 3
- Fixing accessories
- A manual.

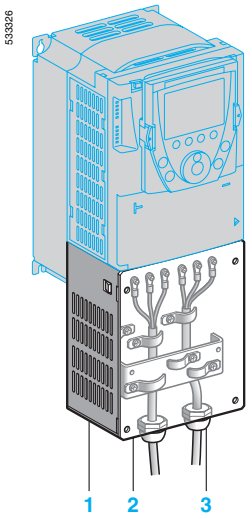
For ATV 61HD55M3X…HD90M3X and ATV 61HD90N4…HC31N4 drives, the kit consists of:
- An IP 54 casing 4 used to maintain the IP 54 degree of protection for the power part
- An EMC plate 5
- A UL Type 1 cover 7
- A pre-drilled plate 6 for connecting the tubes 3
- Fixing accessories
- A manual.

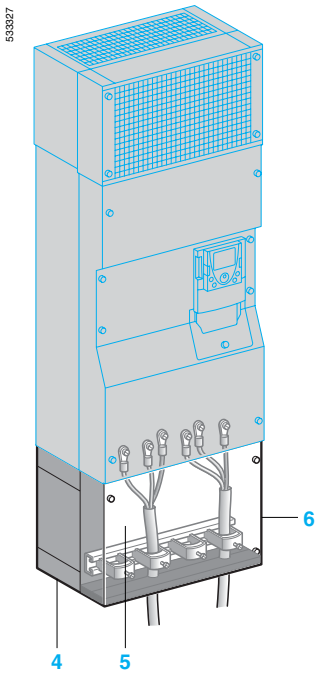
References

For drives		Reference	Weight kg
ATV 61H075M3…HU15M3 ATV 61H075N4…HU22N4		**VW3 A9 201**	1.300
ATV 61HU22M3…HU40M3 ATV 61HU30N4, HU40N4		**VW3 A9 202**	1.500
ATV 61HU55M3 ATV 61HU55N4, HU75N4		**VW3 A9 203**	1.800
ATV 61HU75M3 ATV 61HD11N4		**VW3 A9 204**	2.000
ATV 61HD11M3X, HD15M3X ATV 61HD15N4, HD18N4		**VW3 A9 205**	2.800
ATV 61HD18M3X, HD22M3X ATV 61HD22N4		**VW3 A9 206**	4.000
ATV 61HD30N4, HD37N4		**VW3 A9 207**	5.000
ATV 61HD30M3X…HD45M3X		**VW3 A9 217**	7.000
ATV 61HD45N4…HD75N4		**VW3 A9 208**	7.000
ATV 61HD55M3X, HD75M3X ATV 61HD90N4, HC11N4		**VW3 A9 209**	9.400
ATV 61HD90M3X ATV 61HC13N4		**VW3 A9 210**	11.800
ATV 61HC16N4		**VW3 A9 211**	11.600
ATV 61HC22N4		**VW3 A9 212**	14.600
ATV 61HC25N4, HC31N4	Without braking unit	**VW3 A9 213**	19.500
	With braking unit	**VW3 A9 214**	19.500

Dimensions:
pages 2/258 and 2/259

Variable speed drives for asynchronous motors
Altivar 61
Option: accessories





IP 21 or IP 31 conformity kits

Kits for IP 21 or IP 31 conformity (mounting outside the enclosure)

When the drive is mounted directly on a wall outside the enclosure, this kit can be used to ensure conformity with IP 21 or IP 31 degree of protection when connecting the cables with a cable gland.
The shielding is connected inside the kit.

For ATV 61H●●●M3, ATV 61HD11M3X…HD45M3X and ATV 61H075N4...HD75N4 drives, the kit conforms to IP 21 degree of protection.
It consists of:
- All the mechanical parts 1 including a drilled plate 2 for attaching the cable glands 3
- Fixing accessories
- A manual.

For ATV 61HD55M3X…HD90M3X and ATV 61HD90N4...HC63N4 drives, the kit conforms to IP 31 degree of protection.
It consists of:
- An IP 54 casing 4 used to maintain the IP 54 degree of protection for the power part
- An EMC plate with cable clips 5
- An IP 31 cover 6
- Fixing accessories
- A manual.

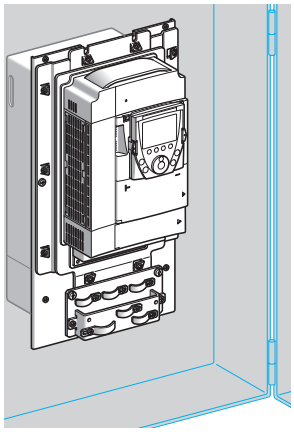
References

For drives		Degree of protection	Reference	Weight kg
ATV 61H075M3…HU15M3 ATV 61H075N4…HU22N4		IP 21	**VW3 A9 101**	1.300
ATV 61HU22M3…HU40M3 ATV 61HU30N4, HU40N4		IP 21	**VW3 A9 102**	1.500
ATV 61HU55M3 ATV 61HU55N4, HU75N4		IP 21	**VW3 A9 103**	1.800
ATV 61HU75M3 ATV 61HD11N4		IP 21	**VW3 A9 104**	2.000
ATV 61HD11M3X, HD15M3X ATV 61HD15N4, HD18N4		IP 21	**VW3 A9 105**	2.800
ATV 61HD18M3X, HD22M3X ATV 61HD22N4		IP 21	**VW3 A9 106**	4.000
ATV 61HD30N4, HD37N4		IP 21	**VW3 A9 107**	5.000
ATV 61HD30M3X…HD45M3X		IP 21	**VW3 A9 117**	7.000
ATV 61HD45N4…HD75N4		IP 21	**VW3 A9 108**	7.000
ATV 61HD55M3X, HD75M3X ATV 61HD90N4, HC11N4		IP 31	**VW3 A9 109**	9.400
ATV 61HD90M3X ATV 61HC13N4		IP 31	**VW3 A9 110**	11.800
ATV 61HC16N4		IP 31	**VW3 A9 111**	11.600
ATV 61HC22N4		IP 31	**VW3 A9 112**	14.600
ATV 61HC25N4, HC31N4	Without braking unit	IP 31	**VW3 A9 113**	19.500
	With braking unit	IP 31	**VW3 A9 114**	19.500
ATV 61HC40N4, HC50N4		IP 31	**VW3 A9 115**	25.000
ATV 61HC63N4		IP 31	**VW3 A9 116**	35.000

Dimensions:
pages 2/258 and 2/259

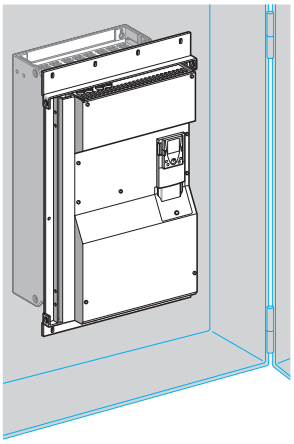
Variable speed drives for asynchronous motors
Altivar 61
Option: accessories

533254



ATV 61HU75N4 flush-mounted

533255



ATV 61HC31N4D flush-mounted

Kit for flush-mounting in a dust and damp-proof enclosure

This kit can be used to mount the power part of the drive outside the enclosure (IP 54 degree of protection), which reduces the power dissipated into the enclosure, see page 2/310.
It is available for ATV 61H●●●M3, ATV 61H●●●M3X, ATV 61HD55M3XD…HD90M3XD, ATV 61HD90N4…HC31N4 and ATV 61HD90N4D…HC31N4D drives.

With this type of mounting, the maximum internal temperature in the enclosure can then reach 60°C without it being necessary to derate the drive current.
Between 50°C and 60°C, a control card fan kit must be used for the ATV 61HD18M3X…HD45M3X and ATV 61HD22N4…HD75N4 drives to prevent hot spots, see page 2/177.

The back of the enclosure must be drilled and cut out for this type of mounting.

The kit consists of:
- A metal frame of the right size for the drive rating
- Corner pieces
- Seals
- A fan support. This can be used to move the fans so that they can be accessed from the front of the enclosure
- Fixing accessories
- A cutting and drilling template
- A manual.

References

For drives		Reference	Weight kg
ATV 61H075M3…HU15M3 ATV 61H075N4…HU22N4		**VW3 A9 501**	2.700
ATV 61HU22M3…HU40M3 ATV 61HU30N4, HU40N4		**VW3 A9 502**	3.100
ATV 61HU55M3 ATV 61HU55N4, HU75N4		**VW3 A9 503**	3.700
ATV 61HU75M3 ATV 61HD11N4		**VW3 A9 504**	4.600
ATV 61HD11M3X, HD15M3X ATV 61HD15N4, HD18N4		**VW3 A9 505**	4.900
ATV 61HD18M3X, HD22M3X ATV 61HD22N4		**VW3 A9 506**	3.900
ATV 61HD30N4, HD37N4		**VW3 A9 507**	4.200
ATV 61HD30M3X…HD45M3X		**VW3 A9 508**	4.900
ATV 61HD45N4…HD75N4		**VW3 A9 509**	5.200
ATV 61HD55M3X, HD75M3X ATV 61HD55M3XD, HD75M3XD ATV 61HD90N4, HC11N4, ATV 61HD90N4D, HC11N4D		**VW3 A9 510** *(1)*	5.100
ATV 61HD90M3X ATV 61HD90M3XD ATV 61HC13N4 ATV 61HC13N4D		**VW3 A9 511** *(1)*	3.600
ATV 61HC16N4 ATV 61HC16N4D		**VW3 A9 512** *(1)*	4.300
ATV 61HC22N4 ATV 61HC22N4D		**VW3 A9 513** *(1)*	4.700
ATV 61HC25N4, HC31N4 ATV 61HC25N4D, HC31N4D	Without braking unit	**VW3 A9 514** *(1)*	4.700
	With braking unit	**VW3 A9 515** *(1)*	4.700

(1) The procedure for cutting out and drilling the enclosure varies depending on whether the DC choke is present or not:
- Drives supplied with DC choke:
ATV 61HD55M3X…HD90M3X, ATV 61HD90N4…HC31N4,
- Drives supplied without DC choke:
ATV 61HD55M3XD…HD90M3XD, ATV 61HD90N4D…HC31N4D.
See pages 2/259 and 2/262.

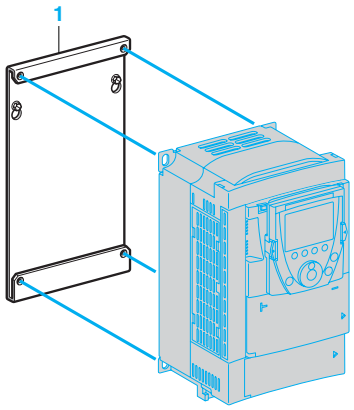
Dimensions:
pages 2/259 to 2/262

Variable speed drives for asynchronous motors

Altivar 61

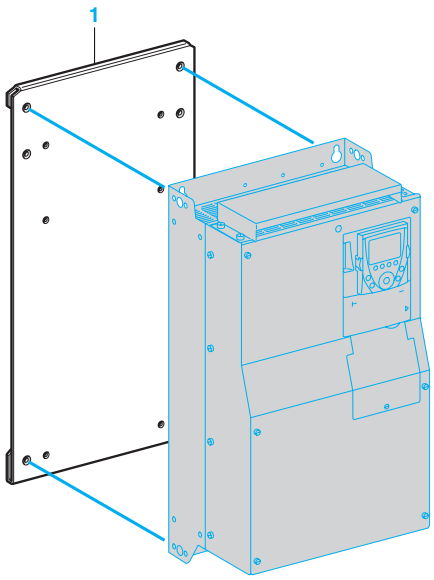
Option: accessories

533238



VW3 A9 304

533237



VW3 A9 312

Substitution kit for Altivar 38 drives

This kit 1 is used to install an Altivar 61 drive in place of an Altivar 38 drive using the same fixing holes. It includes the mechanical adapters required for mounting.

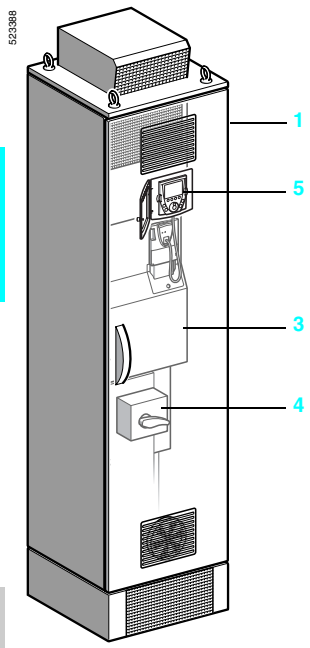
References

Old drive	Motor Power kW	Motor Power *HP*	Replaced by	Reference	Weight kg
Replacing an Altivar 38 drive with an integrated EMC filter Three phase supply voltage: 380…480 V 50/60 Hz					
ATV 38HU18N4	0.75	*1*	ATV 61H075N4	**VW3 A9 302**	–
ATV 38HU29N4	1.5	*2*	ATV 61HU15N4	**VW3 A9 302**	–
ATV 38HU41N4	2.2	*3*	ATV 61HU22N4	**VW3 A9 302**	–
ATV 38HU54N4	3	–	ATV 61HU30N4	**VW3 A9 304**	–
ATV 38HU72N4	4	*5*	ATV 61HU40N4	**VW3 A9 304**	–
ATV 38HU90N4	5.5	*7.5*	ATV 61HU55N4	**VW3 A9 305**	–
ATV 38HD12N4	7.5	*10*	ATV 61HU75N4	**VW3 A9 306**	–
ATV 38HD16N4	11	*15*	ATV 61HD11N4	**VW3 A9 307**	–
ATV 38HD23N4	15	*20*	ATV 61HD15N4	**VW3 A9 308**	–
ATV 38HD25N4	18.5	*25*	ATV 61HD18N4	**VW3 A9 309**	–
ATV 38HD28N4	22	*30*	ATV 61HD22N4	**VW3 A9 310**	–
ATV 38HD33N4	30	*40*	ATV 61HD30N4	**VW3 A9 310**	–
ATV 38HD46N4	37	*50*	ATV 61HD37N4	**VW3 A9 312**	–
ATV 38HD54N4	45	*60*	ATV 61HD45N4	**VW3 A9 312**	–
ATV 38HD64N4	55	*75*	ATV 61HD55N4	**VW3 A9 312**	–
ATV 38HD79N4	75	*100*	ATV 61HD75N4	**VW3 A9 312**	–

References (continued)

Old drive	Motor Power kW	Motor Power *HP*	Replaced by	Reference	Weight kg
Replacing an Altivar 38 drive without an integrated EMC filter Three phase supply voltage: 380…480 V 50/60 Hz					
ATV 38HD25N4X	18.5	*25*	ATV 61HD18N4	**VW3 A9 309**	–
ATV 38HD28N4X	22	*30*	ATV 61HD22N4	**VW3 A9 310**	–
ATV 38HD33N4X	30	*40*	ATV 61HD30N4	**VW3 A9 310**	–
ATV 38HD46N4X	37	*50*	ATV 61HD37N4	**VW3 A9 312**	–
ATV 38HD54N4X	45	*60*	ATV 61HD45N4	**VW3 A9 312**	–
ATV 38HD64N4X	55	*75*	ATV 61HD55N4	**VW3 A9 312**	–
ATV 38HD79N4X	75	*100*	ATV 61HD75N4	**VW3 A9 312**	–

Variable speed drives for asynchronous motors
Altivar 61 ready-assembled in IP 54 enclosure



ATV 61E5C11N4…E5C31N4, ATV 61E5C25N4F, E5C31N4F

Presentation

Altivar 61 variable speed drives rated from 110 kW to 630 kW can be supplied ready-assembled in an IP 54 enclosure to facilitate installation and, in particular, to ensure optimum ventilation.

This ATV 61E5C●●N4● offer comprises one or two IP 54 enclosures with a non-modifiable hardware configuration for a 380 ....480 V three phase supply only.

Description

The Altivar 61 ready-assembled in enclosure offer comprises:
- One ready-assembled enclosure 1 or two ready-assembled enclosures 2 and 7 depending on the rating
- A drive on heatsink ATV 61HC11N4…HC63N4 3
- A switch and fast-acting fuses 4
- An IP 65 remote graphic display terminal kit 5

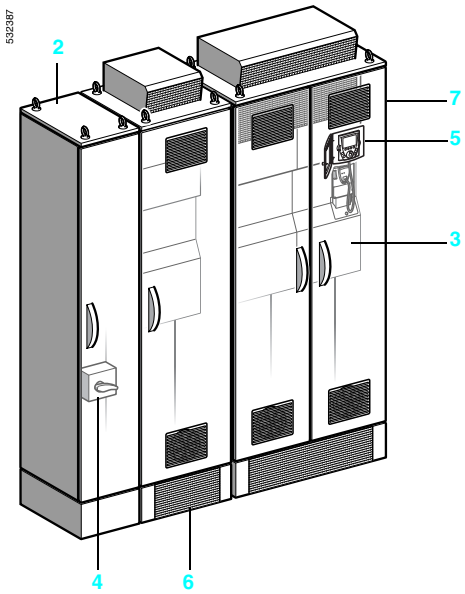
This equipment is supplied with operating instructions containing all the:
- Parts lists
- Electric diagrams
- Mechanical drawings

Options

All the following options available for the ATV 61HC●●N4 drives can be used at the same rating with the ATV 61E5C●●N4● enclosed drives offer (see the compatible combination tables for Altivar 61 UL Type 1/IP 20 drives, pages 2/248 and 2/249):
- Adaptor for 115 V ∿ logic inputs
- Option cards: Communication, multi-pump, programmable "Controller Inside" and I/O extension cards
- Braking resistors
- Line chokes and passive filters
- Additional EMC input filters
- Sinus filters and motor chokes
- PowerSuite software workshop

These options can be assembled according to customer requirements.

Note: *UL Type 1, IP 21 or IP 31 conformity kits are not necessary for this range.*



ATV 61E5C40N4…E5C63N4 + VW3 A7E 102

Note: *The order shown above is compulsory. The braking unit must be placed directly to the left of the drive.*

Resistance braking units

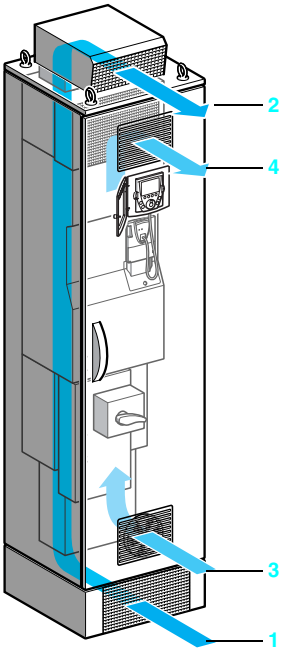
ATV 61E5C11N4…E5C22N4 ready-assembled enclosures include an integrated braking transistor in the drive.

ATV 61E5C25N4…E5C63N4 ready-assembled enclosures require a braking unit, which is controlled by the drive.
Assembly of the braking unit varies depending on the drive rating:
- For ATV 61E5C25N4F and ATV 61E5C31N4F enclosures, the braking unit is mounted directly in the enclosure, on the left-hand side of the drive.
- For ATV 61E5C40N4...E5C63N4 enclosures, the VW3 A7E 102 braking unit is supplied in a separate enclosure IP 54 6. This enclosure must be installed between enclosures 2 and 7:
  - Enclosure 7 contains the ATV 61HC40N4…HC63N4 drive 3.
  - Enclosure 2 contains the switch 4 and the fast acting fuses.

Characteristics: page 2/183
References: page 2/184
Dimensions: pages 2/185 to 2/187

Variable speed drives for asynchronous motors
Altivar 61 ready-assembled in IP 54 enclosure

Ventilation



Two separate air circuits ensure optimum enclosure ventilation by cooling the power section and the control section.

Power section:
1 Air intake is via an IP 54 grille on the front of the plinth.
2 Air is expelled via an IP 54 grille on the front of the enclosure roof.

Control section:
3 Air intake is via a fan with IP 54 filter on the lower part of the enclosure door.
4 Air is expelled via an IP 54 grille with filter on the upper part of the enclosure door.

Characteristics specific to the ATV 61E5C●●N4● offer *(1)*

Maximum external temperature of enclosure		+ 45 °C inside the enclosure, + 50 °C outside the enclosure
Line supply connection		Directly to the switch, cable entry required at base of enclosure
Motor connection		Directly to the drive, cable entry required at base of enclosure
Control terminal connection		Directly to the drive's control terminals
Colour of SAREL Spacial 6000 Cell Enclosures		RAL 7032

(1) For other characteristics, see page 2/162.

Presentation: page 2/182
References: page 2/184
Dimensions: pages 2/185 to 2/187

Variable speed drives for asynchronous motors

Altivar 61 ready-assembled in IP 54 enclosure

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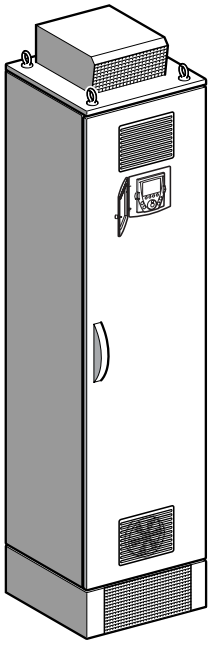
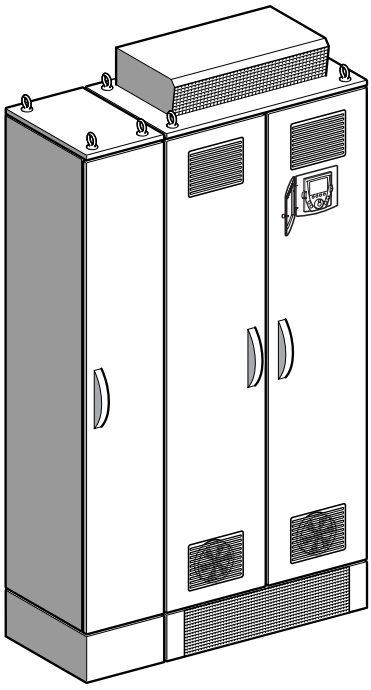


ATV 61E5C11N4...E5C31N4
ATV 61E5C25N4F, E5C31N4F

References

Description	Motor Power kW	Motor Power HP	With drive	Reference	Weight kg
Ready-assembled enclosure with integrated braking transistor in the drive	110	150	ATV 61HC11N4	**ATV 61E5C11N4**	280.000
	132	200	ATV 61HC13N4	**ATV 61E5C13N4**	300.000
	160	250	ATV 61HC16N4	**ATV 61E5C16N4**	310.000
	220	350	ATV 61HC22N4	**ATV 61E5C22N4**	340.000
Ready-assembled enclosure with braking unit in the enclosure	250	400	ATV 61HC25N4	**ATV 61E5C25N4F**	603.000
	315	500	ATV 61HC31N4	**ATV 61E5C31N4F**	603.000
Ready-assembled enclosure without braking unit	250	400	ATV 61HC25N4	**ATV 61E5C25N4** *(1)*	430.000
	315	500	ATV 61HC31N4	**ATV 61E5C31N4** *(1)*	430.000
	400	600	ATV 61HC40N4	**ATV 61E5C40N4** *(2)*	748.000
	500	700	ATV 61HC50N4	**ATV 61E5C50N4** *(2)*	806.000
	630	900	ATV 61HC63N4	**ATV 61E5C63N4** *(2)*	938.000

523391



ATV 61E5C40N4...E5C63N4

Option specific to ATV 61E5C40N4...E5C63N4 drives

Description	For drive	Reference	Weight kg
IP 54 enclosure with braking unit	ATV 61E5C40N4 ATV 61E5C50N4 ATV 61E5C63N4	**VW3 A7E 102**	262.000

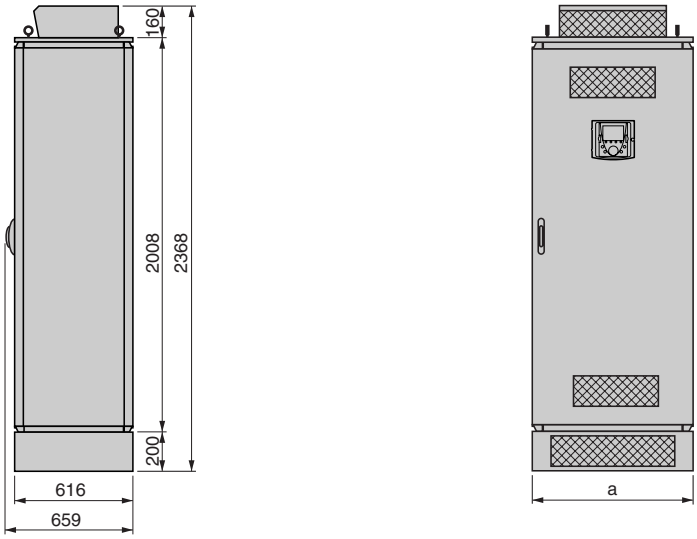
(1) To add a compatible braking unit, order reference ATV 61E5C25N4F or ATV 61E5C31N4F depending on the rating required. The braking unit is then supplied mounted in the enclosure next to the drive.
(2) Braking unit in IP 54 enclosure to be ordered separately (see reference above).

Presentation: page 2/182
Characteristics: page 2/183
Dimensions: pages 2/185 to 2/187

Variable speed drives for asynchronous motors

Altivar 61 ready-assembled in IP 54 enclosure

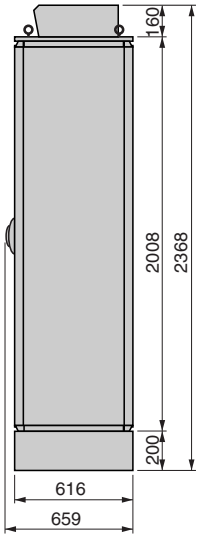
ATV 61E5C11N4…E5C31N4, ATV 61E5C25N4F, E5C31N4F



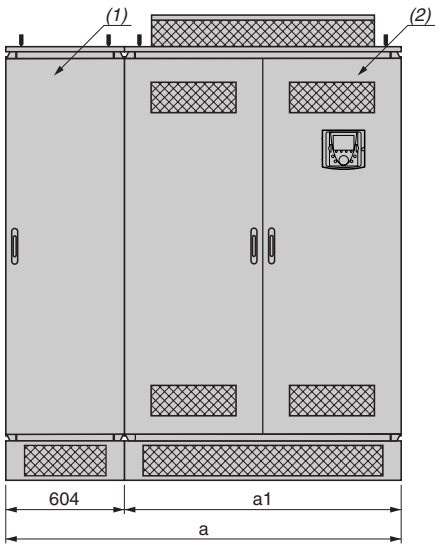
ATV 61E5	a
C11N4…C22N4	616
C25N4, C31N4	816
C25N4F, C31N4F	816

ATV 61E5C40N4…E5C63N4

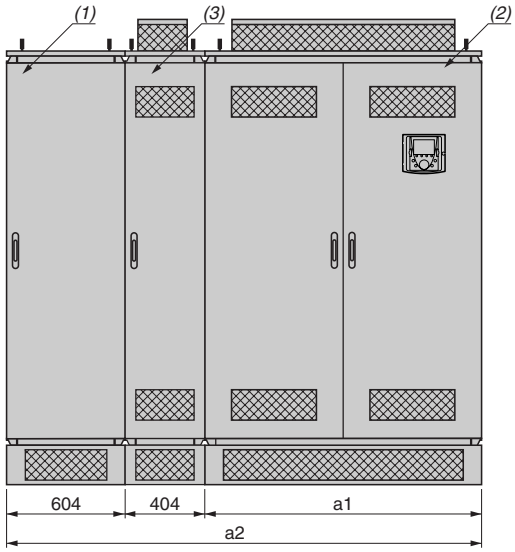
Common side view



ATV 61E5C40N4…E5C63N4 without braking unit



ATV 61E5C40N4…E5C63N4 with braking unit

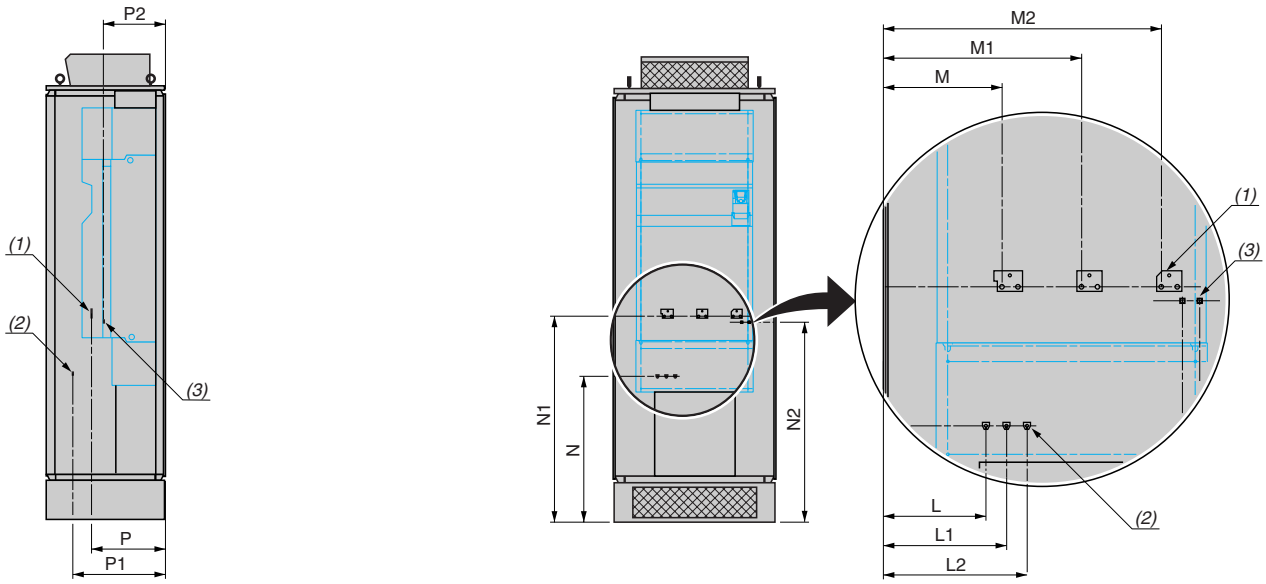


ATV 61E5	a	a1	a2
C40N4	1620	1016	2024
C50N4	1620	1016	2024
C63N4	1820	1216	2224

(1) Supplied with the ATV 61E5C40N4…E5C63N4 ready-assembled enclosure (2), this enclosure contains the switch and fast acting fuses.
(2) ATV 61E5C40N4…E5C63N4 ready-assembled enclosure.
(3) VW3 A7E 102 braking unit in enclosure.

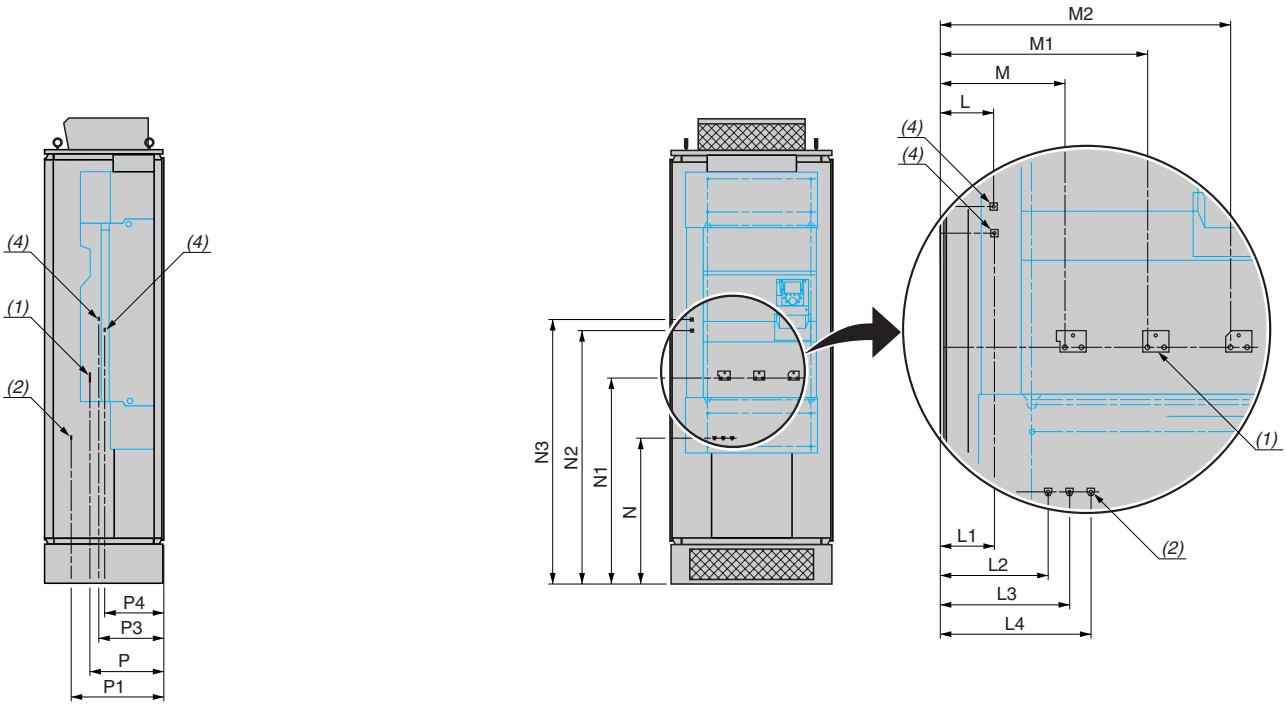
Variable speed drives for asynchronous motors
Altivar 61 ready-assembled in IP 54 enclosure

ATV 61E5C11N4...E5C22N4



ATV 61E5	L	L1	L2	M	M1	M2	N	N1	N2	P	P1	P2
C11N4	230	265	300	290	350	410	770	1330	1295	350	465	280
C13N4	225	270	315	240	300	360	740	1330	1267	380	470	315
C16N4	225	270	315	260	335	410	740	1055	1024	375	470	305
C22N4	225	270	315	205	310	415	740	1060	1024	375	470	315

ATV 61E5C25N4, E5C31N4, ATV 61E5C25N4F, E5C31N4F



ATV 61E5	L	L1	L2	L3	L4	M	M1	M2	N	N1	N2	N3	P	P1	P3	P4
C25N4, C31N4	–	–	225	270	315	260	435	610	740	1045	–	–	375	470	–	–
C25N4F, C31N4F	110	112	225	270	315	260	435	610	740	1045	1285	1342	375	470	330	300

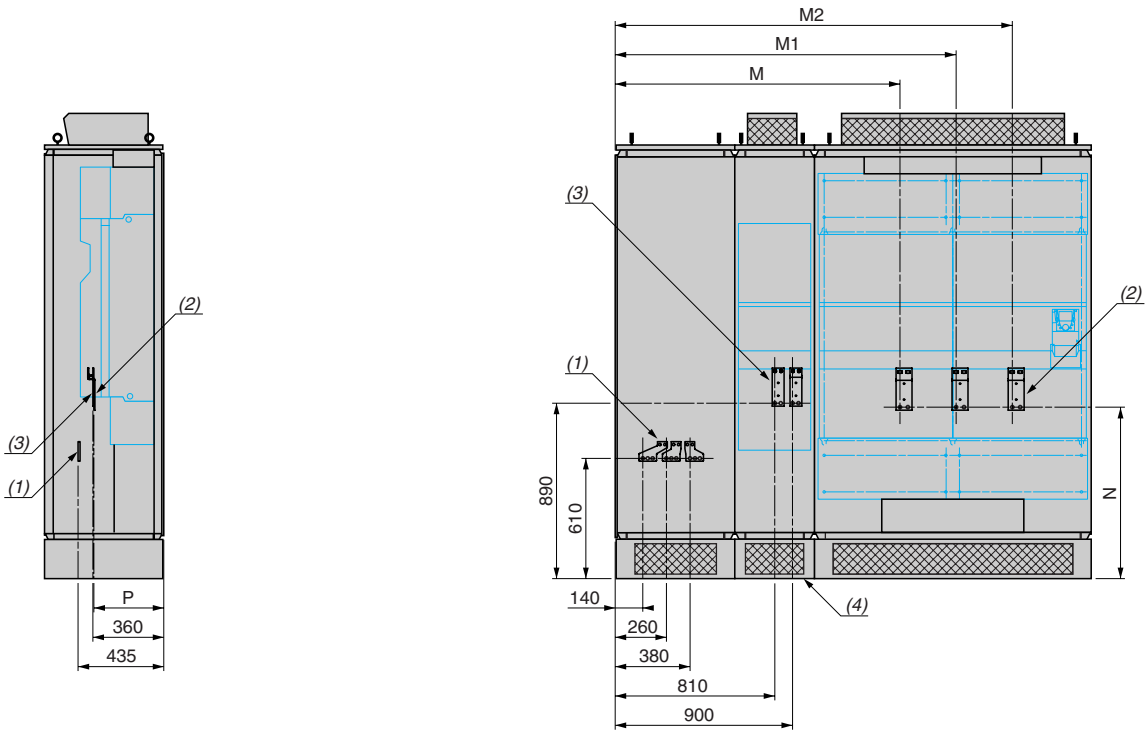
(1) Terminal for connecting the motor.
(2) Terminal for connecting the switch.
(3) Terminal for connecting the braking resistor.
*(4) Terminal for connecting the braking unit (**ATV 61E5C25N4F** and **ATV 61E5C31N4F** only).*

Presentation: page 2/182
Characteristics: page 2/183
References: page 2/184

Variable speed drives for asynchronous motors

Altivar 61 ready-assembled in IP 54 enclosure

ATV 61E5C40N4…E5C63N4



ATV 61E5	With braking unit			Without braking unit				
	M	M1	M2	M	M1	M2	N	P
C40N4	1445	1730	2015	840	1125	1410	870	355
C50N4	1335	1675	2015	730	1070	1410	870	355
C63N4	1320	1755	2190	715	1150	1585	865	360

(1) Terminal for connecting the switch.
(2) Terminal for connecting the motor.
(3) Terminal for connecting the braking resistor.
(4) VW3 A7E 102 braking unit in enclosure.

Variable speed drives for asynchronous motors

Altivar 61

Options: dialogue

Remote graphic display terminal

(this display terminal can be supplied with the drive or ordered separately)

This display terminal is attached to the front of the drive. In the case of drives supplied without a graphic display terminal, it covers the integrated 7-segment display terminal.
It can be:
- Used remotely in conjunction with the appropriate accessories (see below)
- Connected to several drives using multidrop link components (see page 2/189)

It is used:
- To control, adjust and configure the drive
- To display the current values (motor, input/output values, etc.)
- To save and download configurations; 4 configuration files can be saved.

The terminal's maximum operating temperature is 60°C and it features IP 54 protection.

Description

1 Graphic display:
- 8 lines, 240 x 160 pixels
- Large digits that can be read from 5 m away
- Supports display of bar charts

2 Assignable function keys F1, F2, F3, F4:
- Dialogue functions: direct access, help screens, navigation
- Application functions: "Local Remote", preset speed

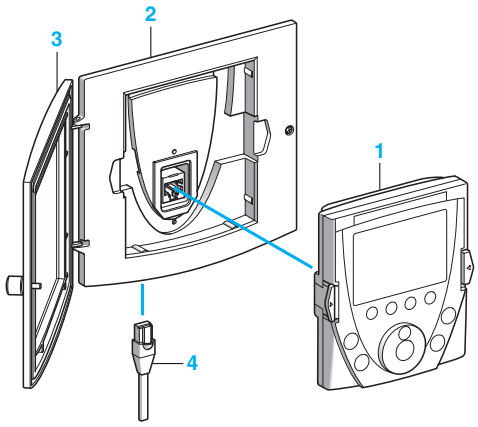
3 "STOP/RESET": local control of motor stop/fault reset
4 "RUN": local control of motor operation
5 Navigation button:
- Press: saves the current value (ENT)
- Turn ±: increases or decreases the value, takes you to the next or previous line.

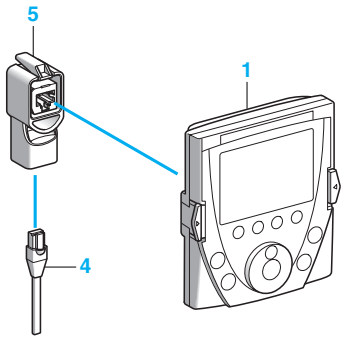
6 "FWD/REV": reverses the direction of rotation of the motor
7 "ESC": aborts a value, a parameter or a menu to return to the previous selection

Note: *Keys 3, 4 and 6 can be used to control the drive directly.*

References

Description	Code	Reference	Weight kg
Remote graphic display terminal	1	**VW3 A1 101**	0.145





Graphic display terminal accessories

The available accessories are:
- A remote mounting kit for mounting on an enclosure door with IP 54 degree of protection. It includes:
  - All the mechanical fittings
  - The screws and bolts
- A transparent door which attaches to the remote mechanics to achieve IP 65 degree of protection
- A cable equipped with two RJ45 connectors so that the graphic display terminal can be connected to the Altivar 61 drive (1, 3, 5 or 10 m lengths available)
- An RJ45 female/female adapter for connecting the VW3 A1 101 graphic display terminal to the VW3 A1 104 R●●● remote cable

References

Description	Code	Length m	Degree of protection	Reference	Weight kg
Remote mounting kit *(1)*	2	–	IP 54	**VW3 A1 102**	0.150
Door *(2)*	3	–	IP 65	**VW3 A1 103**	0.040
Remote cables Equipped with 2 RJ45 connectors	4	1	–	**VW3 A1 104 R10**	0.050
	4	3	–	**VW3 A1 104 R30**	0.150
	4	5	–	**VW3 A1 104 R50**	0.250
	4	10	–	**VW3 A1 104 R100**	0.500
RJ45 female/female adaptor	5	–	–	**VW3 A1 105**	0.010

(1) In this case, use a VW3 A1 104 R●● remote connecting cable, which must be ordered separately (see above).
(2) To be mounted on remote mounting kit VW3 A1 102 (for mounting on an enclosure door), which must be ordered separately (see above).

Dimensions:
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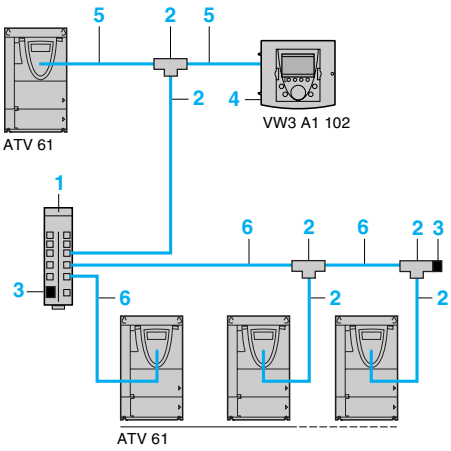
Variable speed drives for asynchronous motors
Altivar 61
Options: dialogue



Example of connection via multidrop link

Multidrop link components

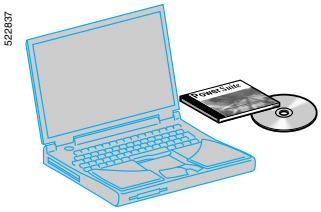
These components enable a graphic display terminal to be connected to several drives via a multidrop link. This multidrop link is connected to the Modbus terminal port on the front of the drive.

Connection accessories

Description			Code	Sold in lots of	Unit reference	Weight kg
Modbus splitter box 10 RJ45 connectors and 1 screw terminal			1	–	**LU9 GC3**	0.500
Modbus T-junction boxes	With integrated 0.3 m cable		2	–	**VW3 A8 306 TF03**	–
	With integrated 1 m cable		2	–	**VW3 A8 306 TF10**	–
Modbus line terminator	For RJ45 connector	R = 120 Ω C = 1 nF	3	2	**VW3 A8 306 RC**	0.010
Remote mounting kit	For the VW3 A1 101 graphic display terminal		4	–	**VW3 A1 102**	0.150

Connecting cables
(equipped with 2 RJ45 connectors)

Used with	Code	Length m	Reference	Weight kg
For remote operation of the Altivar 61 and the VW3 A1 101 graphic display terminal	5	1	**VW3 A1 104 R10**	0.050
		3	**VW3 A1 104 R30**	0.150
		5	**VW3 A1 104 R50**	0.250
		10	**VW3 A1 104 R100**	0.500
Modbus bus	6	0.3	**VW3 A8 306 R03**	0.025
		1	**VW3 A8 306 R10**	0.060
		3	**VW3 A8 306 R30**	0.130



PowerSuite software workshop

PowerSuite software workshop

The PowerSuite software workshop offers the following benefits:
- Messages can be displayed in plain text in several languages (English, French, German, Italian and Spanish)
- Work can be prepared in the design office without having to connect the drive to the PC
- Configurations and settings can be saved to floppy disk or hard disk and downloaded to the drive
- Print facility
- Altivar 38 files can be converted for transfer to an Altivar 61 drive
- Oscillograms can be displayed

See pages 3/2 to 3/5.

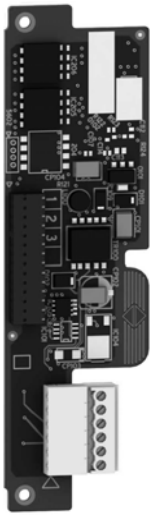
Dimensions:
page 2/263

Variable speed drives for asynchronous motors

Altivar 61

Option: encoder interface cards

Presentation



VW3 A3 401

Encoder interface card is used for machine safety, irrespective of the control type:
- Overspeed detection
- Load veering detection.

Three types of card are available depending on the encoder technology:
- RS 422 compatible differential outputs
- Open collector outputs (NPN)
- Push-pull outputs.

The card is inserted into a dedicated slot.

Characteristics

Encoder interface cards with RS422 compatible differential outputs

Type of card		VW3 A3 401	
Power (supplied by the card)	Voltage	5 V ⎓ (min. 5 V, max. 5.5 V)	
	Maximum current	200 mA	
		Short-circuit and overload protection	
Maximum operating frequency		300 kHz	
Input signals		A, $\overline{A}$, B, $\overline{B}$	
	Impedance	440 Ω	
Number of pulses/ encoder revolution		5000 maximum The maximum high-speed frequency should not exceed 300 kHz.	
Maximum consumption current of encoder		**100 mA** *(1)*	**200 mA** *(1)*
Minimum recommended cross-section of conductors *(2)*	For a maximum cable length of 25 m	0.2 mm^2 (AWG 24)	0.5 mm^2 (AWG 20)
	For a maximum cable length of 50 m	0.5 mm^2 (AWG 20)	0.75 mm^2 (AWG 18)
	For a maximum cable length of 100 m	0.75 mm^2 (AWG 18)	1.5 mm^2 (AWG 15)

(1) Minimum encoder power supply 4.5 V.

(2) Shielded cable containing 3 twisted pairs at intervals of between 20 and 50 mm. Connect the shielding to earth at both ends. Minimum recommended conductor cross-section for a minimum encoder voltage in order to limit line voltage drops.

Schemes: page 2/283

Variable speed drives for asynchronous motors

Altivar 61

Option: encoder interface cards

Characteristics (continued)

Encoder interface card with open collector outputs

Type of card		VW3 A3 403		VW3 A3 404	
Power (supplied by the card)	Voltage	12 V ⎓ (min. 12 V, max. 13 V)		15 V ⎓ (min. 15 V, max. 16 V)	
	Maximum current	175 mA			
		Short-circuit and overload protection			
Maximum operating frequency		300 kHz			
Input signals		A, $\overline{A}$, B, $\overline{B}$ / AB / A			
	Impedance	1 kΩ			
Number of pulses/encoder revolution		5000 maximum The maximum high-speed frequency should not exceed 300 kHz.			
Maximum consumption current of encoder		**100 mA** *(1)*	**175 mA** *(1)*	**100 mA** *(1)*	**175 mA** *(1)*
Minimum recommended cross-section of conductors *(2)*	For a maximum cable length of 100 m	0.2 mm² (AWG 24)	0.5 mm² (AWG 20)	0.2 mm² (AWG 24)	
	For a maximum cable length of 200 m	0.5 mm² (AWG 20)	0.75 mm² (AWG 18)	0.2 mm² (AWG 24)	
	For a maximum cable length of 500 m	1 mm² (AWG 17)	1.5 mm² (AWG 15)	0.5 mm² (AWG 20)	

Encoder interface card with push-pull outputs

Type of card		VW3 A3 405	VW3 A3 406	VW3 A3 407
Power (supplied by the card)	Voltage	12 V ⎓ (min. 12 V, max. 13 V)	15 V ⎓ (min. 15 V, max. 16 V)	+24 V ⎓ (min. 20 V, max. 30 V)
	Maximum current	175 mA		100 mA
		Short-circuit and overload protection		
Maximum operating frequency		300 kHz		
Input signals		A, $\overline{A}$, B, $\overline{B}$ / AB / A		
	Impedance	1 kΩ		1.6 kΩ
	State 0	If < 1.5 V		
	State 1	If > 7.7 V and < 13 V	If > 7.7 V and < 16 V	If > 11.5 V and < 25 V
Number of pulses/encoder revolution		5000 maximum The maximum high-speed frequency should not exceed 300 kHz.		

Maximum consumption current of encoder		**100 mA** *(1)*	**175 mA** *(1)*	**100 mA** *(1)*	**175 mA** *(1)*	**100 mA** *(2)*
Minimum recommended cross-section of conductors *(3)*	For a maximum cable length of 100 m	0.2 mm² (AWG 24)	0.5 mm² (AWG 20)	0.2 mm² (AWG 24)		
	For a maximum cable length of 200 m	0.5 mm² (AWG 20)	0.75 mm² (AWG 18)	0.2 mm² (AWG 24)		
	For a maximum cable length of 500 m	1 mm² (AWG 17)	1.5 mm² (AWG 15)	0.5 mm² (AWG 20)		0.2 mm² (AWG 24)

References

Encoder interface cards *(4)*

Description	Voltage V	Reference	Weight kg
Encoder interface cards with RS422 compatible differential outputs	5	**VW3 A3 401**	0.200
Encoder interface cards with open collector outputs	12	**VW3 A3 403**	0.200
	15	**VW3 A3 404**	0.200
Encoder interface cards with push-pull outputs	12	**VW3 A3 405**	0.200
	15	**VW3 A3 406**	0.200
	24	**VW3 A3 407**	0.200

(1) Minimum encoder power supply 10 V.
(2) Minimum encoder power supply 14 V.
(3) Shielded cable containing 3 twisted pairs at intervals of between 20 and 50 mm. Connect the shielding to earth at both ends. Minimum recommended conductor cross-section for a minimum encoder voltage in order to limit line voltage drops.
(4) The Altivar 61 drive cannot support more than one encoder interface card. Consult the summary tables of possible drive, option and accessory combinations (see pages 2/246 to 2/251).

Schemes:
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Variable speed drives for asynchronous motors

Altivar 61

Options: I/O extension cards

Presentation

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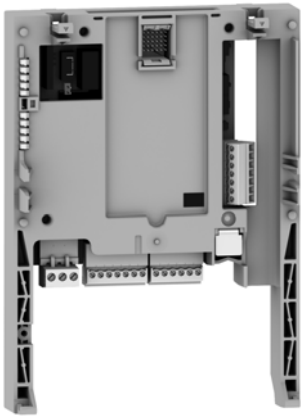

VW3 A3 202

Altivar 61 drives can be specially adapted to particular application areas by installing I/O extension cards.

Two models are available:

■ Card with logic I/O featuring:
- □ 1 relay logic output (“C/O” contact)
- □ 4 x 24 V ⎓ positive or negative logic inputs
- □ 2 x 24 V ⎓ open collector positive or negative logic outputs
- □ 1 input for PTC probes

■ Card with extended I/O featuring:
- □ 1 differential current analog input (0…20 mA)
- □ 1 software-configurable voltage (0…10 V ⎓) or current (0…20 mA) analog input
- □ 2 software-configurable voltage (± 10 V ⎓, 0…10 V) or current (0…20 mA) analog outputs
- □ 1 relay logic output
- □ 4 x 24 V ⎓ positive or negative logic inputs
- □ 2 x 24 V ⎓ open collector positive or negative logic outputs
- □ 1 input for PTC probes
- □ 1 frequency control input

Characteristics

Logic I/O card VW3 A3 201

Internal supplies available		Short-circuit and overload protection: ■ 1 x 24 V ⎓ supply (min. 21 V, max. 27 V), maximum current 200 mA for the complete drive and I/O extension card assembly ■ 1 x 10.5 V ⎓ supply (± 5%) for the reference potentiometer (1 to 10 kΩ), max. current 10 mA
Configurable relay output	R3A, R3B, R3C	1 relay logic output, one “N/C” contact and one “N/O” contact with common point. Minimum switching capacity: 3 mA for 24 V ⎓ Maximum switching capacity: ■ on resistive load (cos φ = 1): 5 A for 250 V ∿ or 30 V ⎓ ■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 V ∿ or 30 V ⎓ Electrical service life: 100,000 operations Maximum response time: 7 ms ± 0.5 ms
Logic inputs	LI7…LI10	4 programmable logic inputs, 24 V ⎓, compatible with level 1 PLC, IEC 65A-68 standard Impedance 3.5 kΩ Maximum voltage: 30 V Multiple assignment makes it possible to configure several functions on one input Maximum sampling time: 2 ms ± 0.5 ms
	Positive logic (Source)	State 0 if ⩽ 5 V or logic input not wired, state 1 if ⩾ 11 V
	Negative logic (Sink)	State 0 if ⩾ 16 V or logic input not wired, state 1 if ⩽ 10 V
Logic outputs	LO1, LO2	2 x 24 V ⎓ assignable open collector positive logic (Source) or negative logic (Sink) outputs, compatible with level 1 PLC, IEC 65A-68 standard 24 V ⎓ internal or 24 V ⎓ external power supply (min. 12 V, max. 30 V) Maximum current: 200 mA Logic output common (CLO) isolated from other signals Maximum sampling time: 2 ms ± 0.5 ms. The active state is software-configurable as is a delay for each switching operation
Input for PTC probes	TH1+/TH1-	1 input for a maximum of 6 PTC probes mounted in series: ■ nominal value < 1.5 kΩ ■ trip resistance 3 kΩ, reset value 1.8 kΩ ■ short-circuit protection < 50 Ω
Maximum I/O connection capacity and tightening torque		1.5 mm² (AWG 16) 0.25 Nm

Schemes:
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Variable speed drives for asynchronous motors

Altivar 61

Options: I/O extension cards

Characteristics (continued)

Extended I/O card VW3 A3 202

Internal supplies available		Short-circuit and overload protection: ■ 1 x 24 V ⎓ supply (min. 21 V, max. 27 V), max. current 200 mA for the complete drive and I/O extension card assembly ■ 1 x 10.5 V ⎓ supply (± 5%) for the reference potentiometer (1 to 10 kΩ), max. current 10 mA
Analog inputs AI	AI3+/AI3-	1 X-Y mA differential current analog input by programming X and Y from 0 to 20 mA, with impedance 250 Ω Maximum sampling time: 5 ms ± 1 ms Resolution: 11 bits + 1 sign bit Accuracy: ± 0.6% for a temperature variation of 60°C Linearity: ± 0.15% of the maximum value
	AI4	1 software-configurable current or voltage analog input: ■ voltage analog input 0…10 V ⎓, impedance 30 kΩ (maximum safe voltage 24 V) ■ X-Y mA current analog input by programming X and Y from 0 to 20 mA, with impedance 250 Ω Maximum sampling time: 5 ms ± 1 ms Resolution: 11 bits Accuracy: ± 0.6% for a temperature variation of 60°C Linearity: ± 0.15% of the maximum value
Analog outputs	AO2, AO3	2 software-configurable current or voltage analog outputs: ■ voltage analog output ± 10 V ⎓, 0…10 V, minimum load impedance 470 Ω ■ X-Y mA current analog output by programming X and Y from 0 to 20 mA, maximum load impedance 500 Ω Maximum sampling time: 5 ms ± 1 ms Resolution: 10 bits Accuracy: ± 1% for a temperature variation of 60°C Linearity: ± 0.2% of the maximum value
Configurable relay output	R4A, R4B, R4C	1 relay logic output, one "N/C" contact and one "N/O" contact with common point. Minimum switching capacity: 3 mA for 24 V ⎓ Maximum switching capacity: ■ on resistive load (cos φ = 1): 5 A for 250 V ∿ or 30 V ⎓ ■ on inductive load (cos φ = 0.4 and L/R = 7 ms): 1.5 A for 250 V ∿ or 30 V ⎓ Electrical service life: 100,000 operations Maximum response time: 10 ms ± 1 ms
Logic inputs	LI11…LI14	4 programmable logic inputs, 24 V ⎓, compatible with level 1 PLC, IEC 65A-68 standard Impedance 3.5 kΩ Maximum voltage: 30 V Multiple assignment makes it possible to configure several functions on one input Maximum sampling time: 5 ms ± 1 ms
	Positive logic (Source)	State 0 if ⩽ 5 V or logic input not wired, state 1 if ⩾ 11 V
	Negative logic (Sink)	State 0 if ⩾ 16 V or logic input not wired, state 1 if ⩽ 10 V
Logic outputs	LO3, LO4	2 x 24 V ⎓ assignable open collector positive logic (Source) or negative logic (Sink) outputs, compatible with level 1 PLC, IEC 65A-68 standard Maximum voltage: 30 V Maximum current: 200 mA Logic output common (CLO) isolated from other signals Maximum sampling time: 5 ms ± 1 ms. The active state is software-configurable as is a delay for each switching operation
Input for PTC probes	TH2+/TH2-	1 input for a maximum of 6 PTC probes mounted in series: ■ nominal value < 1.5 kΩ ■ trip resistance 3 kΩ, reset value 1.8 kΩ ■ short-circuit protection < 50 Ω
Frequency control input	RP	Frequency range: 0…30 kHz Cyclic ratio: 50 % ± 10 % Maximum sampling time: 5 ms ± 1 ms Maximum input voltage 30 V, 15 mA Add a resistor if the input voltage is greater than 5 V (510 Ω for 12 V, 910 Ω for 15 V, 1.3 kΩ for 24 V) State 0 if < 1.2 V, state 1 if > 3.5 V
Maximum I/O connection capacity and tightening torque		1.5 mm² (AWG 16) 0.25 Nm

References

I/O extension cards *(1)*

Description	Reference	Weight kg
Logic I/O card	**VW3 A3 201**	0.300
Extended I/O card	**VW3 A3 202**	0.300

(1) The Altivar 61 cannot support more than one I/O card with the same reference. Please refer to the compatibility tables summarizing the possible combinations for drives, options and accessories on pages 2/246 to 2/251.

Schemes:
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Variable speed drives for asynchronous motors

Altivar 61

Option: Multi-pump cards

Presentation

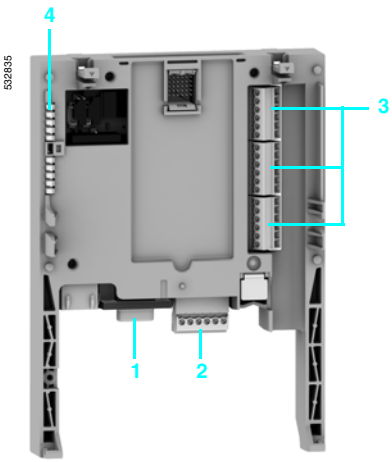
Multi-pump cards are used to adapt the drive for pump applications.
Various predefined configurable applications are sold by Schneider Electric and its partners.
In order to protect our know-how, it is not possible to transfer the program from the card to the PC.
A single multi-pump card can be fitted in the Altivar 61 drive. It can be combined with another option card (I/O extension or communication). Consult the tables summarizing the possible combinations: drives, options and accessories, see pages 2/246 to 2/251.

Each multi-pump card consists of:
- 10 logic inputs, 2 of which can be used for 2 counters
- 2 analog inputs
- 6 logic outputs
- 2 analog outputs
- A master port for the CANopen machine bus.

If the power consumption table does not exceed 200 mA, this card can be powered by the ATV 61H●●●●● drives.
Otherwise, an external 24 V ⎓ power supply must be used.
The ATV 61W●●●N4A24 variable speed drives incorporate a 24 V ⎓ power supply and allow an additional consumption of 250 mA.

Multi-pump cards can also use:
- The drive I/O
- The I/O extension card I/O
- The drive parameters (speed, current, torque, etc.).

The Altivar 61 drive:
- Incorporates all the application functions for managing your pumps:
sleep, wake-up, zero flow detection, fluid absence detection, underload detection, overload detection, PID regulator with preset PID references
- Is used to adjust your pumps' operating points:
2/5-point quadratic ratio, energy saving ratio
- Protects your pumps:
motor thermal protection, PTC management, low speed detection and time delay.



Description

1 9-way male SUB-D connector for connection to the CANopen machine bus.

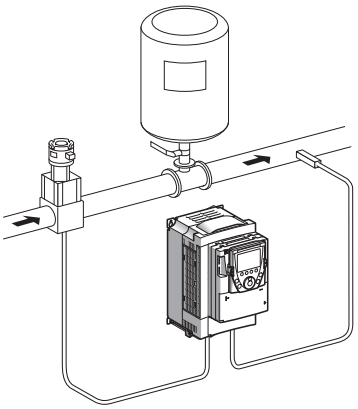
2 Connector with removable screw terminals, 6 contacts at intervals of 3.81 for the 24 V ⎓ power supply and 4 logic inputs.

3 3 connectors with removable screw terminals, 6 contacts at intervals of 3.81 for 6 logic inputs, 6 logic outputs, 2 analog inputs, 2 analog outputs and 2 commons.

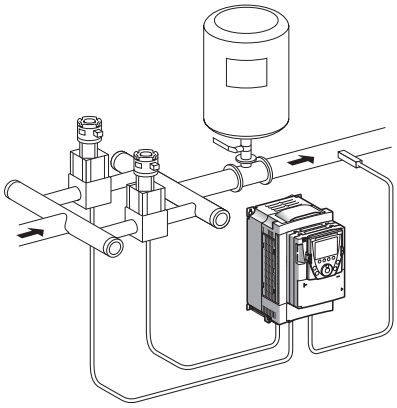
4 5 LEDs, comprising:
- 1 to indicate the presence of the 24 V ⎓ power supply
- 1 to indicate a program execution fault
- 2 to indicate the CANopen machine bus communication status
- 1 controlled by the application program.

Operation: pages 2/195 and 2/196
Characteristics: page 2/197
References: page 2/197
Schemes: page 2/283

Variable speed drives for asynchronous motors
Altivar 61
Option: Multi-pump cards



Single variable mode



Single variable mode with auxiliary pump

Operation

Multi-pump cards have the following basic operating modes:

Single variable

The same variable pump is always used.
Fixed flow pumps are started in ascending order of the logic outputs.
Fixed flow pumps are stopped in descending order of the logic outputs.

Multiple variable

All the pumps can be variable. The variable pump is chosen according to its operating time. The pump with the shortest operating time is selected. Fixed pumps are started and stopped in ascending and descending order of the logic outputs respectively.

Switching the auxiliary pumps

You start by selecting the pump with the shortest operating time.
You stop a pump by selecting the pump with the longest operating time.

Limiting the operating time between pumps

A relative operating time differential between each pump can be programmed to ensure better distribution of operating times, thereby limiting pump wear.
If the total operating time differential between an operating auxiliary pump and one which is off exceeds the programmed differential, the first pump is stopped and replaced by the second one.

Continuity of service for your installation

If a pump is faulty (information on the Lix logic input) it is not taken into consideration and the start and stop conditions are determined by the other pumps.
It is possible for each pump to:
- Display the operating time
- Reset the counter
- Save the operating times.

Presentation: page 2/194 | Characteristics: page 2/197 | References: page 2/197 | Schemes: page 2/283

Variable speed drives for asynchronous motors

Altivar 61

Option: Multi-pump cards

VW3 A3 502 multi-pump card

The **VW3 A3 502** multi-pump card ensures the compatibility of pump applications developed for an Altivar 38 drive with an Altivar 61 drive.

The card's 9 operating modes are as follows:

- OFF: no function is activated; this mode is used in particular during the installation's maintenance
- Single variable
- Multiple variable
- Single variable with changeover of auxiliary pumps
- Multiple variable with changeover of auxiliary pumps
- Single variable with limited operating time
- Multiple variable with limited operating time
- Single variable with changeover of auxiliary pumps and limited operating time
- Multiple variable with changeover of auxiliary pumps and limited operating time.

VW3 A3 503 "Water solution" multi-pump card

The **VW3 A3 503** multi-pump card is used to support all multi-pump applications.

In addition to the existing operating modes, it is possible to develop new applications: booster station, irrigation, etc.

Variable speed drives for asynchronous motors

Altivar 61

Option: Multi-pump cards

Electrical characteristics

Power supply	Voltage	**V**	24 ⎓ (min. 19, max. 30)
Power consumption Current	Maximum	**A**	2
	No-load	**mA**	80
	Per logic output	**mA**	200 maximum *(1)*
Analog inputs	AI51, AI52		2 current analog inputs 0…20 mA, impedance 250 Ω Resolution: 10 bits Accuracy: ± 1% for a temperature variation of 60°C Linearity: ± 0.2% of the maximum value Common point for all the card I/O *(2)*
Analog outputs	AO51, AO52		2 current analog outputs 0…20 mA, impedance 500 Ω Resolution: 10 bits Accuracy: ± 1% for a temperature variation of 60°C Linearity: ± 0.2% of the maximum value Common point for all the card I/O *(2)*
Logic inputs	LI51…LI60		Ten 24 V ⎓ logic inputs, compatible with leve1 1 PLC, IEC 65A-68 standard, 2 of which can be used for 2 counters or 4 of which can be used for 2 incremental encoders Impedance: 4.4 kΩ Maximum voltage: 30 V ⎓ Switching thresholds: State 0 if ⩽ 5 V or logic input not wired State 1 if ⩾ 11 V Common point for all the card I/O *(2)*
Logic outputs	LO51…LO56		Six 24 V ⎓ logic outputs, positive logic open collector type (source), compatible with level 1 PLC, standard IEC 65A-68 Maximum switching voltage: 30 V Maximum current: 200 mA Common point for all the card I/O *(2)*
Connection of I/O	Type of contact		Screw, at intervals of 3.81 mm²
	Maximum wire	**mm²**	1.5 (AWG 16)
	Tightening torque	**Nm**	0.25
Lithium battery	Life		8 years approx.

References *(3)*

Description	Use	Reference	Weight kg
Multi-pump card *(4)* equipped with one 9-way male SUB-D connector	This card ensures compatibility with an ATV 61 drive of applications developed for an ATV 38 drive	**VW3 A3 502**	0.320
"Water solution" multi-pump card *(4)* equipped with one 9-way male SUB-D connector	This card can be used to support all multi-pump applications	**VW3 A3 503**	0.320

(1) If the power consumption table does not exceed 200 mA, this card can be powered by the drive. Otherwise, an external 24 V ⎓ power supply must be used.
(2) This common point is also the drive 0 V.
(3) It is recommended that a Nautilus® electronic pressure sensor, type XML F or XML G, is added to the installation. Please refer to the "Global Detection - Electronic and electromechanical detectors" catalogue.
(4) The Altivar 61 drive cannot support more than one multi-pump card. Consult the tables summarizing the possible combinations: drives, options and accessories, see pages 2/246 to 2/251.

Presentation: page 2/194 | Operation: pages 2/195 and 2/196 | Schemes: page 2/283

Variable speed drives for asynchronous motors

Altivar 61

Option: “Controller Inside” programmable card

Presentation

The “Controller Inside” programmable card is used to adapt the variable speed drive to specific applications by integrating control system functions.

Various predefined configurable applications are sold by Schneider Electric and its partners.
The PS 1131 software workshop for PC is used for programming and debugging new applications, quickly and in an open-ended manner (see page 2/201).
It is not possible to transfer the program from the card to the PC, which enables us to protect our know-how.

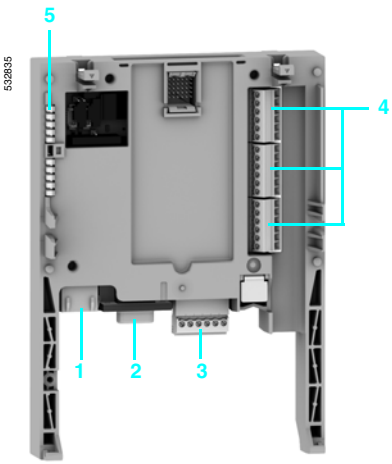
A single “Controller Inside” programmable card can be installed in the Altivar 61 drive. It can be combined with another option card (I/O extension or communication). Consult the tables summarizing the possible combinations between drives, options and accessories, see pages 2/246 to 2/251.

The “Controller Inside” programmable card has:
- 10 logic inputs, 2 of which can be used for 2 counters or 4 of which can be used for 2 incremental encoders
- 2 analog inputs
- 6 logic outputs
- 2 analog outputs
- A master port for the CANopen machine bus
- A PC port for programming with the PS 1131 software workshop

If the power consumption table does not exceed 250 mA, the “Controller Inside” programmable card can be powered by Altivar 61 drives. Otherwise, an external 24 V ⎓ power supply must be used.

The ATV 61W●●●N4A24 variable speed drives incorporate a 24 V ⎓ power supply and allow an additional consumption of 200 mA.

The “Controller Inside” programmable card can also use:
- The drive I/O
- The I/O extension card I/O
- The encoder interface card points counter
- The drive parameters (speed, current, torque, etc.).



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Description

1 RJ45 connector for connecting the PS 1131 software workshop via an RS 485 serial link.
Connection to the PC is via a cable and an RS 232/RS 485 connector included in the VW3 A8 106 PowerSuite for PC connection kit.

2 9-way male SUB-D connector for connection to the CANopen machine bus.

3 Connector with removable screw terminals, 6 contacts at intervals of 3.81 for the 24 V ⎓ power supply and 4 logic inputs.

4 3 connectors with removable screw terminals, 6 contacts at intervals of 3.81 for 6 logic inputs, 6 logic outputs, 2 analog inputs, 2 analog outputs and 2 commons.

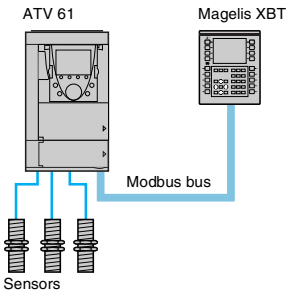
5 5 LEDs, comprising:
- 1 to indicate the presence of the 24 V ⎓ power supply
- 1 to indicate a program execution fault
- 2 to indicate the CANopen machine bus communication status
- 1 controlled by the application program

Characteristics: page 2/200 | Functions: pages 2/201 to 2/204 | Schemes: page 2/283 | References: page 2/205

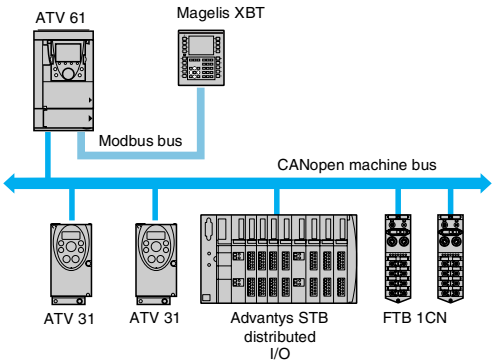
Variable speed drives for asynchronous motors

Altivar 61

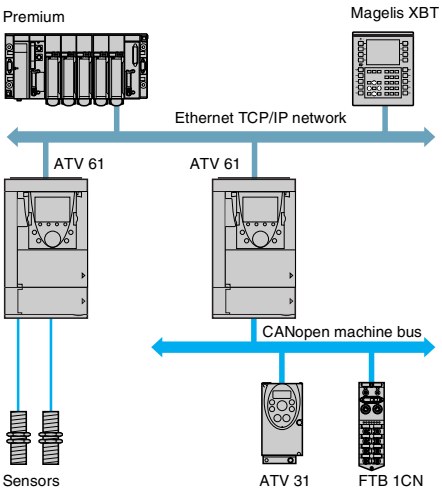
Option: “Controller Inside” programmable card



Independent machine with multiwire system



Independent machine with CANopen machine bus



Modular machine with Ethernet TCP/IP network

Dialogue

Human-machine dialogue with the application programmed in the “Controller Inside” programmable card is possible using:

- The Altivar 61 graphic display terminal
- A Magelis industrial HMI terminal connected to the drive Modbus port
- A Magelis industrial HMI terminal connected to the Ethernet TCP/IP network (if the drive is equipped with an Ethernet TCP/IP communication card)

A graphic terminal menu is dedicated to the “Controller Inside” programmable card. This menu can be customized by the card program according to the application.

Any industrial HMI terminal which supports the Modbus protocol can be used to display and modify the “Controller Inside” programmable card parameters. The Modbus server provides access to 2 Kwords (% MW, etc) in the card.

Master CANopen communication

The master CANopen port on the “Controller Inside” programmable card can be used to extend the I/O capacity and to control other CANopen slave devices.

Communication with a PLC

The Altivar 61 drive equipped with a “Controller Inside” programmable card fits easily into complex architectures.
Regardless of which bus, network or serial link is being used (Ethernet TCP/IP, Modbus/Uni-Telway, FIPIO, Modbus Plus, Profibus DP, INTERBUS, etc.), the PLC can communicate with the “Controller Inside” programmable card and the drive.
The periodic variables can still be configured as required.

Clock

A clock backed up by a lithium battery makes it possible to have a log of events that have occurred. When the “Controller Inside” programmable card is installed in the drive, the drive faults are automatically time and date-stamped without special programming.

Characteristics: page 2/200
Functions: pages 2/201 to 2/204
Schemes: page 2/283
References: page 2/205

Variable speed drives for asynchronous motors

Altivar 61

Option: “Controller Inside” programmable card

Electrical characteristics

Power supply	Voltage	**V**	24 ⎓ (min. 19, max. 30)
Power consumption Current	Maximum	**A**	2
	No-load	**mA**	80
	Per logic output	**mA**	200 maximum *(1)*
Analog inputs	AI51, AI52		2 current analog inputs 0…20 mA, impedance 250 Ω Resolution: 10 bits Accuracy: ± 1% for a temperature variation of 60°C Linearity: ± 0.2% of the maximum value Common point for all the card I/O *(2)*
Analog outputs	AO51, AO52		2 current analog outputs 0…20 mA, impedance 500 Ω Resolution: 10 bits Accuracy: ± 1% for a temperature variation of 60°C Linearity: ± 0.2% of the maximum value Common point for all the card I/O *(2)*
Logic inputs	LI51…LI60		Ten 24 V ⎓ logic inputs, compatible with level 1 PLC, IEC 65A-68 standard, 2 of which can be used for 2 counters or 4 of which can be used for 2 incremental encoders Impedance: 4.4 kΩ Maximum voltage: 30 V ⎓ Switching thresholds: State 0 if ⩽ 5 V or logic input not wired State 1 if ⩾ 11 V Common point for all the card I/O *(2)*
Logic outputs	LO51…LO56		Six 24 V ⎓ logic outputs, positive logic open collector type (source), compatible with level 1 PLC, standard IEC 65A-68 Maximum switching voltage: 30 V Maximum current: 200 mA Common point for all the card I/O *(2)*
Connection of I/O	Type of contact		Screw, at intervals of 3.81 mm²
	Maximum wire	**mm²**	1.5 (AWG 16)
	Tightening torque	**Nm**	0.25
Lithium battery	Life		8 years approx.

Characteristics of the application program

Compiled program (saved in “flash” memory)	Maximum size	**Kb**	320
Data	Maximum size	**Kwords**	64
	Saved size (NVRAM)	**Kwords**	4
	Size accessible by Modbus	**Kwords**	2

Characteristics of the CANopen communication port

Structure	Connector	One 9-way male SUB-D connector
	Network management	Master
	Transmission speed	Configurable via the program: 50 Kbps, 125 Kbps, 250 Kbps, 500 Kbps or 1 Mbps
	Address (Node ID)	32 slaves maximum
Services	CANopen application layer	DS 301 V4.02
	Functional profile	DSP 405
	PDO	10 receive and transmit PDOs in total for each slave
	SDO	2 client SDOs per slave (1 read and 1 write). Block transfer
	Error check	Node Guarding, producer and consumer Heartbeat
	Other services	Emergency, Boot-up, Sync
Diagnostics	Using LEDs	2 LEDs: “RUN” and “ERROR”, conforming to CIA DR303 version 1.0

(1) Above this, use an external 24 V c power supply.
(2) This common point is also the drive 0 V.

Variable speed drives for asynchronous motors
Altivar 61
Option: “Controller Inside” programmable card

PS 1131 software workshop

The PS 1131 software workshop conforms to international standard IEC 61131-3, and includes all the functions for programming and setting up the “Controller Inside” programmable card.
It includes the configurator for CANopen.
It is designed for Microsoft Windows® 98, Microsoft Windows® NT 4.0, Microsoft Windows® Millennium, Microsoft Windows® 2000 Professional and Microsoft Windows® XP operating systems.

It benefits from the user-friendly interface associated with these operating systems:
- Pop-up menus
- Function blocks
- Online help.

The PS 1131 software workshop is available in both English and German.

The programming and debugging tools are accessible via the application browser. This provides the user with an overview of the program and rapid access to all the application components:
- Program editor
- Function block editor
- Variables editor
- Animation tables editor
- Runtime screens editor.

Modular structured programming

The PS 1131 software workshop is used to structure an application into function modules consisting of sections (program code), animation tables and runtime screens. Each program section has a name and is programmed in one of the six available languages. To protect know-how or prevent any accidental modification, each section can be write-protected or read/write-protected.

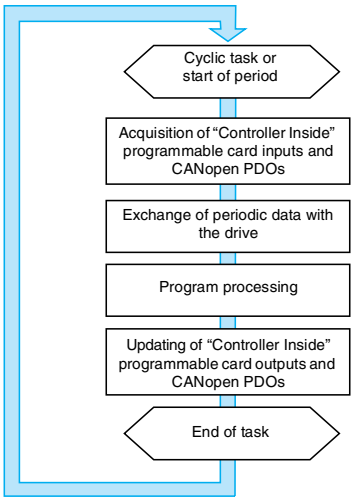
Exporting/importing function modules
It is possible to export all or part of the tree structure in function modules.

Program structure and execution of an application

The program structure is single-task. It consists of several subroutines.
Exchanges with the drive are performed by a function block available in the standard library.
Cycle execution can be either cyclic or periodic. A software watchdog, which can be configured between 100 and 800 ms by the user, monitors the cycle time.
A task can be synchronized with the drive’s main task to improve repeat accuracy in motion control applications.

Cyclic execution
Once each cycle ends, execution of a new cycle begins. The cycle execution must last for at least 5 ms.

Periodic execution
The program is executed periodically, and the period can be set by the user between 5 and 100 ms. Cycle execution must last for less than the defined period. Drive response in the event of the cycle time being exceeded can be managed by the program.

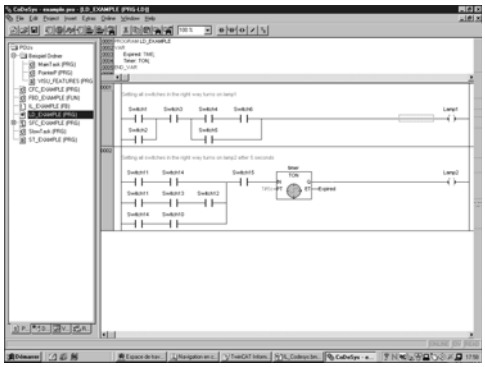


Example of cycle execution for the “Controller Inside” programmable card connected on a CANopen machine bus

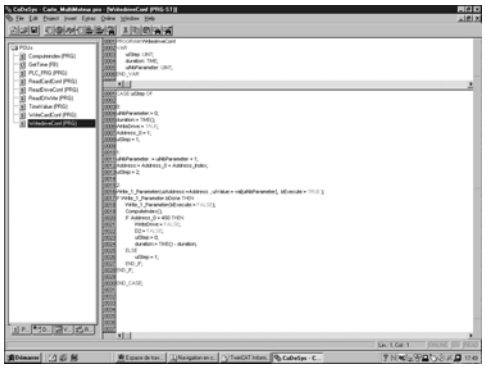
Variable speed drives for asynchronous motors

Altivar 61

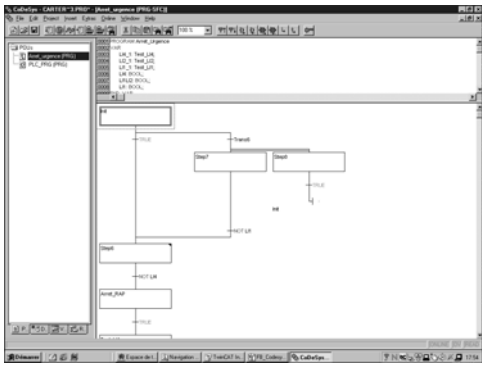
Option: “Controller Inside” programmable card



Example of Ladder language programming



Example of Structured Text language programming



Example of Grafcet language programming

Programming languages

6 programming languages are available:

- Ladder language (LD)
- Structured Text language (ST)
- Grafcet language (SFC)
- Instruction List language (IL)
- Function block diagram (FBD)
- Continuous Flow Chart (CFC)

Ladder Diagram (LD)

A Ladder language program consists of a set of rungs executed sequentially.
A rung consists of several lines.
A line consists of several contacts and a coil.
The language objects can be entered and displayed as symbols or tags as required.
The Ladder language editor enables the immediate call of entry help functions such as access to function libraries and access to the variables editor.

Structured Text (ST)

Structured Text language is a sophisticated algorithmic type language which is particularly well-suited to programming complex arithmetical functions, manipulating tables, message handling, etc.
Structured Text language enables direct transcription of an analysis based on a flow chart, and is organized in statements.

Grafcet language (SFC)

Grafcet language is used to describe the sequential part of the control system in a simple, graphic way. It corresponds to the “Sequential Function Chart” (SFC) language described in standard IEC 61131-3.
Programs written in Grafcet (SFC) language consist of:

- Macro-steps which are the grouping of a set of steps and transitions
- Steps with which the actions to be performed can be associated
- Transitions with which the conditions are associated (transition conditions)
- Directed links connecting the steps and transitions

Variable speed drives for asynchronous motors

Altivar 61

Option: “Controller Inside” programmable card

Example of Instruction List language programming

Example of a function block:
sending the speed reference to the drive

Programming languages (continued)

Instruction List language (IL)

Instruction List language can be used to write Boolean equations and use all the functions available in the language. It can be used to represent the equivalent of a ladder diagram in text form.
Each instruction consists of an instruction code and a bit or word type operand.
As in Ladder language, instructions are organized in sequences of instructions called statements (equivalent to a rung).

Function block diagram (FBD)

FBD is a graphic language. It consists of function blocks connected by a rung.
The program is executed sequentially.
Each block can be a logical or arithmetical expression, a call to another function block, a jump or a return instruction.

Continuous Flow Chart (CFC)

Continuous Flow Chart programming is a graphic language. The rung connecting the various function blocks on the page is not necessarily sequential. The output of a function block may be looped back on its input or on the input of a block already inserted in the rung.

Function blocks

The PS 1131 software workshop has pre-programmed function blocks (standard library) and offers users the option of creating their own function blocks (user library).

Standard library

The standard library contains:
- Logic functions (AND, OR, etc.)
- Mathematical functions (Cos, Sin, Exp, etc.)
- Function blocks dedicated to drives which simplify data exchanges between the drive and the “Controller Inside” programmable card (e.g. sending the speed reference)
- Function blocks for managing the CANopen machine bus
- Graphic terminal display function blocks.

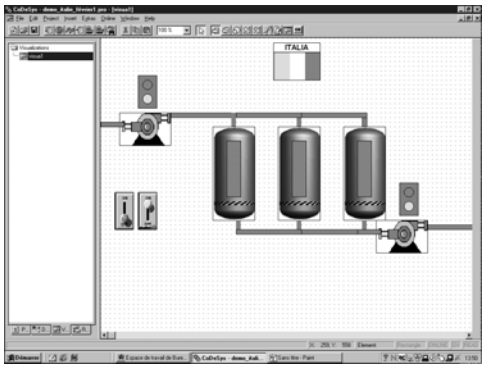
User library

Users have the option of creating their own function blocks in order to structure their applications. This is also a means of protecting the know-how contained in the algorithms, as it is possible to lock access to the user function blocks program.

Variable speed drives for asynchronous motors

Altivar 61

Option: “Controller Inside” programmable card



Example of runtime screen

Debugging

The PS 1131 software workshop offers a complete set of tools for debugging the application.

Program execution for debugging

The main debugging functions are:

- Use of breakpoints
- Step-by-step program execution
- Execution of a single cycle
- Direct access to the subroutines that have been called (call stack).

Realtime program animation

The main functions of realtime animation of the program are:

- Animation of part of the program in any language
- Automatic display of a variables window relating to this part of the program

Animation tables

Tables containing variables for the application to be monitored can be created and saved.

In both these tools, in addition to animating the data, it is possible to:

- Modify and force the value of data of any type
- Change the display format (binary, hexadecimal, etc.).

Oscilloscope

The PS 1131 software workshop Oscilloscope function can be used to monitor up to 20 variables in the form of curves.

Runtime screens

A tool integrated in the PS 1131 software workshop can be used to design and use runtime screens for the application:

- Creation of screen backgrounds
- Animation of graphic objects associated with variables
- Display of messages
- …

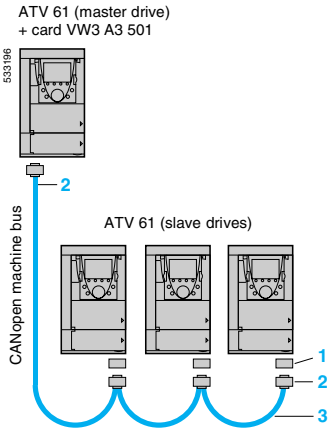
Simulation

The PS 1131 software workshop Simulation function can be used to test the program without having to set up the drive.

Variable speed drives for asynchronous motors

Altivar 61

Option: “Controller Inside” programmable card



Master/slave application

VW3 CAN A71

TSX CAN KCDF 180 T

References

Card

Description	Reference	Weight kg
“Controller Inside” programmable card *(1)* equipped with one 9-way male SUB-D connector	**VW3 A3 501**	0.320

Connection accessories *(2)*

Description	No.	Reference	Weight kg
CANopen adapter to be mounted on the RJ45 socket in the drive control terminals. The adaptor provides a 9-way male SUB-D connector conforming to the CANopen standard (CIA DRP 303-1).	1	**VW3 CAN A71**	–
CANopen connector 9-way female SUB-D with line terminator that can be disabled	2	**TSX CAN KCDF 180T**	–

Cables *(2)*

Description	No.	Length (m)	Reference	Weight kg
CANopen cables Standard cable, CE marking Low smoke emission, halogen-free Flame retardant (IEC 60332-1)	3	50	**TSX CAN CA 50**	4.930
		100	**TSX CAN CA 100**	8.800
		300	**TSX CAN CA 300**	24.560
CANopen cables UL certification, CE marking Flame retardant (IEC 60332-2)	3	50	**TSX CAN CB 50**	3.580
		100	**TSX CAN CB 100**	7.840
		300	**TSX CAN CB 300**	21.870
CANopen cables Cable for harsh environments *(3)* or mobile installation, CE marking Low smoke emission, halogen-free Flame retardant (IEC 60332-1)	3	50	**TSX CAN CD 50**	3.510
		100	**TSX CAN CD 100**	7.770
		300	**TSX CAN CD 300**	21.700

PS 1131 software workshop

Description	Reference	Weight kg
PS 1131 software workshop supplied on CD-ROM	*(4)*	–
Connection kit for PC serial port including various accessories such as: ■ 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	**VW3 A8 106**	0.350

(1) The Altivar 61 drive can only take one “Controller Inside” programmable card. Consult the tables summarizing the possible combinations: drives, options and accessories, see pages 2/246 to 2/251.
(2) Consult our “Machines and installations with CANopen” catalogue.
(3) Harsh environments:
- 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) The product reference is provided during the “Controller Inside” programmable card training course. Please consult your Regional Sales Office.

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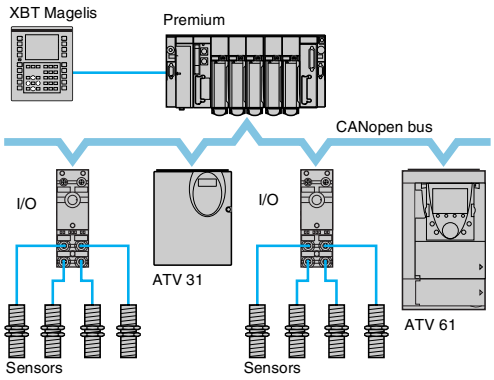
Characteristics: page 2/200
Functions: pages 2/201 to 2/204
Schemes: page 2/283

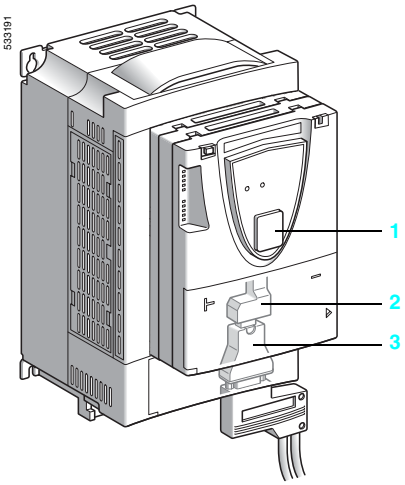
Variable speed drives for asynchronous motors

Altivar 61

Communication buses and networks



Example of configuration on the CANopen machine bus



Presentation

The Altivar 61 drive is designed to suit all configurations found in communicating industrial installations.

It includes Modbus and CANopen communication protocols as standard.

The Modbus protocol can be accessed directly by means of 2 integrated communication ports (for characteristics, see page 2/169):
- One RJ45 Modbus terminal port 1, located on the drive front panel, for connecting:
  - The remote graphic display terminal
  - A Magelis industrial HMI terminal
  - The PowerSuite software workshop
- One RJ45 Modbus network port 2, located on the drive control terminals. It is dedicated to control and signalling by a PLC or other type of controller.

It can also be used to connect a terminal or the PowerSuite software workshop.

The CANopen protocol can be accessed from the Modbus network port via the CANopen adapter 3 (for characteristics, see page 2/169). In this case, terminal port 1 must be used to access the Modbus protocol.

By means of the addition of one of the 11 optional communication cards, the Altivar 61 drive can also be connected to other communication buses and networks used in different fields, for example in industrial applications or in building management systems (HVAC) *(1)*.

Communication cards for industrial applications:
- Ethernet TCP/IP
- Modbus/Uni-Telway: This card provides access to additional functions to complement those of the integrated, Modbus ASCII and 4-wire RS 485 ports
- Fipio
- Modbus Plus
- Profibus DP
- DeviceNet
- INTERBUS

Communication cards for building management systems (HVAC):
- LONWORKS,
- METASYS N2
- APOGEE FLN
- BACnet

The option of powering the control part separately enables communication to be maintained (monitoring, diagnostics) even if there is no power supply to the power part.

The main Altivar 38 drive communication functions are compatible with the Altivar 61 drive *(2)*:
- Connection
- Communication services
- Drive behaviour (profile)
- Control and monitoring parameters
- Standard adjustment parameters

The PowerSuite software workshop can be used to port configurations from the Altivar 38 drive to the Altivar 61 drive.

(1) Heating Ventilation Air Conditioning
(2) Consult the ATV 38/ATV 61 substitution guide supplied on the documentation CD-ROM.

Functions: page 2/207
Characteristics: pages 2/208 to 2/213
References: pages 2/214 and 2/215

Variable speed drives for asynchronous motors
Altivar 61
Communication buses and networks

Functions

All the drive functions can be accessed via the network:
- Control
- Monitoring
- Adjustment
- Configuration

If the drive is equipped with a “Controller Inside” programmable card or a multi-pump card, its variables (% MW, etc.) can be accessed using the Modbus message handling services via the integrated communication ports or the Ethernet TCP/IP communication card.

The speed command and reference may come from different control sources:
- I/O terminals
- Communication network
- “Controller Inside” programmable card
- Multi-pump cards
- Remote graphic display terminal

The advanced functions of the Altivar 61 drive can be used to manage switching of these drive control sources according to the application requirements.

It is possible to choose the assignment of the communication periodic variables using:
- The network configuration software (Sycon, etc.)
- The Altivar 61 drive communication scanner function

For the integrated Modbus and CANopen ports and for the communication cards for industrial applications, the Altivar 61 drive can be controlled:
- According to the CiA DSP 402 (Drivecom) profile
- According to the I/O profile where control is as simple and adaptable as control via the I/O terminals

The DeviceNet card also supports the ODVA AC Drive and Allen-Bradley drive profiles.

Communication is monitored according to criteria specific to each protocol. However, regardless of the protocol, it is possible to configure how the drive responds to a communication fault:
- Freewheel stop, stop on ramp, fast stop or braked stop
- Maintain the last command received
- Fallback position at a predefined speed
- Ignore the fault

A command from the CANopen machine bus is processed with the same priority as one of the drive terminal inputs. This results in excellent response times on the network port via the CANopen adaptor.

Variable speed drives for asynchronous motors

Altivar 61

Communication buses and networks

Characteristics of the VW3 A3 310 Ethernet TCP/IP card *(1)*

Structure	Connector	One RJ45 connector
	Transmission speed	10/100 Mbps, half duplex and full duplex
	IP addressing	■ Manual assignment via the display terminal or the PowerSuite software workshop ■ BOOTP (IP address dynamic server depending on the IEEE address) ■ DHCP (address dynamic server depending on the Device Name) with automatic reiteration
	Physical	Ethernet 2
	Link	LLC: IEEE 802.2 MAC: IEEE 802.3
	Network	IP (RFC791) ICMP client for supporting certain IP services such as the “ping” command
	Transport	TCP (RFC793), UDP The maximum number of connections is 8 (port 502)
Services	Transparent Ready *(2)* class	C20
	Web server	Simultaneous access via 3 Web browsers (more, according to the number of connections used) Server factory-configured and modifiable The memory available for the application is approximately 1 MB The factory-configured server contains the following pages: ■ Altivar viewer: displays the drive status and the state of its I/O, the main measurements (speed, current, etc) ■ Data editor: access to the drive parameters for configuration, adjustment and signalling ■ Altivar chart: simplified oscilloscope function ■ Security: configuration of passwords to access viewing and modification ■ FDR Agent: configuration of the “Faulty Device Replacement” parameters ■ IO Scanner: configuration of periodic variables for controlling and monitoring the drive via the PLC, etc. ■ Ethernet statistics: drive identification (IP addresses, version, etc.) from the Ethernet transmission statistics
	Messaging	Read Holding Registers (03), 63 words maximum Read Input Registers (04), 63 words maximum Write Single Register (06) Write Multiple Registers (16), 63 words maximum Read/Write Multiple Registers (23) Read Device Identification (43) Diagnostics (08)
	Periodic variables	I/O scanning service (can be inhibited): ■ 10 control variables which can be assigned by the PowerSuite software workshop or the standard Web server ■ 10 monitoring variables which can be assigned by the PowerSuite software workshop or the standard Web server The Global Data service is not supported
	Functional profiles	CiA DSP 402: “Device Profile Drives and Motion Control” I/O profile
	Network management	SNMP
	File transfer	FTP for Web server and TFTP for FDR
	FDR (Faulty Device Replacement)	Yes
	Communication monitoring	Can be inhibited Time out can be set between 0.5 and 60 s via the terminal, the PowerSuite software workshop or the standard Web server
Diagnostics	Using LEDs	5 LEDs on the card: “RX” (reception), “TX” (transmission), “FLT” (Ethernet fault), “STS” (IP address) and “10/100” Mbps (speed)
	Using the graphic display terminal	Control word received Reference received
	Via the Web server	Number of frames received Number of incorrect frames

(1) For Ethernet TCP/IP network, see pages 4/2 to 4/7.
(2) Please consult our “Ethernet TCP/IP Transparent Ready” catalogue.

Presentation: page 2/206 Functions: page 2/207 References: pages 2/214 and 2/215

Variable speed drives for asynchronous motors
Altivar 61
Communication buses and networks

Characteristics of the VW3 A3 303 Modbus/Uni-Telway card

Structure	Connector	One 9-way female SUB-D connector
	Transmission speed	Configurable via the display terminal or the PowerSuite software workshop: ■ 4800 bps ■ 9600 bps ■ 19200 bps
	Polarization	Type of polarization can be configured using switches on the card: ■ No polarization impedances (supplied by the wiring system, for example, in the master) ■ Two 4.7 kΩ polarization resistors
	Selection of the protocol	Via the display terminal or the PowerSuite software workshop: ■ Modbus RTU ■ Modbus ASCII ■ Uni-Telway
Services	Functional profiles	CiA DSP 402: “Device Profile Drives and Motion Control” I/O profile
	Communication monitoring	Can be inhibited Fixed time out: 10 s
Diagnostics	Using LEDs	2 LEDs on the card: “RUN” (status) and “ERR” (fault)
	Using the graphic display terminal	Control word received Reference received

Characteristics of the Modbus protocol *(1)*

Structure	Physical interface	2-wire RS 485, 4-wire RS 485
	Transmission mode	RTU, ASCII
	Format	Configurable via the display terminal or the PowerSuite software workshop: In RTU mode only: ■ 8 bits, odd parity, 1 stop ■ 8 bits, no parity, 1 stop ■ 8 bits, even parity, 1 stop ■ 8 bits, no parity, 2 stop In RTU and ASCII modes: ■ 7 bits, even parity, 1 stop ■ 7 bits, odd parity, 1 stop ■ 7 bits, even parity, 2 stop ■ 7 bits, odd parity, 2 stop
	Address	1 to 247, configurable using switches on the card.
Service	Messaging	Read Holding Registers (03), 63 words maximum Read Input Registers (04), 63 words maximum Write Single Register (06) Write Multiple Registers (16), 61 words maximum Read/Write Multiple Registers (23) Read Device Identification (43) Diagnostics (08)

Characteristics of the Uni-Telway protocol *(2)*

Structure	Physical interface	2-wire RS 485
	Format	8 bits, odd parity, 1 stop
	Address	1 to 147, configurable using switches on the card.
Service	Messaging	Read word (04h) Write word (14h) Read object (36h), 63 words maximum Write object (37h), 60 words maximum Identification (0Fh) Protocol version (30h) Mirror (FAh) Read error counters (A2h) Reset counters (A4h)

(1) For the Modbus serial link, see pages 4/12 to 4/15.
(2) For the Uni-Telway serial link, see pages 4/20 and 4/21.

2

2.4

Characteristics of the VW3 A3 311 Fipio card *(1)*

Structure	Connector	One 9-way male SUB-D connector
	Transmission speed	1 Mbps
	Address	1 to 62, configurable using switches on the card
Services	Adjustment using PLC software (Unity, PL7)	No
	Periodic variables	8 control variables which can be assigned by communication scanner 8 monitoring variables which can be assigned by communication scanner PKW indexed periodic variable (settings)
	Communication profile	FED C 32
	Functional profiles	CiA DSP 402: “Device Profile Drives and Motion Control” I/O profile
	Communication monitoring	Can be inhibited Fixed time out: 256 ms
Diagnostics	Using LEDs	4 LEDs on the card: “RUN” (status), “ERROR” (fault), “COM” (data exchange) and “I/O” (minor internal fault)
	Using the graphic display terminal	Control word received Reference received Periodic variables (communication scanner)

Characteristics of the VW3 A3 302 Modbus Plus card *(2)*

Structure	Connector	One 9-way female SUB-D connector
	Transmission speed	1 Mbps
	Address	1 to 64, configurable using switches on the card
Services	Messaging	Yes (Modbus)
	Periodic variables	“Peer Cop”: 8 control variables which can be assigned by communication scanner “Global data”: 8 monitoring variables which can be assigned by communication scanner
	Functional profiles	CiA DSP 402: “Device Profile Drives and Motion Control” I/O profile
	Communication monitoring	Can be inhibited Time out can be set between 0.1 and 60 s via the terminal or the PowerSuite software workshop.
Diagnostics	Using LEDs	1 LEDs on the card: “MB+” (status)
	Using the graphic display terminal	Control word received Reference received Periodic variables (communication scanner)

(1) For the Fipio bus, see pages 4/8 to 4/11.
(2) For the Modbus Plus network, see pages 4/16 to 4/19.

Characteristics of the VW3 A3 307 Profibus DP card

Structure	Connector	One 9-way female SUB-D connector
	Transmission speed	9600 bps, 19.2 Kbps, 93.75 Kbps, 187.5 Kbps, 500 Kbps, 1.5 Mbps, 3 Mbps, 6 Mbps or 12 Mbps
	Address	1 to 126, configurable using switches on the card
Services	Periodic variables	PPO type 5 8 control variables which can be assigned by communication scanner 8 monitoring variables which can be assigned by communication scanner PKW indexed periodic variable (settings)
	Functional profiles	CiA DSP 402: “Device Profile Drives and Motion Control” I/O profile
	Communication monitoring	Can be inhibited Time out can be set via the Profibus DP network configurator
Diagnostics	Using LEDs	2 LEDs on the card: “ST” (status) and “DX” (data exchange)
	Using the graphic display terminal	Control word received Reference received Periodic variables (communication scanner)
Description file		A single gsd file is supplied on the documentation CD-ROM for the whole range or can be downloaded from the Internet at “www.telemecanique.com”. This file does not contain the description of the drive parameters.

Characteristics of the VW3 A3 309 DeviceNet card

Structure	Connector	One removable screw connector, 5 contacts at intervals of 5.08
	Transmission speed	125 Kbps, 250 Kbps or 500 Kbps, configurable using switches on the card
	Address	1 to 63, configurable using switches on the card
Services	Periodic variables	ODVA assemblies type 20, 21, 70 and 71 Allen-Bradley® assemblies type 103, 104 and 105 Communication scanner assemblies 100 and 101
	Periodic exchange mode	Inputs: Polled, Change of state, Cyclic Outputs: Polled
	Functional profiles	ODVA AC Drive (02) profile Allen-Bradley drive profile CiA DSP 402: “Device Profile Drives and Motion Control” I/O profile
	Auto Device Replacement	No
	Communication monitoring	Can be inhibited Time out can be set via the DeviceNet network configurator
Diagnostics	Using LEDs	One two-tone LED on the card: “MNS” (status)
	Using the graphic display terminal	Control word received Reference received
Description file		A single eds file is supplied on the documentation CD-ROM for the whole range or can be downloaded from the Internet at “www.telemecanique.com”. This file contains the description of the drive parameters.

2

2.4

Presentation: page 2/206
Functions: page 2/207
References: pages 2/214 and 2/215

Characteristics of the VW3 A3 304 INTERBUS card

Structure	Connector	2 connectors: One 9-way male SUB-D and one 9-way female SUB-D
	Power supply	The card is powered by the drive. To ensure that the INTERBUS subscriber continues to operate during line supply failures to the power part, fit a separate power supply for the drive control part.
Services	Messaging	PCP: ■ Read: read a parameter ■ Write: write a parameter ■ Initiate: initialize the communication relationship ■ Abort: abort the communication relationship ■ Status: Communication and drive status ■ Get-OV: read an object description ■ Identify: identification of the card
	Periodic variables	2 control variables (command and reference) 2 monitoring variables (status and speed output)
	Functional profile	CiA DSP 402 (Drivecom profile 21)
	Communication monitoring	Can be inhibited Fixed time out: 640 ms
Diagnostics	Using LEDs	5 LEDs on the card: “U” (power supply), “RC” (bus input), “Rd” (bus output), “BA” (periodic data) and “TR” (messaging)
	Using the graphic display terminal	Control word received Reference received

Characteristics of the VW3 A3 312 LONWORKS card

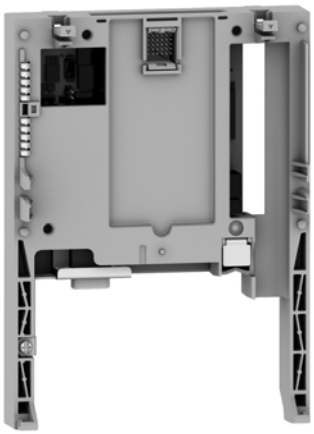
Structure	Connector	1 removable 3-way screw connector
	Topology	TP/FT-10 (free topology)
	Transmission speed	78 Kbps
Services	Functional profiles	LONMARK 6010: Variable Speed Motor Drive LONMARK 0000: Node Object
Diagnostics	Using LEDs	3 LEDs on the card: “Service”, “Status”, “Fault”
	Using the graphic display terminal	Control word received Reference received
Description file		An xif file is supplied on the documentation CD-ROM or can be downloaded from the Internet at “www.telemecanique.com”.

Characteristics of the VW3 A3 313 METASYS N2 card		
Structure	Connector	One 9-way female SUB-D connector
Diagnostics	Using LEDs	2 LEDs on the card: “COM” (network traffic) and “ERR” (fault)
	Using the graphic display terminal	Control word received Reference received
Characteristics of the VW3 A3 314 APOGEE FLN card		
Structure	Connector	One 9-way female SUB-D connector
Diagnostics	Using LEDs	2 LEDs on the card: “COM” (network traffic) and “ERR” (fault)
	Using the graphic display terminal	Control word received Reference received
Characteristics of the VW3 A3 315 BACnet card		
Structure	Connector	One 9-way female SUB-D connector
Diagnostics	Using LEDs	2 LEDs on the card: “COM” (network traffic) and “ERR” (fault)
	Using the graphic display terminal	Control word received Reference received

Variable speed drives for asynchronous motors

Altivar 61

Communication buses and networks



VW3 A3 311

TSX FP ACC12

490 NAD 911 03

Communication cards *(1) (2)*

Description	Use	Reference	Weight kg
Ethernet *(3)*	To be connected on a Hub or Switch using a 490 NTW 000 ●● cable. See pages 4/6 and 4/7	**VW3 A3 310**	0.300
Modbus/ Uni-Telway	To be connected on TSX SCA 62 subscriber socket using the VW3 A8 306 2 cable. See pages 4/14 and 4/21	**VW3 A3 303**	0.300
Fipio	To be connected using a TSX FP ACC 12 connector with a TSX FP CC●● extension cable or a TSX FP CA●● drop cable. See pages 4/10 and 4/11	**VW3 A3 311**	0.300
Modbus Plus	To be connected to the 990 NAD 230 00 IP 20 Modbus Plus tap using a 990 NAD 219●0 cable. See pages 4/18 and 4/19	**VW3 A3 302**	0.300
Profibus DP	To be connected using a 490 NAD 911●● connector to Profibus cable TSX PBS CA●00 *(4)*	**VW3 A3 307**	0.300
DeviceNet	The card is equipped with a removable 5-way screw terminal block.	**VW3 A3 309**	0.300
INTERBUS	To be connected using the 170 MCI ●●●00 *(4)*cable	**VW3 A3 304**	0.300
LONWORKS	The card is equipped with a removable 3-way screw terminal block.	**VW3 A3 312**	0.300
METASYS N2	The card is equipped with a 9-way male SUB-D connector	**VW3 A3 313**	0.300
APOGEE FLN	The card is equipped with a 9-way male SUB-D connector	**VW3 A3 314**	0.300
BACnet	The card is equipped with a 9-way male SUB-D connector	**VW3 A3 315**	0.300

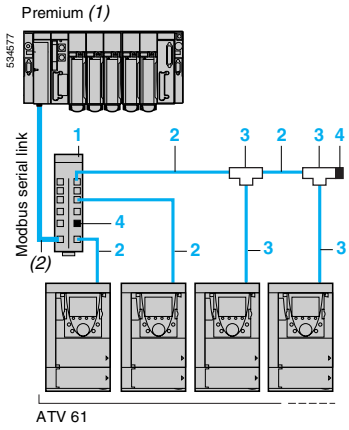
(1) The Altivar 61 drive can only take one communication card. Consult the tables summarizing the possible combinations between drives, options and accessories (see pages 2/246 to 2/251).

(2) The user manuals are supplied on CD-ROM or can be downloaded from the Internet at "www.telemecanique.com". For Profibus DP, DeviceNet and LONWORKS cards, the description files in gsd, eds or xif format are also supplied on CD-ROM or can be downloaded from the Internet at "www.telemecanique.com".

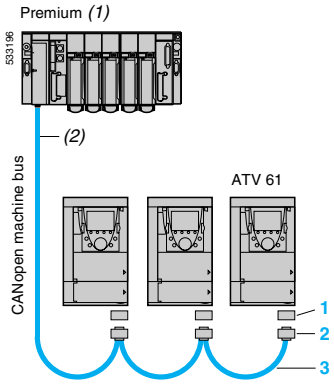
(3) Please consult our "Ethernet TCP/IP Transparent Ready" catalogue.

(4) Please consult our specialist "Automation platform Modicon Premium and Unity - PL7 software" catalogue.

Variable speed drives for asynchronous motors
Altivar 61
Communication buses and networks



Example of Modbus diagram, connections via splitter blocks and RJ45 connectors



Example of CANopen diagram

VW3 CAN A71

VW3 CAN KCDF 180 T

Connection accessories

Description	No.	Length m	Unit reference	Weight kg
Modbus serial link				
Modbus splitter block 10 RJ45 connectors and 1 screw terminal block	1	–	**LU9 GC3**	0.500
Cables for Modbus serial link equipped with 2 RJ45 connectors	2	0.3	**VW3 A8 306 R03**	0.025
		1	**VW3 A8 306 R10**	0.060
		3	**VW3 A8 306 R30**	0.130
Modbus T-junction boxes (with integrated cable)	3	0.3	**VW3 A8 306 TF03**	0.190
		1	**VW3 A8 306 TF10**	0.210
Line terminators for RJ45 connector *(3)*	4	–	**VW3 A8 306 RC**	0.010
			VW3 A8 306 R	0.010

Description	No.	Length m	Reference	Weight kg
CANopen machine bus *(4)*				
CANopen adapter for mounting on the RJ45 socket in the drive control terminals. The adapter provides a 9-way male SUB-D connector conforming to the CANopen standard (CIA DRP 303-1)	1	–	**VW3 CAN A71**	–
CANopen connector *(5)* 9-way female SUB-D connector with line terminator (can be disabled) Output at 180° for 2 CANopen cables. CAN-H, CAN-L, CAN-GND connection	2	–	**VW3 CAN KCDF 180T**	–
CANopen cables *(1)* Standard cable, CE marking Low smoke emission, halogen-free Flame retardant (IEC 60332-1)	3	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)	3	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 *(6)* or mobile installation, CE marking Low smoke emission, halogen-free Flame retardant (IEC 60332-1)	3	50	**TSX CAN CD 50**	3.510
		100	**TSX CAN CD 100**	7.770
		300	**TSX CAN CD 300**	21.700

(1) Please consult our specialist "Automation platform Modicon Premium and Unity - PL7 software" and "Automation platform Modicon TSX Micro and PL7 software" catalogues.
(2) Cable depending on the type of controller or PLC.
(3) Sold in lots of 2.
(4) Please consult our catalogue "Machines & installations with CANopen"
(5) For ATV 61H●●●M3, ATV 61HD11M3X, HD15M3X, ATV 61H075N4 ... HD18N4 drives, this connector can be replaced by the TSX CAN KCDF 180T connector.
(6) Harsh environments:
- Resistance to hydrocarbons, industrial oils, detergents and solder splashes
- Relative humidity up to 100%
- Saline atmosphere
- Significant temperature variations
- Operating temperature between -10°C and +70°C

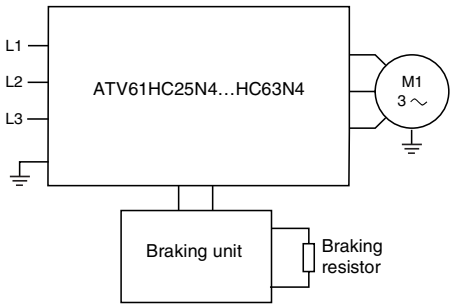
Presentation: page 2/206
Functions: page 2/207
Characteristics: pages 2/208 to 2/213

Variable speed drives for asynchronous motors

Altivar 61

Option: resistance braking units

Presentation



Resistance braking enables the Altivar 61 drive to operate while braking to a standstill or during "generator" operation, by dissipating the energy in the braking resistor.

The ATV 61H●●●M3, ATV 61H●●●M3X, ATV 61H075N4…HC22N4, ATV 61W●●●N4 and ATV 61W●●●N4C drives have a built-in dynamic brake transistor.

For ATV 61HC25N4…HC63N4 drives, a braking unit must be used. It is controlled by the drive:

- For ATV 61HC25N4, HC31N4 and ATV 61HC25N4D, HC31N4D drives, the braking unit is mounted directly on the left-hand side of the drive, see dimensions on pages 2/253 and 2/255,
- For ATV 61HC40N4...HC63N4 drives, the braking unit is an external module, see dimensions on page 2/263.

Application

Machines with high inertia.

Characteristics

Type of braking unit			VW3 A7 101	VW3 A7 102
Ambient air temperature around the device	Operation	°C	- 10…+ 50	
	Storage	°C	- 25…+ 70	
Degree of protection of enclosure			IP 20	
Degree of pollution			2 according to standard EN 50178	
Relative humidity			Class 3K3 without condensation	
Maximum operating altitude		m	2000	
Vibration resistance			0.2 gn	
Nominal voltage of line supply and drive supply (rms value)		V	~ 380 - 15%…480 + 10%	
Engage threshold		V	⎓ 785 ± 1%	
Maximum DC bus voltage		V	850	
Maximum braking power on 400 V ≂ supply	785 V ⎓ *(1)*	kW	420	750
Percentage of conduction time at constant power at 785 V ⎓			5 % at 420 kW	5 % at 750 kW
			15% at 320 kW	15% at 550 kW
			50 % at 250 kW	50 % at 440 kW
Cycle time		s	≤ 240	
Maximum continuous power		kW	200	400
Thermal protection			Integrated, via thermal probe	
Forced ventilation		m^3/h	100	600
Installation			Vertical	
Minimum resistor value to be associated with the braking unit		Ω	1.05	0.7

(1) Braking unit engage threshold

References: page 2/217 | Selection: pages 2/220 to 2/223 | Dimensions: pages 2/253, 2/255 and 2/263 | Schemes: page 2/280 and 2/287

Variable speed drives for asynchronous motors

Altivar 61

Option: resistance braking units

Braking units

Supply voltage: 380...480 V 50/60 Hz

For drives	Power		Loss	Cable (drive-braking unit)		Cable (braking unit-resistors)		Reference	Weight
	Continuous	Max.	Continuous power	Cross-section	Max. length	Cross-section	Max. length		
	kW	kW	W	mm^2	m	mm^2	m		kg
ATV 61HC25N4, ATV 61HC31N4	200	420	550	–	–	2 x 95	50	**VW3 A7 101**	30.000
				Internal connections					
ATV 61HC40N4, ATV 61HC50N4, ATV 61HC63N4	400	750	750	2 x 150	1	2 x 150	50	**VW3 A7 102**	80.000

Note: *To increase the braking power, several resistors can be mounted in parallel on the same braking unit. In this case, do not forget to take the minimum resistance value on each unit into account, see Characteristics on page 2/216.*

Variable speed drives for asynchronous motors

Altivar 61

Option: braking resistors

Presentation

The braking resistor enables the Altivar 61 drive to operate while braking to a standstill, by dissipating the braking energy.
It enables maximum transient braking torque.
The resistors are designed to be mounted on the outside of the enclosure, but should not inhibit natural cooling. Air inlets and outlets must not be obstructed, even partially. The air must be free of dust, corrosive gas and condensation.

Application

Inertia machines.

General characteristics

Type of braking resistor			VW3 A7 701...709	VW3 A7 710...718
Ambient air temperature around the device	Operation	°C	0...+ 50	
	Storage	°C	- 25...+ 70	
Degree of protection of enclosure			IP 20	IP 23
Thermal protection			Via temperature controlled switch or via the drive	Via thermal overload relay
Temperature controlled switch *(1)*	Tripping temperature	°C	120	–
	Max. voltage - max. current		250 V ∿ -1 A	–
	Min. voltage - min. current		24 V ⎓ -0.1 A	–
	Maximum contact resistance	mΩ	60	–
Load factor for the dynamic brake transistors			The internal circuits of Altivar 61 drives rated 220 kW or less have a built-in dynamic brake transistor.	
	ATV 61H●●●M3, ATV 61H●●●M3X, ATV 61H075N4...HD75N4, ATV 61W075N4...WD90N4, ATV 61W075N4C...WD90N4C		The dynamic brake transistor is designed so that it can tolerate 120% of the nominal motor power for 60 s.	
	ATV 61HD90N4...HC22N4		The dynamic brake transistor is designed so that it can tolerate 110 % of the nominal motor power for 60 s.	

Connection characteristics

Type of terminal		Drive connection	Temperature-controlled switch
Maximum wire size	VW3 A7 701...703	4 mm² (AWG 28)	1.5 mm² (AWG 16)
	VW3 A7 704...709	Bar connection, M6	2.5 mm² (AWG 14)
	VW3 A7 710...718	Bar connection, M10	–

Minimum ohmic value of the resistors to be associated with the Altivar 61 drive, at 20°C *(2)*

ATV 61H●●●M3, ATV 61H●●●M3X and ATV 61H●●●N4 drives

Drive type	ATV 61H		075M3	U15M3	U22M3, U30M3	U40M3	U55M3	U75M3	D11M3X, D15M3X	D18M3X	D22M3X, D30M3X	D37M3X... D75M3X
Minimum value		Ω	44	33	22	16	11	8	3	4	3.3	1.7
Drive type	**ATV 61H**		**D90M3X**	**075N4... U22N4**	**U30N4, U40N4**	**U55N4**	**U75N4**	**D11N4**	**D15N4, D18N4**	**D22N4, D30N4**	**D37N4**	**D45N4, D55N4**
Minimum value		Ω	1.3	56	34	23	19	12	7	13.3	6.7	5
Drive type	**ATV 61H**		**D75N4**	**D90N4, C11N4**	**C13N4... C22N4**	**C25N4, C31N4**	**C40N4... C63N4**					
Minimum value		Ω	3.3	2.5	1.9	1.05	0.7					

ATV 61W●●●N4 and ATV 61W●●●N4C drives

Drive type	ATV 61W		075N4... U30N4	U40N4, U55N4	U75N4	D11N4	D15N4	D18N4, D22N4	D30N4, D37N4	D45N4	D55N4, D75N4	D90N4
Minimum value		Ω	56	34	23	19	12	7	13.3	6.7	5	3.3
Drive type	**ATV 61W**		**075N4C... U30N4C**	**U40N4C, U55N4C**	**U75N4C**	**D11N4C**	**D15N4C**	**D18N4C, D22N4C**	**D30N4C, D37N4C**	**D45N4C**	**D55N4C, D75N4C**	**D90N4C**
Minimum value		Ω	56	34	23	19	12	7	13.3	6.7	5	3.3

(1) The contact should be connected in the sequence (use for signalling, or in the line contactor control).
(2) The minimum ohmic value is determined at a temperature of 20°C. In an environment where the temperature is below 20°C, make sure that the minimum ohmic value recommended in the table is followed.

References: page 2/219 | Selection: pages 2/220 to 2/223 | Dimensions: pages 2/263 and 2/264 | Schemes: pages 2/280 and 2/287

Variable speed drives for asynchronous motors
Altivar 61
Option: braking resistors

VW3 A7 701

Braking resistors

For drives	Ohmic value at 20 °C	Average power available at 50 °C *(1)*	Reference	Weight
	Ω	kW		kg
Supply voltage: 200…240 V 50/60 Hz				
ATV 61H075M3	100	0.05	**VW3 A7 701**	1.900
ATV 61HU15M3, HU22M3	60	0.1	**VW3 A7 702**	2.400
ATV 61HU30M3, HU40M3	28	0.2	**VW3 A7 703**	3.500
ATV 61HU55M3, HU75M3	15	1	**VW3 A7 704**	11.000
ATV 61HD11M3X	10	1	**VW3 A7 705**	11.000
ATV 61HD15M3X	8	1	**VW3 A7 706**	11.000
ATV 61HD18M3X, HD22M3X	5	1	**VW3 A7 707**	11.000
ATV 61HD30M3X	4	1	**VW3 A7 708**	11.000
ATV 61HD37M3X, HD45M3X	2.5	1	**VW3 A7 709**	11.000
ATV 61HD55M3X, HD75M3X	1.8	15.3	**VW3 A7 713**	50.000
ATV 61HD90M3X	1.4	20.9	**VW3 A7 714**	63.000
Supply voltage: 380…480 V 50/60 Hz				
ATV 61H075N4…HU40N4 ATV 61W075N4…WU55N4 *(2)* ATV 61W075N4C…WU55N4C *(2)*	100	0.05	**VW3 A7 701**	1.900
ATV 61HU55N4, HU75N4 ATV 61WU75N4, WD11N4 *(2)* ATV 61WU75N4C, WD11N4C *(2)*	60	0.1	**VW3 A7 702**	2.400
ATV 61HD11N4, HD15N4 ATV 61WD15N4, WD18N4 *(2)* ATV 61WD15N4C, WD18N4C *(2)*	28	0.2	**VW3 A7 703**	3.500
ATV 61HD18N4…HD30N4 ATV 61WD22N4…WD37N4 *(2)* ATV 61WD22N4C…WD37N4C *(2)*	15	1	**VW3 A7 704**	11.000
ATV 61HD37N4 ATV 61WD45N4 *(2)* ATV 61WD45N4C *(2)*	10	1	**VW3 A7 705**	11.000
ATV 61WD55N4…WD90N4 *(2)* ATV 61WD55N4C…WD90N4C *(2)*	8	1	**VW3 A7 706**	11.000
ATV 61HD45N4…HD75N4	5	1	**VW3 A7 707**	11.000
ATV 61HD90N4, HC11N4	2.75	25	**VW3 A7 710**	80.000
ATV 61HC13N4, HC16N4	2.1	37	**VW3 A7 711**	86.000
ATV 61HC22N4	2.1	44	**VW3 A7 712**	104.000
ATV 61HC25N4	1.05	56	**VW3 A7 715**	136.000
ATV 61HC31N4	1.05	75	**VW3 A7 716**	172.000
ATV 61HC40N4, HC50N4	0.7	112	**VW3 A7 717**	266.000
ATV 61HC63N4	0.7	150	**VW3 A7 718**	350.000

(1) Load factor for resistors: the value of the average power that can be dissipated at 50 °C from the resistor into the casing is determined for a load factor during braking that corresponds to the majority of normal applications.
(2) The braking resistors' degree of protection is IP 20 or IP 23.

2

2.4

Presentation: page 2/218 | Characteristics: page 2/218 | Selection: pages 2/220 to 2/223 | Dimensions: pages 2/263 and 2/264 | Schemes: pages 2/280 and 2/287

Variable speed drives for asynchronous motors
Altivar 61
Option: braking units and resistors

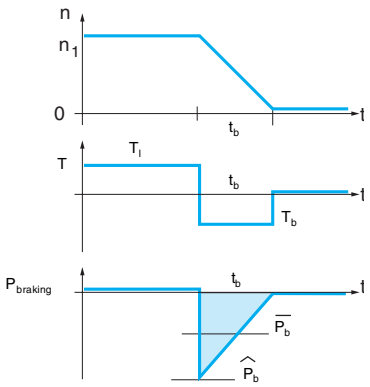
Determining the braking unit and resistor

Calculating the various braking powers makes it possible to determine the braking unit and the braking resistor.

Operation

The braking power during deceleration is characterized by a peak power $\hat{P}_b$ obtained at the start of deceleration, which decreases to 0 in proportion to the speed.
Example: Stopping centrifuges, ventilation, change of direction, etc.

n_1	Motor speed	[rpm]
T_l	Load torque	[Nm]
T_b	Braking torque	[Nm]
$\hat{P}_b$	Peak braking power	[W]
$\bar{P}_b$	Average braking power during t_b	[W]
t_b	Braking time	[s]

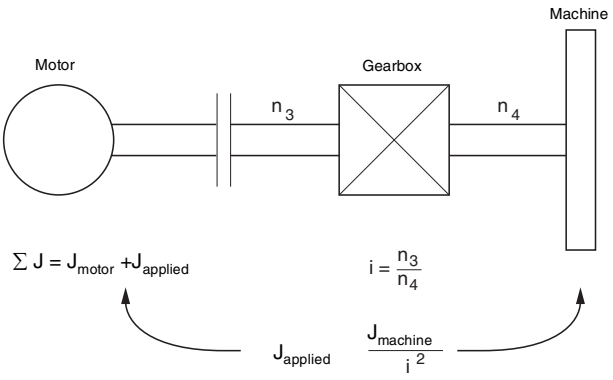


Calculating the braking time from the inertia

$$t_b = \frac{J \cdot \omega}{T_b + T_r} \qquad \omega = \frac{2\pi \cdot n}{60} \qquad T_b = \frac{\Sigma J \cdot (n_3 - n_4)}{9,55 \cdot t_b}$$

$$\hat{P}_b = \frac{T_b \cdot n_3}{9,55} \qquad \bar{P}_b = \frac{\hat{P}_b}{2}$$

T_b	Motor braking torque	[Nm]
ΣJ	Total inertia applied to the motor	[kgm²]
n	Motor speed	[rpm]
n_3	Motor speed ahead of gearbox	[rpm]
n_4	Motor speed after gearbox	[rpm]
t_b	Braking time	[s]
$\hat{P}_b$	Peak braking power	[W]
$\bar{P}_f$	Average braking power during time t_b	[W]
T_r	Resistive torque	[Nm]



Variable speed drives for asynchronous motors

Altivar 61

Characteristics curves for resistors

Example of using characteristics curves

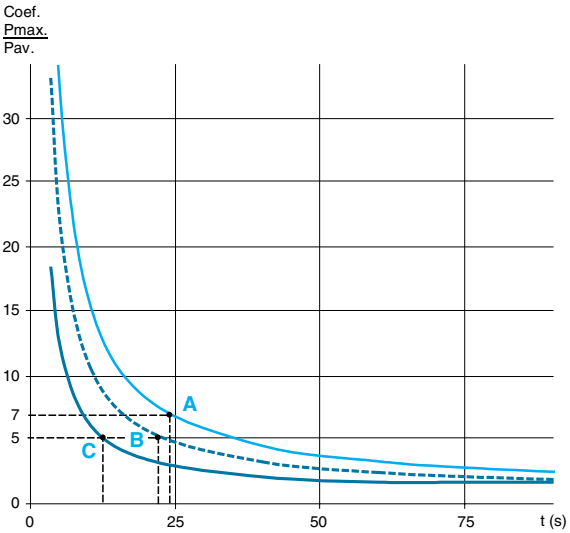
VW3 A7 710 (P continuous = 25 kW) for 2.75 Ω at 20°C

Example of using the curves:

*Point **A** For a 200 s cycle, the resistance of 2.75 Ω can take an overload of 7 x 25 kW (continuous power) for 24 s, or 175 kW of braking every 200 s.*

*Point **B** For a 120 s cycle, the resistance of 2.75 Ω can take an overload of 5 x 25 kW (continuous power) for 20 s, or 125 kW of braking every 120 s.*

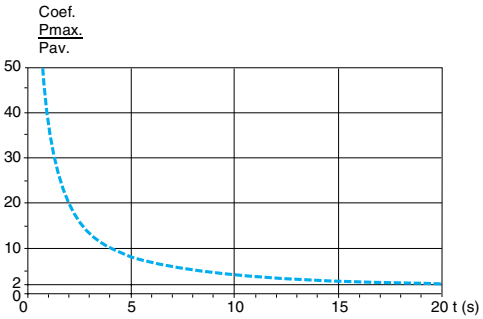
*Point **C** For a 60 s cycle, the resistance of 2.75 Ω can take an overload of 5 x 25 kW (continuous power) for 10 s, or 125 kW of braking every 60 s.*



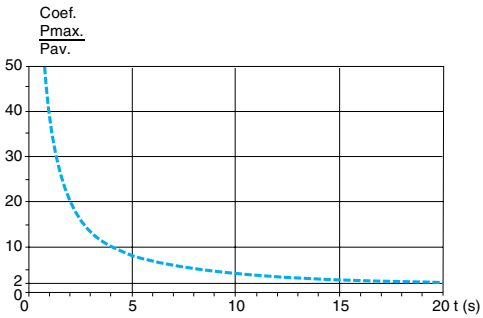
— *P max/P av (60 s cycle)*
- - - *P max/P av (120 s cycle)*
— *P max/P av (200 s cycle)*

Braking resistors

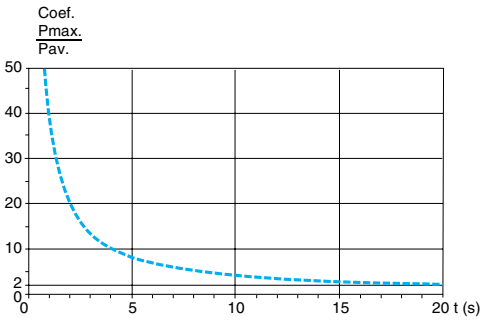
VW3 A7 701 (P continuous = 0.05 kW)



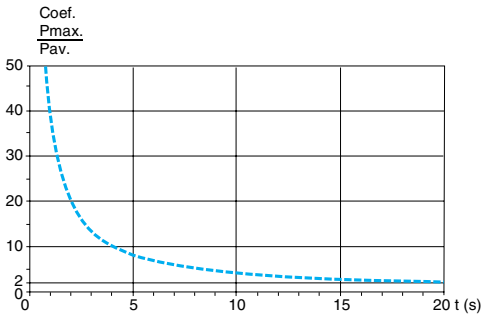
VW3 A7 702 (P continuous = 0.1 kW)



VW3 A7 703 (P continuous = 0.2 kW)



VW3 A7 704…709 (P continuous = 1 kW)



- - - *P max/P av (40 s cycle)*

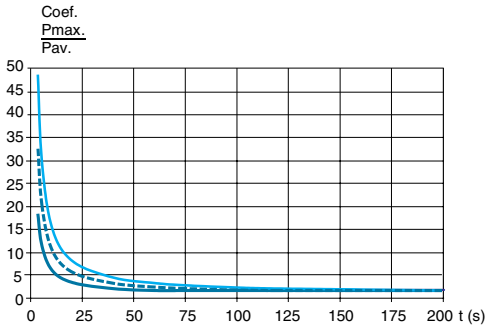
Variable speed drives for asynchronous motors

Altivar 61

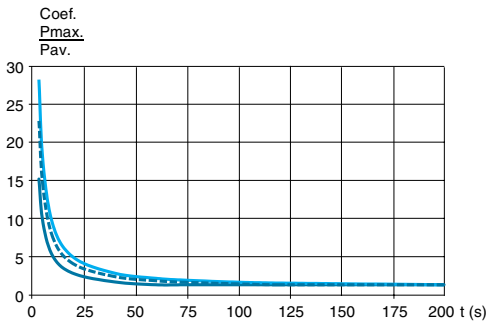
Characteristics curves for resistors

Braking resistors (continued)

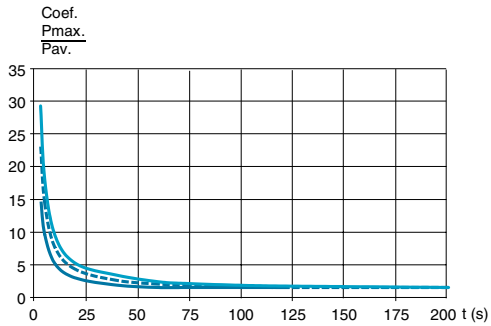
VW3 A7 710 (P continuous = 25 kW)



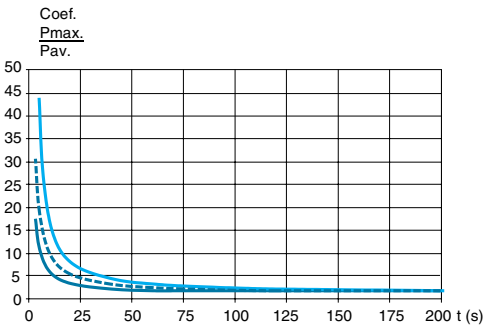
VW3 A7 711 (P continuous = 37 kW)



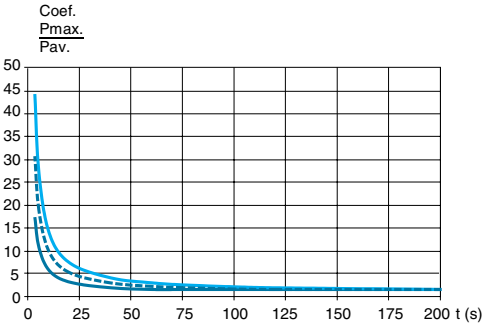
VW3 A7 712 (P continuous = 44 kW)



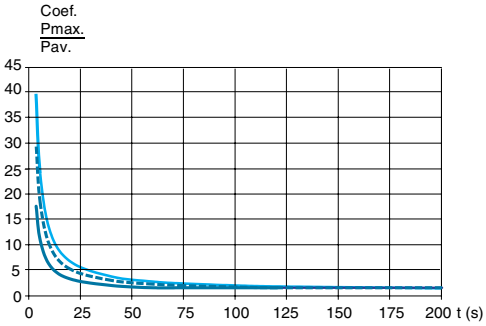
VW3 A7 713 (P continuous = 15.3 kW)



VW3 A7 714 (P continuous = 20.9 kW)



VW3 A7 715 (P continuous = 56 kW)



P max/P av (60 s cycle)
P max/P av (120 s cycle)
P max/P av (200 s cycle)

Presentation: pages 2/216 and 2/218
Characteristics: pages 2/216 and 2/218
References: pages 2/217 and 2/219
Dimensions: pages 2/263 and 2/264
Schemes: pages 2/280 and 2/287

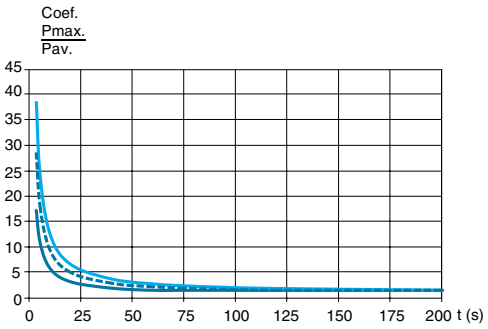
Variable speed drives for asynchronous motors

Altivar 61

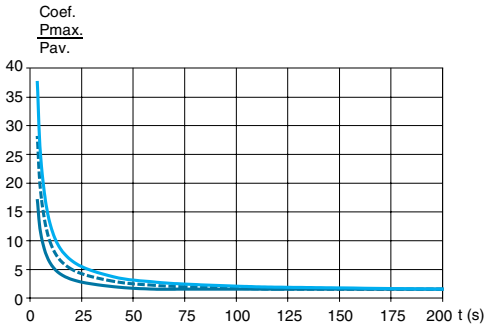
Characteristics curves for resistors

Braking resistors (continued)

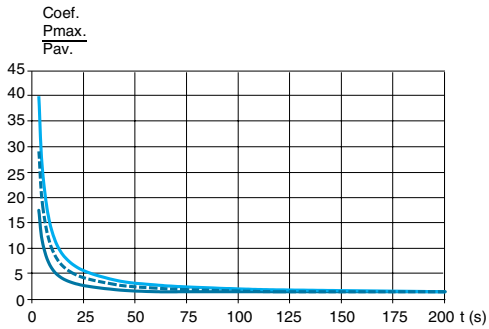
VW3 A7 716 (P continuous = 75 kW)



VW3 A7 717 (P continuous = 112 kW)



VW3 A7 718 (P continuous = 150 kW)

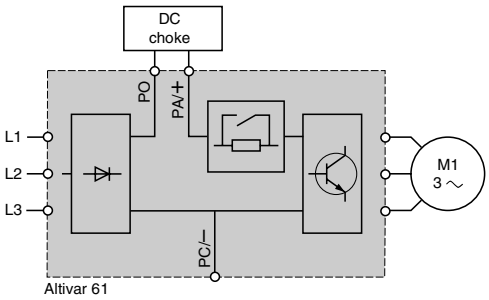


P max/P av (60 s cycle)
P max/P av (120 s cycle)
P max/P av (200 s cycle)

Variable speed drives for asynchronous motors

Altivar 61: Reduction of current harmonics

Option: DC chokes



Altivar 61

The main solutions for reducing current harmonics are as follows:
- DC chokes, see below
- Line chokes, see page 2/228
- 16% and 10% passive filters, see page 2/231
- Use of passive filters with a DC choke, see pages 2/231 to 2/235

These 4 solutions can be used on the same installation.
It is always easier and less expensive to handle current harmonics at installation level as a whole rather than at the level of each individual unit, particularly when using passive filters and active compensators.

DC chokes

DC chokes are used to reduce current harmonics in order to comply with standard IEC 61000-3-12 for drives on which the line current is greater than 16 A and less than 75 A.
Using the DC choke with the drive complies with standard IEC 61000-3-12 provided that the RSCE ⩾ 120 *(1)* at the point of connection to the public network. 120 represents the minimum value of RSCE *(1)* for which the values in table 4 of standard IEC 61000-3-12 are not exceeded.
It is the responsibility of the installer or the user to ensure that the device is connected correctly to a connection point with an RSCE ⩾ 120.
The DC choke is connected to the drive power terminals.

It is supplied as standard with ATV 61HD55M3X, HD90M3X and ATV 61HD90N4…HC63N4 drives and is integrated into ATV 61W●●●N4 and ATV 61W●●●N4C drives.

Applications

Reduction of current harmonics.
Reduction of THD to 5% or to 10% in association with passive filters, see pages 2/231 to 2/235.
Maintaining the motor torque in relation to the line choke.

(1) Short-circuit ratio

Characteristics: page 2/227
References: page 2/227
Dimensions: page 2/265
Schemes: pages 2/276 to 2/279, 2/285 and 2/288

Variable speed drives for asynchronous motors

Altivar 61: Reduction of current harmonics

Option: DC chokes

Example of current harmonic levels for ATV 61H075M3...ATV 61HD90M3X drives (1)

Motor power		For ATV 61 drives	Line supply		Current harmonic levels																	THD (3)
			Line current	Line Isc (2)	H1	H5	H7	H11	H13	H17	H19	H23	H25	H29	H31	H35	H37	H41	H43	H47	H49	
kW	HP		A	kA	A	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
3-phase supply voltage: 230 V 50 Hz, with optional DC choke																						
0.75	1	H075M3	3.05	5	2.81	31.99	20.91	8.88	7.36	5.6	4.63	4.07	3.42	3.18	2.71	2.59	2.24	2.17	1.91	1.86	1.66	41.27
1.5	2	HU15M3	6.04	5	5.55	33.65	21.59	8.14	6.84	4.97	4.19	3.54	3.08	2.71	2.43	2.17	2.01	1.78	1.7	1.5	1.47	42.4
2.2	3	HU22M3	8.33	5	7.64	34.89	21.11	8.78	6.72	5.36	4.1	3.8	3	2.9	2.37	2.29	1.95	1.85	1.66	1.52	1.44	43.33
3	–	HU30M3	11.12	5	10.19	35.17	20.68	8.71	6.48	5.24	3.94	3.67	2.88	2.76	2.27	2.15	1.87	1.71	1.58	1.37	1.37	43.22
4	5	HU40M3	14.53	5	13.29	36.23	20.51	8.73	6.2	5.2	3.73	3.61	2.71	2.68	2.14	2.06	1.76	1.61	1.49	1.27	1.28	43.91
5.5	7.5	HU55M3	19.2	8	17.9	30.68	17.26	8.75	6.31	5.3	4.03	3.72	2.98	2.79	2.36	2.17	1.94	1.71	1.63	1.36	1.4	38
7.5	10	HU75M3	26.1	15	23.9	35.23	21.09	8.82	6.71	5.38	4.09	3.82	2.98	2.91	2.35	2.31	1.92	1.87	1.63	1.54	1.4	43.96
11	15	HD11M3X	36.6	15	34.2	30.91	17.12	8.86	6.36	5.37	4.08	3.77	3.01	2.82	2.37	2.19	1.94	1.73	1.62	1.37	1.38	38.14
15	20	HD15M3X	48.6	15	45.8	28.3	14.9	8.8	6.2	5.3	4.1	3.7	3	2.7	2.4	2.1	1.9	1.6	1.6	1.2	1.3	35
18.5	25	HD18M3X	60	22	56	31.5	17.1	8.7	6.1	5.2	3.9	3.7	2.9	2.7	2.3	2.1	1.9	1.7	1.6	1.3	1.3	38.5
22	30	HD22M3X	70.28	22	65.92	29.81	15.91	8.7	6.15	5.23	3.99	3.63	2.95	2.68	2.32	2.04	1.89	1.57	1.57	1.22	1.32	36.62
30	40	HD30M3X	96.9	22	88.78	36.68	19.42	8.38	5.67	4.86	3.44	3.29	2.52	2.38	1.98	1.77	1.62	1.34	1.34	1.02	1.12	43.51
37	50	HD37M3X	116.1	22	107.9	33.09	16.4	8.59	5.59	4.97	3.54	3.33	2.6	2.36	2.03	1.72	1.63	1.26	1.32	0.94	1.06	39.24
45	60	HD45M3X	138.7	22	130.5	30.15	13.86	8.65	5.38	5.01	3.49	3.33	2.55	2.33	1.96	1.66	1.53	1.2	1.19	0.9	0.9	35.7
3-phase supply voltage: 230 V 50 Hz, with DC choke supplied as standard with the drive																						
55	75	HD55M3X	120	14	109.29	39.77	18.67	7.98	4.67	4.16	2.59	2.61	1.81	1.76	1.35	1.23	1.02	0.87	0.78	0.63	0.59	45.36
75	100	HD75M3X	163	35	148.35	38.83	20.24	8.2	5.43	4.58	3.15	3.04	2.24	2.17	1.7	1.62	1.33	1.23	1.06	0.94	0.84	45.51
90	125	HD90M3X	196.06	35	177.16	40.75	21.04	8.1	5.26	4.42	2.93	2.88	2.06	2.04	1.55	1.49	1.21	1.12	0.95	0.85	0.75	47.41

Example of current harmonic levels for ATV 61H075N4...ATV 61HC63N4 drives (1)

Motor power		For ATV 61 drives	Line supply		Current harmonic levels																	THD (3)
			Line current	Line Isc (2)	H1	H5	H7	H11	H13	H17	H19	H23	H25	H29	H31	H35	H37	H41	H43	H47	H49	
kW	HP		A	kA	A	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
3-phase supply voltage: 400 V 50 Hz, with optional DC choke																						
0.75	1	H075N4	1.77	5	1.61	34.6	23.7	8.9	7.8	5.6	4.8	4.1	3.5	3.2	2.8	2.6	2.3	2.2	1.9	1.9	1.7	44.95
1.5	2	HU15N4	3.34	5	3.03	35.55	23.53	8.95	7.65	5.61	4.74	4.06	3.49	3.16	2.76	2.57	2.28	2.15	1.94	1.83	1.68	45.48
2.2	3	HU22N4	4.83	5	4.4	35.79	22.77	8.7	7.11	5.41	4.36	3.89	3.2	3.01	2.53	2.43	2.09	2.01	1.77	1.7	1.53	45
3	–	HU30N4	6.13	5	5.67	31.61	18.82	9.41	6.82	5.88	4.57	4.24	3.38	3.28	2.67	2.63	2.19	2.16	1.86	1.8	1.6	40.08
4	5	HU40N4	8.24	5	7.51	36.16	21.63	9	8.17	5.52	4.17	3.93	3.05	3	2.4	2.38	1.98	1.93	1.68	1.58	1.45	44.72
5.5	7.5	HU55N4	10.81	22	9.83	34.85	23.08	9.68	4.05	6.12	5.18	4.45	3.83	3.48	3.04	2.85	2.52	2.4	2.14	2.06	1.85	45.19
7.5	10	HU75N4	15.01	10	13.8	34.09	20.49	8.57	6.43	5.28	3.95	3.78	2.89	2.9	2.28	2.32	1.88	1.9	1.59	1.58	1.37	42.25
11	15	HD11N4	21.1	9	19.3	35.22	20.11	8.95	6.5	5.41	4.02	3.8	2.95	2.86	2.32	2.23	1.9	1.77	1.6	1.42	1.37	43.1
15	20	HD15N4	28.2	12	25.8	35.22	20.01	8.98	6.49	5.43	4.02	3.82	2.94	2.88	2.32	2.24	1.9	1.78	1.6	1.43	1.37	43.06
18.5	25	HD18N4	33.9	12	31.9	28.36	15.16	8.85	6.18	5.39	4.04	3.78	2.98	2.83	2.34	2.18	1.9	1.7	1.58	1.33	1.33	35.23
22	30	HD22N4	40.87	22	37.85	32.79	18.73	8.6	6.42	5.28	4.09	3.75	3.03	2.85	2.4	2.25	1.97	1.81	1.67	1.48	1.44	40.4
30	40	HD30N4	54.1	20	50.6	29.97	16.26	8.75	6.27	5.32	4.07	3.73	3.01	2.79	2.37	2.15	1.94	1.69	1.62	1.33	1.38	36.99
37	50	HD37N4	66.43	22	62.6	28.49	15.01	8.63	6.08	5.23	4	3.65	2.97	2.71	2.34	2.07	1.9	1.61	1.58	1.26	1.32	35.13
45	60	HD45N4	83.11	22	75.56	38.31	20.96	8.24	5.81	4.85	3.48	3.33	2.54	2.44	2	1.85	1.64	1.42	1.38	1.1	1.17	45.59
55	75	HD55N4	98.6	22	91.69	32.94	16.76	8.5	5.68	4.98	3.62	3.38	2.67	2.44	2.09	1.81	1.69	1.37	1.39	1.04	1.14	39.29
75	100	HD75N4	134	22	125.9	30.65	14.43	8.4	5.4	4.84	3.52	3.21	2.59	2.25	2	1.61	1.58	1.17	1.25	0.88	0.96	36.2
3-phase supply voltage: 400 V 50 Hz, with DC choke supplied as standard with the drive																						
90	125	HD90N4	158.81	35	145.1	36.72	20.66	8.33	6.19	4.93	3.78	3.43	2.75	2.56	2.13	1.99	1.72	1.59	1.4	1.29	1.16	44.26
110	150	HC11N4	188.59	35	175.53	33.15	16.56	8.29	5.6	4.81	3.57	3.26	2.58	2.36	1.97	1.77	1.53	1.36	1.2	1.04	0.95	39.26
132	200	HC13N4	226.53	35	209.69	34.91	17.14	8.21	5.36	4.66	3.33	3.11	2.4	2.22	1.82	1.64	1.41	1.24	1.1	0.94	0.86	40.86
160	250	HC16N4	271.34	50	251.7	34	17.22	8.28	5.59	4.8	3.51	3.23	2.56	2.35	1.94	1.76	1.51	1.34	1.2	1.04	0.95	40.24
200	300	HC22N4	337.95	50	313.51	34.38	16.75	8.23	5.33	4.65	3.32	3.09	2.39	2.2	1.81	1.63	1.38	1.22	1.07	0.91	0.84	40.24
220	350	HC22N4	369.49	50	344.77	32.98	15.54	8.23	5.26	4.66	3.33	3.07	2.39	2.17	1.79	1.57	1.35	1.16	1.03	0.86	0.79	38.53
250	400	HC25N4	418.15	50	390.95	32.69	14.89	8.15	5.14	4.56	3.26	2.98	2.32	2.07	1.71	1.48	1.29	1.07	0.97	0.78	0.72	37.95
280	450	HC31N4	471.17	50	437.41	34.78	15.9	8.1	4.92	4.44	3.04	2.86	2.16	1.97	1.6	1.4	1.21	1	0.9	0.72	0.67	40.05
315	500	HC31N4	526.6	50	492.29	33.1	14.44	8.08	4.85	4.41	3.05	2.81	2.15	1.9	1.57	1.32	1.15	0.92	0.84	0.65	0.61	37.99
355	–	HC40N4	591.92	50	554.81	32.59	13.7	8	4.73	4.32	2.99	2.71	2.09	1.8	1.5	1.22	1.08	0.84	0.78	0.57	0.55	37.2
400	600	HC40N4	660.94	50	622.77	31.23	12.61	7.95	4.71	4.26	2.99	2.63	2.06	1.71	1.45	1.12	1.01	0.75	0.7	0.51	0.49	35.57
500	700	HC50N4	834.65	50	781.47	33.52	13.05	7.75	4.28	3.97	2.65	2.37	1.82	1.49	1.26	0.96	0.88	0.63	0.61	0.43	0.42	37.54
560	800	HC63N4	930.84	50	874.82	32.5	12.37	7.76	4.28	3.96	2.67	2.34	1.78	1.46	1.21	0.86	0.79	0.56	0.54	0.39	0.38	36.39
630	900	HC63N4	1037.11	50	980.2	31.06	11.11	7.64	4.23	3.81	2.63	2.15	1.73	1.27	1.13	0.77	0.73	0.5	0.48	0.39	0.36	34.61

(1) Example of current harmonic levels up to harmonic order 49 for a 230 V/50 Hz line supply for ATV 61H●●●M3 and ATV 61H●●●M3X drives or 400 V/50 Hz for ATV 61H●●●N4 drives, with the chokes connected between the PO and PA/+ on the Altivar 61.

(2) The line Icc values are given for the current harmonic levels in the tables.

(3) Total harmonic distortion conforming to standard IEC 61000-3-12.

Characteristics: page 2/227 | References: page 2/227 | Dimensions: page 2/265 | Schemes: pages 2/276 to 2/279, 2/285 and 2/288

Variable speed drives for asynchronous motors

Altivar 61: Reduction of current harmonics

Option: DC chokes

Example of current harmonic levels for ATV 61W●●●N4 and ATV 61W●●●N4C drives (1)

3-phase supply voltage: 400 V 50 Hz, with integrated DC choke

Motor power		For ATV 61 drives	Line supply		Current harmonic levels																	THD (3)
			Line current	Line Isc (2)	H1	H5	H7	H11	H13	H17	H19	H23	H25	H29	H31	H35	H37	H41	H43	H47	H49	
kW	HP		A	kA	A	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
0.75	1	W075N4 W075N4C	1.75	5	1.61	32.12	22.41	8.97	7.96	5.77	5	4.25	3.69	3.36	2.93	2.78	2.43	2.37	2.08	2.06	1.81	42.65
1.5	2	WU15N4 WU15N4C	3.38	5	3.08	34.84	23.58	8.77	7.71	5.60	4.77	4.11	3.51	3.24	2.78	2.67	2.30	2.26	1.96	1.96	1.71	45.12
2.2	3	WU22N4 WU22N4C	4.77	5	4.38	33.37	22.01	8.8	7.48	5.6	4.7	4.1	3.48	3.23	2.76	2.65	2.28	2.24	1.94	1.93	1.69	43.12
3	–	WU30N4 WU30N4C	6.39	5	5.84	35.07	22.41	8.51	7.38	5.36	4.63	3.89	3.43	3.04	2.73	2.48	2.26	2.08	1.93	1.79	1.67	44.48
4	5	WU40N4 WU40N4C	8.39	5	7.64	36.07	22.73	8.45	7.27	5.29	4.52	3.82	3.33	2.97	2.65	2.42	2.19	2.02	1.86	1.73	1.61	45.34
5.5	7.5	WU55N4 WU55N4C	10.71	22	9.9	30.94	21	9.56	8.22	6.09	5.31	4.47	3.94	3.52	3.14	2.9	2.6	2.45	2.21	2.11	1.92	41.41
7.5	10	WU75N4 WU75N4C	15.1	22	13.73	35.93	23.66	8.72	7.55	5.53	4.65	4.03	3.41	3.16	2.7	2.59	2.23	2.19	1.89	1.88	1.64	45.9
11	15	WD11N4 WD11N4C	20.75	22	19.35	29.81	18.76	9.1	7.38	5.76	4.79	4.2	3.56	3.29	2.83	2.69	2.34	2.26	1.99	1.93	1.72	38.88
15	20	WD15N4 WD15N4C	28.74	22	26.24	35.65	22.28	8.55	7.22	5.32	4.50	3.83	3.32	2.97	2.63	2.41	2.17	2.01	1.84	1.71	1.58	44.79
18.5	25	WD18N4 WD18N4C	35.41	22	32.11	37.49	23.29	8.44	7.13	5.22	4.36	3.74	3.19	2.88	2.52	2.32	2.08	1.93	1.75	1.63	1.51	46.65
22	30	WD22N4 WD22N4C	41.66	22	37.87	37.21	22.55	8.38	6.95	5.16	4.26	3.69	3.13	2.84	2.47	2.29	2.02	1.89	1.7	1.6	1.46	45.99
30	40	WD30N4 WD30N4C	54.02	22	50.77	29.05	16.24	8.66	6.55	5.39	4.32	3.86	3.22	2.96	2.55	2.36	2.09	1.92	1.76	1.59	1.5	36.54
37	50	WD37N4 WD37N4C	66.15	22	62.09	29.46	16.33	8.76	6.51	5.41	4.25	3.85	3.15	2.93	2.48	2.32	2.03	1.86	1.7	1.52	1.45	36.89
45	60	WD45N4 WD45N4C	80.82	22	75.33	31.82	17.26	8.57	6.24	5.22	4.02	3.69	2.97	2.78	2.34	2.18	1.91	1.73	1.59	1.39	1.35	38.98
55	75	WD55N4 WD55N4C	100.42	22	92.45	35.41	19.11	8.24	6.06	4.92	3.78	3.43	2.77	2.57	2.16	2	1.73	1.6	1.42	1.3	1.18	42.51
75	100	WD75N4 WD75N4C	133.88	22	125.86	30.11	14.93	8.5	5.85	5.07	3.82	3.49	2.81	2.56	2.19	1.92	1.76	1.46	1.43	1.12	1.18	36.35
90	125	WD90N4 WD90N4C	164.46	35	152.4	33.86	17.83	8.24	5.98	4.93	3.8	3.43	2.8	2.57	2.18	2	1.75	1.6	1.43	1.29	1.18	40.65

(1) Example of current harmonic levels up to harmonic order 49 for a 400 V/50 Hz supply with chokes connected between the PO and PA/+ terminals on the Altivar 61.

(2) The line Icc values are given for the current harmonic levels in the tables.

(3) Total harmonic distortion conforming to standard IEC 61000-3-12.

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Variable speed drives for asynchronous motors

Altivar 61: Reduction of current harmonics

Option: DC chokes

General characteristics

Degree of protection			IP 20
Maximum relative humidity			95%
Ambient air temperature around the device	Operation	°C	- 10…+ 50 without derating Up to 60°C with current derating of 2.2% per °C above 50°C
	Storage	°C	- 40…+ 65
Maximum operating altitude		m	1000 without derating 1000…3000 with current derating of 1% per additional 100 m
Voltage drop			4 to 6%
Maximum current			1.65 x nominal current for 60 seconds

Connection characteristics

Type of terminal		Earth	Power supply
Maximum connection capacity and tightening torque	VW3 A4 501…505	10 mm² (AWG 6) 1.2…1.4 Nm	2.5 mm² (AWG 12) 0.4…0.6 Nm
	VW3 A4 506	10 mm² (AWG 6) 1.2…1.4 Nm	4 mm² (AWG 10) 0.5…0.8 Nm
	VW3 A4 507	10 mm² (AWG 6) 1.2…1.4 Nm	6 mm² (AWG 8) 0.8…1 Nm
	VW3 A4 508, 509	10 mm² (AWG 6) 1.2…1.4 Nm	10 mm² (AWG 6) 1.2…1.4 Nm
	VW3 A4 510	10 mm² (AWG 6) 1.2…1.4 Nm	35 mm² (AWG 0) 2.5…3 Nm
	VW3 A4 511	–	Connected on a bar, Ø 9 –
	VW3 A4 512	–	Connected on a bar, Ø 9 –

DC chokes *(1)*

For drives	Inductance value	Nominal current	Loss	Reference	Weight
	mH	A	W		kg
3-phase supply voltage: 200…240 V 50/60 Hz					
ATV 61H075M3	6.8	8	22.5	**VW3 A4 503**	1.700
ATV 61HU15M3	3.2	14.3	32	**VW3 A4 505**	2.200
ATV 61HU22M3	2.2	19.2	33	**VW3 A4 506**	2.500
ATV 61HU30M3	1.6	27.4	43	**VW3 A4 507**	3.000
ATV 61HU40M3, HU55M3	1.2	44	61	**VW3 A4 508**	4.500
ATV 61HU75M3	0.7	36	30.5	**VW3 A4 509**	2.500
ATV 61HD11M3X, HD15M3X	0.52	84.5	77	**VW3 A4 510**	6.200
ATV 61HD18M3X, HD22M3X	0.22	171.2	86	**VW3 A4 511**	15.500
ATV 61HD30M3X… HD45M3X	0.09	195	73	**VW3 A4 512**	10.000
3-phase supply voltage: 380…480 V 50/60 Hz					
ATV 61H075N4	18	2.25	7.7	**VW3 A4 501**	0.650
ATV 61HU15N4	10	4.3	11	**VW3 A4 502**	1.000
ATV 61HU22N4, HU30N4	6.8	8	22.5	**VW3 A4 503**	1.700
ATV 61HU40N4	3.9	10.7	27	**VW3 A4 504**	1.650
ATV 61HU55N4	3.2	14.3	32	**VW3 A4 505**	2.200
ATV 61HU75N4	2.2	19.2	33	**VW3 A4 506**	2.500
ATV 61HD11N4	1.6	27.4	43	**VW3 A4 507**	3.000
ATV 61HD15N4, HD18N4	1.2	44	57.5	**VW3 A4 508**	4.300
ATV 61HD22N4… HD37N4	0.52	84.5	98.3	**VW3 A4 510**	5.600
ATV 61HD45N4… HD75N4	0.22	171.2	128	**VW3 A4 511**	9.100

(1) For ATV 61HD55M3X…HD90M3X, ATV 61HD90N4…HC63N4 drives, the choke is supplied as standard with the drive.
It is integrated into ATV 61W●●●N4 and ATV 61W●●●N4C drives.

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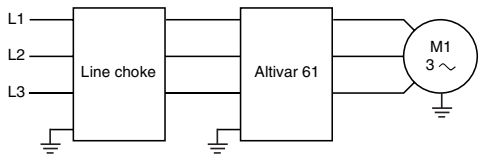
Dimensions: page 2/265
Schemes: pages 2/276 to 2/279, 2/285 and 2/288

Variable speed drives for asynchronous motors

Altivar 61: Reduction of current harmonics

Option: Line chokes



Line chokes

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

Line chokes are compulsory on ATV 61HU40M3…HU75M3 drives supplied with a single phase 200…240 V 50/60 Hz supply voltage.

They can be used instead of a DC choke. In this case, to order an ATV 61HD55M3X…HD90M3X and ATV 61HD90N4…HC63N4 drive without DC choke, add the letter D to the end of the drive's reference, see pages 2/172 and 2/173.

The recommended chokes can be used to 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 between phases of 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 drive.

Applications

The use of line chokes is recommended in particular under the following circumstances:

- Close connection of several drives in parallel
- Line supply with significant disturbance from other equipment (interference, overvoltages)
- Line supply with voltage imbalance between phases above 1.8% of the nominal voltage
- Drive supplied by a line with very low impedance (in the vicinity of a power transformer 10 times more powerful than the drive rating)
- Installation of a large number of frequency converters on the same line
- Reduction of overload in cos φ correction capacitors, if the installation has a power factor correction unit

2

2.4

Characteristics: page 2/229
References: page 2/230
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Variable speed drives for asynchronous motors

Altivar 61: Reduction of current harmonics

Option: Line chokes

General characteristics

Type of choke			VW3 A58501. A58502	VW3 A4 551... A4 553	VW3 A4 554, A4 555	VW3 A4 556... A4 560	VW3 A4 561, A4 564, 565, A4 568, 569
Conformity to standards			EN 50178 (VDE 0160 level 1 high energy overvoltages on the line supply), IEC 60076 (with HD 398)				
Degree of protection	Choke		IP 00				
	Terminals		IP 20		IP 10	IP 00	
Atmospheric pollution			3 C2, 3B1, 3S1 conforming to IEC 721.3.3				
Degree of pollution			2 conforming to EN 50178				
Vibration resistance			1.5 mm from 3…13 Hz, 1 gn from 13…200 Hz, conforming to IEC 60068-2				
Shock resistance			15 gn for 11 ms conforming to IEC/EN 60068-2-27				
Maximum relative humidity			95%				
Ambient air temperature around the device	Operation	**°C**	0…+ 45 without derating Up to + 55°C with current derating of 2% per °C above 45°C				
	Storage	**°C**	- 25…+ 70				
Isolation class			F				
Clearance distance in air		**mm**	5.5 conforming to IEC 60664				
Leakage distance in air		**mm**	11.5 conforming to IEC 60664				
Maximum operating altitude		**m**	1000 without derating 1000…3000 with current derating of 1% per additional 100 m				
Voltage drop			Between 3% and 5% of the nominal supply voltage. Values higher than this will cause loss of torque.				
Maximum current			1.65 x nominal current for 60 seconds				

Connection characteristics

Maximum connection capacity and tightening torque	VW3 A58501		16 mm^2, (AWG 4) 1.2…1.4 Nm
	VW3 A58502		6 mm^2, (AWG 8) 0.8…1 Nm
	VW3 A4 551, 552		2.5 mm^2, (AWG 12) 0.4…0.6 Nm
	VW3 A4 553		6 mm^2, (AWG 8) 0.8…1 Nm
	VW3 A4 554		16 mm^2, (AWG 4) 1.2…1.4 Nm
	VW3 A4 555		35 mm^2, (AWG 0) 2.5…3 Nm
	VW3 A4 556		Connected on a bar, Ø 6.5 mm –
	VW3 A4 557, 558		Connected on a bar, Ø 9 mm –
	VW3 A4 559…561		Connected on a bar, Ø 11 mm –
	VW3 A4 564, 565		Connected on a bar, Ø 13 mm –
	VW3 A4 568		Connected on a bar, Ø 11 mm –
	VW3 A4 569		Connected on a bar, Ø 13 mm –

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Variable speed drives for asynchronous motors

Altivar 61: Reduction of current harmonics

Option: Line chokes

Line chokes

For drives	Line supply Line Isc	Line choke				Number required per drive	Reference	Weight
		Inductance value	Nominal current	Saturation current	Loss			
	kA	mH	A	A	W			kg
Single phase supply voltage: 200…240 V 50/60 Hz								
ATV 61HU40M3	5	2	25	–	45	1	**VW3 A58501**	3.500
ATV 61HU55M3	5	1	45	–	50	1	**VW3 A58502**	3.500
ATV 61HU75M3	22	1	45	–	50	1	**VW3 A58502**	3.500
3-phase supply voltage: 200…240 V 50/60 Hz								
ATV 61H075M3	5	10	4	–	45	1	**VW3 A4 551**	1.500
ATV 61HU15M3, HU22M3	5	4	10	–	65	1	**VW3 A4 552**	3.000
ATV 61HU30M3	5	2	16	–	75	1	**VW3 A4 553**	3.500
ATV 61HU40M3	5	1	30	–	90	1	**VW3 A4 554**	6.000
ATV 61HU55M3	22	1	30	–	90	1	**VW3 A4 554**	6.000
ATV 61HU75M3, HD11M3X	22	0.5	60	–	94	1	**VW3 A4 555**	11.000
ATV 61HD15M3X	22	0.3	100	–	260	1	**VW3 A4 556**	16.000
ATV 61HD18M3X…HD45M3X	22	0.15	230	–	400	1	**VW3 A4 557**	45.000
ATV 61HD55M3XD	35	0.12	222	346	278	1	**VW3 A4 559**	35.000
ATV 61HD75M3XD	35	0.085	300	474	315	1	**VW3 A4 568**	46.000
ATV 61HD90M3XD	35	0.06	450	574	335	1	**VW3 A4 569**	70.000
3-phase supply voltage: 380…480 V 50/60 Hz								
ATV 61H075N4, HU15N4 ATV 61W075N4, WU15N4 ATV 61W075N4C, WU15N4C	5	10	4	–	45	1	**VW3 A4 551**	1.500
ATV 61HU22N4…HU40N4 ATV 61WU22N4…WU40N4 ATV 61WU22N4C…WU40N4C	5	4	10	–	65	1	**VW3 A4 552**	3.000
ATV 61HU55N4, HU75N4 ATV 61WU55N4, WU75N4 ATV 61WU55N4C, WU75N4C	22	2	16	–	75	1	**VW3 A4 553**	3.500
ATV 61HD11N4, HD15N4 ATV 61WD11N4, WD15N4 ATV 61WD11N4C, WD15N4C	22	1	30	–	90	1	**VW3 A4 554**	6.000
ATV 61HD18N4, HD22N4 ATV 61WD18N4, WD22N4 ATV 61WD18N4C, WD22N4C	22	0.5	60	–	94	1	**VW3 A4 555**	11.000
ATV 61HD30N4…HD55N4 ATV 61WD30N4…WD55N4 ATV 61WD30N4C…WD55N4C	22	0.3	100	–	260	1	**VW3 A4 556**	16.000
ATV 61HD75N4 ATV 61WD75N4 ATV 61WD75N4C	22	0.15	230	–	400	1	**VW3 A4 557**	45.000
ATV 61HD90N4D ATV 61WD90N4 ATV 61WD90N4C	35	0.155	184	370	220	1	**VW3 A4 558**	31.000
ATV 61HC11N4D	35	0.12	222	346	278	1	**VW3 A4 559**	35.000
ATV 61HC13N4D	35	0.098	264	530	245	1	**VW3 A4 560**	43.000
ATV 61HC16N4D	50	0.085	300	474	315	1	**VW3 A4 568**	46.000
ATV 61HC22N4D Motor P 200 kW	50	0.066	344	685	258	1	**VW3 A4 561**	47.000
Motor P 220 kW	50	0.06	450	574	335	1	**VW3 A4 569**	70.000
ATV 61HC25N4D	50	0.06	450	574	335	1	**VW3 A4 569**	70.000
ATV 61HC31N4D	50	0.038	613	1150	307	1	**VW3 A4 564**	73.000
ATV 61HC40N4D	50	0.032	720	1352	428	1	**VW3 A4 565**	82.000
ATV 61HC50N4D	50	0.06	450	574	335	2	**VW3 A4 569**	70.000
ATV 61HC63N4D	50	0.038	613	1150	307	2	**VW3 A4 564**	73.000

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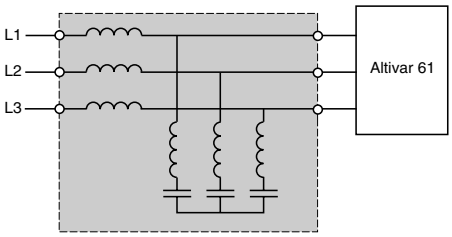
Variable speed drives for asynchronous motors

Altivar 61: Reduction of current harmonics

Option: Passive filters

Passive filters



Passive filter

The passive filter is used to reduce current harmonics with total harmonic distortion factors of less than 16% or 10%. These ratios may be less than 10% or 5% if the filter is used with a DC choke, see pages 2/224 to 2/227.

The reactive power increases at no load or low load. To eliminate this reactive power, the filter capacitors can be disconnected via the drive, see page 2/285.
To do this, the contactor must be controlled by one of the relay outputs on the drive, at a value lower than 10% of the nominal drive current (In) (please refer to the Programming Manual).

Applications

Reduction of current harmonics in order to use drives in the first environment.

General characteristics

Degree of protection			IP 20
Maximum relative humidity			Class F humidity without condensation 5%…85%
Ambient air temperature around the device	Operation	**°C**	5…+ 40 without derating Up to 55°C with current derating of 3% per additional °C
	Storage	**°C**	- 25…+ 55
Maximum operating altitude		**m**	1000 without derating 1000…4000 with current derating of 5% per additional 1000 m

Electrical characteristics

Range			**400 V**	**460 V**
Nominal voltage ± 10%		**V**	380…415 ∿	440…480 ∿
Operating frequency			50 ± 5 %	60 ± 5 %
Overload capacity			1.5 x In (A)	
Efficiency			98 % (2% of thermal losses)	
THDI *(1)*		**%**	≤ 16	
Cos φ			At 75% of the line current: 0.85 At 100% of the line current: 0.99 At 150% of the line current: 1	

Connection characteristics

Maximum connection capacity	VW3 A4 601…604		16 mm²
	VW3 A4 605…609		50 mm²
	VW3 A4 610, 611		Connected on a bar, Ø 12.5
	VW3 A4 612, 613, 619		Connected on a bar, Ø 16.5
	VW3 A4 618		Connected on a bar, Ø 16.5
	VW3 A4 621, 622		16 mm²
	VW3 A4 623…627		50 mm²
	VW3 A4 628, 629		Connected on a bar, Ø 12.5
	VW3 A4 630…639		Connected on a bar, Ø 16.5
	VW3 A4 641…644		16 mm²
	VW3 A4 645…648		50 mm²
	VW3 A4 649		Connected on a bar, Ø 12.5
	VW3 A4 650, 651, 656, 657		Connected on a bar, Ø 16.5
	VW3 A4 661…663		16 mm²
	VW3 A4 664…666		50 mm²
	VW3 A4 667, 668		Connected on a bar, Ø 12.5
	VW3 A4 669, 671, 676, 677		Connected on a bar, Ø 16.5

(1) The total current harmonic distortion (THDI) is indicated for a total voltage harmonic distortion (THDU) < 2% and a short-circuit ratio (RSCE) > 66%, and only for the nominal current of the passive filter. If these conditions are not adhered to, the total current harmonics will be reduced without any guarantee of level.

References: pages 2/232 to 2/235
Dimensions: pages 2/266 and 2/267
Schemes: pages 2/284 and 2/285

Variable speed drives for asynchronous motors

Altivar 61: Reduction of current harmonics

Option: Passive filters

Passive filters: 3-phase power supply 400 V 50 Hz

Motor rating		For ATV 61 drives	Line supply	Filter	Number required per drive	Reference	Weight
			Line current	In (2)			
kW	HP		A	A			kg
THDI 16 % (1)							
0.75	1	H075N4	2.5	6	1	**VW3 A4 601**	15.000
1.5	2	HU15N4	3.6	6	1	**VW3 A4 601**	15.000
2.2	3	HU22N4	5	6	1	**VW3 A4 601**	15.000
3	–	HU30N4	6	6	1	**VW3 A4 601**	15.000
4	5	HU40N4	7.8	10	1	**VW3 A4 602**	19.000
5.5	7.5	HU55N4	10	10	1	**VW3 A4 602**	19.000
7.5	10	HU75N4	14	19	1	**VW3 A4 603**	21.000
11	15	HD11N4	19	19	1	**VW3 A4 603**	21.000
15	20	HD15N4	26	26	1	**VW3 A4 604**	22.000
18.5	25	HD18N4	32	35	1	**VW3 A4 605**	34.000
22	30	HD22N4	38	43	1	**VW3 A4 606**	38.000
30	40	HD30N4	52	72	1	**VW3 A4 607**	56.000
37	50	HD37N4	63	72	1	**VW3 A4 607**	56.000
45	60	HD45N4	77	101	1	**VW3 A4 608**	69.000
55	75	HD55N4	91	101	1	**VW3 A4 608**	69.000
75	100	HD75N4	126	144	1	**VW3 A4 609**	97.000
THDI 10 %							
0.75	1	W075N4, W075N4C	2.5	6	1	**VW3 A4 601**	15.000
1.5	2	WU15N4, WU15N4C	3.6	6	1	**VW3 A4 601**	15.000
2.2	3	WU22N4, WU22N4C	5	6	1	**VW3 A4 601**	15.000
3	–	WU30N4, WU30N4C	6	6	1	**VW3 A4 601**	15.000
4	5	WU40N4, WU40N4C	7.8	10	1	**VW3 A4 602**	19.000
5.5	7.5	WU55N4, WU55N4C	10	10	1	**VW3 A4 602**	19.000
7.5	10	WU75N4, WU75N4C	14	19	1	**VW3 A4 603**	21.000
11	15	WD11N4, WD11N4C	19	19	1	**VW3 A4 603**	21.000
15	20	WD15N4, WD15N4C	26	26	1	**VW3 A4 604**	22.000
18.5	25	WD18N4, WD18N4C	32	35	1	**VW3 A4 605**	34.000
22	30	WD22N4, WD22N4C	38	43	1	**VW3 A4 606**	38.000
30	40	WD30N4, WD30N4C	52	72	1	**VW3 A4 607**	56.000
37	50	WD37N4, WD37N4C	63	72	1	**VW3 A4 607**	56.000
45	60	WD45N4, WD45N4C	77	101	1	**VW3 A4 608**	69.000
55	75	WD55N4, WD55N4C	91	101	1	**VW3 A4 608**	69.000
75	100	WD75N4, WD75N4C	126	144	1	**VW3 A4 609**	97.000
90	125	HD90N4 WD90N4, WD90N4C	149	144	1	**VW3 A4 609**	97.000
110	150	HC11N4	182	180	1	**VW3 A4 610**	103.000
132	200	HC13N4	218	216	1	**VW3 A4 611**	112.000
160	250	HC16N4	287	289	1	**VW3 A4 612**	135.000
200	300	HC22N4	353.5	370	1	**VW3 A4 613**	155.000
220	350	HC22N4	364	370	1	**VW3 A4 613**	155.000
250	400	HC25N4	415	216	2	**VW3 A4 611**	112.000
280	450	HC31N4	485	289	2	**VW3 A4 612**	135.000
315	500	HC31N4	543	289	2	**VW3 A4 612**	135.000
355	–	HC40N4	588	289	2	**VW3 A4 612**	135.000
400	600	HC40N4	664	325	2	**VW3 A4 619**	155.000
500	700	HC50N4	840	289	3	**VW3 A4 612**	135.000
560	800	HC63N4	978	370	3	**VW3 A4 613**	155.000
630	900	HC63N4	1091	370	3	**VW3 A4 613**	155.000

(1) If a DC choke (see page 2/224) is used with ATV 61H075N4…HD75N4 drives, the THD will be ≤ 10%. These reduced current harmonics are obtained on condition that the THDU is < 2% and the RSCE is > 66% and only for the nominal current of the passive filter.

(2) In: Nominal filter current.

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Variable speed drives for asynchronous motors

Altivar 61: Reduction of current harmonics

Option: Passive filters

Passive filters: 3-phase power supply 400 V 50 Hz (continued)

Motor rating		For ATV 61 drives	Line supply	Filter	Number required per drive	Reference	Weight
			Line current	In (2)			
kW	HP		A	A			kg
THDI 10 % (1)							
0.75	1	H075N4	2.5	6	1	**VW3 A4 621**	21.000
1.5	2	HU15N4	3.6	6	1	**VW3 A4 621**	21.000
2.2	3	HU22N4	5	6	1	**VW3 A4 621**	21.000
3	–	HU30N4	6	6	1	**VW3 A4 621**	21.000
4	5	HU40N4	7.8	10	1	**VW3 A4 622**	27.000
5.5	7.5	HU55N4	10	10	1	**VW3 A4 622**	27.000
7.5	10	HU75N4	14	19	1	**VW3 A4 623**	28.000
11	15	HD11N4	19	19	1	**VW3 A4 623**	28.000
15	20	HD15N4	26	26	1	**VW3 A4 624**	40.000
18.5	25	HD18N4	32	35	1	**VW3 A4 625**	49.000
22	30	HD22N4	38	43	1	**VW3 A4 626**	52.000
30	40	HD30N4	52	72	1	**VW3 A4 627**	88.000
37	50	HD37N4	63	72	1	**VW3 A4 627**	88.000
45	60	HD45N4	77	101	1	**VW3 A4 628**	150.000
55	75	HD55N4	91	101	1	**VW3 A4 628**	150.000
75	100	HD75N4	126	144	1	**VW3 A4 629**	167.000
THDI 5 % (1)							
0.75	1	W075N4, W075N4C	2.5	6	1	**VW3 A4 621**	21.000
1.5	2	WU15N4, WU15N4C	3.6	6	1	**VW3 A4 621**	21.000
2.2	3	WU22N4, WU22N4C	5	6	1	**VW3 A4 621**	21.000
3	–	WU30N4, WU30N4C	6	6	1	**VW3 A4 621**	21.000
4	5	WU40N4, WU40N4C	7.8	10	1	**VW3 A4 622**	27.000
5.5	7.5	WU55N4, WU55N4C	10	10	1	**VW3 A4 622**	27.000
7.5	10	WU75N4, WU75N4C	14	19	1	**VW3 A4 623**	28.000
11	15	WD11N4, WD11N4C	19	19	1	**VW3 A4 623**	28.000
15	20	WD15N4, WD15N4C	26	26	1	**VW3 A4 624**	40.000
18.5	25	WD18N4, WD18N4C	32	35	1	**VW3 A4 625**	49.000
22	30	WD22N4, WD22N4C	38	43	1	**VW3 A4 626**	52.000
30	40	WD30N4, WD30N4C	52	72	1	**VW3 A4 627**	88.000
37	50	WD37N4, WD37N4C	63	72	1	**VW3 A4 627**	88.000
45	60	WD45N4, WD45N4C	77	101	1	**VW3 A4 628**	150.000
55	75	WD55N4, WD55N4C	91	101	1	**VW3 A4 628**	150.000
75	100	WD75N4, WD75N4C	126	144	1	**VW3 A4 629**	167.000
90	125	HD90N4 WD90N4, WD90N4C	149	144	1	**VW3 A4 629**	167.000
110	150	HC11N4	182	180	1	**VW3 A4 630**	178.000
132	200	HC13N4	218	216	1	**VW3 A4 631**	224.000
160	250	HC16N4	287	289	1	**VW3 A4 632**	271.000
200	300	HC22N4	353.5	370	1	**VW3 A4 633**	320.000
220	350	HC22N4	364	370	1	**VW3 A4 633**	320.000
250	400	HC25N4	415	216	2	**VW3 A4 631**	224.000
280	450	HC31N4	485	289	2	**VW3 A4 632**	271.000
315	500	HC31N4	543	289	2	**VW3 A4 632**	271.000
355	–	HC40N4	588	289	2	**VW3 A4 632**	271.000
400	600	HC40N4	664	325	2	**VW3 A4 639**	284.000
500	700	HC50N4	840	289	3	**VW3 A4 632**	271.000
560	800	HC63N4	918	370	3	**VW3 A4 633**	320.000
630	900	HC63N4	1091	370	3	**VW3 A4 633**	320.000

(1) If a DC choke (see page 2/224) is used with ATV 61H075N4…HD75N4 drives, the THD will be ≤ 5%.
These reduced current harmonics are obtained on condition that the THDU is < 2% and the RSCE is > 66% and only for the nominal current of the passive filter.
(2) In: Nominal filter current.

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Variable speed drives for asynchronous motors

Altivar 61: Reduction of current harmonics

Option: Passive filters

Passive filters: 3-phase power supply 460 V 60 Hz

Motor rating		For ATV 61 drives	Line supply	Filter	Number required per drive	Reference	Weight
			Line current	In (2)			
kW	HP		A	A			kg
THDI 16 % (1)							
0.75	1	H075N4	2.5	6	1	**VW3 A4 641**	15.000
1.5	2	HU15N4	3	6	1	**VW3 A4 641**	15.000
2.2	3	HU22N4	5	6	1	**VW3 A4 641**	15.000
3	–	HU30N4	6	6	1	**VW3 A4 641**	15.000
4	5	HU40N4	7	10	1	**VW3 A4 642**	19.000
5.5	7.5	HU55N4	10	10	1	**VW3 A4 642**	19.000
7.5	10	HU75N4	13	19	1	**VW3 A4 643**	23.000
11	15	HD11N4	19	19	1	**VW3 A4 643**	23.000
15	20	HD15N4	24	26	1	**VW3 A4 644**	34.000
18.5	25	HD18N4	32	35	1	**VW3 A4 645**	42.000
22	30	HD22N4	35	35	1	**VW3 A4 645**	42.000
30	40	HD30N4	46	43	1	**VW3 A4 646**	45.000
37	50	HD37N4	58.7	72	1	**VW3 A4 647**	61.000
45	60	HD45N4	68	72	1	**VW3 A4 647**	61.000
55	75	HD55N4	82.6	101	1	**VW3 A4 648**	75.000
75	100	HD75N4	108	101	1	**VW3 A4 648**	75.000
THDI 10 % (1)							
0.75	1	W075N4, W075N4C	2.5	6	1	**VW3 A4 641**	15.000
1.5	2	WU15N4, WU15N4C	3	6	1	**VW3 A4 641**	15.000
2.2	3	WU22N4, WU22N4C	5	6	1	**VW3 A4 641**	15.000
3	–	WU30N4, WU30N4C	6	6	1	**VW3 A4 641**	15.000
4	5	WU40N4, WU40N4C	7	10	1	**VW3 A4 642**	19.000
5.5	7.5	WU55N4, WU55N4C	10	10	1	**VW3 A4 642**	19.000
7.5	10	WU75N4, WU75N4C	13	19	1	**VW3 A4 643**	23.000
11	15	WD11N4, WD11N4C	19	19	1	**VW3 A4 643**	23.000
15	20	WD15N4, WD15N4C	24	26	1	**VW3 A4 644**	34.000
18.5	25	WD18N4, WD18N4C	32	35	1	**VW3 A4 645**	42.000
22	30	WD22N4, WD22N4C	35	35	1	**VW3 A4 645**	42.000
30	40	WD30N4, WD30N4C	46	43	1	**VW3 A4 646**	45.000
37	50	WD37N4, WD37N4C	58.7	72	1	**VW3 A4 647**	61.000
45	60	WD45N4, WD45N4C	68	72	1	**VW3 A4 647**	61.000
55	75	WD55N4, WD55N4C	82.6	101	1	**VW3 A4 648**	75.000
75	100	WD75N4, WD75N4C	108	101	1	**VW3 A4 648**	75.000
90	125	HD90N4 WD90N4, WD90N4C	134	180	1	**VW3 A4 649**	107.000
110	150	HC11N4	163	180	1	**VW3 A4 649**	107.000
132	200	HC13N4	192	217	1	**VW3 A4 656**	119.000
160	250	HC16N4	235	289	1	**VW3 A4 650**	145.000
200	300	HC22N4	300	370	1	**VW3 A4 651**	185.000
220	350	HC22N4	330	370	1	**VW3 A4 651**	185.000
250	400	HC25N4	400	217	2	**VW3 A4 656**	119.000
280	450	HC31N4	440	289	2	**VW3 A4 650**	145.000
315	500	HC31N4	470	289	2	**VW3 A4 650**	145.000
355	–	HC40N4	530	289	2	**VW3 A4 650**	145.000
400	600	HC40N4	590	325	2	**VW3 A4 657**	165.000
500	700	HC50N4	730	370	2	**VW3 A4 651**	185.000
560	800	HC63N4	858	325	3	**VW3 A4 657**	165.000
630	900	HC63N4	964	325	3	**VW3 A4 657**	165.000

(1) If a DC choke (see page 2/224) is used with ATV 61H075N4…HD75N4 drives, the THD will be ≤ 10%.
These reduced current harmonics are obtained on condition that the THDU is < 2% and the RSCE is > 66% and only for the nominal current of the passive filter.
(2) In: Nominal filter current.

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Variable speed drives for asynchronous motors

Altivar 61: Reduction of current harmonics

Option: Passive filters

Passive filters: 3-phase power supply 460 V 60 Hz

Motor rating		For ATV 61 drives	Line supply	Filter	Number required per drive	Reference	Weight
			Line current	In (2)			
kW	HP		A	A			kg
THDI 10 % (1)							
0.75	1	H075N4	2.5	6	1	**VW3 A4 661**	21.000
1.5	2	HU15N4	3	6	1	**VW3 A4 661**	21.000
2.2	3	HU22N4	5	6	1	**VW3 A4 661**	21.000
3	–	HU30N4	6	6	1	**VW3 A4 661**	21.000
4	5	HU40N4	7	10	1	**VW3 A4 662**	27.000
5.5	7.5	HU55N4	10	10	1	**VW3 A4 662**	27.000
7.5	10	HU75N4	13	19	1	**VW3 A4 663**	28.000
11	15	HD11N4	19	19	1	**VW3 A4 663**	28.000
15	20	HD15N4	24	26	1	**VW3 A4 664**	41.000
18.5	25	HD18N4	32	35	1	**VW3 A4 665**	49.000
22	30	HD22N4	35	35	1	**VW3 A4 665**	49.000
30	40	HD30N4	44	43	1	**VW3 A4 666**	56.000
37	50	HD37N4	58.7	72	1	**VW3 A4 667**	80.000
45	60	HD45N4	68	72	1	**VW3 A4 668**	98.000
55	75	HD55N4	82.6	101	1	**VW3 A4 668**	98.000
75	100	HD75N4	108	101	1	**VW3 A4 668**	98.000
THDI 5 % (1)							
0.75	1	W075N4, W075N4C	2.5	6	1	**VW3 A4 661**	21.000
1.5	2	WU15N4, WU15N4C	3	6	1	**VW3 A4 661**	21.000
2.2	3	WU22N4, WU22N4C	5	6	1	**VW3 A4 661**	21.000
3	–	WU30N4, WU30N4C	6	6	1	**VW3 A4 661**	21.000
4	5	WU40N4, WU40N4C	7	10	1	**VW3 A4 662**	27.000
5.5	7.5	WU55N4, WU55N4C	10	10	1	**VW3 A4 662**	27.000
7.5	10	WU75N4, WU75N4C	13	19	1	**VW3 A4 663**	28.000
11	15	WD11N4, WD11N4C	19	19	1	**VW3 A4 663**	28.000
15	20	WD15N4, WD15N4C	24	26	1	**VW3 A4 664**	41.000
18.5	25	WD18N4, WD18N4C	32	35	1	**VW3 A4 665**	49.000
22	30	WD22N4, WD22N4C	35	35	1	**VW3 A4 665**	49.000
30	40	WD30N4, WD30N4C	44	43	1	**VW3 A4 666**	56.000
37	50	WD37N4, WD37N4C	58.7	72	1	**VW3 A4 667**	80.000
45	60	WD45N4, WD45N4C	68	72	1	**VW3 A4 668**	98.000
55	75	WD55N4, WD55N4C	82.6	101	1	**VW3 A4 668**	98.000
75	100	WD75N4, WD75N4C	108	101	1	**VW3 A4 668**	98.000
90	125	HD90N4 WD90N4, WD90N4C	134	180	1	**VW3 A4 669**	151.000
110	150	HC11N4	163	180	1	**VW3 A4 669**	151.000
132	200	HC13N4	192	217	1	**VW3 A4 676**	171.000
160	250	HC16N4	235	289	1	**VW3 A4 670**	215.000
200	300	HC22N4	300.5	370	1	**VW3 A4 671**	250.000
220	350	HC22N4	330	370	1	**VW3 A4 671**	250.000
250	400	HC25N4	400	217	2	**VW3 A4 676**	171.000
280	450	HC31N4	440	289	2	**VW3 A4 670**	240.000
315	500	HC31N4	470	289	2	**VW3 A4 670**	240.000
355	–	HC40N4	530	289	2	**VW3 A4 670**	240.000
400	600	HC40N4	590	325	2	**VW3 A4 677**	215.000
500	700	HC50N4	730	370	2	**VW3 A4 671**	250.000
560	800	HC63N4	858	325	3	**VW3 A4 677**	240.000
630	900	HC63N4	964	325	3	**VW3 A4 677**	240.000

(1) If a DC choke (see page 2/224) is used with ATV 61H075N4…HD75N4 drives, the THD will be ≤ 5%.
These reduced current harmonics are obtained on condition that the THDU is < 2% and the RSCE is > 66% and only for the nominal current of the passive filter.
(2) In: Nominal filter current.

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Characteristics: page 2/231
Dimensions: pages 2/266 and 2/267
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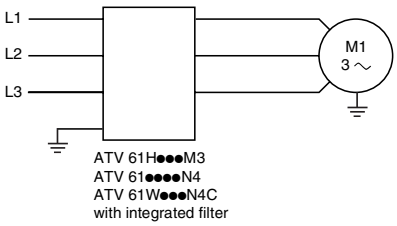
Variable speed drives for asynchronous motors

Altivar 61: EMC filters

Optional integrated filters and additional filters



ATV 61H●●●M3
ATV 61●●●●N4
ATV 61W●●●N4C
with integrated filter

Integrated EMC filters

The Altivar 61 drive, except for the ATV 61H●●●M3X, has built-in radio interference input filters to meet the requirements of 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).

UL Type 1/IP 20 drives

Drives	Maximum length of shielded cable *(1)* according to			
	EN 55011 class A Gr1 *(2)* / IEC/EN 61800-3 category C2 *(2)*		EN 55011 class A Gr2 *(2)* / IEC/EN 61800-3 category C3 *(2)*	
	LF *(3)* *(4)*	HF *(3)* *(4)*	LF *(3)* *(4)*	HF *(3)* *(4)*
	m	m	m	m
ATV 61H075M3…HU22M3	10	5	–	–
ATV 61HU30M3…HU75M3	–	–	10	5
ATV 61H075N4…HU40N4	10	5	–	–
ATV 61HU55N4…HD15N4	–	–	10	5
ATV 61HD18N4…HC63N4	–	–	50	25

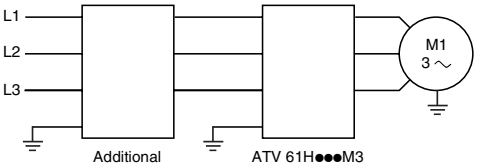
UL Type 12/IP 54 drives

Drives	Maximum length of shielded cable *(1)* according to					
	EN 55011 class A Gr1 *(2)* / IEC/EN 61800-3 category C2 *(2)*			EN 55011 class B Gr1 *(2)* / IEC/EN 61800-3 category C1 *(2)*		
	LF *(3)*	HF *(3)*		LF *(3)*	HF *(3)*	
	2 kHz	8 kHz	16 kHz	2 kHz	8 kHz	16 kHz
	m	m	m	m	m	m
ATV 61W●●●N4	80	50	50	–	–	–
ATV 61W075N4C…WU40N4C	–	–	–	20	20	20
ATV 61WU40N4C…WU55N4C	–	–	–	50	50	50
ATV 61WU75N4C…WD11N4C	–	–	–	20	20	20
ATV 61WD15N4C	–	–	–	50	50	50
ATV 61WD18N4C…WD22N4C	–	–	–	50	50	50
ATV 61WD30N4C	–	–	–	20	50	20
ATV 61WD37N4C…WD45N4C	–	–	–	20	50	20
ATV 61WD55N4C…WD90N4C	–	–	–	20	20	20

Additional EMC input filters

Applications

Additional EMC input filters can be used to meet more stringent requirements and are designed to cut down conducted emissions on the line supply below the limits of standards EN 55011 group 1, class A or B and IEC/EN 61800-3 category C1 or C2 (see page 2/162).
For ATV 61H●●●M3, ATV 61HD11M3X...HD45M3X and ATV 61H075N4...HD75N4 drives, the additional EMC filters can be mounted beside or under the device. They act as a support for the drives and are attached to them via tapped holes.
For ATV 61HD55M3X…HD90M3X and ATV 61HD90N4…HC63N4 drives, the additional EMC filters are only mounted beside the drives.



Additional EMC filter

ATV 61H●●●M3
ATV 61H●●●M3X
ATV 61H●●●N4

(1) Maximum lengths for shielded cables connecting motors to drives, for a factory-set switching frequency of 2.5 or 4 kHz depending on the rating see page 2/164. If motors are connected in parallel, it is the sum of the cable lengths that should be taken into account.
(2) See page 2/162.
(3) LF: low switching frequency. HF: high switching frequency.
(4) The LF and HF frequencies depend on the drive rating.

Drives	Switching frequency	
	LF	HF
	kHz	kHz
ATV 61H●●●M3 ATV 61H075N4…HD30N4	4	4.1…16
ATV 61HD37N4…HD75N4	2…2.5	2.6…12
ATV 61HD90N4…HC63N4	2…4	4.1…8

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Schemes: page 2/286

Variable speed drives for asynchronous motors

Altivar 61: EMC filters

Option: additional input filters

Additional EMC input filters (continued)

Use according to the type of line supply

Use of these additional filters is only possible on TN (neutral connection) and TT (neutral to earth) type networks.

Standard IEC/EN 61800-3, appendix D2.1, states that on IT networks (isolated or impedance earthed neutral), filters can cause permanent insulation monitors to operate in a random manner.
In addition, the effectiveness of additional filters on this type of network depends on the type of impedance between neutral and earth, and therefore cannot be predicted.
In the case of a machine which needs to be installed on an IT network, the solution would be to insert an isolation transformer and place the machine locally on a TN or TT network.

General characteristics

EMC filter type			VW3 A4 401…409	VW3 A4 410…413
Conformity to standards			EN 133200	
Degree of protection			IP 20 and IP 41 on upper part	IP 00 IP 30 with kits VW3 A9 601, 602
Maximum relative humidity			93% without condensation or dripping water conforming to IEC 68-2-3	
Ambient air temperature around the unit	Operation	°C	- 10…+ 50	- 25…+ 45
	Storage	°C	- 40…+ 65	- 25…+ 85
Maximum operating altitude		m	1000 without derating 1000…3000 derating the current by 1% per additional 100 m. Limited to 2000 m for the “Corner Grounded” distribution network	
Vibration resistance			1.5 mm peak to peak from 3…13 Hz, 1 gn peak from 13…150 Hz, in accordance with IEC 60068-2-6	
Shock resistance			15 gn for 11 ms conforming to IEC 60068-2-27	
Maximum nominal voltage	50/60 Hz three-phase	V	240 + 10% 480 + 10%	

Connection characteristics

Maximum wire size and tightening torque	VW3 A4 401		4 mm² (AWG 10). 0.6 Nm
	VW3 A4 402		6 mm² (AWG 8). 1.5 Nm
	VW3 A4 403		10 mm² (AWG 6). 1.5 Nm
	VW3 A4 404		16 mm² (AWG 4). 2 Nm
	VW3 A4 405…407		50 mm² (AWG 0). 6 Nm
	VW3 A4 408		150 mm² (300 kcmil). 25 Nm
	VW3 A4 409		25 mm² (AWG 2). 4 Nm
	VW3 A4 410…412		Bar connection, M10 –
	VW3 A4 413		Bar connection, 2 x M12 –

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Variable speed drives for asynchronous motors

Altivar 61: EMC filters

Option: additional input filters

Additional EMC input filters for ATV 61H●●●●● drives

Drives	Maximum length of shielded cable (1)				In (2)	Il (3)	Loss (4)	Reference	Weight
	EN 55011 (5) class A Gr1 IEC/EN 61800-3 category C2 (5)		EN 55011 (5) class B Gr1 IEC/EN 61800-3 category C1 (5)						
	LF (6)	HF (6)	LF (6)	HF (6)					
	m	m	m	m	A	mA	W		kg
Three-phase supply voltage: 200…240 V 50/60 Hz									
ATV 61H075M3, HU15M3	100	50	50	20	12	4	10	**VW3 A4 401**	2.200
ATV 61HU22M3…HU40M3	100	50	50	20	26	4.4	18	**VW3 A4 402**	4.000
ATV 61HU55M3	100	50	50	20	35	3	24	**VW3 A4 403**	5.800
ATV 61HU75M3	100	50	50	20	46	10	19	**VW3 A4 404**	7.000
ATV 61HD11M3X, HD15M3X	200	100	50	25	72	33	34	**VW3 A4 405**	12.000
ATV 61HD18M3X, HD22M3X	200	100	50	25	90	33	34	**VW3 A4 406**	15.000
ATV 61HD30M3X...HD45M3X	200	100	50	25	180	80	58	**VW3 A4 408**	40.000
ATV 61HD55M3X, HD75M3X	100	50	50	25	273	285	60	**VW3 A4 410**	22.000
ATV 61HD90M3X	100	50	50	25	336	500	125	**VW3 A4 411**	22.000
Three-phase supply voltage: 380…480 V 50/60 Hz									
ATV 61H075N4…HU22N4	100	50	50	20	12	7	5	**VW3 A4 401**	2.200
ATV 61HU30N4, HU40N	100	50	50	20	26	8	6	**VW3 A4 402**	4.000
ATV 61HU55N4, HU75N4	100	50	50	20	35	7	14	**VW3 A4 403**	5.800
ATV 61HD11N4	100	50	50	20	46	14	13	**VW3 A4 404**	7.000
ATV 61HD15N4 *(7)*, HD18N4	300	200	100	100	72	60	14	**VW3 A4 405**	12.000
ATV 61HD22N4	300	200	100	100	90	60	11	**VW3 A4 406**	15.000
ATV 61HD30N4, HD37N4	300	200	100	100	92	60	30	**VW3 A4 407**	17.000
ATV 61HD45N4…HD75N4	300	200	100	100	180	140	58	**VW3 A4 408**	40.000
ATV 61HD90N4…HC16N4	300	150	50	25	273	500	60	**VW3 A4 410**	22.000
ATV 61HC22N4…HC31N4	300	150	50	25	546	500	125	**VW3 A4 411**	25.000
ATV 61HC40N4, HC50N4	300	150	50	25	728	500	210	**VW3 A4 412**	25.000
ATV 61HC63N4	300	150	50	25	1456	200	380	**VW3 A4 413**	34.000

(1) The filter selection tables give the maximum lengths for shielded cables connecting motors to drives for a switching frequency of 1 to 16 kHz (see page 2/164). These limits are given as examples only as they vary depending on the stray capacitance of the motors and the cables used. If motors are connected in parallel, it is the sum of all cable lengths that should be taken into account.
(2) Filter nominal current.
(3) Maximum earth leakage current at 230 V and at 400 V 50 Hz on a TT network.
(4) Via thermal dissipation.
(5) See page 2/162.
(6) LF: low switching frequency. HF: high switching frequency. These frequencies depend on the drive rating:

For drives	Switching frequency	
	LF	HF
	kHz	kHz
ATV 61H●●●M3 ATV 61H075N4…HD11N4	4	4.1…16
ATV 61HD11M3X, HD15M3X ATV 61HD15N4…HD30N4	3.5...4	4.1…12
ATV 61HD18M3X...HD45M3X ATV 61HD37N4...HD75N4	2…2.5	2.6…12
ATV 61HD55M3X...HD90M3X	2.5…4	4.1…8
ATV 61HD90N4...HC63N4	2…4	4.1…8

*(7) It is possible to use a special filter **VW3 A4 409** with a leakage current Il (3) of 14 mA, which enables a maximum motor cable length of 100 m.*

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Variable speed drives for asynchronous motors

Altivar 61: EMC filters

Option: additional input filters

IP 30 protection kits

Description	For filters	Reference	Weight kg
Mechanical device consisting of an IP 30 cover and cable clips	VW3 A4 410, 411	**VW3 A9 601**	–
	VW3 A4 412, 413	**VW3 A9 602**	–

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Characteristics: page 2/237
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Variable speed drives for asynchronous motors
Altivar 61: Output filters

The Altivar 61 drive includes as standard a software function used to limit overvoltages at the motor terminals.
Depending on the cable lengths or the type of application, it may be necessary to use output filters:
- Motor chokes used to limit the dv/dt
- Sinus filters that are particularly effective for long cable runs

Cable length *(2)*	10…50 m	50…100 m	100…150 m	150…300 m	300…600 m	600…1000 m
Shielded cable						
ATV 61H●●●M3 ATV 61H075N4…HD15N4 ATV 61W075N4…WD15N4 ATV 61W075N4C…WD15N4C	Software function *(1)*	Motor choke			–	
ATV 61H●●●M3X ATV 61HD18N4…HC63N4 ATV 61WD18N4…WD90N4 ATV 61WD18N4C…WD90N4C	Software function *(1)*		Motor choke		–	
Unshielded cable						
ATV 61H075M3, HU15M3 ATV 61H075N4...HU22N4 ATV 61W075N4…WU22N4 ATV 61W075N4C…WU22N4C	Software function *(1)*		Motor choke or sinus filter		–	
ATV 61HU22M3, HU30M3 ATV 61HU30N4…HU55N4 ATV 61WU30N4…WU55N4 ATV 61WU30N4C…WU55N4C	Software function *(1)*		Motor choke		Sinus filter	–
ATV 61HU40M3…HU75M3 ATV 61HU75N4…HD15N4 ATV 61WU75N4…WD15N4 ATV 61WU75N4C…WD15N4C	Software function *(1)*		Motor choke		Sinus filter	
ATV 61HD11M3X…HD45M3X ATV 61HD18N4…HD75N4 ATV 61WD18N4…WD90N4 ATV 61WD18N4C…WD90N4C	Software function *(1)*			Motor choke	Sinus filter	
ATV 61HD55M3X…HD90M3X ATV 61HD90N4…HC63N4	Software function *(1)*			Motor choke	2 motor chokes connected in series	–

(1) The software function limits the overvoltage at the motor terminals to twice the DC bus voltage.
For any application with braking cycles, the DC bus voltage rises to more than the supply voltage multiplied by √2.
You must check the electrical characteristics of the motor before using this function.
(2) The cable length varies depending on the combination between variable speed drive/motor choke or sinus filter, see pages 2/242 and 2/245.
For an application with several motors connected in parallel, the cable length must include all tap-offs.
Recommended cable types:
- *Shielded cables: "GORSE" cable, type GUOSTV-LS/LH; "PROTOFLEX" cable, type EMV2YSL CY,*
- *Unshielded cables: "GORSE" cable, type H07 RN-F4GXX; "BELDEN" cable, type 2950X*

Schemes:
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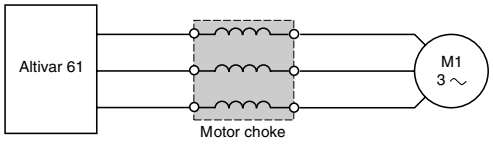
Variable speed drives for asynchronous motors

Altivar 61: Output filters

Option: Motor chokes

Motor chokes



Altivar 61 drives have been designed for operation with the following maximum motor cable lengths:

For drives	Maximum length of motor cable *(1)*	
	Shielded cable	Unshielded cable
	m	m
ATV 61H●●●M3 ATV 61HD11M3X, HD15M3X ATV 61H075N4…HD18N4 ATV 61W075N4…WD18N4 ATV 61W075N4C…WD18N4C	⩾ 50	⩾ 100
ATV 61HD18M3X…HD90M3X ATV 61HD22N4…HC63N4 ATV 61WD22N4…WD90N4 ATV 61WD22N4C…WD90N4C	⩾ 100	⩾ 200

The motor choke enables operation beyond these motor cable length limits and/or can limit the dv/dt to 500 V/µs at the motor terminals.

It also enables:
- Overvoltages on the motor terminals to be limited as follows:
  - 1000 V to 400 V ~ (rms value)
  - 1150 V to 460 V ~ (rms value)
- Interference caused by opening a contactor placed between the filter and the motor to be filtered
- The motor earth leakage current to be reduced

General characteristics *(2)*

Type of choke			VW3 A5 101…103	VW3 A5 104…108
Maximum drive switching frequency	ATV 61H●●●M3 ATV 61HD11M3X, HD15M3X ATV 61H075N4…HD30N4	**kHz**	4	
	ATV 61HD18M3X…HD90M3X ATV 61HD37N4…HC63N4	**kHz**	2.5	
Maximum drive output frequency		**Hz**	100	
Degree of protection			IP 00	IP 00 IP 20 with kits VW3 A9 612 and VW3 A9 613
Thermal protection			By temperature controlled switch	–
Temperature controlled switch *(3)*	Tripping temperature	**°C**	125	–
	Maximum voltage	**V**	250 ~	–
	Maximum current	**A**	0.5	–
Ambient air temperature around the device	Operation	**°C**	- 10…+ 50	
	Storage	**°C**	- 25…+ 70	

Connection characteristics

Maximum connection capacity and tightening torque	VW3 A5 101, 102		10 mm² (AWG 6) 1.5 Nm
	VW3 A5 103		Connected on a bar, Ø 9 mm –
	VW3 A5 104		Connected on a tag connector, M10 –
	VW3 A5 105, 106		Connected on a tag connector, M12 –
	VW3 A5 107, 108		Connected on a tag connector, 2 x M12 –

(1) These values are given for a maximum switching frequency of 2.5 or 4 kHz depending on the rating.
(2) Choke performance is ensured by not exceeding the cable lengths between the motor and the drive given in the table above. For an application with several motors connected in parallel, the cable length must include all tap-offs. If a cable longer than that recommended is used, the motor chokes may overheat.
(3) The contact should be connected in sequence (used for signalling or controlling the line contactor).

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Variable speed drives for asynchronous motors

Altivar 61: Output filters

Option: Motor chokes

VW3 A5 101

Motor chokes

For drives		Maximum length of motor cable *(1)* Shielded	Maximum length of motor cable *(1)* Un-shielded	Loss	Nominal current	Sold in lots of	Unit reference	Weight
		m	m	W	A			kg
3-phase supply voltage: 200…240 V 50/60 Hz								
ATV 61H075M3…HU22M3		150	300	150	12	–	**VW3 A5 101**	5.500
ATV 61HU30M3…HU75M3		200	260	250	48	–	**VW3 A5 102**	8.000
		300	300	350	90	–	**VW3 A5 103**	10.000
ATV 61HD11M3X…HD22M3X		150	300	350	90	–	**VW3 A5 103**	10.000
ATV 61HD30M3X…HD45M3X		150	300	430	215	3	**VW3 A5 104**	17.300
ATV 61HD55M3X, HD75M3X		150	300	475	314	3	**VW3 A5 105**	29.600
ATV 61HD90M3X		250	300	530	481	3	**VW3 A5 106**	44.400
3-phase supply voltage: 380...480 V 50/60 Hz								
ATV 61H075N4…HU40N4 ATV 61W075N4…WU40N4 ATV 61W075N4C…WU40N4C		75	90	150	12	–	**VW3 A5 101**	5.500
		85	95	250	48	–	**VW3 A5 102**	8.000
		160	200	350	90	–	**VW3 A5 103**	10.000
ATV 61HU55N4…HD18N4 ATV 61WU55N4…WD18N4 ATV 61WU55N4C…WD18N4C		85	95	250	48	–	**VW3 A5 102**	8.000
		160	200	350	90	–	**VW3 A5 103**	10.000
		200	300	430	215	3	**VW3 A5 104**	17.300
ATV 61HD22N4, HD30N4 ATV 61WD22N4, WD30N4 ATV 61WD22N4C, WD30N4C		140	170	350	90	–	**VW3 A5 103**	10.000
		150	300	430	215	3	**VW3 A5 104**	17.300
ATV 61HD37N4 ATV 61WD37N4 ATV 61WD37N4C		97	166	350	90	–	**VW3 A5 103**	10.000
		200	300	430	215	3	**VW3 A5 104**	17.300
ATV 61HD45N4…HD75N4 ATV 61WD45N4…WD75N4 ATV 61WD45N4C…WD75N4C		150	300	430	215	3	**VW3 A5 104**	17.300
ATV 61HD90N4 ATV 61WD90N4 ATV 61WD90N4C		200	300	430	215	3	**VW3 A5 104**	17.300
ATV 61HC11N4, HC13N4		150	250	475	314	3	**VW3 A5 105**	29.600
ATV 61HC16N4		250	300	530	481	3	**VW3 A5 106**	44.400
ATV 61HC22N4		250	300	530	481	3	**VW3 A5 106**	44.400
ATV 61HC25N4		200	250	598	759	3	**VW3 A5 107**	64.500
ATV 61HC31N4		200	250	598	759	3	**VW3 A5 107**	64.500
ATV 61HC40N4	Motor P 355 kW	200	250	598	759	3	**VW3 A5 107**	64.500
	Motor P 400 kW	250	300	682	1188	3	**VW3 A5 108**	99.200
ATV 61HC50N4		250	300	682	1188	3	**VW3 A5 108**	99.200
ATV 61HC63N4		250	300	682	1188	3	**VW3 A5 108**	99.200

(1) Maximum length given for a switching frequency of 2.5 or 4 kHz depending on the rating of the fan, see Characteristics on page 2/241.

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Variable speed drives for asynchronous motors

Altivar 61: Output filters

Option: Motor chokes

IP 20 protection kits

Description	For filters	Reference	Weight kg
Mechanical device consisting of an IP 20 cover and cable clips	VW3 A5 104, 105	**VW3 A9 612**	–
	VW3 A5 106…108	**VW3 A9 613**	–

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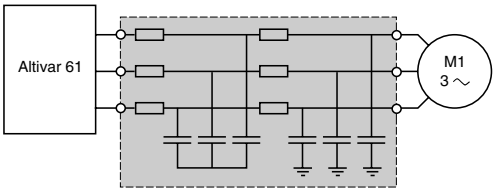
Variable speed drives for asynchronous motors

Altivar 61: Output filters

Option: Sinus filters

Sinus filters



Sinus filter

Sinus filter allows Altivar 61 drives to operate with longer motor cables (up to 1000 m).
For ATV 61H●●●M3, ATV 61HD11M3X...HD45M3X and ATV 61●U15N4…●D90N4 drives, it also enables the use of unshielded cables whilst maintaining compliance with the standards governing radiated EMC emissions (EN 55011 class A Gr 1 and IEC/EN 61800-3 category C2).

For ATV 61HD55M3X...HD90M3X and ATV 61HD90N4…HC63N4 drives, the sinus filter only operates with a drive voltage/frequency ratio.

The sinus filter is never compatible with the voltage ratio in sensorless flux vector control.

Nota : *The Programming Manual must be referred to when setting up the sinus filter.*

Applications

For ATV 61H●●●M3, ATV 61HD11M3X...HD45M3X, ATV 61HU15N4... HD75N4 drives, applications requiring:
- Long cable runs
- Mechanical restrictions preventing the use of shielded cables
- An intermediate transformer between the drive and the motor
- Motors connected in parallel

For ATV 61HD55M3X...HD90M3X and ATV 61HD90N4...HC63N4 drives, applications requiring:
- An intermediate transformer between the drive and the motor

General characteristics

Type of filter			VW3 A5 201…206	VW3 A5 207…211
Degree of protection			IP 20	IP 00
Atmospheric pollution			3C2, 3B1, 3S1 conforming to IEC 721.3.3	
Degree of pollution			2 conforming to standard EN 50178	
Vibration resistance			1.5 mm from 3...13 Hz, 1 gn from 13...200 Hz, conforming to IEC 60068-2	
Shock resistance			15 gn for 11 ms conforming to IEC 60068-2-27	
Maximum relative humidity			95%	
Ambient air temperature around the device	Operation	**°C**	-10...+40 without derating 40...50°C with current derating of 1.5% per additional °C	
	Storage	**°C**	- 40…+ 65	
Maximum operating altitude		**m**	1000 without derating 1000…3000 with current derating of 1% per additional 100 m	
Switching frequency		**kHz**	4...8	
Output frequency		**Hz**	0...100	
Voltage drop			< 10%	
Maximum voltage		**V**	500 ~	
Maximum current			1.5 x nominal current for 60 s	
Maximum motor cable length	Unshielded cable	**m**	600 or 1000 depending on the drive rating, see page 2/240	

Connection characteristics

Maximum connection capacity and tightening torque	VW3 A5 201		4 mm² (AWG 10) 0.6 Nm
	VW3 A5 202		6 mm² (AWG 8) 1.5 Nm
	VW3 A5 203		10 mm² (AWG 6) 1.5 Nm
	VW3 A5 204		25 mm² (AWG 2) 4 Nm
	VW3 A5 205		50 mm² (AWG 0) 6 Nm
	VW3 A5 206, 207		95 mm² (AWG 4/0) 20 Nm
	VW3 A5 208, 209		Connected on a bar, Ø 11 mm –
	VW3 A5 210		Connected on a bar, Ø 14 mm –
	VW3 A5 211		Connected on a bar, 4 x Ø 11 mm –

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Variable speed drives for asynchronous motors

Altivar 61: Output filters

Option: Sinus filters

Sinus filters

For drives		Nominal current	Loss at 100 Hz	Reference	Weight
		A	W		kg
3-phase supply voltage: 200…240 V 50/60 Hz					
ATV 61H075M3, HU15M3 *(1)*		11	50	**VW3 A5 201**	8.000
ATV 61HU22M3, HU30M3		16	70	**VW3 A5 202**	11.000
ATV 61HU40M3... HU75M3		33	120	**VW3 A5 203**	22.000
ATV 61HD11M3X, HD15M3X		66	180	**VW3 A5 204**	45.000
ATV 61HD18M3X, HD22M3X		95	250	**VW3 A5 205**	60.000
ATV 61HD30M3X... HD45M3X		180	400	**VW3 A5 206**	120.000
ATV 61HD55M3X, HD75M3X		300	1360	**VW3 A5 208**	165.000
ATV 61HD90M3X		400	1900	**VW3 A5 209**	190.000
3-phase supply voltage: 380…480 V 50/60 Hz					
ATV 61HU15N4...HU40N4 *(1)* ATV 61WU15N4...WU40N4 ATV 61WU15N4C...WU40N4C		11	50	**VW3 A5 201**	8.000
ATV 61HU55N4 ATV 61WU55N4 ATV 61WU55N4C		16	70	**VW3 A5 202**	11.000
ATV 61HU75N4...HD15N4 ATV 61WU75N4...WD15N4 ATV 61WU75N4C...WD15N4C		33	120	**VW3 A5 203**	22.000
ATV 61HD18N4... HD30N4 ATV 61WD18N4... WD30N4 ATV 61WD18N4C... WD30N4C		66	180	**VW3 A5 204**	45.000
ATV 61HD37N4, HD45N4 ATV 61WD37N4, WD45N4 ATV 61WD37N4C, WD45N4C		95	250	**VW3 A5 205**	60.000
ATV 61HD55N4, HD75N4 ATV 61WD55N4, WD75N4 ATV 61WD55N4C, WD75N4C		180	400	**VW3 A5 206**	120.000
ATV 61HD90N4, HC11N4 ATV 61WD90N4 ATV 61WD90N4C		200	945	**VW3 A5 207**	130.000
ATV 61HC13N4, HC16N4		300	1360	**VW3 A5 208**	165.000
ATV 61HC22N4		400	1900	**VW3 A5 209**	190.000
ATV 61HC25N4		600	2370	**VW3 A5 210**	260.000
ATV 61HC31N4		600	2370	**VW3 A5 210**	260.000
ATV 61HC40N4	Motor P 355 kW	600	2370	**VW3 A5 210**	260.000
	Motor P 400 kW	1200	5150	**VW3 A5 211**	600.000
ATV 61HC50N4		1200	5150	**VW3 A5 211**	600.000
ATV 61HC63N4		1200	5150	**VW3 A5 211**	600.000

(1) For ATV 61H075M3, HU15M3 and ATV 61HU15N4 drives, it is advisable to use a less powerful motor with a sinus filter.

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Variable speed drives for asynchronous motors

Altivar 61

Supply voltage 200…240 V 50/60 Hz

Table showing possible combinations of options for Altivar 61 UL Type 1/IP 20 drives

Motor		Drive	Options					
			DC choke	Line choke	Additional EMC input filter	IP 30 EMC filter kit	Motor choke	IP 20 kit for motor choke
kW	*HP*							
Single-phase supply voltage: 200…240 V 50/60 Hz								
0.37	*0.5*	**ATV 61H075M3**	VW3 A4 503	–	VW3 A4 401	–	VW3 A5 101	–
0.75	*1*	**ATV 61HU15M3**	VW3 A4 505	–	VW3 A4 401	–	VW3 A5 101	–
1.5	*2*	**ATV 61HU22M3**	VW3 A4 506	–	VW3 A4 402	–	VW3 A5 101	–
2.2	*3*	**ATV 61HU30M3**	VW3 A4 507	–	VW3 A4 402	–	VW3 A5 102, 103	–
3	–	**ATV 61HU40M3**	VW3 A4 508	VW3 A58501	VW3 A4 402	–	VW3 A5 102, 103	–
4	*5*	**ATV 61HU55M3**	VW3 A4 508	VW3 A58502	VW3 A4 403	–	VW3 A5 102, 103	–
5.5	*7.5*	**ATV 61HU75M3**	VW3 A4 509	VW3 A58502	VW3 A4 404	–	VW3 A5 102, 103	–
Three-phase supply voltage: 200…240 V 50/60 Hz								
0.75	*1*	**ATV 61H075M3**	VW3 A4 503	VW3 A4 551	VW3 A4 401	–	VW3 A5 101	–
1.5	*2*	**ATV 61HU15M3**	VW3 A4 505	VW3 A4 552	VW3 A4 401	–	VW3 A5 101	–
2.2	*3*	**ATV 61HU22M3**	VW3 A4 506	VW3 A4 552	VW3 A4 402	–	VW3 A5 101	–
3	–	**ATV 61HU30M3**	VW3 A4 507	VW3 A4 553	VW3 A4 402	–	VW3 A5 102, 103	–
4	*5*	**ATV 61HU40M3**	VW3 A4 508	VW3 A4 554	VW3 A4 402	–	VW3 A5 102, 103	–
5.5	*7.5*	**ATV 61HU55M3**	VW3 A4 508	VW3 A4 554	VW3 A4 403	–	VW3 A5 102, 103	–
7.5	*10*	**ATV 61HU75M3**	VW3 A4 509	VW3 A4 555	VW3 A4 404	–	VW3 A5 102, 103	–
11	*15*	**ATV 61HD11M3X**	VW3 A4 510	VW3 A4 555	VW3 A4 405	–	VW3 A5 103	–
15	*20*	**ATV 61HD15M3X**	VW3 A4 510	VW3 A4 556	VW3 A4 405	–	VW3 A5 103	–
18.5	*25*	**ATV 61HD18M3X**	VW3 A4 511	VW3 A4 557	VW3 A4 406	–	VW3 A5 103	–
22	*30*	**ATV 61HD22M3X**	VW3 A4 511	VW3 A4 557	VW3 A4 406	–	VW3 A5 103	–
30	*40*	**ATV 61HD30M3X**	VW3 A4 512	VW3 A4 557	VW3 A4 408	–	VW3 A5 104	VW3 A9 612
37	*50*	**ATV 61HD37M3X**	VW3 A4 512	VW3 A4 557	VW3 A4 408	–	VW3 A5 104	VW3 A9 612
45	*60*	**ATV 61HD45M3X**	VW3 A4 512	VW3 A4 557	VW3 A4 408	–	VW3 A5 104	VW3 A9 612
55	*75*	**ATV 61HD55M3X**	Integrated	*(1)*	VW3 A4 410	VW3 A9 601	VW3 A5 105	VW3 A9 612
75	*100*	**ATV 61HD75M3X**	Integrated	*(1)*	VW3 A4 410	VW3 A9 601	VW3 A5 105	VW3 A9 612
90	*125*	**ATV 61HD90M3X**	Integrated	*(1)*	VW3 A4 411	VW3 A9 601	VW3 A5 106	VW3 A9 613
Pages		2/172	2/227	2/230	2/238	2/239	2/242	2/243

List of options common to all Altivar 61 UL Type 1/IP 20 drives

For drives	Logic input adaptor 115 V ∿	Remote graphic display terminal	Encoder interface cards			I/O cards *(2)*	
			with RS 422 compatible outputs	with open collector outputs	with push-pull outputs	Logic	Extended
ATV 61H●●●M3 **ATV 61H●●●M3X**	VW3 A3 101	VW3 A1 101	VW3 A3 401	VW3 A3 403, 404	VW3 A3 405…407	VW3 A3 201	VW3 A3 202
Pages	2/176	2/188	2/191	2/191	2/191	2/193	2/193

For drives	Multi-pump cards *(2)*		"Controller Inside" programmable card *(2)*	PowerSuite for PC software workshop
	compatible with ATV 38 applications	"Water solution"		
ATV 61H●●●M3 **ATV 61H●●●M3X**	VW3 A3 502	VW3 A3 503	VW3 A3 501	VW3 A8 104, 105
Pages	2/197	2/197	2/205	3/4

(1) See page 2/230.

(2) Maximum combination: see page 2/247.

Sinus filter	Braking resistor	Control card fan kit	UL Type 1 conformity kit (outside enclosure)	IP 21 or IP 31 conformity kit (outside enclosure)	Flush-mounting kit (in dust and damp proof enclosure)
VW3 A5 201	VW3 A7 701	–	VW3 A9 201	VW3 A9 101	VW3 A9 501
VW3 A5 201	VW3 A7 702	–	VW3 A9 201	VW3 A9 101	VW3 A9 501
VW3 A5 202	VW3 A7 702	–	VW3 A9 202	VW3 A9 102	VW3 A9 502
VW3 A5 202	VW3 A7 703	–	VW3 A9 202	VW3 A9 102	VW3 A9 502
VW3 A5 203	VW3 A7 703	–	VW3 A9 202	VW3 A9 102	VW3 A9 502
VW3 A5 203	VW3 A7 704	–	VW3 A9 203	VW3 A9 103	VW3 A9 503
VW3 A5 203	VW3 A7 704	–	VW3 A9 204	VW3 A9 104	VW3 A9 504
VW3 A5 201	VW3 A7 701	–	VW3 A9 201	VW3 A9 101	VW3 A9 501
VW3 A5 201	VW3 A7 702	–	VW3 A9 201	VW3 A9 101	VW3 A9 501
VW3 A5 202	VW3 A7 702	–	VW3 A9 202	VW3 A9 102	VW3 A9 502
VW3 A5 202	VW3 A7 703	–	VW3 A9 202	VW3 A9 102	VW3 A9 502
VW3 A5 203	VW3 A7 703	–	VW3 A9 202	VW3 A9 102	VW3 A9 502
VW3 A5 203	VW3 A7 704	–	VW3 A9 203	VW3 A9 103	VW3 A9 503
VW3 A5 203	VW3 A7 704	–	VW3 A9 204	VW3 A9 104	VW3 A9 504
VW3 A5 204	VW3 A7 705	–	VW3 A9 205	VW3 A9 105	VW3 A9 505
VW3 A5 204	VW3 A7 706	–	VW3 A9 205	VW3 A9 105	VW3 A9 505
VW3 A5 205	VW3 A7 707	VW3 A9 404	VW3 A9 206	VW3 A9 106	VW3 A9 506
VW3 A5 205	VW3 A7 707	VW3 A9 404	VW3 A9 206	VW3 A9 106	VW3 A9 506
VW3 A5 206	VW3 A7 708	VW3 A9 406	VW3 A9 217	VW3 A9 117	VW3 A9 508
VW3 A5 206	VW3 A7 709	VW3 A9 406	VW3 A9 217	VW3 A9 117	VW3 A9 508
VW3 A5 206	VW3 A7 709	VW3 A9 406	VW3 A9 217	VW3 A9 117	VW3 A9 508
VW3 A5 208	VW3 A7 713	–	VW3 A9 209	VW3 A9 109	VW3 A9 510
VW3 A5 208	VW3 A7 713	–	VW3 A9 209	VW3 A9 109	VW3 A9 510
VW3 A5 209	VW3 A7 714	–	VW3 A9 210	VW3 A9 110	VW3 A9 511
2/245	2/219	2/177	2/178	2/179	2/180

Communication cards

Ethernet TCP/IP	Modbus/ Uni-Telway	Fipio	Modbus Plus	Profibus DP	DeviceNet	INTERBUS	LONWORKS	METASYS N2	APOGEE FLN	BACnet
VW3 A3 310	VW3 A3 303	VW3 A3 311	VW3 A3 302	VW3 A3 307	VW3 A3 309	VW3 A3 304	VW3 A3 312	VW3 A3 313	VW3 A3 314	VW3 A3 315
2/214 and 4/6	2/214, 4/13 and 4/21	2/214 and 4/10	2/214 and 4/18	2/214	2/214	2/214	2/214	2/214	2/214	2/214

Maximum combination: 2 cards, in accordance with the compatibility table below

Type of card	Logic I/O VW3 A3 201	Extended I/O VW3 A3 202	Multi-pump VW3 A3 502, 503	Programmable "Controller Inside" VW3 A3 501	Communication VW3 A3 3●●
Logic I/O VW3 A3 201					
Extended I/O VW3 A3 202					
Multi-pump VW3 A3 502, 503					
Programmable "Controller Inside" VW3 A3 501					
Communication VW3 A3 3●●					

Possible to combine

Not possible to combine

Variable speed drives for asynchronous motors

Altivar 61

Supply voltage 380…480 V 50/60 Hz

Table showing possible combinations of options for Altivar 61 UL Type 1/IP 20 drives

Motor kW	Motor HP	Drive	Options: DC choke	Line choke	Passive filter (1)	Additional EMC input filter	IP 30 EMC filter kit	Motor choke	IP 20 motor choke kit
Three-phase supply voltage: 380…480 V 50/60 Hz									
0.75	1	**ATV 61H075N4**	VW3 A4 501	VW3 A4 551	VW3 A4 6●1	VW3 A4 401	–	VW3 A5 10●	–
1.5	2	**ATV 61HU15N4**	VW3 A4 502	VW3 A4 551	VW3 A4 6●1	VW3 A4 401	–	VW3 A5 10●	–
2.2	3	**ATV 61HU22N4**	VW3 A4 503	VW3 A4 552	VW3 A4 6●1	VW3 A4 401	–	VW3 A5 10●	–
3	–	**ATV 61HU30N4**	VW3 A4 503	VW3 A4 552	VW3 A4 6●1	VW3 A4 402	–	VW3 A5 10●	–
4	5	**ATV 61HU40N4**	VW3 A4 504	VW3 A4 552	VW3 A4 6●2	VW3 A4 402	–	VW3 A5 10●	–
5.5	7.5	**ATV 61HU55N4**	VW3 A4 505	VW3 A4 553	VW3 A4 6●2	VW3 A4 403	–	VW3 A5 10●	VW3 A9 612
7.5	10	**ATV 61HU75N4**	VW3 A4 506	VW3 A4 553	VW3 A4 6●3	VW3 A4 403	–	VW3 A5 10●	VW3 A9 612
11	15	**ATV 61HD11N4**	VW3 A4 507	VW3 A4 554	VW3 A4 6●3	VW3 A4 404	–	VW3 A5 10●	VW3 A9 612
15	20	**ATV 61HD15N4**	VW3 A4 508	VW3 A4 554	VW3 A4 6●4	VW3 A4 405	–	VW3 A5 10●	VW3 A9 612
18.5	25	**ATV 61HD18N4**	VW3 A4 508	VW3 A4 555	VW3 A4 6●5	VW3 A4 405	–	VW3 A5 10●	VW3 A9 612
22	30	**ATV 61HD22N4**	VW3 A4 510	VW3 A4 555	VW3 A4 6●6	VW3 A4 406	–	VW3 A5 10●	VW3 A9 612
30	40	**ATV 61HD30N4**	VW3 A4 510	VW3 A4 556	VW3 A4 6●7	VW3 A4 407	–	VW3 A5 10●	VW3 A9 612
37	50	**ATV 61HD37N4**	VW3 A4 510	VW3 A4 556	VW3 A4 6●7	VW3 A4 407	–	VW3 A5 10●	VW3 A9 612
45	60	**ATV 61HD45N4**	VW3 A4 511	VW3 A4 556	VW3 A4 6●8	VW3 A4 408	–	VW3 A5 104	VW3 A9 612
55	75	**ATV 61HD55N4**	VW3 A4 511	VW3 A4 556	VW3 A4 6●8	VW3 A4 408	–	VW3 A5 104	VW3 A9 612
75	100	**ATV 61HD75N4**	VW3 A4 511	VW3 A4 557	VW3 A4 6●9	VW3 A4 408	–	VW3 A5 104	VW3 A9 612
90	125	**ATV 61HD90N4**	–	(2)	VW3 A4 6●9	VW3 A4 410	VW3 A9 601	VW3 A5 104	VW3 A9 612
110	150	**ATV 61HC11N4**	–	(2)	VW3 A4 6●0	VW3 A4 410	VW3 A9 601	VW3 A5 105	VW3 A9 612
132	200	**ATV 61HC13N4**	–	(2)	VW3 A4 6●1	VW3 A4 410	VW3 A9 601	VW3 A5 105	VW3 A9 612
160	250	**ATV 61HC16N4**	–	(2)	VW3 A4 6●2	VW3 A4 410	VW3 A9 601	VW3 A5 106	VW3 A9 613
200	300	**ATV 61HC22N4**	–	(2)	VW3 A4 6●3	VW3 A4 411	VW3 A9 601	VW3 A5 106	VW3 A9 613
220	350	**ATV 61HC22N4**	–	(2)	VW3 A4 6●3	VW3 A4 411	VW3 A9 601	VW3 A5 106	VW3 A9 613
250	400	**ATV 61HC25N4**	–	(2)	VW3 A4 6●1	VW3 A4 411	VW3 A9 601	VW3 A5 107	VW3 A9 613
280	450	**ATV 61HC31N4**	–	(2)	VW3 A4 6●2	VW3 A4 411	VW3 A9 601	VW3 A5 107	VW3 A9 613
315	500	**ATV 61HC31N4**	–	(2)	VW3 A4 6●2	VW3 A4 411	VW3 A9 601	VW3 A5 107	VW3 A9 613
355	–	**ATV 61HC40N4**	–	(2)	VW3 A4 6●2	VW3 A4 412	VW3 A9 602	VW3 A5 107	VW3 A9 613
400	600	**ATV 61HC40N4**	–	(2)	VW3 A4 6●9	VW3 A4 412	VW3 A9 602	VW3 A5 108	VW3 A9 613
500	700	**ATV 61HC50N4**	–	(2)	VW3 A4 6●2	VW3 A4 412	VW3 A9 602	VW3 A5 108	VW3 A9 613
560	800	**ATV 61HC63N4**	–	(2)	VW3 A4 6●3	VW3 A4 413	VW3 A9 602	VW3 A5 108	VW3 A9 613
630	900	**ATV 61HC63N4**	–	(2)	VW3 A4 6●3	VW3 A4 413	VW3 A9 602	VW3 A5 108	VW3 A9 613
Pages		2/173	2/227	2/230	2/232	2/238	2/239	2/242	2/243

List of options common to all Altivar 61 UL Type 1/IP 20 drives

For drives	Logic input adaptor 115 V ∿	Remote graphic display terminal	Encoder interface cards: with RS 422 compatible outputs	with open collector outputs	with push-pull outputs	I/O cards (3): Logic	Extended
ATV 61H●●●N4	VW3 A3 101	VW3 A1 101	VW3 A3 401	VW3 A3 403, 404	VW3 A3 405…407	VW3 A3 201	VW3 A3 202
Pages	2/176	2/188	2/191	2/191	2/191	2/193	2/193

For drives	Multi-pump cards (3): compatible with ATV 38 applications	"Water solution"	"Controller Inside" programmable card (3)	PowerSuite for PC software workshop
ATV 61H●●●N4	VW3 A3 502	VW3 A3 503	VW3 A3 501	VW3 A8 104, 105
Pages	2/197	2/197	2/205	3/4

(1) There are special passive filters for a 460 V∿ supply, see pages 2/234 and 2/235.
(2) See page 2/230
(3) Maximum combination: see page 2/249.

Sinus filter	Resistance braking unit	Braking resistor	Control card fan kit	UL Type 1 conformity kit (outside enclosure)	IP 21 or IP 31 conformity kit (outside enclosure)	Flush-mounting kit (in dust and damp proof enclosure)
–	–	VW3 A7 701	–	VW3 A9 201	VW3 A9 101	VW3 A9 501
VW3 A5 201	–	VW3 A7 701	–	VW3 A9 201	VW3 A9 101	VW3 A9 501
VW3 A5 201	–	VW3 A7 701	–	VW3 A9 201	VW3 A9 101	VW3 A9 501
VW3 A5 201	–	VW3 A7 701	–	VW3 A9 202	VW3 A9 102	VW3 A9 502
VW3 A5 201	–	VW3 A7 701	–	VW3 A9 202	VW3 A9 102	VW3 A9 502
VW3 A5 202	–	VW3 A7 702	–	VW3 A9 203	VW3 A9 103	VW3 A9 503
VW3 A5 203	–	VW3 A7 702	–	VW3 A9 203	VW3 A9 103	VW3 A9 503
VW3 A5 203	–	VW3 A7 703	–	VW3 A9 204	VW3 A9 104	VW3 A9 504
VW3 A5 203	–	VW3 A7 703	–	VW3 A9 205	VW3 A9 105	VW3 A9 505
VW3 A5 204	–	VW3 A7 704	–	VW3 A9 205	VW3 A9 105	VW3 A9 505
VW3 A5 204	–	VW3 A7 704	VW3 A9 404	VW3 A9 206	VW3 A9 106	VW3 A9 506
VW3 A5 204	–	VW3 A7 704	VW3 A9 405	VW3 A9 207	VW3 A9 107	VW3 A9 507
VW3 A5 205	–	VW3 A7 705	VW3 A9 405	VW3 A9 207	VW3 A9 107	VW3 A9 507
VW3 A5 205	–	VW3 A7 707	VW3 A9 407	VW3 A9 208	VW3 A9 108	VW3 A9 509
VW3 A5 206	–	VW3 A7 707	VW3 A9 407	VW3 A9 208	VW3 A9 108	VW3 A9 509
VW3 A5 206	–	VW3 A7 707	VW3 A9 407	VW3 A9 208	VW3 A9 108	VW3 A9 509
VW3 A5 207	–	VW3 A7 710	–	VW3 A9 209	VW3 A9 109	VW3 A9 510
VW3 A5 207	–	VW3 A7 710	–	VW3 A9 209	VW3 A9 109	VW3 A9 510
VW3 A5 208	–	VW3 A7 711	–	VW3 A9 210	VW3 A9 110	VW3 A9 511
VW3 A5 208	–	VW3 A7 711	–	VW3 A9 211	VW3 A9 111	VW3 A9 512
VW3 A5 209	–	VW3 A7 712	–	VW3 A9 212	VW3 A9 112	VW3 A9 513
VW3 A5 209	–	VW3 A7 712	–	VW3 A9 212	VW3 A9 112	VW3 A9 513
VW3 A5 210	VW3 A7 101	VW3 A7 715	–	VW3 A9 213, 214	VW3 A9 113, 114	VW3 A9 514, 515
VW3 A5 210	VW3 A7 101	VW3 A7 716	–	VW3 A9 213, 214	VW3 A9 113, 114	VW3 A9 514, 515
VW3 A5 210	VW3 A7 101	VW3 A7 716	–	VW3 A9 213, 214	VW3 A9 113, 114	VW3 A9 514, 515
VW3 A5 210	VW3 A7 102	VW3 A7 717	–	–	VW3 A9 115	–
VW3 A5 211	VW3 A7 102	VW3 A7 717	–	–	VW3 A9 115	–
VW3 A5 211	VW3 A7 102	VW3 A7 717	–	–	VW3 A9 115	–
VW3 A5 211	VW3 A7 102	VW3 A7 718	–	–	VW3 A9 116	–
VW3 A5 211	VW3 A7 102	VW3 A7 718	–	–	VW3 A9 116	–
2/245	2/217	2/219	2/177	2/178	2/179	2/180

Communication cards

Ethernet TCP/IP	Modbus/ Uni-Telway	Fipio	Modbus Plus	Profibus DP	DeviceNet	INTERBUS	LONWORKS	METASYS N2	APOGEE FLN	BACnet
VW3 A3 310	VW3 A3 303	VW3 A3 311	VW3 A3 302	VW3 A3 307	VW3 A3 309	VW3 A3 304	VW3 A3 312	VW3 A3 313	VW3 A3 314	VW3 A3 315
2/214 and 4/6	2/214, 4/13 and 4/21	2/214 and 4/10	2/214 and 4/18	2/214	2/214	2/214	2/214	2/214	2/214	2/214

Maximum combination: 2 cards, in accordance with the compatibility table below

Type of card	Logic I/O VW3 A3 201	Extended I/O VW3 A3 202	Multi-pump VW3 A3 502, 503	Programmable "Controller Inside" VW3 A3 501	Communication VW3 A3 3●●
Logic I/O VW3 A3 201					
Extended I/O VW3 A3 202					
Multi-pump VW3 A3 502, 503					
Programmable "Controller Inside" VW3 A3 501					
Communication VW3 A3 3●●					

Possible to combine *Not possible to combine*

Variable speed drives for asynchronous motors

Altivar 61

Supply voltage 380…480 V 50/60 Hz

Table showing possible combinations of options for Altivar 61 UL Type 12/IP 54 drives

Motor		Drive	Options		
			Line chokes	Passive filter *(1)*	Motor choke
kW	*HP*				
Three-phase supply voltage: 380…480 V 50/60 Hz					
0.75	*1*	**ATV 61W075N4** **ATV 61W075N4C**	VW3 A4 551	VW3 A4 6●1	VW3 A5 101, 102, 103
1.5	*2*	**ATV 61WU15N4** **ATV 61WU15N4C**	VW3 A4 551	VW3 A4 6●1	VW3 A5 101, 102, 103
2.2	*3*	**ATV 61WU22N4** **ATV 61WU22N4C**	VW3 A4 552	VW3 A4 6●1	VW3 A5 101, 102, 103
3	–	**ATV 61WU30N4** **ATV 61WU30N4C**	VW3 A4 552	VW3 A4 6●1	VW3 A5 101, 102, 103
4	*5*	**ATV 61WU40N4** **ATV 61WU40N4C**	VW3 A4 552	VW3 A4 6●2	VW3 A5 101, 102, 103
5.5	*7.5*	**ATV 61WU55N4** **ATV 61WU55N4C**	VW3 A4 553	VW3 A4 6●2	VW3 A5 102, 103, 104
7.5	*10*	**ATV 61WU75N4** **ATV 61WU75N4C**	VW3 A4 553	VW3 A4 6●3	VW3 A5 102, 103, 104
11	*15*	**ATV 61WD11N4** **ATV 61WD11N4C**	VW3 A4 554	VW3 A4 6●3	VW3 A5 102, 103, 104
15	*20*	**ATV 61WD15N4** **ATV 61WD15N4C**	VW3 A4 554	VW3 A4 6●4	VW3 A5 102, 103, 104
18.5	*25*	**ATV 61WD18N4** **ATV 61WD18N4C**	VW3 A4 555	VW3 A4 6●5	VW3 A5 102, 103, 104
22	*30*	**ATV 61WD22N4** **ATV 61WD22N4C**	VW3 A4 555	VW3 A4 6●6	VW3 A5 103, 104
30	*40*	**ATV 61WD30N4** **ATV 61WD30N4C**	VW3 A4 556	VW3 A4 6●7	VW3 A5 103, 104
37	*50*	**ATV 61WD37N4** **ATV 61WD37N4C**	VW3 A4 556	VW3 A4 6●7	VW3 A5 103, 104
45	*60*	**ATV 61WD45N4** **ATV 61WD45N4C**	VW3 A4 556	VW3 A4 6●8	VW3 A5 104
55	*75*	**ATV 61WD55N4**	VW3 A4 556	VW3 A4 6●8	VW3 A5 104
55	*75*	**ATV 61WD55N4C**	VW3 A4 556	VW3 A4 6●8	VW3 A5 104
75	*100*	**ATV 61WD75N4**	VW3 A4 557	VW3 A4 6●9	VW3 A5 104
75	*100*	**ATV 61WD75N4C**	VW3 A4 557	VW3 A4 6●9	VW3 A5 104
90	*125*	**ATV 61WD90N4**	VW3 A4 558	VW3 A4 6●9	VW3 A5 104
90	*125*	**ATV 61WD90N4C**	VW3 A4 558	VW3 A4 6●9	VW3 A5 104
Pages		2/174 and 2/175	2/230	2/232	2/242

List of options common to all Altivar 61 UL Type 12/IP 54 drives

For drives	Logic input adaptor 115 V ∿	Remote graphic display terminal	Encoder interface cards			I/O cards *(2)*	
			with RS 422 compatible outputs	with open collector outputs	with push-pull outputs	Logic	Extended
ATV 61W●●●N4 **ATV 61W●●●N4C**	VW3 A3 101	VW3 A1 101	VW3 A3 401	VW3 A3 403, 404	VW3 A3 405…407	VW3 A3 201	VW3 A3 202
Pages	2/176	2/188	2/191	2/191	2/191	2/193	2/193

For drives	Multi-pump cards *(2)*		"Controller Inside" programmable card *(2)*	PowerSuite for PC software workshop
	compatible with ATV 38 applications	"Water solution"		
ATV 61W●●●N4 **ATV 61W●●●N4C**	VW3 A3 502	VW3 A3 503	VW3 A3 501	VW3 A8 104, 105
Pages	2/197	2/197	2/205	3/4

(1) There are special passive filters for a 460 V∿ supply, see pages 2/234 and 2/235.
(2) Maximum combination: see page 2/251.

IP 20 motor choke kit VW3 A5 104	Sinus filters	Braking resistor	Ready-assembled IP 54 base plate
–	VW3 A5 201	VW3 A7 701	VW3 A9 901
–	VW3 A5 201	VW3 A7 701	VW3 A9 901
–	VW3 A5 201	VW3 A7 701	VW3 A9 901
–	VW3 A5 201	VW3 A7 701	VW3 A9 901
–	VW3 A5 201	VW3 A7 701	VW3 A9 901
VW3 A9 612	VW3 A5 202	VW3 A7 701	VW3 A9 901
VW3 A9 612	VW3 A5 203	VW3 A7 702	VW3 A9 902
VW3 A9 612	VW3 A5 203	VW3 A7 702	VW3 A9 902
VW3 A9 612	VW3 A5 203	VW3 A7 703	VW3 A9 903
VW3 A9 612	VW3 A5 204	VW3 A7 703	VW3 A9 904
VW3 A9 612	VW3 A5 204	VW3 A7 704	VW3 A9 904
VW3 A9 612	VW3 A5 204	VW3 A7 704	VW3 A9 905
VW3 A9 612	VW3 A5 205	VW3 A7 704	VW3 A9 906
VW3 A9 612	VW3 A5 205	VW3 A7 705	VW3 A9 906
VW3 A9 612	VW3 A5 206	VW3 A7 706	VW3 A9 907
VW3 A9 612	VW3 A5 206	VW3 A7 706	VW3 A9 909
VW3 A9 612	VW3 A5 206	VW3 A7 706	VW3 A9 907
VW3 A9 612	VW3 A5 206	VW3 A7 706	VW3 A9 909
VW3 A9 612	VW3 A5 207	VW3 A7 706	VW3 A9 908
VW3 A9 612	VW3 A5 207	VW3 A7 706	VW3 A9 910
2/243	2/245	2/219	2/176

Communication cards

Ethernet TCP/IP	Modbus/ Uni-Telway	Fipio	Modbus Plus	Profibus DP	DeviceNet	INTERBUS	LONWORKS	METASYS N2	APOGEE FLN	BACnet
VW3 A3 310	VW3 A3 303	VW3 A3 311	VW3 A3 302	VW3 A3 307	VW3 A3 309	VW3 A3 304	VW3 A3 312	VW3 A3 313	VW3 A3 314	VW3 A3 315
2/214 and 4/6	2/214, 4/13 and 4/21	2/214 and 4/10	2/214 and 4/18	2/214	2/214	2/214	2/214	2/214	2/214	2/214

Maximum combination: 2 cards, in accordance with the compatibility table below

Type of card	Logic I/O VW3 A3 201	Extended I/O VW3 A3 202	Multi-pump VW3 A3 502, 503	Programmable "Controller Inside" VW3 A3 501	Communication VW3 A3 3●●
Logic I/O VW3 A3 201					
Extended I/O VW3 A3 202					
Multi-pump VW3 A3 502, 503					
Programmable "Controller Inside" VW3 A3 501					
Communication VW3 A3 3●●					

Possible to combine

Possible to combine

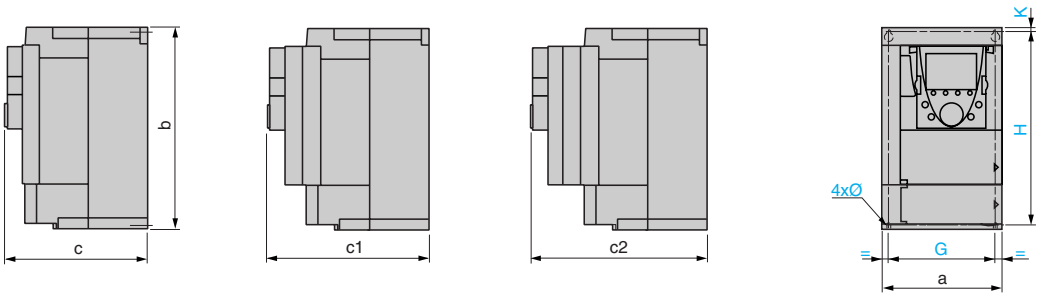
Variable speed drives for asynchronous motors

Altivar 61

UL Type 1/IP 20 drives

ATV 61H●●●M3, ATV 61HD11M3X...HD15M3X, ATV 61H075N4...HD18N4

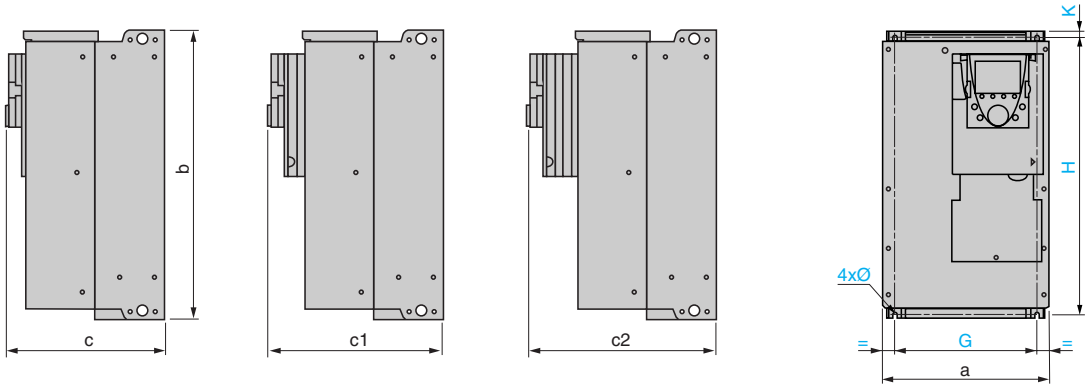
Without option card | **1 option card** *(1)* | **2 option cards** *(1)* | **Common front view**



ATV 61H	a	b	c	c1	c2	G	H	K	Ø
075M3, U15M3, 075N4...U22N4	130	230	175	198	221	113.5	220	5	5
U22M3...U40M3, U30N4, U40N4	155	260	187	210	233	138	249	4	5
U55M3, U55N4, U75N4	175	295	187	210	233	158	283	6	5
U75M3, D11N4	210	295	213	236	259	190	283	6	6
D11M3X, D15M3X, D15N4, D18N4	230	400	213	236	259	210	386	8	6

ATV 61HD18M3X...45M3X, ATV 61HD22N4...HD37N4

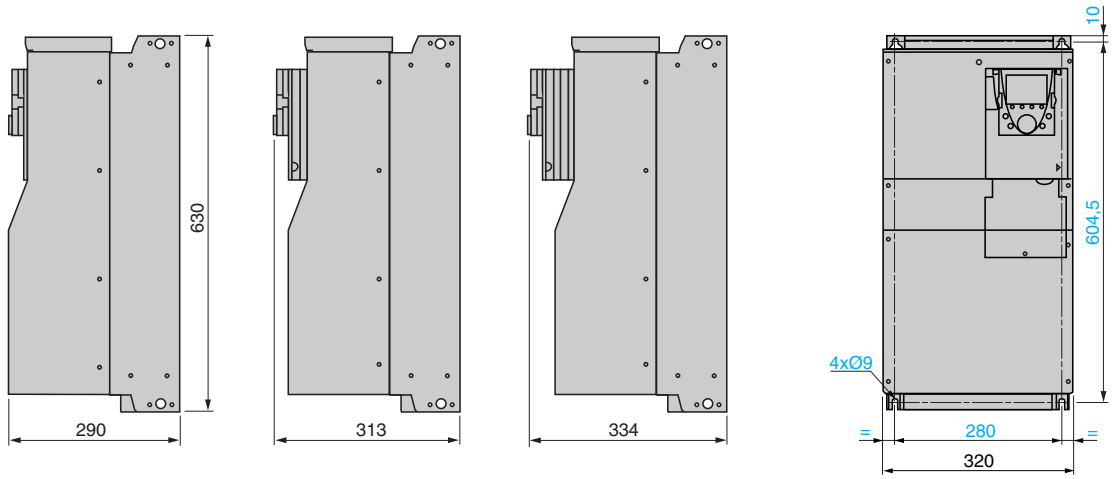
Without option card | **1 option card** *(1)* | **2 option cards** *(1)* | **Common front view**



ATV 61H	a	b	c	c1	c2	G	H	K	Ø
D18M3X, D22M3X, D22N4	240	420	236	259	282	206	403	10	6
D30N4, D37N4	240	550	266	289	312	206	529	10	6
D30M3X...D45M3X	320	550	266	289	312	280	524	10	9

ATV 61HD45N4...HD75N4

Without option card | **1 option card** *(1)* | **2 option cards** *(1)* | **Common front view**



(1) Option cards: I/O extension cards, multi-pump cards, "Controller Inside" programmable card, communication cards.

Presentation: pages 2/158 to 2/161 | Characteristics: pages 2/162 to 2/169 | References: pages 2/172 and 2/173 | Schemes: pages 2/274 to 2/291 | Functions: pages 2/312 to 2/339

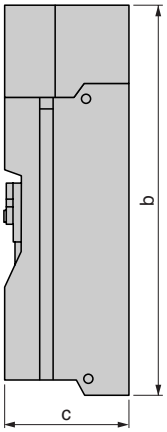
Variable speed drives for asynchronous motors

Altivar 61

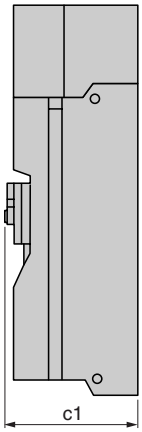
UL Type 1/IP 20 drives

ATV 61HD55M3X...HD90M3X, ATV 61HD90N4...HC31N4

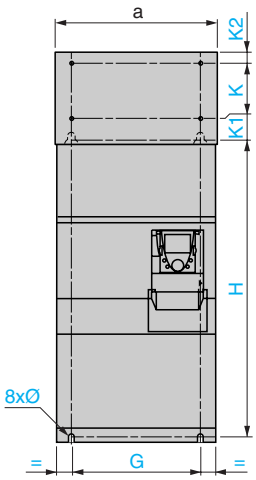
With or without 1 option card *(1)*



2 option cards *(1)*

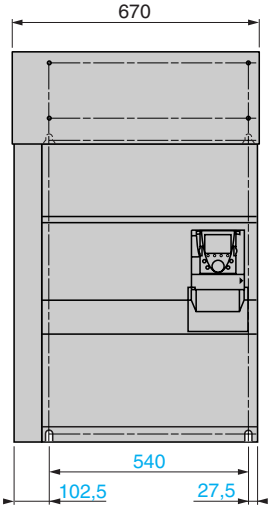


Common front view



ATV 61HC25N4, HC31N4 with braking unit VW3 A7 101

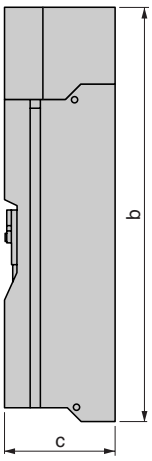
Front view



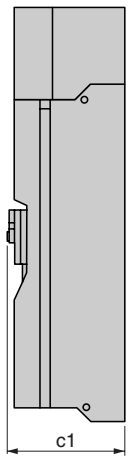
ATV 61H	a	b	c	c1	G	H	K	K1	K2	Ø
D55M3X, D75M3X D90N4, C11N4	320	920	377	392	250	650	150	75	30	11.5
D90M3X, C13N4	360	1022	377	392	298	758	150	75	30	11.5
C16N4	340	1190	377	392	285	920	150	75	30	11.5
C22N4	440	1190	377	392	350	920	150	75	30	11.5
C25N4, C31N4	595	1190	377	392	540	920	150	75	30	11.5

ATV 61HC40N4...HC63N4

With or without 1 option card *(1)*

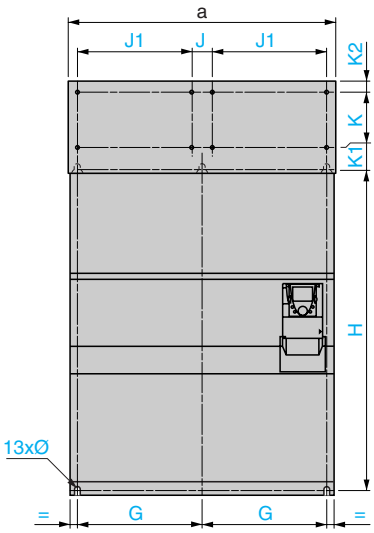


2 option cards *(1)*



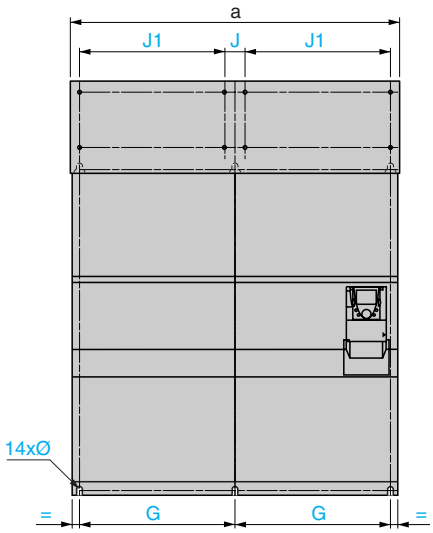
ATV 61HC40N4, HC50N4

Front view



ATV 61HC63N4

Front view



ATV 61H	a	b	c	c1	G	J	J1	H	K	K1	K2	Ø
C40N4, C50N4	890	1390	377	392	417.5	70	380	1120	150	75	30	11.5
C63N4	1120	1390	377	392	532.5	70	495	1120	150	75	30	11.5

(1) Option cards: I/O extension cards, multi-pump cards, "Controller Inside" programmable card, communication cards.

Presentation: pages 2/158 to 2/161
Characteristics: pages 2/162 to 2/169
References: pages 2/172 and 2/173
Schemes: pages 2/274 to 2/291
Functions: pages 2/312 to 2/339

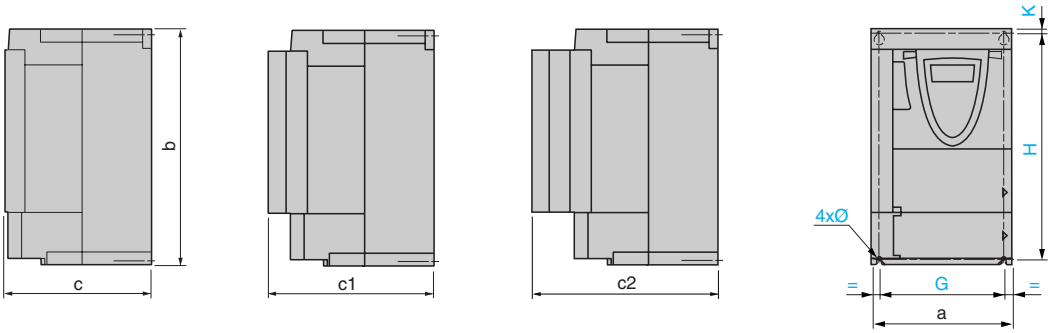
Variable speed drives for asynchronous motors

Altivar 61

UL Type 1/IP 20 drives

ATV 61H●●●M3Z, ATV 61HD11M3XZ, HD15M3XZ, ATV 61H075N4Z...HD18N4Z

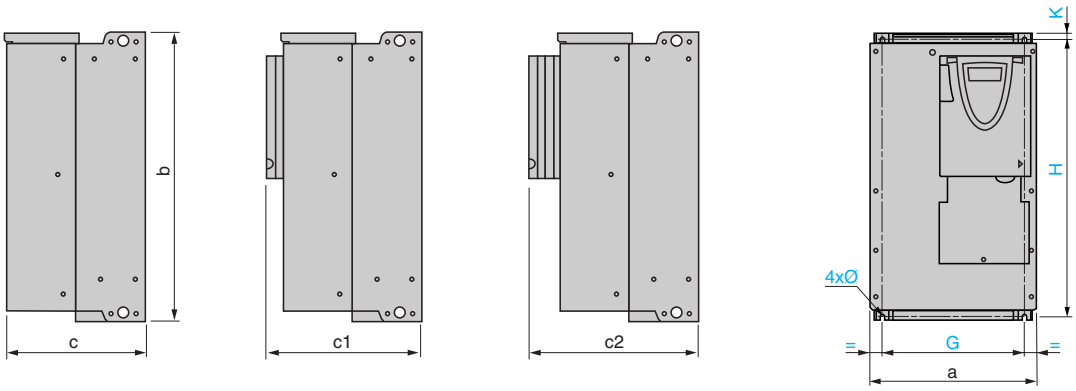
Without option card *(1)* | **1 option card** *(1)* | **2 option cards** *(1)* | **Common front view**



ATV 61H	a	b	c	c1	c2	G	H	K	Ø
075M3Z, U15M3Z, 075N4Z...U22N4Z	130	230	149	172	195	113.5	220	5	5
U22M3Z...U40M3Z, U30N4Z, U40N4Z	155	260	161	184	207	138	249	4	5
U55M3Z, U55N4Z, U75N4Z	175	295	161	184	207	158	283	6	5
U75M3Z, D11N4Z	210	295	187	210	233	190	283	6	6
D11M3XZ, D15M3XZ D15N4Z, D18N4Z	230	400	187	210	233	210	386	8	6

ATV 61HD18M3XZ...45M3XZ, ATV 61HD22N4Z...HD37N4Z

Without option card | **1 option card** *(1)* | **2 option cards** *(1)* | **Common front view**



ATV 61H	a	b	c	c1	c2	G	H	K	Ø
D18M3XZ, D22M3XZ, D22N4Z	240	420	210	233	256	206	403	10	6
D30N4Z, D37N4Z	240	550	230	253	276	206	529	10	6
D30M3XZ...D45M3XZ	320	550	230	253	276	280	529	10	9

(1) Option cards: I/O extension cards, multi-pump cards, "Controller Inside" programmable card, communication cards.

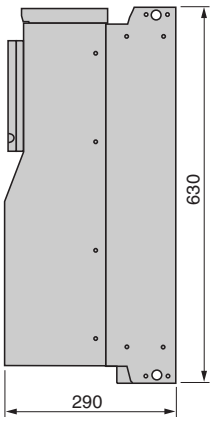
Variable speed drives for asynchronous motors

Altivar 61

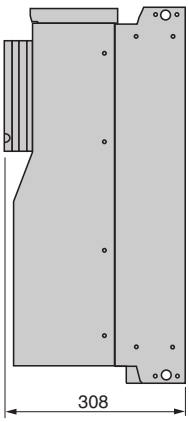
UL Type 1/IP 20 drives

ATV 61HD45N4Z...HD75N4Z

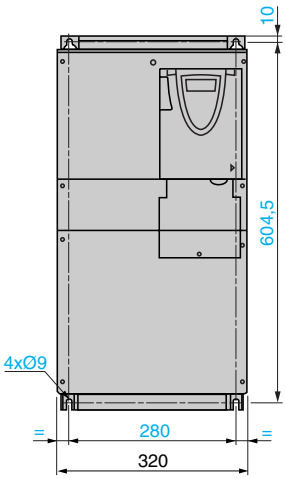
With or without 1 option card *(1)*



2 option cards *(1)*

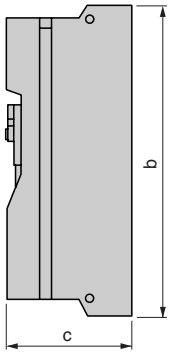


Common front view

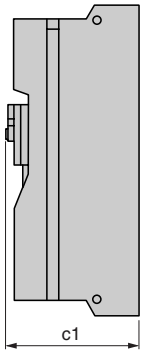


ATV 61HD55M3XD...HD90M3XD, ATV 61HD90N4D...HC31N4D

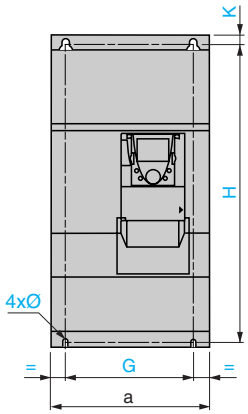
With or without 1 option card *(1)*



2 option cards *(1)*

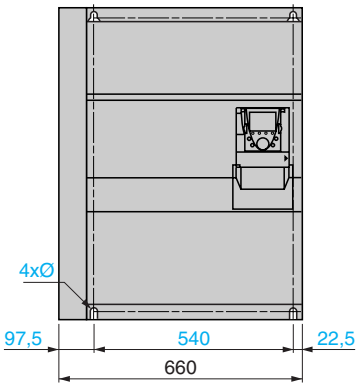


Common front view



ATV 61HC25N4D, HC31N4D with braking unit VW3 A7 101

Front view



ATV 61H	a	b	c	c1	G	H	K	Ø
D55M3XD, D75M3XD D90N4D, C11N4D	310	680	377	392	250	650	15	11.5
D90M3XD, C13N4D	350	782	377	392	298	758	12	11.5
C16N4D	330	950	377	392	285	920	15	11.5
C22N4D	430	950	377	392	350	920	15	11.5
C25N4D, C31N4D	585	950	377	392	540	920	15	11.5

(1) Option cards: I/O extension cards, multi-pump cards, "Controller Inside" programmable card, communication cards.

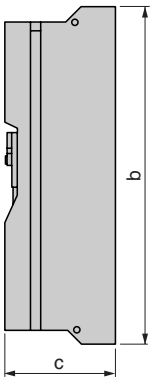
Variable speed drives for asynchronous motors

Altivar 61

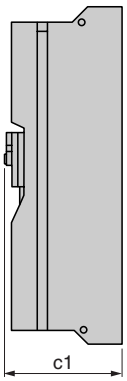
UL Type 1/IP 20, UL Type 12/IP 54 drives

ATV 61HC40N4D...HC63N4D

With or without 1 option card *(1)*

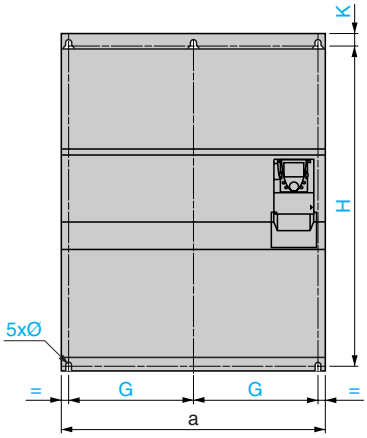


2 option cards *(1)*



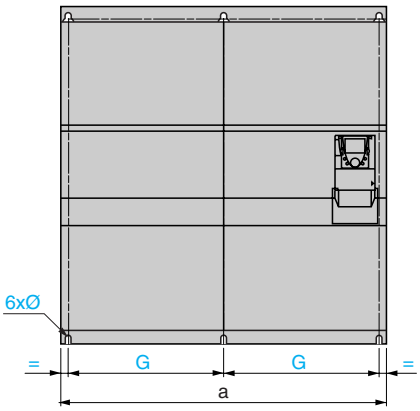
ATV 61HC40N4D, HC50N4D

Front view



ATV 61HC63N4D

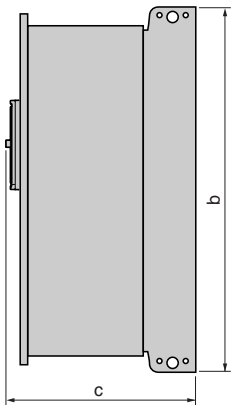
Front view

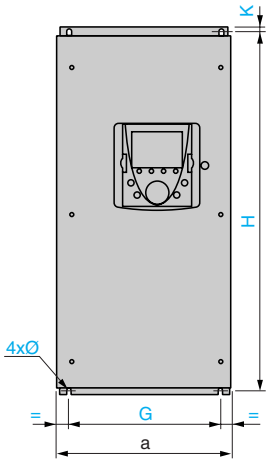


ATV 61H	a	b	c	c1	G	H	K	Ø
C40N4D, C50N4D	880	1150	377	392	417,5	1120	15	11,5
C63N4D	1110	1150	377	392	532,5	1120	15	11,5

(1) Option cards: I/O extension cards, multi-pump cards, "Controller Inside" programmable card, communication cards.

ATV 61W075N4...WD90N4, ATV 61W075N4C...WD90N4C

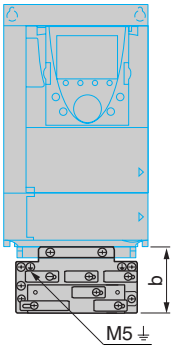




ATV 61W	a	b	c	G	H	K	Ø
075N4...U30N4 075N4C...U30N4C	235	490	272	200	478	6	6
U40N4, U55N4 U40N4C, U55N4C	235	490	286	200	478	6	6
U75N4, D11N4 U75N4C, D11N4C	255	525	286	220	513	6	6
D15N4 D15N4C	290	560	315	250	544	8	6
D18N4, D22N4 D18N4C, D22N4C	310	665	315	270	650	10	6
D30N4 D30N4C	284	720	315	245	700	10	7
D37N4, D45N4 D37N4C, D45N4C	284	880	343	245	860	10	7
D55N4...D90N4 D55N4C...D90N4C	362	1000	364	300	975	10	9

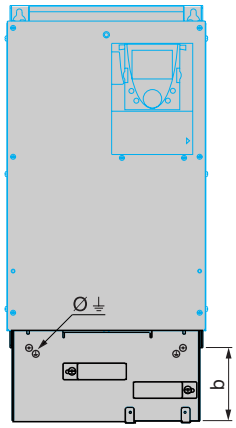
EMC mounting plates *(1)*

For ATV 61H●●●M3, ATV 61HD11M3X, HD15M3X, ATV 61H075N4…HD18N4



For ATV 61H	b
075M3…U40M3, 075N4…U40N4	83
U55M3…U75M3 D11M3X, D15M3X U55N4…D18N4	95

For ATV 61HD18M3X…HD45M3X, ATV 61HD22N4…HD75N4

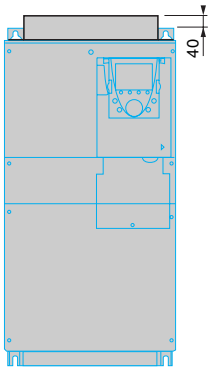


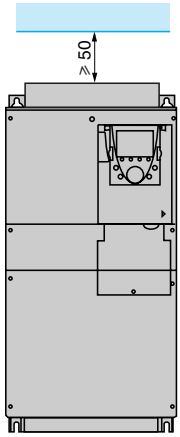
For ATV 61H	b	Ø
D18M3X, D22M3X, D22N4	122	M5
D30N4, D37N4	113	M5
D30M3X…D45M3X D45N4…D75N4	118	M8

(1) Supplied with the drive apart from ATV 61HD55M3X… HD90M3X and ATV 61HD90N4…HC63N4. In the case of these drives the mounting plate is supplied with the UL Type 1, IP 21 or IP 31 conformity kits, which must be ordered separately, see pages 2/178 and 2/179. Dimensions, see page 2/258 and 2/259.

VW3 A9 404…407 control card fan kits

Mounting recommendations





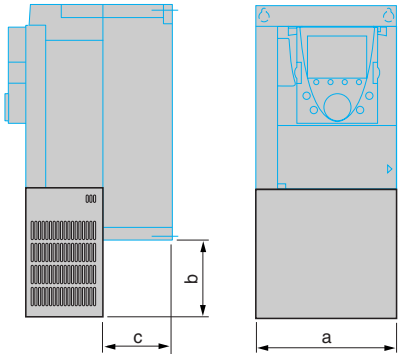
Variable speed drives for asynchronous motors

Altivar 61

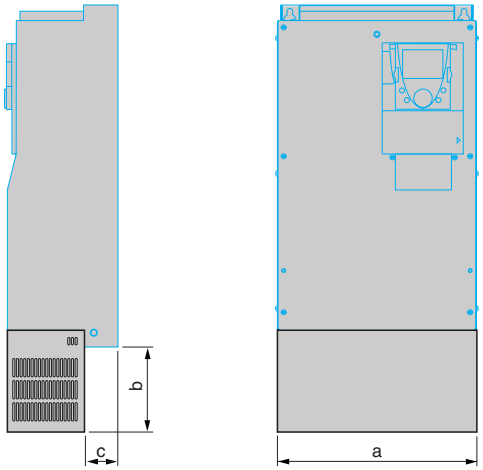
Accessories

UL Type 1 VW3 A9 2●●, IP 21 or IP 31 VW3 A9 1●● conformity kits

VW3 A9 201…205, 101…105



VW3 A9 206…208, 217, 106…108, 117



VW3	a	b	c
A9 201	132.6	31.4	60
A9 202	154.9	31.4	70
A9 203	177	31.4	70
A9 204	211.6	35.4	90
A9 205	231.6	38.9	90
A9 101	132.6	96.8	60
A9 102	154.9	104.1	70
A9 103	177	111.7	70
A9 104	211.6	128.9	90
A9 105	231.6	199.4	90

VW3	a	b	c
A9 206	240	59.9	102
A9 207	240	51.5	102
A9 217	320	48	102
A9 208	320	136	102
A9 106	240	75	102
A9 107	240	75	102
A9 117	320	75	102
A9 108	320	163	102

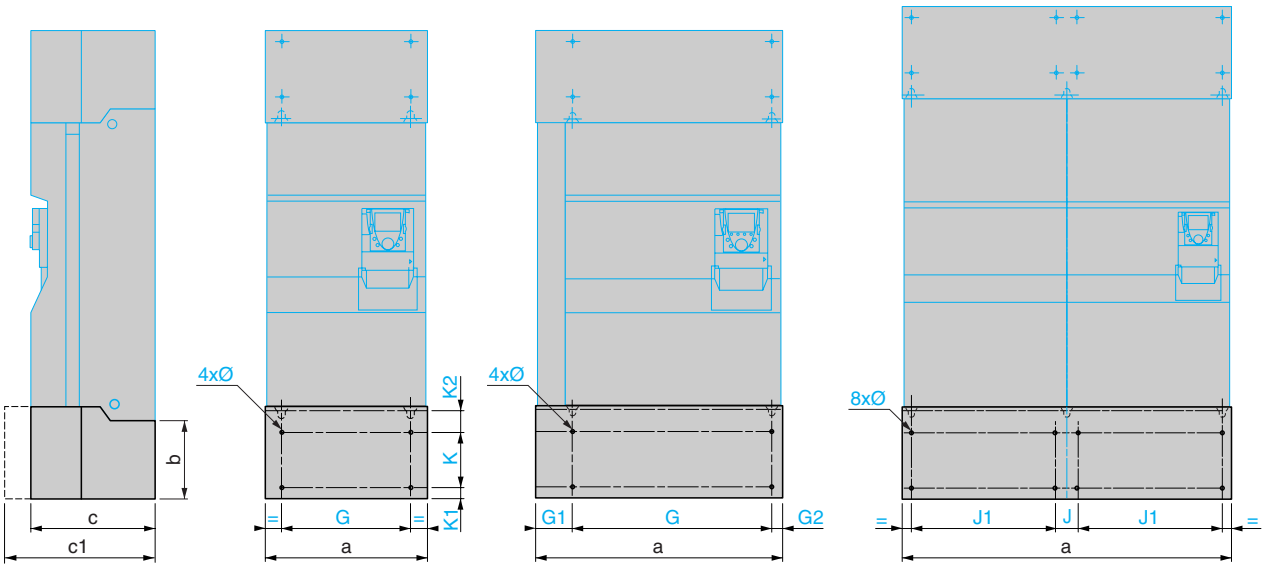
Presentation :
pages 2/178 and 2/179

References :
pages 2/178 and 2/179

Functions :
pages 2/312 to 2/339

UL Type 1 VW3 A9 2●●, IP 21 or IP 31 VW3 A9 1●● conformity kits (continued)

VW3 A9 209…214, VW3 A9 109…116	VW3 A9 209…213, VW3 A9 109…113, 115	VW3 A9 214, 114 (with braking unit)	VW3 A9 116

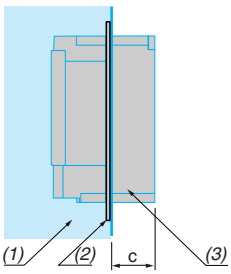


VW3	a	b	c	c1	G	G1	G2	K	K1	K2	Ø	J	J1
A9 209	334	220	377	–	250	–	–	95	65	75	11.5	–	–
A9 210	374	300	377	–	298	–	–	172	65	75	11.5	–	–
A9 211	345	315	377	–	285	–	–	250	65	75	11.5	–	–
A9 212	445	375	377	–	350	–	–	250	65	75	11.5	–	–
A9 213	600	375	377	–	540	–	–	250	65	75	11.5	–	–
A9 214	670	375	377	–	540	102.5	27.5	250	65	75	11.5	–	–
A9 109	334	220	377	–	250	–	–	95	65	75	11.5	–	–
A9 110	374	300	377	–	298	–	–	172	65	75	11.5	–	–
A9 111	345	315	377	–	285	–	–	250	65	75	11.5	–	–
A9 112	445	375	377	–	350	–	–	250	65	75	11.5	–	–
A9 113	600	375	377	–	540	–	–	250	65	75	11.5	–	–
A9 114	670	375	377	–	540	102.5	27.5	250	65	75	11.5	–	–
A9 115	895	475	–	477	835	–	–	350	65	75	11.5	–	–
A9 116	1125	475	–	477	–	–	–	350	65	75	11.5	70	495

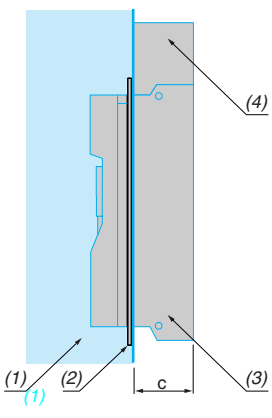
Kits for flush-mounting in a dust and damp proof enclosure

Installation of the drive using the kit for flush-mounting

Side view



Side view



For ATV 61H drives	c	Kit VW3
075M3, U15M3, 075N4…U22N4	60	**A9 501**
U22M3…U55M3, U30N4…U75N4	70	**A9 502, 503**
U75M3, D11M3X, D15M3X, D11N4…D18N4	90	**A9 504, 505**
D18M3X…D45M3X D22N4…D75N4	105	**A9 506…509**
D55M3X, D75M3X D55M3XD, D75M3XD, D90N4, HC11N4, D90N4D, HC11N4D	150	**VW3 A9 510**
D90M3X, D90M3XD, HC13N4…HC31N4, HC13N4D…HC31N4D	250	**VW3 A9 511…515**

(1) Dust and damp proof enclosure.
(2) Kit for flush-mounting in a dust and damp proof enclosure.
(3) Power part of the drive outside the enclosure.
(4) DC choke for ATV 61HD55M3X…HD90M3X and ATV 61HD90N4…HC31N4 drives.

Presentation : pages 2/178 to 2/180
References : pages 2/178, 2/179 and 2/180
Functions : pages 2/312 to 2/339

2

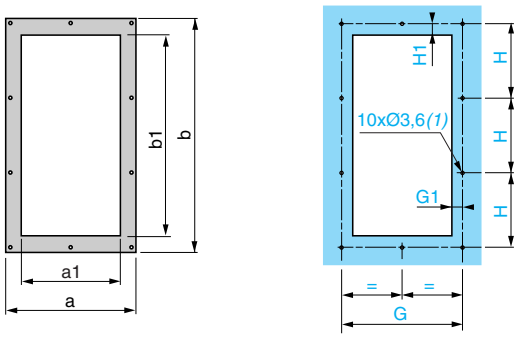
2.4

Kits for flush-mounting in a dust and damp proof enclosure (continued)

Installation of the drive using the kit for flush-mounting (continued)

VW3 A9 501…505

Cut-outs and drill holes

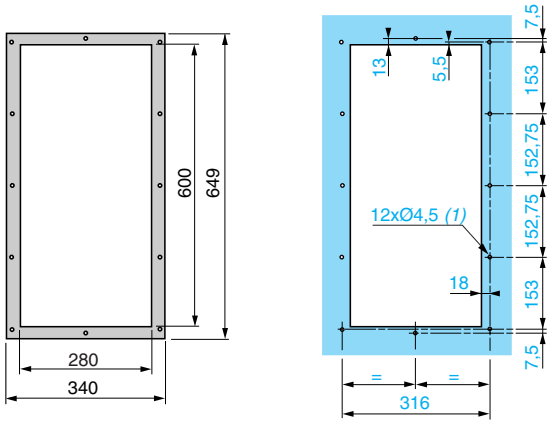


VW3	a	a1	b	b1	G	G1	H	H1
A9 501	222	170	397	351	205	17.5	127	15
A9 502	250	198	429.5	384.5	233	17.5	137.5	14
A9 503	267	215	465	419	250	17.5	149.5	14.5
A9 504	302	250	481.5	438	285	17.5	155	13
A9 505	324.5	270	584.5	537.5	305	17.5	189.5	15.5

(1) Ø 3.6 hole for M4 self-tapping screw..

VW3 A9 506

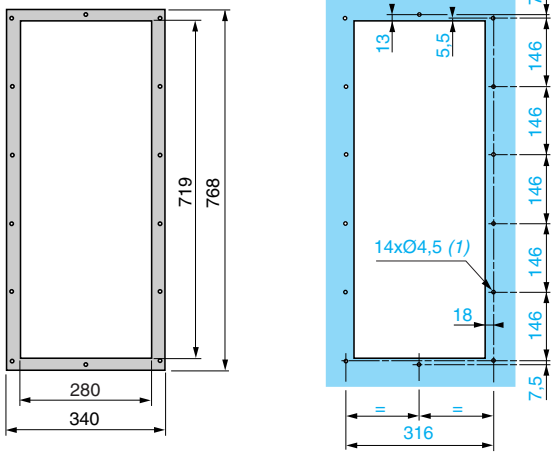
Cut-outs and drill holes



(1) Ø 4.5 hole for M5 self-tapping screw.

VW3 A9 507

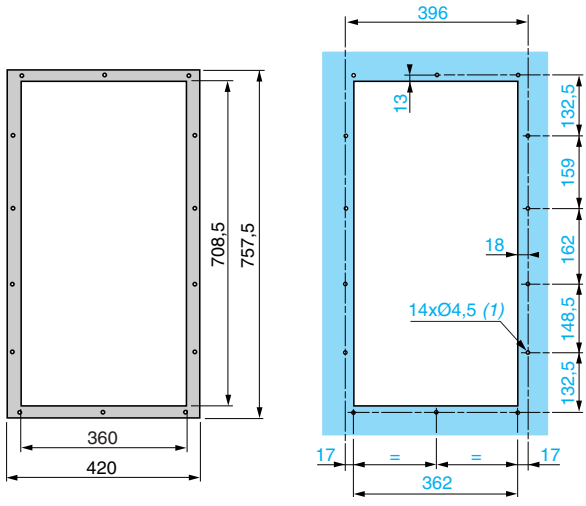
Cut-outs and drill holes



(1) Ø 4.5 hole for M5 self-tapping screw.

VW3 A9 508

Cut-outs and drill holes

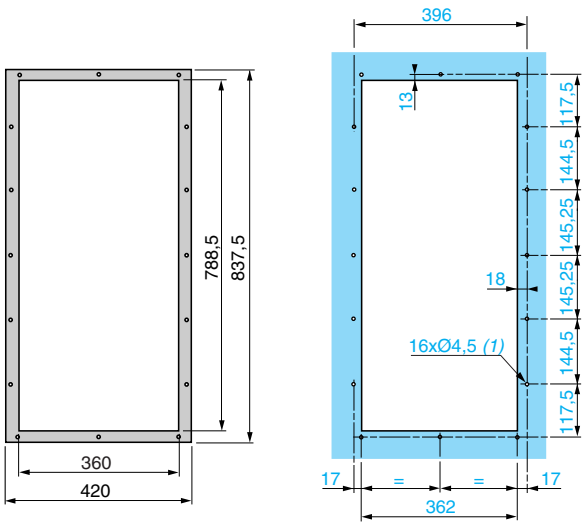


(1) Ø 4.5 hole for M5 self-tapping screw.

Kits for flush-mounting in a dust and damp proof enclosure (continued)

VW3 A9 509

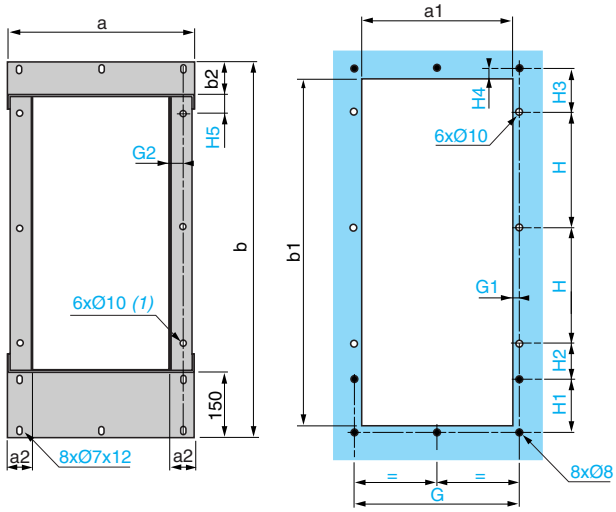
Cut-outs and drill holes



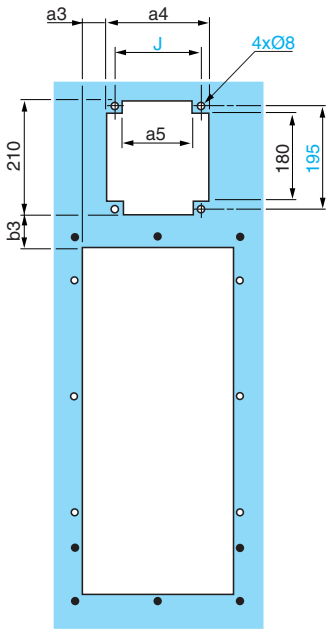
(1) Ø 4.5 hole for M5 self-tapping screw.

VW3 A9 510, 511

Cut-outs and drill holes without DC choke



Cut-outs and drill holes with DC choke



VW3	a	a1	a2	b	b1	b2	G	G1
A9 510	420	340	55	850	790	80	370	15
A9 511	440	360	45	885	845	66	396	18

VW3	G2	H	H1	H2	H3	H4	H5
A9 510	30	260	120	80	100	15	35
A9 511	23	310	70	91.5	83.5	10	27.5

(1) For fixing using an M8 screw min.

VW3	a3	a4	a5	b3	J
A9 510	82.5	180	120	45	150
A9 511	87.5	190	130	35	160

Presentation : page 2/180
References : page 2/180
Functions : pages 2/312 to 2/339

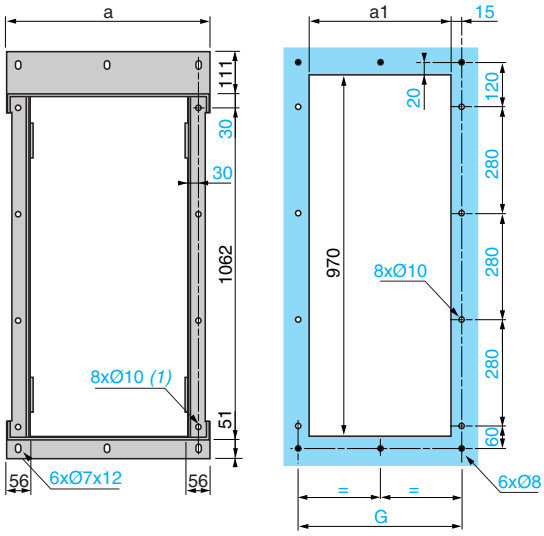
2

2.4

Kits for flush-mounting in a dust and damp proof enclosure (continued)

VW3 A9 512, 513

Cut-outs and drill holes without DC choke

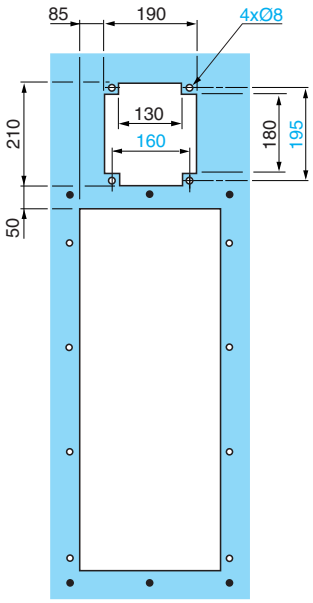


VW3	a	a1	G
A9 512	442	360	390
A9 513	542	460	490

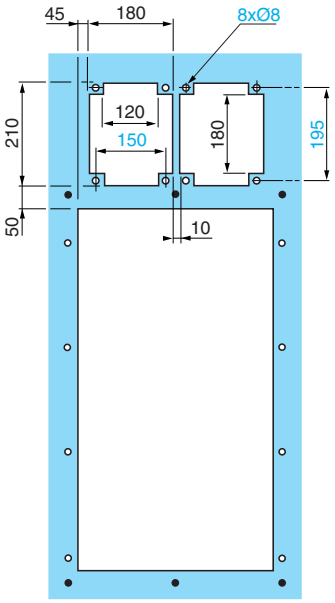
(1) For fixing using an M8 screw min.

VW3 A9 512

Cut-outs and drill holes with DC choke

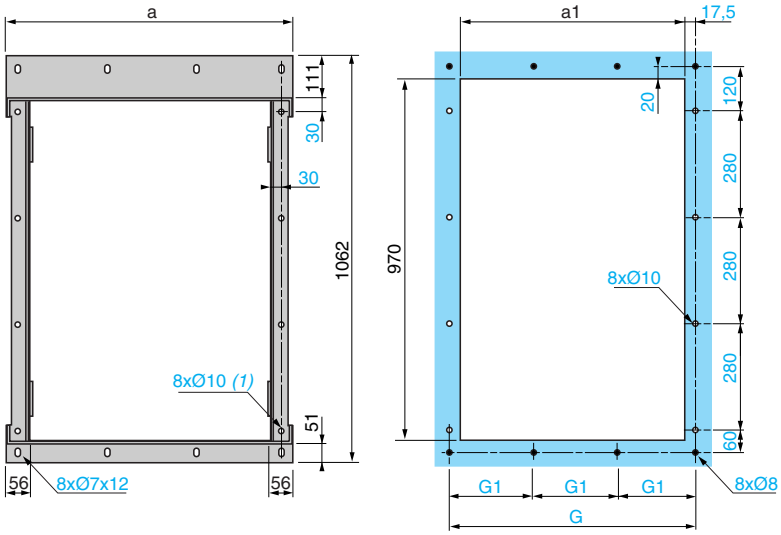


VW3 A9 513



VW3 A9 514 (without braking unit), VW3 A9 515 (with braking unit)

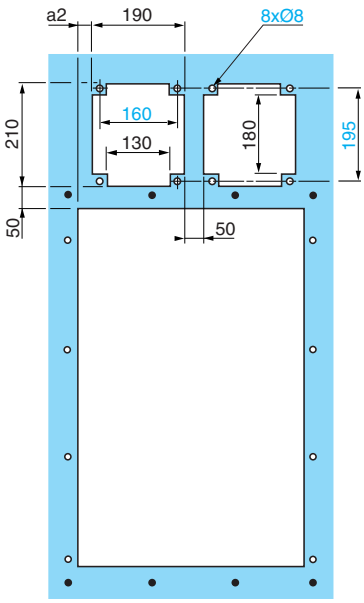
Cut-outs and drill holes without DC choke



VW3	a	a1	G	G1
A9 514	697	610	645	215
A9 515	772	685	720	240

(1) For fixing using an M8 screw min.

Cut-outs and drill holes with DC choke



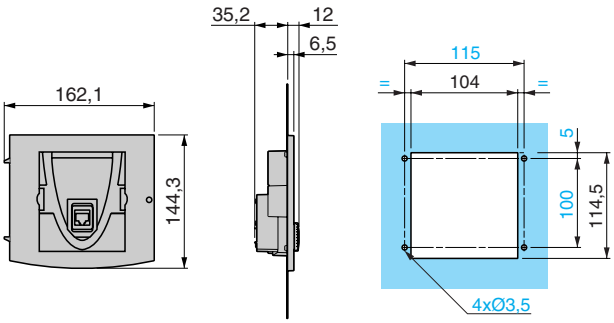
VW3	a2
A9 514	90
A9 515	165

Presentation : page 2/180
References : page 2/180
Functions : pages 2/312 to 2/339

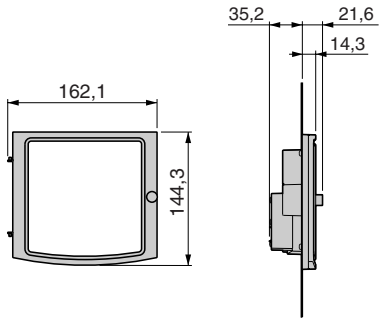
Remote graphic display terminal

IP 54 kit VW3 A1 102

Cut-outs and drill holes

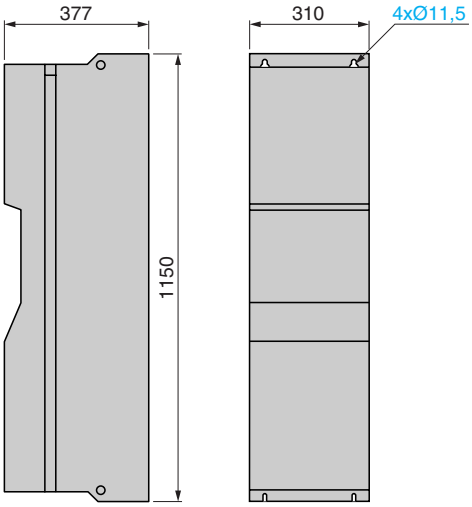


IP 65 door VW3 A1 103



Braking units VW3 A7 101 *(1)*, VW3 A7 102

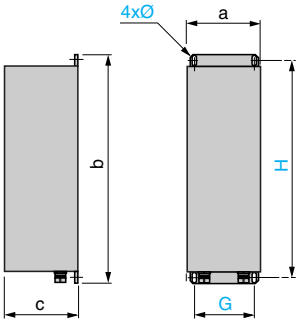
VW3 A7 102



(1) The VW3 A7 101 braking unit is mounted on the left-hand side of the drive, see pages 2/253 and 2/255.

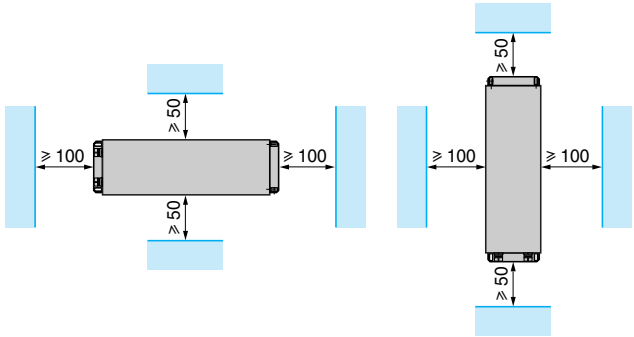
Braking resistors

VW3 A7 701...703



VW3	a	b	c	G	H	Ø
A7 701	95	293	95	70	275	6 x 12
A7 702	95	293	95	70	375	6 x 12
A7 703	140	393	120	120	375	6 x 12

Mounting recommendations



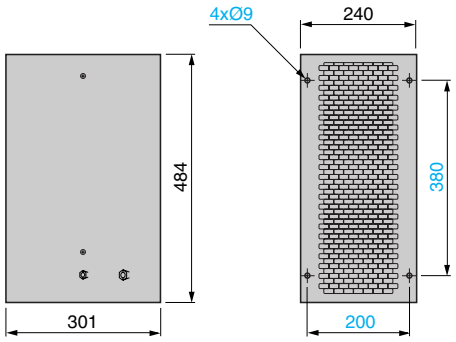
2

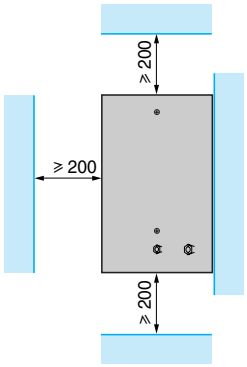
2.4

Braking resistors (continued)

VW3 A7 704…709

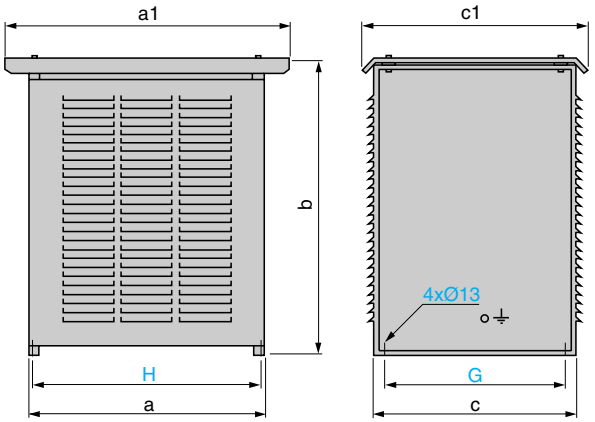
Mounting recommendations

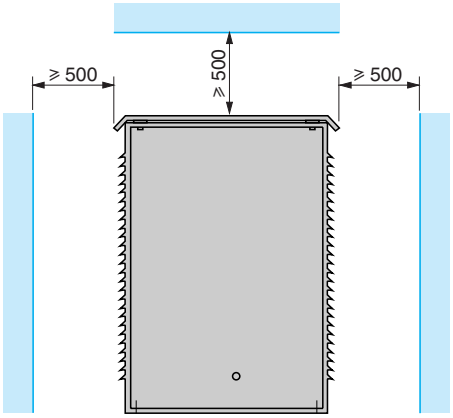




VW3 A7 710…712, 715…718 *(1)*

Mounting recommendations



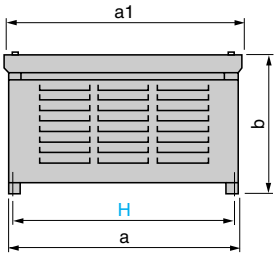


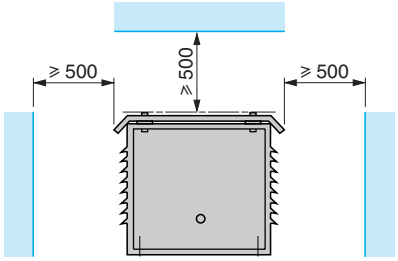
VW3	a	a1	b	c	c1	G	H
A7 710	860	1040	690	480	560	400	832
A7 711	960	1140	1150	380	460	300	932
A7 712	860	1040	1150	540	620	460	832
A7 715	960	1140	1150	540	620	460	932
A7 716	960	1140	1150	740	820	660	932
A7 717 *(1)*	960	1140	1150	540	620	460	932
A7 718 *(1)*	960	1140	1150	740	820	660	932

(1) The dimension is given for 1 component. References VW3 A7 717 and 718 consist of two components; all components must be taken into account to determine the overall dimensions. A space of 300 mm must be left between each component.

VW3 A7 713, 714

Mounting recommendations





VW3	a	a1	b	c	c1	G	H
A7 713	760	790	440	480	540	400	732
A7 714	960	990	440	480	540	400	932

Presentation: page 2/218 | Characteristics: page 2/218 | References: page 2/219 | Schemes: pages 2/280 and 2/287 | Functions: pages 2/312 to 2/339

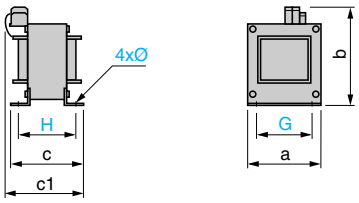
Variable speed drives for asynchronous motors

Altivar 61

DC chokes, line chokes

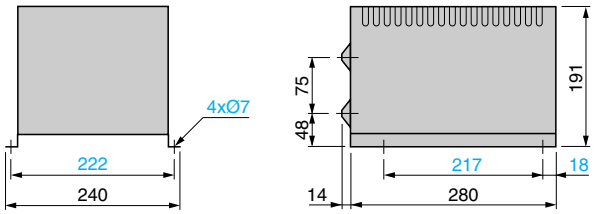
DC chokes

VW3 A4 501...510



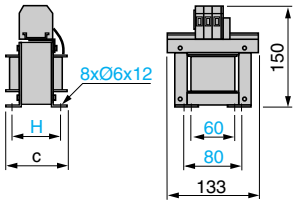
VW3	a	b	c	c1	G	H	Ø
A4 501	60	103	60	95	50	51	3.5
A4 502	60	103	77	118	50	68	3.5
A4 503	96	134	80	115	80	65	5.5
A4 504	96	134	79	115	80	64	5.5
A4 505	96	134	85	120	80	70	5.5
A4 506	96	134	89	120	80	74	5.5
A4 507	96	134	99	130	80	84	5.5
A4 508	108	142	112	145	90	97	5.5
A4 509	96	134	89	120	80	74	5.5
A4 510	126	171	120	170	105	103	7

VW3 A4 511, 512



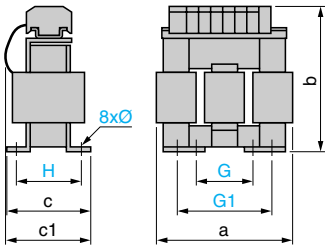
Line chokes

VW3 A58501, A58502



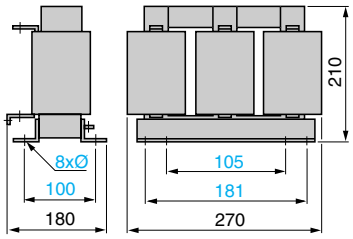
VW3	c	H
A58501	95	65
A58502	105	77

VW3 A4 551...555



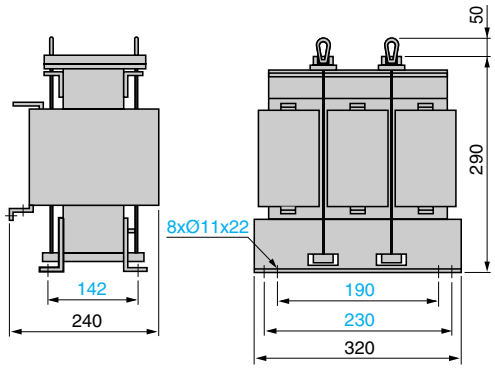
VW3	a	b	c	c1	G	G1	H	Ø
A4 551	100	135	55	60	40	60	42	6 x 9
A4 552, A4 553	130	155	85	90	60	80.5	62	6 x 12
A4 554	155	170	115	135	75	107	90	6 x 12
A4 555	180	210	125	165	85	122	105	6 x 12

VW3 A4 556

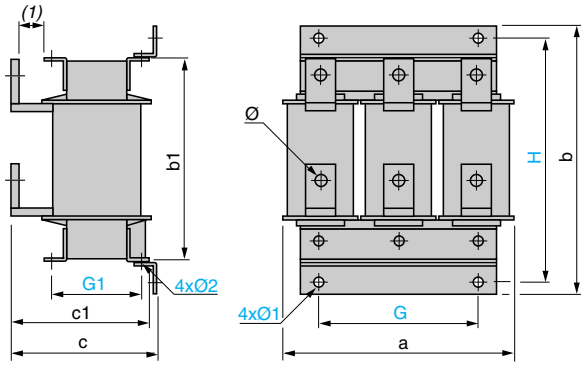


VW3	Ø
A4 556	11 x 22

VW3 A4 557



VW3 A4 558...561, 564, 565, 568, 569



VW3	a	b	b1	c	c1	G	G1	H	Ø	Ø1	Ø2
A4 558	280	305	240	210	200	200	125	275	9	9	9
A4 559	280	330	260	210	200	200	125	300	11	9	9
A4 560, 561	320	380	300	210	200	225	150	350	11	9	9
A4 564	320	380	300	250	230	225	150	350	13	11	11
A4 565	385	440	340	275	250	300	125	400	2 x Ø13	13.5	13.5
A4 568	320	380	300	210	200	225	150	350	11	9	9
A4 569	320	380	300	250	230	225	150	350	13	11	11

(1) 25 mm minimum.

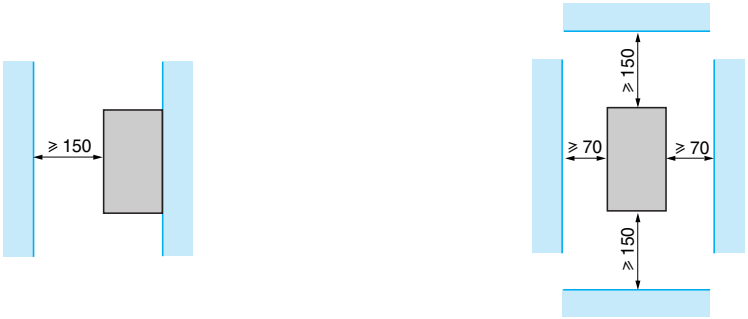
Presentation: pages 2/224 to 2/226, 2/228
Characteristics: pages 2/227 and 2/229
References: pages 2/227 and 2/230
Schemes: pages 2/276 to 2/288
Functions: pages 2/312 to 2/339

2

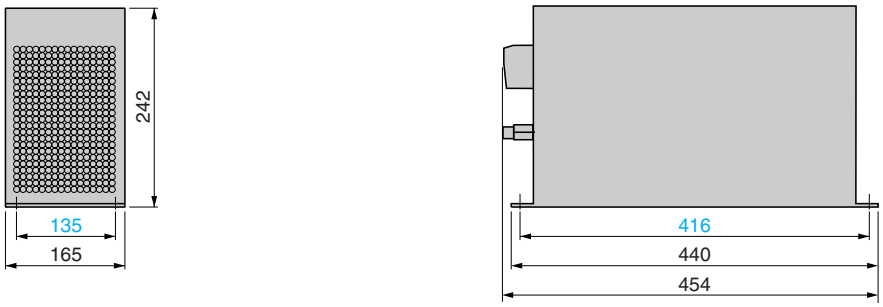
2.4

Passive filters VW3 A4 601…609, 621…627, 641…648, 661…666

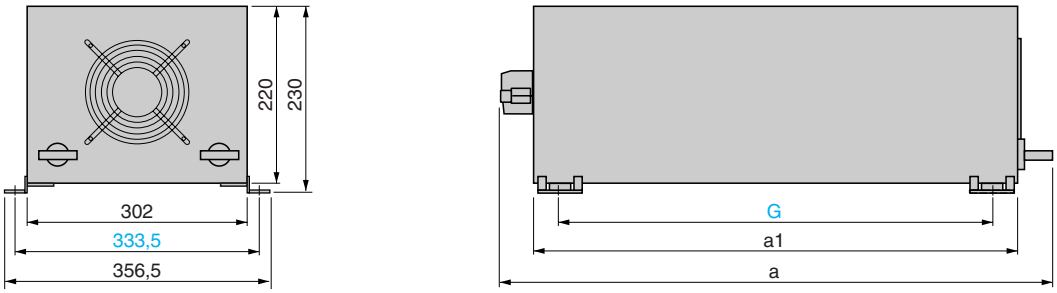
Mounting recommendations *(1)*



VW3 A4 601…604, 621, 622, 641…644, 661…663



VW3 A4 605…609, 623…627, 645…648, 664…666

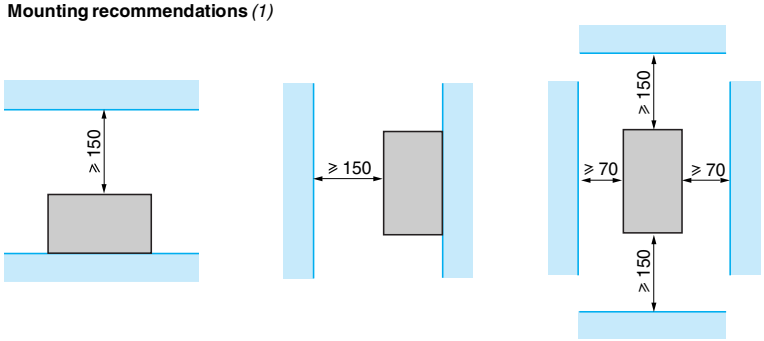


VW3	a	a1	G
A4 605, 606, 623…625, 645, 646, 664, 665	698	600	532,5
A4 607…609, 626, 627, 647, 648, 666	938	840	772,5

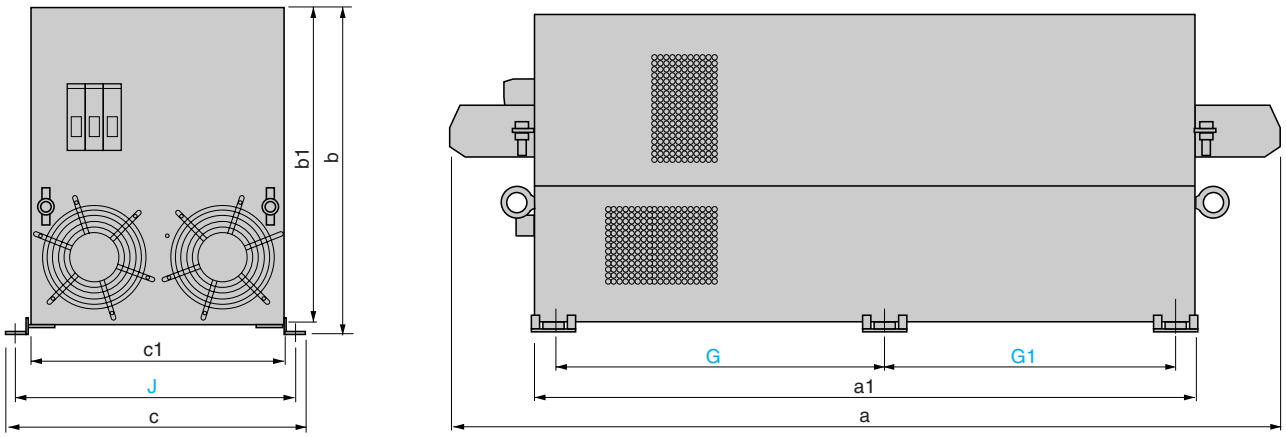
(1) Vertical mounting only

Passive filters VW3 A4 610…613, 619, 628…633, 639, 649…651, 656, 657, 667…671, 676, 677

Mounting recommendations *(1)*

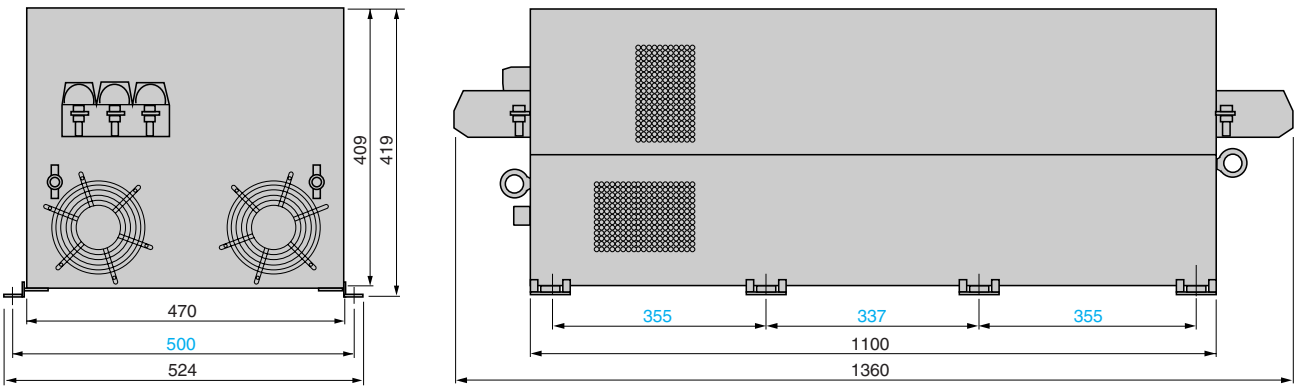


VW3 A4 610…613, 619, 628…632, 639, 649…651, 656, 657, 667…670, 676, 677



VW3	a	a1	b	b1	c	c1	G	G1	J
A4 610, 611, 628, 629, 649, 667, 668	1060	830	400	390	393	345	395	377	370
A4 612, 619, 630, 631, 650, 656, 657, 669	1160	900	419	409	454	406	430	412	430
A4 613, 632, 639, 651, 670, 676, 677	1330	1070	419	409	454	406	515	497	430

VW3 A4 633, 671



(1) Vertical or horizontal mounting.

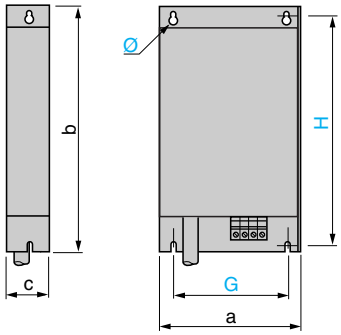
Variable speed drives for asynchronous motors

Altivar 61

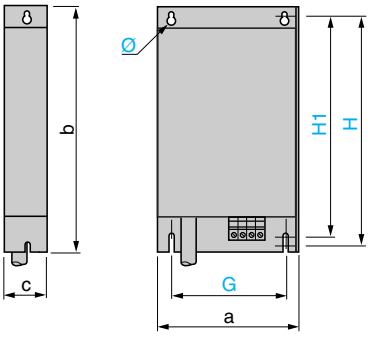
Additional EMC input filters

Additional EMC input filters

VW3 A4 401...404

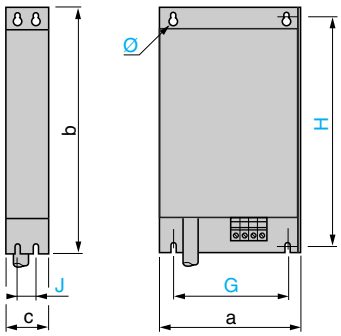


VW3 A4 405, 409



VW3	a	b	c	G	H	H1	Ø
A4 401	130	290	40	105	275	–	4.5
A4 402	155	324	50	130	309	–	4.5
A4 403	175	370	60	150	355	–	6.5
A4 404	210	380	60	190	365	–	6.5
A4 405	230	498.5	62	190	479.5	460	6.5
A4 409	230	498.5	62	190	479.5	460	6.5

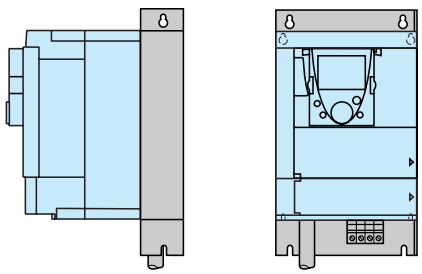
VW3 A4 406...408



VW3	a	b	c	G	H	J	Ø
A4 406	240	522	79	200	502.5	40	9
A4 407	240	650	79	200	631	40	9
A4 408	320	750	119	280	725	80	9

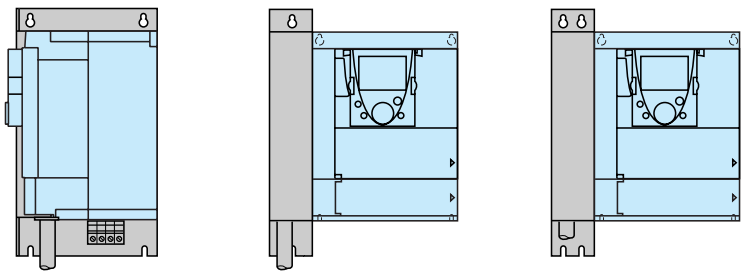
Mounting the filter under the drive

Front view



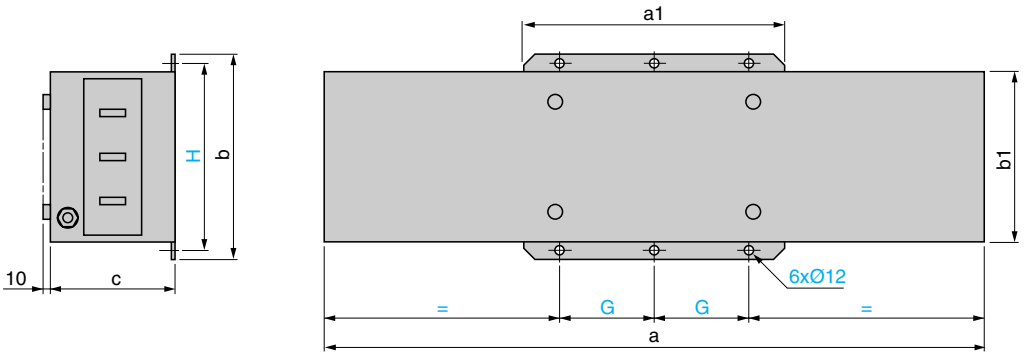
Mounting the filter next to the drive

Front view



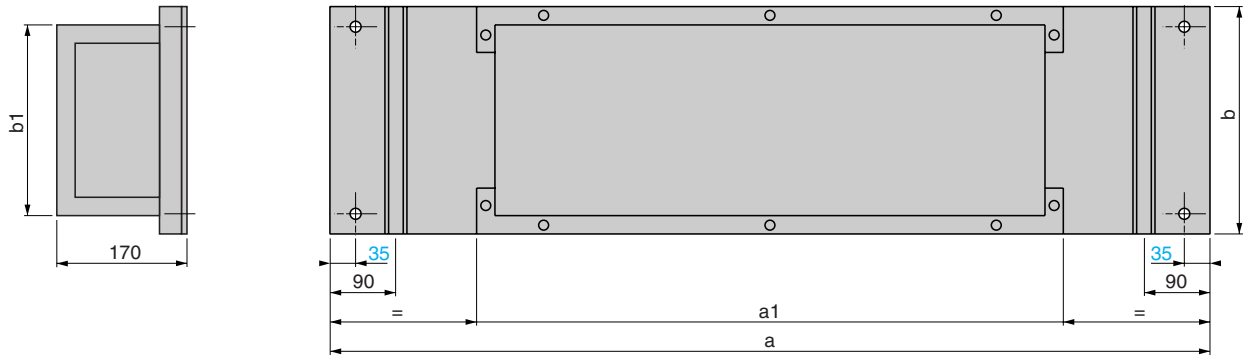
Additional EMC input filters (continued)

VW3 A4 410...413



VW3	a	a1	b	b1	c	G	H
A4 410	800	302	261	219	139	120	235
A4 411	800	302	261	219	139	120	235
A4 412	900	352	281	239	174	145	255
A4 413	1000	401	301	259	164	170	275

IP 30 protection kits for filters VW3 A4 410...413



VW3	a	a1	b	b1
A9 601	1200	800	310	270
A9 602	1400	1000	350	310

Variable speed drives for asynchronous motors

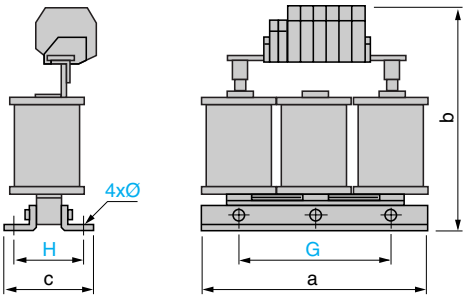
Altivar 61

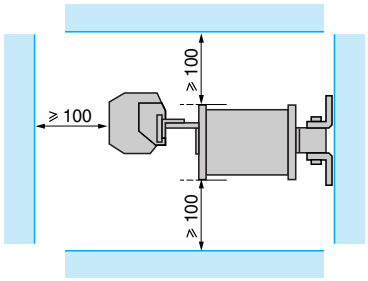
Motor chokes

Motor chokes *(1)*

VW3 A5 101, 102

Mounting recommendations *(2)*

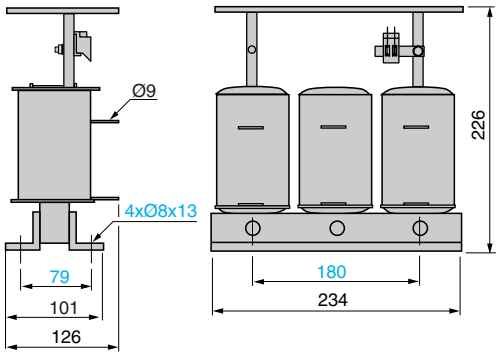


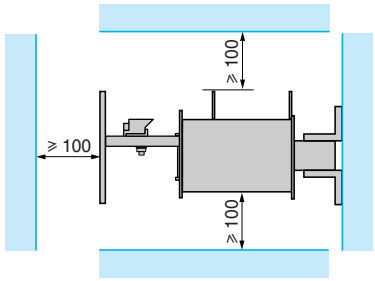


VW3	a	b	c	G	H	Ø
A5 101	190	210	90	170	45	8 x 12
A5 102	190	235	120	170	48	8 x 12

VW3 A5 103

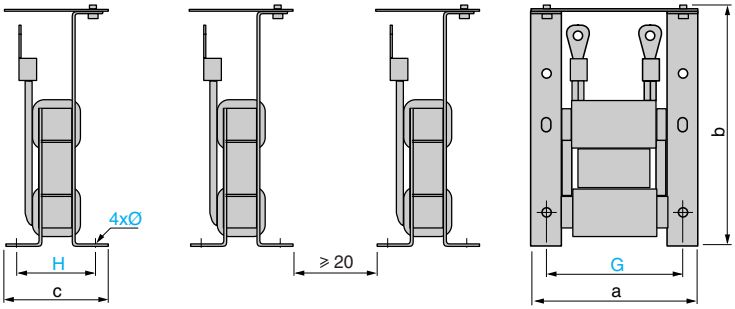
Mounting recommendations *(2)*





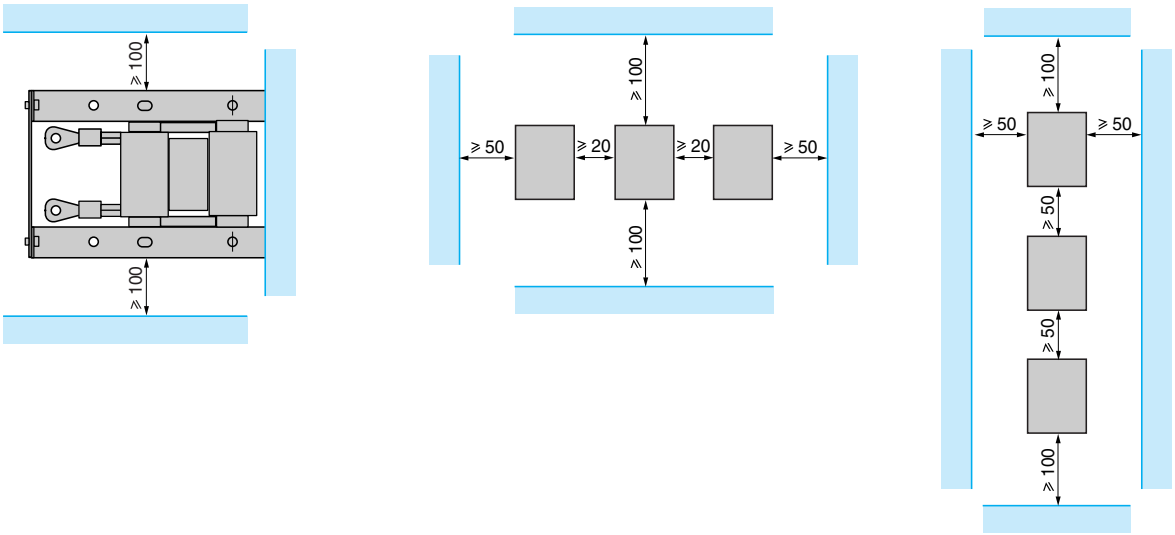
(1) It is absolutely essential that the motor chokes are mounted on a metal support (grille, frame, etc.)
(2) Because of the magnetic field and/or heat dissipation, it is very important to follow the mounting recommendations provided.

Motor chokes (continued) *(1)*
VW3 A5 104, 105 *(2)*



VW3	a	b	c	G	H	Ø
A5 104	170	250	100	150	75	9
A5 105	210	250	110	175	75	9 x 13

Mounting recommendations *(3)*



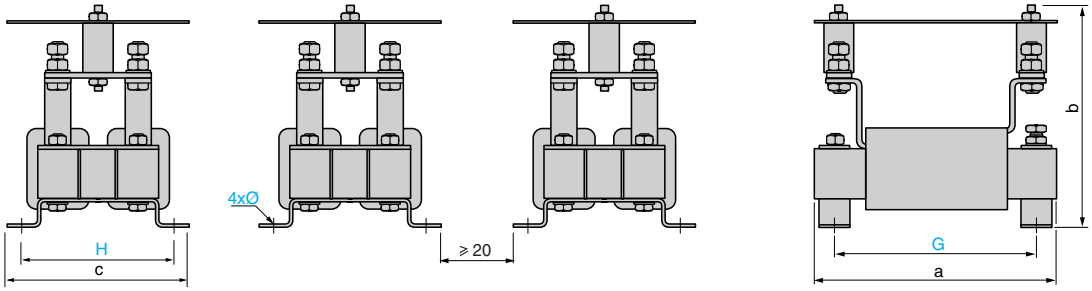
(1) It is absolutely essential that the motor chokes are mounted on a metal support (grille, frame, etc.)
(2) References VW3 A5 104 and 105 consist of 3 components.
(3) Because of the magnetic field and/or heat dissipation, it is very important to follow the mounting recommendations provided.

2

2.4

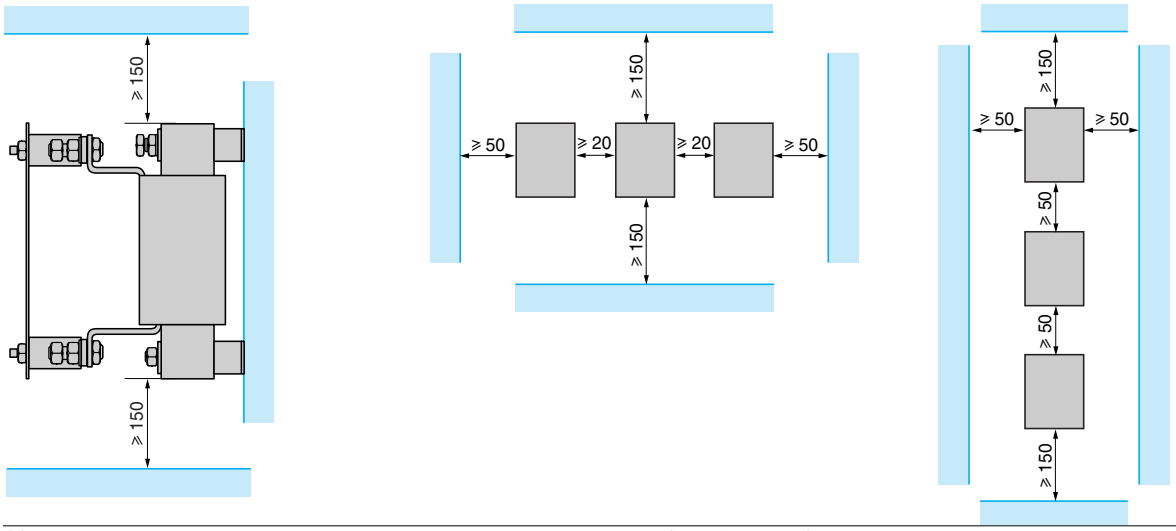
Motor chokes (continued) *(1)*

VW3 A5 106…108 *(2)*



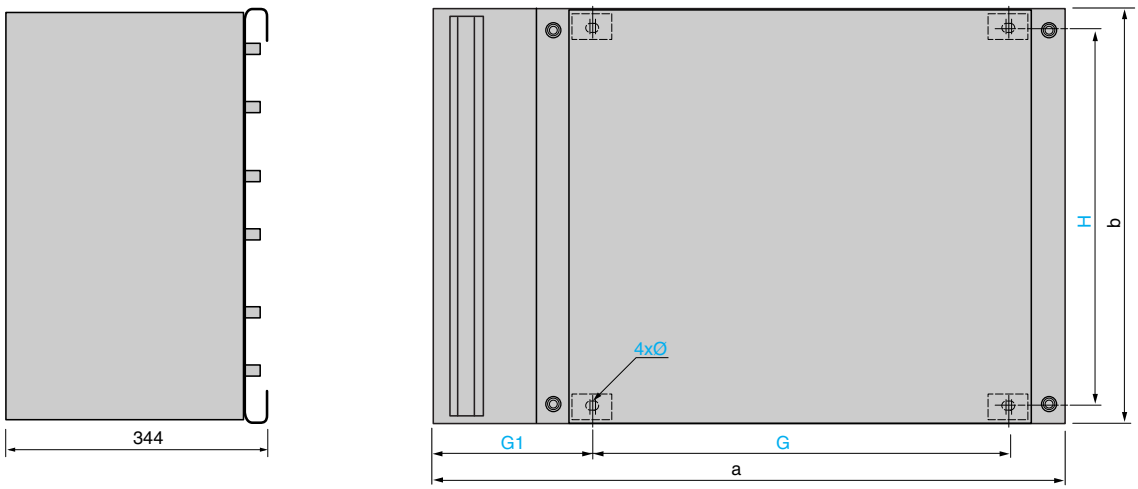
VW3	a	b	c	G	H	Ø
A5 106	245	250	200	225	175	9
A5 107	320	250	220	275	200	9
A5 108	370	250	230	325	200	9

Mounting recommendations *(3)*



(1) It is absolutely essential that the motor chokes are mounted on a metal support (grille, frame, etc.)
(2) References VW3 A5 106…108 consist of 3 components.
(3) Because of the magnetic field and/or heat dissipation, it is very important to follow the mounting recommendations provided.

IP 20 protection kits for chokes VW3 A5 104…108



VW3	a	b	G	G1	H	Ø
A9 612	780	580	530	190	526	10 x 15
A9 613	1180	780	800	200	726	10 x 15

Presentation: pages 2/240 and 2/241 | Characteristics: page 2/241 | References: pages 2/242 and 2/243 | Schemes: page 2/286 | Functions: pages 2/312 to 2/339

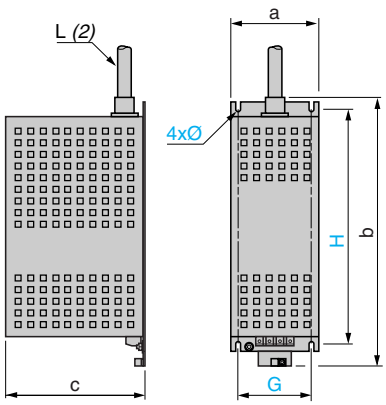
Variable speed drives for asynchronous motors

Altivar 61

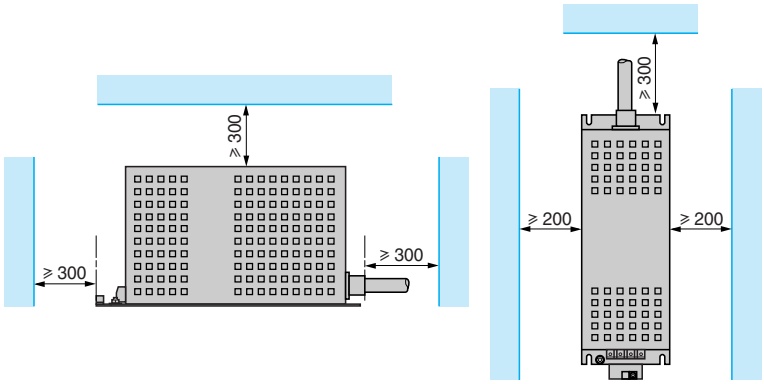
Sinus filters

Sinus filters *(1)*

VW3 A5 201...206

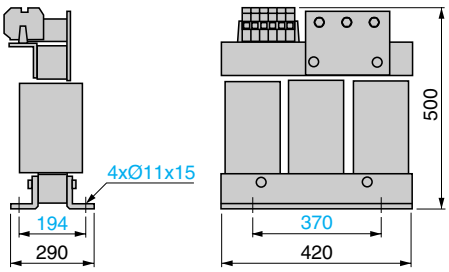


Mounting recommendations

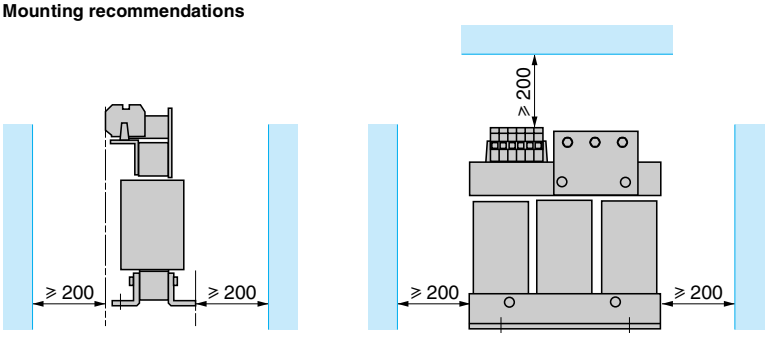


VW3	a	b	c	G	H	Ø	L *(2)*
A5 201	120	335	160	100	280	6.6	700
A5 202	120	405	190	100	350	6.6	900
A5 203	150	470	240	120	380	6.6	900
A5 204	210	650	280	160	530	8.6	1500
A5 205	250	780	360	200	650	11	1600
A5 206	310	1060	375	220	880	11	2700

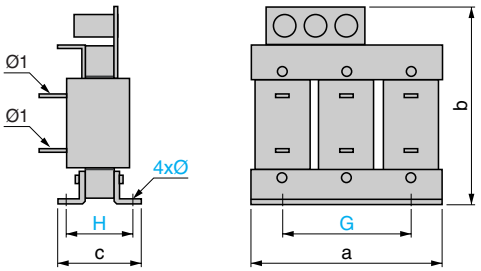
VW3 A5 207



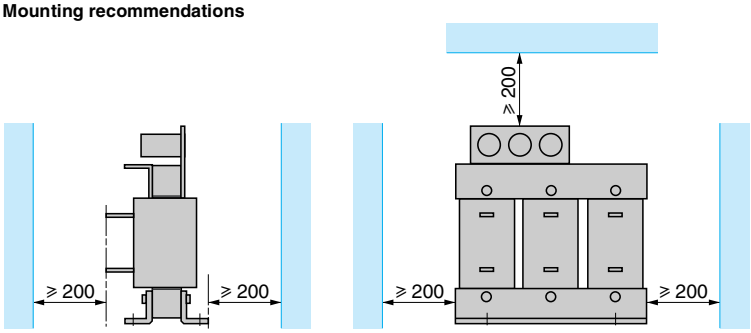
Mounting recommendations



VW3 A5 208...211



Mounting recommendations



VW3	a	b	c	G	H	Ø	Ø1
A5 208	420	500	345	370	231	11 x 15	11
A5 209	480	600	340	430	238	13 x 18	11
A5 210	480	710	370	430	258	13 x 18	14
A5 211	620	930	500	525	352	13 x 22	4 x Ø11

(1) Sinus filters emit considerable heat and must not be placed underneath the drive.
(2) Length of cable integrated in sinus filter.

Presentation: pages 2/240 and 2/244 | Characteristics: page 2/244 | References: page 2/245 | Schemes: page 2/286 | Functions: pages 2/312 to 2/339

Variable speed drives for asynchronous motors
Altivar 61
Safety requirements

"Power Removal" safety function

The Altivar 61 drive integrates the "Power Removal" safety function which prohibits unintended equipment operation. The motor no longer produces torque.

This safety function:
- conforms to machine safety standard EN 954-1, category 3
- conforms to operational safety standard IEC/EN 61508, capacity SIL2 (safety control-signalling applied to processes and systems)

The SIL (Safety Integrity Level) capacity depends on the connection diagram for the drive and for the safety function. Failure to follow the setup recommendations could inhibit the SIL capacity of the "Power Removal" safety function.
- conforms to draft product standard IEC/EN 61800-5-2 for both stop functions:
  - Safe Torque Off ("STO"): response time ≤ 100 ms
  - Safe Stop 1 ("SS1")

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

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

Categories relating to safety according to EN 954-1

Categories	Main safety basis	Control system requirements	Behaviour in the event of a fault
B	Selecting components which conform to the relevant standards	Monitoring in accordance with established practice	Possible loss of safety function
1	Selecting components and safety principles	Use of tested components and tested safety principles	Possible loss of safety function with a lower probability than in **B**
2	Selecting 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 should not result in loss of the safety function. The fault must be detected if this is reasonably possible	Safety function assured except in the event of an accumulation of faults
4	Structure of the safety circuits	A single fault should 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 should 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.

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

SIL1 according to standard IEC/EN 61508 is comparable with category 1 according to EN 954-1 (SIL1: mean probability of undetected dangerous failure per hour between 10^{-5} and 10^{-6}).
SIL2 according to standard IEC/EN 61508 is comparable with category 3 according to EN 954-1 (SIL 2: mean probability of undetected dangerous failure per hour between 10^{-6} and 10^{-7}).

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

Variable speed drives for asynchronous motors
Altivar 61
Safety requirements

"Power Removal" safety function considerations

The "Power Removal" safety function cannot be considered as a means of electrical disconnection of the motor (no electrical isolation); if necessary, a Vario switch disconnector must be used.
The "Power Removal" safety function is not designed to overcome any malfunction in the drive process control or application functions.
The output signals available on the drive must not be considered as safety signals (example: "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 that defines 3 stop categories:
- Category 0: stopping by immediate removal of the power from the actuators (example: uncontrolled stop)
- Category 1: controlled stop maintaining the power on the actuators until the machine stops, then cutting off the power when the actuators stop as a result of the machine stopping
- Category 2: controlled stop maintaining the power on the actuators

Connection schemes and applications

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

Use of the connection schemes on pages 2/276 and 2/277 which use a line contactor or a Vario switch disconnector between the drive and the motor. In this case, the "Power Removal" safety function is not used and the motor stops in accordance with category 0 of standard IEC/EN 60204-1.

Conformity with 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 Altivar 61 drive combined with a Preventa safety module to monitor the Emergency stop circuits.

Machines with short freewheel stopping times (low inertia, see page 2/278).
When the activation command is given on the PWR input with the controlled motor, the motor power supply is immediately switched off and the motor stops according to category 0 of standard IEC/EN 60204-1.
Restarting is not permitted ("STO") if the activation command is given after the motor has come to a complete stop.
This safe stop is maintained while the PWR input remains activated.

Machines with long freewheel stopping times (high inertia, see page 2/279).
When the activation command is given, deceleration of the motor controlled by the drive is first requested, then, following a time delay controlled by a Preventa-type fault relay which corresponds to the deceleration time, the "Power Removal" safety function is activated by the PWR input. The motor stops according to category 1 of standard IEC/EN 60204-1 ("SS1").

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

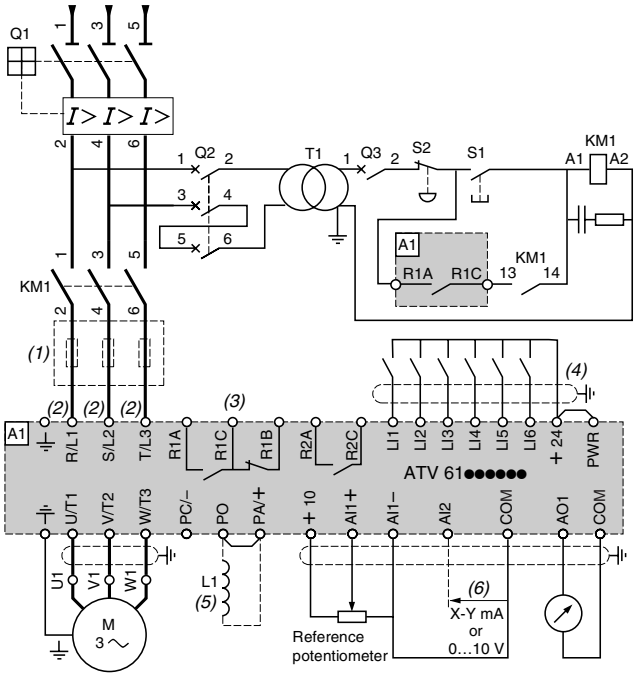
2

2.4

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

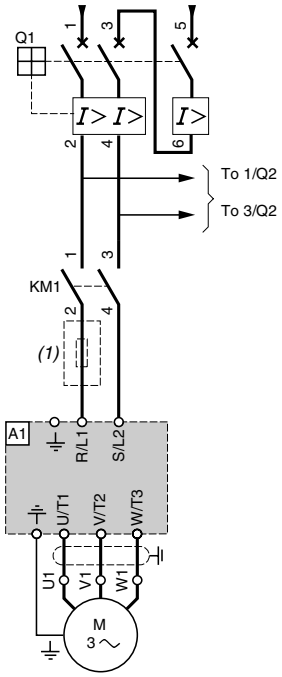
ATV 61●●●●M3, ATV 61●●●●M3X, ATV 61●●●●N4, ATV 61W●●●N4C

3-phase power supply with upstream breaking via contactor



ATV 61H075M3...HU75M3

Power section for single phase power supply



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

Components for use with the Altivar (for a complete list of references, see our "Motor starter solutions. Power control and protection components" specialist catalogue).

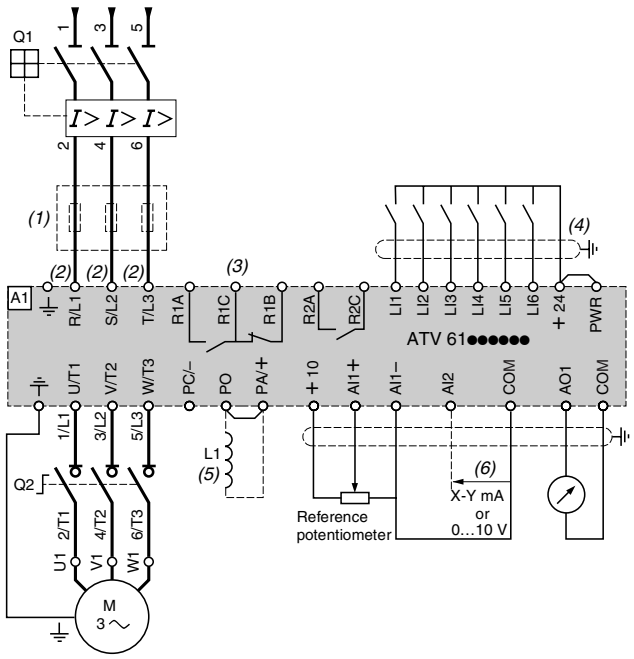
Reference	Description
A1	ATV 61 drive, see pages 2/172 to 2/175
KM1	Contactor, see motor starters pages 2/292 to 2/301
L1	DC choke, see page 2/227
Q1	Circuit-breaker, see motor starters pages 2/292 to 2/301
Q2	GV2 L rated at twice the nominal primary current of T1
Q3	GB2 CB05
S1, S2	XB4 B or XB5 A pushbuttons
T1	100 VA transformer 220 V secondary

(1) Line choke (single phase or 3-phase), see page 2/230.
(2) For ATV 61HC50N4 and ATV 61HC63N4 drives, see page 2/280.
(3) Fault relay contacts for remote signalling of the drive status
(4) Connection of the common for the logic inputs depends on the positioning of the SW1 switch: see schemes on page 2/280.
(5) DC choke as an option for ATV 61H●●●M3, ATV 61HD11M3X...HD45M3X, ATV 61H075N4...HD75N4. Connected in place of the strap between the PO and PA/+ terminals. For ATV 61HD55M3X, HD75M3X, ATV 61HD90N4...HC50N4 drives, the choke is supplied with the drive; the customer is responsible for connecting it. On drives ATV 61W●●●N4 and ATV 61W●●●N4C, the DC choke is integrated.
(6) Software-configurable current (0...20 mA) or voltage (0...10 V) analog input.

Schemes conforming to standards EN 954-1 category 1, IEC/EN 61508 capacity SIL1, in stopping category 0 according to IEC/EN 60204-1 (continued)

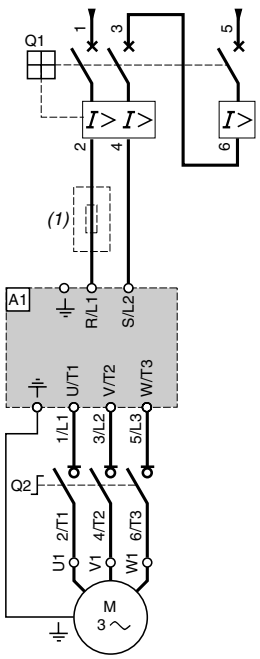
ATV 61●●●●M3, ATV 61●●●●M3X, ATV 61●●●●N4, ATV 61W●●●N4C

3-phase power supply with downstream breaking via switch disconnector



ATV 61H075M3...HU75M3

Power section for single phase power supply



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

Components for use with the Altivar (for a complete list of references, see our "Motor starter solutions. Power control and protection components" specialist catalogue).

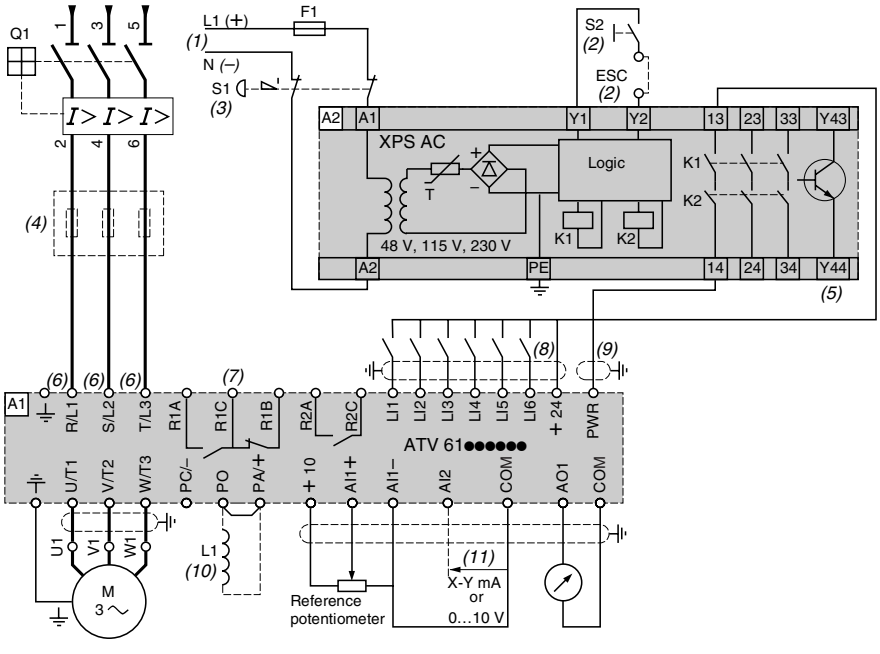
Reference	Description
A1	ATV 61 drive, see pages 2/172 to 2/175
L1	DC choke, see page 2/227
Q1	Circuit-breaker, see motor starters pages 2/292 to 2/301
Q2	Switch disconnector (Vario)

(1) Line choke (single phase or 3-phase), see page 2/230.
(2) For ATV 61HC50N4 and ATV 61HC63N4 drives, see page 2/280.
(3) Fault relay contacts for remote signalling of the drive status
(4) Connection of the common for the logic inputs depends on the positioning of the SW1 switch: see schemes on page 2/280.
(5) DC choke as an option for ATV 61H●●●M3, ATV 61HD11M3X…HD45M3X, ATV 61H075N4…HD75N4. Connected in place of the strap between the PO and PA/+ terminals. For ATV 61HD55M3X, HD75M3X, ATV 61HD90N4…HC50N4 drives, the choke is supplied with the drive; the customer is responsible for connecting it. On drives ATV 61W●●●N4 and ATV 61W●●●N4C, the DC choke is integrated.
(6) Software-configurable current (0…20 mA) or voltage (0…10 V) analog input.

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

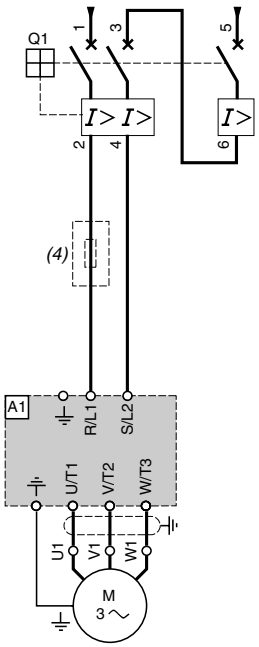
ATV 61H●●●M3, ATV 61H●●●M3X, ATV 61●●●●N4, ATV 61W●●●N4C

3-phase power supply, low inertia machine



ATV 61H075M3…HU75M3

Power section for single phase power supply



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

Components for use with the Altivar (for a complete list of references, see our "Motor starter solutions. Power control and protection components" and "Preventa safety solutions" specialist catalogues).

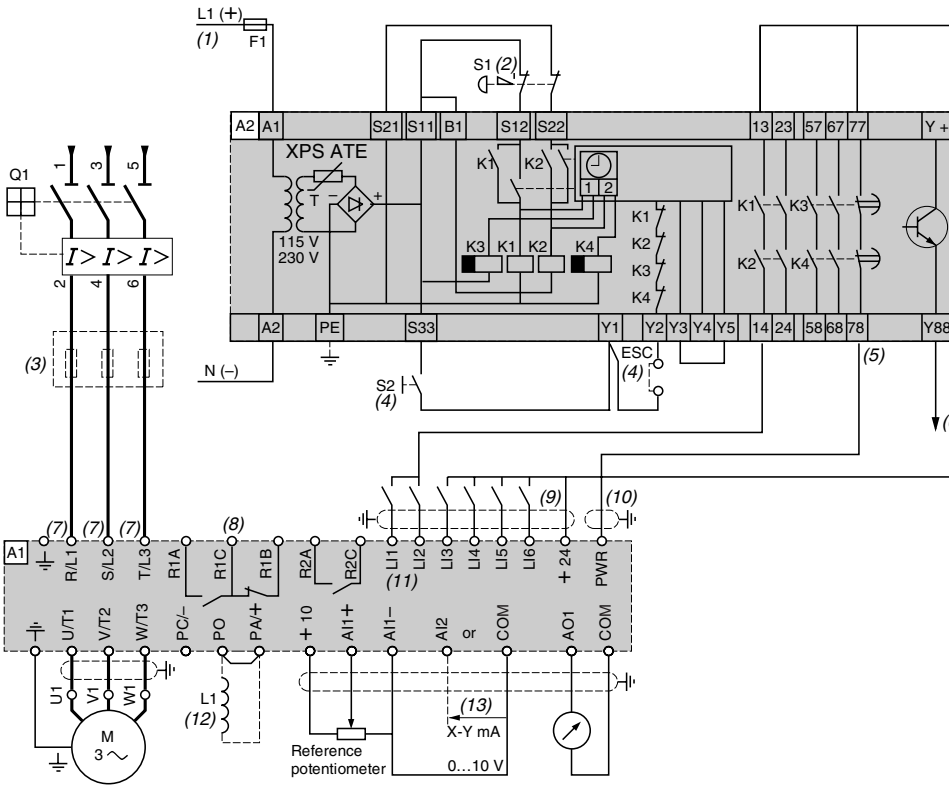
Reference	Description
A1	ATV 61 drive, see pages 2/172 to 2/175
A2	Preventa XPS AC safety module for monitoring Emergency stops and switches. One safety module can manage the "Power Removal" function for several drives on the same machine. In this case, each drive supplies its own PWR input terminal from its own + 24 V via an independent safety contact on the XPS AC module.
F1	Fuse
L1	DC choke, see page 2/227
Q1	Circuit-breaker, see motor starters pages 2/292 to 2/301
S1	Emergency stop button with 2 contacts
S2	XB4 B or XB5 A pushbutton

(1) Power supply: ⎓ or 24 V ∿, 48 V ∿, 115 V ∿, 230 V ∿.
(2) S2: resets XPS AC module on power-up or after an Emergency stop. ESC can be used to set external starting conditions.
(3) Requests freewheel stopping of the movement and activates the "Power Removal" safety function.
(4) Line choke (single phase or 3-phase), see page 2/230.
(5) The logic output can be used to signal that the machine is in a safe stop state.
(6) For ATV 61HC50N4 and ATV 61HC63N4 drives, see page 2/280.
(7) Fault relay contacts for remote signalling of the drive status
(8) Connection of the common for the logic inputs depends on the positioning of the SW1 switch: see schemes on page 2/280.
(9) Standardized coaxial cable, type RG174/U according to MIL-C17 or KX3B according to NF C 93-550, external diameter 2.54 mm, maximum length 15 m. The cable shielding must be earthed.
(10) DC choke as an option for ATV 61H●●●●M3, ATV 61HD11M3X…HD45M3X, ATV 61H075N4…HD75N4. Connected in place of the strap between the PO and PA/+ terminals. For ATV 61HD55M3X, HD75M3X, ATV 61HD90N4…HC50N4 drives, the choke is supplied with the drive; the customer is responsible for connecting it. On drives ATV 61W●●●N4 and ATV 61W●●●N4C, the DC choke is integrated.
(11) Software-configurable current (0…20 mA) or voltage (0…10 V) analog input.

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

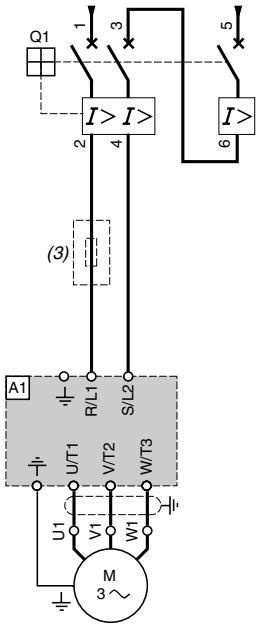
ATV 61H●●●M3, ATV 61H●●●M3X, ATV 61●●●●N4, ATV 61W●●●N4C

3-phase power supply, high inertia machine



ATV 61H075M3...HU75M3

Power section for single phase power supply



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

Components for use with the Altivar (for a complete list of references, see our "Motor starter solutions. Power control and protection components" and "Preventa safety solutions" specialist catalogues).

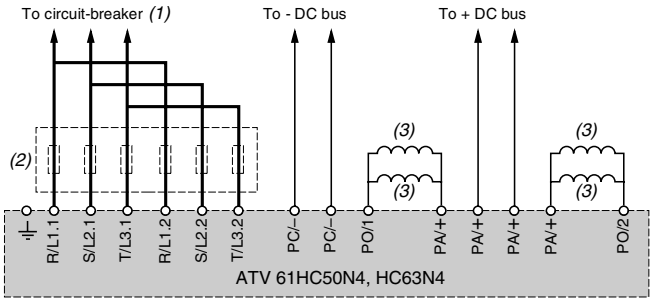
Reference	Description
A1	ATV 61 drive, see pages 2/172 to 2/175
A2 *(6)*	Preventa XPS ATE safety module for monitoring Emergency stops and switches. One safety module can manage the "Power Removal" safety function for several drives on the same machine. In this case, the time delay must be adjusted on the drive controlling the motor that requires the longest stopping time. In addition, each drive supplies its own + 24 V via an independent safety contact on the XPS ATE module.
F1	Fuse
L1	DC choke, see page 2/227
Q1	Circuit-breaker, see motor starters pages 2/292 to 2/301
S1	Emergency stop button with 2 contacts
S2	XB4 B or XB5 A pushbutton

(1) Power supply: ⎓ or 24 V ∿, 115 V ∿, 230 V ∿.
(2) Requests controlled stopping of the movement and activates the "Power Removal" safety function.
(3) Line choke (single phase or 3-phase), see page 2/230.
(4) S2: resets XPS AT module on power-up or after an Emergency stop. ESC can be used to set external starting conditions.
(5) The "O" contact can be used to signal that the machine is in a safe stop state.
(6) 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.
(7) For ATV 61HC50N4 and ATV 61HC63N4 drives, see page 2/280.
(8) Fault relay contacts for remote signalling of the drive status
(9) Connection of the common for the logic inputs depends on the positioning of the SW1 switch: see schemes on page 2/280.
(10) Standardized coaxial cable, type RG174/U according to MIL-C17 or KX3B according to NF C 93-550, external diameter 2.54 mm, maximum length 15 m. The cable shielding must be earthed.
(11) Logic inputs LI1 and LI2 must be assigned to the direction of rotation: LI1 in the forward direction and LI2 in the reverse direction.
(12) DC choke as an option for ATV 61H●●●●M3, ATV 61HD11M3X…HD45M3X, ATV 61H075N4…HD75N4. Connected in place of the strap between the PO and PA/+ terminals. For ATV 61HD55M3X, HD75M3X, ATV 61HD90N4…HC50N4 drives, the choke is supplied with the drive; the customer is responsible for connecting it. On drives ATV 61W●●●N4 and ATV 61W●●●N4C, the DC choke is integrated.
(13) Software-configurable current (0…20 mA) or voltage (0…10 V) analog input.

2

Power terminal connections

For ATV 61HC50N4 and ATV 61HC63N4

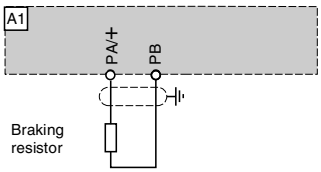


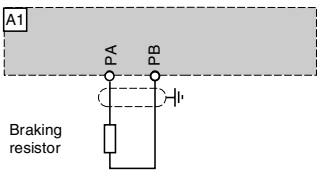
(1) For control section connections, see pages 2/276 to 2/279.
(2) Line choke, see page 2/230.
(3) DC chokes provided as standard with the drive

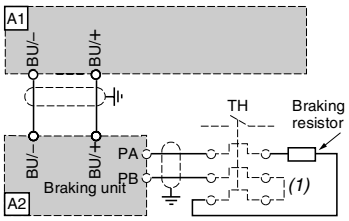
VW3 A7 7●● braking resistors or VW3 A7 1●● braking units

ATV 61H●●●M3, ATV 61HD11M3X…HD45M3X, ATV 61H075N4 …HD75N4, ATV 61W●●●N4, ATV 61W●●●N4C	ATV 61HD55M3X…HD90M3X, ATV 61HD90N4…HC22N4	ATV 61HC25N4…HC63N4

2.4







Components for use with the Altivar	
Reference	**Description**
A1	ATV 61 drive, see pages 2/172 to 2/175
A2	Braking unit, if using a braking resistor for ATV 61HC25N4…HC63N4, see page 2/217
Braking resistor	See page 2/219

(1) Option of using a thermal overload relay.

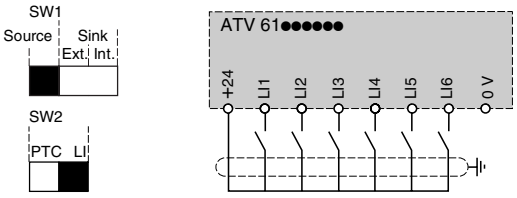
Examples of recommended schemes

Logic inputs

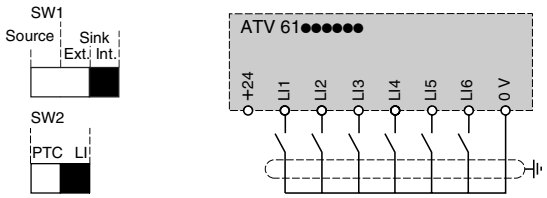
The SW1 switch is used to adapt operation of the logic inputs (LI) to the PLC output technology:
- Set the switch to Source (factory setting) if using PLC outputs with PNP transistors,
- Set the switch to Sink Int or Sink Ext if using PLC outputs with NPN transistors

Internal power supply

Switch in "Source" position

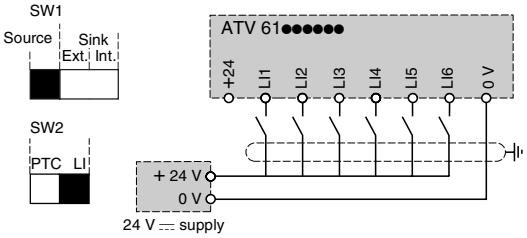


Switch in "Sink Int" position

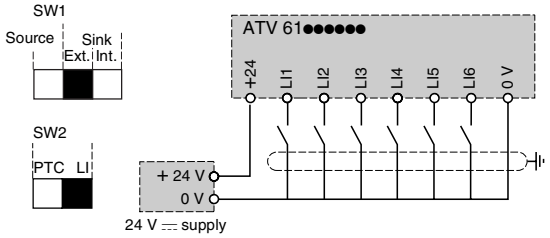


External power supply

Switch in "Source" position



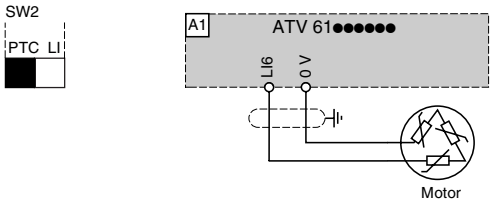
Switch in "Sink Ext" position



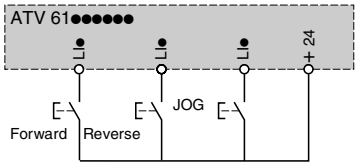
Examples of recommended schemes (continued)

Input for PTC probes

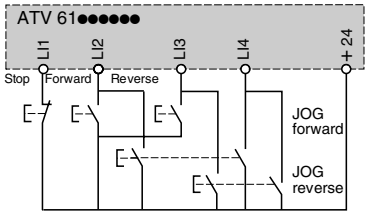
The SW2 switch is used to operate the LI6 input:
- As a logic input by setting the SW2 switch to LI (factory setting)
- Or for protecting the motor via PTC probes by setting the SW2 switch to PTC



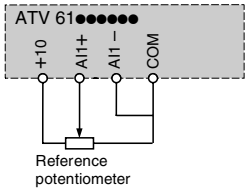
2-wire control and jog operation (JOG)



3-wire control and jog operation (JOG)

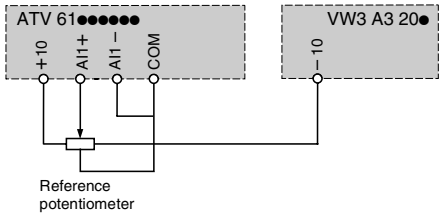


Unipolar speed reference



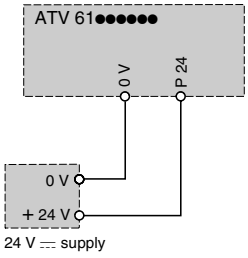
Bipolar speed reference

Requires a VW3 A3 201 or VW3 A3 202 I/O extension card



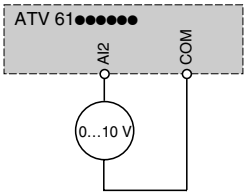
Separate control power supply

The separate control card can be powered by an external 24 V ⎓ supply

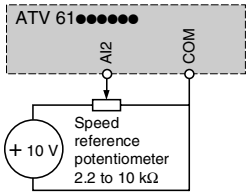


Analog input configured for voltage

External 0…10 V

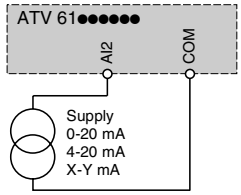


External + 10 V



Analog input configured for current

0-20 mA, 4-20 mA, X-Y mA



VW3 A3 201 and VW3 A3 202 I/O extension cards

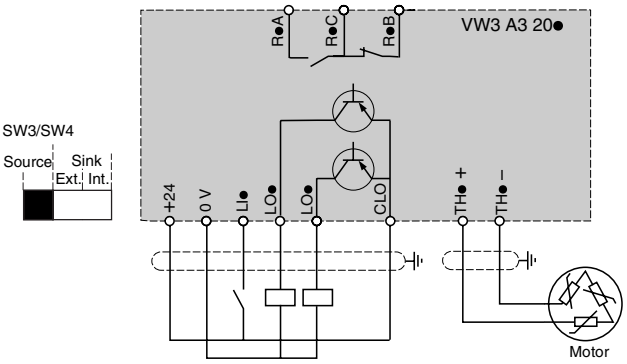
Logic I/O

The SW3 or SW4 switch is used to adapt operation of the logic inputs (LI) to the PLC output technology:

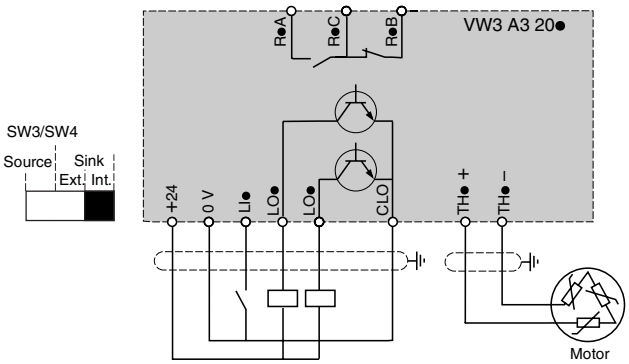
- Set the switch to Source (factory setting) if using PLC outputs with PNP transistors,
- Set the switch to Sink Int or Sink Ext if using PLC outputs with NPN transistors

Internal power supply

Switch in "Source" position

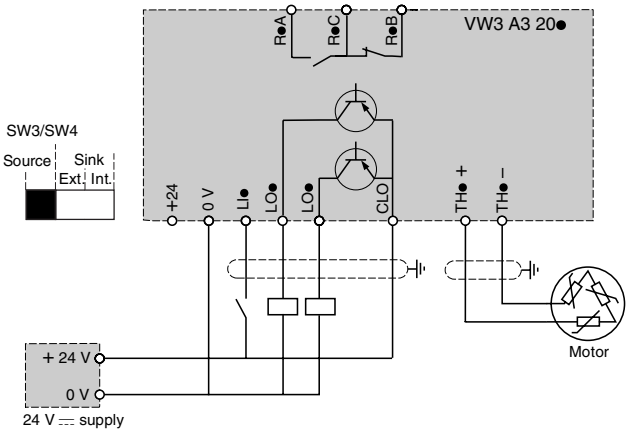


Switch in "Sink Int" position

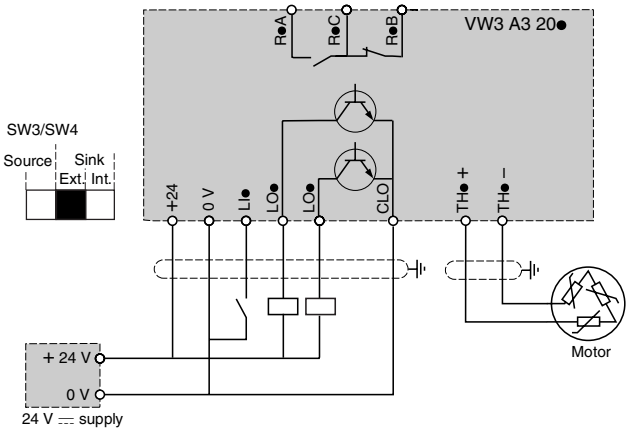


External power supply

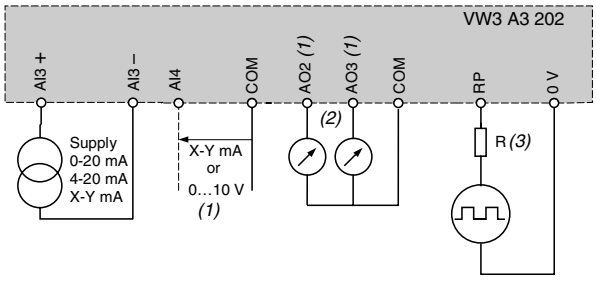
Switch in "Source" position



Switch in "Sink Ext" position



Analog I/O (only on VW3 A3 202 extended I/O card)

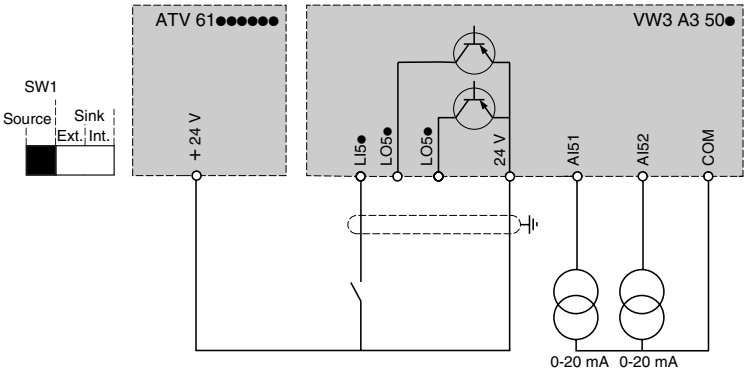


(1) Software-configurable current (0-20 mA) or voltage (0…10 V) analog input.
(2) Software-configurable current (0-20 mA) or voltage (± 10 V or 0…10 V) analog outputs, independent selection possible for each output via switch.
(3) R: add a resistor if the input voltage of the pulse train is greater than 5 V.
Recommended values:

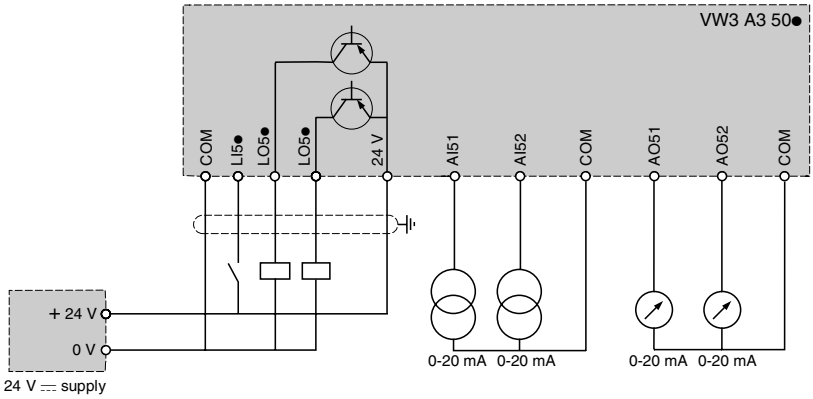
Input voltage V	Resistance Ω
12	510
15	910
24	1300

VW3 A3 502 and VW3 A3 503 multi-pump cards, VW3 A3 501 “Controller Inside” programmable card

Card powered by the drive *(1)*

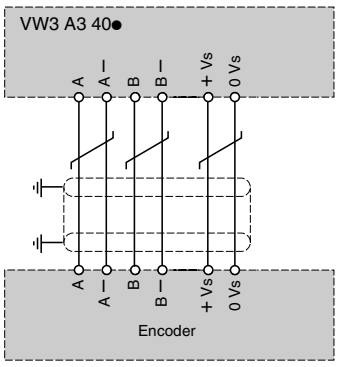


Card powered by external power supply

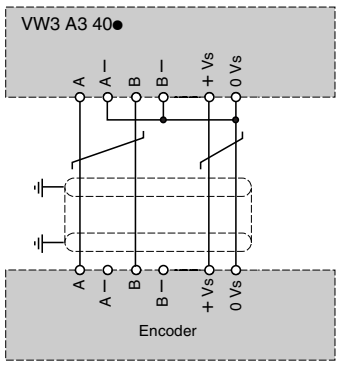


VW3 A3 401, VW3 A3 403 to VW3 A3 407 encoder interface cards

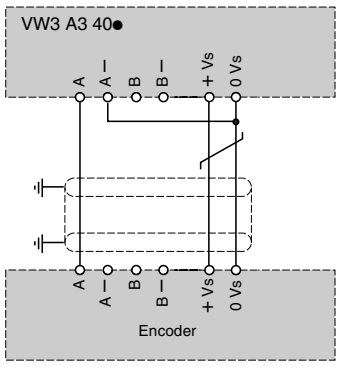
Wiring of encoders VW3 A3 401, 403…407 A, $\overline{A}$, B, $\overline{B}$ signals



Wiring of encoders VW3 A3 403…407 AB signals



Wiring of encoders VW3 A3 403…407 A signal



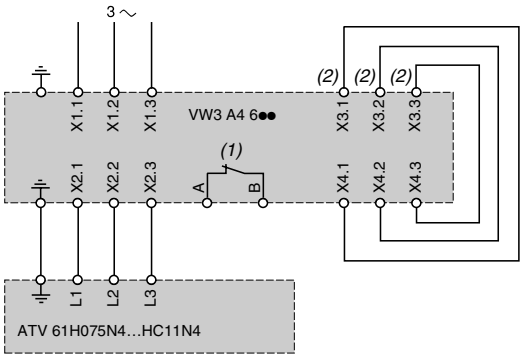
(1) Only if the power consumption is less than 200 mA; otherwise use an external power supply.

2

2.4

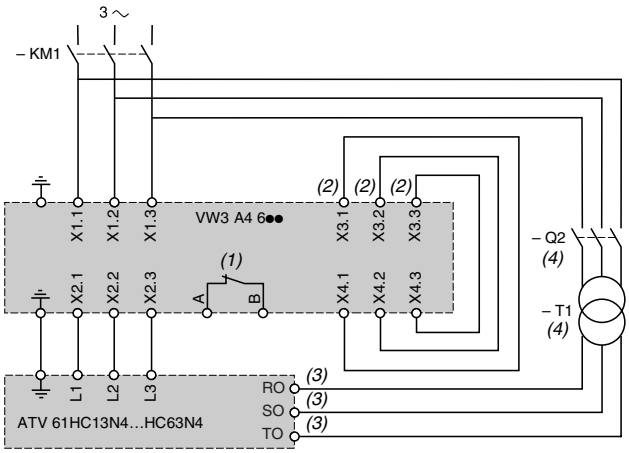
VW3 A4 6●● passive filters

Scheme with 1 passive filter for ATV 61H075N4…HC11N4 drives

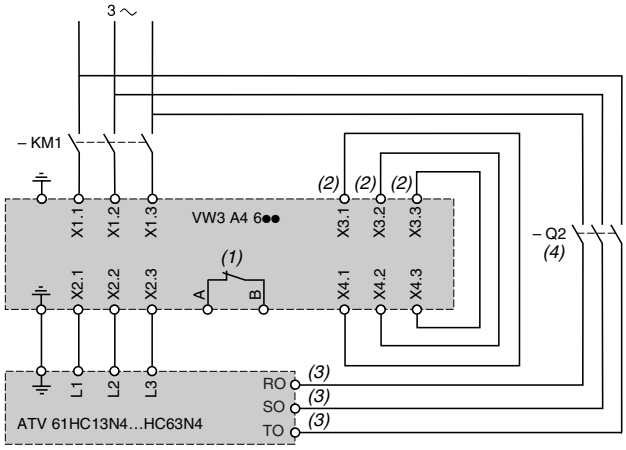


Scheme with 1 passive filter for ATV 61HC13N4…HC63N4 drives

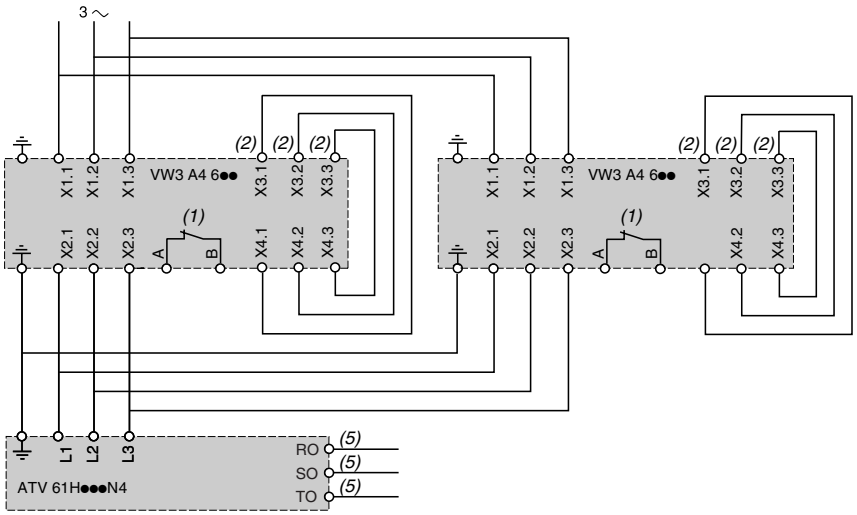
Connection downstream of the line contactor



Connection upstream of the line contactor



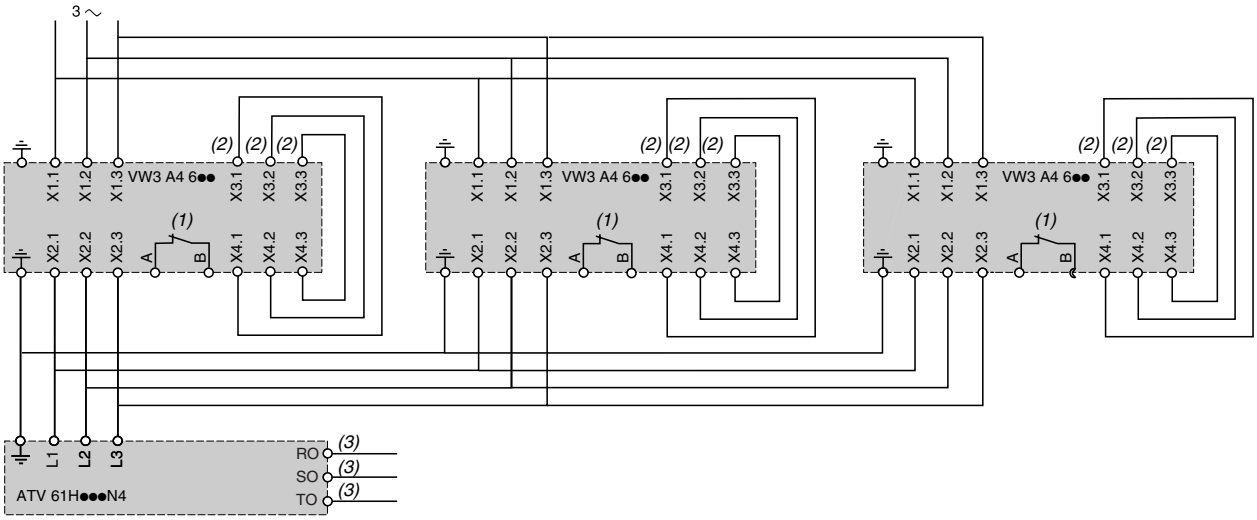
Scheme with 2 passive filters for ATV 61H075N4…HC11N4 drives



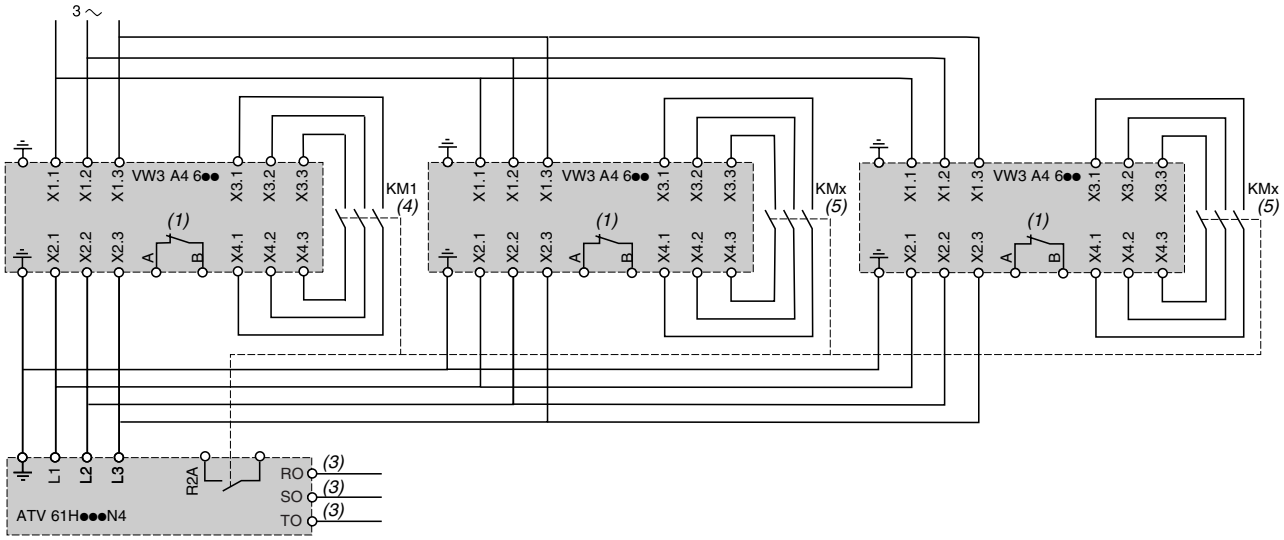
(1) Contact for indicating the thermal state of the passive filter, to be connected in the safety circuit of the installation.
(2) Cable supplied.
(3) Fan external power supply.
(4) Q2: GV2 RT10 thermal-magnetic circuit-breaker. T1: transformer 400/400 V or 460/460 V.
(5) For ATV 61HC13N4…HC63N4 drives, the external power supply for the fan is obligatory, see diagram above with one passive filter.

VW3 A4 6●● passive filters (continued)

Scheme with 3 passive filters for ATV 61H075N4...HC11N4 drives



Scheme for controlling the filter via the drive according to the load

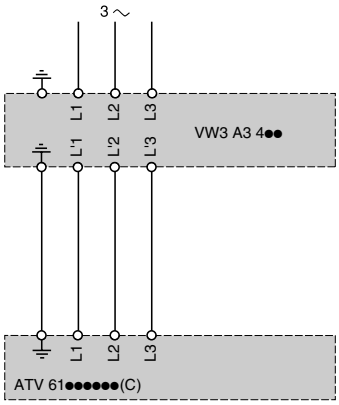


(1) Contact for indicating the thermal state of the passive filter, to be connected in the safety circuit of the installation.
(2) Cable supplied.
(3) For ATV 61HC13N4...HC63N4 drives, the external power supply for the fan is obligatory, see diagram page 2/484 with one passive filter.
(4) KM1: Category AC1 contactor sized at 50% of the drive nominal current (In).
(5) KMx: Contactor type and sizing identical to KM1. It may be necessary to provide an intermediate relay to control the KMx contactors.

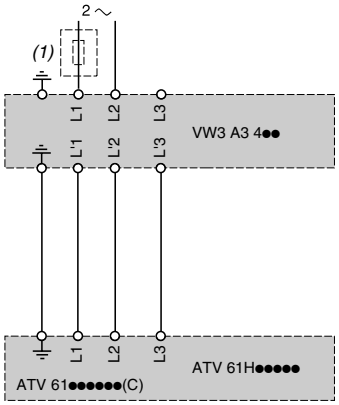
2

VW3 A4 4●● additional EMC input filters

3-phase power supply, 3-phase filter



Single phase power supply, 3-phase filter

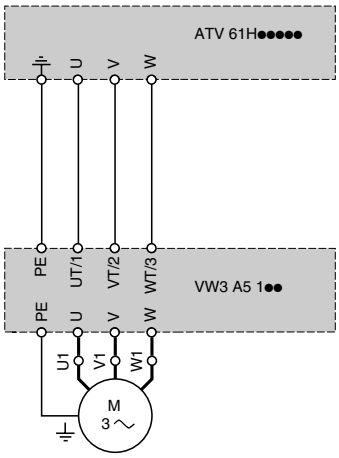


(1) Line choke compulsory for ATV 61HU40M3…HU75M3, see page 2/230.

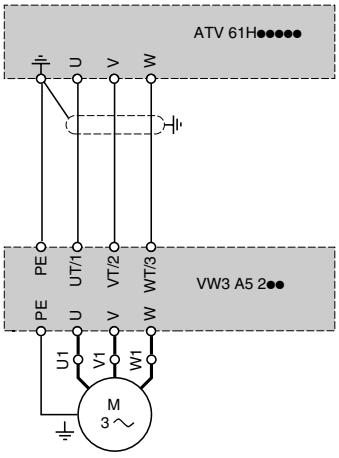
Output filters

2.4

VW3 A5 1●● motor chokes

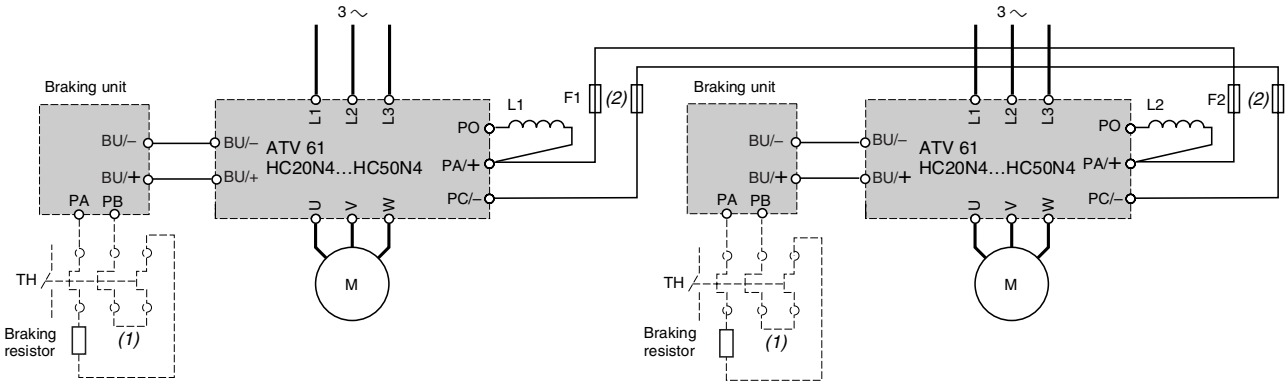


VW3 A5 2●● sinus filters



Drives combined with a braking unit and wired onto the same DC bus

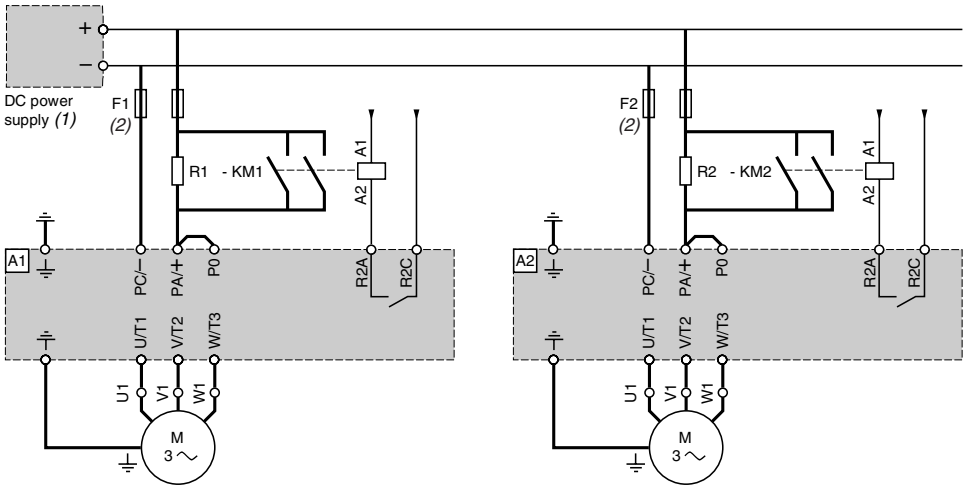
ATV 61HC25N4...HC63N4



(1) Option of using a thermal overload relay.
(2) Fast-acting semi-conductor fuses, see page 2/287. The function of the fuses is to protect the DC bus wiring in the event of a drive short-cirduit.

Drives powered by external DC power supply

ATV 61HD18M3X...HD45M3X, ATV 61HD22N4...HD75N4, ATV 61WD22N4...WD90N4, ATV 61WD22N4C...WD90N4C



For drives A1, A2	Braking resistors R1, R2		Contactors (3) KM1, KM2
	Value	Reference	
	Ω		
ATV 61HD18M3X	5	VW3 A7 707	LC1 D32●●
ATV 61HD22M3X	5	VW3 A7 707	LC1 D40●●
ATV 61HD30M3X	5	VW3 A7 707	LC1 D65●●
ATV 61HD37M3X	5	VW3 A7 707	LC1 D80●●
ATV 61HD45M3X	5	VW3 A7 707	LC1 D80●●
ATV 61HD22N4, ATV 61WD22N4, WD22N4C	5	VW3 A7 707	LC1 D25●●
ATV 61HD30N4, ATV 61WD30N4, WD30N4C	5	VW3 A7 707	LC1 D32●●
ATV 61HD37N4, ATV 61WD37N4, WD37N4C	5	VW3 A7 707	LC1 D38●●
ATV 61HD45N4, ATV 61WD45N4, WD45N4C	5	VW3 A7 707	LC1 D40●●
ATV 61HD55N4, ATV 61WD55N4, WD55N4C	5	VW3 A7 707	LC1 D50●●
ATV 61HD75N4, ATV 61WD75N4, WD75N4C	5	VW3 A7 707	LC1 D80●●
ATV 61HD90N4, ATV 61WD90N4, WD90N4C	5	VW3 A7 707	LC1 D80●●

(1) DC power supply not included.
(2) Fast-acting fuses, see page 2/289. The function of the fuses is to protect the DC bus wiring in the event of a drive short-circuit.
(3) See our "Motor starter solutions. Power control and protection components" specialist catalogue.

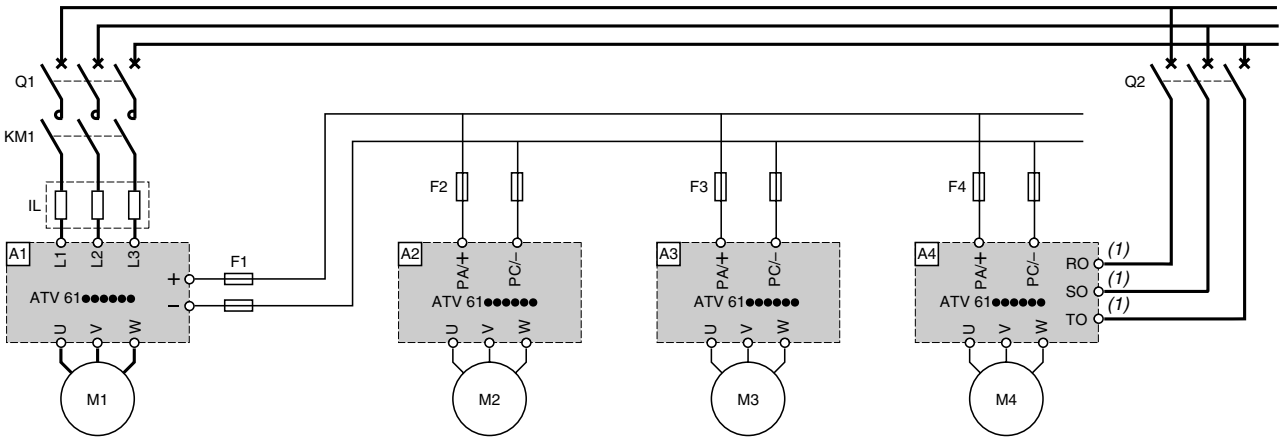
Note: *ATV 61H●●●M3, ATV 61HD11M3X, HD15M3X, ATV 61H075N4...HD18N4, ATV 61W075N4...WD18N4 and ATV 61W075N4C...WD18N4C have an integrated pre-charge circuit. This is used to connect the DC power supply directly to the drive without the need for an external pre-charge circuit.*

2

2.4

Connection diagrams for several drives in parallel on the DC bus

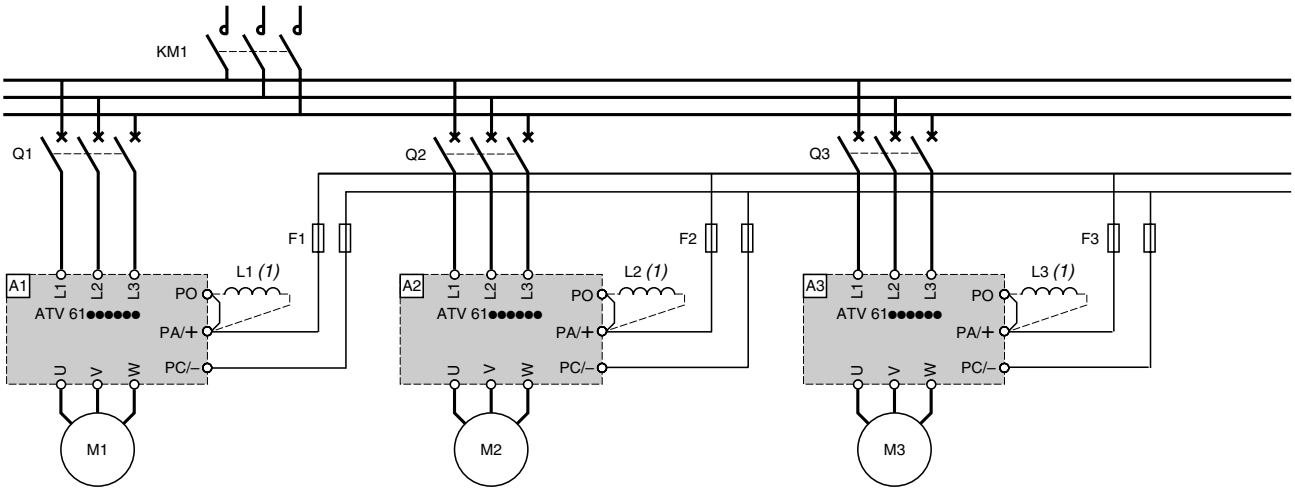
Drives with different ratings



Reference	Description
A1	ATV 61 drive, see pages 2/172 to 2/175. Drive power = ∑ motor power ratings M1 + M2 + M3 + M4 +…
A2, A3, A4	ATV 61 drives powered by the DC bus. They must be protected using fast-acting fuses. Contactors on the DC circuit are ineffective as the switching action may cause the fuses to blow owing to the high load current.
F1	Fast-acting fuses, see page 2/287. Drive A1 powered by the AC supply with an output bus. The function of the fuse is to protect the internal diode bridge in the event of a short-circuit on the external DC bus.
F2, F3, F4	Fast-acting fuses, see page 2/287. Drives A2, A3 and A4 are powered by their DC bus and are not connected to the AC input. The function of the fuses is to protect the DC bus wiring in the event of a drive short-circuit.

(1) With ATV 61HD90M3X and ATV 61HC11N4…HC63N4 drives, make provision for connection of the fans' power supply.

Drives with equivalent ratings



Reference	Description
A1, A2, A3	ATV 61 drives, see pages 2/172 to 2/175. The power difference between the drives connected in parallel must not exceed any rating.
F1, F2, F3	Fast-acting fuses, see page 2/287. Drives A1, A2 and A3 powered by the AC supply with an output bus. The function of the fuse is to protect the internal diode bridge in the event of a short-circuit on the external DC bus.
KM1	When using a common line contactor, all the Altivar 61 drive load circuits operate in parallel and cannot therefore be overloaded.
L1, L2, L3	DC chokes, see page 2/227.
Q1, Q2, Q3	Circuit-breakers on the line supply side to protect drives against overloads. Use trip contacts on the "external fault" logic input or the line contactor. The line contactor must only be activated if all three circuit-breakers are closed, as otherwise there is a risk of damage to the drives.

(1) DC chokes compulsory except for ATV 61HD55M3X…HD90M3X and ATV 61HD90N4…HC63N4 (these drives include a DC choke as standard).

Variable speed drives for asynchronous motors
Altivar 61

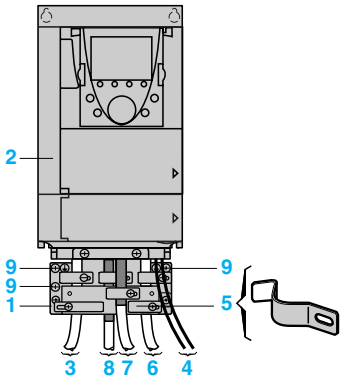
Size of DC bus fuses (F1, F2, F3, F4) depending on the drive rating

For drives	Fast-acting fuses *(1)*
	A
ATV 61H075M3	10
ATV 61HU15M3, HU22M3	16
ATV 61HU30M3	25
ATV 61HU40M3, HU55M3	40
ATV 61HU75M3	50
ATV 61HD11M3X	80
ATV 61HD15M3X	100
ATV 61HD18M3X	125
ATV 61HD22M3X	160
ATV 61HD30M3X	200
ATV 61HD37M3X	250
ATV 61HD45M3X	315
ATV 61HD55M3X	350
ATV 61HD75M3X	500
ATV 61HD90M3X	630
ATV 61H075N4...HU22N4, ATV 61W075N4...WU22N4, ATV 61W075N4C...WU22N4C	10
ATV 61HU30N4, HU40N4, ATV 61WU30N4, WU40N4, ATV 61WU30N4C, WU40N4C	16
ATV 61HU55N4, ATV 61WU55N4, ATV 61WU55N4C	25
ATV 61HU75N4, HD11N4, ATV 61WU75N4, WD11N4, ATV 61WU75N4C, WD11N4C	40
ATV 61HD15N4...HD22N4, ATV 61WD15N4...WD22N4, ATV 61WD15N4C...WD22N4C	80
ATV 61HD30N4, HD37N4, ATV 61WD30N4, WD37N4, ATV 61WD30N4C, WD37N4C	125
ATV 61HD45N4, ATV 61WD45N4, ATV 61WD45N4C	160
ATV 61HD55N4, ATV 61WD55N4, ATV 61WD55N4C	200
ATV 61HD75N4, HD90N4 ATV 61WD75N4, WD90N4, ATV 61WD75N4C, WD90N4C	315
ATV 61HC11N4	400
ATV 61HC13N4	500
ATV 61HC16N4	550
ATV 61HC22N4	800
ATV 61HC25N4	900
ATV 61HC31N4	1100
ATV 61HC40N4	1400
ATV 61HC50N4	1800
ATV 61HC63N4	2250

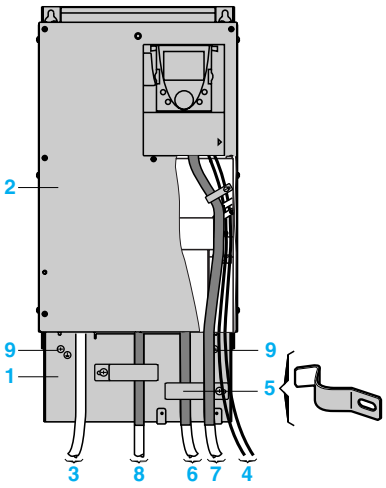
(1) Nominal voltage of fast-acting fuse:

Line voltage	Nominal voltage of fast-acting fuse
∼ V	V
230	690
400	690
440	800
460	800
480	800

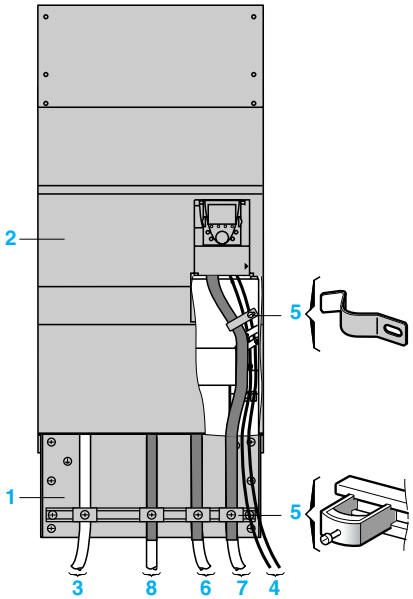
Variable speed drives for asynchronous motors
Altivar 61
Electromagnetic compatibility



ATV 61H●●●M3, ATV 61HD11M3X, HD15M3X, ATV 61H075N4…HD18N4



ATV 61HD18M3X…HD45M3X, ATV 61HD22N4…HD75N4



ATV 61HD55M3X…HD90M3X, ATV 61HD90N4…HC63N4

Connections to meet the requirements of EMC standards

Principle

■ Earths between drive, motor and cable shielding must have “high frequency” equipotentiality.
■ Use shielded cables with shielding connected to earth over 360° at both ends for the 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 motor cable.

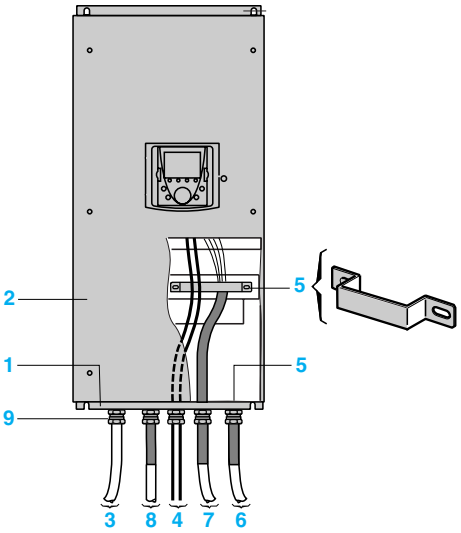
Installation plan for ATV 61H●●●M3, ATV 61H●●●M3X, ATV 61H●●●N4 drives

1 Steel plate *(1)*, to be mounted on the drive (machine earth).
2 Altivar 61 UL Type 1/IP 20 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 and 8 as close as possible to the 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 metal plate to ensure good contact.
6 Shielded cable for connecting the motor
7 Shielded cable for connecting the control/signalling wiring.
For applications requiring several conductors, use cables with a small cross-section (0.5 mm^2).
8 Shielded cable for connecting the braking resistor
6, 7, 8, the shielding must be earthed at both ends.
The shielding must be continuous and intermediate terminals must be placed in EMC shielded metal boxes.
9 Earth screw.

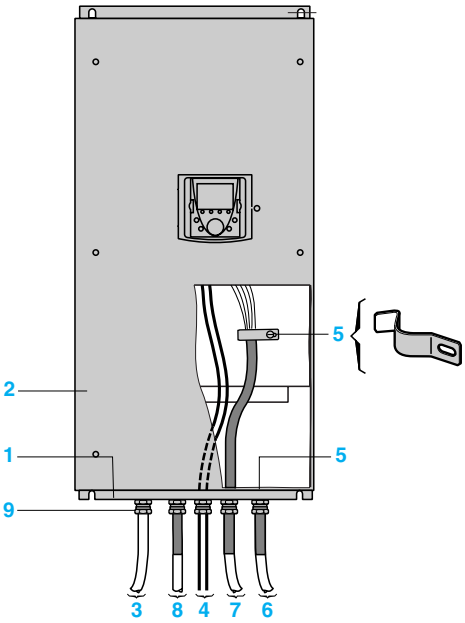
Note: *The HF equipotential ground connection between the drive, motor and cable shielding does not remove the need to connect the PE protective conductors (green-yellow) to the appropriate terminals on each unit.*
If using an additional EMC input filter, it should be mounted beneath the drive and connected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

(1) Plate supplied for ATV 61H●●●M3, ATV 61HD11M3X, HD45M3X and ATV 61H075N4…HD75N4 drives.
For ATV 61HD55M3X... HD90M3X and ATV 61HD90N4…HC31N4 drives, the plate is supplied with the UL Type 1 conformity kit or the IP 21 or IP 31 conformity kit, to be ordered separately, see pages 2/178 and 2/179.
For ATV 61HC40N4...HC63N4 drives the plate is supplied with the IP 31 conformity kit, to be ordered separately, see page 2/179.

Variable speed drives for asynchronous motors
Altivar 61
Electromagnetic compatibility



ATV 61W075N4...WD30N4,
ATV 61W075N4C...WD30N4C



ATV 61WD37N4...WD90N4,
ATV 61WD37N4C...WD90N4C

Connections to meet the requirements of EMC standards (continued)

Installation plan for ATV 61W●●●N4, ATV 61W●●●N4C drives

1 Steel plate (machine earth)
2 Altivar 61 UL Type 12/IP 54 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 and 8 as close as possible to the drive:
- strip the shielding,
- Attach the shielded cable to the cable gland 9 ensuring it is fully in contact 360°,
- fold back the shielding and clamp it between the ring and the body of the cable gland.
According to the rating, the cable shielding 7 can be earthed by using a cable gland 5, a clamp 5 or a cable clip 5.
The shielding must be clamped tightly enough to the metal plate to ensure good contact.
6 Shielded cable for connecting the motor
7 Shielded cable for connecting the control/signalling wiring.
For applications requiring several conductors, use cables with a small cross-section (0.5 mm^2).
8 Shielded cable for connecting the braking resistor
6, 7, 8, the shielding must be earthed at both ends.
The shielding must be continuous and intermediate terminals must be placed in EMC shielded metal boxes.
9 Metal cable gland (not supplied) for cables 6, 7 and 8.
Standard cable gland (not supplied) for cables 3 and 4.

Note: *The HF equipotential ground connection between the drive, 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 beside the drive and connected directly to the line supply via an unshielded cable. Link 3 on the drive is then via the filter output cable.

Variable speed drives for asynchronous motors

Altivar 61

Motor starters: supply voltage 200…240 V

DF534567

DF534568

DF534636

GV2 L20
+
LC1 D25●●
+
ATV 61HU22M3

Applications

Circuit-breaker/contactor/drive combinations can be used to ensure continuous service of the installation with optimum safety.
The type of circuit-breaker/contactor coordination selected can reduce maintenance costs in the event of a motor short-circuit by minimizing the time required to make the necessary repairs and the cost of replacement equipment. The suggested combinations provide type 1 or type 2 coordination depending on the drive rating.

Type 2 coordination: A motor short-circuit will not damage the device or affect its settings. The motor starter should be able to operate once the electrical fault has been removed. The electrical isolation provided by the circuit-breaker will not be affected by the short-circuit. Welding of the contactor contacts is permissible if they can be separated easily.

Type 1 coordination: The electrical isolation provided by the circuit-breaker will not be affected by the incident and no other elements apart from the contactor are damaged as a result of the motor short-circuit.

The drive controls the motor, provides protection against short-circuits between the drive and the motor and protects the motor cable against overloads. The overload protection is provided by the drive's motor thermal protection. If this protection is removed, external thermal protection should be provided.
Before restarting the installation, the cause of the trip must be removed.

Motor starters for UL Type 1/IP 20 drives

Motor Power (1)		Drive Reference	Circuit-breaker Reference (2)	Rating	Im	Line contactor Reference (3) (4)
kW	HP			A	A	
Single phase supply voltage: 200…240 V 50/60 Hz. Type 2 coordination						
0.37	*0.5*	**ATV 61H075M3**	**GV2 L14**	10	–	**LC1 D09●●**
0.75	*1*	**ATV 61HU15M3**	**GV2 L16**	14	–	**LC1 D18●●**
1.5	*2*	**ATV 61HU22M3**	**GV2 L20**	18	–	**LC1 D25●●**
2.2	*3*	**ATV 61HU30M3**	**GV2 L32** **NS80HMA50**	32 50	– 300	**LC1 D32●●** **LC1 D32●●**
3	–	**ATV 61HU40M3** *(5)*	**GV2 L32** **NS80HMA50**	32 50	– 300	**LC1 D32●●** **LC1 D32●●**
4	*5*	**ATV 61HU55M3** *(5)*	**NS80HMA50**	50	300	**LC1 D40●●**
5.5	*7.5*	**ATV 61HU75M3** *(5)*	**NS80HMA50**	50	300	**LC1 D50●●**
Single phase supply voltage: 200…240 V 50/60 Hz. Type 1 coordination						
0.37	*0.5*	**ATV 61H075M3**	**GV2 LE14**	10	–	**LC1 K06●●**
0.75	*1*	**ATV 61HU15M3**	**GV2 LE16**	14	–	**LC1 K06●●**
1.5	*2*	**ATV 61HU22M3**	**GV2 LE20**	18	–	**LC1 K06●●**
2.2	*3*	**ATV 61HU30M3**	**GV2 LE32**	32	–	**LC1 D18●●**
3	–	**ATV 61HU40M3** *(5)*	**GV2 LE32**	32	–	**LC1 D18●●**
4	*5*	**ATV 61HU55M3** *(5)*	**NS80HMA50**	50	300	**LC1 D40●●**
5.5	*7.5*	**ATV 61HU75M3** *(5)*	**NS80HMA50**	50	300	**LC1 D50●●**

(1) Standard power ratings for 4-pole motors 230 V 50/60 Hz.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA: product sold under the Merlin Gerin brand.
Breaking capacity of circuit-breakers according to standard IEC 60947-2:

Circuit-breaker	Icu (kA) for 240 V
GV2 L14, GV2 L16, GV2 LE14…GV2 LE20	100
GV2 L20, GV2 L32, GV2 LE32	50
NS80HMA	100

(3) Composition of contactors:
LC1 K06: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
LC1 D09 to LC1 D50: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 K06	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
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 available between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.
(5) A line choke must be added (see page 2/230).

Variable speed drives for asynchronous motors
Altivar 61
Motor starters: supply voltage 200…240 V

DF534570

DF534571

DF534629

NS80HMA50
+
LC1 D40●●
+
ATV 61HU55M3

Motor starters for UL Type 1/IP 20 drives

Motor Power *(1)*		Drive Reference	Circuit-breaker Reference *(2)*	Rating	Im	Line contactor Reference *(3) (4)*
kW	*HP*			A	A	
3-phase supply voltage: 200…240 V 50/60 Hz. Type 2 coordination						
0.75	*1*	**ATV 61H075M3**	**GV2 L10**	6.3	–	**LC1 D09●●**
1.5	*2*	**ATV 61HU15M3**	**GV2 L16**	14	–	**LC1 D18●●**
2.2	*3*	**ATV 61HU22M3**	**GV2 L20**	18	–	**LC1 D18●●**
3	–	**ATV 61HU30M3**	**GV2 L22**	25	–	**LC1 D25●●**
4	*5*	**ATV 61HU40M3**	**GV2 L32**	32	–	**LC1 D40●●**
5.5	*7.5*	**ATV 61HU55M3**	**NS80HMA50**	50	300	**LC1 D40●●**
7.5	*10*	**ATV 61HU75M3**	**NS80HMA50**	50	300	**LC1 D50●●**
11	*15*	**ATV 61HD11M3X**	**NS80HMA80**	80	480	**LC1 D65●●**
15	*20*	**ATV 61HD15M3X**	**NS80HMA80**	80	480	**LC1 D80●●**
18.5	*25*	**ATV 61HD18M3X**	**NS80HMA80**	80	480	**LC1 D80●●**
22	*30*	**ATV 61HD22M3X**	**NS100●MA100**	100	600	**LC1 D115●●**
30	*40*	**ATV 61HD30M3X**	**NS160●MA150**	150	1350	**LC1 D115●●**
37	*50*	**ATV 61HD37M3X**	**NS160●MA150**	150	1350	**LC1 D150●●**
45	*60*	**ATV 61HD45M3X**	**NS250●MA220**	220	1980	**LC1 F185●●**
55	*75*	**ATV 61HD55M3X**	**NS250●MA220**	220	1980	**LC1 F225●●**
75	*100*	**ATV 61HD75M3X**	**NS400●MA320**	320	1920	**LC1 F265●●**
90	*125*	**ATV 61HD90M3X**	**NS630●MAE500**	500	3000	**LC1 F330●●**
3-phase supply voltage: 200…240 V 50/60 Hz. Type 1 coordination						
0.75	*1*	**ATV 61H075M3**	**GV2 LE10**	6.3	–	**LC1 K06●●**
1.5	*2*	**ATV 61HU15M3**	**GV2 LE16**	14	–	**LC1 K06●●**
2.2	*3*	**ATV 61HU22M3**	**GV2 LE20**	18	–	**LC1 K06●●**
3	–	**ATV 61HU30M3**	**GV2 LE22**	25	–	**LC1 K06●●**
4	*5*	**ATV 61HU40M3**	**GV2 LE32**	32	–	**LC1 D18●●**
5.5	*7.5*	**ATV 61HU55M3**	**NS80HMA50**	50	300	**LC1 D25●●**
7.5	*10*	**ATV 61HU75M3**	**NS80HMA50**	50	300	**LC1 D32●●**
11	*15*	**ATV 61HD11M3X**	**NS80HMA80**	80	480	**LC1 D40●●**
15	*20*	**ATV 61HD15M3X**	**NS80HMA80**	80	480	**LC1 D50●●**
18.5	*25*	**ATV 61HD18M3X**	**NS80HMA80**	80	480	**LC1 D50●●**
22	*30*	**ATV 61HD22M3X**	**NS100●MA100**	100	600	**LC1 D80●●**
30	*40*	**ATV 61HD30M3X**	**NS160●MA150**	150	1350	**LC1 D80●●**
37	*50*	**ATV 61HD37M3X**	**NS160●MA150**	150	1350	**LC1 D115●●**
45	*60*	**ATV 61HD45M3X**	**NS250●MA220**	220	1320	**LC1 D115●●**
55	*75*	**ATV 61HD55M3X**	**NS250●MA220**	220	1980	**LC1 D115●●**
75	*100*	**ATV 61HD75M3X**	**NS400●MA320**	320	1920	**LC1 F185●●**
90	*125*	**ATV 61HD90M3X**	**NS630●MAE500**	500	3000	**LC1 F265●●**

(1) Standard power ratings for 4-pole motors 230 V 50/60 Hz.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA●●, NS●●●●MA : products sold under the Merlin Gerin brand.
Breaking capacity of circuit-breakers according to standard IEC 60947-2:

Circuit-breaker	Icu (kA) for 240 V			
		N	H	L
GV2 L10, GV2 L16, GV2 L20, GV2 LE10, GV2 LE16, GV2 LE20	100	–	–	–
GV2 L22, GV2 L32, GV2 LE22, GV2 LE32	50	–	–	–
NS80HMA	100	–	–	–
NS●●●●MA	–	85	100	150

(3) Composition of contactors:
LC1 K06: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
LC1 D09 to LC1 D150: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
LC1 F●●●: 3 poles. To add auxiliary contacts or other accessories, please consult our specialist catalogue "Motor-starter solutions. Control and protection components".
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 K06	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 D09…D150	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	–	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F185, F225	50 Hz (LX1 coil)	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz (LX1 coil)	–	**E6**	**F6**	**M6**	–	**U6**
	40…400 Hz (LX9 coil)	–	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F265, LC1 F330	40…400 Hz (LX1 coil)	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**

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

Variable speed drives for asynchronous motors

Altivar 61

Motor starters: supply voltage 380…415 V

DF534573

DF534574

DF534631

NS160●MA150
+
LC1 D115●●
+
ATV 61HD55N4

Motor starters for UL Type 1/IP 20 drives

Motor Power *(1)*		Drive Reference	Circuit-breaker Reference *(2)*	Rating	Im	Line contactor Reference *(3) (4)*
kW	*HP*			A	A	
3-phase supply voltage: 380…415 V 50/60 Hz. Type 2 coordination						
0.75	*1*	**ATV 61H075N4**	**GV2 L08**	4	–	**LC1 D09●●**
1.5	*2*	**ATV 61HU15N4**	**GV2 L10**	6.3	–	**LC1 D09●●**
2.2	*3*	**ATV 61HU22N4**	**GV2 L14**	10	–	**LC1 D09●●**
3	–	**ATV 61HU30N4**	**GV2 L16**	14	–	**LC1 D18●●**
4	*5*	**ATV 61HU40N4**	**GV2 L16**	14	–	**LC1 D18●●**
5.5	*7.5*	**ATV 61HU55N4**	**GV2 L22**	25	–	**LC1 D25●●**
7.5	*10*	**ATV 61HU75N4**	**GV2 L32** **NS80HMA50**	32 50	– 300	**LC1 D32●●** **LC1 D32●●**
11	*15*	**ATV 61HD11N4**	**NS80HMA50**	50	300	**LC1 D40●●**
15	*20*	**ATV 61HD15N4**	**NS80HMA50**	50	300	**LC1 D50●●**
18.5	*25*	**ATV 61HD18N4**	**NS80HMA50**	50	300	**LC1 D50●●**
22	*30*	**ATV 61HD22N4**	**NS80HMA80**	80	480	**LC1 D50●●**
30	*40*	**ATV 61HD30N4**	**NS80HMA80**	80	480	**LC1 D65●●**
37	*50*	**ATV 61HD37N4**	**NS80HMA80**	80	480	**LC1 D80●●**
45	*60*	**ATV 61HD45N4**	**NS100●MA100**	100	600	**LC1 D115●●**
55	*75*	**ATV 61HD55N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
75	*100*	**ATV 61HD75N4**	**NS250●MA220**	220	1980	**LC1 F185●●**
90	*125*	**ATV 61HD90N4**	**NS250●MA220**	220	1980	**LC1 F185●●**
110	*150*	**ATV 61HC11N4**	**NS250●MA220**	220	1980	**LC1 F225●●**
132	*200*	**ATV 61HC13N4**	**NS250●MA220**	220	1980	**LC1 F265●●**
160	*250*	**ATV 61HC16N4**	**NS400●MA320**	320	1920	**LC1 F330●●**
200	*300*	**ATV 61HC22N4**	**NS630●MAE500**	500	3000	**LC1 F400●●**
220	*350*	**ATV 61HC22N4**	**NS630●MAE500**	500	3000	**LC1 F400●●**
250	*400*	**ATV 61HC25N4**	**NS630●MAE500**	500	3000	**LC1 F500●●**
280	*450*	**ATV 61HC31N4**	**NS630●MAE500**	500	3000	**LC1 F500●●**
315	*500*	**ATV 61HC31N4**	**NS800L Micrologic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
355	–	**ATV 61HC40N4**	**NS800L Micrologic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
400	*600*	**ATV 61HC40N4**	**NS800L Micrologic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
500	*700*	**ATV 61HC50N4**	**NS1000L Micrologic 2 or 5 (LR OFF)**	1000	2000	**LC1 F630●●**
560	*800*	**ATV 61HC63N4**	**NS1000L Micrologic 2 or 5 (LR OFF)**	1000	2000	**LC1 F780●●**

(1) Standard power ratings for 4-pole motors 400 V 50/60 Hz.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA●●, NS●●●●: products sold under the Merlin Gerin brand.
For references to be completed, replace the dot with the letter corresponding to the circuit-breaker breaking performance (N, H, L).
Breaking capacity of circuit-breakers according to standard IEC 60947-2:

Circuit-breaker	Icu (kA) for 400 V			
		N	H	L
GV2 L08…L14	100	–	–	–
GV2 L16…L32	50	–	–	–
NS80HMA	70	–	–	–
NS100●MA	–	25	70	150
NS160●MA, NS250●MA	–	36	70	150
NS400●MA, NS630●MAE	–	45	70	150
NS800L Micrologic 2 or 5, NS1000L Micrologic 2 or 5	–	–	–	150

(3) Composition of contactors:
LC1 D09 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
LC1 F●●●: 3 poles. To add auxiliary contacts or other accessories, please consult our specialist catalogue "Motor-starter solutions. Control and protection components".
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 D09…D115	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	**–**	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F185, F225	50 Hz (LX1 coil)	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz (LX1 coil)	**–**	**E6**	**F6**	**M6**	**–**	**U6**
	40…400 Hz (LX9 coil)	**–**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F265, F330	40…400 Hz (LX1 coil)	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F400…F630	40…400 Hz (LX1 coil)	**–**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F780	40…400 Hz (LX1 coil)	**–**	**–**	**F7**	**P7**	**P7**	**P7**

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

Variable speed drives for asynchronous motors
Altivar 61
Motor starters: supply voltage 380…415 V

DF534573

DF534632

DF534631

NS160●MA150
+
LC1 D80●●
+
ATV 61HD55N4

Motor starters for UL Type 1/IP 20 drives

Motor		Drive	Circuit-breaker			Line contactor
Power *(1)*		Reference	Reference *(2)*	Rating	Im	Reference *(3) (4)*
kW	*HP*			A	A	
3-phase supply voltage: 380…415 V 50/60 Hz. Type 1 coordination						
0.75	*1*	**ATV 61H075N4**	**GV2 LE08**	4	–	**LC1 K06●●**
1.5	*2*	**ATV 61HU15N4**	**GV2 LE10**	6.3	–	**LC1 K06●●**
2.2	*3*	**ATV 61HU22N4**	**GV2 LE14**	10	–	**LC1 K06●●**
3	–	**ATV 61HU30N4**	**GV2 LE16**	14	–	**LC1 K06●●**
4	*5*	**ATV 61HU40N4**	**GV2 LE16**	14	–	**LC1 K06●●**
5.5	*7.5*	**ATV 61HU55N4**	**GV2 LE22**	25	–	**LC1 D09●●**
7.5	*10*	**ATV 61HU75N4**	**GV2 LE32**	32	–	**LC1 D18●●**
11	*15*	**ATV 61HD11N4**	**NS80HMA50**	50	300	**LC1 D25●●**
15	*20*	**ATV 61HD15N4**	**NS80HMA50**	50	300	**LC1 D32●●**
18.5	*25*	**ATV 61HD18N4**	**NS80HMA50**	50	300	**LC1 D32●●**
22	*30*	**ATV 61HD22N4**	**NS80HMA80**	50	300	**LC1 D32●●**
30	*40*	**ATV 61HD30N4**	**NS80HMA80**	80	480	**LC1 D50●●**
37	*50*	**ATV 61HD37N4**	**NS80HMA80**	80	480	**LC1 D80●●**
45	*60*	**ATV 61HD45N4**	**NS100●MA100**	100	600	**LC1 D80●●**
55	*75*	**ATV 61HD55N4**	**NS160●MA150**	150	1350	**LC1 D80●●**
75	*100*	**ATV 61HD75N4**	**NS250●MA220**	220	1980	**LC1 D115●●**
90	*125*	**ATV 61HD90N4**	**NS250●MA220**	220	1980	**LC1 D115●●**
110	*150*	**ATV 61HC11N4**	**NS250●MA220**	220	1980	**LC1 F150●●**
132	*200*	**ATV 61HC13N4**	**NS250●MA220**	220	1980	**LC1 F150●●**
160	*250*	**ATV 61HC16N4**	**NS400●MA320**	320	1920	**LC1 F225●●**
200	*300*	**ATV 61HC22N4**	**NS630●MAE500**	500	3000	**LC1 F330●●**
220	*350*	**ATV 61HC22N4**	**NS630●MAE500**	500	3000	**LC1 F330●●**
250	*400*	**ATV 61HC25N4**	**NS630●MAE500**	500	3000	**LC1 F400●●**
280	*450*	**ATV 61HC31N4**	**NS630●MAE500**	500	3000	**LC1 F400●●**
315	*500*	**ATV 61HC31N4**	**NS800 Micrologic 2 or 5 (LR OFF)**	800	1600	**LC1 F500●●**
355	–	**ATV 61HC40N4**	**NS800 Micrologic 2 or 5 (LR OFF)**	800	1600	**LC1 F500●●**
400	*600*	**ATV 61HC40N4**	**NS800 Micrologic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
500	*700*	**ATV 61HC50N4**	**NS1000 Micrologic 2 or 5 (LR OFF)**	1000	2000	**LC1 F630●●**
560	*800*	**ATV 61HC63N4**	**NS1000 Micrologic 2 or 5 (LR OFF)**	1000	2000	**LC1 F630●●**
630	*900*	**ATV 61HC63N4**	**NS1250 Micrologic 2 or 5 (LR OFF)**	1000	2000	**LC1 F630●●S011**

(1) Standard power ratings for 4-pole motors 400 V 50/60 Hz.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA●●, NS●●●●: products sold under the Merlin Gerin brand.
For references to be completed, replace the dot with the letter corresponding to the circuit-breaker breaking performance (N, H, L).
Breaking capacity of circuit-breakers according to standard IEC 60947-2:

Circuit-breaker	Icu (kA) for 400 V			
		N	H	L
GV2 LE08…LE22	15	–	–	–
GV2 LE32	10	–	–	–
NS80HMA	70	–	–	–
NS100●MA	–	25	70	150
NS160●MA, NS250●MA	–	36	70	150
NS400●MA, NS630●MAE	–	45	70	150
NS800 Micrologic 2 or 5, NS1000 Micrologic 2 or 5, NS1250 Micrologic 2 or 5	–	50	70	–

(3) Composition of contactors:
LC1 K06, LC1 D09 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
LC1 F●●●: 3 poles. To add auxiliary contacts or other accessories, please consult our specialist catalogue "Motor-starter solutions. Control and protection components".
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 K06	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 D09…D115	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	**–**	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F150, F225	50 Hz (LX1 coil)	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz (LX1 coil)	**–**	**E6**	**F6**	**M6**	**–**	**U6**
	40…400 Hz (LX9 coil)	**–**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F330	40…400 Hz (LX1 coil)	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F400…F630	40…400 Hz (LX1 coil)	**–**	**E7**	**F7**	**M7**	**P7**	**U7**

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

Variable speed drives for asynchronous motors
Altivar 61
Motor starters: supply voltage 380…415 V

DF594573

DF534574

DF594634

NS160●MA150
+
LC1 D115●●
+
ATV 61WD55N4

Motor starters for UL Type 12/IP 54 drives

Motor		Drive	Circuit-breaker			Line contactor
Power *(1)*		Reference	Reference *(2)*	Rating	Im	Reference *(3) (4)*
kW	*HP*			A	A	
3-phase supply voltage: 380…415 V 50/60 Hz Type 2 coordination						
0.75	*1*	**ATV 61W075N4** **ATV 61W075N4C**	**GV2 L07**	2.5	–	**LC1 D09●●**
1.5	*2*	**ATV 61WU15N4** **ATV 61WU15N4C**	**GV2 L08**	4	–	**LC1 D09●●**
2.2	*3*	**ATV 61WU22N4** **ATV 61WU22N4C**	**GV2 L10**	6.3	–	**LC1 D09●●**
3	–	**ATV 61WU30N4** **ATV 61WU30N4C**	**GV2 L14**	10	–	**LC1 D09●●**
4	*5*	**ATV 61WU40N4** **ATV 61WU40N4C**	**GV2 L14**	10	–	**LC1 D09●●**
5.5	*7.5*	**ATV 61WU55N4** **ATV 61WU55N4C**	**GV2 L16**	14	–	**LC1 D18●●**
7.5	*10*	**ATV 61WU75N4** **ATV 61WU75N4C**	**GV2 L20**	18	–	**LC1 D18●●**
11	*15*	**ATV 61WD11N4** **ATV 61WD11N4C**	**GV2 L22**	25	–	**LC1 D25●●**
15	*20*	**ATV 61WD15N4** **ATV 61WD15N4C**	**GV2 L32**	32	–	**LC1 D40●●**
18.5	*25*	**ATV 61WD18N4** **ATV 61WD18N4C**	**NS80HMA50**	50	300	**LC1 D40●●**
22	*30*	**ATV 61WD22N4** **ATV 61WD22N4C**	**NS80HMA50**	50	300	**LC1 D50●●**
30	*40*	**ATV 61WD30N4** **ATV 61WD30N4C**	**NS80HMA80**	80	480	**LC1 D65●●**
37	*50*	**ATV 61WD37N4** **ATV 61WD37N4C**	**NS80HMA80**	80	480	**LC1 D80●●**
45	*60*	**ATV 61WD45N4** **ATV 61WD45N4C**	**NS100●MA100**	100	600	**LC1 D80●●**
55	*75*	**ATV 61WD55N4** **ATV 61WD55N4C**	**NS160●MA150**	150	1350	**LC1 D115●●**
75	*100*	**ATV 61WD75N4** **ATV 61WD75N4C**	**NS160●MA150**	150	1350	**LC1 D115●●**
90	*125*	**ATV 61WD90N4** **ATV 61WD90N4C**	**NS250●MA220**	220	1980	**LC1 F185●●**

(1) Standard power ratings for 4-pole motors 400 V 50/60 Hz.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA●●, NS●●●●: products sold under the Merlin Gerin brand.
For references to be completed, replace the dot with the letter corresponding to the circuit-breaker breaking performance (N, H, L).
Breaking capacity of circuit-breakers according to standard IEC 60947-2:

Circuit-breaker	Icu (kA) for 400 V			
		N	H	L
GV2 L07…L14	100	–	–	–
GV2 L16…L32	50	–	–	–
NS80HMA	70	–	–	–
NS100●MA	–	25	70	150
NS160●MA, NS250●MA	–	36	70	150

(3) Composition of contactors:
LC1 D09 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
LC1 F185: 3 poles. To add auxiliary contacts or other accessories, please consult our specialist catalogue "Motor-starter solutions. Control and protection components".
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 D09…D115	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	**–**	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F185	50 Hz (LX1 coil)	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz (LX1 coil)	**–**	**E6**	**F6**	**M6**	**–**	**U6**
	40…400 Hz (LX9 coil)	**–**	**E7**	**F7**	**M7**	**P7**	**U7**

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

Variable speed drives for asynchronous motors
Altivar 61
Motor starters: supply voltage 380…415 V

DF534573

DF534574

DF534635

NS160●MA150
+
LC1 D115●●
+
ATV 61WD75N4

Motor starters for UL Type 12/IP 54 drives

Motor		Drive	Circuit-breaker			Line contactor
Power *(1)*		Reference	Reference *(2)*	Rating	Im	Reference *(3) (4)*
kW	*HP*			A	A	
3-phase supply voltage: 380…415 V 50/60 Hz Type 1 coordination						
0.75	*1*	**ATV 61W075N4** **ATV 61W075N4C**	**GV2 LE07**	2.5	–	**LC1 K06●●**
1.5	*2*	**ATV 61WU15N4** **ATV 61WU15N4C**	**GV2 LE08**	4	–	**LC1 K06●●**
2.2	*3*	**ATV 61WU22N4** **ATV 61WU22N4C**	**GV2 LE10**	6.3	–	**LC1 K06●●**
3	–	**ATV 61WU30N4** **ATV 61WU30N4C**	**GV2 LE14**	10	–	**LC1 K06●●**
4	*5*	**ATV 61WU40N4** **ATV 61WU40N4C**	**GV2 LE14**	10	–	**LC1 K06●●**
5.5	*7.5*	**ATV 61WU55N4** **ATV 61WU55N4C**	**GV2 LE16**	14	–	**LC1 K06●●**
7.5	*10*	**ATV 61WU75N4** **ATV 61WU75N4C**	**GV2 LE20**	18	–	**LC1 K06●●**
11	*15*	**ATV 61WD11N4** **ATV 61WD11N4C**	**GV2 LE22**	25	–	**LC1 D09●●**
15	*20*	**ATV 61WD15N4** **ATV 61WD15N4C**	**GV2 LE32**	32	–	**LC1 D18●●**
18.5	*25*	**ATV 61WD18N4** **ATV 61WD18N4C**	**NS80HMA50**	50	300	**LC1 D25●●**
22	*30*	**ATV 61WD22N4** **ATV 61WD22N4C**	**NS80HMA50**	50	300	**LC1 D32●●**
30	*40*	**ATV 61WD30N4** **ATV 61WD30N4C**	**NS80HMA80**	80	480	**LC1 D40●●**
37	*50*	**ATV 61WD37N4** **ATV 61WD37N4C**	**NS80HMA80**	80	480	**LC1 D50●●**
45	*60*	**ATV 61WD45N4** **ATV 61WD45N4C**	**NS100●MA100**	100	600	**LC1 D80●●**
55	*75*	**ATV 61WD55N4** **ATV 61WD55N4C**	**NS160●MA150**	150	1350	**LC1 D80●●**
75	*100*	**ATV 61WD75N4** **ATV 61WD75N4C**	**NS160●MA150**	150	1350	**LC1 D115●●**
90	*125*	**ATV 61WD90N4** **ATV 61WD90N4C**	**NS250●MA220**	220	1980	**LC1 D115●●**

(1) Standard power ratings for 4-pole motors 400 V 50/60 Hz.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA●●, NS●●●●: products sold under the Merlin Gerin brand.
For references to be completed, replace the dot with the letter corresponding to the circuit-breaker breaking performance (N, H, L).
Breaking capacity of circuit-breakers according to standard IEC 60947-2:

Circuit-breaker	Icu (kA) for 400 V			
		N	H	L
GV2 LE07…LE14	100	–	–	–
GV2 LE16…LE22	15	–	–	–
GV2 LE32	10			
NS80HMA	70	–	–	–
NS100●MA	–	25	70	150
NS160●MA, NS250●MA	–	36	70	150

(3) Composition of contactors:
LC1 K06: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
LC1 D09 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 K06	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 D09…D115	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 available between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.

Variable speed drives for asynchronous motors
Altivar 61
Motor starters: supply voltage 440…480 V

DF534573

DF534574

DF534637

NS160●MA150
+
LC1 D115●●
+
ATV 61HD75N4

Motor starters for UL Type 1/IP 20 drives

Motor		Drive	Circuit-breaker			Line contactor
Power *(1)*		Reference	Reference *(2)*	Rating	Im	Reference *(3) (4)*
kW	*HP*			A	A	
3-phase supply voltage: 440…480 V 50/60 Hz. Type 2 coordination						
0.75	*1*	**ATV 61H075N4**	**GV2 L08**	4	–	**LC1 D09●●**
1.5	*2*	**ATV 61HU15N4**	**GV2 L10**	6.3	–	**LC1 D09●●**
2.2	*3*	**ATV 61HU22N4**	**GV2 L14**	10	–	**LC1 D09●●**
3	–	**ATV 61HU30N4**	**GV2 L14**	10	–	**LC1 D09●●**
4	*5*	**ATV 61HU40N4**	**GV2 L16**	14	–	**LC1 D18●●**
5.5	*7.5*	**ATV 61HU55N4**	**GV2 L20**	18	–	**LC1 D18●●**
7.5	*10*	**ATV 61HU75N4**	**GV2 L22**	25	–	**LC1 D25●●**
11	*15*	**ATV 61HD11N4**	**GV2 L32** **NS80HMA50**	32 50	– 300	**LC1 D32●●** **LC1 D40●●**
15	*20*	**ATV 61HD15N4**	**NS80HMA50**	50	300	**LC1 D40●●**
18.5	*25*	**ATV 61HD18N4**	**NS80HMA50**	50	300	**LC1 D40●●**
22	*30*	**ATV 61HD22N4**	**NS80HMA50**	50	300	**LC1 D50●●**
30	*40*	**ATV 61HD30N4**	**NS80HMA80**	80	480	**LC1 D65●●**
37	*50*	**ATV 61HD37N4**	**NS80HMA80**	80	480	**LC1 D80●●**
45	*60*	**ATV 61HD45N4**	**NS100HMA100**	100	600	**LC1 D115●●**
55	*75*	**ATV 61HD55N4**	**NS100HMA100**	100	600	**LC1 D115●●**
75	*100*	**ATV 61HD75N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
90	*125*	**ATV 61HD90N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
110	*150*	**ATV 61HC11N4**	**NS250●MA220**	220	1980	**LC1 F185●●**
132	*200*	**ATV 61HC13N4**	**NS250●MA220**	220	1980	**LC1 F265●●**
160	*250*	**ATV 61HC16N4**	**NS400●MA320**	320	1920	**LC1 F330●●**
200	*300*	**ATV 61HC22N4**	**NS630●MAE500**	500	3000	**LC1 F330●●**
220	*350*	**ATV 61HC22N4**	**NS630●MAE500**	500	3000	**LC1 F400●●**
250	*400*	**ATV 61HC25N4**	**NS630●MAE500**	500	3000	**LC1 F500●●**
280	*450*	**ATV 61HC31N4**	**NS630●MAE500**	500	3000	**LC1 F500●●**
315	*500*	**ATV 61HC31N4**	**NS800L Micrologic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
355	–	**ATV 61HC40N4**	**NS800L Micrologic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
400	*600*	**ATV 61HC40N4**	**NS800L Micrologic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
500	*700*	**ATV 61HC50N4**	**NS1000L Micrologic 2 or 5 (LR OFF)**	1000	2000	**LC1 F630●●**
560	*800*	**ATV 61HC63N4**	**NS1000L Micrologic 2 or 5 (LR OFF)**	1000	2000	**LC1 F630●●**
630	*900*	**ATV 61HC63N4**	**NS1000L Micrologic 2 or 5 (LR OFF)**	1000	2000	**LC1 F630●●**

(1) Standard power ratings for 4-pole motors 400 V 50/60 Hz.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA●●, NS●●●●: products sold under the Merlin Gerin brand.
For references to be completed, replace the dot with the letter corresponding to the circuit-breaker breaking performance (N, H, L).
Breaking capacity of circuit-breakers according to standard IEC 60947-2:

Circuit-breaker	Icu (kA) for 440 V			
		N	H	L
GV2 L08, GV2 L10	100	–	–	–
GV2 L14…L32	20	–	–	–
NS80HMA	65	–	–	–
NS100●MA	–	25	65	130
NS160●MA, NS250●MA	–	35	65	130
NS400●MA, NS630●MAE	–	42	65	130
NS800L Micrologic 2 or 5, NS1000L Micrologic 2 or 5	–	–	–	130

(3) Composition of contactors:
LC1 D09 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
LC1 F●●●: 3 poles. To add auxiliary contacts or other accessories, please consult our specialist catalogue "Motor-starter solutions. Control and protection components".
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 D09…D115	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	**–**	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F185	50 Hz (LX1 coil)	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz (LX1 coil)	**–**	**E6**	**F6**	**M6**	**–**	**U6**
	40…400 Hz (LX9 coil)	**–**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F265, LC1 F330	40…400 Hz (LX1 coil)	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F400…F630	40…400 Hz (LX1 coil)	**–**	**E7**	**F7**	**M7**	**P7**	**U7**

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

Variable speed drives for asynchronous motors
Altivar 61
Motor starters: supply voltage 440…480 V

DF534573

DF534574

DF534637

NS160●MA150
+
LC1 D115●●
+
ATV 61HD75N4

Motor starters for UL Type 1/IP 20 drives

Motor		Drive	Circuit-breaker			Line contactor
Power *(1)*		Reference	Reference *(2)*	Rating	Im	Reference *(3) (4)*
kW	*HP*			A	A	
3-phase supply voltage: 440…480 V 50/60 Hz. Type 1 coordination						
0.75	*1*	**ATV 61H075N4**	**GV2 LE08**	4	–	**LC1 K06●●**
1.5	*2*	**ATV 61HU15N4**	**GV2 LE10**	6.3	–	**LC1 K06●●**
2.2	*3*	**ATV 61HU22N4**	**GV2 LE14**	10	–	**LC1 K06●●**
3	–	**ATV 61HU30N4**	**GV2 LE14**	10	–	**LC1 K06●●**
4	*5*	**ATV 61HU40N4**	**GV2 LE16**	14	–	**LC1 D09●●**
5.5	*7.5*	**ATV 61HU55N4**	**GV2 LE20**	18	–	**LC1 D09●●**
7.5	*10*	**ATV 61HU75N4**	**GV2 LE22**	25	–	**LC1 D18●●**
11	*15*	**ATV 61HD11N4**	**GV2 LE32**	32	–	**LC1 D25●●**
15	*20*	**ATV 61HD15N4**	**NS80HMA50**	50	300	**LC1 D40●●**
18.5	*25*	**ATV 61HD18N4**	**NS80HMA50**	50	300	**LC1 D40●●**
22	*30*	**ATV 61HD22N4**	**NS80HMA50**	50	300	**LC1 D40●●**
30	*40*	**ATV 61HD30N4**	**NS80HMA80**	80	300	**LC1 D50●●**
37	*50*	**ATV 61HD37N4**	**NS80HMA80**	80	300	**LC1 D65●●**
45	*60*	**ATV 61HD45N4**	**NS100HMA100**	100	600	**LC1 D80●●**
55	*75*	**ATV 61HD55N4**	**NS100HMA100**	100	600	**LC1 D80●●**
75	*100*	**ATV 61HD75N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
90	*125*	**ATV 61HD90N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
110	*150*	**ATV 61HC11N4**	**NS250●MA220**	220	1980	**LC1 D115●●**
132	*200*	**ATV 61HC13N4**	**NS250●MA220**	220	1980	**LC1 F265●●**
160	*250*	**ATV 61HC16N4**	**NS400●MA320**	320	1920	**LC1 F330●●**
200	*300*	**ATV 61HC22N4**	**NS630●MAE500**	500	3000	**LC1 F330●●**
220	*350*	**ATV 61HC22N4**	**NS630●MAE500**	500	3000	**LC1 F400●●**
250	*400*	**ATV 61HC25N4**	**NS630●MAE500**	500	3000	**LC1 F500●●**
280	*450*	**ATV 61HC31N4**	**NS630●MAE500**	500	3000	**LC1 F500●●**
315	*500*	**ATV 61HC31N4**	**NS800 Micrologic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
355	–	**ATV 61HC40N4**	**NS800 Micrologic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
400	*600*	**ATV 61HC40N4**	**NS800 Micrologic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
500	*700*	**ATV 61HC50N4**	**NS800 Micrologic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
560	*800*	**ATV 61HC63N4**	**NS1000 Micrologic 2 or 5 (LR OFF)**	1000	2000	**LC1 F630●●**
630	*900*	**ATV 61HC63N4**	**NS1000 Micrologic 2 or 5 (LR OFF)**	1000	2000	**LC1 F630●●**

(1) Standard power ratings for 4-pole motors 400 V 50/60 Hz.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA●●, NS●●●●: products sold under the Merlin Gerin brand.
For references to be completed, replace the dot with the letter corresponding to the circuit-breaker breaking performance (N, H, L).
Breaking capacity of circuit-breakers according to standard IEC 60947-2:

Circuit-breaker	Icu (kA) for 440 V			
		N	H	L
GV2 LE08	100	–	–	–
GV2 LE10	50	–	–	–
GV2 LE14	15	–	–	–
GV2 LE16, GV2 LE20	8	–	–	–
GV2 LE22, GV2 LE32	6	–	–	–
NS80HMA	65	–	–	–
NS100●MA	–	25	65	130
NS160●MA, NS250●MA	–	35	65	130
NS400●MA, NS630●MAE	–	42	65	130
NS800 Micrologic 2 or 5, NS1000 Micrologic 2 or 5	–	50	65	–

(3) Composition of contactors:
LC1 K06, LC1 D09 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
LC1 F●●●: 3 poles. To add auxiliary contacts or other accessories, please consult our specialist catalogue "Motor-starter solutions. Control and protection components".
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 K06	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 D09…D115	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	**–**	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F265, LC1 F330	40…400 Hz (LX1 coil)	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F400…F630	40…400 Hz (LX1 coil)	**–**	**E7**	**F7**	**M7**	**P7**	**U7**

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

Variable speed drives for asynchronous motors
Altivar 61
Motor starters: supply voltage 440…480 V

DF534573

DF534574

DF534635

NS100●MA100
+
LC1 D115●●
+
ATV 61WD55N4

Motor starters for UL Type 12/IP 54 drives

Motor		Drive	Circuit-breaker			Line contactor
Power *(1)*		Reference	Reference *(2)*	Rating	Im	Reference *(3) (4)*
kW	*HP*			A	A	
3-phase supply voltage: 440…480 V 50/60 Hz. Type 2 coordination						
0.75	*1*	**ATV 61W075N4** **ATV 61W075N4C**	**GV2 L07**	2.5	–	**LC1 D09●●**
1.5	*2*	**ATV 61WU15N4** **ATV 61WU15N4C**	**GV2 L08**	4	–	**LC1 D09●●**
2.2	*3*	**ATV 61WU22N4** **ATV 61WU22N4C**	**GV2 L10**	6.3	–	**LC1 D09●●**
3	–	**ATV 61WU30N4** **ATV 61WU30N4C**	**GV2 L10**	6.3	–	**LC1 D09●●**
4	*5*	**ATV 61WU40N4** **ATV 61WU40N4C**	**GV2 L14**	10	–	**LC1 D09●●**
5.5	*7.5*	**ATV 61WU55N4** **ATV 61WU55N4C**	**GV2 L14**	10	–	**LC1 D18●●**
7.5	*10*	**ATV 61WU75N4** **ATV 61WU75N4C**	**GV2 L20**	18	–	**LC1 D18●●**
11	*15*	**ATV 61WD11N4** **ATV 61WD11N4C**	**GV2 L22**	25	–	**LC1 D25●●**
15	*20*	**ATV 61WD15N4** **ATV 61WD15N4C**	**GV2 L32**	32	–	**LC1 D40●●**
18.5	*25*	**ATV 61WD18N4** **ATV 61WD18N4C**	**NS80HMA50**	50	300	**LC1 D40●●**
22	*30*	**ATV 61WD22N4** **ATV 61WD22N4C**	**NS80HMA50**	50	300	**LC1 D40●●**
30	*40*	**ATV 61WD30N4** **ATV 61WD30N4C**	**NS80HMA50**	50	300	**LC1 D50●●**
37	*50*	**ATV 61WD37N4** **ATV 61WD37N4C**	**NS80HMA80**	80	480	**LC1 D80●●**
45	*60*	**ATV 61WD45N4** **ATV 61WD45N4C**	**NS80HMA80**	80	480	**LC1 D80●●**
55	*75*	**ATV 61WD55N4** **ATV 61WD55N4C**	**NS100●MA100**	100	600	**LC1 D115●●**
75	*100*	**ATV 61WD75N4** **ATV 61WD75N4C**	**NS160●MA150**	150	1350	**LC1 D115●●**
90	*125*	**ATV 61WD90N4** **ATV 61WD90N4C**	**NS250●MA220**	220	1980	**LC1 F185●●**

(1) Standard power ratings for 4-pole motors 400 V 50/60 Hz.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA●●, NS●●●●: products sold under the Merlin Gerin brand.
For references to be completed, replace the dot with the letter corresponding to the circuit-breaker breaking performance (N, H, L).
Breaking capacity of circuit-breakers according to standard IEC 60947-2:

Circuit-breaker	Icu (kA) for 440 V			
		N	H	L
GV2 L07…GV2 L10	100	–	–	–
GV2 L14…L32	20	–	–	–
NS80HMA	65	–	–	–
NS100●MA	–	25	65	130
NS160●MA, NS250●MA	–	35	65	130

(3) Composition of contactors:
LC1 D09 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
LC1 F185: 3 poles. To add auxiliary contacts or other accessories, please consult our specialist catalogue "Motor-starter solutions. Control and protection components".
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 D09…D115	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	**–**	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F185	50 Hz (LX1 coil)	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz (LX1 coil)	**–**	**E6**	**F6**	**M6**	**–**	**U6**
	40…400 Hz (LX9 coil)	**–**	**E7**	**F7**	**M7**	**P7**	**U7**

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

Variable speed drives for asynchronous motors

Altivar 61

Motor starters: supply voltage 440…480 V

DF534573

DF534632

DF534635

NS100●MA100
+
LC1 D80●●
+
ATV 61WD55N4

Motor starters for UL Type 12/IP 54 drives

Motor Power *(1)* kW	*HP*	Drive Reference	Circuit-breaker Reference *(2)*	Rating A	Im A	Line contactor Reference *(3) (4)*
3-phase supply voltage: 440…480 V 50/60 Hz. Type 1 coordination						
0.75	*1*	**ATV 61W075N4** **ATV 61W075N4C**	**GV2 LE07**	2.5	–	**LC1 K06●●**
1.5	*2*	**ATV 61WU15N4** **ATV 61WU15N4C**	**GV2 LE08**	4	–	**LC1 K06●●**
2.2	*3*	**ATV 61WU22N4** **ATV 61WU22N4C**	**GV2 LE10**	6.3	–	**LC1 K06●●**
3	–	**ATV 61WU30N4** **ATV 61WU30N4C**	**GV2 LE10**	6.3	–	**LC1 K06●●**
4	*5*	**ATV 61WU40N4** **ATV 61WU40N4C**	**GV2 LE14**	10	–	**LC1 K06●●**
5.5	*7.5*	**ATV 61WU55N4** **ATV 61WU55N4C**	**GV2 LE14**	10	–	**LC1 K06●●**
7.5	*10*	**ATV 61WU75N4** **ATV 61WU75N4C**	**GV2 LE20**	18	–	**LC1 D09●●**
11	*15*	**ATV 61WD11N4** **ATV 61WD11N4C**	**GV2 LE22**	25	–	**LC1 D09●●**
15	*20*	**ATV 61WD15N4** **ATV 61WD15N4C**	**GV2 LE32**	32	–	**LC1 D18●●**
18.5	*25*	**ATV 61WD18N4** **ATV 61WD18N4C**	**NS80HMA50**	50	300	**LC1 D32●●**
22	*30*	**ATV 61WD22N4** **ATV 61WD22N4C**	**NS80HMA50**	50	300	**LC1 D32●●**
30	*40*	**ATV 61WD30N4** **ATV 61WD30N4C**	**NS80HMA50**	50	300	**LC1 D40●●**
37	*50*	**ATV 61WD37N4** **ATV 61WD37N4C**	**NS80HMA80**	80	480	**LC1 D50●●**
45	*60*	**ATV 61WD45N4** **ATV 61WD45N4C**	**NS80HMA80**	80	480	**LC1 D65●●**
55	*75*	**ATV 61WD55N4** **ATV 61WD55N4C**	**NS100●MA100**	100	600	**LC1 D80●●**
75	*100*	**ATV 61WD75N4** **ATV 61WD75N4C**	**NS160●MA150**	150	1350	**LC1 D115●●**
90	*125*	**ATV 61WD90N4** **ATV 61WD90N4C**	**NS250●MA220**	220	1980	**LC1 D115●●**

(1) Standard power ratings for 4-pole motors 400 V 50/60 Hz.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA●●, NS●●●●: products sold under the Merlin Gerin brand.
For references to be completed, replace the dot with the letter corresponding to the circuit-breaker breaking performance (N, H, L).
Breaking capacity of circuit-breakers according to standard IEC 60947-2:

Circuit-breaker	Icu (kA) for 440 V			
		N	H	L
GV2 LE07…LE10	100	–	–	–
GV2 LE14…LE32	20	–	–	–
NS80HMA	65	–	–	–
NS100●MA	–	25	65	130
NS160●MA, NS250●MA	–	35	65	130

(3) Composition of contactors:
LC1 K06, LC1 D09 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 D09…D115	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 available between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.

Variable speed drives for asynchronous motors

Altivar 61

UL Type 1/IP 20 drives

2

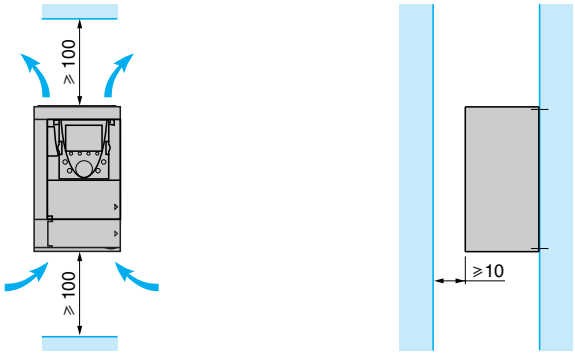
2.4

Mounting recommendations

Depending on the conditions in which the drive is to be used, its installation will require certain precautions and the use of appropriate accessories.
Install the unit vertically:

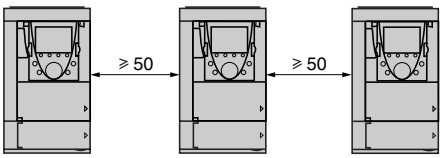
- Do not place it close to heating elements.
- Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

ATV 61H●●●M3, ATV 61HD11M3X...HD45M3X, ATV 61H075N4...HD75N4

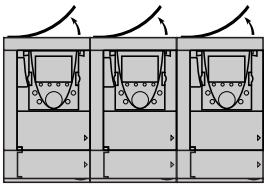


Mounting types

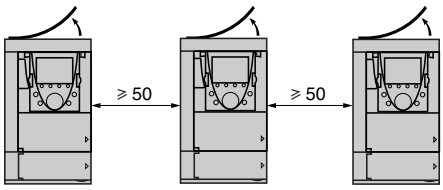
■ **Type A mounting**



■ **Type B mounting**

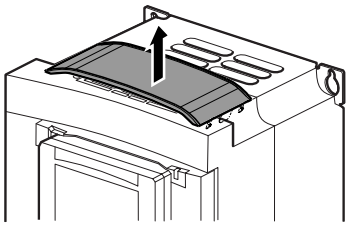


■ **Type C mounting**



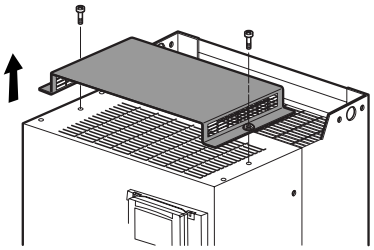
By removing the protective blanking cover from the top of the drive, the degree of protection for the drive becomes IP 20. The protective blanking cover may vary according to the drive model, see opposite.

522085



Removing the protective blanking cover for:
ATV 61H●●●M3, ATV 61HD11M3X, HD15M3X, ATV 61HD075N4...HD18N4

564510



Removing the protective blanking cover for:
ATV 61HD18M3X...HD45M3X, ATV 61HD22N4...HD75N4

Variable speed drives for asynchronous motors
Altivar 61
UL Type 1/IP 20 drives

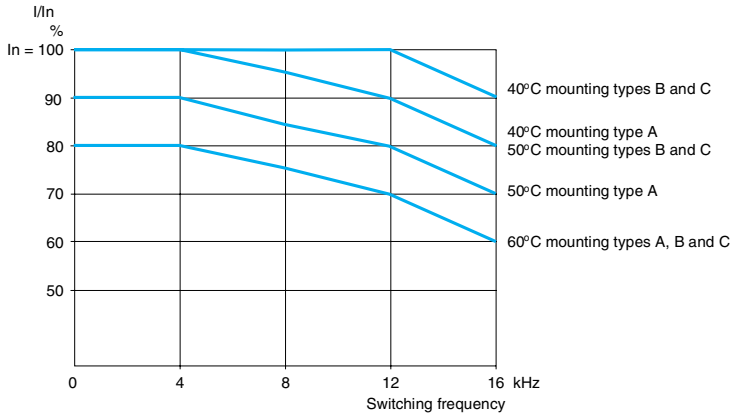
Mounting recommendations (continued)

Derating curves

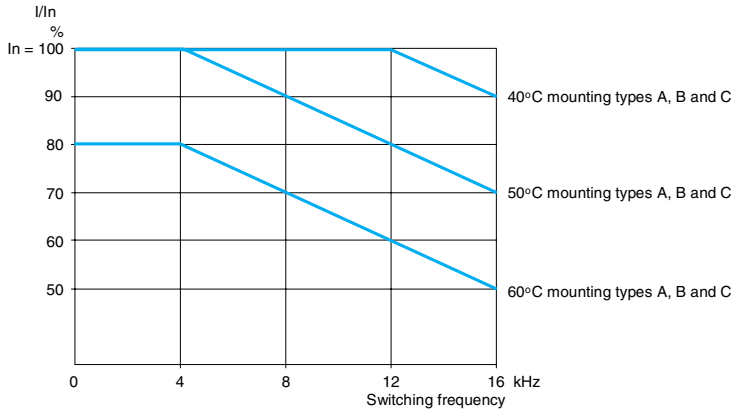
The derating curves for the drive nominal current (In) depend on the temperature, the switching frequency and the mounting type.

For intermediate temperatures (55°C for example) interpolate between 2 curves.

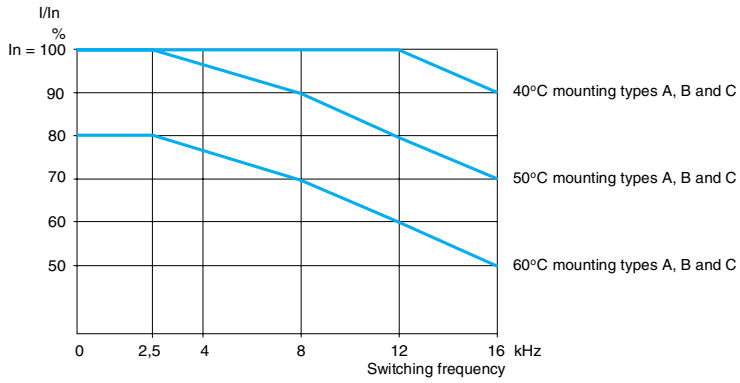
ATV 61H●●●M3, ATV 61HD11M3X, HD15M3X and ATV 61H075N4...HD18N4



ATV 61HD22N4 and ATV 61HD30N4 *(1)*



ATV 61HD18M3X...HD45M3X and ATV 61HD37N4...HD75N4 *(1)*



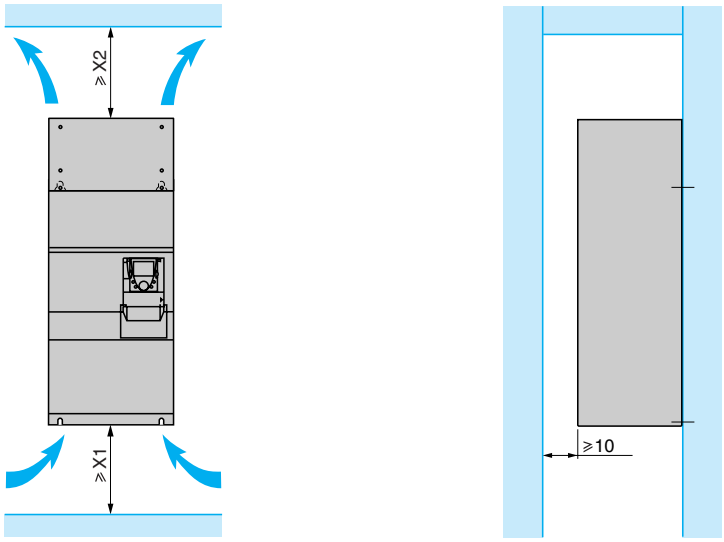
(1) Above 50°C, ATV 61HD18M3X...HD45M3X, ATV 61HD22N4...HD75N4 drives should be equipped with a control card fan kit. See page 2/176.

2

2.4

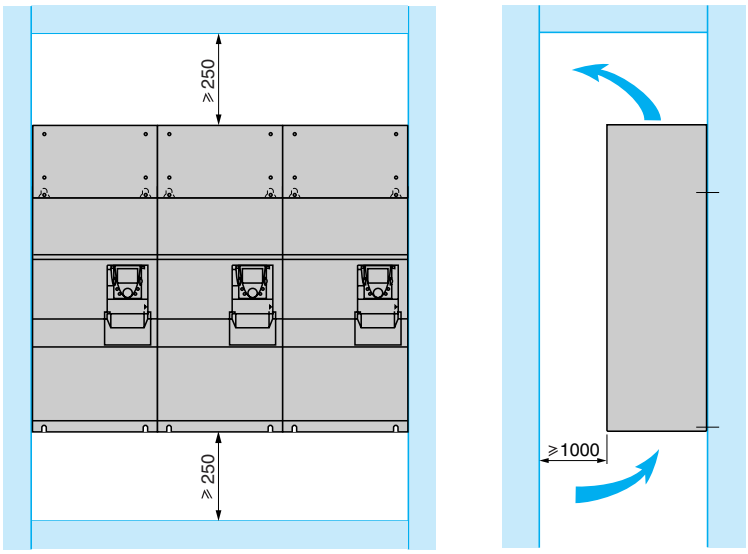
Mounting recommendations (continued)

ATV 61HD55M3X…HD90M3X, ATV 61HD90N4…HC63N4



ATV 61H	X1	X2
D55M3X…D90M3X, D90N4, C11N4	100	100
C13N4…C22N4	150	150
C25N4, C31N4	150	200
C40N4, C50N4	250	300
C63N4	250	400

These drives can be mounted side by side, observing the following mounting recommendations:



Variable speed drives for asynchronous motors
Altivar 61
UL Type 1/IP 20 drives

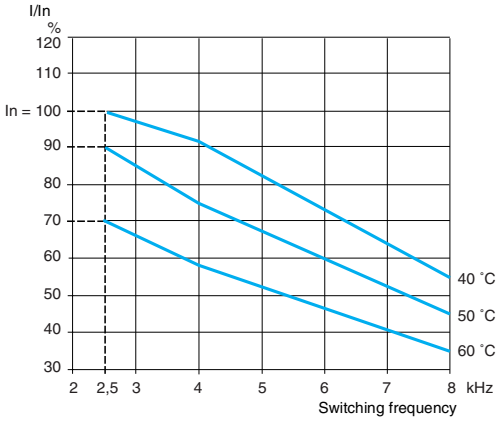
Mounting recommendations (continued)

Derating curves

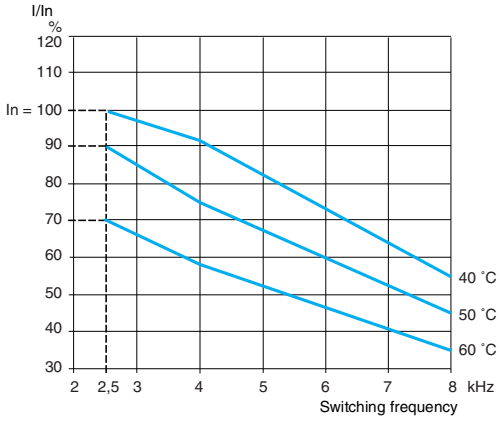
The derating curves for the drive nominal current (In) depend on the temperature, the switching frequency and the mounting type.

For intermediate temperatures (55°C for example), interpolate between 2 curves.

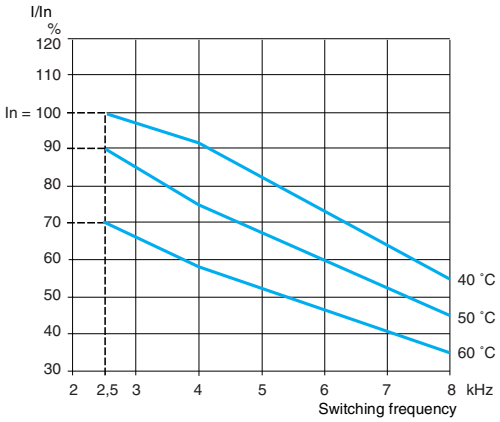
ATV 61HD55M3X



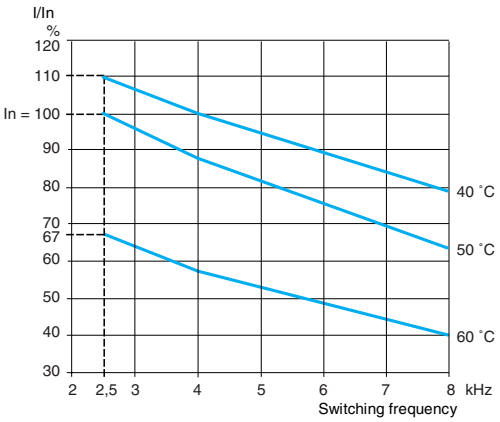
ATV 61HD75M3X



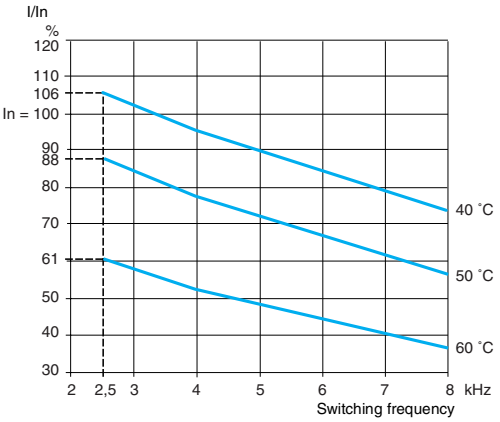
ATV 61HD90M3X



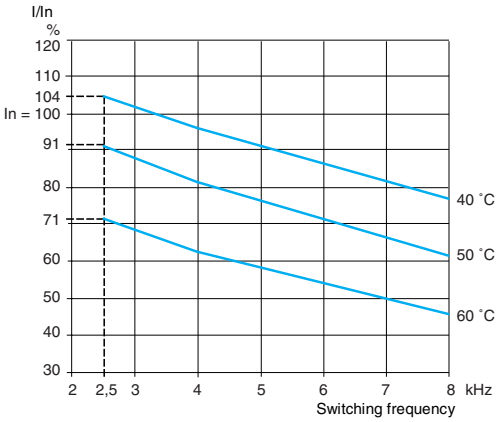
ATV 61HD90N4



ATV 61HC11N4



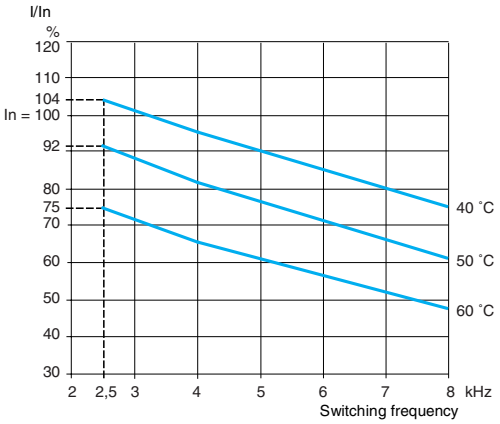
ATV 61HC13N4



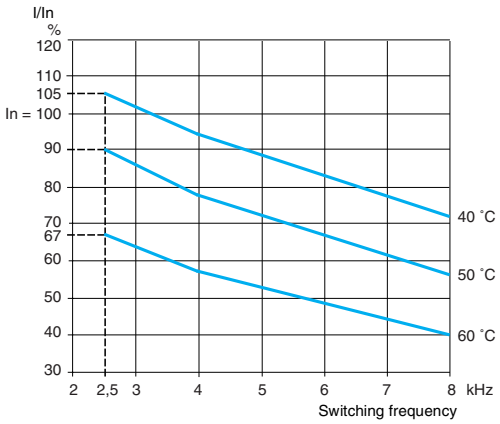
Variable speed drives for asynchronous motors
Altivar 61
UL Type 1/IP 20 drives

Derating curves (continued)

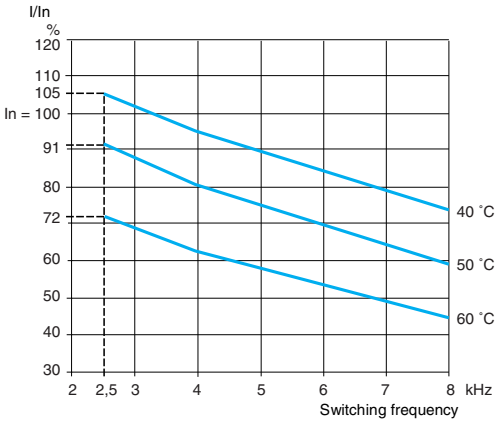
ATV 61HC16N4



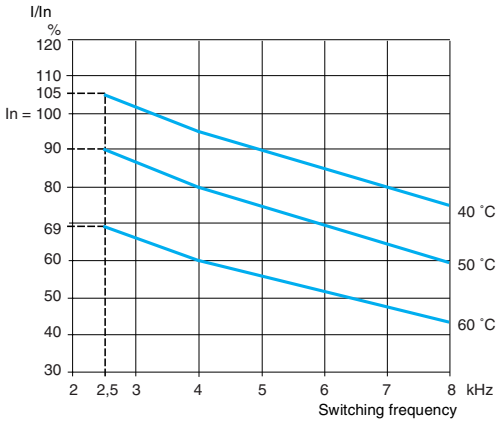
ATV 61HC22N4 combined with a 200 kW motor



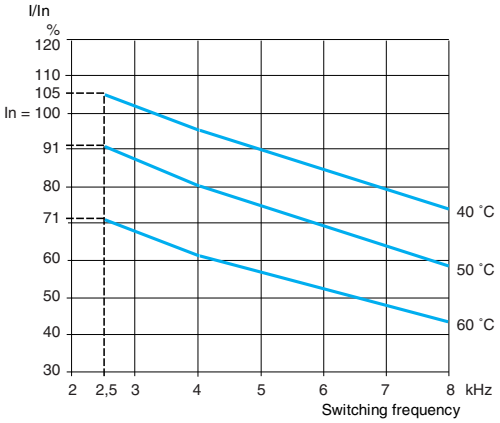
ATV 61HC22N4 combined with a 220 kW motor



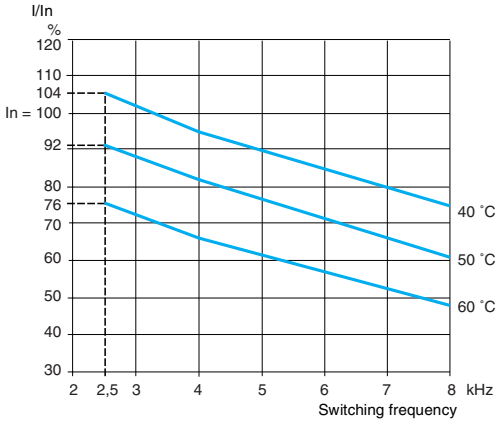
ATV 61HC25N4



ATV 61HC31N4 combined with a 280 kW motor



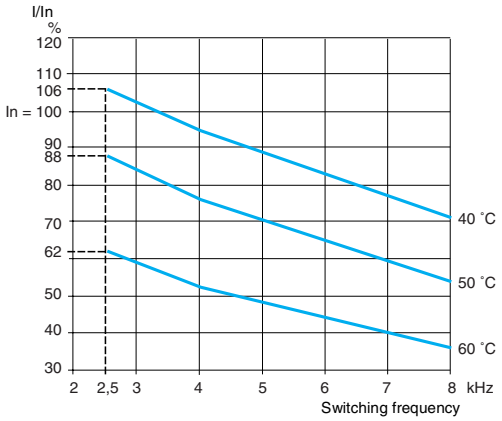
ATV 61HC31N4 combined with a 315 kW motor



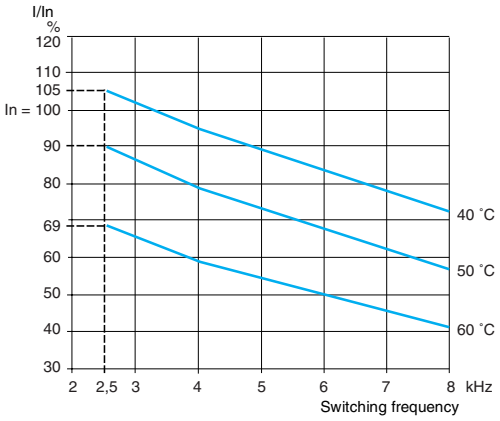
Variable speed drives for asynchronous motors
Altivar 61
UL Type 1/IP 20 drives

Derating curves (continued)

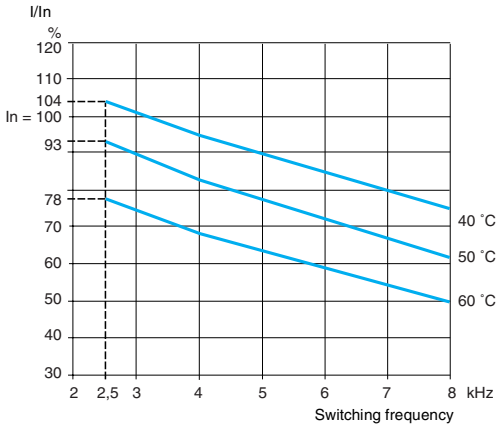
ATV 61HC40N4 combined with a 355 kW motor



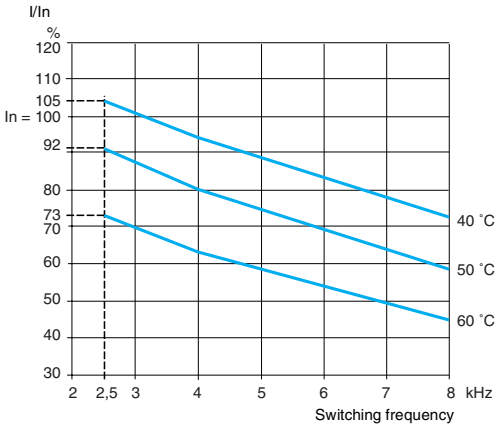
ATV 61HC40N4 combined with a 400 kW motor



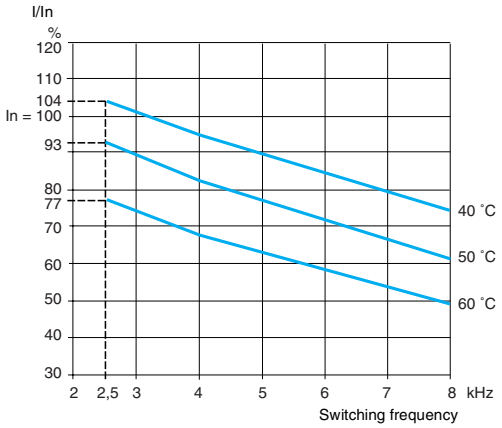
ATV 61HC50N4



ATV 61HC63N4 combined with a 560 kW motor



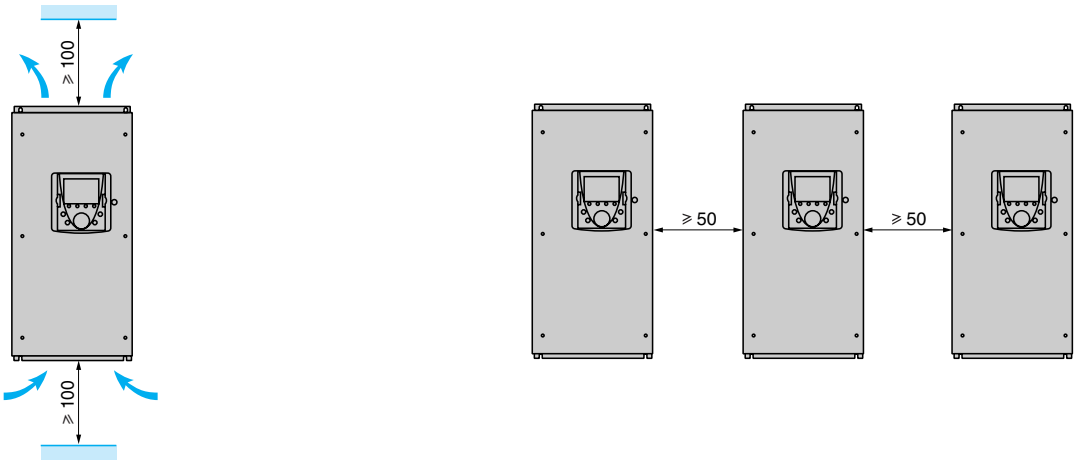
ATV 61HC63N4 combined with a 630 kW motor



Mounting recommendations (continued)

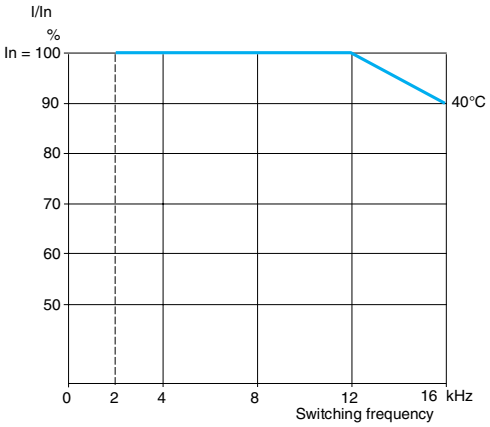
Depending on the conditions in which the drive is to be used, its installation will require certain precautions and the use of appropriate accessories.
Install the unit vertically:
- Do not place it close to heating elements.
- Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

ATV 61W●●●N4, ATV 61W●●●N4C

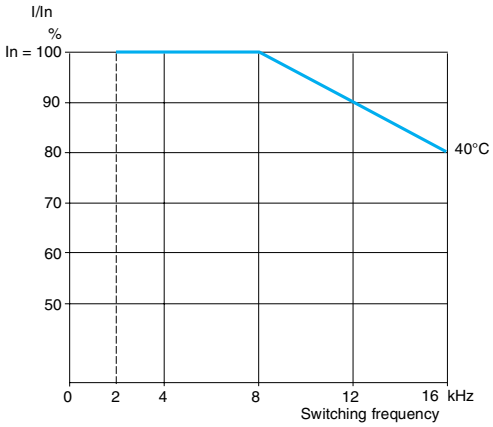


Derating curves

ATV 61W075N4...WU55N4, ATV 61W075N4C...WU55N4C



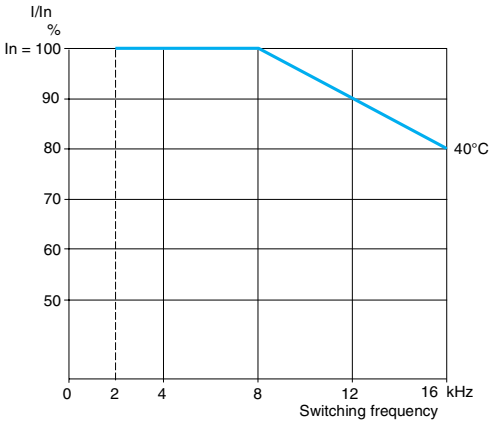
ATV 61WU75N4, WD11N4, ATV 61WU75N4C, WD11N4C



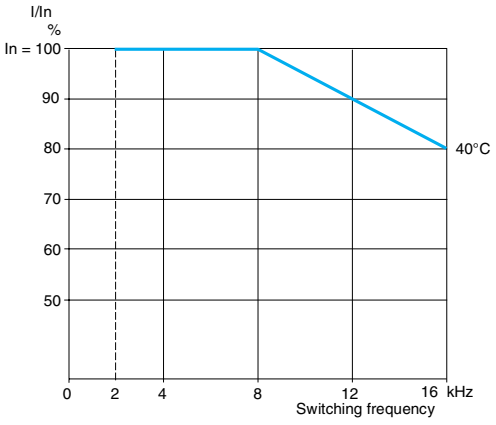
Variable speed drives for asynchronous motors
Altivar 61
UL Type 12/IP 54 drives

Derating curves (continued)

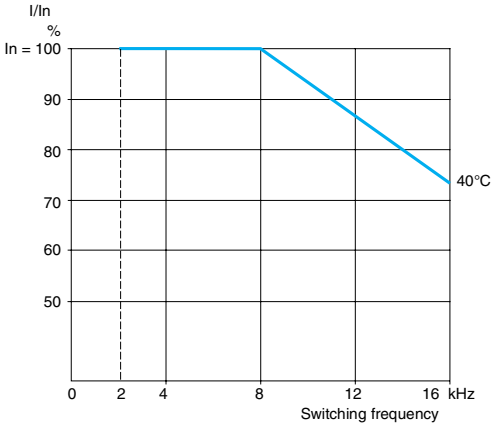
ATV 61WD15N4, ATV 61WD15N4C



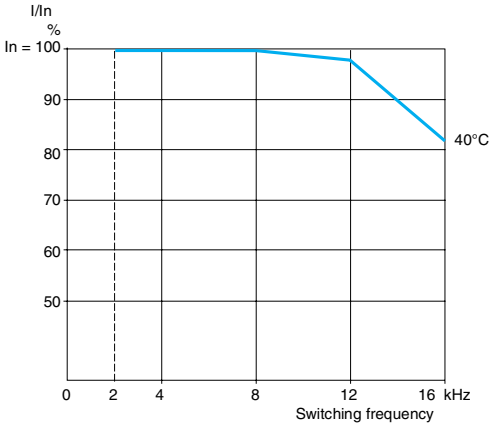
ATV 61WD18N4, WD22N4, ATV 61WD18N4C, WD22N4C



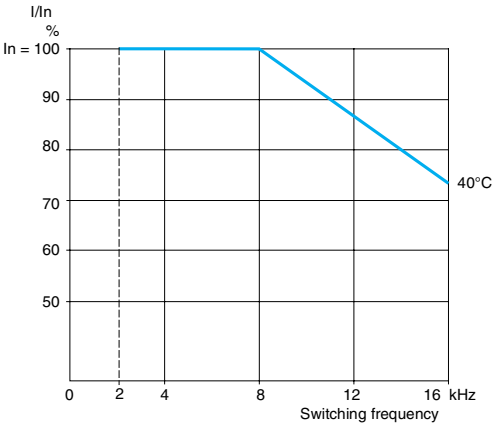
ATV 61WD30N4, ATV 61WD30N4C



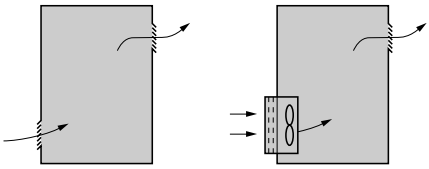
ATV 61WD37N4, WD45N4, ATV 61WD37N4C, WD45N4C



ATV 61WD55N4...WD90N4, ATV 61WD55NC4...WD90N4C



Variable speed drives for asynchronous motors
Altivar 61
UL Type 1/IP 20 drives



Specific recommendations for mounting in an enclosure *(1)*

Follow the mounting recommendations described on pages 2/302 to 2/307.
To ensure proper air circulation in the drive:
- Fit ventilation grilles.
- Ensure that there is sufficient ventilation. If there is not, install forced ventilation with a filter. The openings and/or fans must provide a flow rate at least equal to that of the drive fans (see page 2/311)
- Use special filters with IP 54 protection.
- Remove the blanking cover from the top of the drive, see page 2/302.

Power dissipated inside the enclosure *(1)*

For drives	Dissipated power *(2)*	
	Mounted in the enclosure (power section inside the enclosure)	**Dust and damp proof flush-mounting** (power section outside the enclosure)
	W	**W**
3-phase supply voltage: 200…240 V 50/60 Hz		
ATV 61H075M3	66	27
ATV 61HU15M3	101	30
ATV 61HU22M3	122	38
ATV 61HU30M3	154	38
ATV 61HU40M3	191	41
ATV 61HU55M3	293	59
ATV 61HU75M3	363	67
ATV 61HD11M3X	566	80
ATV 61HD15M3X	620	84
ATV 61HD18M3X	657	114
ATV 61HD22M3X	766	124
ATV 61HD30M3X	980	144
ATV 61HD37M3X	1154	161
ATV 61HD45M3X	1366	180
ATV 61HD55M3X	1715	154
ATV 61HD75M3X	1715	154
ATV 61HD90M3X	2204	154
3-phase supply voltage: 380…480 V 50/60 Hz		
ATV 61H075N4	44	26
ATV 61HU15N4	64	28
ATV 61HU22N4	87	30
ATV 61HU30N4	114	35
ATV 61HU40N4	144	40
ATV 61HU55N4	178	50
ATV 61HU75N4	217	55
ATV 61HD11N4	320	65
ATV 61HD15N4	392	85
ATV 61HD18N4	486	86
ATV 61HD22N4	574	110
ATV 61HD30N4	799	135
ATV 61HD37N4	861	137
ATV 61HD45N4	1060	165
ATV 61HD55N4	1210	178
ATV 61HD75N4	1720	225
ATV 61HD90N4	2065	237
ATV 61HC11N4	2514	237
ATV 61HC13N4	3179	261
ATV 61HC16N4	4036	296
ATV 61HC22N4	5482	350
ATV 61HC25N4	6379	493
ATV 61HC31N4	7867	658
ATV 61HC40N4	9598	772
ATV 61HC50N4	12055	935
ATV 61HC63N4	15007	1116

(1) Only for ATV 61H●●●M3, ATV 61H●●●M3X and ATV 61H●●●N4 drives.
(2) This value is given for operation at nominal load and for a switching frequency of 2.5 or 4 kHz depending on the rating.
Add 7 W to this value for each additional option card.

Fan flow rate depending on the drive rating

For drive	Flow rate m³/hour
ATV 61H075M3…HU15M3, ATV 61H075N4…HU22N4	17
ATV 61HU22M3…HU40M3, ATV 61HU30N4, HU40N4	56
ATV 61HU55M3, ATV 61HU55N4, HU75N4	112
ATV 61HU75M3, ATV 61HD11N4	163
ATV 61HD11M3X, HD15M3X ATV 61HD15N4, HD18N4	252
ATV 61HD18M3X, HD22M3X, ATV 61HD22N4…HD37N4	203
ATV 61HD30M3X…HD45M3X, ATV 61HD45N4…HD75N4	406
ATV 61HD55M3X, HD75M3X, ATV 61HD90N4, HC11N4	402
ATV 61HD90M3X, ATV 61HC13N4	774
ATV 61HC16N4	745
ATV 61HC22N4	860
ATV 61HC25N4, HC31N4	1260
ATV 61HC40N4, HC50N4	2100
ATV 61HC63N4	2400

Sealed metal enclosure (IP 54 degree of protection)

The drive must be mounted in a dust and damp proof enclosure in certain environmental conditions: dust, corrosive gases, high humidity with risk of condensation and dripping water, splashing liquid, etc.
This enables the drive to be used in an enclosure where the maximum internal temperature reaches 50°C.

Calculating the enclosure dimensions *(1)*

Maximum thermal resistance Rth (°C/W)

$$Rth = \frac{\theta - \theta e}{P}$$

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 drive: see page 2/310 (mounting in an enclosure or flush-mounting in an enclosure).
Add the power dissipated by the other equipment components.

Useful heat dissipation surface of enclosure S (m²)

(sides + top + front panel if wall-mounted)

$$S = \frac{K}{Rth}$$

K = enclosure thermal resistance per m²

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.*

(1) Only for ATV 61H●●●M3, ATV 61H●●●M3X and ATV 61H●●●N4 drives.

Variable speed drives for asynchronous motors
Altivar 61

Summary of functions

Remote graphic display terminal functions

Description	page 2/314
Navigation	page 2/315
Password	page 2/315

Integrated 7-segment display terminal

Presentation	page 2/316

Start-up

Simply Start menu	page 2/316
Programming using macro-configurations	page 2/317
MONITORING menu	page 2/318

Configuration and settings

Presentation	page 2/318

Operation

Presentation	page 2/318

Maintenance, diagnostics

Response to faults or alarms	page 2/319
Fault history and help	page 2/319
IDENTIFICATION menu	page 2/319
Test functions	page 2/319
Oscilloscope function	page 2/319

Controlling the drive

Via the drive I/O	page 2/320
Via the remote graphic display terminal	page 2/320
Via a communication network	
- I/O profile	page 2/321
- CiA DSP 402 profile	page 2/321
- ODVA profile	page 2/321

Functions suitable for pumping and ventilation applications

Motor control profiles	
- Energy saving ratio	page 2/322
- Quadratic ratio (Kn ^{2})	page 2/322
PID regulator	
- Internal references	page 2/322
- Preset PID references	page 2/322
- PID feedback	page 2/323
- PI feedback supervision	page 2/323
- Sleep/wake-up	page 2/323
- Activate sleep mode by flow detection	page 2/323
- Alarms	page 2/323
- Predictive speed reference	page 2/323
- Auto/Man.	page 2/323
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Other application functions

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Phase rotation	page 2/324
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Variable speed drives for asynchronous motors
Altivar 61

Summary of functions (continued)
Other application functions (continued)

Motor control types	
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Remote graphic display terminal functions

This display terminal is attached to the front of the drive. It includes the integrated 7-segment display terminal for drives supplied without a graphic display terminal.

■ **Description**

□ **Description of graphic display terminal**

1 Graphic display unit:
- 8 lines, 240 x 160 pixels
- large digit display that can be read from 5 m away
- bar chart display

2 Assignable functions keys F1, F2, F3, F4:
- dialogue functions: direct access, help screens, navigation
- application functions: Local/Remote, preset speed.

3 STOP/RESET key: local control of motor stopping/fault clearing

4 RUN key: local control of motor operation

5 Navigation button:
- Press to save the current value (ENT)
- Turn ± to increase or decrease the value, or go to the next or previous line

6 FWD/REV key: reverses the direction of rotation of the motor

7 ESC key: aborts a value, parameter or menu to return to the previous option.

Note: *Keys 3, 4 and 6 can be used to control the drive directly.*

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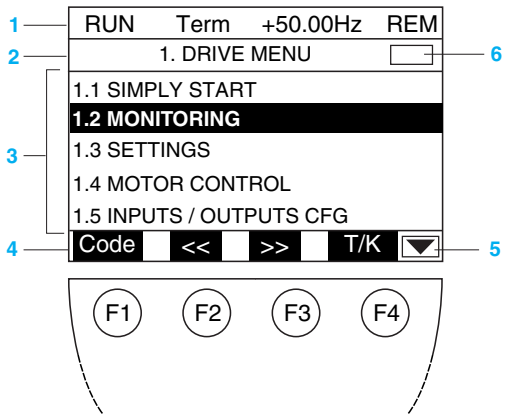


□ **Description of graphic display unit**

1 Display line. Its content can be configured; the factory settings show:
- the drive status (example: RUN)
- the active control channel (example: “Term”: Terminals),
- the frequency reference
- Type of control (example: “LOC/REM”).

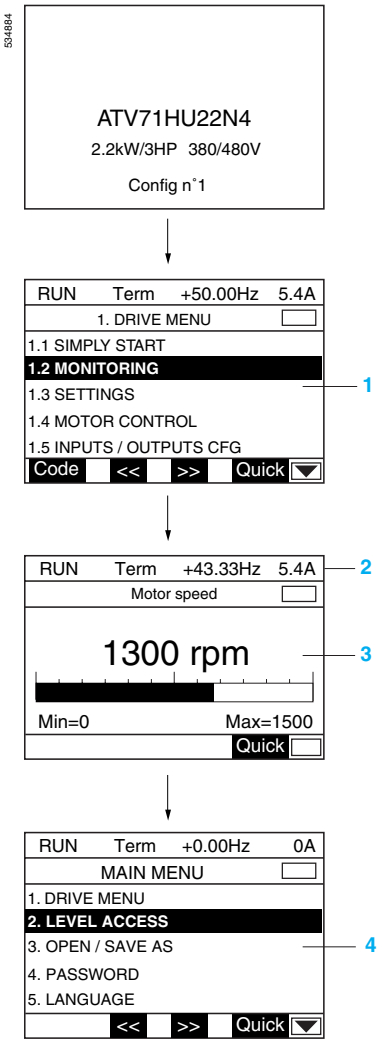
2 Menu line. Indicates the current menu or submenu.

3 Area displaying menus, submenus, parameters, values, bar charts, in the form of a scrolling window, with a maximum of 5 lines.
The line or value selected using the navigation button is displayed in reverse video (see opposite).

4 Section displaying the functions assigned to the keys F1 to F4 and aligned with them, for example:
- >> : Horizontal scrolling to the right, or proceeding to the next menu or submenu, or, in the case of a value, decreasing the value, displayed in reverse video (see example opposite)
- << : Horizontal scrolling to the left, or proceeding to the next menu or submenu, or, in the case of a value, increasing the value, displayed in reverse video
- “T/K” : Local Remote function assigned to key F4,
- HELP: Contextual help
- Code: Displays the selected parameter code
- Other functions (application functions) can be assigned to these keys via the 1.6 COMMAND menu.

5 ▭ : Means that this display window does not scroll further down.
▼ : Means that this display window can scroll further down.

6 ▲ : Means that this display window can scroll further up.
▭ : Means that this display window does not scroll further up.



Remote graphic display terminal functions (continued)

■ **Navigation: accessing menus and parameters**

Structure of main menus:

1 Drive menu:

Menu type	Function
1.1 SIMPLY START	Simplified menu for fast startup
1.2 MONITORING	Displays current values for motor, inputs/outputs and communication (command words, status words, etc.)
1.3 SETTINGS	Accesses the adjustment parameters, which can be modified during operation
1.4 MOTOR CONTROL	Accesses the motor parameters, including adjustment of motor control profiles
1.5 INPUTS/OUTPUTS CFG	Configures the I/O and transforms signals
1.6 COMMAND	Configures the command and reference channels
1.7 APPLICATION FUNCT.	Configures the application functions (preset speeds, PID regulator, etc.)
1.8 FAULT MANAGEMENT	Configures the fault management process
1.9 COMMUNICATION	Configures the communication networks
1.10 DIAGNOSTICS	Provides diagnostics for motor and drive, integrated test procedures, fault history
1.11 IDENTIFICATION	Identifies the drive and internal options
1.12 FACTORY SETTINGS	Restores factory settings (completely or by parameter group)
1.13 USER MENU	Accesses the parameters selected by the user
1.14 PROGRAMMABLE CARD	Accesses the parameters for the multipump card or the Controller Inside programmable card

2 Display line

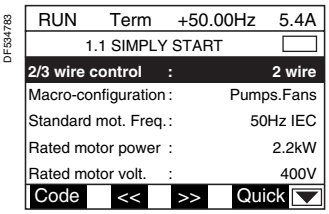
3 Display screen: Displays values in the form of bar charts or digital values, depending on the extent of customization.

4 Main menu:

Menu type	Function
1. DRIVE MENU	See above (1 Drive menu)
2. ACCESS LEVEL	4 access levels: basic, limited, advanced, expert
3. OPEN / SAVE AS	Transfers files between the graphic display terminal and the drive
4. PASSWORD	Provides password protection for the configuration
5. LANGUAGE	Choice of 6 languages available (English, German, Spanish, French, Italian and Chinese)
6. MONITORING CONFIG.	Customizes the display line 2 and the display screen 3 (bar charts, digital values)
7. DISPLAY CONFIG.	Configures how parameters are displayed: customization, selection for User menu, visibility, accessibility

■ **Password**

Altivar 61 drives allow individual parameters to be selected for password protection. Rights can be set for save operations and for loading the configuration.



Simply Start menu

Integrated 7-segment display terminal

ATV 61●●●●●M3, ATV 61HD11M3X…HD45M3X and ATV 61H075N4…HD75N4 drives can be supplied without a graphic display terminal. In this case, they are equipped with an integrated 7-segment display terminal.
This can be used to:
- Display status and faults
- Access and modify parameters

Start-up

The Altivar 61 drive is supplied ready for use for most applications.
When the drive is switched on, the menus for setting the language and access level appear automatically.

■ Simply Start menu

By accessing the Simply Start menu directly, it is possible to:
- Pre-program the drive for an application:
  - Select the relevant macro-configuration
  - 2-wire/3-wire control
- Benefit from optimum motor performance:
  - Enter data from the motor rating plate
  - Auto-tuning.
- Protect the motor by setting the drive's integrated electronic thermal overload relay

Start-up (continued)

■ **Programming using macro-configurations**

Programming using macro-configurations offers the choice of five options corresponding to the various business areas and applications:

- Start/stop
- General use
- PID regulation
- Communication network connectivity
- Ventilation pump.

Choosing one of these macro-configurations automatically assigns the functions, parameters and I/O, even in the case of option cards. Although the configuration is preset, it can still be modified, if necessary.

The Ventilation pump macro-configuration is set as the factory configuration.
The preset functions for each macro-configuration are given in the table below.

Type of macro-configuration		Start/stop	General use	PID regulation	Communication network connectivity	Ventilation pump.
Altivar 61 drive I/O						
AI1		Ref. 1 channel	Ref. 1 channel	PID reference	Ref. 2 channel Ref. 1 channel by bus	Ref. 1 channel
AI2		Not assigned	Sum ref. 2	PID feedback	Not assigned	Ref. 1B channel
AO1		Motor freq.	Motor freq.	Motor freq.	Motor freq.	Motor freq.
2-wire	**LI1**	Forward	Forward	Forward	Forward	Forward
	LI2	Fault reset	Reverse	Fault reset	Fault reset	Not assigned
	LI3	Not assigned	JOG	PID integral reset	Ref. 2 switching	Ref. 1B switching
	LI4	Not assigned	Fault reset	PID 2 preset ref.	Fault reset	Fault reset
	LI5	Not assigned	Torque limit	PID 4 preset ref.	Not assigned	Not assigned
	LI6	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
3-wire	**LI1**	Stop	Stop	Stop	Stop	Stop
	LI2	Forward	Forward	Forward	Forward	Forward
	LI3	Reverse	Reverse	Reverse	Reverse	Not assigned
	LI4	Not assigned	JOG	PID integral reset	Ref. 2 switching	Ref. 1B switching
	LI5	Not assigned	Fault reset	PID 2 preset ref.	Forced local	Fault reset
	LI6	Not assigned	Torque limit	PID 4 preset ref.	Not assigned	Not assigned
R1		Faulty	Faulty	Faulty	Faulty	Faulty
R2		Not assigned	Not assigned	Not assigned	Not assigned	Drive operation
I/O extension card I/O						
2-wire	**LI7**	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
3-wire	**LI7**	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
LI8 to LI14		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
LO1 to LO4		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
R3/R4		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
AI3, AI4		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
RP		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
AO2		Motor current	Motor current	Motor current	Motor current	Motor current
AO3		Not assigned	Not assigned	PID error	Not assigned	Not assigned
Graphic display terminal keys						
F1 key		Not assigned	Not assigned	Not assigned	Control via graphic display terminal	Not assigned
F2, F3, F4 keys		Not assigned	Not assigned	Not assigned	Not assigned	T/K (control via graphic display terminal)

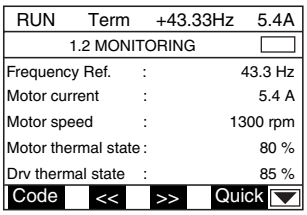
2

2.4

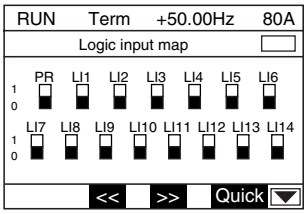
Start-up (continued)

■ **MONITORING menu**

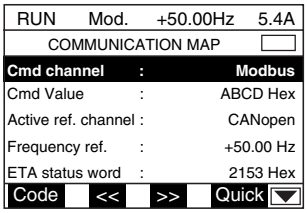
The MONITORING menu can be used to display commands, the operation of the motor and application through the drive of its I/O or of the communication network connections.



Displaying physical values



Logic input map



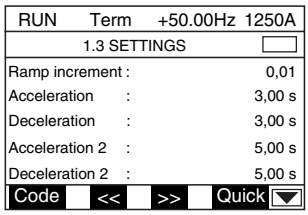
Communication map

One of the uses of this menu is to display the alarm groups, thermal states and electrical values such as:

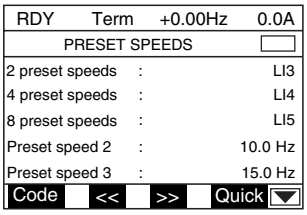
- electrical power consumed by the drive
- the drive's cumulative electrical power, etc.

Configuration and settings

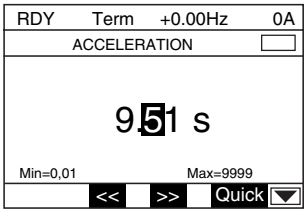
The SETTINGS menu can be used to configure all the drive's settings.
Activating a function automatically provides access to the related settings on the same screen (the application functions are described on pages 2/322 to 2/339).



Settings screen



Setting a function

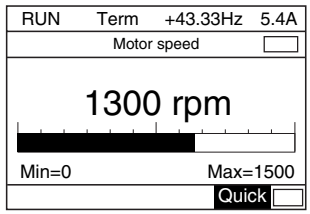


Configuring a value

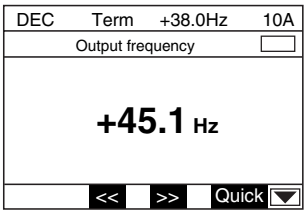
Operation

The display screen appears automatically every time the drive is turned on.
There are different possible scenarios:

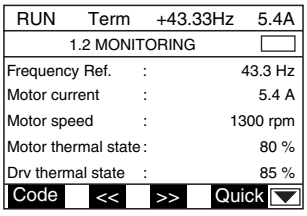
- One or two bar charts are displayed.
- One, two or five digital values are displayed.



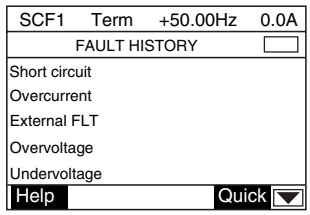
1 bar chart



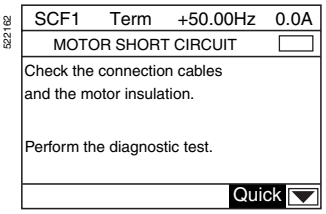
1 digital value



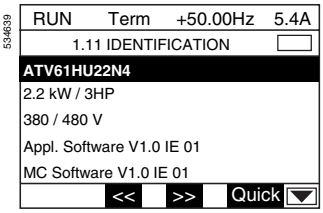
5 digital values



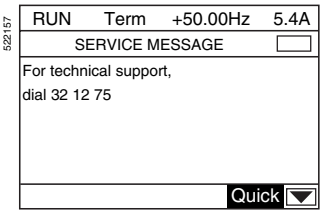
Fault history



Troubleshooting screen



Identification screen



Example of a customized message

Maintenance, diagnostics

New functions have been added to the Altivar 61 drive to enable it to provide quick and simple maintenance, ultimately boosting productivity:

■ Response to faults or alarms

It is possible to use the alarm management or drive operation configuration functions to take corrective measures before stopping the machine.

■ Fault history and help

When a fault occurs, a help screen is available to quickly identify the cause of the fault.
As soon as the fault occurs, values such as speed, current, thermal state, timer are saved and restored in the fault history.
The last 8 faults are stored.

■ IDENTIFICATION menu

The IDENTIFICATION menu can be used to display the relevant serial numbers and software versions, thereby helping to manage the equipment base. This information, also available from the PowerSuite software workshop, can be exported to other database-type software applications.

■ Test functions

The Altivar 61 drive includes the following test functions:
□ Identifying any motor short-circuit before start-up
□ Running, via the graphic display terminal or PowerSuite software workshop, automatic procedures during maintenance operations aimed at testing:
- the motor
- the drive power components

The test results are shown on the graphic display terminal or using the PowerSuite software workshop.
It is also possible to write and read messages in the drive using the graphic display terminal or the PowerSuite software workshop.

■ Oscilloscope function

The Altivar 61 drive has an oscilloscope function, which produces traces that can be viewed using the PowerSuite software workshop.
The PowerSuite software workshop can also be used to carry out remote diagnostics via modem.

2

2.4

Controlling the drive

■ **Via the drive I/O**

Control signals are transmitted via cable to the I/O. Functions are assigned to logic inputs, analog inputs, etc.
A logic input can be assigned to more than one function. This means that two functions can be controlled using a single signal, thereby limiting the number of inputs required.

The Altivar 61 drive I/O can be configured independently from each other. For instance,
□ A time delay can be applied when it comes to reading the logic inputs, so as to avoid any bounce-back from certain switches.
□ Transforming incoming signals on the analog inputs can help the drive fully adapt to the control devices and applications:
- Minimum and maximum values for the input signal
- Input filtering in order to eliminate unwanted interference from the signals received
- Magnifying glass effect through delinearizing the input signal in order to increase the precision with small amplitude signals
- “Pedestal” and “Deadband” functions for signals in order to prevent low speed operations which can have an adverse effect on the application
- “Mid-point” function, which can be used from a unipolar input signal to obtain a bipolar output signal to control the speed and direction of rotation

□ Transforming analog outputs which transfer information sent by the drive to other devices (display units, drives, PLCs, etc.):
- voltage or current output signal
- minimum and maximum values for the output signal
- output signal filtering

Logic outputs can be delayed on activation and deactivation. The output state can also be configured when the signal is active.
The frequency control signals are also transformed by the drive:
□ signal frequency minimum and maximum values (30 kHz on the extended I/O card’s RP input).

■ **Via the remote graphic display terminal**

The rotation commands and references (speed or PID) can be controlled via the graphic display terminal. Some application functions can also be assigned to the function keys F1, F2, F3 and F4 on the graphic display terminal. It is possible to manage a change in command and/or reference source (bumpless function) in different ways.
Example: two options are offered when switching control from via the terminals to via the graphic display terminal:
□ stop the Altivar 61 drive, or
□ continue operation with a copy of the direction of rotation and reference

Variable speed drives for asynchronous motors
Altivar 61

Controlling the drive (continued)

■ **Via a communication network**

□ **I/O profile**

The I/O profile, which is easy and quick to use, can be used to control the Altivar 61 drive via the communication network, in the same way as via the I/O terminals. When commands are sent via a network they are written in a command word. This word behaves like virtual terminals containing logic inputs.
Application functions can be assigned to the bits of this word. More than one function can be assigned to the same bit.

The commands and references can come from different sources, such as the terminals, graphic display terminal or communication networks.
Each source can be set or switched individually using logic inputs or command word bits.

The I/O profile is supported by all integrated communication ports (Modbus, CANopen), as well as by all the communication cards available (Ethernet TCP/IP, Fipio, Profibus DP, etc.).

□ **CiA DSP 402 profile ("Device Profile Drives and Motion Control")**

This profile from the organization CiA (CAN in Automation) describes standard functions, parameters and operation for variable speed drives.
This standard is an extension of the Drivecom profile. The Altivar 61 drive complies with the CiA DSP 402 standard and it supports the following 2 modes in this profile: separate and not separate.

Separate mode

The Start/Stop commands and references can come from different sources.
Example: the speed reference is transmitted by the Ethernet TCP/IP network and the Start/Stop commands by the logic signals wired on the terminals.

Each source can be set or switched individually using logic inputs or command word bits.

Not separate mode

The Start/Stop commands and references (speed, torque, PID, etc.) come from the same source (example: CANopen bus).

It is possible to replace this source by another one, using a logic input or command word bit.

The CiA DSP 402 profile is supported by all integrated communication ports (Modbus, CANopen), as well as by all the communication cards available (Ethernet TCP/IP, Fipio, Profibus DP, etc.).

□ **ODVA profile**

The ODVA profile is supported by the DeviceNet communication card.

2

2.4

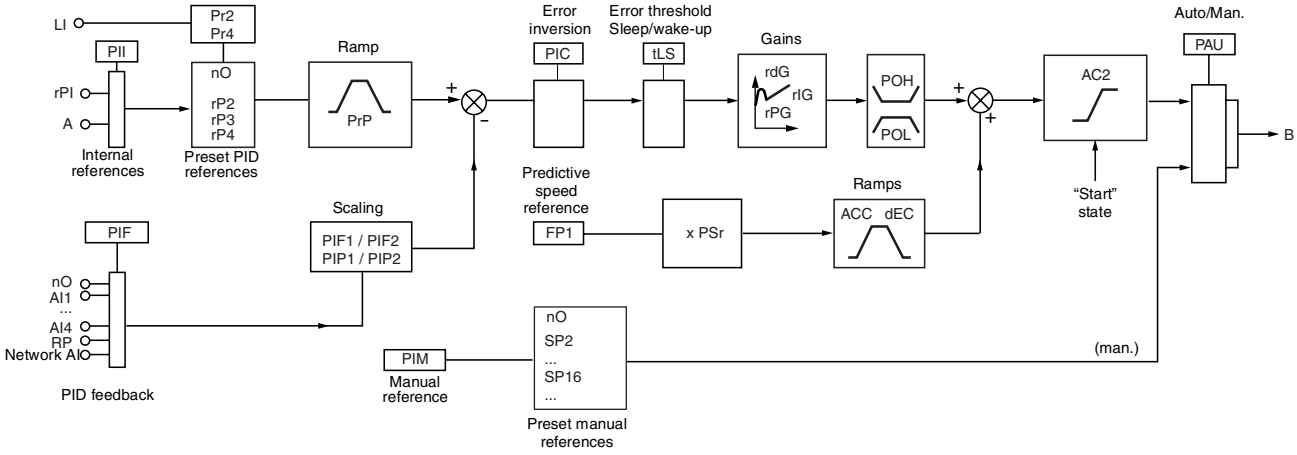
Functions suitable for pumping and ventilation applications

■ **Motor control profiles**

□ **Energy saving ratio**
This type of command makes it possible to optimize the energy consumed based on the load applied to the machine.

□ **Quadratic ratio (Kn^2)**
This type of command is optimized for centrifugal pumps and ventilators.

■ **PID regulator**
This can be used to regulate a process with a reference and feedback given by a sensor.



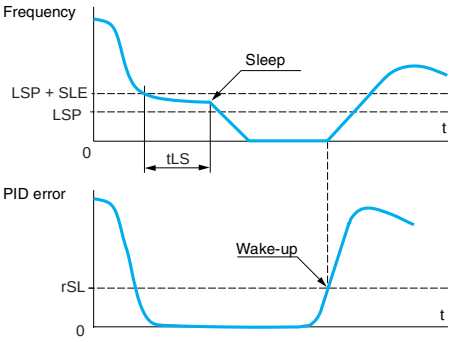
ACC: acceleration, dEC: deceleration, LI: logic inputs, B: Speed reference.

□ **Internal references**
- rPI: reference transmitted by the graphic display terminal or a communication network.
- A: reference given by Fr1 or Fr1b with the summing, subtraction and multiplication functions, as appropriate.

The "PII" parameter is used to choose between these two references.

□ **Preset PID references**
2 or 4 PID references are available. Table showing combinations of selected PID references:

LIx (Pr4)	LIy (Pr2)	Reference
0	0	rPI or A
0	1	rP2
1	0	rP3
1	1	rP4



LSP: Low speed
SLE: Adjustable restart threshold
tLS: Maximum low speed operating time
rSL: Restart error threshold

Example of operation of sleep/wake-up function

■ **PID regulator (continued)**

□ **PID feedback**

PID feedback can be assigned to one of the analog inputs (AI1 to AI4) or the frequency control input (RP), depending on the option cards present. It can also be transmitted by a communication network (network AI).

The following 4 functionalities can be used in combination with the PID regulator:

□ **PI feedback supervision**

□ **Sleep/wake-up**

This function is used in addition to the PID regulator to avoid extended operation at too low speeds that is unnecessary or undesirable.
It stops the motor following a period of reduced speed operation. This duration (tLS parameter) and this speed (LSP + SLE parameters) can be adjusted.
It restarts the motor if the error or the PID feedback exceeds an adjustable threshold (rSL or UPP parameters depending on the threshold).

□ **Activate sleep mode by flow detection**

This function is used in applications where zero flow cannot be detected by the sleep function alone.

□ **Alarms**

Minimum and maximum monitoring thresholds of the PID regulator feedback and monitoring threshold of the PID regulator error.

□ **Predictive speed reference**

This reference can come from the terminals (analog inputs, etc.), the graphic display terminal or a communication network.
This speed input gives an initial reference for starting.

□ **Auto/Man.**

This can be used to switch from speed regulation mode (Man.) to PID regulation mode (Auto). A logic input or command word bit is used for switching.

Speed regulation mode (Man.)

The manual reference is transmitted via the terminals (analog inputs, preset speeds, etc.).
With manual switching, the speed reference changes according to the ramp times ACC and dEC.

PID regulation mode (Auto)

In automatic mode it is possible to:
- Adapt the references and feedback to the process (transformation)
- Correct a PID inversion
- Adjust the proportional, integral and derivative gains (Kp, Ki and Kd)
- Shunt the integral
- Use the “alarm” on the logic output or display it on the graphic display terminal, if the threshold is exceeded (Max. feedback, Min. feedback and PID error)
- Display the PID reference, PID feedback, PID error and PID output on the graphic display terminal and assign them to an analog output
- Apply a ramp (time = PrP) to the PID reference.

The motor speed is limited to between LSP and HSP.
It is displayed as process values.

■ **Forced operation**

In combination with the function inhibiting all faults, this function allows the run command to be forced in a defined direction and the reference to be forced to a configured value.

■ **Flow limit**

Allows the flow of a fluid to be limited, for pumps.

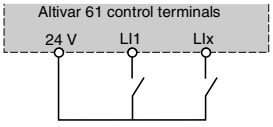
Variable speed drives for asynchronous motors
Altivar 61

Other application functions

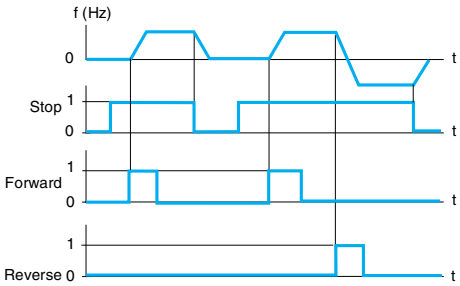
■ 2-wire control

This can be used to control the direction of operation by means of a stay-put contact.
It is enabled by means of 1 or 2 logic inputs (non-reversing or reversing).

This function is suitable for all non-reversing and reversing applications.
3 operating modes are possible:
- □ Detection of the state of the logic inputs
- □ Detection of a change in state of the logic inputs
- □ Detection of the state of the logic inputs with forward operation always having priority over reverse



Wiring diagram for 2-wire control

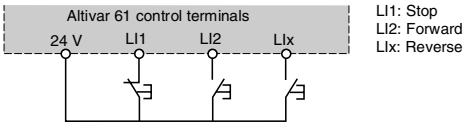


Example of 3-wire control operation

■ 3-wire control

This can be used to control the operating and stopping direction by means of pulsed contacts.
It is enabled by means of 2 or 3 logic inputs (non-reversing or reversing).

This function is suitable for all non-reversing and reversing applications.



Wiring diagram for 3-wire control

■ Phase rotation

This function can be used to reverse the direction of rotation without modifying the drive wiring.

522164

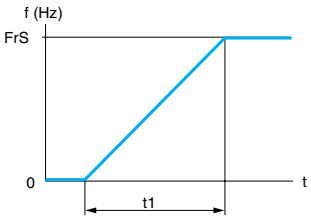
RDY	Term	+0.00Hz	0.0A
RAMP			
Ramp shape	:		Linear
Ramp increment	:		0.01
Acceleration	:		3.92 s
Deceleration	:		0.54 s
Ramp 2 threshold	:		0.0 Hz
Code			Quick

Ramp settings

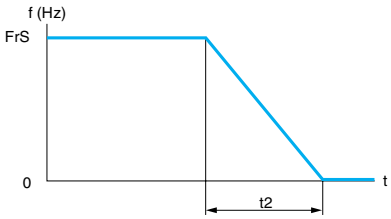
■ Ramps

□ Acceleration and deceleration ramp times

This can be used to define acceleration and deceleration ramp times according to the application and the machine dynamics.



Linear acceleration ramp



Linear deceleration ramp

FrS: Nominal motor frequency
t1: Acceleration time
t2: Deceleration time
t1 and t2 can be set independently from 0.01 to 9000 s (according to one of the following ramp increments: 0.01 s, 0.1 s or 1 s);
Factory setting: 3 s.

Variable speed drives for asynchronous motors
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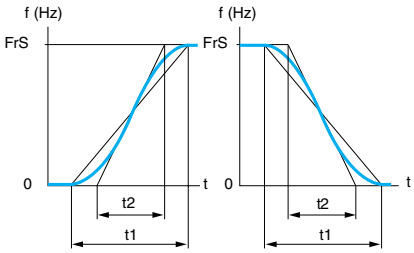
◻ Acceleration and deceleration ramp profile

This can be used to gradually increase the output frequency starting from a speed reference, following a linear profile or a preset profile.

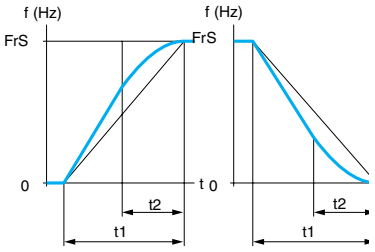
In the case of applications involving handling, packaging and passenger transport, the use of S ramps takes up mechanical play and eliminates jolts and also limits “non-following” of speed during rapid transient operation of high-inertia machines. Selecting “linear”, “S”, “U” or customized profiles assigns both the acceleration and deceleration ramps.

S ramps



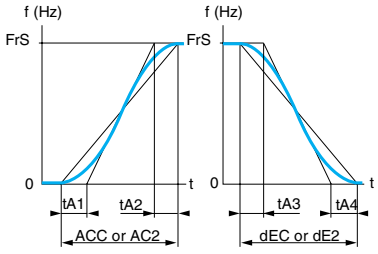
FrS: Nominal motor frequency
t1: Ramp time set
t2 = 0.6 x t1
The curve coefficient is fixed.

U ramps

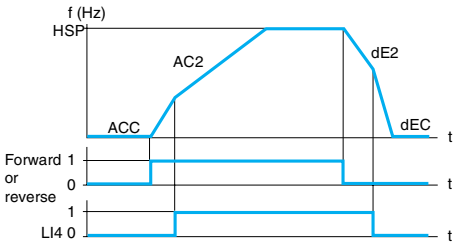


FrS: Nominal motor frequency
t1: Ramp time set
t2 = 0.5 x t1
The curve coefficient is fixed.

Customized ramps



FrS: Nominal motor frequency
tA1: Can be set between 0 and 100% (of ACC or AC2)
tA2: Can be set between 0 and (100% - tA1) (of ACC or AC2)
tA3: Can be set between 0 and 100% (of dEC or dE2)
tA4: Can be set between 0 and (100% - tA3) (of dEC or dE2)
ACC: Acceleration ramp 1 time
AC2: Acceleration ramp 2 time
dEC: Deceleration ramp 1 time
dE2: Deceleration ramp 2 time



Example of switching using logic input LI4

Acceleration 1 (ACC) and deceleration 1 (dEC):
- adjustment 0.01 to 9000 s
- factory setting 3 s

Acceleration 2 (AC2) and deceleration 2 (dE2):
- adjustment 0.01 to 9000 s
- factory setting 5 s

HSP: high speed.

◻ Ramp switching

This can be used to switch 2 acceleration and deceleration ramp times, which can be adjusted separately.
Ramp switching can be enabled by:
- a logic input
- a frequency threshold
- a combination of the logic input (or a command word bit) and the frequency threshold
- a command word bit

Function suitable for:
- material handling with smooth starting and approach
- machines with fast steady state speed correction

◻ Automatic adaptation of deceleration ramp

This can be used to automatically adapt the deceleration ramp if the initial setting is too low when the load inertia is taken into account. This function prevents the drive from locking in the event of an overbraking fault.
When this function is active and a short deceleration time has been set, the drive optimizes the motor power supply in order to achieve a high braking torque.

Function suitable for all applications which do not need to stop at a precise moment and do not use braking resistors.

Automatic adaption must be disabled for machines with a stop position on a ramp and using a braking resistor.

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534800

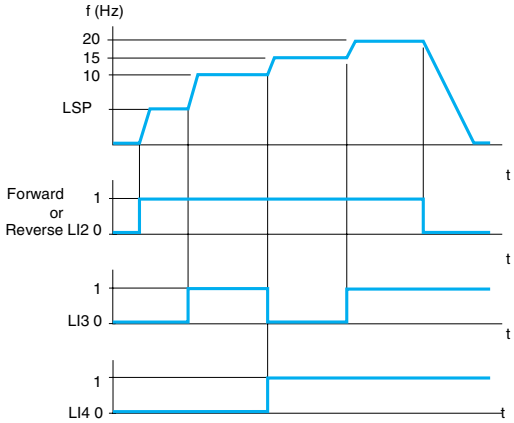
RDY	Term	+0.00Hz	0.0A
PRESET SPEEDS			
2 preset speeds	:		LI3
4 preset speeds	:		LI4
8 preset speeds	:		LI5
Preset speed 2	:		10.0 Hz
Preset speed 3	:		15.0 Hz
Code	<<	>>	Quick

Preset speed settings

■ Preset speeds

This can be used to switch preset speed references.
Choose between two, four or eight preset speeds.
Enabled by means of 1, 2 or 3 logic inputs.
Preset speeds can be set in increments of 0.1 Hz, from 0 Hz to 500 Hz or 1000 Hz, depending on the rating.

Function suitable for material handling and machines with several operating speeds.



The speed achieved with the LI3 and LI4 inputs at 0 is LSP or speed reference, resulting from the operations carried out on the references.

Factory settings:

1st speed: LSP (low speed or speed reference)

2th speed: 10 Hz

3th speed: 15 Hz

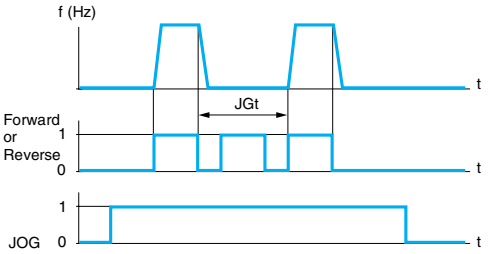
4th speed: 20 Hz

Example of operation with 4 preset speeds and 2 logic inputs

■ JOG operation

This can be used for pulse operation with minimum ramp times (0.1 s), limited speed reference and minimum time between 2 pulses.
It is enabled by 1 logic input and pulses given by the operating direction command.

Function suitable for machines with product insertion in manual mode (example: gradual movement of the mechanism during maintenance operations).



Speed reference: can be set from 0 to 10 Hz, factory setting 10 Hz.

JGt: minimum time between 2 pulses, which can be set between 0.5 and 2 s.

Example of JOG operation

■ Limiting low speed operating time

The motor is stopped automatically after a period of operation at low speed (LSP) with a zero reference and a run command present.
This time can be set between 0.1 and 999.9 seconds (0 corresponds to an unlimited time). Factory setting 0 s. The motor restarts automatically on the ramp when the reference reappears or if the run command is interrupted and then re-established.

Function suitable for automatic Stops/Starts.

Variable speed drives for asynchronous motors
Altivar 61

■ **Motor control types**

□ **Sensorless Flux Vector Control**

In voltage mode, this control type can be used with a single motor or motors connected in parallel.

□ **2-point Vector Control**

The zone for operating at constant power can be optimized by defining an additional point in the control profile.
This function should be used with motors offering a two-part defluxing zone.
It can be used to limit the voltage at the motor terminals when the motor is being powered by a high line supply.

□ **Voltage/frequency ratio**

This control type is particularly suitable for special motors (high-speed motors, synchronized asynchronous motors, etc.). The ratio can be adjusted by 2 or 5 points and used to achieve output frequencies of up to 1000 Hz.

□ **Synchronous motor**

This control type is exclusively reserved for controlling open loop synchronous permanent magnet motors with sinusoidal electromotive force (EMF).

■ **Limiting motor overvoltage**

The Altivar 61 drive inverter bridge control can be used to limit overvoltage in the motor terminals, which is double the voltage level in the DC bus (Stressless PWM). This function is useful in cases where long lengths of cabling, rewound motors or motors in a low isolation class are involved.

■ **Auto-tuning**

Auto-tuning can be performed:
□ using a dialogue tool (graphical display terminal, PowerSuite software workshop, integrated 7-segment display terminal)
□ via a communication network
□ automatically every time the drive is switched on
□ by enabling a logic input.

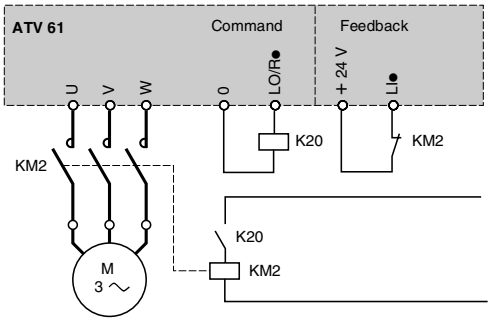
Auto-tuning can be used to enhance application performance.
In Flux Vector Control mode (FVC open loop with voltage regulation), certain parameters are measured periodically.
Saving the motor thermal state can help to compensate exactly for the motor resistors, even after the drive has been switched off.

■ **Switching frequency, noise reduction**

The switching frequency setting permits a reduction in the noise generated by the motor for any application requiring a low level of noise.
The switching frequency is modulated randomly in order to avoid resonance. This function can be disabled if it causes instability.
Switching the intermediate DC voltage at high frequency is useful for supplying the motor with a current wave having little harmonic distortion.
The switching frequency is adjustable during operation to reduce the noise generated by the motor.
Value: 1 to 16 kHz depending on rating

2

2.4



Output contactor command

■ **Motor fluxing**
This can be used to obtain rapid high torque on start-up; magnetic flux needs to be already established in the motor.
There is a choice between open loop or closed loop operation.

In continuous mode, the drive automatically establishes the flux when it is powered up.

In non-continuous mode:
□ If a logic input or command word bit is assigned to the motor fluxing command, flux is established when the command is confirmed.
□ If neither a logic input nor command word bit has been assigned, or if the latter are not active when a run command is given, fluxing occurs when the motor starts.

Fluxing is accelerated if a higher current than the nominal motor current is applied, then it is set to the value of the motor no-load current.

■ **Output contactor command**
This allows the drive to control a contactor located between the drive and the motor. The request to close the contactor is made when a run command appears. The request to open the contactor is made when there is no current in the motor.

Note: *If a DC injection braking function has been configured it should not be left operating too long in stop mode, as the contactor only opens at the end of braking.*

■ **Stop on thermal alarm**
This can be used to:
□ Allow a movement to end before examining a thermal fault. There are two adjustable thresholds used to define the thermal state level which, when exceeded, makes a machine stop;
□ Prevent a new run command from being accepted as long as the drive and motor temperatures are not less than 100%.

522166

RDY	Term	+0.00Hz	0.0A
+/- SPEED			
+ speed assign. :			LI3
- speed assign. :			LI4
Ref. saved :			RAM
Code			Quick

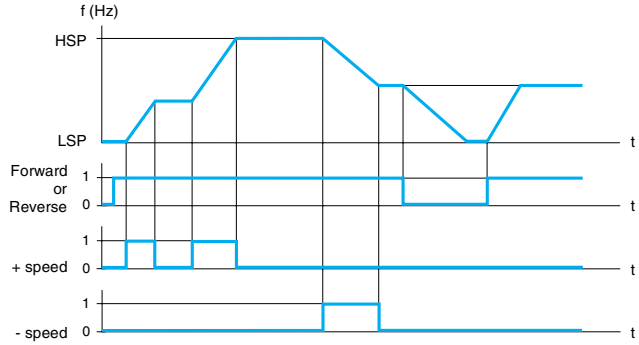
+/- speed function settings

■ **Uncontrolled output cut**
It is possible to configure output phase loss protection, which will allow the drive or motor circuit to be broken without the drive becoming locked in fault mode and facilitate a smooth restart after the motor has been reconnected. The output phase loss may also lock the drive, depending on the configuration.

■ **+/- speed**
This can be used to increase or decrease a speed reference by means of 1 or 2 logic inputs, with or without the last reference being saved (motorized potentiometer function).
This function is suitable for centralized control of a machine with several sections operating in one direction or for control by a handling crane pendant control station with two operating directions.

Two types of operation are available:
□ Use of single action buttons: 2 logic inputs are required in addition to the operating direction(s).
□ Use of double action buttons: only 1 logic input assigned to + speed is required.

□ **Use of single action buttons**: 2 logic inputs are required in addition to the operating direction(s).

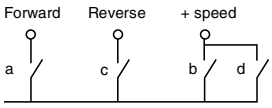


LSP: low speed, HSP: high speed

Example of "+/- speed" with 2 logic inputs, single action buttons and reference saving

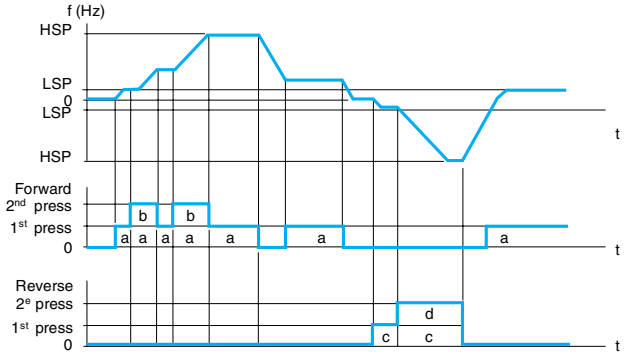
□ **Use of double action buttons**: only 1 logic input assigned to + speed is required.

Logic inputs:



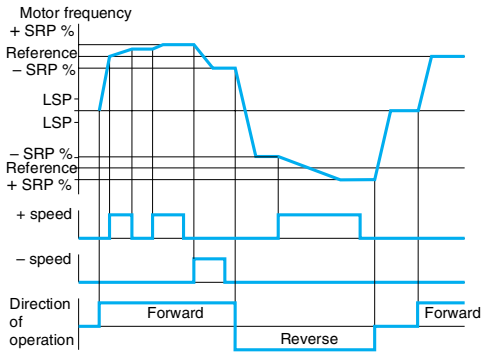
a and b: 1st press
c and d: 2st press

	Released (- speed)	**1st press** (speed maintained)	**2nd press** (+ speed)
Forward button	–	a	a and b
Reverse button	–	c	c and d



LSP: low speed, HSP: high speed

Example with double action buttons and 1 logic input
***Note:** This type of +/- speed control is incompatible with 3-wire control.*



Example of +/- speed around a 2-wire control reference

□ **Reference saving**
This function is associated with +/- speed control.
This can be used for reading and saving the last speed reference prior to the loss of the run command or line supply. The reference saved is applied the next time a run command is received.

□ **+/- speed around a reference**
The reference is given by Fr1 or Fr1b, including, if relevant, the summing, subtraction and multiplication functions, as well as the preset speeds.
During the run command the drive goes to the reference, following the acceleration and deceleration ramps (pressing +/- speed makes the speed vary around this reference according to acceleration ramp 2 and deceleration ramp 2).
+ or - speed variation around the reference is limited to a percentage of the reference (SRP parameter). When operation has stopped, the amended reference is not saved.
The maximum total reference is always limited by high speed (HSP parameter) and the minimum reference (LSP parameter).

■ **Automatic catching of a spinning load with speed detection** (“catch on the fly”)
This function can be used to restart the motor smoothly after one of the following events, provided the run command is still present:
□ loss of line supply or power off
□ fault reset or automatic restart
□ freewheel stop.

Once the event is over, the effective speed of the motor is detected in order to restart on a ramp at this speed and return to the reference speed. The speed detection time can reach 0.5 s.

This function is suitable for machines which suffer low motor speed loss during a power failure (high-inertia machines such as centrifuges, etc.).

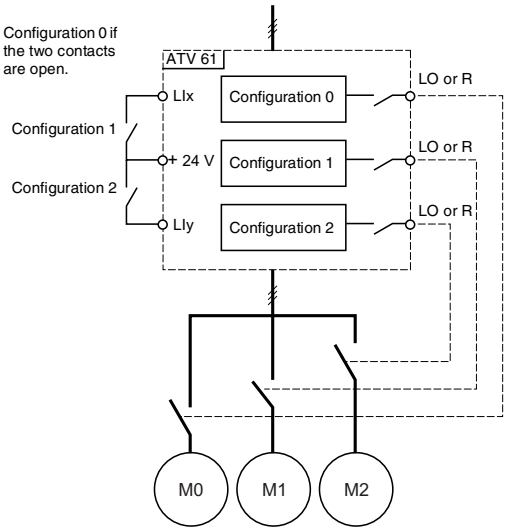
■ **Undervoltage management**
Depending on the application, it is possible to configure the Altivar 61's response to undervoltages or power failures.
If undervoltage occurs:
□ The Altivar 61 drive can continue operating with undervoltage levels up to -50% (adjustable threshold)
□ If the drive locks as a result, management of the fault relay can be configured (open or not). If the fault relay does not open an alarm is shown.

The Altivar 61 drive can also be configured to prevent the drive locking (using an alarm):
□ Controlled stop according to the type of stop configured
□ Deceleration based on a ramp which it automatically adapts to maintain the DC bus voltage, thereby preventing the drive from locking in fault mode
□ Instant IGBT (inverter bridge) loss followed by power supplied to the motor as soon as the line voltage has reappeared. This function can be used to prevent the Altivar 61 drive being reinitialized.

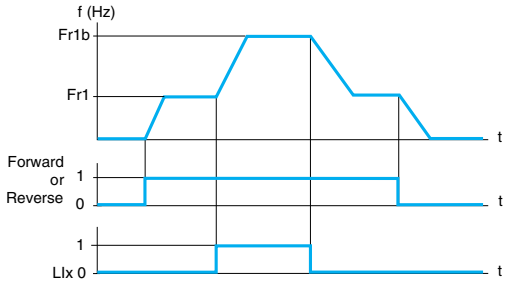
■ **Braking balance**
When several drives are connected on a common DC bus, this function can be used to adjust the braking thresholds in order to balance the braking powers among the various drives or braking units.

■ **Braking resistor thermal protection**
The Altivar 61 drive incorporates thermal protection for braking resistors if it is not equipped with a thermal switch. If the resistor thermal state is too high an alarm can be assigned to the logic output or the drive may lock in fault mode, depending on how the function is programmed.

Variable speed drives for asynchronous motors
Altivar 61



Schematic diagram for multi-motor mode



Example of reference switching

■ **Parameter set switching (multi-parameter)**
This can be used to switch 3 sets of 15 parameters maximum when the motor is running.
Each set can contain a different value for each of the parameters. The sets are switched using 1 or 2 logic inputs or command word bits.

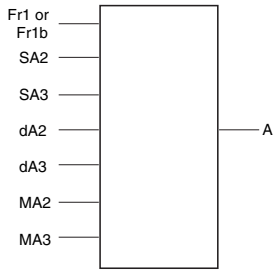
Function suitable for machines involving 2 or 3 manufacturing processes.

■ **Motor or configuration switching (multi-motor or multi-configuration)**
The Altivar 61 drive can have 3 configurations, which can be activated remotely, allowing it to adapt to:
□ 2 or 3 different motors or mechanisms in multi-motor mode. In this instance, the thermal state for all the motors is calculated and saved. This means that each motor is protected thermally.
□ 2 or 3 configurations for the same motor in multi-configuration mode. This function can also be used to save the current configuration in another memory zone, which it can be retrieved from.
Switching is carried out using 1 or 2 logic inputs, depending on the number of motors or configurations chosen (2 or 3).

Multi-motor and multi-configuration modes cannot be used together.

■ **Reference switching**
Switching between two references (speed, PID, etc.) can be enabled by:
□ a logic input
□ a command word bit
Reference 1 (Fr1) is active if the logic input (or command word bit) is at 0; reference 2 (Fr1b) is active if the logic input (or command word bit) is at 1.
References can be switched with the motor running.

Reference Fr1b, like Fr1, can originate from:
□ an analog input (AI)
□ a frequency control input (RP)
□ the graphic display terminal
□ the Modbus or CANopen bus
□ a communication card
□ the “Controller Inside” programmable card



A: drive reference
SA2, SA3: summing inputs
dA2, dA3: subtraction inputs
MA2, MA3: multiplication inputs.

■ **Operations on the references (summing, subtraction, multiplication)**
Summing, subtraction and multiplication inputs can be activated simultaneously.

The drive reference is thus:
□ reference of drive A = (Fr1 or Fr1b + SA2 + SA3 - dA2 - dA3) x MA2 x MA3

□ **Summing inputs**
They can be used to add 2 to 3 references from different sources to Fr1 or Fr1b (see “Reference switching”).
The references to be added together are selected from all the possible types of reference.

Example:
Reference Fr1 or Fr1b from AI1
Reference SA2 from CANopen
Reference SA3 from a communication card
Reference of drive A = Fr1 or Fr1b + SA2 + SA3.

□ **Subtraction inputs**
They can be used to subtract 2 to 3 references from different sources from Fr1 or Fr1b (see “Reference switching”).
The references to be subtracted are selected from all the possible types of reference.

Example:
Reference Fr1 or Fr1b from AI1
Reference dA2 from CANopen
Reference dA3 from a communication card
Reference of drive A = Fr1 or Fr1b - dA2 - dA3.

□ **Multiplication inputs**
They can be used to multiply 2 to 3 references from different sources by Fr1 or Fr1b (see “Reference switching”).
The references to be multiplied are selected from all the possible types of reference.

Example:
Reference Fr1 or Fr1b from AI1
Reference MA2 from CANopen
Reference MA3 from a communication card
Reference of drive A = Fr1 or Fr1b x MA2 x MA3.

2

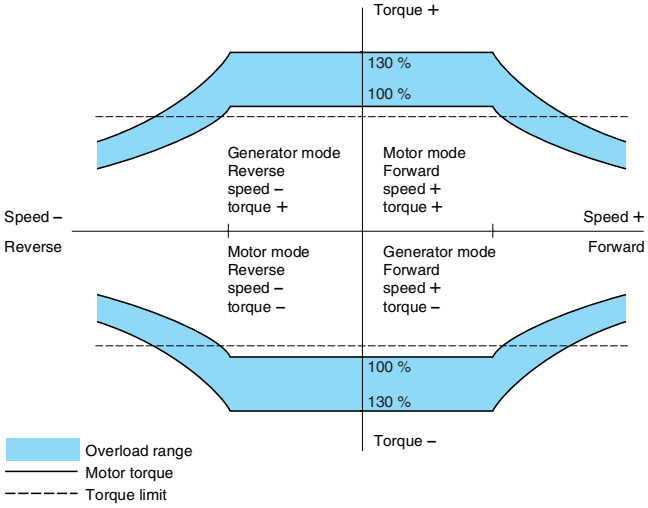
2.4

■ **Torque limit**
This can be used to limit the torque in the motor and generator quadrants using separate settings.

There are two types of torque limit:
- one with a value set by a parameter
- the other with a value given by an analog input or a frequency control input.

When both torque limit types are enabled it is the lowest value which is read. They can be switched using a logic input or command word bit.

This function is not available for voltage/frequency ratio.



The torque limit operates in both directions of rotation in motor or generator mode.

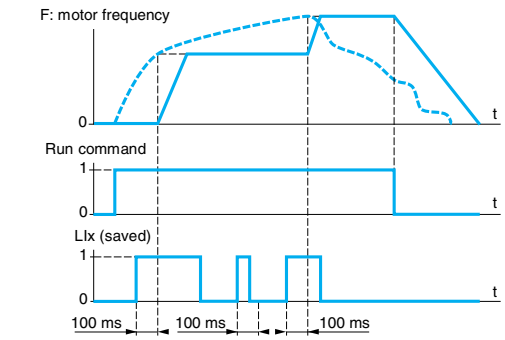
■ **Torque or current limit detection**
This function can be used to detect when the current or torque limit has been reached. Depending on the configuration, it is possible to:
- use an alarm to signal this
- lock the drive after an adjustable period of time.

■ **Current limit**
A 2nd current limit can be configured between 1.1 and 1.2 times the nominal drive current and it can be used to limit the rise in motor temperature and the torque. Switching between 2 current limits can be enabled via:
- a logic input
- a command word bit

522170

RDY	Term	+0.00Hz	0.0A
2nd CURRENT LIMIT.			☐
I Limit. 2 activ.	:		LI6
I Limit. 2 value	:		6.4 A
Current limitation	:		7.9 A
Code			Quick

Configuring current switching



Example of how reference saving works

■ **Reference saving**
This can be used to:
□ Read and save the speed reference value of the analog input using a logic input when the command lasts longer than 0.1 s
□ Control the speed of several drives alternately via a single analog reference and a logic input for each drive
□ Enable via a logic input a line reference (serial link) on several drives in order to synchronize movements by eliminating variations when the reference is sent
The reference is acquired 100 ms after the rising edge of the acquisition request. A new reference is not then acquired until a new request is made.

522167

RDY	Term	+0.00Hz	0.0A
STOP CONFIGURATION			
Type of stop	:		Ramp stop
Freewheel assign.	:		NO
Fast stop assign.	:		LI4
Ramp divider	:		0
DC inject. assign.	:		NO
Code			Quick

Configuring stop types

■ **Stop types**

□ **Freewheel stop**
This function stops the motor by resistive torque if the motor power supply is cut.

A freewheel stop is achieved:
- by configuring a normal stop command as a freewheel stop (when a run command is over or a stop command occurs)
- by enabling a logic input
- by activating a command word bit

□ **Fast stop**
This can be used to achieve a braked stop with an acceptable deceleration ramp time (divided by an adjustable coefficient from 0 to 10) for the drive/motor unit to avoid locking in the event of an overbraking fault. If the coefficient is equal to 0 the motor decelerates as fast as possible.

This is used for conveyors with emergency stop electrical braking.
A fast stop is achieved:
- by configuring a normal stop as a fast stop (when a run command is over or a stop command occurs)
- by enabling a logic input
- by activating a command word bit

□ **Fastest possible stop**
If the ramp divider coefficient is equal to 0 the motor decelerates as fast as possible.

□ **DC injection stop**
This can be used to brake high-inertia machines at low speed or maintain torque on stopping.
A DC injection stop is achieved:
- by configuring a normal stop as a DC injection stop (when a run command is over or a stop command occurs)
- by enabling a logic input
- by activating a command word bit

The DC value and the standstill braking time are adjustable.

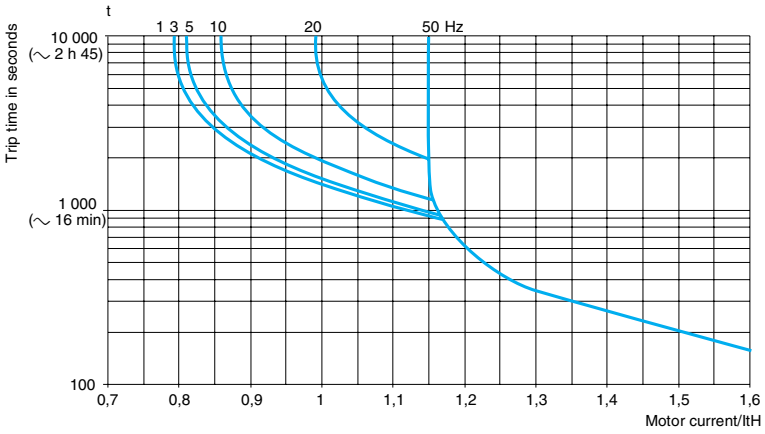
Variable speed drives for asynchronous motors
Altivar 61

■ **Motor thermal protection**
Motor thermal protection is provided by the drive:
□ directly, through PTC probes located in the motor windings
□ indirectly, via the integrated thermal relay. Indirect thermal protection is implemented via continuous calculation of its theoretical temperature rise.

The microprocessor calculates the theoretical temperature rise of the motor based on various elements:
□ the operating frequency
□ the current taken by the motor
□ the operating time
□ the maximum ambient temperature around the motor (40°C)
□ the type of motor ventilation (self-cooled or force-cooled)

Thermal protection can be adjusted from 0.5 to 1.2 times the nominal current, depending on the drive type. It must be adjusted to the nominal current indicated on the motor rating plate.

Note: *The motor thermal state memory returns to zero when the drive control part is switched off.*



Motor thermal protection curves

□ Self-cooled motors:
The tripping curves vary with the motor frequency.

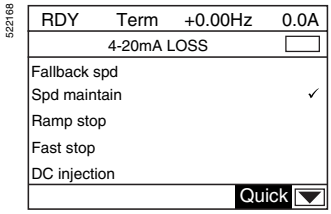
□ Force-cooled motors:
Only the 50 Hz tripping curve should be considered, whatever the motor frequency.

■ **Drive thermal protection**
The drive thermal protection is provided by a PTC probe mounted on the heatsink or integrated with the power module.

■ **IGBT thermal protection**
The drive manages the switching frequency intelligently according to the IGBT temperature.
If the drive's current rating is exceeded (example: current higher than the nominal drive current for a zero stator frequency), an alarm is displayed and a timer increases for as long the alarm is present.

■ **Machine protection**
Makes it possible to detect under and/or overload.

Variable speed drives for asynchronous motors
Altivar 61



Configuration of the drive's fault response

■ **Configuring the drive's fault response (fault management)**
Different responses can be configured for the drive in the event of a resettable fault occurring:
- freewheel stop
- drive switches to the fallback speed
- drive maintains the speed at which it was operating when the fault occurred until the fault disappears
- stop on ramp
- fast stop
- DC injection stop
- no stop (alarm activated)

List of resettable faults:
- external fault
- speed feedback loss
- overspeed
- output phase loss
- auto-tuning fault
- loss of 4-20 mA
- PTC probe
- drive overheating
- motor overload if the thermal state is less than 100%
- line overvoltage
- overbraking
- current/torque limit
- IGBT overheating
- communication faults (Modbus, CANopen and other communication networks),
- process overload
- process underload
- PI supervision,
- No flow.

■ **Resetting resettable faults**
This can be used to remove the last fault using a logic input, command word bit or the STOP/RESET key on the graphic display terminal.
The restart conditions after a reset to zero are the same as those of a normal power-up.
List of resettable faults, see "Configuring the drive's fault response".
Line supply undervoltage and input phase loss faults are reset automatically when the line supply is restored.

Function suitable for applications where drives are difficult to access, for example, a drive placed on a moving part.

■ **General reset (disables all faults)**
This function inhibits all faults, including thermal protection (forced operation), and can destroy the drive.

Function suitable for applications where restarting may be crucial (conveyor in an oven, smoke extraction system, machines with solidifying products to be discarded).
The function is enabled by a logic input.
Fault monitoring is active if the logic input is at state 1.
All faults are reset on a change of state ↓ of the logic input.

Note: *Use of this function invalidates the guarantee.*

2

2.4

2

2.4

■ **Automatic restart**
This enables the drive to be restarted automatically after it has locked in fault mode if the relevant fault has disappeared and the other operating conditions permit a restart.
This restart is performed by a series of automatic attempts separated by increasingly longer waiting periods of 1 s, 5 s, 10 s then 1 minute for the rest.
The options for the restart process's duration are 5, 10 and 30 min., 1, 2, 3 hours and an unlimited time.
If the drive has not restarted after the configured time, it will lock and the procedure is abandoned until it has been powered off and on again.

The faults which allow the drive to be restarted in this way are:
□ line overvoltage
□ motor thermal overload
□ drive thermal overload
□ d.c. bus overvoltage
□ line phase failure
□ external fault
□ loss of 4-20 mA
□ PTC probe
□ serial link
□ current or torque limit
□ output phase loss
□ line voltage too low. For this fault, the function is always active, even if it is not configured.
□ process overload
□ process underload
□ PI supervision
□ no flow.
□ fault caused by CANopen, Modbus or other commmunication networks. These faults are reset automatically as soon as the command word or frequency reference is sent to the drive.
For these types of fault, the relay configured as a fault relay remains activated if the function is configured. The speed reference and operating direction must be maintained for this function.

This function is suitable for machines or installations which are in continuous operation or unmonitored, and where a restart will not endanger equipment or personnel in any way.

■ **PTC probe protection**
The probes can be connected directly to the drive control card or to the I/O option cards.
The way in which a temperature fault is recorded by the drive can be configured:
□ permanent record
□ only recorded when the drive's power section is switched on
□ only recorded when the motor is running

■ **IGBT testing**
When enabled, this function tests every IGBT and the motor connections in order to detect a short-circuit or an open circuit. This test is run every time the drive is powered on and before each motor start.

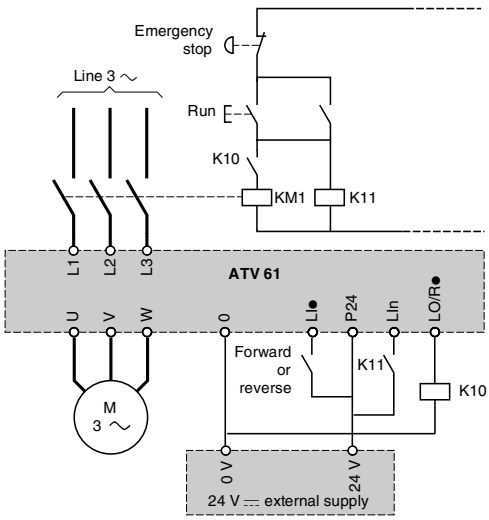
This function must not be enabled with machines with fast cycles in order to preserve the time for recording run commands.

■ **Resetting operating time to zero**
The drive operating and power-up times can be reset.

■ **External fault**
This function can lead to the drive locking if a fault occurs in the machine. This fault is flagged on the drive display unit. The fault is flagged if the signal is at 1 or 0, according to the function configuration.

■ **Line contactor control**
This can be used on each run command to close the line contactor and open it when the motor is no longer on. The drive control section must be powered without fail by an external 24 V ⎓ source.

This function must be used for simple sequences with a low number of Start/Stop operations (Start/Stop cycle longer than 60 seconds).



After a run command, if the line contactor is not closed the drive will lock after an adjustable period of time.

■ **Forced local mode**
Forced local mode imposes control via the terminals or graphic display terminal and disables all other control modes.
Switching to forced local mode may be activated via:
- a logic input
- a function key on the graphic display terminal

The following references and commands are available for forced local mode:
- references AI1, AI2, etc. and command via logic inputs
- reference and command via the graphic display terminal

Variable speed drives for asynchronous motors
Altivar 61

Function compatibility table

■ **Configurable I/O**

The table below lists the incompatibilities between the functions and indicates the priority functions:
Stop functions have priority over run commands.
The Power Removal safety function takes priority over all other functions.
The selection of functions is limited:
- By the number of drive I/O which can be reassigned: if necessary, add an I/O extension card.
- By the incompatibility of certain functions with one another

Functions	PID regulator	Preset speeds	JOG operation	Synchronous motor
PID regulator			⛔	
Preset speeds			↑	
JOG operation	⛔	←		
Synchronous motor				
+/- speed *(1)*			⛔	
+/- speed around a reference	⛔		⛔	
Operation on the references	⛔ *(2)*	↑	↑	
Freewheel stop				
Fast stop				
DC injection stop				⛔

(1) Excluding special use with reference channel Fr2.
(2) Only the multiplier reference is incompatible with the PID regulator.
(3) Priority is given to the first of these two stop modes to be activated.

⛔ Incompatible functions

Compatible functions

N/A

Priority functions (functions which cannot be active at the same time)

← The arrow indicates which function has priority.
Example: the "Freewheel stop" function has priority over the "Fast stop" function

+/- speed *(1)*	+/- speed around a reference	Operation on the references	Freewheel stop	Fast stop	DC injection stop
	⬌	⬌ *(2)*			
		←			
⬌	⬌	←			
					⬌
				←	←
			↑		⬌ *(3)*
			↑	⬌ *(3)*	

Variable speed drives for asynchronous motors
Altivar 71

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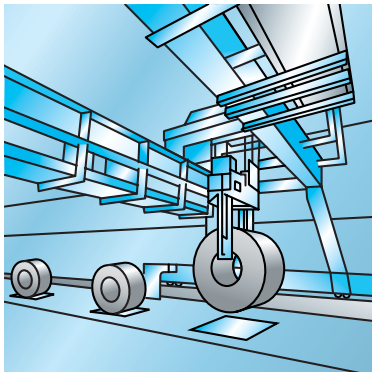


Hoisting application

Applications

With its different types of motor control and numerous integrated functions, the Altivar 71 range of variable speed drives meets the most stringent requirements. It is suitable for the most demanding drive systems:

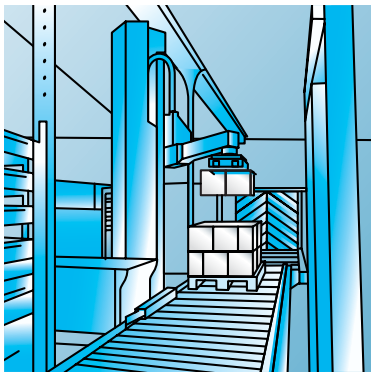
- Torque and speed accuracy at very low speed, high dynamic performance with Flux Vector Control with or without sensor
- Extended frequency range for high-speed motors
- Parallel connection of motors and special drives using the voltage/frequency ratio
- Static speed accuracy and energy saving for open loop synchronous motors
- Smooth flexibility for unbalanced machines with the ENA (ENergy Adaptation) System

The functionality of the Altivar 71 drive boosts performance and increases a machine's flexibility of use across multiple applications.

Hoisting

- Brake control adapted for translational, hoisting and slewing movements
- Load measurement using weight sensor
- High-speed hoisting
- Brake feedback management
- Limit switch management
- Slack sling

532538



Packing application

Handling

- Very quick response times on transmission of a command: 2 ms (± 0.5 ms)
- Reference via pulse train or differential analog input
- Control via the principal communication networks
- Position control via limit switches with time optimization at low speed
- Multiple parameter settings via parameter set switching

Packing

- Up to 50 Hz of the bandwidth
- Very quick response times on change of reference: 2 ms (± 0.5 ms)
- Control via integrated CANopen bus
- Position control via limit switches

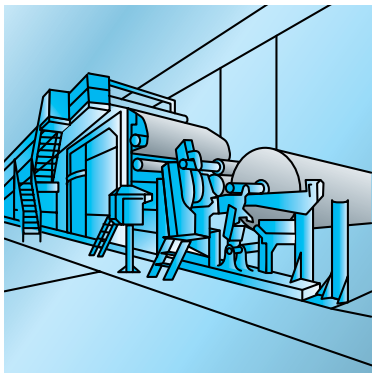
Textile machinery

- High resolution of the digital speed reference (1/32000)
- Speed accuracy assured by use of synchronous motor, irrespective of load
- High bandwidth
- Spooling function
- Connection to common DC bus

Wood-working machinery

- Operation up to 1600 Hz
- Fastest possible controlled stop on loss of line supply
- Control via integrated CANopen bus
- Protection of motor against overvoltages

532539



Process machinery application

Process machinery

- PID regulator
- High reference resolution
- Speed or torque control
- Connection to the principal communication networks
- Separate control power supply
- Braking unit via re-injection to the line supply
- Connection to common DC bus

Lifts

- Brake control adapted to suit passenger comfort
- Processing of load measurement by weight sensor
- Conformity of relays to lift safety standard EN 81-13-2-2-3
- Connection to CANopen bus
- Control with integrity check of output contactor
- Lift car clearance function

Characteristics: pages 2/348 to 2/355
References: pages 2/360 to 2/363
Dimensions: pages 2/446 to 2/471
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Functions: pages 2/512 to 2/543

Variable speed drives for asynchronous motors
Altivar 71

ATV 71HC28N4,
ATV 71HD37M3X, ATV 71HU22N4

ATV 71W075N4

ATV 71PU40N4Z

Comprehensive offer

The Altivar 71 range of variable speed drives extends across a range of motor power ratings from 0.37 kW to 500 kW with three types of power supply:
■ 200…240 V single phase, 0.37 kW to 5.5 kW, UL Type 1/IP 20, (**ATV 71H●●●M3**),
■ 200…240 V three phase, 0.37 kW to 75 kW, UL Type 1/IP 20, (**ATV 71H●●●M3** and **ATV 71H●●●M3X**),
■ 380…480 V three phase, 0.75 kW to 500 kW, UL Type 1/IP 20, **(ATV 71H●●●N4)**.

The Altivar 71 drive integrates the Modbus and CANopen protocols as standard, as well as numerous functions. These functions can be extended using communication option cards, I/O extension cards, a “Controller Inside” programmable card or an encoder interface option card, see page 2/346.

External options such as braking resistors, resistance braking units and filters complete the offer, see page 2/346.

The entire range conforms to international standards IEC/EN 61800-5-1, IEC/EN 61800-2, IEC/EN 61800-3, is UL, CSA, DNV, C-Tick, NOM 117 and GOST certified and has been developed to meet the requirements of directives regarding the protection of the environment (RoHS, WEEE, etc). as well as those of European Directives (CE mark).

The Altivar 71 can be inserted in an installation’s safety system. It integrates the “Power Removal” safety function which prohibits any accidental starting of the motor. This function complies with machine standard EN 954-1 category 3, the standard governing electrical installations IEC/EN 61508 SIL2 and the power drive systems standard IEC/EN 61800-5-2.

Electromagnetic compatibility

Reducing harmonics and observing requirements in respect of electromagnetic compatibility were considered right from the design stage.
The incorporation of EMC filters in **ATV 71H●●●M3** and **ATV 71●●●●N4** and the observance of requirements in respect of EMC simplifies installation and provides an economical means of meeting CE marking requirements.

ATV 71H●●●M3X drives have been designed without an EMC filter. Filters are available as an option and can be installed by the user to reduce emission levels, see pages 2/428 to 2/431.

Standard versions

The Altivar 71 UL Type 1/IP 20 range of variable speed drives is available in two standard versions:

■ A version with UL Type 12/IP 54 degree of protection designed to meet the requirements of applications in difficult environments (dusty, humid, etc.):
■ 0.75 to 75 kW (**ATV 71W●●●N4**)
□ 90 to 500 kW, ready-assembled in enclosure to simplify installation and, in particular, to ensure optimum ventilation of the enclosure (**ATV 71E5●●●N4**)

■ A version on a base plate, 0.75 to 7.5 kW, designed to meet the requirements of applications in which the seal necessary for the environment in which the drive is to be used prevents ventilation (**ATV 71P●●●N4Z**)
As the drive is not equipped with a fan as standard, a DC choke (see page 2/419) must be added in order to prevent overheating during operation.
In environments supporting the use of ventilation, the DC choke (see page 2/419) must be replaced by a fan (see page 2/366).

Variable speed drives for asynchronous motors
Altivar 71

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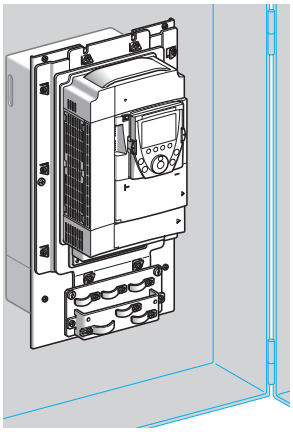
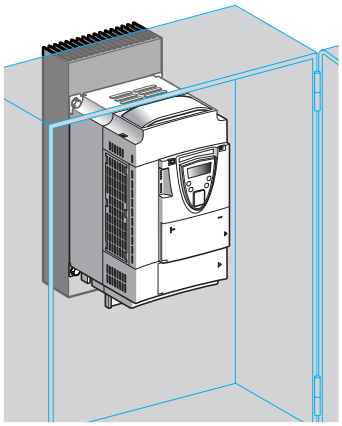


ATV 71HU75N4 flush-mounted

DF503856



ATV 71PU75N4Z in dust and damp proof enclosure

Mounting options

The Altivar 71 drive can be mounted in a variety of ways for integration into machines.

Mounting outside enclosure

The standard version of the Altivar 71 drive (on heatsink) or the base plate version can be mounted directly on a wall without the need for an enclosure. UL Type 1 conformity can be achieved using kit **VW3 A9 2●●** and IP 21 or IP 31 using kit **VW3 A9 1●●** (see pages 2/367 and 2/368).

Flush-mounting inside a dust and damp proof enclosure

The Altivar 71 drive has been designed to optimize the size of enclosures (floor-standing, wall-mounted, etc).
This type of mounting can be used to reduce the size of enclosure required and to limit the temperature rise inside the enclosure:

- The power section, with IP 54 degree of protection, can be easily mounted outside the enclosure using the kit for flush-mounting in a dust and damp proof enclosure **VW3 A9 5●●**, see page 2/365,
- This type of mounting can lead to ambient temperatures of up to 60°C inside the enclosure without derating.

It may be necessary to use a control card fan kit **VW3 A9 4●●** appropriate for the drive rating in order to avoid hot spots, see page 2/364.

- This option permits mounting side-by-side, see pages 2/498 and 2/500.

Mounting in a dust and damp proof enclosure or on machine frame

The Altivar 71 drive on base plate supports two mounting options:

- In a dust and damp proof enclosure, using the kit for dust and damp proof mounting **VW3 A9 80●** (see page 2/366) designed to dissipate heat via a heatsink mounted outside the enclosure
- On a machine frame, where this frame's earth allows the heat to be dissipated

Variable speed drives for asynchronous motors
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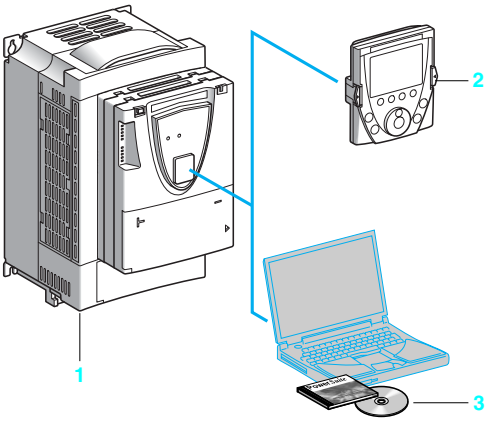

Dialogue tools

The Altivar 71 drive 1 is supplied with a removable graphic display terminal 2 for remote operation:
- The navigation button accesses the drop-down menus quickly and easily.
- The graphic screen displays 8 lines of 24 characters of plain text.
- The advanced functions on the display unit access the more complex drive functions.
- The display screens, menus and parameters can all be customized for the user or the machine.
- Online help screens are available.
- Configurations can be stored and downloaded (four configuration files can be stored).
- The drive can be connected to several other drives via a multidrop link.
- It can be located remotely on an enclosure door with IP 54 or IP 65 degree of protection (UL Type 1/IP 20 drives) or built in (UL Type 12/IP 54 drives).
- It is supplied with 6 languages installed as standard (English, French, German, Italian, Spanish and Chinese). Other languages can be loaded to the flash memory.

Up to 15 kW, the Altivar 71 drive can be controlled using an integrated 7-segment display terminal, see pages 2/360 and 2/361.

The PowerSuite software workshop 3 can be used to configure, adjust and debug the Altivar 71 in just the same way as all other Telemecanique drives and starters. It can be used via a direct connection, Ethernet, modem or a Bluetooth® wireless connection.

522151

RUN	Term	+50.00Hz	5.4A
1.1 SIMPLY START			
2/3 wire control	**:**		**2 wire**
Macro-configuration	:		M. handling
Standard mot. Freq.	:		50Hz IEC
Rated motor power	:		2.2kW
Rated motor volt.	:		400V
Code		<< >>	Quick

"Simply Start" menu

Quick programming

Macro-configuration

The Altivar 71 offers quick and easy programming using macro-configurations corresponding to different applications or uses: start-stop, handling, hoisting, general use, connection to communication networks, PID regulator, master/slave. Each of these configurations is still fully modifiable.

"Simply Start" menu

The "Simply start" menu can be used to ensure the application operates correctly, maximize motor performance and ensure motor protection.

The architecture, the hierarchical parameter structure and the direct access functions all serve to make programming quick and easy, even for the more complex functions.

Characteristics: pages 2/348 to 2/355
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533523

SCF1 Term +50.00Hz 0.0A	
FAULT HISTORY	
Short circuit	
Overcurrent	
External FLT	
Overvoltage	
Undervoltage	
Help	Quick

Fault log

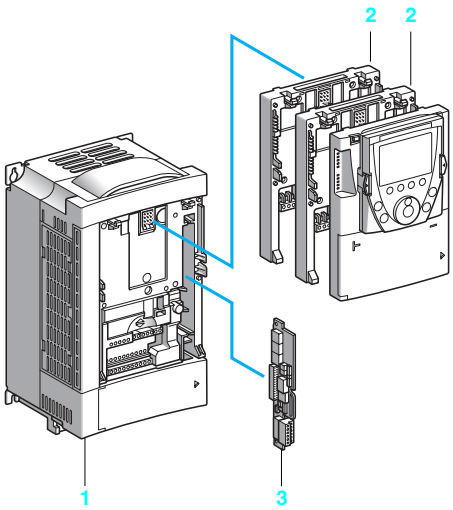
522162

SCF1 Term +50.00Hz 0.0A	
MOTOR SHORT CIRCUIT	
Check the connection cables and the motor insulation.	
Perform the diagnostic test.	
	Quick

Troubleshooting screen

Services

The Altivar 71 has numerous built-in maintenance, monitoring and diagnostic functions:
- Built-in drive test functions with diagnostic screen on the remote graphic display terminal
- I/O maps
- Communication maps for the different ports
- Oscilloscope function that can be viewed using the PowerSuite software workshop
- Management of the drive installed base via processors with flash memory
- Remote use of these functions by connecting the drive to a modem via the Modbus port
- Identification of all the drive's component parts as well as the software versions
- Fault logs with display of the value of up to 16 variables on occurrence of a fault
- Display terminal languages loaded in the flash memory
- A message of up to 5 lines of 24 characters can be stored in the drive



Options

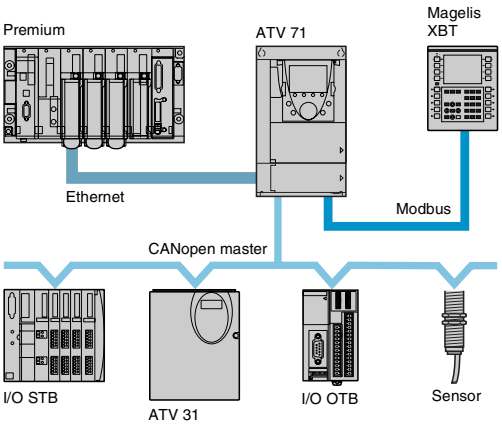
The Altivar 71 drive 1 can integrate a maximum of three option cards simultaneously, of which:
- 2 can be selected from among the following *(1)*:
  - I/O extension cards 2, see pages 2/380 and 2/381
  - Communication cards 2 (Ethernet TCP/IP, Modbus/Uni-Telway, Fipio, Modbus Plus, Profibus DP, DeviceNet, INTERBUS, etc.), see pages 2/390 to 2/397
  - "Controller Inside" programmable card 2 . This is used to adapt the drive to specific applications quickly and progressively, by decentralizing the control system functions (programming in IEC 61131-3 compliant languages), see pages 2/382 to 2/389.
- 1 can be an encoder interface card 3 (with RS 422 compatible differential outputs, open collector outputs, push-pull outputs), see pages 2/378 and 2/379.

External options can be associated with the Altivar 71:
- Braking units and resistors (standard or hoist-specific), see pages 2/398 to 2/411
- Networked braking units, see pages 2/412 to 2/415
- DC chokes, line chokes and passive filters (to reduce harmonic currents), see pages 2/416 to 2/427
- Additional EMC input filters, see pages 2/428 to 2/431
- Motor chokes and sinus filters for long cable runs or to remove the need for shielding, see pages 2/432 to 2/437.

Nota : *Please refer to the compatibility summary tables to determine which options are available for individual drives, see pages 2/438 to 2/445.*

(1) The Altivar 71 cannot support more than one option card with the same reference.

Variable speed drives for asynchronous motors
Altivar 71



Example of a drive equipped with a communication card and a "Controller Inside" programmable card

Integration into control systems

The Altivar 71 integrates a combined Modbus or CANopen port for quick, accurate motion control, adjustment, supervision and configuration. A second port is available for connecting a Magelis terminal for machine dialogue.

The Altivar 71 can also be connected to other communication networks using the communication option cards. The following communication protocols are supported: Ethernet TCP/IP, Fipio, Modbus, Modbus Plus, Uni-Telway, Profibus DP, DeviceNet, INTERBUS (see pages 2/390 to 2/397).

The control part can be powered separately, thus allowing communication (monitoring, diagnostics) to be maintained even if the power section supply fails.

The "Controller Inside" programmable card transforms the drive into an automation island:
- The card integrates its own I/O; it can also manage those of the drive and an I/O extension card.
- It contains onboard application programs developed in IEC 61131-3 compliant languages, which reduce the control system response time.
- Its CANopen master port enables control of other drives and dialogue with I/O modules and sensors.

Variable speed drives for asynchronous motors
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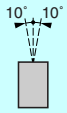
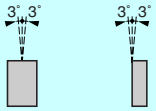
Environmental characteristics

Conformity to standards			Altivar 71 drives have been developed to conform to the strictest international standards and the recommendations relating to electrical industrial control devices (IEC, EN), in particular: low voltage, IEC/EN 61800-5-1, 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 IEC/EN 61000-4-6 level 3 IEC/EN 61000-4-11 *(1)*
Conducted and radiated EMC emissions for drives			IEC/EN 61800-3, environments 1 and 2, categories C1, C2, C3
	ATV 71H037M3…HU22M3 ATV 71H075N4…HU40N4 ATV 71P075N4Z…PU40N4Z		EN 55011 class A group 1, IEC/EN 61800-3 category C2 With additional EMC filter *(2)*: ■ EN 55011 class B group 1, IEC/EN 61800-3 category C1
	ATV 71HU30M3…HU75M3 ATV 71HU55N4…HC50N4 ATV 71PU55N4Z…PU75N4Z		EN 55011 class A group 2, IEC/EN 61800-3 category C3 With additional EMC filter *(2)*: ■ EN 55011 class A group 1, IEC/EN 61800-3 category C2 ■ EN 55011 class B group 1, IEC/EN 61800-3 category C1
	ATV 71H●●●M3X		With additional EMC filter *(2)*: ■ EN 55011 class A group 1, IEC/EN 61800-3 category C2 ■ EN 55011 class B group 1, IEC/EN 61800-3 category C1
	ATV 71W075N4…WU40N4		EN 55011 class A group 1, IEC/EN 61800-3 category C2
	ATV 71WU55N4…WD75N4		EN 55011 class A group 2, IEC/EN 61800-3 category C3 With additional EMC filter *(2)*: EN 55011 class A group 1, IEC/EN 61800-3 category C2
CE marking			The drives have CE marking in accordance with the European directives on low voltage (73/23/EEC and 93/68/EEC) and EMC (89/336/EEC).
Product certifications	ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71●●●●N4		UL, CSA, DNV, C-Tick, NOM 117 and GOST
	ATV 71P●●●N4Z		UL, CSA, C-Tick, NOM 117
Degree of protection			IEC/EN 61800-5-1, IEC/EN 60529
	ATV 71H●●●M3 ATV 71HD11M3X…HD45M3X ATV 71H075N4…HD75N4		IP 21 and IP 41 on upper part IP 20 without blanking plate on upper part of cover IP 54 on the lower part (heatsink) IP 21 with accessory VW3 A9 1●●, UL Type 1 with accessory VW3 A9 2●●, see pages 2/367 and 2/368
	ATV 71HD55M3X, HD75M3X ATV 71HD90N4…HC50N4		IP 00, IP 41 on upper part and IP 30 on front panel and side parts. IP 54 on the lower part (heatsink) IP 31 with accessory VW3 A9 1●●, UL Type 1 with accessory VW3 A9 2●●, see pages 2/367 and 2/368
	ATV 71W●●●N4		UL Type 12/IP 54
Vibration resistance	ATV 71H●●●M3 ATV 71HD11M3X…HD45M3X ATV 71H075N4…HD75N4 ATV 71W●●●N4 ATV 71P●●●N4Z		1.5 mm peak to peak from 3…13 Hz, 1 gn from 13…200 Hz, conforming to IEC/EN 60068-2-6
	ATV 71HD55M3X, HD75M3X ATV 71HD90N4…HC50N4		1.5 mm peak to peak from 3…10 Hz, 0.6 gn from 10…200 Hz, conforming to IEC/EN 60068-2-6
Shock resistance	ATV 71H●●●M3 ATV 71HD11M3X…HD45M3X ATV 71H075N4…HD75N4 ATV 71W●●●N4 ATV 71P●●●N4Z		15 gn for 11 ms conforming to IEC/EN 60068-2-27
	ATV 71HD55M3X, HD75M3X ATV 71HD90N4…HC13N4		7 gn for 11 ms conforming to IEC/EN 60068-2-27
	ATV 71HC16N4…HC50N4		4 gn for 11 ms conforming to IEC/EN 60068-2-27

(1) Drive behaviour according to the drive configurations, see pages 2/529, 2/532, 2/533, 2/541 and 2/542.

(2) See table on page 2/428 to check permitted cable lengths.

Environmental characteristics (continued)

Maximum ambient pollution	ATV 71H●●●M3 ATV 71HD11M3X, HD15M3X ATV 71H075N4…HD18N4 ATV 71P●●●N4Z		Degree 2 conforming to IEC/EN 61800-5-1
	ATV 71HD18M3X…HD75M3X ATV 71HD22N4…HC50N4 ATV 71W●●●N4		Degree 3 conforming to IEC/EN 61800-5-1
Environmental conditions	ATV 71H●●●M3, H●●●M3X ATV 71H075N4…HD75N4 ATV 71P●●●N4Z		IEC 60721-3-3 classes 3C1 and 3S2
	ATV 71H●●●M3S337 ATV 71H●●●M3X337 ATV 71H075N4S337… HD75N4S337 ATV 71HD90N4…HC50N4 ATV 71W●●●N4		IEC 60721-3-3 class 3C2
Relative humidity			5…95% without condensation or dripping water conforming to IEC 60068-2-3
Ambient temperature around the unit	Operation	**°C**	-10…+50 without derating. Up to +60°C with derating and with the control card fan kit VW3 A9 4●● corresponding to the drive rating (see derating curves on pages 2/499 and 2/501 to 2/503)
	Storage	**°C**	-25…+70
Maximum operating altitude		**m**	1000 without derating 1000…3000 derating the current by 1% per additional 100 m. Limited to 2000 m for the “Corner Grounded” distribution network
Operating position Maximum permanent angle in relation to the normal vertical mounting position	ATV 71H●●●M3 ATV 71H●●●M3X ATV 71H●●●N4 ATV 71W●●●N4Z		
	ATV 71P●●●N4Z		

Drive characteristics

Output frequency range	ATV 71H●●●M3 ATV 71HD11M3X…HD37M3X ATV 71H075N4…HD37N4 ATV 71W075N4…WD37N4 ATV 71P●●●N4Z	**Hz**	0…1600
	ATV 71HD45M3X…HD75M3X ATV 71HD45N4…HC50N4 ATV 71WD45N4…WD75N4	**Hz**	0…500
Configurable switching frequency	ATV 71H●●●M3 ATV 71HD11M3X, HD15M3X ATV 71H075N4…HD30N4 ATV 71W075N4…WD30N4 ATV 71P075N4Z…PU75N4Z	**kHz**	Nominal switching frequency: 4 kHz without derating in continuous operation. Adjustable during operation from 1…16 kHz Above 4 kHz, see derating curves on pages 2/499 and 2/501 to 2/503.
	ATV 71HD18M3X, HD45M3X ATV 71HD37N4…HD75N4 ATV 71WD37N4…WD75N4	**kHz**	Nominal switching frequency: 2.5 kHz without derating in continuous operation. Adjustable during operation from 1…16 kHz Above 2.5 kHz, see derating curves on pages 2/499 and 2/501 to 2/503.
	ATV 71HD55M3X, HD75M3X ATV 71HD90N4…HC50N4	**kHz**	Nominal switching frequency: 2.5 kHz without derating in continuous operation. Adjustable during operation from 2.5…8 kHz Above 2.5 kHz, see derating curves on pages 2/499 and 2/501 to 2/503.
Speed range			1…1000 in closed-loop mode with incremental encoder feedback 1…100 in open-loop mode without speed feedback
Speed accuracy	For a torque variation of 0.2 Tn to Tn		± 0.01% of nominal speed, in closed-loop mode with incremental encoder feedback ±10% of nominal slip, without speed feedback
Torque accuracy			± 5% in closed-loop mode with incremental encoder feedback ± 15% in open-loop mode without speed feedback
Transient overtorque			170% of the nominal motor torque (typical value at ± 10%) for 60 s 220% of the nominal motor torque (typical value at ± 10%) for 2 s
Braking torque			30% of the rated motor torque without braking resistor (typical value) Up to 150% with braking or hoist resistor installed as an option, see pages 2/401 and 2/403
Maximum transient current			150% of the nominal drive current for 60 s (typical value) 165% of the nominal drive current for 2 s (typical value)
Permanent torque at 0 Hz	ATV 71H037M3…HD45M3X ATV 71H075N4…HD75N4 ATV 71W●●●N4 ATV 71P●●●N4Z		The Altivar 71 drive can continuously supply the peak value of the drive nominal current
	ATV 71HD55M3X, HD75M3X ATV 71HD90N4…HC50N4		The Altivar 71 drive can continuously supply 80% of the peak value of the drive nominal current
Motor control profile	Asynchronous motor		Flux Vector Control (FVC) with sensor (current vector) Sensorless Flux Vector Control (FVC) (voltage or current vector) Voltage/frequency ratio (2 or 5 points) ENA (ENergy Adaptation) System for unbalanced loads
	Synchronous motor		Vector control without speed feedback
Frequency loop			PI regulator with adjustable structure for a speed response adapted to the machine (accuracy, speed)
Slip compensation			Automatic whatever the load. Can be suppressed or adjusted Not available in voltage/frequency ratio

2

2.5

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References: pages 2/360 to 2/363
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Schemes: pages 2/472 to 2/491
Functions: pages 2/512 to 2/543

Electrical power characteristics

Power supply	Voltage	**V**	200 - 15%...240 + 10% single phase for ATV 71H075M3...HU75M3 200 - 15%...240 + 10% 3-phase for ATV 71H●●●M3 and ATV 71H●●●M3X 380 - 15%...480 + 10% 3-phase for ATV 71H●●●N4
	Frequency	**Hz**	50 - 5%...60 + 5%
Signalling			1 red LED: LED lit indicates the presence of drive voltage
Output voltage			Maximum 3-phase voltage equal to line supply voltage
Drive noise level			Conforming to directive 86-188/EEC
	ATV 71H037M3…HU15M3 ATV 71H075N4…HU22N4 ATV 71W075N4…WU22N4	**dBA**	43
	ATV 71HU22M3…HU40M3 ATV 71H075N4…HU40N4 ATV 71WU30N4, WU40N4	**dBA**	54.5
	ATV 71HU55M3 ATV 71HU55N4, HU75N4 ATV 71WU55N4, WU75N4	**dBA**	55.6
	ATV 71HU75M3 ATV 71HD11N4 ATV 71WD11N4	**dBA**	57.4
	ATV 71HD11M3X, HD15M3X ATV 71HD15N4, HD18N4 ATV 71WD15N4, WD18N4	**dBA**	60.2
	ATV 71HD18M3X, HD22M3X ATV 71HD22N4 ATV 71WD22N4	**dBA**	59.9
	ATV 71HD30M3X…HD45M3X, ATV 71HD30N4, HD37N4 ATV 71WD30N4, WD37N4	**dBA**	64
	ATV 71HD45N4…HD75N4 ATV 71WD45N4…WD75N4	**dBA**	63.7
	ATV 71HD55M3X ATV 71HD90N4	**dBA**	60.5
	ATV 71HD75M3X ATV 71HC11N4	**dBA**	69.5
	ATV 71HC13N4, HC16N4	**dBA**	66
	ATV 71HC20N4…HC28N4	**dBA**	68
	ATV 71HC31N4, HC40N4	**dBA**	70
	ATV 71HC50N4	**dBA**	71
	ATV 71P075N4Z…PU22N4Z	**dBA**	0 With fan kit: 43
	ATV 71PU30N4Z, PU40N4Z	**dBA**	0 With fan kit: 54.5
	ATV 71PU55N4Z, PU75N4Z	**dBA**	0 With fan kit: 55.6
Electrical isolation			Between power and control (inputs, outputs, power supplies)

2

2.5

Connection cable characteristics

Type of cable for	Mounting in an enclosure		Single-strand IEC cable, ambient temperature 45°C, copper 90°C XLPE/EPR or copper 70°C PVC
	Mounting in an enclosure with an IP 21 or IP 31 kit		3-strand IEC cable, ambient temperature 40°C, copper 70°C PVC
	Mounting in an enclosure with a NEMA Type 1 kit		3-strand UL 508 cable except for choke (2-strand UL 508 cable), ambient temperature 40°C, copper 75°C PVC

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

Drive terminals		**L1/R, L2/S, L3/T, U/T1, V/T2, W/T3**	**PC/-, PO, PA/+**	**PA, PB**
Maximum wire size and tightening torque	ATV 71H037M3…HU40M3 ATV 71H075N4…HU40N4 ATV 71W075N4…WU40N4 ATV 71P075N4Z…PU40N4Z	4 mm², AWG 10 1.4 Nm, 12.3 lb.in		
	ATV 71HU55M3 ATV 71HU55N4, HU75N4 ATV 71WU55N4, WU75N4 ATV 71PU55N4Z, PU75N4Z	6 mm², AWG 8 3 Nm, 26.5 lb.in		
	ATV 71HU75M3 ATV 71HD11N4 ATV 71WD11N4	16 mm², AWG 4 3 Nm, 26.5 lb.in		
	ATV 71HD11M3X, HD15M3X ATV 71HD15N4, HD18N4 ATV 71WD15N4, WD18N4	35 mm², AWG 2 5.4 Nm, 47.7 lb.in		
	ATV 71HD18M3X, HD22M3X ATV 71HD22N4…HD37N4 ATV 71WD22N4…WD37N4	50 mm², AWG 1/0 12 Nm, 102,2 lb.in		
	ATV 71HD30M3X…HD45M3X ATV 71HD45N4…HD75N4 ATV 71WD45N4…WD75N4	150 mm², 300 MCM 41 Nm, 360 lb.in		
	ATV 71HD55M3X ATV 71HD90N4	2 x 100 mm², 2 x 250 MCM M10, 24 Nm, 212 lb.in	2 x 100 mm², 2 x 250 MCM M12, 41 Nm, 360 lb.in	60 mm², 250 MCM M8, 12 Nm, 106 lb.in
	ATV 71HD75M3X, HC11N4	2 x 100 mm², 2 x 250 MCM M10, 24 Nm, 212 lb.in	2 x 150 mm², 2 x 250 MCM M12, 41 Nm, 360 lb.in	60 mm², 250 MCM M8, 12 Nm, 106 lb.in
	ATV 71HC13N4	2 x 120 mm², 2 x 250 MCM M10, 24 Nm, 212 lb.in	2 x 120 mm², 2 x 250 MCM M10, 24 Nm, 212 lb.in	120 mm², 250 MCM M10, 24 Nm, 212 lb.in
	ATV 71HC16N4	2 x 150 mm², 2 x 350 MCM M12, 41 Nm, 360 lb.in	2 x 150 mm², 2 x 350 MCM M12, 41 Nm, 360 lb.in	120 mm², 250 MCM M10, 24 Nm, 212 lb.in
	ATV 71HC20N4…HC28N4	4 x 185 mm², 3 x 350 MCM M12, 41 Nm, 360 lb.in	4 x 185 mm², 3 x 350 MCM M12, 41 Nm, 360 lb.in	–
	ATV 71HC31N4	4 x 185 mm², 4 x 500 MCM M12, 41 Nm, 360 lb.in	8 x 185 mm², 4 x 500 MCM M12, 41 Nm, 360 lb.in	–
	ATV 71HC40N4	**R/L1.1, S/L2.1, T/L3.1, R/L1.2, S/L2.2, T/L3.2** 2 x 2 x 185 mm², 4 x 500 MCM M12, 41 Nm, 360 lb.in **U/T1, V/T2, W/T3** 4 x 185 mm², 4 x 500 MCM M12, 41 Nm, 360 lb.in	8 x 185 mm², 4 x 500 MCM M12, 41 Nm, 360 lb.in	–
	ATV 71HC50N4	**R/L1.1, S/L2.1, T/L3.1, R/L1.2, S/L2.2, T/L3.2** 2 x 4 x 185 mm², 2 x 3 x 500 MCM M12, 41 Nm, 360 lb.in **U/T1, V/T2, W/T3** 6 x 185 mm², 5 x 500 MCM M12, 41 Nm, 360 lb.in	8 x 185 mm², 5 x 500 MCM M12, 41 Nm, 360 lb.in	–

2

2.5

Presentation: pages 2/342 to 2/347
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Electrical control characteristics

Internal supplies available			Short-circuit and overload protection: ■ 1 x 10.5 V ⎓ ± 5% supply for the reference potentiometer (1 to 10 kΩ), maximum current 10 mA ■ 1 x 24 V ⎓ supply (min. 21 V, max. 27 V), maximum current 200 mA.
External + 24 V power supply *(1)* (not supplied)			+24 V ⎓ (min. 19 V, max. 30 V) Power 30 W
Analog inputs	AI1-/AI1+		1 bipolar differential analog input ± 10 V ⎓ (maximum safe voltage 24 V) Max. sampling time: 2 ms ± 0.5 ms Resolution: 11 bits + 1 sign bit Accuracy: ± 0.6% for a temperature variation of 60°C Linearity: ± 0.15% of the maximum value
	AI2		1 software-configurable voltage or current analog input: ■ Voltage analog input 0...10 V ⎓, impedance 30 kΩ (max. safe voltage 24 V) ■ Current analog input X-Y mA by programming X and Y from 0 to 20 mA, with impedance 242 Ω Max. sampling time: 2 ms ± 0.5 ms Resolution: 11 bits Accuracy: ± 0.6% for a temperature variation of 60°C Linearity: ± 0.15% of the maximum value
	Other inputs		See option cards
Configurable voltage and current analog outputs	AO1		1 analog output configurable for voltage or current: ■ Voltage analog output 0...10 V ⎓, minimum load impedance 470 Ω ■ Current analog output X-Y mA by programming X and Y from 0 to 20 mA, maximum load impedance 500 Ω Max. sampling time: 2 ms ± 0.5 ms Resolution: 10 bits Accuracy: ± 1% for a temperature variation of 60°C Linearity: ± 0.2%
	Other outputs		See option cards
Configurable relay outputs	R1A, R1B, R1C		1 relay logic output, one “N/C” contact and one “N/O” contact with common point Minimum switching capacity: 3 mA for 24 V ⎓ Maximum switching capacity: ■ On resistive load (cos φ = 1): 5 A for 250 V ∿ or 30 V ⎓ ■ On inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 V ∿ or 30 V ⎓ Max. response time: 7 ms ± 0.5 ms Electrical service life: 100,000 operations
	R2A, R2B		1 relay logic output, one “N/O” contact Minimum switching capacity: 3 mA for 24 V ⎓ Maximum switching capacity: ■ On resistive load (cos φ = 1): 5 A for 250 V ∿ or 30 V ⎓ ■ On inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 V ∿ or 30 V ⎓ Max. response time: 7 ms ± 0.5 ms Electrical service life: 100,000 operations
	Other outputs		See option cards
Logic inputs LI	LI1...LI5		5 programmable logic inputs, 24 V ⎓, compatible with level 1 PLC, IEC 65A-68 standard Impedance: 3.5 kΩ Maximum voltage: 30 V Max. sampling time: 2 ms ± 0.5 ms Multiple assignment makes it possible to configure several functions on one input (example: LI1 assigned to forward and preset speed 2, LI3 assigned to reverse and preset speed 3)
	LI6		1 logic input, switch-configurable as a logic input or as an input for PTC probes Logic input, characteristics identical to inputs LI1...LI5 Input for a maximum of 6 PTC probes mounted in series: ■ nominal value < 1.5 kΩ ■ trip resistance 3 kΩ, reset value 1.8 kΩ ■ short-circuit protection < 50 Ω
	Positive logic (Source)		State 0 if ⩽ 5 V or logic input not wired, state 1 if ⩾ 11 V
	Negative logic (Sink)		State 0 if ⩾ 16 V or logic input not wired, state 1 if ⩽ 10 V
	Other inputs		See option cards
Safety input	PWR		1 input for the Power Removal safety function: ■ Power supply: 24 V ⎓ (max. 30 V) ■ Impedance: 1.5 kΩ ■ State 0 if < 2 V, state 1 if > 17 V
Maximum I/O wire size and tightening torque for inputs/outputs			2.5 mm² (AWG 14) 0.6 Nm

(1) Please consult our specialist catalogue “Power supplies, splitter blocks and interfaces”.

Electrical control characteristics (continued)

Acceleration and deceleration ramps			Ramp profiles: ■ Linear, can be adjusted separately from 0.01 to 9999 s ■ S, U or customized Automatic adaptation of deceleration ramp time if braking capacities exceeded, possible inhibition of this adaptation (use of braking resistor).
Braking to a standstill			By DC injection: ■ By a command on a programmable logic input ■ Automatically as soon as the estimated output frequency drops to < 0.1 Hz, period adjustable from 0 to 60 s or continuous, current adjustable from 0 to 1.2 In (in open-loop mode only).
Main drive protection and safety features			Thermal protection: ■ Against overheating ■ Of the power stage Protection against: ■ Short-circuits between motor phases ■ Input phase breaks ■ Overcurrents between output phases and earth ■ Overvoltages on the DC bus ■ A break on the control circuit ■ Exceeding the limit speed Safety function for: ■ Line supply overvoltage and undervoltage ■ Input phase loss, in 3-phase
Motor protection (see page 2/540)			Thermal protection integrated in drive via continuous calculation of I^2t taking speed into account: ■ The motor thermal state is saved when the drive is powered down. ■ Function can be modified via operator dialogue terminals, depending on the type of motor (force-cooled or self-cooled). Protection against motor phase breaks Protection with PTC probes
Dielectric strength	ATV 71H●●●M3 ATV 71H●●●M3X		Between earth and power terminals: 2830 V ⎓ Between control and power terminals: 4230 V ⎓
	ATV 71●●●●N4 ATV 71P●●●N4Z		Between earth and power terminals: 3535 V ⎓ Between control and power terminals: 5092 V ⎓
Insulation resistance to earth			> 1 MΩ (electrical isolation) 500 V ⎓ for 1 minute
Frequency resolution	Display units	**Hz**	0.1
	Analog inputs	**Hz**	0.024/50 Hz (11 bits)

Operational safety characteristics

Protection	Of the machine		Power Removal (PWR) safety function which forces stopping and/or prevents the motor from restarting unintentionally, 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 the motor from restarting unintentionally, conforming to IEC/EN 61508 level SIL2 and draft standard IEC/EN 61800-5-2.
Response time		**ms**	≤ 100 in STO (Safe Torque Off)

Communication port characteristics

Modbus protocol

Type of connection		Modbus RJ45 connector port	Modbus RJ45 network port
Structure	Physical interface	2-wire RS 485	
	Transmission mode	RTU	
	Transmission speed	Configurable via the display terminal or the PowerSuite software workshop: 9600 bps or 19,200 bps	Configurable via the display terminal or the PowerSuite software workshop: 4800 bps, 9600 bps, 19,200 bps or 38.4 Kbps
	Format	Fixed = 8 bits, even parity, 1 stop	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 should be provided by the wiring system (for example, in the master)	
	Address	1 to 247, configurable via the terminal or the PowerSuite software workshop. 3 addresses can be configured in order to access the drive data, the “Controller Inside” programmable card and the communication card respectively. These 3 addresses are identical for the connector and network ports.	
Services	Functional profiles	CiA DSP 402: “Device Profile Drives and Motion Control”. I/O profile	
	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	Can be inhibited. “Time out”, which can be set between 0.1 s and 30 s	
Diagnostics	With LEDs on ATV 71H●●●M3Z, ATV 71HD11M3XZ, HD15M3XZ, ATV 71H075N4Z…HD75N4Z ATV 71P●●●N4Z	One activity LED on integrated 7-segment display terminal. One LED for each port.	
	With graphic display terminal	One activity LED Command word received Reference received For each port: ■ Number of frames received ■ Number of incorrect frames	

CANopen protocol

Structure	Connector	9-way male SUB-D connector on CANopen adapter. This connects to the Modbus RJ45 network port.
	Network management	Slave
	Transmission speed	20 kbps, 50 kbps, 125 kbps, 250 kbps, 500 kbps or 1 Mbps
	Address (Node ID)	1 to 127, configurable via the terminal or the PowerSuite software workshop.
Services	Number of PDOs	3 receive and 3 transmit (PDO1, PDO2 and PDO3)
	PDO modes	Event-triggered, Time-triggered, Remotely-requested, Sync (cyclic), Sync (acyclic)
	PDO linking	Yes
	PDO mapping	Configurable (PDO1 and PDO2)
	Number of SDOs	1 server
	Emergency	Yes
	CANopen application layer	CiA DS 301, V 4.02
	Profiles	CiA DSP 402: “Device Profile Drives and Motion Control” I/O profile
	Communication monitoring	Node Guarding, Heartbeat
Diagnostics	With LEDs on ATV 71H●●●M3Z, ATV 71HD11M3XZ, HD15M3XZ, ATV 71H075N4Z…HD75N4Z ATV 71P●●●N4Z	2 LEDs: “RUN” and “ERROR” on integrated 7-segment display terminal
	With graphic display terminal and PowerSuite software workshop	2 LEDs: “RUN” and “ERROR” Command word received Reference received Display of received PDOs Display of transmitted PDOs State of NMT chart Received PDOs counter Transmitted PDOs counter Reception error counter Transmission error counter
Description file		A single eds file is supplied for the whole range on the CD-ROM containing the documentation or can be downloaded from the Internet at www.telemecanique.com. It contains the description of the drive parameters.

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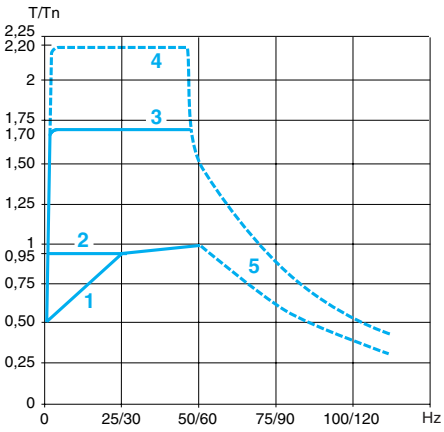
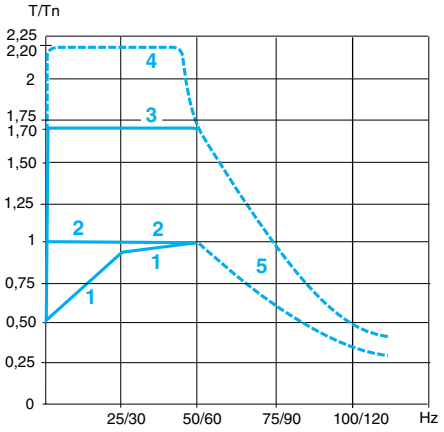
Variable speed drives for asynchronous motors
Altivar 71



Open loop applications



Closed loop applications

Torque characteristics (typical curves)

The curves opposite define the available continuous torque and transient overtorque for both force-cooled and self-cooled motors. The only difference is in the ability of the motor to provide a high continuous torque at less than half the nominal speed.

Open loop applications

1 Self-cooled motor: continuous useful torque *(1)*
2 Force-cooled motor: continuous useful torque
3 Overtorque for 60 s maximum
4 Transient overtorque for 2 s maximum
5 Torque in overspeed at constant power *(2)*

Closed loop applications

1 Self-cooled motor: continuous useful torque *(1)*
2 Force-cooled motor: continuous useful torque
3 Overtorque for 60 s maximum
4 Transient overtorque for 2 s maximum
5 Torque in overspeed at constant power *(2)*

Altivar 71 drives are capable of supplying nominal torque continuously at zero speed.

Motor thermal protection

Altivar 71 drives feature thermal protection designed specifically for self-cooled or forced-cooled variable speed motors. The drive calculates the motor thermal state even when it is switched off.

This motor thermal protection is designed for a maximum ambient temperature of 40°C around the motor. If the temperature around the motor exceeds 40°C, thermal protection should be provided directly by thermistor probes (PTC) integrated in the motor. The probes are managed directly by the drive.

(1) For power ratings ≤ 250 W, derating is 20% instead of 50% at very low frequencies.
(2) The motor nominal frequency and the maximum output frequency can be adjusted from 10 to 500 Hz or 1600 Hz, depending on the rating.
Check the mechanical overspeed characteristics of the selected motor with the manufacturer.

Variable speed drives for asynchronous motors
Altivar 71

Special uses

Using Altivar 71 drives with synchronous motors

Altivar 71 drives are also suitable for powering synchronous motors (sinusoidal electromotive force) in open loop mode and are used to achieve performance levels comparable to those associated with an asynchronous motor in sensorless flux vector control.
This drive/motor combination makes it possible to obtain remarkable speed accuracy and maximum torque even at zero speed. The design and construction of synchronous motors are such that they offer enhanced power density and speed dynamics in a compact unit. Drive control for synchronous motors does not cause stalling.

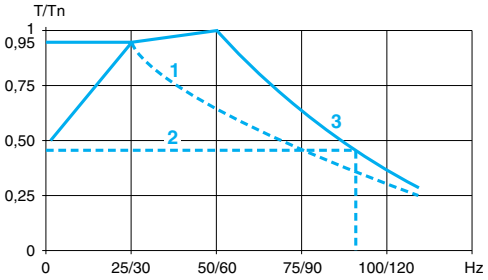
Using special motors at high-speed

These motors are designed for constant torque applications with high frequency ranges. The Altivar 71 drive supports operating frequencies of up to 1600 Hz. By design, this type of motor is more sensitive to overvoltages than a standard motor. Various solutions are available:
- Overvoltage limitation function
- Output filters

The drive's 5-point voltage/frequency control ratio is particularly well-suited as it avoids resonance.

Using a motor at overspeed

The maximum output frequency of the drive can be adjusted from 10 to 1600 Hz for drives rated less than or equal to 37 kW and from 10 to 500 Hz for higher ratings. When using a standardized asynchronous motor at overspeed, check the mechanical overspeed characteristics of the selected motor with the manufacturer.
Above its nominal speed corresponding to a frequency of 50/60 Hz, the motor operates with a decreasing flux, and its torque decreases significantly (see curve opposite).
The application must be able to permit this type of low-torque, high-speed operation.



Using a motor at overspeed

1 Machine torque (degressive torque)
2 Machine torque (low motor torque)
3 Continuous motor torque

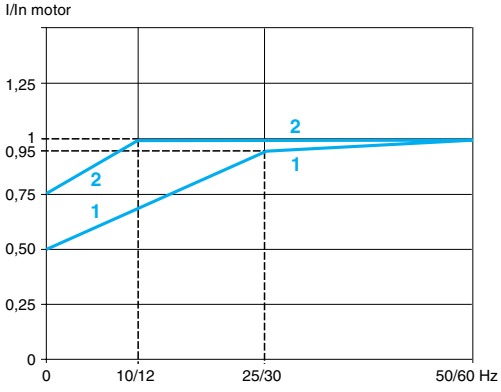
Typical applications: wood-working machinery, broaching machines, high-speed hoisting, etc.

Motor power less than drive power

The Altivar 71 can power any motor which has a rating lower than that for which the drive was designed. This motor/drive combination makes it suitable for applications requiring high, intermittent overtorque.
Typical applications: machines with very high starting torque, grinders, kneaders, etc.

Note: *In this case, it is advisable to over-rate the drive to the next standard power rating immediately above that of the motor.*

Example: Use an 11 kW motor with a 15 kW drive.



Power of a self-cooled motor greater than the drive power

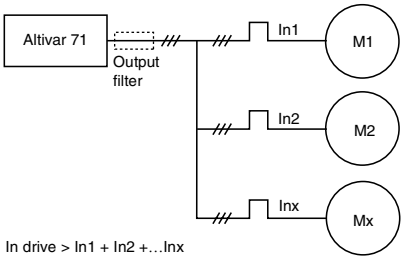
Power of a self-cooled motor greater than the drive power

This motor-drive combination makes it possible to use a self-cooled motor for a greater speed range in continuous operation. The use of a motor with a higher power rating than that of the drive is only possible if the current drawn by this motor is lower than or equal to the nominal drive current.

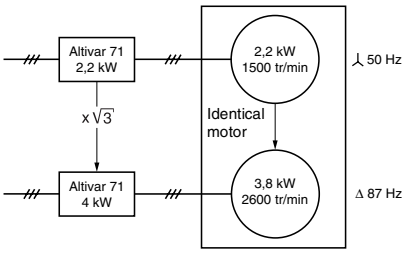
Note: *Limit the motor power to the standard rating immediately above that of the drive.*

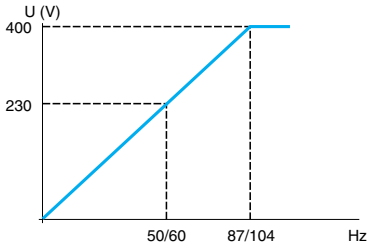
Example: On a single machine, the use of a 2.2 kW drive combined with a 3 kW motor means that the machine can operate at its nominal power (2.2 kW) at low speed.
1 Motor power = drive power = 2.2 kW
2 2.2 kW drive combined with a 3 kW motor: greater speed range at 2.2 kW.

Variable speed drives for asynchronous motors
Altivar 71



Connecting motors in parallel





Using a motor at constant torque up to 87/104 Hz

Special uses (continued)

Connecting motors in parallel

The nominal current of the drive must be greater than or equal to the sum of the currents of the motors to be controlled.
In this case, provide external thermal protection for each motor using probes or thermal overload relays. For cable runs over a certain length, taking account of all the tap links, it is advisable either to install an output filter between the drive and the motors or to use the overvoltage limitation function.

If several motors are used in parallel, there are 2 possible scenarios:
- The motors have equal power ratings, in which case the torque characteristics will remain optimized after the drive has been configured
- The motors have different power ratings, in which case the torque characteristics will not be optimized for all the motors

Using a motor at constant torque up to 87/104 Hz

A 400 V, 50 Hz motor in ⅄ connection can be used at constant torque up to 87 Hz if it is in Δ connection.
In this particular case, the initial motor power and the power of the first associated drive are multiplied by √3 (it is therefore important to select a drive with a suitable rating).
Example: A 2.2 kW 50 Hz motor in ⅄ connection supplies 3.8 kW at 87 Hz with a Δ connection.

Note: *Check the overspeed operating characteristics of the motor.*

Using special motors

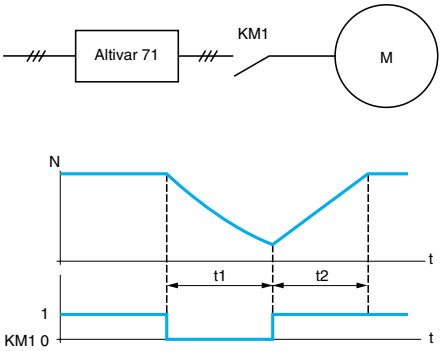
Special brake motors: tapered rotor or flux bypass

The magnetic field releases the brake. This type of operation with the Altivar 71 drive requires application of the voltage/frequency ratio.

Note: *The no-load current may be high, and operation at low speed can only be intermittent.*

Resistive rotor asynchronous motors

Different motor control ratios available on the Altivar 71 drive make it possible to apply specific settings when using high-slip motors.



t1: deceleration without ramp (freewheel)
t2: acceleration with ramp
N: motor speed

Example of loss of output contactor

Special uses (continued)

Switching the motor at the drive output

The drive can be switched when locked or unlocked. If the drive is switched on-the-fly (drive unlocked), the motor is controlled and accelerates until it reaches the reference speed smoothly following the acceleration ramp. This use requires configuration of the automatic catching a spinning load (“catch on the fly”) and the motor phase loss on output cut functions.

Typical applications: loss of safety circuit at drive output, bypass function, switching of motors connected in parallel.
On new installations, it is recommended that the Power Removal safety function is used.

Test on a low power motor or without a motor

In a testing or maintenance environment the drive can be checked without having to switch to a motor with the same rating as the drive (particularly useful in the case of high power drives). This use requires deactivation of the motor phase loss function.

Variable speed drives for asynchronous motors

Altivar 71

Supply voltage 200…240 V 50/60 Hz

PF105779-16-M

ATV 71HU22M3Z

PF105775-13-M

ATV 71H037M3

PF105776-17-M

ATV 71HD37M3X

UL Type 1/IP 20 drives

Motor		Line supply				Altivar 71				
Power indicated on plate *(1)*		Line current *(2)*		Apparent power	Maximum prospective line Isc	Maximum continuous current *(1)*	Max. transient current for		Reference	Weight
		200 V	240 V	240 V		230 V	60 s	2 s		
kW	*HP*	A	A	kVA	kA	A	A	A		kg
Single phase supply voltage: 200…240 V 50/60 Hz										
0.37	*0.5*	6.9	5.8	1.4	5	3	4.5	4.9	**ATV 71H075M3** *(3) (4)*	3.000
0.75	*1*	12	9.9	2.4	5	4.8	7.2	7.9	**ATV 71HU15M3** *(3) (4)*	3.000
1.5	*2*	18.2	15.7	3.7	5	8	12	13.2	**ATV 71HU22M3** *(3) (4)*	3.000
2.2	*3*	25.9	22.1	5.3	5	11	16.5	18.1	**ATV 71HU30M3** *(3) (4)*	4.000
3	–	25.9	22	5.3	5	11	20.6	22.6	**ATV 71HU40M3** *(3) (4) (5)*	4.000
4	*5*	34.9	29.9	7	5	17.5	26.3	28.8	**ATV 71HU55M3** *(3) (4) (5)*	5.500
5.5	*7.5*	47.3	40.1	9.5	22	27.5	41.3	45.3	**ATV 71HU75M3** *(3) (4) (5)*	5.500
3-phase supply voltage: 200…240 V 50/60 Hz										
0.37	*0.5*	3.5	3.1	1.3	5	3	4.5	4.9	**ATV 71H037M3** *(3) (4)*	3.000
0.75	*1*	6.1	5.3	2.2	5	4.8	7.2	7.9	**ATV 71H075M3** *(3) (4)*	3.000
1.5	*2*	11.3	9.6	4	5	8	12	13.2	**ATV 71HU15M3** *(3) (4)*	3.000
2.2	*3*	15	12.8	5.3	5	11	16.5	18.1	**ATV 71HU22M3** *(3) (4)*	4.000
3	–	19.3	16.4	6.8	5	13.7	20.6	22.6	**ATV 71HU30M3** *(3) (4)*	4.000
4	*5*	25.8	22.9	9.5	5	17.5	26.3	28.8	**ATV 71HU40M3** *(3) (4)*	4.000
5.5	*7.5*	35	30.8	12.8	22	27.5	41.3	45.3	**ATV 71HU55M3** *(3) (4)*	5.500
7.5	*10*	45	39.4	16.4	22	33	49.5	54.5	**ATV 71HU75M3** *(3) (4)*	7.000
11	*15*	53.3	45.8	19	22	54	81	89.1	**ATV 71HD11M3X** *(3) (4) (6)*	16.000
15	*20*	71.7	61.6	25.6	22	66	99	109	**ATV 71HD15M3X** *(3) (4) (6)*	16.000
18.5	*25*	77	69	28.7	22	75	112	124	**ATV 71HD18M3X** *(3) (6)*	30.000
22	*30*	88	80	33.3	22	88	132	145	**ATV 71HD22M3X** *(3) (6)*	30.000
30	*40*	124	110	45.7	22	120	180	198	**ATV 71HD30M3X** *(3) (6)*	37.000
37	*50*	141	127	52.8	22	144	216	238	**ATV 71HD37M3X** *(3) (6)*	37.000
45	*60*	167	147	61.1	22	176	264	290	**ATV 71HD45M3X** *(3) (6)*	37.000
55	*75*	200	173	71.9	35	221	332	365	**ATV 71HD55M3X** *(6) (7) (8)*	59.000
75	*100*	271	232	96.4	35	285	428	470	**ATV 71HD75M3X** *(6) (7) (8)*	72.000

(1) These values are given for a nominal switching frequency of 4 kHz up to ATV 71HD15M3X or 2.5 kHz for ATV 71HD18M3X…HD75M3X drives for use in continuous operation.
The switching frequency is adjustable from 1…16 kHz up to ATV 71HD45M3X and from 1...8 kHz for ATV 71HD55M3X and ATV 71HD75M3X drives.
Above 2.5 or 4 kHz, depending on the rating, the drive will reduce the switching frequency automatically in the event of an excessive temperature rise. For continuous operation above the nominal switching frequency, derate the nominal drive current, see derating curves on pages 2/499 and 2/501 to 2/503.

(2) Typical value for the indicated motor power and for the maximum prospective line Isc.

(3) ATV 71HD55M3X and ATV HD75M3X are supplied as standard in a reinforced version for operation in specific environmental conditions (see the environmental conditions on page 2/349).
To order ATV 71H●●●M3 and ATV 71HD11M3X…ATV 71HD45M3X drives in a reinforced version for specific environmental conditions, add the following at the end of the reference:
S337 for ATV 71H●●●M3. For example, ATV 71H037M3 becomes ***ATV 71H037M3S337****,*
337 for ATV 71H●●●M3X. For example, ATV 71HD11M3X becomes ***ATV 71HD11M3X337****.*
If a reinforced version of the drive is supplied for particular environmental conditions, it will feature a remote graphic display terminal.

(4) All drives come with a remote graphic display terminal as standard. To order an ATV 71H●●●M3, ATV 71HD11M3X or ATV 71HD15M3X drive without a graphic display terminal, add a ***Z*** *at the end of the reference.*
The drive will then come equipped with an integrated 7-segment display terminal.
For example, ATV 71H037M3 becomes ***ATV 71H037M3Z****.*

(5) A line choke must be used, see page 2/422.

(6) Drive supplied without EMC filter. EMC filters are available as an option, see page 2/430.

(7) Drive supplied as standard with a DC choke, which must be used when connecting the drive to the 3-phase supply.
For connections to the DC bus, the drive can be ordered without a DC choke by adding a ***D*** *at the end of the reference.*
For example, ATV 71HD55M3X becomes ***ATV 71HD55M3XD****.*

(8) Drive supplied without plate for EMC mounting.
A choke appropriate for the drive rating is supplied in a UL Type 1, IP 21 or IP 31 kit, which must be ordered separately:
- For ATV 71H037M3…HD45M3X, order the kit for IP 21 conformity, see page 2/368,
- For ATV 71HD55M3X and HD75M3X, order the kit for UL Type 1 or IP 31 conformity, see pages 2/367 and 2/368.

Nota : *Consult the summary tables of possible drives, option and accessory combinations, see pages 2/438 and 2/439.*

Variable speed drives for asynchronous motors

Altivar 71

Supply voltage 380…480 V 50/60 Hz

PF121610-13-M

ATV 71HU22N4

PF105773-15-M

ATV 71HU40N4Z

PF105781-32-M

ATV 71HC28N4

UL Type 1/IP 20 drives

Motor		Line supply				Altivar 71					
Power indicated on plate (1)		Line current (2)		Apparent power	Maximum prospective line Isc	Maximum continuous current (1)		Max. transient current for		Reference	Weight
		380 V	480 V	380 V		380 V	460 V	60 s	2 s		
kW	HP	A	A	kVA	kA	A	A	A	A		kg
3-phase supply voltage: 380…480 V 50/60 Hz											
0.75	1	3.7	3	2.4	5	2.3	2.1	3.5	3.8	**ATV 71H075N4** (3) (4)	3.000
1.5	2	5.8	5.3	3.8	5	4.1	3.4	6.2	6.8	**ATV 71HU15N4** (3) (4)	3.000
2.2	3	8.2	7.1	5.4	5	5.8	4.8	8.7	9.6	**ATV 71HU22N4** (3) (4)	3.000
3	–	10.7	9	7	5	7.8	6.2	11.7	12.9	**ATV 71HU30N4** (3) (4)	4.000
4	5	14.1	11.5	9.3	5	10.5	7.6	15.8	17.3	**ATV 71HU40N4** (3) (4)	4.000
5.5	7.5	20.3	17	13.4	22	14.3	11	21.5	23.6	**ATV 71HU55N4** (3) (4)	5.500
7.5	10	27	22.2	17.8	22	17.6	14	26.4	29	**ATV 71HU75N4** (3) (4)	5.500
11	15	36.6	30	24.1	22	27.7	21	41.6	45.7	**ATV 71HD11N4** (3) (4)	7.000
15	20	48	39	31.6	22	33	27	49.5	54.5	**ATV 71HD15N4** (3) (4)	16.000
18.5	25	45.5	37.5	29.9	22	41	34	61.5	67.7	**ATV 71HD18N4** (3) (4)	16.000
22	30	50	42	32.9	22	48	40	72	79.2	**ATV 71HD22N4** (3) (4)	30.000
30	40	66	56	43.4	22	66	52	99	109	**ATV 71HD30N4** (3) (4)	37.000
37	50	84	69	55.3	22	79	65	118.5	130	**ATV 71HD37N4** (3) (4)	37.000
45	60	104	85	68.5	22	94	77	141	155	**ATV 71HD45N4** (3) (4)	44.000
55	75	120	101	79	22	116	96	174	191	**ATV 71HD55N4** (3) (4)	44.000
75	100	167	137	109.9	22	160	124	240	264	**ATV 71HD75N4** (3) (4)	44.000
90	125	166	134	109.3	35	179	179	269	295	**ATV 71HD90N4** (5) (6)	60.000
110	150	202	163	133	35	215	215	323	355	**ATV 71HC11N4** (5) (6)	74.000
132	200	239	192	157.3	35	259	259	388	427	**ATV 71HC13N4** (5) (6)	80.000
160	250	289	233	190.2	50	314	314	471	518	**ATV 71HC16N4** (5) (6)	110.000
200	300	357	286	235	50	387	387	580	638	**ATV 71HC20N4** (5) (6)	140.000
220	350	396	320	260.6	50	427	427	640	704	**ATV 71HC25N4** (5) (6)	140.000
250	400	444	357	292.2	50	481	481	721	793		
280	450	494	396	325.1	50	550	550	825	907	**ATV 71HC28N4** (5) (6)	140.000
315	500	555	444	365.3	50	616	616	924	1016	**ATV 71HC31N4** (5) (6)	215.000
355	–	637	512	419.3	50	671	671	1006	1107	**ATV 71HC40N4** (5) (6)	225.000
400	600	709	568	466.6	50	759	759	1138	1252		
500	700	876	699	576.6	50	941	941	1411	1552	**ATV 71HC50N4** (5) (6)	300.000

(1) These values are given for a nominal switching frequency of 4 kHz up to ATV 71HD30N4 or 2.5 kHz for ATV 71HD37N4…HC50N4 drives for use in continuous operation.
The switching frequency is adjustable from 1…16 kHz up to 71HD37N4…HC50N4 and from 2.5...8 kHz for ATV 71HD90N4…ATV 71HC50N4 drives.
Above 2.5 or 4 kHz, depending on the rating, the drive will reduce the switching frequency automatically in the event of an excessive temperature rise. For continuous operation above the nominal switching frequency, derate the nominal drive current, see derating curves on pages 2/499 and 2/501 to 2/503.

(2) Typical value for the indicated motor power and for the maximum prospective line Isc.

(3) ATV 71HD90N4…HC50N4 drives are supplied as standard in a reinforced version for operation in specific environmental conditions (see the environmental conditions on page 2/349).
*To order the ATV 71H075N4...HD75N4 drives in a reinforced version, add **S337** at the end of the reference.*
*For example, ATV 71H075N4 becomes **ATV 71H075N4S337**.*
If a reinforced version of the drive is supplied for specific environmental conditions, it will feature a remote graphic display terminal.

*(4) All drives come with a remote graphic display terminal as standard. To order an ATV 71H075N4...ATV 71HD75N4 drive without a graphic display terminal, add a **Z** at the end of the reference.*
The drive will then come equipped with an integrated 7-segment display terminal.
*For example, ATV 71H075N4 without a graphic display terminal becomes **ATV 71H075N4Z**.*

(5) Drive supplied as standard with a DC choke, which must be used when connecting the drive to the 3-phase supply.
*For connections to the DC bus, the drive can be ordered without a DC choke by adding a **D** at the end of the reference.*
*For example, ATV 71HD90N4 becomes **ATV 71HD90N4D**.*

(6) Drive supplied without plate for EMC mounting.
A choke appropriate for the drive rating is supplied in a UL Type 1, IP 21 or IP 31 kit, which must be ordered separately:
- For ATV 71H075N4…HD75N4, order the kit for IP 21 conformity, see page 2/368,
- For ATV 71HD90N4…HC50N4, order the kit for UL Type 1 or IP 31 conformity, see pages 2/367 and 2/368.

***Nota :** Consult the summary tables of possible drives, option and accessory combinations, see pages 2/440 and 2/441.*

Presentation: pages 2/342 to 2/347
Characteristics: pages 2/348 to 2/355
Dimensions: pages 2/446 to 2/451
Schemes: pages 2/472 to 2/491
Functions: pages 2/512 to 2/543

Variable speed drives for asynchronous motors

Altivar 71

Supply voltage 380…480 V 50/60 Hz

PF105774-17-M

ATV 71W075N4

UL Type 12/IP 54 drives with an integrated class A EMC filter

Motor		Line supply				Altivar 71					
Power indicated on plate *(1)*		Line current *(2)*		Apparent power	Maximum prospective line Isc	Maximum continuous current *(1)*		Max. transient current for		Reference *(3)*	Weight
		380 V	480 V	380 V		380 V	460 V	60 s	2 s		
kW	*HP*	A	A	kVA	kA	A		A			kg
3-phase supply voltage: 380…480 V 50/60 Hz											
0.75	*1*	3.7	3	2.4	5	2.3	2.1	3.5	3.8	**ATV 71W075N4**	12.000
1.5	*2*	5.8	5.3	3.8	5	4.1	3.4	6.2	6.8	**ATV 71WU15N4**	12.000
2.2	*3*	8.2	7.1	5.4	5	5.8	4.8	8.7	9.6	**ATV 71WU22N4**	12.000
3	–	10.7	9	7	5	7.8	6.2	11.7	12.9	**ATV 71WU30N4**	13.000
4	*5*	14.1	11.5	9.3	5	10.5	7.6	15.8	17.3	**ATV 71WU40N4**	13.000
5.5	*7.5*	20.3	17	13.4	22	14.3	11	21.5	23.6	**ATV 71WU55N4**	16.000
7.5	*10*	27	22.2	17.8	22	17.6	14	26.4	29	**ATV 71WU75N4**	16.000
11	*15*	36.6	30	24.1	22	27.7	21	41.6	45.7	**ATV 71WD11N4**	21.000
15	*20*	48	39	31.6	22	33	27	49.5	54.5	**ATV 71WD15N4**	31.000
18.5	*25*	45.5	37.5	29.9	22	41	34	61.5	67.7	**ATV 71WD18N4**	31.000
22	*30*	50	42	32.9	22	48	40	72	79.2	**ATV 71WD22N4**	30.500
30	*40*	66	56	43.4	22	66	52	99	109	**ATV 71WD30N4**	38.500
37	*50*	84	69	55.3	22	79	65	118.5	130	**ATV 71WD37N4**	38.500
45	*60*	104	85	68.5	22	94	77	141	155	**ATV 71WD45N4**	61.500
55	*75*	120	101	79	22	116	96	174	191	**ATV 71WD55N4**	61.500
75	*100*	167	137	109.9	22	160	124	240	264	**ATV 71WD75N4**	61.500

(1) These values are given for the nominal switching frequency of 4 kHz up to ATV 71WD30N4, or 2.5 kHz for ATV 71WD37N4…WD75N4 drives for use in continuous operation.
The switching frequency is adjustable from 1…16 kHz for all ratings.
Above 2.5 or 4 kHz, depending on the rating, the drive will reduce the switching frequency automatically in the event of an excessive temperature rise. For continuous operation above the nominal switching frequency, derate the nominal drive current, see derating curves on page 2/509.

(2) Typical value for the indicated motor power and for the maximum prospective line Isc.

(3) All drives are supplied with a plate for EMC mounting.

Nota : *Consult the summary tables of possible drive, option and accessory combinations, see pages 2/442 and 2/443.*

Variable speed drives for asynchronous motors

Altivar 71 on base plate

Supply voltage 380…480 V 50/60 Hz

PF106783-134M

ATV 71PU40N4Z

UL Type 1/IP 20 drives on base plate with an integrated class A EMC filter

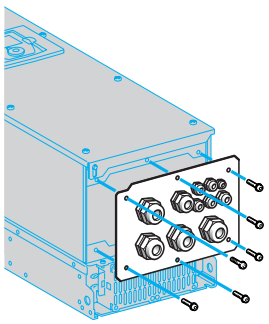
Motor		Line supply				Altivar 71					
Power indicated on plate *(1)*		Line current *(2)*		Apparent power	Maximum prospective line Isc	Maximum continuous current *(1)*		Max. transient current for		Reference *(3) (4) (5)*	Weight
		380 V	480 V	380 V		380 V	460 V	60 s	2 s		
kW	*HP*	A	A	kVA	kA	A	A	A	A		kg
3-phase supply voltage: 380…480 V 50/60 Hz											
0.75	*1*	3.7	3	2.4	5	2.3	2.1	3.5	3.8	**ATV 71P075N4Z**	2.700
1.5	*2*	5.8	5.3	3.8	5	4.1	3.4	6.2	6.8	**ATV 71PU15N4Z**	2.700
2.2	*3*	8.2	7.1	5.4	5	5.8	4.8	8.7	9.6	**ATV 71PU22N4Z**	2.700
3	–	10.7	9	7	5	7.8	6.2	11.7	12.9	**ATV 71PU30N4Z**	3.600
4	*5*	14.1	11.5	9.3	5	10.5	7.6	15.8	17.3	**ATV 71PU40N4Z**	3.600
5.5	*7.5*	20.3	17	13.4	22	14.3	11	21.5	23.6	**ATV 71PU55N4Z**	5.000
7.5	*10*	27	22.2	17.8	22	17.6	14	26.4	29	**ATV 71PU75N4Z**	5.000

(1) These values are given for a nominal switching frequency of 4 kHz for use in continuous operation.
The switching frequency is adjustable from 1…16 kHz.
Above 4 kHz, depending on the rating, the drive will reduce the switching frequency automatically in the event of an excessive temperature rise. For continuous operation above the nominal switching frequency, derate the nominal drive current, see derating curves on page 2/499.
(2) Typical value for the indicated motor power and for the maximum prospective line Isc.
(3) All ATV 71P●●●N4Z drives are equipped with an integrated 7-segment display terminal.
(4) A DC choke must be used, see page 2/419.
(5) All drives are supplied with a plate for EMC mounting and a thermal liner for mounting on the machine frame, see page 2/366.

Nota : *Consult the summary tables of possible drive, option and accessory combinations, see pages 2/444 and 2/445.*

Variable speed drives for asynchronous motors
Altivar 71
Options: accessories

DF535507



Ready-assembled IP 54 base plate

Adapter for 115 V ∿ logic inputs

This adapter is used to connect 115 V ∿ logic signals to the logic inputs on the drive or an I/O extension card.

7 logic inputs with capacitive impedance at 60 Hz of 0.22 µF are available for connecting the logic signals:
- Max. current: 200 mA
- Response time: 5 ms to change from state 0 to state 1, 20 ms to change from state 1 to state 0
- Logic state 0 for a voltage below 20 V, logic state 1 for a voltage between 70 V and 132 V

The power supply must be provided by a 115 V a external power supply (min. 70 V, max. 132 V).

References

Description	Reference	Weight kg
Adapter for 115 V ∿ logic inputs	**VW3 A3 101**	–

Ready-assembled IP 54 base plate (for ATV 71W●●●N4 drives)

This plate can be used to increase the number of cable connections supported by the drive as standard from 3 to 11.

It is supplied with:
- A metal cable gland for the motor cable
- A special plastic cable gland for the network cable
- Plastic cable glands for the connection of the control cable or options such as communication cards, etc.

References

For drive	Type of cable gland			Reference	Weight kg
	Metal	Plastic	Plastic for network cable		
ATV 71W075N4 …WU40N4	1 (ISO 25)	1 (ISO 12), 4 (ISO 16), 3 (ISO 20), 1 (ISO 25)	1 (ISO 32)	**VW3 A9 901**	–
ATV 71WU55N4, WU75N4	1 (ISO 25)	1 (ISO 12), 4 (ISO 16), 3 (ISO 20), 1 (ISO 25)	1 (ISO 32)	**VW3 A9 902**	–
ATV 71WD11N4	1 (ISO 32)	1 (ISO 12), 4 (ISO 16), 1 (ISO 20), 3 (ISO 32)	1 (ISO 32)	**VW3 A9 903**	–
ATV 71WD15N4, WD18N4	1 (ISO 32)	1 (ISO 12), 4 (ISO 16), 1 (ISO 20), 3 (ISO 32)	1 (ISO 32)	**VW3 A9 904**	–
ATV 71WD22N4	1 (ISO 40)	1 (ISO 12), 4 (ISO 16), 1 (ISO 20), 3 (ISO 40)	1 (ISO 32)	**VW3 A9 905**	–
ATV 71WD30N4, WD37N4	1 (ISO 40)	1 (ISO 12), 4 (ISO 16), 1 (ISO 20), 3 (ISO 50)	1 (ISO 32)	**VW3 A9 906**	–
ATV 71WD45N4 …WD75N4	1 (ISO 50)	1 (ISO 12), 4 (ISO 16), 1 (ISO 20), 1 (ISO 50), 1 (ISO 63)	1 (ISO 32)	**VW3 A9 907**	–

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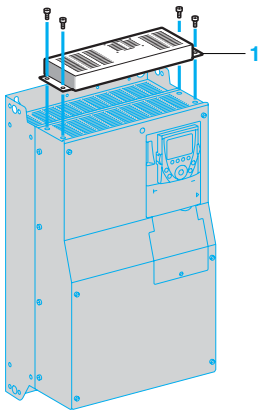


Control card fan kit

Control card fan kit
(for ATV 71H●●●●● drives on heatsink)

This kit is required for ATV 71HD18M3X…HD45M3X and ATV 71HD22N4…HD75N4 drives in order that they can operate at ambient temperatures between 50°C and 60°C, for example if they are mounted in an IP 54 enclosure. The circulation of the air around the electronic cards prevents the formation of hot spots.
Check the derating to be applied to the drive nominal current, see the derating curves on pages 2/499 and 2/501 to 2/503.

The kit 1 is mounted on the upper part of the drive. It is powered by the drive. It consists of:
- A fan subassembly
- Fixing accessories
- A manual

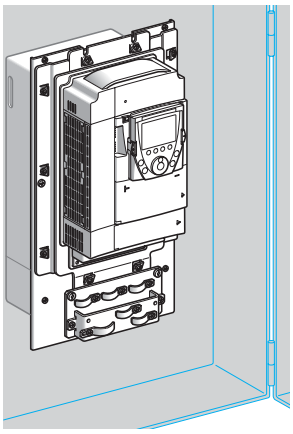
References

For drives	Reference	Weight kg
ATV 71HD18M3X, HD22M3X ATV 71HD22N4	**VW3 A9 404**	–
ATV 71HD30N4, HD37N4	**VW3 A9 405**	–
ATV 71HD30M3X…HD45M3X	**VW3 A9 406**	–
ATV 71HD45N4…HD75N4	**VW3 A9 407**	–

Dimensions:
page 2/452

Variable speed drives for asynchronous motors
Altivar 71
Options: accessories

530254



ATV 71HU75N4 flush-mounted drive

Kit for flush-mounting in a dust and damp proof enclosure
(for ATV 71H●●●●● drives on heatsink)

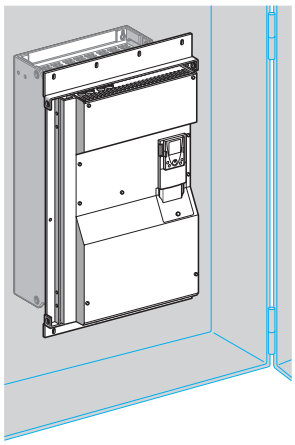
This kit can be used to mount the power section of the drive outside the enclosure (IP 54 degree of protection), which reduces the power dissipated into the enclosure, see page 2/504.
It is available for ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71HD55M3XD, HD75M3XD, ATV 71H●●●N4 and ATV 71HD90N4D…HC28N4D drives.

With this type of mounting, the maximum internal temperature in the enclosure can then reach 60°C without it being necessary to derate the drive current.
Between 50°C and 60°C, a control card fan kit must be used for ATV 71HD18M3X…HD45M3X and ATV 71HD22N4…HD75N4 drives to prevent hot spots, see page 2/364.

The back of the enclosure must be drilled and cut out for this type of mounting.

The kit consists of:
- A metal frame of the right size for the drive rating
- Corner pieces
- Corner pieces
- A fan support (this can be used to move the fans so that they can be accessed from the front of the enclosure).
- Fixing accessories
- A cutting and drilling template
- A manual

530255



ATV 71HC28N4D flush-mounted drive

References

For drives		Reference	Weight kg
ATV 71H037M3…HU15M3 ATV 71H075N4…HU22N4		**VW3 A9 501**	2.700
ATV 71HU22M3…HU40M3 ATV 71HU30N4, HU40N4		**VW3 A9 502**	3.100
ATV 71HU55M3 ATV 71HU55N4, HU75N4		**VW3 A9 503**	3.700
ATV 71HU75M3 ATV 71HD11N4		**VW3 A9 504**	4.600
ATV 71HD11M3X, HD15M3X ATV 71HD15N4, HD18N4		**VW3 A9 505**	4.900
ATV 71HD18M3X, HD22M3X ATV 71HD22N4		**VW3 A9 506**	3.900
ATV 71HD30N4, HD37N4		**VW3 A9 507**	4.200
ATV 71HD30M3X…HD45M3X		**VW3 A9 508**	4.900
ATV 71HD45N4…HD75N4		**VW3 A9 509**	5.200
ATV 71HD55M3X *(1)* ATV 71HD55M3XD *(2)* ATV 71HD90N4 *(1)* ATV 71HD90N4D *(2)*		**VW3 A9 510**	5.100
ATV 71HD75M3X *(1)* ATV 71HD75M3XD *(2)* ATV 71HC11N4 *(1)* ATV 71HC11N4D *(2)*		**VW3 A9 511**	3.600
ATV 71HC13N4 *(1)* ATV 71HC13N4D *(2)*		**VW3 A9 512**	4.300
ATV 71HC16N4 *(1)* ATV 71HC16N4D *(2)*		**VW3 A9 513**	4.400
ATV 71HC20N4…HC28N4 *(1)*	Without braking unit	**VW3 A9 514**	4.700
ATV 71HC20N4D…HC28N4D *(2)*	With braking unit	**VW3 A9 515**	4.700

(1) Drives supplied as standard with a DC choke. In this case, cut out and drill the enclosure for the choke. See pages 2/454 and 2/455.
(2) Drives supplied without DC choke.

Dimensions:
pages 2/453 to 2/455

Variable speed drives for asynchronous motors
Altivar 71
Options: accessories

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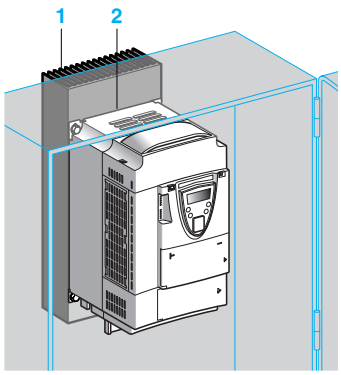

ATV 71PU22N4Z drive in a dust and damp proof enclosure

Kit for mounting in a dust and damp proof enclosure
(for ATV 71P●●●N4Z drives on base plate)

This kit can be used to mount a drive “on base plate” inside a dust and damp proof enclosure (IP 54 degree of protection). Heat is dissipated via a heatsink mounted outside the enclosure.

This type of mounting simply requires that a hole be drilled in the enclosure at the same level as the drive fixing holes used to mount the heatsink.

The kit consists of:
- A heatsink 1
- A thermal liner 2
- Hinged mechanical adapters
- A manual

Enclosure characteristics
The steel used for the floor-standing or wall-mounted enclosure which is to house the drive must meet the following requirements:
- Depth 1.5 to 3 mm
- Steel: Stainless or paint-finished smooth steel
- Heat-treated epoxy paintwork (lacquer finish not permitted), max. depth 70 µm, fine or medium texture

References

For drives	Reference	Weight kg
ATV 71P075N4Z…PU22N4Z	**VW3 A9 801**	–
ATV 71PU30N4Z, PU40N4Z	**VW3 A9 802**	–
ATV 71PU55N4Z, PU75N4Z	**VW3 A9 803**	–

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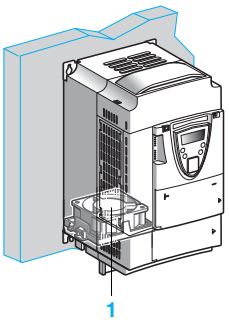

ATV 71PU22N4Z drive with fan VZ3 V1 203

Fan for variable speed drives on base plate
This fan 1 is required for ATV 71P●●●N4Z drives if they are not equipped with a DC choke (see page 2/416).

It is mounted on the lower part of the drive, thereby enabling installation dimensions to be optimized. It is powered by the drive.

References

For drives	Reference	Weight kg
ATV 71P075N4Z…PU22N4Z	**VZ3 V1 203**	–
ATV 71PU30N4Z, PU40N4Z	**VZ3 V1 209**	–
ATV 71PU55N4Z, PU75N4Z	**VZ3 V1 204**	–

Dimensions:
page 2/456

Variable speed drives for asynchronous motors
Altivar 71
Options: accessories

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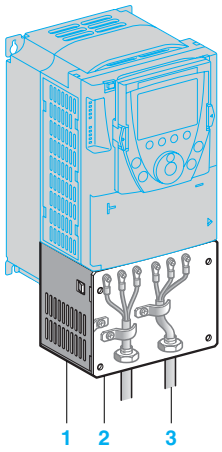

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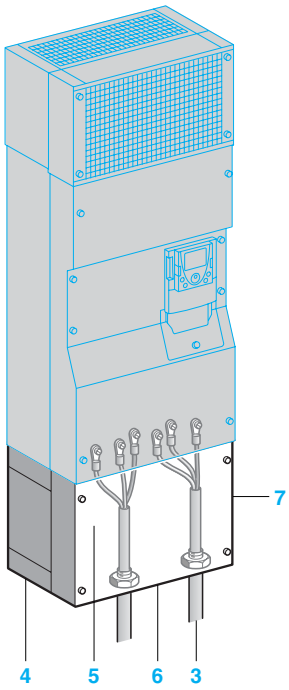


Kit for UL Type 1 conformity (mounting outside the enclosure)

When the drive is mounted directly on a wall outside the enclosure, this kit can be used to ensure UL Type 1 conformity when connecting the cables with a tube. The shielding is connected inside the kit.

For ATV 71H●●●M3, ATV 71HD11M3X…HD45M3X, ATV 71H075N4…HD75N4 and ATV 71P●●●N4Z, the kit consists of:
- All the mechanical parts 1 including a pre-cut plate 2 for connecting the tubes 3
- Fixing accessories
- A manual

For ATV 71HD55M3X, HD75M3X and ATV 71HD90N4…HC50N4, the kit consists of:
- An IP 54 casing 4 used to maintain the IP 54 degree of protection for the power section
- An EMC plate 5
- A UL Type 1 cover 7
- A pre-drilled plate 6 for connecting the tubes 3,
- Fixing accessories
- A manual

References

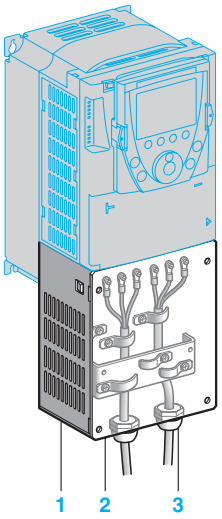
For drives		Reference	Weight kg
ATV 71H037M3…HU15M3 ATV 71H075N4…HU22N4 ATV 71P075N4Z…PU22N4Z		**VW3 A9 201**	1.300
ATV 71HU22M3…HU40M3 ATV 71HU30N4, HU40N4 ATV 71PU30N4Z, PU40N4Z		**VW3 A9 202**	1.500
ATV 71HU55M3 ATV 71HU55N4, HU75N4 ATV 71PU55N4Z, PU75N4Z		**VW3 A9 203**	1.800
ATV 71HU75M3 ATV 71HD11N4		**VW3 A9 204**	2.000
ATV 71HD11M3X, HD15M3X ATV 71HD15N4, HD18N4		**VW3 A9 205**	2.800
ATV 71HD18M3X, HD22M3X ATV 71HD22N4		**VW3 A9 206**	4.000
ATV 71HD30N4, HD37N4		**VW3 A9 207**	5.000
ATV 71HD30M3X…HD45M3X		**VW3 A9 217**	7.000
ATV 71HD45N4…HD75N4		**VW3 A9 208**	7.200
ATV 71HD55M3X *(1)* ATV 71HD55M3XD *(2)* ATV 71HD90N4 *(1)* ATV 71HD90N4D *(2)*		**VW3 A9 209**	9.400
ATV 71HD75M3X *(1)* ATV 71HD75M3XD *(2)* ATV 71HC11N4 *(1)* ATV 71HC11N4D *(2)*		**VW3 A9 210**	11.800
ATV 71HC13N4 *(1)* ATV 71HC13N4D *(2)*		**VW3 A9 211**	11.600
ATV 71HC16N4 *(1)* ATV 71HC16N4D *(2)*		**VW3 A9 212**	14.600
ATV 71HC20N4…HC28N4 *(1)*	Without braking unit	**VW3 A9 213**	19.500
ATV 71HC20N4D…HC28N4D *(2)*	With braking unit	**VW3 A9 214**	19.500

(1) Drives supplied as standard with a DC choke.
(2) Drives supplied without DC choke.

Dimensions:
pages 2/456 and 2/457

Variable speed drives for asynchronous motors
Altivar 71
Options: accessories

533326



Kits for IP 21 or IP 31 conformity (mounting outside the enclosure)

When the drive is mounted directly on a wall outside the enclosure, this kit can be used to ensure IP 21 or IP 31 degree of protection when connecting the cables with a cable gland.
The shielding is connected inside the kit.

For ATV 71H●●●M3, ATV 71HD11M3X…HD45M3X, ATV 71H075N4...HD75N4 and ATV 71P●●●N4Z drives, the kit conforms to IP 21 degree of protection.
It consists of:
- All the mechanical parts 1 including a drilled plate 2 for fixing the cable glands 3
- Fixing accessories
- A manual

For ATV 71HD55M3X, HD75M3X and ATV 71HD90N4...HC50N4, the kit conforms to IP 31 degree of protection.
It consists of:
- An IP 54 casing 4 used to maintain the IP 54 degree of protection for the power section
- An EMC plate with cable clamps 5
- An IP 31 cover 6
- Fixing accessories
- A manual

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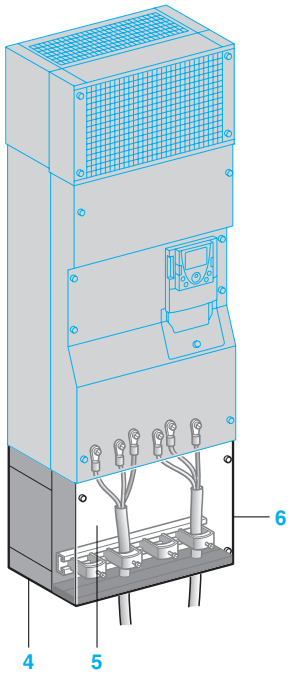


IP 21 or IP 31 conformity kits

References

For drives		Degree of protection	Reference	Weight kg
ATV 71H037M3…HU15M3 ATV 71H075N4…HU22N4 ATV 71P075N4Z…PU22N4Z		IP 21	**VW3 A9 101**	1.300
ATV 71HU22M3…HU40M3 ATV 71HU30N4, HU40N4 ATV 71PU30N4Z, PU40N4Z		IP 21	**VW3 A9 102**	1.500
ATV 71HU55M3 ATV 71HU55N4, HU75N4 ATV 71PU55N4Z, PU75N4Z		IP 21	**VW3 A9 103**	1.800
ATV 71HU75M3 ATV 71HD11N4		IP 21	**VW3 A9 104**	2.000
ATV 71HD11M3X, HD15M3X ATV 71HD15N4, HD18N4		IP 21	**VW3 A9 105**	2.800
ATV 71HD18M3X, HD22M3X ATV 71HD22N4		IP 21	**VW3 A9 106**	4.000
ATV 71HD30N4, HD37N4		IP 21	**VW3 A9 107**	5.000
ATV 71HD30M3X…HD45M3X		IP 21	**VW3 A9 117**	7.000
ATV 71HD45N4…HD75N4		IP 21	**VW3 A9 108**	7.000
ATV 71HD55M3X *(1)* ATV 71HD55M3XD *(2)* ATV 71HD90N4 *(1)* ATV 71HD90N4D *(2)*		IP 31	**VW3 A9 109**	9.400
ATV 71HD75M3X *(1)* ATV 71HD75M3XD *(2)* ATV 71HC11N4 *(1)* ATV 71HC11N4D *(2)*		IP 31	**VW3 A9 110**	11.800
ATV 71HC13N4 *(1)* ATV 71HC13N4D *(2)*		IP 31	**VW3 A9 111**	11.600
ATV 71HC16N4 *(1)* ATV 71HC16N4D *(2)*		IP 31	**VW3 A9 112**	14.600
ATV 71HC20N4…HC28N4 *(1)*	Without braking unit	IP 31	**VW3 A9 113**	19.500
ATV 71HC20N4D…HC28N4D *(2)*	With braking unit	IP 31	**VW3 A9 114**	19.500
ATV 71HC31N4, HC40N4 *(1)* ATV 71HC31N4D, HC40N4D *(2)*		IP 31	**VW3 A9 115**	25.000
ATV 71HC50N4 *(1)* ATV 71HC50N4D *(2)*		IP 31	**VW3 A9 116**	35.000

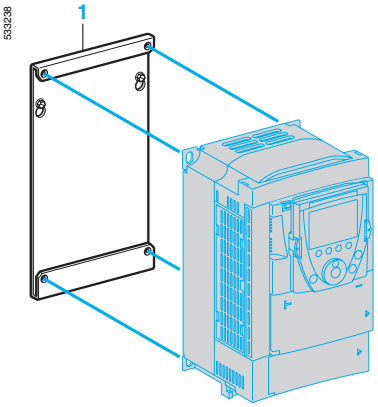
(1) Drives supplied as standard with a DC choke.
(2) Drives supplied without DC choke.

Dimensions:
pages 2/456 and 2/457

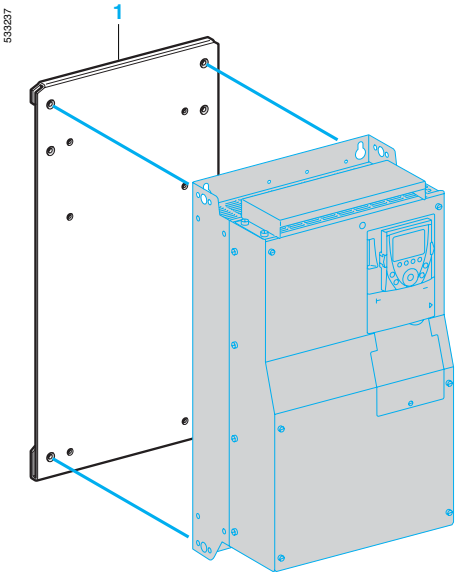
Variable speed drives for asynchronous motors

Altivar 71

Options: accessories



Substitution kit VW3 A9 304



Substitution kit VW3 A9 312

Substitution kit for Altivar 58 or Altivar 58F drives

This kit 1 is used to fit an Altivar 71 drive in the place of an Altivar 58 or Altivar 58F drive using the same fixing holes. It includes the mechanical adapters required for mounting.

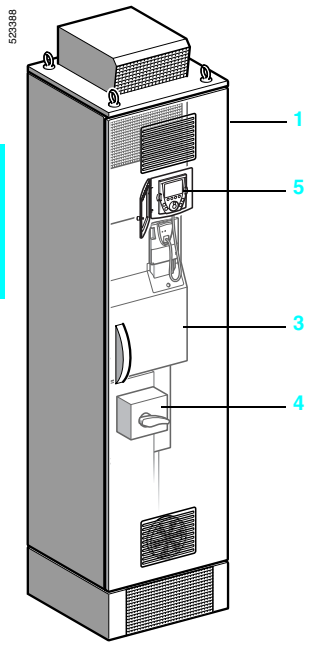
High torque application (170% Tn)

Old drive	Motor Power		Replaced by	Reference	Weight
	kW	*HP*			kg
Supply voltage 200…240 V single phase					
ATV 58HU09M2	0.37	*0.5*	ATV 71H075M3	**VW3 A9 301**	–
ATV 58HU18M2	0.75	*1*	ATV 71HU15M3	**VW3 A9 301**	–
ATV 58HU29M2	1.5	*2*	ATV 71HU22M3	**VW3 A9 303**	–
ATV 58HU41M2	2.2	*3*	ATV 71HU30M3	**VW3 A9 303**	–
ATV 58HU72M2	3	–	ATV 71HU40M3	**VW3 A9 304**	–
ATV 58HU90M2	4	*5*	ATV 71HU55M3	**VW3 A9 306**	–
ATV 58HD12M2	5.5	*7.5*	ATV 71HU75M3	**VW3 A9 307**	–
Supply voltage 200…240 V three-phase					
ATV 58HU29M2	1.5	*2*	ATV 71HU15M3	**VW3 A9 302**	–
ATV 58HU41M2	2.2	*3*	ATV 71HU22M3	**VW3 A9 303**	–
ATV 58HU54M2	3	–	ATV 71HU30M3	**VW3 A9 304**	–
ATV 58HU72M2	4	*5*	ATV 71HU40M3	**VW3 A9 304**	–
ATV 58HU90M2	5.5	*7.5*	ATV 71HU55M3	**VW3 A9 306**	–
ATV 58HD12M2	7.5	*10*	ATV 71HU75M3	**VW3 A9 307**	–
ATV 58HD16M2X	11	*15*	ATV 71HD11M3X	**VW3 A9 309**	–
ATV 58HD23M2X	15	*20*	ATV 71HD15M3X	**VW3 A9 309**	–
ATV 58HD28M2X	18.5	*25*	ATV 71HD18M3X	**VW3 A9 312**	–
ATV 58HD33M2X	22	*30*	ATV 71HD22M3X	**VW3 A9 312**	–
ATV 58HD46M2X	30	*40*	ATV 71HD30M3X	**VW3 A9 314**	–
Supply voltage 380…480 V three-phase					
ATV 58HU18N4	0.75	*1*	ATV 71H075N4	**VW3 A9 302**	–
ATV 58HU29N4	1.5	*2*	ATV 71HU15N4	**VW3 A9 302**	–
ATV 58HU41N4	2.2	*3*	ATV 71HU22N4	**VW3 A9 302**	–
ATV 58HU54N4	3	–	ATV 71HU30N4	**VW3 A9 304**	–
ATV 58HU72N4	4	*5*	ATV 71HU40N4	**VW3 A9 304**	–
ATV 58HU90N4	5.5	*7.5*	ATV 71HU55N4	**VW3 A9 305**	–
ATV 58HD12N4	7.5	*10*	ATV 71HU75N4	**VW3 A9 306**	–
ATV 58HD16N4	11	*15*	ATV 71HD11N4	**VW3 A9 307**	–
ATV 58HD23N4	15	*20*	ATV 71HD15N4	**VW3 A9 308**	–
ATV 58HD28N4	18.5	*25*	ATV 71HD18N4	**VW3 A9 309**	–
ATV 58HD33N4	22	*30*	ATV 71HD22N4	**VW3 A9 310**	–
ATV 58HD46N4	30	*40*	ATV 71HD30N4	**VW3 A9 310**	–
ATV 58HD54N4	37	*50*	ATV 71HD37N4	**VW3 A9 312**	–
ATV 58HD64N4	45	*60*	ATV 71HD45N4	**VW3 A9 312**	–
ATV 58HD79N4	55	*75*	ATV 71HD55N4	**VW3 A9 312**	–

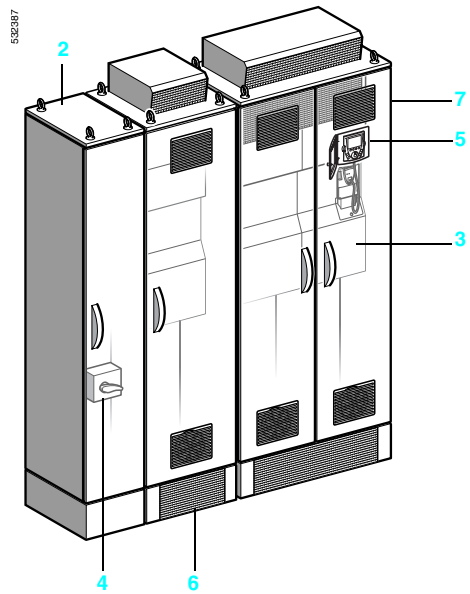
Standard torque application (120% Tn)

Old drive	Motor Power		Replaced by	Reference	Weight
	kW	*HP*			kg
Supply voltage 200…240 V three-phase					
ATV 58HD16M2X	15	*20*	ATV 71HD15M3X	**VW3 A9 309**	–
ATV 58HD23M2X	18.5	*25*	ATV 71HD18M3X	**VW3 A9 310**	–
ATV 58HD28M2X	22	*30*	ATV 71HD22M3X	**VW3 A9 312**	–
ATV 58HD33M2X	30	*40*	ATV 71HD30M3X	**VW3 A9 312**	–
ATV 58HD46M2X	37	*50*	ATV 71HD37M3X	**VW3 A9 312**	–
Supply voltage 380…480 V three-phase					
ATV 58HD28N4	22	*30*	ATV 71HD22N4	**VW3 A9 310**	–
ATV 58HD33N4	30	*40*	ATV 71HD30N4	**VW3 A9 310**	–
ATV 58HD46N4	37	*50*	ATV 71HD37N4	**VW3 A9 310**	–
ATV 58HD54N4	45	*60*	ATV 71HD45N4	**VW3 A9 312**	–
ATV 58HD64N4	55	*75*	ATV 71HD55N4	**VW3 A9 312**	–
ATV 58HD79N4	75	*100*	ATV 71HD75N4	**VW3 A9 312**	–

Variable speed drives for asynchronous motors
Altivar 71 ready-assembled in IP 54 enclosure



ATV 71E5D90N4…E5C28N4,
ATV 71E5C20N4F…E5C28N4F



ATV 71E5C31N4…E5C50N4 + VW3 A7E 102

Note: *The order shown above is compulsory. The braking unit must be placed directly to the left of the drive.*

Presentation

Altivar 71 variable speed drives rated from 90 kW to 500 kW can be supplied ready-assembled in an IP 54 enclosure to facilitate installation and, in particular, to ensure optimum ventilation.

This ATV 71E5●●●N4● offer comprises one or two IP 54 enclosures with a non-modifiable hardware configuration for a 380...480 V three phase supply only.

Description

The Altivar 71 ready-assembled in enclosure offer comprises:
- One ready-assembled enclosure 1 or two ready-assembled enclosures 2 and 7 depending on the rating
- A drive on heatsink ATV 71HD90N4…HC50N4 3
- A switch and fast-acting fuses 4
- An IP 65 remote graphic display terminal kit 5

This equipment is supplied with operating instructions containing all the:
- Parts lists
- Electrical diagrams
- Mechanical drawings

Options

All the following options available for ATV 71H●●●N4 drives can be used at the same rating with the ATV 71E5●●●N4● enclosed drives offer (see the compatible combinations tables for Altivar 71 UL Type 1/IP 20 drives, pages 2/440 and 2/441):
- Adaptor for 115 V ∿ logic inputs
- Option cards: Communication, encoder interface, programmable "Controller Inside" and I/O extension cards
- Braking and hoisting resistors
- Network braking units
- Line chokes and passive filters
- Additional EMC input filters
- Sinus filters and motor chokes
- PowerSuite software workshop

These options can be assembled according to customer requirements.

Note: *UL Type 1, IP 21 or IP 31 conformity kits are not necessary for this range.*

Resistance braking units

ATV 71E5D90N4…E5C16N4 ready-assembled enclosures include an integrated braking transistor in the drive.

ATV 71E5C20N4…E5C50N4 ready-assembled enclosures require a braking unit, which is controlled by the drive.
Assembly of the braking unit varies depending on the drive rating:
- For ATV 71E5C20N4F…E5C28N4F enclosures, the braking unit is mounted directly in the enclosure, on the left-hand side of the drive.
- For ATV 71E5C31N4...E5C50N4 enclosures, the VW3 A7E 102 braking unit is supplied in a separate IP 54 enclosure 6. This enclosure must be installed between enclosures 2 and 7:
  - Enclosure 7 contains the ATV 71HC31N4…HC50N4 drive 3.
  - Enclosure 2 contains the switch 4 and the fast acting fuses.

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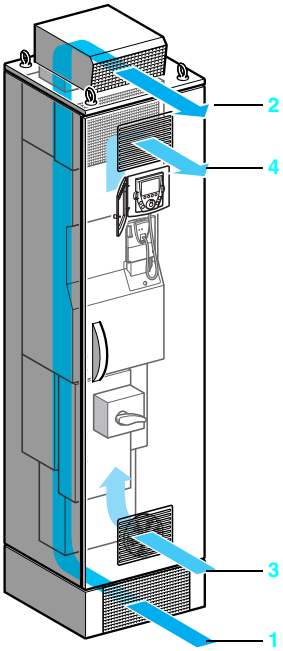
References: page 2/372
Dimensions: pages 2/373 to 2/375

Variable speed drives for asynchronous motors
Altivar 71 ready-assembled in IP 54 enclosure

Ventilation



Two separate air circuits ensure optimum enclosure ventilation by cooling the power section and the control section.

Power section:
1 Air intake is via an IP 54 grille on the front of the plinth.
2 Air is expelled via an IP 54 grille on the front of the enclosure roof.

Control section:
3 Air intake is via a fan with IP 54 filter on the lower part of the enclosure door.
4 Air is expelled via an IP 54 grille with filter on the upper part of the enclosure door.

Characteristics specific to the ATV 71E5●●●N4● offer *(1)*

Maximum temperature		+ 45 °C inside the enclosure, + 50 °C outside the enclosure
Line supply connection		Directly to the switch, cable entry required at base of enclosure
Motor connection		Directly to the drive, cable entry required at base of enclosure
Control terminal connection		Directly to the drive's control terminals
Colour of SAREL Spacial 6000 Cell Enclosures		RAL 7032

(1) For other characteristics, see page 2/348.

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References: page 2/372
Dimensions: pages 2/373 to 2/375

Variable speed drives for asynchronous motors

Altivar 71 ready-assembled in IP 54 enclosure

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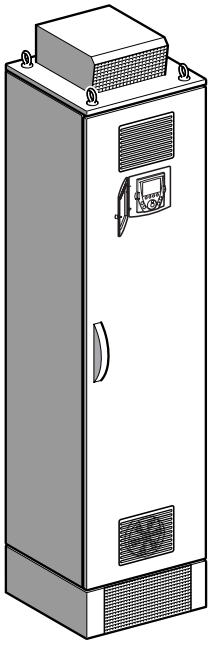

ATV 71E5D90N4...E5C28N4,
ATV 71E5C20N4F...E5C28N4F

References

Description	Motor Power kW	Motor Power HP	With drive	Reference	Weight kg
Ready-assembled enclosure with integrated braking transistor in the drive	90	*125*	ATV 71HD90N4	**ATV 71E5D90N4**	280.000
	110	*150*	ATV 71HC11N4	**ATV 71E5C11N4**	300.000
	132	*200*	ATV 71HC13N4	**ATV 71E5C13N4**	310.000
	160	*250*	ATV 71HC16N4	**ATV 71E5C16N4**	340.000
Ready-assembled enclosure with braking unit in the enclosure	200	*300*	ATV 71HC20N4	**ATV 71E5C20N4F**	603.000
	250	*400*	ATV 71HC25N4	**ATV 71E5C25N4F**	603.000
	280	*450*	ATV 71HC28N4	**ATV 71E5C28N4F**	603.000
Ready-assembled enclosure without braking unit	200	*300*	ATV 71HC20N4	**ATV 71E5C20N4** *(1)*	430.000
	250	*400*	ATV 71HC25N4	**ATV 71E5C25N4** *(1)*	430.000
	280	*450*	ATV 71HC28N4	**ATV 71E5C28N4** *(1)*	430.000
	315	*500*	ATV 71HC31N4	**ATV 71E5C31N4** *(2)*	748.000
	400	*600*	ATV 71HC40N4	**ATV 71E5C40N4** *(2)*	806.000
	500	*700*	ATV 71HC50N4	**ATV 71E5C50N4** *(2)*	938.000

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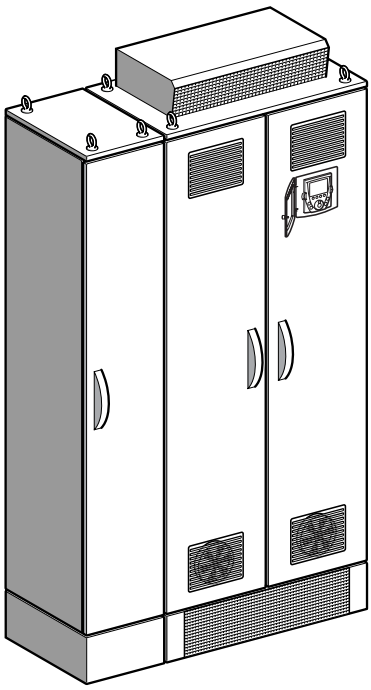

ATV 71E5C31N4...E5C50N4

Option specific to ATV 71E5C31N4...E5C50N4 drives

Description	For drive	Reference	Weight kg
IP 54 enclosure with braking unit	ATV 71E5C31N4 ATV 71E5C40N4 ATV 71E5C50N4	**VW3 A7E 102**	262.000

(1) To add a compatible braking unit, order reference ATV 71E5C20N4F...ATV 71E5C28N4F depending on the rating required. The braking unit is then supplied mounted in the enclosure next to the drive.

(2) Braking unit in IP 54 enclosure to be ordered separately (see reference above).

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Characteristics: page 2/371
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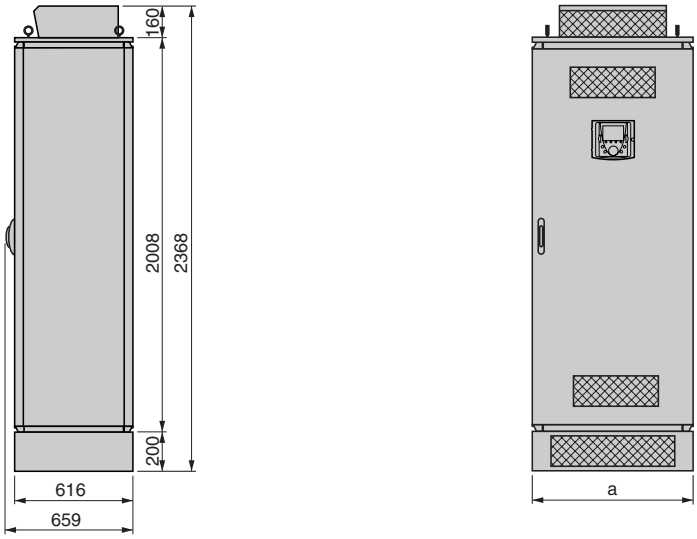
Variable speed drives for asynchronous motors
Altivar 71 ready-assembled in IP 54 enclosure

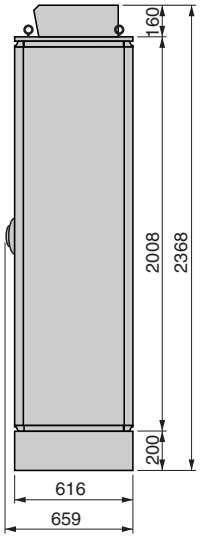
ATV 71E5D90N4…E5C28N4, ATV 71E5C20N4F…E5C28N4F



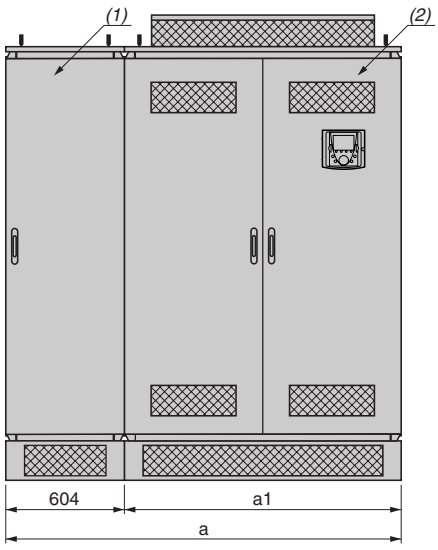
ATV 71E5	a
D90N4…C16N4	616
C20N4…C28N4,	816
C20N4F…C28N4F	816

ATV 71E5C31N4…E5C50N4

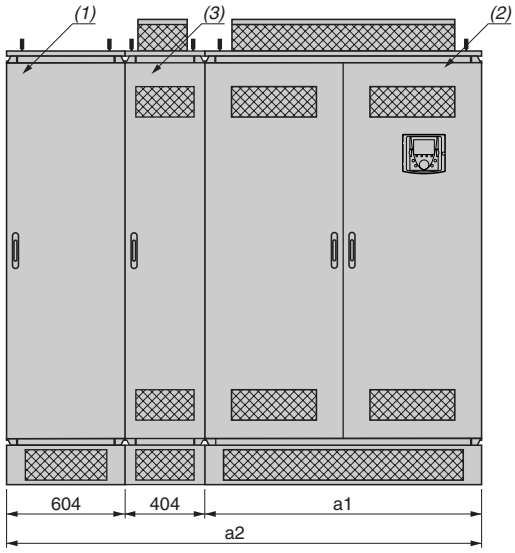
Common side view



ATV 71E5C31N4…E5C50N4 without braking unit



ATV 71E5C31N4…E5C50N4 with braking unit

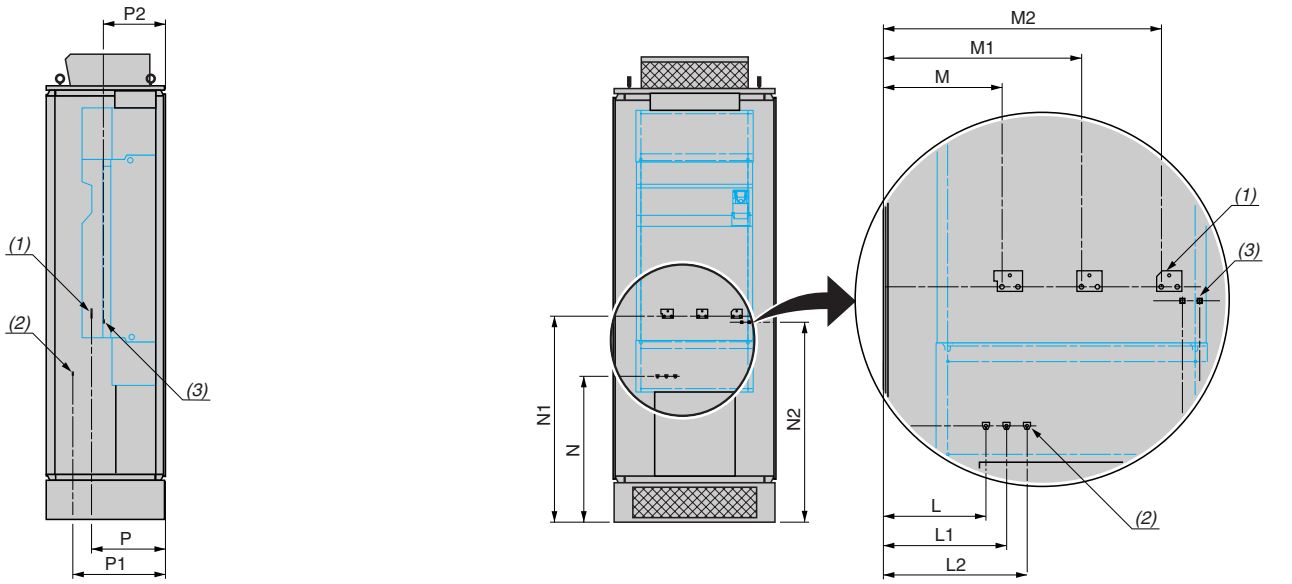


ATV 71E5	a	a1	a2
C31N4	1620	1016	2024
C40N4	1620	1016	2024
C50N4	1820	1216	2224

(1) Supplied with the ATV 71E5C31N4…E5C50N4 ready-assembled enclosure (2), this enclosure contains the switch and fast acting fuses.
(2) ATV 71E5C31N4…E5C50N4 ready-assembled enclosure.
(3) VW3 A7E 102 braking unit in enclosure.

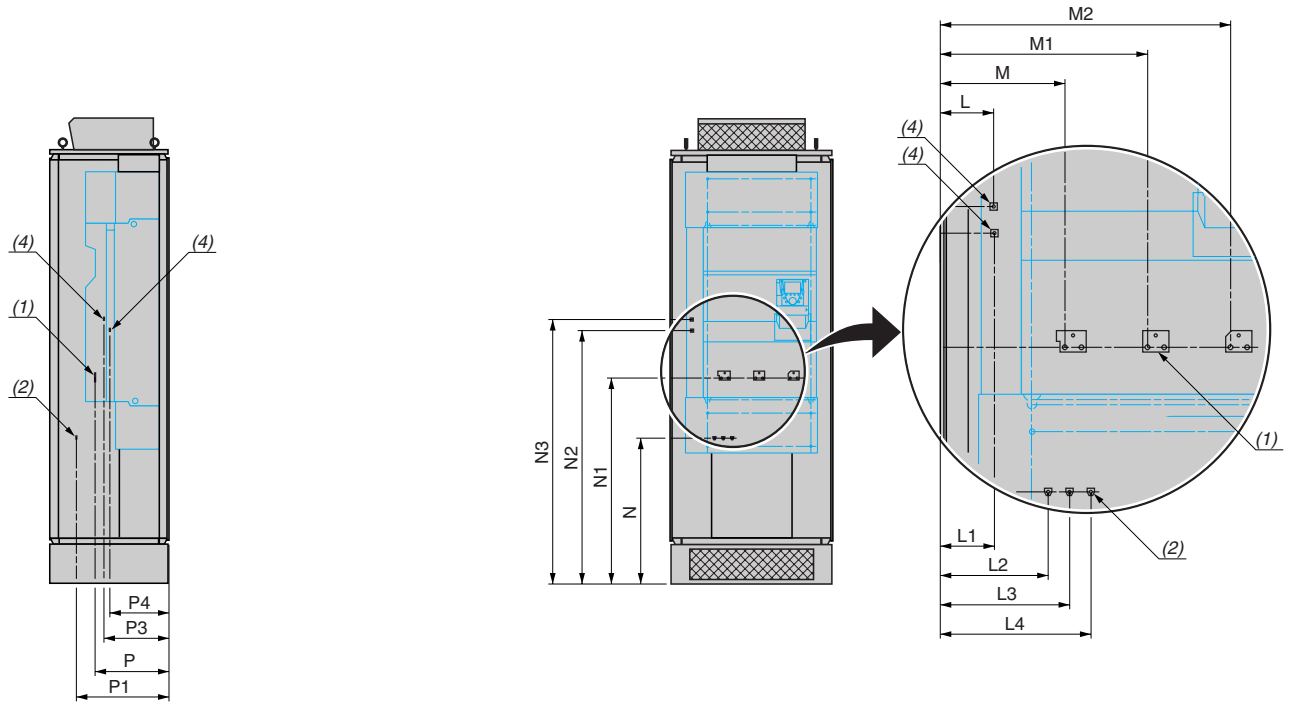
Variable speed drives for asynchronous motors
Altivar 71 ready-assembled in IP 54 enclosure

ATV 71E5D90N4…E5C16N4



ATV 71E5	L	L1	L2	M	M1	M2	N	N1	N2	P	P1	P2
D90N4	230	265	300	290	350	410	770	1330	1295	350	465	280
C11N4	225	270	315	240	300	360	740	1330	1267	380	470	315
C13N4	225	270	315	260	335	410	740	1055	1024	375	470	305
C16N4	225	270	315	205	310	415	740	1060	1024	375	470	315

ATV 71E5C20N4…E5C28N4, ATV 71E5C20N4F…E5C28N4F



ATV 71E5	L	L1	L2	L3	L4	M	M1	M2	N	N1	N2	N3	P	P1	P3	P4
C20N4…C28N4	–	–	225	270	315	260	435	610	740	1045	–	–	375	470	–	–
C20N4F…C28N4F	110	112	225	270	315	260	435	610	740	1045	1285	1342	375	470	330	300

(1) Terminal for connecting the motor.
(2) Terminal for connecting the switch.
(3) Terminal for connecting the braking resistor.
*(4) Terminal for connecting the braking unit (**ATV 71E5C20N4F**…**ATV 71E5C28N4F** only).*

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Characteristics: page 2/371
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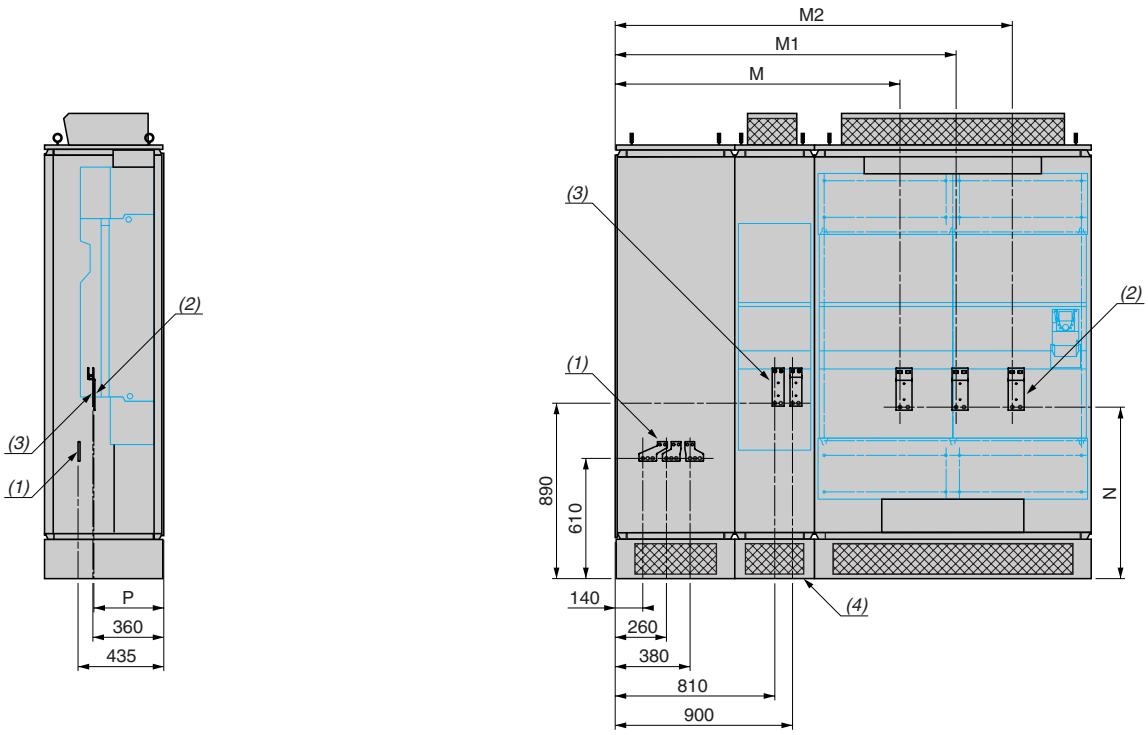
Variable speed drives for asynchronous motors

Altivar 71 ready-assembled in IP 54 enclosure

ATV 71E5C31N4…E5C50N4



ATV 71E5	With braking unit			Without braking unit				
	M	M1	M2	M	M1	M2	N	P
C31N4	1445	1730	2015	840	1125	1410	870	355
C40N4	1335	1675	2015	730	1070	1410	870	355
C50N4	1320	1755	2190	715	1150	1585	865	360

(1) Terminal for connecting the switch.
(2) Terminal for connecting the motor.
(3) Terminal for connecting the braking resistor.
(4) VW3 A7E 102 braking unit in enclosure.

Variable speed drives for asynchronous motors

Altivar 71

Options: dialogue

Remote graphic display terminal

(this display terminal can be supplied with the drive or ordered separately)

This display terminal is attached to the front of the drive. It includes the integrated 7-segment display terminal for drives supplied without a graphic display terminal.
It can be:
- Used remotely in conjunction with the appropriate accessories (see below)
- Connected to several drives using multidrop link components (see page 2/377)

It is used:
- To control, adjust and configure the drive
- To display the current values (motor, input/output values, etc.)
- To save and download configurations; 4 configuration files can be saved.

The terminal's maximum operating temperature is 60°C and it features IP 54 protection.

Description

1 Graphic display:
- 8 lines, 240 x 160 pixels
- Large digits that can be read from 5 m away
- Supports display of bar charts

2 Assignable function keys F1, F2, F3, F4:
- Dialogue functions: direct access, help screens, navigation
- Application functions: "Local Remote", preset speed

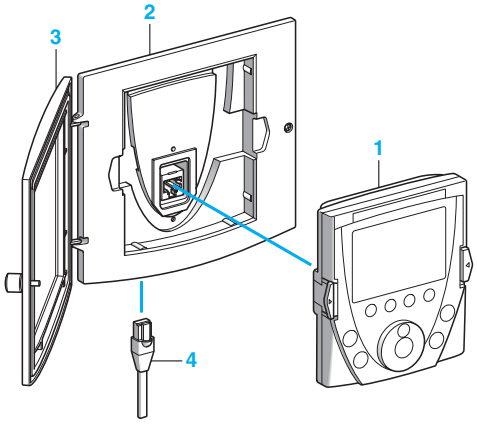
3 "STOP/RESET" key: local control of motor stop/fault reset
4 "RUN" key: local control of motor operation
5 Navigation button:
- Press: Saves the current value (ENT)
- Turn ±: Increases or decreases the value, you to the next or previous line

6 "FWD/REV" key: Reverses the direction of rotation of the motor
7 "ESC" key: Aborts a value, a parameter or a menu to return to the previous selection

Note: *Keys 3, 4 and 6 can be used to control the drive directly.*

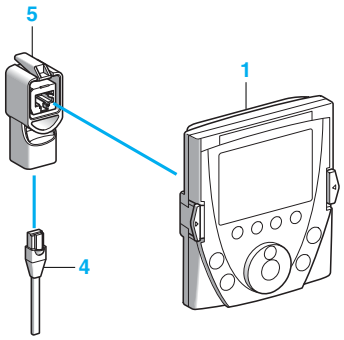
References

Description	No.	Reference	Weight kg
Remote graphic display terminal	1	**VW3 A1 101**	0.145



Remote graphic display terminal accessories

The following accessories are available:
- A remote mounting kit for mounting on an enclosure door with IP 54 degree of protection. It includes:
  - All the mechanical fittings
  - Screws and bolts
- A transparent door which attaches to the remote mechanics to achieve IP 65 degree of protection
- A cable equipped with two RJ45 connectors so that the graphic display terminal can be connected to the Altivar 71 drive (1, 3, 5 or 10 m lengths available)
- An RJ45 female/female adapter for connecting the graphic display terminal VW3 A1 101 to the remote cable VW3 A1 104 R●●●



References

Description	No.	Length m	Degree of protection	Reference	Weight kg
Remote mounting kit *(1)*	2	–	IP 54	**VW3 A1 102**	0.150
Door *(2)*	3	–	IP 65	**VW3 A1 103**	0.040
Remote cables equipped with 2 RJ45 connectors	4	1	–	**VW3 A1 104 R10**	0.050
	4	3	–	**VW3 A1 104 R30**	0.150
	4	5	–	**VW3 A1 104 R50**	0.250
	4	10	–	**VW3 A1 104 R100**	0.500
RJ45 female/female adapter	5	–	–	**VW3 A1 105**	0.010

(1) In this case, use a remote connecting cable VW3 A1 104 R●●, which must be ordered separately (see above).
(2) To be mounted on remote mounting kit VW3 A1 102 (for mounting on an enclosure door), which must be ordered separately (see above).

Dimensions:
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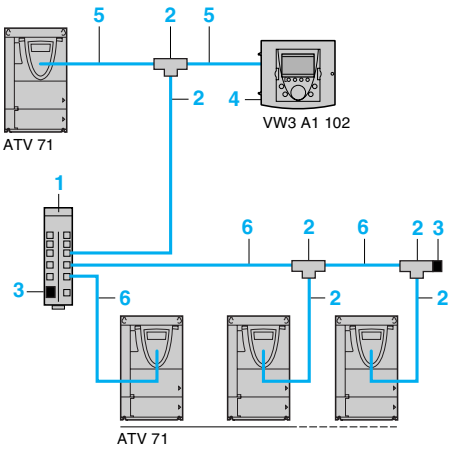
Variable speed drives for asynchronous motors
Altivar 71
Options: dialogue



Example of connection via multidrop link

Multidrop link components

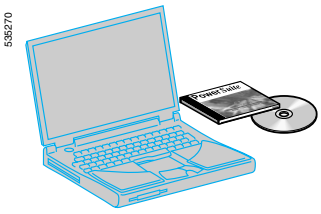
These components enable a graphic display terminal to be connected to several drives via a multidrop link. This multidrop link is connected to the Modbus terminal port on the front of the drive.

Connection accessories

Description			No.	Sold in lots of	Unit reference	Weight kg
Modbus splitter block 10 RJ45 connectors and 1 screw terminal			1	–	**LU9 GC3**	0.500
Modbus T-junction boxes	With integrated cable (0.3 m)		2	–	**VW3 A8 306 TF03**	–
	With integrated cable (1 m)		2	–	**VW3 A8 306 TF10**	–
Modbus line terminator	For RJ45 connector	R = 120 Ω, C = 1 nF	3	2	**VW3 A8 306 RC**	–
Remote mounting kit	For graphic display terminal VW3 A1 101		4	–	**VW3 A1 102**	0.150

Connecting cables
(equipped with 2 RJ45 connectors)

Used with	No.	Length m	Reference	Weight kg
For remote operation of the Altivar 71 and the graphic display terminal VW3 A1 101	5	1	**VW3 A1 104 R10**	0.050
		3	**VW3 A1 104 R30**	0.150
		5	**VW3 A1 104 R50**	0.250
		10	**VW3 A1 104 R100**	0.500
Modbus bus	6	0.3	**VW3 A8 306 R03**	0.025
		1	**VW3 A8 306 R10**	0.060
		3	**VW3 A8 306 R30**	0.130



PowerSuite software workshop

PowerSuite software workshop

The PowerSuite software workshop offers the following benefits:
- Messages can be displayed in plain text in several languages (English, French, German, Italian and Spanish)
- Work can be prepared in the design office without having to connect the drive to the PC
- Configurations and settings can be saved to floppy disk or hard disk and downloaded to the drive
- Print facility
- Altivar 58 or Altivar 58F files can be converted for transfer to an Altivar 71 drive
- Oscillograms can be displayed

See pages 3/2 to 3/5.

Dimensions:
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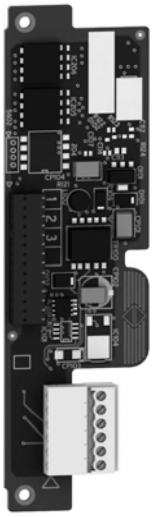
Variable speed drives for asynchronous motors

Altivar 71

Option: encoder interface cards

Presentation



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VW3 A3 401

Encoder interface cards are used for Flux Vector Control operation with sensor (FVC mode) which improves drive performance irrespective of the state of the motor load:
- Zero speed torque
- Accurate speed regulation
- Torque accuracy
- Shorter response times on a torque surge
- Improved dynamic performance in transient state

In other control modes (voltage vector control, voltage/frequency ratio), encoder interface cards improve static speed accuracy.

Encoder interface cards can also be used for machine safety irrespective of the control type:
- Overspeed detection
- Load veering detection

Encoder interface cards can also transmit an Altivar 71 drive reference provided by the encoder input. This use is specific to synchronizing the speed of several drives.

Three types of card are available depending on the encoder technology:
- RS 422 compatible differential outputs
- Open collector outputs (NPN)
- Push-pull outputs

The card is inserted into a dedicated slot.

Characteristics

Encoder interface cards with RS422 compatible differential outputs

Type of card		**VW3 A3 401**		**VW3 A3 402** *(1)*	
Power (supplied by the card)	Voltage	5 V ⎓ (min. 5 V, max. 5.5 V)		15 V ⎓ (min. 15 V, max. 16 V)	
	Maximum current	200 mA		175 mA	
		Short-circuit and overload protection			
Maximum operating frequency		300 kHz			
Input signals		A, $\overline{A}$, B, $\overline{B}$			
	Impedance	440 Ω			
Number of pulses/ encoder revolution		5000 maximum The maximum high-speed frequency should not exceed 300 kHz.			
Maximum consumption current of encoder		**100 mA** *(2)*	**200 mA** *(2)*	**100 mA** *(3)*	**200 mA** *(3)*
Minimum recommended cross-section of conductors *(4)*	For a maximum cable length of 25 m	0.2 mm² (AWG 24)	0.5 mm² (AWG 20)	0.2 mm² (AWG 24)	
	For a maximum cable length of 50 m	0.5 mm² (AWG 20)	0.75 mm² (AWG 18)	0.2 mm² (AWG 24)	
	For a maximum cable length of 100 m	0.75 mm² (AWG 18)	1.5 mm² (AWG 15)	0.2 mm² (AWG 24)	
	For a maximum cable length of 1000 m	–		0.5 mm² (AWG 20)	1 mm² (AWG 17)

(1) Card VW3 A3 402 ensures compatibility between Altivar 68F and Altivar 71 drive applications.
(2) Minimum encoder power supply 4.5 V.
(3) Minimum encoder power supply 8 V.
(4) Shielded cable containing 3 twisted pairs at intervals of between 20 and 50 mm. Connect the shielding to earth at both ends. Minimum recommended conductor cross-section for a minimum encoder voltage in order to limit line voltage drops.

Schemes:
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Characteristics (continued)

Encoder interface card with open collector outputs

Type of card		VW3 A3 403		VW3 A3 404	
Power (supplied by the card)	Voltage	12 V ⎓ (min. 12 V, max. 13 V)		15 V ⎓ (min. 15 V, max. 16 V)	
	Maximum current	175 mA			
		Short-circuit and overload protection			
Maximum operating frequency		300 kHz			
Input signals		A, $\overline{A}$, B, $\overline{B}$ / AB / A			
	Impedance	1 kΩ			
Number of pulses/encoder revolution		5000 maximum The maximum high-speed frequency should not exceed 300 kHz.			
Maximum consumption current of encoder		**100 mA** *(1)*	**175 mA** *(1)*	**100 mA** *(1)*	**175 mA** *(1)*
Minimum recommended cross-section of conductors *(2)*	For a maximum cable length of 100 m	0.2 mm² (AWG 24)	0.5 mm² (AWG 20)	0.2 mm² (AWG 24)	
	For a maximum cable length of 200 m	0.5 mm² (AWG 20)	0.75 mm² (AWG 18)	0.2 mm² (AWG 24)	
	For a maximum cable length of 500 m	1 mm² (AWG 17)	1.5 mm² (AWG 15)	0.5 mm² (AWG 20)	
	For a maximum cable length of 1000 m	–		0.75 mm² (AWG 18)	1.5 mm² (AWG 15)

Encoder interface card with push-pull outputs

Type of card		VW3 A3 405		VW3 A3 406		VW3 A3 407
Power (supplied by the card)	Voltage	12 V ⎓ (min. 12 V, max. 13 V)		15 V ⎓ (min. 15 V, max. 16 V)		+24 V ⎓ (min. 20 V, max. 30 V)
	Maximum current	175 mA				100 mA
		Short-circuit and overload protection				
Maximum operating frequency		300 kHz				
Input signals		A, $\overline{A}$, B, $\overline{B}$ / AB / A				
	Impedance	1 kΩ				1.6 kΩ
	State 0	If < 1.5 V				
	State 1	If > 7.7 V and < 13 V		If > 7.7 V and < 16 V		If > 11.5 V and < 25 V
Number of pulses/encoder revolution		5000 maximum The maximum high-speed frequency should not exceed 300 kHz.				
Maximum consumption current of encoder		**100 mA** *(1)*	**175 mA** *(1)*	**100 mA** *(1)*	**175 mA** *(1)*	**100 mA** *(2)*
Minimum recommended cross-section of conductors *(3)*	For a maximum cable length of 100 m	0.2 mm² (AWG 24)	0.5 mm² (AWG 20)	0.2 mm² (AWG 24)		
	For a maximum cable length of 200 m	0.5 mm² (AWG 20)	0.75 mm² (AWG 18)	0.2 mm² (AWG 24)		
	For a maximum cable length of 500 m	1 mm² (AWG 17)	1.5 mm² (AWG 15)	0.5 mm² (AWG 20)		0.2 mm² (AWG 24)
	For a maximum cable length of 1000 m	–		0.75 mm² (AWG 18)	1.5 mm² (AWG 15)	0.5 mm² (AWG 20)

References

Encoder interface cards *(4)*

Description	Voltage V	Reference	Weight kg
Encoder interface cards with RS422 compatible differential outputs	5	**VW3 A3 401**	0.200
	15	**VW3 A3 402**	0.200
Encoder interface cards with open collector outputs	12	**VW3 A3 403**	0.200
	15	**VW3 A3 404**	0.200
Encoder interface cards with push-pull outputs	12	**VW3 A3 405**	0.200
	15	**VW3 A3 406**	0.200
	24	**VW3 A3 407**	0.200

(1) Minimum encoder power supply 10 V.
(2) Minimum encoder power supply 14 V.
(3) Shielded cable containing 3 twisted pairs at intervals of between 20 and 50 mm. Connect the shielding to earth at both ends. Minimum recommended conductor cross-section for a minimum encoder voltage in order to limit line voltage drops.
(4) The Altivar 71 drive cannot support more than one encoder interface card. Consult the summary tables of possible drive, option and accessory combinations (see pages 2/438 to 2/445).

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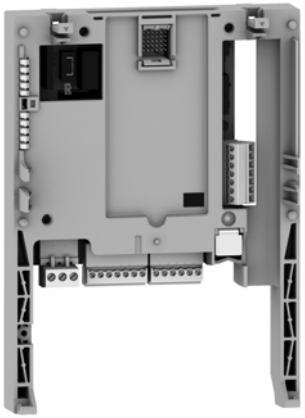
Variable speed drives for asynchronous motors

Altivar 71

Option: I/O extension cards

Presentation



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VW3 A3 202

Altivar 71 drives can be specifically adapted to particular application areas by installing I/O extension cards.

Two models are available:

■ Card with logic I/O featuring:
- □ 1 relay logic output (“C/O” contact)
- □ 4 x 24 V ⎓ positive or negative logic inputs
- □ 2 x 24 V ⎓ open collector positive or negative logic outputs
- □ 1 input for PTC probes

■ Card with extended I/O featuring:
- □ 1 differential current analog input 0…20 mA
- □ 1 software-configurable voltage (0…10 V ⎓) or current (0…20 mA) analog input
- □ 2 software-configurable voltage (± 10 V, 0…10 V ⎓) or current (0…20 mA) analog outputs
- □ 1 relay logic output
- □ 4 x 24 V ⎓ positive or negative logic inputs
- □ 2 x 24 V ⎓ open collector positive or negative logic outputs
- □ 1 input for PTC probes
- □ 1 frequency control input

Characteristics

Logic I/O card VW3 A3 201

Internal supplies available		Short-circuit and overload protection: ■ 1 x 24 V ⎓ supply (min. 21 V, max. 27 V), maximum current 200 mA for the complete drive and I/O extension card assembly ■ 1 x 10.5 V ⎓ (± 5%) supply for the reference potentiometer (1 to 10 kΩ), maximum current 10 mA
Configurable relay outputs	R3A, R3B, R3C	1 relay logic output, one "N/C" contact and one "N/O" contact with common point Minimum switching capacity: 3 mA for 24 V ⎓ Maximum switching capacity: ■ On resistive load (cos φ = 1): 5 A for 250 V ∿ or 30 V ⎓ ■ On inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 V ∿ or 30 V ⎓ Electrical service life: 100,000 operations Maximum response time: 7 ms ± 0.5 ms
Logic inputs	LI7…LI10	4 programmable logic inputs, 24 V ⎓, compatible with level 1 PLC, IEC 65A-68 standard Impedance: 3.5 kΩ Maximum voltage: 30 V Multiple assignment makes it possible to configure several functions on one input Maximum sampling time: 2 ms ± 0.5 ms
	Positive logic (Source)	State 0 if ⩽ 5 V or logic input not wired, state 1 if ⩾ 11 V
	Negative logic (Sink)	State 0 if ⩾ 16 V or logic input not wired, state 1 if ⩽ 10 V
Logic outputs	LO1, LO2	2 x 24 V ⎓ logic outputs assignable as positive (Source) or negative (Sink) logic open collector type, compatible with level 1 PLC, standard IEC 65A-68 24 V ⎓ internal or 24 V ⎓ external power supply (min. 12 V, max. 30 V) Maximum current: 200 mA Logic output common (CLO) isolated from other signals Maximum sampling time: 2 ms ± 0.5 ms. The active state is software-configurable as is a delay for each switching operation.
Input for PTC probes	TH1+/TH1-	1 input for a maximum of 6 PTC probes mounted in series: ■ Nominal value < 1.5 kΩ ■ Trip resistance 3 kΩ, reset value 1.8 kΩ ■ Short-circuit protection < 50 Ω
Maximum I/O wire size and tightening torque		1.5 mm² (AWG 16) 0.25 Nm

2.5

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Variable speed drives for asynchronous motors
Altivar 71
Option: I/O extension cards

Characteristics (continued)

Extended I/O card VW3 A3 202

Internal supplies available		Short-circuit and overload protection: ■ 1 x 24 V ⎓ supply (min. 21 V, max. 27 V), maximum current 200 mA for the complete drive and I/O extension card assembly ■ 1 x 10.5 V ⎓ (± 5%) supply for the reference potentiometer (1 to 10 kΩ), maximum current 10 mA
Analog inputs AI	AI3+/AI3-	1 X-Y mA differential current analog input by programming X and Y from 0 to 20 mA, with impedance 250 Ω Maximum sampling time: 5 ms ± 1 ms Resolution: 11 bits +1 sign bit Accuracy: ± 0.6% for a temperature variation of 60°C Linearity: ± 0.15% of the maximum value
	AI4	1 software-configurable voltage or current analog input: ■ Voltage analog input 0…10 V ⎓, impedance 30 kΩ (max. safe voltage 24 V) ■ X-Y mA current analog input by programming X and Y from 0 to 20 mA, with impedance 250 Ω Maximum sampling time: 5 ms ± 1 ms Resolution: 11 bits Accuracy: ± 0.6% for a temperature variation of 60°C Linearity: ± 0.15% of the maximum value
Analog outputs	AO2, AO3	2 software-configurable voltage or current analog inputs: ■ voltage analog output ± 10 V ⎓, 0…10 V, minimum load impedance 470 Ω ■ X-Y mA current analog output by programming X and Y from 0 to 20 mA, maximum load impedance 500 W Maximum sampling time: 5 ms ± 1 ms Resolution: 10 bits Accuracy: ± 1% for a temperature variation of 60°C Linearity: ± 0,2% of the maximum value
Configurable relay output	R4A, R4B, R4C	1 relay logic output, one "N/C" contact and one "N/O" contact with common point Minimum switching capacity: 3 mA for 24 V ⎓ Maximum switching capacity: ■ On resistive load (cos φ = 1): 5 A for 250 V ∿ or 30 V ⎓ ■ On inductive load (cos φ = 0.4 and L/R = 7 ms): 1.5 A for 250 V ∿ or 30 V ⎓ Electrical service life: 100,000 operations Maximum response time: 10 ms ± 1 ms
Logic inputs	LI11…LI14	4 programmable logic inputs, 24 V ⎓, compatible with level 1 PLC, IEC 65A-68 standard Impedance: 3.5 kΩ Maximum voltage: 30 V Multiple assignment makes it possible to configure several functions on one input Maximum sampling time: 5 ms ± 1 ms
	Positive logic (Source)	State 0 if ⩽ 5 V or logic input not wired, state 1 if ⩾ 11 V
	Negative logic (Sink)	State 0 if ⩾ 16 V or logic input not wired, state 1 if ⩽ 10 V
Logic outputs	LO3, LO4	2 x 24 V ⎓ logic outputs assignable as positive (Source) or negative (Sink) logic open collector type, compatible with level 1 PLC, standard IEC 65A-68 Maximum voltage: 30 V Maximum current: 200 mA Logic output common (CLO) isolated from other signals Maximum sampling time: 5 ms ± 1 ms. The active state is software-configurable as is a delay for each switching operation.
Input for PTC probes	TH2+/TH2-	1 input for a maximum of 6 PTC probes mounted in series: ■ Nominal value < 1.5 kΩ ■ Trip resistance 3 kΩ, reset value 1.8 kΩ ■ Short-circuit protection < 50 Ω
Frequency control input	RP	Frequency range: 0…30 kHz Cyclic ratio: 50% ± 10% Maximum sampling time: 5 ms ± 1 ms Maximum input voltage 30 V, 15 mA Add a resistor if the input voltage is greater than 5 V (510 Ω for 12 V, 910 Ω for 15 V, 1.3 kΩ for 24 V) State 0 if < 1.2 V, state 1 if > 3.5 V
Maximum I/O wire size and tightening torque		1.5 mm^2 (AWG 16) 0.25 Nm

References

I/O extension cards *(1)*

Description	Reference	Weight kg
Logic I/O card	**VW3 A3 201**	0.300
Extended I/O card	**VW3 A3 202**	0.300

(1) The Altivar 71 cannot support more than one I/O card with the same reference. Consult the summary tables of possible drive, option and accessory combinations, see pages 2/438 to 2/445.

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Variable speed drives for asynchronous motors

Altivar 71

Option: “Controller Inside” programmable card

Presentation

The “Controller Inside” programmable card is used to adapt the variable speed drive to specific applications by integrating control system functions.

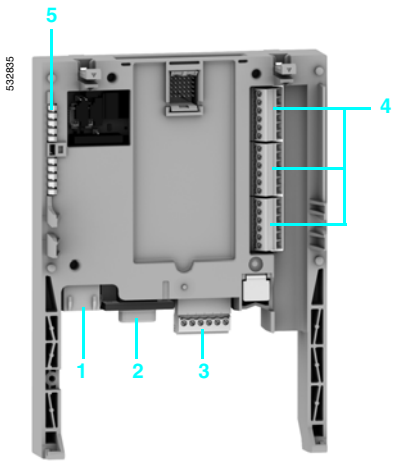
Various predefined configurable applications are sold by Schneider Electric and its partners.
The PS 1131 software workshop for PC is used for programming and debugging new applications, quickly and in an open-ended manner (see page 2/385).
It is not possible to transfer the program from the card to the PC, which enables us to protect our know-how.

A single “Controller Inside” programmable card can be fitted in the Altivar 71 drive. It can be combined with another option card (I/O extension or communication). Consult the summary tables of possible drive, option and accessory combinations, see pages 2/438 to 2/445.

The “Controller Inside” programmable card has:
- 10 logic inputs, 2 of which can be used for 2 counters or 4 of which can be used for 2 incremental encoders
- 2 analog inputs
- 6 logic outputs
- 2 analog outputs
- A master port for the CANopen machine bus
- A PC port for programming with the PS 1131 software workshop

If the power consumption table does not exceed 200 mA, the “Controller Inside” programmable card can be powered by Altivar 71 drives. Otherwise, an external 24 V ⎓ power supply must be used.

The “Controller Inside” programmable card can also use:
- The drive I/O
- The I/O extension card I/O
- The encoder interface card points counter
- The drive parameters (speed, current, torque, …)



Description

1 RJ45 connector for connecting the PS 1131 software workshop via an RS 485 serial link.
Connection to the PC is via a cable and an RS 232/RS 485 converter included in the PowerSuite for PC connection kit, VW3 A8 106.

2 9-way male SUB-D connector for connection to the CANopen machine bus.

3 Connector with removable screw terminals, 6 contacts at intervals of 3.81 for the 24 V ⎓ power supply and 4 logic inputs.

4 3 connectors with removable screw terminals, 6 contacts at intervals of 3.81 for 6 logic inputs, 6 logic outputs, 2 analog inputs, 2 analog outputs and 2 commons.

5 5 LEDs, comprising:
- 1 to indicate the presence of the 24 V ⎓ power supply
- 1 to indicate a program execution fault
- 2 to indicate the CANopen machine bus communication status
- 1 controlled by the application program

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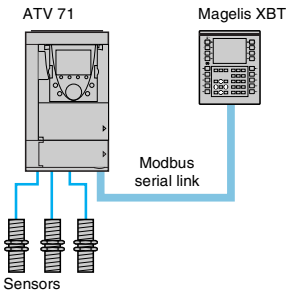
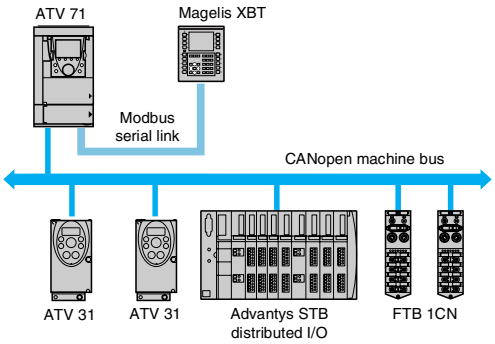
Variable speed drives for asynchronous motors

Altivar 71

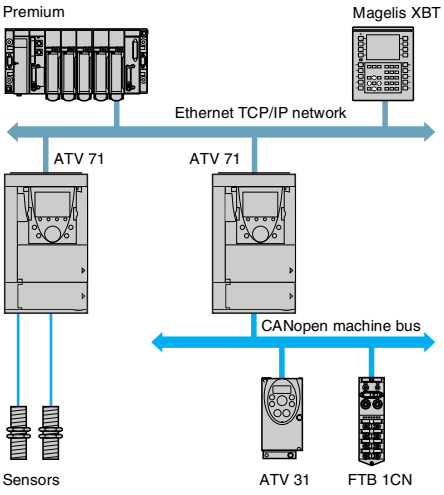
Option: “Controller Inside” programmable card



Independent machine with multiwire system



Independent machine with CANopen machine bus



Modular machine with Ethernet TCP/IP network

Dialogue

Human-machine dialogue with the application programmed in the “Controller Inside” programmable card is possible using:

- The Altivar 71 graphic display terminal
- A Magelis industrial HMI terminal connected to the drive Modbus port
- A Magelis industrial HMI terminal connected to the Ethernet TCP/IP network

(if the drive is equipped with an Ethernet TCP/IP communication card)

There is a dedicated graphic terminal menu for the “Controller Inside” programmable card. This menu can be customized by the card program according to the application.

Any industrial HMI terminal which supports the Modbus protocol can be used to display and modify the “Controller Inside” programmable card parameters. The Modbus server provides access to 2 Kwords (% MW, etc.) in the card.

Master CANopen communication

The master CANopen port on the “Controller Inside” programmable card can be used to extend the I/O capacity and to control other CANopen slave devices.

Communication with a PLC

The Altivar 71 drive, which is equipped with a “Controller Inside” programmable card, fits easily into complex architectures.
Regardless of which bus, network or serial link is being used (Ethernet TCP/IP, Modbus/ Uni-Telway, Fipio, Modbus Plus, Profibus DP, INTERBUS, etc.), the PLC can communicate with the “Controller Inside” programmable card and the drive.
The periodic variables can still be configured as required.

Clock

A clock backed up by a lithium battery makes it possible to have a log of events that have occurred. When the “Controller Inside” programmable card is installed in the drive, drive faults are automatically time and date-stamped without any special programming.

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Variable speed drives for asynchronous motors

Altivar 71

Option: “Controller Inside” programmable card

Electrical characteristics

Power supply	Voltage	**V**	24 ⎓ (min. 19, max. 30)
Power consumption Current	Maximum	**A**	2
	No-load	**mA**	80
	Per logic output	**mA**	200 maximum *(1)*
Analog inputs	AI51, AI52		2 current analog inputs 0…20 mA, impedance 250 Ω Resolution: 10 bits Accuracy: ± 1% for a temperature variation of 60°C Linearity: ± 0.2% of the maximum value Common point for all the card I/O *(2)*
Analog outputs	AO51, AO52		2 current analog outputs 0…20 mA, impedance 500 Ω Resolution: 10 bits Accuracy: ± 1% for a temperature variation of 60°C Linearity: ± 0.2% of the maximum value Common point for all the card I/O *(2)*
Logic inputs	LI51…LI60		Ten 24 V ⎓ logic inputs, compatible with level 1 PLC, IEC 65A-68 standard, 2 of which can be used for 2 counters or 4 of which can be used for 2 incremental encoders Impedance: 4.4 kΩ Maximum voltage: 30 V ⎓ Switching thresholds: State 0 if ⩽ 5 V or logic input not wired State 1 if ⩾ 11 V Common point for all the card I/O *(2)*
Logic outputs	LO51…LO56		Six 24 V ⎓ logic outputs, positive logic open collector type (source), compatible with level 1 PLC, standard IEC 65A-68 Maximum switching voltage: 30 V Maximum current: 200 mA Common point for all the card I/O *(2)*
Connection of I/O	Type of contact		Screw, at intervals of 3.81 mm²
	Maximum wire size	**mm²**	1.5 (AWG 16)
	Tightening torque	**Nm**	0.25
Lithium battery	Life		8 years approx.

Characteristics of the application program

Compiled program (saved in “flash” memory)	Maximum size	**Kb**	320
Data	Maximum size	**Kwords**	64
	Saved size (NVRAM)	**Kwords**	4
	Size accessible by Modbus	**Kwords**	2

Characteristics of the CANopen communication port

Structure	Connector	One 9-way male SUB-D connector
	Network management	Master
	Transmission speed	Configurable via the program: 50 Kbps, 125 Kbps, 250 Kbps, 500 Kbps or 1 Mbps
	Address (Node ID)	32 slaves maximum
Services	CANopen application layer	DS 301 V4.02
	Profile	DSP 405
	PDO	10 receive and transmit PDOs in total for each slave
	SDO	2 client SDOs per slave (1 read and 1 write). Block transfer.
	Error check	Node Guarding, producer and consumer Heartbeat
	Other services	Emergency, Boot-up, Sync
Diagnostics	Using LEDs	2 LEDs: “RUN” and “ERROR”, conforming to CIA DR303 version 1.0

(1) Otherwise, an external 24 V ⎓ power supply must be used.
(2) This common point is also the drive 0 V.

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Variable speed drives for asynchronous motors
Altivar 71
Option: “Controller Inside” programmable card

PS 1131 software workshop

The PS 1131 software workshop conforms to international standard IEC 61131-3 and includes all the functions for programming and setting up the “Controller Inside” programmable card.
It includes the configurator for CANopen.
It is designed for Microsoft Windows® 98, Microsoft Windows® NT 4.0, Microsoft Windows® Millennium, Microsoft Windows® 2000 Professional and Microsoft Windows® XP operating systems.

It benefits from the user-friendly interface associated with these operating systems:
- Pop-up menus
- Function blocks
- Online help

The PS 1131 software workshop is available in both English and German.

The programming and debugging tools can be accessed via the application browser. This provides the user with an overview of the program and quick access to all application components:
- Program editor
- Function blocks editor
- Variables editor
- Animation tables editor
- Runtime screens editor

Modular structured programming

The PS 1131 software workshop is used to structure an application into function modules consisting of sections (program code), animation tables and runtime screens. Each program section has a name and is programmed in one of the six available languages. To protect know-how or prevent any accidental modification, each section can be write-protected or read/write-protected.

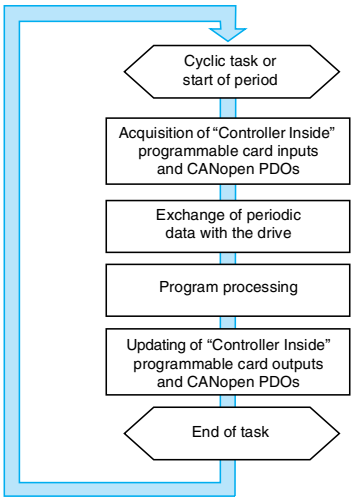
Exporting/Importing function modules
It is possible to export all or part of the tree structure in function modules.

Program structure and execution of an application

The program structure is single-task. It consists of several subroutines.
Exchanges with the drive are performed by a function block available in the standard library.
Cycle execution can be either cyclic or periodic. A software watchdog, which can be configured between 100 and 500 ms by the user, monitors the cycle time.
A task can be synchronized with the drive main task to improve repeat accuracy in motion control applications.

Cyclic execution
Once each cycle ends, execution of a new cycle begins. The cycle execution must last for at least 5 ms.

Periodic execution
The program is executed periodically, and the period can be set by the user between 5 and 100 ms. Cycle execution must last for less than the defined period. Drive response in the event of the cycle time being exceeded can be managed by the program.



Example of cycle execution for the “Controller Inside” programmable card connected on a CANopen machine bus

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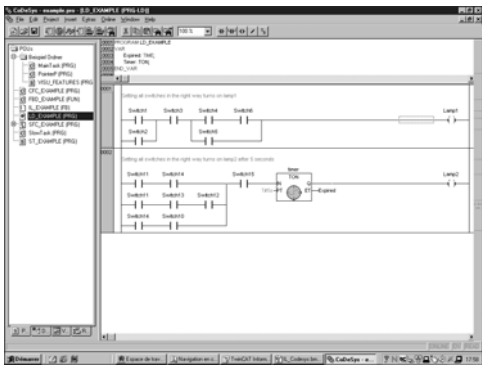
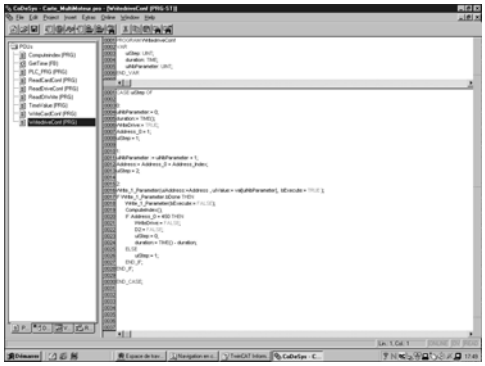
Variable speed drives for asynchronous motors

Altivar 71

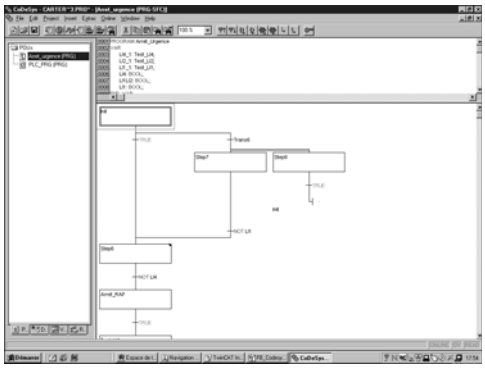
Option: “Controller Inside” programmable card



Example of Ladder Diagram language programming



Example of Structured Text language programming



Example of Grafcet language programming

Programming languages

6 programming languages are available:

- Ladder language (LD)
- Structured Text language (ST)
- Grafcet language (SFC)
- Instruction List language (IL)
- Function Block Diagram (FBD)
- Continuous Flow Chart (CFC)

Ladder Diagram (LD)

A Ladder Diagram program consists of a set of rungs executed sequentially.
A rung consists of several lines.
A line consists of several contacts and a coil.
The language objects can be entered and displayed as symbols or tags as required.
The Ladder Diagram editor enables the immediate call of entry help functions such as access to function libraries and access to the variables editor.

Structured Text (ST)

Structured Text language is a sophisticated algorithmic type language which is particularly well-suited to programming complex arithmetical functions, manipulating tables, message handling, etc.
Structured Text language enables direct transcription of an analysis based on a flow chart, and is organized in statements.

Grafcet language (SFC)

Grafcet language is used to describe the sequential part of the control system in a simple, graphic way. It corresponds to the “Sequential Function Chart” (SFC) language described in standard IEC 61131-3.
Programs written in Grafcet (SFC) language consist of:

- Macro-steps which are the grouping of a set of steps and transitions
- Steps with which the actions to be performed can be associated
- Transitions with which the conditions are associated (transition conditions)
- Directed links connecting the steps and transitions

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Variable speed drives for asynchronous motors

Altivar 71

Option: “Controller Inside” programmable card

Example of Instruction List language programming

Example of a function block:
Sending the speed reference to the drive.

Programming languages (continued)

Instruction List language (IL)

Instruction List language can be used to write Boolean equations and use all the functions available in the language. It can be used to represent the equivalent of a ladder diagram in text form.
Each instruction consists of an instruction code and a bit or word type operand.
As in Ladder Diagram language, instructions are organized in sequences of instructions called statements (equivalent to a rung).

Function Block Diagram (FBD)

FBD is a graphic language. It consists of function blocks connected by a rung. The program is executed sequentially.
Each block can be a logical or arithmetical expression, a call to another function block, a jump or a return instruction.

Continuous Flow Chart (CFC)

Continuous Flow Chart programming is a graphic language. The rung connecting the various function blocks on the page is not necessarily sequential. The output of a function block may be looped back on its input or on the input of a block already inserted in the rung.

Function blocks

The PS 1131 software workshop has pre-programmed function blocks (standard library) and offers users the option of creating their own function blocks (user library).

Standard library

The standard library contains:
- Logic functions (AND, OR, etc.)
- Mathematical functions (Cos, Sin, Exp, etc.)
- Function blocks dedicated to drives which simplify data exchange between the drive and the “Controller Inside” programmable card (example: sending the speed reference)
- Function blocks for managing the CANopen machine bus
- Graphic terminal display function blocks.

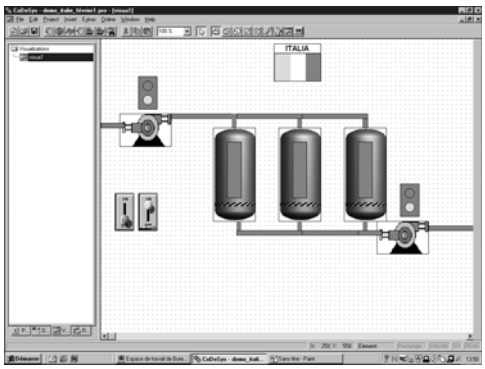
User library

Users have the option of creating their own function blocks to help them structure their applications. This is also a means of protecting the know-how contained in the algorithms, as it is possible to lock access to the user function blocks program.

Variable speed drives for asynchronous motors

Altivar 71

Option: “Controller Inside” programmable card



Example of runtime screen

Debugging

The PS 1131 software workshop offers a complete set of tools for debugging the application.

Program execution for debugging

The main debugging functions are:
- Use of breakpoints
- Step-by-step program execution
- Execution of a single cycle
- Direct access to the subroutines that have been called (call stack)

Realtime program animation

The main functions of realtime animation of the program are:
- Animation of part of the program in any language
- Automatic display of a variables window relating to this part of the program

Animation tables

Tables containing variables for the application to be monitored can be created and saved.
In both these tools, in addition to animating the data, it is possible to:
- Modify and force the value of data of any type
- Change the display format (binary, hexadecimal, etc.).

Oscilloscope

The PS 1131 software workshop Oscilloscope function can be used to monitor up to 20 variables in the form of curves.

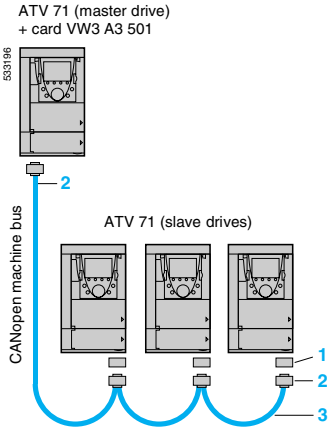
Runtime screens

A tool integrated in the PS 1131 software workshop can be used to design and use runtime screens for the application. These include:
- Creation of screen backgrounds
- Animation of graphic objects associated with variables
- Display of messages
- …

Simulation

The PS 1131 software workshop Simulation function can be used to test the program without having to set up the drive.

Variable speed drives for asynchronous motors
Altivar 71
Option: “Controller Inside” programmable card



Master/slave application


1216625
VW3 CAN A71


522855
TSX CAN KCDF 180 T

References

Card

Description		Reference	Weight kg
“Controller Inside” programmable card *(1)* equipped with one 9-way male SUB-D connector		**VW3 A3 501**	0.320

Connection accessories *(2)*

Description	No.	Reference	Weight kg
CANopen adapter to be mounted on the RJ45 socket in the drive control terminals. The adaptor provides a 9-way male SUB-D connector conforming to the CANopen standard (CIA DRP 303-1).	1	**VW3 CAN A71**	–
CANopen connector 9-way female SUB-D with line terminator that can be disabled	2	**TSX CAN KCDF 180T**	–

Cables *(2)*

Description	No.	Length (m)	Reference	Weight kg
CANopen cables Standard cable, CE marking. Low smoke emission, halogen-free. Flame retardant (IEC 60332-1)	3	50	**TSX CAN CA 50**	4.930
		100	**TSX CAN CA 100**	8.800
		300	**TSX CAN CA 300**	24.560
CANopen cables UL certification, CE marking. Flame retardant (IEC 60332-2)	3	50	**TSX CAN CB 50**	3.580
		100	**TSX CAN CB 100**	7.840
		300	**TSX CAN CB 300**	21.870
CANopen cables Cable for harsh environments *(3)* or mobile installation, CE marking. Low smoke emission, halogen-free. Flame retardant (IEC 60332-1)	3	50	**TSX CAN CD 50**	3.510
		100	**TSX CAN CD 100**	7.770
		300	**TSX CAN CD 300**	21.700

PS 1131 software workshop

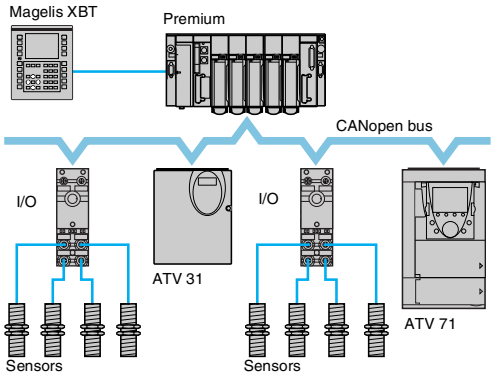
Description	Reference	Weight kg
PS 1131 software workshop supplied on CD-ROM	*(4)*	–

Connection kit for PC serial port including various accessories such as: ■ 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.	**VW3 A8 106**	0.350

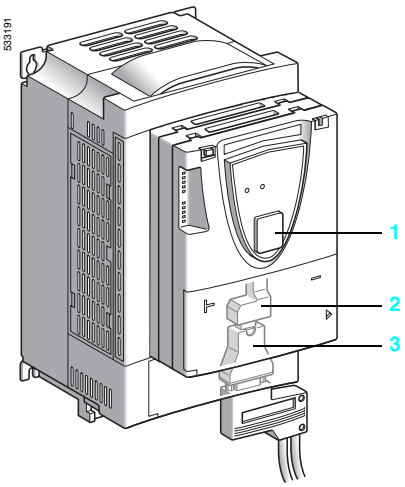
(1) The Altivar 71 drive can only take one “Controller Inside” programmable card. Consult the summary tables of possible drive, option and accessory combinations, see pages 2/438 to 2/445.
(2) Consult our “Machines and installations with CANopen” catalogue.
(3) Harsh environments:
- resistance to hydrocarbons, industrial oils, detergents, solder splashes
- relative humidity up to 100%
- saline atmosphere
- significant temperature variations
- operating temperature between - 10°C and + 70°C.
(4) The product reference is provided during the “Controller Inside” programmable card training course. Please consult your Regional Sales Office.

Presentation: page 2/382
Characteristics: page 2/384
Functions: pages 2/385 to 2/388
Schemes: page 2/482

Variable speed drives for asynchronous motors
Altivar 71
Communication buses and networks



Example of configuration on CANopen machine bus



Presentation

The Altivar 71 drive is designed to suit all configurations found in communicating industrial installations.

It includes Modbus and CANopen communication protocols as standard.

The Modbus protocol can be accessed directly by means of 2 integrated communication ports (for characteristics, see page 2/355):
- One RJ45 Modbus terminal port 1, located on the drive front panel, for connecting:
  - the remote graphic display terminal
  - a Magelis industrial HMI terminal
  - the PowerSuite software workshop
- One RJ45 Modbus network port 2, located on the drive control terminals. It is dedicated to control and signalling by a PLC or other type of controller.
It can also be used to connect a terminal or the PowerSuite software workshop.

The CANopen protocol can be accessed from the Modbus network port via the CANopen adapter 3 (for characteristics, see page 2/355). In this case, terminal port 1 must be used to access the Modbus protocol.

The Altivar 71 drive can also be connected to other industrial communication buses and networks by adding one of the communication option cards:
- Ethernet TCP/IP
- Modbus/Uni-Telway. This card can offer functions in addition to those of the integrated ports: Modbus ASCII and 4-wire RS 485
- Fipio
- Modbus Plus
- Profibus DP
- DeviceNet
- INTERBUS

The option of powering the control section separately enables communication (monitoring, diagnostics) to be maintained even if there is no power supply to the control section.

The main Altivar 58 and Altivar 58F drive communication functions are compatible with the Altivar 71 drive *(1)*:
- Connection
- Communication services
- Drive behaviour (profile)
- Control and monitoring parameters
- Standard adjustment parameters

The PowerSuite software workshop can be used to port configurations from Altivar 58 and Altivar 58F drives to the Altivar 71 drive.

(1) Consult the ATV 58(F)/ATV 71 substitution guide supplied on the documentation CD-ROM.

Functions: page 2/391
Characteristics: pages 2/392 to 2/395
References: pages 2/396 and 2/397

Variable speed drives for asynchronous motors
Altivar 71
Communication buses and networks

Functions

All the drive functions can be accessed via the network:
- Controlling
- Monitoring
- Adjustment
- Configuration

When the drive is equipped with the “Controller Inside” programmable card, its variables (% MW, etc) can be accessed by Modbus messaging via the integrated communication ports or via the Ethernet TCP/IP communication card.

The speed or torque command and reference may come from different control sources:
- I/O terminals
- Communication network
- “Controller Inside” programmable card
- Remote graphic display terminal

The advanced functions of the Altivar 71 drive can be used to manage switching of these drive control sources according to the application requirements.

It is possible to choose the assignment of the communication periodic variables using:
- The network configuration software (Sycon, etc)
- The Altivar 71 drive communication scanner function

For the Modbus and CANopen ports and for the communication cards, the Altivar 71 drive can be controlled:
- According to the CiA DSP 402 profile
- According to the I/O profile where control is as simple and adaptable as control via the I/O terminals.

The DeviceNet card also supports the ODVA AC Drive and Allen-Bradley drive profiles.

Communication is monitored according to criteria specific to each protocol. However, regardless of the protocol, it is possible to configure the drive reaction to a communication fault:
- Freewheel stop, stop on ramp, fast stop or braked stop
- Maintain the last command received
- Fallback position at a predefined speed
- Ignore the fault

A command from the CANopen machine bus is processed with the same priority as one of the drive terminal inputs. This results in excellent response times on the network port via the CANopen adapter.

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Characteristics: pages 2/392 to 2/395
References: pages 2/396 and 2/397

Variable speed drives for asynchronous motors
Altivar 71
Communication buses and networks

Characteristics of the Ethernet TCP/IP card VW3 A3 310 *(1)*

Structure	Connector	One RJ45 connector
	Transmission speed	10/100 Mbps, half duplex and full duplex
	IP addressing	■ Manual assignment via the display terminal or the PowerSuite software workshop ■ BOOTP (IP address dynamic server depending on the IEEE address) ■ DHCP (address dynamic server depending on the Device Name) with automatic reiteration
	Physical	Ethernet 2
	Link	LLC: IEEE 802.2 MAC: IEEE 802.3
	Network	IP (RFC791) ICMP client for supporting certain IP services such as the “ping” command
	Transport	TCP (RFC793), UDP The maximum number of connections is 8 (port 502)
Services	Transparent Ready class *(2)*	C20
	Web server	Simultaneous access via 3 Web browsers (more, according to the number of connections used) Server factory-configured and modifiable The memory available for the application is approximately 1 MB The factory-configured server contains the following pages: ■ Altivar viewer: displays the drive status and the state of its I/O, the main measurements (speed, current, etc) ■ Data editor: access to the drive parameters for configuration, adjustment and signalling ■ Altivar chart: simplified oscilloscope function ■ Security: configuration of passwords to access viewing and modification ■ FDR Agent: configuration of the “Faulty Device Replacement” parameters ■ IO Scanner: configuration of periodic variables for controlling and monitoring the drive via the PLC, etc. ■ Ethernet statistics: drive identification (IP addresses, version, etc.) from the Ethernet transmission statistics
	Messaging	Read Holding Registers (03), 63 words maximum Read Input Registers (04), 63 words maximum Write Single Register (06) Write Multiple Registers (16), 63 words maximum Read/Write Multiple Registers (23) Read Device Identification (43) Diagnostics (08)
	Periodic variables	I/O scanning service (can be inhibited): ■ 10 control variables which can be assigned by the PowerSuite software workshop or the standard Web server ■ 10 monitoring variables which can be assigned by the PowerSuite software workshop or the standard Web server The Global Data service is not supported
	Functional profiles	CiA DSP 402: “Device Profile Drives and Motion Control” I/O profile
	Network management	SNMP
	File transfer	FTP for Web server and TFTP for FDR
	FDR (Faulty Device Replacement)	Yes
	Communication monitoring	Can be inhibited Time out can be set between 0.5 and 60 s via the terminal, the PowerSuite software workshop or the standard Web server
Diagnostics	Using LEDs	5 LEDs on the card: “RX” (reception), “TX” (transmission), “FLT” (Ethernet fault), “STS” (IP address) and “10/100” Mbps (speed)
	Using the graphic display terminal	Control word received Reference received
	Via the Web server	Number of frames received Number of incorrect frames

(1) For Ethernet TCP/IP network, see pages 4/2 to 4/7
(2) Please consult our “Ethernet TCP/IP Transparent Factory” specialist catalogue.

2.5

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Variable speed drives for asynchronous motors
Altivar 71
Communication buses and networks

Characteristics of the Modbus/Uni-Telway card VW3 A3 303

Structure	Connector	One 9-way female SUB-D connector
	Transmission speed	Configurable via the display terminal or the PowerSuite software workshop: ■ 4800 bps ■ 9600 bps ■ 19200 bps
	Polarization	Type of polarization can be configured by switches on the card: ■ No polarization impedances (supplied by the wiring system, for example, in the master) ■ Two 4.7 kΩ polarization resistors
	Selection of the protocol	Via the display terminal or the PowerSuite software workshop: ■ Modbus RTU ■ Modbus ASCII ■ Uni-Telway
Services	Functional profiles	CiA DSP 402: “Device Profile Drives and Motion Control” I/O profile
	Communication monitoring	Can be inhibited Fixed time out: 10 s
Diagnostics	Using LEDs	2 LEDs on the card: “RUN” (status) and “ERR” (fault)
	Using the graphic display terminal	Control word received Reference received

Characteristics of the Modbus protocol *(1)*

Structure	Physical interface	2-wire RS 485, 4-wire RS 485
	Transmission mode	RTU, ASCII
	Format	Configurable via the display terminal or the PowerSuite software workshop: In RTU mode only: ■ 8 bits, odd parity, 1 stop ■ 8 bits, no parity, 1 stop ■ 8 bits, even parity, 1 stop ■ 8 bits, no parity, 2 stop In RTU and ASCII modes: ■ 7 bits, even parity, 1 stop ■ 7 bits, odd parity, 1 stop ■ 7 bits, even parity, 2 stop ■ 7 bits, odd parity, 2 stop
	Address	1 to 247, configurable using switches on the card.
Service	Messaging	Read Holding Registers (03), 63 words maximum Read Input Registers (04), 63 words maximum Write Single Register (06) Write Multiple Registers (16), 61 words maximum Read/Write Multiple Registers (23) Read Device Identification (43) Diagnostics (08)

Characteristics of the Uni-Telway protocol *(2)*

Structure	Physical interface	2-wire RS 485
	Format	8 bits, odd parity, 1 stop
	Address	1 to 147, configurable using switches on the card.
Service	Messaging	Read word (04h) Write word (14h) Read object (36h), 63 words maximum Write object (37h), 60 words maximum Identification (0Fh) Protocol version (30h) Mirror (FAh) Read error counters (A2h) Reset counters (A4h)

(1) For the Modbus serial link, see pages 4/12 to 4/15.
(2) For the Uni-Telway serial link, see pages 4/20 and 4/21.

Presentation: page 2/390 | Functions: page 2/391 | References: pages 2/396 and 2/397

Characteristics of the Fipio cards VW3 A3 311 and VW3 A3 301 *(1)*

Type of card		Standard Fipio card VW3 A3 311	Substitution Fipio card VW3 A3 301
Structure	Connector	One 9-way male SUB-D connector	
	Transmission speed	1 Mbps	
	Address	1 to 62, configurable by switches on the card	
Services	Adjustment using PLC software (Unity, PL7)	No	Yes (limited to ATV 58 or ATV 58F compatibility parameters)
	Periodic variables	8 control variables which can be assigned by communication scanner 8 monitoring variables which can be assigned by communication scanner PKW indexed periodic variable (settings)	5 control variables 8 monitoring variables
	Communication profile	FED C 32	Specific to the Altivar 58 or Altivar 58F drive (FSD C 8P)
	Functional profiles	CiA DSP 402: “Device Profile Drives and Motion Control” I/O profile	
	Communication monitoring	Can be inhibited Fixed time out: 256 ms	
Diagnostics	Using LEDs	4 LEDs on the card: “RUN” (status), “ERR” (fault), “COM” (data exchange) and “I/O” (minor internal fault)	
	Using the graphic display terminal	Control word received Reference received Periodic variables (communication scanner)	

Characteristics of the Modbus Plus card VW3 A3 302 *(2)*

Structure	Connector	One 9-way female SUB-D connector
	Transmission speed	1 Mbps
	Address	1 to 64, configurable by switches on the card
Services	Messaging	Yes (Modbus)
	Periodic variables	“Peer Cop”: 8 control variables which can be assigned by communication scanner “Global data”: 8 monitoring variables which can be assigned by communication scanner
	Functional profiles	CiA DSP 402: “Device Profile Drives and Motion Control”. I/O profile
	Communication monitoring	Can be inhibited Time out can be set between 0.1 and 60 s via the terminal or the PowerSuite software workshop.
Diagnostics	Using LEDs	1 LED on the card: “MB+” (status)
	Using the graphic display terminal	Control word received Reference received Periodic variables (communication scanner)

(1) For the Fipio bus, see pages 4/8 to 4/11.
(2) For the Modbus Plus network, see pages 4/16 to 4/19

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Characteristics of the Profibus DP card VW3 A3 307

Structure	Connector	One 9-way female SUB-D connector
	Transmission speed	9600 bps, 19.2 Kbps, 93.75 Kbps, 187.5 Kbps, 500 Kbps, 1.5 Mbps, 3 Mbps, 6 Mbps or 12 Mbps
	Address	1 to 126, configurable by switches on the card
Services	Periodic variables	PPO type 5 8 control variables which can be assigned by communication scanner 8 monitoring variables which can be assigned by communication scanner PKW indexed periodic variable (settings)
	Functional profiles	CiA DSP 402: “Device Profile Drives and Motion Control” I/O profile
	Communication monitoring	Can be inhibited Time out can be set via the Profibus DP network configurator
Diagnostics	Using LEDs	2 LED on the card: “ST” (status) and “DX” (data exchange)
	Using the graphic display terminal	Control word received Reference received Periodic variables (communication scanner)
Description file		A single gsd file is supplied on the documentation CD-ROM for the whole range or can be downloaded from the Internet at “www.telemecanique.com”. This file does not contain the description of the drive parameters.

Characteristics of the DeviceNet card VW3 A3 309

Structure	Connector	One removable screw connector, 5 contacts at intervals of 5.08
	Transmission speed	125 Kbps, 250 Kbps or 500 Kbps, configurable using switches on the card
	Address	1 to 63, configurable by switches on the card
Services	Periodic variables	ODVA assemblies type 20, 21, 70 and 71 Allen-Bradley® assemblies type 103, 104 and 105 Communication scanner assemblies 100 and 101
	Periodic exchange mode	Inputs: Polled, Change of state, Cyclic Outputs: Polled
	Functional profiles	ODVA AC Drive (02) profile Allen-Bradley drive profile CiA DSP 402: “Device Profile Drives and Motion Control” I/O profile
	Auto Device Replacement	No
	Communication monitoring	Can be inhibited Time out can be set via the DeviceNet network configurator
Diagnostics	Using LEDs	One two-tone LED on the card: “MNS” (status)
	Using the graphic display terminal	Control word received Reference received
Description file		A single eds file is supplied on the documentation CD-ROM for the whole range or can be downloaded from the Internet at “www.telemecanique.com”. This file contains the description of the drive parameters.

Characteristics of the INTERBUS card VW3 A3 304

Structure	Connector	2 connectors: One 9-way male SUB-D and one 9-way female SUB-D
	Power supply	The card is powered by the drive. To ensure that the INTERBUS subscriber continues to operate during line supply failures to the power section, fit a separate power supply for the drive control section.
Services	Messaging	PCP: ■ Read: read a parameter ■ Write: write a parameter ■ Initiate: initialize the communication relationship ■ Abort: abort the communication relationship ■ Status: drive communication status ■ Get-OV: read an object description ■ Identify: identification of the card
	Periodic variables	2 control variables (command and reference) 2 monitoring variables (status and speed output)
	Functional profile	Profile 21
	Communication monitoring	Can be inhibited Fixed time out: 640 ms
Diagnostics	Using LEDs	5 LEDs on the card: “U” (power supply), “RC” (bus input), “Rd” (bus output), “BA” (periodic data) and “TR” (messaging)
	Using the graphic display terminal	Control word received Reference received

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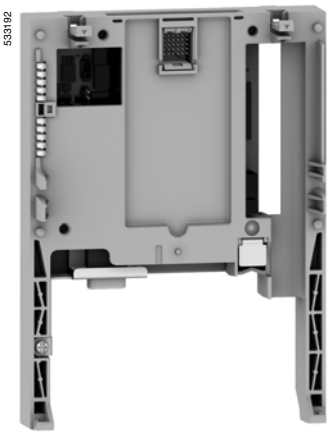

VW3 A3 311

TSX FP ACC12

490 NAD 911 03

Communication cards *(1) (2)*

Description	Use	Reference	Weight kg
Ethernet *(3)*	To be connected on a Hub or Switch using a cable 490 NTW 000 ●●. See pages 4/6 and 4/7	**VW3 A3 310**	0.300
Modbus/ Uni-Telway	To be connected on subscriber socket TSX SCA 62 using cable VW3 A8 306 2. See pages 4/13 and 4/21	**VW3 A3 303**	0.300
Standard Fipio	To be connected using a connector TSX FP ACC 12 with an extension cable TSX FP CC●● or a drop cable TSX FP CA●●. This card should be used for new installations. It is also used to replace an ATV 58 or ATV 58F drive equipped with a VW3 A58 311 card by an ATV 71 drive. To replace an ATV 58 or ATV 58F drive equipped with a VW3 58 301 card by an ATV 71 drive, use the Fipio substitution card VW3 A3 301. See pages 4/10 and 4/11	**VW3 A3 311**	0.300
Substitution Fipio	This card is also used to replace an ATV 58 or ATV 58F drive equipped with a VW3 A58 301 card by an ATV 71 drive. To replace an ATV 58 or ATV 58F drive equipped with a VW3 A58 311 card by a ATV 71 drive, use the standard Fipio card VW3 A3 311. See pages 4/10 and 4/11	**VW3 A3 301**	0.300
Modbus Plus	To be connected to the Modbus Plus IP 20 tap 990 NAD 230 00 using a cable 990 NAD 219●0. See pages 4/18 and 4/19	**VW3 A3 302**	0.300
Profibus DP	To be connected using a connector 490 NAD 911●● to the Profibus cable TSX PBS CA●00 *(4)*	**VW3 A3 307**	0.300
DeviceNet	The card is equipped with a removable 5-way screw terminal block.	**VW3 A3 309**	0.300
INTERBUS	To be connected using cable 170 MCI ●●●00 *(4)*	**VW3 A3 304**	0.300

(1) The Altivar 71 drive can only take one communication card. Consult the summary tables of possible drive, option and accessory combinations (see pages 2/438 to 2/445).
(2) The user manuals are supplied on CD-ROM or can be downloaded from the Internet at www.telemecanique.com. For the Profibus DP and DeviceNet cards, the description files in gsd or eds format are also supplied on CD-ROM or can be downloaded from the Internet at www.telemecanique.com.
(3) Please consult our "Ethernet TCP/IP Transparent Factory" specialist catalogue.
(4) Please consult our "Automation Platform Modicon Premium – Unity & PL7 software" specialist catalogue.

Variable speed drives for asynchronous motors
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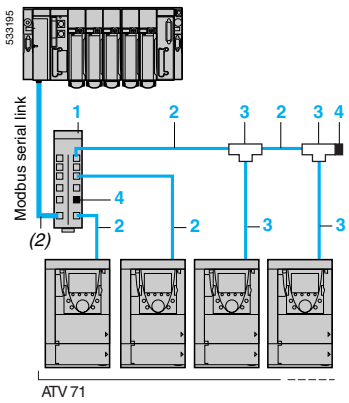
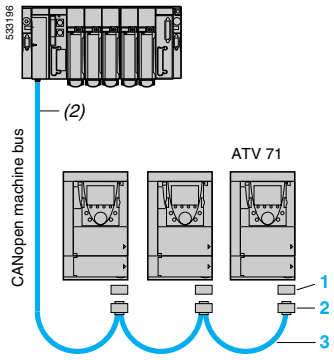
Premium *(1)*



Example of Modbus diagram, connections via splitter blocks and RJ45 connectors

Premium *(1)*



Example of CANopen diagram

VW3 CAN A71

VW3 CAN KCDF 180 T

Connection accessories

Description	No.	Length m	Unit reference	Weight kg
Modbus serial link				
Modbus splitter block 10 RJ45 connectors and 1 screw terminal block	1	–	**LU9 GC3**	0.500
Cables for Modbus serial link equipped with 2 RJ45 connectors	2	0.3	**VW3 A8 306 R03**	0.025
		1	**VW3 A8 306 R10**	0.060
		3	**VW3 A8 306 R30**	0.130
Modbus T-junction boxes (with integrated cable)	3	0.3	**VW3 A8 306 TF03**	0.190
		1	**VW3 A8 306 TF10**	0.210
Line terminators for RJ45 connector *(3)*	4	–	**VW3 A8 306 RC**	0.010
			VW3 A8 306 R	0.010

Description	No.	Length m	Reference	Weight kg
CANopen machine bus *(4)*				
CANopen adapter for mounting on the RJ45 socket in the drive control terminals. The adaptor provides a 9-way male SUB-D connector conforming to the CANopen standard (CIA DRP 303-1).	1	–	**VW3 CAN A71**	–
CANopen connector *(5)* 9-way female SUB-D with line terminator (can be disabled) 180° cable outlet for 2 CANopen cables. CAN-H, CAN-L, CAN-GND connection	2	–	**VW3 CAN KCDF 180T**	–
CANopen cables *(1)* Standard cable, CE marking. Low smoke, zero halogen. Flame retardant (IEC 60332-1).	3	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).	3	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 *(5)* or mobile installation, CE marking. Low smoke, zero halogen. Flame retardant (IEC 60332-1).	3	50	**TSX CAN CD 50**	3.510
		100	**TSX CAN CD 100**	7.770
		300	**TSX CAN CD 300**	21.700

(1) Please consult our "Automation Platform Modicon Premium - Unity & PL7 software" and "Automation platform Modicon TSX Micro – PL7 software" specialist catalogues.
(2) Cable depending on the type of controller or PLC.
(3) Sold in lots of 2.
(4) Please consult our catalogue "Machines & installations with CANopen".
(5) For ATV 71H●●●M3, ATV 71HD11M3X, HD15M3X, ATV 71H075N4…HD18N4, this connector can be replaced by connector TSX CAN KCDF 180T.
(6) Harsh environments:
- 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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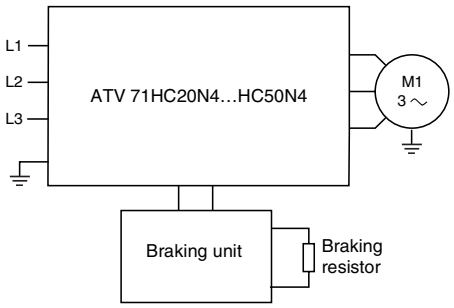
Variable speed drives for asynchronous motors

Altivar 71

Option: resistance braking units

Presentation



Resistance braking enables the Altivar 71 drive to operate while braking to a standstill or during “generator” operation, by dissipating the energy in the braking resistor.

ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71H075N4…HC16N4, ATV 71W●●●N4 and ATV 71P●●●N4Z drives have a built-in dynamic brake transistor.

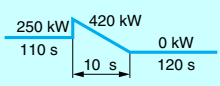
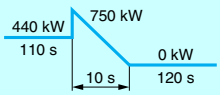
For ATV 71HC20N4…HC50N4 drives, a braking unit must be used.
This is controlled by the drive:

- For ATV 71HC20N4…HC28N4 drives, the braking unit is mounted directly on the left-hand side of the drive, see dimensions page 2/447
- For ATV 71HC40N4, HC50N4 drives, the braking unit is an external module, see dimensions page 2/456

Applications

High-inertia machines, machines with cycles and fast cycles, high-power machines performing vertical movements.

Characteristics

Type of braking unit			VW3 A7 101	VW3 A7 102
Ambient air temperature around the device	Operation	**°C**	-10…+50	
	Storage	**°C**	-25…+70	
Degree of protection of enclosure			IP 20	
Degree of pollution			2 according to standard EN 50178	
Relative humidity			Class 3K3 without condensation	
Maximum operating altitude		**m**	2000	
Vibration resistance			0.2 gn	
Nominal line supply voltage and drive supply voltage (rms value)		**V**	380 – 15%…480 + 10% ~	
Engage threshold		**V**	785 ± 1% ⎓	
Maximum DC bus voltage		**V**	850	
Maximum braking power on 400 V~ line supply	785 V ⎓ *(1)*	**kW**	420	750
Percentage of conduction time at constant power at 785 V⎓			5% at 420 kW	5% at 750 kW
			15% at 320 kW	15% at 550 kW
			50% at 250 kW	50% at 440 kW
Cycle time		**s**	≤ 240	
Maximum continuous power		**kW**	200	400
Braking power on a vertical movement (values given for a cycle time of 240 s)				
Thermal protection			Integrated, via thermal probe	
Forced ventilation		**m³/h**	100	600
Mounting			Vertical	
Minimum resistance value to be associated with the braking unit		Ω	1.05	0.7

(1) Braking unit engage threshold

References: page 2/399 | Selection: pages 2/404 to 2/411 | Dimensions: page 2/456 | Schemes: pages 2/478 and 2/487

Variable speed drives for asynchronous motors

Altivar 71

Option: resistance braking units

Braking units

Supply voltage: 380...480 V 50/60 Hz

For drives	Power		Loss	Cable (drive-braking unit)		Cable (braking unit-resistors)		Reference	Weight
	Contin.	Max.	Continuous power	Cross-section	Max. length	Cross-section	Max. length		
	kW	kW	W	mm²	m	mm²	m		kg
ATV 71HC20N4... HC28N4	200	420	550	– Internal connections	–	2 x 95	50	**VW3 A7 101**	30.000
ATV 71HC31N4... HC50N4	400	750	750	2 x 150	1	2 x 150	50	**VW3 A7 102**	80.000

Note: *To increase the braking power, several braking resistors can be mounted in parallel on the same braking unit. In this case, do not forget to take account of the minimum resistance value on each unit, see characteristics page 2/398.*

Variable speed drives for asynchronous motors

Altivar 71

Option: braking resistors

Presentation

The braking resistor enables the Altivar 71 drive to operate while braking to a standstill or during slowdown braking, by dissipating the braking energy.
It enables maximum transient braking torque.
The resistors are designed to be mounted on the outside of the enclosure, but should not inhibit natural cooling. Air inlets and outlets must not be obstructed in any way. The air must be free of dust, corrosive gas and condensation.

Applications

Inertia machines, machines with cycles

General characteristics

Type of braking resistor			VW3 A7 701…709	VW3 A7 710…718
Ambient air temperature around the device	Operation	°C	0…+50	
	Storage	°C	-25…+70	
Degree of protection of enclosure			IP 20	IP 23
Thermal protection			Via temperature controlled switch or via the drive	Via thermal overload relay
Temperature controlled switch *(1)*	Tripping temperature	°C	120	–
	Max. voltage – max. current		250 V ∿ -1 A	–
	Min. voltage – min. current		24 V ⎓ -0.1 A	–
	Maximum contact resistance	mΩ	60	–
Operating factor for the dynamic brake transistors			The internal circuits of Altivar 71 drives rated 160 kW or less have a built-in dynamic brake transistor	
	ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71H075N4…HD75N4 ATV 71W●●●N4 ATV 71P●●●N4Z		The dynamic brake transistor is sized so that it can tolerate: ■ the nominal motor power continuously ■ 150% of the nominal motor power for 60 s	
	ATV 71HD90N4…HC16N4		The dynamic brake transistor is sized so that it can tolerate: ■ 75% of the nominal motor power continuously ■ 150% of the nominal motor power for 10 s	

Connection characteristics

Type of terminal		Drive connection	Temperature-controlled switch
Maximum connection capacity	VW3 A7 701…703	4 mm² (AWG 28)	1.5 mm² (AWG 16)
	VW3 A7 704…709	Bar connection, M6	2.5 mm² (AWG 14)
	VW3 A7 710…718	Bar connection, M10	–

Minimum ohmic value of the resistors to be associated with the Altivar 71 drive, at 20°C *(2)*

ATV 71H●●●M3, ATV 71H●●●M3X and ATV 71H●●●N4 drives

Type of drive	ATV 71H	037M3, 075M3	U15M3	U22M3, U30M3	U40M3	U55M3	U75M3				
Minimum value	Ω	44	33	22	16	11	8				
Type of drive	**ATV 71H**	**D11M3X, D15M3X**	**D18M3X**	**D22M3X, D30M3X**	**D37M3X… D55M3X**	**D75M3X**					
Minimum value	Ω	3	4	3.3	1.7	1.3					
Type of drive	**ATV 71H**	**075N4… U22N4**	**U30N4, U40N4**	**U55N4**	**U75N4**	**D11N4**	**D15N4, D18N4**	**D22N4, D30N4**	**D37N4**	**D45N4, D55N4**	**D75N4**
Minimum value	Ω	56	34	23	19	12	7	13.3	6.7	5	3.3
Type of drive	**ATV 71H**	**D90N4**	**C11N4… C16N4**	**C20N4… C28N4**	**C31N4… C50N4**						
Minimum value	Ω	2.5	1.9	1.05	0.7						

ATV 71W●●●N4 drives

Type of drive	ATV 71W	075N4… U22N4	U30N4, U40N4	U55N4	U75N4	D11N4	D15N4, D18N4	D22N4, D30N4	D37N4	D45N4, D55N4	D75N4
Minimum value	Ω	56	34	23	19	12	7	13.3	6.7	5	3.3

ATV 71P●●●N4Z drives

Type of drive	ATV 71P	075N4Z… U22N4Z	U30N4Z… U40N4Z	U55N4Z	U75N4Z
Minimum value	Ω	56	34	23	19

(1) The switch should be connected in the sequence (use for signalling, or in the line contactor control).
(2) The minimum ohmic value is determined at a temperature of 20°C. In an environment where the temperature is below 20°C, make sure that the minimum ohmic value recommended in the table is observed.

References: page 2/401 | Selection: pages 2/404 to 2/411 | Dimensions: pages 2/456 and 2/459 | Schemes: page 2/478

Variable speed drives for asynchronous motors

Altivar 71

Option: braking resistors

Braking resistors

For drives	Ohmic value at 20°C	Average power available at 50°C *(1)*	Reference	Weight
	Ω	kW		kg
Supply voltage: 200…240 V 50/60 Hz				
ATV 71H037M3, H075M3	100	0.05	**VW3 A7 701**	1.900
ATV 71HU15M3, HU22M3	60	0.1	**VW3 A7 702**	2.400
ATV 71HU30M3, HU40M3	28	0.2	**VW3 A7 703**	3.500
ATV 71HU55M3, HU75M3	15	1	**VW3 A7 704**	11.000
ATV 71HD11M3X	10	1	**VW3 A7 705**	11.000
ATV 71HD15M3X	8	1	**VW3 A7 706**	11.000
ATV 71HD18M3X, HD22M3X	5	1	**VW3 A7 707**	11.000
ATV 71HD30M3X	4	1	**VW3 A7 708**	11.000
ATV 71HD37M3X, HD45M3X	2.5	1	**VW3 A7 709**	11.000
ATV 71HD55M3X	1.8	15.3	**VW3 A7 713**	50.000
ATV 71HD75M3X	1.4	20.9	**VW3 A7 714**	63.000
Supply voltage: 380…480 V 50/60 Hz				
ATV 71H075N4…HU40N4 ATV 71W075N4, WU40N4 ATV 71P075N4Z, PU40N4Z	100	0.05	**VW3 A7 701**	1.900
ATV 71HU55N4, HU75N4 ATV 71WU55N4, WU75N4 ATV 71PU55N4Z, PU75N4Z	60	0.1	**VW3 A7 702**	2.400
ATV 71HD11N4, HD15N4 ATV 71WD11N4, WD15N4	28	0.2	**VW3 A7 703**	3.500
ATV 71HD18N4…HD30N4 ATV 71WD18N4…WD30N4	15	1	**VW3 A7 704**	11.000
ATV 71HD37N4 ATV 71WD37N4	10	1	**VW3 A7 705**	11.000
ATV 71HD45N4…HD75N4 ATV 71WD45N4…WD75N4	5	1	**VW3 A7 707**	11.000
ATV 71HD90N4	2.75	25	**VW3 A7 710**	80.000
ATV 71HC11N4, HC13N4	2.1	37	**VW3 A7 711**	86.000
ATV 71HC16N4	2.1	44	**VW3 A7 712**	104.000
ATV 71HC20N4	1.05	56	**VW3 A7 715**	136.000
ATV 71HC25N4, HC28N4	1.05	75	**VW3 A7 716**	172.000
ATV 71HC31N4, HC40N4	0.7	112	**VW3 A7 717**	266.000
ATV 71HC50N4	0.7	150	**VW3 A7 718**	350.000

(1) Operating factor for resistors: the value of the average power that can be dissipated at 50°C from the resistor into the casing is determined for an operating factor during braking that corresponds to the majority of normal applications.
For VW3 A7 701…709:
- 2 s braking with 0.6 Tn braking torque for a 40 s cycle
- 0.8 s braking with 1.5 Tn braking torque for a 40 s cycle.
For VW3 A7 710…71:
- 10 s braking with 2 Tn braking torque for a 30 s cycle.

Variable speed drives for asynchronous motors

Altivar 71

Option: hoist resistors

Presentation

The hoist resistor is a braking resistor which enables the Altivar 71 drive to operate while braking to a standstill or during slowdown braking, by dissipating the braking energy.
It enables maximum transient braking torque.
The resistors are designed to be mounted on the outside of the enclosure, but should not inhibit natural cooling. Air inlets and outlets must not be obstructed in any way. The air must be free of dust, corrosive gas and condensation.

Applications

Machines performing vertical movements, machines with fast cycles, high-inertia machines.

General characteristics

Type of hoist resistor			VW3 A7 801	VW3 A7 802…A7 808	VW3 A7 809…A7 817
Ambient air temperature around the device	Operation	°C	0…+50		
	Storage	°C	-25…+75		- 25…+ 65
Degree of protection of enclosure			IP 23 if horizontal mounting IP 20 in other cases	IP 23	
Thermal protection			Via thermal overload relay		
Operating factor for the dynamic brake transistors			The internal circuits of Altivar 71 drives rated 160 kW or less have a built-in dynamic brake transistor		
	ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71H075N4…HD75N4 ATV 71W●●●N4 ATV 71P●●●N4Z		The dynamic brake transistor is sized so that it can tolerate: ■ the nominal motor power continuously ■ 150% of the nominal motor power for 60 s		
	ATV 71HD90N4…HC50N4 *(1)*		The dynamic brake transistor is sized so that it can operate on a 240 s cycle at: ■ 88% of the nominal motor power for 50% of the cycle time ■ 150% of the nominal motor power for 5% of the cycle		

Connection characteristics

Maximum connection capacity	VW3 A7 801		Bar connection, M6
	VW3 A7 802…817		Bar connection, M10

Minimum ohmic value of the resistors to be associated with the Altivar 71 drive, at 20°C *(2)*

ATV 71H●●●M3, ATV 71H●●●M3X and ATV 71H●●●N4 drives

Type of drive	ATV 71H	037M3, 075M3	U15M3	U22M3, U30M3	U40M3	U55M3	U75M3				
Minimum value	Ω	44	33	22	16	11	8				
Type of drive	**ATV 71H**	**D11M3X, D15M3X**	**D18M3X**	**D22M3X, D30M3X**	**D37M3X… D55M3X**	**D75M3X**					
Minimum value	Ω	3	4	3.3	1.7	1.3					
Type of drive	**ATV 71H**	**075N4… U22N4**	**U30N4, U40N4**	**U55N4**	**U75N4**	**D11N4**	**D15N4, D18N4**	**D22N4, D30N4**	**D37N4**	**D45N4, D55N4**	**D75N4**
Minimum value	Ω	56	34	23	19	12	7	13.3	6.7	5	3.3
Type of drive	**ATV 71H**	**D90N4**	**C11N4… C16N4**	**C20N4… C28N4**	**C31N4… C50N4**						
Minimum value	Ω	2.5	1.9	1.05	0.7						

ATV 71W●●●N4 drives

Type of drive	ATV 71W	075N4… U22N4	U30N4, U40N4	U55N4	U75N4	D11N4	D15N4, D18N4	D22N4, D30N4	D37N4	D45N4, D55N4	D75N4
Minimum value	Ω	56	34	23	19	12	7	13.3	6.7	5	3.3

ATV 71P●●●N4Z drives

Type of drive	ATV 71P	075N4Z… U22N4Z	U30N4Z… U40N4Z	U55N4Z	U75N4Z
Minimum value	Ω	56	34	23	19

(1) For ATV 71HC20N4…HC50N4 drives, a braking unit must be used, see page 2/398.
(2) The minimum ohmic value is determined at a temperature of 20°C. In an environment where the temperature is below 20°C, make sure that the minimum ohmic value recommended in the table is observed.

References: page 2/403 | Selection: pages 2/404 to 2/411 | Dimensions: page 2/458 | Schemes: page 2/478

Variable speed drives for asynchronous motors
Altivar 71
Option: hoist resistors

Hoist resistors

For drives	Ohmic value at 20°C	Average power available at 50°C *(1)*	Reference	Weight
	Ω	kW		kg
Supply voltage: 200…240 V 50/60 Hz				
ATV 71H037M3, H075M3	100	1.6	**VW3 A7 801**	6.000
ATV 71HU15M3	60	5.6	**VW3 A7 802**	21.000
ATV 71HU22M3…HU40M3	24.5	9.8	**VW3 A7 803**	28.000
ATV 71HU55M3, HU75M3	14	22.4	**VW3 A7 804**	54.000
ATV 71HD11M3X, HD15M3X	8.1	44	**VW3 A7 805**	92.000
ATV 71HD18M3X	4.2	62	**VW3 A7 806**	126.000
ATV 71HD22M3X, HD30M3X	3.5	19.5	**VW3 A7 807**	51.000
ATV 71HD37M3X, HD45M3X	1.85	27.4	**VW3 A7 808**	94.000
ATV 71HD55M3X	1.8	30.6	**VW3 A7 809**	103.000
ATV 71HD75M3X	1.4	44	**VW3 A7 810**	119.000
Supply voltage: 380…480 V 50/60 Hz				
ATV 71H075N4…HU22N4 ATV 71W075N4…WU22N4 ATV 71P075N4Z…PU22N4Z	100	1.6	**VW3 A7 801**	6.000
ATV 71HU30N4…HU55N4 ATV 71WU30N4…WU55N4 ATV 71PU30N4Z…PU55N4Z	60	5.6	**VW3 A7 802**	21.000
ATV 71HU75N4, HD11N4 ATV 71WU75N4, WD11N4 ATV 71PU75N4Z	24.5	9.8	**VW3 A7 803**	28.000
ATV 71HD15N4…HD30N4 ATV 71WD15N4…WD30N4	14	22.4	**VW3 A7 804**	54.000
ATV 71HD37N4…HD55N4 ATV 71W37N4…WD55N4	8.1	44	**VW3 A7 805**	92.000
ATV 71HD75N4 ATV 71WD75N4	4.2	62	**VW3 A7 806**	126.000
ATV 71HD90N4	2.75	56	**VW3 A7 811**	130.000
ATV 71HC11N4, HC13N4	2.1	75	**VW3 A7 812**	181.000
ATV 71HC16N4	2.1	112	**VW3 A7 813**	250.000
ATV 71HC20N4	1.05	112	**VW3 A7 814**	280.000
ATV 71HC25N4, HC28N4	1.05	150	**VW3 A7 815**	362.000
ATV 71HC31N4, HC40N4	0.7	225	**VW3 A7 816**	543.000
ATV 71HC50N4	0.7	330	**VW3 A7 817**	642.000

(1) Operating factor for hoist resistors: the value of the average power that can be dissipated at 50°C from the resistor is determined by an operating factor during braking.
For VW3 A7 801…808:
- 100 s braking with 1 Tn braking torque for a 200 s cycle
- 20 s braking with 1.6 Tn braking torque for a 200 s cycle.
For VW3 A7 809…817:
- 110 s braking with 1.25 Tn braking torque for a 240 s cycle
- 10 s braking with 2 Tn braking torque for a 240 s cycle.

Variable speed drives for asynchronous motors

Altivar 71

Option: braking units and resistors

Determining the braking unit and resistor

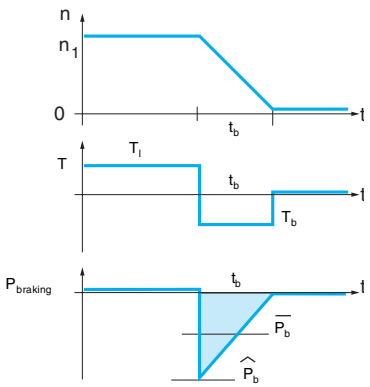
Calculating the various braking powers makes it possible to determine the braking unit and the braking resistor.

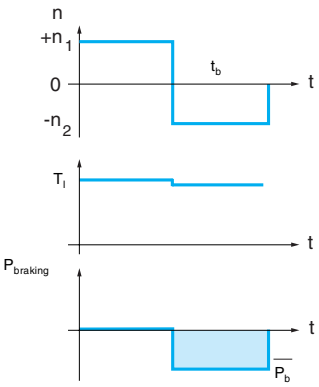
Presentation of the two main types of operation: A and B

A The braking power during deceleration is characterized by a peak power $\hat{P}_f$ obtained at the start of deceleration, which decreases to 0 in proportion with the speed.
Example: Stopping centrifuges, translational movement, change of direction, etc

B Braking power at constant speed n_2.
Example: Vertical downward movement, motor/generator test bench, gravity conveyors, etc.

n_1	Motor speed	[rpm]
n_2	Motor speed during deceleration	[rpm]
T_l	Load torque	[Nm]
T_b	Braking torque	[Nm]
$\hat{P}_b$	Maximum braking power	[W]
$\bar{P}_b$	Average braking power during time t_b	[W]
t_b	Braking time	[s]





Note: These two types of operation can be combined.

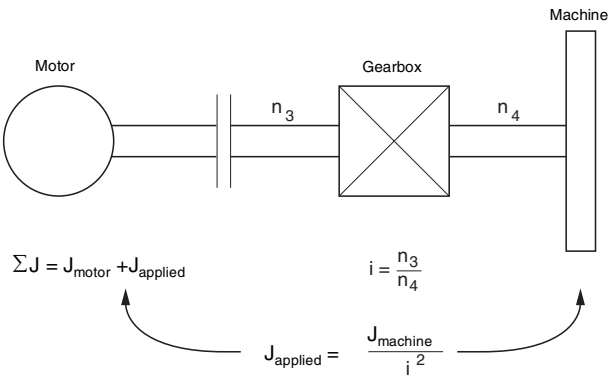
Type A operation

Calculating the braking time from the inertia.

$$t_b = \frac{J \cdot \omega}{T_b + T_r} \qquad \omega = \frac{2\pi \cdot n}{60} \qquad T_b = \frac{\Sigma J \cdot (n_3 - n_4)}{9{,}55 \cdot t_b}$$

$$\hat{P}_b = \frac{T_b \cdot n_3}{9{,}55} \qquad \bar{P}_b = \frac{\hat{P}_b}{2}$$

T_b	Motor braking torque	[Nm]
ΣJ	Total inertia applied to the motor	[kgm²]
n	Motor speed	[rpm]
n_3	Motor speed ahead of gearbox	[rpm]
n_4	Motor speed after gearbox	[rpm]
t_b	Braking time	[s]
$\hat{P}_b$	Peak braking power	[W]
$\bar{P}_b$	Average braking power during time t_b	[W]
T_r	Resistive torque	[Nm]



Variable speed drives for asynchronous motors
Altivar 71
Option: braking units and resistors

Type B operation

1 Braking power of a load moving horizontally with constant deceleration (e.g.: carriage)

W	Kinetic energy	[Joule]
m	Weight	[kg]
v	Speed	[m/s]
t_b	Braking time	[s]
$\hat{P}_b$	Peak braking power	[W]
$\bar{P}_b$	Average braking power during time t_b	[W]
T_b	Braking torque	[Nm]
n	Motor speed	[rpm]
g	Acceleration	9.81 m/s²
a	Deceleration	[m/s²]
v	Linear downward speed	[m/s]
J	Moment of inertia	[kgms²]
ω	Angular speed	[rad/s]
t_b	Downward stopping time	[s]

$$W = \frac{m \cdot v^2}{2} \qquad \bar{P}_b = \frac{W}{t_b} \qquad \hat{P}_b = \bar{P}_b \cdot 2$$

2 Braking power for an active load (e.g.: test bench)

$$\bar{P}_b = \frac{T_b \cdot n}{9{,}95}$$

3 Braking power for a downward vertical movement

$$\bar{P}_b = m \cdot g \cdot v \qquad \hat{P}_b = m \cdot (g + a) \cdot v + \frac{J \cdot \omega^2}{t_f} \qquad \omega = \frac{2\pi \cdot n}{60}$$

All the braking power calculations are only true if it is assumed that there are no losses ($\eta = 1$) and that there is no resistive torque.
To be even more precise, the following must be considered:
- the losses and the resistive torque of the system, which reduce the necessary braking power
- the driving torque (the wind, for example) which increases the braking power

The required braking power is calculated as follows:

$\hat{P}_{bR}$	Maximum actual braking power	[W]
$\bar{P}_{bR}$	Continuous actual braking power	[W]
η_{total}	Total efficiency	
P_{load}	Braking power connected with the resistive or driving torque (not taken into account in the calculation). P_{load} can be positive or negative.	[W]
η_{drive}	Drive efficiency = 0.98	
η_{mec}	Mechanical efficiency	
η_{mot}	Motor efficiency	

$$\hat{P}_{bR} = (\hat{P}_b - P_{load}) \times \eta total \qquad \bar{P}_{bR} = (\bar{P}_b - P_{load}) \times \eta total$$

$$\eta_{total} = \eta_{mec} \times \eta_{mot} \times 0{,}98$$

For braking, the value of the braking resistor is selected to match the required power and the braking cycle.

U_{dc}	Braking unit engage threshold	[V]

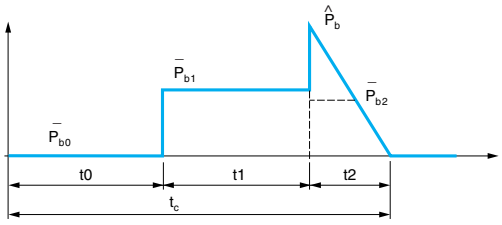
In general:

$$\hat{P}_{bR} = \frac{U^2 dc}{R} \Rightarrow R = \frac{U^2 dc}{\hat{P}_{bR}}$$

Continuous power is obtained by taking the operating cycle into account.

t_c	Cycle time	[s]
$\bar{P}_{b0}$	Upward braking power, therefore zero	[W]
t_0	Rise time	[s]
$\bar{P}_{b1}$	Average braking power during downward movement	[W]
t_1	Downward movement time	[1]
$\hat{P}_b$	Peak braking power	[W]
$\bar{P}_{b2}$	Average power during braking to a standstill	[W]
t_2	Standstill braking time	[s]

$$P_{continuous} = \frac{\bar{P}_{b0} \times t_0 + \bar{P}_{b1} \times t_1 + \bar{P}_{b2} \times t_2}{t_c} \quad [W]$$



The braking unit is selected taking the following into account:
- the continuous power $\bar{P}_{f1}$
- the average braking power during downward movement $\bar{P}_{f2}$
- the peak power $\hat{P}_f$.

Depending on these elements, select the braking unit according to the characteristics on page 2/398.
The braking resistor is selected taking account of the same elements listed above, but with the addition of a check to ensure that the resistance value will allow the peak power to be exceeded $\left(R = \frac{U^2 dc}{\hat{P}_f}\right)$.

Note: The resistance value must always be greater than or equal to the values given in the tables on pages 2/400 and 2/402.

2.5

Variable speed drives for asynchronous motors

Altivar 71

Characteristics curves for resistors

Example of using characteristics curves

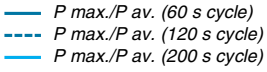
VW3 A7 710 (P continuous = 25 kW) for 2.75 Ω at 20°C

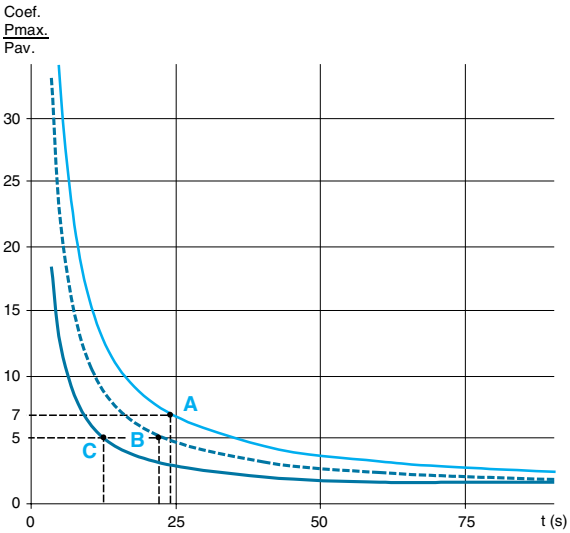
Example of using curves:

*Point **A** For a 200 s cycle, the resistance of 2.75 Ω accepts an overload of 7 x 25 kW (continuous power) for 24 s, i.e. braking 175 kW every 200 s.*

*Point **B** For a 120 s cycle, the resistance of 2.75 Ω accepts an overload of 5 x 25 kW (continuous power) for 20 s, i.e. braking 125 kW every 120 s.*

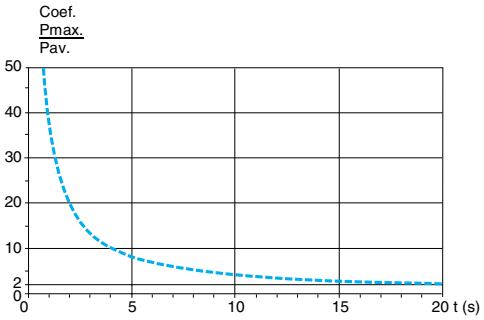
*Point **C** For a 60 s cycle, the resistance of 2.75 Ω accepts an overload of 5 x 25 kW (continuous power) for 10 s, i.e. braking 125 kW every 60 s.*



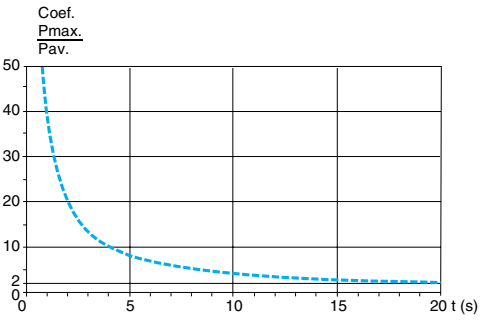


Braking resistors

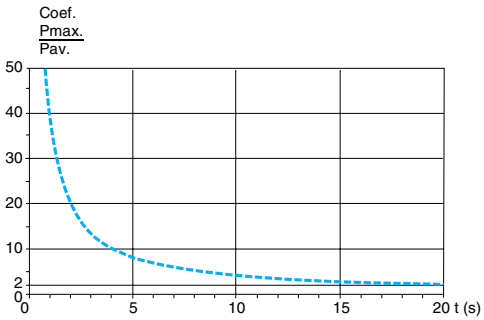
VW3 A7 701 (P continuous = 0.05 kW)



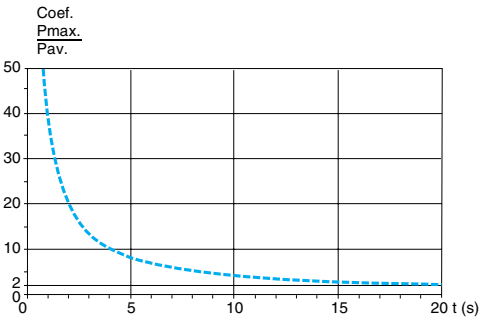
VW3 A7 702 (P continuous = 0.1 kW)



VW3 A7 703 (P continuous = 0.2 kW)



VW3 A7 704…709 (P continuous = 1 kW)



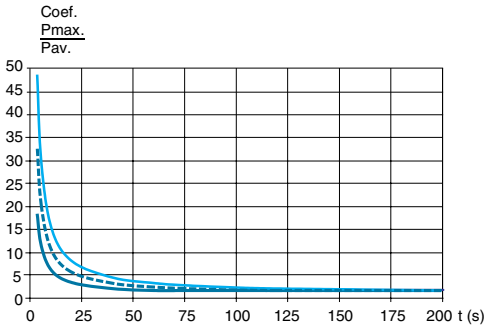
Variable speed drives for asynchronous motors

Altivar 71

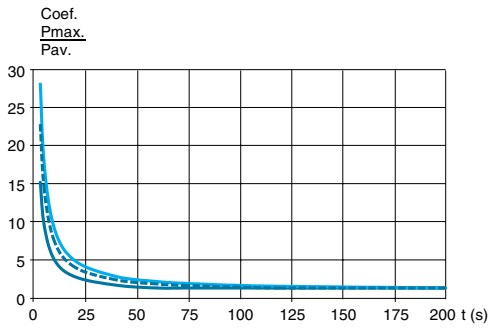
Characteristics curves for resistors

Braking resistors (continued)

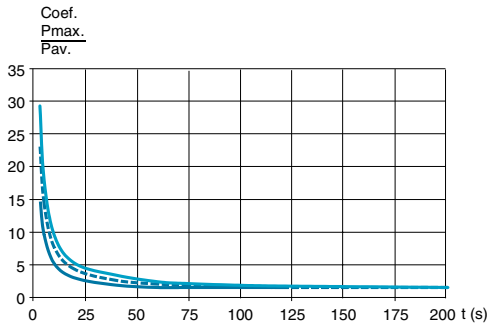
VW3 A7 710 (P continuous = 25 kW)



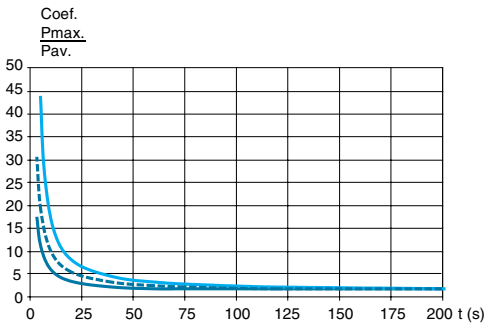
VW3 A7 711 (P continuous = 37 kW)



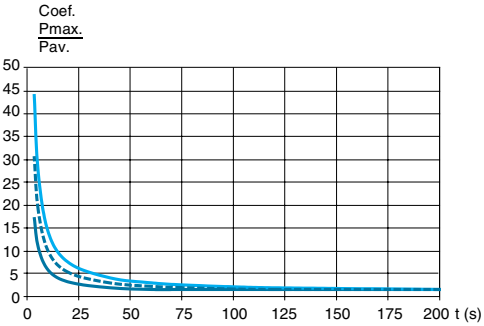
VW3 A7 712 (P continuous = 44 kW)



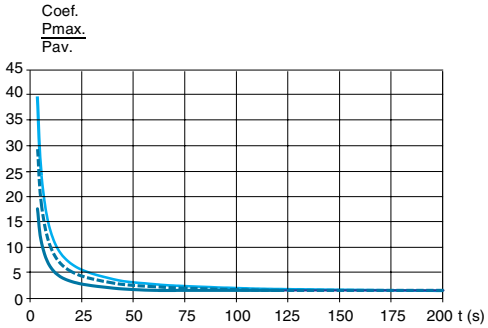
VW3 A7 713 (P continuous = 15.3 kW)



VW3 A7 714 (P continuous = 20.9 kW)



VW3 A7 715 (P continuous = 56 kW)



P max./P av. (60 s cycle)
P max./P av. (120 s cycle)
P max./P av. (200 s cycle)

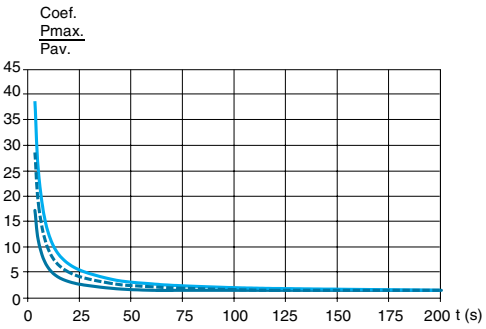
Variable speed drives for asynchronous motors

Altivar 71

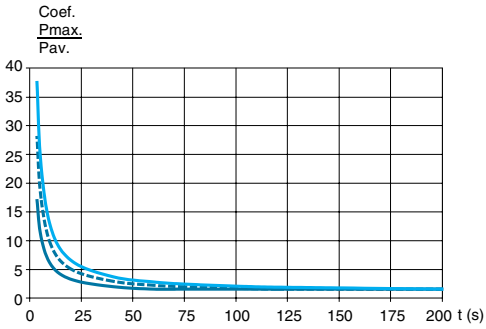
Characteristics curves for resistors

Braking resistors (continued)

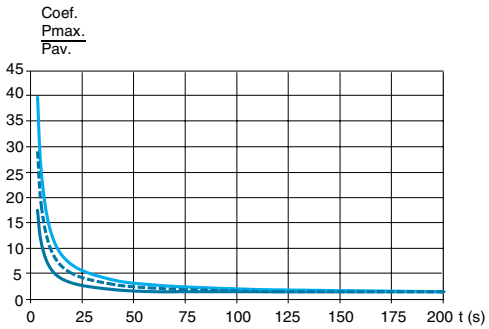
VW3 A7 716 (P continuous = 75 kW)



VW3 A7 717 (P continuous = 112 kW)



VW3 A7 718 (P continuous = 150 kW)



P max./P av. (60 s cycle)
P max./P av. (120 s cycle)
P max./P av. (200 s cycle)

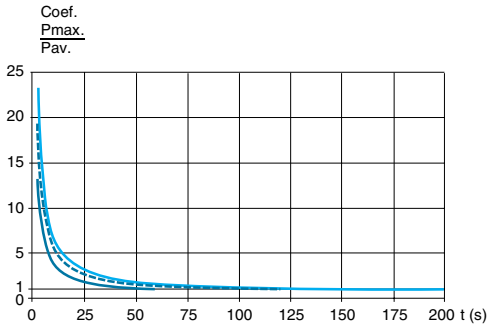
Variable speed drives for asynchronous motors

Altivar 71

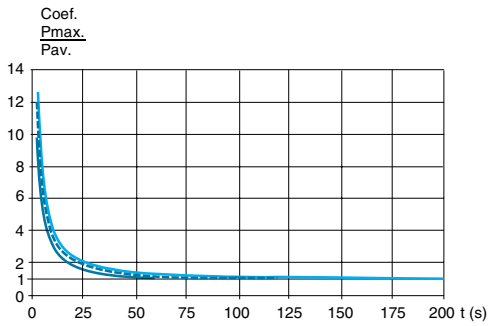
Characteristics curves for resistors

Hoist resistors

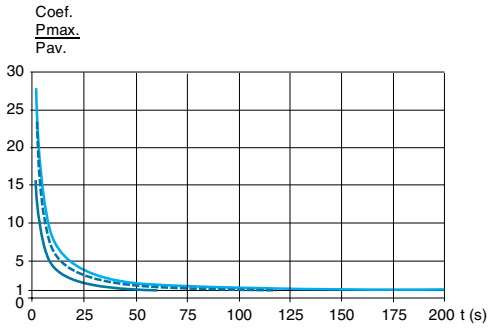
VW3 A7 801 (P continuous = 1.6 kW)



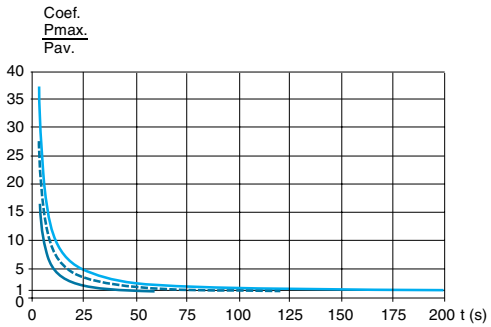
VW3 A7 802 (P continuous = 5.6 kW)



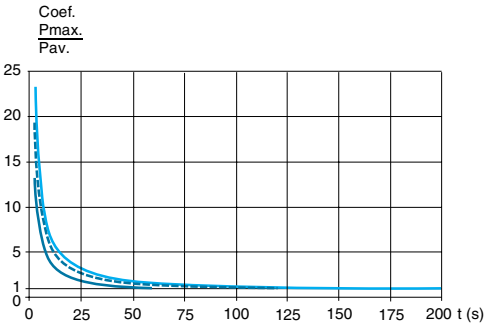
VW3 A7 803 (P continuous = 9.8 kW)



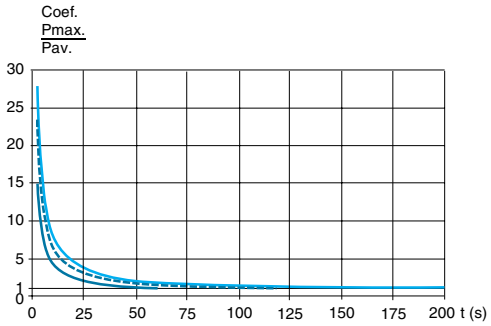
VW3 A7 804 (P continuous = 22.4 kW)



VW3 A7 805 (P continuous = 44 kW)



VW3 A7 806 (P continuous = 62 kW)



P max./P av. (60 s cycle)
P max./P av. (120 s cycle)
P max./P av. (200 s cycle)

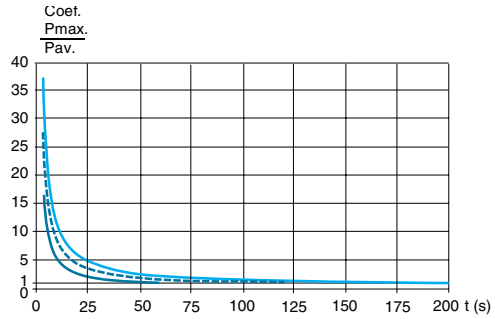
Variable speed drives for asynchronous motors

Altivar 71

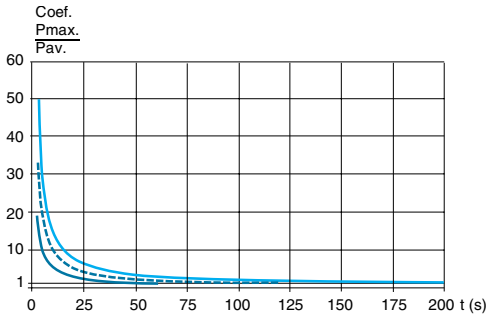
Characteristics curves for resistors

Hoist resistors (continued)

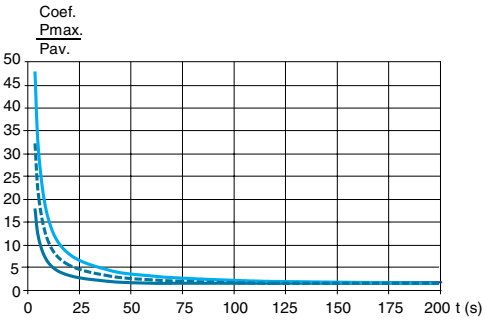
VW3 A7 807 (P continuous = 19.5 kW)



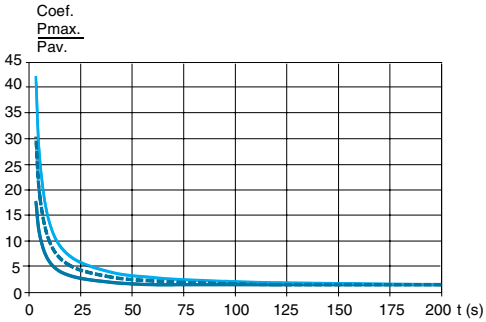
VW3 A7 808 (P continuous = 27.4 kW)



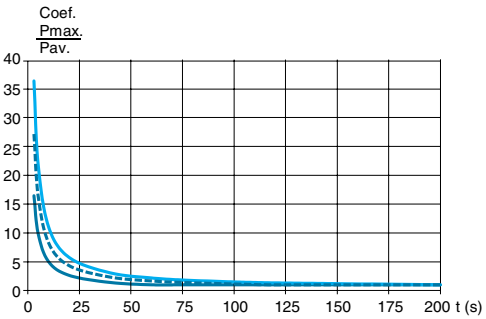
VW3 A7 809 (P continuous = 30.6 kW)



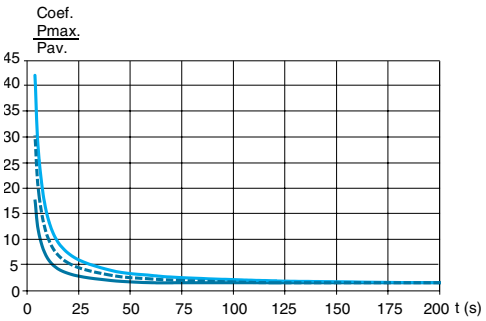
VW3 A7 810 (P continuous = 44 kW)



VW3 A7 811 (P continuous = 56 kW)



VW3 A7 812 (P continuous = 75 kW)



P max./P av. (60 s cycle)
P max./P av. (120 s cycle)
P max./P av. (200 s cycle)

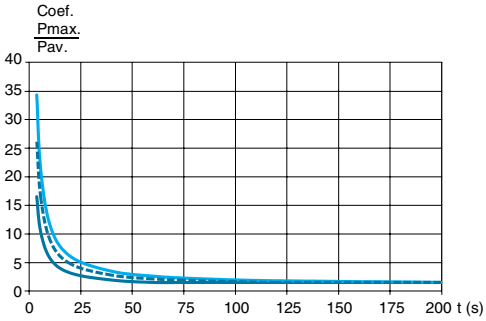
Variable speed drives for asynchronous motors

Altivar 71

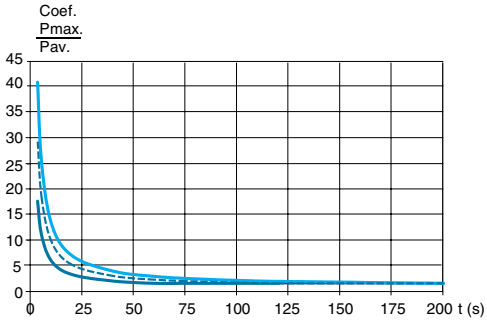
Characteristics curves for resistors

Hoist resistors (continued)

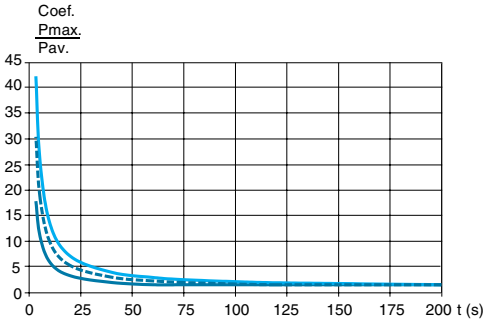
VW3 A7 813 (P continuous = 112 kW)



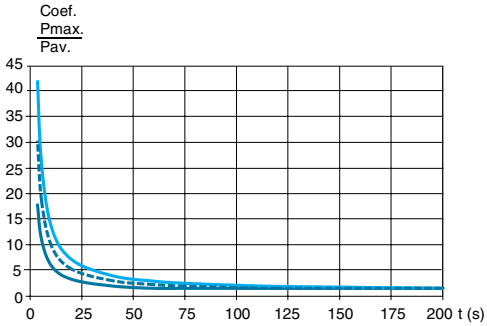
VW3 A7 814 (P continuous = 112 kW)



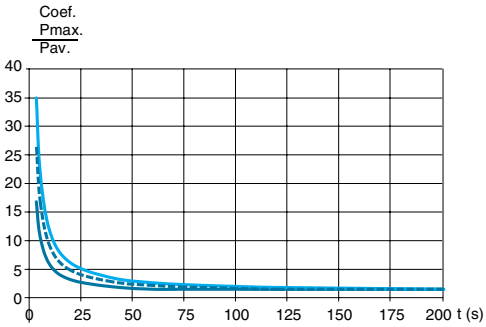
VW3 A7 815 (P continuous = 150 kW)



VW3 A7 816 (P continuous = 225 kW)



VW3 A7 817 (P continuous = 330 kW)



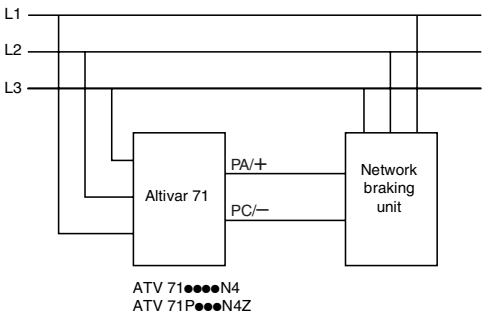
P max./P av. (60 s cycle)
P max./P av. (120 s cycle)
P max./P av. (200 s cycle)

Variable speed drives for asynchronous motors

Altivar 71

Option: network braking units

Presentation



ATV 71●●●●N4
ATV 71P●●●N4Z

The network braking unit can be used to restore the following to the line supply:
- the energy from the motor
- the energy from the motors controlled by several drives connected on the same DC bus

It is available for **ATV 71●●●●N4** and **ATV 71P●●●N4Z** drives.

Applications

Braking on a driving load:
- vertical movements
- escalators
- etc.

General characteristics

Degree of protection			IP 20
Maximum relative humidity			Class F humidity without condensation 5…85%
Ambient air temperature around the device	Operation	**°C**	5…+40 without derating Up to 55°C with current derating of 3% per °C above 40°C
	Storage	**°C**	-25…+55
Maximum operating altitude		**m**	1000 without derating 1000…4000 derating the current by 5% per additional 1000 m

Electrical characteristics

Type of module		**VW3 A7 201…212**	**VW3 A7 231…241**
Supply voltage	**V**	400 ∿	460 ∿
Nominal voltage ± 10%	**V**	380…415 ∿	440…480 ∿
Operating frequency	**Hz**	40…60 ± 10%	
Overload capacity	**A**	1.2 x maximum current (Irms)	
Efficiency		97% (3% of thermal losses)	
Power factor		1	
Fundamental frequency component		0.7…0.95	

Connection characteristics

Maximum connection capacity	VW3 A7 201		25 mm², connected on a bar, M5
	VW3 A7 202…205, VW3 A7 231, 232		35 mm², connected on a bar, M6
	VW3 A7 206…209, VW3 A7 233…238		95 mm², connected on a bar, M8
	VW3 A7 210…212, VW3 A7 239…241		150 mm², connected on a bar, M10

References: page 2/413 | Selection: pages 2/414 and 2/415 | Dimensions: pages 2/461 and 2/462 | Schemes: page 2/486

Variable speed drives for asynchronous motors

Altivar 71

Option: network braking units

Line voltage: 400 V ~

Maximum current Irms ~ A	Maximum current Irms ⎓ A	Continuous braking power kW	Maximum braking power kW	Fast-acting semi-conductor fuses ~ A	Fast-acting semi-conductor fuses ~ V	Reference	Weight kg
11	13	7	7	20	660	**VW3 A7 201**	20.000
20	24	13	13	30	690	**VW3 A7 202**	25.000
32	38	11	22	50	690	**VW3 A7 203**	26.000
48	58	21.5	33	80	690	**VW3 A7 204**	30.000
65	78	26	45	100	690	**VW3 A7 205**	32.000
102	123	32	70	160	660	**VW3 A7 206**	43.000
130	157	38	90	200	660	**VW3 A7 207**	48.000
195	236	38	135	315	660	**VW3 A7 208**	52.000
231	279	86	160	350	660	**VW3 A7 209**	90.000
289	350	120	200	400	1000	**VW3 A7 210**	100.000
360	433	135	250	500	1000	**VW3 A7 211**	115.000
500	600	200	345	630	1000	**VW3 A7 212**	125.000

Line voltage: 460 V ~

Maximum current Irms ~ A	Maximum current Irms ⎓ A	Continuous braking power kW	Maximum braking power kW	Fast-acting semi-conductor fuses ~ A	Fast-acting semi-conductor fuses ~ V	Reference	Weight kg
28	33	11	22	50	690	**VW3 A7 231**	26.000
41	50	21.5	33	80	690	**VW3 A7 232**	30.000
57	69	26	45	100	690	**VW3 A7 233**	36.000
88	107	32	70	160	660	**VW3 A7 234**	43.000
113	137	38	90	200	660	**VW3 A7 235**	48.000
138	166	38	110	250	660	**VW3 A7 236**	48.000
157	189	38	125	250	660	**VW3 A7 237**	50.000
176	212	38	140	315	660	**VW3 A7 238**	90.000
201	243	86	160	315	660	**VW3 A7 239**	100.000
289	346	120	230	500	1000	**VW3 A7 240**	105.000
500	600	240	375	630	1000	**VW3 A7 241**	125.000

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Dimensions: pages 2/461 and 2/462
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Variable speed drives for asynchronous motors
Altivar 71
Characteristics curves

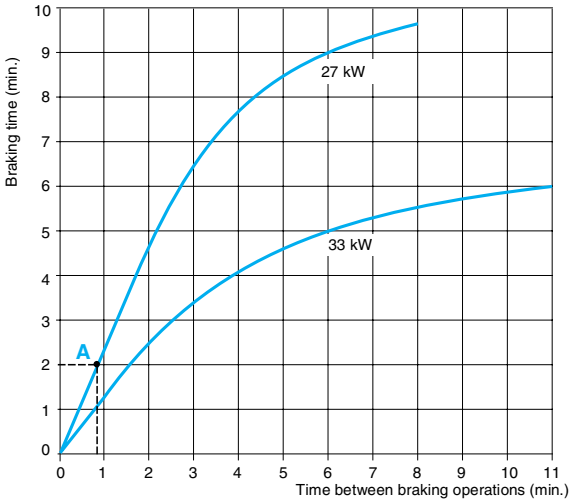
Example of using characteristics curves

VW3 A7 204, A7 232 (Continuous braking power = 21.5 kW) *(1)*

Example of how to use the curves:

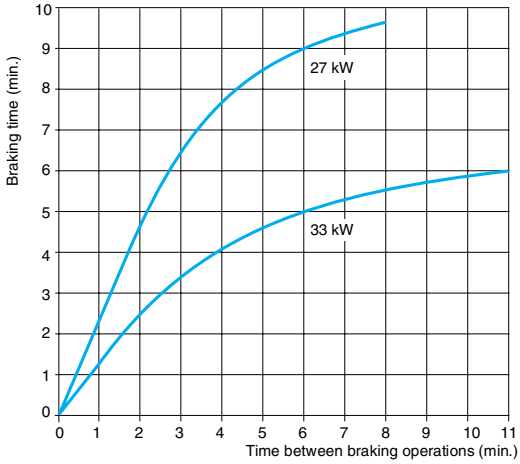
Required braking power of 27 kW.
The intersection point between the braking time and the time between 2 braking operations must be on or below the relevant curve.

Point A For a braking time of 2 minutes, there must be at least 50 seconds between 2 braking operations.

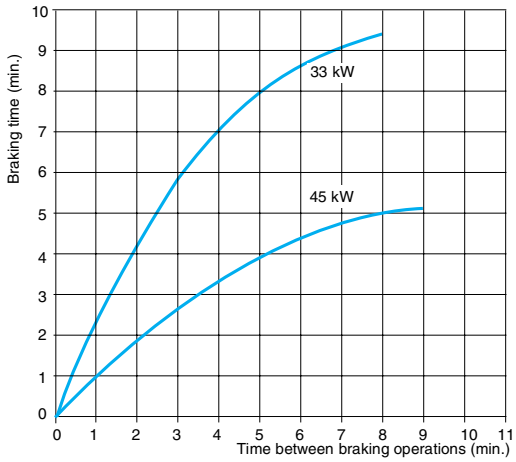


Network braking units

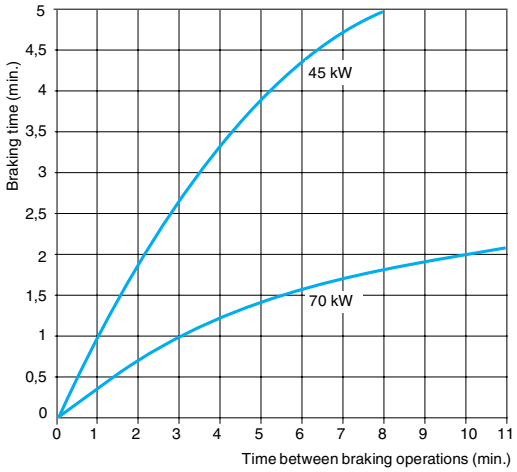
VW3 A7 204, A7 232 (Continuous braking power = 21.5 kW) *(1)*



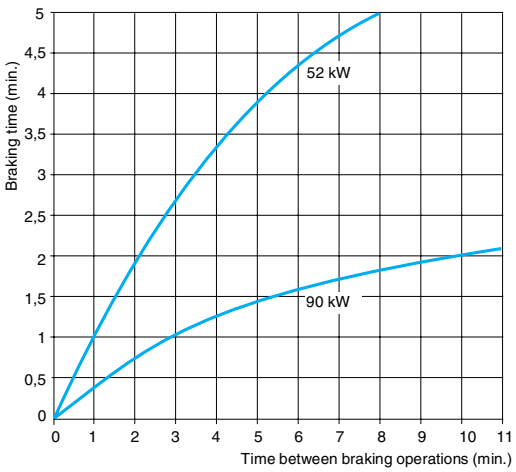
VW3 A7 205, A7 233 (Continuous braking power = 26 kW) *(1)*



VW3 A7 206, A7 234 (Continuous braking power = 32 kW) *(1)*



VW3 A7 207, A7 235 (Continuous braking power = 38 kW) *(1)*



(1) Power indicated for a temperature of 35°C.

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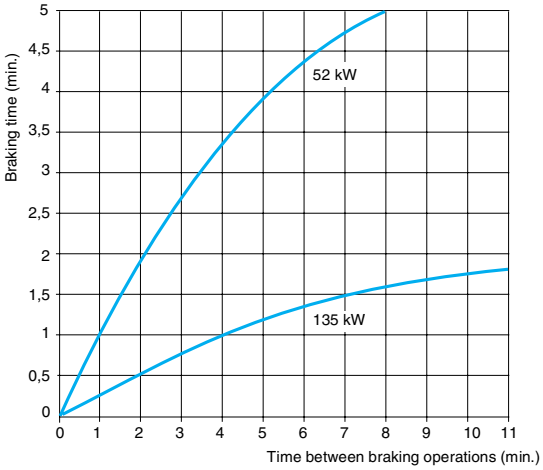
Schemes: page 2/486

Variable speed drives for asynchronous motors

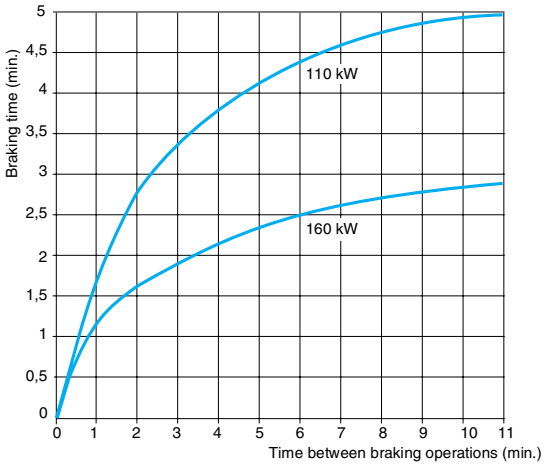
Altivar 71

Characteristics curves

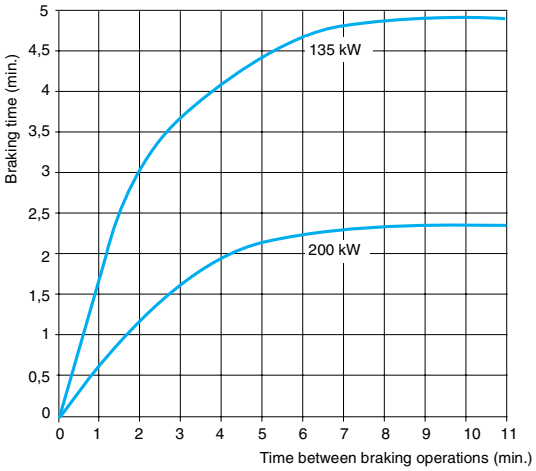
VW3 A7 208 (Continuous braking power = 38 kW) *(1)*



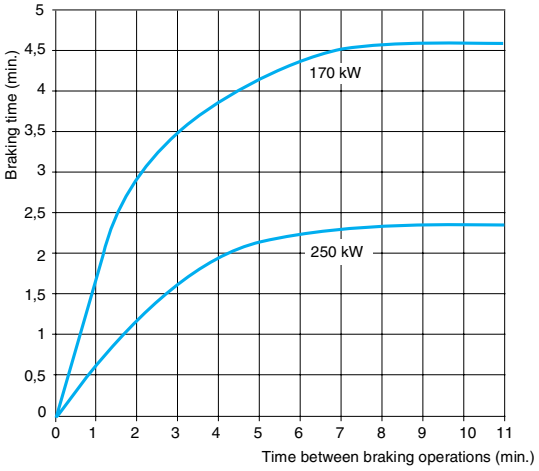
VW3 A7 209, A7 239 (Continuous braking power = 86 kW) *(1)*



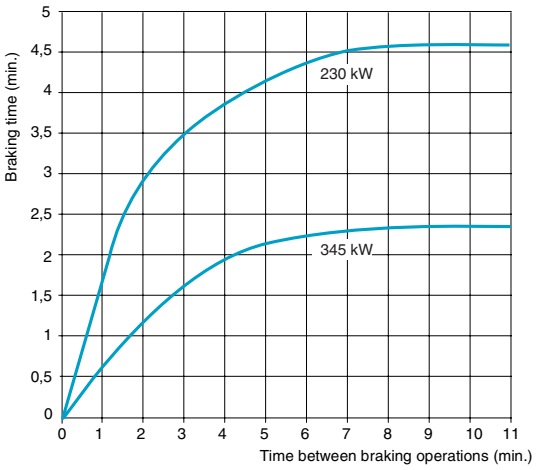
VW3 A7 210, A7 240 (Continuous braking power = 120 kW) *(1)*



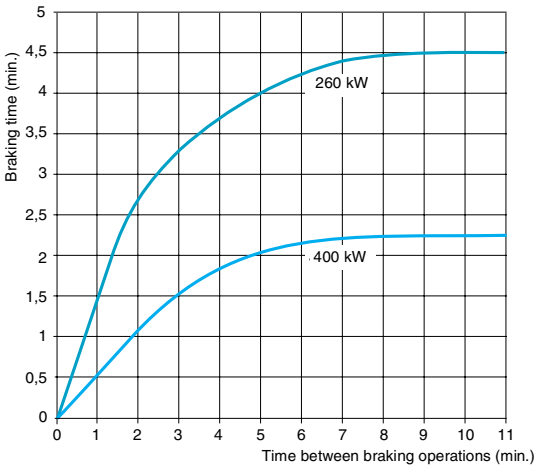
VW3 A7 211 (Continuous braking power = 135 kW) *(1)*



VW3 A7 212 (Continuous braking power = 200 kW) *(1)*



VW3 A7 241 (Continuous braking power = 240 kW) *(1)*



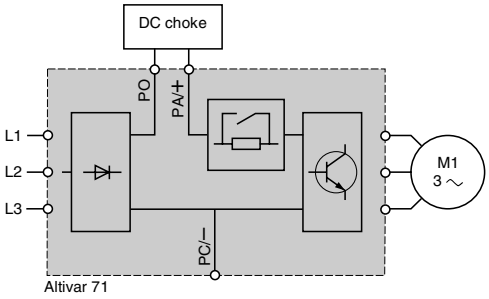
(1) Power indicated for a temperature of 35°C.

Presentation: page 2/412
References: page 2/413
Dimensions: pages 2/461 and 2/462
Schemes: page 2/486

Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Option: DC chokes



Altivar 71

The main solutions for reducing current harmonics are as follows:
- DC chokes, see below
- Line chokes, see page 2/420
- 16% and 10% passive filters, see page 2/423,
- Use of passive filters with a DC choke, see page 2/423

These 4 solutions can be used on the same installation.
It is always easier and less expensive to handle current harmonics at installation level as a whole rather than at the level of each individual unit, particularly when using passive filters and active compensators.

DC chokes

DC chokes are used to reduce current harmonics in order to comply with standard IEC 61000-3-12 for drives in which the line current is more than 16 A and less than 75 A.
Using the DC choke with the drive complies with standard IEC 61000-3-12 provided that the RSCE ⩾ 120 *(1)* at the point of connection to the public network.
120 represents the minimum value of RSCE *(1)* for which the values in table 4 of standard IEC 61000-3-12 are not exceeded.
It is the responsibility of the installer or the user to ensure that the device is connected correctly to a connection point with an RSCE ⩾ 120.
The choke is connected to the drive power terminals.

The DC choke is supplied as standard with ATV 71HD55M3X, HD75M3X and ATV 71HD90N4…HC50N4 drives.
It is compulsory for ATV 71P●●●N4Z drives if they do not have a fan (see page 2/366).

Applications

Reduction of current harmonics.
Reduction of the THD to 5% or 10% when used with passive filters, see pages 2/424 to 2/427.
Maintaining the motor torque in relation to the line choke.

(1) Short-circuit ratio.

Characteristics: page 2/419 | References: page 2/419 | Dimensions: page 2/463 | Schemes: pages 2/474 to 2/477

Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Option: DC chokes

Example of current harmonic levels for ATV 71H●●●M3 and ATV 71H●●●M3X drives (1)

Motor power		For ATV 71 drives	Line supply		Current harmonic levels																THD (3)
			Line current	Line Isc (2)	H1	H5	H7	H11	H13	H17	H19	H23	H25	H29	H31	H35	H37	H41	H43	H47	H49	
kW	HP		A	kA	A	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
3-phase supply voltage: 230 V 50 Hz, with optional DC choke																					
0.37	0.5	H037M3	1.5	5	1.4	26.7	18.4	9.1	7.7	5.8	5.1	4.3	3.8	3.4	3	2.8	2.5	2.4	2.2	2.1	1.9	36.3
0.75	1	H075M3	3.05	5	2.81	31.99	20.91	8.88	7.36	5.6	4.63	4.07	3.42	3.18	2.71	2.59	2.24	2.17	1.91	1.86	1.66	41.27
1.5	2	HU15M3	6.04	5	5.55	33.65	21.59	8.14	6.84	4.97	4.19	3.54	3.08	2.71	2.43	2.17	2.01	1.78	1.7	1.5	1.47	42.4
2.2	3	HU22M3	8.33	5	7.64	34.89	21.11	8.78	6.72	5.36	4.1	3.8	3	2.9	2.37	2.29	1.95	1.85	1.66	1.52	1.44	43.33
3	–	HU30M3	11.12	5	10.19	35.17	20.68	8.71	6.48	5.24	3.94	3.67	2.88	2.76	2.27	2.15	1.87	1.71	1.58	1.37	1.37	43.22
4	5	HU40M3	14.53	5	13.29	36.23	20.51	8.73	6.2	5.2	3.73	3.61	2.71	2.68	2.14	2.06	1.76	1.61	1.49	1.27	1.28	43.91
5.5	7.5	HU55M3	19.2	8	17.9	30.68	17.26	8.75	6.31	5.3	4.03	3.72	2.98	2.79	2.36	2.17	1.94	1.71	1.63	1.36	1.4	38
7.5	10	HU75M3	26.1	15	23.9	35.23	21.09	8.82	6.71	5.38	4.09	3.82	2.98	2.91	2.35	2.31	1.92	1.87	1.63	1.54	1.4	43.96
11	15	HD11M3X	36.6	15	34.2	30.91	17.12	8.86	6.36	5.37	4.08	3.77	3.01	2.82	2.37	2.19	1.94	1.73	1.62	1.37	1.38	38.14
15	20	HD15M3X	48.6	15	55.8	25.51	13.46	8.73	6.32	5.25	4.21	3.6	3.11	2.62	2.42	1.95	1.93	1.47	1.56	1.12	1.26	35.34
18.5	25	HD18M3X	58.7	22	55.8	25.51	13.46	8.73	6.32	5.25	4.21	3.6	3.11	2.62	2.42	1.95	1.93	1.47	1.56	1.12	1.26	32.31
22	30	HD22M3X	70.28	22	65.92	29.81	15.91	8.7	6.15	5.23	3.99	3.63	2.95	2.68	2.32	2.04	1.89	1.57	1.57	1.22	1.32	36.62
30	40	HD30M3X	96.9	22	88.78	36.68	19.42	8.38	5.67	4.86	3.44	3.29	2.52	2.38	1.98	1.77	1.62	1.34	1.34	1.02	1.12	43.51
37	50	HD37M3X	116.1	22	107.9	33.09	16.4	8.59	5.59	4.97	3.54	3.33	2.6	2.36	2.03	1.72	1.63	1.26	1.32	0.94	1.06	39.24
45	60	HD45M3X	138.7	22	130.5	30.15	13.86	8.65	5.38	5.01	3.49	3.33	2.55	2.33	1.96	1.66	1.53	1.2	1.19	0.9	0.9	35.7
3-phase supply voltage: 230 V 50 Hz, with DC choke supplied as standard with the drive																					
55	75	HD55M3X	163.5	35	175.8	46.43	27.19	8.18	6.32	4.57	3.27	3.06	2.23	2.23	1.69	1.70	1.35	1.33	1.10	1.07	0.90	55.32
75	100	HD75M3X	215.7	35	236.8	45.17	25.21	8.08	5.85	4.40	3.02	2.89	2.06	2.06	1.55	1.54	1.23	1.18	0.99	0.92	0.80	53.17

Example of current harmonic levels for ATV 71H●●●N4 drives (1)

Motor power		For ATV 71 drives	Line supply		Current harmonic levels																THD (3)
			Line current	Line Isc (2)	H1	H5	H7	H11	H13	H17	H19	H23	H25	H29	H31	H35	H37	H41	H43	H47	H49	
kW	HP		A	kA	A	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
3-phase supply voltage: 400 V 50 Hz, with optional DC choke																					
0.75	1	H075N4	1.77	5	1.61	34.6	23.7	8.9	7.8	5.6	4.8	4.1	3.5	3.2	2.8	2.6	2.3	2.2	1.9	1.9	1.7	44.95
1.5	2	HU15N4	3.34	5	3.03	35.55	23.53	8.95	7.65	5.61	4.74	4.06	3.49	3.16	2.76	2.57	2.28	2.15	1.94	1.83	1.68	45.48
2.2	3	HU22N4	4.83	5	4.4	35.79	22.77	8.7	7.11	5.41	4.36	3.89	3.2	3.01	2.53	2.43	2.09	2.01	1.77	1.7	1.53	45
3	–	HU30N4	6.13	5	5.67	31.61	18.82	9.41	6.82	5.88	4.57	4.24	3.38	3.28	2.67	2.63	2.19	2.16	1.86	1.8	1.6	40.08
4	5	HU40N4	8.24	5	7.51	36.16	21.63	9	8.17	5.52	4.17	3.93	3.05	3	2.4	2.38	1.98	1.93	1.68	1.58	1.45	44.72
5.5	7.5	HU55N4	10.81	22	9.83	34.85	23.08	9.68	4.05	6.12	5.18	4.45	3.83	3.48	3.04	2.85	2.52	2.4	2.14	2.06	1.85	45.19
7.5	10	HU75N4	15.01	10	13.8	34.09	20.49	8.57	6.43	5.28	3.95	3.78	2.89	2.9	2.28	2.32	1.88	1.9	1.59	1.58	1.37	42.25
11	15	HD11N4	21.1	9	19.3	35.22	20.11	8.95	6.5	5.41	4.02	3.8	2.95	2.86	2.32	2.23	1.9	1.77	1.6	1.42	1.37	43.1
15	20	HD15N4	28.2	12	25.8	35.22	20.01	8.98	6.49	5.43	4.02	3.82	2.94	2.88	2.32	2.24	1.9	1.78	1.6	1.43	1.37	43.06
18.5	25	HD18N4	33.9	12	31.9	28.36	15.16	8.85	6.18	5.39	4.04	3.78	2.98	2.83	2.34	2.18	1.9	1.7	1.58	1.33	1.33	35.23
22	30	HD22N4	40.87	22	37.85	32.79	18.73	8.6	6.42	5.28	4.09	3.75	3.03	2.85	2.4	2.25	1.97	1.81	1.67	1.48	1.44	40.4
30	40	HD30N4	54.1	20	50.6	29.97	16.26	8.75	6.27	5.32	4.07	3.73	3.01	2.79	2.37	2.15	1.94	1.69	1.62	1.33	1.38	36.99
37	50	HD37N4	66.43	22	62.6	28.49	15.01	8.63	6.08	5.23	4	3.65	2.97	2.71	2.34	2.07	1.9	1.61	1.58	1.26	1.32	35.13
45	60	HD45N4	83.11	22	75.56	38.31	20.96	8.24	5.81	4.85	3.48	3.33	2.54	2.44	2	1.85	1.64	1.42	1.38	1.1	1.17	45.59
55	75	HD55N4	98.6	22	91.69	32.94	16.76	8.5	5.68	4.98	3.62	3.38	2.67	2.44	2.09	1.81	1.69	1.37	1.39	1.04	1.14	39.29
75	100	HD75N4	134	22	125.9	30.65	14.43	8.4	5.4	4.84	3.52	3.21	2.59	2.25	2	1.61	1.58	1.17	1.25	0.88	0.96	36.2
3-phase supply voltage: 400 V 50 Hz, with DC choke supplied as standard with the drive																					
90	125	HD90N4	158.81	35	145.1	36.72	20.66	8.33	6.19	4.93	3.78	3.43	2.75	2.56	2.13	1.99	1.72	1.59	1.4	1.29	1.16	44.26
110	150	HC11N4	193.81	35	175.7	38.91	21.7	8.24	6.03	4.78	3.56	3.28	2.56	2.42	1.98	1.87	1.58	1.47	1.28	1.19	1.06	46.45
132	200	HC13N4	228.92	35	209.3	37.23	20.02	8.26	5.8	4.76	3.51	3.26	2.52	2.38	1.94	1.82	1.55	1.42	1.24	1.12	1	44.23
160	250	HC16N4	276.22	50	251.7	38.29	20.22	8.19	5.59	4.66	3.32	3.13	2.37	2.26	1.82	1.7	1.43	1.31	1.14	1.02	0.91	45.11
200	300	HC20N4	340.29	50	313.6	36.03	17.85	8.16	5.3	4.59	3.25	3.05	2.32	2.17	1.76	1.6	1.37	1.2	1.05	0.91	0.82	42.07
220	350	HC25N4	378.67	50	344.9	38.91	19.7	8.11	5.22	4.47	3.04	2.93	2.15	2.07	1.63	1.52	1.27	1.14	0.99	0.85	0.78	45.26
250	400	HC25N4	423.72	50	390.1	36.61	17.59	8.11	5.04	4.46	3.04	2.9	2.16	2.02	1.62	1.46	1.24	1.07	0.95	0.78	0.73	42.35
280	450	HC28N4	471.17	50	437.3	34.78	15.9	8.1	4.92	4.44	3.04	2.86	2.16	1.97	1.6	1.4	1.21	1	0.9	0.72	0.67	40.05
315	500	HC31N4	528.66	50	492.2	34.19	15.08	8.03	4.79	4.36	2.98	2.78	2.1	1.88	1.54	1.31	1.14	0.92	0.84	0.65	0.61	39.15
355	–	HC40N4	607.3	50	555.5	38.78	17.83	7.88	4.59	4.14	2.64	2.58	1.84	1.74	1.37	1.21	1.04	0.85	0.78	0.6	0.58	44.12
400	600	HC40N4	675.3	50	623.4	36.78	15.99	7.86	4.43	4.1	2.64	2.53	1.85	1.67	1.35	1.13	0.99	0.78	0.73	0.54	0.53	41.6
500	700	HC50N4	833.84	50	779.9	33.73	13.22	7.82	4.26	3.99	2.63	2.38	1.81	1.5	1.26	0.95	0.88	0.63	0.61	0.44	0.43	37.8

(1) Example of current harmonic levels up to harmonic order 49 for a 230 V/50 Hz line supply for ATV 71H●●●M3 and ATV 71H●●●M3X drives or 400 V/50 Hz for ATV 71H●●●N4 drives, with the chokes connected between the PO and PA/+ terminals on the Altivar 71.

(2) The line Isc values are given for the current harmonic levels in the table.

(3) Total harmonic distortion conforming to standard IEC 61000-3-12.

Presentation: page 2/416 | References: page 2/419 | Dimensions: page 2/463 | Schemes: pages 2/474 to 2/477

Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Option: DC chokes

Example of current harmonic levels for ATV 71W●●●N4 drives (1)

3-phase supply voltage: 400 V 50 Hz, with optional DC choke

Motor power		For ATV 71 drives	Line supply		Current harmonic levels																THD (3)
			Line current	Line Isc (2)	H1	H5	H7	H11	H13	H17	H19	H23	H25	H29	H31	H35	H37	H41	H43	H47	H49	
kW	HP		A	kA	A	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
0.75	1	W075N4	1.77	5	1.61	34.6	23.7	8.9	7.8	5.6	4.8	4.1	3.5	3.2	2.8	2.6	2.3	2.2	1.9	1.9	1.7	44.95
1.5	2	WU15N4	3.34	5	3.03	35.55	23.53	8.95	7.65	5.61	4.74	4.06	3.49	3.16	2.76	2.57	2.28	2.15	1.94	1.83	1.68	45.48
2.2	3	WU22N4	4.83	5	4.4	35.79	22.77	8.7	7.11	5.41	4.36	3.89	3.2	3.01	2.53	2.43	2.09	2.01	1.77	1.7	1.53	45
3	–	WU30N4	6.13	5	5.67	31.61	18.82	9.41	6.82	5.88	4.57	4.24	3.38	3.28	2.67	2.63	2.19	2.16	1.86	1.8	1.6	40.08
4	5	WU40N4	8.24	5	7.51	36.16	21.63	9	8.17	5.52	4.17	3.93	3.05	3	2.4	2.38	1.98	1.93	1.68	1.58	1.45	44.72
5.5	7.5	WU55N4	10.81	22	9.83	34.85	23.08	9.68	4.05	6.12	5.18	4.45	3.83	3.48	3.04	2.85	2.52	2.4	2.14	2.06	1.85	45.19
7.5	10	WU75N4	15.01	10	13.8	34.09	20.49	8.57	6.43	5.28	3.95	3.78	2.89	2.9	2.28	2.32	1.88	1.9	1.59	1.58	1.37	42.25
11	15	WD11N4	21.1	9	19.3	35.22	20.11	8.95	6.5	5.41	4.02	3.8	2.95	2.86	2.32	2.23	1.9	1.77	1.6	1.42	1.37	43.1
15	20	WD15N4	28.2	12	25.8	35.22	20.01	8.98	6.49	5.43	4.02	3.82	2.94	2.88	2.32	2.24	1.9	1.78	1.6	1.43	1.37	43.06
18.5	25	WD18N4	33.9	12	31.9	28.36	15.16	8.85	6.18	5.39	4.04	3.78	2.98	2.83	2.34	2.18	1.9	1.7	1.58	1.33	1.33	35.23
22	30	WD22N4	40.87	22	37.85	32.79	18.73	8.6	6.42	5.28	4.09	3.75	3.03	2.85	2.4	2.25	1.97	1.81	1.67	1.48	1.44	40.4
30	40	WD30N4	54.1	20	50.6	29.97	16.26	8.75	6.27	5.32	4.07	3.73	3.01	2.79	2.37	2.15	1.94	1.69	1.62	1.33	1.38	36.99
37	50	WD37N4	66.43	22	62.6	28.49	15.01	8.63	6.08	5.23	4	3.65	2.97	2.71	2.34	2.07	1.9	1.61	1.58	1.26	1.32	35.13
45	60	WD45N4	83.11	22	75.56	38.31	20.96	8.24	5.81	4.85	3.48	3.33	2.54	2.44	2	1.85	1.64	1.42	1.38	1.1	1.17	45.59
55	75	WD55N4	98.6	22	91.69	32.94	16.76	8.5	5.68	4.98	3.62	3.38	2.67	2.44	2.09	1.81	1.69	1.37	1.39	1.04	1.14	39.29
75	100	WD75N4	134	22	125.9	30.65	14.43	8.4	5.4	4.84	3.52	3.21	2.59	2.25	2	1.61	1.58	1.17	1.25	0.88	0.96	36.2

Example of current harmonic levels for ATV 71P●●●N4Z drives (1)

3-phase supply voltage: 400 V 50 Hz, with optional DC choke

Motor power		For ATV 71 drives	Line supply		Current harmonic levels																THD (3)
			Line current	Line Isc (2)	H1	H5	H7	H11	H13	H17	H19	H23	H25	H29	H31	H35	H37	H41	H43	H47	H49	
kW	HP		A	kA	A	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
0.75	1	P075N4Z	1.77	5	1.61	34.6	23.7	8.9	7.8	5.6	4.8	4.1	3.5	3.2	2.8	2.6	2.3	2.2	1.9	1.9	1.7	44.95
1.5	2	PU15N4Z	3.34	5	3.03	35.55	23.53	8.95	7.65	5.61	4.74	4.06	3.49	3.16	2.76	2.57	2.28	2.15	1.94	1.83	1.68	45.48
2.2	3	PU22N4Z	4.83	5	4.4	35.79	22.77	8.7	7.11	5.41	4.36	3.89	3.2	3.01	2.53	2.43	2.09	2.01	1.77	1.7	1.53	45
3	–	PU30N4Z	6.13	5	5.67	31.61	18.82	9.41	6.82	5.88	4.57	4.24	3.38	3.28	2.67	2.63	2.19	2.16	1.86	1.8	1.6	40.08
4	5	PU40N4Z	8.24	5	7.51	36.16	21.63	9	8.17	5.52	4.17	3.93	3.05	3	2.4	2.38	1.98	1.93	1.68	1.58	1.45	44.72
5.5	7.5	PU55N4Z	10.81	22	9.83	34.85	23.08	9.68	4.05	6.12	5.18	4.45	3.83	3.48	3.04	2.85	2.52	2.4	2.14	2.06	1.85	45.19
7.5	10	PU75N4Z	15.01	10	13.8	34.09	20.49	8.57	6.43	5.28	3.95	3.78	2.89	2.9	2.28	2.32	1.88	1.9	1.59	1.58	1.37	42.25

(1) Example of current harmonic levels up to harmonic order 49 for a 400 V/50 Hz line supply with chokes connected between the PO and PA/+ terminals on the Altivar 71.
(2) The line Isc values are given for the current harmonic levels in the table.
(3) Total harmonic distortion conforming to standard IEC 61000-3-12.

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References: page 2/419
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Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics
Option: DC chokes

General characteristics

Degree of protection			IP 20
Maximum relative humidity			95%
Ambient air temperature around the device	Operation	**°C**	-10…+50 without derating Up to 60°C with current derating of 2.2% per °C above 50°C
	Storage	**°C**	-40…+65
Maximum operating altitude		**m**	1000 without derating 1000…3000 with current derating of 1% per additional 100 m
Voltage drop			4 to 6%
Maximum current			1.65 x nominal current for 60 seconds

Connection characteristics

Type of terminal		**Earth**	**Power supply**
Maximum connection capacity and tightening torque	VW3 A4 501…505	10 mm² (AWG 6) 1.2…1.4 Nm	2.5 mm² (AWG 12) 0.4…0.6 Nm
	VW3 A4 506	10 mm² (AWG 6) 1.2…1.4 Nm	4 mm² (AWG 10) 0.5…0.8 Nm
	VW3 A4 507	10 mm² (AWG 6) 1.2…1.4 Nm	6 mm² (AWG 8) 0.8…1 Nm
	VW3 A4 508, 509	10 mm² (AWG 6) 1.2…1.4 Nm	10 mm² (AWG 6) 1.2…1.4 Nm
	VW3 A4 510	10 mm² (AWG 6) 1.2…1.4 Nm	35 mm² (AWG 0) 2.5…3 Nm
	VW3 A4 511	–	Connected on a bar, Ø 9 –
	VW3 A4 512	–	Connected on a bar, Ø 9 –

DC chokes *(1)*

For drives	Inductance value	Nominal current	Loss	Reference	Weight
	mH	A	W		kg
3-phase supply voltage: 200…240 V 50/60 Hz					
ATV 71H037M3	18	2.25	7.7	**VW3 A4 501**	0.650
ATV 71H075M3	6.8	8	22.5	**VW3 A4 503**	1.700
ATV 71HU15M3	3.2	14.3	32	**VW3 A4 505**	2.200
ATV 71HU22M3	2.2	19.2	33	**VW3 A4 506**	2.500
ATV 71HU30M3	1.6	27.4	43	**VW3 A4 507**	3.000
ATV 71HU40M3, HU55M3	1.2	44	61	**VW3 A4 508**	4.500
ATV 71HU75M3	0.7	36	30.5	**VW3 A4 509**	2.500
ATV 71HD11M3X, HD15M3X	0.52	84.5	77	**VW3 A4 510**	6.200
ATV 71HD18M3X, HD22M3X	0.22	171.2	86	**VW3 A4 511**	15.500
ATV 71HD30M3X…HD45M3X	0.09	195	73	**VW3 A4 512**	10.000
3-phase supply voltage: 380…480 V 50/60 Hz					
ATV 71H075N4 ATV 71W075N4 ATV 71P075N4Z	18	2.25	7.7	**VW3 A4 501**	0.650
ATV 71HU15N4 ATV 71WU15N4 ATV 71PU15N4Z	10	4.3	11	**VW3 A4 502**	1.000
ATV 71HU22N4, HU30N4 ATV 71WU22N4, WU30N4 ATV 71PU22N4Z, PU30N4Z	6.8	8	22.5	**VW3 A4 503**	1.700
ATV 71HU40N4 ATV 71WU40N4 ATV 71PU40N4Z	3.9	10.7	27	**VW3 A4 504**	1.650
ATV 71HU55N4 ATV 71WU55N4 ATV 71PU55N4Z	3.2	14.3	32	**VW3 A4 505**	2.200
ATV 71HU75N4 ATV 71WU75N4 ATV 71PU75N4Z	2.2	19.2	33	**VW3 A4 506**	2.500
ATV 71HD11N4 ATV 71WD11N4	1.6	27.4	43	**VW3 A4 507**	3.000
ATV 71HD15N4, HD18N4 ATV 71WD15N4, WD18N4	1.2	44	57.5	**VW3 A4 508**	4.300
ATV 71HD22N4…HD37N4 ATV 71WD22N4…WD37N4	0.52	84.5	98.3	**VW3 A4 510**	5.600
ATV 71HD45N4…HD75N4 ATV 71WD45N4…WD75N4	0.22	171.2	128	**VW3 A4 511**	9.100

(1) With ATV 71HD55M3X, HD75M3X and ATV 71HD90N4…HC50N4 drives, the DC choke is supplied as standard with the drive.

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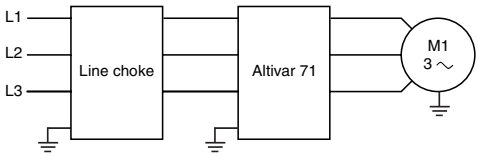
Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

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 drive.

Line chokes are compulsory on ATV 71HU40M3…HU75M3 drives supplied with a single phase 200…240 V 50/60 Hz supply voltage.

Line chokes can be used instead of a DC choke. In this case, to obtain an ATV 71HD55M3X, HD75M3X or ATV 71HD90N4…HC50N4 drive without a DC choke, add the letter D at the end of the drive reference, see pages 2/360 and 2/361.

The recommended chokes are used to 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 choke values are defined for a voltage drop between 3% and 5% of the nominal supply voltage. Values higher than this will cause loss of torque.

These chokes should be installed upstream of the drive.

Applications

The use of line chokes is recommended in particular under the following circumstances:

- Close connection of several drives in parallel
- Line supply with significant disturbance from other equipment (interference, overvoltages)
- Line supply with voltage imbalance between phases above 1.8% of the nominal voltage
- Drive supplied by a line with very low impedance (in the vicinity of a power transformer 10 times more powerful than the drive rating)
- Installation of a large number of frequency converters on the same line
- Reducing overloads on the cos φ correction capacitors, if the installation includes a power factor correction unit.

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Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Option: line chokes

General characteristics

Type of choke			VW3 A58501, A58502	VW3 A4 551... A4 553	VW3 A4 554, A4 555	VW3 A4 556... A4 560	VW3 A4 561... A4 565, A4 569
Conformity to standards			EN 50178 (VDE 0160 level 1 high energy overvoltages on the line supply), IEC 60076 (with HD 398)				
Degree of protection	Choke		IP 00				
	Terminals		IP 20		IP 10	IP 00	
Atmospheric pollution			3 C2, 3B1, 3S1 conforming to IEC 721.3.3				
Degree of pollution			2 conforming to EN 50178				
Vibration resistance			1.5 mm from 3…13 Hz, 1 gn from 13…200 Hz, conforming to IEC 60068-2				
Shock resistance			15 gn for 11 ms conforming to IEC/EN 60068-2-27				
Maximum relative humidity			95%				
Ambient air temperature around the device	Operation	**°C**	0…+ 45 without derating Up to +55°C with current derating of 2% per °C above 45°C				
	Storage	**°C**	-25…+70				
Isolation class			F				
Clearance distance in air		**mm**	5.5 conforming to IEC 60664				
Leakage distance in air		**mm**	11.5 conforming to IEC 60664				
Maximum operating altitude		**m**	1000 without derating 1000…3000 with current derating of 1% per additional 100 m				
Voltage drop			Between 3% and 5% of the nominal supply voltage. Values higher than this will cause loss of torque				
Maximum current			1.65 x nominal current for 60 seconds				

Connection characteristics

Maximum connection capacity and tightening torque	VW3 A58501		16 mm^2, (AWG 4) 1.2…1.4 Nm
	VW3 A58502		6 mm^2, (AWG 8) 0.8…1 Nm
	VW3 A4 551, 552		2.5 mm^2, (AWG 12) 0.4…0.6 Nm
	VW3 A4 553		6 mm^2, (AWG 8) 0.8…1 Nm
	VW3 A4 554		16 mm^2, (AWG 4) 1.2…1.4 Nm
	VW3 A4 555		35 mm^2, (AWG 0) 2.5…3 Nm
	VW3 A4 556		Connected on a bar, Ø 6.5 mm –
	VW3 A4 557, 558		Connected on a bar, Ø 9 mm –
	VW3 A4 559…561		Connected on a bar, Ø 11 mm –
	VW3 A4 562…565, 569		Connected on a bar, Ø 13 mm –

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Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Option: line chokes

Line chokes

For drives	Line supply Line Isc	Line choke				Quantity per drive	Reference	Weight
		Induc-tance value	Nominal current	Saturation current	Loss			
	kA	mH	A	A	W			kg
Single phase supply voltage: 200…240 V 50/60 Hz								
ATV 71HU40M3	5	2	25	–	45	1	**VW3 A58501**	3.500
ATV 71HU55M3	5	1	45	–	50	1	**VW3 A58502**	3.500
ATV 71HU75M3	22	1	45	–	50	1	**VW3 A58502**	3.500
3-phase supply voltage: 200…240 V 50/60 Hz								
ATV 71H037M3, H075M3	5	10	4	–	45	1	**VW3 A4 551**	1.500
ATV 71HU15M3, HU22M3	5	4	10	–	65	1	**VW3 A4 552**	3.000
ATV 71HU30M3	5	2	16	–	75	1	**VW3 A4 553**	3.500
ATV 71HU40M3	5	1	30	–	90	1	**VW3 A4 554**	6.000
ATV 71HU55M3	22	1	30	–	90	1	**VW3 A4 554**	6.000
ATV 71HU75M3, HD11M3X	22	0.5	60	–	94	1	**VW3 A4 555**	11.000
ATV 71HD15M3X	22	0.3	100	–	260	1	**VW3 A4 556**	16.000
ATV 71HD18M3X…HD45M3X	22	0.15	230	–	400	1	**VW3 A4 557**	45.000
ATV 71HD55M3X	35	0.049	429	855	278	1	**VW3 A4 562**	50.000
ATV 71HD75M3X	35	0.038	509	1025	280	1	**VW3 A4 563**	59.000
3-phase supply voltage: 380…480 V 50/60 Hz								
ATV 71H075N4, HU15N4 ATV 71W075N4, WU15N4 ATV 71P075N4Z, PU15N4Z	5	10	4	–	45	1	**VW3 A4 551**	1.500
ATV 71HU22N4…HU40N4 ATV 71WU22N4…WU40N4 ATV 71PU22N4Z…PU40N4Z	5	4	10	–	65	1	**VW3 A4 552**	3.000
ATV 71HU55N4, HU75N4 ATV 71WU55N4, WU75N4 ATV 71PU55N4Z, PU75N4Z	22	2	16	–	75	1	**VW3 A4 553**	3.500
ATV 71HD11N4, HD15N4 ATV 71WD11N4, WD15N4	22	1	30	–	90	1	**VW3 A4 554**	6.000
ATV 71HD18N4, HD22N4 ATV 71WD18N4, WD22N4	22	0,5	60	–	94	1	**VW3 A4 555**	11.000
ATV 71HD30N4…HD55N4 ATV 71WD30N4…WD55N4	22	0.3	100	–	260	1	**VW3 A4 556**	16.000
ATV 71HD75N4 ATV 71WD75N4	22	0.155	184	370	220	1	**VW3 A4 558**	31.000
ATV 71HD90N4, HC11NA	35	0.12	222	346	278	1	**VW3 A4 559**	35.000
ATV 71HC13N4	35	0.098	264	530	245	1	**VW3 A4 560**	43.000
ATV 71HC16N4	50	0.066	344	685	258	1	**VW3 A4 561**	47.000
ATV 71HC20N4	50	0.060	450	574	335	1	**VW3 A4 569**	70.000
ATV 71HC25N4, HC28N4	50	0.038	613	1150	307	1	**VW3 A4 564**	73.000
ATV 71HC31N4	50	0.032	720	1352	428	1	**VW3 A4 565**	82.000
ATV 71HC40N4	50	0.060	450	849	335	2	**VW3 A4 569**	70.000
ATV 71HC50N4	50	0.038	613	1150	307	2	**VW3 A4 564**	73.000

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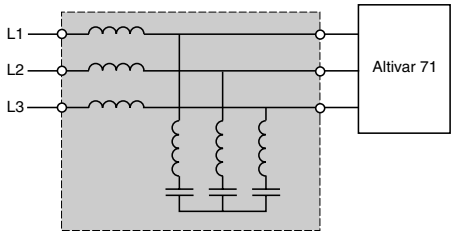
Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Option: passive filters

Passive filters



Passive filter

The passive filter is used to reduce current harmonics with total harmonic distortion factors of less than 16% or 10%. These ratios may be reduced to 10% or 5% if the filter is used with a DC choke, see pages 2/416 to 2/419.

The reactive power increases at no load or low load. To eliminate this reactive power, the filter capacitors can be disconnected via the drive, see page 2/485.
To do this, the contactor must be controlled by one of the relay outputs on the drive, at a value lower than 10% of the nominal drive current (In) (please refer to the Programming Manual).

Application

Reduction of current harmonics in order to use drives in the first environment.

General characteristics

Degree of protection			IP 20
Maximum relative humidity			Class F humidity without condensation 5%…85%
Ambient air temperature around the device	Operation	°C	5…+40 without derating
	Storage	°C	-25…+55
Maximum operating altitude		m	1000 without derating

Electrical characteristics

Range		**400 V**	**460 V**
Nominal voltage ± 10%	V	380…415 ∿	440…480 ∿
Operating frequency		50 ±5 %	60 ± 5%
Overload capacity		1.5 x In (A)	
Efficiency		98% (2% of thermal losses)	
THDI *(1)*	%	≤ 16	
Cos φ		At 75% of the line current: 0.85 At 100% of the line current: 0.99 At 150% of the line current: 1	

Connection characteristics

Maximum connection capacity	VW3 A4 601…604		16 mm²
	VW3 A4 605…609		50 mm²
	VW3 A4 610, 611		Connected on a bar, Ø 12.5
	VW3 A4 612, 613, 619		Connected on a bar, Ø 16.5
	VW3 A4 621, 622		16 mm²
	VW3 A4 623…627		50 mm²
	VW3 A4 628, 629		Connected on a bar, Ø 12.5
	VW3 A4 630…633, 639		Connected on a bar, Ø 16.5
	VW3 A4 641…644		16 mm²
	VW3 A4 645…648		50 mm²
	VW3 A4 649		Connected on a bar, Ø 12.5
	VW3 A4 650, 651, 656, 657		Connected on a bar, Ø 16.5
	VW3 A4 661…663		16 mm²
	VW3 A4 664…666		50 mm²
	VW3 A4 667, 668		Connected on a bar, Ø 12.5
	VW3 A4 669…671, 676, 677		Connected on a bar, Ø 16.5

(1) The total current harmonic distortion (THDI) is indicated for a total voltage harmonic distortion (THDU) < 2% and a short-circuit ratio (RSCE) > 66%, and only for the nominal current of the passive filter. If these conditions are not adhered to, the total current harmonics will be reduced without any guarantee of level.

References: pages 2/424 to 2/427
Dimensions: pages 2/464 and 2/465
Schemes: pages 2/484 and 2/485

Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Option: passive filters

Passive filters: 3-phase power supply 400 V 50 Hz

Motor rating		For drives	Line supply Line current	Filter In (2)	Quantity per drive	Reference	Weight
kW	HP		A	A			kg
THDI 16% (1)							
0.75	1	ATV 71H075N4 ATV 71W075N4 ATV 71P075N4Z	2.5	6	1	**VW3 A4 601**	15.000
1.5	2	ATV 71HU15N4 ATV 71WU15N4 ATV 71PU15N4Z	3.6	6	1	**VW3 A4 601**	15.000
2.2	3	ATV 71HU22N4 ATV 71WU22N4 ATV 71PU22N4Z	5	6	1	**VW3 A4 601**	15.000
3	–	ATV 71HU30N4 ATV 71WU30N4 ATV 71PU30N4Z	6	6	1	**VW3 A4 601**	15.000
4	5	ATV 71HU40N4 ATV 71WU40N4 ATV 71PU40N4Z	7.8	10	1	**VW3 A4 602**	19.000
5.5	7.5	ATV 71HU55N4 ATV 71WU55N4 ATV 71PU55N4Z	10	10	1	**VW3 A4 602**	19.000
7.5	10	ATV 71HU75N4 ATV 71WU75N4 ATV 71PU75N4Z	14	19	1	**VW3 A4 603**	21.000
11	15	ATV 71HD11N4 ATV 71WD11N4	19	19	1	**VW3 A4 603**	21.000
15	20	ATV 71HD15N4 ATV 71WD15N4	26	26	1	**VW3 A4 604**	22.000
18.5	25	ATV 71HD18N4 ATV 71WD18N4	32	35	1	**VW3 A4 605**	34.000
22	30	ATV 71HD22N4 ATV 71WD22N4	38	43	1	**VW3 A4 606**	38.000
30	40	ATV 71HD30N4 ATV 71WD30N4	52	72	1	**VW3 A4 607**	56.000
37	50	ATV 71HD37N4 ATV 71WD37N4	63	72	1	**VW3 A4 607**	56.000
45	60	ATV 71HD45N4 ATV 71WD45N4	77	101	1	**VW3 A4 608**	69.000
55	75	ATV 71HD55N4 ATV 71WD55N4	91	101	1	**VW3 A4 608**	69.000
75	100	ATV 71HD75N4 ATV 71WD75N4	126	144	1	**VW3 A4 609**	97.000
THDI 10%							
90	125	ATV 71HD90N4	149	144	1	**VW3 A4 609**	97.000
110	150	ATV 71HC11N4	182	180	1	**VW3 A4 610**	103.000
132	200	ATV 71HC13N4	218	216	1	**VW3 A4 611**	112.000
160	250	ATV 71HC16N4	287	289	1	**VW3 A4 612**	135.000
200	300	ATV 71HC20N4	353.5	370	1	**VW3 A4 613**	155.000
220	350	ATV 71HC25N4	364	370	1	**VW3 A4 613**	155.000
250	400	ATV 71HC25N4	415	216	2	**VW3 A4 611**	112.000
280	450	ATV 71HC28N4	485	289	2	**VW3 A4 612**	135.000
315	500	ATV 71HC31N4	543	289	2	**VW3 A4 612**	135.000
355	–	ATV 71HC40N4	588	289	2	**VW3 A4 612**	135.000
400	600	ATV 71HC40N4	664	325	2	**VW3 A4 619**	155.000
500	700	ATV 71HC50N4	840	289	3	**VW3 A4 612**	135.000

*(1) By adding a DC choke (see page 2/416) to **ATV 71●075N4…●D75N4** and **ATV 71P●●●N4Z** drives, we get a THD ≤ 10%.*
*This DC choke is supplied as standard with **ATV 71HD90N4…HC50N4** drives.*
These reduced current harmonics are obtained, only for the nominal filter current, on condition that the THDU is <2% and the RSCE >66%.

(2) In: nominal filter current.

Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Option: passive filters

Passive filters: 3-phase power supply 400 V 50 Hz

Motor rating		For drives	Line supply Line current	Filter In (2)	Quantity per drive	Reference	Weight
kW	HP		A	A			kg
THDI 10% (1)							
0.75	1	ATV 71H075N4 ATV 71W075N4 ATV 71P075N4Z	2.5	6	1	**VW3 A4 621**	21.000
1.5	2	ATV 71HU15N4 ATV 71WU15N4 ATV 71PU15N4Z	3.6	6	1	**VW3 A4 621**	21.000
2.2	3	ATV 71HU22N4 ATV 71WU22N4 ATV 71PU22N4Z	5	6	1	**VW3 A4 621**	21.000
3	–	ATV 71HU30N4 ATV 71WU30N4 ATV 71PU30N4Z	6	6	1	**VW3 A4 621**	21.000
4	5	ATV 71HU40N4 ATV 71WU40N4 ATV 71PU40N4Z	7.8	10	1	**VW3 A4 622**	27.000
5.5	7.5	ATV 71HU55N4 ATV 71WU55N4 ATV 71PU55N4Z	10	10	1	**VW3 A4 622**	27.000
7.5	10	ATV 71HU75N4 ATV 71WU75N4 ATV 71PU75N4Z	14	19	1	**VW3 A4 623**	28.000
11	15	ATV 71HD11N4 ATV 71WD11N4	19	19	1	**VW3 A4 623**	28.000
15	20	ATV 71HD15N4 ATV 71WD15N4	26	26	1	**VW3 A4 624**	40.000
18.5	25	ATV 71HD18N4 ATV 71WD18N4	32	35	1	**VW3 A4 625**	49.000
22	30	ATV 71HD22N4 ATV 71WD22N4	38	43	1	**VW3 A4 626**	52.000
30	40	ATV 71HD30N4 ATV 71WD30N4	52	72	1	**VW3 A4 627**	88.000
37	50	ATV 71HD37N4 ATV 71WD37N4	63	72	1	**VW3 A4 627**	88.000
45	60	ATV 71HD45N4 ATV 71WD45N4	77	101	1	**VW3 A4 628**	150.000
55	75	ATV 71HD55N4 ATV 71WD55N4	91	101	1	**VW3 A4 628**	150.000
75	100	ATV 71HD75N4 ATV 71WD75N4	126	144	1	**VW3 A4 629**	167.000
THDI 5%							
90	125	ATV 71HD90N4	149	144	1	**VW3 A4 629**	167.000
110	150	ATV 71HC11N4	182	180	1	**VW3 A4 630**	178.000
132	200	ATV 71HC13N4	218	216	1	**VW3 A4 631**	224.000
160	250	ATV 71HC16N4	287	289	1	**VW3 A4 632**	271.000
200	300	ATV 71HC20N4	353.5	370	1	**VW3 A4 633**	320.000
220	350	ATV 71HC25N4	364	370	1	**VW3 A4 633**	320.000
250	400	ATV 71HC25N4	415	216	2	**VW3 A4 631**	224.000
280	450	ATV 71HC28N4	485	289	2	**VW3 A4 632**	271.000
315	500	ATV 71HC31N4	543	289	2	**VW3 A4 632**	271.000
355	–	ATV 71HC40N4	588	289	2	**VW3 A4 632**	271.000
400	600	ATV 71HC40N4	664	325	2	**VW3 A4 639**	284.000
500	700	ATV 71HC50N4	840	289	3	**VW3 A4 632**	271.000

*(1) By adding a DC choke (see page 2/416) to **ATV 71●075N4…●D75N4** and **ATV 71P●●●N4Z** drives, we get a THD ≤ 5%.*
*This DC choke is supplied as standard with **ATV 71HD90N4…HC50N4** drives.*
These reduced current harmonics are obtained, only for the nominal filter current, on condition that the THDU is <2% and the RSCE >66%.

(2) In: nominal filter current.

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Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Option: passive filters

Passive filters: 3-phase power supply 460 V 60 Hz

Motor rating		For drives	Line supply Line current	Filter In (2)	Quantity per drive	Reference	Weight
kW	HP		A	A			kg
THDI 16% (1)							
0.75	1	ATV 71H075N4 ATV 71W075N4 ATV 71P075N4Z	2.5	6	1	**VW3 A4 641**	15.000
1.5	2	ATV 71HU15N4 ATV 71WU15N4 ATV 71PU15N4Z	3	6	1	**VW3 A4 641**	15.000
2.2	3	ATV 71HU22N4 ATV 71WU22N4 ATV 71PU22N4Z	5	6	1	**VW3 A4 641**	15.000
3	–	ATV 71HU30N4 ATV 71WU30N4 ATV 71PU30N4Z	6	6	1	**VW3 A4 641**	15.000
4	5	ATV 71HU40N4 ATV 71WU40N4 ATV 71PU40N4Z	7	10	1	**VW3 A4 642**	19.000
5.5	7.5	ATV 71HU55N4 ATV 71WU55N4 ATV 71PU55N4Z	10	10	1	**VW3 A4 642**	19.000
7.5	10	ATV 71HU75N4 ATV 71WU75N4 ATV 71PU75N4Z	13	19	1	**VW3 A4 643**	23.000
11	15	ATV 71HD11N4 ATV 71WD11N4	19	19	1	**VW3 A4 643**	23.000
15	20	ATV 71HD15N4 ATV 71WD15N4	24	26	1	**VW3 A4 644**	34.000
18.5	25	ATV 71HD18N4 ATV 71WD18N4	32	35	1	**VW3 A4 645**	42.000
22	30	ATV 71HD22N4 ATV 71WD22N4	35	35	1	**VW3 A4 645**	42.000
30	40	ATV 71HD30N4 ATV 71WD30N4	44	43	1	**VW3 A4 646**	45.000
37	50	ATV 71HD37N4 ATV 71WD37N4	58.7	72	1	**VW3 A4 647**	61.000
45	60	ATV 71HD45N4 ATV 71WD45N4	68	72	1	**VW3 A4 647**	61.000
55	75	ATV 71HD55N4 ATV 71WD55N4	82.6	101	1	**VW3 A4 648**	75.000
75	100	ATV 71 HD75N4 ATV 71 WD75N4	108	101	1	**VW3 A4 648**	75.000
THDI 10%							
90	125	ATV 71HD90N4	134	180	1	**VW3 A4 649**	107.000
110	150	ATV 71HC11N4	163	180	1	**VW3 A4 649**	107.000
132	200	ATV 71HC13N4	192	217	1	**VW3 A4 656**	119.000
160	250	ATV 71HC16N4	235	289	1	**VW3 A4 650**	145.000
200	300	ATV 71HC20N4	300	370	1	**VW3 A4 651**	185.000
220	350	ATV 71HC25N4	330	370	1	**VW3 A4 651**	185.000
250	400	ATV 71HC25N4	400	217	2	**VW3 A4 656**	119.000
280	450	ATV 71HC28N4	440	289	2	**VW3 A4 650**	145.000
315	500	ATV 71HC31N4	470	289	2	**VW3 A4 650**	145.000
355	–	ATV 71HC40N4	530	289	2	**VW3 A4 650**	145.000
400	600	ATV 71HC40N4	590	325	2	**VW3 A4 657**	165.000
500	700	ATV 71HC50N4	730	370	2	**VW3 A4 651**	185.000

*(1) By adding a DC choke (see page 2/416) to **ATV 71●075N4…●D75N4** and **ATV 71P●●●N4Z** drives, we get a THD ≤ 10%.*
*This DC choke is supplied as standard with **ATV 71HD90N4…HC50N4** drives.*
These reduced current harmonics are obtained, only for the nominal filter current, on condition that the THDU is <2% and the RSCE >66%.

(2) In: nominal filter current.

Variable speed drives for asynchronous motors

Altivar 71: reduction of current harmonics

Option: passive filters

Passive filters: 3-phase power supply 460 V 60 Hz

Motor rating		For drives	Line supply Line current	Filter In (2)	Quantity per drive	Reference	Weight
kW	HP		A	A			kg
THDI 10% (1)							
0.75	1	ATV 71H075N4 ATV 71W075N4 ATV 71P075N4Z	2.5	6	1	**VW3 A4 661**	21.000
1.5	2	ATV 71HU15N4 ATV 71WU15N4 ATV 71PU15N4Z	3	6	1	**VW3 A4 661**	21.000
2.2	3	ATV 71HU22N4 ATV 71WU22N4 ATV 71PU22N4Z	4.2	6	1	**VW3 A4 661**	21.000
3	–	ATV 71HU30N4 ATV 71WU30N4 ATV 71PU30N4Z	6	6	1	**VW3 A4 661**	21.000
4	5	ATV 71HU40N4 ATV 71WU40N4 ATV 71PU40N4Z	7	10	1	**VW3 A4 662**	27.000
5.5	7.5	ATV 71HU55N4 ATV 71HU55N4 ATV 71PU55N4Z	10	10	1	**VW3 A4 662**	27.000
7.5	10	ATV 71HU75N4 ATV 71WU75N4 ATV 71PU75N4Z	13	19	1	**VW3 A4 663**	28.000
11	15	ATV 71HD11N4 ATV 71WD11N4	19	19	1	**VW3 A4 663**	28.000
15	20	ATV 71HD15N4 ATV 71WD15N4	24	26	1	**VW3 A4 664**	41.000
18.5	25	ATV 71HD18N4 ATV 71WD18N4	32	35	1	**VW3 A4 665**	49.000
22	30	ATV 71HD22N4 ATV 71WD22N4	35	35	1	**VW3 A4 665**	49.000
30	40	ATV 71HD30N4 ATV 71WD30N4	44	43	1	**VW3 A4 666**	56.000
37	50	ATV 71HD37N4 ATV 71WD37N4	58.7	72	1	**VW3 A4 667**	80.000
45	60	ATV 71HD45N4 ATV 71WD45N4	68	72	1	**VW3 A4 668**	98.000
55	75	ATV 71HD55N4 ATV 71WD55N4	82.6	101	1	**VW3 A4 668**	98.000
75	100	ATV 71HD75N4 ATV 71WD75N4	108	101	1	**VW3 A4 668**	98.000
THDI 5%							
90	125	ATV 71HD90N4	134	180	1	**VW3 A4 669**	151.000
110	150	ATV 71HC11N4	163	180	1	**VW3 A4 669**	151.000
132	200	ATV 71HC13N4	192	217	1	**VW3 A4 676**	171.000
160	250	ATV 71HC16N4	235	289	1	**VW3 A4 670**	215.000
200	300	ATV 71HC20N4	300	370	1	**VW3 A4 671**	250.000
220	350	ATV 71HC25N4	330	370	1	**VW3 A4 671**	250.000
250	400	ATV 71HC25N4	400	217	2	**VW3 A4 676**	171.000
280	450	ATV 71HC28N4	440	289	2	**VW3 A4 670**	215.000
315	500	ATV 71HC31N4	470	289	2	**VW3 A4 670**	215.000
355	–	ATV 71HC40N4	530	289	2	**VW3 A4 670**	215.000
400	600	ATV 71HC40N4	590	325	2	**VW3 A4 677**	240.000
500	700	ATV 71HC50N4	730	370	2	**VW3 A4 671**	250.000

*(1) By adding a DC choke (see page 2/416) to **ATV 71●075N4…●D75N4** and **ATV 71P●●●N4Z** drives, we get a THD ≤ 5%.*
*This DC choke is supplied as standard with **ATV 71HD90N4…HC50N4** drives.*
These reduced current harmonics are obtained, only for the nominal filter current, on condition that the THDU is <2% and the RSCE >66%.

(2) In: nominal filter current.

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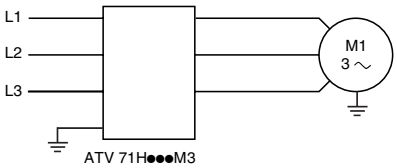
Variable speed drives for asynchronous motors

Altivar 71: CEM filters

Integrated filters and additional filters in option



ATV 71H●●●M3
ATV 71●●●●N4
with integrated filter

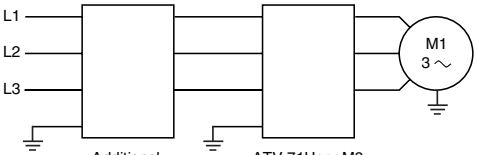
CEM integrated filters

Altivar 71 drives, except for the ATV 71H●●●M3X, 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 drives	Maximum length of shielded cable according to EN 55011 class A *(1)*			
	Group 1 *(2)*		Group 2 *(2)*	
	IEC/EN 61800-3 category C2 *(2)*		IEC/EN 61800-3 category C3 *(2)*	
	LF *(3)*	HF *(3)*	LF *(3)*	HF *(3)*
	m	m	m	m
ATV 71H037M3…HU22M3	10	5	–	–
ATV 71HU30M3…HU75M3	–	–	10	5
ATV 71H075N4…HU40N4 ATV 71W075N4…WU40N4 ATV 71P075N4Z…PU40N4Z	10	5	–	–
ATV 71HU55N4…HD15N4 ATV 71WU55N4…WD15N4 ATV 71PU55N4Z…PU75N4Z	–	–	10	5
ATV 71HD18N4…HC50N4 ATV 71WD18N4…WD75N4	–	–	50	25

Additional EMC input filters

Applications



Additional EMC filter

ATV 71H●●●M3
ATV 71H●●●M3X
ATV 71H●●●N4
ATV 71P●●●N4Z

Additional EMC input filters can be used to meet more stringent requirements and are designed to reduce conducted emissions on the line supply below the limits of standards EN 55011 group 1, class A or B and IEC/EN 61800-3 category C2 or C3 (see page 2/348).
For ATV 71H●●●M3, ATV 71HD11M3X…HD45M3X, ATV 71H075N4…HD75N4 and ATV 71P075N4Z…PU75N4Z drives, the additional EMC filters can be mounted beside or under the device. They act as a support for the drives and are attached to them via tapped holes.
For ATV 71HD55M3X, HD75M3X and ATV 71HD90N4…HC50N4 drives, the additional EMC filters can only be mounted beside the drive.

Use according to the type of network

Use of these additional filters is only possible on TN (connected to neutral) and TT (neutral to earth) type networks.

Standard IEC/EN 61800-3, appendix D2.1, states that on IT networks (impedance or isolated neutral), filters can cause permanent insulation monitors to operate in a random manner.
In addition, the effectiveness of additional filters on this type of network depends on the type of impedance between neutral and earth, and therefore cannot be predicted. In the case of a machine which needs to be installed on an IT network, the solution would be to insert an isolation transformer and place the machine locally on a TN or TT network.

(1) Maximum lengths for shielded cables connecting motors to drives, for a factory-set switching frequency of 2.5 or 4 kHz depending on the rating see page 2/350. If motors are connected in parallel, it is the sum of all cable lengths that should be taken into account.
(2) See page 2/348.
(3) LF: low switching frequency. HF: high switching frequency. These frequencies depend on the drive rating:

For drives	Switching frequency	
	LF	HF
	kHz	kHz
ATV 71H●●●M3 ATV 71H075N4…HD30N4 ATV 71W075N4…WD30N4 ATV 71P075N4Z…PU75N4Z	4	4.1…16
ATV 71HD37N4…HD75N4 ATV 71WD37N4…WD75N4	2…2.5	2.6…12
ATV 71HD90N4…HC50N4	2…4	4.1…8

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References: pages 2/430 and 2/431
Dimensions: pages 2/466 and 2/467
Schemes: page 2/483

Variable speed drives for asynchronous motors

Altivar 71: CEM filters

Option: Input additional filters

General characteristics

EMC filter type			VW3 A4 401…408	VW3 A4 410…413
Conformity to standards			EN 133200	
Degree of protection			IP 20 and IP 41 on upper part	IP 00 IP 30 with kits VW3 A9 601, 602
Maximum relative humidity			93% without condensation or dripping water conforming to IEC 68-2-3	
Ambient air temperature around the device	Operation	°C	-10…+50	-25…+45
	Storage	°C	-40…+65	-25…+85
Maximum operating altitude		m	1000 without derating 1000…3000 derating the current by 1% per additional 100 m. Limited to 2000 m for the “Corner Grounded” distribution network	
Vibration resistance			1.5 mm peak to peak from 3…13 Hz, 1 gn peak from 13…150 Hz, in accordance with IEC 60068-2-6	
Shock resistance			15 gn for 11 ms conforming to IEC/EN 60068-2-27	
Maximum nominal voltage	50/60 Hz 3-phase	V	240 +10% 480 +10%	

Connection characteristics

Maximum connection capacity and tightening torque	VW3 A4 401		4 mm² (AWG 10). 0.6 Nm
	VW3 A4 402		6 mm² (AWG 8). 1.5 Nm
	VW3 A4 403		10 mm² (AWG 6). 1.5 Nm
	VW3 A4 404		16 mm² (AWG 4). 2 Nm
	VW3 A4 405…407		50 mm² (AWG 0). 6 Nm
	VW3 A4 408		150 mm² (300 kcmil). 25 Nm
	VW3 A4 409		25 mm² (AWG 2). 4 Nm
	VW3 A4 410…412		Bar connection, M10 –
	VW3 A4 413		Bar connection, 2 x M12 –

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Variable speed drives for asynchronous motors

Altivar 71: CEM filters

Option: Input additional filters

Additional EMC input filters

For drives	Maximum length of shielded cable (1)				In (2)	Il (3)	Loss (4)	Reference	Weight
	EN 55011 (5) class A Gr1 IEC/EN 61800-3 category C2 (5)		EN 55011 (5) class B Gr1 IEC/EN 61800-3 category C1 (5)						
	LF (6)	HF (6)	LF (6)	HF (6)					
	m	m	m	m	A	mA	W		kg
3-phase supply voltage: 200…240 V 50/60 Hz									
ATV 71H037M3…HU15M3	100	50	50	20	12	4	10	**VW3 A4 401**	2.200
ATV 71HU22M3…HU40M3	100	50	50	20	26	4.4	18	**VW3 A4 402**	4.000
ATV 71HU55M3	100	50	50	20	35	3	24	**VW3 A4 403**	5.800
ATV 71HU75M3	100	50	50	20	46	10	19	**VW3 A4 404**	7.000
ATV 71HD11M3X, HD15M3X	100	50	50	25	72	33	34	**VW3 A4 405**	12.000
ATV 71HD18M3X, HD22M3X	100	50	50	25	90	33	34	**VW3 A4 406**	15.000
ATV 71HD30M3X...HD45M3X	100	50	50	25	180	80	58	**VW3 A4 408**	40.000
ATV 71HD55M3X, HD75M3X	100	50	50	25	273	285	60	**VW3 A4 410**	22.000
3-phase supply voltage: 380…480 V 50/60 Hz									
ATV 71H075N4…HU22N4 ATV 71W075N4…WU22N4 ATV 71P075N4Z…PU22N4Z	100	50	50	20	12	7	5	**VW3 A4 401**	2.200
ATV 71HU30N4, HU40N4 ATV 71WU30N4, WU40N4 ATV 71PU30N4Z, PU40N4Z	100	50	50	20	26	8	6	**VW3 A4 402**	4.000
ATV 71HU55N4, HU75N4 ATV 71WU55N4,WU75N4 ATV 71PU55N4Z, PU75N4Z	100	50	50	20	35	7	14	**VW3 A4 403**	5.800
ATV 71HD11N4 ATV 71WD11N4	100	50	50	20	46	14	13	**VW3 A4 404**	7.000
ATV 71HD15N4 (7), HD18N4 ATV 71WD15N4 (7), WD18N4	300	200	100	100	72	60	14	**VW3 A4 405**	12.000
ATV 71HD22N4 ATV 71WD22N4	300	200	100	100	90	60	11	**VW3 A4 406**	15.000
ATV 71HD30N4, HD37N4 ATV 71WD30N4, WD37N4	300	200	100	100	92	60	30	**VW3 A4 407**	17.000
ATV 71HD45N4…HD75N4 ATV 71WD45N4…WD75N4	300	200	100	100	180	140	58	**VW3 A4 408**	40.000
ATV 71HD90N4…HC13N4	300	150	50	25	273	500	60	**VW3 A4 410**	22.000
ATV 71HC16N4…HC28N4	300	150	50	25	546	500	125	**VW3 A4 411**	25.000
ATV 71HC31...HC40N4	300	150	50	25	728	500	210	**VW3 A4 412**	25.000
ATV 71HC50N4	300	150	50	25	1456	200	380	**VW3 A4 413**	34.000

(1) The filter selection tables give the maximum lengths for shielded cables connecting motors to drives for a switching frequency of 1 to 16 kHz (see page 2/350). These limits are given as examples only as they vary depending on the stray capacitance of the motors and the cables used. If motors are connected in parallel, it is the sum of the cable lengths that should be taken into account.

(2) Filter nominal current.

(3) Maximum earth leakage current at 230 V and at 400 V 50 Hz on a TT network.

(4) Via thermal dissipation.

(5) See page 2/348.

(6) LF: low switching frequency. HF: high switching frequency. These frequencies depend on the drive rating:

For drives	Switching frequency	
	LF	HF
	kHz	kHz
ATV 71H●●●M3 ATV 71H075N4…HD11N4 ATV 71W075N4…WD11N4 ATV 71P075N4Z…PU75N4Z	4	4.1…16
ATV 71HD11M3X, HD15M3X ATV 71HD15N4…HD30N4 ATV 71WD15N4…WD30N4	3.5...4	4.1…12
ATV 71HD18M3X...HD45M3X ATV 71HD37N4...HD75N4 ATV 71WD37N4…WD75N4	2…2.5	2.6…12
ATV 71HD55M3X, HD75M3X	2…4	4.1…8
ATV 71HD90N4...HC50N4	2…4	4.1…8

*(7) It is possible to use a special filter **VW3 A4 409** with an leakage current Il (3) of 14 mA which enables a maximum motor cable length of 100 m.*

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Variable speed drives for asynchronous motors

Altivar 71: CEM filters

Option: Input additional filters

IP 30 protection kits

Description	For filters	Reference	Weight kg
Mechanical device consisting of an IP 30 cover and cable clips	VW3 A4 410, 411	**VW3 A9 601**	–
	VW3 A4 412, 413	**VW3 A9 602**	–

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Variable speed drives for asynchronous motors
Altivar 71: output filters

The Altivar 71 drive includes as standard a software function used to limit overvoltages at the motor terminals.
Depending on the cable lengths or the type of application, it may be necessary to use output filters:
- Motor chokes used to limit the dv/dt
- Sinus filters that are particularly effective for long cable runs

Cable length *(2)*	10…50 m	50…100 m	100…150 m	150…300 m	300…600 m	600…1000 m
Shielded cable						
ATV 71H●●●M3 ATV 71H075N4…HD15N4 ATV 71W075N4…WD15N4 ATV 71P075N4Z…PU75N4Z	Software function *(1)*	Motor choke			–	
ATV 71H●●●M3X ATV 71HD18N4…HC50N4 ATV 71WD18N4…WD75N4	Software function *(1)*		Motor choke		–	
Unshielded cable						
ATV 71H037M3...HU15M3 ATV 71H075N4...HU22N4 ATV 71W075N4…WU22N4 ATV 71P075N4Z...PU22N4Z	Software function *(1)*		Motor choke or sinus filter		–	
ATV 71HU22M3, HU30M3 ATV 71HU30N4…HU55N4 ATV 71PU30N4Z...PU55N4Z ATV 71WU30N4…WU55N4	Software function *(1)*		Motor choke		Sinus filter	–
ATV 71HU40M3…HU75M3 ATV 71HU75N4…HD15N4 ATV 71WU75N4…WD15N4 ATV 71PU75N4Z	Software function *(1)*		Motor choke		Sinus filter	
ATV 71HD11M3X…HD45M3X ATV 71HD18N4…HD75N4 ATV 71WD18N4…WD75N4	Software function *(1)*			Motor choke	Sinus filter	
ATV 71HD55M3X…HD75M3X ATV 71HD90N4…HC50N4	Software function *(1)*			Motor choke	2 motor chokes in series	–

(1) The software function limits the overvoltage at the motor terminals to twice the DC bus voltage.
For any application with braking cycles, the DC bus voltage rises to more than the supply voltage multiplied by √2.
You must check the electrical characteristics of the motor before using this function.
(2) The cable length varies depending on the combination variable speed drive/motor choke or sinus filter, see pages 2/434 and 2/437.
For an application with several motors connected in parallel, the cable length must include all cabling.
Recommended types of cable:
- *Shielded cables: "GORSE" cable, type GUOSTV-LS/LH; "PROTOFLEX" cable, type EMV2YSL CY,*
- *Unshielded cables: "GORSE" cable, type H07 RN-F4GXX; "BELDEN" cable, type 2950X*

Schemes:
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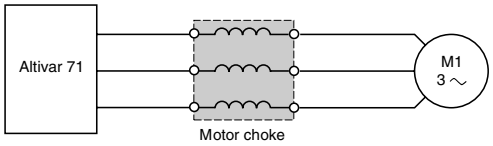
Variable speed drives for asynchronous motors

Altivar 71: output filters

Option: motor chokes

Motor chokes



Altivar 71 drives have been developed to operate with the following maximum motor cable lengths:

For drives	Maximum length of motor cable *(1)*	
	Shielded cable	Unshielded cable
	m	m
ATV 71H●●●M3 ATV 71HD11M3X, HD15M3X ATV 71H075N4…HD18N4 ATV 71W075N4…WD18N4 ATV 71P075N4Z…PU75N4Z	50	100
ATV 71HD18M3X…HD75M3X ATV 71HD22N4…HC50N4 ATV 71WD22N4…WD75N4	100	200

The motor choke enables operation with motor cables above these maximum lengths and/or limits the dv/dt to 500 V/µs at the motor terminals.

It is also used to:
- Limit overvoltages on the motor terminals to:
  - 1000 V to 400 V ~ (rms value)
  - 1150 V to 460 V ~ (rms value)
- Filter interference caused by opening a contactor placed between the filter and the motor
- Reduce the motor earth leakage current.

General characteristics *(2)*

Type of choke			VW3 A5 101…103	VW3 A5 104…108
Drive switching frequency	ATV 71H●●●M3 ATV 71HD11M3X, HD15M3X ATV 71H075N4…HD30N4 ATV 71W075N4…WD30N4 ATV 71P075N4Z…PU75N4Z	**kHz**	4	
	ATV 71HD18M3X…HD75M3X ATV 71HD37N4…HC50N4 ATV 71WD37N4…WD75N4	**kHz**	2.5	
Maximum drive output frequency		**Hz**	100	
Degree of protection			IP 00	IP 00 IP 20 with kits VW3 A9 612 and VW3 A9 613
Thermal protection			By temperature controlled switch	–
Temperature controlled switch *(3)*	Tripping temperature	**°C**	125	–
	Maximum voltage	**V**	250 ~	–
	Maximum current	**A**	0.5	–
Ambient air temperature around the device	Operation	**°C**	-10…+50	
	Storage	**°C**	-25…+70	

Connection characteristics

Maximum connection capacity and tightening torque	VW3 A5 101, 102		10 mm² (AWG 6) 1.5 Nm
	VW3 A5 103		Connected on a bar, Ø 9 mm –
	VW3 A5 104		Connected on a tag connector, M10 –
	VW3 A5 105, 106		Connected on a tag connector, M12 –
	VW3 A5 107, 108		Connected on a tag connector, 2 x M12 –

(1) These values are given for a switching frequency of 2.5 or 4 kHz depending on the rating.
(2) Choke performance is ensured by not exceeding the above cable lengths. For an application with several motors connected in parallel, the cable length must include all cabling. If a cable longer than that recommended is used, the motor chokes may overheat.
(3) The contact should be connected in the sequence (use for signalling or controlling the line contactor).

References: page 2/434
Dimensions: pages 2/468 to 2/470
Schemes: page 2/483

Variable speed drives for asynchronous motors

Altivar 71: output filters

Option: motor chokes

VW3 A5 101

Motor chokes

For drives		Maximum length of motor cable *(1)* Shielded	Maximum length of motor cable *(1)* Un-shielded	Loss	Nominal current	Sold in lots of	Reference	Weight
		m	m	W	A			kg
3-phase supply voltage: 200…240 V 50/60 Hz								
ATV 71H037M3…HU22M3		150	300	150	12	–	**VW3 A5 101**	5.500
ATV 71HU30M3…HU75M3		200	260	250	48	–	**VW3 A5 102**	8.000
		300	300	350	90	–	**VW3 A5 103**	10.000
ATV 71HD11M3X…HD22M3X		150	300	350	90	–	**VW3 A5 103**	10.000
ATV 71HD30M3X…HD45M3X		150	300	430	215	3	**VW3 A5 104**	17.300
ATV 71HD55M3X, HD75M3X		150	300	475	314	3	**VW3 A5 105**	29.600
3-phase supply voltage: 380...480 V 50/60 Hz								
ATV 71H075N4…HU40N4 ATV 71W075N4…WU40N4 ATV 71P075N4Z…PU40N4Z		75	90	150	12	–	**VW3 A5 101**	5.500
		85	95	250	48	–	**VW3 A5 102**	8.000
		160	200	350	90	–	**VW3 A5 103**	10.000
ATV 71HU55N4…HD18N4 ATV 71WU55N4…WD18N4 ATV 71PU55N4Z…PU75N4Z		85	95	250	48	–	**VW3 A5 102**	8.000
		160	200	350	90	–	**VW3 A5 103**	10.000
		200	300	430	215	3	**VW3 A5 104**	17.300
ATV 71HD22N4, HD30N4 ATV 71WD22N4, WD30N4		140	170	350	90	–	**VW3 A5 103**	10.000
		150	300	430	215	3	**VW3 A5 104**	17.300
ATV 71HD37N4 ATV 71WD37N4		97	166	350	90	–	**VW3 A5 103**	10.000
		200	300	430	215	3	**VW3 A5 104**	17.300
ATV 71HD45N4…HD75N4 ATV 71WD45N4…WD75N4		150	300	430	215	3	**VW3 A5 104**	17.300
ATV 71HD90N4,		200	300	430	215	3	**VW3 A5 104**	17.300
ATV 71HC11N4, HC13N4		150	250	475	314	3	**VW3 A5 105**	29.600
ATV 71HC16N4, HC20N4		250	300	530	481	3	**VW3 A5 106**	44.400
ATV 71HC25N4	Motor P 220 kW	250	300	530	481	3	**VW3 A5 106**	44.400
	Motor P 250 kW	200	250	598	759	3	**VW3 A5 107**	64.500
ATV 71HC28N4, HC31N4		200	250	598	759	3	**VW3 A5 107**	64.500
ATV 71HC40N4	Motor P 355 kW	200	250	598	759	3	**VW3 A5 107**	64.500
	Motor P 400 kW	250	300	682	1188	3	**VW3 A5 108**	99.200
ATV 71HC50N4		250	300	682	1188	3	**VW3 A5 108**	99.200

(1) Maximum length given for a switching frequency of 2.5 or 4 kHz depending on the rating of the fan, see characteristics page 2/433.

Presentation: page 2/432 | Characteristics: page 2/433 | Dimensions: pages 2/468 to 2/470 | Schemes: page 2/483

Variable speed drives for asynchronous motors

Altivar 71: output filters

Option: motor chokes

IP 20 protection kits

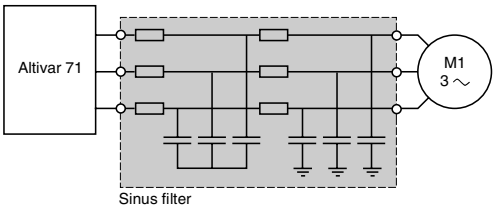
Description	For filters	Reference	Weight kg
Mechanical kit including an IP 20 cover and cable clamps	VW3 A5 104, 105	**VW3 A9 612**	–
	VW3 A5 106…108	**VW3 A9 613**	–

Variable speed drives for asynchronous motors

Altivar 71: output filters

Option: sinus filters

Sinus filters



Sinus filter

Sinus filter allows Altivar 71 drives to operate with longer motor cables (up to 1000 m).

For ATV 71H075M3…HD45M3X, ATV 71●U15N4...●D75N4 and ATV 71P●●●N4Z drives, it also enables the use of unshielded cables while still complying with the standards on radiated EMC emissions (EN55011 class A Gr1 and IEC/EN 61800-3 category C2).

For ATV 71HD55M3X, HD75M3X and ATV 71HD90N4…HC50N4 drives, the sinus filter only operates with a drive voltage/frequency ratio.

The sinus filter is never compatible with the voltage ratio in flux vector control with sensor.

Nota : *The Programming Manual must be referred to when setting up the sinus filter.*

Applications

For ATV 71H075M3…HD45M3X, ATV 71●U15N4... ●D75N4 and ATV 71P●●●N4Z drives, applications requiring:
- Long cable runs
- Mechanical restrictions preventing the use of shielded cables
- An intermediate transformer between the drive and the motor
- Motors connected in parallel

For ATV 71HD55M3X, HD75M3X and ATV 71HD90N4...HC50N4 drives, applications requiring:
- An intermediate transformer between the drive and the motor

General characteristics

Type of sinus filter			VW3 A5 201…206	VW3 A5 207…211
Degree of protection			IP 20	IP 00
Atmospheric pollution			3C2, 3B1, 3S1 conforming to IEC 721.3.3	
Degree of pollution			2 conforming to standard EN 50178	
Vibration resistance			1.5 mm from 3...13 Hz, 1 gn from 13...200 Hz, conforming to IEC 60068-2	
Shock resistance			15 gn for 11 ms conforming to IEC 60068-2-27	
Maximum relative humidity			95%	
Ambient air temperature around the device	Operation	°C	-10...+40 without derating From 40...50°C with current derating of 1.5% per additional °C	
	Storage	°C	-40…+65	
Maximum operating altitude		m	1000 without derating From 1000…3000 with current derating of 1% per additional 100 m	
Switching frequency		kHz	4...8	
Output frequency		Hz	0...100	
Voltage drop			< 10%	
Maximum voltage		V	500 ~	
Maximum current			1.5 x nominal current for 60 s	
Maximum length of motor cable	Unshielded cable	m	600 or 1000 depending on the drive rating, see page 2/432	

Connection characteristics

Maximum connection capacity and tightening torque	VW3 A5 201		4 mm² (AWG 10) 0.6 Nm
	VW3 A5 202		6 mm² (AWG 8) 1.5 Nm
	VW3 A5 203		10 mm² (AWG 6) 1.5 Nm
	VW3 A5 204		25 mm² (AWG 2) 4 Nm
	VW3 A5 205		50 mm² (AWG 0) 6 Nm
	VW3 A5 206, 207		95 mm² (AWG 4/0) 20 Nm
	VW3 A5 208, 209		Connected on a bar, Ø 11 mm –
	VW3 A5 210		Connected on a bar, Ø 14 mm –
	VW3 A5 211		Connected on a bar, 4 x Ø 11 mm –

References: page 2/437
Dimensions: page 2/471
Schemes: page 2/483

Variable speed drives for asynchronous motors

Altivar 71: output filters

Option: sinus filters

Sinus filters

For drives		Nominal current	Loss at 100 Hz	Reference	Weight
		A	W		kg
3-phase supply voltage: 200…240 V 50/60 Hz					
ATV 71H075M3, HU15M3 *(1)*		11	50	**VW3 A5 201**	8.000
ATV 71HU22M3, HU30M3		16	70	**VW3 A5 202**	11.000
ATV 71HU40M3... HU75M3		33	120	**VW3 A5 203**	22.000
ATV 71HD11M3X, HD15M3X		66	180	**VW3 A5 204**	45.000
ATV 71HD18M3X, HD22M3X		95	250	**VW3 A5 205**	60.000
ATV 71HD30M3X... HD45M3X		180	400	**VW3 A5 206**	120.000
ATV 71HD55M3X, HD75M3X		300	1360	**VW3 A5 208**	165.000
3-phase supply voltage: 380…480 V 50/60 Hz					
ATV 71HU15N4...HU40N4 *(1)* ATV 71WU15N4…WU40N4 ATV 71PU15N4Z...PU40N4Z		11	50	**VW3 A5 201**	8.000
ATV 71HU55N4 ATV 71WU55N4 ATV 71PU55N4Z		16	70	**VW3 A5 202**	11.000
ATV 71HU75N4...HD15N4 ATV 71WU75N4 ATV 71PU75N4Z		33	120	**VW3 A5 203**	22.000
ATV 71HD18N4... HD30N4 ATV 71WD18N4…WD30N4		66	180	**VW3 A5 204**	45.000
ATV 71HD37N4, HD45N4 ATV 71WD37N4, WD45N4		95	250	**VW3 A5 205**	60.000
ATV 71HD55N4, HD75N4 ATV 71WD55N4, WD75N4		180	400	**VW3 A5 206**	120.000
ATV 71HD90N4, HC11N4		200	945	**VW3 A5 207**	130.000
ATV 71HC13N4, HC16N4		300	1360	**VW3 A5 208**	165.000
ATV 71HC20N4		400	1900	**VW3 A5 209**	190.000
ATV 71HC25N4	Motor P 220 kW	400	1900	**VW3 A5 209**	190.000
	Motor P 250 kW	600	2370	**VW3 A5 210**	260.000
ATV 71HC28N4, HC31N4		600	2370	**VW3 A5 210**	260.000
ATV 71HC40N4	Motor P 355 kW	600	2370	**VW3 A5 210**	260.000
	Motor P 400 kW	1200	5150	**VW3 A5 211**	600.000
ATV 71HC50N4		1200	5150	**VW3 A5 211**	600.000

(1) For ATV 71H075M3, ATV 71HU15M3 and ATV 71HU15N4 drives, it is advisable to use a lower category of motor with a sinus filter.

2.5

Presentation: page 2/436 | Characteristics: page 2/436 | Dimensions: page 2/471 | Schemes: page 2/483

Variable speed drives for asynchronous motors
Altivar 71

Table showing possible combinations of ATV 71H●●●M3 and ATV 71H●●●M3X drive options

Motor		Drive	Options				
			DC choke	Line choke	Additional EMC input filter	Motor choke	IP 20 motor choke kit
kW	*HP*						
Single phase supply voltage: 200…240 V 50/60 Hz							
0.37	*0.5*	**ATV 71H075M3**	–	–	VW3 A4 401	VW3 A5 101	–
0.75	*1*	**ATV 71HU15M3**	–	–	VW3 A4 401	VW3 A5 101	–
1.5	*2*	**ATV 71HU22M3**	–	–	VW3 A4 402	VW3 A5 101	–
2.2	*3*	**ATV 71HU30M3**	–	–	VW3 A4 402	VW3 A5 102, 103	–
3	–	**ATV 71HU40M3**	–	VW3 A58 501	VW3 A4 402	VW3 A5 102, 103	–
4	*5*	**ATV 71HU55M3**	–	VW3 A58 502	VW3 A4 403	VW3 A5 102, 103	–
5.5	*7.5*	**ATV 71HU75M3**	–	VW3 A58 502	VW3 A4 404	VW3 A5 102, 103	–
3-phase supply voltage: 200…240 V 50/60 Hz							
0.37	*0.5*	**ATV 71H037M3**	VW3 A4 501	VW3 A4 551	VW3 A4 401	VW3 A5 101	–
0.75	*1*	**ATV 71H075M3**	VW3 A4 503	VW3 A4 551	VW3 A4 401	VW3 A5 101	–
1.5	*2*	**ATV 71HU15M3**	VW3 A4 505	VW3 A4 552	VW3 A4 401	VW3 A5 101	–
2.2	*3*	**ATV 71HU22M3**	VW3 A4 506	VW3 A4 552	VW3 A4 402	VW3 A5 101	–
3	–	**ATV 71HU30M3**	VW3 A4 507	VW3 A4 553	VW3 A4 402	VW3 A5 102, 103	–
4	*5*	**ATV 71HU40M3**	VW3 A4 508	VW3 A4 554	VW3 A4 402	VW3 A5 102, 103	–
5.5	*7.5*	**ATV 71HU55M3**	VW3 A4 508	VW3 A4 554	VW3 A4 403	VW3 A5 102, 103	–
7.5	*10*	**ATV 71HU75M3**	VW3 A4 509	VW3 A4 555	VW3 A4 404	VW3 A5 102, 103	–
11	*15*	**ATV 71HD11M3X**	VW3 A4 510	VW3 A4 555	VW3 A4 405	VW3 A5 103	–
15	*20*	**ATV 71HD15M3X**	VW3 A4 510	VW3 A4 556	VW3 A4 405	VW3 A5 103	–
18.5	*25*	**ATV 71HD18M3X**	VW3 A4 511	VW3 A4 557	VW3 A4 406	VW3 A5 103	–
22	*30*	**ATV 71HD22M3X**	VW3 A4 511	VW3 A4 557	VW3 A4 406	VW3 A5 103	–
30	*40*	**ATV 71HD30M3X**	VW3 A4 512	VW3 A4 557	VW3 A4 408	VW3 A5 104	VW3 A9 612
37	*50*	**ATV 71HD37M3X**	VW3 A4 512	VW3 A4 557	VW3 A4 408	VW3 A5 104	VW3 A9 612
45	*60*	**ATV 71HD45M3X**	VW3 A4 512	VW3 A4 557	VW3 A4 408	VW3 A5 104	VW3 A9 612
55	*75*	**ATV 71HD55M3X**	–	VW3 A4 562	VW3 A4 410	VW3 A5 105	VW3 A9 612
75	*100*	**ATV 71HD75M3X**	–	VW3 A4 563	VW3 A4 410	VW3 A5 105	VW3 A9 612
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Table showing possible combinations of options common to all Altivar 71 drives

For drives	Logic input adapter 115 V ∿	Remote graphic display terminal	Encoder interface cards			I/O cards *(1)*		"Controller Inside" programmable card	PowerSuite software workshop for PC
			RS 422 compatible differential outputs	Open collector outputs	Push-pull outputs	Logic	Extended		
ATV 71H●●●●●	VW3 A3 101	VW3 A1 101	VW3 A3 401, 402	VW3 A3 403, 404	VW3 A3 405 …407	VW3 A3 201	VW3 A3 202	VW3 A3 501	VW3 A8 104, 105
Pages	2/364	2/376	2/379	2/379	2/379	2/381	2/381	2/389	3/4

(1) Maximum combination: 2 cards, in accordance with the compatibility table below:

Type of card	Logic I/O VW3 A3 201	Extended I/O VW3 A3 202	Programmable "Controller Inside" VW3 A3 501	Communication VW3 A3 3●●
Logic I/O VW3 A3 201				
Extended I/O VW3 A3 202				
Programmable "Controller Inside" VW3 A3 501				
Communication VW3 A3 3●●				

Possible to combine

Not possible to combine

Sinus filter	Braking resistor	Hoist resistor	Flush-mounting kit (dust and damp proof enclosure)	UL Type 1 conformity kit (outside enclosure)	IP 21 or IP 31 conformity kit (outside enclosure)	Control card fan kit
VW3 A5 201	VW3 A7 701	VW3 A7 801	VW3 A9 501	VW3 A9 201	VW3 A9 101	–
VW3 A5 201	VW3 A7 702	VW3 A7 802	VW3 A9 501	VW3 A9 201	VW3 A9 101	–
VW3 A5 202	VW3 A7 702	VW3 A7 803	VW3 A9 502	VW3 A9 202	VW3 A9 102	–
VW3 A5 202	VW3 A7 703	VW3 A7 803	VW3 A9 502	VW3 A9 202	VW3 A9 102	–
VW3 A5 203	VW3 A7 703	VW3 A7 803	VW3 A9 502	VW3 A9 202	VW3 A9 102	–
VW3 A5 203	VW3 A7 704	VW3 A7 804	VW3 A9 503	VW3 A9 203	VW3 A9 103	–
VW3 A5 203	VW3 A7 704	VW3 A7 804	VW3 A9 504	VW3 A9 204	VW3 A9 104	–
VW3 A5 201	VW3 A7 701	VW3 A7 801	VW3 A9 501	VW3 A9 201	VW3 A9 101	–
VW3 A5 201	VW3 A7 701	VW3 A7 801	VW3 A9 501	VW3 A9 201	VW3 A9 101	–
VW3 A5 201	VW3 A7 702	VW3 A7 802	VW3 A9 501	VW3 A9 201	VW3 A9 101	–
VW3 A5 202	VW3 A7 702	VW3 A7 803	VW3 A9 502	VW3 A9 202	VW3 A9 102	–
VW3 A5 202	VW3 A7 703	VW3 A7 803	VW3 A9 502	VW3 A9 202	VW3 A9 102	–
VW3 A5 203	VW3 A7 703	VW3 A7 803	VW3 A9 502	VW3 A9 202	VW3 A9 102	–
VW3 A5 203	VW3 A7 704	VW3 A7 804	VW3 A9 503	VW3 A9 203	VW3 A9 103	–
VW3 A5 203	VW3 A7 704	VW3 A7 804	VW3 A9 504	VW3 A9 204	VW3 A9 104	–
VW3 A5 204	VW3 A7 705	VW3 A7 805	VW3 A9 505	VW3 A9 205	VW3 A9 105	–
VW3 A5 204	VW3 A7 706	VW3 A7 805	VW3 A9 505	VW3 A9 205	VW3 A9 105	–
VW3 A5 205	VW3 A7 707	VW3 A7 806	VW3 A9 506	VW3 A9 206	VW3 A9 106	VW3 A9 404
VW3 A5 205	VW3 A7 707	VW3 A7 807	VW3 A9 506	VW3 A9 206	VW3 A9 106	VW3 A9 404
VW3 A5 206	VW3 A7 708	VW3 A7 807	VW3 A9 508	VW3 A9 217	VW3 A9 117	VW3 A9 406
VW3 A5 206	VW3 A7 709	VW3 A7 808	VW3 A9 508	VW3 A9 217	VW3 A9 117	VW3 A9 406
VW3 A5 206	VW3 A7 709	VW3 A7 808	VW3 A9 508	VW3 A9 217	VW3 A9 117	VW3 A9 406
VW3 A5 208	VW3 A7 713	VW3 A7 809	VW3 A9 510	VW3 A9 209	VW3 A9 109	–
VW3 A5 208	VW3 A7 714	VW3 A7 810	VW3 A9 511	VW3 A9 210	VW3 A9 110	–
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Communication cards *(1)*							
Ethernet TCP/IP	Modbus/ Uni-Telway	Fipio standard	Substitution Fipio	Modbus Plus	Profibus DP	DeviceNet	INTERBUS
VW3 A3 310	VW3 A3 303	VW3 A3 311	VW3 A3 301	VW3 A3 302	VW3 A3 307	VW3 A3 309	VW3 A3 304
2/396 and 4/6	2/396, 4/13 and 4/21	2/396 and 4/10	2/396 and 4/10	2/396 and 4/18	2/396	2/396	2/396

Variable speed drives for asynchronous motors
Altivar 71

Table showing possible combinations of ATV 71H●●●N4 drive options

Motor kW	Motor HP	Drive	Option: DC choke	Line choke	Passive filter (1)	Additional EMC input filter	IP 30 EMC filter kit	Motor choke	IP 20 motor choke kit
3-phase supply voltage: 380…480 V 50/60 Hz									
0.75	1	**ATV 71H075N4**	VW3 A4 501	VW3 A4 551	VW3 A4 6●1	VW3 A4 401	–	VW3 A5 10●	–
1.5	2	**ATV 71HU15N4**	VW3 A4 502	VW3 A4 551	VW3 A4 6●1	VW3 A4 401	–	VW3 A5 10●	–
2.2	3	**ATV 71HU22N4**	VW3 A4 503	VW3 A4 552	VW3 A4 6●1	VW3 A4 401	–	VW3 A5 10●	–
3	–	**ATV 71HU30N4**	VW3 A4 503	VW3 A4 552	VW3 A4 6●1	VW3 A4 402	–	VW3 A5 10●	–
4	5	**ATV 71HU40N4**	VW3 A4 504	VW3 A4 552	VW3 A4 6●2	VW3 A4 402	–	VW3 A5 10●	–
5.5	7.5	**ATV 71HU55N4**	VW3 A4 505	VW3 A4 553	VW3 A4 6●2	VW3 A4 403	–	VW3 A5 10●	VW3 A9 612
7.5	10	**ATV 71HU75N4**	VW3 A4 506	VW3 A4 553	VW3 A4 6●3	VW3 A4 403	–	VW3 A5 10●	VW3 A9 612
11	15	**ATV 71HD11N4**	VW3 A4 507	VW3 A4 554	VW3 A4 6●3	VW3 A4 404	–	VW3 A5 10●	VW3 A9 612
15	20	**ATV 71HD15N4**	VW3 A4 508	VW3 A4 554	VW3 A4 6●4	VW3 A4 405	–	VW3 A5 10●	VW3 A9 612
18.5	25	**ATV 71HD18N4**	VW3 A4 508	VW3 A4 555	VW3 A4 6●5	VW3 A4 405	–	VW3 A5 10●	VW3 A9 612
22	30	**ATV 71HD22N4**	VW3 A4 510	VW3 A4 555	VW3 A4 6●6	VW3 A4 406	–	VW3 A5 10●	VW3 A9 612
30	40	**ATV 71HD30N4**	VW3 A4 510	VW3 A4 556	VW3 A4 6●7	VW3 A4 407	–	VW3 A5 10●	VW3 A9 612
37	50	**ATV 71HD37N4**	VW3 A4 510	VW3 A4 556	VW3 A4 6●7	VW3 A4 407	–	VW3 A5 10●	VW3 A9 612
45	60	**ATV 71HD45N4**	VW3 A4 511	VW3 A4 556	VW3 A4 6●8	VW3 A4 408	–	VW3 A5 104	VW3 A9 612
55	75	**ATV 71HD55N4**	VW3 A4 511	VW3 A4 556	VW3 A4 6●8	VW3 A4 408	–	VW3 A5 104	VW3 A9 612
75	100	**ATV 71HD75N4**	VW3 A4 511	VW3 A4 558	VW3 A4 6●9	VW3 A4 408	–	VW3 A5 104	VW3 A9 612
90	125	**ATV 71HD90N4**	–	VW3 A4 558	VW3 A4 6●9	VW3 A4 410	VW3 A9 601	VW3 A5 104	VW3 A9 612
110	150	**ATV 71HC11N4**	–	VW3 A4 559	VW3 A4 6●0	VW3 A4 410	VW3 A9 601	VW3 A5 105	VW3 A9 612
132	200	**ATV 71HC13N4**	–	VW3 A4 560	VW3 A4 6●1	VW3 A4 410	VW3 A9 601	VW3 A5 105	VW3 A9 612
160	250	**ATV 71HC16N4**	–	VW3 A4 561	VW3 A4 6●2	VW3 A4 411	VW3 A9 601	VW3 A5 106	VW3 A9 613
200	300	**ATV 71HC20N4**	–	VW3 A4 569	VW3 A4 6●3	VW3 A4 411	VW3 A9 601	VW3 A5 106	VW3 A9 613
220	350	**ATV 71HC25N4**	–	VW3 A4 562	VW3 A4 6●3	VW3 A4 411	VW3 A9 601	VW3 A5 106	VW3 A9 613
250	400	**ATV 71HC25N4**	–	VW3 A4 564	VW3 A4 6●1	VW3 A4 411	VW3 A9 601	VW3 A5 107	VW3 A9 613
280	450	**ATV 71HC28N4**	–	VW3 A4 564	VW3 A4 6●2	VW3 A4 411	VW3 A9 601	VW3 A5 107	VW3 A9 613
315	500	**ATV 71HC31N4**	–	VW3 A4 565	VW3 A4 6●2	VW3 A4 412	VW3 A9 602	VW3 A5 107	VW3 A9 613
355	–	**ATV 71HC40N4**	–	VW3 A4 569	VW3 A4 6●2	VW3 A4 412	VW3 A9 602	VW3 A5 107	VW3 A9 613
400	600	**ATV 71HC40N4**	–	VW3 A4 569	VW3 A4 6●9	VW3 A4 412	VW3 A9 602	VW3 A5 108	VW3 A9 613
500	700	**ATV 71HC50N4**	–	VW3 A4 564	VW3 A4 6●2	VW3 A4 413	VW3 A9 602	VW3 A5 108	VW3 A9 613
Pages		2/361	2/419	2/422	2/424	2/430	2/431	2/434	2/435

Table showing possible combinations of options common to all Altivar 71 drives

For drives	Logic input adapter 115 V ~	Remote graphic display terminal	Encoder interface cards: RS 422 compatible differential outputs	Open collector outputs	Push-pull outputs	I/O cards (2): Logic	Extended	"Controller Inside" programmable card	PowerSuite software workshop for PC
ATV 71H●●●N4	VW3 A3 101	VW3 A1 101	VW3 A3 401, 402	VW3 A3 403, 404	VW3 A3 405 …407	VW3 A3 201	VW3 A3 202	VW3 A3 501	VW3 A8 104, 105
Pages	2/364	2/376	2/379	2/379	2/379	2/381	2/381	2/389	3/4

(1) There are special passive filters for a 460 V ~ supply, see pages 2/426 and 2/427.
(2) Maximum combination: 2 cards, in accordance with the compatibility table below:

Type of card	Logic I/O VW3 A3 201	Extended I/O VW3 A3 202	Programmable "Controller Inside" VW3 A3 501	Communication VW3 A3 3●●
Logic I/O VW3 A3 201				
Extended I/O VW3 A3 202				
Programmable "Controller Inside" VW3 A3 501				
Communication VW3 A3 3●●				

Possible to combine

Not possible to combine

Sinus filter	Resistance braking unit	Braking resistor	Hoist resistor	Flush-mounting kit (dust and damp proof enclosure)	UL Type 1 conformity kit (outside enclosure)	IP 21 or IP 31 conformity kit (outside enclosure)	Control card fan kit
–	–	VW3 A7 701	VW3 A7 801	VW3 A9 501	VW3 A9 201	VW3 A9 101	–
VW3 A5 201	–	VW3 A7 701	VW3 A7 801	VW3 A9 501	VW3 A9 201	VW3 A9 101	–
VW3 A5 201	–	VW3 A7 701	VW3 A7 801	VW3 A9 501	VW3 A9 201	VW3 A9 101	–
VW3 A5 201	–	VW3 A7 701	VW3 A7 802	VW3 A9 502	VW3 A9 202	VW3 A9 102	–
VW3 A5 201	–	VW3 A7 701	VW3 A7 802	VW3 A9 502	VW3 A9 202	VW3 A9 102	–
VW3 A5 202	–	VW3 A7 702	VW3 A7 802	VW3 A9 503	VW3 A9 203	VW3 A9 103	–
VW3 A5 203	–	VW3 A7 702	VW3 A7 803	VW3 A9 503	VW3 A9 203	VW3 A9 103	–
VW3 A5 203	–	VW3 A7 703	VW3 A7 803	VW3 A9 504	VW3 A9 204	VW3 A9 104	–
VW3 A5 203	–	VW3 A7 703	VW3 A7 804	VW3 A9 505	VW3 A9 205	VW3 A9 105	–
VW3 A5 204	–	VW3 A7 704	VW3 A7 804	VW3 A9 505	VW3 A9 205	VW3 A9 105	–
VW3 A5 204	–	VW3 A7 704	VW3 A7 804	VW3 A9 506	VW3 A9 206	VW3 A9 106	VW3 A9 404
VW3 A5 204	–	VW3 A7 704	VW3 A7 804	VW3 A9 507	VW3 A9 207	VW3 A9 107	VW3 A9 405
VW3 A5 205	–	VW3 A7 705	VW3 A7 805	VW3 A9 507	VW3 A9 207	VW3 A9 107	VW3 A9 405
VW3 A5 205	–	VW3 A7 707	VW3 A7 805	VW3 A9 509	VW3 A9 208	VW3 A9 108	VW3 A9 407
VW3 A5 206	–	VW3 A7 707	VW3 A7 805	VW3 A9 509	VW3 A9 208	VW3 A9 108	VW3 A9 407
VW3 A5 206	–	VW3 A7 707	VW3 A7 806	VW3 A9 509	VW3 A9 208	VW3 A9 108	VW3 A9 407
VW3 A5 207	–	VW3 A7 710	VW3 A7 811	VW3 A9 510	VW3 A9 209	VW3 A9 109	–
VW3 A5 207	–	VW3 A7 711	VW3 A7 812	VW3 A9 511	VW3 A9 210	VW3 A9 110	–
VW3 A5 208	–	VW3 A7 711	VW3 A7 812	VW3 A9 512	VW3 A9 211	VW3 A9 111	–
VW3 A5 208	–	VW3 A7 712	VW3 A7 813	VW3 A9 513	VW3 A9 212	VW3 A9 112	–
VW3 A5 209	VW3 A7 101	VW3 A7 715	VW3 A7 814	VW3 A9 514, 515	VW3 A9 213, 214	VW3 A9 113, 114	–
VW3 A5 209	VW3 A7 101	VW3 A7 716	VW3 A7 815	VW3 A9 514, 515	VW3 A9 213, 214	VW3 A9 113, 114	–
VW3 A5 210	VW3 A7 101	VW3 A7 716	VW3 A7 815	VW3 A9 514, 515	VW3 A9 213, 214	VW3 A9 113, 114	–
VW3 A5 210	VW3 A7 101	VW3 A7 716	VW3 A7 815	VW3 A9 514, 515	VW3 A9 213, 214	VW3 A9 113, 114	–
VW3 A5 210	VW3 A7 102	VW3 A7 717	VW3 A7 816	–	–	VW3 A9 115	–
VW3 A5 210	VW3 A7 102	VW3 A7 717	VW3 A7 816	–	–	VW3 A9 115	–
VW3 A5 211	VW3 A7 102	VW3 A7 717	VW3 A7 816	–	–	VW3 A9 115	–
VW3 A5 211	VW3 A7 102	VW3 A7 718	VW3 A7 817	–	–	VW3 A9 116	–
2/437	2/399	2/401	2/403	2/365	2/367	2/368	2/364

Communication cards *(2)*							
Ethernet TCP/IP	**Modbus/ Uni-Telway**	**Fipio standard**	**Substitution Fipio**	**Modbus Plus**	**Profibus DP**	**DeviceNet**	**INTERBUS**
VW3 A3 310	VW3 A3 303	VW3 A3 311	VW3 A3 301	VW3 A3 302	VW3 A3 307	VW3 A3 309	VW3 A3 304
2/396 and 4/6	2/396, 4/13 and 4/21	2/396 and 4/10	2/396 and 4/10	2/396 and 4/18	2/396	2/396	2/396

Variable speed drives for asynchronous motors
Altivar 71

Table showing possible combinations of ATV 71W●●●N4 drive options

Motor		Drive	Option			
			DC choke	Line choke	Passive filter *(1)*	Additional EMC filter
kW	*HP*					
3-phase supply voltage: 380…480 V 50/60 Hz						
0.75	*1*	**ATV 71W075N4**	VW3 A4 501	VW3 A4 551	VW3 A4 6●1	VW3 A4 401
1.5	*2*	**ATV 71WU15N4**	VW3 A4 502	VW3 A4 551	VW3 A4 6●1	VW3 A4 401
2.2	*3*	**ATV 71WU22N4**	VW3 A4 503	VW3 A4 552	VW3 A4 6●1	VW3 A4 401
3	–	**ATV 71WU30N4**	VW3 A4 503	VW3 A4 552	VW3 A4 6●1	VW3 A4 402
4	*5*	**ATV 71WU40N4**	VW3 A4 504	VW3 A4 552	VW3 A4 6●2	VW3 A4 402
5.5	*7.5*	**ATV 71WU55N4**	VW3 A4 505	VW3 A4 553	VW3 A4 6●2	VW3 A4 403
7.5	*10*	**ATV 71WU75N4**	VW3 A4 506	VW3 A4 553	VW3 A4 6●3	VW3 A4 403
11	*15*	**ATV 71WD11N4**	VW3 A4 507	VW3 A4 554	VW3 A4 6●3	VW3 A4 404
15	*20*	**ATV 71WD15N4**	VW3 A4 508	VW3 A4 554	VW3 A4 6●4	VW3 A4 405
18.5	*25*	**ATV 71WD18N4**	VW3 A4 508	VW3 A4 555	VW3 A4 6●5	VW3 A4 405
22	*30*	**ATV 71WD22N4**	VW3 A4 510	VW3 A4 555	VW3 A4 6●6	VW3 A4 406
30	*40*	**ATV 71WD30N4**	VW3 A4 510	VW3 A4 556	VW3 A4 6●7	VW3 A4 407
37	*50*	**ATV 71WD37N4**	VW3 A4 510	VW3 A4 556	VW3 A4 6●7	VW3 A4 407
45	*60*	**ATV 71WD45N4**	VW3 A4 511	VW3 A4 556	VW3 A4 6●8	VW3 A4 408
55	*75*	**ATV 71WD55N4**	VW3 A4 511	VW3 A4 556	VW3 A4 6●8	VW3 A4 408
75	*100*	**ATV 71WD75N4**	VW3 A4 511	VW3 A4 558	VW3 A4 6●9	VW3 A4 408
Pages		2/362	2/419	2/422	2/424	2/430

Table showing possible combinations of options common to all Altivar 71 drives

For drives	Logic input adapter 115 V ∿	Remote graphic display terminal	Encoder interface cards			I/O cards *(2)*		"Controller Inside" programmable card	PowerSuite software workshop for PC
			RS 422 compatible differential outputs	Open collector outputs	Push-pull outputs	Logic	Extended		
ATV 71W●●●N4	VW3 A3 101	VW3 A1 101	VW3 A3 401, 402	VW3 A3 403, 404	VW3 A3 405 …407	VW3 A3 201	VW3 A3 202	VW3 A3 501	VW3 A8 104, 105
Pages	2/364	2/376	2/379	2/379	2/379	2/381	2/381	2/389	3/4

(1) There are special passive filters for a 460 V ∿ supply, see pages 2/426 and 2/427.
(2) Maximum combination: 2 cards, in accordance with the compatibility table below:

Type of card	Logic I/O VW3 A3 201	Extended I/O VW3 A3 202	Programmable "Controller Inside" VW3 A3 501	Communication VW3 A3 3●●
Logic I/O VW3 A3 201				
Extended I/O VW3 A3 202				
Programmable "Controller Inside" VW3 A3 501				
Communication VW3 A3 3●●				

Possible to combine

Not possible to combine

Motor choke	IP 20 motor choke kit	Sinus filter	Braking resistor	Hoist resistor	Ready-assembled IP 54 base plate
VW3 A5 10●	–	–	VW3 A7 701	VW3 A7 801	VW3 A9 901
VW3 A5 10●	–	VW3 A5 201	VW3 A7 701	VW3 A7 801	VW3 A9 901
VW3 A5 10●	–	VW3 A5 201	VW3 A7 701	VW3 A7 801	VW3 A9 901
VW3 A5 10●	–	VW3 A5 201	VW3 A7 701	VW3 A7 802	VW3 A9 901
VW3 A5 10●	–	VW3 A5 201	VW3 A7 701	VW3 A7 802	VW3 A9 901
VW3 A5 10●	VW3 A9 612	VW3 A5 202	VW3 A7 702	VW3 A7 802	VW3 A9 902
VW3 A5 10●	VW3 A9 612	VW3 A5 203	VW3 A7 702	VW3 A7 803	VW3 A9 902
VW3 A5 10●	VW3 A9 612	VW3 A5 203	VW3 A7 703	VW3 A7 803	VW3 A9 903
VW3 A5 10●	VW3 A9 612	VW3 A5 203	VW3 A7 703	VW3 A7 804	VW3 A9 904
VW3 A5 10●	VW3 A9 612	VW3 A5 204	VW3 A7 704	VW3 A7 804	VW3 A9 904
VW3 A5 10●	VW3 A9 612	VW3 A5 204	VW3 A7 704	VW3 A7 804	VW3 A9 905
VW3 A5 10●	VW3 A9 612	VW3 A5 204	VW3 A7 704	VW3 A7 804	VW3 A9 906
VW3 A5 10●	VW3 A9 612	VW3 A5 205	VW3 A7 705	VW3 A7 805	VW3 A9 906
VW3 A5 104	VW3 A9 612	VW3 A5 205	VW3 A7 707	VW3 A7 805	VW3 A9 907
VW3 A5 104	VW3 A9 612	VW3 A5 206	VW3 A7 707	VW3 A7 805	VW3 A9 907
VW3 A5 104	VW3 A9 612	VW3 A5 206	VW3 A7 707	VW3 A7 806	VW3 A9 907
2/434	2/435	2/437	2/401	2/403	2/364

Communication cards *(2)*							
Ethernet TCP/IP	Modbus/ Uni-Telway	Fipio standard	Substitution Fipio	Modbus Plus	Profibus DP	DeviceNet	INTERBUS
VW3 A3 310	VW3 A3 303	VW3 A3 311	VW3 A3 301	VW3 A3 302	VW3 A3 307	VW3 A3 309	VW3 A3 304
2/396 and 4/6	2/396, 4/13 and 4/21	2/396 and 4/10	2/396 and 4/10	2/396 and 4/18	2/396	2/396	2/396

2

Table showing possible combinations of ATV 71P●●●N4Z drive options

Motor kW	Motor *HP*	Drive	Options: DC choke	Line choke	Passive filter	Additional EMC filter	Motor choke	IP 20 motor choke kit
3-phase supply voltage: 380…480 V 50/60 Hz								
0.75	*1*	**ATV 71P075N4Z**	VW3 A4 501	VW3 A4 551	VW3 A4 6●1	VW3 A4 401	VW3 A5 101	–
1.5	*2*	**ATV 71PU15N4Z**	VW3 A4 502	VW3 A4 551	VW3 A4 6●1	VW3 A4 401	VW3 A5 101, 102, 103	–
2.2	*3*	**ATV 71PU22N4Z**	VW3 A4 503	VW3 A4 552	VW3 A4 6●1	VW3 A4 401	VW3 A5 101, 102, 103	–
3	–	**ATV 71PU30N4Z**	VW3 A4 503	VW3 A4 552	VW3 A4 6●1	VW3 A4 402	VW3 A5 101, 102, 103	–
4	*5*	**ATV 71PU40N4Z**	VW3 A4 504	VW3 A4 552	VW3 A4 6●2	VW3 A4 402	VW3 A5 101, 102, 103	–
5.5	*7.5*	**ATV 71PU55N4Z**	VW3 A4 505	VW3 A4 553	VW3 A4 6●2	VW3 A4 403	VW3 A5 102, 103, 104	VW3 A9 612
7.5	*10*	**ATV 71PU75N4Z**	VW3 A4 506	VW3 A4 553	VW3 A4 6●3	VW3 A4 403	VW3 A5 102, 103, 104	VW3 A9 612
Pages			2/363	2/419	2/422	2/424	2/430	2/434	2/435

2.5

Table showing possible combinations of options common to all Altivar 71 drives

For drives	Logic input adapter 115 V ∼	Remote graphic display terminal	Encoder interface cards: RS 422 compatible differential outputs	Encoder interface cards: Open collector outputs	Encoder interface cards: Push-pull outputs	I/O cards *(2)*: Logic	I/O cards *(2)*: Extended	"Controller Inside" programmable card	PowerSuite software workshop for PC
ATV 71P●●●N4Z	VW3 A3 101	VW3 A1 101	VW3 A3 401, 402	VW3 A3 403, 404	VW3 A3 405 …407	VW3 A3 201	VW3 A3 202	VW3 A3 501	VW3 A8 104, 105
Pages	2/364	2/376	2/379	2/379	2/379	2/381	2/381	2/389	3/4

(1) There are special passive filters for a 460 V ∼ supply, see pages 2/426 and 2/427.
(2) Maximum combination: 2 cards, in accordance with the compatibility table below:

Type of card	Logic I/O VW3 A3 201	Extended I/O VW3 A3 202	Programmable "Controller Inside" VW3 A3 501	Communication VW3 A3 3●●
Logic I/O VW3 A3 201				
Extended I/O VW3 A3 202				
Programmable "Controller Inside" VW3 A3 501				
Communication VW3 A3 3●●				

Possible to combine

Not possible to combine

Sinus filter	Braking resistor	Hoist resistor	Kits for mounting inside dust and damp proof enclosure	Fan	UL Type 1 conformity kit (outside enclosure)	IP 21 or IP 31 conformity kit (outside enclosure)
VW3 A5 201	VW3 A7 701	VW3 A7 801	VW3 A9 801	VZ3 V1 203	VW3 A9 201	VW3 A9 101
VW3 A5 201	VW3 A7 701	VW3 A7 801	VW3 A9 801	VZ3 V1 203	VW3 A9 201	VW3 A9 101
VW3 A5 201	VW3 A7 701	VW3 A7 801	VW3 A9 801	VZ3 V1 203	VW3 A9 201	VW3 A9 101
VW3 A5 201	VW3 A7 701	VW3 A7 802	VW3 A9 802	VZ3 V1 209	VW3 A9 202	VW3 A9 102
VW3 A5 201	VW3 A7 701	VW3 A7 802	VW3 A9 802	VZ3 V1 209	VW3 A9 202	VW3 A9 102
VW3 A5 202	VW3 A7 702	VW3 A7 802	VW3 A9 803	VZ3 V1 204	VW3 A9 203	VW3 A9 103
VW3 A5 203	VW3 A7 702	VW3 A7 803	VW3 A9 803	VZ3 V1 204	VW3 A9 203	VW3 A9 103
2/401	2/401	2/403	2/366	2/366	2/367	2/368

Communication cards *(2)*							
Ethernet TCP/IP	Modbus/ Uni-Telway	Fipio standard	Substitution Fipio	Modbus Plus	Profibus DP	DeviceNet	INTERBUS
VW3 A3 310	VW3 A3 303	VW3 A3 311	VW3 A3 301	VW3 A3 302	VW3 A3 307	VW3 A3 309	VW3 A3 304
2/396 and 4/6	2/396, 4/13 and 4/21	2/396 and 4/10	2/396 and 4/10	2/396 and 4/18	2/396	2/396	2/396

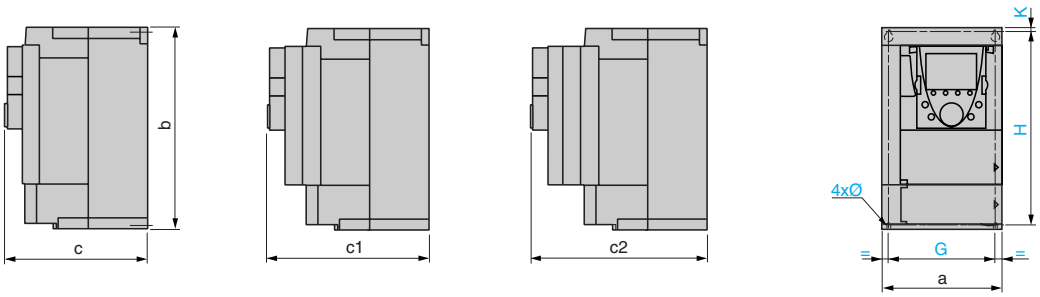
Variable speed drives for asynchronous motors

Altivar 71

UL Type 1/IP 20 drives

ATV 71H●●●M3, ATV 71HD11M3X, HD15M3X, ATV 71H075N4...HD18N4 variable speed drives

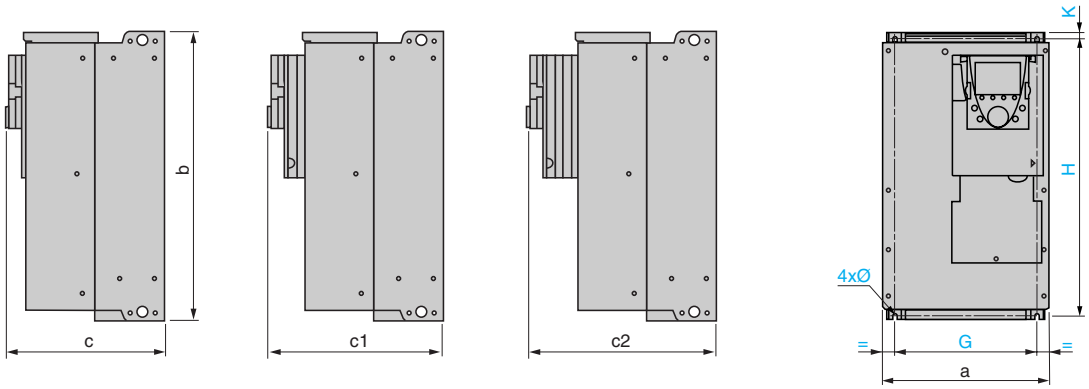
Without option card | **1 option card** *(1)* | **2 option cards** *(1)* | **Common front view**



ATV 71H	a	b	c	c1	c2	G	H	K	Ø
037M3...U15M3, 075N4...U22N4	130	230	175	198	221	113.5	220	5	5
U22M3...U40M3, U30N4, U40N4	155	260	187	210	233	138	249	4	5
U55M3, U55N4, U75N4	175	295	187	210	233	158	283	6	5
U75M3, D11N4	210	295	213	236	259	190	283	6	6
D11M3X, D15M3X, D15N4, D18N4	230	400	213	236	259	210	386	8	6

ATV 71HD18M3X...45M3X, ATV 71HD22N4...HD37N4 variable speed drives

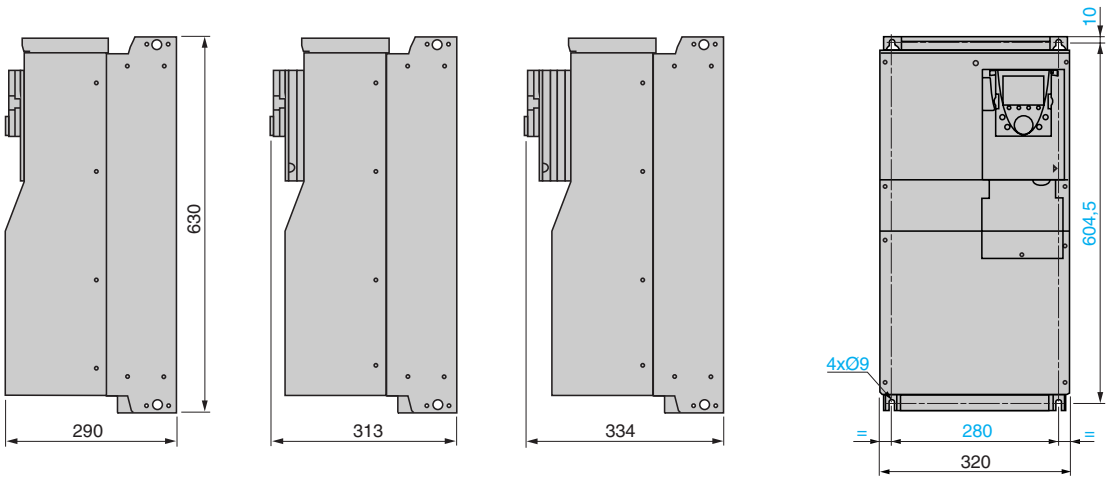
Without option card | **1 option card** *(1)* | **2 option cards** *(1)* | **Common front view**



ATV 71H	a	b	c	c1	c2	G	H	K	Ø
D18M3X, D22M3X, D22N4	240	420	236	259	282	206	403	10	6
D30N4, D37N4	240	550	266	289	312	206	529	10	6
D30M3X...D45M3X	320	550	266	289	312	280	524	10	9

ATV 71HD45N4...HD75N4 variable speed drives

Without option card | **1 option card** *(1)* | **2 option cards** *(1)* | **Common front view**



(1) Option cards: I/O extension cards, communication cards or "Controller Inside" programmable card.

Presentation: pages 2/342 to 2/347 | Characteristics: pages 2/348 to 2/355 | References: pages 2/360 to 2/363 | Schemes: pages 2/472 to 2/491 | Functions: pages 2/512 to 2/543

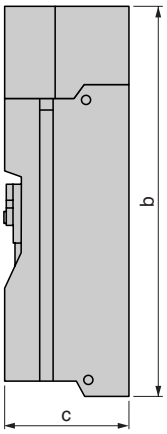
Variable speed drives for asynchronous motors

Altivar 71

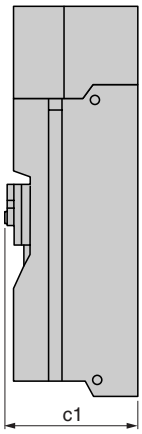
UL Type 1/IP 20 drives

ATV 71HD55M3X, HD75M3X, ATV 71HD90N4...HC28N4 variable speed drives

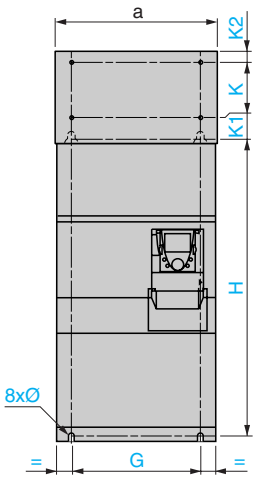
With or without 1 option card *(1)*



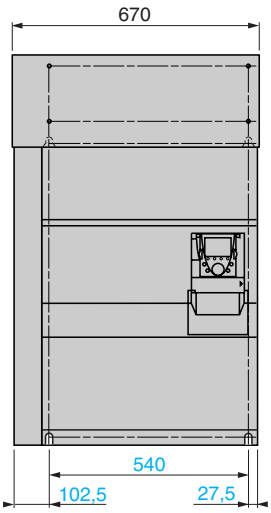
2 option cards *(1)*



Common front view



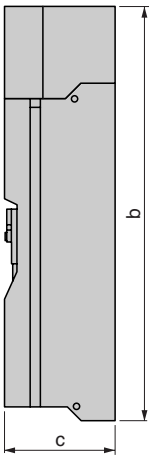
ATV 71HC20N4...HC28N4 with braking unit VW3 A7 101



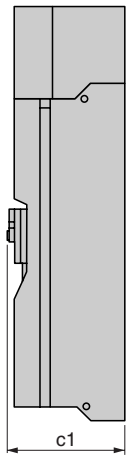
ATV 71H	a	b	c	c1	G	H	K	K1	K2	Ø
D55M3X, D90N4	320	920	377	392	250	650	150	75	30	11.5
D75M3X, C11N4	360	1022	377	392	298	758	150	75	30	11.5
C13N4	340	1190	377	392	285	920	150	75	30	11.5
C16N4	440	1190	377	392	350	920	150	75	30	11.5
C20N4...C28N4	595	1190	377	392	540	920	150	75	30	11.5

ATV 71HC31N4...HC50N4 variable speed drives

With or without 1 option card *(1)*

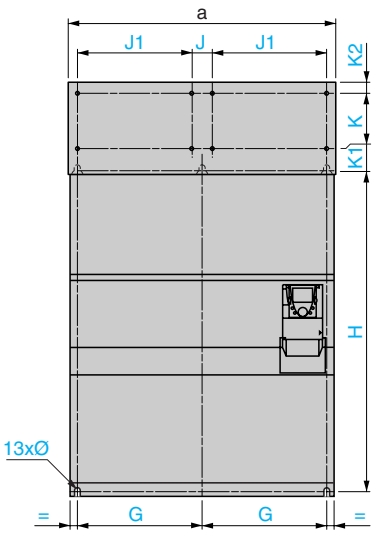


2 option cards *(1)*



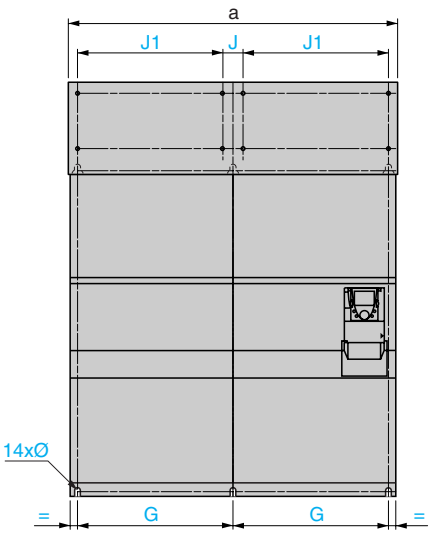
ATV 71HC31N4, HC40N4

Front view



ATV 71HC50N4

Front view



ATV 71H	a	b	c	c1	G	J	J1	H	K	K1	K2	Ø
C31N4, C40N4	890	1390	377	392	417	70	380	1120	150	75	30	11.5
C50N4	1120	1390	377	392	532	70	495	1120	150	75	30	11.5

(1) Option cards: I/O extension cards, communication cards or "Controller Inside" programmable card.

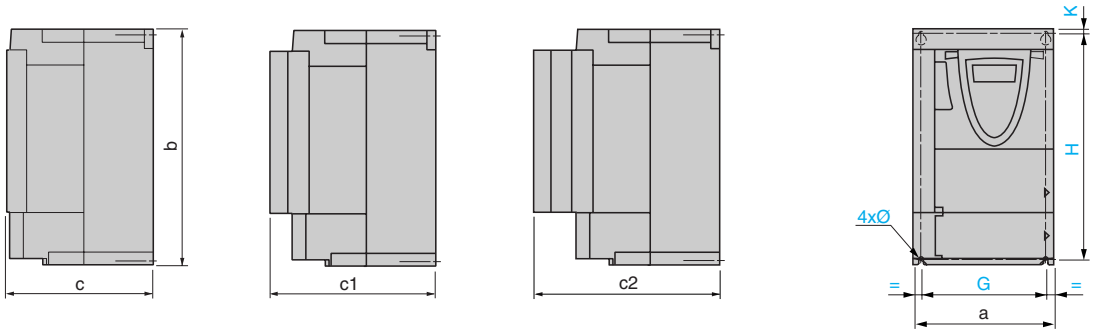
Variable speed drives for asynchronous motors

Altivar 71

UL Type 1/IP 20 drives

Variable speed drives without graphic display terminal
ATV 71H●●●M3Z, ATV 71HD11M3XZ, HD15M3XZ, ATV 71H075N4Z...HD18N4Z, ATV 71P●●●N4Z

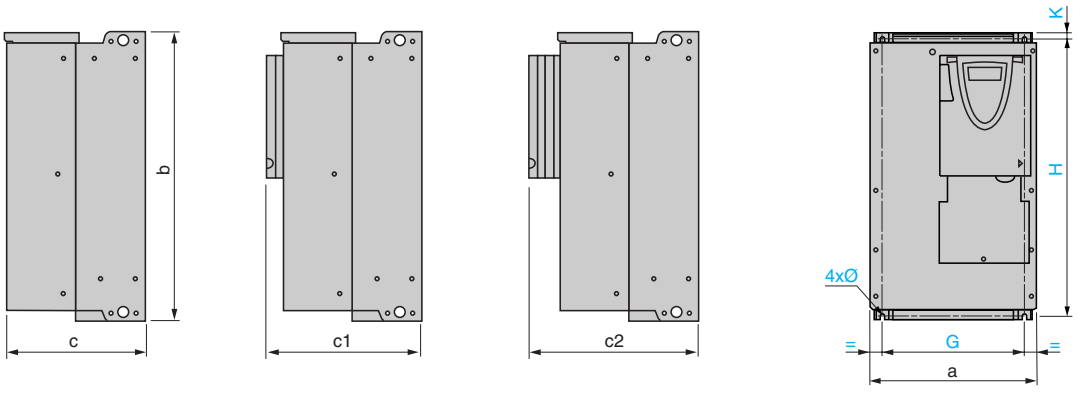
Without option card *(1)* | **1 option card** *(1)* | **2 option cards** *(1)* | **Common front view**



ATV 71	a	b	c	c1	c2	G	H	K	Ø
H037M3Z...HU15M3Z, H075N4Z...HU22N4Z P075N4Z, PU22N4Z	130	230	149	172	195	113.5	220	5	5
HU22M3Z...HU40M3Z, HU30N4Z, HU40N4Z PU30N4Z, PU40N4Z	155	260	161	184	207	138	249	4	5
HU55M3Z, HU55N4Z, HU75N4Z PU55N4Z, PU75N4Z	175	295	161	184	207	158	283	6	6
HU75M3Z, HD11N4Z	210	295	187	210	233	190	283	6	6
HD11M3XZ, HD15M3XZ HD15N4Z, HD18N4Z	230	400	187	210	233	210	386	8	6

Variable speed drives without graphic display terminal
ATV 71HD22N4Z...HD37N4Z

Without option card | **1 option card** *(1)* | **2 option cards** *(1)* | **Common front view**

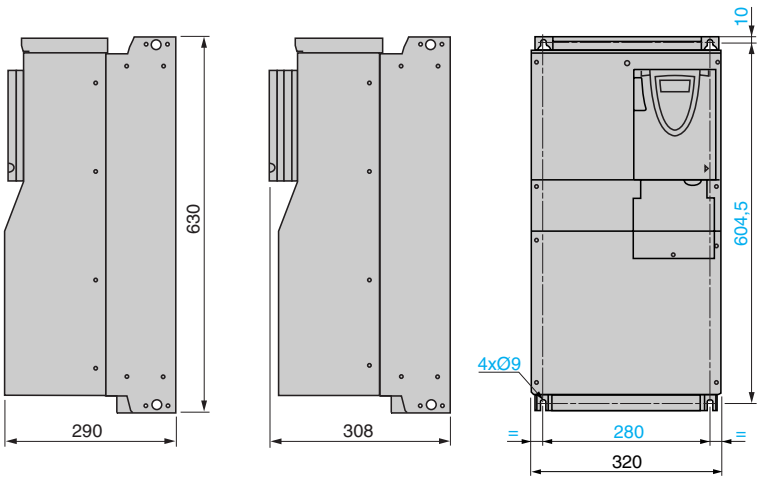


ATV 71H	a	b	c	c1	c2	G	H	K	Ø
D22N4Z	240	420	210	233	256	206	403	10	6
D30N4Z, D37N4Z	240	550	230	253	276	206	531,5	10	6

(1) Option cards: I/O extension cards, multi-pump cards, "Controller Inside" programmable card, communication cards.

Variable speed drives without graphic display terminal
ATV 71HD45N4Z...HD75N4Z

With or without 1 option card *(1)*	2 option cards *(1)*	Common front view

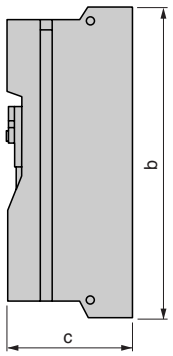


(1) Option cards: I/O extension cards, communication cards or "Controller Inside" programmable card.

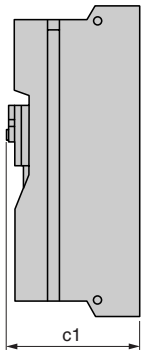
Variable speed drives for asynchronous motors
Altivar 71
UL Type 1/IP 20 drives

Variable speed drives without DC choke
ATV 71HD55M3XD, HD75M3XD, ATV 71HD90N4D...HC28N4D

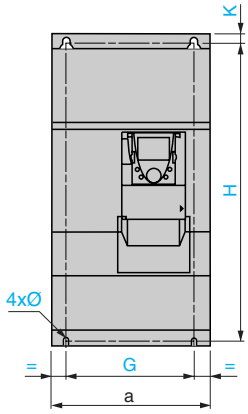
With or without 1 option card *(1)*



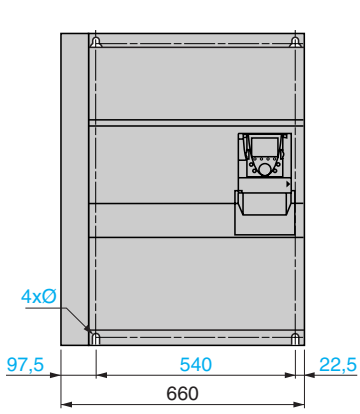
2 option cards *(1)*



Common front view



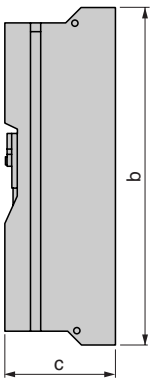
ATV 71HC20N4D...HC28N4D with braking unit VW3 A7 101



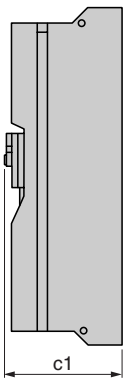
ATV 71H	a	b	c	c1	G	H	K	Ø
D55M3XD, D90N4D	310	680	377	392	250	650	15	11.5
D75M3XD, C11N4D	350	782	377	392	298	758	12	11.5
C13N4D	330	950	377	392	285	920	15	11.5
C16N4D	430	950	377	392	350	920	15	11.5
C20N4D...C28N4D	585	950	377	392	540	920	15	11.5

Variable speed drives without DC choke
ATV 71HC31N4D...HC50N4D

With or without 1 option card *(1)*

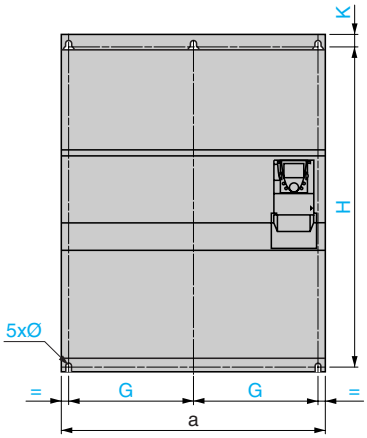


2 option cards *(1)*



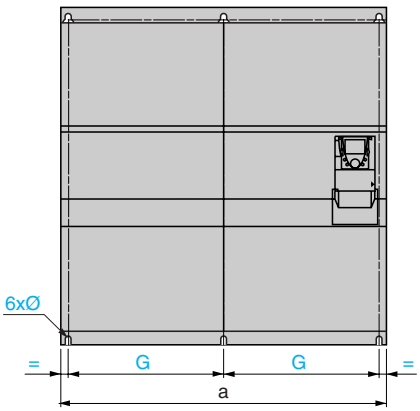
ATV 71HC31N4D, HC40N4D

Front view



ATV 71HC50N4D

Front view



ATV 71H	a	b	c	c1	G	H	K	Ø
C31N4D, C40N4D	880	1150	377	392	417.5	1120	15	11.5
C50N4D	1110	1150	377	392	532.5	1120	15	11.5

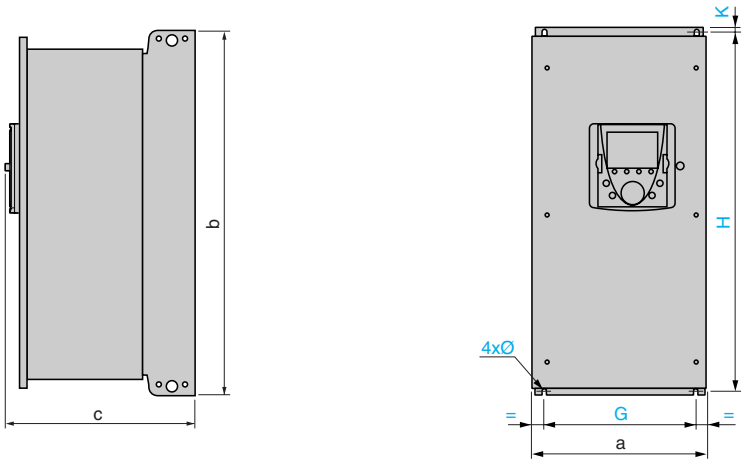
(1) Option cards: I/O extension cards, multi-pump cards, "Controller Inside" programmable card or communication cards.

Variable speed drives for asynchronous motors

Altivar 71

UL Type 12/IP 54 drives

ATV 71W075N4...WD75N4 variable speed drives



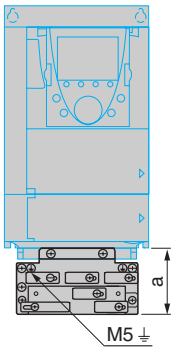
ATV 71W	a	b	c	G	H	K	Ø
075N4...U22N4	235	490	272	200	478	6	6
U30N4, U40N4	235	490	286	200	478	6	6
U55N4, U75N4	255	525	286	220	513	6	6
D11N4	290	560	315	250	544	8	6
D15N4, D18N4	310	665	315	270	650	10	6
D22N4	284	720	315	245	700	10	7
D30N4, D37N4	284	880	343	245	860	10	7
D45N4...D75N4	362	1000	364	300	975	10	9

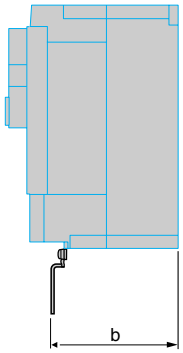
2

2.5

EMC mounting plates *(1)*

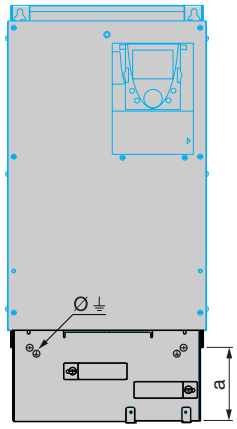
Pour ATV 71H●●●M3, ATV 71HD11M3X, HD15M3X, ATV 71H075N4…HD18N4, ATV 71P●●●N4Z

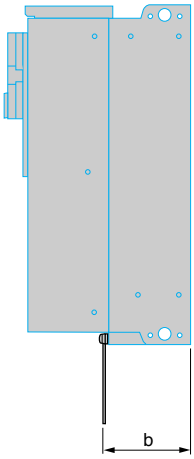




For ATV 71	a	b
H037M3…HU15M3 H075N4…HU22N4 P075N4Z…PU22N4Z	83	70
HU22M3…HU40M3 HU30N4, HU40N4	83	85
HU55M3 HU55N4, HU75N4	95	85
HU75M3…HD15M3X HD11N4…HD18N4	95	118

For ATV 71HD18M3X…HD45M3X, ATV 71HD22N4…HD75N4



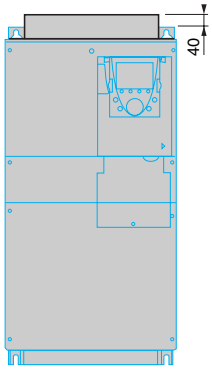


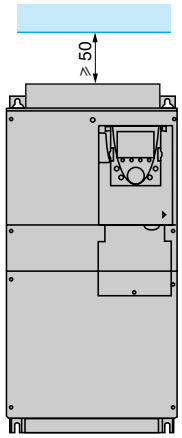
For ATV 71	a	b	Ø
HD18M3X, HD22M3X HD22N4	122	120	M5
HD30N4, HD37N4	113	127	M5
HD30M3X…HD45M3X	118	128	M8
HD45N4…HD75N4	118	173	M8

(1) Supplied with the drive apart from ATV 71HD55M3X, HD75M3X and ATV 71HD90N4…HC50N4. In the case of these drives the mounting plate is supplied with the UL Type 1 or IP 31 conformity kit, which must be ordered separately, see pages 2/367 and 2/368. Dimensions, see pages 2/456 and 2/457.

Control card fan kits VW3 A9 404…407

Mounting recommendations



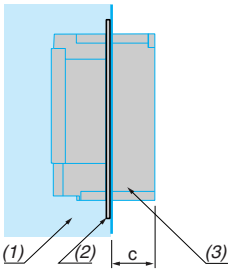


Variable speed drives for asynchronous motors
Altivar 71
Accessories

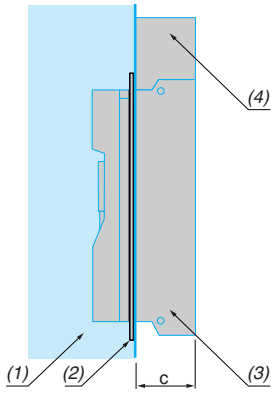
Kits for flush-mounting inside dust and damp proof enclosure

Installing the drive using the flush-mounting kit

Side view



Side view

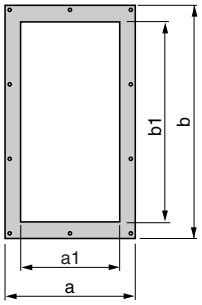


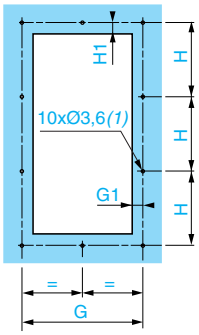
For ATV 71 drives	c	Kit VW3
H037M3, HU15M3, H075N4…HU22N4	60	A9 501
HU22M3…HU55M3, HU30N4…HU75N4	70	A9 502, 503
HU75M3…HD15M3X, HD11N4…HD18N4	90	A9 504, 505
HD18M3X…HD45M3X, HD22N4…HD75N4	105	A9 506…509
HD55M3X, HD55M3XD, HD90N4…HD90N4D	150	A9 510
HD75M3X, HD75M3XD, HC11N4…HC28N4, HC11N4D…HC28N4D	250	A9 511…515

(1) Dust and damp proof enclosure.
(2) Kit for flush-mounting in a dust and damp proof enclosure.
(3) Drive power section outside the enclosure.
(4) DC choke for ATV 71HD55M3X, HD75M3X and ATV 71HD90N4…HC28N4 drives.

VW3 A9 501…505

Cut-outs and drill holes



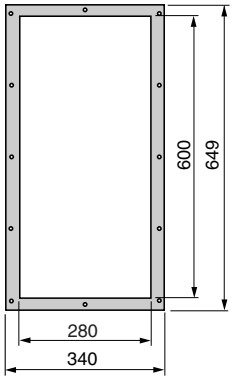


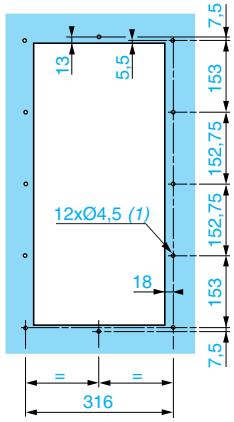
VW3	a	a1	b	b1	G	G1	H	H1
A9 501	222	170	397	351	205	17.5	127	15
A9 502	250	198	429.5	384.5	233	17.5	137.5	14
A9 503	267	215	465	419	250	17.5	149.5	14.5
A9 504	302	250	481.5	438	285	17.5	155	13
A9 505	324.5	270	584.5	537.5	305	17.5	189.5	15.5

(1) Ø 3.6 hole for M4 self-tapping screw.

VW3 A9 506

Cut-outs and drill holes

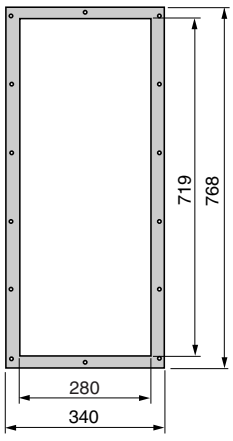


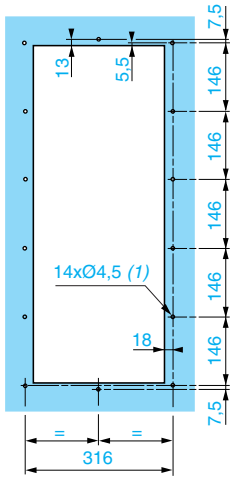


(1) Ø 4.5 hole for M5 self-tapping screw.

VW3 A9 507

Cut-outs and drill holes

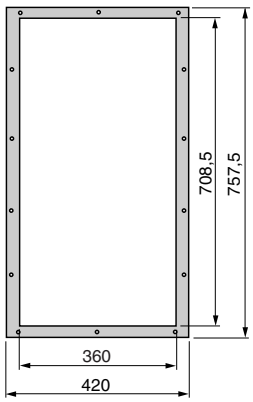


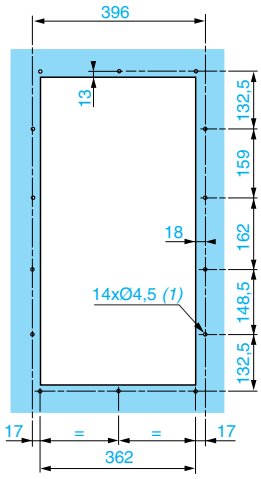


(1) Ø 4.5 hole for M5 self-tapping screw.

VW3 A9 508

Cut-outs and drill holes





(1) Ø 4.5 hole for M5 self-tapping screw.

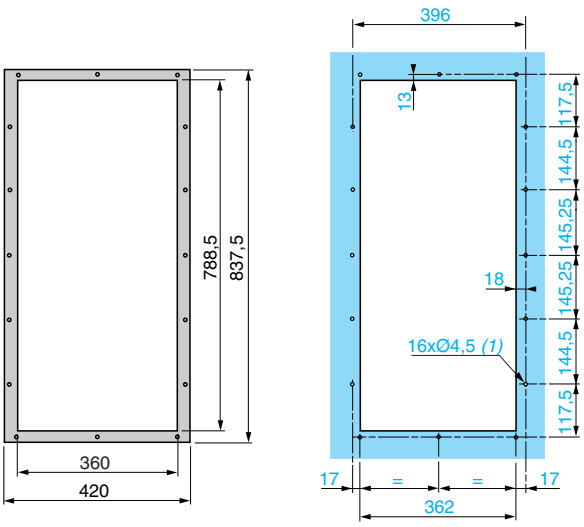
Presentation: page 2/365
References: page 2/365
Functions: pages 2/512 to 2/543

2

Kits for flush-mounting inside dust and damp proof enclosure (continued)

VW3 A9 509

Cut-outs and drill holes

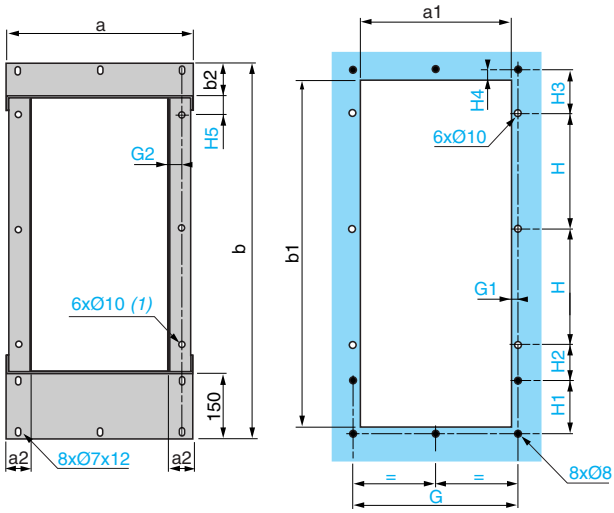


(1) Ø 4.5 hole for M5 self-tapping screw.

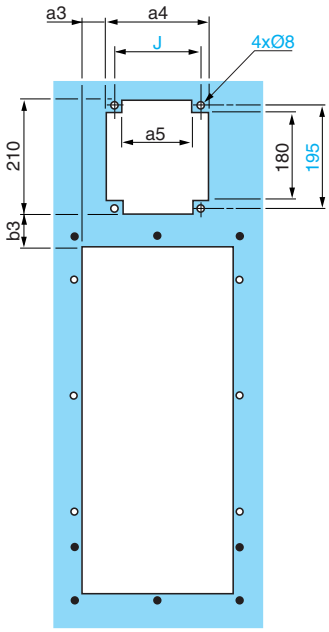
2.5

VW3 A9 510, 511

Cut-outs and drill holes without DC choke



Cut-outs and drill holes with DC choke



VW3	a	a1	a2	b	b1	b2	G	G1
A9 510	420	340	55	850	790	80	370	15
A9 511	440	360	45	885	845	66	396	18

VW3	G2	H	H1	H2	H3	H4	H5
A9 510	30	260	120	80	100	15	35
A9 511	23	310	70	91.5	83.5	10	27.5

(1) For fixing using an M8 screw min.

VW3	a3	a4	a5	b3	J
A9 510	82.5	180	120	45	150
A9 511	87.5	190	130	35	160

Presentation:
page 2/365

References:
page 2/365

Functions:
pages 2/512 to 2/543

Variable speed drives for asynchronous motors

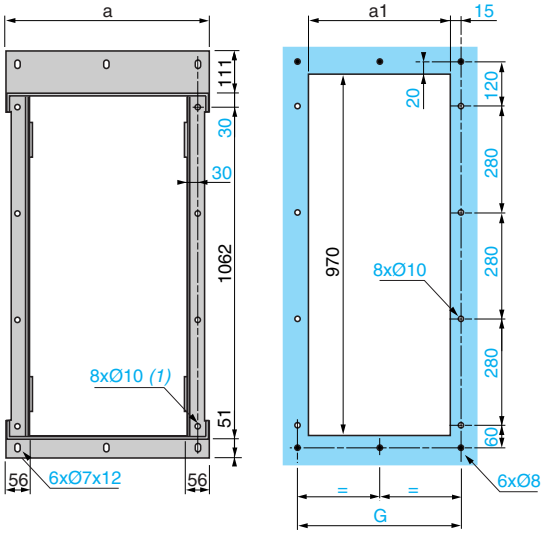
Altivar 71

Accessories

Kits for flush-mounting inside dust and damp proof enclosure (continued)

VW3 A9 512, 513

Cut-outs and drill holes without DC choke

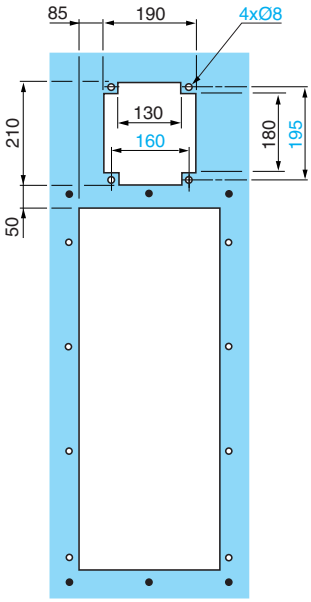


VW3	a	a1	G
A9 512	442	360	390
A9 513	542	460	490

(1) For fixing using an M8 screw min.

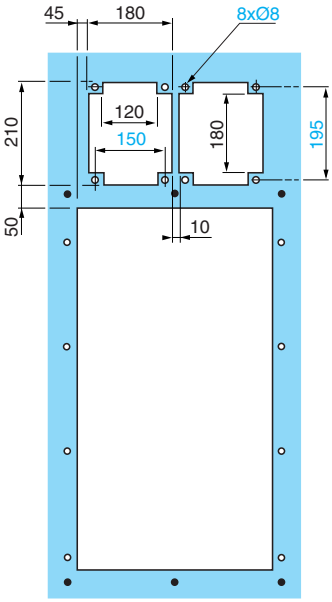
VW3 A9 512

Cut-outs and drill holes with DC choke



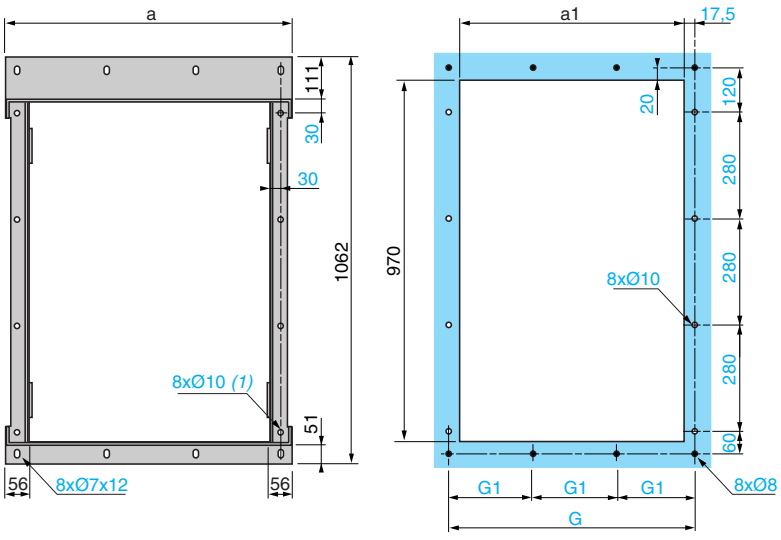
VW3 A9 513

Cut-outs and drill holes with DC choke



VW3 A9 514 (without braking unit), VW3 A9 515 (with braking unit)

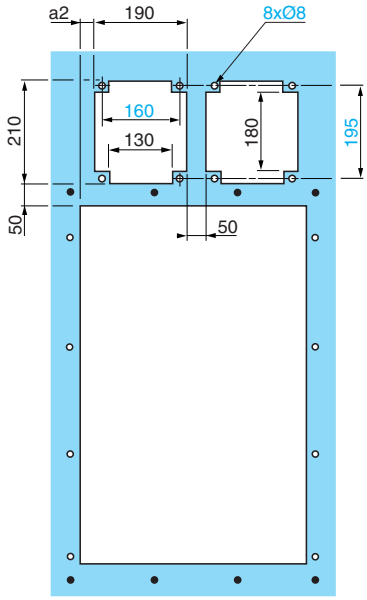
Cut-outs and drill holes without DC choke



VW3	a	a1	G	G1
A9 514	697	610	645	215
A9 515	772	685	720	240

(1) For fixing using an M8 screw min.

Cut-outs and drill holes with DC choke



VW3	a2
A9 514	90
A9 515	165

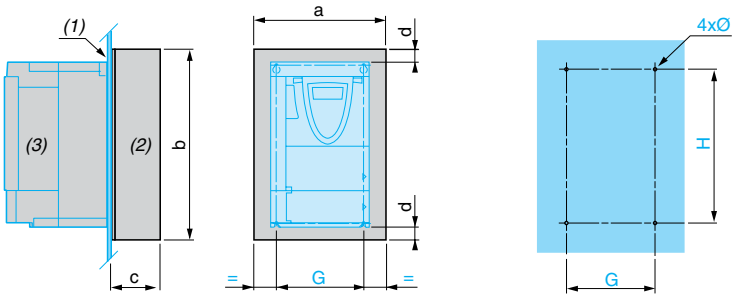
Presentation: page 2/365
References: page 2/365
Functions: pages 2/512 to 2/543

2

Kits for inside dust and damp proof enclosure

VW3 A9 801...803

Drill holes in the enclosure



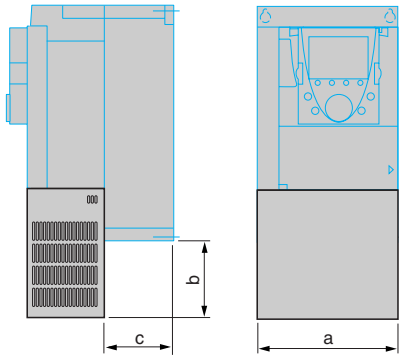
VW3	a	b	c	d	G	H	Ø
A9 801	150	226	80	2	113.5	220	M4
A9 802	175	450	80	95	138	249	M4
A9 803	300	700	83	203	158	283	M5

(1) Plate in the enclosure
(2) Kit VW3 A9 801, VW3 A9 802 or VW3 A9 803
(3) ATV 71P●●●N4Z drive

UL Type 1 conformity kit VW3 A9 2●●, IP 21 or IP 31 VW3 A9 1●● conformity kits

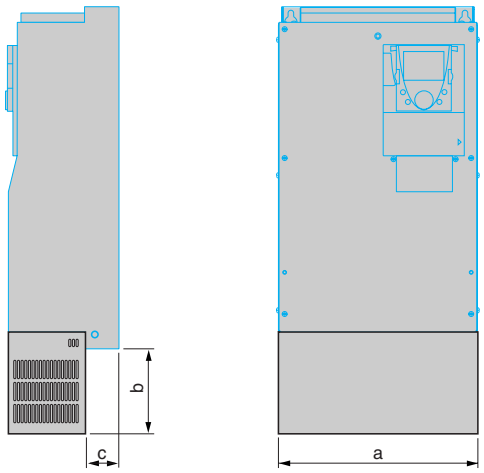
2.5

VW3 A9 201...205, 101...105



VW3	a	b	c
A9 201	132.6	31.4	60
A9 202	154.9	31.4	70
A9 203	177	31.4	70
A9 204	211.6	35.4	90
A9 205	231.6	38.9	90
A9 101	132.6	96.8	60
A9 102	154.9	104.1	70
A9 103	177	111.7	70
A9 104	211.6	128.9	90
A9 105	231.6	199.4	90

VW3 A9 206...208, 217, 106...108, 117



VW3	a	b	c
A9 206	240	59.9	102
A9 207	240	51.5	102
A9 217	320	48	102
A9 208	320	136	102
A9 106	240	75	102
A9 107	240	75	102
A9 117	320	75	102
A9 108	320	163	102

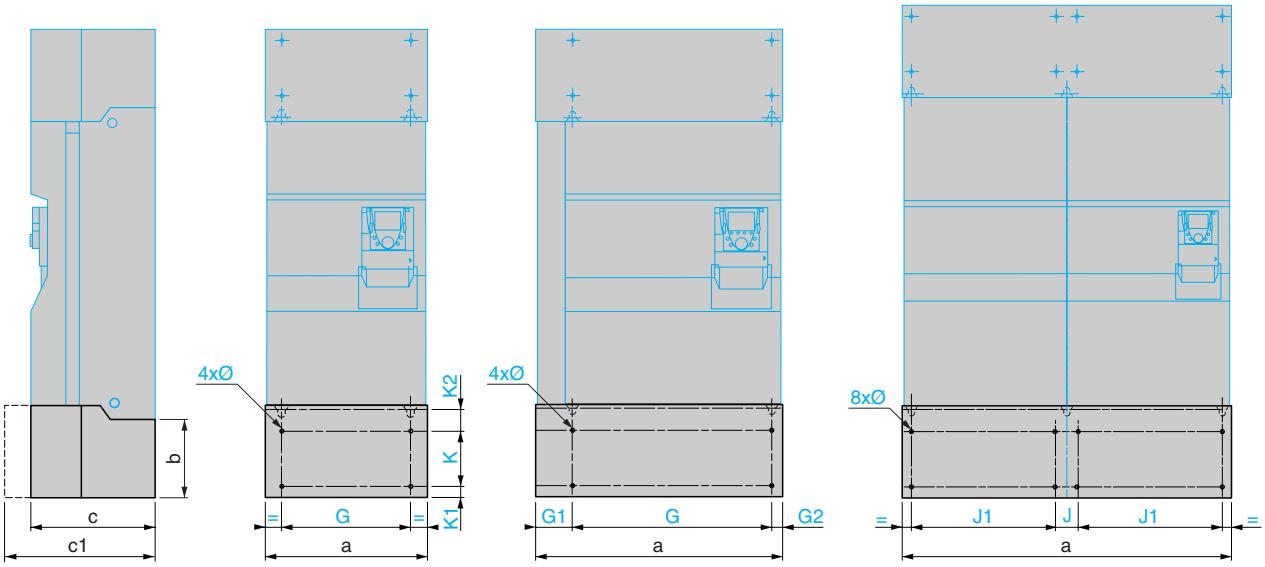
Presentation:
pages 2/366 to 2/368

References:
pages 2/366 to 2/368

Functions:
pages 2/512 to 2/543

UL Type 1 conformity kit VW3 A9 2●●, IP 21 or IP 31 VW3 A9 1●● conformity kits (continued)

VW3 A9 209…214, VW3 A9 109…116	VW3 A9 209…213, VW3 A9 109…113, 115	VW3 A9 214, 114 (with braking unit)	VW3 A9 116



VW3	a	b	c	c1	G	G1	G2	K	K1	K2	Ø	J	J1
A9 209	334	220	377	–	250	–	–	95	65	75	11.5	–	–
A9 210	374	300	377	–	298	–	–	172	65	75	11.5	–	–
A9 211	345	315	377	–	285	–	–	250	65	75	11.5	–	–
A9 212	445	375	377	–	350	–	–	250	65	75	11.5	–	–
A9 213	600	375	377	–	540	–	–	250	65	75	11.5	–	–
A9 214	670	375	377	–	540	102	27	250	65	75	11.5	–	–
A9 109	334	220	377	–	250	–	–	95	65	75	11.5	–	–
A9 110	374	300	377	–	298	–	–	172	65	75	11.5	–	–
A9 111	345	315	377	–	285	–	–	250	65	75	11.5	–	–
A9 112	445	375	377	–	350	–	–	250	65	75	11.5	–	–
A9 113	600	375	377	–	540	–	–	250	65	75	11.5	–	–
A9 114	670	375	377	–	540	102	27	250	65	75	11.5	–	–
A9 115	895	475	–	477	835	–	–	350	65	75	11.5	–	–
A9 116	1125	475	–	477	–	–	–	350	65	75	11.5	70	495

Presentation:
pages 2/367 and 2/368

References:
pages 2/367 and 2/368

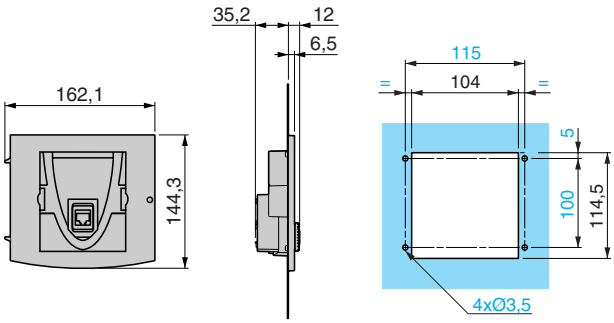
Functions:
pages 2/512 to 2/543

2

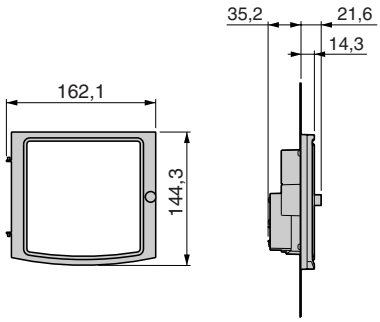
Remote graphic display terminal

IP 54 kit VW3 A1 102

Cut-outs and drill holes

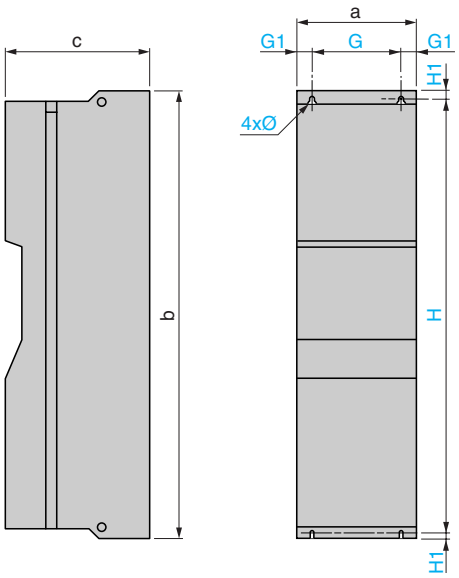


IP 65 door VW3 A1 103



Braking units VW3 A7 101 *(1)*, VW3 A7 102

VW3 A7 102

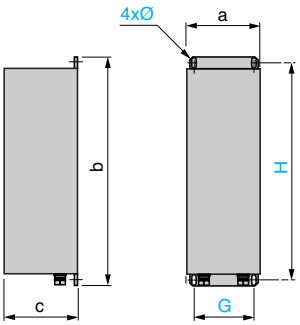


VW3	a	b	c	G	G1	H	H1	Ø
A7 101 *(1)*	75	950	377	–	–	–	–	–
A7 102	310	1150	377	265	22	1120	15	11.5

(1) Braking unit VW3 A7 101 can only be mounted on the left side of the drive, see page 2/447.

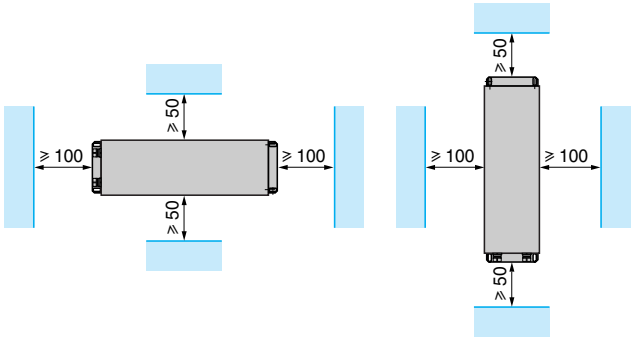
Braking resistors

VW3 A7 701...703



VW3	a	b	c	G	H	Ø
A7 701	95	293	95	70	275	6 x 12
A7 702	95	293	95	70	375	6 x 12
A7 703	140	393	120	120	375	6 x 12

Mounting recommendations



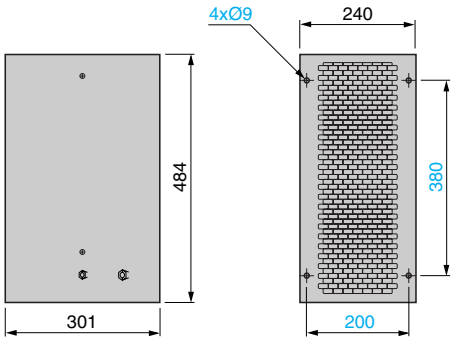
Variable speed drives for asynchronous motors

Altivar 71

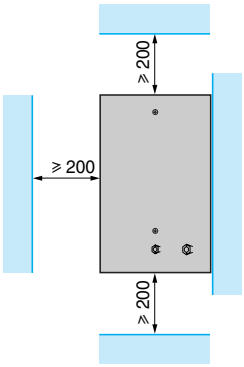
Braking resistors

Braking resistors (continued)

VW3 A7 704…709

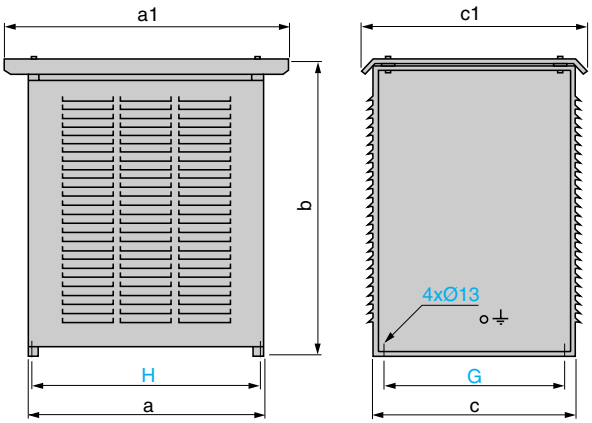


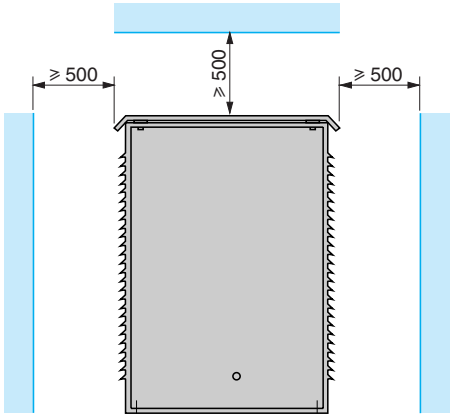
Mounting recommendations



VW3 A7 710…712, 715…718 *(1)*

Mounting recommendations



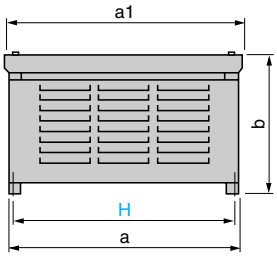


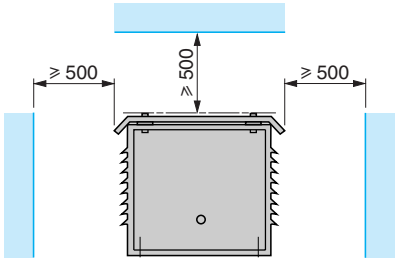
VW3	a	a1	b	c	c1	G	H
A7 710	860	1040	690	480	560	400	832
A7 711	960	1140	1150	380	460	300	932
A7 712	860	1040	1150	540	620	460	832
A7 715	960	1140	1150	540	620	460	932
A7 716	960	1140	1150	740	820	660	932
A7 717 *(1)*	960	1140	1150	540	620	460	932
A7 718 *(1)*	960	1140	1150	740	820	660	932

(1) The dimension is given for 1 component. References VW3 A7 717, 718 consist of two components; all components must be taken into account to determine the overall dimensions. A space of 300 mm must be left between each component.

VW3 A7 713, 714

Mounting recommendations





VW3	a	a1	b	c	c1	G	H
A7 713	760	790	440	480	540	400	732
A7 714	960	990	440	480	540	400	932

Variable speed drives for asynchronous motors

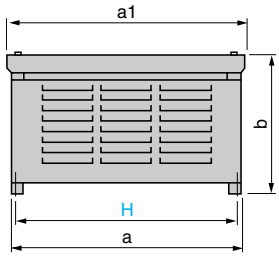
Altivar 71

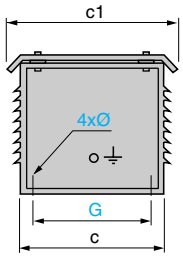
Hoist resistors

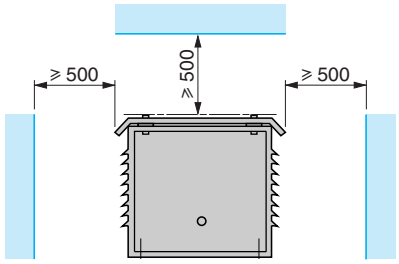
Hoist resistors

VW3 A7 801...804, 807...809

Mounting recommendations



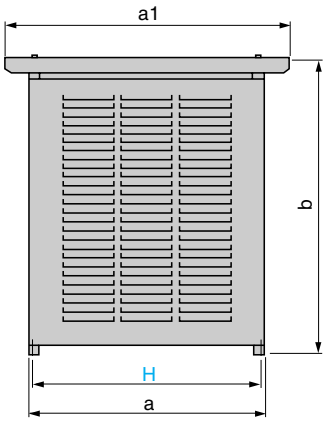


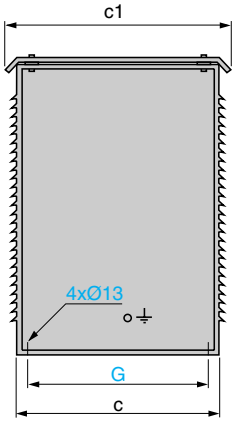


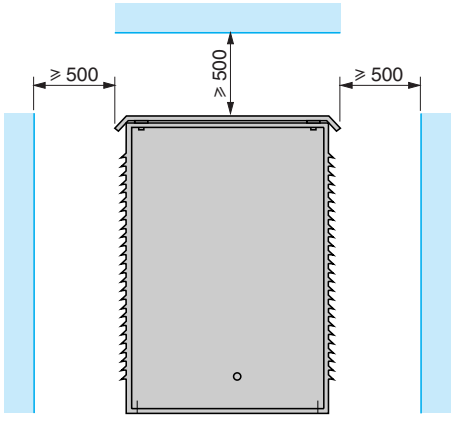
VW3	a	a1	b	c	c1	G	H	Ø
A7 801	490	452	203.5	153	202	95	470	10
A7 802	420	450	440	480	540	400	392	13
A7 803	580	610	440	480	540	400	552	13
A7 804	960	990	440	480	540	400	932	13
A7 807	860	890	440	480	540	400	832	13
A7 808	860	890	690	480	540	400	832	13
A7 809	860	890	690	480	450	400	832	13

VW3 A7 805, 806, 810...817 *(1)*

Mounting recommendations







VW3	a	a1	b	c	c1	G	H
A7 805	860	1040	1150	540	620	460	832
A7 806	860	1040	1150	740	820	660	832
A7 810	860	1040	1150	540	620	460	832
A7 811	960	1140	1150	540	620	460	932
A7 812	960	1140	1150	740	820	660	932
A7 813 *(1)*	960	1140	1150	540	620	460	932
A7 814 *(1)*	960	1140	1150	540	620	460	932
A7 815 *(1)*	960	1140	1150	740	820	660	932
A7 816 *(1)*	960	1140	1150	740	820	660	932
A7 817 *(1)*	960	1140	1700	740	820	660	932

(1) The dimension is given for 1 component. References VW3 A7 813…815 consist of 2 components and references VW3 A7 816 and 817 consist of 3 components; all components must be taken into account to determine the overall dimensions. A space of 300 mm must be left between each component.

Variable speed drives for asynchronous motors

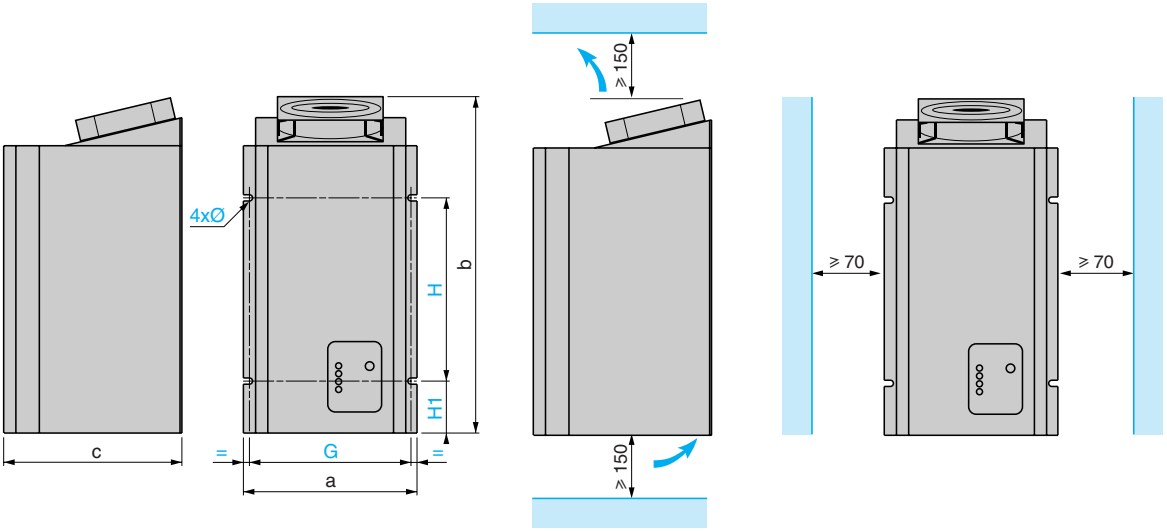
Altivar 71

Network braking units

Network braking units

VW3 A7 201…205, 231, 232

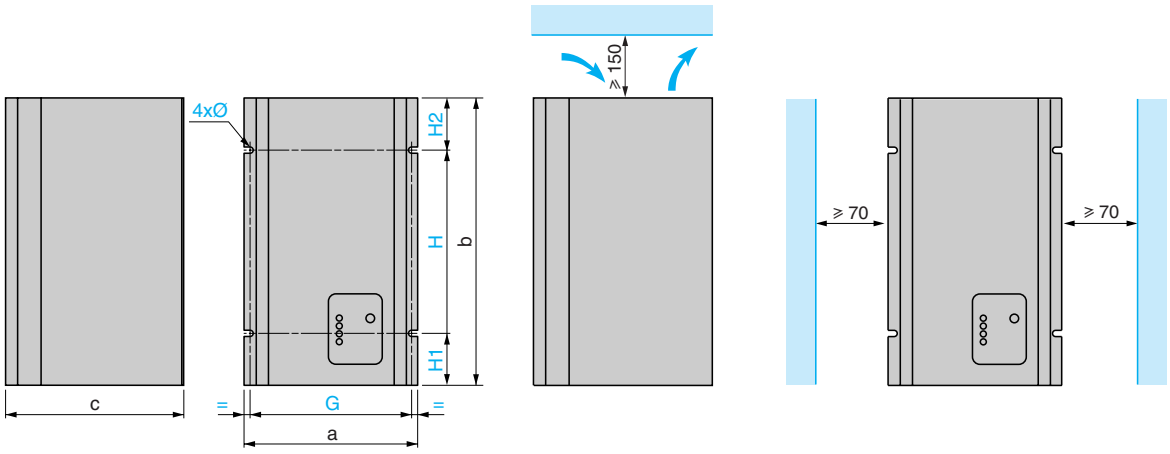
Mounting recommendations



VW3	a	b	c	G	H	H1	Ø
A7 201, 202	270	500	295	260	260	80	7
A7 203…205, A7 231…232	270	580	295	260	340	80	7

VW3 A7 206…208, 233…237

Mounting recommendations



VW3	a	b	c	G	H	H1	H2	Ø
A7 206…208	245	700	272	260	440	80	180	7
A7 233…237	272	700	295	260	440	80	180	7

Presentation: page 2/412
Characteristics: page 2/412
References: page 2/413
Schemes: pages 2/486 and 2/487
Functions: pages 2/512 to 2/543

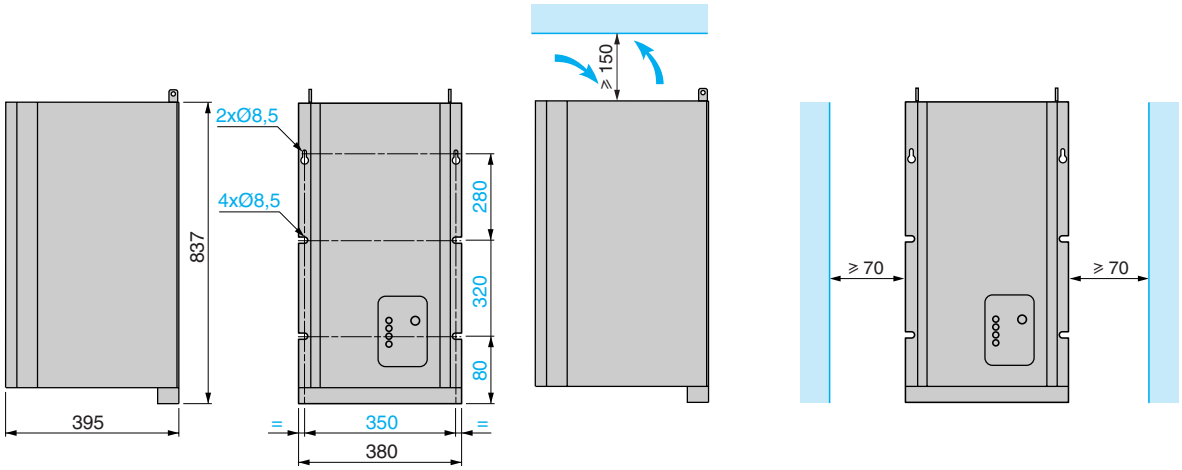
2

2.5

Network braking units (continued)

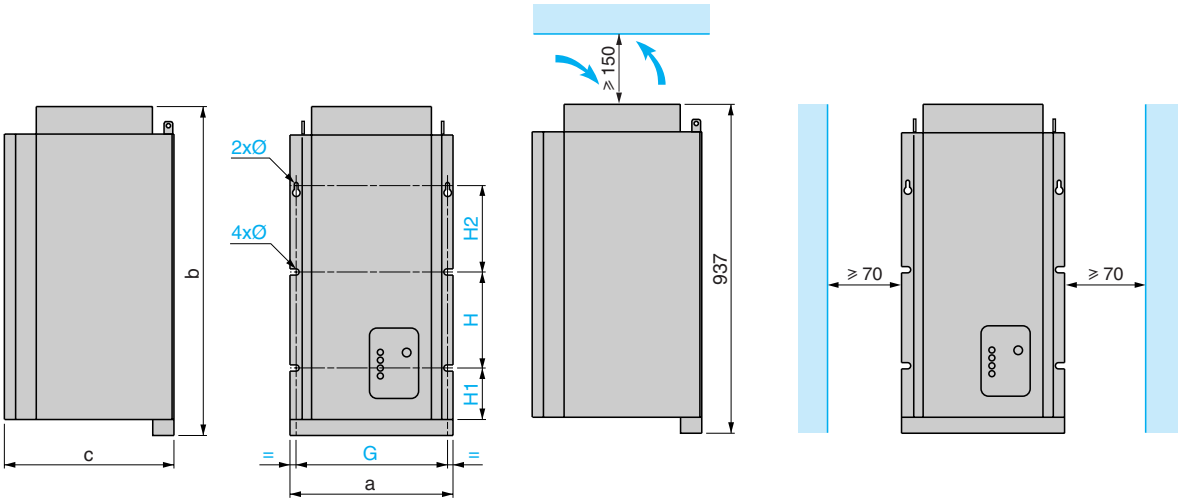
VW3 A7 209, 210, 238, 239

Mounting recommendations



VW3 A7 211, 212, 240, 241

Mounting recommendations



VW3	a	b	c	G	H	H1	H2	Ø
A7 211, 240	380	937	395	350	320	80	280	8.5
A7 212, 241	380	1037	395	350	320	80	280	8.5

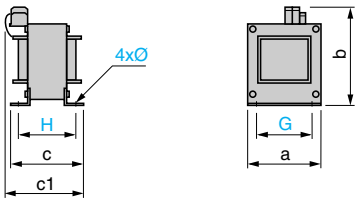
Variable speed drives for asynchronous motors

Altivar 71

DC chokes, line chokes

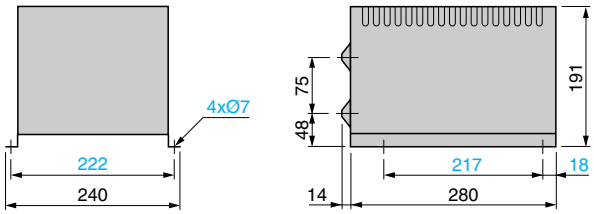
DC chokes

VW3 A4 501...510



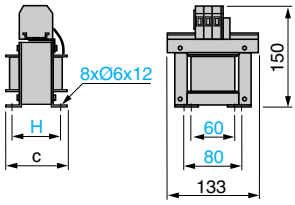
VW3	a	b	c	c1	G	H	Ø
A4 501	60	103	60	95	50	51	3.5
A4 502	60	103	77	118	50	68	3.5
A4 503	96	134	80	115	80	65	5.5
A4 504	96	134	79	115	80	64	5.5
A4 505	96	134	85	120	80	70	5.5
A4 506	96	134	89	120	80	74	5.5
A4 507	96	134	99	130	80	84	5.5
A4 508	108	142	112	145	90	97	5.5
A4 509	96	134	89	120	80	74	5.5
A4 510	126	171	120	170	105	103	7

VW3 A4 511, 512



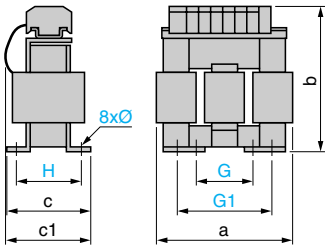
Line chokes

VW3 A58501, A58502



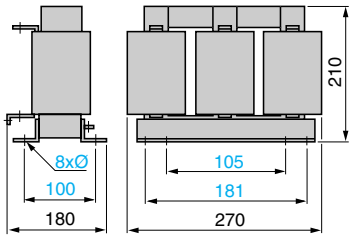
VW3	c	H
A58501	95	65
A58502	105	77

VW3 A4 551...555



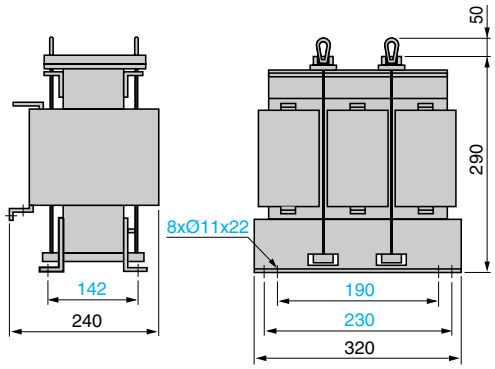
VW3	a	b	c	c1	G	G1	H	Ø
A4 551	100	135	55	60	40	60	42	6 x 9
A4 552, A4 553	130	155	85	90	60	80.5	62	6 x 12
A4 554	155	170	115	135	75	107	90	6 x 12
A4 555	180	210	125	165	85	122	105	6 x 12

VW3 A4 556

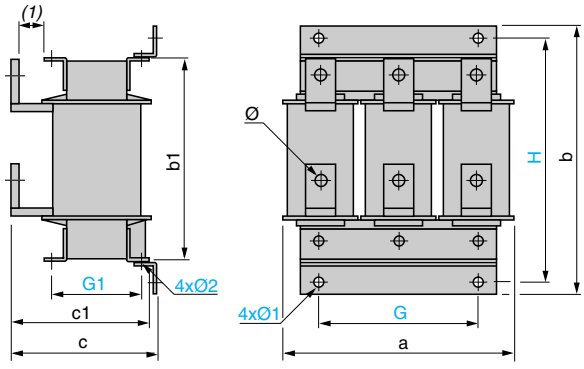


VW3	Ø
A4 556	11 x 22

VW3 A4 557



VW3 A4 558...565, 569



VW3	a	b	b1	c	c1	G	G1	H	Ø	Ø1	Ø2
A4 558	280	305	240	210	200	200	125	275	9	9	9
A4 559	280	330	260	210	200	200	125	300	11	9	9
A4 560, 561	320	380	300	210	200	225	150	350	11	9	9
A4 562...564	320	380	300	250	230	225	150	350	13	11	11
A4 565	385	440	340	275	250	300	125	400	2 x Ø13	13.5	13.5
A4 569	320	380	300	250	230	225	150	350	13	11	11

(1) 25 mm minimum.

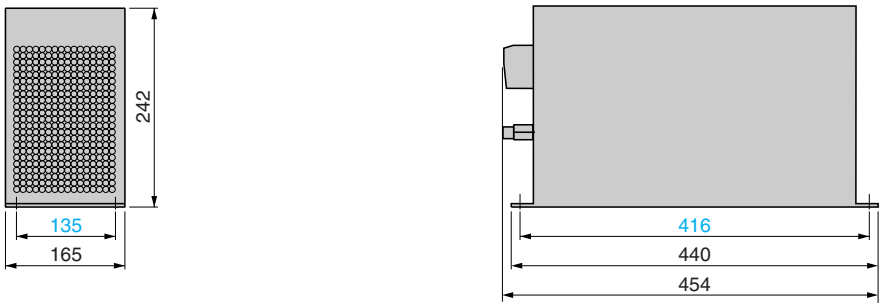
2

2.5

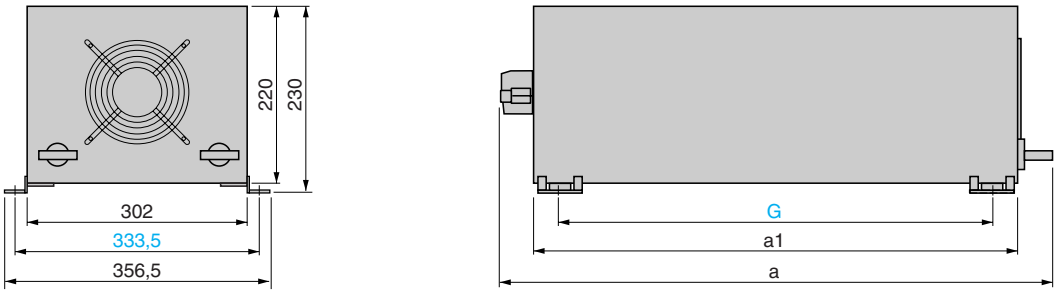
Passive filters VW3 A4 601…609, 621…627, 641…648, 661…666

Mounting recommendations *(1)*

VW3 A4 601…604, 621, 622, 641…644, 661…663



VW3 A4 605…609, 623…627, 645…648, 664…666

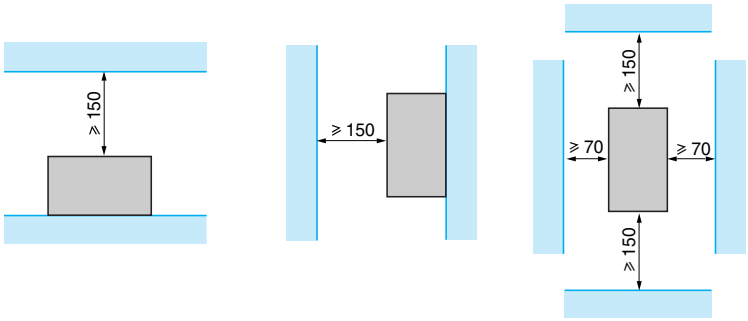


VW3	a	a1	G
A4 605, 606, 623…625, 645, 646, 664, 665	698	600	532.5
A4 607…609, 626, 627, 647, 648, 666	938	840	772.5

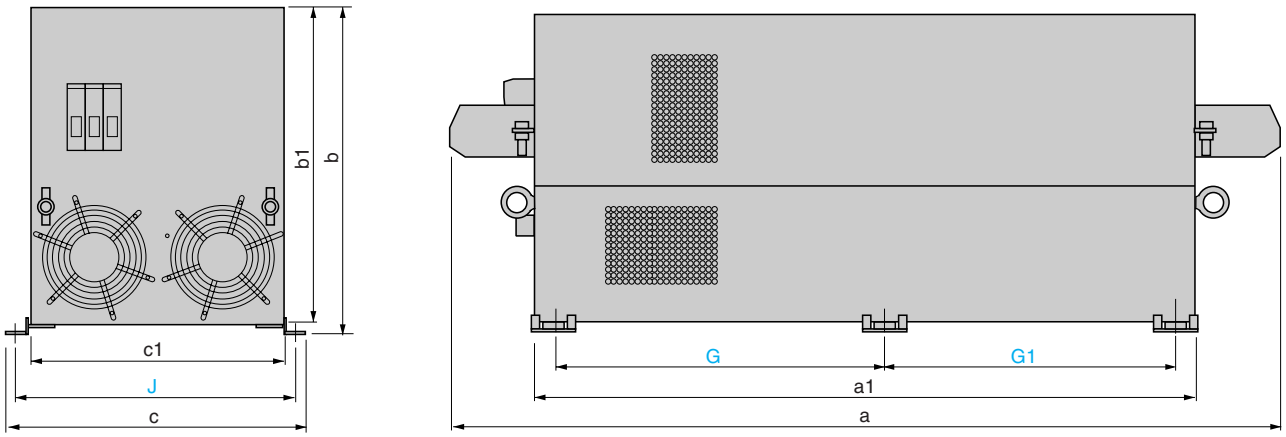
(1) Vertical mounting only

Passive filters VW3 A4 610…613, 619, 628…633, 639, 649…651, 656, 657, 667…671, 676, 677

Mounting recommendations *(1)*

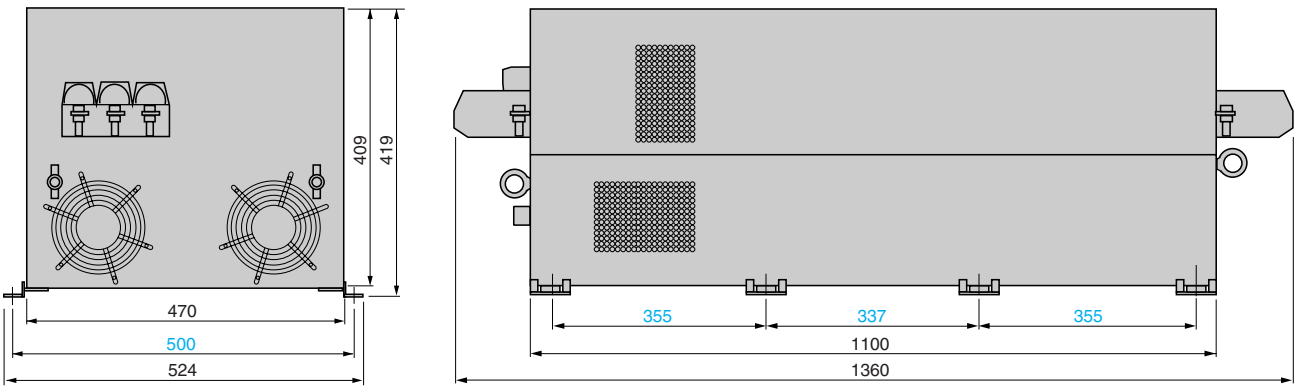


VW3 A4 610…613, 619, 628…632, 639, 649…651, 656, 657, 667…670, 676, 677



VW3	a	a1	b	b1	c	c1	G	G1	J
A4 610, 611, 628, 629, 649, 667, 668	1060	830	400	390	393	345	395	377	370
A4 612, 619, 630, 631, 650, 656, 657, 669	1160	900	419	409	454	406	430	412	430
A4 613, 632, 639, 651, 670, 676, 677	1330	1070	419	409	454	406	515	497	430

VW3 A4 633, 671

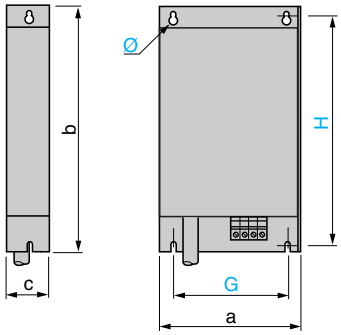


(1) Horizontal or vertical mounting.

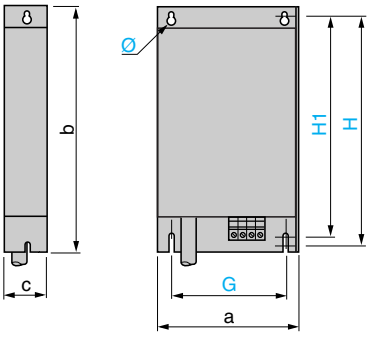
Variable speed drives for asynchronous motors
Altivar 71
Additional EMC input filters

Additional EMC input filters

VW3 A4 401...404

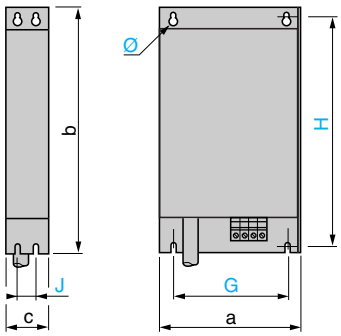


VW3 A4 405, 409



VW3	a	b	c	G	H	H1	Ø
A4 401	130	290	40	105	275	–	4.5
A4 402	155	324	50	130	309	–	4.5
A4 403	175	370	60	150	355	–	6.5
A4 404	210	380	60	190	365	–	6.5
A4 405	230	498.5	62	190	479.5	460	6.5
A4 409	230	498.5	62	190	479.5	460	6.5

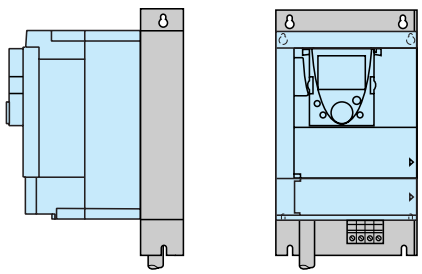
VW3 A4 406...408



VW3	a	b	c	G	H	J	Ø
A4 406	240	522	79	200	502.5	40	9
A4 407	240	650	79	200	631	40	9
A4 408	320	750	119	280	725	80	9

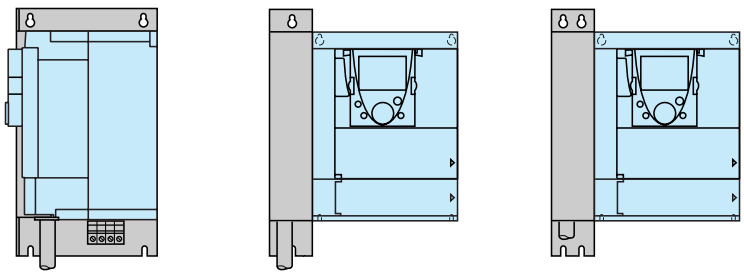
Mounting the filter under the drive

Front view



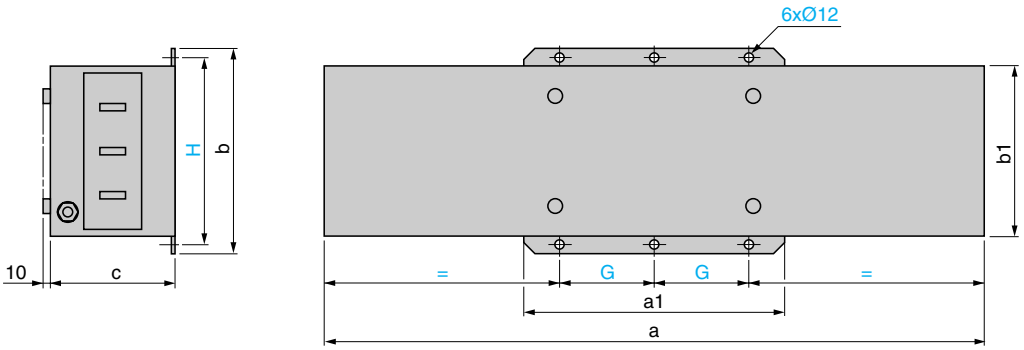
Mounting the filter next to the drive

Front view



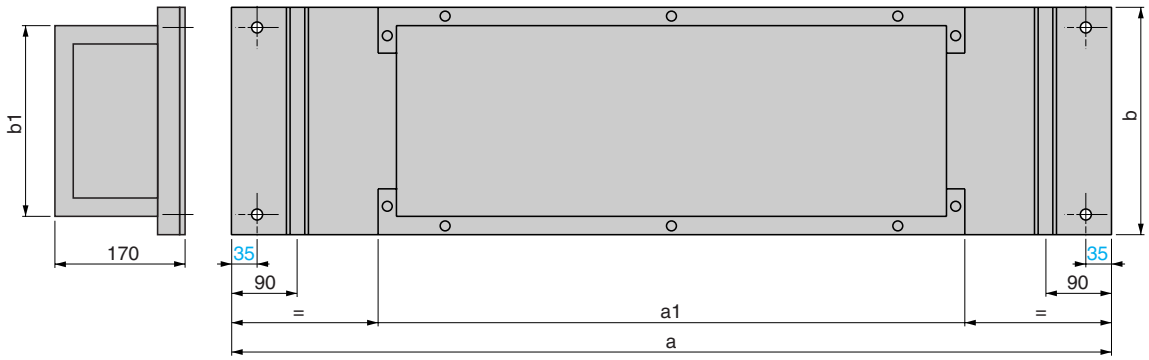
Additional EMC input filters (continued)

VW3 A4 410...413



VW3	a	a1	b	b1	c	G	H
A4 410	800	302	261	219	139	120	235
A4 411	800	302	261	219	139	120	235
A4 412	900	352	281	239	174	145	255
A4 413	1000	401	301	259	164	170	275

IP 30 protection kits for filters VW3 A4 410...413



VW3	a	a1	b	b1
A9 601	1200	800	310	270
A9 602	1400	1000	350	310

Variable speed drives for asynchronous motors

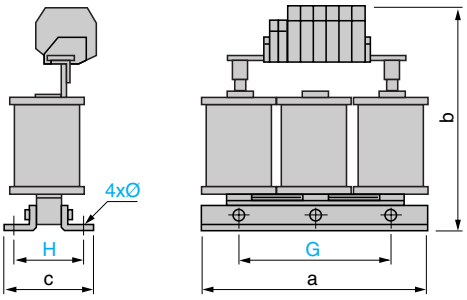
Altivar 71

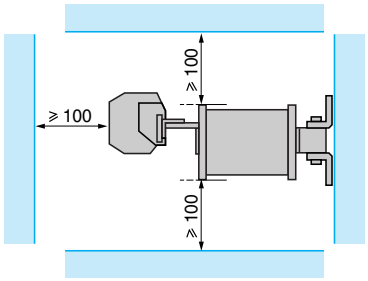
Motor chokes

Motor chokes *(1)*

VW3 A5 101, 102

Mounting recommendations *(2)*

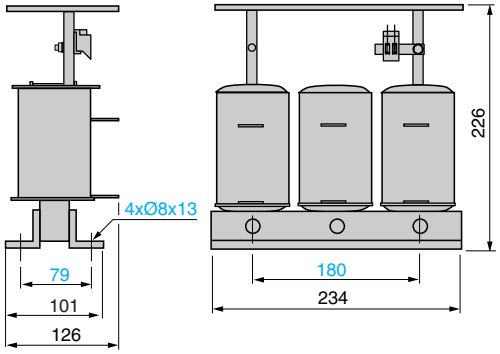


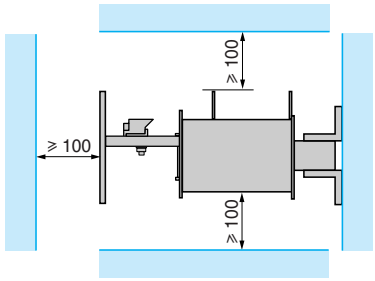


VW3	a	b	c	G	H	Ø
A5 101	190	210	90	170	45	8 x 12
A5 102	190	235	120	170	48	8 x 12

VW3 A5 103

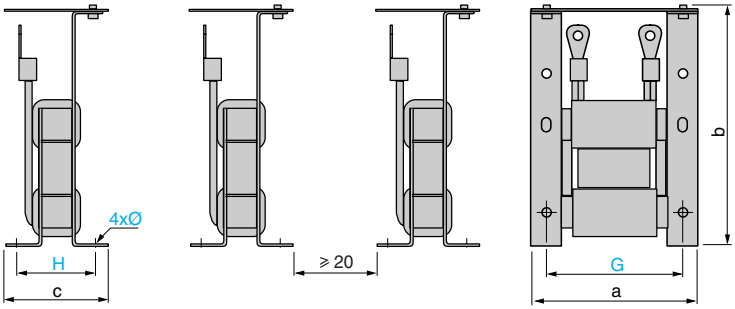
Mounting recommendations *(2)*





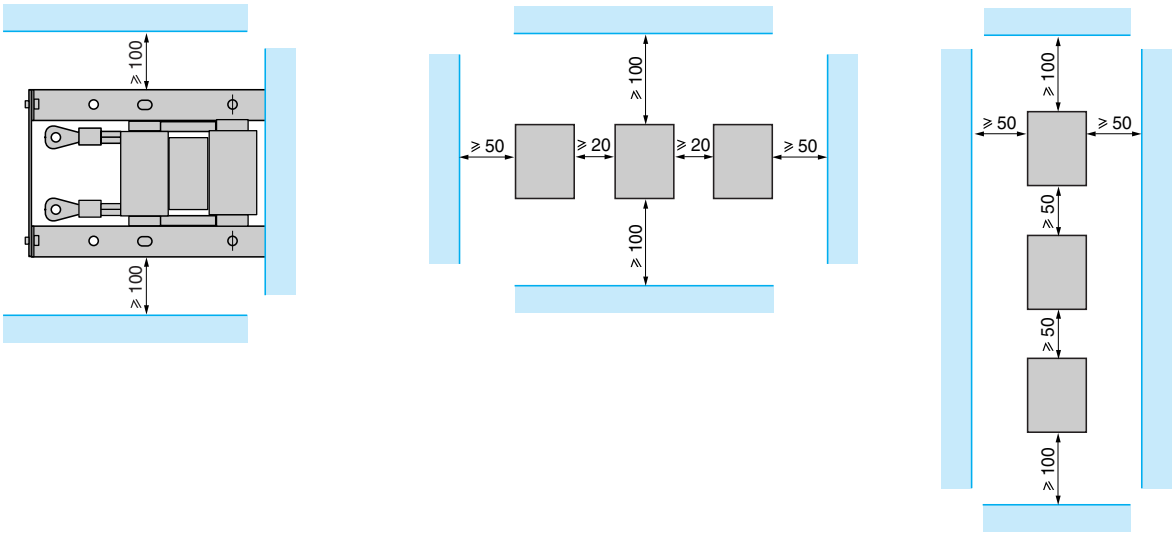
(1) It is essential that the motor chokes are mounted on a metal support (grille, frame, etc.)
(2) Because of the magnetic field and/or the heat dissipation, it is essential to follow the mounting recommendations provided.

Motor chokes (continued) *(1)*
VW3 A5 104, 105 *(2)*



VW3	a	b	c	G	H	Ø
A5 104	170	250	100	150	75	9
A5 105	210	250	110	175	75	9 x 13

Mounting recommendations *(3)*



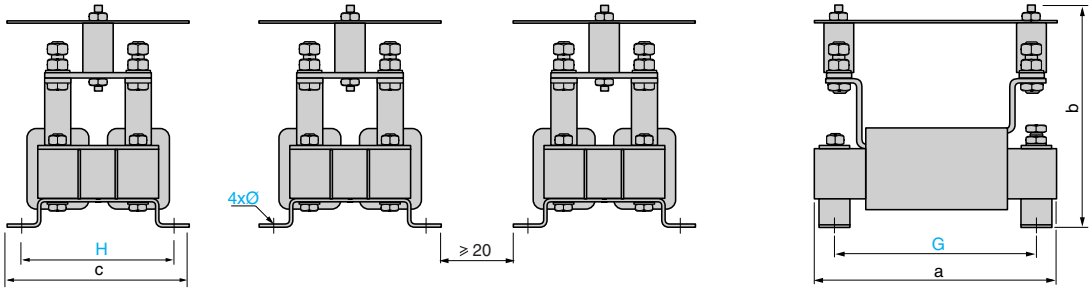
(1) It is essential that the motor chokes are mounted on a metal support (grille, frame, etc.)
(2) References VW3 A5 104 and 105 consist of 3 components.
(3) Because of the magnetic field and/or the heat dissipation, it is essential to follow the mounting recommendations provided.

2

2.5

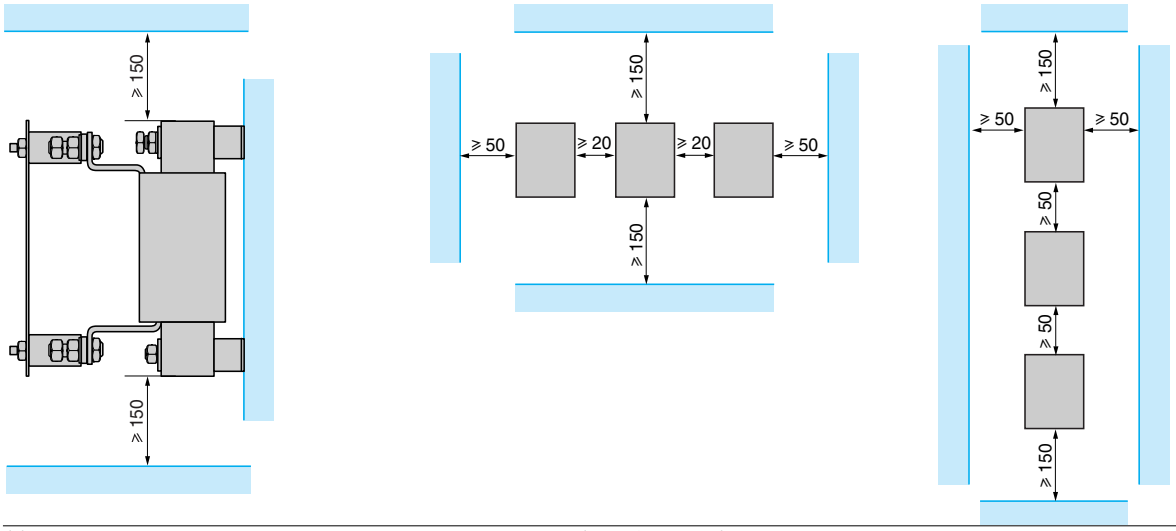
Motor chokes (continued) ***(1)***

VW3 A5 106…108 *(2)*



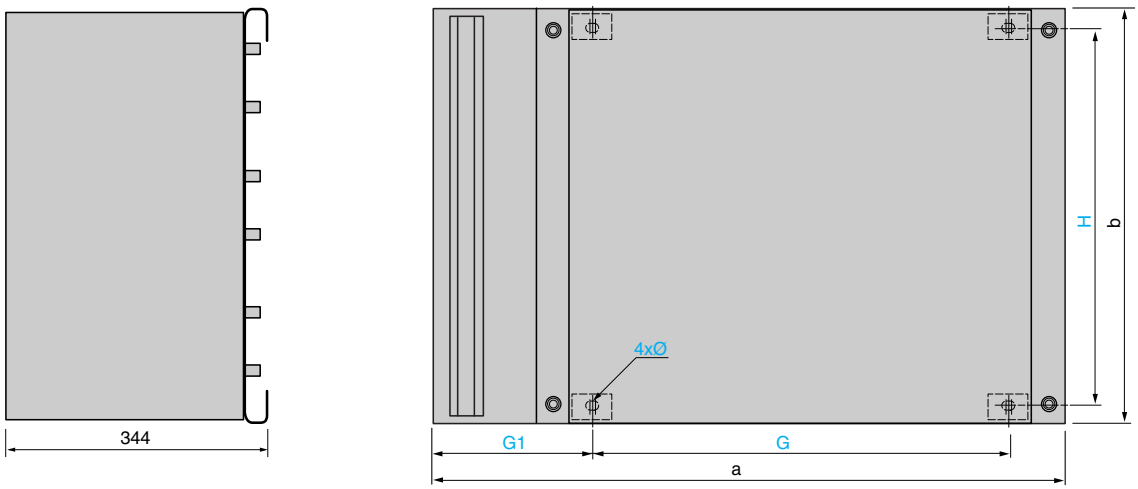
VW3	a	b	c	G	H	Ø
A5 106	245	250	200	225	175	9
A5 107	320	250	220	275	200	9
A5 108	370	250	230	325	200	9

Mounting recommendations *(3)*



(1) It is essential that the motor chokes are mounted on a metal support (grille, frame, etc.)
(2) References VW3 A5 106…108 consist of 3 components.
(3) Because of the magnetic field and/or the heat dissipation, it is essential to follow the mounting recommendations provided.

IP 20 protection kits for chokes VW3 A5 104…108



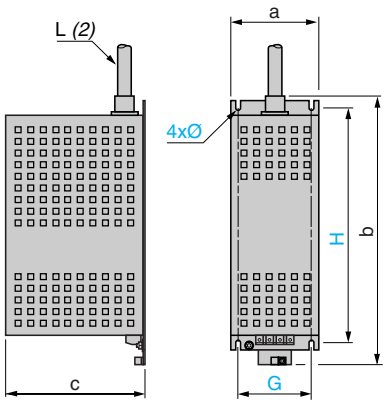
VW3	a	b	G	G1	H	Ø
A9 612	780	580	530	190	526	10 x 15
A9 613	1180	780	800	200	726	10 x 15

Presentation: pages 2/432 and 2/433 | Characteristics: page 2/433 | References: pages 2/434 and 2/435 | Schemes: page 2/483 | Functions: pages 2/512 to 2/543

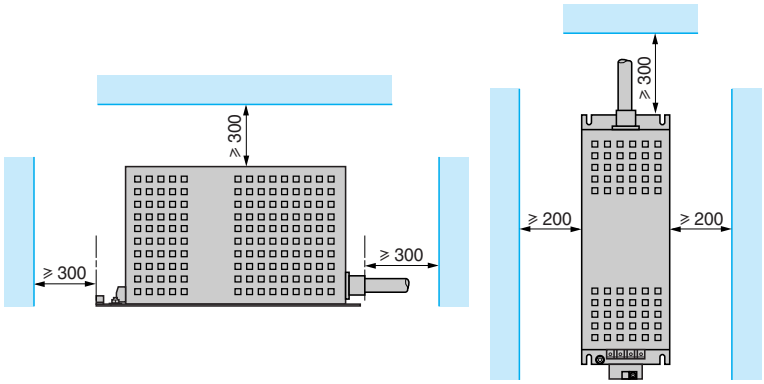
Variable speed drives for asynchronous motors
Altivar 71
Sinus filters

Sinus filters *(1)*

VW3 A5 201...206



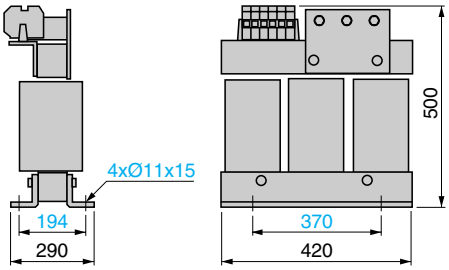
Mounting recommendations

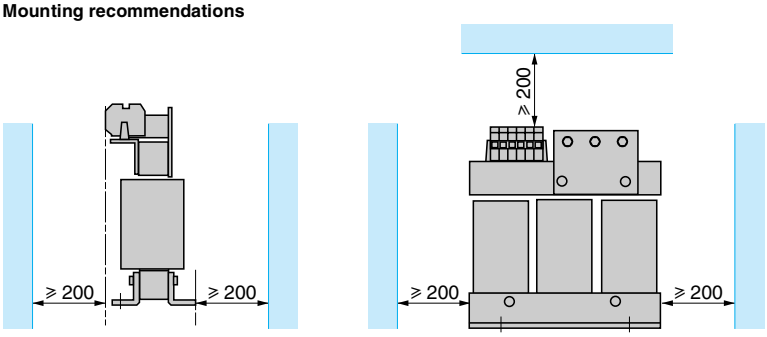


VW3	a	b	c	G	H	Ø	L *(2)*
A5 201	120	335	160	100	280	6.6	700
A5 202	120	405	190	100	350	6.6	900
A5 203	150	470	240	120	380	6.6	900
A5 204	210	650	280	160	530	8.6	1500
A5 205	250	780	360	200	650	11	1600
A5 206	310	1060	375	220	880	11	2700

VW3 A5 207

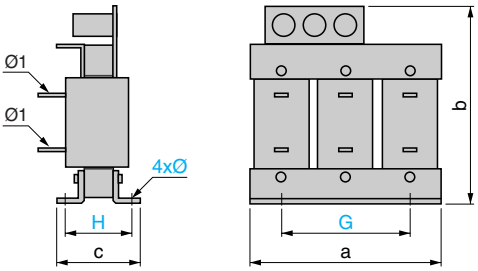
Mounting recommendations

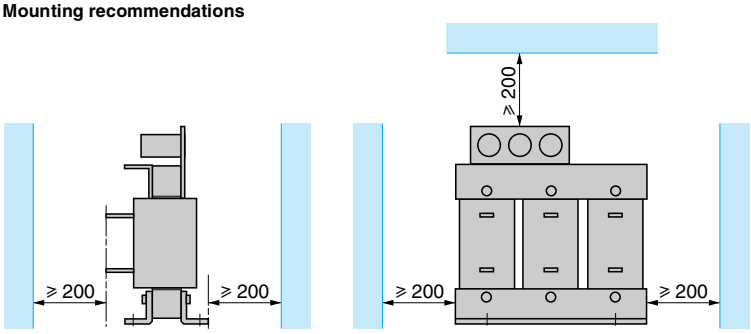




VW3 A5 208...211

Mounting recommendations





VW3	a	b	c	G	H	Ø	Ø1
A5 208	420	500	345	370	231	11 x 15	11
A5 209	480	600	340	430	238	13 x 18	11
A5 210	480	710	370	430	258	13 x 18	14
A5 211	620	930	500	525	352	13 x 22	4 x Ø11

(1) Sinus filters emit considerable heat and must not be placed underneath the drive.
(2) Length of the cable integrated in the sinus filter.

Presentation: pages 2/432 and 2/436
Characteristics: page 2/436
References: page 2/437
Schemes: page 2/483
Functions: pages 2/512 to 2/543

Variable speed drives for asynchronous motors
Altivar 71
Safety requirements

“Power Removal” safety function

The Altivar 71 drive integrates the “Power Removal” safety function which prohibits unintended equipment operation. The motor no longer produces torque.

This safety function:
- complies with the standard for safety of machinery N 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 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”): response time ≤ 100 ms
  - 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 INERIS certification body under a program of voluntary certification.

Categories relating to safety according to EN 954-1

Categories	Basic safety principle	Control system requirements	Behaviour in the event of a fault
B	Selection of components that conform to relevant standards	Control in accordance with good engineering practice	Possible loss of safety function
1	Selection of components and safety principles	Use of tried and tested components and proven safety principles	Possible loss of safety function, but with a lower probability than in **B**
2	Selection of components and safety principles	Cycklic testing. The test intervals 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 of 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 with 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 with category 3 according to EN 954-1 (SIL2: mean probability of undetected failure per hour between 10^{-6} and 10^{-7}).

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

Variable speed drives for asynchronous motors
Altivar 71
Safety requirements

"Power Removal" safety function considerations

The "Power Removal" safety function cannot be considered as a means of electrical disconnection of the motor (no electrical isolation); if necessary, a Vario switch disconnector must be used.
The "Power Removal" safety function is not designed to overcome any malfunction in the drive process control or application functions.
The output signals available on the drive must not be considered as safety 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 3 categories of stop:
- 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 with category 1 of standard EN 954-1 and level SIL1 according to standard IEC/EN 61508

Use of the connection diagrams on pages 2/474 and 2/475 which use a line contactor or a Vario switch disconnector between the drive and the motor. In this case, the "Power Removal" safety function is not used and the motor stops in accordance with category 0 of standard IEC/EN 60204-1.

Conformity with 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 Altivar 71 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 2/476).
When the activation command is given on the PWR input with the controlled motor, the motor power supply is immediately switched off and the 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 motor has come to a complete stop ("STO").
This safe stop is maintained while the PWR input remains activated.

This diagram must also be used for hoisting applications.
On a "Power Removal" command, the 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 page 2/477).
When the activation command is given, deceleration of the motor controlled by the drive is first requested, then, following a time delay controlled by a Preventa-type fault relay which corresponds to the deceleration time, the "Power Removal" safety function is activated by the PWR input. The motor stops according to category 1 of standard IEC/EN 60204-1 ("SS1").

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

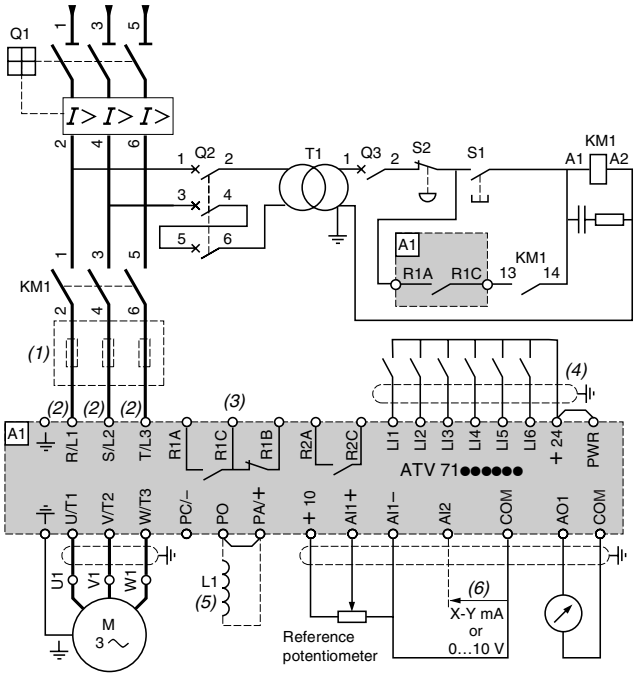
2

2.5

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

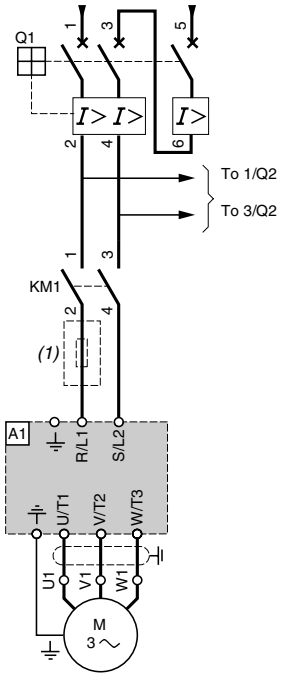
ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71●●●●N4, ATV 71P●●●N4Z

3-phase power supply with upstream breaking via contactor



ATV 71H075M3...HU75M3

Power section for single phase power supply



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

Components for use with the Altivar (for a complete list of references, see our "Motor starter solutions. Power control and protection components" specialist catalogue).

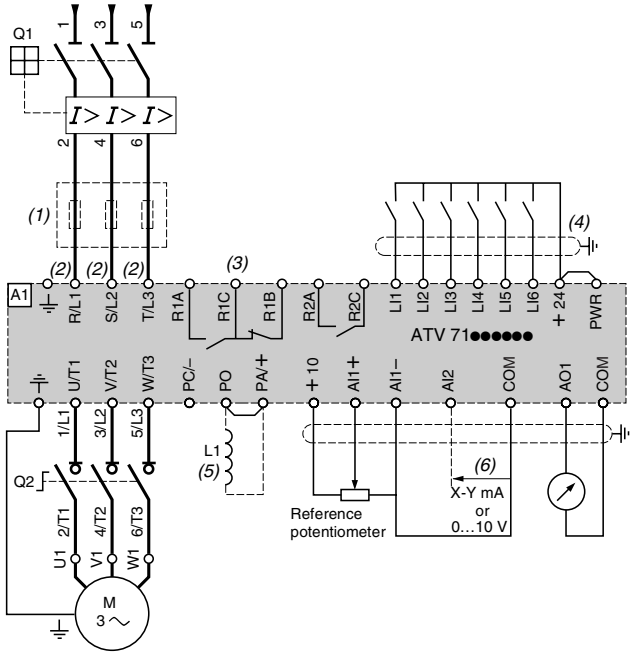
Reference	Description
A1	ATV 71 drive, see pages 2/360 to 2/363
KM1	Contactor, see motor starters pages 2/492 to 2/497
L1	DC choke, see page 2/419
Q1	Circuit-breaker, see motor starters pages 2/492 to 2/497
Q2	GV2 L rated at twice the nominal primary current of T1
Q3	GB2 CB05
S1, S2	XB4 B or XB5 A pushbuttons
T1	100 VA transformer 220 V secondary

(1) Line choke (single phase or 3-phase), see page 2/422.
(2) For ATV 71HC40N4 drives combined with a 400 kW motor and ATV 71HC50N4, see page 2/478.
(3) Fault relay contacts. Used for remote signalling of the drive status
(4) Connection of the common for the logic inputs depends on the positioning of the SW1 switch: see schemes on page 2/479.
(5) DC choke as an option for ATV 71H●●●M3, ATV 71HD11M3X...HD45M3X, ATV 71●075N4...●D75N4 and ATV 71P●●●N4Z. Connected in place of the strap between the PO and PA/+ terminals. For ATV 71HD55M3X, HD75M3X, ATV 71HD90N4...HC50N4 drives, the choke is supplied with the drive; the customer is responsible for connecting it.
(6) Software-configurable current (0...20 mA) or voltage (0...10 V) analog input.

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

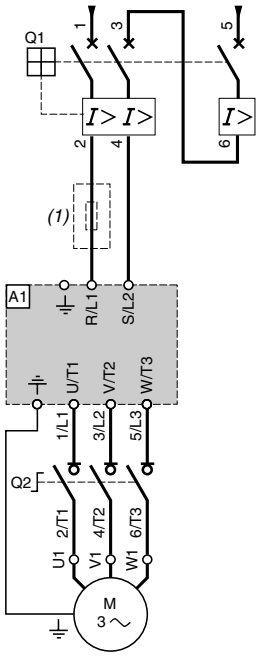
ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71●●●●N4, ATV 71P●●●N4Z

3-phase power supply with downstream breaking via switch disconnector



ATV 71H075M3...HU75M3

Power section for single phase power supply



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

Components for use with the Altivar (for a complete list of references, see our "Motor starter solutions. Power control and protection components" specialist catalogue).

Reference	Description
A1	ATV 71 drive, see pages 2/360 to 2/363
L1	DC choke, see page 2/419
Q1	Circuit-breaker, see motor starters pages 2/492 to 2/497
Q2	Switch disconnector (Vario)

(1) Line choke (single phase or 3-phase), see page 2/422.
(2) For ATV 71HC40N4 drives combined with a 400 kW motor and ATV 71HC50N4, see page 2/478.
(3) Fault relay contacts. Used for remote signalling of the drive status
(4) Connection of the common for the logic inputs depends on the positioning of the SW1 switch: see schemes on page 2/479.
(5) DC choke as an option for ATV 71H●●●M3, ATV 71HD11M3X...HD45M3X, ATV 71●075N4...●D75N4 and ATV 71P●●●N4Z. Connected in place of the strap between the PO and PA/+ terminals. For ATV 71HD55M3X, HD75M3X, ATV 71HD90N4...HC50N4 drives, the choke is supplied with the drive; the customer is responsible for connecting it.
(6) Software-configurable current (0...20 mA) or voltage (0...10 V) analog input.

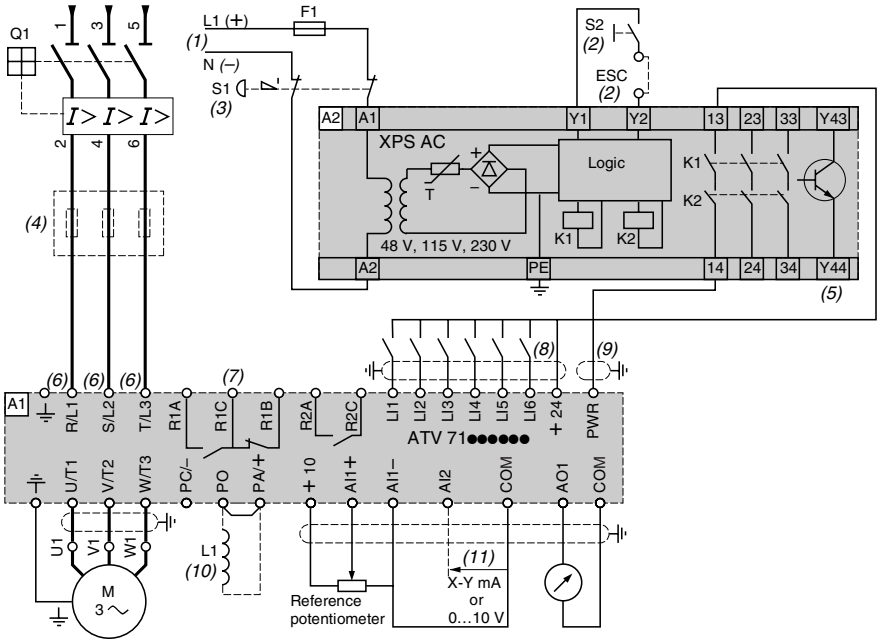
2

2.5

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

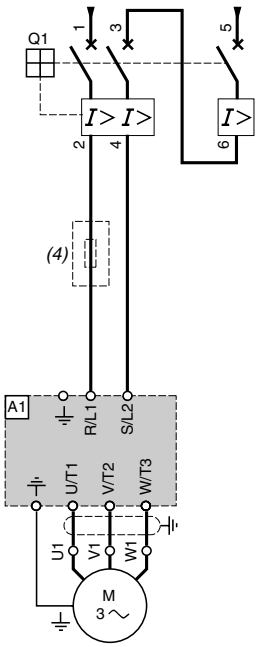
ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71●●●●N4, ATV 71P●●●N4Z

3-phase power supply, low inertia machine, vertical movement



ATV 71H075M3...HU75M3

Power section for single phase power supply



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

Components for use with the Altivar (for a complete list of references, see our "Motor starter solutions. Power control and protection components" and "Preventa safety solutions" specialist catalogues).

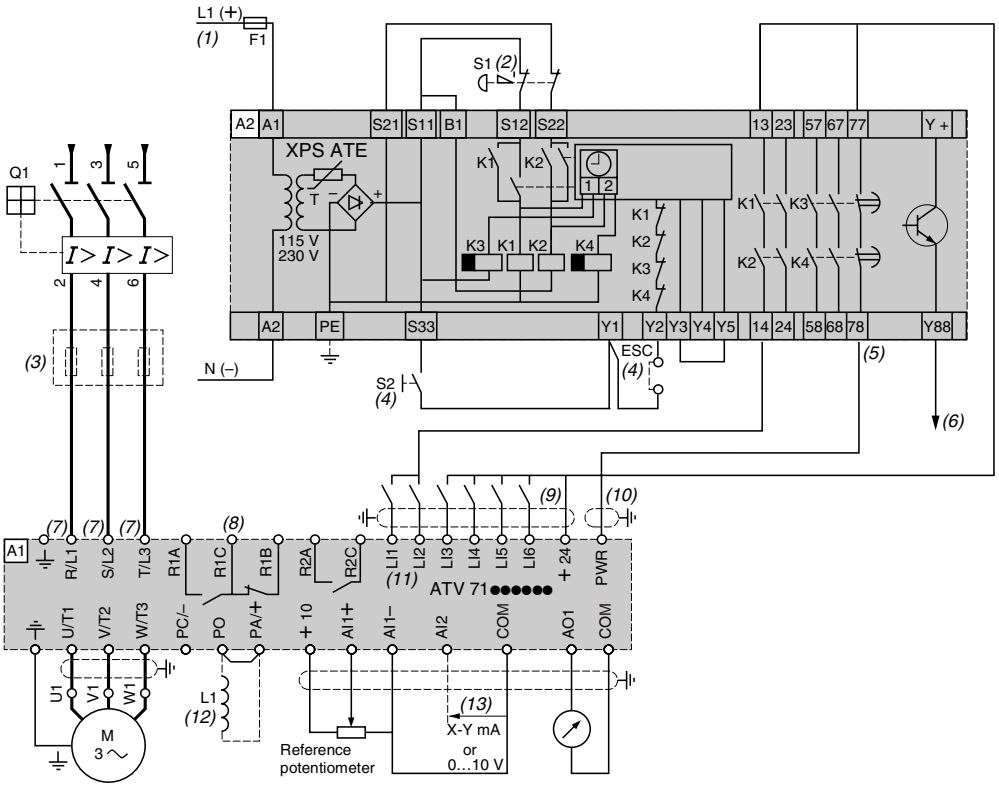
Reference	Description
A1	ATV 71 drive, see pages 2/360 to 2/363
A2	Preventa XPS AC safety module for monitoring emergency stops and switches. One safety module can manage the "Power Removal" function for several drives on the same machine. In this case, each drive supplies its own PWR input terminal from its own +24 V via an independent safety contact on the XPS AC module.
F1	Fuse
L1	DC choke, see page 2/419
Q1	Circuit-breaker, see motor starters pages 2/492 to 2/497
S1	Emergency stop button with 2 contacts
S2	XB4 B or XB5 A pushbutton

(1) Power supply: ⎓ or 24 V ∿, 48 V ∿, 115 V ∿, 230 V ∿.
(2) S2: resets XPS AC module on power-up or after an emergency stop. ESC can be used to set external starting conditions.
(3) Requests freewheel stopping of the movement and activates the "Power Removal" safety function.
(4) Line choke (single phase or 3-phase), see page 2/422.
(5) The logic output can be used to signal that the machine is in a safe stop state.
(6) For ATV 71HC40N4 drives combined with a 400 kW motor and ATV 71HC50N4, see page 2/478.
(7) Fault relay contacts. Used for remote signalling of the drive status
(8) Connection of the common for the logic inputs depends on the positioning of the SW1 switch: see schemes on page 2/479.
(9) Standardized coaxial cable, type RG174/U according to MIL-C17 or KX3B according to NF C 93-550, external diameter 2.54 mm, maximum length 15 m. The cable shielding must be earthed.
(10) Optional DC choke for ATV 71H●●●M3, ATV 71HD11M3X...HD45M3X, ATV 71●075N4...●D75N4 and ATV 71P●●●N4Z. Connected in place of the strap between the PO and PA/+ terminals. For ATV 71HD55M3X, HD75M3X, ATV 71HD90N4...HC50N4 drives, the choke is supplied with the drive; the customer is responsible for connecting it.
(11) Software-configurable current (0...20 mA) or voltage (0...10 V) analog input.

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

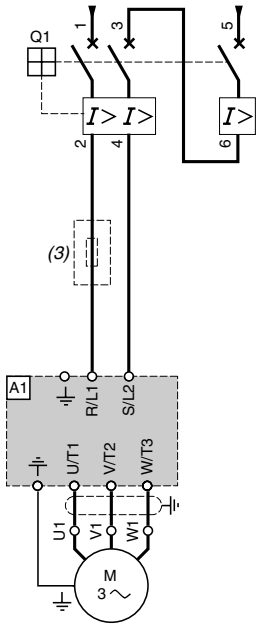
ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71H●●●N4, ATV 71P●●●N4Z

3-phase power supply, high inertia machine



ATV 71H075M3…HU75M3

Power section for single phase power supply



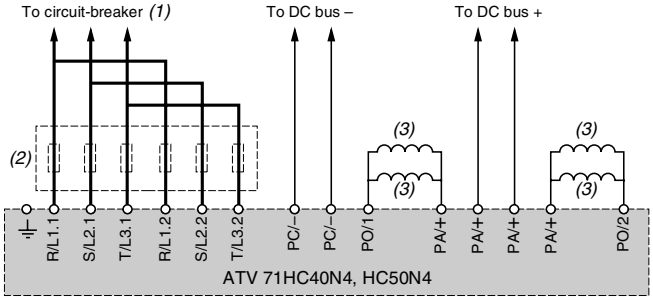
Note: *All terminals are located at the bottom of the drive. Fit interference suppressors to all inductive circuits near the drive or connected on the same circuit, such as relays, contactors, solenoid valves, fluorescent lighting, etc.*

Components for use with the Altivar (for a complete list of references, see our "Motor starter solutions. Power control and protection components" and "Preventa safety solutions" specialist catalogues).

Reference	Description
A1	ATV 71 drive, see pages 2/360 to 2/363
A2 *(5)*	Preventa XPS ATE safety module for monitoring emergency stops and switches. One safety module can manage the "Power Removal" safety function for several drives on the same machine. In this case the time delay must be adjusted on the drive controlling the motor that requires the longest stopping time. In addition, each drive supplies its own PWR input terminal from its own +24 V via an independent safety contact on the XPS ATE module.
F1	Fuse
L1	DC choke, see page 2/419
Q1	Circuit-breaker, see motor starters pages 2/492 to 2/497
S1	Emergency stop button with 2 N/C contacts
S2	Run button

(1) Power supply: ⎓ or 24 V ∿, 115 V ∿, 230 V ∿.
(2) Requests controlled stopping of the movement and activates the "Power Removal" safety function.
(3) Line choke (single phase or 3-phase), see page 2/422.
(4) S2: resets XPS ATE module on power-up or after an emergency stop. ESC can be used to set external starting conditions.
(5) 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.
(6) The logic output can be used to signal that the machine is in a safe state.
(7) For ATV 71HC40N4 drives combined with a 400 kW motor and ATV 71HC50N4, see page 2/478.
(8) Fault relay contacts. Used for remote signalling of the drive status
(9) Connection of the common for the logic inputs depends on the positioning of the SW1 switch: see schemes on page 2/479.
(10) Standardized coaxial cable, type RG174/U according to MIL-C17 or KX3B according to NF C 93-550, external diameter 2.54 mm, maximum length 15 m. The cable shielding must be earthed.
(11) Logic inputs LI1 and LI2 must be assigned to the direction of rotation: LI1 in the forward direction and LI2 in the reverse direction.
(12) Optional DC choke for ATV 71H●●●M3, ATV 71HD11M3X…HD45M3X, ATV 71●075N4…●D75N4 and ATV 71P●●●N4Z. Connected in place of the strap between the PO and PA/+ terminals. For ATV 71HD55M3X, HD75M3X, ATV 71HD90N4…HC50N4 drives, the choke is supplied with the drive; the customer is responsible for connecting it.
(13) Software-configurable current (0…20 mA) or voltage (0…10 V) analog input.

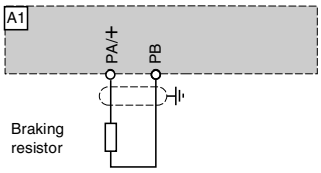
Power terminal connections for ATV 71HC40N4 combined with a 400 kW motor and ATV 71HC50N4



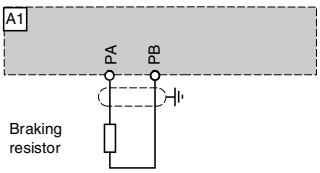
(1) For control section connections, see pages 2/474 to 2/477.
(2) Line choke, see page 2/422.
(3) DC chokes supplied as standard with the drive

VW3 A7 7●● braking resistors or VW3 A7 8●● hoist resistors, VW3 A7 1●● braking units

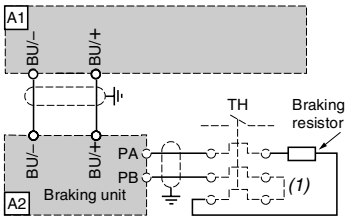
ATV 71H●●●M3, ATV 71HD11M3X…HD45M3X, ATV 71H075N4…HD75N4, ATV 71W●●●N4, ATV 71P●●●N4Z



ATV 71HD55M3X, HD75M3X, ATV 71HD90N4…HC16N4



ATV 71HC20N4…HC50N4



Components for use with the Altivar	
Reference	**Description**
A1	ATV 71 drive, see pages 2/360 to 2/363
A2	Braking unit, if using a braking resistor or a hoist resistor, for ATV 71HC20N4…HC50N4, see pages 2/398 and 2/399
Braking resistor	See pages 2/400 and 2/401

(1) A thermal overload relay can be added.

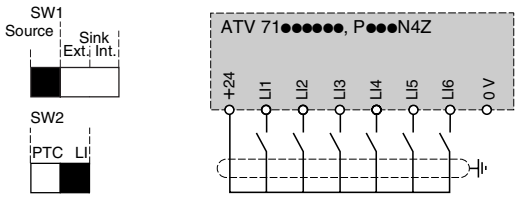
Examples of recommended schemes

Logic inputs

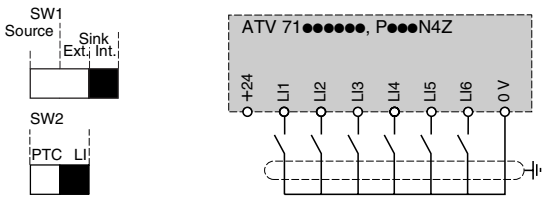
The SW1 switch is used to adapt operation of the logic inputs (LI) to the PLC output technology:
- Position the switch on Source (factory setting) if using PLC outputs with PNP transistors
- Position the switch on Sink Int or Sink Ext if using PLC outputs with NPN transistors

Internal power supply

Switch in "Source" position

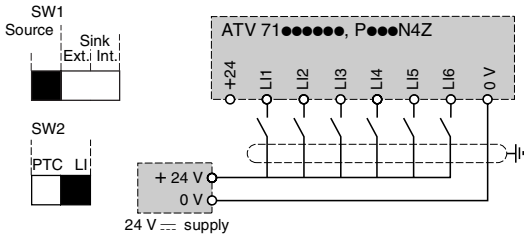


Switch in "Sink Int" position

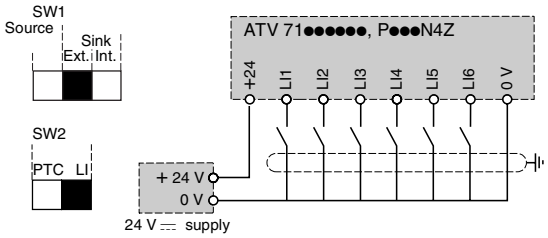


External power supply

Switch in "Source" position

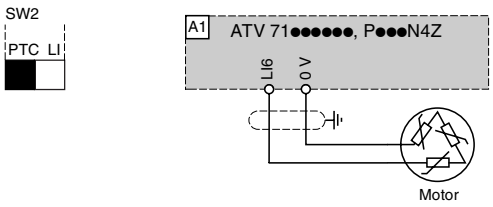


Switch in "Sink Ext" position

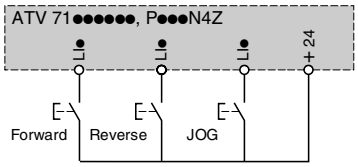


Input for PTC probes

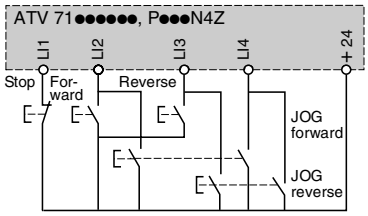
The SW2 switch is used to operate the LI6 input:
- As a logic input by setting the SW2 switch to LI (factory setting)
- Or for protecting the motor via PTC probes by setting the SW2 switch to PTC



2-wire control and jog operation (JOG)

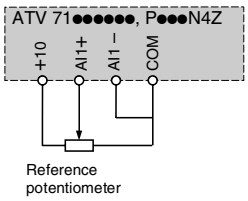


3-wire control and jog operation (JOG)



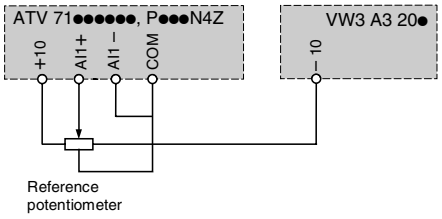
Examples of recommended schemes (continued)

Unipolar speed reference

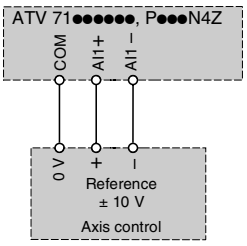


Bipolar speed reference

Requires a VW3 A3 201 or VW3 A3 202 I/O extension card

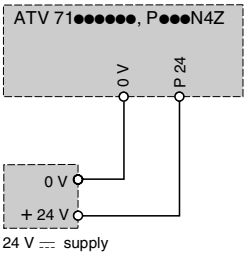


Speed reference using axis control



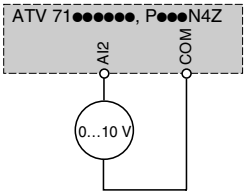
Separate control power supply

The separate control card can be powered by an external 24 V ⎓ supply

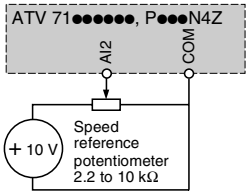


Analog input configured for voltage

External 0…10 V

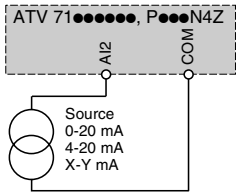


External + 10 V



Analog input configured for current

0-20 mA, 4-20 mA, X-Y mA



VW3 A3 201 and VW3 A3 202 I/O extension cards

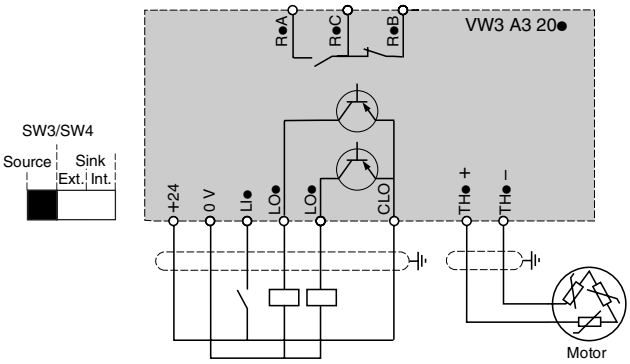
Logic I/O

The SW3 or SW4 switch is used to adapt operation of the logic inputs (LI) to the PLC output technology:

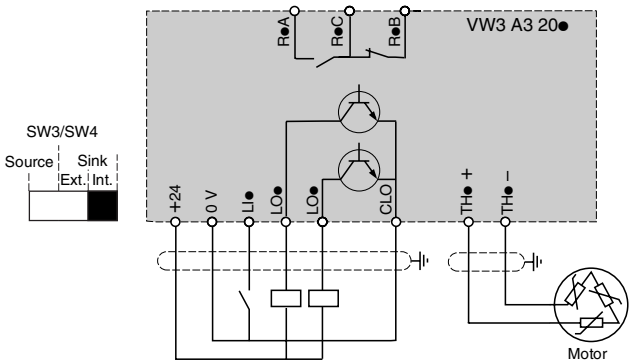
- Position the switch on Source (factory setting) if using PLC outputs with PNP transistors
- Position the switch on Sink Int or Sink Ext if using PLC outputs with NPN transistors

Internal power supply

Switch in "Source" position

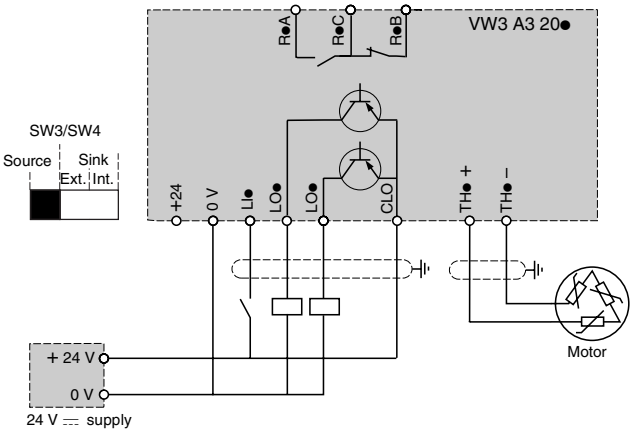


Switch in "Sink Int" position

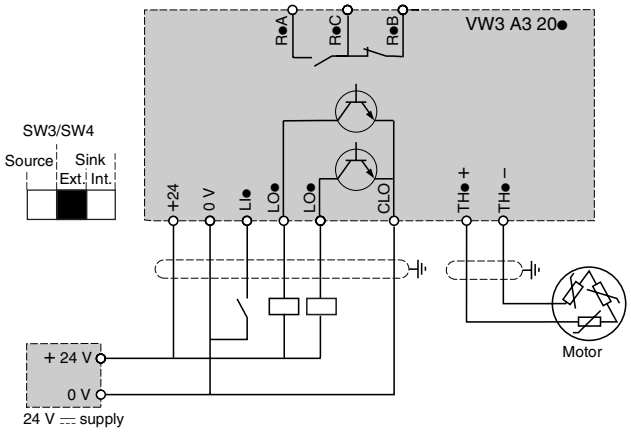


External power supply

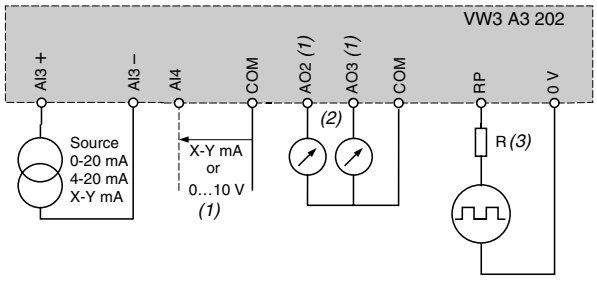
Switch in "Source" position



Switch in "Sink Ext" position



Analog I/O (only on VW3 A3 202 extended I/O card)



(1) Software-configurable current (0-20 mA) or voltage (0…10 V) analog input.
(2) Software-configurable current (0-20 mA) or voltage (± 10 V or 0…10 V) analog outputs, independent selection possible for each output via switch).
(3) R: add a resistor if the input voltage of the pulse train is greater than 5 V.
Recommended values:

Input voltage V	Resistance Ω
12	510
15	910
24	1300

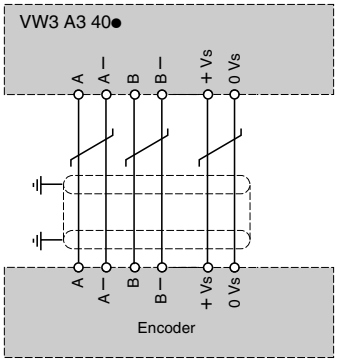
2

2.5

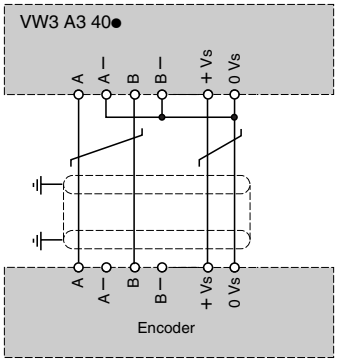
VW3 A3 401 to VW3 A3 407 encoder interface cards

Closed loop control

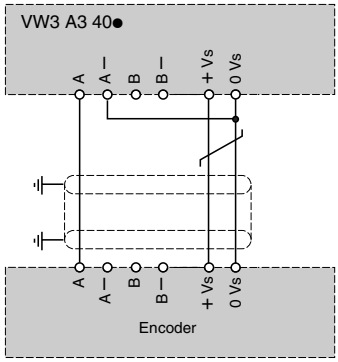
Wiring of encoders VW3 A3 401…407
A, $\overline{A}$, B, $\overline{B}$ signals



Wiring of encoders VW3 A3 403…407
AB signals

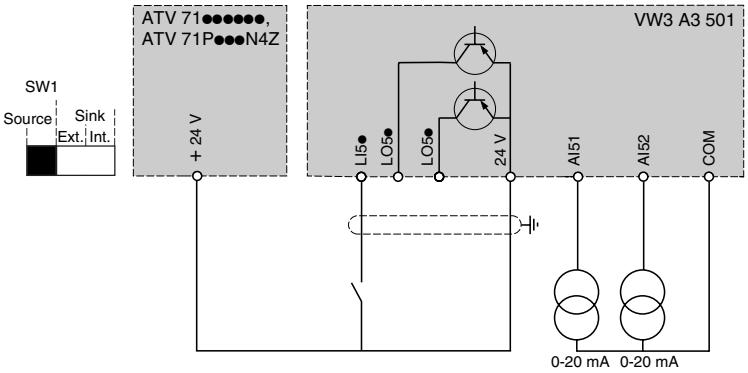


Wiring of encoders VW3 A3 403…407
A signal

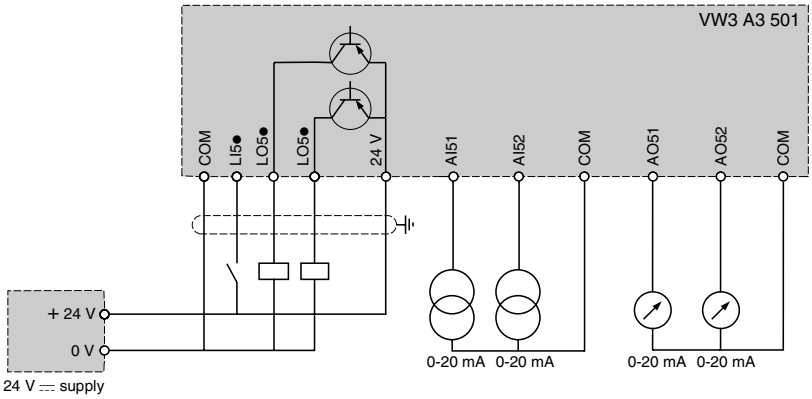


VW3 A3 501 “Controller Inside” programmable card

Card powered by the drive *(1)*



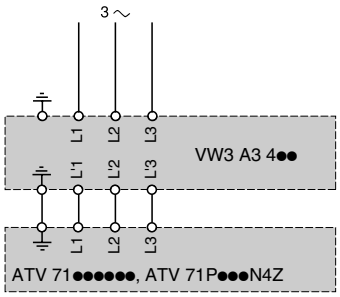
Card powered by external power supply



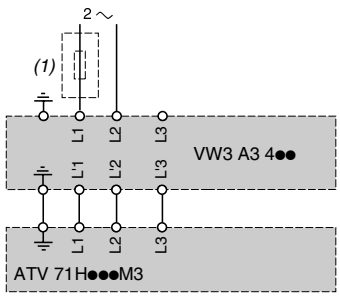
(1) Only if the power consumption is less than 200 mA; otherwise use an external power supply.

VW3 A4 4●● additional EMC input filters

3-phase power supply, 3-phase filter



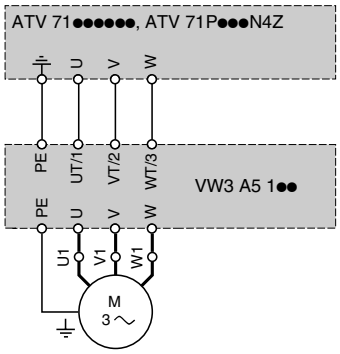
Single phase power supply, 3-phase filter



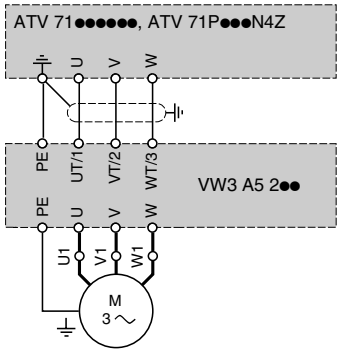
(1) Line choke compulsory for ATV 71HU40M3…HU75M3, see page 2/422.

Output filters

VW3 A5 1●● motor chokes



VW3 A5 2●● sinus filters

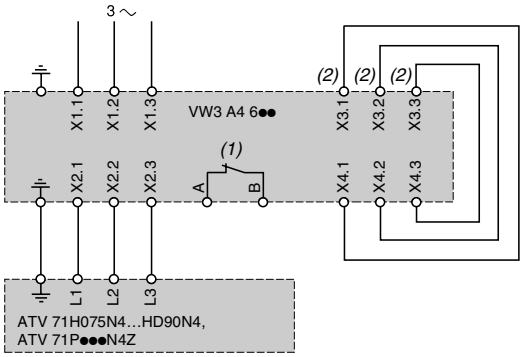


2

2.5

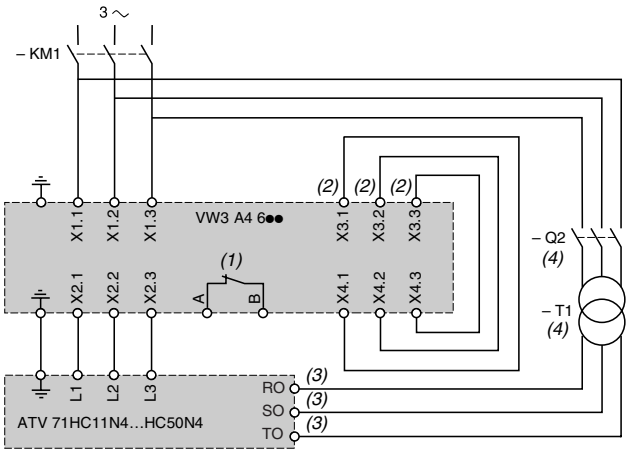
VW3 A4 6●● passive filters

Scheme with 1 passive filter for ATV 71H075N4…HD90N4 and ATV 71P●●●N4Z drives

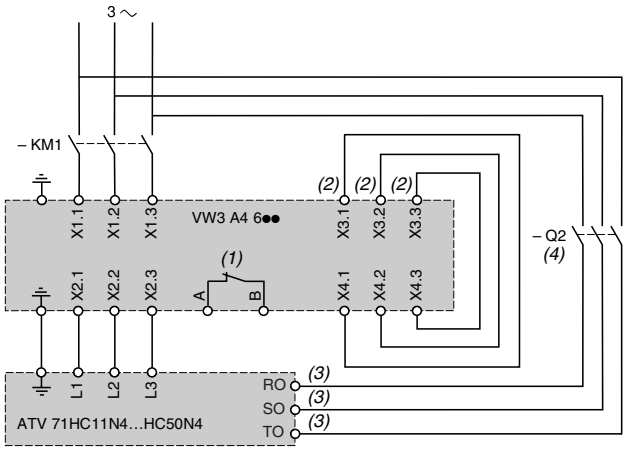


Scheme with 2 passive filters for ATV 71HC11N4…HC50N4 drives

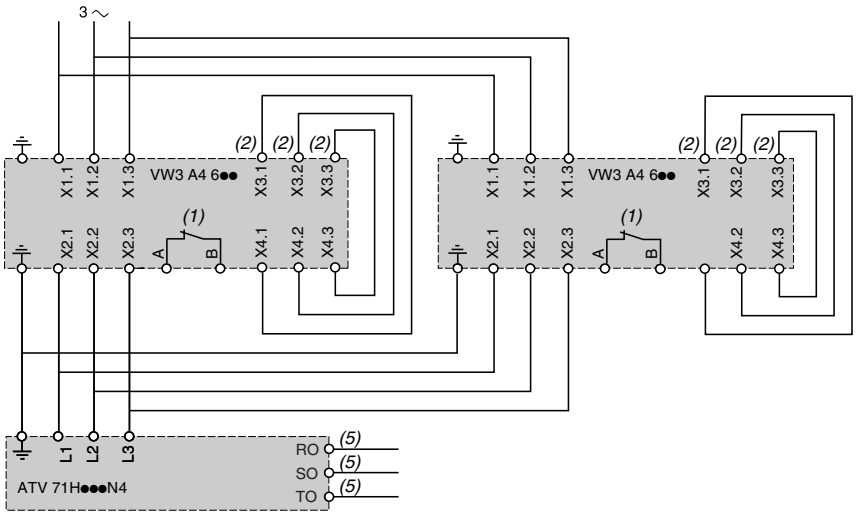
Connection downstream of the line contactor



Connection upstream of the line contactor



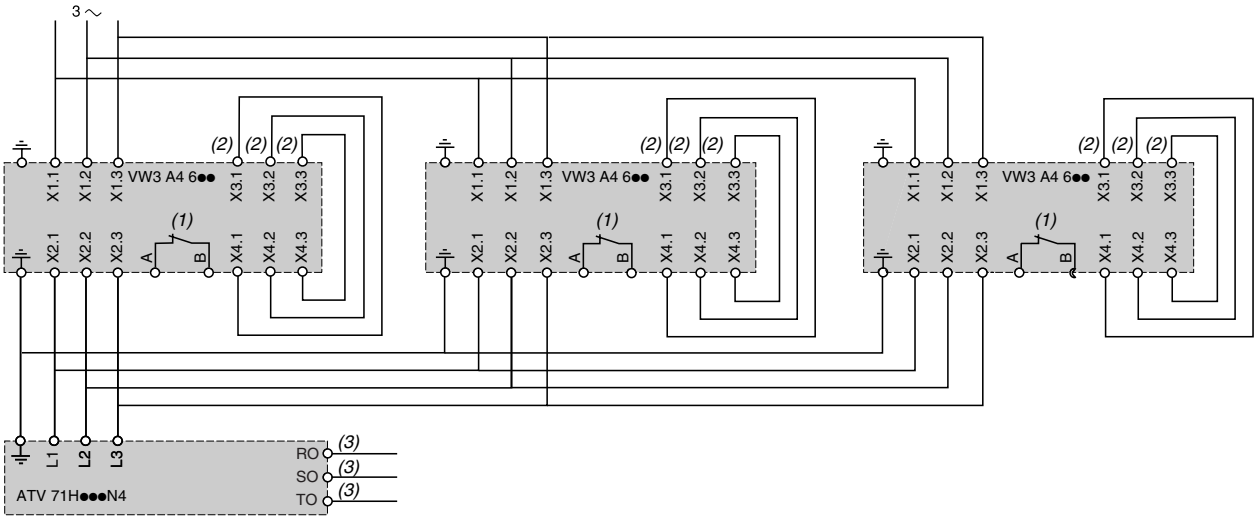
Scheme with 2 passive filters for ATV 71H075N4…HD90N4 drives



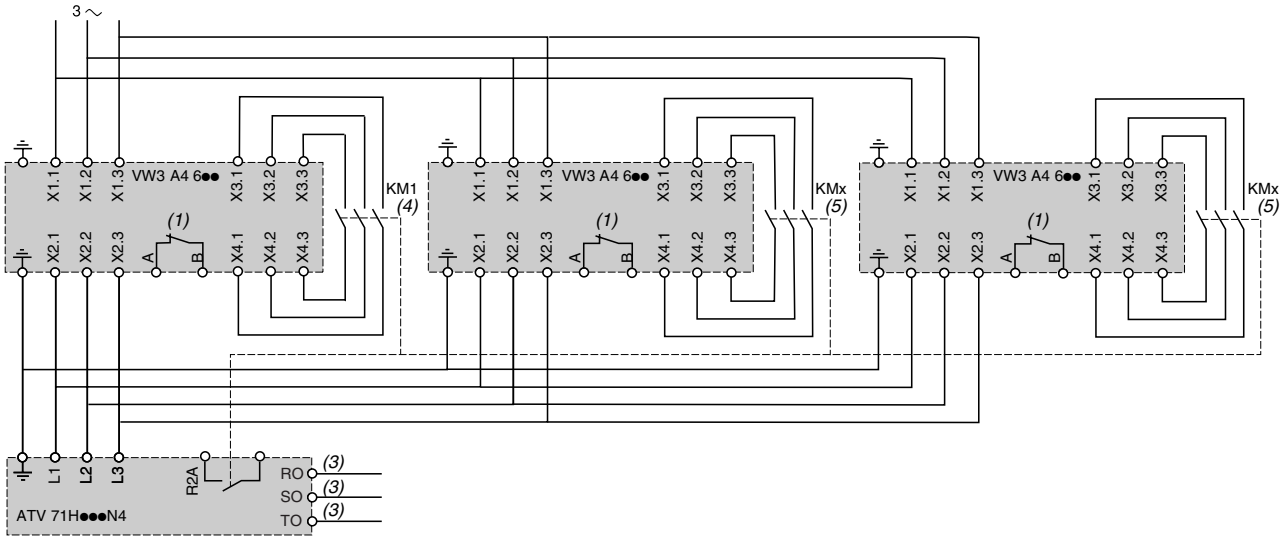
(1) Contact for indicating the thermal state of the passive filter, to be connected in the safety circuit of the installation.
(2) Cable supplied.
(3) Fan external power supply.
(4) Q2: GV2 RT10 thermal-magnetic circuit-breaker. T1: transformer 400/400 V or 460/460 V.
(5) For ATV 71HC11N4…HC50N4 drives, the external power supply for the fan is obligatory, see diagram above with one passive filter.

VW3 A4 6●● passive filters (continued)

Scheme with 3 passive filters for ATV 71H075N4...HD90N drives

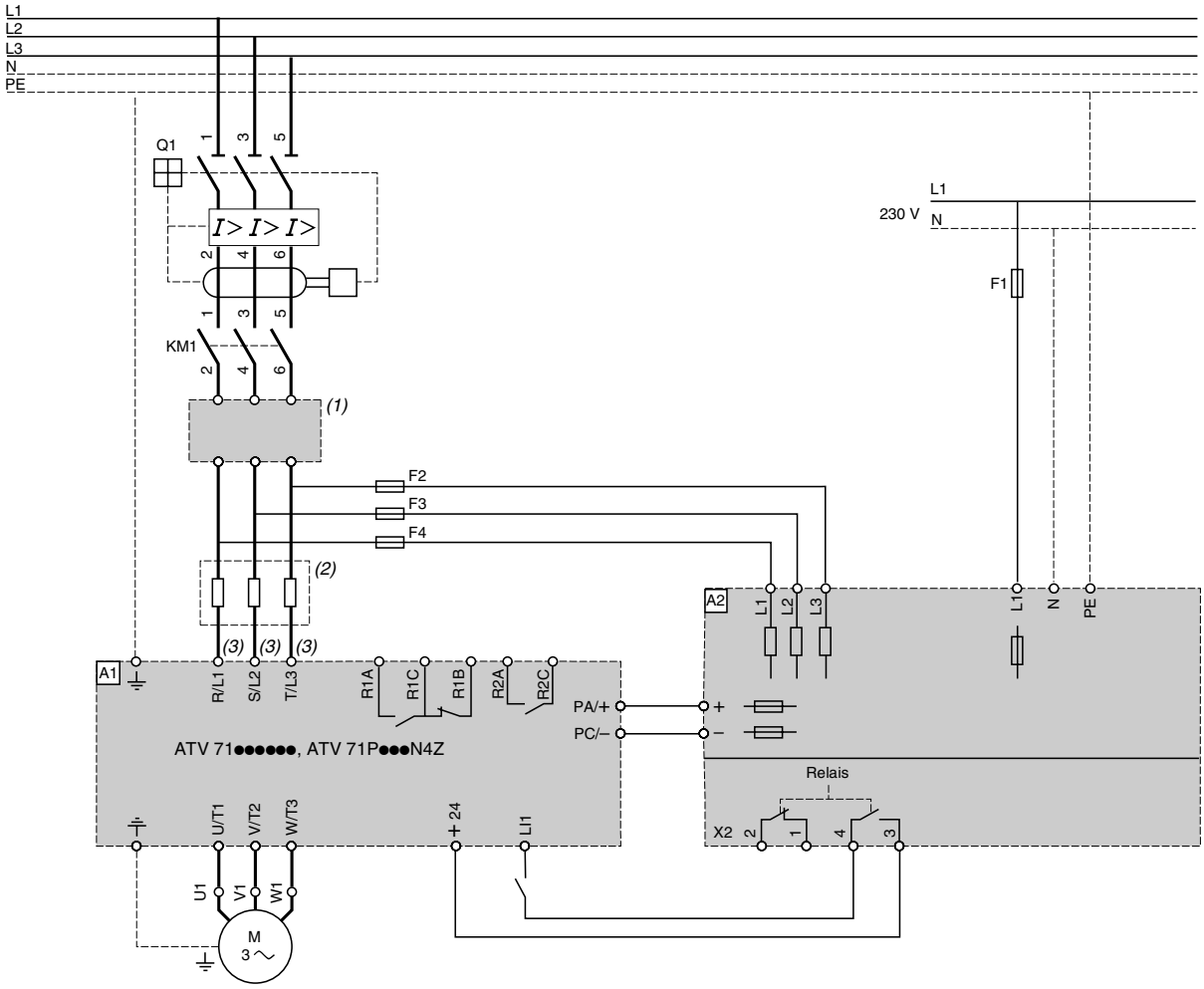


Scheme for controlling the filter via the drive according to the load



(1) Contact for indicating the thermal state of the passive filter, to be connected in the safety circuit of the installation.
(2) Cable supplied.
(3) For ATV 71HC11N4...HC50N4 drives, the external power supply for the fan is obligatory, see diagram page 2/484 with one passive filter.
(4) KM1: Category AC1 contactor sized at 50% of the drive nominal current (In).
(5) KMx: Contactor type and sizing identical to KM1. It may be necessary to provide an intermediate relay to control the KMx contactors.

Network braking unit



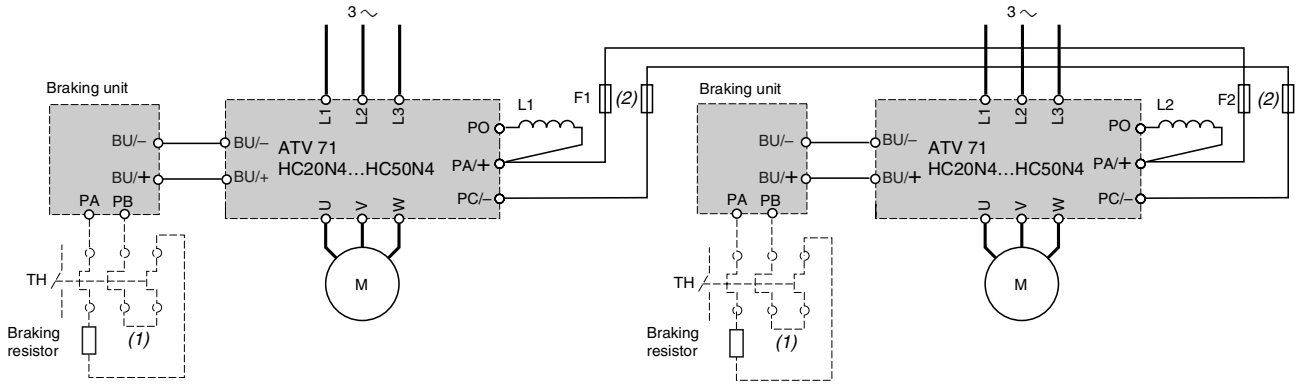
Components for use with the Altivar (for a complete list of references, see our "Motor starter solutions. Power control and protection components" specialist catalogue).

Reference	Description
A1	ATV 71 drive, see pages 2/360 to 2/363
A2	Network braking unit, see page 2/413
F1	2 A fuse, 230 V~
F2…F4	For fuses, see reference tables on page 2/413.
Q1	Earth fault circuit-breaker 300 mA. Protects against earth leakage faults. Rating: see motor starters on pages 2/492 to 2/497

(1) Additional EMC input filter if necessary, see page 2/430.
(2) Line choke recommended, see page 2/422.
(3) For ATV 71HC40N4 drives combined with a 400 kW motor and ATV 71HC50N4, see page 2/478.

Drives combined with a braking unit and wired onto the same DC bus

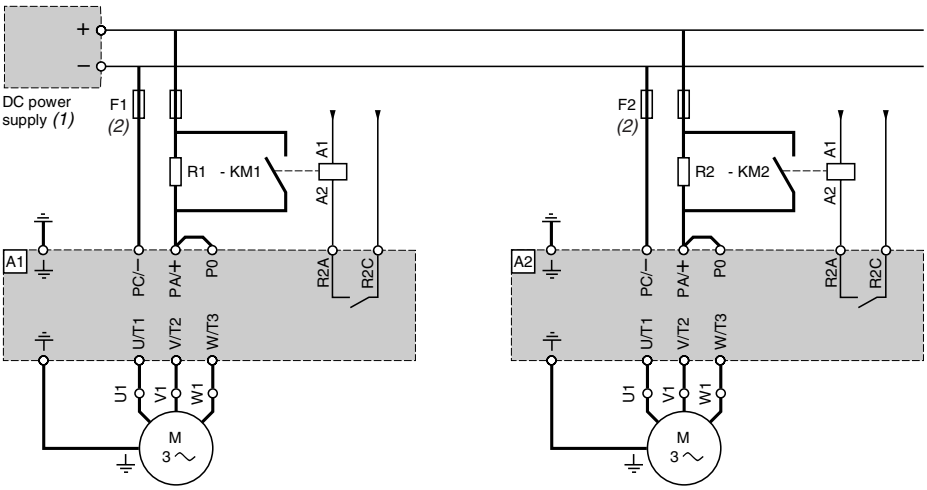
ATV 71HC20N4...HC50N4



(1) A thermal overload relay can be added.
(2) Fast-acting semi-conductor fuses, see page 2/489. The function of the fuses is to protect the DC bus wiring in the event of a drive short-circuit.

Drives powered by external DC power supply

ATV 71HD18M3X...HD45M3X, ATV 71●D22N4...●D75N4



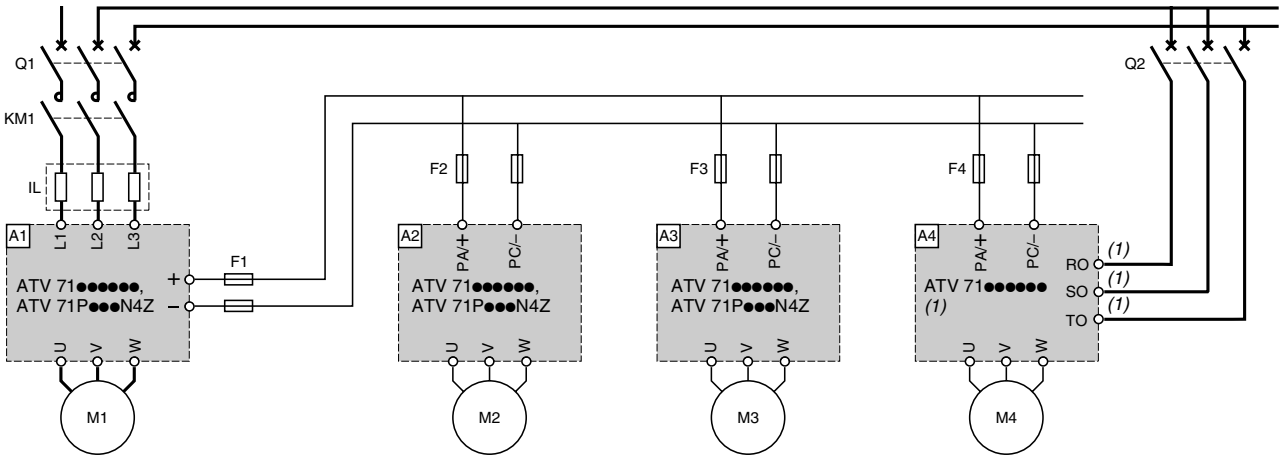
For drives A1, A2	Braking resistors R1, R2		Contactors *(3)* KM1, KM2
	Value	Reference	
	Ω		
ATV 71HD18M3X	5	**VW3 A7 707**	**LC1 D32●●**
ATV 71HD22M3X	5	**VW3 A7 707**	**LC1 D40●●**
ATV 71HD30M3X	5	**VW3 A7 707**	**LC1 D65●●**
ATV 71HD37M3X	5	**VW3 A7 707**	**LC1 D80●●**
ATV 71HD45M3X	5	**VW3 A7 707**	**LC1 D80●●**
ATV 71HD22N4, WD22N4	5	**VW3 A7 707**	**LC1 D25●●**
ATV 71HD30N4, WD30N4	5	**VW3 A7 707**	**LC1 D32●●**
ATV 71HD37N4, WD37N4	5	**VW3 A7 707**	**LC1 D38●●**
ATV 71HD45N4, WD45N4	5	**VW3 A7 707**	**LC1 D40●●**
ATV 71HD55N4, WD55N4	5	**VW3 A7 707**	**LC1 D50●●**
ATV 71HD75N4, WD75N4	5	**VW3 A7 707**	**LC1 D80●●**

(1) DC power supply not included.
(2) Fast-acting semi-conductor fuses, see page 2/489. The function of the fuses is to protect the DC bus wiring in the event of a drive short-circuit.
(3) See our "Motor starter solutions. Power control and protection components" specialist catalogue.

***Note:** ATV 71H●●●M3, ATV 71HD11M3X, HD15M3X, ATV 71●075N4...●D18N4 and ATV 71P●●●N4Z drives have an integrated pre-charge circuit. This is used to connect the DC power supply directly to the drive without the need for an external pre-charge circuit.*

Connection diagrams for several drives in parallel on the DC bus

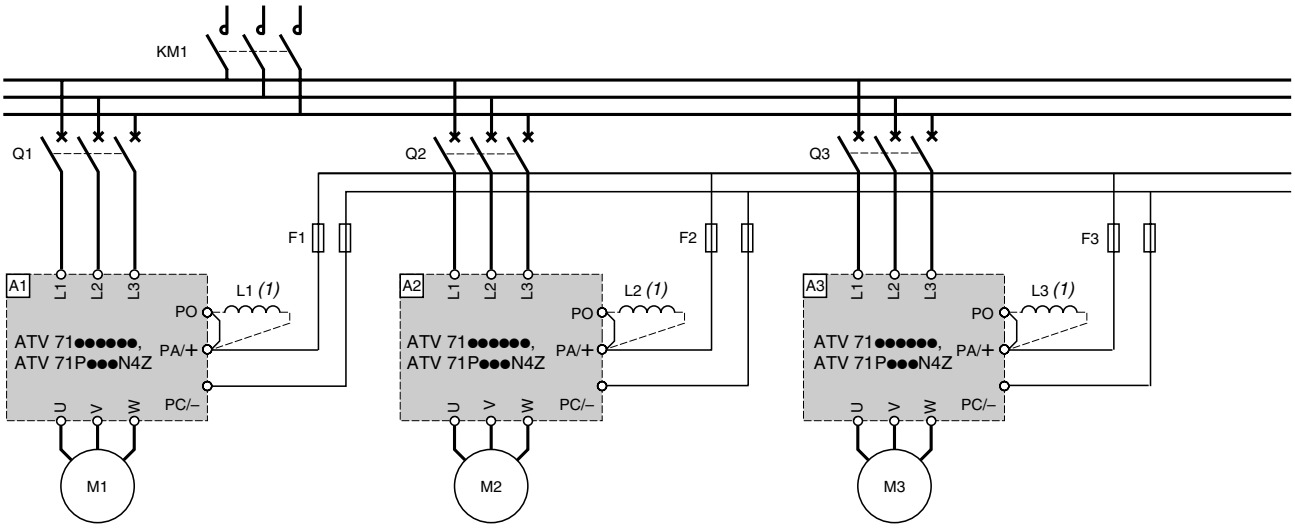
Drives with different ratings



Reference	Description
A1	ATV 71 drive, see pages 2/360 to 2/363. Drive power = ∑ motor power ratings M1 + M2 + M3 + M4 + …
A2, A3, A4	ATV 71 drives powered by the DC bus. They must be protected using fast-acting semi-conductor fuses. Contactors on the DC circuit are ineffective as the switching action may cause the fuses to blow owing to the high load current.
F1	Fast-acting semi-conductor fuses, see page 2/489. Drive A1 powered by the AC supply with an output bus. The function of the fuse is to protect the internal diode bridge in the event of a short-circuit on the external DC bus.
F2, F3, F4	Fast-acting semi-conductor fuses, see page 2/489. Drives A2, A3 and A4 are powered by their DC bus and are not connected to the AC input. The function of the fuses is to protect the DC bus wiring in the event of a drive short-circuit.

(1) For ATV 71HD55M3X, HD75M3X and ATV 71HD90N4…HC50N4 drives, provide the fan power supply connection.

Drives with equivalent ratings



Reference	Description
A1, A2, A3	ATV 71 drives, see pages 2/360 to 2/363. The power difference between the drives connected in parallel must not exceed one rating.
F1, F2, F3	Fast-acting semi-conductor fuses, see page 2/489. Drives A1, A2 and A3 powered by the AC supply with an output bus. The function of the fuse is to protect the internal diode bridge in the event of a short-circuit on the external DC bus.
KM1	When using a common line contactor, all the Altivar 71 drive load circuits operate in parallel and cannot therefore be overloaded.
L1, L2, L3	DC chokes, see page 2/419.
Q1, Q2, Q3	Circuit-breakers on the line supply side to protect drives against overloads. Use trip contacts on the “external fault” logic input or the line contactor. The line contactor must only be activated if all three circuit-breakers are closed, as otherwise there is a risk of damage to the drives.

(1) DC chokes compulsory except for ATV 71HD55M3X, HD75M3X and ATV 71HD90N4…HC50N4 drives which include a DC choke as standard.

Variable speed drives for asynchronous motors
Altivar 71

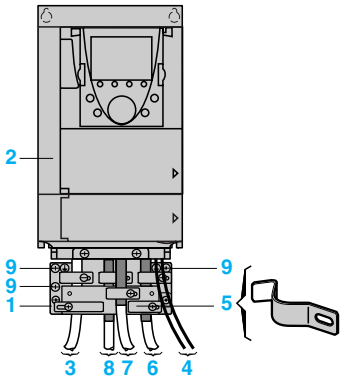
Size of DC bus fuses (F1, F2, F3 and F4) depending on the drive rating

For drives	Fast-acting semi-conductor fuses *(1)*
	A
ATV 71H037M3…HU15M3	25
ATV 71HU22M3…HU40M3	50
ATV 71HU55M3, HU75M3	100
ATV 71HD11M3X…HD18M3X	160
ATV 71HD22M3X, HD30M3X	250
ATV 71HD37M3X, HD45M3X	350
ATV 71HD55M3X	500
ATV 71HD75M3X	630
ATV 71H075N4…HU22N4 ATV 71W075N4…WU22N4 ATV 71P075N4Z…PU22N4Z	25
ATV 71HU30N4, HU40N4 ATV 71WU30N4, WU40N4 ATV 71PU30N4Z, PU40N4Z	50
ATV 71HU55N4…HD11N4 ATV 71WU55N4…WD11N4 ATV 71PU55N4Z, PU75N4Z	80
ATV 71HD15N4…HD22N4 ATV 71WD15N4…WD22N4	100
ATV 71HD30N4, HD37N4 ATV 71WD30N4, WD37N4	160
ATV 71HD45N4 ATV 71WD45N4	200
ATV 71HD55N4 ATV 71WD55N4	250
ATV 71HD75N4 ATV 71WD75N4	350
ATV 71HD90N4	315
ATV 71HC11N4, HC13N4	400
ATV 71HC16N4	500
ATV 71HC20N4	630
ATV 71HC25N4, HC28N4	800
ATV 71HC31N4	1000
ATV 71HC40N4, HC50N4	1250

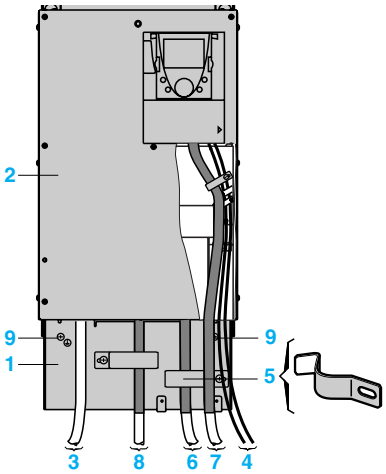
(1) Nominal voltage of fast-acting fuse:

Line voltage	Nominal voltage of fast-acting fuse
V ∼	V
230	690
400	690
440	800
460	800
480	800

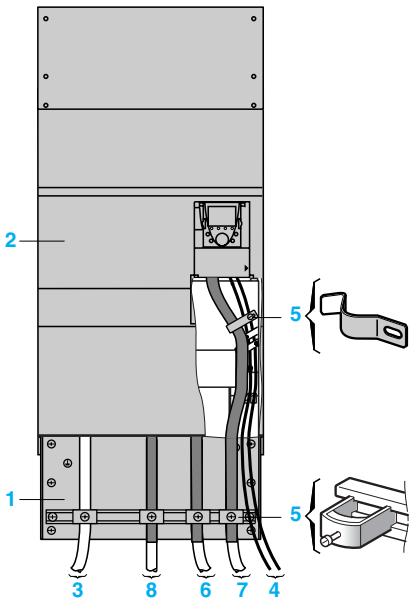
Variable speed drives for asynchronous motors
Altivar 71
Electromagnetic compatibility



ATV 71H●●●M3, ATV 71HD11M3X, HD15M3X,
ATV 71H075N4…HD18N4,
ATV 71P075N4Z…PU75N4Z



ATV 71HD18M3X…HD45M3X,
ATV 71HD22N4…HD75N4



ATV 71HD55M3X, HD75M3X,
ATV 71HD90N4…HC50N4

Connections for ensuring conformity to EMC standards

Principle

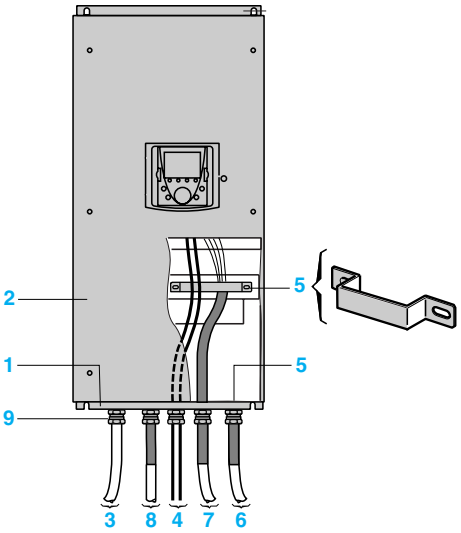
■ Earths between drive, motor and cable shielding must have “high frequency” equipotentiality.
■ Use shielded cables with shielding connected to earth over 360° at both ends for the motor cable, the braking resistor cable and the control-signalling cables. Conduit or metal ducting can be used for part 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 motor cable.

Installation diagram for ATV 71H●●●M3, ATV 71H●●●M3X, ATV 71H●●●N4 and ATV 71P●●●N4Z drives

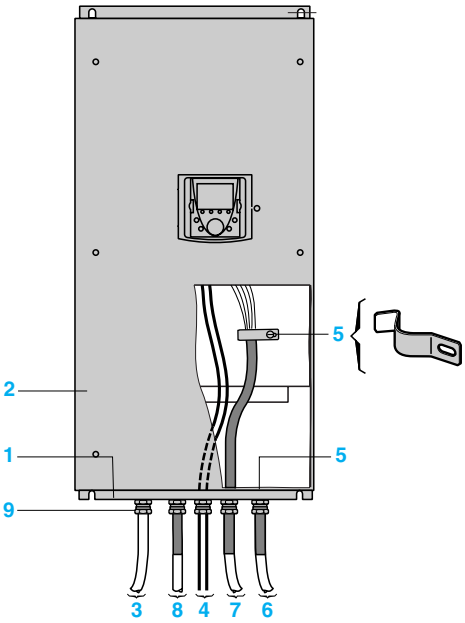
1 Steel plate *(1)*, to be mounted on the drive (earthed casing).
2 Altivar 71 UL Type 1/IP 20 drive
3 Unshielded power supply wires or cable
4 Unshielded wires for the output of the fault relay contacts
5 Fix and earth the shielding of cables 6, 7 and 8 as close as possible to the drive:
- strip the shielding
- fix 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 metal plate to ensure good contact.
6 Shielded cable for connecting the motor
7 Shielded cable for connecting the control/signal wiring.
For applications requiring several conductors, use cables with a small cross-section (0.5 mm²).
8 Shielded cable for connecting the braking resistor 6, 7, 8, the shielding must be connected to earth at both ends.
The shielding must be continuous, and if intermediate terminals are used, they must be placed in EMC shielded metal boxes.
9 Earth screw.

Note: *The HF equipotential earth connection between the drive, 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 beside or beneath the drive, depending on the rating, and connected directly to the line supply via an unshielded cable.
Link 3 on the drive is via the filter output cable.

(1) Plate supplied for ATV 71H●●●M3, ATV 71HD11M3X…HD45M3X, ATV 71H075N4…HD75N4 and ATV 71P075N4Z…PU75N4Z drives.
For ATV 71HD55M3X, HD75M3X and ATV 71HD90N4…HC28N4 drives, the plate is supplied with the UL Type 1 conformity kit or the IP 31 conformity kit.
For ATV 71HC31N4…HC50N4 drives, the plate is supplied with the IP 31 conformity kit.
For ATV 71P075N4Z…PU75N4Z drives, the plate is supplied with the UL Type 1 conformity kit or the IP 21 conformity kit.
These kits must be ordered separately, see pages 2/367 et 2/368.



ATV 71W075N4…WD22N4



ATV 71WD30N4…WD75N4

Connections for ensuring conformity to EMC standards (continued)

Installation diagram for ATV 71W●●●N4 drives

1 Steel plate mounted on the drive (earthed casing)
2 Altivar 71 UL Type 12/IP 54 drive.
3 Unshielded power supply wires or cable
4 Unshielded wires for the output of the fault relay contacts
5 Fix and earth the shielding of cables 6, 7 and 8 as close as possible to the drive:
- strip the shielding
- attach the shielded cable to the cable gland 9 ensuring it is fully in contact throughout 360° – fold back the shielding and clamp it between the ring and the body of the cable gland.
Depending on the drive rating, the shielding of cable 7 can be earthed using a cable gland 9, a clamp 5 or a cable clip 5.
The shielding must be clamped tightly enough to the metal plate to ensure good contact.
6 Shielded cable for connecting the motor
7 Shielded cable for connecting the control/signalling wiring.
For applications requiring several conductors, use cables with a small cross-section (0.5 mm^2).
8 Shielded cable for connecting the braking resistor 6, 7, 8, the shielding must be connected to earth at both ends.
The shielding must be continuous, and if intermediate terminals are used, they must be placed in EMC shielded metal boxes.
9 Metal cable gland (not supplied) for cables 6, 7 and 8.
Standard cable gland (not supplied) for cables 3 and 4.

Note: *The HF equipotential earth connection between the drive, 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 beside the drive and connected directly to the line supply via an unshielded cable. Link 3 on the drive is via the filter output cable.

Variable speed drives for asynchronous motors
Altivar 71
Motor starters: supply voltage 200…240 V

DF533367-16-M

103282_14-M

PF105778-28-M

GV2 L20
+
LC1 D25●●
+
ATV 71HU22M3

Applications

Circuit-breaker/contactor/drive combinations can be used to ensure continuous service of the installation with optimum safety.
The type of circuit-breaker/contactor coordination selected can reduce maintenance costs in the event of a motor short-circuit by minimizing the time required to make the necessary repairs and the cost of replacement equipment. The suggested combinations provide type 1 or type 2 coordination depending on the drive rating.

Type 2 coordination: A motor short-circuit will not damage the device or affect its settings. The motor starter should be able to operate once the electrical fault has been removed. The electrical isolation provided by the circuit-breaker will not be affected by the short-circuit. Welding of the contactor contacts is permissible if they can be separated easily.

Type 1 coordination: The electrical isolation provided by the circuit-breaker will not be affected by the incident and no other elements apart from the contactor are damaged as a result of the motor short-circuit.

The drive controls the motor, provides protection against short-circuits between the drive and the motor and protects the motor cable against overloads. The overload protection is provided by the drive's motor thermal protection. If this protection is removed, external thermal protection should be provided.
Before restarting the installation, the cause of the trip must be removed.

Motor starters for UL Type 1/IP 20 drives

Motor Power *(1)*		Drive Reference	Circuit-breaker Reference *(2)*	Circuit-breaker Rating	Circuit-breaker Im	Line contactor Reference *(3) (4)*
kW	***HP***			**A**	**A**	
Single phase supply voltage 200…240 V 50/60 Hz. Type 2 coordination						
0.37	*0.5*	**ATV 71H075M3**	**GV2 L10**	6.3	–	**LC1 D18●●**
0.75	*1*	**ATV 71HU15M3**	**GV2 L14**	10	–	**LC1 D18●●**
1.5	*2*	**ATV 71HU22M3**	**GV2 L20**	18	–	**LC1 D25●●**
2.2	*3*	**ATV 71HU30M3**	**GV2 L22**	25	–	**LC1 D25●●**
3	–	**ATV 71HU40M3** *(5)*	**GV2 L22**	25	–	**LC1 D25●●**
4	*5*	**ATV 71HU55M3** *(5)*	**NS80HMA50**	50	300	**LC1 D40●●**
5.5	*7.5*	**ATV 71HU75M3** *(5)*	**NS80HMA50**	50	300	**LC1 D50●●**

(1) Standard power ratings for 4-pole motors 50/60 Hz 230 V.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA: product sold under the Merlin Gerin brand.
Breaking capacity of circuit-breakers according to standard IEC 60947-2:

Circuit-breaker	Icu (kA) for 240 V
GV2 L	50
NS80HMA	100

(3) Composition of contactors:
LC1 D18 to LC1 D50: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	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 available between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.
(5) A line choke must be added (see page 2/422).

Variable speed drives for asynchronous motors
Altivar 71
Motor starters: supply voltage 200…240 V

046751_20-M

103308_18-M

PF105780-32-M

NS80HMA50
+
LC1 D40●●
+
ATV 71HU55M3

Motor starters for UL Type 1/IP 20 drives

Motor Power *(1)*		Drive Reference	Circuit-breaker Reference *(2)*	Rating	Im	Line contactor Reference *(3) (4)*
kW	***HP***			**A**	**A**	
3-phase supply voltage 200…240 V 50/60 Hz. Type 2 coordination						
0.37	*0.5*	**ATV 71H037M3**	**GV2 L08**	4	–	**LC1 D09●●**
0.75	*1*	**ATV 71H075M3**	**GV2 L14**	10	–	**LC1 D09●●**
1.5	*2*	**ATV 71HU15M3**	**GV2 L14**	10	–	**LC1 D18●●**
2.2	*3*	**ATV 71HU22M3**	**GV2 L16**	14	–	**LC1 D18●●**
3	–	**ATV 71HU30M3**	**GV2 L20**	18	–	**LC1 D25●●**
4	*5*	**ATV 71HU40M3**	**GV2 L22**	25	–	**LC1 D25●●**
5.5	*7.5*	**ATV 71HU55M3**	**NS80HMA50**	50	300	**LC1 D40●●**
7.5	*10*	**ATV 71HU75M3**	**NS80HMA50**	50	300	**LC1 D50●●**
11	*15*	**ATV 71HD11M3X**	**NS80HMA80**	80	480	**LC1 D65●●**
15	*20*	**ATV 71HD15M3X**	**NS100NMA80**	80	480	**LC1 D65●●**
18.5	*25*	**ATV 71HD18M3X**	**NS100NMA100**	100	600	**LC1 D80●●**
22	*30*	**ATV 71HD22M3X**	**NS100NMA100**	100	600	**LC1 D80●●**
30	*40*	**ATV 71HD30M3X**	**NS160NMA150**	150	1350	**LC1 D115●●**
37	*50*	**ATV 71HD37M3X**	**NS160NMA150**	150	1350	**LC1 D150●●**
45	*60*	**ATV 71HD45M3X**	**NS250NMA220**	220	1980	**LC1 D150●●**
55	*75*	**ATV 71HD55M3X**	**NS250NMA220**	220	1980	**LC1 F225●●**
75	*100*	**ATV 71HD75M3X**	**NS400NMA320**	320	1920	**LC1 F265●●**

(1) Standard power ratings for 4-pole motors 50/60 Hz 230 V.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA, NS●●●N: Products sold under the Merlin Gerin brand.
Breaking capacity of circuit-breakers according to standard IEC60947-2:

Circuit-breaker	Icu (kA) for 240 V
GV2 L08…L20	100
GV2 L22	50
NS80HMA	100
NS●●●NMA	85

(3) Composition of contactors:
LC1 D09 to LC1 D150: 3 poles + 1 "N/O" auxiliary contact + 1 "N/C" auxiliary contact.
LC1 F●●●: 3 poles. To add auxiliary contacts or other accessories, please consult our specialist catalogue "Motor-starter solutions. Control and protection components".
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	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**
LC1 F225	50 Hz (LX1 coil)	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz (LX1 coil)	–	**E6**	**F6**	**M6**	–	**U6**
	40…400 Hz (LX9 coil)	–	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F265	40…400 Hz (LX1 coil)	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**

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

Variable speed drives for asynchronous motors
Altivar 71
Motor starters: supply voltage 380…415 V

DF533345-20-M

105517-13-M

PF105777-31-M

NS160●MA150
+
LC1 D115●●
+
ATV 71HD45N4

Motor starters for UL Type 1/IP 20 drives

Motor Power *(1)*		Drive Reference	Circuit-breaker Reference *(2)*	Rating	Im	Line contactor Reference *(3) (4)*
kW	*HP*			A	A	
3-phase supply voltage 380…415 V 50/60 Hz. Type 2 coordination						
0.75	*1*	**ATV 71H075N4**	**GV2 L08**	4	–	**LC1 D18●●**
1.5	*2*	**ATV 71HU15N4**	**GV2 L10**	6.3	–	**LC1 D18●●**
2.2	*3*	**ATV 71HU22N4**	**GV2 L14**	10	–	**LC1 D18●●**
3	–	**ATV 71HU30N4**	**GV2 L16**	14	–	**LC1 D18●●**
4	*5*	**ATV 71HU40N4**	**GV2 L16**	14	–	**LC1 D18●●**
5.5	*7.5*	**ATV 71HU55N4**	**GV2 L22**	25	–	**LC1 D25●●**
7.5	*10*	**ATV 71HU75N4**	**NS80HMA50**	50	300	**LC1 D40●●**
11	*15*	**ATV 71HD11N4**	**NS80HMA50**	50	300	**LC1 D40●●**
15	*20*	**ATV 71HD15N4**	**NS80HMA50**	50	300	**LC1 D50●●**
18.5	*25*	**ATV 71HD18N4**	**NS80HMA50**	50	300	**LC1 D50●●**
22	*30*	**ATV 71HD22N4**	**NS80HMA80**	80	480	**LC1 D65●●**
30	*40*	**ATV 71HD30N4**	**NS80HMA80**	80	480	**LC1 D65●●**
37	*50*	**ATV 71HD37N4**	**NS100●MA100**	100	800	**LC1 D80●●**
45	*60*	**ATV 71HD45N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
55	*75*	**ATV 71HD55N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
75	*100*	**ATV 71HD75N4**	**NS250●MA150**	150	1350	**LC1 D150●●**
90	*125*	**ATV 71HD90N4**	**NS250●MA220**	220	1980	**LC1 F185●●**
110	*150*	**ATV 71HC11N4**	**NS250●MA220**	220	1980	**LC1 F185●●**
132	*200*	**ATV 71HC13N4**	**NS400●MA320**	320	1920	**LC1 F265●●**
160	*250*	**ATV 71HC16N4**	**NS400●MA320**	320	1920	**LC1 F265●●**
200	*300*	**ATV 71HC20N4**	**NS400●MA320**	320	1920	**LC1 F400●●**
220	*350*	**ATV 71HC25N4**	**NS630●MAE500**	500	3000	**LC1 F400●●**
250	*400*	**ATV 71HC25N4**	**NS630●MAE500**	500	3000	**LC1 F500●●**
280	*450*	**ATV 71HC28N4**	**NS630●MAE500**	500	3000	**LC1 F500●●**
315	*500*	**ATV 71HC31N4**	**NS630●MAE500**	500	3000	**LC1 F500●●**
3-phase supply voltage 380…415 V 50/60 Hz. Type 1 coordination						
355	–	**ATV 71HC40N4**	**NS800 MicroLogic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
400	*600*	**ATV 71HC40N4**	**NS800 MicroLogic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
500	*700*	**ATV 71HC50N4**	**NS1000 MicroLogic 2 or 5 (LR OFF)**	1000	2000	**LC1 F800●●**

(1) Standard power ratings for 4-pole motors 50/60 Hz 400 V.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA, NS●●●●, NS800, NS1000: products sold under the Merlin Gerin brand.
For references to be completed, replace the dot with the letter corresponding to the circuit-breaker breaking performance (N, H, L).
Breaking capacity of circuit-breakers according to standard IEC 60947-2:

Circuit-breaker	Icu (kA) for 400 V			
		N	H	L
GV2 L08…L14	100	–	–	–
GV2 L16, L22	50	–	–	–
NS80HMA	70	–	–	–
NS100●MA	–	25	70	150
NS160●MA, NS250●MA	–	36	70	150
NS400●, NS630●, NS800, NS1000	–	45	70	150

(3) Composition of contactors:
LC1 D18 to LC1 D150: 3 poles + 1 "N/O" auxiliary contact + 1 "N/C" auxiliary contact.
LC1 F●●●: 3 poles. To add auxiliary contacts or other accessories, please consult our specialist catalogue "Motor-starter solutions. Control and protection components".
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ⏦	24	48	110	220	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**
LC1 F185	50 Hz (LX1 coil)	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz (LX1 coil)	**–**	**E6**	**F6**	**M6**	**–**	**U6**
	40…400 Hz (LX9 coil)	**–**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F265	40…400 Hz (LX1 coil)	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F400…F630	40…400 Hz (LX1 coil)	**–**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F800	40…400 Hz (LX1 coil)	**–**	**–**	**FE7**	**P7**	**P7**	**P7**

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

Variable speed drives for asynchronous motors
Altivar 71
Motor starters: supply voltage 440…480 V

DF534573

105517-13-M

121615-33-M

NS160●MA150
+
LC1 D115●●
+
ATV 71HD75N4

Motor starters for UL Type 1/IP 20 drives

Motor Power *(1)*		Drive Reference	Circuit-breaker Reference *(2)*	Rating	Im	Line contactor Reference *(3) (4)*
kW	*HP*			A	A	
3-phase supply voltage 440…480 V 50/60 Hz. Type 2 coordination						
0.75	*1*	**ATV 71H075N4**	**GV2 L08**	4	–	**LC1 D18●●**
1.5	*2*	**ATV 71HU15N4**	**GV2 L10**	6.3	–	**LC1 D18●●**
2.2	*3*	**ATV 71HU22N4**	**GV2 L14**	10	–	**LC1 D18●●**
3	–	**ATV 71HU30N4**	**GV2 L14**	10	–	**LC1 D18●●**
4	*5*	**ATV 71HU40N4**	**GV2 L16**	14	–	**LC1 D18●●**
5.5	*7.5*	**ATV 71HU55N4**	**NS80HMA50**	50	300	**LC1 D25●●**
7.5	*10*	**ATV 71HU75N4**	**NS80HMA50**	50	300	**LC1 D40●●**
11	*15*	**ATV 71HD11N4**	**NS80HMA50**	50	300	**LC1 D40●●**
15	*20*	**ATV 71HD15N4**	**NS80HMA50**	50	300	**LC1 D50●●**
18.5	*25*	**ATV 71HD18N4**	**NS100●MA50**	50	300	**LC1 D50●●**
22	*30*	**ATV 71HD22N4**	**NS100●MA50**	50	300	**LC1 D65●●**
30	*40*	**ATV 71HD30N4**	**NS100●MA100**	100	600	**LC1 D65●●**
37	*50*	**ATV 71HD37N4**	**NS100●MA100**	100	600	**LC1 D80●●**
45	*60*	**ATV 71HD45N4**	**NS160●MA100**	100	600	**LC1 D115●●**
55	*75*	**ATV 71HD55N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
75	*100*	**ATV 71HD75N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
90	*125*	**ATV 71HD90N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
110	*150*	**ATV 71HC11N4**	**NS250●MA220**	220	1980	**LC1 F185●●**
132	*200*	**ATV 71HC13N4**	**NS250●MA220**	220	1980	**LC1 F225●●**
160	*250*	**ATV 71HC16N4**	**NS400●MA320**	320	1920	**LC1 F265●●**
200	*300*	**ATV 71HC20N4**	**NS400●MA320**	320	1920	**LC1 F330●●**
220	*350*	**ATV 71HC25N4**	**NS400●MA320**	320	1920	**LC1 F400●●**
250	*400*	**ATV 71HC25N4**	**NS630●MAE500**	500	3000	**LC1 F400●●**
280	*450*	**ATV 71HC28N4**	**NS630●MAE500**	500	3000	**LC1 F500●●**
315	*500*	**ATV 71HC31N4**	**NS630●MAE500**	500	3000	**LC1 F500●●**
355	–	**ATV 71HC40N4**	**NS630●MAE500**	500	3000	**LC1 F630●●**
3-phase supply voltage 440…480 V 50/60 Hz. Type 1 coordination						
400	*600*	**ATV 71HC40N4**	**NS800 MicroLogic 2 or 5 (LR OFF)**	800	1600	**LC1 F630●●**
500	*700*	**ATV 71HC50N4**	**NS1000 MicroLogic 2 or 5 (LR OFF)**	1000	2000	**LC1 F800●●**

(1) Standard power ratings for 4-pole motors 50/60 Hz 400 V.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS800HMA, NS●●●●, NS800, NS1000: products sold under the Merlin Gerin brand.
For references to be completed, replace the dot with the letter corresponding to the circuit-breaker breaking performance (N, H, L).
Breaking capacity of circuit-breakers according to standard IEC 60947-2:

Circuit-breaker	Icu (kA) for 440 V			
		N	H	L
GV2 L08, GV2 L10	100	–	–	–
GV2 L14, GV2 L16	20	–	–	–
NS80HMA	65	–	–	–
NS100●MA	–	25	65	130
NS160●MA, NS250●MA	–	35	65	130
NS400●, NS630●	–	42	65	130
NS800, NS1000	–	50	65	130

(3) Composition of contactors:
LC1 D18 to LC1 D115: 3 poles + 1 "N/O" auxiliary contact + 1 "N/C" auxiliary contact.
LC1 F●●●: 3 poles. To add auxiliary contacts or other accessories, please consult our specialist catalogue "Motor-starter solutions. Control and protection components".
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	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**
LC1 F185	50 Hz (LX1 coil)	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz (LX1 coil)	–	**E6**	**F6**	**M6**	–	**U6**
	40…400 Hz (LX9 coil)	–	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F265, F330	40…400 Hz (LX1 coil)	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F400…F630	40…400 Hz (LX1 coil)	–	**E7**	**F7**	**M7**	**P7**	**U7**
LC1 F800	40…400 Hz (LX1 coil)	–	–	**FE7**	**P7**	**P7**	**P7**

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

Variable speed drives for asynchronous motors
Altivar 71
Motor starters: supply voltage 380…480 V

DF533345-20-M

105517-13-M

PF105784-32-M

NS160●MA150
+
LC1 D115●●
+
ATV 71WD55N4

Motor starters for UL Type 12/IP 54 drives

Motor Power *(1)*		Drive Reference	Circuit-breaker Reference *(2)*	Rating	Im	Line contactor Reference *(3) (4)*
kW	*HP*			A	A	
3-phase supply voltage 380…415 V 50/60 Hz. Type 2 coordination						
0.75	*1*	**ATV 71W075N4**	**GV2 L08**	4	–	**LC1 D18●●**
1.5	*2*	**ATV 71WU15N4**	**GV2 L10**	6.3	–	**LC1 D18●●**
2.2	*3*	**ATV 71WU22N4**	**GV2 L14**	10	–	**LC1 D18●●**
3	–	**ATV 71WU30N4**	**GV2 L16**	14	–	**LC1 D18●●**
4	*5*	**ATV 71WU40N4**	**GV2 L16**	14	–	**LC1 D18●●**
5.5	*7.5*	**ATV 71WU55N4**	**GV2 L22**	25	–	**LC1 D25●●**
7.5	*10*	**ATV 71WU75N4**	**NS80HMA50**	50	300	**LC1 D40●●**
11	*15*	**ATV 71WD11N4**	**NS80HMA50**	50	300	**LC1 D40●●**
15	*20*	**ATV 71WD15N4**	**NS80HMA50**	50	300	**LC1 D50●●**
18.5	*25*	**ATV 71WD18N4**	**NS80HMA50**	50	300	**LC1 D50●●**
22	*30*	**ATV 71WD22N4**	**NS80HMA80**	80	480	**LC1 D65●●**
30	*40*	**ATV 71WD30N4**	**NS80HMA80**	80	480	**LC1 D65●●**
37	*50*	**ATV 71WD37N4**	**NS100●MA100**	100	800	**LC1 D80●●**
45	*60*	**ATV 71WD45N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
55	*75*	**ATV 71WD55N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
75	*100*	**ATV 71WD75N4**	**NS250●MA150**	150	1350	**LC1 D150●●**
3-phase supply voltage 440…480 V 50/60 Hz. Type 2 coordination						
0.75	*1*	**ATV 71W075N4**	**GV2 L08**	4	–	**LC1 D18●●**
1.5	*2*	**ATV 71WU15N4**	**GV2 L10**	6.3	–	**LC1 D18●●**
2.2	*3*	**ATV 71WU22N4**	**GV2 L14**	10	–	**LC1 D18●●**
3	–	**ATV 71WU30N4**	**GV2 L14**	10	–	**LC1 D18●●**
4	*5*	**ATV 71WU40N4**	**GV2 L16**	14	–	**LC1 D18●●**
5.5	*7.5*	**ATV 71WU55N4**	**NS80HMA50**	50	300	**LC1 D25●●**
7.5	*10*	**ATV 71WU75N4**	**NS80HMA50**	50	300	**LC1 D40●●**
11	*15*	**ATV 71WD11N4**	**NS80HMA50**	50	300	**LC1 D40●●**
15	*20*	**ATV 71WD15N4**	**NS80HMA50**	50	300	**LC1 D50●●**
18.5	*25*	**ATV 71WD18N4**	**NS100●MA50**	50	300	**LC1 D50●●**
22	*30*	**ATV 71WD22N4**	**NS100●MA50**	50	300	**LC1 D65●●**
30	*40*	**ATV 71WD30N4**	**NS100●MA100**	100	600	**LC1 D65●●**
37	*50*	**ATV 71WD37N4**	**NS100●MA100**	100	600	**LC1 D80●●**
45	*60*	**ATV 71WD45N4**	**NS160●MA100**	100	600	**LC1 D115●●**
55	*75*	**ATV 71WD55N4**	**NS160●MA150**	150	1350	**LC1 D115●●**
75	*100*	**ATV 71WD75N4**	**NS160●MA150**	150	1350	**LC1 D115●●**

(1) Standard power ratings for 4-pole motors 50/60 Hz 400 V.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA●●, NS●●●●: products sold under the Merlin Gerin brand.
For references to be completed, replace the dot with the letter corresponding to the circuit-breaker breaking performance (N, H, L).
Breaking capacity of circuit-breakers according to standard IEC 60947-2:

Circuit-breaker	Icu (kA) for 400 V			
		N	H	L
GV2 L08…L14	100	–	–	–
GV2 L16, L22	50	–	–	–
NS80HMA	70	–	–	–
NS100●MA	–	25	70	150
NS160●MA, NS250●MA	–	36	70	150
Circuit-breaker	**Icu (kA) for 440 V**			
		N	**H**	**L**
GV2 L08, GV2 L10	100	–	–	–
GV2 L14, GV2 L16	20	–	–	–
NS80HMA	65	–	–	–
NS100●MA	–	25	65	130
NS160●MA	–	35	65	130

(3) Composition of contactors:
LC1 D18 to LC1 D150: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	230	240
LC1 D18…D150	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 available between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.

Variable speed drives for asynchronous motors
Altivar 71
Motor starters: supply voltage 440…480 V


DF536086-16-M


1032T9-14-M


PF105783-28-M

GV2 L16
+
LC1 D18●●
+
ATV 71PU40N4Z

Motor starters for UL Type 1/IP 20 drives on base plates

Motor Power *(1)*		Drive Reference	Circuit-breaker Reference *(2)*	Rating	Im	Line contactor Reference *(3) (4)*
kW	*HP*			A	A	
3-phase supply voltage 380…415 V 50/60 Hz. Type 2 coordination						
0.75	*1*	**ATV 71P075N4Z**	**GV2 L08**	4	–	**LC1 D18●●**
1.5	*2*	**ATV 71PU15N4Z**	**GV2 L10**	6.3	–	**LC1 D18●●**
2.2	*3*	**ATV 71PU22N4Z**	**GV2 L14**	10	–	**LC1 D18●●**
3	–	**ATV 71PU30N4Z**	**GV2 L16**	14	–	**LC1 D18●●**
4	*5*	**ATV 71PU40N4Z**	**GV2 L16**	14	–	**LC1 D18●●**
5.5	*7.5*	**ATV 71PU55N4Z**	**GV2 L22**	25	–	**LC1 D25●●**
7.5	*10*	**ATV 71PU75N4Z**	**NS80HMA50**	50	300	**LC1 D40●●**
3-phase supply voltage 440…480 V 50/60 Hz. Type 2 coordination						
0.75	*1*	**ATV 71P075N4Z**	**GV2 L08**	4	–	**LC1 D18●●**
1.5	*2*	**ATV 71PU15N4Z**	**GV2 L10**	6.3	–	**LC1 D18●●**
2.2	*3*	**ATV 71PU22N4Z**	**GV2 L14**	10	–	**LC1 D18●●**
3	–	**ATV 71PU30N4Z**	**GV2 L14**	10	–	**LC1 D18●●**
4	*5*	**ATV 71PU40N4Z**	**GV2 L16**	14	–	**LC1 D18●●**
5.5	*7.5*	**ATV 71PU55N4Z**	**NS80HMA50**	50	300	**LC1 D25●●**
7.5	*10*	**ATV 71PU75N4Z**	**NS80HMA50**	50	300	**LC1 D40●●**

(1) Standard power ratings for 4-pole motors 50/60 Hz 400 V.
The values expressed in HP comply with the NEC (National Electrical Code).
(2) NS80HMA: Products sold under the Merlin Gerin brand.
Breaking capacity of circuit-breakers according to standard IEC60947-2:

Circuit-breaker	Icu (kA) for 400 V			
		N	H	L
GV2 L08…L14	100	–	–	–
GV2 L16, L22	50	–	–	–
NS80HMA	70	–	–	–

(3) Composition of contactors:
LC1 D18 to LC1 D40: 3 poles + 1 "N/O" auxiliary contact and 1 "N/C" auxiliary contact.
(4) Replace ●● with the control circuit voltage reference indicated in the table below.

	Volts ∿	24	48	110	220	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**

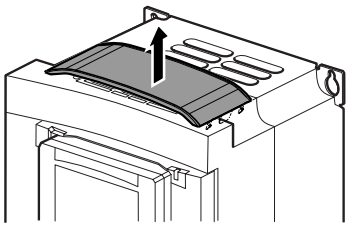
For other voltages available between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.

Variable speed drives for asynchronous motors

Altivar 71

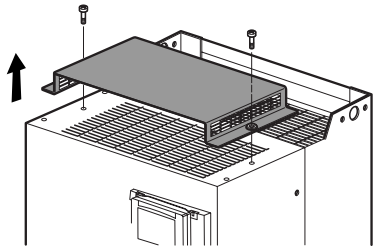
UL Type 1/IP 20 drives

522085



Removing the protective blanking cover for:
ATV 71H●●●M3, ATV 71HD11M3X, HD15M3X, ATV 71H075N4...HD18N4, ATV 71P075N4Z...PU75N4Z

564510



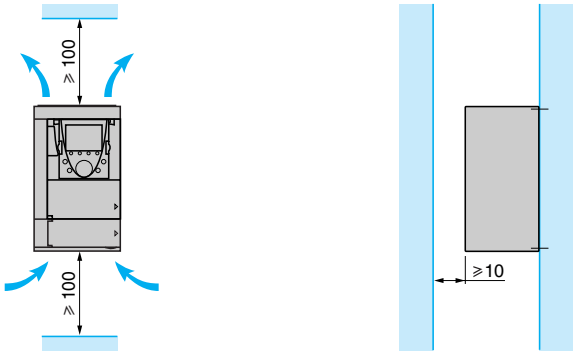
Removing the protective blanking cover for:
ATV 71HD18M3X...HD45M3X, ATV 71HD22N4...HD75N4

Mounting recommendations

Depending on the conditions in which the drive is to be used, its installation will require certain precautions and the use of appropriate accessories.
Install the unit vertically:

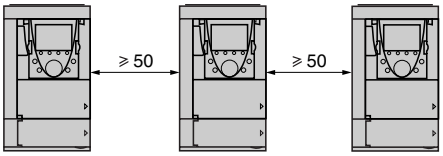
- Do not place it close to heating elements.
- Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

ATV 71H●●●M3, ATV 71HD11M3X...HD45M3X, ATV 71H075N4...HD75N4, P075N4Z...PU75N4Z

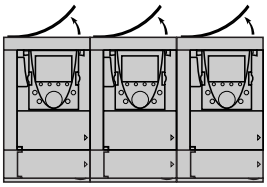


Mounting types

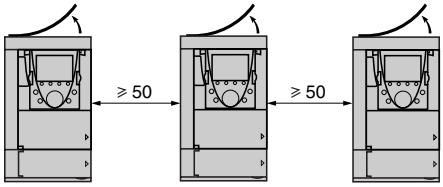
■ Type A mounting



■ Type B mounting



■ Type C mounting



By removing the protective blanking cover from the top of the drive, the degree of protection for the drive becomes IP 20.
The protective blanking cover may vary according to the drive model, see drawings opposite.

Note: *The protective blanking cover must be removed from ATV 71P●●●N4Z drives when they are mounted in a dust and damp proof enclosure.*

Variable speed drives for asynchronous motors
Altivar 71
UL Type 1/IP 20 drives

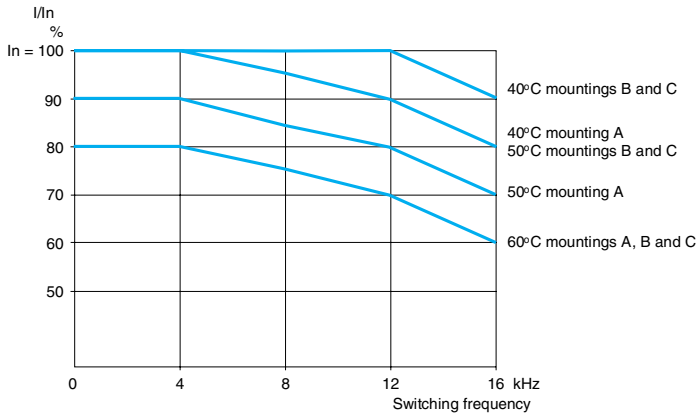
Mounting recommendations (continued)

Derating curves

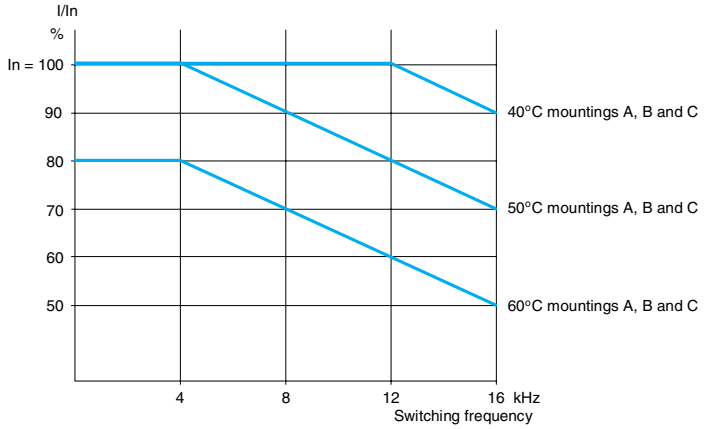
The derating curves for the drive nominal current (In) depend on the temperature, the switching frequency and the mounting type.

For intermediate temperatures (55°C for example), interpolate between 2 curves.

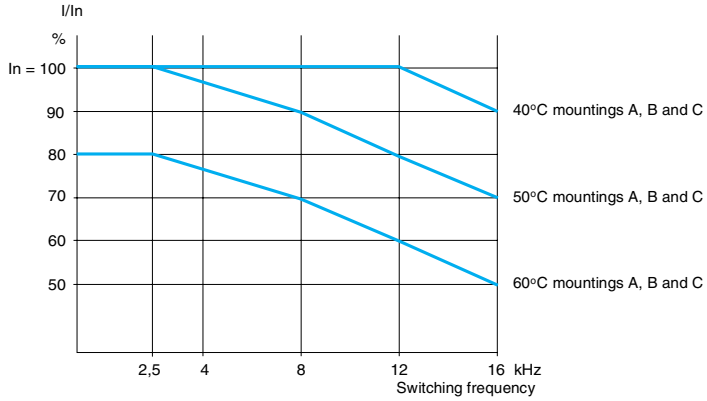
ATV 71H037M3...HD15M3X et ATV 71H075N4...HD18N4 and ATV 71P075N4Z...PU75N4Z



ATV 71HD22N4 and ATV 71HD30N4 *(1)*



ATV HD18M3X...HD45M3X and ATV 71HD37N4...HD75N4 *(1)*

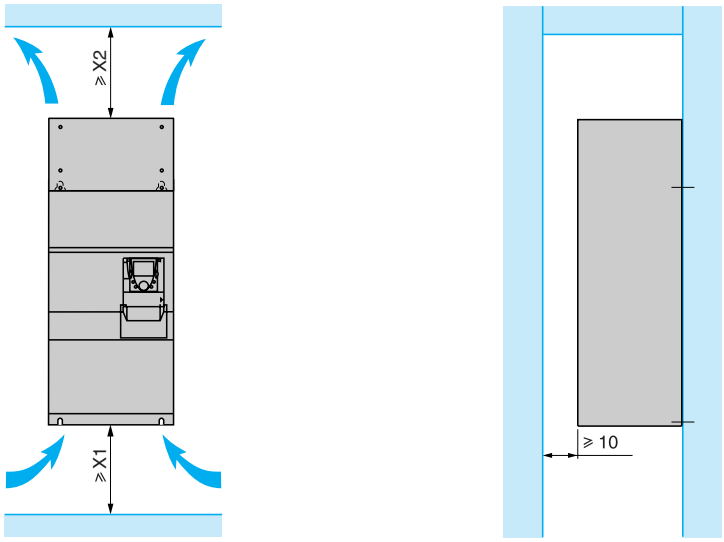


(1) Above 50°C, IATV 71HD18M3X...HD45M3X et ATV 71HD22N4...HD75N4 drives should be fitted with a control card fan kit. See page 2/364.

Variable speed drives for asynchronous motors
Altivar 71
UL Type 1/IP 20 drives

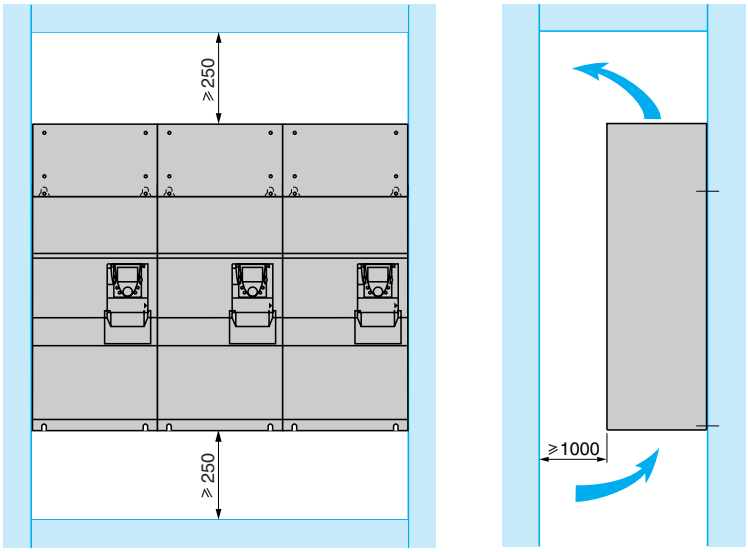
Mounting recommendations (continued)

ATV 71HD55M3X, HD75M3X, ATV 71HD90N4...HC50N4



ATV 71H	X1	X2
D55M3X, D75M3X D90N4	100	100
C11N4...C16N4	150	150
C20N4...C28N4	150	200
C31N4, C40N4	250	300
C50N4	250	400

These drives can be mounted side by side, observing the following mounting recommendations:



Variable speed drives for asynchronous motors
Altivar 71
UL Type 1/IP 20 drives

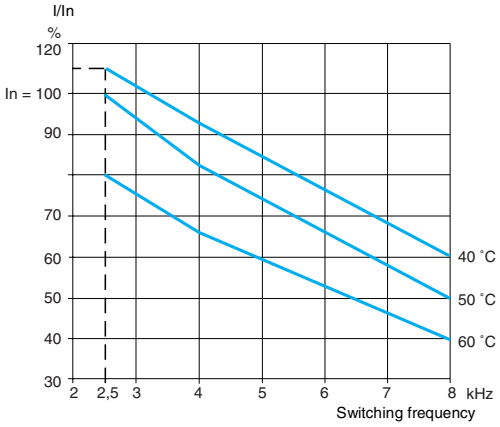
Mounting recommendations (continued)

Derating curves

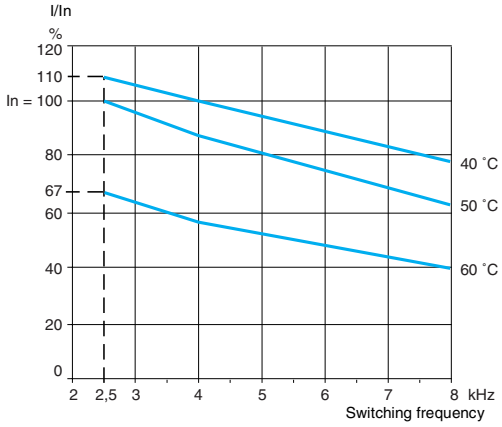
The derating curves for the drive nominal current (In) depend on the temperature, the switching frequency and the mounting type.

For intermediate temperatures (55°C for example), interpolate between 2 curves.

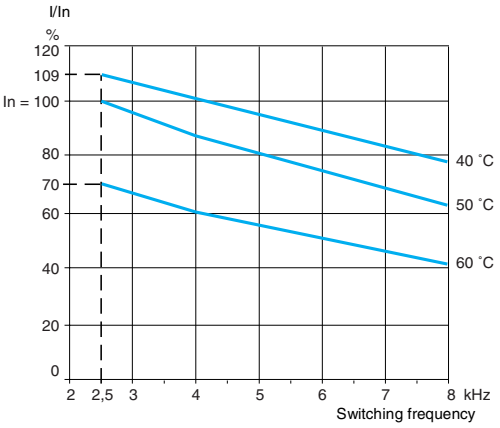
ATV 71HD55M3X, HD75M3X



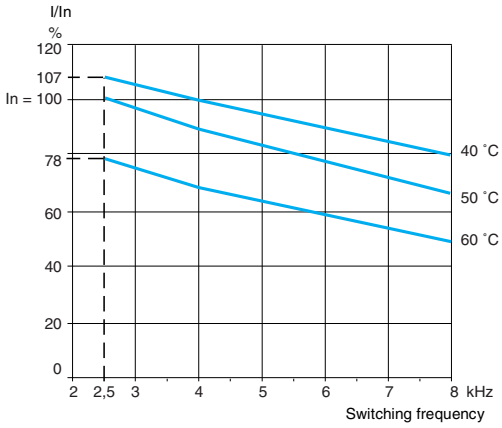
ATV 71HD90N4



ATV 71HC11N4



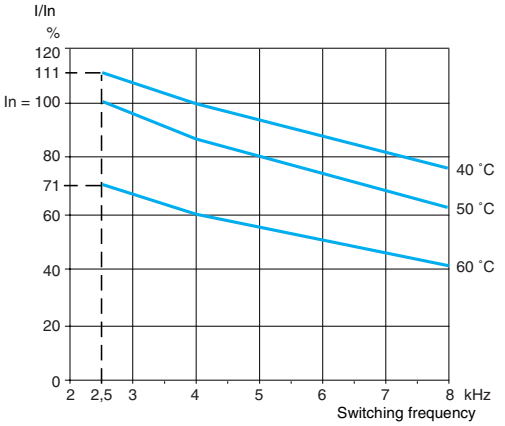
ATV 71HC13N4



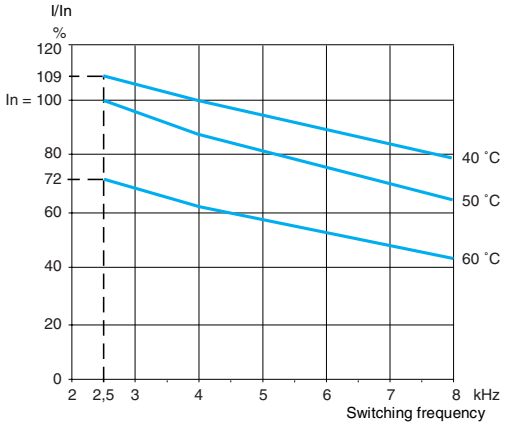
Mounting recommendations (continued)

Derating curves

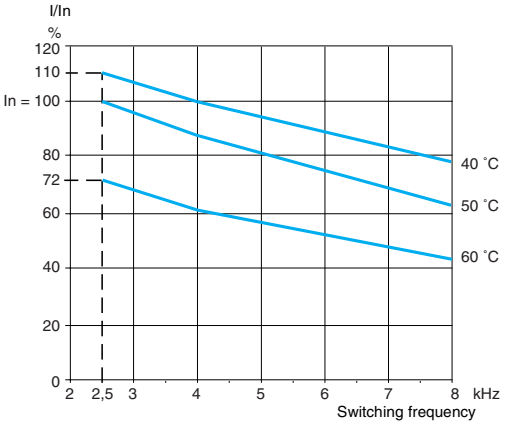
ATV 71HC16N4



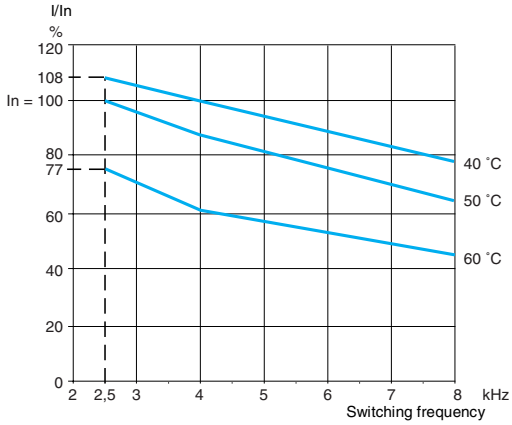
ATV 71HC20N4



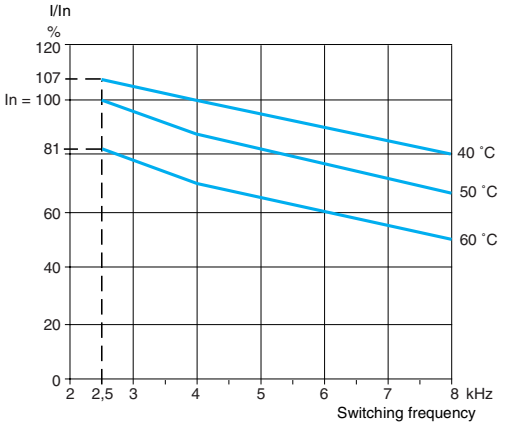
ATV 71HC25N4 combined with a 220 kW motor



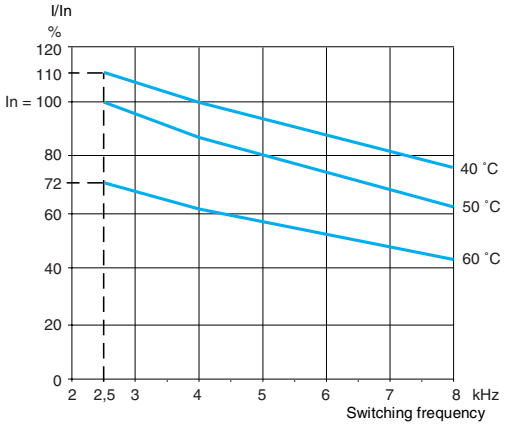
ATV 71HC25N4 combined with a 250 kW motor



ATV 71HC28N4



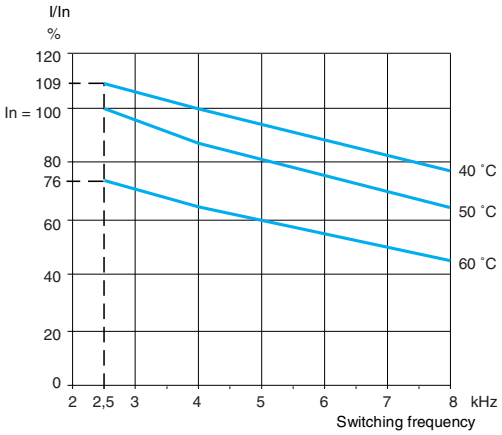
ATV 71HC31N4



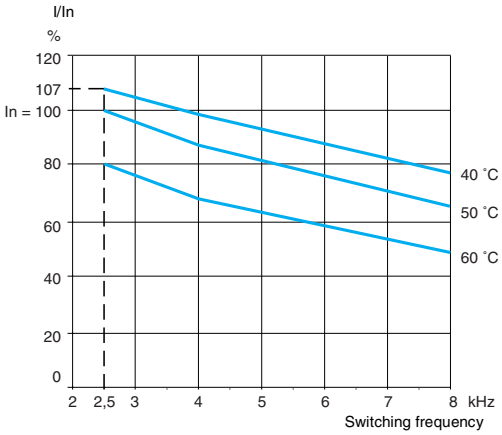
Mounting recommendations (continued)

Derating curves

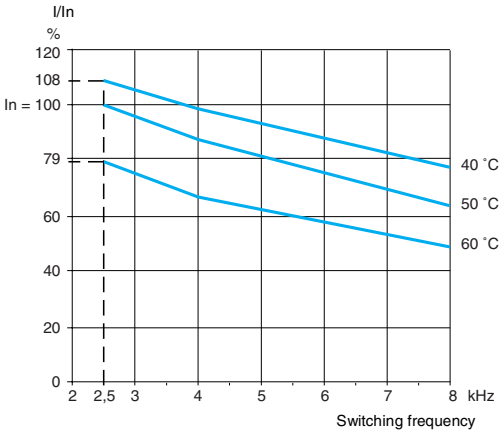
ATV 71HC40N4 combined with a 355 kW motor



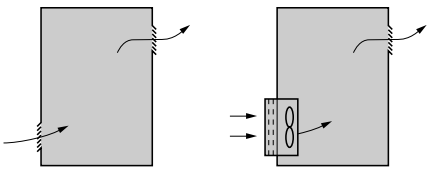
ATV 71HC40N4 combined with a 400 kW motor



ATV 71HC50N4



Variable speed drives for asynchronous motors
Altivar 71
UL Type 1/IP 20 drives on heatsinks



Specific recommendations for mounting ATV 71H●●●M3, ATV 71H●●●M3X and ATV 71H●●●N4 drives in enclosures

Observe the mounting recommendations described on pages 2/498 to 2/503.
To ensure proper air circulation in the drive:
- Fit ventilation grilles
- Ensure that there is sufficient ventilation. If there is not, install a forced ventilation unit with a filter. The openings and/or fans must provide a flow rate at least equal to that of the drive fans (see page 2/507).
- Use special filters with IP 54 protection
- Remove the blanking cover from the top of the drive (see page 2/498).

Power dissipated inside the enclosure

For drives	Dissipated power *(1)*	
	Mounted in the enclosure (power section inside the enclosure)	**Dust and damp proof flush-mounted** (power section outside the enclosure)
	W	**W**
3-phase supply voltage: 200…240 V 50/60 Hz		
ATV 71H037M3	46	25
ATV 71H075M3	66	27
ATV 71HU15M3	101	30
ATV 71HU22M3	122	38
ATV 71HU30M3	154	38
ATV 71HU40M3	191	41
ATV 71HU55M3	293	59
ATV 71HU75M3	363	67
ATV 71HD11M3X	566	80
ATV 71HD15M3X	620	84
ATV 71HD18M3X	657	114
ATV 71HD22M3X	766	124
ATV 71HD30M3X	980	144
ATV 71HD37M3X	1154	161
ATV 71HD45M3X	1366	180
ATV 71HD55M3X	1715	154
ATV 71HD75M3X	2204	154
3-phase supply voltage: 380…480 V 50/60 Hz		
ATV 71H075N4	44	26
ATV 71HU15N4	64	28
ATV 71HU22N4	87	30
ATV 71HU30N4	114	35
ATV 71HU40N4	144	40
ATV 71HU55N4	185	50
ATV 71HU75N4	217	55
ATV 71HD11N4	320	65
ATV 71HD15N4	392	85
ATV 71HD18N4	486	86
ATV 71HD22N4	574	110
ATV 71HD30N4	799	133
ATV 71HD37N4	861	137
ATV 71HD45N4	1060	165
ATV 71HD55N4	1210	178
ATV 71HD75N4	1720	225
ATV 71HD90N4	2403	237
ATV 71HC11N4	2726	261
ATV 71HC13N4	3191	296
ATV 71HC16N4	3812	350
ATV 71HC20N4	4930	493
ATV 71HC25N4	5873	586
ATV 71HC28N4	6829	658
ATV 71HC31N4	7454	772
ATV 71HC40N4	9291	935
ATV 71HC50N4	11345	1116

(1) This value is given for operation at nominal load and for a switching frequency of 2.5 or 4 kHz depending on the rating.
Add 7 W to this value for each additional option card.

Fan flow rate depending on the drive rating

For drive	Flow rate m³/hour
ATV 71H037M3…HU15M3, ATV 71H075N4…HU22N4	17
ATV 71HU22M3…HU40M3, ATV 71HU30N4, HU40N4	56
ATV 71HU55M3, ATV 71HU55N4, HU75N4	112
ATV 71HU75M3, ATV 71HD11N4	163
ATV 71HD11M3X, HD15M3X ATV 71HD15N4, HD18N4	252
ATV 71HD18M3X, HD22M3X, ATV 71HD22N4	203
ATV 71HD30N4, HD37N4	203
ATV 71HD30M3X…HD45M3X	406
ATV 71HD45N4…HD75N4	406
ATV 71HD55M3X, ATV 71HD90N4	402
ATV 71HD75M3X, ATV 71HC11N4	774
ATV 71HC13N4	745
ATV 71HC16N4	860
ATV 71HC20N4… HC28N4	1260
ATV 71HC31N4, HC40N4	2100
ATV 71HC50N4	2400

Sealed metal enclosure (IP 54 degree of protection)

The drive must be mounted in a dust and damp proof casing in certain environmental conditions: dust, corrosive gases, high humidity with risk of condensation and dripping water, splashing liquid, etc.
This enables the drive to be used in an enclosure where the maximum internal temperature reaches 50°C.

Calculating the enclosure dimensions

Maximum thermal resistance Rth (°C/W)

$$Rth = \frac{\theta - \theta e}{P}$$

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 drive: see page 2/504 (mounting in an enclosure or flush-mounting in an enclosure).
Add the power dissipated by the other equipment components.

Useful heat dissipation surface of enclosure S (m²)

(sides + top + front panel if wall-mounted)

$$S = \frac{K}{Rth}$$

K = enclosure thermal resistance per m²

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.*

Variable speed drives for asynchronous motors
Altivar 71
UL Type 1/IP 20 drives on base plates

Specific recommendations for mounting drives on base plates in a dust and damp proof enclosure or on a machine frame

Observe the mounting recommendations described on pages 2/498 and 2/499.

Power dissipated inside the enclosure

For drives	Dissipated power *(1)*	
	Mounted in the enclosure with no fan *(2)*	Mounted in the enclosure with a fan
	W	W
3-phase supply voltage: 380…480 V 50/60 Hz		
ATV 71P075N4Z	26	39
ATV 71PU15N4Z	28	41
ATV 71PU22N4Z	30	43
ATV 71PU30N4Z	35	65
ATV 71PU40N4Z	37	67
ATV 71PU55N4Z	40	95
ATV 71PU75N4Z	40	95

Specific recommendations for mounting in a dust and damp proof enclosure

Drives on base plates can be mounted in a dust and damp proof enclosure in accordance with the following specific recommendations:
- External ambient temperature (heatsink side, see page 2/366): -10…+40°C
- Temperature inside the enclosure: +40°C for a switching frequency of 4 kHz, or +50°C for a switching frequency of 12 kHz
- Remove the blanking cover from the top of the drive, see page 2/498.

Specific recommendations for mounting on a machine frame

Drives on base plates can also be mounted on a machine frame in accordance with the following specific recommendations:
- Ambient temperature: -10…+40°C
- Thermal resistance (Rth) of the frame smaller than or equal to the thermal resistance of the kit for mounting in a dust and damp proof enclosure VW3 A980● (see page 2/366)
- Aluminium machine frame; mounting on iron frame not recommended
- Support area machined on the frame, to give a surface smoothness of 100 µm and unevenness of 3.2 µm maximum
- Heatsink mounted in the centre of the support with a minimum thickness and a minimum cooling area, exposed to the open air (see table below).

Drives	Switching frequency	Minimum area		Minimum thickness
		With DC choke	With fan	
		m^2	m^2	mm
ATV 71P075N4Z …PU22N4Z	4 kHz	–	–	20
	12 kHz	0.60	0.70	20
ATV 71PU30N4Z, PU40N4Z	4 kHz	1.50	–	20
	12 kHz	2.00	1.50	20
ATV 71PU55N4Z, PU75N4Z	4 kHz	3.50	3.00	20
	12 kHz	5.40	5.00	20

(1) This value is given for operation at nominal load and for a switching frequency of 4 kHz. Add 7 W to this value for each additional option card.
(2) Add the dissipation of the DC choke, see page 2/419.

Calculating the thermal resistance

Thermal resistance Rth of the machine frame or base plate (°C/W)

For drive	Rth maximum (°C/W)
ATV 71P075N4Z	0.65
ATV 71PU15N4Z	0.36
ATV 71PU22N4Z	0.24
ATV 71PU30N4Z	0.21
ATV 71PU40N4Z	0.15
ATV 71HPU55N4Z	0.03
ATV 71PU75N4Z	0.02

Mounting several drives on the same frame or the same cold plate

Determine the equivalent thermal resistance (Rthe) for all the drives:

$$\frac{1}{Rthe} = \frac{1}{Rth1} + \frac{1}{Rth2} + \frac{1}{Rth3} + \ldots + \frac{1}{Rthn}$$

Calculation example with three drives of 0.75 kW, 1.5 kW and 2.2 kW

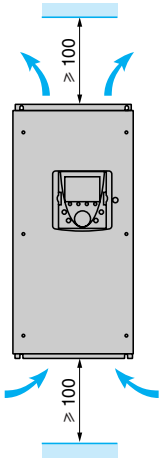
$$\frac{1}{Rth} = \frac{1}{0,65} + \frac{1}{0,36} + \frac{1}{0,24}$$ Rth = 0.12 °C/W.

Variable speed drives for asynchronous motors
Altivar 71
UL Type 12/IP 54 drives

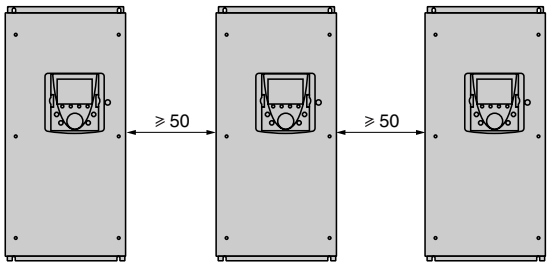
Mounting recommendations

Depending on the conditions in which the drive is to be used, its installation will require certain precautions and the use of appropriate accessories.
Install the unit vertically:
- Do not place it close to heating elements
- Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

ATV 71W●●●N4



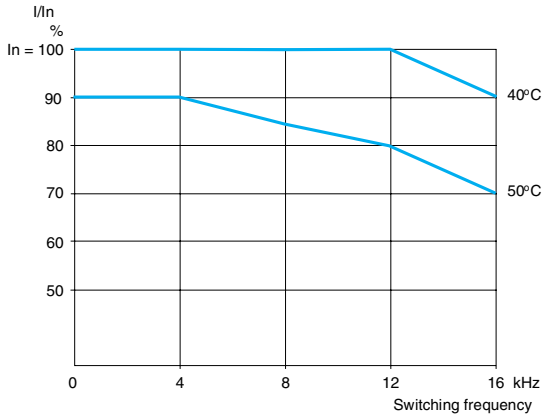
Mounting



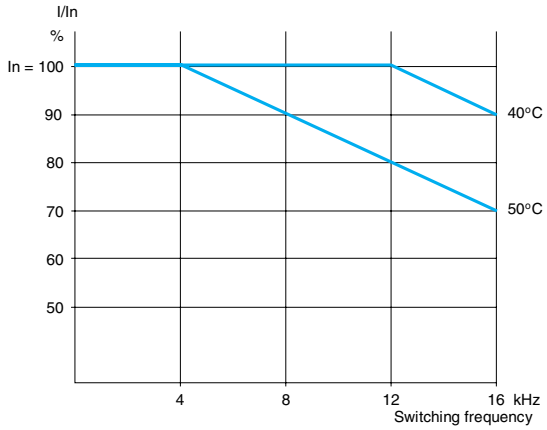
Variable speed drives for asynchronous motors
Altivar 71
UL Type 12/IP 54 drives

Derating curves

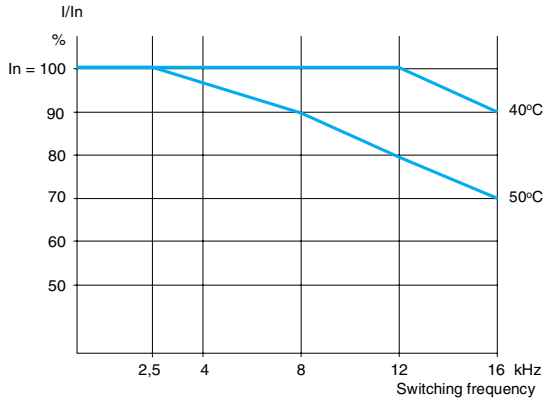
ATV 71W075N4...WD18N4



ATV 71WD22N4, WD30N4



ATV 71WD37N4...WD75N4



Variable speed drives for asynchronous motors
Altivar 71

Compatible combinations of functions and applications

Applications	Hoisting	Lift	Material handling
Machines	**Cranes, overhead cranes, gantries (vertical hoisting, translation, slewing), lifting platforms**	**Retrofit lifts up to 1.2 ms**	**Palletizers/depalletizers, carton packers, labelling machines, conveyors, roller tables**
			
Motor control functions			
Flux vector control with and without sensor	■	■	■
2-point vector control	■		
Open-loop synchronous motor			
ENA system			
Voltage/frequency ratio			■
Output frequency 1000 Hz			
Motor overvoltage limiting	■	■	■
Application functions			
Differential bipolar reference	■		■
Reference delinearization (magnifying glass effect)	■		■
Frequency control input			
Operations on references (summing, subtraction, multiplication)			■
Brake control	■	■	■
Brake feedback via contact	■		
High-speed hoisting	■		
Load measurement	■	■	
Load sharing	■		■
Slack sling	■		
Limit switch management	■	■	■
S ramp	■	■	■
Current limiting			
Output contactor command		■	
Integrity check of output contactor		■	
Rescue following power failure		■	
Stop on thermal alarm		■	
Torque control			■
Torque limit			■
Motor fluxing	■		■
Parameter set switching	■	■	■
Motor switching	■		■
Position control via limit switches			■
Uncontrolled output cut			■
Torque or current limit detection			■
PID regulator			
Auto/man			
Reference saving			
+/- speed, single action button			
+/- speed, double action button	■		
+/- speed around a reference			
Traverse control			
Automatic catching a spinning load with speed detection (catch on the fly)			
Undervoltage management			
Fastest possible stop			

■ **Frequent or necessary use**

2.5

Presentation: pages 2/342 to 2/347 | Characteristics: pages 2/348 to 2/355 | References: pages 2/360 to 2/363 | Dimensions: pages 2/446 to 2/471 | Schemes: pages 2/472 to 2/491

(For other functions that can be used for all applications, see pages 2/522 to 2/543)

Packing	Textiles	Wood	High inertia	Process
Palletizers/depalletizers, carton packers, labelling machines	Weaving looms, carding frames, washing machines, spinners, drawing frames	Automatic lathes, saws, milling	Centrifuges, mixers, unbalanced machines (beam pumps, presses)	Sectional production lines (speed < 500 m/min) Example: building materials
				
■	■	■	■	■
	■			
	■			
			■	
		■	■	
	■	■		
■	■	■	■	■
■				
	■			■
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	■	■	■	■
		■	■	

Variable speed drives for asynchronous motors
Altivar 71

Summary of functions

Remote graphic display terminal functions

Description	page 2/514
Navigation	page 2/515
Password	page 2/515

Integrated 7-segment display terminal

Presentation	page 2/516

Start-up

Simply Start menu	page 2/516
Programming using macro-configurations	page 2/517
MONITORING menu	page 2/518

Configuration and settings

Presentation	page 2/518

Operation

Presentation	page 2/518

Maintenance, diagnostics

Response to faults or alarms	page 2/519
Fault log and help	page 2/519
IDENTIFICATION menu	page 2/519
Test functions	page 2/519
Oscilloscope function	page 2/519

Controlling the drive

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105631-36-M

Remote graphic display terminal functions

This display terminal is attached to the front of the drive. It includes the integrated 7-segment display terminal for drives supplied without a graphic display terminal.

■ **Description**

□ **Description of graphic display terminal**

1 Graphic display unit:
- 8 lines, 240 x 160 pixels
- large digit display that can be read from 5 m away
- bar chart display

2 Assignable function keys F1, F2, F3, F4:
- dialogue functions: direct access, help screens, navigation
- application functions: Local/Remote, preset speed

3 STOP/RESET key: local control of motor stopping/fault clearing

4 RUN key: local control of motor operation

5 Navigation button:
- Press to save the current value (ENT)
- Turn ± to increase or decrease the value, go to the next or previous line

6 FWD/REV key: reverses the direction of rotation of the motor

7 ESC key: aborts a value, parameter or menu to return to the previous option

Note: *keys 3, 4 and 6 can be used to control the drive directly.*

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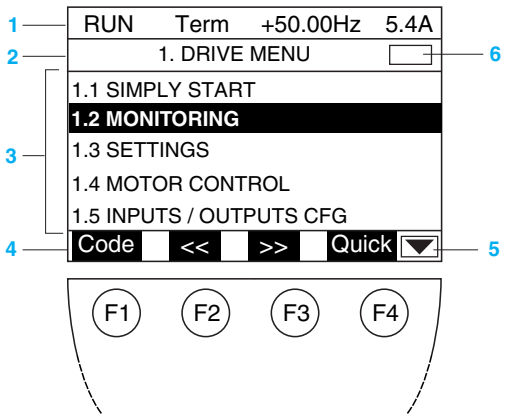

□ **Description of graphic display unit**

1 Display line. Its content can be configured; the factory settings show:
- the drive status (e.g. RUN)
- the active control channel (e.g. “Term”: terminals)
- the frequency reference
- the current in the motor

2 Menu line. Indicates the current menu or submenu.

3 Area displaying menus, submenus, parameters, values, bar charts, in the form of a scrolling window, with a maximum of 5 lines.
The line or value selected using the navigation button is displayed in reverse video (see example opposite).

4 Section displaying the functions assigned to the F1 to F4 keys and aligned with them, for example:
- >>: Horizontal scrolling to the right, or proceeding to the next menu or submenu, or, in the case of a value, decreasing the value, displayed in reverse video (see example opposite).
- <<: Horizontal scrolling to the left, or proceeding to the next menu or submenu, or, in the case of a value, increasing the value, displayed in reverse video
- Quick: Rapid access to a parameter from any screen when the Quick function is displayed above the F4 key
- HELP: Contextual help
- Code: Displays the selected parameter code
- Other functions (application functions) can be assigned to these keys via the 1.6 COMMAND menu.

5 ▭ : Means that this display window does not scroll further down.
▼ : Means that this display window can scroll further down.

6 ▲ : Means that this display window can scroll further up.
▭ : Means that this display window does not scroll further up.

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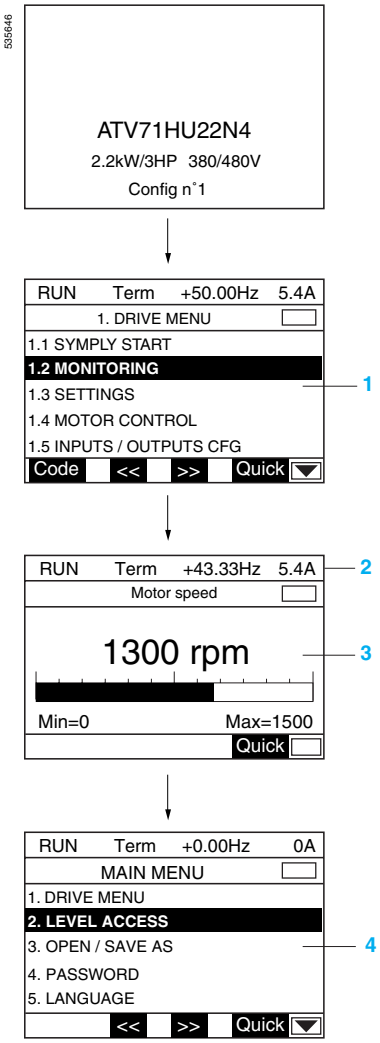


Remote graphic display terminal functions (continued)

■ **Navigation: accessing menus and parameters**

Structure of main menus:

1 Drive menu:

Menu type	Function
1.1 SIMPLY START	Simplified menu for a quick start
1.2 MONITORING	Displays current values for motor, inputs/outputs and communication (command words, status words, etc.)
1.3 SETTINGS	Accesses the adjustment parameters, which can be modified during operation
1.4 MOTOR CONTROL	Accesses the motor parameters, including adjustment of motor control profiles
1.5 INPUTS/OUTPUTS CFG	Configures the I/O and transforms signals
1.6 COMMAND	Configures the command and reference channels
1.7 APPLICATION FUNCT.	Configures the application functions (preset speeds, PID regulator, etc.)
1.8 FAULT MANAGEMENT	Configures the fault management process
1.9 COMMUNICATION	Configures the communication networks
1.10 DIAGNOSTICS	Provides diagnostics for motor and drive, integrated test procedures, fault log
1.11 IDENTIFICATION	Identifies the drive and the internal options
1.12 FACTORY SETTINGS	Restores factory settings (completely or by parameter group)
1.13 USER MENU	Accesses the parameters selected by the user
1.14 PROGRAMMABLE CARD	Accesses the parameters for the Controller Inside programmable card

2 Display line

3 Display screen: Displays values in the form of bar charts or digital values, depending on the extent of customization.

4 Main menu:

Menu type	Function
1. DRIVE MENU	See above (1 Drive menu)
2. ACCESS LEVEL	4 access levels: basic, limited, advanced, expert
3. OPEN/SAVE AS	Transfers files between the graphic display terminal and the drive
4. PASSWORD	Provides password protection for the configuration
5. LANGUAGE	Choice of 6 languages available (English, German, Spanish, French, Italian and Chinese)
6. MONITORING CONFIG.	Customizes the display line 2 and the display screen 3 (bar charts, digital values)
7. DISPLAY CONFIG.	Configures how parameters are displayed: customization, selection for User menu, visibility, accessibility

■ **Password**

Altivar 71 drives allow individual parameters to be selected for password protection. Rights can be set for save operations and for loading the configuration.

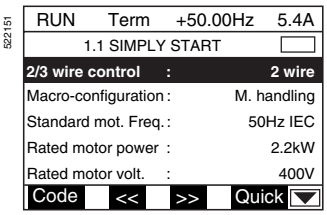
2

Integrated 7-segment display terminal

ATV 71●●●●M3, ATV 71HD11M3X, HD15M3X, ATV 71H075N4…HD15N4 drives can be supplied without a graphic display terminal. In this case, they are equipped with an integrated 7-segment display terminal.
ATV 71P●●●N4Z drives are equipped as standard with an integrated 7-segment display terminal.
This can be used to:
- Display status and faults
- Access and modify parameters

Start-up

The Altivar 71 drive is supplied ready for use for most applications.
When the drive is switched on, the menus for setting the language and access level appear automatically.



Simply Start menu

■ Simply Start menu

By accessing the Simply Start menu directly it is possible to:
- Pre-program the drive for an application:
  - Select the relevant macro-configuration
  - 2-wire/3-wire control
- Benefit from optimum motor performance:
  - Enter data from the motor rating plate
  - Auto-tuning
- Protect the motor by setting the drive's integrated electronic thermal overload relay

2.5

Start-up (continued)

■ **Programming using macro-configurations**

Programming using macro-configurations offers the choice of seven options corresponding to the various business areas and applications:

- □ Start/stop
- □ Material handling
- □ General use
- □ Hoisting
- □ PID regulation
- □ Communication network connectivity
- □ Master/slave applications

Choosing one of these macro-configurations automatically assigns the functions, parameters and I/O, even in the case of option cards. Although the configuration is preset, it can still be modified, if necessary.

The Start/stop macro-configuration is set as the factory configuration.
The preset functions for each macro-configuration are given in the table below.

Type of macro-configuration		Start/stop	Material handling	General use	Hoisting	PID regulation	Communication network connectivity	Master/slave application
Altivar 71 drive I/O								
AI1		Ref. 1 channel	Ref. 1 channel	Ref. 1 channel	Ref. 1 channel	PID reference	Ref. 2 channel Ref. 1 channel by bus	Ref. 1 channel
AI2		Not assigned	Sum ref. 2	Sum ref. 2	Not assigned	PID feedback	Not assigned	Torque ref. 2 channel
AO1		Motor freq.	Motor freq.	Motor freq.	Motor freq.	Motor freq.	Motor freq.	Signed torque
2-wire	**LI1**	Forward	Forward	Forward	Forward	Forward	Forward	Forward
	LI2	Reverse	Reverse	Reverse	Reverse	Reverse	Reverse	Reverse
	LI3	Not assigned	2 preset speeds	JOG	Fault reset	PID integral reset	Ref 2 switch	Trq/spd switching
	LI4	Not assigned	4 preset speeds	Fault reset	Ext fault	PID 2 preset ref.	Fault reset	Fault reset
	LI5	Not assigned	8 preset speeds	Torque limit	Not assigned	PID 4 preset ref.	Not assigned	Not assigned
	LI6	Not assigned	Fault reset	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
3-wire	**LI1**	Stop	Stop	Stop	Stop	Stop	Stop	Stop
	LI2	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
	LI3	Reverse	Reverse	Reverse	Reverse	Reverse	Reverse	Reverse
	LI4	Not assigned	2 preset speeds	JOG	Fault reset	PID integral reset	Ref 2 switch	Trq/spd switching
	LI5	Not assigned	4 preset speeds	Fault reset	Ext fault	PID 2 preset ref.	Fault reset	Fault reset
	LI6	Not assigned	8 preset speeds	Torque limit	Not assigned	PID 4 preset ref.	Not assigned	Not assigned
R1		Faulty	Faulty	Faulty	Faulty	Faulty	Faulty	Faulty
R2		Not assigned	Not assigned	Not assigned	Brk control	Not assigned	Not assigned	Not assigned
I/O extension card I/O								
2-wire	**LI7**	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
3-wire	**LI7**	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
LI8 to LI14		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
LO1 to LO4		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
R3/R4		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
AI3, AI4		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
RP		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
AO2		Motor current	Motor current	Motor current	Motor current	Motor current	Motor current	Motor current
AO3		Not assigned	Signed torque	Not assigned	Signed torque	PID error	Not assigned	Motor freq.
Graphic display terminal keys								
F1 key		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Control via graphic display terminal	Not assigned
F2, F3, F4 keys		Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned

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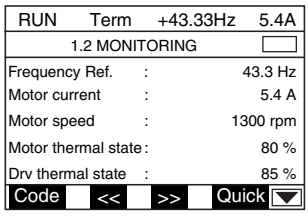
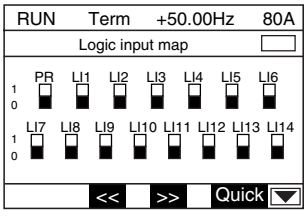
Altivar 71

Start-up (continued)

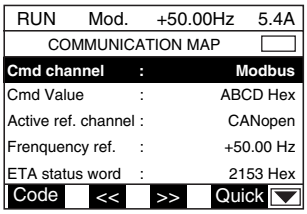
■ **MONITORING menu**
The MONITORING menu can be used to display commands, the operation of the motor and the application via the drive, its I/O or the communication network connections.



Displaying physical values



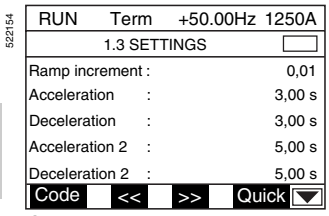
Logic input map



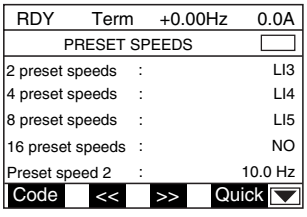
Communication map

Configuration and settings

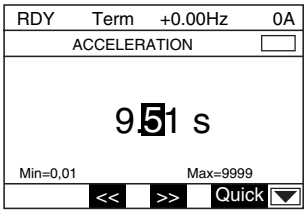
The SETTINGS menu can be used to configure all the drive's settings.
Activating a function automatically provides access to the related settings on the same screen (the application functions are described on pages 2/522 to 2/543).



Settings screen



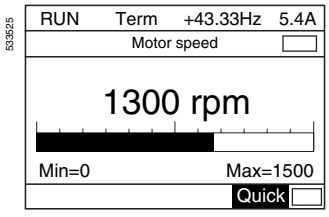
Setting a function



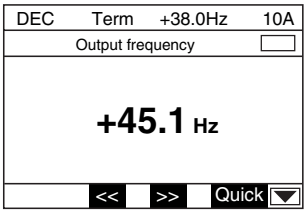
Configuring a value

Operation

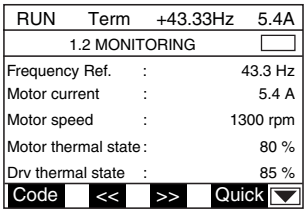
The display screen appears automatically every time the drive is turned on.
There are various possibilities:
- One or two bar charts are displayed.
- One, two or five digital values are displayed.



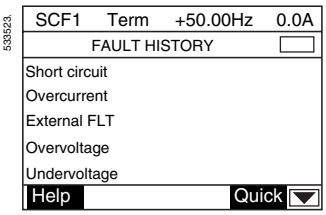
1 bar chart



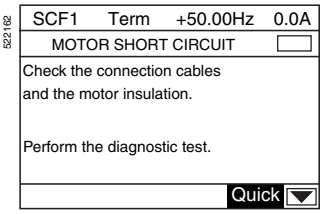
1 digital value



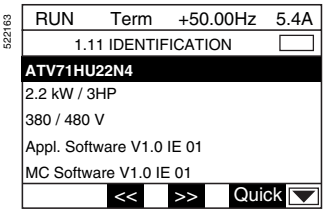
5 digital values



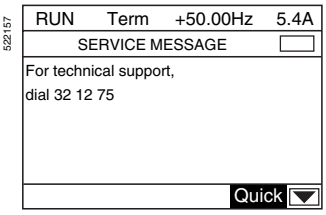
Fault log



Troubleshooting screen



Identification screen



Example of a customized message

Maintenance, diagnostics

New functions have been added to the Altivar 71 drive to enable it to provide quick and simple maintenance, ultimately boosting productivity:

■ Response to faults or alarms

It is possible to use the alarm management or drive operation configuration functions to take corrective actions before stopping the machine.

■ Fault log and help

When a fault occurs, a help screen is available to quickly identify the cause of the fault.
When a fault occurs, values such as speed, current, thermal state and timer are saved and restored in the fault log.
The last 8 faults are stored.

■ IDENTIFICATION menu

The IDENTIFICATION menu can be used to display the relevant serial numbers and software versions, thereby helping to manage the equipment base. This information, also available with the PowerSuite software workshop, can be exported to other database-type software applications.

■ Test functions

The Altivar 71 drive includes the following test functions:
□ Identifying any motor short-circuit before start-up
□ Running, via the graphic display terminal or PowerSuite software workshop, automatic procedures during maintenance operations to test:
- the motor
- the drive power components

The test results are shown on the graphic display terminal or using the PowerSuite software workshop.
It is also possible to write and read messages in the drive using the graphic display terminal or the PowerSuite software workshop.

■ Oscilloscope function

The Altivar 71 drive has an oscilloscope function, which produces traces that can be viewed using the PowerSuite software workshop.
The PowerSuite software workshop can also be used to carry out remote diagnostics via modem.

2

2.5

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2

2.5

Controlling the drive

■ **Via the drive I/O**

Control signals are transmitted via cable to the I/O. Functions are assigned to logic inputs, analog inputs, etc.
A logic input can be assigned to more than one function. This means that two functions can be controlled using a single signal, thereby limiting the number of inputs required.

The Altivar 71 drive I/O can be configured independently from each other.
For instance,
□ A time delay can be applied when it comes to reading the logic inputs, so as to avoid any bounce-back from certain switches.
□ Transforming incoming signals on the analog inputs can help the drive fully adapt to the control devices and applications:
- Minimum and maximum values for the input signal
- Input filtering in order to eliminate unwanted interference from the signals received
- Magnifying glass effect through delinearizing the input signal in order to increase the precision with small amplitude signals
- “Pedestal” and “Deadband” functions for signals in order to prevent low speed operations which can have an adverse effect on the application
- “Mid-point” function, which can be used from a unipolar input signal to obtain a bipolar output signal to control the speed and direction of rotation

□ Transforming analog outputs which transfer information sent by the drive to other devices (display units, drives, PLCs, etc.):
- voltage or current output signal
- minimum and maximum values for the output signal
- output signal filtering

Logic outputs can be delayed on activation and deactivation.
The output state can also be configured when the signal is active.
The frequency control signals are also transformed by the drive:
□ signal frequency minimum and maximum values (30 kHz on the extended I/O card’s RP input, 300 kHz maximum on the encoder interface card input).

■ **Via the remote graphic display terminal**

The rotation commands and references (torque, speed or PID) can be controlled via the graphic display terminal. Some application functions can also be assigned to the function keys F1, F2, F3 and F4 on the graphic display terminal. It is possible to manage a change in command and/or reference source (bumpless function) in different ways.
For example: two options are offered when switching from control via the terminals to control via the graphic display terminal:
□ stop the Altivar 71 drive, or
□ continue operation with a copy of the direction of rotation and reference

Controlling the drive (continued)

■ **Via a communication network**

□ **I/O profile**

The I/O profile, which is quick and easy to use, can be used to control the Altivar 71 drive via the communication network, in the same way as via the I/O terminals. When commands are sent via a network they are written in a command word. This word behaves like virtual terminals containing logic inputs.
Application functions can be assigned to the bits of this word. More than one function can be assigned to the same bit.

The commands and references can come from different sources, such as the terminals, graphic display terminal or communication networks.
Each source can be set or switched individually using logic inputs or command word bits.

The I/O profile is supported by all integrated communication ports (Modbus, CANopen), as well as by all the communication cards available (Ethernet TCP/IP, Fipio, Profibus DP, etc.).

□ **CiA DSP 402 profile ("Device Profile Drives and Motion Control")**

This profile, from the CiA (CAN in Automation) organization, describes standard functions, parameters and operation for variable speed drives.
This standard is an extension of the Drivecom profile. The Altivar 71 drive complies with the CiA DSP 402 standard and it supports the following 2 modes in this profile: separate and not separate.

Separate mode

The Start/Stop commands and references can come from different sources.
E.g. the speed reference is transmitted by the Ethernet TCP/IP network and the Start/Stop commands by the logic signals wired on the terminals.

Each source can be set or switched individually using logic inputs or command word bits.

Not separate mode

The Start/Stop commands and references (speed, torque, PID, etc.) come from the same source (e.g. CANopen bus).

It is possible to replace this source by another one, using a logic input or command word bit.

The CiA DSP 402 profile is supported by all integrated communication ports (Modbus, CANopen), as well as by all the communication cards available (Ethernet TCP/IP, Fipio, Profibus DP, etc.).

□ **ODVA profile**

The ODVA profile is supported by the DeviceNet communication card.

2

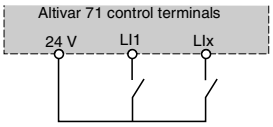
2.5

Application functions

■ 2-wire control

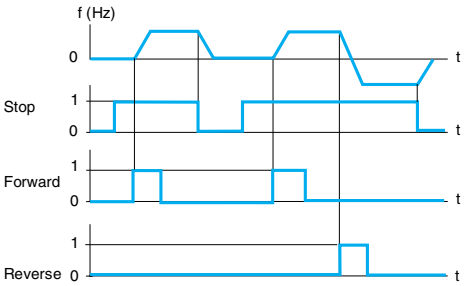
This function is used to control the direction of operation by means of a stay-put contact.
It is enabled by means of 1 or 2 logic inputs (non-reversing or reversing).

This function is suitable for all non-reversing and reversing applications.
3 operating modes are possible:
- □ Detection of the state of the logic inputs
- □ Detection of a change in state of the logic inputs
- □ Detection of the state of the logic inputs with forward operation always having priority over reverse



LI1: Forward
LIx: Reverse

Wiring diagram for 2-wire control

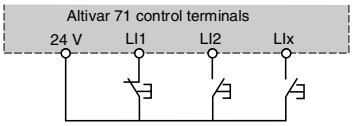


Example of 3-wire control operation

■ 3-wire control

This function is used to control the operating and stopping direction by means of pulsed contacts.
It is enabled by means of 2 or 3 logic inputs (non-reversing or reversing).

This function is suitable for all non-reversing and reversing applications.

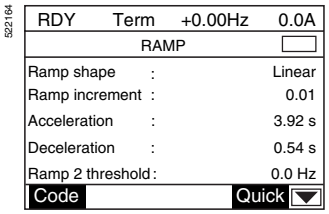


LI1: Stop
LI2: Forward
LIx: Reverse

Wiring diagram for 3-wire control

■ Phase rotation

This function can be used to reverse the direction of rotation without modifying the drive wiring.

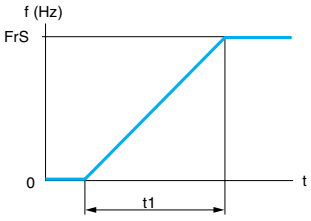


Ramp settings

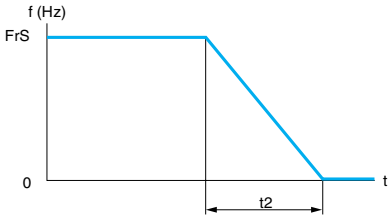
■ Ramps

□ Acceleration and deceleration ramp times

This function is used to define acceleration and deceleration ramp times according to the application and the machine dynamics.



Linear acceleration ramp



Linear deceleration ramp

FrS: Nominal motor frequency
t1: Acceleration time
t2: Deceleration time
t1 and t2 can be set independently from 0.01 to 9999 s
(according to one of the following ramp increments: 0.01 s, 0.1 s or 1 s)
Factory setting: 3 s.

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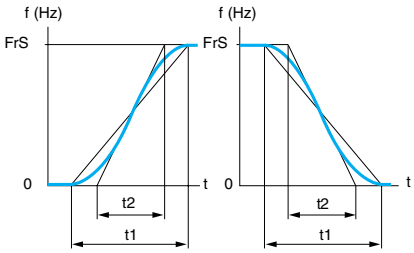
□ Acceleration and deceleration ramp profile

Used to gradually increase the output frequency starting from a speed reference, following a linear profile or a preset profile.

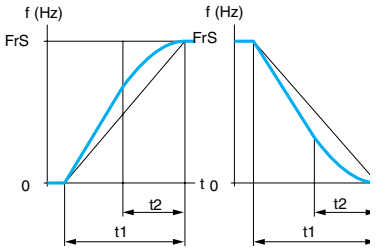
In the case of applications involving handling, packaging and passenger transport, the use of S ramps takes up mechanical play and eliminates jolts, and also limits “non-following” of speed during rapid transient operation of high-inertia machines. Selecting “linear”, “S”, “U” or customized profiles assigns both the acceleration and deceleration ramps.

S ramps



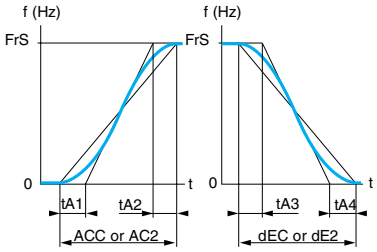
FrS: Nominal motor frequency
t1: Ramp time set
t2 = 0.6 x t1
The curve coefficient is fixed.

U ramps

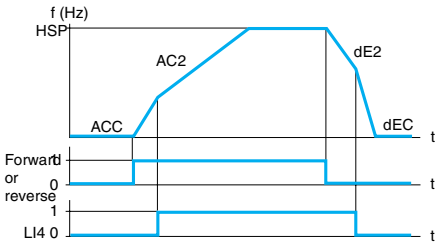


FrS: Nominal motor frequency
t1: Ramp time set
t2 = 0.5 x t1
The curve coefficient is fixed.

Customized ramps



FrS: Nominal motor frequency
tA1: Adjustable between 0 and 100% (of ACC or AC2)
tA2: Adjustable between 0 and (100% - tA1) (of ACC or AC2)
tA3: Adjustable between 0 and 100% (of dEC or dE2)
tA4: Adjustable between 0 and (100% - tA3) (of dEC or dE2)
ACC: Acceleration ramp 1 time
AC2: Acceleration ramp 2 time
dEC: Deceleration ramp 1 time
dE2: Deceleration ramp 2 time



Example of switching using logic input LI4

Acceleration 1 (ACC) and deceleration 1 (dEC):
- Adjustment 0.01 to 9999 s
- Factory setting 3 s

Acceleration 2 (AC2) and deceleration 2 (dE2):
- Adjustment 0.01 to 9999 s
- Factory setting 5 s

HSP: High speed.

□ Ramp switching

This function is used to switch two acceleration and deceleration ramp times, which can be adjusted separately.
Ramp switching can be enabled by:
- a logic input
- a frequency threshold
- a combination of the logic input (or a command word bit) and the frequency threshold
- a command word bit

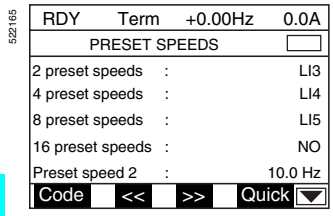
This function is suitable for:
- material handling with smooth starting and approach
- machines with fast steady state speed correction

□ Automatic adaptation of deceleration ramp

Used to automatically adapt the deceleration ramp if the initial setting is too low when the load inertia is taken into account. This function prevents the drive from locking in the event of an overbraking fault.
When this function is active and a short deceleration time has been set, the drive optimizes the motor power supply in order to achieve a high braking torque.

This function is suitable for all applications not requiring precise stopping and not using braking resistors.

Automatic adaption must be disabled for machines with a stop position on a ramp and using a braking resistor. This function is automatically disabled if the brake sequence is configured.

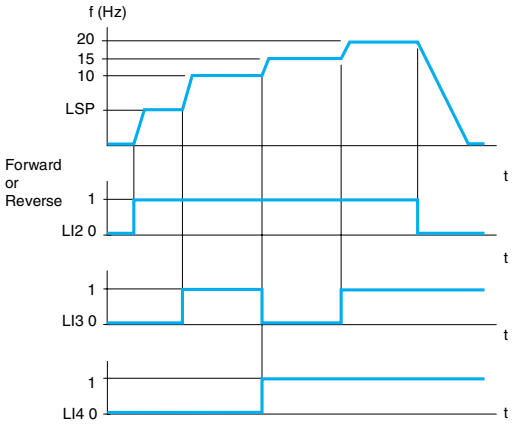


Preset speed settings

■ Preset speeds

This can be used to switch preset speed references.
Choose between 2, 4, 8 or 16 preset speeds.
It is enabled by means of 1, 2, 3 or 4 logic inputs.
Preset speeds can be set in increments of 0.1 Hz, from 0 Hz to 500 Hz or 1000 Hz, depending on the rating.

This function is suitable for material handling and machines with several operating speeds.



The speed achieved with the LI3 and LI4 inputs at 0 is LSP or reference speed, resulting from the operations carried out on the references.

Factory settings:

1st speed: LSP
(low speed or speed reference)

2nd speed: 10 Hz

3rd speed: 15 Hz

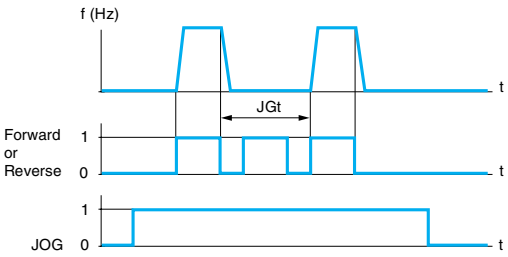
4th speed: 20 Hz

Example of operation with 4 preset speeds and 2 logic inputs

■ Jog operation

This can be used for pulse operation with minimum ramp times (0.1 s), limited speed reference and minimum time between 2 pulses.
It is enabled by 1 logic input and pulses given by the operating direction command.

This function is suitable for machines with product insertion in manual mode (e.g. gradual movement of the mechanism during maintenance operations).



Speed reference:
Adjustable from 0 to 10 Hz, factory setting 10 Hz.

JGt: minimum time between 2 pulses, which can be set between 0.5 and 2 s.

Example of jog operation

■ Limiting low speed operating time

The motor is stopped automatically after a period of operation at low speed (LSP) with a zero reference and a run command present.
This time can be set between 0.1 and 999.9 seconds (0 corresponds to an unlimited time). Factory setting 0 s. The motor restarts automatically on the ramp when the reference reappears or if the run command is interrupted and then re-established.

Function suitable for automatic Stops/Starts.

■ **Motor control types**

□ **Flux vector control with sensor (FVC)**
In current mode, this control type can be used to obtain the best static and dynamic torque performance.

□ **Sensorless flux vector contro**l
In voltage mode, this control type can be used with a single motor or motors connected in parallel.
In current mode, this profile performs better than the previous type, but it cannot supply power to motors connected in parallel.

□ **2-point vector control**
The zone for operating at constant power can be optimized by defining an additional point in the control profile.
This function should be used with motors offering a two-part defluxing zone.
It can be used to limit the voltage at the motor terminals when the motor is being powered by a high line supply.

□ **Voltage/frequency ratio**
This control type is particularly suitable for special motors (high-speed motors, synchronized asynchronous motors, etc.). The ratio can be adjusted by 2 or 5 points and used to achieve output frequencies of up to 1000 Hz.

□ **ENA system**
This profile is reserved for unbalanced machines (presses, etc.). It can be used to reduce mechanical stress, power consumption and avoid the use of braking resistors.

□ **Synchronous motor**
This control type is exclusively reserved for controlling open loop synchronous permanent magnet motors with sinusoidal electromotive force (EMF).

2

2.5

■ **Using an incremental encoder**
The Altivar 71 drive uses encoder feedback to:
□ Operate in FVC closed loop control mode. In addition to the torque performance and speed accuracy it provides, the speed feedback can also be used to manage overspeed and slipping protection.
□ Improve the steady state speed accuracy and/or manage overspeed and slipping protection in the other control types (FVC open loop control mode and U/f ratio)
□ Manage only overspeed and slipping protection

■ **Encoder tests**
The Altivar 71 drive can detect encoder signal loss, as well as a mechanical break in the coupling between encoder and motor.

■ **Limiting motor overvoltage**
The Altivar 71 drive inverter bridge control can be used to limit overvoltage in the motor terminals, which is double the voltage level in the DC bus (Stressless PWM). This function is useful in cases where long lengths of cabling, rewound motors or motors in a low isolation class are involved.

■ **Auto tune**
Auto-tuning can be performed:
□ using a dialogue tool (graphical display terminal, PowerSuite software workshop, integrated 7-segment display terminal)
□ via a communication network
□ automatically every time the drive is switched on
□ by enabling a logic input

Auto-tuning is used to optimize application performance.
In Flux Vector Control mode (FVC closed loop and FVC open loop with current control), certain parameters are measured periodically.
Saving the motor thermal state can help to compensate exactly for the motor resistors, even after the drive has been switched off.

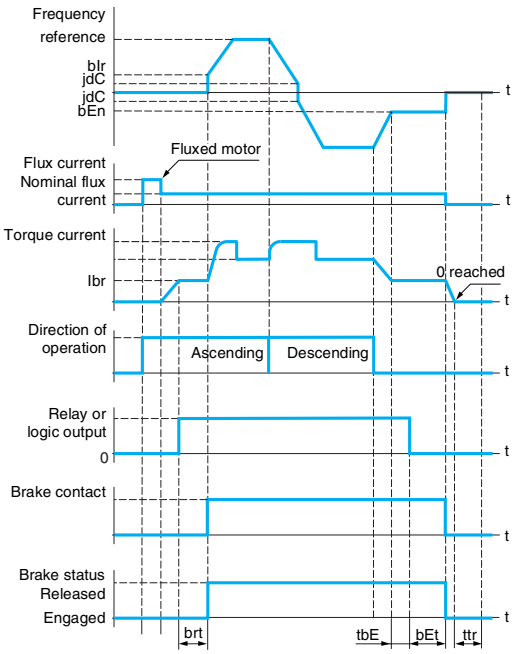
■ **Switching frequency, noise reduction**
The switching frequency setting permits a reduction in the noise generated by the motor for any application requiring a low level of noise.
The switching frequency is modulated randomly in order to avoid resonance.
This function can be disabled if it causes instability.
High frequency switching of the intermediate DC voltage can be used to supply the motor with a current wave that has little harmonic distortion.
The switching frequency can be adjusted during operation to reduce the noise generated by the motor.
Value: 1 to 16 kHz; factory setting 2.5 or 4 kHz, depending on the rating.

■ **Motor fluxing**
This can be used to obtain rapid high torque on start-up; magnetic flux needs to be already established in the motor.
There is a choice between open loop or closed loop operation.

In continuous mode, the drive automatically establishes the flux when it is powered up.

In non-continuous mode:
□ If a logic input or command word bit is assigned to the motor fluxing command, flux is established when the command is confirmed.
□ If neither a logic input nor a command word bit has been assigned, or if the latter are not active when a run command is given, fluxing occurs when the motor starts.

Fluxing is accelerated if a current higher than the nominal motor current is applied, then it is set to the value of the motor magnetizing current.



Open loop vertical movement

bEn: Brake engage frequency
bEt: Brake engage time
bIr: Initialization of ramp once the "brake release" time (brt) has expired
brt: Brake release time
Ibr: Brake release current
JdC: Reverse jump
tbE: Brake engage time
ttr: Restart time

Note: *In open loop mode, feedback from an incremental encoder can be connected to the drive in order to directly detect overspeed and slipping.*

■ Brake control

This can be used to manage control of an electromagnetic brake in synchronization with starting and stopping the motor to avoid jolts and load slipping.
The brake control sequence is managed by the drive.

□ Movement type

The Altivar 71 drive adapts the brake control operation to the type of movement, whether vertical or horizontal, in order to achieve maximum torque performance and eliminate jolts.

□ Brake feedback via contact

By connecting a brake contact to the drive, it is possible to detect brake faults.
If the brake status does not match the relevant control (the contact must be open for a released brake), the drive locks when a fault occurs.

□ Brake release pulse

This can be used to set the torque for brake release when ascending (forward) or two release thresholds (one for ascending and the other for descending).

This function is only available for vertical movements.

□ Brake engage on reversal of operating direction

To prevent the speed from passing through zero when reversing the direction of rotation, the drive firstly requires the brake to be engaged at the end of deceleration and then for it to be released before accelerating in the other direction of rotation.

□ Brake engage request time delay

In the case of slewing movements, this function can be used, at the end of deceleration, to control how the brake is engaged when the torsional stress being exerted on the machine structure is zero.

□ Automatic DC injection

In the case of a horizontal movement, the DC injection at the end of deceleration can be used to prevent jolting when the brake is being engaged.

This function is only available for horizontal movements.

■ Limit switch management

This can be used to manage the operation of one or two limit switches (with 1 or 2 operating directions).
Each limit (forward, reverse) is associated with a logic input. The type of stop that occurs on detection of a limit can be configured as a stop on ramp, freewheel or fast stop.
Following a stop, the motor can restart in the opposite direction only.

■ Slack sling

This is used to adapt the motor speed to the load depending on the minimum configured torque, either in speed reference mode or in current limiting mode.
A logic output can be assigned to this function to indicate the load value in relation to the configured torque value.

2

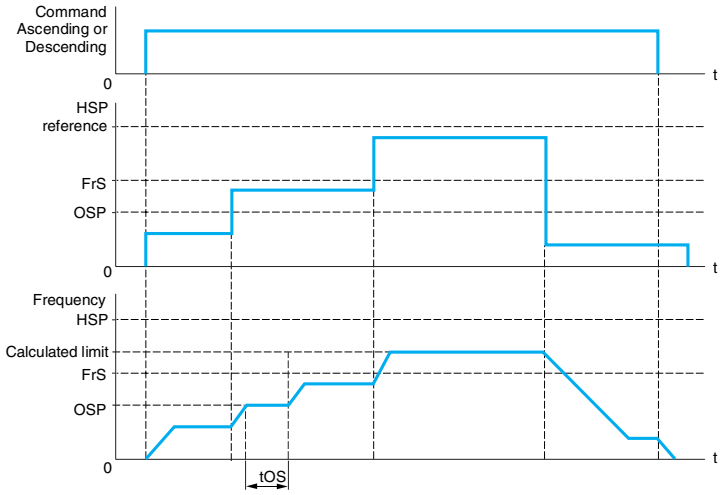
2.5

■ **High-speed hoisting**

This can be used to optimize cycle times for hoisting movements when the load is zero or small.
It allows operation at constant power (motor defluxing beyond the nominal motor frequency) in order to achieve a higher speed than the nominal speed, without exceeding the nominal motor current and thereby preventing the motor from overheating.

There are 2 possible operating modes:

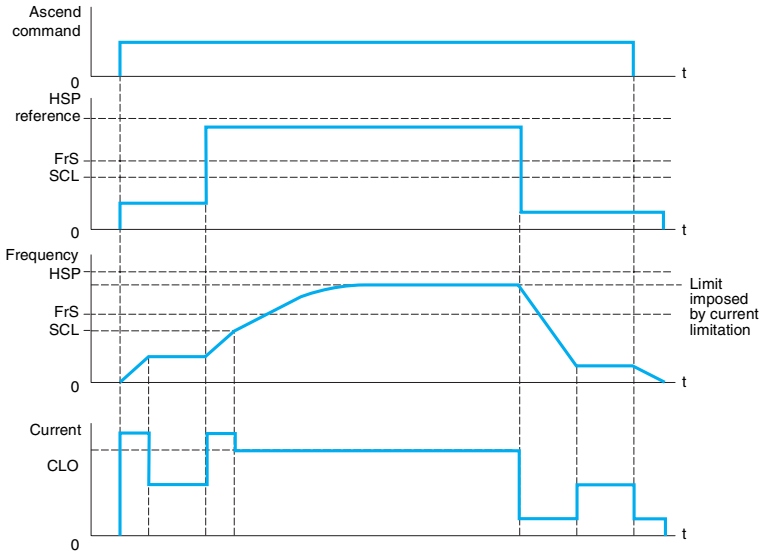
□ Speed reference mode: The maximum permitted speed is calculated by the drive at an imposed speed step so that the drive can measure the load.



Speed reference mode

FrS: Nominal motor frequency
HSP: High speed parameter
OSP: Adjustable speed step for load measurement
tOS: Load measuring time
Two parameters can be used to reduce the speed calculated by the drive, for ascending and descending.

□ Current limiting mode: The maximum permitted speed is the speed at which the current is limited in the motor quadrant, ascending only. For descending, operation is always based on speed reference mode.



Current limiting mode

CLO: Current limitation for high speed-function
FrS: Nominal motor frequency
HSP: High speed parameter
SCL: Adjustable speed threshold above which current limitation is active

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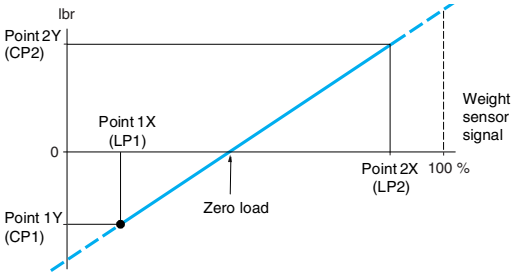
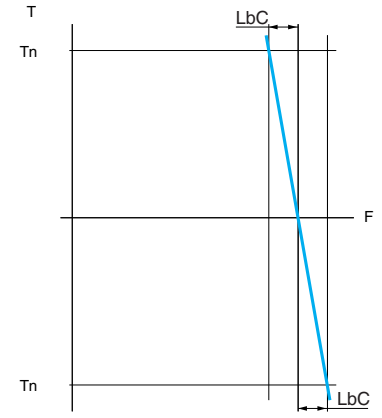


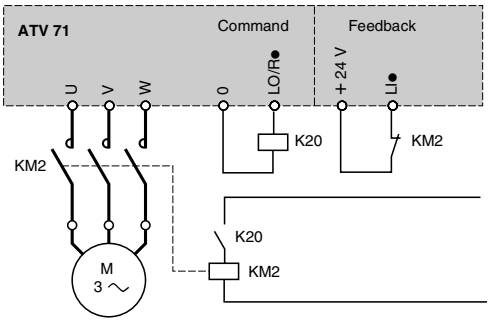
CP1, CP2, LP1, LP2: weight sensor calibration points

This curve can represent a weight sensor on a lift winch, where a zero load is exerted on the motor when the load in the cabin is not zero.



LbC: Load correction (Hz)

Load sharing



Output contactor control and integrity check

■ External weight measurement

This function uses the information supplied by a weight sensor via an analog input (usually a 4-20 mA signal) to adapt the current (Ibr) of the Brake logic control function.

Function suitable for applications involved in:
- □ measuring the total weight of a hoisting winch and its load
- □ measuring the total weight of a lift winch, the cabin and counterweight.

The current (Ibr) is adapted according to the curve opposite.

■ Load sharing

This function can be used for applications where several motors are mechanically linked in order to balance the loads of the different motors by adjusting the speed according to the torque on each motor.

■ Output contactor control and integrity check

□ Control

This allows the drive to control a contactor located between the drive and the motor.
The request to close the contactor is made when a run command appears.
The request to open the contactor is made when there is no current in the motor.

Note: *If a DC injection braking function has been configured it should not be left operating too long in stop mode, as the contactor only opens at the end of braking.*

□ Integrity check

This check is carried out by connecting a volt-free contact on each contactor to one of the drive's logic inputs.
The corresponding logic input should be at 1 when there is no run command and at 0 during operation.
When there is any inconsistency, the drive locks in fault mode if the output contactor does not close (LIx = 1) or gets stuck (LIx = 0). The time delay for when the drive locks in fault mode can be adjusted.

These sequences are commonly used in lift applications.
In order to increase the safety level and reduce the amount of maintenance work, it is recommended that the Altivar 71 drive's integrated "Power Removal" safety function is used.

■ Stop on thermal alarm

This can be used to:
- □ Allow a movement to end before examining a thermal fault. There are two adjustable thresholds used to define the thermal state level which, when exceeded, makes a machine stop.
- □ Prevent a new run command from being accepted as long as the drive and motor temperatures are not less than 100%.

Function suitable for lift applications: it can prevent people getting trapped if a lift gets stuck between two floors.

■ Evacuation following power failure

This can be used to control the reduced speed engine with a reduced voltage supply (220 V ≂, for example: uninterruptible power supply (UPS)), by preserving torque performance.

Function suitable for lift applications: When there is a power failure, it facilitates the evacuation of people trapped in a lift stuck between two floors.

522166

RDY	Term	+0.00Hz	0.0A
+/- SPEED			
+ speed assign. :			LI3
- speed assign. :			LI4
Ref. saved :			RAM
Code			Quick

+/- speed function settings

■ **Uncontrolled output cut**

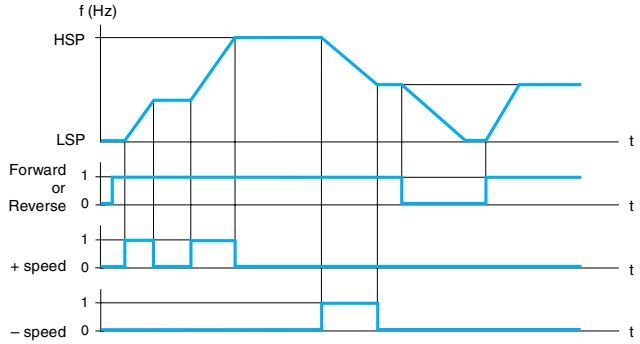
It is possible to configure output phase loss protection, which will allow the drive or motor circuit to be broken without the drive becoming locked in fault mode and facilitate a smooth restart after the motor has been reconnected. The output phase loss may also lock the drive, depending on the configuration.

■ **+/- speed**

Used to increase or decrease a speed reference by means of 1 or 2 logic inputs, with or without the last reference being saved (motorized potentiometer function). This function is suitable for centralized control of a machine with several sections operating in one direction or for control by a handling crane pendant control station with two operating directions.

Two types of operation are available:
□ Use of single action buttons: 2 logic inputs are required in addition to the operating direction(s).
□ Use of double action buttons: only 1 logic input assigned to + speed is required.

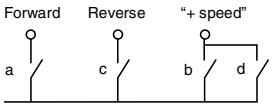
Use of single action buttons: 2 logic inputs are required in addition to the operating direction(s).



PV : low speed, HSP: high speed
Example of "+/- speed" with 2 logic inputs, single action buttons and reference saving

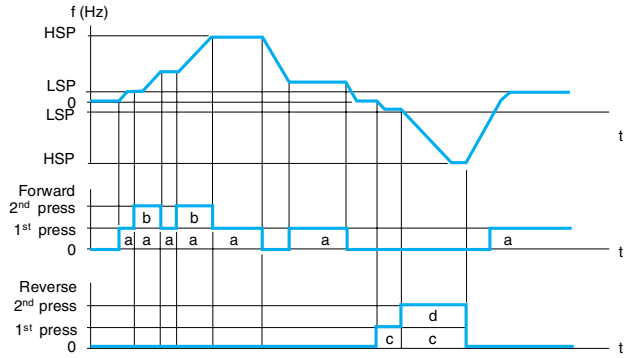
Use of double action buttons: only 1 logic input assigned to + speed is required.

Logic inputs:

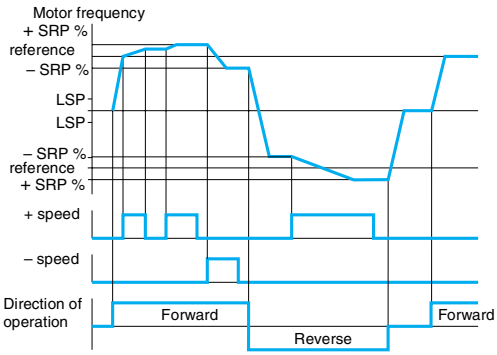


a and c: 1st press
b and d: 2nd press

	Released (- speed)	1st press (speed maintained)	2nd press (+ speed)
Forward button	–	a	a and b
Reverse button	–	c	c and d



PV : low speed, HSP: high speed
Example with double action buttons and 1 logic input
Note: *This type of +/- speed control is incompatible with 3-wire control.*

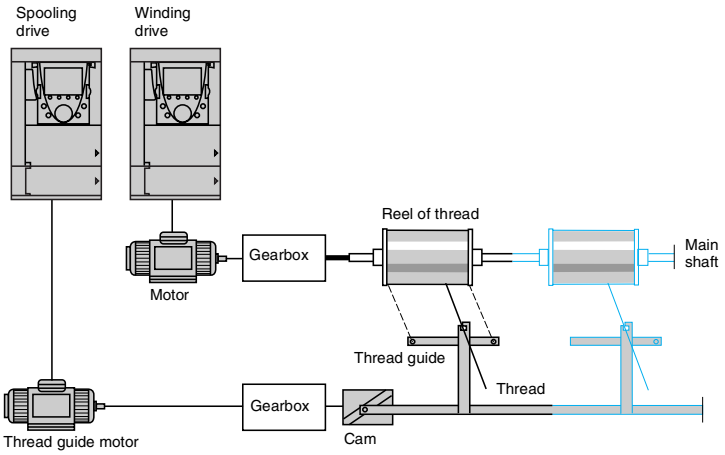


Example of +/- speed around a 2-wire control reference

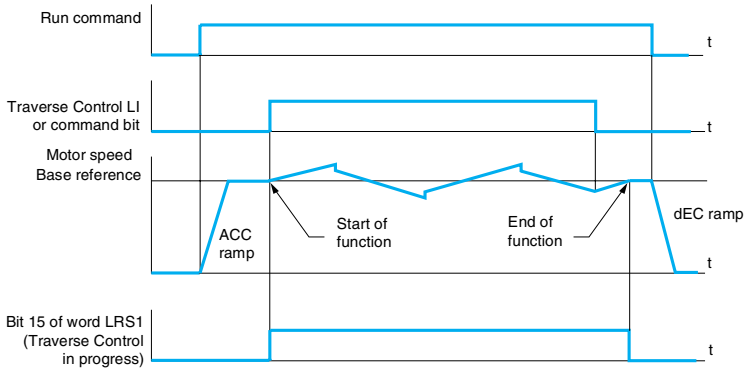
□ **Reference saving**
This function is associated with "+/- speed" control.
This can be used for reading and saving the last speed reference prior to the loss of the run command or line supply. The saved reference is applied the next time a run command is received.

□ **+/- speed around a reference**
The reference is given by Fr1 or Fr1b, including, if relevant, the summing, subtraction and multiplication functions, as well as the preset speeds.
During the run command the drive goes to the reference, following the acceleration and deceleration ramps (pressing +/- speed makes the speed vary around this reference according to acceleration ramp 2 and deceleration ramp 2).
+ or – speed variation around the reference is limited to a percentage of the reference (SRP parameter). When operation has stopped, the amended reference is not saved.
The maximum total reference is always limited by high speed (HSP parameter) and the minimum reference (LSP parameter).

■ **Spooling**
□ **Traverse control**
Function for winding reels of thread (in textile applications)



The cam rotation speed must follow a precise profile to ensure a steady, compact, linear reel is obtained.



A function can also be used to reduce the base reference as the reel gets larger.

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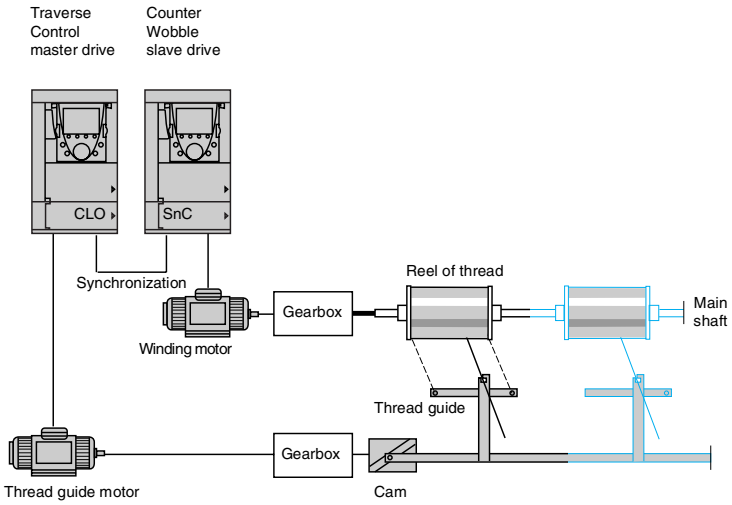
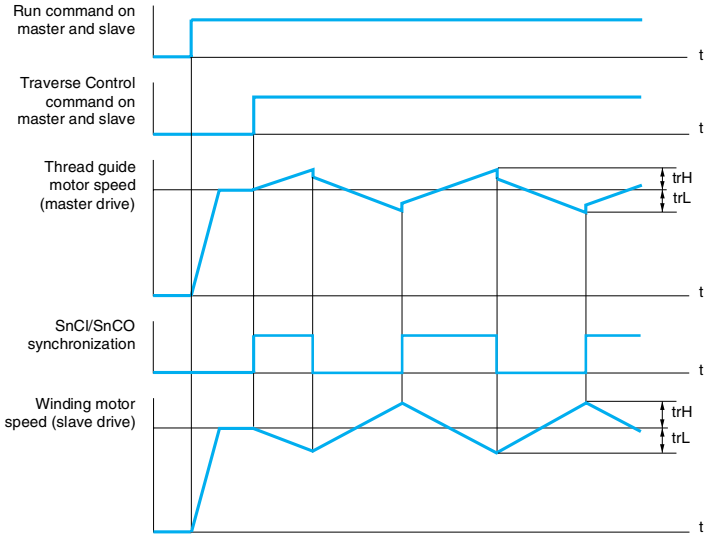
□ **Counter Wobble**



The Counter Wobble function is used in certain applications to obtain a constant thread tension when the Traverse Control function is producing considerable variations in speed on the thread guide motor.
The master drive controls the speed of the thread guide, while the slave drive controls the winding speed. The function assigns the slave a speed profile, which is in antiphase to that of the master. This means that synchronization is required, using one of the master's logic outputs and one of the slave's logic inputs.



■ **Automatic catching of a spinning load with speed detection** ("catch on the fly")
This function is used to restart the motor smoothly after one of the following events, provided the run command is still present:
□ loss of line supply or power off
□ fault reset or automatic restart
□ freewheel stop

On disappearance of the event, the effective speed of the motor is detected in order to restart on a ramp at this speed and return to the reference speed.
The speed detection time can reach 0.5 s.
This function is automatically disabled if the brake sequence is configured.
This function is suitable for machines for which the motor speed loss is negligible during a power failure (high-inertia machines such as centrifuges, etc.).

■ **Undervoltage management**
Depending on the application, it is possible to configure the Altivar 71's response to undervoltages or power failures.
If undervoltage occurs:
□ The Altivar 71 drive can continue operating with undervoltage levels up to -50% (adjustable threshold)
□ If the drive locks as a result, management of the fault relay can be configured (open or not). If the fault relay does not open an alarm is shown.

The Altivar 71 drive can also be configured to prevent the drive locking (using an alarm):
□ Controlled stop according to the type of stop configured
□ Deceleration based on a ramp which it automatically adapts to maintain the DC bus voltage, thereby preventing the drive from locking in fault mode
□ Instant IGBT (inverter bridge) loss followed by power supplied to the motor as soon as the line voltage has reappeared. This function can be used to prevent the Altivar 71 drive being reinitialized.

■ **Braking balance**
When several drives are connected on a common DC bus, this function can be used to adjust the braking thresholds in order to balance the braking powers between the various drives or braking units.

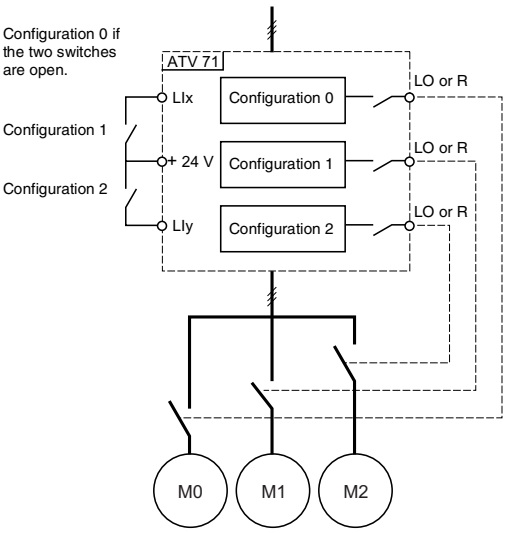
■ **Braking resistor thermal protection**
The Altivar 71 drive incorporates thermal protection for the braking resistor if it is not equipped with a thermal switch. If the resistor thermal state is too high an alarm can be assigned to the logic output or the drive may lock in fault mode, depending on how the function is programmed.

■ **Parameter set switching (multi-parameter)**
This can be used to switch 3 sets of 15 parameters maximum when the motor is running.
Each set can contain a different value for each of the parameters.
The sets are switched using 1 or 2 logic inputs or command word bits.

Function suitable for machines involving 2 or 3 manufacturing processes.

■ **Motor or configuration switching (multi-motor or multi-configuration)**
The Altivar 71 drive can have 3 configurations, which can be activated remotely, allowing it to adapt to:
□ 2 or 3 different motors or mechanisms in multi-motor mode. In this instance, the thermal state for all the motors is calculated and saved. This means that each motor is protected thermally.
□ 2 or 3 configurations for the same motor in multi-configuration mode. This function can also be used to save the current configuration in another memory zone, from which it can be retrieved.
Switching is carried out using 1 or 2 logic inputs, depending on the number of motors or configurations chosen (2 or 3).

Multi-motor and multi-configuration modes cannot be used together.



Schematic diagram for multi-motor mode

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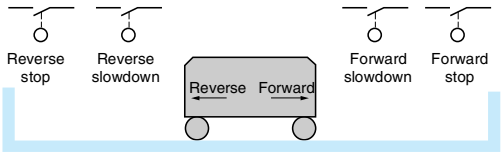
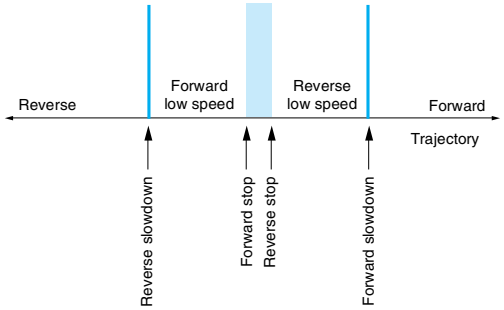


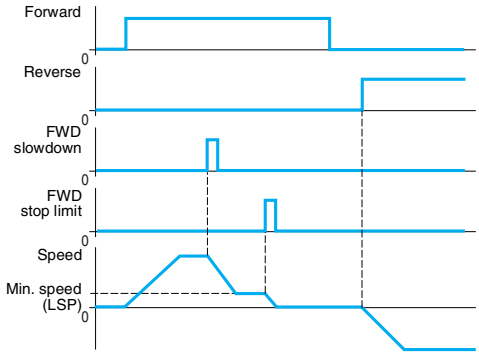
***Example 1**: limit switch positioning*
Slowdown and stopping occur when the sensor changes state (open contact). It is possible to assign a command word bit or a logic input to disable the function in order to be able restart or not stop on the position.



***Example 2**: positioning on a target zone*
The disable contact can be used to restart in order to get past the target.

■ Positioning on limit switches or position sensors

This can be used to manage positioning based on limit switches or position sensors.



Activating the slowdown contact or stop contact allows the device to start in the other direction, even at high speed.

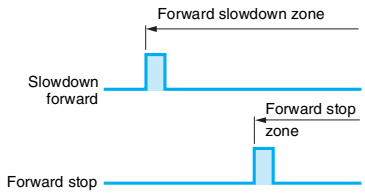
Slowdown mode can be configured:
- ☐ The drive uses the validated ramp time
- ☐ The drive calculates a ramp time according to the actual speed when the request to slow down is made. This calculation can be used to optimize the cycle time by limiting the time spent operating at low speed.

The stop type can also be configured:
- ☐ stop on ramp
- ☐ freewheel stop
- ☐ fast stop

■ Short and long cam operation

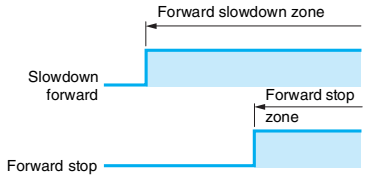
☐ Short cams

In this instance, when operating for the first time or after restoring the factory settings, the drive must initially be started outside the slowdown and stop zones in order to initialize the function.



☐ Long cams

In this instance, there is no restriction, which means that the function is initialized across the whole trajectory.



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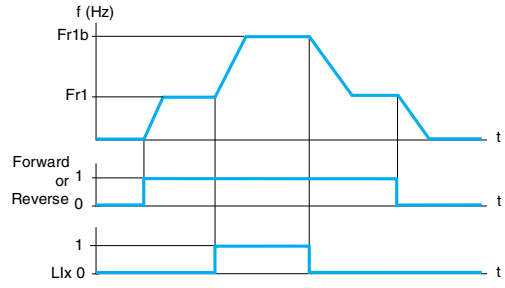
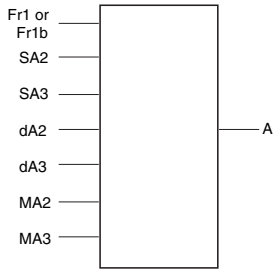


Example of reference switching



A: drive reference
SA2, SA3: summed inputs
dA2, dA3: subtraction inputs
MA2, MA3: multiplication inputs.

■ **Reference switching**
Switching between two references (speed, torque, PID, etc.) can be enabled by:
□ a logic input
□ a command word bit
Reference 1 (Fr1) is active if the logic input (or command word bit) is at 0; reference 2 (Fr1b) is active if the logic input (or command word bit) is at 1.
References can be switched with the motor running.

Reference Fr1b, like Fr1, can originate from:
□ an analog input (AI)
□ a frequency control input (RP)
□ the graphic display terminal
□ the Modbus serial link or the CANopen machine bus
□ a communication card
□ the Controller Inside programmable card

■ **Operations on references (summing, subtraction, multiplication)**
Summing, subtraction and multiplication inputs can be activated simultaneously.

The drive reference is thus:
□ reference of drive A = (Fr1 or Fr1b + SA2 + SA3 - dA2 - dA3) x MA2 x MA3

□ **Summing inputs**
These can be used to add 2 to 3 references from different sources to Fr1 or Fr1b (see “Reference switching”).
The references to be added together are selected from all the possible types of reference.

For example:
Reference Fr1 or Fr1b from AI1
Reference SA2 from CANopen
Reference SA3 from a communication card
Reference of drive A = Fr1 or Fr1b + SA2 + SA3.

□ **Subtraction inputs**
These can be used to subtract 2 to 3 references from different sources from Fr1 or Fr1b (see “Reference switching”).
The references to be subtracted are selected from all the possible types of reference.

For example:
Reference Fr1 or Fr1b from AI1
Reference dA2 from CANopen
Reference dA3 from a communication card
Reference of drive A = Fr1 or Fr1b - dA2 - dA3.

□ **Multiplication inputs**
These can be used to multiply 2 to 3 references from different sources by Fr1 or Fr1b (see “Reference switching”).
The references to be multiplied are selected from all the possible types of reference.

For example:
Reference Fr1 or Fr1b from AI1
Reference MA2 from CANopen
Reference MA3 from a communication card
Reference of drive A = Fr1 or Fr1b x MA2 x MA3.

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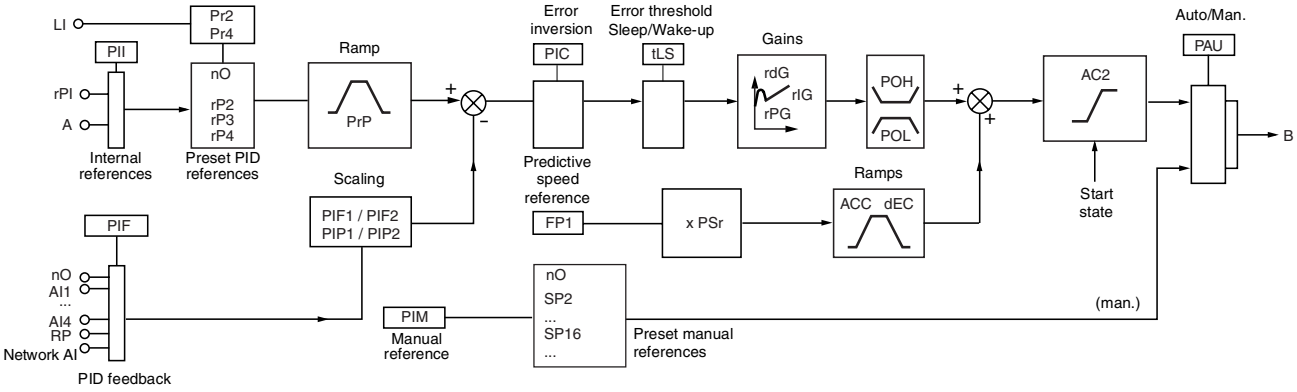
■ PID regulator

This can be used to regulate a process with a reference and feedback given by a sensor.
Function suitable for controlling traction on a winder.



ACC: Acceleration, DEC: Deceleration, LI: Logic inputs, B: Speed reference

□ Internal references

- rPI: reference transmitted by the graphic display terminal or a communication network.
- A: reference given by Fr1 or Fr1b with the summing, subtraction and multiplication functions, as appropriate.

The “PII” parameter is used to choose between these two references.

□ Preset PID references

2 or 4 PID references are available. Table showing combinations of selected PID references:

LIx (Pr4)	LIy (Pr2)	Reference
0	0	rPI or A
0	1	rP2
1	0	rP3
1	1	rP4

□ PID feedback

PID feedback can be assigned to one of the analog inputs (AI1 to AI4), the frequency control input (RP) or the encoder, depending on the option cards present. It can also be transmitted by a communication network (AI network).

□ Predictive speed reference

This reference can come from the terminals (analog inputs, encoders, etc.), the graphic display terminal or a communication network.
This speed input gives an initial reference for starting.

□ Auto/Man.

This can be used to switch from speed regulation mode (Man.) to PID regulation mode (Auto). A logic input or command word bit is used for switching.

Speed regulation mode (Man.)

The manual reference is transmitted via the terminals (analog inputs, encoder, preset speeds, etc.).
With manual switching, the speed reference changes according to the ACC and dEC ramp times.

PID regulation mode (Auto)

In automatic mode it is possible to:

- adapt the references and feedback to the process (transformation)
- correct a PID inversion
- adjust the proportional, integral and derivative gains (Kp, Ki and Kd)
- shunt the integral
- use the “alarm” on the logic output or display it on the graphic display terminal, if the threshold is exceeded (Max. feedback, Min. feedback and PID error)
- display the PID reference, PID feedback, PID error and PID output on the graphic display terminal and assign them to an analog output
- apply a ramp (time = PrP) to the PID reference

The motor speed is limited to between LSP and HSP. It is displayed as process values.

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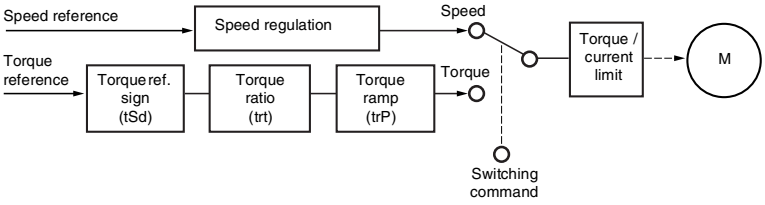
■ **Torque control**

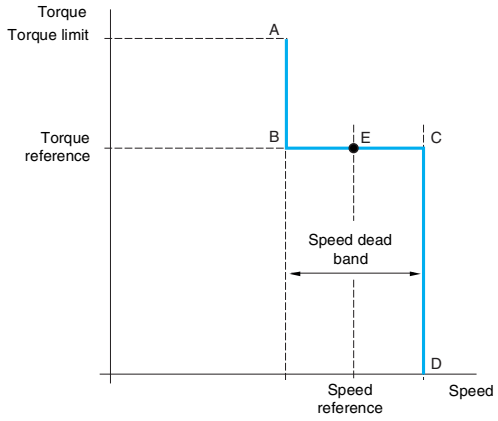
This supports torque control or speed regulation mode.
These two types of mode can be switched using a logic input or command word bit.

Function suitable for applications requiring traction control.



The torque reference is signed and has its own ramp. A torque ratio can be used to scale the reference. It can be transmitted via an analog input, frequency control input (RP input or encoder) or communication network.
The torque sign and value can be output to a logic output and an analog output.

In torque control mode the speed may vary within an adjustable dead band. When it has reached the lower or upper limit, the drive automatically switches to speed regulation mode (fallback position).
The regulated torque is no longer maintained, in which case two scenarios can occur:
□ The speed falls within the dead band; the torque takes the required value.
□ The torque does not return to the required value at the end of an adjustable time; the drive switches to fault or alarm mode, depending on the configuration.



AB and CD: Fallback position
BC: Torque control zone
E: Ideal operating point

The stop in torque control mode can be configured:
□ automatic switch to speed regulation mode
□ freewheel stop
□ stop at zero torque but still maintaining the flux in the motor for an adjustable period of time.

2

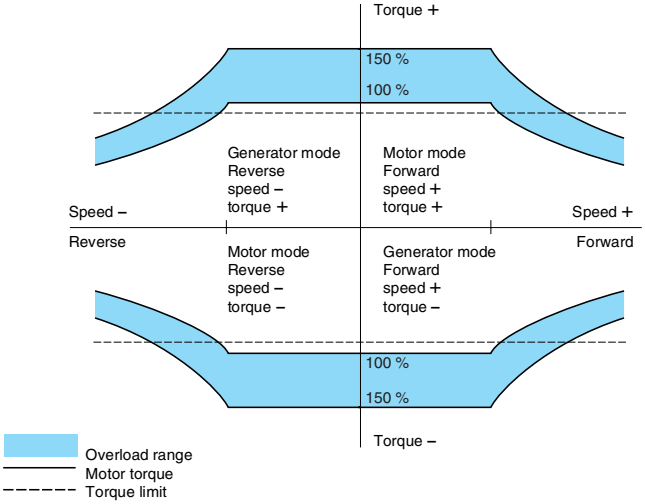
2.5

■ **Torque limit**
This can be used to limit the torque in the motor and generator quadrants using separate settings.

There are two types of torque limit:
- one with a value set by a parameter
- the other with a value given by an analog input, frequency control input or encoder.

When both torque limit types are enabled it is the lowest value which is read.
They can be switched using a logic input or command word bit.

This function is not available for voltage/frequency ratio.



The torque limit operates in both directions of rotation in motor or generator mode.

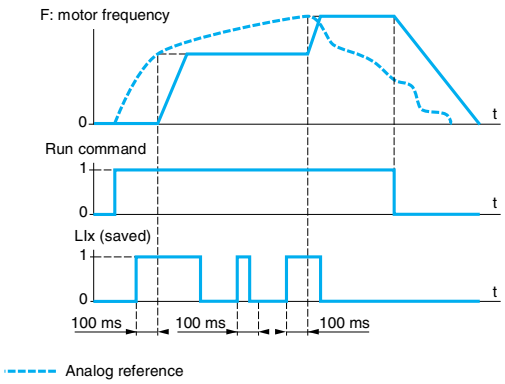
■ **Torque or current limit detection**
This function can be used to detect when the current or torque limit has been reached.
Depending on the configuration, it is possible to:
- use an alarm to signal this
- lock the drive after an adjustable period of time.

■ **Current limit**
A 2nd current limit can be configured between 0 and 1.65 times the drive nominal current and it can be used to limit the rise in motor temperature and the torque.
Switching between the two current limits can be enabled via:
- a logic input
- a command word bit

522170

RDY	Term	+0.00Hz	0.0A
2nd CURRENT LIMIT.			
I Limit. 2 activ.	:		LI6
I Limit. 2 value	:		6.4 A
Current limitation :			7.9 A
Code			Quick

Configuring current switching



Example of how reference saving works

■ **Reference saving**
This can be used to:
□ Read and save a speed reference level on the reference input using a command lasting longer than 0.1 s on a logic input
□ Control the speed of several drives alternately via a single analog reference and a logic input for each drive
□ Enable a line reference (serial link) on several drives via a logic input in order to synchronize movements by eliminating variations when the reference is sent
The reference is acquired 100 ms after the rising edge of the request.
A new reference is not then acquired until a new request is made.

522167

RDY	Term	+0.00Hz	0.0A
STOP CONFIGURATION			
Type of stop	:	Ramp stop	
Freewheel assign.	:	NO	
Fast stop assign.	:	LI4	
Ramp divider	:	0	
DC inject. assign.	:	NO	
Code		Quick	

Configuring stop types

■ **Stop types**

□ **Freewheel stop**
This stops the motor by resistive torque if the motor power supply is cut.

A freewheel stop is achieved:
- by configuring a normal stop command as a freewheel stop
(on disappearance of a run command or appearance of a stop command)
- by enabling a logic input
- by activating a command word bit

□ **Fast stop**
This can be used to achieve a braked stop with an acceptable deceleration ramp time (divided by an adjustable coefficient from 0 to 10) for the drive/motor unit to avoid locking in the event of an overbraking fault. If the coefficient is equal to 0 the motor decelerates as fast as possible.

Used for conveyors with emergency stop electrical braking.
A fast stop is achieved:
- by configuring a normal stop as a fast stop (on disappearance of a run command or appearance of a stop command)
- by enabling a logic input
- by activating a command word bit

□ **Fastest possible stop**
If the ramp divider coefficient is equal to 0 the motor decelerates as fast as possible.

□ **DC injection stop**
This can be used to brake high-inertia machines at low speed or maintain torque on stopping.
A DC injection stop is achieved:
- by configuring a normal stop as a DC injection stop (on disappearance of a run command or appearance of a stop command)
- by enabling a logic input
- by activating a command word bit

The DC value and the standstill braking time are adjustable.

2

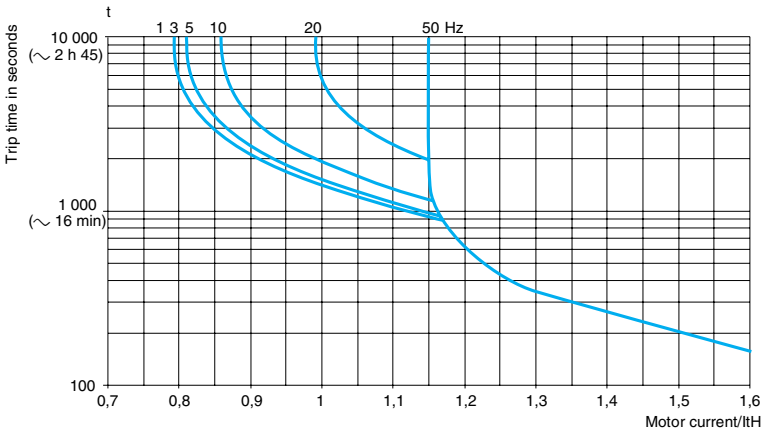
2.5

■ **Motor thermal protection**
Motor thermal protection is provided by the drive:
□ directly, through PTC probes located in the motor windings
□ indirectly, via the integrated thermal relay. Indirect thermal protection is implemented via continuous calculation of its theoretical temperature rise.

The microprocessor calculates the theoretical temperature rise of the motor based on various elements:
□ the operating frequency
□ the current taken by the motor
□ the operating time
□ the maximum ambient temperature around the motor (40°C)
□ the type of motor ventilation (self-cooled or force-cooled)

Thermal protection can be adjusted from 0.2 to 1.5 times the nominal drive current. It must be adjusted to the nominal current indicated on the motor rating plate.

Note: *The motor thermal state memory returns to zero when the drive control section is switched off.*



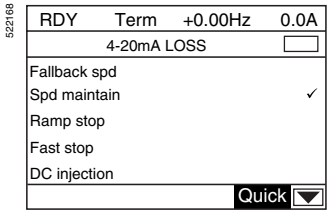
Motor thermal protection curves

□ Self-cooled motors:
The tripping curves vary with the motor frequency.

□ Force-cooled motors:
Only the 50 Hz tripping curve should be considered, whatever the motor frequency.

■ **Drive thermal protection**
The drive thermal protection is provided by a PTC probe mounted on the heatsink or integrated in the power module.

■ **IGBT thermal protection**
The drive manages the switching frequency intelligently according to the IGBT temperature.
If the drive's current rating is exceeded (e.g.: current higher than the nominal drive current for a zero stator frequency), an alarm is displayed and a timer increases for as long the alarm is present.



Configuration of the drive's fault response

■ **Configuring the drive's fault response (fault management)**
Different responses can be configured for the drive in the event of a resettable fault occurring:
- freewheel stop
- drive switches to the fallback speed
- drive maintains the speed at which it was operating when the fault occurred until the fault disappears
- stop on ramp
- fast stop
- DC injection stop
- no stop (alarm activated)

List of resettable faults:
- external fault
- speed feedback loss
- overspeed
- slipping
- output phase loss
- auto-tuning fault
- brake contactor feedback fault
- encoder coupling
- loss of 4-20mA
- PTC probe
- drive overheating
- motor overload if the thermal state is less than 100%
- line overvoltage
- overbraking
- current/torque limit
- IGBT overheating
- communication faults (Modbus, CANopen and other communication networks).

■ **Resetting resettable faults**
This can be used to remove the last fault using a logic input, command word bit or the STOP/RESET key on the graphic display terminal.
The restart conditions after a reset to zero are the same as those of a normal power-up.
List of resettable faults, see "Configuring the drive's fault response".
Line supply undervoltage and input phase loss faults are reset automatically when the line supply is restored.

Function suitable for applications where drives are difficult to access, such as when a drive is placed on a moving part.

■ **General reset (disables all faults)**
This function inhibits all faults, including thermal protection (forced operation), which can destroy the drive.

This function is suitable for applications where restarting may be crucial (conveyor in an oven, smoke extraction system, machines with solidifying products that need to be removed).
The function is enabled by a logic input.
Fault monitoring is active if the logic input is at state 1.
All faults are reset on a change of state ↓ of the logic input.

Note: *Use of this function invalidates the guarantee.*

2

2.5

2

2.5

■ **Automatic restart**
This function enables the drive to be restarted automatically after it has locked in fault mode, provided the relevant fault has disappeared and the other operating conditions permit a restart.
This restart is performed by a series of automatic attempts separated by increasingly longer waiting periods of 1 s, 5 s, 10 s then 1 minute for the rest.
The options for the restart process's duration are 5, 10 and 30 min., 1, 2, 3 hours and an unlimited time.
If the drive has not restarted after the configured time, it will lock and the procedure is abandoned until it has been powered off and on again.

The faults which permit this type of restart are:
□ line overvoltage
□ motor thermal overload
□ drive thermal overload
□ DC bus overvoltage
□ line phase failure
□ external fault
□ loss of 4-20mA
□ PTC probe
□ serial link
□ current or torque limit
□ output phase loss
□ line voltage too low. For this fault, the function is always active, even if it is not configured.
□ fault caused by CANopen machine bus, Modbus serial link or other commmunication networks. These faults are reset automatically as soon as the command word or frequency reference is sent to the drive.
For these types of fault, the relay configured as a fault relay remains activated if the function is configured. The speed reference and direction of operation must be maintained for this function.

This function is suitable for machines or installations which are in continuous operation or are not monitored, and where a restart will not endanger equipment or personnel in any way.

■ **PTC probe protection**
The probes can be connected directly to the drive control card or to the I/O option cards.
The way in which a temperature fault is recorded by the drive can be configured:
□ permanent record
□ only recorded when the drive's power section is switched on
□ only recorded when the motor is running

■ **IGBT testing**
When enabled, this function tests every IGBT and the motor connections in order to detect a short-circuit or an open circuit. This test is run every time the drive is powered on and before each motor start.

This function must not be enabled with machines with fast cycles in order to preserve the time for recording run commands.

■ **Resetting operating time to zero**
The drive operating and power-up time can be reset.

■ **External fault**
This function can lead to the drive locking if a fault occurs in the machine.
This fault is flagged on the drive display unit. The fault is flagged if the signal is at 1 or 0, according to the function configuration.

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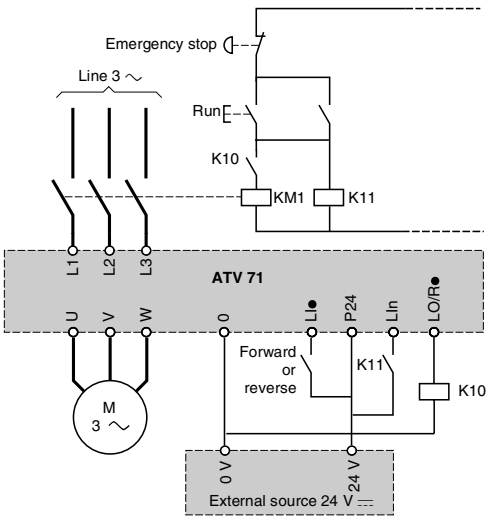
■ **Line contactor control**
This can be used on each run command to close the line contactor and open it when the motor is no longer on. The drive control section must be powered without fail by an external 24 V ⎓ source.

This function must be used for simple sequences with a low number of Start/Stop operations (Start/Stop cycle longer than 60 seconds).



After a run command, if the line contactor is not closed the drive will lock after an adjustable period of time.

■ **Forced local mode**
Forced local mode imposes control via the terminals or graphic display terminal and disables all other control modes.
Switching to forced local mode may be activated via:
- a logic input
- a function key on the graphic display terminal

The following references and commands are available for forced local mode:
- references AI1, AI2, etc. and command via logic inputs
- reference and command via the graphic display terminal

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Function compatibility table

■ **Configurable I/O**

Functions which are not listed in this table are fully compatible.
Stop functions have priority over run commands.
The selection of functions is limited:
- By the number of drive I/O which can be reassigned: if necessary, add an I/O extension card.
- By the incompatibility of certain functions with one another.

Functions	Operation on the references	+/- speed *(3)*	Limit switch management	Preset speeds	PID regulator	Traverse control	Jog operation	Brake control
Operation on the references				↑	⊖		↑	
+/- speed *(3)*						⊖	⊖	
Limit switch management					⊖			
Preset speeds	←						↑	
PID regulator	⊖		⊖			⊖	⊖	⊖
Traverse control		⊖			⊖		⊖	
Jog operation	←	⊖		←	⊖	⊖		⊖
Brake control					⊖		⊖	
Automatic catching a spinning load with speed detection (catch on the fly)								⊖
Control and integrity check of output contactor								⊖
DC injection stop								⊖
Fast stop								
Freewheel stop								
+/- speed around a reference					⊖	⊖	⊖	
High-speed hoisting					⊖	⊖	⊖	
Torque control	⊖ *(1)*	⊖ *(1)*		⊖ *(1)*	⊖ *(1)*	⊖ *(1)*	⊖ *(1)*	⊖ *(1)*
Load sharing					⊖			
Position control via limit switches					⊖			

(1) Torque control and the speed reference functions are only incompatible if torque control mode is active.
(2) Priority is given to the first of these two stop modes to be activated.
(3) Excluding special use with reference channel Fr2.

⊖ Incompatible functions
Compatible functions
N/A

Priority functions (functions which cannot be active at the same time)
← The arrow indicates which function has priority.
↑ Example: The "Freewheel stop" function has priority over the "Fast stop" function.

Automatic catching a spinning load with speed detection (catch on the fly)	Control and integrity check of output contactor	DC injection stop	Fast stop	Freewheel stop	+/- speed around a reference	High-speed hoisting	Torque control	Load sharing	Position control via limit switches
							⊖ (1)		
							⊖ (1)		
							⊖ (1)		
					⊖	⊖	⊖ (1)	⊖	⊖
					⊖	⊖	⊖ (1)		
					⊖	⊖	⊖ (1)		
⊖	⊖	⊖					⊖ (1)		
							⊖ (1)		
			⊖ (2)	↑					
		⊖ (2)		↑					
		←	←						
							⊖ (1)		
							⊖		⊖
⊖ (1)					⊖ (1)	⊖		⊖	⊖ (1)
							⊖		
						⊖ (1)	⊖		

Contents

3 - PowerSuite software workshop

PowerSuite software workshop

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- Functions . . . . . page 3/2
- References . . . . . page 3/4
- Compatibility . . . . . page 3/5

3

PowerSuite software workshop

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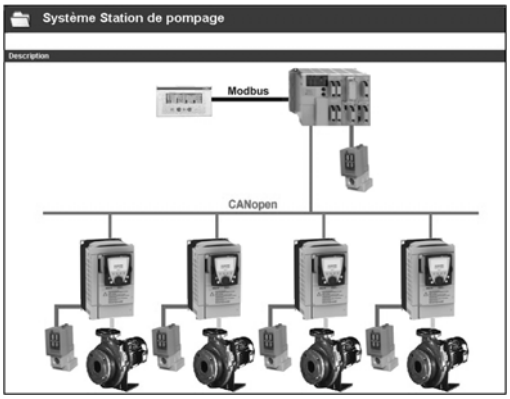

PowerSuite screen on PC
Installed base management

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.

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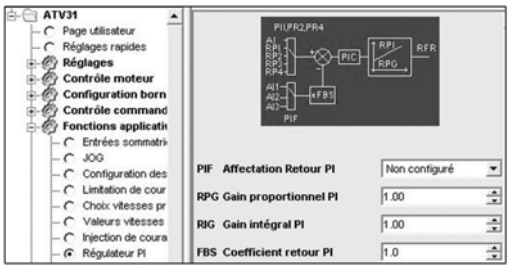

PowerSuite screen on PC
View of PI regulator function parameters

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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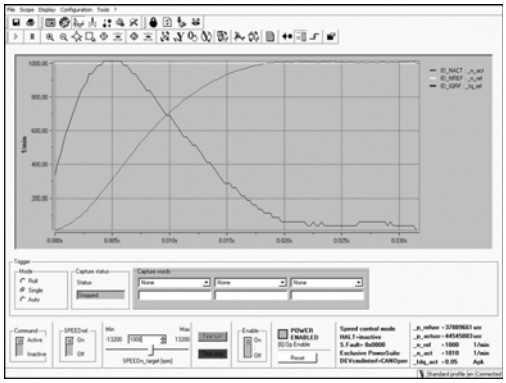


View of the FTT oscilloscope function

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 3/3.

References:
page 3/4

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	□	□	■	■	■	■	■

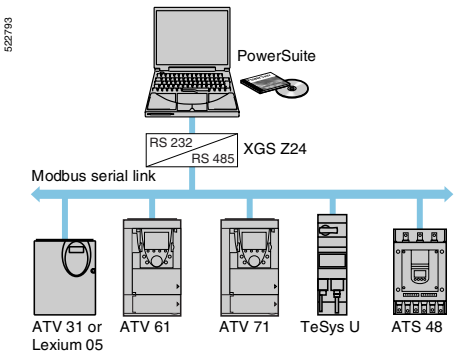
■ Functions available
□ Functions not available

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.

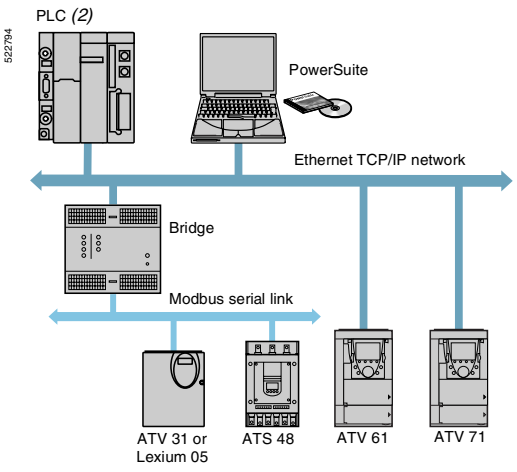
Two types of connection are possible:
- With a single device (point-to-point connection), using a VW3 A8 106 PC serial port connection kit
- With a number of devices (multidrop connection), using the XGS Z24 interface.



Modbus multidrop connection

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



Ethernet connection

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 3/5.
(2) Please refer to our "Automation platform Modicon Premium and Unity - PL7 software" and "Automation platform Modicon TSX Micro - PL7 software" catalogues.

Presentation:
page 3/2

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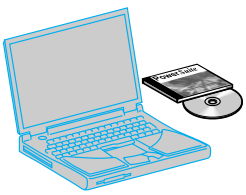
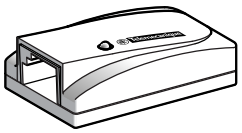
page 3/4

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	**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 3/2
Functions: pages 3/2 and 3/3

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/B *(2)*
Modbus	V1.40	V1.30	V1.40	V2.0	V2.3	V2.2	V2.4
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	V2.4
Bluetooth®		V2.2		V2.2	V2.3	V2.2	V2.4

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® 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 05A●●●●●● servo drives, the minimum software version is 2.2.

3

Presentation: page 3/2
Functions: pages 3/2 and 3/3
References: page 3/4

Contents

4 - Communication

Starters, drives and communication

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- Communication via Fipio bus . . . . . *page 4/10*
- Communication via Modbus serial link . . . . . *page 4/13*
- Communication via Modbus Plus network . . . . . *page 4/15*
- Communication via Uni-Telway serial link . . . . . *page 4/18*
- Communication via gateways LUF-P . . . . . *page 4/23*
- Communication via gateway LA9-P307 . . . . . *page 4/25*

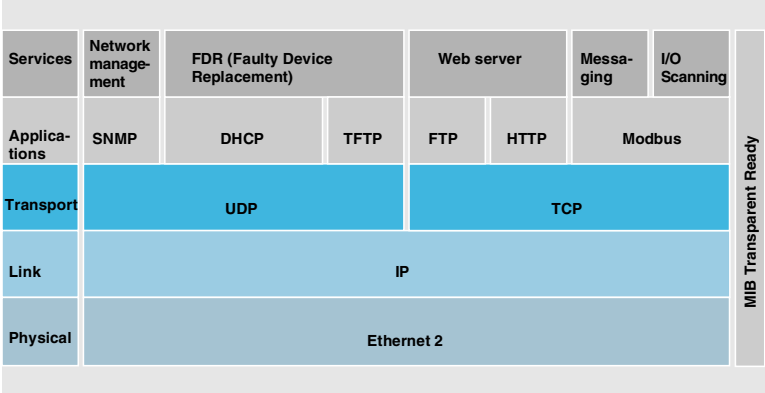
Starters, drives and communication
Ethernet TCP/IP network
Transparent Ready concept

Presentation

Introduced by Schneider Electric, the Transparent Ready concept enables transparent communication between control system devices, production and management. Network technologies and the associated new services are used to share and distribute data between sensors, PLCs, workstations and third-party devices in an increasingly efficient manner.
Web servers embedded in the network components and control system devices can be used to:
- Access configuration data transparently
- Perform remote diagnostics
- Incorporate simple human/machine interface functions

This concept is based on the Ethernet TCP/IP industrial standard which proposes a single network that meets most communication requirements from sensors/actuators through to production management systems.
Where a variety of communication systems are usually required, Transparent Ready standard technologies can result in significant cost savings in the areas of definition, installation, maintenance or training.

Transparent Ready is based on:
- Ethernet TCP/IP-based services meeting control system requirements in terms of functions, performance and quality of services
- Products including several ranges of PLC, distributed I/O, industrial terminals, variable speed drives, gateways and an increasing number of partner products
- The ConneXium range of cabling accessories: hubs, switches, cables adapted to the environment and to the requirements of industrial conditions.



Services supported by Altivar 61 and Altivar 71 drives

The Altistart 48 soft start/soft stop unit and the Altivar 31 variable speed drive are connected to the Ethernet TCP/IP network via an Ethernet/Modbus bridge TSX ETG 100.

Altivar 61 and Altivar 71 variable speed drives are connected to the Ethernet TCP/IP network via a VW3 A3 310 communication card.
This card comes with a basic web server, which users can adapt completely to the application (Java or FactoryCast development tool).

Starters, drives and communication
Ethernet TCP/IP network
Transparent Ready concept

Characteristics

Structure	Topology	Industrial local area network conforming to ANSI/IEEE 802.3 (4th edition 1993-07-08) Star network	
	Transmission mode	Manchester baseband. Half-duplex or full-duplex	
	Data rate	10/100 Mbps with automatic recognition	
	Medium	STP double shielded twisted pair, impedance 100 Ω ± 15 Ω for 10 BASE-T or category 5 Ethernet cable, conforming to standard TIA/EIA-568A	
	Length of network	100 m maximum between hub or switch and a station	
Type of device		**ATS 48, ATV 31**	**ATV 61, ATV 71**
Type of interface		**TSX ETG 100**	**VW3 A3 310**
Universal services		SNMP	HTTP, BOOTP, DHCP, FTP, TFTP, SNMP
Transparent Ready services		Modbus messaging	Modbus messaging, IO Scanning, FDR

Universal services

HTTP

HTTP “Hypertext Transfer Protocol” (RFC 1945) is a protocol used to transmit web pages between a server and a browser. HTTP has been used on the Web since 1990.

Web servers embedded in control system devices are at the heart of the Transparent Ready concept and provide easy access to devices anywhere in the world using a standard web browser such as Internet Explorer or Netscape Navigator.

BOOTP/DHCP

BOOTP/DHCP (RFC 1531) is used to supply devices (client) automatically with IP addresses and parameters. This avoids having to manage the addresses of each device individually by transferring their management to a server.
BOOTP identifies the client device by its Ethernet MAC address. This address is unique to each device and must be entered in the server each time the device is changed.
DHCP “Dynamic Host Configuration Protocol” identifies the client device by a name in plain language (“Device Name”) which is maintained throughout the application: e.g. “Conveyor 23”.

Altivar 61 and Altivar 71 drives can be given a name (“Device Name”) by the terminal or the PowerSuite software workshop.
The FDR (“Faulty Device Replacement”) service uses the standard DHCP and TFTP protocols.

FTP/TFTP

FTP, “File Transfer Protocol” (RFCs 959, 2228 and 2640) and TFTP, “Trivial File Transfer Protocol” (RFC 1123), are used to exchange files with devices.

Transparent Ready devices implement FTP for downloading firmware or custom web pages.
The FDR (“Faulty Device Replacement”) service uses the standard DHCP and TFTP protocols.

SNMP

The Internet community has developed the SNMP standard, “Simple Network Management Protocol” (RFCs 1155, 1156 and 1157), to support the management of the various network components by means of a single system. The network management system can exchange data with SNMP agent devices. This function allows the manager to view the status of the network and devices, to modify their configuration and to return alarms in the event of a fault.

Transparent Ready devices are compatible with SNMP and can be integrated naturally into a network administered via SNMP.

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Starters, drives and communication
Ethernet TCP/IP network
Transparent Ready concept

Transparent Ready services

Modbus communication standard

Modbus, the industry communication standard since 1979, has been ported to Ethernet TCP/IP, the backbone of the Internet revolution, to create Modbus TCP/IP, a totally open protocol on Ethernet. There is no need for any proprietary component, nor the purchase of a licence in order to develop a connection to Modbus TCP/IP.
This protocol can easily be ported to any device supporting a standard TCP/IP communication stack. The specifications can be obtained free of charge from the website: www.modbus.org.

Modbus TCP/IP, simple and open

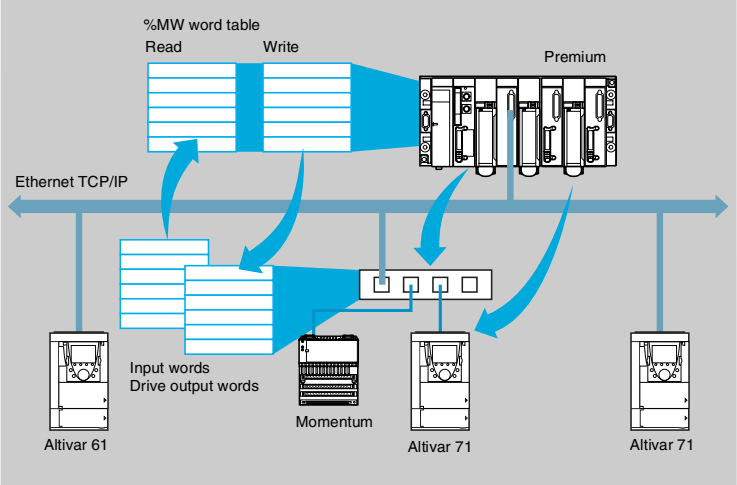
The Modbus application layer is very simple and universally known. Thousands of manufacturers are already implementing this protocol. Many have already developed a Modbus TCP/IP connection and numerous products are currently available.
The simplicity of Modbus TCP/IP enables any small field device, such as an I/O module, to communicate on Ethernet without the need for a powerful microprocessor or a large amount of internal memory.

Modbus TCP/IP, high performance

Thanks to the simplicity of its protocol and the fast Ethernet throughput data rate of 100 Mbps, Modbus TCP/IP achieves excellent performance. This means that this type of network can be used in realtime applications such as I/O Scanning.

I/O Scanning service

Schematic diagram



Altivar 61 and Altivar 71 drives accept the I/O Scanning service generated by:
- The following automation platforms:
  - Premium equipped with a TSX ETY 410/5101 module
  - Quantum
  - Momentum M1E
- A PC equipped with Modbus communication software with the I/O scanner function.

This service is used to manage the exchange of remote I/O on the Ethernet network after simple configuration and without the need for special programming.

The drive I/O are scanned transparently by means of read/write requests according to the Modbus Master/Slave protocol on the TCP/IP profile.

The I/O Scanning service can be configured, activated or deactivated by:
- The PowerSuite software workshop
- The standard web server

Starters, drives and communication

Ethernet TCP/IP network

Transparent Ready concept

Transparent Ready services (continued)

Faulty Device Replacement (FDR) service

The FDR service uses standard DHCP and TFTP technologies with the aim of simplifying the maintenance of Ethernet devices.
It is used to replace a faulty device with a new product, ensuring its detection, reconfiguration and automatic restarting by the system, without the need for any delicate manual intervention.

The main steps are:
- A device using the FDR service becomes faulty
- A similar device is taken out of the maintenance reserve base, preconfigured with the “Device_name” of the faulty device, then reinstalled on the network.
- The FDR server (which can be a Quantum or Premium PLC Ethernet module) detects the new arrival, configures it with its IP address and transfers all its configuration parameters to it.
- The substituted device checks that the parameters are fully compatible with its own characteristics, then switches to operational mode.

Web server

The Ethernet card in Altivar 61 and Altivar 71 drives incorporates a standard web server, in English.
The functions provided by this web server require no special configuration or programming of the PC supporting the web browser. Using a password, two levels of access to the web server can be defined: read-only or modification.

The standard web server provides access to the following functions:
- Altivar Viewer
- Data Editor
- Ethernet Statistics
- Security
- Etc

The standard web server can be adapted or replaced by a customized web server depending on the requirements of the application and downloaded via FTP.
Knowledge of the HTTP protocol and Java technology are required to be able to create or modify a web server.

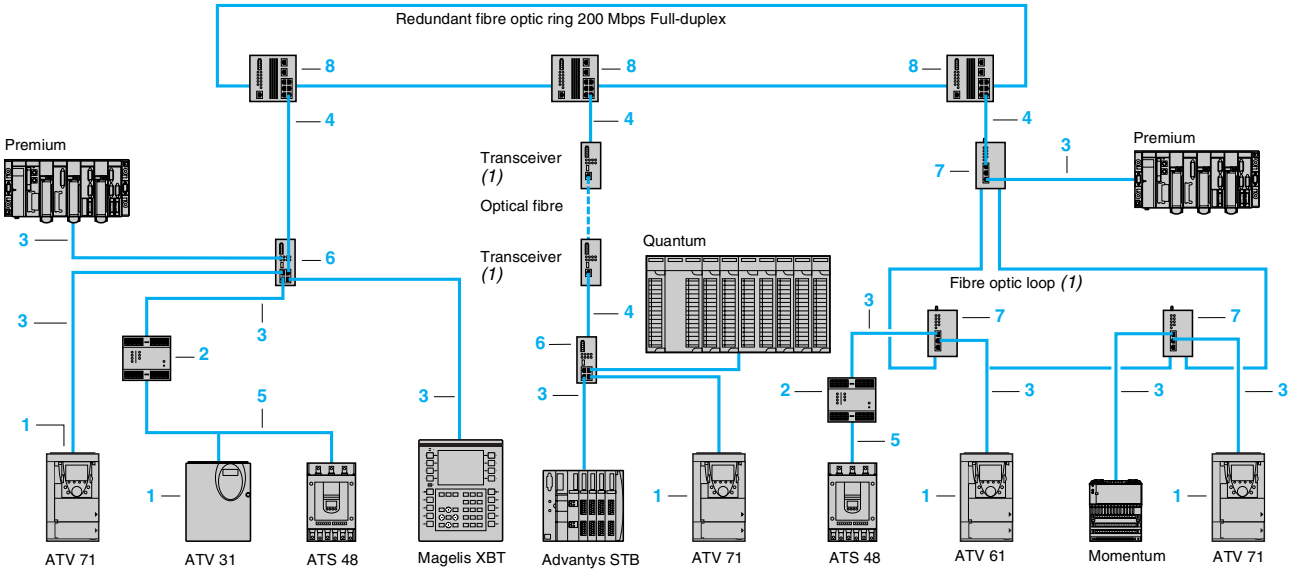
Altivar Viewer

Starters, drives and communication

Ethernet TCP/IP network

Transparent Ready concept

Connections



Ethernet TCP/IP network connection elements *(1)*

Communication interfaces

Description	Use	Item no.	Reference	Weight kg
Communication card equipped with an RJ45 connector Ethernet Modbus TCP/IP 10/100 Mbps Class C20	Variable speed drives ATV 61, ATV 71	1	**VW3 A3 310**	0.300
Modbus Ethernet Bridge/router Class B10	Soft start-soft stop units ATS 48 Variable speed drives ATV 31	2	**TSX ETG 100**	–
Configuration kit	Used to configure the bridge via the Ethernet or RS 232 port. Consists of an RJ45/9-way SUB-D adapter and a CAT5 crossover cable, length 3 m	–	**TCS EAK 0100**	–
PoE power supply (conforming to IEEE 802.3af)	Used to supply the bridge via Ethernet CAT5 cable. Power supply connected via daisy-chain connection. Includes mains cable (Australia, Europe, UK and USA)	–	**TCS EAQ 0100**	–

TSX ETG 100

ConneXium connecting cables

Description	Use		Item no.	Length m	Reference *(2)*	Weight kg
	From	To				
Straight shielded twisted pair cables equipped with 2 RJ45 connectors	ATV 61 or ATV 71 (+ communication card VW3 A3 310) or any other terminal equipment	Hubs 499 N●H 1●● ●0, switches 499 N●S ●●● 0●, TCS ESM083F2●●●	3	2	**490 NTW 000 02**	–
				5	**490 NTW 000 05**	–
				12	**490 NTW 000 12**	–
				40	**490 NTW 000 40**	–
				80	**490 NTW 000 80**	–
Crossed shielded twisted pair cables equipped with 2 RJ45 connectors	Hubs 499 NEH 1●● ●0, switches 499 N●S 251 02, TCS ESM083F2C●0, transceivers *(1)*	Hubs 499 NEH 1●● ●0, switches 499 N●S 251 02, TCS ESM083F2C●0, transceivers *(1)*	4	5	**490 NTC 000 05**	–
				15	**490 NTC 000 15**	–
				40	**490 NTC 000 40**	–
				80	**490 NTC 000 80**	–
Cable for Modbus serial link equipped with 1 RJ45 connector and one stripped end	ATS 48, ATV 31	Ethernet/ Modbus bridge TSX ETG 100	5	3	**VW3 A8 306 D30**	–

(1) To order other Ethernet TCP/IP network connection elements, please refer to the "Ethernet TCP/IP, Transparent Ready" catalogue.

*(2) Cable conforming to EIA/TIA-568 standard category 5 and IEC 1180/EN 50 173, class D. For UL and CSA 22.1 approved cables, add the letter **U** at the end of the reference. Example: 490 NTW 000 02 becomes **490 NTW 000 02U**.*

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Starters, drives and communication

Ethernet TCP/IP network

Transparent Ready concept

499 NEH 141 00

499 NES 251 00

499 NMS 251 02

Ethernet TCP/IP network connection elements *(1)* (continued)

ConneXium Hubs

Description	Number of ports		Item no.	Reference	Weight kg
	Copper cable	Optical fibre			
Hub - 10 Mbps twisted pair 10BASE-T ports for copper cable, shielded RJ45 connectors	4	–	6	**499 NEH 104 10**	0.530
Hub - 100 Mbps twisted pair 100BASE-TX ports for copper cable, shielded RJ45 connectors	4	–	6	**499 NEH 141 00**	0.240
Hub - 10 Mbps twisted pair and multimode optical fibre 10BASE-T ports for copper cable, shielded RJ45 connectors 10BASE-FL ports for optical fibre, ST connectors (BFOC)	3	2	7	**499 NOH 105 10**	0.900

ConneXium Switches

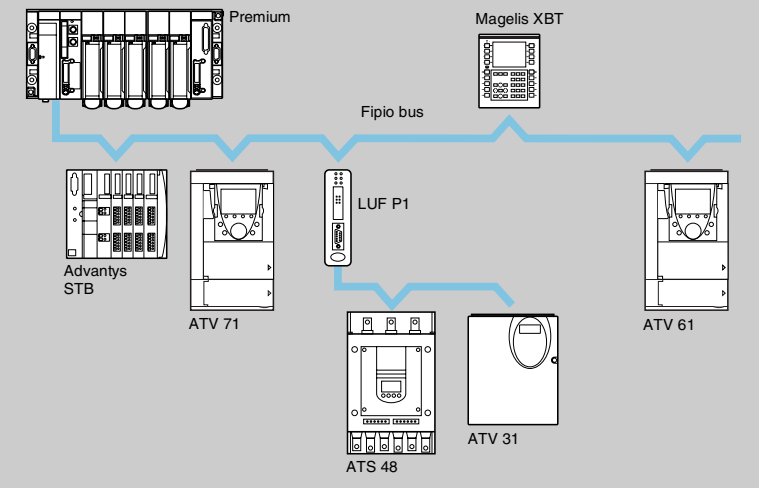
Description	Number of ports		Item no.	Manageable	Reference	Weight kg
	Copper cable	Optical fibre				
Optimized switch, twisted pair 10BASE-T/100BASE-TX copper ports for copper cable, shielded RJ45 connectors	5	–	–	no	**499 NES 251 00**	0.190
Switches, twisted pair 10BASE-T/100BASE-TX ports for copper cable, shielded RJ45 connectors	8	–	–	no	**499 NES 181 00**	0.230
	8	–	–	yes	**TCS ESM083F23F0**	–
Switches, twisted pair and multimode optical fibre 10BASE-T/100BASE-TX ports for copper cable, shielded RJ45 connectors 100BASE-FX ports for optical fibre, SC connectors	4	1	–	no	**499 NMS 251 01**	0.330
	3	2	8	no	**499 NMS 251 02**	0.335
	6	2	8	yes	**TCS ESM083F2CU0**	–
Switches, twisted pair and single-mode optical fibre 10BASE-T/100BASE-TX ports, for copper cable, shielded RJ45 connectors 100BASE-FX ports, for optical fibre, SC connectors	4	1	–	no	**499 NSS 251 01**	0.330
	3	2	8	no	**499 NSS 251 02**	0.335
	6	2	8	yes	**TCS ESM083F2CS0**	–

(1) To order other Ethernet TCP/IP network connection elements, please refer to the "Ethernet TCP/IP, Transparent Ready" catalogue.

4

Starters, drives and communication
Communication via 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 maximum distance of 15 km.
The Fipio bus manager is integrated in the PLC processor.

The Altistart 48 soft start/soft stop unit and the Altivar 31 variable speed drive can be connected to the Fipio bus via an LUF P1 Fipio/Modbus gateway.

Altivar 61 and Altivar 71 drives can be connected to the Fipio bus via a communication card VW3 A3 311.

The following devices can also be connected to the Fipio bus:
- TSX Micro *(2)* or Premium Agent function *(1)* PLCs
- The CCX 17 operator panel *(2)*
- The Magelis XBT-F terminal with graphic screen *(3)*
- The Magelis iPC industrial PC *(3)*
- Advantys STB IP 20 distributed I/O *(4)*
- Discrete, analog or application-specific Momentum distributed I/O *(5)*
- Discrete or analog (IP 20) TBX distributed I/O *(1)*
- TBX discrete (IP 65) or TSX E●F (IP67) dust and damp proof distributed I/O *(1)*
- The TBX SAP 10 Fipio/AS-Interface gateway *(1)*
- The LUF P1 Fipio/Modbus gateway
- A PC terminal
- Partner products in the Collaborative Automation programme

(1) Please consult our "Automation Platform Modicon Premium – Unity & PL7 software" specialist catalogue.
(2) Please consult our "Automation platform Modicon TSX Micro – PL7 software" specialist catalogue".
(3) Please consult our "Human-Machine interfaces" specialist catalogue.
(4) Please consult our "Distributed I/O Advantys STB" specialist catalogue.
(5) Please consult our "Modicon Momentum Automation platform" specialist catalogue.

Characteristics: page 4/9
Connections: page 4/10
References: pages 4/10 and 4/11

Starters, drives and communication
Communication via Fipio bus

Characteristics

Structure	Topology	Industrial bus conforming to the World FIP standard Subscribers linked via daisy-chain or tap junctions	
	Access method	Producer/consumer principle Bus management by a fixed arbitrator (bus manager)	
	Transmission mode	Baseband physical layer on shielded twisted pair, according to standard NF C 46-604	
	Data rate	1 Mbps	
	Medium	Shielded twisted pair 150 Ω Optical fibre 62.5/125 with the use of electrical/fibre optic repeaters	
	Number of subscribers	32 maximum per segment 1 manager + 127 agents maximum over all segments The number of Fipio agents is limited by the memory capacity of Premium processors (62 Altivar drives maximum) *(1)*	
	Number of segments	Unlimited in tree or star architectures Limited to 5 cascaded segments The link between 2 subscribers may cross 4 electrical or electrical/fibre optic repeaters maximum	
	Length of bus	15,000 m maximum 1,000 m maximum without repeater for an electrical segment 5,000 m maximum for 5 electrical segments 3,000 m maximum for 1 fibre optic segment	
Type of device		**ATS 48, ATV 31**	**ATV 61, ATV 71**
Type of interface		**LUF P1**	**VW3 A3 311**
Profile		FED C 32P	FED C 32
Control and adjustment		26 configurable words	8 configurable words (communication scanner)
Monitoring		26 configurable words	8 configurable words (communication scanner)
Configuration and adjustment		1 indexed word Read/write access to all functions by the PLC application program	

(1) Please consult our "Automation Platform Modicon Premium – Unity & PL7 software" specialist catalogue.

4

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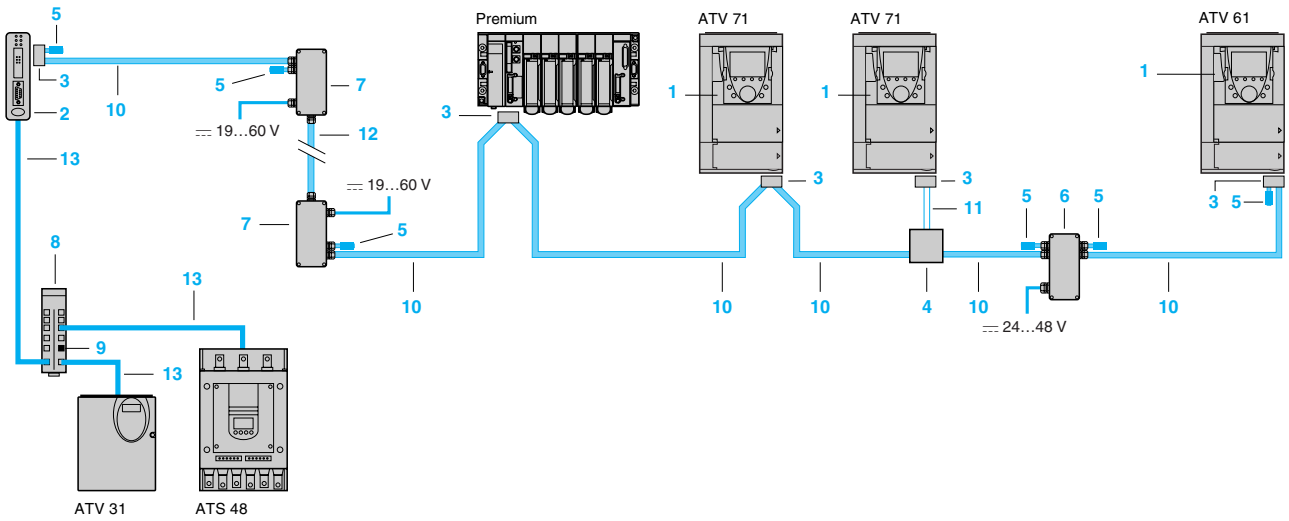
References: pages 4/10 and 4/11

Starters, drives and communication
Communication via Fipio bus

Fipio wiring system



Elements for connecting the Fipio bus and a Premium PLC *(1)*

Cards and gateway

Description	Used for	No.	Reference	Weight kg
Standard Fipio card The card is equipped with a 9-way male SUB-Dconnector which can take a TSX FP ACC12 connector with a TSX FP CA●00 trunk cable or TSX FP CC●00 drop cable. This card should be used for new installations. It is also used to replace an ATV 58 or ATV 58F equipped with a VW3 A58 311 card by an ATV 71.	ATV 61 ATV 71	1	**VW3 A3 311**	0.300
Substitution Fipio card The card is equipped with a 9-way male SUB-D connector which can take a TSX FP ACC12 connector with a TSX FP CA●00 trunk cable or TSX FP CC●00 drop cable. This Fipio communication card is reserved for replacing an ATV 58 or ATV 58F equipped with a VW3 A58 301 card by an ATV 71.	ATV 71	1	**VW3 A3 301**	0.300
Fipio/Modbus gateway The gateway is equipped with: ■ 1 Fipio 9-way male SUB-D connector which can take a TSX FP ACC12 connector for use with a TSX FP CA●00 trunk cable or TSX FPCC●00 drop cable ■ 1 RJ45 connector for Modbus for connection with the VW3 A8 306 R●● cable. Fit an external 24 V ⎓ power supply, 100 mA minimum, to be ordered separately *(2)*.	ATS 48 ATV 31	2	**LUF P1**	0.240

LUF P1

(1) To order other elements for connection to the Fipio bus, please consult our "Automation platform Modicon Premium – Unity & PL7 software" specialist catalogue.
(2) Please consult our "Power supplies, splitter blocks and interfaces" specialist catalogue.

Presentation: page 4/8
Characteristics: page 4/9

Starters, drives and communication
Communication via Fipio bus

Elements for connecting the Fipio bus and a Premium PLC (continued) (1)

Accessories

Description	Use	No.	Unit reference	Weight kg
Female connector for device with 9-way female SUB-D connector (polycarbonate, IP 20)	Connection via daisy-chain or tap junctions. For ATV 61, ATV 71, gateway LUF P1 and Premium PLC	3	**TSX FP ACC12**	0.040
Tap junction (polycarbonate, IP 20)	Trunk cable tap link	4	**TSX FP ACC14**	0.120
Fipio line terminators (sold in lots of 2)	Connector, tap junction and repeater	5	**TSX FP ACC7**	0.020
Electrical repeater (IP 65) Power supply 24…48 V ⎓, 150 mA *(2)*	Increases the length of the bus while enabling connection of 2 segments of 1000 m maximum	6	**TSX FP ACC6**	0.520
Electrical/fibre optic repeater (IP 65) Power supply 19…60 V ⎓, 210 mA *(2)*	Used for connection (via a patch panel) of an electrical segment (1000 m max.) and a fibre optic segment (3000 m max.)	7	**TSX FP ACC8M**	0.620
Modbus splitter block equipped with 10 RJ45 connectors and 1 screw terminal	Used to connect an ATV 31, ATS 48 on the LUP P1 gateway	8	**LU9 GC3**	0.500
Modbus line terminators *(3)*	LU9 GC3 Modbus splitter block	9	**VW3 A8 306 RC**	0.010
FIP wiring test tool	Used to test each section of a network segment	–	**TSX FP ACC9**	0.050

Connecting cables (1)

Description	Use		No.	Length m	Reference	Weight kg
	From	To				
Trunk cables 8 mm, 1 shielded twisted pair 150 Ω. In standard atmosphere *(4)* and inside buildings	Connector TSX FP ACC12, junction box TSX FP ACC14, repeaters TSX FP ACC6, ACC8M	Connector TSX FP ACC12, junction box TSX FP ACC14, repeater TSX FP ACC6	10	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 *(5)*, outside buildings or in mobile installations *(6)*	Connector TSX FP ACC12, junction box TSX FP ACC14, repeaters TSX FP ACC6, ACC8M	Connector TSX FP ACC12, junction box TSX FP ACC14, repeater TSX FP ACC6	10	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 atmosphere *(4)* and inside buildings	Connector TSX FP ACC12	Junction box TSX FP ACC14	11	100	**TSX FP CC100**	5.680
				200	**TSX FP CC200**	10.920
				500	**TSX FP CC500**	30.000
Fibre optic jumper Double optical fibre 62.5/125	Repeater TSX FP ACC8M	Patch panel	12	2	**TSX FP JF020**	0.550
Cables for Modbus bus 2 RJ45 connectors	LUF P1 gateway, ATS 48, ATV 31	LU9 GC3 Modbus splitter block	13	0.3	**VW3 A8 306 R03**	0.025
				1	**VW3 A8 306 R10**	0.060
				3	**VW3 A8 306 R30**	0.130

Documentation

The manuals and quick reference guides for starters and variable speed drives, as well as the user manuals for communication gateways, are available on the web site: www.telemecanique.com.

(1) To order other elements for connection to the Fipio bus, please consult our "Automation platform Modicon Premium – Unity & PL7 software" specialist catalogue.
(2) Please consult our "Power supplies, splitter blocks and interfaces" specialist catalogue.
(3) Sold in lots of 2.
(4) Standard environment:
- no particular environmental constraints
- operating temperature between +5°C and +60°C
- fixed installation
(5) Harsh environment:
- withstand 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
(6) Mobile installation: cables in accordance with standard VDE 472 part 603/H:
- use on a cable-carrier chain with bending radius 75 mm minimum
- use on a gantry, provided that operating conditions such as acceleration, speed, length, etc, are adhered to: please consult your Regional Sales Office
- use not permitted on robots or multi-axis applications.

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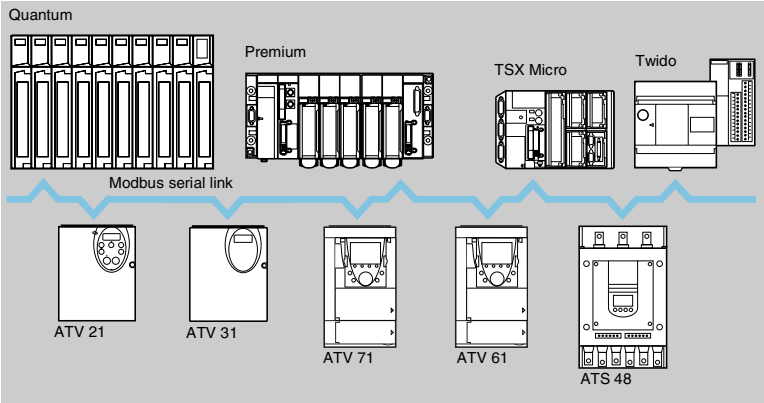
Starters, drives and communication
Communication via Modbus serial link

Presentation



Modbus is a master/slave protocol.

Two exchange mechanisms are possible:
- Request/response: The request from the master is addressed to a given slave. The master then waits for the response from the slave which has been interrogated.
- Broadcasting: The master broadcasts a request to all the slave stations on the serial link, which execute the command without transmitting a response.

The Altistart 48 soft start/soft stop units and the Altivar 21, Altivar 31, Altivar 61 and Altivar 71 variable speed drives have the Modbus protocol integrated as standard.

The Altistart 48 soft start/soft stop unit and the Altivar 21 and Altivar 31 variable speed drives are connected to the Modbus serial link via their terminal ports.

The Altivar 61 and Altivar 71 variable speed drives have 2 integrated communication ports:
- A terminal port for connecting the graphic display terminal or an industrial HMI terminal (Magelis type)
- A Modbus serial link port

As an option, they can also be equipped with a VW3 A3 303 Modbus/Uni-Telway communication card which offers additional characteristics (4-wire RS 485, ASCII mode, etc.).

Characteristics

Type of device			**ATS 48**	**ATV 21**	**ATV 31**	**ATV 61, ATV 71**		
Type de connection			**Terminal port**				**Modbus serial link port**	**Communication card**
Structure	Connector		RJ45	RJ45	RJ45	RJ45	RJ45	9-way female SUB-D
	Topology		Serial link					
	Physical interface		2-wire RS 485					2-wire or 4-wire RS 485
	Access method		Master/slave					
	Transmission mode		RTU					RTU or ASCII
	Data rate	38.4 Kbps	–	–	–	–	●	–
		19.2 or 9.6 Kbps	●	●	●	●	●	●
		4.8 Kbps	●	–	●	–	●	●
	Medium		Double shielded twisted pair					
	Number of subscribers		18, 27 or 31 slaves, depending on polarization *(1)*					
	Type of polarization		4.7 kΩ pulldown resistors	No pulldown				Configurable. No pulldown or 4.7 kΩ pulldown resistors
	Length of serial link		1000 or 1300 m excluding tap links, depending on polarization *(1)*					
	Tap link		3 or 20 m maximum, depending on polarization *(1)*					

(1) See the configuration table on page 4/13.

Connections: pages 4/13 and 4/14
References: pages 4/13 to 4/15

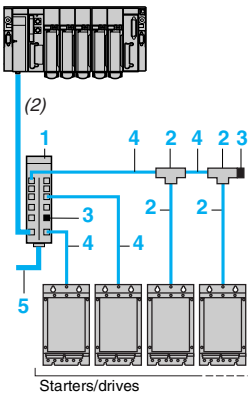
Starters, drives and communication
Communication via Modbus serial link

Configuration on the basis of polarization

The specification of the physical layer provided by standard RS 485 is incomplete.
Various polarization diagrams can therefore be applied depending on the environment in which the equipment is to be used.
The Modbus standard specifies the polarization exactly *(1)*.

		Master	
		With or without polarization 4.7 kΩ	**With polarization 470 Ω**
Slave	**Without polarization**	Configuration not recommended.	Modbus type configuration 31 slaves. Length of serial link: 1300 m Tap link: 3 m maximum RC line terminators (R =120 Ω, C = 1 nF)
	With polarization 4.7 kΩ	Uni-Telway type configuration 27 slaves Length of serial link: 1000 m Tap link: 20 m maximum RC line terminators (R =120 Ω, C = 1 nF)	Mixed configuration 18 slaves Length of serial link: 1000 m Tap link: 20 m maximum RC line terminators (R =120 Ω, C = 1 nF)

PLC



Connection elements for RJ45 wiring system

Card

Description	Used with	Reference	Weight kg
Communication card equipped with a 9-way female SUB-D connector	ATV 61, ATV 71	**VW3 A3 303**	0.300

Accessories

Description		No.	Unit reference	Weight kg
Modbus splitter block 10 RJ45 connectors and 1 screw terminal block		1	**LU9 GC3**	0.500
Modbus T-junction boxes	With integrated cable (0.3 m)	2	**VW3 A8 306 TF03**	0,190
	With integrated cable (1 m)	2	**VW3 A8 306 TF10**	0,210
Line terminators for RJ45 connector *(3)*	R = 120 Ω, C = 1 nF	3	**VW3 A8 306 RC**	0,010
	R = 150 Ω	3	**VW3 A8 306 R**	0.010

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LU9 GC3

Cables

Description	Use		No.	Length m	Reference	Weight kg
	From	To				
Cables for Modbus serial link 2 RJ45 connectors	ATS 48, ATV 21, ATV 31, ATV 61, ATV 71 (terminal ports or Modbus serial liink ports)	Modbus splitter block LU9 GC3	4	0.3	**VW3 A8 306 R03**	0.025
				1	**VW3 A8 306 R10**	0.060
				3	**VW3 A8 306 R30**	0.130
	Modbus T-junction box VW3 A8 306 TF●● Modbus splitter block LU9 GC3	Modbus T-junction box VW3 A8 306 TF●● Modbus splitter block LU9 GC3				
Cables for Modbus serial link One 9-way male SUB-D connector 1 RJ45 connector	ATV 61, ATV 71 (+ communication card VW3 A3 303)	Modbus splitter block LU9 GC3	4	1	**VW3 A58 306 R10**	0.080
				3	**VW3 A58 306 R30**	0.150
Double shielded twisted pair cables	Modbus splitter block LU9 GC3 (screw terminals)	Modbus splitter block LU9 GC3 (screw terminals)	5	100	**TSX CSA 100**	5.680
				200	**TSX CSA 200**	10.920
				500	**TSX CSA 500**	30.000

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VW3 A8 306 TF●●

(1) Standard defined in 2002, available on the website: www.modbus.org.
(2) The cable for connecting the PLC and the splitter block depends on the type of PLC; please consult our "Automation platform Modicon Premium – Unity & PL7 software", "Automation platform Modicon Quantum", "Automation platform Modicon TSX Micro – PL7 software" and "Automation and relay functions" specialist catalogues.
(3) Sold in lots of 2.

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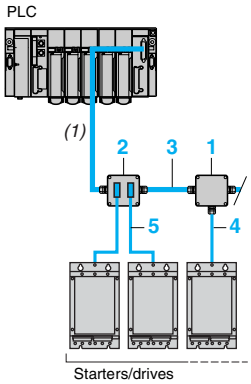

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TSX SCA 50

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TSX SCA 62

Connection elements using tap junctions

Accessories

Description	No.	Reference	Weight kg
Tap junction 3 screw terminals, RC line terminator	1	**TSX SCA 50**	0.520
Subscriber socket Two 15-way female SUB-D connectors and 2 screw terminals, RC line terminator	2	**TSX SCA 62**	0.570

Cables

Description	Use		No.	Length m	Reference	Weight kg
	From	To				
Double shielded twisted pair cables	Tap junction TSX SCA 50, subscriber socket TSX SCA 62	Tap junction TSX SCA 50, subscriber socket TSX SCA 62	3	100	**TSX CSA 100**	5.680
				200	**TSX CSA 200**	10.920
				500	**TSX CSA 500**	30.000
Cable for Modbus serial link 1 RJ45 connector and one stripped end	ATS 48, ATV 21, ATV 31, ATV 61, ATV 71 (terminal ports or Modbus serial link ports)	Tap junction TSX SCA 50	4	3	**VW3 A8 306 D30**	0.150
Cable for Modbus serial link 1 RJ45 connector and one 15-way male SUB-D connector	ATS 48, ATV 21, ATV 31, ATV 61, ATV 71 (terminal ports or Modbus serial link ports)	Subscriber socket TSX SCA 62	5	3	**VW3 A8 306**	0.150
Cable for Uni-Telway and Modbus serial link 2 male SUB-D connectors, 9 and 15-way	ATV 61, ATV 71 (+ communication card VW3 A3 303)	Subscriber socket TSX SCA 62	5	3	**VW3 A8 306 2**	0.150

(1) The cable for connecting the PLC and the splitter block depends on the type of PLC; please consult our "Automation platform Modicon Premium - Unity & PL7 software", "Automation platform Modicon Quantum", "Automation platform Modicon TSX Micro – PL7 software" and "Automation and relay functions" specialist catalogues.

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Starters, drives and communication
Communication via Modbus serial link

Connection elements using screw terminals

Accessories

Description		Sold in lots of	Reference unit	Weight kg
Line terminators for screw terminals	R = 120 Ω, C = 1 nF	2	**VW3 A8 306 DRC**	0.200
	R = 150 Ω	2	**VW3 A8 306 DR**	0.200

Cable

Description	Use		Length	Reference	Weight
	From	To	m		kg
Cable for Modbus 1 RJ45 connector and one stripped end	ATS 48, ATV 21, ATV 31, ATV 61, ATV 71 (terminal ports or Modbus serial link ports)	Standard screw terminal, tap junction TSX SCA 50	3	**VW3 A8 306 D30**	0.150

Documentation

The manuals and quick reference guides for starters and variable speed drives, as well as the user manuals for communication gateways, are available on the website: www.telemecanique.com.

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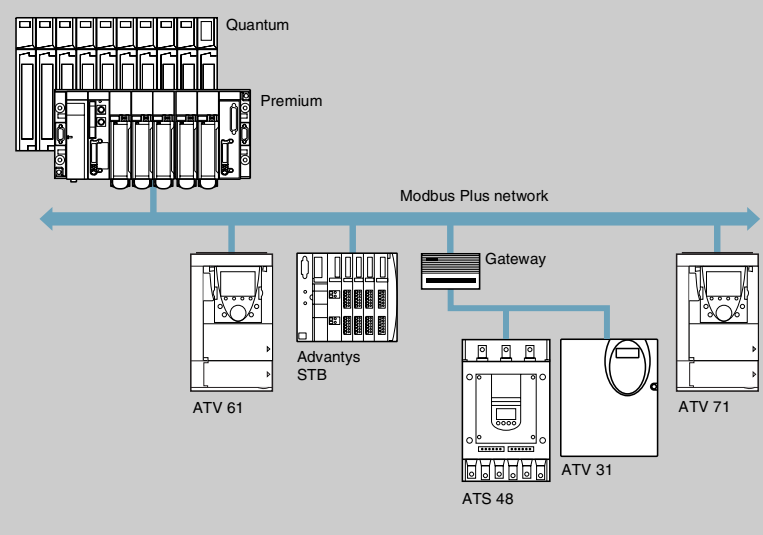
Characteristics: page 4/12
Connections: pages 4/13 and 4/14

Starters, drives and communication
Communication via Modbus Plus network

Presentation



The Modbus Plus network is a high-performance industrial local area network which can be used to meet 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 Altistart 48 soft start/soft stop unit and the Altivar 31 variable speed drive can be connected to the Modbus Plus network via an NW BM85000 gateway which has four RS 232 serial ports.

The Altivar 61 and Altivar 71 variable speed drives are connected to the Modbus Plus network via communication card VW3 A3 302.

Communication services

The main data exchange services between subscribers connected to the network are:
- The “Modbus messaging” service according to Modbus protocol
- The “Global Data” service: each subscriber makes available 32 words for each of the 63 other network subscribers
- The “Peer Cop” dialogue service: point-to-point transaction of 32 receive or transmit words

The “Global Data” and “Peer Cop” services are restricted to a Modbus Plus network with a maximum of 64 subscribers.

Altivar 61 and Altivar 71 drives are accessed by simple configuration in the PLC using “Peer Cop” and “Global Data” services.
These services enable rapid exchange of the main drive parameters:
- The “Peer Cop” service for controlling and adjusting the drive
- The “Global data” service for monitoring the drive

Other parameters, which are used less frequently, can be accessed by the Modbus messaging service.

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Connections: page 4/18
References: pages 4/18 and 4/19

Starters, drives and communication
Communication via Modbus Plus network

Characteristics

Structure	Topology	Network	
	Physical interface	RS 485	
	Access method	Token network	
	Transmission mode	HDLC synchronous	
	Data rate	1 Mbps	
	Medium	Shielded twisted pair 120 Ω Optical fibre	
	Number of subscribers per network	32, without repeater 64, with one or more repeaters	
	Number of networks	4, separated by a maximum of 3 bridges	
	Length of network	450 m maximum without repeater 1800 m maximum with 3 electrical repeaters 3000 m between 2 fibre optic repeaters	
Services	Modbus messaging	Point-to-point requests with confirmation report: 200 bytes maximum, compatible with all Modbus subscribers	
	"Global Data"	4096-byte shared database Cyclic exchange of 32 broadcast words Limited to one network This service does not cross bridges	
	"Peer Cop" dialogue	Point-to-point or broadcast message Limited to one network This service does not cross bridges	
Type of device		**ATS 48, ATV 31**	**ATV 61, ATV 71**
Type of interface		**NW BM85000**	**VW3 A3 302**
Control		"Modbus messaging"	"Peer Cop" 8 configurable words maximum (communication scanner)
Monitoring		"Modbus messaging"	"Global Data" 8 configurable words maximum (communication scanner)
Configuration and adjustment		"Modbus messaging"	"Modbus messaging" Read/write access to all drive parameters

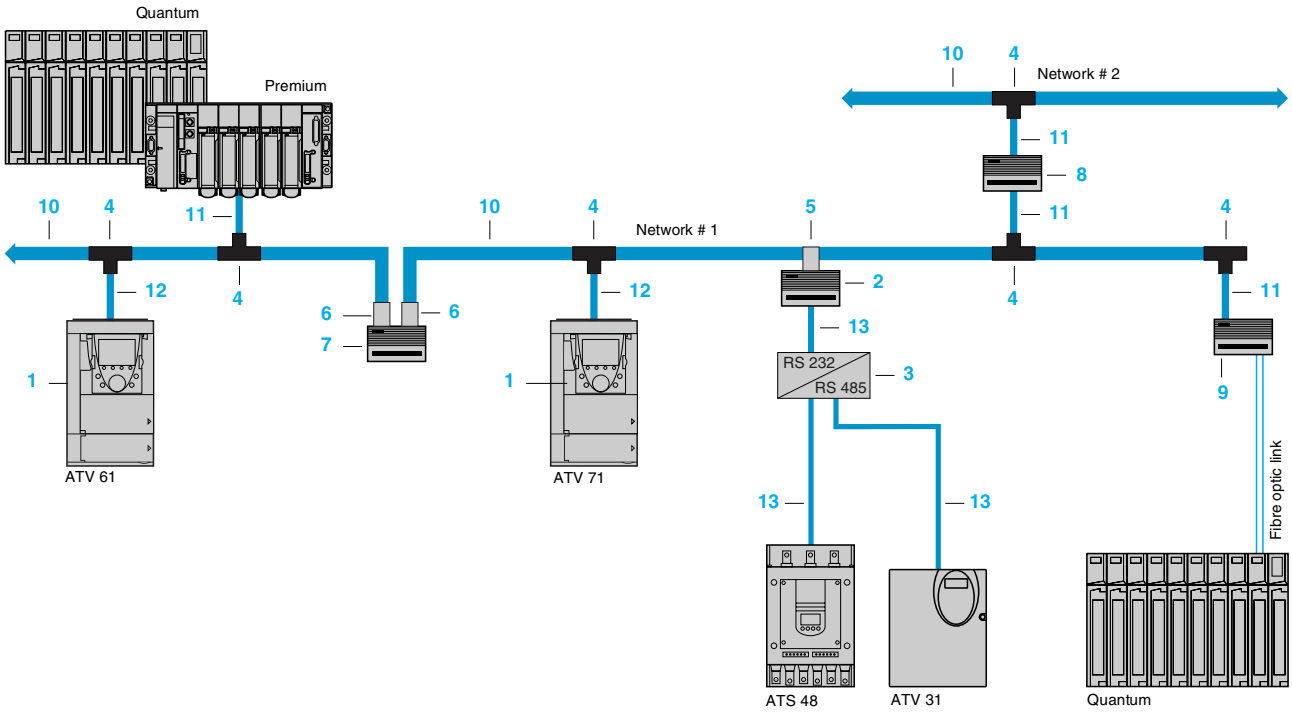
4

Presentation: page 4/16
Connections: page 4/18
References: pages 4/18 and 4/19

Starters, drives and communication

Communication via Modbus Plus network

Modbus Plus wiring system



Modbus Plus network connection elements *(1)*

Cards and gateways

Description	Used with	No.	Reference	Weight kg
Communication cards equipped with one 9-way female SUB-D connector	ATV 61, ATV 71	1	**VW3 A3 302**	0.300
Modbus Plus/Modbus gateway 4 RS 232 ports power supply 115…220 V ~	ATS 48, ATV 31	2	**NW BM85000**	3.158
RS 232/RS 485 interface power supply 24 V ⎓, 20 mA *(2)*	ATS 48, ATV 31	3	**XGS Z24**	0.105

Connection accessories

Description	Use	No.	Reference	Weight kg
Modbus Plus tap (IP 20)	For connecting via a tap junction	4	**990 NAD 230 00**	0.230
Modbus Plus in-line connector	Gateway, bridge and repeater	5	**AS MBKT 085**	0.035
Connector with Modbus Plus terminator (sold in lots of 2)	Bridge and repeater	6	**AS MBKT 185**	0.260
Modbus Plus electrical repeater	Extension beyond 450 m or up to 64 subscribers	7	**NW RR85 001**	2.677
Modbus Plus bridge with 4 ports	Connection of 4 networks maximum	8	**NW BP85 002**	2.813
Line/station fibre-optic repeater	–	9	**490 NRP 254 00**	2.856
Point-to-point fibre-optic repeater	Used to connect an electrical segment to the fibre-optic segment (3000 m maximum)	–	**NW NRP 253 00**	2.863
Wiring tool	Inserting trunk and drop cables in a 990 NAD 230 00 tap	–	**043 509 383**	3.000

(1) To order other connection elements, please consult our "Automation platform Modicon Premium – Unity & PL7 software" and "Automation platform Modicon Quantum" specialist catalogues.
(2) Please consult our "Power supplies, splitter blocks and interfaces" specialist catalogue.

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Starters, drives and communication
Communication via Modbus Plus network

Modbus Plus network connection elements (continued) (1)

Cables

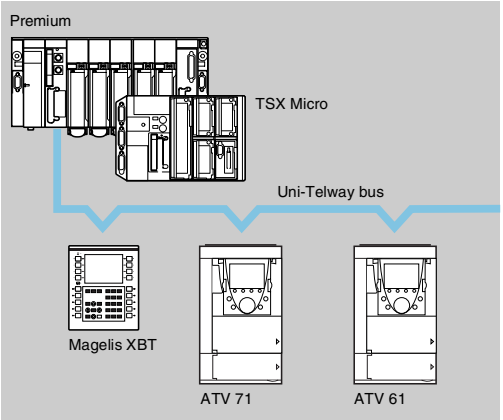
Description	Use		No.	Length	Reference	Weight
	From	To		m		kg
Trunk cables for Modbus Plus	Modbus Plus tap 990 NAD 230 00	Modbus Plus tap 990 NAD 230 00, Modbus Plus in-line connector AS MBKT 085, Modbus Plus connector with terminators AS MBKT 185	10	30.5	**490 NAA 271 01**	1.833
				152.5	**490 NAA 271 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, Quantum PLCs, Modbus Plus bridge with 4 ports NW BP85 002, line/station fibre optic repeater 490 NRP 253 00	Modbus Plus tap 990 NAD 230 00	11	2.4	**990 NAD 211 10**	0.169
				6	**990 NAD 211 30**	0.459
	ATV 61, ATV 71 (+ communication card VW3 A3 302)	Modbus Plus tap 990 NAD 230 00	12	2.4	**990 NAD 219 10**	0.142
				6	**990 NAD 219 30**	0.465
Cable for Modbus 1 RJ45 connector and one stripped end	ATS 48, ATV 31, Modbus Plus/ Modbus gateway NW BM85000	RS 232-RS 485 interface	13	3	**VW3 A8 306 D30**	0.115

(1) To order other connection elements, please consult our "Automation platform Modicon Premium – Unity & PL7 software" and "Automation platform Modicon Quantum" specialist catalogues.

4

Starters, drives and communication
Communication via Uni-Telway bus

Presentation



The Uni-Telway bus is a standard means of communication between control system components (PLCs, HMI terminals, supervisors, variable speed drives, numerical controllers, etc).

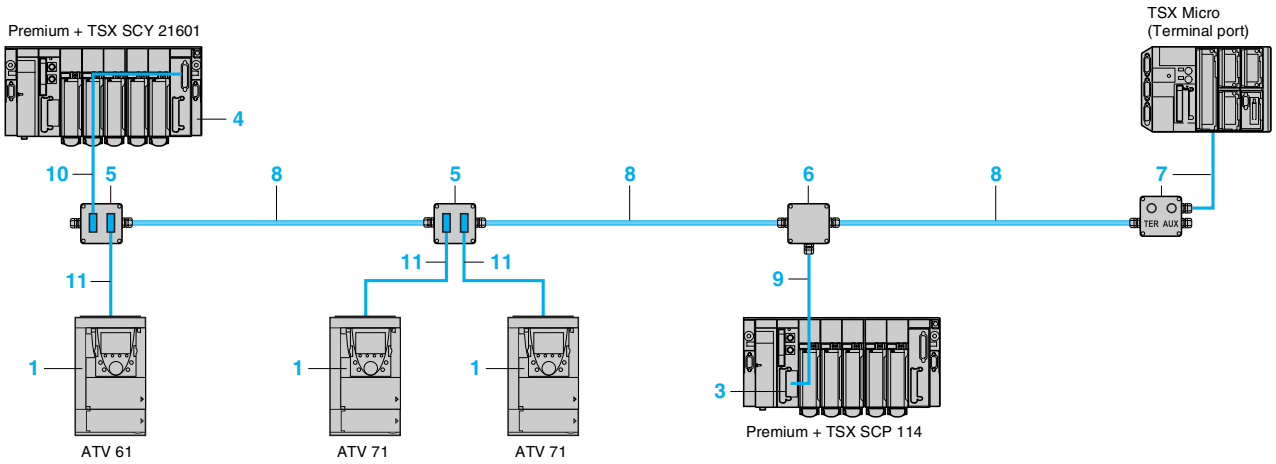
The Uni-Telway bus requires a master station (Premium, TSX Micro PLCs) which manages the allocation of bus access rights to the various connected slave stations (HMI terminals, variable speed drives, etc). The slave stations can communicate with one another without programming the master station.
An industrial HMI terminal (Magelis type) can be connected directly to the bus and can be used to adjust drives without developing applications specific to the PLC.

The Altivar 61 and Altivar 71 variable speed drives can be connected to the Uni-Telway bus via a communication card VW3 A3 303.

Characteristics

Structure	Topology	Bus
	Physical interface	RS 485 isolated
	Link	Multidrop
	Access method	Master/slave type
	Transmission mode	Asynchronous transmission in baseband
	Data rate	4.8…19.2 Kbps
	Medium	Double shielded twisted pair
	Number of stations	28 maximum
	Length of bus	1000 m maximum excluding tap links
	Tap links	20 m maximum
Services	UNI-TE	Request/response of up to 240 bytes *(1)* initiated by any connected station. Unsolicited point-to-point data of up to 240 bytes *(1)* without confirmation report, initiated by any connected station. Broadcast messages of up to 240 bytes *(1)* initiated by the master station.
	Other functions	Transparent communication, via the master station, with any X-WAY architecture. Diagnostics, debugging, adjustment, programming of PLCs.
	Security	Check character on each frame, acknowledgement and, if required, repetition of messages ensure security of transmission.
	Monitoring	The bus status table, transmission error counters and station status can be accessed on each station.

Uni-Telway bus wiring system



(1) Limited to 128 bytes with the Premium and TSX Micro PLC terminal port.

Starters, drives and communication
Communication via Uni-Telway bus

Uni-Telway bus connection elements *(1)*

Cards, kit and module

Description	Used with	No.	Protocol	Reference	Weight kg
Communication card card equipped with a 9-way female SUB-D connector	ATV 61 ATV 71	1	Uni-Telway, Modbus	**VW3 A3 303**	0.300
RS 485 type III PCMCIA card (compatible with RS 422) 1.2...19.2 Kbps	Premium, Atrium, TSX Micro PLCs, or TSX SCY 21601 module	3	Uni-Telway, Modbus, character mode	**TSX SCP 114**	0.105
Communication module	Premium or Atrium PLC	4	Uni-Telway, Modbus, character mode	**TSX SCY 21601**	0.360


533153

TSX SCA 62

Connection accessories

Description	Use	No.	Reference	Weight kg
Subscriber socket Two 15-way female SUB-D connectors and 2 screw terminals	2-channel junction box, trunk cable extension and line terminator	5	**TSX SCA 62**	0.570
Tap junction 3 screw terminals	Junction box, trunk cable extension and line terminator	6	**TSX SCA 50**	0.520
Terminal port connection box with integrated cable, length 1 m	Connection of a TSX Micro or Premium PLC via the PLC terminal port and line terminator	7	**TSX P ACC 01**	0.690


535577

TSX SCA 50


533154

TSX P ACC 01

Cables

Description	Use		No.	Length m	Reference	Weight kg
	From	To				
Uni-Telway double shielded twisted pair cables	Junction box TSX SCA 50, subscriber socket TSX SCA 62, terminal port connection box TSX P ACC 01	Subscriber socket TSX SCA 62, junction box TSX SCA 50, terminal port connection box TSX P ACC 01	8	100	**TSX CSA 100**	5.680
				200	**TSX CSA 200**	10.920
				500	**TSX CSA 500**	30.000
Cables for isolated RS 485 tap link	Card TSX SCP 114	Junction box TSX SCA 50	9	3	**TSX SCP CU 4030**	0.160
		Subscriber socket TSX SCA 62	9	3	**TSX SCP CU 4530**	0.180
	Integrated channel (channel 0) of TSX SCY 21601 module	Junction box TSX SCA 50	10	3	**TSX SCP CU 6030**	0.180
		Subscriber socket TSX SCA 62	10	3	**TSX SCY CU 6530**	0.200
Cable for Uni-Telway or Modbus bus 2 male SUB-D connectors 9 and 15-way	ATV 61, ATV 71 (+ communi-cation card VW3 A3 303)	Subscriber socket TSX SCA 62	11	3	**VW3 A8 306 2**	0.150

(1) To order other elements for connection to the Fipio bus, please consult our "Automation platform Modicon Premium – Unity & PL7 software" and "Automation platform Modicon TSX Micro – PL7 software" specialist catalogues.

Starters, drives and communication
Communication gateways LUF P

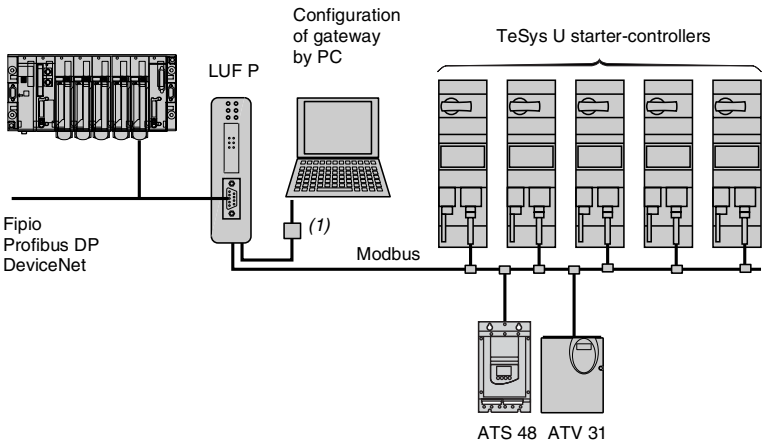
Presentation

Communication gateways LUF P allow connection between the Modbus serial link and Fipio, Profibus DP or DeviceNet field buses.

After configuration, these gateways manage information which can be accessed by the Modbus serial link and make this information available for read/write functions (command, monitoring, configuration and adjustment) on the field buses.

An LUF P communication gateway consists of a box which can be clipped onto a 35 mm omega rail, allowing connection of up to 8 Slaves connected on the Modbus serial link.

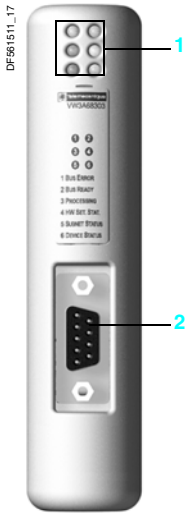
Example of architecture



(1) Connection kit for PowerSuite software workshop.

Description

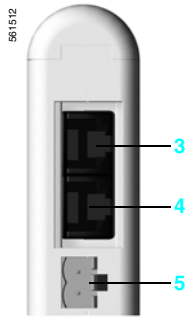
Front panel of the product



1 LED indicating :
- communication status of the Modbus serial links,
- gateway status,
- communication status of the Fipio, Profibus DP or DeviceNet bus.

2 Connectors for connection to Fipio, Profibus DP or DeviceNet buses.

Underside of product



3 RJ45 connector for connection of the Modbus serial link
4 RJ45 connector for link to a PC
5 ⎓ 24 V power supply

Software set-up

For the Fipio bus, software set-up of the gateway is performed using either PL7 Micro/Junior/Pro software or ABC Configurator software.
For the Profibus DP and DeviceNet buses, software set-up is performed using ABC Configurator.
This software is included in the TeSys U user's manual.

Characteristics, references: page 4/23
Dimensions: page 4/23

Starters, drives and communication
Communication gateways LUF P

Characteristics

Bus type			Fipio	Profibus DP	DeviceNet
Environment	Conforming to IEC 60664		Degree of pollution: 2		
Ambient air temperature	Around the device	**°C**	+ 5…+ 50		
Degree of protection			IP 20		
Electromagnetic compatibility	Emission		Conforming to IEC 50081-2: 1993		
	Immunity		Conforming to IEC 61000-6-2: 1999		
Number of Modbus slaves which can be connected			⩽ 8		
Connection	Modbus		By RJ45 connector conforming to Schneider Electric RS485 standard		
	To a PC		By RJ45 connector, with PowerSuite connection kit		
	Field bus		By SUB D9 female connector	By SUB D9 female connector	By 5-way removable screw connector
Supply		**V**	External supply, ⎓ 24 ± 10 %		
Consumption	Max.	**mA**	280		
	Typical	**mA**	100		
Indication/diagnostics			By LED on front panel		
Services	Profile		FED C32 or FED C32P	–	–
	Command		26 configurable words *(1)*	122 configurable words	256 configurable words
	Monitoring		26 configurable words *(1)*	122 configurable words	256 configurable words
	Configuration and adjustment		By gateway mini messaging facility (PKW)		

(1) If the gateway is configured using PL7 and not ABC Configurator, the I/O capacity is limited to a total of 26 words.

References

	Description	For use with		With bus/ serial link	Reference	Weight kg
	Communication gateways	TeSys U starter-controllers, Altistart 48, Altivar 31		Fipio/Modbus	**LUF P1**	0.245
				Profibus DP/Modbus	**LUF P7**	0.245
				DeviceNet/Modbus	**LUF P9**	0.245

Connection accessories

TSX FP ACC 12

490 NAD 911 03

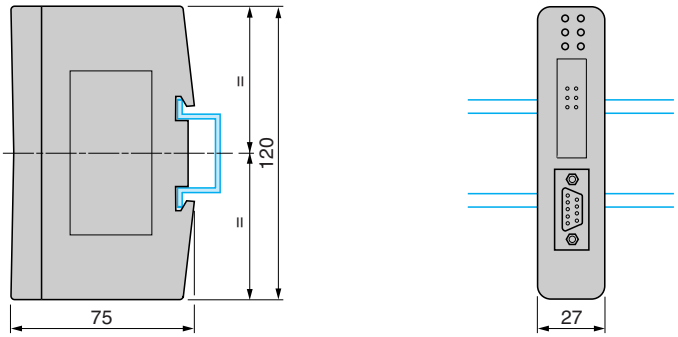
	Description	For use with	Length m	Connectors	Reference	Weight kg
	Connection cables	Modbus *(2)*	3	1 RJ45 type connector and one end with stripped wires	**VW3 A8 306 D30**	0.150
			0.3	2 RJ45 type connectors	**VW3 A8 306 R03**	0.050
			1	2 RJ45 type connectors	**VW3 A8 306 R10**	0.050
			3	2 RJ45 type connectors	**VW3 A8 306 R30**	0.150
	Connectors	Fipio	–	1 SUB-D 9 male connector	**TSX FP ACC12**	0.040
		Profibus mid line	–	1 SUB-D 9 male connector	**490 NAD 911 04**	–
		Profibus line end	–	1 SUB-D 9 male connector	**490 NAD 911 03**	–

Documentation

	Description	Medium	Language	Reference	Weight kg
	User's manual for TeSys U range *(3)*	CD-Rom	Multilingual: English, French, German, Italian, Spanish	**LU9 CD1**	0.022

(2) See pages 4/12 and 4/15.
(3) This CD-Rom contains user's manuals for AS-Interface and Modbus communication modules, multifunction control units and gateways, as well as for the gateway programming software, ABC Configurator.

Dimensions



Presentation, description: page 4/22
Setting-up: page 4/22

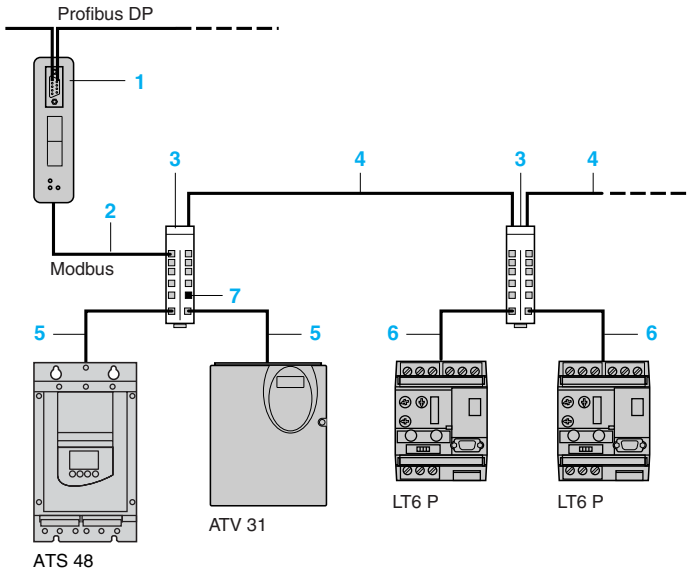
Starters, drives and communication
Communication gateway LA9 P307

Presentation

Communication gateway LA9 P307 provides connection between the Profibus DP field bus and Modbus serial link. It is a Slave on the Profibus DP bus and Master of the Modbus serial link. It manages information present on the Modbus serial link to make it available for read/write functions in the Master PLC on the Profibus DP bus.

Gateway LA9 P307 consists of a box which can be clipped onto a 35 mm omega rail. It manages up to15 Slaves on the Modbus serial link.

Example of architecture



1 Gateway LA9 P307,
2 Tap-off cable VW3 P07 306 R10,
3 Modbus splitter box LU9 GC3,
4 Cable TSX CSA ●00,
5 Tap-link cable VW3 A8 306 R●●,
6 Tap-link cable VW3 A8 306 D30,
7 Line end adapter VW3 A8 306 RC.

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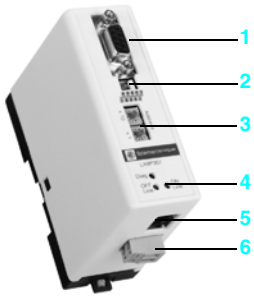


Description

Gateway LA9 P307 comprises :
1 A SUB-D 9-way female connector for connection to the Profibus DP bus,
2 A line end adapter on the Profibus DP bus,
3 Gateway address coding on the Profibus DP bus,
4 Status signalling LED,
5 RJ 45 female connector for connection to the Modbus serial link,
6 ⎓ 24 V power supply.

Software set-up

The gateway is configured using the standard software tools for the Profibus bus. For the Premium automation platform, use SYCON configurator software.
The user's manual (.PDF) and the gateway description file (.GSD) are supplied on diskette with the gateway.

Characteristics, references : page 4/25
Dimensions : page 4/25

Starters, drives and communication
Communication gateway LA9 P307

Characteristics

Environment	Conforming to IEC 60664		Degree of pollution: 2
Ambient air temperature	Around the device	**°C**	0...+ 50
Degree of protection			IP 20
Number of Modbus slaves which can be connected			15
Connection on	Modbus		RJ 45 connector
	Profibus		SUB-D 9-way female connector
Supply			External supply, ⎓ 24 V ± 20 %
Consumption		**mA**	150 on ⎓ 24 V
Indication/diagnostics			By LED
Services	Command		16 words
	Monitoring		16 words
	Configuration and adjustment		By gateway mini messaging facility (PKW)

References

LA9 P307

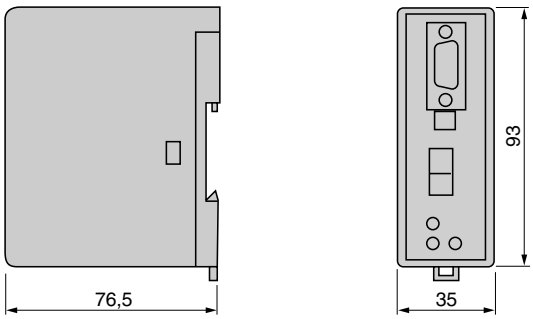
490 NAD 911 03

Description	For use with	Length m	Reference	Weight kg
Profibus DP/Modbus communication gateway	LT6 P ATS 48 ATV 31		**LA9 P307**	0.260

Description	For use with	Length m	Reference	Weight kg
RJ 45 cable with stripped wires	**Screw terminal block** - T-junction box TSX SCA 50 - Y-junction subscriber socket TSX SCA 62 **SUB-D connector** (to be ordered separately) - LT6 P (SUB-D 9 female)	3	**VW3 A8 306 D30**	0.150
RJ 45-RJ 45 cable	ATS 48 ATV 31 Modbus splitter box LU9 GC3	1	**VW3 P07 306 R10**	0.050
Connectors	Profibus mid line	–	**490 NAD 911 04**	–
	Profibus line end	–	**490 NAD 911 03**	–

Dimensions

LA9 P307



Presentation, description : page 4/24
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Technical appendices
Speed control

Technical information

Units

International System of Units (SI): MKSA

Size - base units:
- length L in metres (m)
- mass m in kilograms (kg)
- time t in seconds (s)
- electric current I in amperes (A)

Basic formulae

Kinematic

■ Rectilinear motion

□ Length: L

□ Speed: LT^{-1}

$$V = \frac{dl}{dt} = \frac{l}{t}$$ **(m/s)**

□ Acceleration: LT^{-2}

$$\gamma = \frac{dv}{dt}$$ **(m/s^2)**

■ Circular motion

$$\Theta = \frac{l}{r}$$ **(radian)**

□ Angular speed: LT^{-1}

$$\omega = \frac{d\Theta}{dt} = \frac{\Theta}{t}$$ **(rad/s)**

$$\omega = \frac{2\pi N}{60}$$ **(N: rpm)**

□ Speed: LT^{-1}

$$v = \frac{l}{t} = r\omega$$ **(ω: rad/s)** (v: **m/s**)

□ Angular acceleration: LT^{-2}

$$\alpha = \frac{d^2\Theta}{dt^2} = \frac{d\omega}{dt}$$ **(rad/s^2)**

□ Tangential acceleration: LT^{-2}

$$\gamma = r\alpha$$ **(m/s^2)**

Dynamic

■ Rectilinear motion

□ Force: MLT^{-2}

$$F = m\gamma$$ (**N** newton)

□ Starting force

$$F = m\gamma$$

□ Work: ML^2T^{-2}

$$W = Fl$$ (**J** joule)

□ Power: ML^2T^{-3}

$$P = \frac{W}{t} = \frac{Fl}{t} = Fv$$ **(W** watt)

$$1 \text{ watt} = \frac{1 \text{ joule}}{1 \text{ second}}$$

■ Circular motion

□ Torque: ML^2T^{-2}

$$T = Fr$$ **(Nm** or **J/rad** *(1)*)

□ Starting torque

$$T = J\frac{d\omega}{dt}$$ J: moment of inertia (**$kg.m^2$**)

□ Work: ML^2T^{-2}

$$W = T\Theta$$ (**J** joule)

□ Power: ML^2T^{-3}

$$P = \frac{T\Theta}{t} = T\omega$$ **(W** watt)

$$P = T\frac{2\pi N}{60}$$

□ Energy: Kinetic energy is determined by the speed of the object.

$$W = 1/2\ mv^2$$

$$W = 1/2\ mr^2\omega^2 = 1/2\ J\omega^2$$

(1) In order to avoid confusion, you are advised not to use the symbol mN.

Technical appendices
Speed control

Mechanical information

Old units

Force	1 kgp = 9.81 N = approx. 10 N = 1 daN
Work	1 kgm = 9.81 Nm = 9.81 J
Power	1 kgm/s = 9.81 Nm/s = 9.81 J/s = 9.81 W 1 ch = 75 kgm/s = 75 x 9.81 = 736 W
Torque	1 m kgp = 9.81 Nm

Other information

Moment of inertia J (kg m²)

$$J = \frac{mr^2}{2} = \frac{mD^2}{8}$$

m = mass, in kg
r = gyration radius, in metres
D = gyration diameter, in metres

The moment of inertia J1 of a mass rotating at speed N1 connected to a shaft rotating at speed N2 is calculated as follows:

$$J1 = J2\left(\frac{N1}{N2}\right)^2$$

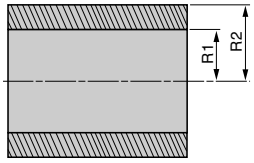
Gyration radius

■ **Solid cylinder**

$$r^2 = \frac{R^2}{2}$$

R = cylinder radius
r = gyration radius (or r = 0.707 R)

■ **Hollow cylinder**



$$r^2 = \frac{R1^2 + R2^2}{2}$$

$$\Rightarrow \quad J = mr^2 = m\frac{R1^2 + R2^2}{2}$$

Centrifugal force

$$F = m\,\omega^2 r$$

In circular motion at constant speed ω:
F: **N**
m: **kg**
ω: **rad/s**
r: **m**

5

Technical appendices
Speed control

Conversion tables for standard units

Length

Units	m	in.	ft	yd
1 metre (m)	1	39.37	3.281	1.094
1 inch (in. or ")	0.0254	1	0.0833	0.02778
1 foot (ft or ')	0.3048	12	1	0.3333
1 yard (yd)	0.9144	36	3	1

Area

Units	m^2	sq.in	sq.ft	sq.yd
1 square metre (m^2)	1	1550	10.764	1.196
1 square inch (sq.in.) (in^2)	$6.45\ 10^{-4}$	1	$6.944\ 10^{-3}$	$7.716\ 10^{-4}$
1 square foot (sq.ft) (ft^2)	0.0929	144	1	0.111
1 square yard (sq.yd) (yd^2)	0.8361	1296	9	1

Volume

Units	m^3	dm^3	cu.in.	cu.ft	cu.yd
1 cubic metre (m^3)	1	1000	61024	35.3147	1.3079
1 cubic decimetre (dm^3) (litre)	0.001	1	61.024	0.0353	0.0013
1 cubic inch (cu.in.) (in^3)	$1.639\ 10^{-5}$	0.0164	1	$5.787\ 10^{-4}$	$2.143\ 10^{-5}$
1 cubic foot (cu.ft) (ft^3)	0.0283	28.32	1728	1	0.0370
1 cubic yard (cu.yd) (yd^3)	0.7645	764.5	46656	27	1

Mass

Units	kg	oz	lb
1 kilogram (kg)	1	35.27	2.205
1 ounce (oz)	0.028	1	0.0625
1 pound (lb)	0.454	16	1

Pressure

Units	Pa	MPa	bar	psi
1 pascal (Pa) **or 1 newton per square metre** (N/m^2)	1	10^{-6}	10^{-5}	$1.45\ 10^{-4}$
1 mega pascal (MPa) **or 1 newton per mm²** (N/mm^2)	10^6	1	10	145.04
1 bar (bar)	10^5	0.1	1	14.504
1 pound weight per square inch (1 $lbf/in.^2$) (psi)	6895	$6.895\ 10^{-3}$	0.06895	1

Technical appendices
Speed control

Conversion tables for standard units (continued)

Angular speed

Units	rad/s	rpm
1 radian per second (rad/s)	1	9.549
1 revolution per minute (rpm)	0.105	1

Linear speed

Units	m/s	km/h	m/min
1 metre per second (m/s)	1	3.6	60
1 kilometre per hour (km/h)	0.2778	1	16.66
1 metre per minute (m/min)	0.01667	0.06	1

Power

Units	W	ch	HP	ft-lbf/s
1 watt (W)	1	$1.36\ 10^{-3}$	$1.341\ 10^{-3}$	0.7376
1 metric horsepower (ch)	736	1	0.9863	542.5
1 horsepower (HP)	745.7	1.014	1	550
1 ft-lbf/s	1.356	$1.843\ 10^{-3}$	$1.818\ 10^{-3}$	1

Force

Units	N	kgf	lbf	pdl
1 newton (N)	1	0.102	0.225	7.233
1 kilogram force (kgf)	9.81	1	2.205	70.93
1 pound weight (lbf)	4.448	0.453	1	32.17
1 poundal (pdl)	0.138	0.0141	0.0311	1

Energy-Work-Heat

Units	J	cal	kWh	B.t.u.
1 joule (J)	1	0.24	$2.78\ 10^{-7}$	$9.48\ 10^{-4}$
1 calorie (cal)	4.1855	1	$1.163\ 10^{-6}$	$3.967\ 10^{-3}$
1 kilowatt-hour (kWh)	$3.6\ 10^{6}$	$8.60\ 10^{5}$	1	3412
1 British thermal unit (B.t.u.)	1055	252	$2.93\ 10^{-4}$	1

Moment of inertia

Units	kg.m²	lb.ft²	lb.in²	oz.in²
1 kilogram/square metre (kg.m²)	1	23.73	3417	54675
1 pound/square foot (lb.ft²)	0.042	1	144	2304
1 pound/square inch (lb.in²)	$2.926\ 10^{-4}$	$6.944\ 10^{-3}$	1	16
1 ounce/square inch (oz.in²)	$1.829\ 10^{-5}$	$4.34\ 10^{-4}$	0.0625	1

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Technical appendices
Speed control

Driving machines

The machine connected to the motor introduces a moment of inertia J (kg.m^2) to which the moment of inertia of the motor, which may be significant, must be added. Calculating this total inertia enables transient states (starts and stops) to be analyzed although it has no effect in steady state.

Circular motion

If the machine is being driven by a gearbox at speed N1, its moment of inertia at the motor rotating at speed N2 is expressed using the formula:

$$J_{\text{machine at the motor}} = J_{\text{machine}} \left(\frac{N1}{N2}\right)^2$$

Translatory motion

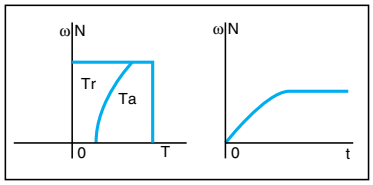
If the machine of mass m (kg) moves at linear speed V (m/s), the moment of inertia at drive shaft level for the speed of rotation ω (rad/s) of the drive motor is expressed using the formula:

$$J_{\text{machine}} = m\frac{V^2}{\omega^2} = m\frac{V^2 3600}{4\pi^2 N^2} \quad \text{where} \quad \omega = \frac{2\pi N}{60}$$

Starting

In order to start within a specific time t (changing from stop to angular speed ω), the average accelerating torque required (Ta) can be calculated if the moment of inertia J is known.

$$Ta\ (Nm) = J\ (kg.m)^2 \frac{d\omega(rad/s)}{dt\ (s)} = J\ (kg.m)^2 \frac{2\pi N(rpm)}{60t\ (s)}$$



The average accelerating torque Ta and the average resistive torque Tr due to the mechanics determine the average motor torque required during the starting time Ts.

$$Ts = Tr + Ta$$

Conversely, if an accelerating torque Ta is fixed, the starting time, for Ta constant, is determined by:

$$t = \frac{J\omega}{Ta}$$

In practice:

■ For DC:

Ts = kTn where Tn = nominal motor torque

k = motor overload coefficient:

□ It is linked to the overload time and the initial temperature.

□ Its value is usually between 1.2 and 1.9 (see the motor manufacturer's catalogue).

In this zone, the armature current and the torque may be approximately proportional.

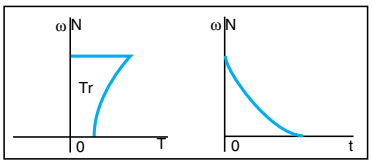
■ For AC:

Please refer to the overtorque and overcurrent characteristics given in the motor manufacturer's catalogue and to the operating characteristics given in this catalogue.

Stopping

If the machine is left alone when the supply voltage is disconnected, the deceleration torque will be equal to the resistive torque:

$$Tdec = Tr = J\frac{d\omega}{dt}$$



The motor will stop after a period of time (t) has elapsed which is related to the moment of inertia by means of the ratio:

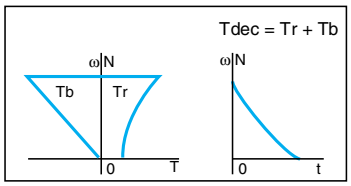
$$t = \frac{J}{Tr}\omega$$

if the value of Tr is more or less constant.

Driving machines (continued)

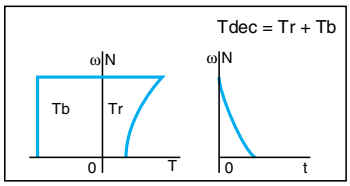
If this stopping time is not acceptable, the deceleration torque must be increased by an electrical braking torque Tb such as:

$$Tdec = Tr + Tb = J\frac{d\omega}{dt}$$



Rheostatic braking

Braking may be rheostatic.
It should be remembered, however, that its effect will be proportional to the speed: Tb = kω.

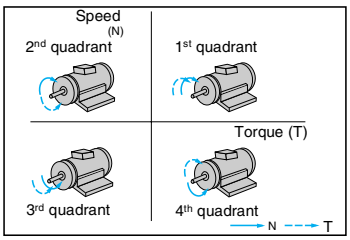


Regenerative braking

Braking may be achieved by regenerating the power from the drive. In this case, the motor feeds the braking energy back to the drive. This energy can be:
- Dissipated in a braking resistor
- Restored to the line supply using a network braking unit

If current limiting is applied, the braking torque remains constant until a stop is reached.

The machine determines the size of the motor and the equipment which must be suitable for both continuous and intermittent operation, including frequent or fast stops and repeated load surges.



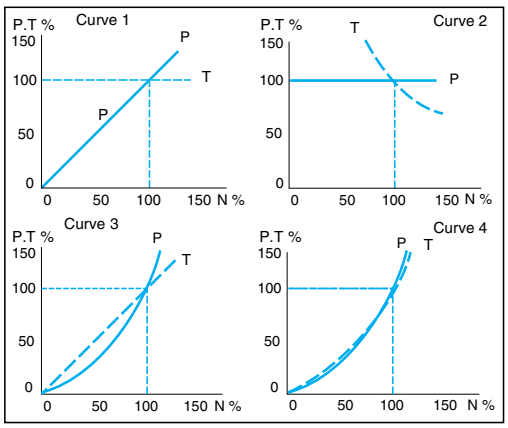
Direction of operation

The illustration opposite shows the four operating options (4 quadrants) in the torque/speed range.

These options are summarized in the table below:

Rotation	Machine operating	Torque T	Speed N	Product T x N	Quadrant
1st direction	as a motor	+	+	+	1
	as a generator	–	+	–	2
2nd direction	as a motor	–	–	+	3
	as a generator	+	–	–	4

As a general rule for all our products, applying a positive reference voltage will cause the motor to rotate in a clockwise direction (1st quadrant) if the appropriate polarities are applied at the armature and at the field coil.



Torque and power

It is essential to determine the torque/speed characteristic of the various machines driven in order to select the correct motor/drive assembly.

In practice, all machines can be classified in four basic categories:
- Constant torque (Curve1)
- Constant power (Curve 2)
- Torque increasing linearly with the speed **T = kN** and power P varing in accordance with the square of the speed (Curve 3)
- Torque increasing with the square of the speed **T = kN2** and power varing in accordance with the cube of the speed (Curve 4)

Some machines may have operating characteristics which are the result of a combination of these different categories. They are limited in number.

Driving machines (continued)

Constant torque

With the exception of pumps and fans, 90% of machines used in industry operate at constant torque.
The torque required by the machine is not determined by the speed.
If the speed doubles, the power also doubles.
On starting, the starting overtorque is often much greater than the resistive torque which is introduced subsequently.

Constant power

For machines operating at constant power, the power required is not determined by the speed and the torque will vary so that it is inversely proportional to the speed.
This type of operation is most often found in machine tools and in winding systems.
Drilling, cutting, milling and turning applications are usually performed at constant power, which means that the torque must be high at low speed and low at high speed.
The motor must supply maximum torque at minimum speed, which usually requires the drive to be oversized in relation to the motor.

Torque increasing linearly with speed

For these machines, the torque varies linearly with the speed, although the power will vary in accordance with the square of the speed.
This may be found in certain helical positive displacement pumps and mixers.

Torque increasing with the square of the speed

For these machines, the torque will vary in accordance with the square of the speed, although the power will vary in accordance with the cube of the speed.
This type of operation is found in centrifugal pumps and fans.
In some cases, the power required by a fan or an air blower will vary in accordance with the fifth power of the speed.
This characteristic must be taken into account when selecting the motor and associated drives.
In this configuration, when the speed doubles, the torque is multiplied by 4 and the power by 8.

Driving machines (continued)

Operating range at constant torque

The table below shows how different types of machine behave during starting and in continuous operation:

Type of machine	Starting torque or overtorque during operation	Drive selection
Machine with ball or roller bearings	110 to 125%	Normal
Machine with axle bearings	130 to 150%	Normal
High friction conveyor or machine	160 to 250%	Oversize the drive and, if necessary, the motor
Machine with jerky operating cycle (press, machine with cams or connecting rod systems)	250 to 600%	Oversize the drive and the motor
High inertia machine with flywheel or rotating masses (centrifuge)	–	The size of the drive will depend on the time required for starting and/or braking

The power ratings given in the catalogues generally correspond to the nominal speed of the motors. The cooling of self-cooled motors is directly linked to their speed and is therefore reduced as the motor slows down.
If continuous operation at nominal torque is required at low speed, you must select a motor with auxiliary forced cooling.

Torque limiting

The drives have a configurable function for limiting the current drawn and thus the torque applied by the motor. The maximum current value is I max. continuous, except in specific operating circumstances where this value may be exceeded temporarily. This method of limiting protects the motor and the machine being driven.
Some drives have two-state limitation which permits temporary overloads on starting up to 1.3 times the nominal torque (Tn).
Overloads are permitted on high-performance (e.g. static reversible) drives.

Driving machines (continued)

Examples of theoretical applications

Use the following information to determine the nominal power Pn of a motor:

$PD^2 = 8\ kg.m^2$
$\Delta n = 0...3000$ rpm in 5 s
$Ts = 2\ Tn$
$Tr = 0.1\ Tn$

■ **Answer**

$Pn = Tn\ \omega n$
$Ts = Tr + Ta$ therefore $Ta = Ts - Tr = 2\ Tn - 0.1\ Tn = 1.9\ Tn$

therefore $Tn = \frac{Ta}{1,9}$

$$Ta = J\frac{d\omega}{dt} = \frac{PD^2}{4} \times \frac{2\pi N}{60 \times 5} = \frac{8}{4} \times \frac{2\pi 3000}{300} = 125.6\ Nm$$

therefore $Cn = \frac{125.6}{1.9} = 66.1\ Nm$

$$Pn = 66.1 \times \frac{2\pi 3000}{60} = 20757\ W \text{ or } 21\ kW$$

Power of motor to be controlled:

$$\frac{Pn}{\eta} = \frac{21}{0.85} = 24.5\ kW \text{ with efficiency } \eta = 0.85$$

Use the following information to determine the starting time of a machine:

Pn on shaft = 5 kW
N = 3000 rpm
$Ts = 1.6\ Tn$
$Tr = 0.8\ Tn$
J machine at the motor = $0.2\ kg.m^2$
J motor = $0.063\ kg\ m^2$

■ **Answer**

J, total inertia = $0.2 + 0.063 = 0.263\ kg.m^2$

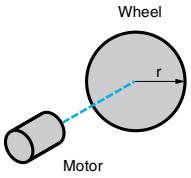
$$\omega n = \frac{2\pi N}{60} = 314\ rad/s$$

$$Pn = Tn\ \omega n \quad \text{or } Tn = \frac{Pn}{\omega n} = \frac{5000}{314} = 16\ Nm$$

$$Ta = Ts - Tr = 1.6 - 0.8 = 0.8\ Tn = 0.8 \times 16 = 12.8\ Nm$$

$$Ta = J\frac{d\omega}{dt} \quad \text{or } t = J\frac{\omega n}{Ta} = 0.263 \times \frac{314}{12.8} = 6.5\ s$$

Driving machines (continued)



Examples of theoretical applications (continued)

Determine the starting time of a wheel driven by a motor (assume that the entire mass is concentrated on the rim):

Wheel: r = 60 cm Mass: 1000 kg Nr = 100 rpm
Motor: Pn = 5 kW N = 3000 rpm JM = 0.063 kg.m^2
$\eta \neq 1$ Ts = 1.6 Tn Tr = 0.2 Tn

■ **Answer**

Total inertia Jt = Jr + JM = mr^2 = 1000.0.6^2 = 360 kg.m^2

$JrM_{\text{ at the motor}} = \frac{Jr}{K^2} = \frac{360}{900} = 0.4 \text{ kg.m}^2$

where $K = \frac{\Omega M}{\Omega r} = \frac{N}{Nr} = 30$

Jt = 0.4 + 0.063 = 0.463 kg.m^2

$Pn = Tn\omega$ or $Tn = \frac{Pn}{\omega n}$ where $\omega n = \frac{2\pi N}{60} = 314$ rad/s

$Tn = \frac{5000}{314} = 16$ Nm

$Ta = Ts - Tn = 1.6\,Tn - 0.2\,Tn = 1.4\,Tn$

$Ta = J\frac{d\omega}{dt}$ or $t = \frac{J\omega}{Ta} = \frac{0.463 \times 314}{1.4 \times 16} = 6.5$ s

Use the following information to determine the braking time and the number of stopping revolutions:

Braking time tb = 3 tM where tM = motor time
$\Theta a = tM\ \omega o$
Braking torque Tb = 3 Tn
N = 1750 rpm
Pn = 15 kW
PD^2 = 2 kg.m^2

■ **Answer**

$J = \frac{PD^2}{4} = \frac{2}{4} = 0.5 \text{ kg.m}^2$

$\omega o = \omega n = \frac{2\pi N}{60} = 183$ rad/s

$Tn = \frac{Pn}{\omega n} = \frac{15000}{183} = 82$ Nm

$Tb = 3\,Tn = 3 \times 82 = 246$ Nm

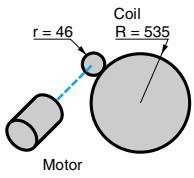
$tM = \frac{J}{Tb} \times d\omega = \frac{0.5 \times 183}{246} = 0.37$ s

$ta = 3\,tM = 3 \times 0.37 \neq 1$ s where ta = stop time

Number of revolutions to stop:

$\Theta a = tM\ \omega o = 0.37 \times 183 = 67.77$ rad or $\frac{67.5}{2\pi} = 10$ revs

Use the following data to determine the Tr, Ts, Tn and Ta values of a machine:



A solid coil weighing 1500 kg rotating at 500 rpm,
driven by a 2 kW motor rotating at 1800 rpm,
time to implement = 26 s
Ts = 2 Tn
Check that the data is compatible

■ **Answer**

$Jc = \frac{MR^2}{2} = \frac{1500 \times 0.535^2}{2} = 215 \text{ kg.m}^2$

$Jc \text{ at the motor} = JcM = \frac{J}{K^2} = \frac{215}{535^2} = 1.6 \text{ kg.m}^2$

where $K = \frac{R}{r}$

$Ta = J\frac{d\omega}{dt} = \frac{1.6 \times 190}{26} = 11.7$ Nm

$Tn = \frac{Pn}{\omega n} = \frac{2000}{190} = 10.5$ Nm $\omega n = \frac{2\pi N}{60} = 190$ rad/s

$Ts = 2\,Tn = 10.5 \times 2 = 21$ Nm

$Tr = Ts - Ta = 21 - 11.7 = 9.3$ Nm

5

Cage asynchronous motors

Basic characteristics

Depending on the speed, the torque for an asynchronous motor will vary in accordance with the square of the voltage.

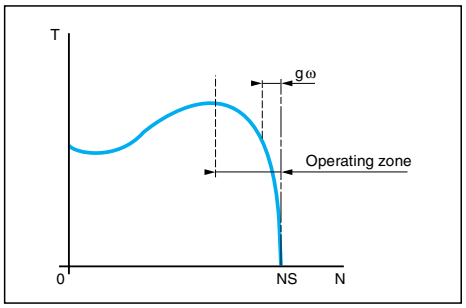
$$T = ko\frac{\phi^2 R\omega g}{R^2 + L^2\omega^2 g^2} \quad (1) \qquad \text{or } T = k\phi^2 \text{ at } \omega g \text{ constant}$$

$$g = \frac{\omega - \omega r}{\omega}$$

L = rotor inductance
R = rotor resistance
f = flux
$\omega g = \omega - \omega r$
ωg = angular speed of field in relation to rotor
ω = synchronous angular speed
ωr = rotor angular speed
g = slip
p = number of pairs of poles

The flux Φ will be proportional to U if the frequency remains constant:

$$f = \frac{\omega}{2\pi} \quad \text{therefore} \quad T = KU^2$$



The lower the stator voltage, the lower the torque for a given speed.
The torque increases, exceeds a maximum value and stops at synchronous speed NS.
The maximum torque is defined using the formula *(1)*.

Divide the second part by R ωg:

$$T = ko\frac{\phi^2}{\frac{L^2\omega g}{R} + \frac{R}{\omega g}}$$

The product of the two expressions with new denominator is constant.
The value of the denominator is minimum and that of the torque maximum if:

$$\frac{R}{\omega g} = \frac{L^2\omega g}{R} \text{ or } R^2 = L^2\omega^2 g^2 \text{ where } \omega g = \frac{R}{L}$$

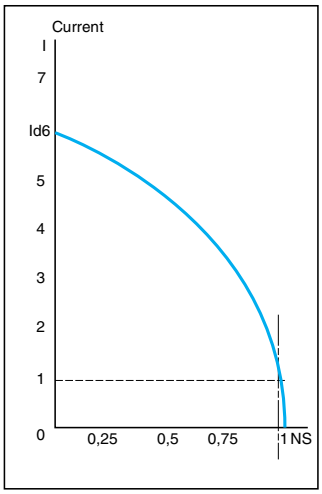
The maximum value becomes:

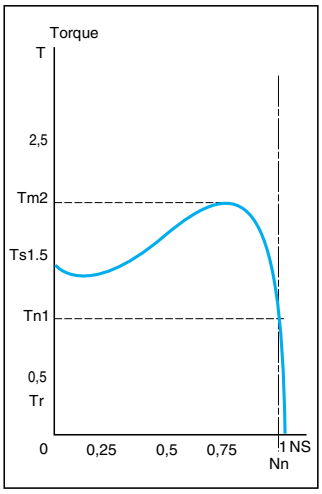
$$T = ko\frac{\phi^2}{2L}$$

which is independent of ωg and R.

The operation of the motor is stable above the speed corresponding to the maximum torque. Below this, the motor is unable to drive the load and stalls.

Cage asynchronous motors (continued)





Basic characteristics (continued)

■ **Current**
□ Is = starting current
□ In = nominal current

■ **Torque**
□ Ts = starting torque
□ Tm = maximum torque
□ Tn = nominal torque

■ **Speed**
□ Ns = synchronous speed

$$Ns = \frac{60\,f}{p}$$

□ Nn = nominal motor speed: corresponds to the speed of the rotor for the nominal motor load

□ gn = nominal slip

$$gn = \frac{Ns - Nn}{Ns}$$

$$Nn = Ns(1 - gn)$$

■ **Power**
□ mechanical:
useful output power on shaft

$$PU = T\omega$$

□ electrical:
electrical motor power

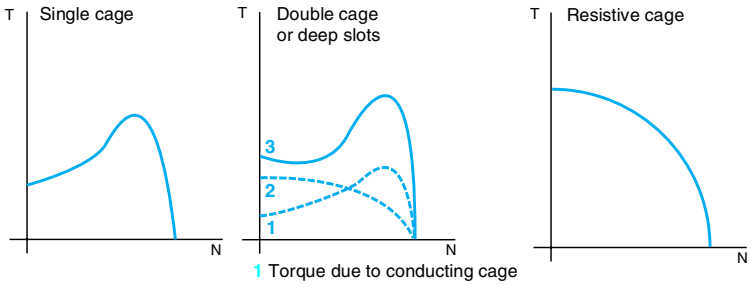
$$PE = \frac{PU}{\eta}$$

$$PE = UI\sqrt{3}\cos\varphi$$

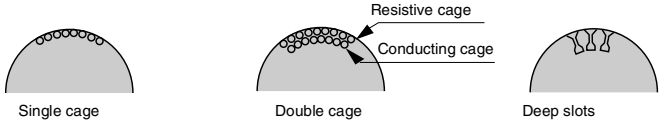
U = supply voltage
I = rms current drawn by the motor
Cos φ = power factor

Torque/speed characteristics of single cage asynchronous motors

Single cage asynchronous motors have a low starting torque (see curves below):



1 Torque due to conducting cage
2 Torque due to resistive cage
3 Resulting torque



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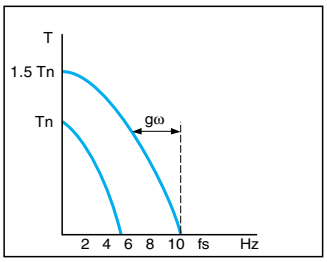
Cage asynchronous motors (continued)

To improve starting torque, modern motors have double cage or deep slot rotors. These include motors used with frequency inverters.

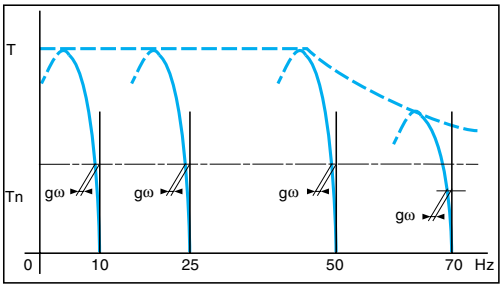
Operation at variable frequency

Supplied with power by a frequency inverter, the operating characteristics of a constant load asynchronous motor are as follows:



■ **Below 50 Hz**

The supply voltage has a ratio U = kf.
Therefore, the flux remains constant for the same number of slipped revolutions ωg and the torque does not change. It follows that the torque characteristics for all frequencies will remain parallel with the torque characteristics at 50 Hz.
The drive automatically compensates for any slip g.



■ **Above 50 Hz**

The voltage U ceases to increase and the flux decreases by:

$$\frac{50}{f}$$

This has three consequences:

□ At constant slip g, the number of "slipped revolutions" gω increases by:

$$\frac{f}{50}$$

□ In comparison, the motor torque falls by:

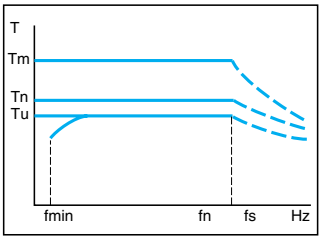
$$\frac{50}{f}$$

□ The maximum torque decreases by:

$$\left(\frac{50}{f}\right)^2$$

Operating conditions

The drive or frequency inverter has been designed to continuously supply the nominal current of the standardized power motor to which it is connected.
The curve illustrates the useful torque (Tu) which a self-cooled motor can supply continuously for the various display speeds between fmin and fn.



fmin = between 1 and 5 Hz depending on the type of drive
fn = nominal output frequency: 50/60 Hz
Tm = maximum torque
Tn = nominal motor torque
Tu = continuous useful torque

For continuous operation, the recommended torque Tu may vary between 0.8 and 0.95 Tn depending on the type of drive.
For transient operation, the maximum torque Tm may vary between 1.3 and 1.75 Tn depending on the type of drive.

In both cases, observe the operating guidelines for each product, which can be found in the catalogue.

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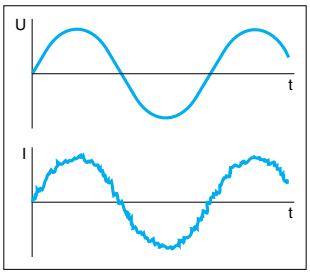
Technical appendices
Electronic speed control

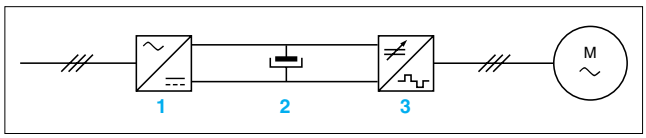
Power circuits



Pulse width modulator (PWM)

Principle

The motor is supplied with power by a variable amplitude and frequency voltage wave. Every half-wave comprises a series of pulses of fixed amplitude and variable width.



1 Fixed AC/DC converter generally comprising one diode bridge
2 Filter comprising one capacitor bank
3 AC/DC pulse width modulator which can be used as:
- A transistor commutator
- A GTO commutator (thyristor with built-in extinction circuit)
- A thyristor commutator with an extinction circuit

The shape of the voltage and current signals in the motor phases is illustrated in the diagrams opposite.

This principle is used in Altivar drives, whose operating characteristics are described below by way of example.

Operation

In the drive, the PWM sine wave commutator comprises 6 transistors and 6 “freewheel” diodes.

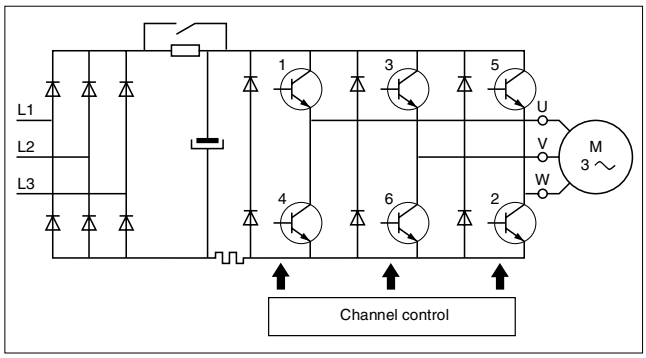
Today, these components are IGBTs.

This inverter bridge has been designed to supply the motor with a variable amplitude and frequency three-phase AC voltage system.

The frequency variation in the voltage applied to the motor is obtained by varying the frequency of the control signals of transistors 1 to 6.

In order to eliminate torque transients, a special type of transistor control can be used to eliminate very low order harmonics. The resulting current is close to the sine wave.

The voltage variation principle consists of modulating each base peak in order to obtain a voltage with an average value lower than that of the filtered DC voltage on each of the peaks.



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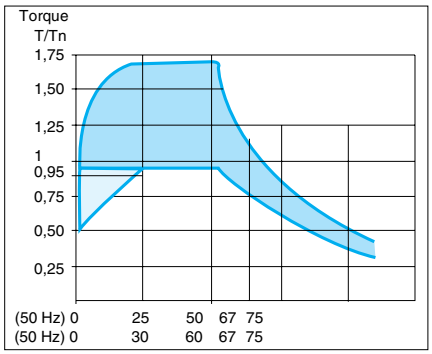
Technical appendices
Electronic speed control

Application examples



Selecting a drive on a conveyor belt

A conveyor belt whose load is more or less constant must operate in a speed range between 1 and 3, which corresponds to a motor speed of 480 to 1440 rpm. The resistive torque at the motor is 7 Nm.

■ **Answer**

$$\text{P useful required by the conveyor} = T\omega n = \frac{T2\pi N}{60} = \frac{7 \times 6.28 \times 1440}{60} = 1055 \text{ W}$$

$$\text{P useful to be supplied by the motor} = \frac{\text{P motor}}{\text{n gearbox}} = \frac{1055}{0.9} = 1180 \text{ W}$$

Determining the frequency at low speed

For 480 rpm, $f = \frac{50}{3} = 17$ Hz

On the torque curve opposite, the derating to be taken into account is 0.8.

$$\textbf{Motor power} = \frac{\textbf{1180}}{\textbf{0.8}} = \textbf{1475 W}$$

The motor to be selected is a standard motor with a power rating that is immediately above 1.5 kW and supplied with power by a 1.5 kW Altivar variable speed drive.

Selecting a drive on a fan

Control of a fan at variable speed with a maximum flow rate of 50,000 m^3/h at a pressure of 245 pascals at a speed of 3000 rpm with efficiency of 0.68.

Defining the motor

Maximum useful output power drawn by the fan:

$$Pu = \frac{Q \times M \times P}{\eta}$$

$$Pu = \frac{50\,000 \times 1.293 \times 245}{3600 \times 0.68} = 6470 \text{ W}$$

Q = air flow in m^3/s
M = air mass in kg/m^3
P = pressure in pascal or N/m^2

Defining the drive

Using an Altivar type variable speed drive to power the motor requires the intended speed to be derated by 0.9.

$$Pm = \frac{Pu}{0.9} = \frac{6470}{0.9} = 7188 \text{ W}$$

i.e. a standardized 7.5 kW motor.

The drive rating selected should be the next highest rating i.e., in this example, a 7.5 kW Altivar drive.

Technical appendices
Electronic speed control

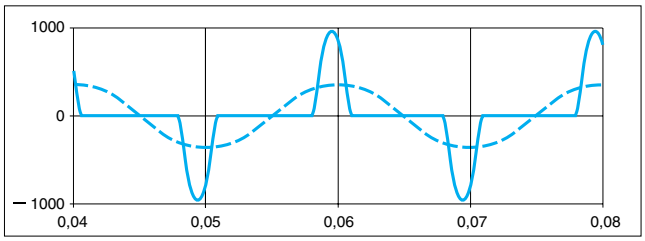
Harmonics

Types of current drawn by the drives

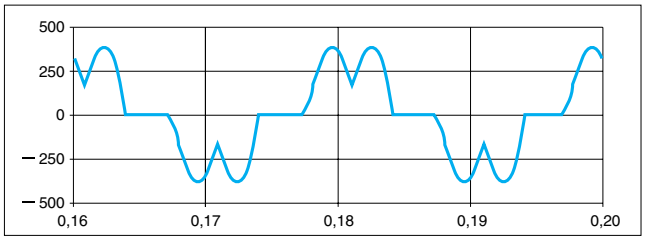
The currents drawn by the variable speed drives are not sinusoidal. The shape of these currents is illustrated in the curves below for different types of drive.

These currents are therefore the result of the superimposition of a fundamental current (at the line frequency) and current harmonics.

Altivar drive with single-phase supply



Altivar drive with three-phase supply
(with additional line choke)



Disturbance caused by harmonics

The presence of harmonics in supply systems can cause numerous problems:
- Overloading and aging of reactive power compensation capacitors
- Overloading of neutral conductors due to the accumulation of third order harmonics generated by single-phase loads
- Distortion of the supply voltage which may disturb sensitive loads
- Overloading of distribution networks due to an increase in the rms current
- Overloading, vibration and aging of alternators, transformers and motors
- Interference on telephone lines.

These types of disturbance may have serious consequences:
- Premature aging of and irreparable damage to equipment
- Oversizing of installations
- Accidental tripping and downtime of installations

All these consequences can have considerable economic impact in terms, for example, of costs incurred due to the oversizing of equipment or reduced service life, additional energy losses and loss of productivity.

Harmonics (continued)

Standards and recommendations

In the case of low frequencies, a variable speed power drive system (PDS) *(1)* may be a source of harmonic currents which contribute to harmonic voltages at the point of connection to the line supply. Standards IEC/EN 61000-2-2 for public supply systems and IEC/EN 61000-2-4 for industrial supply systems provide compatibility levels for harmonic voltages.
In order to fully understand the constraints related to current harmonics, the operating and installation conditions of the PDS in question must be carefully examined. Standard IEC 61000-2-6 and the EMC standard for PDSs, IEC/EN 61800-3 Appendices B and C, can help with this process.
It should also be noted that it may be preferable to filter the harmonics of the installation rather than of each of the PDSs individually in order to reduce the risk of resonance. The EMC standard for PDSs, IEC/EN 61800-3, and IEEE publication 519 examine this global approach for installations.

Standards limiting current harmonics in public supply systems

IEC/EN 61000-3-2

On a public low-voltage distribution system, equipment or devices with an input current of less than 16 A per phase must comply with the limits for harmonic current emissions stipulated by standard IEC/EN 61000-3-2.
In practice, given the low limit value of the supply current stipulated, very few devices incorporating variable speed drives are subject to the requirements of this standard.

IEC/EN 61000-3-12

Equipment installed on a public low-voltage distribution system with an input current of between 16 and 75 A per phase must comply with the limits for harmonic current emissions stipulated by standard IEC/EN 61000-3-12.
If the equipment complies with the short-circuit ratio (RSCE) between the short-circuit power of the supply system at the connection point (SSC) and its installed apparent nominal power (Sequ), filtering by choke is sufficient to ensure compliance with the limits stipulated.
This standard stipulates harmonic current limits order by order up to order 13 and total harmonic distortion (THD) up to order 40. This information is available for users in the variable speed drive catalogue pages.

IEC 61000-3-4 technical report

This technical report recommends harmonic current emissions for equipment installed on public low-voltage distribution systems with an input current of more than 75 A per phase.
The requirements recommended by this report are similar to those of standard IEC/EN 61000-3-12 which was produced from it, and generally speaking choke-based filtering is sufficient to ensure compliance with these limits. If it does not, methods must be used to reduce harmonics throughout the installation or a special agreement must be reached with the electricity supplier.

Limiting current harmonics in industrial supply systems

Equipment incorporating PDSs *(1)* used on a system which is not directly powered by a public low-voltage distribution system is not subject to the requirements of standards IEC/EN 61000-3-2, IEC/EN 61000-3-12 or IEC 61000-3-4.
When necessary, the total level of harmonic current emissions generated by the entire installation should be taken into account.
Appendix B4 of the EMC standard on PDSs, IEC/EN 61800-3, may help companies adopt a reasonable strategy for their installation.

(1) PDS: Power Drive System

Reduction of current harmonics

Line chokes or DC chokes

In order to reduce the current harmonics emitted by variable speed drives in the Altivar range, an inexpensive solution can be applied to each device consisting of connecting either:
- A line choke upstream of the drive
- A DC choke on the DC bus

The inductances are calculated so that the value of the rms current drawn by the drive will not exceed that of the nominal current of the motor connected to the line supply.

The line inductance values are defined to create a voltage drop between 3% and 5% of the nominal line voltage. Values higher than this will cause loss of torque at 50 Hz.

The use of chokes is also recommended in particular under the following circumstances:
- Line supply with significant disturbance from other equipment (interference, overvoltages)
- Line supply with voltage imbalance between phases > 1.8% of nominal voltage
- Drive supplied by a line with very low impedance (in the vicinity of power transformers 10 times more powerful than the drive rating)
- Installation of a large number of frequency inverters on the same line
- Reduction of overloads in capacitors, if the installation has a bank to correct the power factor
- Total power of all drives greater than 10% of the power of the installation

Reduced capacitor technology

This technology is used to significantly reduce the value of the capacitors in the filtering cell of the DC bus. This means that the current harmonics emitted by the drive are significantly reduced, thus allowing fast and inexpensive installation. This solution is particularly suitable for applications which do not require high braking capacity, such as fluid management in service industry buildings (HVAC: heating, ventilation and air conditioning).

Filter solutions for installations

The use of line chokes alone to reduce current harmonic emissions may not be enough to ensure correct operation of the installation or to conform to strict harmonic distortion limits.

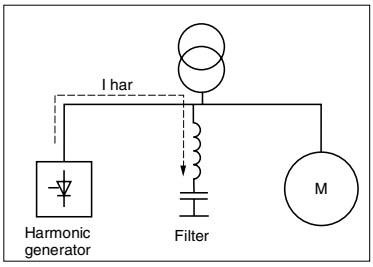
Filter solutions must also be provided if the power of all drives exceeds 20% to 30% of the subscribed demand of the installation.

A filter may be installed for a drive, a group of drives or an entire installation.

Three types of filter are available:
- Passive filters
- Active filters
- Hybrid filters

Technical appendices
Electronic speed control

Reduction of current harmonics (continued)

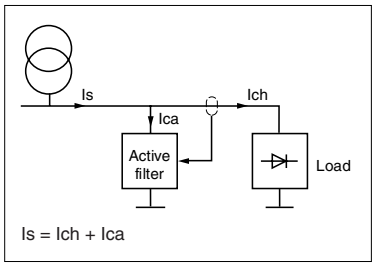


Passive filters

The principle is based on “trapping” the current harmonics in the L-C circuits connected on the harmonic orders to be eliminated. The filter is “stepped”, with each step corresponding to a harmonic order. The fifth to seventh orders are most often filtered.

The filter is selected on the basis of the harmonics generated and the line characteristics.

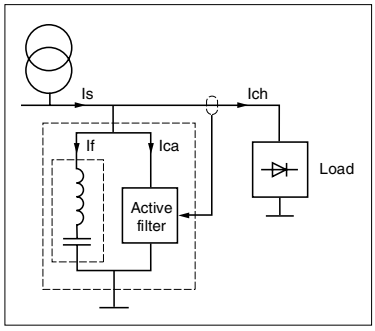
This type of filter can also be used to reduce harmonic distortion already present in the electrical supply provided by utility.



Active filters

Connected in parallel to the load and the line, these filters measure the current harmonics emitted by the load and generate opposing current harmonics (Ica).

The advantages are:
- No dependence on load or line characteristics
- Auto-adaptation



Hybrid filters

The two previous types of device can be combined within a single device, creating a hybrid filter. This novel filter solution enables the benefits of existing solutions to be combined in order to cover a wide range of power and performance.

Passive filter:
- Reactive power compensation
- High current filtering capacity

Active filter:
- Filtering over a broad frequency band

5

Technical appendices

Nominal load currents of cage asynchronous motors

4-pole three-phase motors

Current values for power in kW

Rated operating power (1)	Guide values of rated operating currents at 230 V	400 V	500 V	690 V
kW	A	A	A	A
0.06	0.35	0.2	0.16	0.12
0.09	0.52	0.3	0.24	0.17
0.12	0.7	0.44	0.32	0.23
0.18	1	0.6	0.48	0.35
0.25	1.5	0.85	0.68	0.49
0.37	1.9	1.1	0.88	0.64
0.55	2.6	1.5	1.2	0.87
0.75	3.3	1.9	1.5	1.1
1.1	4.7	2.7	2.2	1.6
1.5	6.3	3.6	2.9	2.1
2.2	8.5	4.9	3.9	2.8
3	11.3	6.5	5.2	3.8
4	15	8.5	6.8	4.9
5.5	20	11.5	9.2	6.7
7.5	27	15.5	12.4	8.9
11	38	22	17.6	12.8
15	51	29	23	17
18.5	61	35	28	21
22	72	41	33	24
30	96	55	44	32
37	115	66	53	39
45	140	80	64	47
55	169	97	78	57
75	230	132	106	77
90	278	160	128	93
110	340	195	156	113
132	400	230	184	134
160	487	280	224	162
200	609	350	280	203
250	748	430	344	250
315	940	540	432	313
355	1061	610	488	354
400	1200	690	552	400
500	1478	850	680	493
560	1652	950	760	551
630	1844	1060	848	615
710	2070	1190	952	690
800	2340	1346	1076	780
900	2640	1518	1214	880
1000	2910	1673	1339	970

Current values for power in HP

Rated operating power (2)	Guide values of rated operating currents at 110 - 120 V	200 V	208 V	220 - 240 V	380 - 415 V	440 - 480 V	550 - 600 V
HP	A	A	A	A	A	A	A
1/2	4.4	2.5	2.4	2.2	1.3	1.1	0.9
3/4	6.4	3.7	3.5	3.2	1.8	1.6	1.3
1	8.4	4.8	4.6	4.2	2.3	2.1	1.7
1 1/2	12	6.9	6.6	6	3.3	3	2.4
2	13.6	7.8	7.5	6.8	4.3	3.4	2.7
3	19.2	11	10.6	9.6	6.1	4.8	3.9
5	30.4	17.5	16.7	15.2	9.7	7.6	6.1
7 1/2	44	25.3	24.2	22	14	11	9
10	56	32.2	30.8	28	18	14	11
15	84	48.3	46.2	42	27	21	17
20	108	62.1	59.4	54	34	27	22
25	136	78.2	74.8	68	44	34	27
30	160	92	88	80	51	40	32
40	208	120	114	104	66	52	41
50	260	150	143	130	83	65	52
60	–	177	169	154	103	77	62
75	–	221	211	192	128	96	77
100	–	285	273	248	165	124	99
125	–	359	343	312	208	156	125
150	–	414	396	360	240	180	144
200	–	552	528	480	320	240	192
250	–	–	–	604	403	302	242
300	–	–	–	722	482	361	289
350	–	–	–	828	560	414	336
400	–	–	–	954	636	477	382
450	–	–	–	1030	–	515	412
500	–	–	–	1180	786	590	472

(1) Values compliant with standard IEC 60072-1 (50 Hz)
(2) Values compliant with standard UL 508 (60 Hz)

Note: *The values shown in this table are provided for information only and will vary depending on the type of motor, its polarity and the manufacturer.*

Technical information
Protective treatment of equipment according to climatic environment

Depending on the climatic and environmental conditions in which the equipment is placed, Schneider Electric can offer specially adapted products to meet your requirements.

In order to make the correct choice of protective finish, two points should be remembered:
- the prevailing climate of the country is never the only criterion,
- only the atmosphere in the immediate vicinity of the equipment need be considered.

All climates treatment “TC”

This is the standard treatment for Telemecanique brand equipment and is suitable for the vast majority of applications. It is the equivalent of treatments described as “Klimafest”, “Climateproof”.
In particular, it meets the requirements specified in the following publications:
- Publication UTE C 63-100 (method I), successive cycles of humid heat at:
+ 40 °C and 95 % relative humidity.
- DIN 50016 - Variations of ambient conditions within a climatic chamber:
+ 23 °C and 83 % relative humidity,
+ 40 °C and 92 % relative humidity.

It also meets the requirements of the following marine classification societies: BV-LR-GL-DNV-RINA.

Characteristics

- Steel components are usually treated with zinc. When they have a mechanical function, they may also be painted.
- Insulating materials are selected for their high electrical, dielectric and mechanical characteristics.
- Metal enclosures have a stoved paint finish, applied over a primary phosphate protective coat, or are galvanised (e.g. some prefabricated busbar trunking components).

Limits for use of “TC” (All climates) treatment

- “TC” treatment is suitable for the following temperatures and humidity:

Temperature (°C)	**Relative humidity** (%)
20	95
40	80
50	50

“TC” treatment is therefore suitable for all latitudes and in particular tropical and equatorial regions where the equipment is mounted in normally ventilated industrial premises. Being sheltered from external climatic conditions, temperature variations are small, the risk of condensation is minimised and the risk of dripping water is virtually non-existent.

Extension of use of “TC” (All climates) treatment

In cases where the humidity around the equipment exceeds the conditions described above, or in equatorial regions if the equipment is mounted outdoors, or if it is placed in a very humid location (laundries, sugar refineries, steam rooms, etc.), “TC” treatment can still be used if the following precautions are taken:
- The enclosure in which the equipment is mounted must be protected with a “TH” finish (see next page) and must be well ventilated to avoid condensation and dripping water (e.g. enclosure base plate mounted on spacers).
- Components mounted inside the enclosure must have a “TC” finish.
- If the equipment is to be switched off for long periods, a heater must be provided (0.2 to 0.5 kW per square decimetre of enclosure), that switches on automatically when the equipment is turned off. This heater keeps the inside of the enclosure at a temperature slightly higher than the outside surrounding temperature, thereby avoiding any risk of condensation and dripping water (the heat produced by the equipment itself during normal running is sufficient to provide this temperature difference).
- Special considerations for "Operator dialog" and "Detection" products:
for certain pilot devices, the use of “TC” treatment can be extended to outdoor use provided their enclosure is made of light alloys, zinc alloys or plastic material. In this case, it is also essential to ensure that the degree of protection against penetration of liquids and solid objects is suitable for the applications involved.

Technical information
Protective treatment of equipment according to climatic environment

"TH" treatment for hot and humid environments

This treatment is suitable for hot and humid atmospheres where installations are regularly subject to condensation, dripping water and the risk of fungi.

In addition, plastic insulating components are resistant to attacks from insects such as termites and cockroaches. These properties have often led to this treatment being described as "Tropical Finish", but this does not mean that all equipment installed in tropical and equatorial regions must systematically have undergone "TH" treatment. On the other hand, certain operating conditions in temperate climates may well require the use of "TH" treated equipment (see limitations for use of "TC" treatment).

Special characteristics of "TH" treatment

■ All insulating components are made of materials which are either resistant to fungi or treated with a fungicide, and which have increased resistance to creepage (Standards IEC 60112, NF C 26-220, DIN 5348).
■ Metal enclosures receive a top-coat of stoved, fungicidal paint, applied over a rust inhibiting undercoat. Components with "TH" treatment may be subject to a surcharge *(1)*. Please consult your Regional Sales Office.

Protective treatment selection guide

Surrounding environment	Duty cycle	Internal heating of enclosure when not in use	Type of climate	Protective treatment	
				of equip-ment	of enclo-sure
Indoors					
No dripping water or condensation	Unimportant	Not necessary	Unimportant	"TC"	"TC"
Presence of dripping water or condensation	Frequent switching off for periods of more than 1 day	No	Temperate	"TC"	"TH"
			Equatorial	"TH"	"TH"
		Yes	Unimportant	"TC"	"TH"
	Continuous	Not necessary	Unimportant	"TC"	"TH"
Outdoors (sheltered)					
No dripping water or dew	Unimportant	Not necessary	Temperate	"TC"	"TC"
			Equatorial	"TH"	"TH"
Exposed outdoors or near the sea					
Frequent and regular presence of dripping water or dew	Frequent switching off for periods of more than 1 day	No	Temperate	"TC"	"TH"
			Equatorial	"TH"	"TH"
		Yes	Unimportant	"TC"	"TH"
	Continuous	Not necessary	Unimportant	"TC"	"TH"

These treatments cover, in particular, the applications defined by methods I and II of guide UTE C 63-100.

Special precautions for electronic equipment

Electronic products always meet the requirements of "TC" treatment. A number of them are "TH" treated as standard.

Some electronic products (for example: programmable controllers, flush mountable controllers CCX and flush mountable operator terminals XBT) require the use of an enclosure providing a degree of protection to at least IP 54, as defined by standards IEC 60664 and NF C 20 040, for use in industrial applications or in environmental conditions requiring "TH" treatment.

These electronic products, including flush mountable products, must have a degree of protection to at least IP 20 (provided either by their own enclosure or by their installation method) for restricted access locations where the degree of pollution does not exceed 2 (a test booth not containing machinery or other dust producing activities, for example).

Special treatments

For particularly harsh industrial environments, Schneider Electric is able to offer special protective treatments. Please consult your Regional Sales Office.

(1) A large number of the Telemecanique brand products are "TH" treated as standard and are, therefore, not subject to a surcharge.

Technical information
Product standards and certifications

Standardisation

Conformity to standards

Telemecanique brand products satisfy, in the majority of cases, national (for example: BS in Great Britain, NF in France, DIN in Germany), European (for example: CENELEC) or international (IEC) standards. These product standards precisely define the performance of the designated products (such as IEC 60947 for low voltage equipment).
When used correctly, as designated by the manufacturer and in accordance with regulations and correct practices, these products will allow users to build equipment, machine systems or installations that conform to their appropriate standards (for example: IEC 60204-1, relating to electrical equipment used on industrial machines).
Schneider Electric is able to provide proof of conformity of its production to the standards it has chosen to comply with, through its quality assurance system.
On request, and depending on the situation, Schneider Electric can provide the following:
- a declaration of conformity,
- a certificate of conformity (ASEFA/LOVAG),
- a homologation certificate or approval, in the countries where this procedure is required or for particular specifications, such as those existing in the merchant navy.

Code	Certification authority		Country
	Name	Abbreviation	
ANSI	American National Standards Institute	ANSI	USA
BS	British Standards Institution	BSI	Great Britain
CEI	Comitato Elettrotecnico Italiano	CEI	Italy
DIN/VDE	Verband Deutscher Electrotechniker	VDE	Germany
EN	Comité Européen de Normalisation Electrotechnique	CENELEC	Europe
GOST	Gosudarstvenne Komitet Standartov	GOST	Russia
IEC	International Electrotechnical Commission	IEC	Worldwide
JIS	Japanese Industrial Standard	JISC	Japan
NBN	Institut Belge de Normalisation	IBN	Belgium
NEN	Nederlands Normalisatie Institut	NNI	Netherlands
NF	Union Technique de l'Electricité	UTE	France
SAA	Standards Association of Australia	SAA	Australia
UNE	Asociacion Española de Normalizacion y Certificacion	AENOR	Spain

European EN standards

These are technical specifications established in conjunction with, and with approval of, the relative bodies within the various CENELEC member countries (European Union, European Free Trade Association and many central and eastern European countries having «member» or «affiliated» status). Prepared in accordance with the principle of consensus, the European standards are the result of a weighted majority vote. Such adopted standards are then integrated into the national collection of standards, and contradictory national standards are withdrawn.
European standards incorporated within the French collection of standards carry the prefix NF EN. At the 'Union Technique de l'Electricité' (*Technical Union of Electricity*) (UTE), the French version of a corresponding European standard carries a dual number: European reference (NF EN …) and classification index (C …).
Therefore, the standard NF EN 60947-4-1 relating to motor contactors and starters, effectively constitutes the French version of the European standard EN 60947-4-1 and carries the UTE classification C 63-110.
This standard is identical to the British standard BS EN 60947-4-1 or the German standard DIN EN 60947-4-1.
Whenever reasonably practical, European standards reflect the international standards (IEC).
With regard to automation system components and distribution equipment, in addition to complying with the requirements of French NF standards, Telemecanique brand components conform to the standards of all other major industrial countries.

Regulations

European Directives

Opening up of European markets assumes harmonisation of the regulations pertaining to each of the member countries of the European Union.
The purpose of the European Directive is to eliminate obstacles hindering the free circulation of goods within the European Union, and it must be applied in all member countries. Member countries are obliged to transcribe each Directive into their national legislation and to simultaneously withdraw any contradictory regulations. The Directives, in particular those of a technical nature which concern us, only establish the objectives to be achieved, referred to as "essential requirements".
The manufacturer must take all the necessary measures to ensure that his products conform to the requirements of each Directive applicable to his production.
As a general rule, the manufacturer certifies conformity to the essential requirements of the Directive(s) for his product by affixing the CE mark.
The CE mark is affixed to Telemecanique brand products concerned, in order to comply with French and European regulations.

Significance of the CE mark
- The CE mark affixed to a product signifies that the manufacturer certifies that the product conforms to the relevant European Directive(s) which concern it; this condition must be met to allow free distribution and circulation within the countries of the European Union of any product subject to one or more of the E.U. Directives.
- The CE mark is intended solely for national market control authorities.
- The CE mark must not be confused with a conformity marking.

Technical information
Product standards and certifications

European Directives (continued)

For electrical equipment, only conformity to standards signifies that the product is suitable for its designated function, and only the guarantee of an established manufacturer can provide a high level of quality assurance.
For Telemecanique brand products, one or several Directives are likely to be applicable, depending on the product, and in particular:

- the Low Voltage Directive 73/23/EEC amended by Directive 93/68/EEC: the CE mark relating to this Directive has been compulsory since 1st January 1997.
- the Electromagnetic Compatibility Directive 89/336/EEC, amended by Directives 92/31/EEC and 93/68/EEC: the CE mark on products covered by this Directive has been compulsory since 1st January 1996

ASEFA-LOVAG certification

The function of ASEFA (Association des Stations d'Essais Française d'Appareils électriques - *Association of French Testing Stations for Low Voltage Industrial Electrical Equipment*) is to carry out tests of conformity to standards and to issue certificates of conformity and test reports.
ASEFA laboratories are authorised by the French authorisation committee (COFRAC).
ASEFA is now a member of the European agreement group LOVAG (Low Voltage Agreement Group). This means that any certificates issued by LOVAG/ASEFA are recognised by all the authorities which are members of the group and carry the same validity as those issued by any of the member authorities.

Quality labels

When components can be used in domestic and similar applications, it is sometimes recommended that a "Quality label" be obtained, which is a form of certification of conformity.

Code	Quality label	Country
CEBEC	Comité Electrotechnique Belge	Belgium
KEMA-KEUR	Keuring van Electrotechnische Materialen	Netherlands
NF	Union Technique de l'Electricité	France
ÖVE	Österreichischer Verband für Electrotechnik	Austria
SEMKO	Svenska Electriska Materiel Kontrollanatalten	Sweden

Product certifications

In some countries, the certification of certain electrical components is a legal requirement. In this case, a certificate of conformity to the standard is issued by the official test authority.
Each certified device must bear the relevant certification symbols when these are mandatory:

Code	Certification authority	Country
CSA	Canadian Standards Association	Canada
UL	Underwriters Laboratories	USA
CCC	China Compulsory Certification	China

Note on certifications issued by the Underwriters Laboratories (UL). There are two levels of approval:

"Recognized" ( ) The component is fully approved for inclusion in equipment built in a workshop, where the operating limits are known by the equipment manufacturer and where its use within such limits is acceptable by the Underwriters Laboratories.
The component is not approved as a "Product for general use" because its manufacturing characteristics are incomplete or its application possibilities are limited.
A "Recognized" component does not necessarily carry the certification symbol.

"Listed" (UL) The component conforms to all the requirements of the classification applicable to it and may therefore be used both as a "Product for general use" and as a component in assembled equipment. A "Listed" component must carry the certification symbol.

Marine classification societies

Prior approval (= certification) by certain marine classification societies is generally required for electrical equipment which is intended for use on board merchant vessels.

Code	Classification authority	Country
BV	Bureau Veritas	France
DNV	Det Norske Veritas	Norway
GL	Germanischer Lloyd	Germany
LR	Lloyd's Register	Great Britain
NKK	Nippon Kaiji Kyokaï	Japan
RINA	Registro Italiano Navale	Italy
RRS	Register of Shipping	Russia

Note

For further details on a specific product, please refer to the "Characteristics" pages in this catalogue or consult your Regional Sales Office.

Technical information
Degrees of protection provided by enclosures
IP code

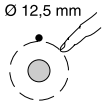
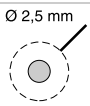
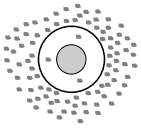
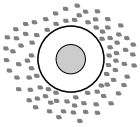
Degrees of protection against the penetration of solid bodies, water and personnel access to live parts

The European standard EN 60529 dated October 1991, IEC publication 529 (2nd edition - November 1989), defines a coding system (IP code) for indicating the degree of protection provided by electrical equipment enclosures against accidental direct contact with live parts and against the ingress of solid foreign objects or water. This standard does not apply to protection against the risk of explosion or conditions such as humidity, corrosive gasses, fungi or vermin.
Certain equipment is designed to be mounted on an enclosure which will contribute towards achieving the required degree of protection (example : control devices mounted on an enclosure).
Different parts of an equipment can have different degrees of protection (example : enclosure with an opening in the base).
Standard NF C 15-100 (May 1991 edition), section 512, table 51 A, provides a cross-reference between the various degrees of protection and the environmental conditions classification, relating to the selection of equipment according to external factors.
Practical guide UTE C 15-103 shows, in the form of tables, the characteristics required for electrical equipment (including minimum degrees of protection), according to the locations in which they are installed.

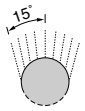
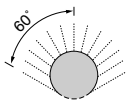
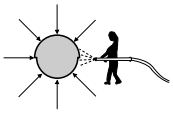
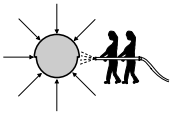
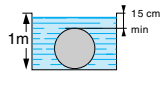
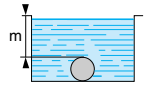
IP ●●● code

The IP code comprises **2 characteristic numerals** (e.g. **IP 55**) and may include **an additional letter** when the actual protection of personnel against direct contact with live parts is better than that indicated by the first numeral (e.g. IP 20C).
Any characteristic numeral which is unspecified is replaced by an X (e.g. IP XXB).

1st characteristic numeral:
corresponds to protection of the equipment against penetration of solid objects and protection of personnel against direct contact with live parts.

	Protection of the equipment		Protection of personnel
0	Non-protected		Non-protected
1		Protected against the penetration of solid objects having a diameter greater than or equal to 50 mm	Protected against direct contact with the back of the hand (accidental contacts).
2		Protected against the penetration of solid objects having a diameter greater than or equal to 12.5 mm.	Protected against direct finger contact.
3		Protected against the penetration of solid objects having a diameter greater than or equal to 2.5 mm.	Protected against direct contact with a Ø 2.5 mm tool.
4		Protected against the penetration of solid objects having a diameter > 1 mm.	Protected against direct contact with a Ø 1 mm wire.
5		Dust protected (no harmful deposits).	Protected against direct contact with a Ø 1 mm wire.
6		Dust tight.	Protected against direct contact with a Ø 1 mm wire.

2nd characteristic numeral:
corresponds to protection of the equipment against penetration of water with harmful effects.

0	Non-protected	
1		Protected against vertical dripping water, (condensation).
2		Protected against dripping water at an angle of up to 15°.
3		Protected against rain at an angle of up to 60°.
4		Protected against splashing water in all directions.
5		Protected against water jets in all directions.
6		Protected against powerful jets of water and waves.
7		Protected against the effects of temporary immersion.
8		Protected against the effects of prolonged immersion under specified conditions.

Additional letter:
corresponds to protection of personnel against direct contact with live parts.

A	With the back of the hand.
B	With the finger.
C	With a Ø 2.5 mm tool.
D	With a Ø 1 mm wire.

Technical information

Degrees of protection provided by enclosures
IK code

Degrees of protection against mechanical impact

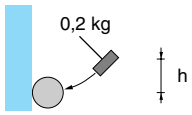
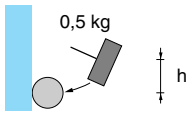
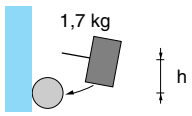
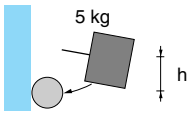
The European standard EN 50102 dated March 1995 defines a coding system (IK code) for indicating the degree of protection provided by electrical equipment enclosures against external mechanical impact.
Standard NF C 15-100 (May 1991 edition), section 512, table 51 A, provides a cross-reference between the various degrees of protection and the environmental conditions classification, relating to the selection of equipment according to external factors.
Practical guide UTE C 15-103 shows, in the form of tables, the characteristics required for electrical equipment (including minimum degrees of protection), according to the locations in which they are installed.

IK ●● code

The IK code comprises **2 characteristic numerals** (e.g. **IK 05**).

2 characteristic numerals:

corresponding to a value of impact energy.

		h (cm)	Energy (J)
00	Non-protected		
01		7.5	0.15
02		10	0.2
03		17.5	0.35
04		25	0.5
05		35	0.7
06		20	1
07		40	2
08		30	5
09		20	10
10		40	20

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Substituting starters
LH4 N1 and LH4 N2
Old/new equivalence tables *(1)*

536219

ATS 01

These tables of equivalence can be used to substitute devices on the basis of:
- line voltage
- motor power
- the positions of connection terminals.

The solutions offered are based on the equivalence between simple applications. For complex application, check compatibility in the corresponding catalogue.

Reference	Position of the connection terminals	Reference	Position of the connection terminals
Old starters LH4 N1		**Replaced by starters ATS 01N1**	
Line voltage 200...240 V single phase		**Line voltage 110...230 V single phase**	
LH4 N106LU7	top and bottom	**ATS 01N106FT**	top and bottom
LH4 N112LU7	top and bottom	**ATS 01N112FT**	top and bottom
LH4 N125LU7	top and bottom	**ATS 01N125FT**	top and bottom
Line voltage 200...480 V 3-phase		**Line voltage 110...480 V 3-phase**	
LH4 N106●●7	top and bottom	**ATS 01N106FT**	top and bottom
LH4 N112●●7	top and bottom	**ATS 01N112FT**	top and bottom
LH4 N125●●7	top and bottom	**ATS 01N125FT**	top and bottom
Old starters LH4 N2		**Replaced by soft start/soft stop units ATS 01N2**	
Line voltage 200...240 V 3-phase		**Line voltage 200...240 V 3-phase**	
LH4 N206LU7	top and bottom	**ATS 01N206LU**	top and bottom
LH4 N212LU7	top and bottom	**ATS 01N212LU**	top and bottom
LH4 N225LU7	top and bottom	**ATS 01N222LU**	top and bottom
Line voltage 380...415 V 3-phase		**Line voltage 380...415 V 3-phase**	
LH4 N206QN7	top and bottom	**ATS 01N206QN**	top and bottom
LH4 N212QN7	top and bottom	**ATS 01N212QN**	top and bottom
LH4 N225QN7	top and bottom	**ATS 01N222QN**	top and bottom
Line voltage 440...480 V 3-phase		**Line voltage 440...480 V 3-phase**	
LH4 N206RT7	top and bottom	**ATS 01N206RT**	top and bottom
LH4 N212RT7	top and bottom	**ATS 01N212RT**	top and bottom
LH4 N225RT7	top and bottom	**ATS 01N222RT**	top and bottom
Line voltage 230...690 V 3-phase		**Line voltage 230...690 V 3-phase**	
LH4 N230LY7	top and bottom	**ATS 01N232LY**	top and bottom
LH4 N244LY7	top and bottom	**ATS 01N244LY**	top and bottom
LH4 N272LY7	top and bottom	**ATS 01N272LY**	top and bottom
LH4 N285LY7	top and bottom	**ATS 01N285LY**	top and bottom
Line voltage 400 V 3-phase		**Line voltage 400 V 3-phase**	
LH4 N230Q7	top and bottom	**ATS 01N244Q**	top and bottom
LH4 N244Q7	top and bottom		
LH4 N272Q7	top and bottom	**ATS 01N272Q**	top and bottom
LH4 N285Q7	top and bottom	**ATS 01N285Q**	top and bottom

(1) For additional information, please consult your Regional Sales Office.

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Selection guide:
pages 1/2 and 1/3

Substituting starters

ATS 23, ATS 23P and ATS 46

Old/new equivalence tables (1)


106762

ATS 48

Old starters ATS 23 and ATS 23P		Replaced by starters ATS 46		Replaced by starters ATS 48	
Reference	**Position of the connection terminals**	**Reference**	**Position of the connection terminals**	**Reference**	**Position of the connection terminals**
Line voltage 230...415 V 3-phase					
ATS 23, ATS 23PU70N	top and bottom	**ATS 46D17N**	top and bottom	**ATS 48D17Q**	top and bottom
ATS 23, ATS 23PD12N	top and bottom				
ATS 23, ATS 23PD16N	top and bottom				
–	–	**ATS 46D22N**	top and bottom	**ATS 48D22Q**	top and bottom
ATS 23, ATS 23PD30N	top and bottom	**ATS 46D32N**	top and bottom	**ATS 48D32Q**	top and bottom
–	–	**ATS 46D38N**	top and bottom	**ATS 48D38Q**	top and bottom
ATS 23, ATS 23PD44N	top and bottom	**ATS 46D47N**	top and bottom	**ATS 48D47Q**	top and bottom
–	–	**ATS 46D62N**	top and bottom	**ATS 48D62Q**	top and bottom
ATS 23, ATS 23PD72N	top and bottom	**ATS 46D75N**	top and bottom	**ATS 48D75Q**	top and bottom
–	–	**ATS 46D88N**	top and bottom	**ATS 48D88Q**	top and bottom
ATS 23, ATS 23PC10N	top and bottom	**ATS 46C11N**	top and bottom	**ATS 48C11Q**	top and bottom
ATS 23, ATS 23PC15N	top and bottom	**ATS 46C14N**	top and bottom	**ATS 48C14Q**	top and bottom
–	–	**ATS 46C17N**	top and bottom	**ATS 48C17Q**	top and bottom
–	–	**ATS 46C21N**	top and bottom	**ATS 48C21Q**	top and bottom
ATS 23, ATS 23PC24N	bottom	**ATS 46C25N**	top and bottom	**ATS 48C25Q**	top and bottom
ATS 23, ATS 23PC30N	bottom	**ATS 46C32N**	top and bottom	**ATS 48C32Q**	top and bottom
ATS 23, ATS 23PC41N	bottom	**ATS 46C41N**	top and bottom	**ATS 48C41Q**	top and bottom
–	–	**ATS 46C48N**	top and bottom	**ATS 48C48Q**	top and bottom
ATS 23, ATS 23PC58N	bottom	**ATS 46C59N**	top and bottom	**ATS 48C59Q**	top and bottom
–	–	**ATS 46C66N**	top and bottom	**ATS 48C66Q**	top and bottom
–	–	**ATS 46C79N**	top and bottom	**ATS 48C79Q**	top and bottom
ATS 23, ATS 23PC82N	bottom	**ATS 46M10N**	top and bottom	**ATS 48M10Q**	top and bottom
ATS 23, ATS 23PM12N	bottom	**ATS 46M12N**	top and bottom	**ATS 48M12Q**	top and bottom
Line voltage 208...690 V 3-phase					
ATS 23, ATS 23PU70N	top and bottom	**ATS 46D17N**	top and bottom	**ATS 48D17Y**	top and bottom
ATS 23, ATS 23PD12N	top and bottom				
ATS 23, ATS 23PD16N	top and bottom	**ATS 46D22N**	top and bottom	**ATS 48D22Y**	top and bottom
ATS 23, ATS 23PD30N	top and bottom	**ATS 46D32N**	top and bottom	**ATS 48D32Y**	top and bottom
–	–	**ATS 46D38N**	top and bottom	**ATS 48D38Y**	top and bottom
ATS 23, ATS 23PD44N	top and bottom	**ATS 46D47N**	top and bottom	**ATS 48D47Y**	top and bottom
–	–	**ATS 46D62N**	top and bottom	**ATS 48D62Y**	top and bottom
ATS 23, ATS 23PD72N	top and bottom	**ATS 46D75N**	top and bottom	**ATS 48D75Y**	top and bottom
–	–	**ATS 46D88N**	top and bottom	**ATS 48D88Y**	top and bottom
ATS 23, ATS 23PC10N	top and bottom	**ATS 46C11N**	top and bottom	**ATS 48C11Y**	top and bottom
–	–	**ATS 46C14N**	top and bottom	**ATS 48C14Y**	top and bottom
ATS 23, ATS 23PC15N	top and bottom	**ATS 46C17N**	top and bottom	**ATS 48C17Y**	top and bottom
–	–	**ATS 46C21N**	top and bottom	**ATS 48C21Y**	top and bottom
ATS 23, ATS 23PC24N	bottom	**ATS 46C25N**	top and bottom	**ATS 48C25Y**	top and bottom
ATS 23, ATS 23PC30N	bottom	**ATS 46C32N**	top and bottom	**ATS 48C32Y**	top and bottom
–	–	**ATS 46C41N**	top and bottom	**ATS 48C41Y**	top and bottom
ATS 23, ATS 23PC41N	bottom	**ATS 46C48N**	top and bottom	**ATS 48C48Y**	top and bottom
–	–	**ATS 46C59N**	top and bottom	**ATS 48C59Y**	top and bottom
ATS 23, ATS 23PC58N	bottom	**ATS 46C66N**	top and bottom	**ATS 48C66Y**	top and bottom
–	–	**ATS 46C79N**	top and bottom	**ATS 48C79Y**	top and bottom
ATS 23, ATS 23PC82N	bottom	**ATS 46M10N**	top and bottom	**ATS 48M10Y**	top and bottom
ATS 23, ATS 23PM12N	bottom	**ATS 46M12N**	top and bottom	**ATS 48M12Y**	top and bottom

(1) For additional information, please consult your Regional Sales Office.

Guide de choix :
pages 1/2 and 1/3

Substituting variable speed drives
ATV 08
Old/new equivalence table *(1)*

ATV 11

These equivalence tables can be used to determine substitute devices, taking account of:
- Line voltage
- Motor power.

The suggested solutions are based on the equivalence of simple functions (forward, reverse, speed reference 0…10 V). For more complex functions, check compatibility in the corresponding catalogue.

Drives (ATV 08 to ATV 11)		**ATV 08**	**Replaced by ATV 11**
Motor power		**Reference**	**Reference**
kW	***HP***		
Single-phase line voltage 200…240 V			
0.18	***0.25***	**ATV 08HU05M2**	**ATV 11HU05M2E**
0.37	***0.5***	**ATV 08HU09M2**	**ATV 11HU09M2E**
0.75	***1***	**ATV 08HU18M2**	**ATV 11HU18M2E**
0.18	***0.25***	**ATV 08PU05M2**	**ATV 11HU05M2E**
0.37	***0.5***	**ATV 08PU09M2**	**ATV 11PU09M2E**
0.75	***1***	**ATV 08PU18M2**	**ATV 11PU18M2E**
0.18	***0.25***	**ATV 08HU05M2X**	**ATV 11HU05M2U**
0.37	***0.5***	**ATV 08HU09M2X**	**ATV 11HU09M2U**
0.75	***1***	**ATV 08HU18M2X**	**ATV 11HU18M2U** *(2)*
0.18	***0.25***	**ATV 08PU05M2X**	**ATV 11PU05M2U**
0.37	***0.5***	**ATV 08PU09M2X**	**ATV 11PU09M2U**
0.75	***1***	**ATV 08PU18M2X**	**ATV 11PU18M2U**

(1) For any additional information, please consult your Regional Sales Office.
(2) Product with fan.

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Selection guide:
pages 2/2 and 2/3

Substituting variable speed drives

ATV 16, ATV 18, ATV 28 and ATV 58

Old/new equivalence table (1)

531250

ATV 31

Drives (ATV 16 to ATV 31)		ATV 16 (without option card)	Replaced by ATV 18	Replaced by ATV 28	Replaced by ATV 31
Motor power		Reference	Reference	Reference	Reference
kW	HP				
Single-phase line voltage 200…240 V					
0.37	0.5	ATV 16U09M2	ATV 18U09M2	ATV 28●U09M2	ATV 31H037M2 (2)
0.75	1	ATV 16U18M2	ATV 18U18M2	ATV 28●U18M2	ATV 31H075M2 (2)
1.5	2	ATV 16U29M2	ATV 18U29M2	ATV 28●U29M2	ATV 31HU15M2 (2)
2.2	3	ATV 16U41M2	ATV 18U41M2	ATV 28●U41M2	ATV 31HU22M2 (2)
Three-phase line voltage 200…240 V					
0.37	0.5	ATV 16U29M2	–	–	ATV 31H037M3X (2)
0.75	1	ATV 16U41M2	–	–	ATV 31H075M3X (2)
3	–	–	ATV 18U54M2	ATV 28●U54M2	ATV 31HU30M3X (2)
4	5	–	ATV 18U72M2	ATV 28●U72M2	ATV 31HU40M3X (2)
5.5	7.5	–	ATV 18U90M2	ATV 28HU90M2	ATV 31HU55M3X (2)
7.5	10	–	ATV 18D12M2	ATV 28HD12M2	ATV 31HU75M3X (2)
Three-phase line voltage 380…500 V					
0.75	1	ATV 16U18N4	ATV 18U18N4	ATV 28HU18N4	ATV 31H075N4 (2)
1.5	2	ATV 16U29N4	ATV 18U29N4	ATV 28HU29N4	ATV 31HU15N4 (2)
2.2	3	ATV 16U41N4	ATV 18U41N4	ATV 28HU41N4	ATV 31HU22N4 (2)
3	–	ATV 16U54N4	ATV 18U54N4	ATV 28HU54N4	ATV 31HU30N4 (2)
4	5	ATV 16U72N4	ATV 18U72N4	ATV 28HU72N4	ATV 31HU40N4 (2)
5.5	7.5	ATV 16U90N4	ATV 18U90N4	ATV 28HU90N4	ATV 31HU55N4 (2)
7.5	10	–	ATV 18D12N4	ATV 28HD12N4	ATV 31HU75N4 (2)
11	15	–	ATV 18D16N4	ATV 28HD16N4	ATV 31HD11N4 (2)
15	20	–	ATV 18D23N4	ATV 28HD23N4	ATV 31HD11N4 (2)

121612

ATV 71

Drives (ATV 16 to ATV 71)		ATV 16 (with option card)	Replaced by ATV 58	Replaced by ATV 71
Motor power		Reference	Reference	Reference
kW	HP			
Single-phase line voltage 200…240 V				
0.37	0.5	ATV 16U09M2	ATV 58H09M2	ATV 71H075M3
0.75	1	ATV 16U18M2	ATV 58HU18M2	ATV 71HU15M3
1.5	2	ATV 16U29M2	ATV 58HU29M2	ATV 71HU22M3
2.2	3	ATV 16U41M2	ATV 58HU41M2	ATV 71HU30M3
Three-phase line voltage 380…500 V				
0.75	1	ATV 16U18N4	ATV 58HU18N4	ATV 71H075N4
1.5	2	ATV 16U29N4	ATV 58HU29N4	ATV 71HU15N4
2.2	3	ATV 16U41N4	ATV 58HU41N4	ATV 71HU22N4
3	–	ATV 16U54N4	ATV 58HU54N4	ATV 71HU30N4
4	6	ATV 16U72N4	ATV 58HU72N4	ATV 71HU40N4
5.5	7.5	ATV 16U90N4	ATV 58HU90N4	ATV 71HU55N4

(1) For any additional information, please consult your Regional Sales Office.
(2) ATV 31 drives do not have a separate control section power supply.

Selection guide:
pages 2/2 and 2/3

Substituting variable speed drives
ATV 452, ATV 66 and ATV 58
Old/new equivalence table (1)

These equivalence tables can be used to determine substitute devices, taking account of:
- Line voltage
- Motor power.

The suggested solutions are based on the equivalence of simple functions (forward, reverse, speed reference 0…10 V). For more complex functions, check compatibility in the corresponding catalogue.

121612

ATV 71

Drives (ATV 452 to ATV 71)		ATV 452 (2)	Replaced by ATV 66	Replaced by ATV 58 (3)	Replaced by ATV 71
Motor power		Reference	Reference	Reference	Reference
kW	HP				
Three-phase line voltage 200…240 V, constant torque application					
0.75	1	ATV 452075M	ATV 66U41M2	ATV 58HU29M2	ATV 71H075M3
1.5	2	–	ATV 66U41M2	ATV 58HU29M2	ATV 71HU15M3
2.2	3	ATV 452U22M	ATV 66U41M2	ATV 58HU41M2	ATV 71HU22M3
4	5	ATV 452U22M	ATV 66U72M2	ATV 58HU72M2	ATV 71HU40M3
5.5	7.5	ATV 452U22M	ATV 66U90M2	ATV 58HU90M2	ATV 71HU55M3
7.5	10	ATV 452U22M	ATV 66D12M2	ATV 58HD12M2	ATV 71HU75M3
11	15	ATV 452D22M	ATV 66D16M2	ATV 58HD16M2X	ATV 71HD11M3X
15	20	ATV 452D22M	ATV 66D23M2	ATV 58HD23M2X	ATV 71HD15M3X
22	30	–	ATV 66D33M2	ATV 58HD33M2X	ATV 71HD22M3X
30	40	–	ATV 66D46M2	ATV 58HD46M2X	ATV 71HD30M3X
Three-phase line voltage 380…500 V, constant torque application					
0.75	1	ATV 452075M	ATV 66U41N4	ATV 58HU18N4	ATV 71H075N4
1.5	2	ATV 452U15	ATV 66U41N4	ATV 58HU29N4	ATV 71HU15N4
2.2	3	ATV 452U22	ATV 66U41N4	ATV 58HU41N4	ATV 71HU22N4
3	–	ATV 452U30	ATV 66U54N4	ATV 58HU54N4	ATV 71HU30N4
4	5	ATV 452U40	ATV 66U72N4	ATV 58HU72N4	ATV 71HU40N4
5.5	7.5	ATV 452U55	ATV 66U90N4	ATV 58HU90N4	ATV 71HU55N4
7.5	10	ATV 452U75	ATV 66D12N4	ATV 58HD12N4	ATV 71HU75N4
11	15	ATV 452D11	ATV 66D16N4	ATV 58HD16N4	ATV 71HD11N4
15	20	ATV 452D15	ATV 66D23N4	ATV 58HD23N4	ATV 71HD15N4
22	30	ATV 452D22	ATV 66D33N4	ATV 58HD33N4	ATV 71HD22N4
30	40	ATV 452D30	ATV 66D46N4	ATV 58HD46N4	ATV 71HD30N4
37	50	ATV 452D37	ATV 66D54N4	ATV 58HD54N4	ATV 71HD37N4
45	60	–	ATV 66D64N4	ATV 58HD64N4	ATV 71HD45N4
55	75	ATV 452D55	ATV 66D79N4	ATV 58HD79N4	ATV 71HD55N4

Drives (ATV 452 to ATV 71)		ATV 452 (2)	Replaced by ATV 66	Replaced by ATV 68	Replaced by ATV 71
Motor power		Reference	Reference	Reference	Reference
kW	HP				
Three-phase line voltage 380…500 V, constant torque application					
75	100	ATV 452D75	ATV 66C10N4	ATV 68C10N4	ATV 71HD75N4
90	125	ATV 452D90	ATV 66C13N4	ATV 68C13N4	ATV 71HD90N4
110	150	–	ATV 66C15N4	ATV 68C15N4	ATV 71HC11N4
132	200	–	ATV 66C19N4	ATV 68C19N4	ATV 71HC13N4
160	250	–	ATV 66C23N4	ATV 68C23N4	ATV 71HC16N4
200	300	–	ATV 66C28N4	ATV 68C28N4	ATV 71HC20N4
220	350	–	ATV 66C31N4	ATV 68C33N4	ATV 71HC25N4
250	400	–	–	ATV 68C33N4	ATV 71HC25N4

(1) For any additional information, please consult your Regional Sales Office.
(2) On ATV 452 drives, the terminal connections are located at the top and bottom of the drive. On ATV 66, ATV 58 and ATV 71 drives, the connections are at the bottom.
(3) ATV 58 drives do not have a separate control section power supply.

Selection guide: pages 2/2 and 2/3

Substituting variable speed drives

ATV 452V, ATV 66 and ATV 38

Old/new equivalence table *(1)*

105485

ATV 61

Drives (ATV 452V to ATV 61)		ATV 452V *(2)*	Replaced by ATV 66	Replaced by ATV 38	Replaced by ATV 61
Motor power		Reference	Reference	Reference	Reference
kW	*HP*				
Three-phase line voltage 200…240 V, variable torque application					
0.75	*1*	–	ATV 66U41M2	–	ATV 61H075M3
1.5	*2*	–	ATV 66U41M2	–	ATV 61HU15M3
2.2	*3*	–	ATV 66U41M2	ATV 38HU41M2	ATV 61HU22M3
3	–	–	ATV 66U41M2	ATV 38HU72M2	ATV 61HU30M3
5.5	*7.5*	–	ATV 66U72M2	ATV 38HU90M2	ATV 61HU40M3
7.5	*10*	–	ATV 66U90M2	ATV 38HD12M2	ATV 61HU75M3
11	*15*	–	ATV 66D12M2	ATV 38HD16M2X	ATV 61HD11M3X
15	*20*	–	ATV 66D23M2	ATV 38HD16M2X	ATV 61HD15M3X
18.5	*25*	–	ATV 66D23M2	ATV 38HD28M2X	ATV 61HD18M3X
30	*40*	–	ATV 66D33M2	ATV 38HD33M2X	ATV 61HD30M3X
37	*50*	–	ATV 66D46M2	ATV 38HD46M2X	ATV 61HD37M3
Three-phase line voltage 380…500 V, variable torque application					
0.75	*1*	–	ATV 66U41N4	ATV 38HU18N4	ATV 61H075N4
1.1	*1.5*	ATV 452VU11	ATV 66U41N4	ATV 38HU29N4	ATV 61HU15N4
1.5	*2*	ATV 452VU15	ATV 66U41N4	ATV 38HU29N4	ATV 61HU15N4
2.2	*3*	–	ATV 66U41N4	ATV 38HU41N4	ATV 61HU22N4
3	–	ATV 452VU30	ATV 66U41N4	ATV 38HU54N4	ATV 61HU30N4
4	*5*	ATV 452VU40	ATV 66U54N4	ATV 38HU72N4	ATV 61HU40N4
5.5	*7.5*	ATV 452VU55	ATV 66U72N4	ATV 38HU90N4	ATV 61HU55N4
7.5	*10*	–	ATV 66U90N4	ATV 38HD12N4	ATV 61HU75N4
11	*15*	ATV 452VD11	ATV 66D12N4	ATV 38HD16N4	ATV 61HD11N4
15	*20*	ATV 452VD15	ATV 66D16N4	ATV 38HD23N4	ATV 61HD15N4
18.5	*25*	–	ATV 66D23N4	ATV 38HD28N4	ATV 61HD18N4
22	*30*	ATV 452VD22	ATV 66D33N4	ATV 38HD28N4	ATV 61HD22N4
30	*40*	–	ATV 66D33N4	ATV 38HD33N4	ATV 61HD30N4
37	*50*	ATV 452VD37	ATV 66D46N4	ATV 38HD46N4	ATV 61HD37N4
45	*60*	ATV 452VD45	ATV 66D54N4	ATV 38HD54N4	ATV 61HD45N4
55	*75*	–	ATV 66D64N4	ATV 38HD64N4	ATV 61HD55N4
75	*100*	ATV 452VD75	ATV 66D79N4	ATV 38HD79N4	ATV 61HD75N4
90	*125*	ATV 452VD90	ATV 66C10N4	ATV 38HC10N4X	ATV 61HD90N4
110	*150*	ATV 452VC11	ATV 66C13N4	ATV 38HC13N4X	ATV 61HC11N4
132	*200*	–	ATV 66C15N4	ATV 38HC15N4X	ATV 61HC13N4
160	*250*	–	ATV 66C23N4	ATV 38HC19N4X	ATV 61HC16N4
200	*300*	–	ATV 66C23N4	ATV 38HC23N4X	ATV 61HC22N4
220	*350*	–	ATV 66C28N4	ATV 38HC25N4X	ATV 61HC22N4
250	*400*	–	ATV 66C31N4	ATV 38HC28N4X	ATV 61HC25N4

(1) For any additional information, please consult your Regional Sales Office.
(2) On ATV 452V drives, the terminal connections are located at the top and bottom of the drive.
On ATV 66, ATV 38 and ATV 61 drives, the connections are at the bottom.

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