Fine Lock Cylinders/Lock-up Cylinder

CL Series

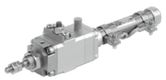
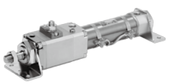
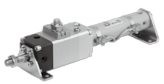
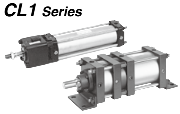
ø16, ø20, ø25, ø32, ø40, ø50, ø63, ø80, ø100, ø125, ø140, ø160

Locking method	Spring locking	Pneumatic locking	Spring and pneumatic locking
Features	• Unlocking Discharging the air causes the lock to operate.	• Pressure locking The holding power can be varied according to the air pressure that is applied to the port.	• Pressure locking The holding power can be varied according to the air pressure that is applied to the port. • Unlocking Discharging the air causes the lock to operate.

(Lock-up cylinders are spring locking only.)

Locking in both directions is possible.
Locking in either side of cylinder stroke is possible, too.
(The lock-up cylinder can be locked only in one direction.)

Series Variations

Series	Action	Rod	Standard variations: Auto switch built-in magnet	Standard variations: With rod boot	Locking direction	Locking method: Spring locking	Locking method: Pneumatic locking	Locking method: Spring and Pneumatic locking	Bore size (mm)	Standard stroke (mm)	Page
Fine lock cylinders											
CLJ2 Series 	Double acting	Single rod	●		Both directions	●	●	●	16	15 to 200	791
CLM2 Series 	Double acting	Single rod	●	●	Both directions	●	●	●	20 25 32 40	25 to 300	801
CLG1 Series 	Double acting	Single rod	●	●	Both directions	●	●	●	20 25 32 40	25 to 200 25 to 300	818
Lock-up cylinder											
CL1 Series 	Double acting	Single rod	●	●	One direction	●			40 50, 63 80, 100 125, 140 160	25 to 500 25 to 600 25 to 700 Up to 1000 Up to 1200	830

CL Series
Specific Product Precautions 1

Be sure to read this before handling the products. The precautions on these pages are for the fine lock cylinders and the lock-up cylinders. Refer to back page 50 for Safety Instructions. For general actuator precautions, refer to Actuator Precautions on pages 3 to 7.

Design of Equipment and Machinery

⚠ Warning

1. Construct so that the human body will not come into direct contact with driven objects or the moving parts of locking cylinders.
If there is a risk of contact, provide safety measures such as a cover or a system that uses sensors that will activate an emergency stop before contact is made.

2. Use a balance circuit in which lurching of the piston is taken into consideration. If the lock is applied at a desired position of a stroke and compressed air is applied to only one side of the cylinder, the piston will lurch at a high speed the moment the lock is disengaged. In such a situation, there is a risk of injury to humans, or equipment damage. To prevent the piston from lurching, use a balance circuit such as the recommended pneumatic circuit (P. 788). If an air-hydro fine lock cylinder is used, make sure to operate the lock portion through air pressure. Never use oil on the lock-up cylinder because the lock-up cylinder is a non-lube type. Failure to observe this could cause the lock to malfunction.

Selection

⚠ Warning

Refer to the following criteria for the maximum load in the locked state, and set.

Holding force (maximum static load) means the maximum capability of holding a static load that is not accompanied by vibration or impact under the condition that no load is applied. Therefore, it does not refer to a load that cannot be held constantly. To ensure braking force, the maximum load must be set as described below.

1. For constant static loads, such as for drop prevention:
- Fine lock series (CLJ2/CLM2/CLG1 series)
  35% or less of the holding force (maximum static load)
  Note) For applications such as drop prevention, consider situations in which the air source is shut off, and make selections based on the holding force of the spring locked state. Do not use the pneumatic lock for drop prevention purposes.
- Lock-up series (CL1 series)
  50% or less of the holding force (maximum static load)

2. When kinetic energy acts upon the cylinder in a locked state, such as when effecting an intermediate stop, there are constraints in terms of the allowable kinetic energy. Therefore, refer to the allowable kinetic energy of the respective series. Furthermore, during locking, the mechanism must sustain the thrust of the cylinder itself, in addition to absorbing the kinetic energy. Therefore, even within a given allowable kinetic energy level, there is an upper limit to the amount of the load that can be sustained.
- Fine lock series (CLJ2/CLM2/CLG1 series)
  Maximum load at horizontal mounting: 70% or less of the holding force (Maximum static load) for spring lock
  Maximum load at vertical mounting: 35% or less of the holding force (Maximum static load) for spring lock
- Lock-up series (CL1 series)
  Maximum load at horizontal mounting: 50% or less of the holding force (Maximum static load)
  Maximum load at vertical mounting: 25% or less of the holding force (Maximum static load)

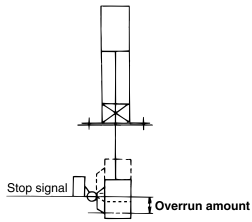
3. In a locked state, do not apply impacts, strong vibrations or rotational forces.
Do not apply a impacts, strong vibrations or rotational forces from external sources, because this could damage or shorten the life of the lock unit.

4. The locking of the fine lock cylinder is directional.
Although the fine lock cylinder can be locked in both directions, be aware that its holding force is smaller in one of the directions.
CLJ2/CLM2/CLG1···· Holding force at piston rod extended side decreases approx. 15%.

5. The locking of the lock-up cylinder is unidirectional.
Because the locking direction of the lock-up cylinder is unidirectional, select the locking direction in accordance with the particular operating conditions. It is also possible to manufacture a bidirectional lock-up cylinder. For details, refer to “Made to Order” on page 1400. Due to the nature of its construction, a lock-up cylinder has a play of approximately 0.5 mm to 1 mm in the axial direction. Therefore, if an external stopper is used to stop the piston rod and the lock is engaged, the piston rod will shift in the amount of its axial play.

6. To effect an intermediate stop, take the cylinder’s stopping precision and overrun amount into consideration.
Because the lock is applied by mechanical means, the piston will not stop immediately in response to a stopping signal, but only after a time lag. This lag determines the amount of the overrun of the piston stroke. Thus, the range of the maximum and minimum amounts of the overrun is the stopping precision.
- Place the limit switch before the desired stopping position, only in the amount of the overrun.
- The limit switch must have a detection length (dog length) of the overrun amount + α.
- For SMC’s auto switches, the operating range are between 8 and 14 mm. (It varies depending on a switch model.) When the overrun amount exceeds this range, self-holding of the contact should be performed at the switch load side.

∗ For stopping accuracy, refer to CLJ2 series (P. 793), CLM2 series (P. 804), CLG1 series (P. 820), and CL1 series (P. 831) respectively.



7. In order to further improve stopping accuracy, the time from the stop signal to the operation of the lock should be shortened as much as possible.
To accomplish this, use a device such as a highly responsive electric control circuit or solenoid valve driven by direct current, and place the solenoid valve as close as possible to the cylinder.

8. Be aware that the stopping accuracy is influenced by changes in the piston speed.
The variance in the stopping position increases if the piston speed changes, such as due to load fluctuations during the reciprocal movement of the piston. Therefore, take measures to ensure a constant piston speed immediately preceding the stopping position. Furthermore, the variances in the stopping position increases when the piston is effecting a cushioning stroke or during acceleration after starting its movement.

9. When unlocking is performed, if the thrust is applied to the piston, unlocking will not be easily done. To avoid that, ensure that unlocking should be performed before the thrust is applied to the piston.

CL Series
Specific Product Precautions 2

Be sure to read this before handling the products. The precautions on these pages are for the fine lock cylinders and the lock-up cylinders. Refer to back page 50 for Safety Instructions. For general actuator precautions, refer to Actuator Precautions on pages 3 to 7.

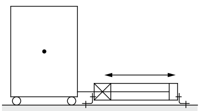
Mounting

⚠Warning

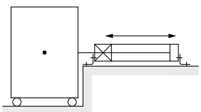
1. Be certain to connect the rod end to the load with the lock released.
- If this is performed with the lock engaged, a load that exceeds the allowable rotational force or holding force would be applied to the piston rod, which could damage the locking mechanism. The fine lock and CL1 series with ø40 to ø100 cylinders have a built-in manual unlocking mechanism. Therefore, they can be maintained in the unlocked state without supplying air. However, it is recommended that the piping is connected to the unlocking port, an air pressure of 0.3 MPa or more is supplied, and the work is performed in the unlocked state. For CL1 series with ø125 to ø160 cylinders, simply connect piping to the lock-up port, and supply air pressure of 0.2 MPa or more to disengage the lock in order to attach a load.

⚠Caution

1. Do not apply offset loads on the piston rod.
- Pay particular attention to aligning the center of gravity of the load with the axial center of the cylinder. If there is a large amount of deviation, the piston rod could become unevenly worn or damaged due to the inertial moment that is created when the piston rod is stopped by the lock.



X Load center of gravity and cylinder shaft center are not matched.



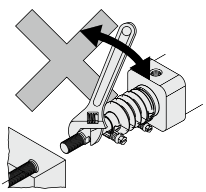
○ Load center of gravity and cylinder shaft center are matched.

Note) Can be used if all of the generated moment is absorbed by an effective guide.

⚠Caution

1. Do not turn the piston rod with the rod boot kept locked.
When turning the piston rod, loosen the band once and do not twist the rod boot.

2. Set the breathing hole in the rod boot downward or in the direction that prevents entry of dust or water content.



Adjustment

⚠Caution

1. Place it in the locked position. (Excluding the CL1 series ø125 to ø160.)
- The locks are manually disengaged at the time the cylinders are shipped from the factory. Therefore, make sure to change them to the locked state before using the cylinders. For procedures to effect the change, refer to page 789 for the fine lock series. Be aware that the lock will not operate properly if the change is not performed correctly.
- Adjust the cylinder's air balance. In the state in which a load is attached to the cylinder, disengage the lock and adjust the air pressure at the rod side and the head side of the cylinder to obtain a load balance. By maintaining a proper air balance, the piston rod can be prevented from lurching when the lock is disengaged.

2. Adjust the mounting position of detections such as those of the auto switches. To effect an intermediate stop, adjust the mounting position of the auto switch detection by taking the amount of overrun into consideration in relation to the desired stopping position.

CL Series
Specific Product Precautions 3

Be sure to read this before handling the products. The precautions on these pages are for the fine lock cylinders and the lock-up cylinders. Refer to back page 50 for Safety Instructions. For general actuator precautions, refer to Actuator Precautions on pages 3 to 7.

Pneumatic Circuit

⚠ Warning

1. Be certain to use an pneumatic circuit which will apply balancing pressure to both sides of the piston when in a locked stop.

In order to prevent cylinder lurching after a lock stop, when restarting or when manually unlocking, a circuit should be used to which will apply balancing pressure to both sides of the piston, thereby canceling the force generated by the load in the direction of piston movement.

2. The effective area of the lock release solenoid valve should be at least 50% of the effective area of the cylinder driving solenoid valve, and it should be installed as close to the cylinder as possible so that it is closer than the cylinder driving solenoid valve.

If the effective area of the lock release solenoid valve is smaller than the cylinder driving solenoid valve or if it is installed at a distance from the cylinder, the time required for exhausting air for releasing the lock will be longer, which may cause a delay in the locking operation.

The delay in the locking operation may result in problems such as increase of overrunning when performing intermediate stop or emergency stop during operation, or if maintaining position from the operation stop state such as drop prevention, workpieces may be dropped depending on the timing of the load action to the operation delay of the lock.

3. Avoid backflow of the exhaust pressure when there is a possibility of interference of exhaust air, for example for a common exhaust type valve manifold.

The lock may not operate properly when the exhaust air pressure backflows due to interference of the exhaust air when exhausting air for lock release. It is recommended to use an individual exhaust type manifold or individual valves.

4. Allow at least 0.5 seconds from a locked stop (intermediate stop of the cylinder) until release of the lock.

When the locked stop time is too short, the piston rod (and load) may lurch at a speed greater than the control speed of the speed controller.

5. When restarting, control the switching signal for the unlocking solenoid valve so that it acts before or at the same time as the cylinder drive solenoid valve.

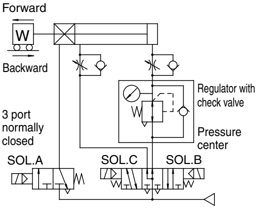
If the signal is delayed, the piston rod (and load) may lurch at a speed greater than the control speed of the speed controller.

6. Carefully check for dew condensation due to repeated air supply and exhaust of the locking solenoid valve.

The operating stroke of the lock part is very small. So, if the piping is long and the air supply and exhaust are repeated, the dew condensation caused by the adiabatic expansion accumulates in the lock part. This may corrode internal parts, causing air leak or lock release fault.

7. Basic circuit

1) [Horizontal]

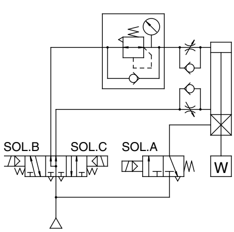


SOL.A	SOL.B	SOL.C	Action
ON	ON	OFF	Forward
OFF	OFF	OFF	Locked stop
ON	OFF	OFF	Unlocked
ON	ON	OFF	Forward
ON	OFF	ON	Backward
OFF	OFF	OFF	Locked stop
ON	OFF	OFF	Unlocked
ON	OFF	ON	Backward

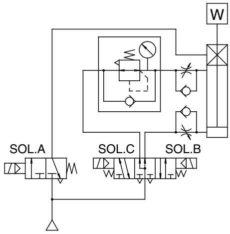
0.5 s or more
0 to 0.5 s
0.5 s or more
0 to 0.5 s

2) [Vertical]

[Load in the direction of rod extension]

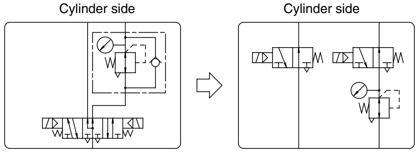


[Load in the direction of rod retraction]



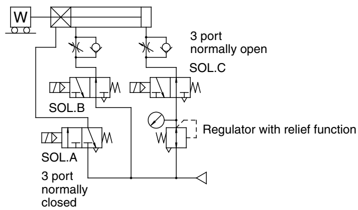
⚠ Caution

1. A 3 position pressure center solenoid valve and regulator with check valve can be replaced with two 3 port normally open valves and a regulator with relief function.



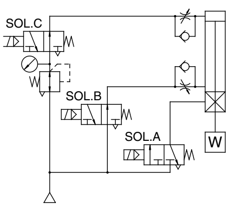
[Example]

1) [Horizontal]

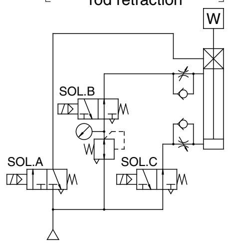


2) [Vertical]

[Load in the direction of rod extension]



[Load in the direction of rod retraction]



∗ The symbol for the fine lock cylinder and lock-up cylinder in the pneumatic circuit uses SMC original symbol. (Fine lock cylinder)

CL Series
Specific Product Precautions 4

Be sure to read this before handling the products. The precautions on these pages are for the fine lock cylinders and the lock-up cylinders. Refer to back page 50 for Safety Instructions. For general actuator precautions, refer to Actuator Precautions on pages 3 to 7.

How to Manually Disengage the Lock and Change from the Unlocked to the Locked State

The lock is manually disengaged at the time the cylinder is shipped from the factory. Because the lock will not operate in this state, make sure to change it to the locked state before operation, after having adjusted the axial center for installation.

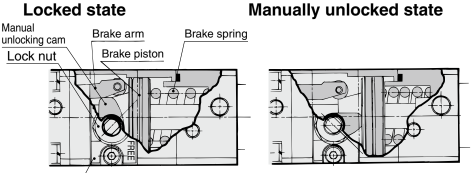
How to Change from Unlocked to Locked State

1. CLJ2, CLM2, CLG1 Series

1) Loose locking nut.
2) Turn the wrench flats section of the manual unlocking cam to the LOCK position that is marked on the cam guide.
3) While keeping the wrench flats section in place, tighten the lock nut.

Note) The manual unlocking cam will rotate approximately 180°. Do not rotate the wrench flats section excessively.

Locked state **Manually unlocked state**



"**LOCK**" and "**FREE**" are marked on the cam guide.

⚠ Warning

1. Never operate the unlocking cam until safety has been confirmed. (Do not turn to the FREE side.)
- When unlocking is performed with air pressure applied to only one side of the cylinder, the moving parts of the cylinder will lurch at high speed causing a serious hazard.
- When unlocking is performed, be sure to confirm that personnel are not within the load movement range and that no other problems will occur if the load moves.

2. Before operating the unlocking cam, exhaust any residual pressure which is in the system.

3. Take measures to prevent the load from dropping when unlocking is performed.
- Perform work with the load in its lowest position.
- Take measures for drop prevention by strut, etc.

Note) For details about how to manually unlock the lock-up cylinder (ø40 to ø100) and change from the unlocked state to the locked state, refer to page 834.

Manually Unlocking

The lock of a fine lock series cylinder can be disengaged manually through the procedure described below. However, make sure to disengage the lock pneumatically before operating the cylinder.

Note) Manual disengagement of the lock could create a greater cylinder sliding resistance than pneumatic disengagement of the lock.

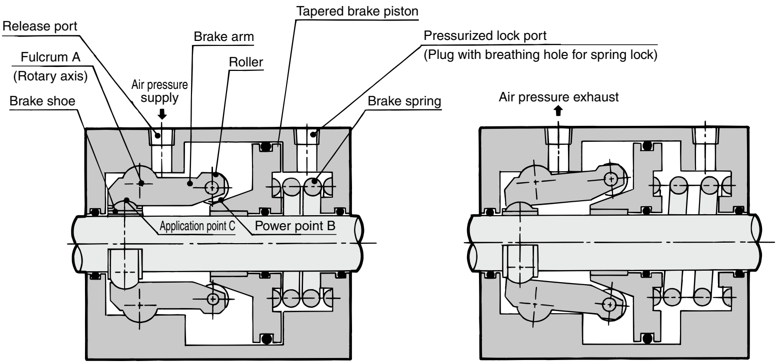
1. CLJ2, CLM2, CLG1 Series

1) Loose locking nut.
2) Supply air pressure of 0.3 MPa or more to the lock release port.
3) Turn the wrench flats section of the manual unlocking cam until it stops at the FREE position that is marked on the cam guide.
4) While keeping the wrench flats section in place, tighten the lock nut.

Prior to Use

Construction Principle/Applicable Series: CLJ2, CLM2, CLG1, MLGC

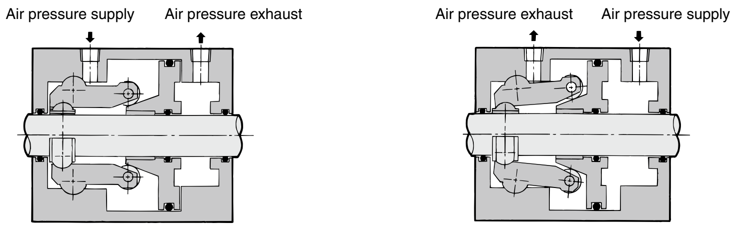
Spring locking type



Unlocked state **Locked state**

Spring locking (Exhaust locking)
The spring force that is applied to the tapered brake piston becomes amplified through the wedge effect. This force becomes further amplified to the power of AB/AC through the mechanical advantage of a lever and acts on the brake shoe, which in turn, applies a large force to tighten and lock the piston rod. To disengage the lock, air pressure is supplied through the unlocking port, thus disengaging the brake spring force.

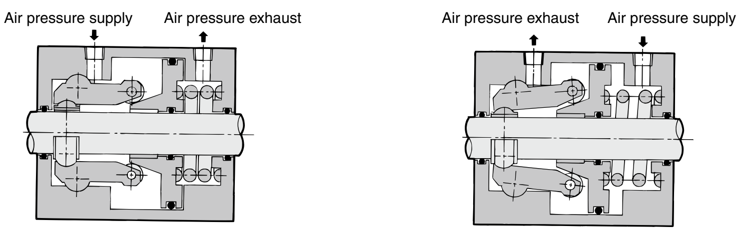
Pneumatic locking type



Unlocked state **Locked state**

Brake piston is operated by air pressure.

Spring and pneumatic locking type



Unlocked state **Locked state**

Brake piston is operated by air pressure and spring force.

Fine Lock Cylinder
Double Acting, Single Rod
CLJ2 Series

ø16

How to Order

CLJ2 L 16 - 60 R - E - [ ]

With auto switch CDLJ2 L 16 - 60 R - E - M9BW [ ] - C - [ ]

With auto switch (Built-in magnet)

Mounting type

B	Basic type
L	Axial foot type
F	Rod side flange type
D	Double clevis type

Bore size

16	16 mm

Standard stroke (mm)

ø16	15, 30, 45, 60, 75, 100, 125, 150, 175, 200

Port location on head cover

Nil	Perpendicular to axis
R	Axial direction

Lock operation

E	Spring locking (Exhaust locking)
P	Pneumatic locking (Pressure locking)
D	Spring and pneumatic locking

Auto switch

Nil	Without auto switch

∗ For the applicable auto switch model, refer to the table below.

Number of auto switches

Nil	2 pcs.
S	1 pc.
n	"n" pcs.

Auto switch mounting bracket Note)

Note) This symbol is indicated when the D-A9□ or M9□ type auto switch is specified.
This mounting bracket does not apply to other auto switches (D-C7□ and H7□, etc.) (Nil)

Made to Order
Refer to page 792 for details.

Built-in Magnet Cylinder Model

If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch.
(Example) CDLJ2B16-45-P

Applicable Auto Switches/Refer to pages 1119 to 1245 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage DC		Load voltage AC	Auto switch model Band mounting Perpendicular	Band mounting In-line	Rail mounting Perpendicular	Rail mounting In-line	Lead wire length (m) 0.5 (Nil)	1 (M)	3 (L)	5 (Z)	None (N)	Pre-wired connector	Applicable load	
Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V,12 V	—	M9NV	M9N	M9NV	M9N	●	●	●	○	—	○	IC circuit	Relay, PLC
Solid state auto switch	—	Grommet	Yes	3-wire (PNP)	24 V	5 V,12 V	—	M9PV	M9P	M9PV	M9P	●	●	●	○	—	○	IC circuit	Relay, PLC
Solid state auto switch	—	Grommet	Yes	2-wire	24 V	12 V	—	M9BV	M9B	M9BV	M9B	●	●	●	○	—	○	—	Relay, PLC
Solid state auto switch	—	Connector	Yes	2-wire	24 V	12 V	—	—	H7C	J79C	—	●	—	●	●	●	—	—	Relay, PLC
Solid state auto switch	Diagnostic indication (2-color indicator)	Grommet	Yes	3-wire (NPN)	24 V	5 V,12 V	—	M9NWV	M9NW	M9NWV	M9NW	●	●	●	○	—	○	IC circuit	Relay, PLC
Solid state auto switch	Diagnostic indication (2-color indicator)	Grommet	Yes	3-wire (PNP)	24 V	5 V,12 V	—	M9PWV	M9PW	M9PWV	M9PW	●	●	●	○	—	○	IC circuit	Relay, PLC
Solid state auto switch	Diagnostic indication (2-color indicator)	Grommet	Yes	2-wire	24 V	12 V	—	M9BWV	M9BW	M9BWV	M9BW	●	●	●	○	—	○	—	Relay, PLC
Solid state auto switch	Water resistant (2-color indicator)	Grommet	Yes	3-wire (NPN)	24 V	5 V,12 V	—	M9NAV∗1	M9NA∗1	M9NAV∗1	M9NA∗1	○	○	●	○	—	○	IC circuit	Relay, PLC
Solid state auto switch	Water resistant (2-color indicator)	Grommet	Yes	3-wire (PNP)	24 V	5 V,12 V	—	M9PAV∗1	M9PA∗1	M9PAV∗1	M9PA∗1	○	○	●	○	—	○	IC circuit	Relay, PLC
Solid state auto switch	Water resistant (2-color indicator)	Grommet	Yes	2-wire	24 V	12 V	—	M9BAV∗1	M9BA∗1	M9BAV∗1	M9BA∗1	○	○	●	○	—	○	—	Relay, PLC
Solid state auto switch	With diagnostic output (2-color indicator)	Grommet	Yes	4-wire (NPN)	24 V	5 V,12 V	—	—	H7NF	—	F79F	●	—	●	○	—	○	IC circuit	Relay, PLC
Reed auto switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	A96V	A96	A96V	A96	●	—	●	—	—	—	IC circuit	—
Reed auto switch	—	Grommet	Yes	2-wire	—	—	200 V	—	—	A72	A72H	●	—	●	—	—	—	—	Relay, PLC
Reed auto switch	—	Grommet	Yes	2-wire	24 V	12 V	100 V	A93V∗2	A93	A93V∗2	A93	●	●	●	●	—	—	—	Relay, PLC
Reed auto switch	—	Grommet	No	2-wire	24 V	12 V	100 V or less	A90V	A90	A90V	A90	●	—	●	●	—	—	IC circuit	Relay, PLC
Reed auto switch	—	Connector	Yes	2-wire	24 V	12 V	—	—	C73C	A73C	—	●	—	●	●	●	—	—	Relay, PLC
Reed auto switch	—	Connector	No	2-wire	24 V	12 V	24 V or less	—	C80C	A80C	—	●	—	●	●	●	—	IC circuit	Relay, PLC
Reed auto switch	Diagnostic indication (2-color indicator)	Grommet	Yes	2-wire	24 V	—	—	—	—	A79W	—	●	—	●	—	—	—	—	Relay, PLC

∗1 Water resistant type auto switches can be mounted on the above models, but in such case SMC cannot guarantee water resistance.
Consult with SMC regarding water resistant types with the above model numbers.
∗2 1 m type lead wire is only applicable to D-A93.
∗ Lead wire length symbols: 0.5 m ······· Nil (Example) M9NW
1 m ······· M (Example) M9NWM
3 m ······· L (Example) M9NWL
5 m ······· Z (Example) M9NWZ
None ······· N (Example) H7CN
∗ Since there are other applicable auto switches than listed, refer to page 800 for details.
∗ For details about auto switches with pre-wired connector, refer to pages 1192 and 1193.
∗ Solid state auto switches marked with "○" are produced upon receipt of order.
∗ The D-A9□, M9□, M9□W, A7□□, A80□, F7□□, J7□□ auto switches are shipped together, (but not assembled).
(However, only the auto switch mounting brackets are assembled for band mounting before shipment.)

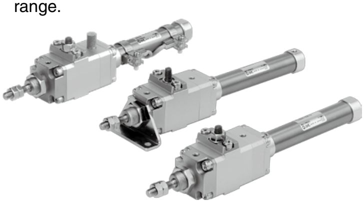
Provided with a compact lock mechanism, it is suitable for intermediate stop, emergency stop, and drop prevention.

Locking in both directions

The piston rod can be locked in either direction of its cylinder stroke.

Maximum piston speed: 500 mm/s

It can be used at 50 to 500 mm/s provided that it is within the allowable kinetic energy range.



Head Cover Port Location

Either perpendicular to the cylinder axis or in-line with the cylinder axis is available for basic type.

Axial

Perpendicular

Made to Order Specifications

(For details, refer to pages 1247 to 1440.)

Symbol	Specifications
-XA□	Change of rod end shape

Refer to pages 798 to 800 for cylinders with auto switches.

- Minimum auto switch mounting stroke
- Proper auto switch mounting position (detection at stroke end) and mounting height
- Operating range
- Switch mounting bracket: Part no.

Specifications

Bore size (mm)	**16**
Action	Double acting, Single rod
Lubricant	Not required (Non-lube)
Lock operation	Spring locking (Exhaust locking) Pneumatic locking (Pressure locking) Spring and pneumatic locking
Fluid	Air
Proof pressure	1.05 MPa
Maximum operating pressure	0.7 MPa
Minimum operating pressure	0.08 MPa
Ambient and fluid temperature	Without auto switch: –10 to 70°C (No freezing) With auto switch: –10 to 60°C (No freezing)
Piston speed	50 to 500 mm/s *
Cushion	Rubber bumper
Stroke length tolerance	$^{+1.0}_{0}$
Mounting	Basic type, Axial foot type, Rod side flange type, Double clevis type

* Constraints associated with the allowable kinetic energy are imposed on the speeds at which the piston can be locked.
The maximum speed of 750 mm/s can be accommodated if the piston is to be locked in the stationary state for the purpose of drop prevention.

Fine Lock Specifications

Lock operation	Spring locking (Exhaust locking)	Spring and pneumatic locking	Pneumatic locking (Pressure locking)
Fluid	Air		
Maximum operating pressure	0.5 MPa		
Unlocking pressure	0.3 MPa or more		0.1 MPa or more
Lock starting pressure	0.25 MPa or less		0.05 MPa or more
Locking direction	Both directions		

Standard Stroke/

Refer to the minimum auto switch mounting stroke (page 799) for those with an auto switch.

(mm)

Bore size (mm)	Standard stroke
16	15, 30, 45, 60, 75, 100, 125, 150, 175, 200

* Manufacture of intermediate strokes at 1 mm intervals is possible. (Spacers are not used.)

Mounting Bracket and Accessory/For details about part numbers and dimensions, refer to page 797.

	Mounting	Basic type	Axial foot type	Rod side flange type	Double clevis type
Standard equipment	Mounting nut	●	●	●	—
	Rod end nut	●	●	●	●
	Clevis pin	—	—	—	●
Option	Single knuckle joint	●	●	●	●
	Double knuckle joint (With pin) *	●	●	●	●
	T-bracket	—	—	—	●

* Pins and retaining rings are packaged together with double clevis and double knuckle joint.

Mounting Bracket Part No.

Mounting bracket	Part no.
Foot	CLJ-L016B
Flange	CLJ-F016B
T-bracket *	CJ-T016B

* T-bracket is used with double clevis (D).

Weight

(g)

Bore size (mm)		16
Standard weight *		320
Additional weight per each 15 mm of stroke		6.5
Mounting bracket Weight	Axial foot type	27
	Rod side flange type	21
	Double clevis type (With pin) **	10

* Mounting nut and rod end nut are included in the basic weight.
** Mounting nut is not included in double clevis type.
Calculation: (Example) **CLJ2L16-60**
• Basic weight··················320 (ø16)
• Additional weight··········6.5/15 stroke
• Cylinder stroke·············60 stroke
320 + 6.5/15 x 60 + 27 = 373 g

Stopping Accuracy (Not including tolerance of control system.) (mm)

Lock type	Piston speed (mm/s) 50	100	300	500
Spring locking (Exhaust locking)	± 0.4	± 0.5	± 1.0	± 2.0
Pneumatic locking (Pressure locking) Spring and pneumatic locking	± 0.2	± 0.3	± 0.5	± 1.5

Condition: Load: 2 kg
Solenoid valve: Lock port mounting

⚠Caution

Selection/Recommended Pneumatic Circuit/Caution on Handling

For detailed specifications of the fine lock cylinder, CLJ2 series mentioned above, refer to pages 786 to 789.

⚠ Caution/Allowable Kinetic Energy when Locking

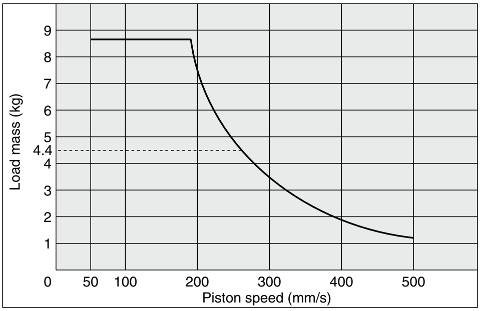
Bore size (mm)	16
Allowable kinetic energy (J)	0.17

1. In terms of specific load conditions, this allowable kinetic energy is equivalent to a load of 3.7 kg in mass, and a piston speed of 300 mm/sec. Therefore, if the operating conditions are below these values, there is no need to calculate.
2. Apply the following formula to obtain the kinetic energy of the load.

$$Ek = \frac{1}{2} m\upsilon^2$$

Ek: Kinetic energy of load (J)
m: Load mass (kg)
υ: Piston speed (m/s)

3. The piston speed will exceed the average speed immediately before locking. To determine the piston speed for the purpose of obtaining the kinetic energy of load, use 1.2 times the average speed as a guide.
4. The relationship between the speed and the load is indicated in the graph below. The area below the line is the allowable kinetic energy range.
5. There is an upper limit to the size of the load that can be sustained. Thus, a horizontally mounted cylinder must be operated below the solid line, and a vertically mounted cylinder must be operated below the dotted line.

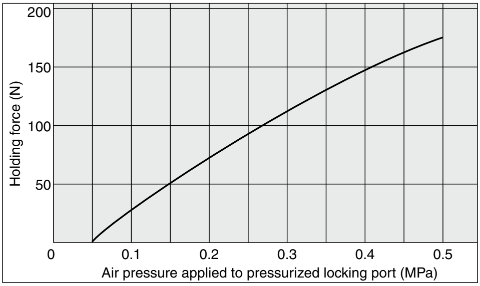


Holding Force of Spring Locking (Maximum static load)

Bore size (mm)	16
Holding force (N)	122

Note) Holding force at piston rod extended side decreases approximately 15%.

Holding Force of Pneumatic Locking (Maximum static load)



* When selecting cylinders, refer to the Precautions and allowable kinetic energy when locking on page 786, and then select a cylinder.

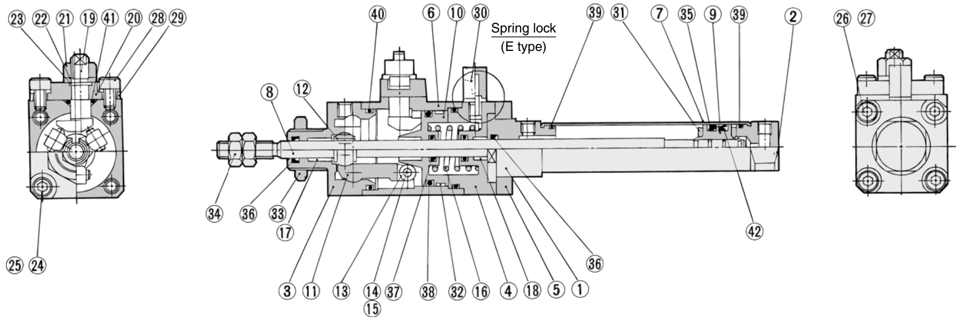
⚠Caution

Caution when Locking

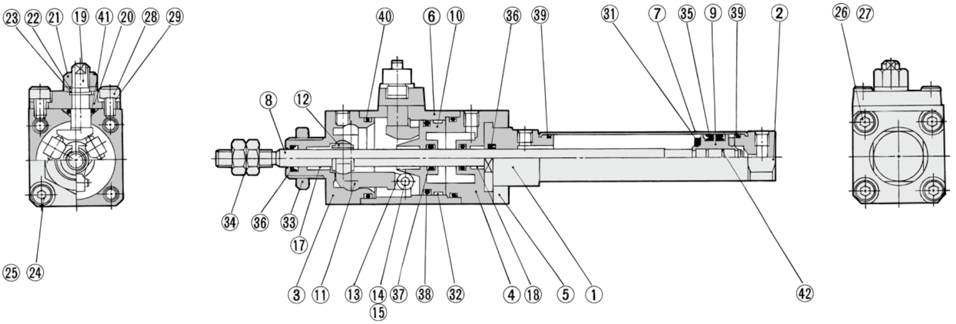
Holding force (maximum static load) means the maximum capability of holding a static load that is not accompanied by vibration or impact under the condition that no load is applied. Therefore, it does not refer to a load that cannot be held constantly.
When using (selecting) this product, carefully check the following points.
• If the piston rod slips because the lock's holding force has been exceeded, the brake shoe could be damaged, resulting in a reduced holding force or shortened life.
• The upper limit of the load that is used under the conditions not associated with the kinetic energy when locking, such as drop prevention must be 35% or less of the holding force.
• Do not use the cylinder in the locked state to sustain a load that involves impact.

Construction (Not able to disassemble)

Spring locking (Exhaust locking)
Spring and pneumatic locking



Pneumatic locking (Pressure locking)



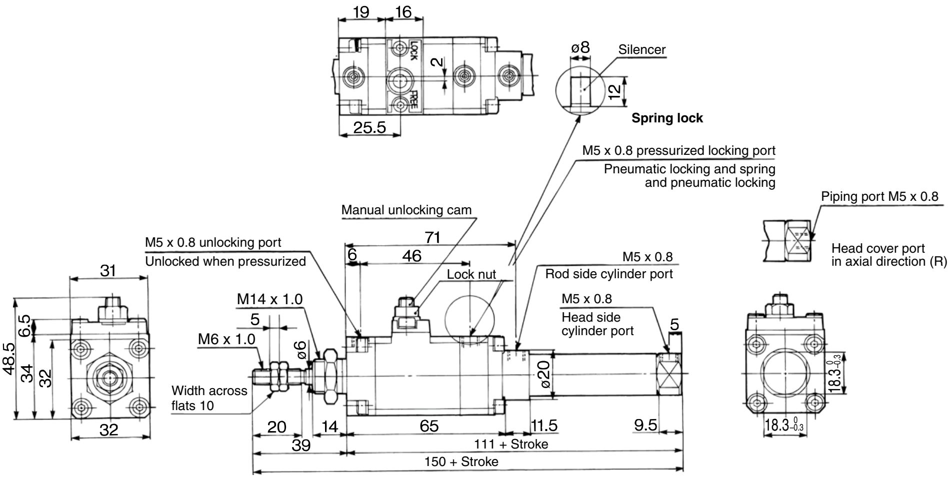
Component Parts

No.	Description	Material	Note
1	**Rod cover**	Aluminum alloy	Clear anodized
2	**Head cover**	Aluminum alloy	Clear anodized
3	**Cover A**	Carbon steel	Nitrided, nickel chrome plated
4	**Cover B**	Aluminum alloy	Hard anodized
5	**Cover C**	Aluminum alloy	Hard anodized
6	**Intermediate cover**	Aluminum alloy	Hard anodized
7	**Cylinder tube**	Stainless steel	
8	**Piston rod**	Stainless steel	Hard chrome plated
9	**Piston**	Aluminum alloy	Chromated
10	**Brake piston**	Carbon steel	Nitrided
11	**Brake arm**	Carbon steel	Nitrided
12	**Brake shoe**	Special friction material	
13	**Roller**	Carbon steel	Nitrided
14	**Pin**	Carbon steel	Heat treated
15	**Retaining ring**	Carbon tool steel	
16	**Brake spring**	Steel wire	Zinc chromated
17	**Bushing A**	Bearing alloy	
18	**Bushing B**	Bearing alloy	
19	**Manual lock release cam**	Chromium molybdenum steel	Nitrided
20	**Cam guide**	Carbon steel	Nitrided, platinum silver painted
21	**Lock nut**	Rolled steel	

No.	Description	Material	Note
22	**Plain washer**	Rolled steel	
23	**Retaining ring**	Carbon tool steel	
24	**Hexagon socket head cap screw**	Chromium molybdenum steel	
25	**Spring washer**	Steel wire	
26	**Hexagon socket head cap screw**	Chromium molybdenum steel	
27	**Spring washer**	Steel wire	
28	**Hexagon socket head cap screw**	Chromium molybdenum steel	
29	**Spring washer**	Steel wire	
30	**Silencer**	Bronze	Type E only
31	**Bumper**	Urethane	
32	**Wear ring**	Resin	
33	**Mounting nut**	Brass	
34	**Rod end nut**	Rolled steel	
35	**Piston seal**	NBR	
36	**Rod seal A**	NBR	
37	**Rod seal B**	NBR	
38	**Brake piston seal**	NBR	
39	**Cylinder tube gasket**	NBR	
40	**Intermediate cover gasket**	NBR	
41	**Cam gasket**	NBR	
42	**Piston gasket**	NBR	

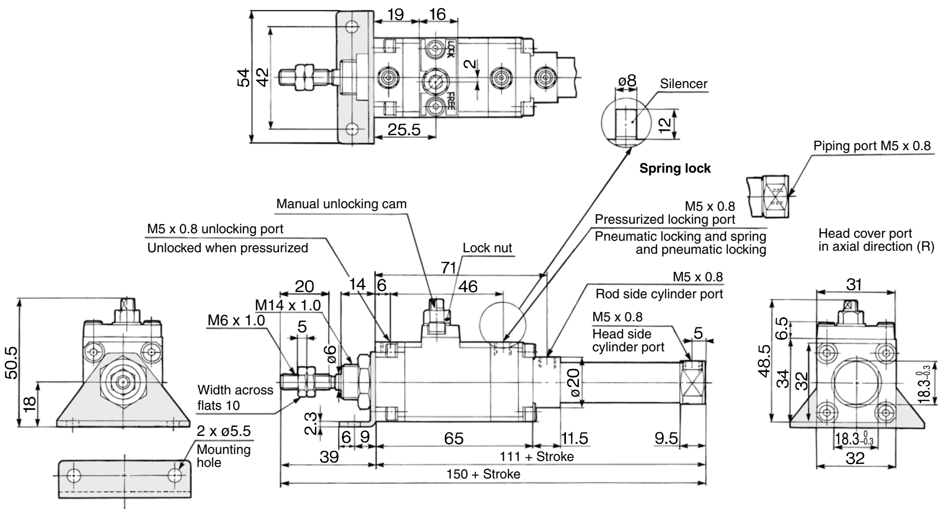
Basic Type (B)

CLJ2B16-□□-E/D/P



Axial Foot Type (L)

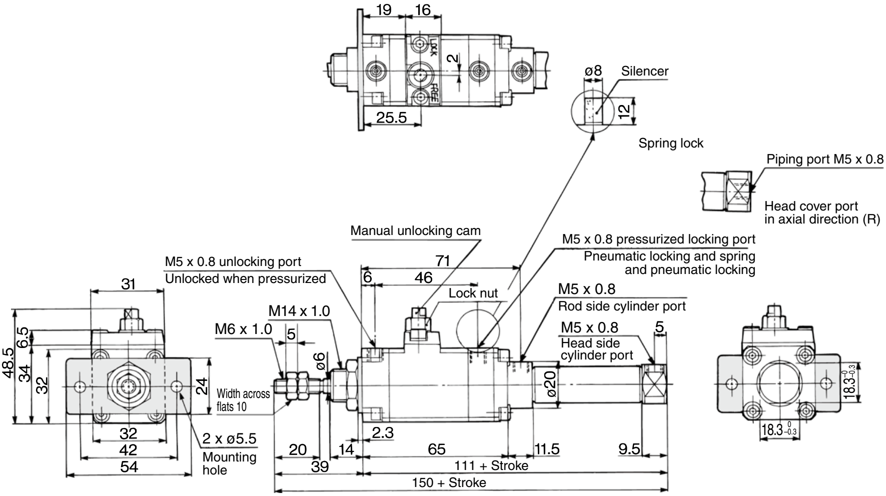
CLJ2L16-□□-E/D/P



CLJ2
CLM2
CLG1
CL1
MLGC
CNG
MNB
CNA2
CNS
CLS
CLQ
RLQ
MLU
MLGP
ML1C
D-□
-X□

Rod Side Flange Type (F)

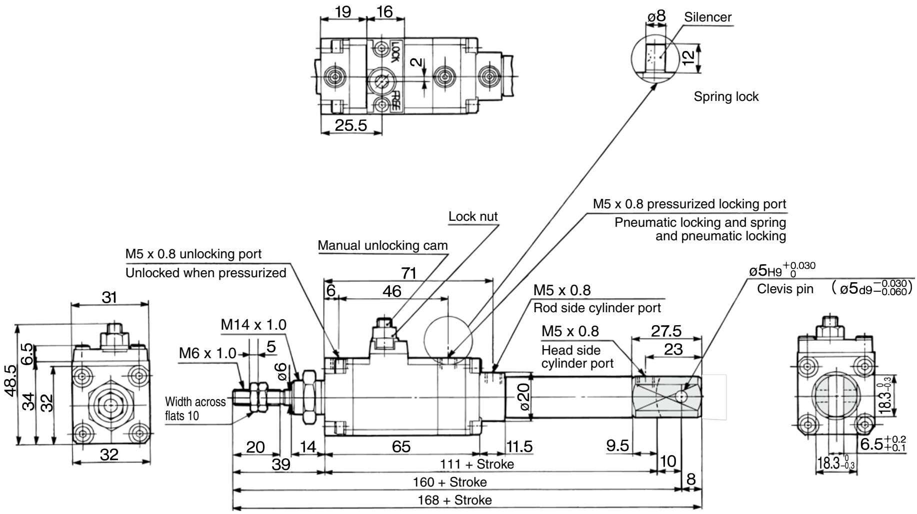
CLJ2F16-□□-E/D/P



Double Clevis Type (D)

∗ Clevis pin and retaining ring are shipped together.

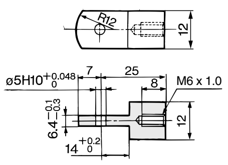
CLJ2D16-□□-E/D/P



Accessory Bracket Dimensions

Accessory Bracket Dimensions

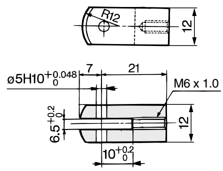
Single Knuckle Joint: I-LJ016B



Material: Rolled steel

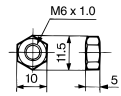
Double Knuckle Joint: Y-LJ016B

∗ Knuckle pin and retaining ring are shipped together.



Material: Rolled steel

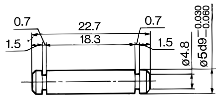
Rod End Nut: NT-015A



Material: Rolled steel

Clevis Pin: CD-Z015

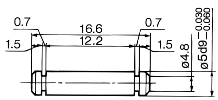
∗ Retaining rings are shipped together.



Material: Stainless steel

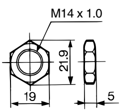
Knuckle Pin: IY-J015A

∗ Retaining rings are shipped together.



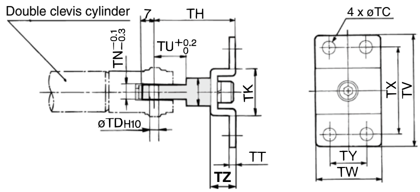
Material: Stainless steel

Mounting Nut: SNLJ-016B



Material: Brass

T-bracket: CJ-T016B



Material: Rolled steel

Part no.	Bore size (mm)	TC	TDH10	TH	TK	TN	TT	TU	TV	TW	TX	TY	TZ
CJ-T016B	16	5.5	5$^{+0.048}_{0}$	35	20	6.4	2.3	14	48	28	38	16	10

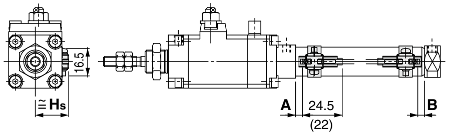
∗ T-bracket includes a T-bracket base, single knuckle joint, hexagon socket head cap screw and spring washer.

Auto Switch Mounting 1

Auto Switch Proper Mounting Position (Detection at Stroke End) and Its Mounting Height

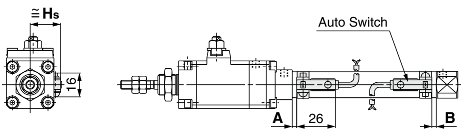
Reed auto switch
<Band Mounting>

D-A9□

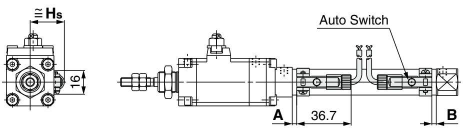


( ): For D-A96

D-C7□/C80

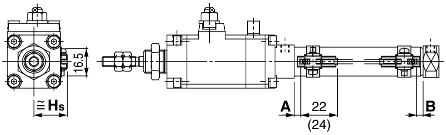


D-C73C□/C80C



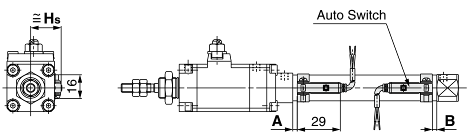
Solid state auto switch
<Band Mounting>

D-M9□
D-M9□A
D-M9□W

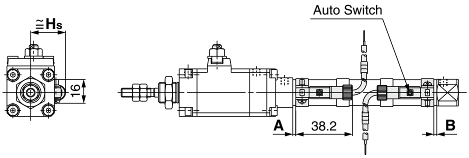


( ): For D-M9□A

D-H7□
D-H7□W
D-H7BA
D-H7NF



D-H7C



Auto Switch Proper Mounting Position (Detection at Stroke End) and Its Mounting Height

Auto Switch Proper Mounting Position

(mm)

Auto switch model / Bore size (mm)	D-M9□(V) D-M9□W(V) D-M9□A(V)		D-A9□(V)		D-C7/C8 D-C73C D-C80C		D-H7□ D-H7C D-H7□W D-H7BA D-H7NF	
	A	B	A	B	A	B	A	B
16	6.5	6.5	2.5	2.5	3	3	2	2

Note) Adjust the auto switch after confirming the operating conditions in the actual setting.

Auto Switch Mounting Height

(mm)

Auto switch model / Bore size (mm)	D-M9□(V) D-M9□W(V) D-M9□A(V) D-A9□(V)	D-C7/C8 D-H7□ D-H7□W D-H7NF D-H7BA	D-C73C D-C80C	D-H7C
	Hs	Hs	Hs	Hs
16	21	20.5	23	23.5

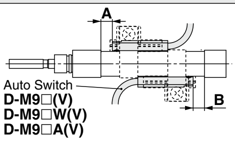
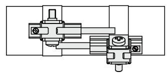
Minimum Auto Switch Mounting Stroke

(mm)

Auto switch mounting	Auto switch model	No. of auto switches mounted				
		1	2		n (n: No. of auto switches)	
			Different surfaces	Same surface	Different surfaces	Same surface
Band mounting	**D-M9□** **D-M9□W** **D-M9□A** **D-A9□**	10	15 Note 1)	45 Note 1)	$15 + 35 \frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	45 + 15 (n – 2) (n = 2, 3, 4, 5···)
	D-M9□V	5	15 Note 1)	35	$15 + 35 \frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	35 + 25 (n – 2) (n = 2, 3, 4, 5···)
	D-M9□WV **D-M9□AV**	10	15 Note 1)	35	$15 + 35 \frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	35 + 25 (n – 2) (n = 2, 3, 4, 5···)
	D-A9□V	5	10	35	$10 + 35 \frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	35 + 25 (n – 2) (n = 2, 3, 4, 5···)
	D-C7□ **D-C80**	10	15	50	$15 + 40 \frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	50 + 20 (n – 2) (n = 2, 3, 4, 5···)
	D-H7□/H7□W **D-H7BA** **D-H7NF**	10	15	60	$15 + 45 \frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	60 + 22.5 (n – 2) (n = 2, 3, 4, 5···)
	D-C73C **D-C80C** **D-H7C**	10	15	65	$15 + 50 \frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	50 + 27.5 (n – 2) (n = 2, 3, 4, 5···)

Note 3) When “n” is an odd number, an even number that is one larger than this odd number is used for the calculation.

Note 1) Auto switch mounting.

Auto switch model	With 2 auto switches	
	Different surfaces (1)	Same surface (1)
	 The proper auto switch mounting position is 5.5 mm inward from the switch holder edge. The above A and B indicate values for band mounting in the table of page 798	 The auto switch is mounted by slightly displacing it in a direction (cylinder tube circumferential exterior) so that the auto switch and lead wire do not interfere with each other.
D-M9□/M9□W/M9□A	Less than 20 stroke Note2)	Less than 55 stroke Note2)
D-A90/A93	—	Less than 50 stroke Note2)

Note 2) Minimum stroke for auto switch mounting in types other than those mentioned in Note 1.

Operating Range

(mm)

Auto switch model	Bore size (mm)
	16
D-A9□	7
D-M9□ **D-M9□W**	3
D-C7□/C80 **D-C73C/C80C**	7
D-H7□/H7□W/H7BA/H7NF	4
D-H7C	9

∗ Since the operating range is provided as a guideline including hysteresis, it cannot be guaranteed (assuming approximately ±30% dispersion). It may vary substantially depending on an ambient environment.

Auto Switch Mounting 2

Auto Switch Mounting Bracket: Part No.

Auto switch mounting	Auto switch model	Bore size (mm)	
		10	16
Band mounting	**D-M9□** **D-M9□V** **D-M9□W** **D-M9□WV** **D-A9□** **D-A9□V**	Note 1) BJ6-010	Note 1) BJ6-016
	D-M9□A **D-M9□AV**	Note 2) BJ6-010S	Note 2) BJ6-016S
	D-C7□/C80 **D-C73C/C80C** **D-H7□/H7□W** **D-H7BA/H7NF**	BJ2-010	BJ2-016

Note 1) Set part number which includes the auto switch mounting band (BJ2-□□□) and the holder kit (BJ5-1/Switch bracket: Transparent).Since the switch bracket (made from nylon) are affected in an environment where alcohol, chloroform, methylamines, hydrochloric acid or sulfuric acid is splashed over, so it cannot be used. Please consult SMC regarding other chemicals.
Note 2) Set part number which includes the auto switch mounting band (BJ2-□□□S) and the holder kit (BJ4-1/Switch bracket: White).
Note 3) For the D-M9□A (V) type auto switch, do not install the switch bracket on the indicator light.

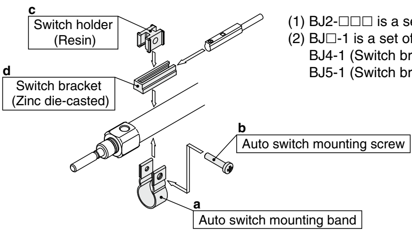
[Mounting screw set made of stainless steel]

The following set of mounting screws made of stainless steel is available. Use it in accordance with the operating environment. (Please order the auto switch mounting bracket separately, since it is not included.)

BBA4: For D-C7/C8/H7 types

Note 2) Refer to page 1226 for the details of BBA4.

D-H7BAL auto switch is set on the cylinder with the stainless steel screws above when shipped. When an auto switch is shipped independently, BBA4 is attached.



(1) BJ2-□□□ is a set of "a" and "b".
(2) BJ□-1 is a set of "c" and "d".
BJ4-1 (Switch bracket: White)
BJ5-1 (Switch bracket: Transparent)

Besides the models listed in How to Order, the following auto switches are applicable.
Refer to pages 1119 to 1245 for the detailed specifications.

Auto switch type	Part no.	Electrical entry (Fetching direction)	Features
Reed	D-C73, C76	Grommet (In-line)	—
	D-C80		Without indicator light
Solid state	D-H7A1, H7A2, H7B		—
	D-H7NW, H7PW, H7BW		Diagnostic indication (2-color indicator)

∗ For solid state auto switches, auto switches with a pre-wired connector are also available. Refer to pages 1192 and 1193 for details.
∗ Normally closed (NC = b contact) solid state auto switches (D-F9G/F9H types) are also available. Refer to page 1137 for details.

Fine Lock Cylinder
Double Acting, Single Rod
CLM2 Series
ø20, ø25, ø32, ø40

How to Order

CLM2 [ ] L 25 [ ] - 100 [ ] - E - [ ]

With auto switch: CDLM2 [ ] L 25 [ ] - 100 [ ] - E - M9BW [ ] - C - [ ]

With auto switch (Built-in magnet)

Type

Nil	Pneumatic
H	Air-hydro

Port thread type

Nil	Rc
TN	NPT

Mounting type

B	Basic type	T	Head side trunnion type
L	Axial foot type	E	Clevis integrated type
F	Rod side flange type	BZ	Boss-cut basic type
G	Head side flange type	FZ	Boss-cut flange type
C	Single clevis type		
D	Double clevis type		

Bore size

20	20 mm
25	25 mm
32	32 mm
40	40 mm

Cylinder stroke (mm)
Refer to "Standard Stroke" on page 802.

With rod boot

Nil	None
J	Nylon tarpaulin
K	Heat resistant tarpaulin

Lock operation

E	Spring locking (Exhaust locking)
P	Pneumatic locking (Pressure locking)
D	Spring and pneumatic locking

Auto switch

Nil	Without auto switch

∗ For the applicable auto switch model, refer to the table below.

Number of auto switches

Nil	2 pcs.
S	1 pc.
n	"n" pcs.

Auto switch mounting bracket Note)

Note) This symbol is indicated when the D-A9□ or M9□ type auto switch is specified.
This mounting bracket does not apply to other auto switches (D-C7□ and H7□, etc.) (Nil)

Made to Order
Refer to page 802 for details.

Built-in Magnet Cylinder Model

If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch.
(Example) CDLM2F32-100-P

Applicable Auto Switches/Refer to pages 1119 to 1245 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage DC		Load voltage AC	Auto switch model Perpendicular	Auto switch model In-line	Lead wire length (m) 0.5 (Nil)	1 (M)	3 (L)	5 (Z)	None (N)	Pre-wired connector	Applicable load	
Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	M9NV	M9N	●	—	●	○	—	○	IC circuit	Relay, PLC
				3-wire (PNP)				M9PV	M9P	●	—	●	○	—	○		
				2-wire		12 V		M9BV	M9B	●	—	●	○	—	○	—	
		Connector						—	H7C	●	—	●	●	●	—		
		Terminal conduit		3-wire (NPN)		5 V, 12 V		—	G39A	—	—	—	—	●	—	IC circuit	
				2-wire		12 V		—	K39A	—	—	—	—	●	—	—	
	Diagnostic indication (2-color indicator)	Grommet		3-wire (NPN)		5 V,12 V		M9NWV	M9NW	●	●	●	○	—	○	IC circuit	
				3-wire (PNP)				M9PWV	M9PW	●	●	●	○	—	○		
				2-wire		12V		M9BWV	M9BW	●	●	●	○	—	○	—	
	Water resistant (2-color indicator)			3-wire (NPN)		5 V, 12 V		M9NAV*1	M9NA*1	○	○	●	○	—	○	IC circuit	
				3-wire (PNP)				M9PAV*1	M9PA*1	○	○	●	○	—	○		
				2-wire		12V		M9BAV*1	M9BA*1	○	○	●	○	—	○	—	
	With diagnostic output (2-color indicator)			4-wire (NPN)		5 V, 12 V		—	H7NF	●	—	●	○	—	○	IC circuit	
Reed auto switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	A96V	A96	●	—	●	—	—	—	IC circuit	—
				2-wire	24 V	12 V	100 V	A93V*2	A93	●	●	●	●	—	—	—	Relay, PLC
			No				100 V or less	A90V	A90	●	—	●	—	—	—	IC circuit	
			Yes				100 V, 200V	—	B54	●	—	●	●	—	—	—	
			No				200 V or less	—	B64	●	—	●	—	—	—		
		Connector	Yes			12 V	—	—	C73C	●	—	●	●	●	—		
			No				24 V or less	—	C80C	●	—	●	●	●	—	IC circuit	
		Terminal conduit	Yes				—	—	A33A	—	—	—	—	●	—	—	PLC
							100 V, 200 V	—	A34A	—	—	—	—	●	—		Relay, PLC
		DIN terminal						—	A44A	—	—	—	—	●	—		
	Diagnostic indication (2-color indicator)	Grommet				—	—	—	B59W	●	—	●	—	—	—		

∗1 Water resistant type auto switches can be mounted on the above models, but in such case SMC cannot guarantee water resistance.
Consult with SMC regarding water resistant types with the above model numbers.
∗2 1 m type lead wire is only applicable to D-A93.

∗ Lead wire length symbols: 0.5 m ·······Nil (Example) M9NW
1 m ·······M (Example) M9NWM
3 m ······· L (Example) M9NWL
5 m ······· Z (Example) M9NWZ
None ······· N (Example) H7CN

∗ Solid state auto switches marked with "○" are produced upon receipt of order.
∗ Do not indicate suffix "N" for no lead wire on D-A3□A/A44A/G39A/K39A models.

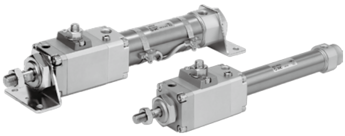
∗ Since there are other applicable auto switches than listed above, refer to page 817 for details.
∗ For details about auto switches with pre-wired connector, refer to pages 1192 and 1193.
∗ D-A9□(V)/M9□(V)/M9□W(V)/M9□A(V) auto switches are shipped together (not assembled). (Only auto switch mounting brackets are assembled at the time of shipment.)

SMC

Provided with a compact lock mechanism, it is suitable for intermediate stop, emergency stop, and drop prevention.

Locking in both directions
The piston rod can be locked in either direction of its cylinder stroke.

Maximum piston speed: 500 mm/s
It can be used at 50 to 500 mm/s provided that it is within the allowable kinetic energy range.



Made to Order Specifications
(For details, refer to pages 1247 to 1440.)

Symbol	Specifications
-XA□	Change of rod end shape

Rod Boot Material

Symbol	Rod boot material	Maximum ambient temperature
J	Nylon tarpaulin	70°C
K	Heat resistant tarpaulin	110°C *

* Maximum ambient temperature for the rod boot itself.

Refer to pages 814 to 817 for cylinders with auto switches.
• Minimum auto switch mounting stroke • Proper auto switch mounting position (detection at stroke end) and mounting height • Operating range • Switch mounting bracket: Part no.

Specifications

Bore size (mm)	20	25	32	40
Action	Double acting, Single rod			
Type	Air cylinder			
Lock operation	Spring locking (Exhaust locking) Pneumatic locking (Pressurized locking), Spring and pneumatic locking			
Fluid	Air			
Proof pressure	1.5 MPa			
Maximum operating pressure	1.0 MPa			
Minimum operating pressure	0.08 MPa			
Ambient and fluid temperature	Without auto switch: –10 to 70°C (No freezing) With auto switch: –10 to 60°C (No freezing)			
Lubrication	Not required (Non-lube)			
Piston speed	50 to 500 mm/s *			
Cushion	Rubber bumper (Standard equipment)			
Stroke length tolerance	$^{+1.4}_{\ 0}$			
Piping/Screw-in type	Rc 1/8			Rc 1/4
Mounting	Basic type, Axial foot type, Rod side flange type, Head side flange type, Single clevis type, Double clevis type, Head side trunnion type, Clevis integrated type, Boss-cut basic type, Boss-cut flange type			

* Constraints associated with the allowable kinetic energy are imposed on the speeds at which the piston can be locked. The maximum speed of 750 mm/s can be accommodated if the piston is to be locked in the stationary state for the purpose of drop prevention.

Fine Lock Specifications

Lock operation	Spring locking (Exhaust locking)	Spring and pneumatic locking	Pneumatic locking (Pressure locking)
Fluid	Air		
Maximum operating pressure	0.5 MPa		
Unlocking pressure	0.3 MPa or more		0.1 MPa or more
Lock starting pressure	0.25 MPa or less		0.05 MPa or more
Locking direction	Both directions		

* Refer to page 804 for the allowable kinetic energy when locking, holding force of spring locking and stopping accuracy.

Standard Stroke / Refer to the minimum auto switch mounting stroke (page 816) for those with an auto switch.

Bore size (mm)	Standard stroke (1) (mm)	Maximum stroke (mm)
20	25, 50, 75, 100, 125, 150 200, 250, 300	1000
25		
32		
40		

Note1) Intermediate strokes other than listed above are produced upon receipt of order. Manufacture of intermediate strokes at 1 mm intervals is possible. (Spacers are not used.)
Note 2) When exceeding 300 strokes, the allowable maximum stroke length is determined by the stroke selection table (technical data).

Mounting Bracket and Accessory

Mounting \ Accessory	Standard equipment: Mounting nut	Standard equipment: Rod end nut	Standard equipment: Clevis pin	Option: Single knuckle joint	Option: Double[3] knuckle joint	Option: Clevis[4] pivot bracket	Option: Rod boot	Option: Pivot[6] bracket	Option: Pivot[7] bracket pin
Basic type	●(1 pc.)	●	—	●	●	—	●	—	—
Axial foot type	●(2)	●	—	●	●	—	●	—	—
Rod side flange type	●(1)	●	—	●	●	—	●	—	—
Head side flange type	●(1)	●	—	●	●	—	●	—	—
Clevis integrated type	—(1)	●	—	●	●	●	●	—	—
Single clevis type	—(1)	●	—	●	●	—	●	●	●
Double clevis type (3)	—(1)	●	●(5)	●	●	—	●	—	—
Head side trunnion type	●(1)(2)	●	—	●	●	—	●	●	●
Boss-cut basic type	●(1)	●	—	●	●	—	●	—	—
Boss-cut flange type	●(1)	●	—	●	●	—	●	—	—
Note					With pin	With pin			

Note 1) Mounting nut is not equipped with clevis integrated type, single clevis type and double clevis type.
Note 2) Trunnion nuts are attached for head side trunnion type.
Note 3) Pin and retaining ring (ø40: cotter pin) are shipped together with double clevis and double knuckle joint.
Note 4) Pin and retaining ring are shipped together with clevis pivot bracket.
Note 5) Clevis pins come with retaining rings (cotter pins for ø40).
Note 6) Pivot brackets do not come with pins and retaining rings.
Note 7) Pivot bracket pins come with retaining rings.
Note 8) For part numbers and dimensions of accessories (Options), refer to pages 811 to 813.

Weight

(kg)

	Bore size (mm)	20	25	32	40
Basic weight	Basic type	0.55	0.87	0.94	1.30
	Axial foot type	0.70	1.03	1.10	1.57
	Flange type	0.61	0.96	1.03	1.42
	Clevis integrated type	0.53	0.85	0.93	1.26
	Single clevis type	0.59	0.91	0.98	1.39
	Double clevis type	0.60	0.93	0.99	1.43
	Trunnion type	0.59	0.94	1.00	1.40
	Boss-cut basic type	0.54	0.85	0.92	1.27
	Boss-cut flange type	0.60	0.94	1.01	1.39
Additional weight per each 50 mm of stroke		0.04	0.06	0.08	0.13
Option bracket	Clevis bracket (With pin)	0.07	0.07	0.14	0.14
	Single knuckle joint	0.06	0.06	0.06	0.23
	Double knuckle joint (With pin)	0.07	0.07	0.07	0.20
	Pivot bracket	0.06	0.06	0.06	0.06
	Pivot bracket pin	0.02	0.02	0.02	0.03

Calculation: (Example) **CLM2L32-100-E**
- Basic weight ············· 1.10 (Foot, ø32)
- Additional weight ······ 0.08/50 stroke
- Cylinder stroke ······· 100 stroke   1.10 + 0.08 x 100/50 = 1.26 kg

Mounting Bracket Part No.

Bore size (mm)	20	25	32	40
Axial foot *	CM-L020B	CM-L032B		CM-L040B
Flange	CM-F020B	CM-F032B		CM-F040B
Single clevis	CM-C020B	CM-C032B		CM-C040B
Double clevis **	CM-D020B	CM-D032B		CM-D040B
Trunnion (with nut)	CM-T020B	CM-T032B		CM-T040B

* When ordering foot bracket, order 2 pieces per cylinder.
** Clevis pin and retaining ring (ø40: cotter pin) are shipped together with double clevis type.

Boss-cut type

Boss for the head side cover bracket is eliminated and the total length of cylinder is shortened.

Comparison of the full length dimension (Versus standard type)

(mm)

ø20	ø25	ø32	ø40
▲13	▲13	▲13	▲16

Mounting type

■ Boss-cut basic type **(BZ)** ■ Boss-cut flange type **(FZ)**

Air-hydro

CLM2H [Mounting type] [Bore size] — [Stroke] [Rod boot]

Air-hydro

Low hydraulic cylinder 1 MPa or less
Through the concurrent use of a CC series air-hydro unit, it is possible to operate at a constant or low speeds or to effect an intermediate stop, just like a hydraulic unit, while using pneumatic equipment such as a valve.

Specifications

Fluid	Turbine oil (Lock portion is air)
Action	Double acting, Single rod
Bore size (mm)	ø20, ø25, ø32, ø40
Maximum operating pressure	1.0 MPa
Minimum operating pressure	0.2 MPa
Piston speed	15 to 300 mm/s
Cushion	Rubber bumper (Standard equipment)
Piping	Screw-in type
Mounting	Basic type, Axial foot type, Rod side flange type Head side flange type, Single clevis type Double clevis type, Head side trunnion type Clevis integrated type, Boss-cut type

* Auto switch capable
- For an exterior dimension diagram to identify the mounting support types, refer to pages 806 to 810 as the dimensions are identical to those of standard.

⚠ Caution/Allowable Kinetic Energy when Locking

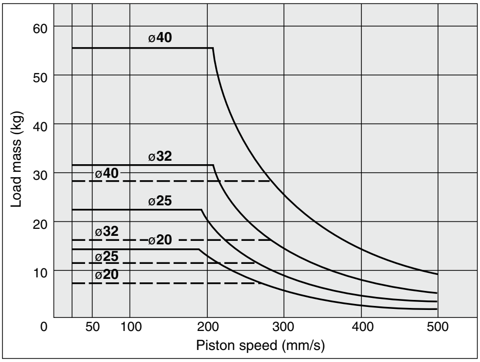
Bore size (mm)	20	25	32	40
Allowable kinetic energy (J)	0.26	0.42	0.67	1.19

1. In terms of specific load conditions, the allowable kinetic energy indicated in the table above is equivalent to a 50% load ratio at 0.5 MPa, and a piston speed of 300 mm/sec. Therefore, if the operating conditions are below these values, calculations are unnecessary.
2. Apply the following formula to obtain the kinetic energy of the load.

$$Ek = \frac{1}{2} m\upsilon^2$$

Ek: Kinetic energy of load (J)
m: Load mass (kg)
υ: Piston speed (m/s)

3. The piston speed will exceed the average speed immediately before locking. To determine the piston speed for the purpose of obtaining the kinetic energy of load, use 1.2 times the average speed as a guide.
4. The relation between the speed and the load of the respective tube bores is indicated in the diagram below. Use the cylinder in the range below the line.
5. Even within a given allowable kinetic energy level, there is an upper limit to the size of the load that can be sustained. Thus, a horizontally mounted cylinder must be operated below the solid line, and a vertically mounted cylinder must be operated below the dotted line.



Stopping Accuracy (Not including tolerance of control system.) (mm)

Locking method	Piston speed (mm/s)				
	20 *	50	100	300	500
Spring locking (Exhaust locking)	±0.3	±0.4	±0.5	±1.0	±2.0
Pneumatic locking (Pressure locking) Spring and pneumatic locking	±0.15	±0.2	±0.3	±0.5	±1.5

Conditions: Load: 25% of thrust force at 0.5 MPa
Solenoid valve: Mounted to the lock port
20 mm/s marked with the asterisk is in the case of actuating hydraulically by means of air-hydro type.

⚠ Caution

Selection/Recommended Pneumatic Circuit/Caution on Handling

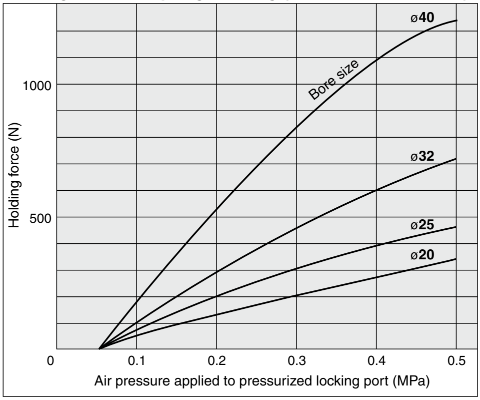
For detailed speceifications of the fine lock cylinder, CLM2 series mentioned above, refer to pages 786 to 789.

Holding Force of Spring Locking (Maximum static load)

Bore size (mm)	20	25	32	40
Holding force (N)	196	313	443	784

Note) Holding force at piston rod extended side decreases approximately 15%.

Holding Force of Spring Locking (Maximum static load)



* When selecting cylinders, refer to the Precautions and allowable kinetic energy when locking on page 786, and then select a cylinder.

⚠ Caution

Caution when Locking

Holding force (maximum static load) means the maximum capability of holding a static load that is not accompanied by vibration or impact under the condition that no load is applied. Therefore, it does not refer to a load that cannot be held constantly. When using (selecting) this product, carefully check the following points.

- If the piston rod slips because the lock's holding force has been exceeded, the brake shoe could be damaged, resulting in a reduced holding force or shortened life.
- Do not use the cylinder in the locked state to sustain a load that involves impact.
- The upper limit of the load that is used under the conditions not associated with the kinetic energy when locking, such as drop prevention must be 35% or less of the holding force.

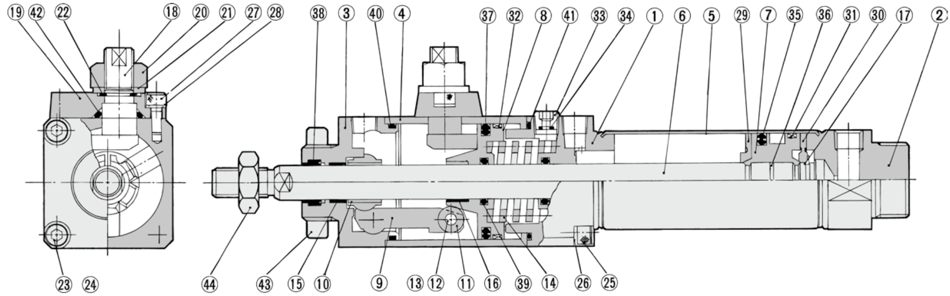
⚠ Caution

Operating Precautions

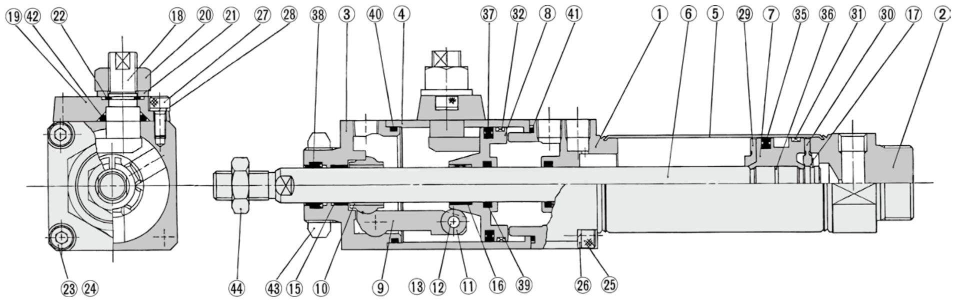
- Install a rod boot without twisting.
  If the cylinder is installed with its bellows twisted, it could damage the bellows.

Construction (Not able to disassemble)

Spring locking (Exhaust locking)
Spring and pneumatic locking



Pneumatic locking (Pressure locking)



Component Parts

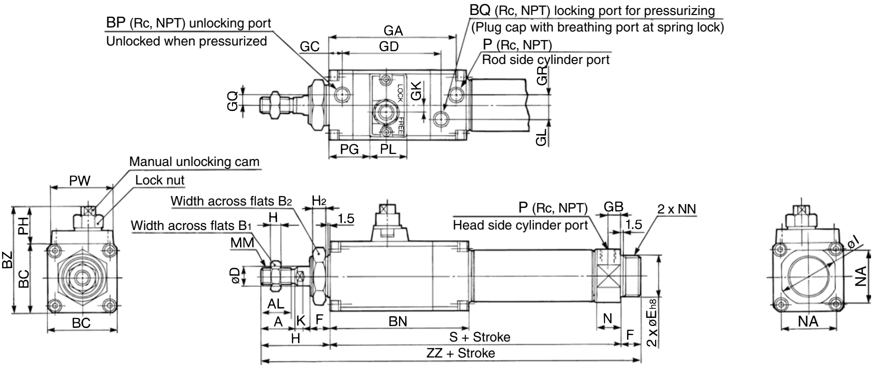
No.	Description	Material	Note
1	**Rod cover**	Aluminum alloy	Clear anodized
2	**Head cover**	Aluminum alloy	Clear anodized
3	**Cover**	Carbon steel	Nitrided, chrome plated
4	**Intermediate cover**	Aluminum alloy	Hard anodized
5	**Cylinder tube**	Stainless steel	
6	**Piston rod**	Carbon steel	Hard chrome plated
7	**Piston**	Aluminum alloy	Chromated
8	**Brake piston**	Carbon steel	Nitrided
9	**Brake arm**	Carbon steel	Nitrided
10	**Brake shoe**	Special friction material	
11	**Roller**	Carbon steel	
12	**Pin**	Carbon steel	
13	**Retaining ring**	Carbon tool steel	
14	**Brake spring**	Spring steel wire	Anti-corrosive treatment
15	**Bushing**	Bearing alloy	
16	**Bushing**	Bearing alloy	
17	**Retaining ring**	Stainless steel	
18	**Manual lock release cam**	Chromium molybdenum steel	Nickel plated
19	**Cam guide**	Carbon steel	Nitrided, painted
20	**Lock nut**	Rolled steel	
21	**Flat washer**	Rolled steel	
22	**Retaining ring**	Carbon tool steel	
23	**Hexagon socket head cap screw**	Chromium molybdenum steel	

No.	Description	Material	Note
24	**Spring washer**	Steel wire	
25	**Hexagon socket head cap screw**	Chromium molybdenum steel	
26	**Spring washer**	Steel wire	
27	**Hexagon socket head cap screw**	Chromium molybdenum steel	
28	**Spring washer**	Steel wire	
29	**Bumper A**	Urethane	
30	**Bumper B**	Urethane	
31	**Wear ring**	Resin	
32	**Wear ring**	Resin	
33	**Hexagon socket head plug**	Carbon steel	Type E only
34	**Element**	Bronze	Type E only
35	**Piston seal**	NBR	
36	**Piston gasket**	NBR	
37	**Brake piston seal**	NBR	
38	**Rod seal A**	NBR	
39	**Rod seal B**	NBR	
40	**Middle cover gasket A**	NBR	
41	**Middle cover gasket B**	NBR	
42	**Cam gasket**	NBR	
43	**Mounting nut**	Carbon steel	
44	**Rod end nut**	Carbon steel	

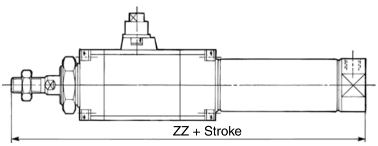
Basic Type (B)

CLM2B Bore size – Stroke

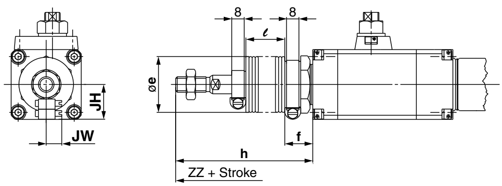
Standard type



Boss-cut type



With rod boot



(mm)

Bore (mm)	Stroke range	A	AL	B_1	B_2	BC	BN	BP	BQ	BZ	D	E	F	GA	GB	GC	GD	GK	GL	GQ	GR	H	H_1	H_2	I
20	Up to 300	18	15.5	13	26	38	80	1/8	1/8	57.5	8	$20^{\ 0}_{-0.033}$	13	73.5	8	8	55	3.5	6	4	4	41	5	8	28
25	Up to 300	22	19.5	17	32	45	90	1/8	1/8	69	10	$26^{\ 0}_{-0.033}$	13	83.5	8	9	64.5	4	9	7	7	45	6	8	33.5
32	Up to 300	22	19.5	17	32	45	90	1/8	1/8	69	12	$26^{\ 0}_{-0.033}$	13	83.5	8	9	64.5	4	9	7	7	45	6	8	37.5
40	Up to 300	24	21	22	41	52	100.5	1/8	1/8	76	14	$32^{\ 0}_{-0.039}$	16	90.5	11	8	70	4	11	8	7	50	8	10	46.5

(mm)

Bore (mm)	K	MM	N	NA	NN	P	PG	PH	PL	PW	S	ZZ
20	5	M8 x 1.25	15	24	M20 x 1.5	1/8	22	19.5	20	38	127	181
25	5.5	M10 x 1.25	15	30	M26 x 1.5	1/8	27	24	24	41	137	195
32	5.5	M10 x 1.25	15	34.5	M26 x 1.5	1/8	27	24	24	41	139	197
40	7	M14 x 1.5	21.5	42.5	M32 x 2	1/4	29	24	24	41	167	233

Boss-cut

Bore (mm)	ZZ
20	168
25	182
32	184
40	217

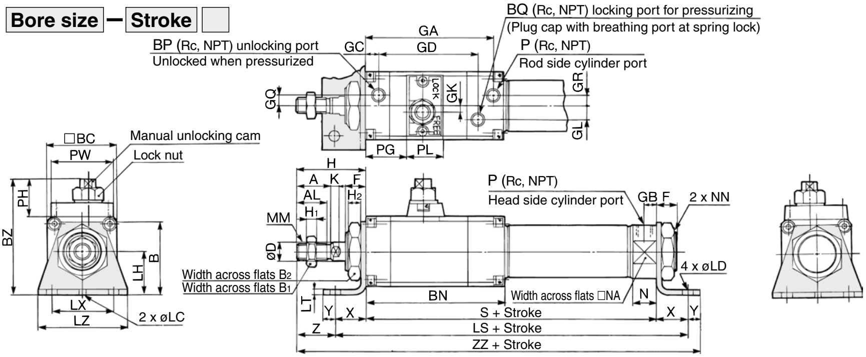
With Rod Boot

(mm)

Bore (mm)	e	f	h					ℓ					ZZ					JH	JW
			1 to 50	51 to 100	101 to 150	151 to 200	201 to 300	1 to 50	51 to 100	101 to 150	151 to 200	201 to 300	1 to 50	51 to 100	101 to 150	151 to 200	201 to 300	(Reference)	(Reference)
20	36	17	68	81	93	106	131	12.5	25	37.5	50	75	208	221	233	246	271	23.5	10.5
25	36	17	72	85	97	110	135	12.5	25	37.5	50	75	222	232	247	260	285	23.5	10.5
32	36	17	72	85	97	110	135	12.5	25	37.5	50	75	224	237	249	262	287	23.5	10.5
40	46	19	77	90	102	115	140	12.5	25	37.5	50	75	260	273	285	298	323	23.5	10.5

Axial Foot Type (L)

CLM2L Bore size – Stroke □



(mm)

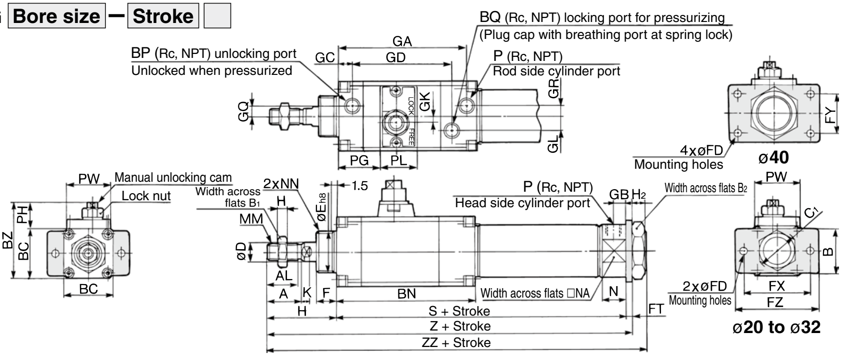
Bore (mm)	Stroke range	A	AL	B	B_1	B_2	BC	BN	BP	BQ	BZ	D	F	GA	GB	GC	GD	GK	GL	GQ	GR	H	H_1	H_2
20	Up to 400	18	15.5	40	13	26	38	80	1/8	1/8	63.5	8	13	73.5	8	8	55	3.5	6	4	4	41	5	8
25	Up to 450	22	19.5	47	17	32	45	90	1/8	1/8	74.5	10	13	83.5	8	9	64.5	4	9	7	7	45	6	8
32	Up to 450	22	19.5	47	17	32	45	90	1/8	1/8	74.5	12	13	83.5	8	9	64.5	4	9	7	7	45	6	8
40	Up to 500	24	21	54	22	41	52	100.5	1/8	1/8	80	14	16	90.5	11	8	70	4	11	8	7	50	8	10

(mm)

Bore (mm)	K	LC	LD	LH	LS	LT	LX	LZ	MM	N	NA	NN	P	PG	PH	PL	PW	S	X	Y	Z	ZZ
20	5	4	6.8	25	167	3.2	40	55	M8 x 1.25	15	24	M20 x 1.5	1/8	22	19.5	20	38	127	20	8	21	196
25	5.5	4	6.8	28	177	3.2	40	55	M10 x 1.25	15	30	M26 x 1.5	1/8	27	24	24	41	137	20	8	25	210
32	5.5	4	6.8	28	179	3.2	40	55	M10 x 1.25	15	34.5	M26 x 1.5	1/8	27	24	24	41	139	20	8	25	212
40	7	4	7	30	213	3.2	55	75	M14 x 1.5	21.5	42.5	M32 x 2	1/4	29	24	24	41	167	23	10	27	250

Head Side Flange Type (G)

CLM2G Bore size – Stroke □



(mm)

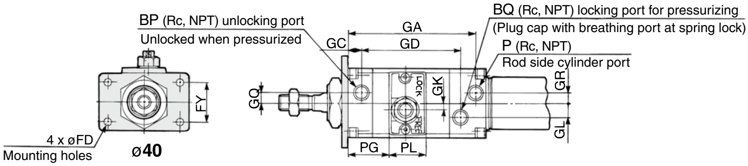
Bore (mm)	Stroke range	A	AL	B	B_1	B_2	BC	BN	BP	BQ	BZ	C_1	D	E	F	FD	FT	FX	FY	FZ	GA	GB
20	Up to 300	18	15.5	34	13	26	38	80	1/8	1/8	57.5	30	8	$20^{\ 0}_{-0.033}$	13	7	4	60	—	75	73.5	8
25	Up to 300	22	19.5	40	17	32	45	90	1/8	1/8	69	37	10	$26^{\ 0}_{-0.033}$	13	7	4	60	—	75	83.5	8
32	Up to 300	22	19.5	40	17	32	45	90	1/8	1/8	69	37	12	$26^{\ 0}_{-0.033}$	13	7	4	60	—	75	83.5	8
40	Up to 300	24	21	52	22	41	52	100.5	1/8	1/8	76	47.3	14	$32^{\ 0}_{-0.039}$	16	7	5	66	36	82	90.5	11

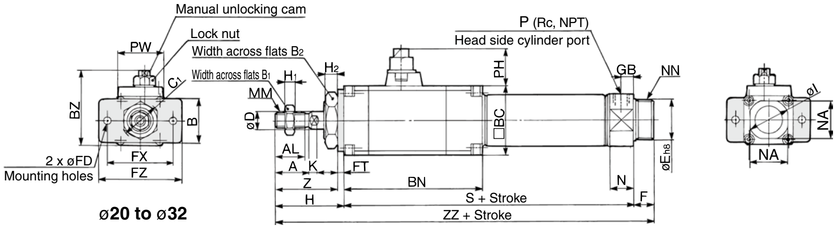
(mm)

Bore (mm)	GC	GD	GK	GL	GQ	GR	H	H_1	H_2	K	MM	N	NA	NN	P	PG	PH	PL	PW	S	Z	ZZ
20	8	55	3.5	6	4	4	41	5	8	5	M8 x 1.25	15	24	M20 x 1.5	1/8	22	19.5	20	38	127	172	181
25	9	64.5	4	9	7	7	45	6	8	5.5	M10 x 1.25	15	30	M26 x 1.5	1/8	27	24	24	41	137	186	195
32	9	64.5	4	9	7	7	45	6	8	5.5	M10 x 1.25	15	34.5	M26 x 1.5	1/8	27	24	24	41	139	188	197
40	8	70	4	11	8	7	50	8	10	7	M14 x 1.5	21.5	42.5	M32 x 2	1/4	29	24	24	41	167	222	233

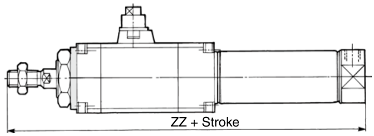
Rod Side Flange Type (F)

CLM2F Bore size – Stroke





Boss-cut type



(mm)

Bore (mm)	Stroke range	A	AL	B	B_1	B_2	BC	BN	BP	BQ	BZ	C_1	D	E	F	FD	FT	FX	FY	FZ	GA	GB	GC	GD	GK
20	Up to 400	18	15.5	34	13	26	38	80	1/8	1/8	57.5	30	8	$20^{\ 0}_{-0.033}$	13	7	4	60	—	75	73.5	8	8	55	3.5
25	Up to 450	22	19.5	40	17	32	45	90	1/8	1/8	69	37	10	$26^{\ 0}_{-0.033}$	13	7	4	60	—	75	83.5	8	9	64.5	4
32	Up to 450	22	19.5	40	17	32	45	90	1/8	1/8	69	37	12	$26^{\ 0}_{-0.033}$	13	7	4	60	—	75	83.5	8	9	64.5	4
40	Up to 500	24	21	52	22	41	52	100.5	1/8	1/8	76	47.3	14	$32^{\ 0}_{-0.039}$	16	7	5	66	36	82	90.5	11	8	70	4

(mm)

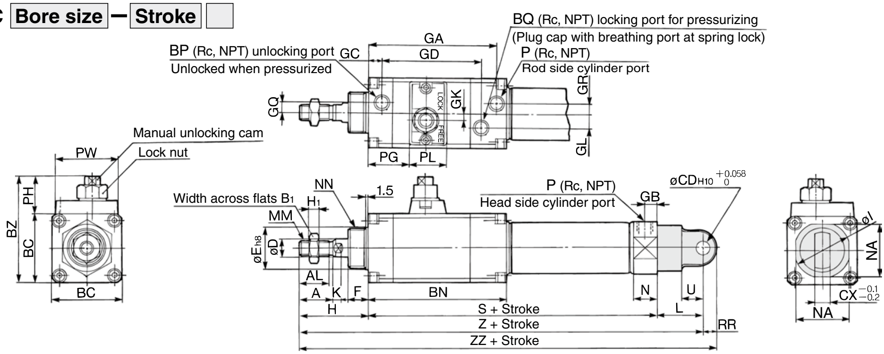
Bore (mm)	GL	GQ	GR	H	H_1	H_2	I	K	MM	N	NA	NN	P	PG	PH	PL	PW	S	Z	ZZ
20	6	4	4	41	5	8	28	5	M8 x 1.25	15	24	M20 x 1.5	1/8	22	19.5	20	38	127	37	181
25	9	7	7	45	6	8	33.5	5.5	M10 x 1.25	15	30	M26 x 1.5	1/8	27	24	24	41	137	41	195
32	9	7	7	45	6	8	37.5	5.5	M10 x 1.25	15	34.5	M26 x 1.5	1/8	27	24	24	41	139	41	197
40	11	8	7	50	8	10	46.5	7	M14 x 1.5	21.5	42.5	M32 x 2	1/4	29	24	24	41	167	45	233

Boss-cut

Bore (mm)	ZZ
20	168
25	182
32	184
40	217

Single Clevis Type (C)

CLM2C Bore size – Stroke ☐



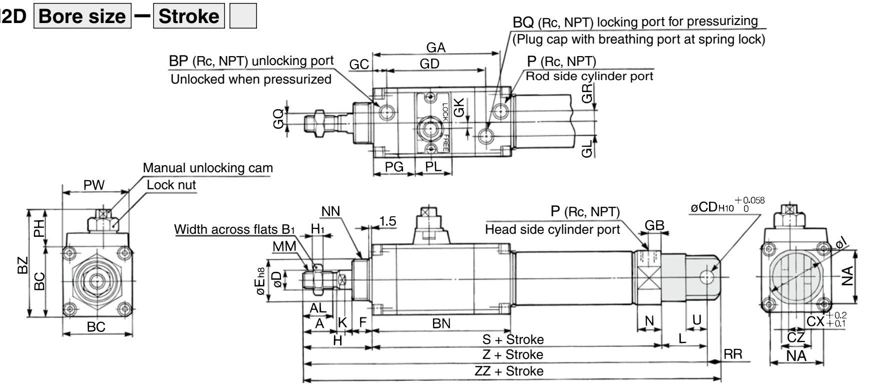
(mm)

Bore (mm)	Stroke range	A	AL	B1	BC	BN	BP	BQ	BZ	CD	CX	D	E	F	GA	GB	GC	GD	GK	GL	GQ
20	Up to 300	18	15.5	13	38	80	1/8	1/8	57.5	9	10	8	$20^{\ 0}_{-0.033}$	13	73.5	8	8	55	3.5	6	4
25	Up to 300	22	19.5	17	45	90	1/8	1/8	69	9	10	10	$26^{\ 0}_{-0.033}$	13	83.5	8	9	64.5	4	9	7
32	Up to 300	22	19.5	17	45	90	1/8	1/8	69	9	10	12	$26^{\ 0}_{-0.033}$	13	83.5	8	9	64.5	4	9	7
40	Up to 300	24	21	22	52	100.5	1/8	1/8	76	10	15	14	$32^{\ 0}_{-0.039}$	16	90.5	11	8	70	4	11	8

Bore (mm)	GR	H	H1	I	K	L	MM	N	NA	NN	P	PG	PH	PL	PW	RR	S	U	Z	ZZ
20	4	41	5	28	5	30	M8 x 1.25	15	24	M20 x 1.5	1/8	22	19.5	20	38	9	127	14	198	207
25	7	45	6	33.5	5.5	30	M10 x 1.25	15	30	M26 x 1.5	1/8	27	24	24	41	9	137	14	212	221
32	7	45	6	37.5	5.5	30	M10 x 1.25	15	34.5	M26 x 1.5	1/8	27	24	24	41	9	139	14	214	223
40	7	50	8	46.5	7	39	M14 x 1.5	21.5	42.5	M32 x 2	1/4	29	24	24	41	11	167	18	256	267

Double Clevis Type (D)

CLM2D Bore size – Stroke ☐



(mm)

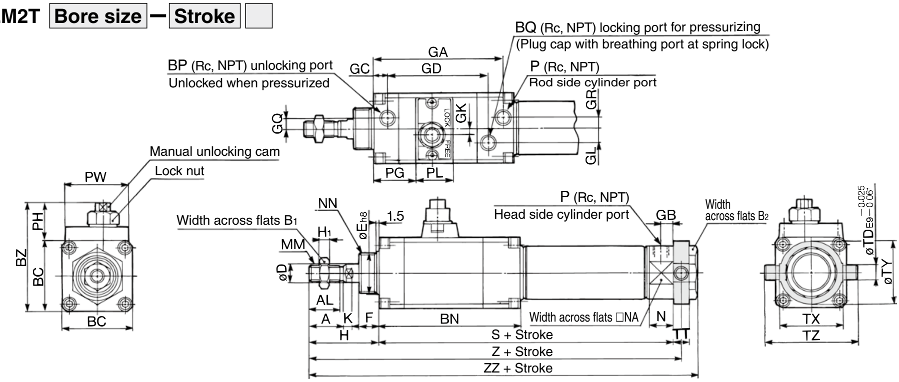
Bore (mm)	Stroke range	A	AL	B1	BC	BN	BP	BQ	BZ	CD	CX	CZ	D	E	F	GA	GB	GC	GD	GK	GL
20	Up to 300	18	15.5	13	38	80	1/8	1/8	57.5	9	10	19	8	$20^{\ 0}_{-0.033}$	13	73.5	8	8	55	3.5	6
25	Up to 300	22	19.5	17	45	90	1/8	1/8	69	9	10	19	10	$26^{\ 0}_{-0.033}$	13	83.5	8	9	64.5	4	9
32	Up to 300	22	19.5	17	45	90	1/8	1/8	69	9	10	19	12	$26^{\ 0}_{-0.033}$	13	83.5	8	9	64.5	4	9
40	Up to 300	24	21	22	52	100.5	1/8	1/8	76	10	15	30	14	$32^{\ 0}_{-0.039}$	16	90.5	11	8	70	4	11

Bore (mm)	GQ	GR	H	H1	I	K	L	MM	N	NA	NN	P	PG	PH	PL	PW	RR	S	U	Z	ZZ
20	4	4	41	5	28	5	30	M8 x 1.25	15	24	M20 x 1.5	1/8	22	19.5	20	38	9	127	14	198	207
25	7	7	45	6	33.5	5.5	30	M10 x 1.25	15	30	M26 x 1.5	1/8	27	24	24	41	9	137	14	212	221
32	7	7	45	6	37.5	5.5	30	M10 x 1.25	15	34.5	M26 x 1.5	1/8	27	24	24	41	9	139	14	214	223
40	8	7	50	8	46.5	7	39	M14 x 1.5	21.5	42.5	M32 x 2	1/4	29	24	24	41	11	167	18	256	267

∗ Clevis pin and snap ring (ø40: cotter pin) are shipped together.

Head Side Trunnion Type (T)

CLM2T Bore size – Stroke



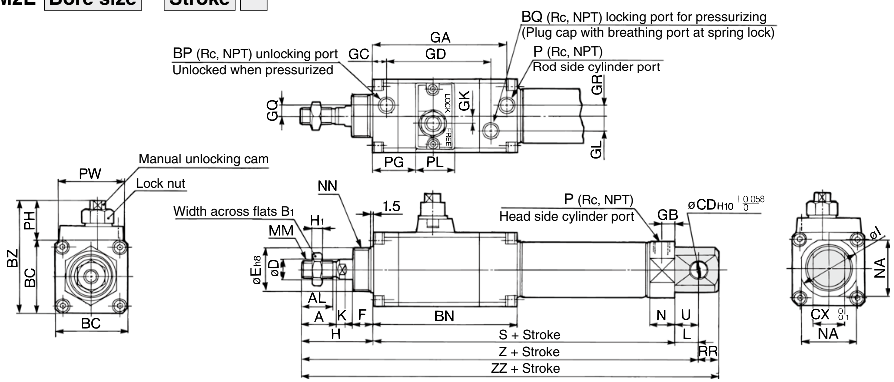
(mm)

Bore (mm)	Stroke range	A	AL	B1	B2	BC	BN	BP	BQ	BZ	D	E	F	GA	GB	GC	GD	GK	GL	GQ
20	Up to 300	18	15.5	13	26	38	80	1/8	1/8	57.5	8	$20^{\ 0}_{-0.033}$	13	73.5	8	8	55	3.5	6	4
25	Up to 300	22	19.5	17	32	45	90	1/8	1/8	69	10	$26^{\ 0}_{-0.033}$	13	83.5	8	9	64.5	4	9	7
32	Up to 300	22	19.5	17	32	45	90	1/8	1/8	69	12	$26^{\ 0}_{-0.033}$	13	83.5	8	9	64.5	4	9	7
40	Up to 300	24	21	22	41	52	100.5	1/8	1/8	76	14	$32^{\ 0}_{-0.039}$	16	90.5	11	8	70	4	11	8

Bore (mm)	GR	H	H1	K	MM	N	NA	NN	P	PG	PH	PL	PW	S	TD	TT	TX	TY	TZ	Z	ZZ
20	4	41	5	5	M8 x 1.25	15	24	M20 x 1.5	1/8	22	19.5	20	38	127	8	10	32	32	52	173	183
25	7	45	6	5.5	M10 x 1.25	15	30	M26 x 1.5	1/8	27	24	24	41	137	9	10	40	40	60	187	197
32	7	45	6	5.5	M10 x 1.25	15	34.5	M26 x 1.5	1/8	27	24	24	41	139	9	10	40	40	60	189	199
40	7	50	8	7	M14 x 1.5	21.5	42.5	M32 x 2	1/4	29	24	24	41	167	10	11	53	53	77	222.5	233

Clevis Integrated Type (E)

CLM2E Bore size – Stroke



(mm)

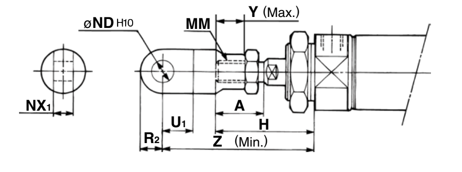
Bore (mm)	Stroke range	A	AL	B1	BC	BN	BP	BQ	BZ	CD	CX	D	E	F	GA	GB	GC	GD	GK	GL	GQ
20	Up to 300	18	15.5	13	38	80	1/8	1/8	57.5	8	12	8	$20^{\ 0}_{-0.033}$	13	73.5	8	8	55	3.5	6	4
25	Up to 300	22	19.5	17	45	90	1/8	1/8	69	8	12	10	$26^{\ 0}_{-0.033}$	13	83.5	8	9	64.5	4	9	7
32	Up to 300	22	19.5	17	45	90	1/8	1/8	69	10	20	12	$26^{\ 0}_{-0.033}$	13	83.5	8	9	64.5	4	9	7
40	Up to 300	24	21	22	52	100.5	1/8	1/8	76	10	20	14	$32^{\ 0}_{-0.039}$	16	90.5	11	8	70	4	11	8

Bore (mm)	GR	H	H1	I	K	L	MM	N	NA	NN	P	PG	PH	PL	PW	RR	S	U	Z	ZZ
20	4	41	5	28	5	12	M8 x 1.25	15	24	M20 x 1.5	1/8	22	19.5	20	38	9	127	11.5	180	189
25	7	45	6	33.5	5.5	12	M10 x 1.25	15	30	M26 x 1.5	1/8	27	24	24	41	9	137	11.5	194	203
32	7	45	6	37.5	5.5	15	M10 x 1.25	15	34.5	M26 x 1.5	1/8	27	24	24	41	12	139	14.5	199	211
40	7	50	8	46.5	7	15	M14 x 1.5	21.5	42.5	M32 x 2	1/4	29	24	24	41	12	167	14.5	232	244

Accessory Bracket Dimensions 1

Single Knuckle Joint

(mm)

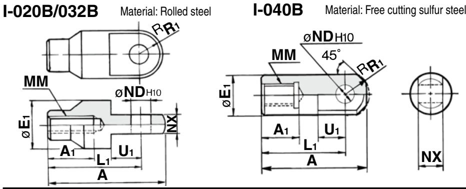


Bore size	A	H	MM	ND H10	NX1	U1	R2	Y	Z
20	18	41	M8 x 1.25	$9^{+0.058}_{0}$	$9^{-0.1}_{-0.2}$	14	10	11	66
25, 32	22	45	M10 x 1.25	$9^{+0.058}_{0}$	$9^{-0.1}_{-0.2}$	14	10	14	69
40	24	50	M14 x 1.5	$12^{+0.070}_{0}$	$16^{-0.1}_{-0.3}$	20	14	13	92

Single Knuckle Joint

(mm)

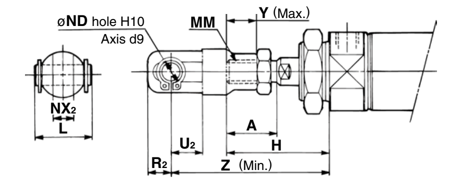
I-020B/032B Material: Rolled steel **I-040B** Material: Free cutting sulfur steel



Part no.	Applicable bore size	A	A1	E1	L1	MM	ND H10	NX	R1	U1
I-020B	**20**	46	16	20	36	M8 x 1.25	$9^{+0.058}_{0}$	$9^{-0.1}_{-0.2}$	10	14
I-032B	**25, 32**	48	18	20	38	M10 x 1.25	$9^{+0.058}_{0}$	$9^{-0.1}_{-0.2}$	10	14
I-040B	**40**	69	22	24	55	M14 x 1.5	$12^{+0.070}_{0}$	$16^{-0.1}_{-0.3}$	15.5	20

Double Knuckle Joint

(mm)

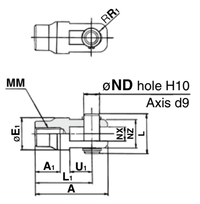


Bore size	A	H	L	MM	ND	NX2	R2	U2	Y	Z
20	18	41	25	M8 x 1.25	9	$9^{+0.2}_{+0.1}$	10	14	11	66
25, 32	22	45	25	M10 x 1.25	9	$9^{+0.2}_{+0.1}$	10	14	14	69
40	24	50	49.7	M14 x 1.5	12	$16^{+0.3}_{+0.1}$	13	25	13	92

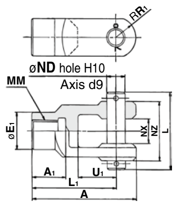
Double Knuckle Joint

(mm)

Y-020B/Y-032B Material: Rolled steel



Y-040B Material: Cast iron



Part no.	Applicable bore size	A	A1	E1	L	L1	MM	ND	NX	NZ	R1	U1	Applicable pin part number	Retaining ring Cotter pin size
Y-020B	20	46	16	20	25	36	M8 x 1.25	9	$9^{+0.2}_{+0.1}$	18	5	14	CDP-1	Type C 9 for axis
Y-032B	25, 32	48	18	20	25	38	M10 x 1.25	9	$9^{+0.2}_{+0.1}$	18	5	14	CDP-1	Type C 9 for axis
Y-040B	40	68	22	24	49.7	55	M14 x 1.5	12	$16^{+0.3}_{+0.1}$	38	13	25	CDP-3	ø3 x 18 ℓ

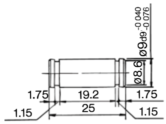
∗ Clevis pin and retaining ring (cotter pin for 40) are attached.

Double Clevis Pin/Material: Carbon steel

(mm)

Bore size/ø20, ø25, ø32

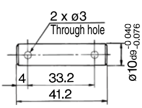
CDP-1



Retaining ring: Type C9 for axis

Bore size/ø40

CDP-2



Cotter pin
ø3 x 18 ℓ

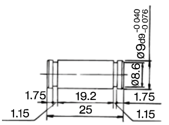
∗ Retaining rings (cotter pins for ø40) are attached.

Double Knuckle Pin/Material: Carbon steel

(mm)

Bore size/ø20, ø25, ø32

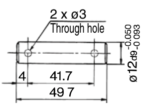
CDP-1



Retaining ring: Type C9 for axis

Bore size/ø40

CDP-3



Cotter pin
ø3 x 18 ℓ

∗ Retaining rings (cotter pins for ø40) are attached.

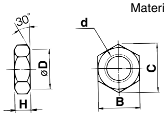
CLJ2
CLM2
CLG1
CL1
MLGC
CNG
MNB
CNA2
CNS
CLS
CLQ
RLQ
MLU
MLGP
ML1C
D-□
-X□

CLM2 Series
Accessory Bracket Dimensions 2

Rod End Nut

(mm)

Material: Carbon steel

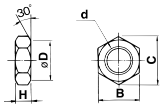


Part no.	Applicable bore size	B	C	D	d	H
NT-02	**20**	13	15.0	12.5	M8 x 1.25	5
NT-03	**25, 32**	17	19.6	16.5	M10 x 1.25	6
NT-04	**40**	22	25.4	21.0	M14 x 1.5	8

Mounting Nut

(mm)

Material: Carbon steel

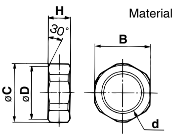


Part no.	Applicable bore size	B	C	D	d	H
SN-020B	**20**	26	30	25.5	M20 x 1.5	8
SN-032B	**25, 32**	32	37	31.5	M26 x 1.5	8
SN-040B	**40**	41	47.3	40.5	M32 x 2.0	10

Trunnion Nut

(mm)

Material: Carbon steel

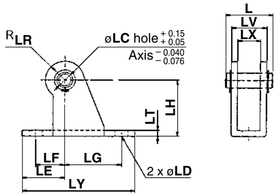


Part no.	Applicable bore size	B	C	D	d	H
TN-020B	**20**	26	28	25.5	M20 x 1.5	10
TN-032B	**25, 32**	32	34	31.5	M26 x 1.5	10
TN-040B	**40**	41	45	40.5	M32 x 2	10

Clevis Pivot Bracket (For CLM2E)

(mm)

Material: Rolled steel plate



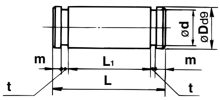
Part no.	Applicable bore size	L	LC	LD	LE	LF	LG	LH	LR	LT	LX	LY	LV	Applicable pin part no.
CM-E020B	**20, 25**	24.5	8	6.8	22	15	30	30	10	3.2	12	59	18.4	CD-S02
CM-E032B	**32, 40**	34	10	9	25	15	40	40	13	4	20	75	28	CD-S03

Note 1) Clevis pins and retaining rings (cotter pins for ø40) are attached.
Note 2) It cannot be used for single clevis type (CM2C) and double clevis type (CM2D).

Clevis Pin (For CLM2E)

(mm)

Material: Carbon steel

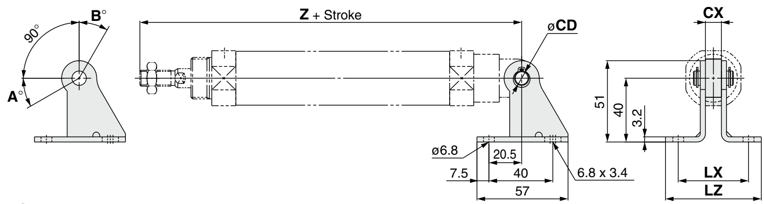


Part no.	Applicable bore size	Dd9	d	L	L_1	m	t	Applicable retaining ring part no.
CD-S02	**20, 25**	$8^{-0.040}_{-0.076}$	7.6	24.5	19.5	1.6	0.9	Type C 8 for axis
CD-S03	**32, 40**	$10^{-0.040}_{-0.076}$	9.6	34	29	1.35	1.15	Type C 10 for axis

Note) Retaining rings are attached.

Regarding mounting bracket, accessory made of stainless steel (Some are not available.), refer to page 1286 for -XB12, External stainless steel cylinder.

Single Clevis



Rotation Angle

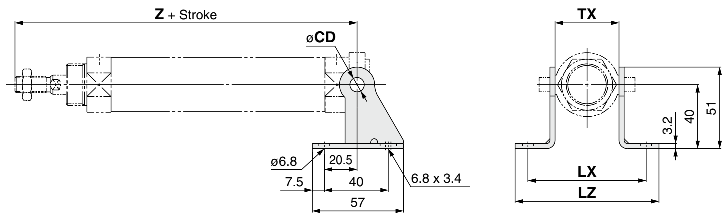
Bore size (mm)	A°	B°	A° + B° + 90°
20	25	85	200
25, 32	21	81	192
40	26	86	202

(mm)

Mounting	Part no.	Applicable bore size	CX	Z + Stroke	CD	LX	LZ
CLM2C (Single clevis type)	CM-B032	**20**	10	198	9	44	60
		25		212			
		32		214			
	CM-B040	**40**	15	256	10	49	65

Note) Pivot brackets do not come with pivot bracket pins and retaining rings.

Head Side Trunnion



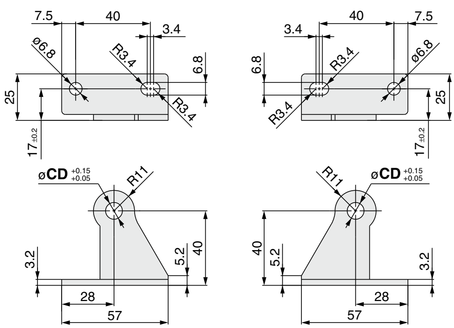
(mm)

Mounting	Part no.	Applicable bore size	TX	Head side trunnion Z + Stroke	CD	LX	LZ
CLM2T (Head side trunnion)	CM-B020	**20**	32	173	8	66	82
	CM-B032	**25**	40	187	9	74	90
		32		189			
	CM-B040	**40**	53	222.5	10	87	103

Note) Pivot brackets do not come with pivot bracket pins and retaining rings.

Pivot Bracket

∗ 2 brackets per set

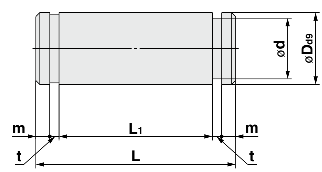


(mm)

Part no.	CD
CM-B020 (2)	8
CM-B032	9
CM-B040	10

Note 1) Pivot brackets do not come with pivot bracket pins and retaining rings.
Note 2) Only for trunnion type

Pivot Bracket Pin (For CM2C)



(mm)

Applicable bore size	Part no.	Dd9	d	L	L1	m	t	Applicable retaining ring part no.
20 to 32	CDP-1	$9^{-0.040}_{-0.076}$	8.6	25	19.2	1.75	1.15	Type C 9 for axis
40	CD-S03	$10^{-0.040}_{-0.076}$	9.6	34	29	1.75	1.15	Type C 10 for axis

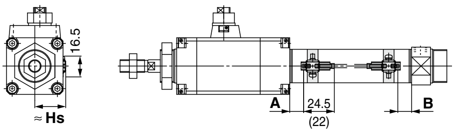
Note) Pivot bracket pins come with retaining rings.

Auto Switch Mounting 1

Auto Switch Proper Mounting Position (Detection at Stroke End) and Its Mounting Height

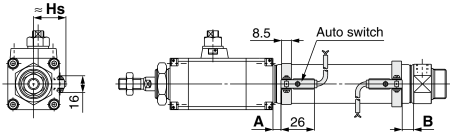
Reed auto switch

D-A9□

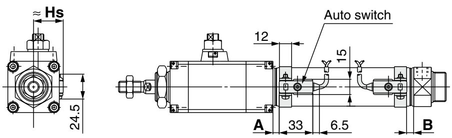


( ): For D-A96

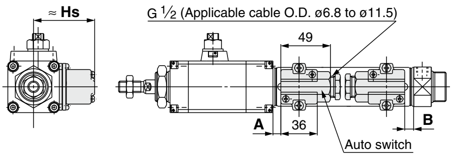
D-C7/C8



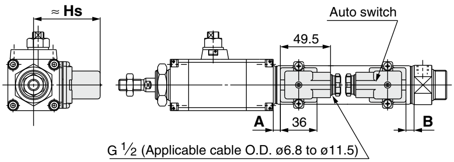
D-B5/B6/B59W



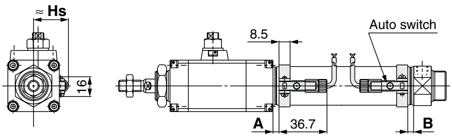
D-A33A/A34A



D-A44A

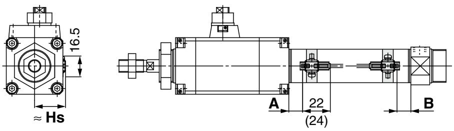


D-C73C/C80C



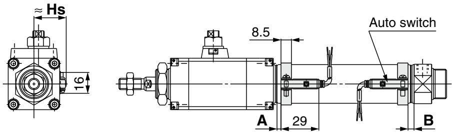
Solid state auto switch

D-M9□
D-M9□A
D-M9□W

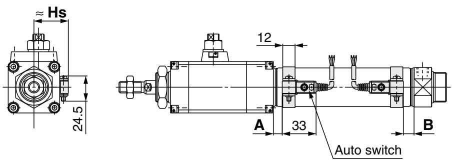


( ): For D-M9□A

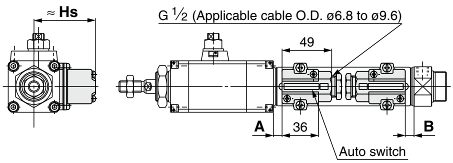
D-H7□/H7□W/H7NF/H7BA



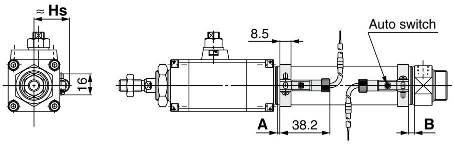
D-G5NTL



D-G39A/K39A



D-H7C



Auto Switch Proper Mounting Position (Detection at Stroke End) and Its Mounting Height

Auto Switch Proper Mounting Position

(mm)

Auto switch model / Bore size	D-M9□(V) D-M9□W(V) D-M9□A(V)		D-A9□(V)		D-C7/C8 D-C73C D-C80C		D-B5 D-B6		D-B59W		D-A3□A D-G39A D-K39A D-A44A		D-H7□ D-H7C D-H7□W D-H7BA D-H7NF		D-G5NT	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
20	10.5	9.5	6.5	5.5	7	6	1	0	4	3	0.5	0	6	5	2.5	1.5
25	10.5	9.5	6.5	5.5	7	6	1	0	4	3	0.5	0	6	5	2.5	1.5
32	11.5	10.5	7.5	6.5	8	7	2	1	5	4	1.5	0.5	7	6	3.5	2.5
40	17.5	15.5	13.5	11.5	13	12	7	6	10	9	6.5	5.5	12	11	8.5	7.5

Note) Adjust the auto switch after confirming the operating conditions in the actual setting.

Auto Switch Mounting Height

(mm)

Auto switch model / Bore size	D-M9□(V) D-M9□W(V) D-M9□A(V) D-A9□(V)	D-C7/C8 D-H7□ D-H7□W D-H7NF D-H7BA	D-B5□ D-B64 D-B59W D-G5NT D-H7C	D-C73C D-C80C	D-A3□A D-G39A D-K39A	D-A44A
	Hs	Hs	Hs	Hs	Hs	Hs
20	23	22.5	25.5	25	60	69.5
25	25.5	25	28	27.5	62.5	72
32	29	28.5	31.5	31	66	75.5
40	33	32.5	35.5	35	70	79.5

Auto Switch Mounting 2

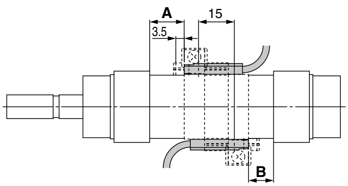
Minimum Auto Switch Mounting Stroke

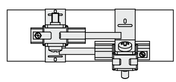
n: No. of auto switches (mm)

Auto switch model	No. of auto switches mounted				
	1	2		n	
		Different surfaces	Same surface	Different surfaces	Same surface
D-M9□	5	20	55	$20 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6…) Note 3)	55 + 35 (n – 2) (n = 2, 3, 4, 5…)
D-M9□W	10	20	55	$20 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6…) Note 3)	55 + 35 (n – 2) (n = 2, 3, 4, 5…)
D-M9□A	10	25	60	$25 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6…) Note 3)	60 + 35 (n – 2) (n = 2, 3, 4, 5…)
D-A9□	5	15	50	$15 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6…) Note 3)	50 + 35 (n – 2) (n = 2, 3, 4, 5…)
D-M9□V	5	20	35	$20 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6…) Note 3)	35 + 35 (n – 2) (n = 2, 3, 4, 5…)
D-A9□V	5	15	25	$15 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6…) Note 3)	25 + 35 (n – 2) (n = 2, 3, 4, 5…)
D-M9□WV **D-M9□AV**	10	20	35	$20 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6…) Note 3)	35 + 35 (n – 2) (n = 2, 3, 4, 5…)
D-C7□ **D-C80**	5	20	60	$20 + 45\frac{(n-2)}{2}$ (n = 2, 4, 6…) Note 3)	60 + 45 (n – 2) (n = 2, 3, 4, 5…)
D-H7□ **D-H7□W** **D-H7BA** **D-H7NF**	10	25	70	$25 + 45\frac{(n-2)}{2}$ (n = 2, 4, 6…) Note 3)	70 + 45 (n – 2) (n = 2, 3, 4, 5…)
D-C73C **D-C80C** **D-H7C**	15	30	80	$30 + 50\frac{(n-2)}{2}$ (n = 2, 4, 6…) Note 3)	80 + 50 (n – 2) (n = 2, 3, 4, 5…)
D-B5□ **D-B64** **D-G5□** **D-K59□**	10	25	70	$25 + 50\frac{(n-2)}{2}$ (n = 2, 4, 6…) Note 3)	70 + 50 (n – 2) (n = 2, 3, 4, 5…)
D-B59W	15	30	75	$30 + 50\frac{(n-2)}{2}$ (n = 2, 4, 6…) Note 3)	75 + 50 (n – 2) (n = 2, 3, 4, 5…)
D-A3□A **D-G39A** **D-K39A** **D-A44A**	20	35	110	$35 + 30\frac{(n-2)}{2}$ (n = 2, 3, 4, 5…)	110 + 100 (n – 2) (n = 2, 3, 4, 5…)

Note 3) When “n” is an odd number, an even number that is one larger than this odd number is used for the calculation.

Note 1) Auto switch mounting

<table>
<tr><td rowspan="3">Auto switch model</td><td colspan="2">With 2 auto switches</td></tr>
<tr><td>Different surfaces</td><td>Same surface</td></tr>
<tr><td>

The proper auto switch mounting position is 3.5 mm inward from the switch holder edge.</td><td>
The auto switch is mounted by slightly displacing it in a direction (cylinder tube circumferential exterior) so that the auto switch and lead wire do not interfere with each other.</td></tr>
<tr><td>D-M9□
D-M9□W</td><td>Less than 20 stroke Note 2)</td><td>Less than 55 stroke Note 2)</td></tr>
<tr><td>D-M9□A</td><td>Less than 25 stroke Note 2)</td><td>Less than 60 stroke Note 2)</td></tr>
<tr><td>D-A9□</td><td>—</td><td>Less than 50 stroke Note 2)</td></tr>
</table>

Note 2) Minimum stroke for auto switch mounting in types other than those mentioned in Note 1.

Operating Range

(mm)

Auto switch model	Bore size 20	25	32	40
D-A9□	6	6	6	6
D-M9□ **D-M9□W**	3.5	3	3.5	3
D-C7□/C80 **D-C73C/C80C**	7	8	8	8
D-B5□/B64 **D-A3□A/A44A**	8	8	9	9
D-B59W	12	12	13	13
D-H7□/H7□W/H7BAL **D-G5NTL/H7NF**	4	4	4.5	5
D-H7C	7	8.5	9	10
D-G39A/K39A	8	9	9	9

∗ Since the operating range is provided as a guideline including hysteresis, it cannot be guaranteed (assuming approximately ±30% dispersion). It may vary substantially depending on an ambient environment.

Auto Switch Mounting Bracket: Part No.

Auto switch model	Bore size (mm) ø20	ø25	ø32	ø40
D-M9□V(V) **D-M9□W(V)** **D-A9□V(V)**	Note 1) BM5-020	Note 1) BM5-025	Note 1) BM5-032	Note 1) BM5-040
D-M9□AV(V)	Note 2) BM5-020S	Note 2) BM5-025S	Note 2) BM5-032S	Note 2) BM5-040S
D-C7□/C80 **D-C73C/C80C** **D-H7□** **D-H7□W** **D-H7NF** **D-H7BA**	BM2-020A	BM2-025A	BM2-032A	BM2-040A
D-B5□/B64 **D-B59W** **D-G5□/K59** **D-G5□W/K59W** **D-G5BA/G59F** **D-G5NT** **D-G5NB**	BA2-020	BA2-025	BA2-032	BA2-040
D-A3□A/A44A **D-G39A/K39A**	BM3-020	BM3-025	BM3-032	BM3-040

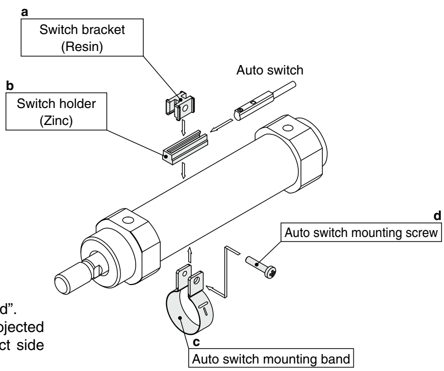
Note 1) Set part number which includes the auto switch mounting band (BM2-□□□A) and the holder kit (BJ5-1/Switch bracket: Transparent).
Since the switch bracket (made from nylon) are affected in an environment where alcohol, chloroform, methylamines, hydrochloric acid or sulfuric acid is splashed over, so it cannot be used. Please consult SMC regarding other chemicals.
Note 2) Set part number which includes the auto switch mounting band (BM2-□□□AS/Stainless steel screw) and the holder kit (BJ4-1/Switch bracket: White).
Note 3) For the D-M9□A (V) type auto switch, do not install the switch bracket on the indicator light.

[Mounting screw set made of stainless steel]

The following set of mounting screws made of stainless steel is available. Use it in accordance with the operating environment. (Please order the auto switch mounting bracket separately, since it is not included.)

BBA4: For D-C7/C8/H7 types

Note 4) Refer to page 1226 for the details of BBA4.
D-H7BA auto switch is set on the cylinder with the stainless steel screws above when shipped. When an auto switch is shipped independently, BBA4 is attached.



① BJ□-1 is a set of “a” and “b”.
② BM2-□□□A(S) is a set of “c” and “d”.
Band (c) is mounted so that the projected part is on the internal side (contact side with the tube).
BJ4-1 (Switch bracket: White)
BJ5-1 (Switch bracket: Transparent)

Besides the models listed in How to Order, the following auto switches are applicable.
Refer to pages 1119 to 1245 for the detailed specifications.

Auto switch type	Part no.	Electrical entry (Fetching direction)	Features
Reed	D-B53, C73, C76	Grommet (In-line)	—
	D-C80		Without indicator light
Solid state	D-H7A1, H7A2, H7B		—
	D-H7NW, H7PW, H7BW		Diagnostic indication (2-color)
	D-G5NT		With timer

∗ For solid state auto switches, auto switches with a pre-wired connector are also available. Refer to pages 1192 and 1193 for details.
∗ Normally closed (NC = b contact) solid state auto switches (D-F9G/F9H types) are also available. Refer to page 1137 for details.
∗ Wide range detection type, solid state auto switches (D-G5NB type) are also available. Refer to page 1182 for details.

Fine Lock Cylinder
Double Acting, Single Rod
CLG1 Series
ø20, ø25, ø32, ø40

How to Order

CLG1 **L** **N** **25** [ ] − **100** [ ] − **E** − [ ]

With auto switch: CDLG1 **L** **N** **25** [ ] − **100** [ ] − **E** − **M9BW** [ ] − **C** − [ ]

With auto switch (Built-in magnet)

Mounting type

B	Basic type
L	Axial foot type
F	Rod side flange type
G	Head side flange type
U	Rod side trunnion type
T	Head side trunnion type
D	Clevis type

∗ Mounting bracket is shipped together, (but not assembled).

Type

N	Non-lube/Rubber bumper
A	Non-lube/Air cushion

Bore size

20	20 mm
25	25 mm
32	32 mm
40	40 mm

Port thread type

Nil	Rc
TN	NPT

Cylinder stroke (mm)

Bore size (mm)	Standard stroke (mm)	Long stroke (mm)
20	25, 50, 75, 100, 125, 150, 200	201 to 350
25	25, 50, 75, 100, 125, 150, 200, 250, 300	301 to 400
32		301 to 450
40		301 to 800

∗ Intermediate stroke is available, too.

Cylinder symbol

Nil	Without rod boot
J	Nylon tarpaulin
K	Heat resistant tarpaulin

Lock operation

E	Spring locking (Exhaust locking)
P	Pneumatic locking (Pressure locking)
D	Spring and pneumatic locking

Auto switch

Nil	Without auto switch

∗ For the applicable auto switch model, refer to the table below.

Number of auto switches

Nil	2 pcs.
S	1 pc.
n	"n" pcs.

Auto switch mounting bracket Note)

Note) This symbol is indicated when the D-A9□ or M9□ type auto switch is specified. This mounting bracket does not apply to other auto switches (D-C7□ and H7□, etc.) (Nil)

Made to Order

Refer to page 819 for details.

Built-in Magnet Cylinder Model

If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch. (Example) CDLG1FA32-100-P

Applicable Auto Switches/Refer to pages 1119 to 1245 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage DC		Load voltage AC	Auto switch model / Applicable bore size: Perpendicular	In-line	Lead wire length (m) 0.5 (Nil)	1 (M)	3 (L)	5 (Z)	None (N)	Pre-wired connector	Applicable load	
Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	M9NV	M9N	●	●	●	○	—	○	IC circuit	Relay, PLC
								—	—	●	—	●	○	—	○		
				3-wire (PNP)				M9PV	M9P	●	●	●	○	—	○		
								—	—	●	—	●	○	—	○		
				2-wire		12 V		M9BV	M9B	●	●	●	○	—	○	—	
								—	—	●	—	●	○	—	○		
		Connector						—	H7C	●	—	●	●	●	—		
	Diagnostic indication (2-color indicator)	Grommet		3-wire (NPN)		5 V, 12 V		M9NWV	M9NW	●	●	●	○	—	○	IC circuit	
								—	—	●	—	●	○	—	○		
				3-wire (PNP)				M9PWV	M9PW	●	●	●	○	—	○		
								—	—	●	—	●	○	—	○		
				2-wire		12 V		M9BWV	M9BW	●	●	●	○	—	○	—	
								—	—	●	—	●	○	—	○		
	Water resistant (2-color indicator)			3-wire (NPN)		5 V, 12 V		M9NAV∗1	M9NA∗1	○	○	●	○	—	○	IC circuit	
				3-wire (PNP)				M9PAV∗1	M9PA∗1	○	○	●	○	—	○		
				2-wire		12 V		M9BAV∗1	M9BA∗1	○	○	●	○	—	○	—	
								—	—	●	—	●	○	—	○		
	With diagnostic output (2-color indicator)			4-wire (NPN)		5 V, 12 V		—	H7NF	●	—	●	○	—	○	IC circuit	
Reed auto switch		Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	A96V	A96	●	—	●	—	—	—	IC circuit	—
				2-wire	24 V	12 V	100 V	A93V∗2	A93	●	●	●	●	—	—	—	Relay, PLC
			No				100 V or less	A90V	A90	●	—	●	—	—	—	IC circuit	
			Yes				100 V, 200 V	—	B54	●	—	●	●	—	—	—	
			No				200 V or less	—	B64	●	—	●	—	—	—		
		Connector	Yes				—	—	C73C	●	—	●	●	●	—		
			No				24 V or less	—	C80C	●	—	●	●	●	—	IC circuit	
	Diagnostic indication (2-color indicator)	Grommet	Yes			—	—	—	B59W	●	—	●	—	—	—	—	

∗1 Water resistant type auto switches can be mounted on the above models, but in such case SMC cannot guarantee the water resistance.
A water-resistant type cylinder is recommended for use in an environment which requires water resistance. However, please contact SMC for water-resistant products of ø20 and ø25.

∗2 1 m type lead wire is only applicable to D-A93.

∗ Lead wire length symbols: 0.5 m ·······Nil (Example) M9NW
1 m ·······M (Example) M9NWM
3 m ······· L (Example) M9NWL
5 m ······· Z (Example) M9NWZ
None ······· N (Example) H7CN

∗ Solid state auto switches marked with "○" are produced upon receipt of order.

∗ Since there are other applicable auto switches than listed above, refer to page 829 for details.

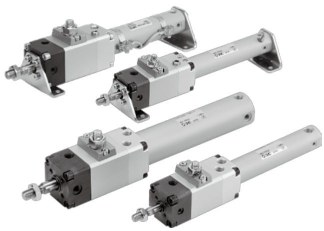
∗ For details about auto switches with pre-wired connector, refer to pages 1192 and 1193.

∗ D-A9□(V)/M9□(V)/M9□W(V)/M9□A(V) auto switches are shipped together (not assembled). (Only auto switch mounting brackets are assembled at the time of shipment.)

Provided with a compact lock mechanism, it is suitable for intermediate stop, emergency stop, and drop prevention.

Locking in both directions
The piston rod can be locked in either direction of its cylinder stroke.

Maximum piston speed: 500 mm/s
It can be used at 50 to 500 mm/s provided that it is within the allowable kinetic energy range.



Made to Order Specifications
(For details, refer to pages 1247 to 1440.)

Symbol	Specifications
-XA□	Change of rod end shape

Weight
(kg)

Bore size (mm)		20	25	32	40
Basic weight	Basic type	0.61	0.97	1.06	1.35
	Axial foot type	0.72	1.10	1.22	1.57
	Flange type	0.73	1.15	1.23	1.58
	Trunnion type	0.62	0.99	1.09	1.40
	Clevis type	0.66	1.05	1.21	1.58
Rod side pivot bracket		0.11	0.13	0.20	0.27
Head side pivot bracket		0.08	0.09	0.17	0.25
Single knuckle joint		0.05	0.09	0.09	0.10
Double knuckle joint (with pin)		0.05	0.09	0.09	0.13
Additional weight per each 50 mm of stroke		0.05	0.07	0.09	0.15
Additional weight with air cushion		0.01	0.01	0.02	0.02
Additional weight for long stroke		0.01	0.01	0.02	0.03

Calculation: (Example)
CLG1LA20-100 (Foot Type, ø20, 100 st)
- Basic weight 0.72
- Additional weight .... 0.05/50 st
- Air cylinder stroke .... 100 st
- Additional weight of air cushion ...... 0.01 kg

0.72 + 0.05 x 100/50 + 0.01 = 0.83 kg

Model

Series	Type	Action	Cushion	Bore size (mm)	Lock operation
CLG1□N	Non-lube	Double acting	Rubber bumper	20, 25 32, 40	Spring locking (Exhaust locking) Pneumatic locking (Pressure locking) Spring and pneumatic locking
CLG1□A			Air cushion		

Specifications

Bore size (mm)	20	25	32	40
Fluid	Air			
Lubrication	Not required (Non-lube)			
Proof pressure	1.5 MPa			
Maximum operating pressure	1 MPa			
Minimum operating pressure	0.08 MPa			
Ambient and fluid temperature	Without auto switch: –10 to 70°C (No freezing) With auto switch: –10 to 60°C (No freezing)			
Piston speed	50 to 500 mm/sec *			
Stroke length tolerance	Up to 1000 st $^{+1.4}_{0}$ mm to 1500 st $^{+1.8}_{0}$ mm			
Cushion	Rubber bumper, Air cushion			
Mounting **	Basic type, Axial foot type, Rod side flange type, Head side flange type, Rod side trunnion type, Head side trunnion type, Clevis type (Used when port position is changed to 90°.)			

* Constraints associated with the allowable kinetic energy are imposed on the speeds at which the piston can be locked.
The maximum speed of 1000 mm/s can be accommodated if the piston is to be locked in the stationary state for the purpose of drop prevention.
** The long stroke type is applicable to the axial foot type, and the rod side flange type.

Fine Lock Specifications

Lock operation	Spring locking (Exhaust locking)	Spring and pneumatic locking	Pneumatic locking (Pressure locking)
Fluid	Air		
Maximum operating pressure	0.5 MPa		
Unlocking pressure	0.3 MPa or more		0.1 MPa or more
Lock starting pressure	0.25 MPa or less		0.05 MPa or more
Locking direction	Both directions		

Accessory

Mounting		Basic type	Axial foot type	Rod side flange type	Head side flange type	Rod side trunnion type	Head side trunnion type	Clevis type
Standard equipment	Rod end nut	●	●	●	●	●	●	●
	Clevis pin	—	—	—	—	—	—	●
Option	Single knuckle joint	●	●	●	●	●	●	●
	Double knuckle joint* (With pin)	●	●	●	●	●	●	●
	Pivot bracket	—	—	—	—	●	●	●
	Rod boot	●	●	●	●	●	●	●

* Pin and retaining ring are shipped together with double knuckle joint.
* For part numbers and dimensions, refer to page 825. (For rod boots, refer to pages 821 and 823.)

Standard Stroke / Refer to the minimum auto switch mounting stroke (page 827) for those with an auto switch.

Bore size (mm)	Standard stroke (mm)	Long stroke (mm)	Maximum manufacturable stroke (mm)
20	25, 50, 75, 100, 125, 150, 200	201 to 350	1500
25	25, 50, 75, 100, 125, 150, 200, 250, 300	301 to 400	
32		301 to 450	
40		301 to 800	

* Intermediate stroke is available, too. Spacers are not used.
* Long strokes are applicable for the axial foot and rod side flange types. If other mounting brackets are used or the length exceeds the long stroke limit, the maximum stroke should be determined based on the stroke selection table (technical data).

Refer to pages 826 to 829 for cylinders with auto switches.

- Minimum auto switch mounting stroke
- Proper auto switch mounting position (detection at stroke end) and mounting height
- Operating range
- Switch mounting bracket: Part no.

Rod Boot Material

Symbol	Rod boot material	Maximum ambient temperature
J	Nylon tarpaulin	70°C
K	Heat resistant tarpaulin	110°C *

* Maximum ambient temperature for the rod boot itself.

⚠ Caution/Allowable Kinetic Energy when Locking

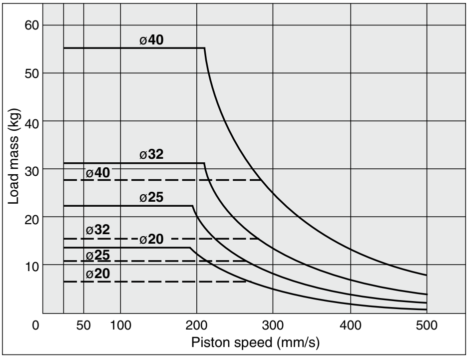
Bore size (mm)	20	25	32	40
Allowable kinetic energy (J)	0.26	0.42	0.67	1.19

1. In terms of specific load conditions, the allowable kinetic energy indicated in the table above is equivalent to a 50% load ratio at 0.5 MPa, and a piston speed of 300 mm/sec. Therefore, if the operating conditions are below these values, calculations are unnecessary.
2. Apply the following formula to obtain the kinetic energy of the load.

$$Ek = \frac{1}{2} m\upsilon^2$$

Ek: Kinetic energy of load (J)
m: Load mass (kg)
υ: Piston speed (m/s) (Average speed x 1.2 times)

3. The piston speed will exceed the average speed immediately before locking. To determine the piston speed for the purpose of obtaining the kinetic energy of load, use 1.2 times the average speed as a guide.
4. The relation between the speed and the load of the respective tube bores is indicated in the diagram below. Use the cylinder in the range below the line.
5. Even within a given allowable kinetic energy level, there is an upper limit to the size of the load that can be sustained. Thus, a horizontally mounted cylinder must be operated below the solid line, and a vertically mounted cylinder must be operated below the dotted line.

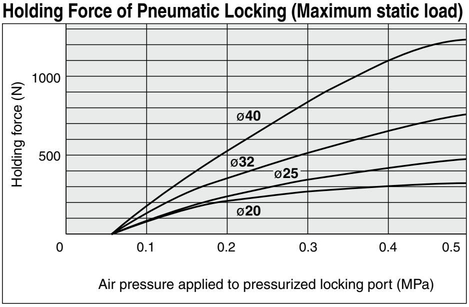


Holding Force of Spring Locking (Maximum static load)

Bore size (mm)	20	25	32	40
Holding force (N)	196	313	443	784

Note) Holding force at piston rod extended side decreases approximately 15%.

Holding Force of Pneumatic Locking (Maximum static load)



∗ When selecting cylinders, refer to the Precautions and allowable kinetic energy when locking on page 786, and then select a cylinder.

⚠ Caution

Caution when Locking

Holding force (maximum static load) means the maximum capability of holding a static load that is not accompanied by vibration or impact under the condition that no load is applied. Therefore, it does not refer to a load that cannot be held constantly.

When using (selecting) this product, carefully check the following points.

- If the piston rod slips because the lock's holding force has been exceeded, the brake shoe could be damaged, resulting in a reduced holding force or shortened life.
- The upper limit of the load that is used under the conditions not associated with the kinetic energy when locking, such as drop prevention must be 35% or less of the holding force.
- Do not use the cylinder in the locked state to sustain a load that involves impact.

Stopping Accuracy (Not including tolerance of control system.) (mm)

Locking method	Piston speed (mm/s) 50	100	300	500
Spring locking (Exhaust locking)	±0.4	±0.5	±1.0	±2.0
Pneumatic locking (Pressure locking) Spring and pneumatic locking	±0.2	±0.3	±0.5	±1.5

Condition/load: 25% of thrust force at 0.5 MPa
Solenoid valve: Mounted to the lock port

⚠ Caution

Selection/Recommended Pneumatic Circuit/Caution on Handling

For detailed speceifications of the fine lock cylinder, CLG1 series mentioned above, refer to pages 786 to 789.

Operating Precautions

⚠ Warning

1. **Do not operate the cushion valve in the fully closed or fully opened state.**
   Using it in the fully closed state will cause the cushion seal to be damaged. Using it in the fully opened state will cause the piston rod assembly or the cover to be damaged.
2. **Operate within the specified cylinder speed.**
   Otherwise, cylinder and seal damage may occur.
3. **Carefully check the cushion performance in a low speed range.**
   The performance and effect at around 50 mm/s may vary depending on the individual difference of each product.
4. **If a cylinder is actuated at high speed when mounted with one side fastened and one side free (basic type, flange type, direct mount type), the bending moment may act on the cylinder due to vibration at the stroke end, causing damage to the cylinder. In such cases, install a mounting bracket to suppress vibration of the cylinder body, or reduce piston speed until the cylinder body does not vibrate at the stroke end. Also, use a mounting bracket when moving the cylinder body, or mounting a long stroke cylinder horizontally with one-sided fastening.**

⚠ Caution

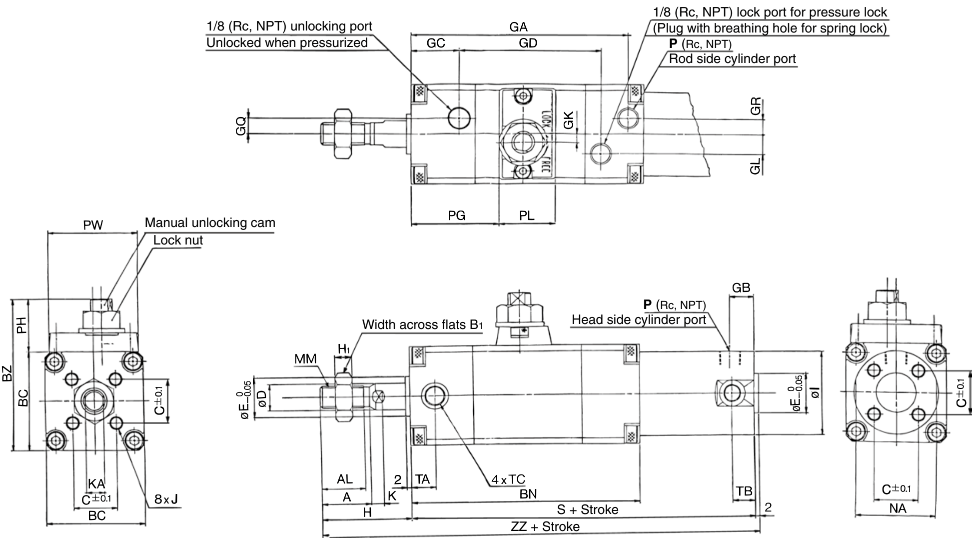
1. **Install a rod boot without twisting.**
   If the cylinder is installed with its bellows twisted, it could damage the bellows.
2. **Tighten clevis bracket mounting bolts with the following proper tightening torque.**
   ø20: 1.5N·m, ø25 to 32: 2.9N·m, ø40: 4.9N·m,
   ø50: 11.8N·m, ø63 to 80: 24.5N·m, ø100: 42.2N·m

Mounting Bracket Part No.

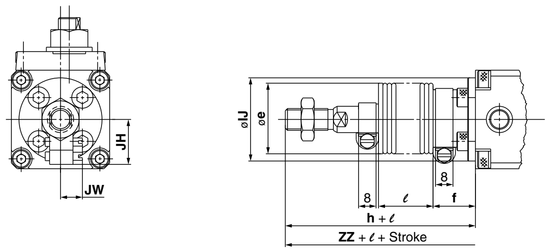
Mounting blacket	Bore size (mm) 20	25	32	40
Axial foot ∗	CNG-L020	CNG-L025	CNG-L032	CNG-L040
Flange	CNG-F020	CNG-F025	CNG-F032	CNG-F040
Trunnion pin	CG-T020	CG-T025	CG-T032	CG-T040
Clevis ∗∗	CG-D020	CG-D025	CG-D032	CG-D040
Rod side pivot bracket	CNG-020-24	CNG-025-24	CNG-032-24	CNG-040-24
Head side pivot bracket	CG-020-24A	CG-025-24A	CG-032-24A	CG-040-24A

∗ When ordering foot bracket, order 2 pieces per cylinder.
∗∗ For the clevis type, clevis pins, retaining rings and mounting bolts are included.
∗∗∗ Mounting bolts are shipped together for the foot and flange types.

Basic Type: CLG1BN



CLG1 With rod boot
(Mounting bracket: Basic type)



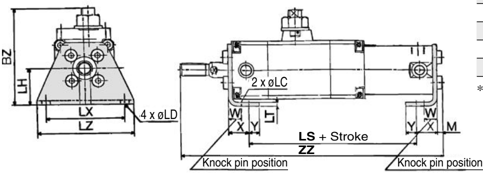
Bore size (mm)	Stroke range	AL	A	B_1	BC	BN	BZ	C	D	E	GA	GB	GC	GD	GK	GL	GQ	GR	I	J	K	KA	MM
20	Up to 200	15.5	18	13	38	91	57.5	14	8	12	84	10	19	54	3.5	5.5	4	4	26	M4 x 0.7 depth 7	5	6	M8 x 1.25
25	Up to 300	19.5	22	17	45	101	69	16.5	10	14	94	10	20	62	4	9	7	7	31	M5 x 0.8 depth 7.5	5	8	M10 x 1.25
32	Up to 300	19.5	22	17	45	102	69	20	12	18	95	10	21	62	4	9	7	7	38	M5 x 0.8 depth 8	5.5	10	M10 x 1.25
40	Up to 300	27	30	19	52	111	76	26	16	25	103	10	23	67	4	11	8	7	47	M6 x 1 depth 12	6	14	M14 x 1.5

Bore size (mm)	Stroke range	H_1	NA	P	PG	PH	PL	PW	S	TA	TB	TC	Without rod boot		With rod boot							
													H	ZZ	IJ	JH (Reference)	JW (Reference)	e	f	h	ℓ	ZZ
20	Up to 200	5	24	1/8	33	19.5	20	38	141	11	11	M5 x 0.8	35	178	27	15.5	10.5	30	18	55	1/4 stroke	198 (206)
25	Up to 300	6	29	1/8	38	24	24	41	151	11	11	M6 x 0.75	40	193	32	16.5	10.5	30	19	62		215 (223)
32	Up to 300	6	35.5	1/8	39	24	24	41	154	11	10	M8 x 1	40	196	38	18.5	10.5	35	19	62		218 (226)
40	Up to 300	8	44	1/8	44	24	24	41	169	12	10	M10 x 1.25	50	221	48	21.5	10.5	35	19	70		241 (250)

∗ For long stroke refer to page 823.
∗∗ The minimum stroke for cylinders with a rod boot is 20 mm.

With Mounting Bracket

Foot type: CLG1LN

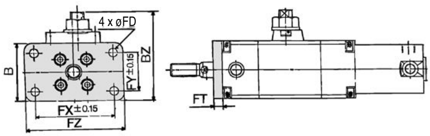


Foot Type

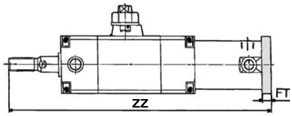
Bore size (mm)	BZ	M	W	X	Y	LC	LD	LH	LS	LT	LX	LZ	Without rod boot ZZ	With rod boot ZZ
20	63.5	3	10	15	7	4	6	25	117	3	50	62	182 + stroke	202 + 1.25 stroke
25	74.5	3.5	10	15	7	4	6	28	127	3	57	70	197.5 + stroke	219.5 + 1.25 stroke
32	74.5	3.5	10	16	8	4	7	28	128	3	60	74	200.5 + stroke	222.5 + 1.25 stroke
40	83	4	10	16.5	8.5	4	7	33	142	3	68	84	226 + stroke	246 + 1.25 stroke

∗ For long stroke, refer to page 823.

Rod side flange type: CLG1FN



Head side flange type: CLG1GN



Rod Side Flange Type

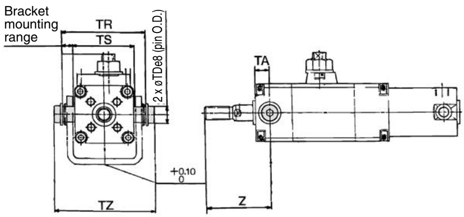
Bore size (mm)	B	BZ	FD	FT	FX	FY	FZ
20	38	57.5	5.5	6	52	25	65
25	45	69	5.5	7	60	30	75
32	45	69	6.6	7	60	30	75
40	52	76	6.6	8	66	36	82

∗ For long stroke, refer to page 823.

Head Side Flange Type

Bore size (mm)	Without rod boot ZZ	With rod boot ZZ
20	182 + stroke	202 + 1.25 stroke
25	198 + stroke	220 + 1.25 stroke
32	201 + stroke	223 + 1.25 stroke
40	227 + stroke	247 + 1.25 stroke

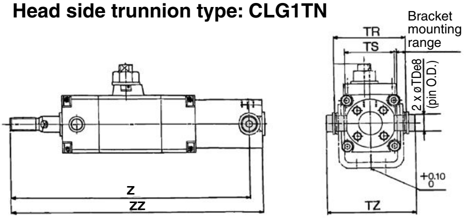
Rod side trunnion type: CLG1UN



Rod Side Trunnion Type

Bore size (mm)	TDe8	TR	TS	TZ	Without rod boot Z	With rod boot Z
20	$8^{-0.025}_{-0.047}$	51	40	59.6	46	66 + 0.25 stroke
25	$10^{-0.025}_{-0.047}$	58	47	68	51	73 + 0.25 stroke
32	$12^{-0.032}_{-0.059}$	62.5	47	75.7	51	73 + 0.25 stroke
40	$14^{-0.032}_{-0.059}$	72.5	54	85.7	62	82 + 0.25 stroke

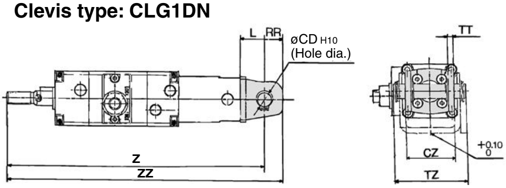
Head side trunnion type: CLG1TN



Head Side Trunnion Type

Bore size (mm)	TDe8	TR	TS	TZ	Without rod boot Z	Without rod boot ZZ	With rod boot Z	With rod boot ZZ
20	$8^{-0.025}_{-0.047}$	39	28	47.6	165 + stroke	178 + stroke	185 + 1.25 stroke	198 + 1.25 stroke
25	$10^{-0.025}_{-0.047}$	43	33	53	180 + stroke	193 + stroke	202 + 1.25 stroke	215 + 1.25 stroke
32	$12^{-0.032}_{-0.059}$	54.5	40	67.7	184 + stroke	196 + stroke	206 + 1.25 stroke	218 + 1.25 stroke
40	$14^{-0.032}_{-0.059}$	65.5	49	78.7	209 + stroke	221 + stroke	229 + 1.25 stroke	241 + 1.25 stroke

Clevis type: CLG1DN



Clevis Type

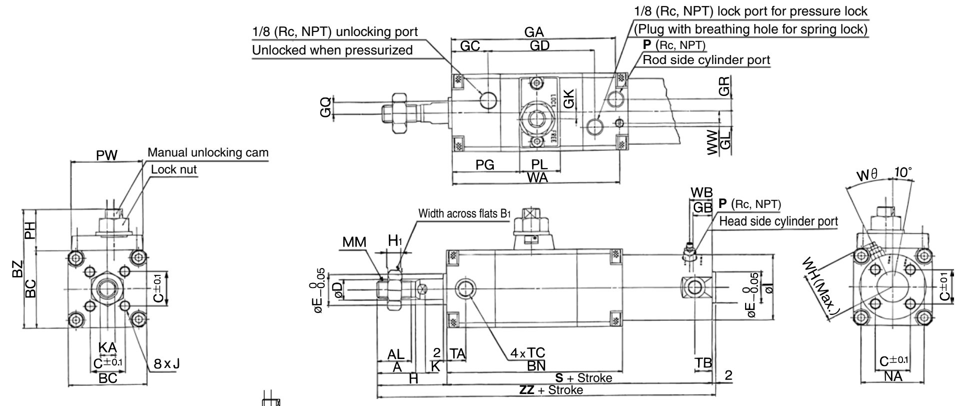
Bore size (mm)	CDH10	CZ	L	RR	TT	TZ
20	$8^{+0.058}_{0}$	29	14	11	3.2	43.4
25	$10^{+0.058}_{0}$	33	16	13	3.2	48
32	$12^{+0.070}_{0}$	40	20	15	4.5	59.4
40	$14^{+0.070}_{0}$	49	22	18	4.5	71.4

∗ Clevis pin and retaining ring are attached.

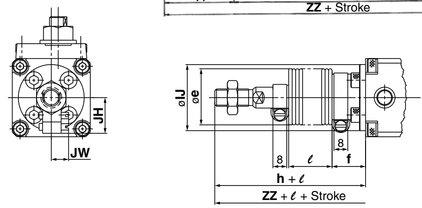
Bore size (mm)	Without rod boot Z	Without rod boot ZZ	With rod boot Z	With rod boot ZZ
20	190 + stroke	201 + stroke	210 + 1.25 stroke	221 + 1.25 stroke
25	207 + stroke	220 + stroke	229 + 1.25 stroke	242 + 1.25 stroke
32	214 + stroke	229 + stroke	236 + 1.25 stroke	251 + 1.25 stroke
40	241 + stroke	259 + stroke	261 + 1.25 stroke	279 + 1.25 stroke

Basic Type with Air Cushion: CLG1BA

∗ Refer to page 822 for mounting bracket, since the dimensions except GA, P, WA, WB, WH, WW, Wθ are the same.



CLG1 With rod boot
(Mounting bracket: Basic type)



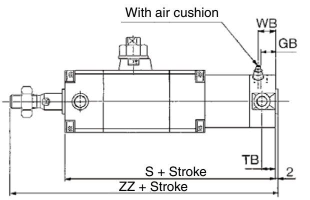
Bore size (mm)	Stroke range	AL	A	B_1	BC	BN	BZ	C	D	E	GA	GB	GC	GD	GK	GL	GQ	GR	I	J	K	KA	MM	NA	H_1
20	Up to 200	15.5	18	13	38	91	57.5	14	8	12	85	10	19	54	3.5	5.5	4	4	26	M4 x 0.7 depth 7	5	6	M8 x 1.25	24	5
25	Up to 300	19.5	22	17	45	101	69	16.5	10	14	95	10	20	62	4	9	7	7	31	M5 x 0.8 depth 7.5	5.5	8	M10 x 1.25	29	6
32	Up to 300	19.5	22	17	45	102	69	20	12	18	95	10	21	62	4	9	7	7	38	M5 x 0.8 depth 8	5.5	10	M10 x 1.25	35.5	6
40	Up to 300	27	30	19	52	111	76	26	16	25	103	10	23	67	4	11	8	7	47	M6 x 1 depth 12	6	14	M14 x 1.5	44	8

Bore size (mm)	Stroke range	P	PG	PH	PL	PW	S	TA	TB	TC	WA	WW	WB	WH	Wθ	Without rod boot		With rod boot							
																H	ZZ	IJ	JH (Reference)	JW (Reference)	e	f	h	ℓ	ZZ
20	Up to 200	M5 x 0.8	33	19.5	20	38	141	11	11	M5 x 0.8	86	5.5	15	23	30°	35	178	27	15.5	10.5	30	18	55	1/4 stroke	198 (206)
25	Up to 300	M5 x 0.8	38	24	24	41	151	11	11	M6 x 0.75	96	6	15	25	30°	40	193	32	16.5	10.5	30	19	62		215 (223)
32	Up to 300	1/8	39	24	24	41	154	11	10	M8 x 1	97	6	15	28.5	25°	40	196	38	18.5	10.5	35	19	62		218 (226)
40	Up to 300	1/8	44	24	24	41	169	12	10	M10 x 1.25	106	8	15	33	20°	50	221	48	21.5	10.5	35	19	70		241 (250)

∗ The minimum stroke for cylinders with a rod boot is 20 mm.

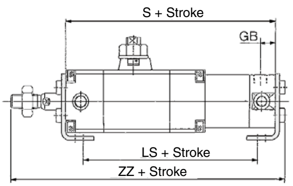
Long Stroke/Refer to pages 821 to 823 for mounting dimensions except the table below.

Basic type



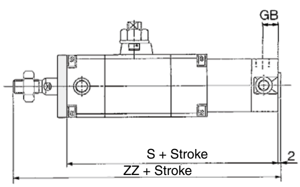
Bore size (mm)	Stroke range	GB	S	Without rod boot ZZ	With rod boot ZZ	TB	WB
20	201 to 350	12	149	186	206	11	16
25	301 to 400	12	159	201	223	11	16
32	301 to 450	12	162	204	226	11	16
40	301 to 800	13	178	230	250	12	16

Foot type



Bore size (mm)	Stroke range	GB	S	LS	Without rod boot ZZ	With rod boot ZZ
20	201 to 350	12	149	125	190	210
25	301 to 400	12	159	135	205.5	227.5
32	301 to 450	12	162	136	208.5	230.5
40	301 to 800	13	178	151	235	255

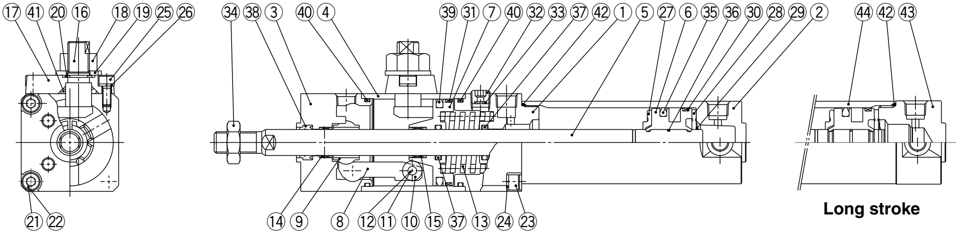
Rod side flange type



Bore size (mm)	Stroke range	GB	S	Without rod boot ZZ	With rod boot ZZ
20	201 to 350	12	149	186	206
25	301 to 400	12	159	201	223
32	301 to 450	12	162	204	226
40	301 to 800	13	178	230	250

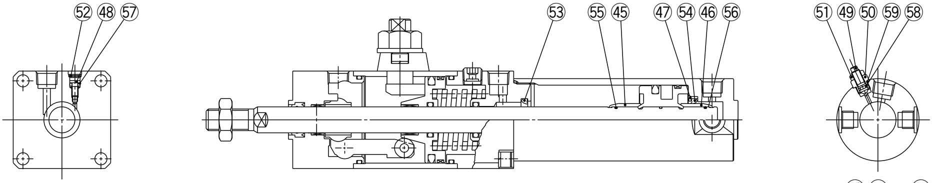
Construction

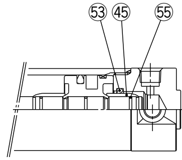
With rubber bumper: CLG1BN



Long stroke

With air cushion: CLG1BA





Long stroke

Component Parts

No.	Description	Material	Note
1	**Rod cover**	Aluminum alloy	Clear hard anodized
2	**Tube cover**	Aluminum alloy	Hard anodized
3	**Cover**	Carbon steel	Nitrided
4	**Intermediate cover**	Aluminum alloy	Clear hard anodized
5	**Piston rod**	Carbon steel	Hard chromated
6	**Piston**	Aluminum alloy	Chromated
7	**Brake piston**	Carbon steel	Nitrided
8	**Brake arm**	Carbon steel	Nitrided
9	**Brake shoe**	Special friction material	
10	**Roller**	Carbon steel	Nitrided
11	**Pin**	Carbon steel	Heat treated
12	**Retaining ring**	Carbon tool steel	
13	**Brake spring**	Spring steel wire	Anti-corrosive treatment: Types C, E only
14	**Bushing**	Bearing alloy	
15	**Bushing**	Bearing alloy	
16	**Manual lock release cam**	Chromium molybdenum steel	Nitrided, nickel plated
17	**Cam guide**	Carbon steel	Nitrided, painted
18	**Lock nut**	Rolled steel	
19	**Flat washer**	Rolled steel	
20	**Retaining ring**	Carbon tool steel	
21	**Hexagon socket head cap screw**	Chromium molybdenum steel	
22	**Spring washer**	Steel wire	
23	**Hexagon socket head cap screw**	Chromium molybdenum steel	
24	**Spring washer**	Steel wire	
25	**Hexagon socket head cap screw**	Chromium molybdenum steel	
26	**Spring washer**	Steel wire	
27	**Bumper A**	Urethane	
28	**Bumper B**	Urethane	
29	**Retaining ring**	Stainless steel	
30	**Wear ring**	Resin	
31	**Wear ring**	Resin	
32	**Hexagon socket head plug**	Carbon steel	Type E only
33	**Element**	Bronze	Type E only
34	**Rod end nut**	Rolled steel	
35	**Piston seal**	NBR	
36	**Piston gasket**	NBR	
37	**Rod seal A**	NBR	
38	**Rod seal B**	NBR	
39	**Brake piston seal**	NBR	
40	**Intermediate cover gasket**	NBR	
41	**Cam gasket**	NBR	
42	**Cylinder tube gasket**	NBR	
43	**Head cover**	Aluminum alloy	Clear hard anodized
44	**Cylinder tube**	Aluminum alloy	Hard anodized
45	**Cushion ring A**	Aluminum alloy	Anodized
46	**Cushion ring B**	Aluminum alloy	Anodized
47	**Seal retaining**	Rolled steel	Zinc chromated
48	**Cushion valve A**	Chromium molybdenum steel	Electroless nickel plated
49	**Cushion valve B**	Rolled steel	Electroless nickel plated
50	**Valve retaining**	Rolled steel	Electroless nickel plated
51	**Lock nut**	Rolled steel	Electroless nickel plated
52	**Retaining ring**	Stainless steel	
53	**Cushion seal A**	Urethane	
54	**Cushion seal B**	Urethane	
55	**Cushion ring gasket A**	NBR	
56	**Cushion ring gasket B**	NBR	
57	**Valve seal A**	NBR	
58	**Valve seal B**	NBR	
59	**Valve retaining gasket**	NBR	

Replacement Parts: Seal Kit

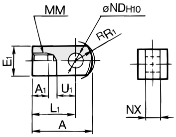
Bore size (mm)	Kit no.	Contents
20	CG1N20-PS	Set of nos. above 35, 38, 42
25	CG1N25-PS	
32	CG1N32-PS	
40	CG1N40-PS	

∗ Since the lock section for CLG1 series is normally replaced as a unit, kits are for the cylinder section only. These can be ordered using the order number for each bore size.
∗ Seal kit includes a grease pack (10 g).
Order with the following part number when only the grease pack is needed.
Grease pack part no.: GR-S-010 (10 g)

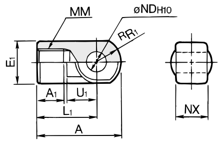
CLG1 Series
Accessory Bracket Dimensions

Single Knuckle Joint

I-G02/G03
Material: Rolled steel



I-G04
Material: Cast iron

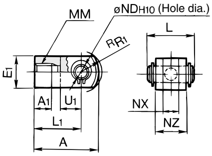


Part no.	Applicable bore size (mm)	A	A_1	E_1	L_1	MM	$^RR_1$	U_1	ND_{H10}	NX
I-G02	20	34	8.5	□16	25	M8 x 1.25	10.3	11.5	$8^{+0.058}_{0}$	$8^{-0.2}_{-0.4}$
I-G03	25, 32	41	10.5	□20	30	M10 x 1.25	12.8	14	$10^{+0.058}_{0}$	$10^{-0.2}_{-0.4}$
I-G04	40	42	14	ø22	30	M14 x 1.5	12	14	$10^{+0.058}_{0}$	$18^{-0.3}_{-0.5}$

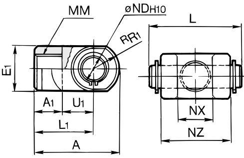
Double Knuckle Joint

∗ Knuckle pin and retaining ring are packaged.

Y-G02/G03
Material: Rolled steel



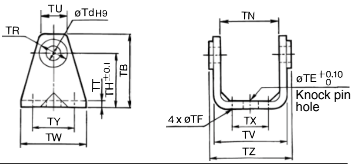
Y-G04
Material: Cast iron



Part no.	Applicable bore size (mm)	A	A_1	E_1	L_1	MM	$^RR_1$	U_1	ND_{H10}	NX	NZ	L	Applicable pin part no.
Y-G02	20	34	8.5	□16	25	M8 x 1.25	10.3	11.5	$8^{+0.058}_{0}$	$8^{+0.4}_{+0.2}$	16	21	IY-G02
Y-G03	25, 32	41	10.5	□20	30	M10 x 1.25	12.8	14	$10^{+0.058}_{0}$	$10^{+0.4}_{+0.2}$	20	25.6	IY-G03
Y-G04	40	42	16	ø22	30	M14 x 1.5	12	14	$10^{+0.058}_{0}$	$18^{+0.5}_{+0.3}$	36	41.6	IY-G04

Rod Side Pivot Bracket

ø20 to ø40
Material:
Rolled steel

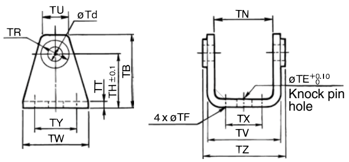


Part no.	Applicable bore size (mm)	TB	Td_{H9}	TE	TF	TH	TN
CNG-020-24	20	42	$8^{+0.036}_{0}$	10	5.5	31	40
CNG-025-24	25	48	$10^{+0.036}_{0}$	10	5.5	37	47
CNG-032-24	32	53	$12^{+0.043}_{0}$	10	6.6	38.5	47
CNG-040-24	40	60	$14^{+0.043}_{0}$	10	6.6	42.5	55

Part no.	Applicable bore size (mm)	TR	TT	TU	TV	TW	TX	TY	TZ
CNG-020-24	20	13	3.2	21.2	47.8	42	26	28	50
CNG-025-24	25	15	3.2	21.3	54.8	42	28	28	57
CNG-032-24	32	17	4.5	25.6	57.4	48	28	28	61.4
CNG-040-24	40	21	4.5	26.3	65.4	56	36	30	71.4

Head Side Pivot Bracket

ø20 to ø40
Material:
Rolled steel

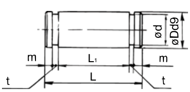


Part no.	Applicable bore size (mm)	TB	Td	TE	TF	TH	TN
CG-020-24A	20	36	8	10	5.5	25	(29.3)
CG-025-24A	25	43	10	10	5.5	30	(33.1)
CG-032-24A	32	50	12	10	6.6	35	(40.4)
CG-040-24A	40	58	14	10	6.6	40	(49.2)

Part no.	Applicable bore size (mm)	TR	TT	TU	TV	TW	TX	TY	TZ
CG-020-24A	20	13	3.2	18.1	35.8	42	16	28	38.3
CG-025-24A	25	15	3.2	20.7	39.8	42	20	28	42.1
CG-032-24A	32	17	4.5	23.6	49.4	48	22	28	53.8
CG-040-24A	40	21	4.5	27.3	58.4	56	30	30	64.6

Knuckle Pin

Material: Carbon steel

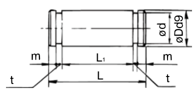


Part no.	Applicable bore size (mm)	Dd9	L	d	L_1	m	t	Applicable retaining ring
IY-G02	20	$8^{-0.040}_{-0.076}$	21	7.6	16.2	1.5	0.9	Type C 8 for axis
IY-G03	25, 32	$10^{-0.040}_{-0.076}$	25.6	9.6	20.2	1.55	1.15	Type C 10 for axis
IY-G04	40	$10^{-0.040}_{-0.076}$	41.6	9.6	36.2	1.55	1.15	Type C 10 for axis

∗ Retaining rings are included.

Clevis Pin

Material: Carbon steel

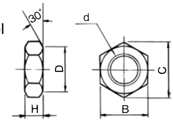


Part no.	Applicable bore size (mm)	Dd9	L	d	L_1	m	t	Applicable retaining ring
CD-G02	20	$8^{-0.040}_{-0.076}$	43.4	7.6	38.6	1.5	0.9	Type C 8 for axis
CD-G25	25	$10^{-0.040}_{-0.076}$	48	9.6	42.6	1.55	1.15	Type C 10 for axis
CD-G03	32	$12^{-0.050}_{-0.093}$	59.4	11.5	54	1.55	1.15	Type C 12 for axis
CD-G04	40	$14^{-0.050}_{-0.093}$	71.4	13.4	65	2.05	1.15	Type C 14 for axis

∗ Retaining rings are included.

Rod End Nut

Material:
Carbon steel

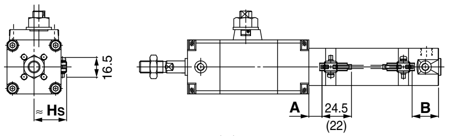


Part no.	Applicable bore size (mm)	B	C	D	d	H
NT-02	20	13	15.0	12.5	M8 x 1.25	5
NT-03	25, 32	17	19.6	16.5	M10 x 1.25	6
NT-G04	40	19	21.9	18	M14 x 1.5	8

CLG1 Series
Auto Switch Mounting 1

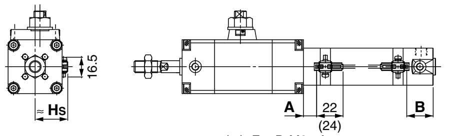
Auto Switch Proper Mounting Position (Detection at Stroke End) and Its Mounting Height

Reed auto switch
D-A9□



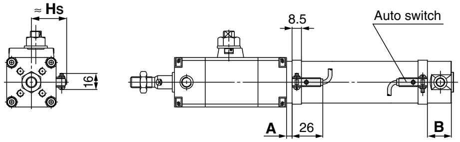
( ): For D-A96

Solid state auto switch
D-M9□
D-M9□A
D-M9□W

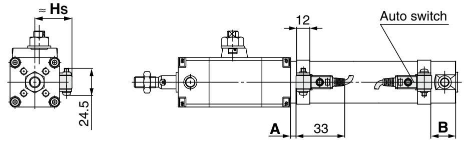


( ): For D-M9□A

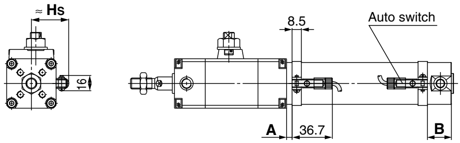
D-C7/C8



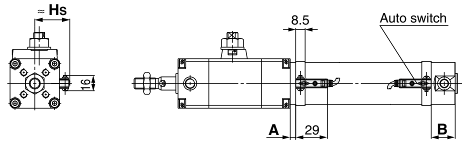
D-G5NT



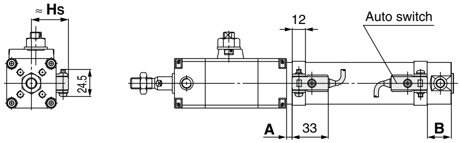
D-C73C/C80C



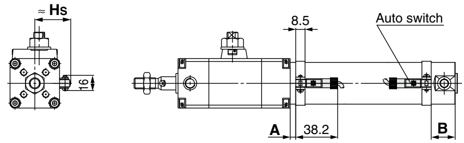
D-H7□/H7□W
D-H7NF/H7BA



D-B5/B6/B59W



D-H7C



Auto Switch Proper Mounting Position

(mm)

Auto switch model / Bore size (mm)	D-M9□(V) D-M9□W(V) D-M9□A(V)		D-A9□(V)		D-C7/C8 D-C73C D-C80C		D-B5 D-B6		D-B59W		D-H7□ D-H7C D-H7□W D-H7BA D-H7NF		D-G5□W D-K59W D-G59F D-G5 D-K5 D-G5NT D-G5BA	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
20	10.5	27 (35)	6.5	23 (31)	7	23.5 (31.5)	1	17.5 (25.5)	4	20.5 (28.5)	6	22.5 (30.5)	2.5	19 (27)
25	10.5	27 (35)	6.5	23 (31)	7	23.5 (31.5)	1	17.5 (25.5)	4	20.5 (28.5)	6	22.5 (30.5)	2.5	19 (27)
32	10.5	29 (37)	6.5	25 (33)	7	25.5 (33.5)	1	19.5 (27.5)	4	22.5 (30.5)	6	24.5 (32.5)	2.5	21 (29)
40	13.5	32 (41)	9.5	28 (37)	10	28.5 (37.5)	4	22.5 (31.5)	7	25.5 (34.5)	9	27.5 (36.5)	5.5	24 (33)

Auto Switch Mounting Height

(mm)

Auto switch model / Bore size (mm)	D-M9□(V) D-M9□W(V) D-M9□A(V) D-A9□(V)	D-C7/C8 D-H7□ D-H7□W D-H7NF D-H7BA	D-C73C D-C80C	D-B5/B6 D-B59W D-G5/K5 D-G5□W D-K59W D-G5NT D-G59F D-H7C D-G5BA
	Hs	Hs	Hs	Hs
20	25	24.5	27	27.5
25	27.5	27	29.5	30
32	31	30.5	33	33.5
40	35.5	35	37.5	38

∗ ( ): Values for long strokes
Note) Adjust the auto switch after confirming the operating conditions in the actual setting.

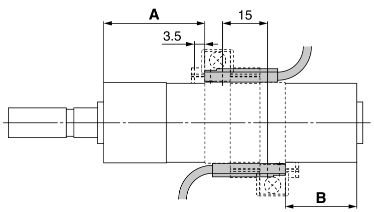
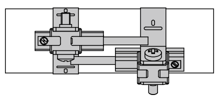
Minimum Auto Switch Mounting Stroke

n: No. of auto switches (mm)

Auto switch model	No. of auto switches mounted				
	1	2		n	
		Different surfaces	Same surface	Different surfaces	Same surface
D-M9□	5	15 Note 1)	40 Note 1)	$20 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	55 + 35 (n – 2) (n = 2, 3, 4, 5···)
D-M9□W	10	15 Note 1)	40 Note 1)	$20 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	55 + 35 (n – 2) (n = 2, 3, 4, 5···)
D-M9□A	10	25	40 Note 1)	$25 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	60 + 35 (n – 2) (n = 2, 3, 4, 5···)
D-A9□	5	15	30 Note 1)	$15 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	50 + 35 (n – 2) (n = 2, 3, 4, 5···)
D-M9□V	5	20	35	$20 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	35 + 35 (n – 2) (n = 2, 3, 4, 5···)
D-A9□V	5	15	25	$15 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	25 + 35 (n – 2) (n = 2, 3, 4, 5···)
D-M9□WV **D-M9□AV**	10	20	35	$20 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	35 + 35 (n – 2) (n = 2, 3, 4, 5···)
D-C7□ **D-C80**	5	20	60	$20 + 45\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	60 + 45 (n – 2) (n = 2, 3, 4, 5···)
D-H7□ **D-H7□W** **D-H7BA** **D-H7NF**	10	25	70	$25 + 45\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	70 + 45 (n – 2) (n = 2, 3, 4, 5···)
D-C73C **D-C80C** **D-H7C**	5	30	80	$30 + 50\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	80 + 50 (n – 2) (n = 2, 3, 4, 5···)
D-B5□ **D-B64** **D-G5□** **D-K59□**	5	25	70	$25 + 50\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	70 + 50 (n – 2) (n = 2, 3, 4, 5···)
D-B59W	10	30	75	$30 + 50\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	75 + 50 (n – 2) (n = 2, 3, 4, 5···)

Note 3) When “n” is an odd number, an even number that is one larger than this odd number is used for the calculation.

Note 1) Auto switch mounting

Auto switch model	With 2 auto switches	
	Different surfaces	Same surface
	 The proper auto switch mounting position is 3.5 mm inward from the switchholder edge.	 The auto switch is mounted by slightly displacing it in a direction (cylinder tubecircumferential exterior) so that the auto switch and lead wire do not interfere witheach other.
D-M9□ **D-M9□W**	Less than 20 stroke Note2)	Less than 55 stroke Note2)
D-M9□A	Less than 20 stroke Note2)	Less than 60 stroke Note2)
D-A9□	—	Less than 50 stroke Note2)

Note 2) Minimum stroke for mounting auto switches in the other mounting types mentioned in note 1.

Auto Switch Mounting 2

Operating range

(mm)

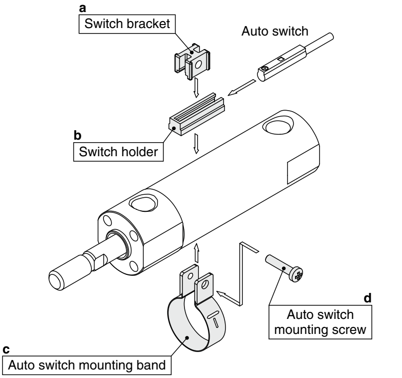
Auto switch model	Bore size (mm)			
	20	25	32	40
D-A9□	7	6	8	8
D-M9□ D-M9□W	4.5	5	4.5	5.5
D-C7□/C-80 D-C73C/C-80C	8	10	9	10
D-B5□/B64	8	10	9	10
D-B59W	13	13	14	14
D-H7□/H7□W D-H7BA/H7NF	4	4	4.5	5
D-H7C	7	8.5	9	10
D-G5NT	4	4	4.5	5
D-G5NB	35	40	40	45

∗ Since the operating range is provided as a guideline including hysteresis, it cannot be guaranteed (assuming approximately ±30% dispersion).
It may vary substantially depending on an ambient environment.

Auto Switch Mounting Bracket: Part No.

Auto switch model	Bore size (mm)			
	20	25	32	40
D-M9□(V) D-M9□W(V) D-A9□(V)	Note 1) BMA3-020	Note 1) BMA3-025	Note 1) BMA3-032	Note 1) BMA3-040
D-M9□A(V)	Note 2) BMA3-020S	Note 2) BMA3-025S	Note 2) BMA3-032S	Note 2) BMA3-040S
D-C7□/C80 D-C73C/C80C D-H7□ D-H7□W D-H7NF D-H7BA	BMA2-020A	BMA2-025A	BMA2-032A	BMA2-040A
D-B5□/B64 D-B59W D-G5□/K59 D-G5□W/K59W D-G5BA/G59F D-G5NT D-G5NB	BA-01	BA-02	BA-32	BA-04

Note 1) Set part number which includes the auto switch mounting band (BMA2-□□□A) and the holder kit (BJ5-1/Switch bracket: Transparent).
Since the switch bracket (made from nylon) are affected in an environment where alcohol, chloroform, methylamines, hydrochloric acid or sulfuric acid is splashed over, so it cannot be used. Please consult SMC regarding other chemicals.
Note 2) Set part number which includes the auto switch mounting band (BMA2-□□□AS/ Stainless steel screw) and the holder kit (BJ4-1/Switch bracket: White).
Note 3) For the D-M9□A (V) type auto switch, do not install the switch bracket on the indicator light.



(1) BJ□-1 is a set of “a” and “b”.
BJ4-1 (Switch bracket: White)
BJ5-1 (Switch bracket: Transparent)
(2) BMA2-□□□A(S) is a set of “c” and “d”.
Band (c) is mounted so that the projected part is on the internal side (contact side with the tube).

[Mounting screw set made of stainless steel]

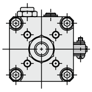
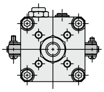
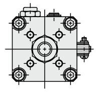
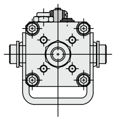
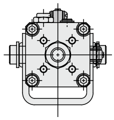
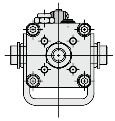
The following set of mounting screws made of stainless steel is available. Use it inaccordance with the operating environment. (Please order the auto switch mounting bracket separately, since it is not included.)

BBA3: For D-B5/B6/G5/K5 types
BBA4: For D-C7/C80/H7 types

Note 4) Refer to page 1225 for the details of BBA3.
D-H7BA/G5BA auto switches are set on the cylinder with the stainless steel screws above when shipped. When an auto switch is shipped independently, BBA3 or BBA4 is attached.

Cylinder Bracket/Stroke: Auto Switch Mounting Surface

st: Stroke (mm)

Mounting bracket	Basic, Foot, Flange, Clevis			Trunnion		
No. of auto switches	1 (Rod cover side)	2 (Different surfaces)	2 (Same surface)	1 (Rod cover side)	2 (Different surfaces)	2 (Same surface)
Switch mounting surface / Switch model	Port side 	Port side 	Port side 			
D-A9□ D-M9□ D-M9□W	10 st or more	15 to 44 st	45 st or more	10 st or more	15 to 44 st	45 st or more
D-C7□/C80	10 st or more	15 to 49 st	50 st or more	10 st or more	15 to 49 st	50 st or more
D-H7□/H7□W D-H7BA/H7NF	10 st or more	15 to 59 st	60 st or more	10 st or more	15 to 59 st	60 st or more
D-C73C/C80C/H7C	10 st or more	15 to 64 st	65 st or more	10 st or more	15 to 64 st	65 st or more
D-B5□/B64/G5NT	10 st or more	15 to 74 st	75 st or more	10 st or more	15 to 74 st	75 st or more
D-B59W	15 st or more	20 to 74 st	75 st or more	15 st or more	20 to 74 st	75 st or more

Besides the models listed in How to Order, the following auto switches are applicable.
Refer to pages 1119 to 1245 for the detailed specifications.

Auto switch type	Part no.	Electrical entry (Fetching direction)	Features	Applicable bore size
Reed	D-B53, C73, C76	Grommet (In-line)	—	ø20 to ø40
	D-C80		Without indicator light	
Solid state	D-H7A1, H7A2, H7B		—	
	D-H7NW, H7PW, H7BW		Diagnostic indication (2-color indicator)	
	D-G5NT		With timer	

∗ For solid state auto switches, auto switches with a pre-wired connector are also available. Refer to pages 1192 and 1193 for details.
∗ Normally closed (NC = b contact) solid state auto switches (D-F9G/F9H types) are also available. Refer to page 1137 for details.
∗ Wide range detection type, solid state auto switches (D-G5NB type) are also available.Refer to page 1182 for details.

Lock-up Cylinder
Double Acting, Single Rod
CL1 Series
ø40, ø50, ø63, ø80, ø100, ø125, ø140, ø160

The **CL1** series lock-up cylinder is a self-locking type that contains a ring that is tilted by a spring force, which is further tilted by the load that is applied to the cylinder, thus locking the piston rod. This cylinder is suitable for intermediate stops, emergency stops, or for drop prevention.

How to Order

CL1 L ☐ 100 ☐ – 200 F – JN – ☐

With auto switch **CDL1 L ☐ 100 ☐ – 200 F – JN – M9BW ☐ – ☐**

With auto switch (Built-in magnet)

Mounting type

B	Basic type	**C**	Single clevis type
L	Foot type	**D**	Double clevis type
F	Rod side flange type	**T**	Center trunnion type
G	Head side flange type		

Tubing material

Symbol	Bore size	Without magnet Tubing material	Built-in magnet Tubing material
Nil	40 to 100	Aluminum tube	Aluminum tube
Nil	125,140	Aluminum tube (1000st or less)	Aluminum tube
Nil	125,140	Steel tube (1001st or more)	Aluminum tube
Nil	160	Aluminum tube (1200st or less)	Aluminum tube
Nil	160	Steel tube (1201st or more)	Aluminum tube
F *1	40 to 160	Steel tube	

*1 Auto switches are not available with steel tube.

Cylinder tube I.D.

Symbol	Bore size	Symbol	Bore size	Symbol	Bore size
40	40 mm	**80**	80 mm	**140**	140 mm
50	50 mm	**100**	100 mm	**160**	160 mm
63	63 mm	**125**	125 mm		

Port thread type

Nil	Rc
TN	NPT
TF	G

Cylinder stroke (mm)
For details, refer to page 831.

Auto switch

Nil	Without auto switch

* For the applicable auto switch model, refer to the table below.

Number of auto switches

Nil	2 pcs.
S	1 pc.
n	"n" pcs.

With rod boot/cushion

Rod boot	**Nil**	Without rod boot
Rod boot	**J**	Nylon tarpaulin
Rod boot	**K**	Heat resistant tarpaulin
Cushion	**N**	Without cushion
Cushion	**R**	With rod cushion
Cushion	**H**	With head cushion
Cushion	**Nil**	With cushion on both ends

* Indicate alphabetically when 2 or more symbols are applicable.

Made to Order
Refer to page 831 for details.

Locked-up direction

F	Piston extension locking
B	Piston retraction locking

* For both sides lock, refer to Made to Order "-X51".

Built-in Magnet Cylinder Model

If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch.
(Example) CDL1L40-100F

Applicable Auto Switches/Refer to pages 1119 to 1245 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage DC		Load voltage AC	Auto switch model Tie-rod mounting ø40 to ø100	Tie-rod mounting ø125 to ø160	Band mounting ø40 to ø100	Band mounting ø125 to ø160	Lead wire length (m) 0.5 (Nil)	1 (M)	3 (L)	5 (Z)	Pre-wired connector	Applicable load	
Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V,12 V	—	M9N		—		●	●	●	○	○	IC circuit	Relay, PLC
								—		G59***	—	●	—	●	○	○		
				3-wire (PNP)				M9P		—		●	●	●	○	○		
								—		G5P***	—	●	—	●	○	○		
				2-wire		12 V		M9B		—		●	●	●	○	○	—	
								—		K59***	—	●	—	●	○	○		
					—	—	100 V, 200 V	J51		—		●	—	●	○	—		
		Terminal connector		3-wire (NPN)	24 V	12 V	—	G39C	—	G39		—	—	—	—	—		
				2-wire				K39C	—	K39		—	—	—	—	—	IC circuit	
	Diagnostic indication (2-color indicator)	Grommet		3-wire (NPN)		5 V,12 V		M9NW		—		●	●	●	○	○		
								—		K59***	—	●	—	●	○	○		
				3-wire (PNP)				M9PW		—		●	●	●	○	○		
								—		G5PW***	—	●	—	●	○	○		
				2-wire		12 V		M9BW		—		●	●	●	○	○	—	
								—		K59W***	—	●	—	●	○	○		
	Water resistant (2-color indicator)			3-wire (NPN)		5 V, 12 V		M9NA*1		—		○	○	●	○	○		
				3-wire (PNP)				M9PA*1		—		○	○	●	○	○		
				2-wire		12 V		M9BA*1		—		○	○	●	○	○		
								—		G5BA***	—	—	—	●	○	○		
	With diagnostic output (2-color indicator)			4-wire (NPN)		5 V, 12 V		F59F		G59F***	—	●	—	●	○	○	IC circuit	
	Magnetic field resistant (2-color indicator)			2-wire (Non-polar)		—		P4DW***	—	—		—	—	●	●	○	—	
Reed auto switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	A96**		—	—	●	—	●	—	—	IC circuit	—
				2-wire	24 V	12 V	100 V	A93**		—	—	●	●	●	●	—	—	Relay, PLC
			No				100 V or less	A90**		—	—	●	—	●	—	—	IC circuit	
			Yes				100 V, 200 V	A54		B54***	—	●	—	●	●	—	—	
			No				200 V or less	A64		B64***	—	●	—	●	—	—		
		Terminal connector	Yes				—	A33C***	—	A33		—	—	—	—	—		PLC
							100 V, 200 V	A34C***	—	A34		—	—	—	—	—		Relay, PLC
		DIN terminal						A44C***	—	A44		—	—	—	—	—		
	Diagnostic indication (2-color indicator)	Grommet				—	—	A59W		B59W***	—	●	—	●	—	—		

*1 Water resistant type auto switches can be mounted on the above models, but in such case SMC cannot guarantee water resistance.
Consult with SMC regarding water resistant types with the above model numbers.

* Lead wire length symbols: 0.5 m ·······Nil (Example) M9NW
1 m ·······M (Example) M9NWM
3 m ······· L (Example) M9NWL
5 m ······· Z (Example) M9NWZ

* Solid state auto switches marked with "○" are produced upon receipt of order.
** D-A9☐/A9☐V cannot be mounted on ø50.
*** The following auto switches cannot be mounted on ø125 to ø160.
D-G39C, K39C, A3☐C, A44C, G5☐, K59, G5☐W, K59W, G5BA, G59F, G5NT, B5☐, B64, B59W, P4DW.

* Since there are other applicable auto switches than listed, refer to page 850 for details.
* For details about auto switches with pre-wired connector, refer to pages 1192 and 1193.
* D-A9☐/M9☐/M9☐W/M9☐A auto switches are shipped together (not assembled). (Only auto switch mounting brackets for the models listed above are assembled at the time of shipment.)

Made to Order: Individual Specifications
(For details, refer to page 851.)

Symbol	Specifications
-X51	Both-directions lock-up cylinder

Made to Order Specifications
(For details, refer to pages 1247 to 1440.)

Symbol	Specifications
-XA□	Change of rod end shape
-XC3	Special port location
-XC14	Change of trunnion bracket mounting position (ø40 to 100 only)

Lock-up Unit Specifications

Lock operation	Spring lock
Lock-up release pressure	0.2 MPa or more (at no load)
Lock-up start pressure	0.05 MPa or less
Lock-up direction	One direction (Lock direction can be changed.)

Stopping Accuracy
(Not including tolerance of control system)

Piston speed	Bore size (mm)	
	40 to 100	**125 to 160**
50 mm/s	± 0.6 mm	± 1 mm
100 mm/s	± 1.2 mm	± 2 mm
200 mm/s	± 2.3 mm	± 3 mm

Lock-up Unit Model

Applicable bore size (mm)	40	50	63	80	100
Lock-up unit part no.	CL-40	CL-50	CL-63	CL-80	CL-100

Refer to pages 844 to 850 for cylinders with auto switches.

- Minimum auto switch mounting stroke
- Proper auto switch mounting position (detection at stroke end) and mounting height
- Operating range
- Switch mounting bracket: Part no.

Specifications

Bore size (mm)	**ø40 to ø100**	**ø125 to ø160**
Proof pressure	1.5 MPa	1.57 MPa
Maximum operating pressure	1.0 MPa	0.97 MPa
Minimum operating pressure	0.08 MPa	
Piston speed	50 to 200 mm/s*	
Ambient and fluid temperature	Without auto switch –10 to 70°C With auto switch –10 to 60°C (No freezing)	Without auto switch 0 to 70°C With auto switch 0 to 60°C (No freezing)
Lubrication	Not required (Non-lube)	
Cushion	Air cushion	
Stroke length tolerance	Up to 250$^{+1.0}_{0}$, 251 to 1000$^{+1.4}_{0}$, 1001 to 1500$^{+1.8}_{0}$, 1501 to 1600$^{+2.2}_{0}$	
Mounting	Basic type , Axial foot type, Rod side flange type Head side flange type, Single clevis type Double clevis type, Center trunnion type	

* Make sure to operate the cylinder in such a way that the piston speed does not exceed 200 mm/s during locking.
* The maximum speed of 500 mm/s can be accommodated if the piston is to be locked in the stationary state for the purpose of drop prevention.

Max. Load and Lock Holding Force (Max. static load)

Bore size (mm)		40	50	63	80	100	125	140	160
Max. load (N)	Horizontal Mounting	588	981	1470	2450	3820	6010	7540	9850
	Vertical Mounting	294	490	735	1230	1910	3000	3770	4920
Holding force (Max. static load) (N)*		1230	1920	3060	4930	7700	12100	15100	19700

* The holding force (max. static load) indicates the maximum capability to hold a static load without loads, vibration or impact. This does not indicate a load that can be held in ordinary conditions. The maximum load is limited depending on the mounting orientation.
Refer to the CL series Specific Product Precautions 1 on page 786 for selecting cylinders.

Cylinder Stroke (ø40 to ø100) /

Refer to the minimum auto switch mounting stroke (pages 844 and 846) for those with an auto switch.

Bore size (mm)	Standard stroke (mm)	Long stroke (L, F only)
40	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500	800
50, 63	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600	1200
80, 100	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700	ø80: 1400, ø100: 1500

Note 1) Strokes other than listed above are produced upon receipt of order. Spacers are not used for intermediate strokes.
Note 2) Long strokes are applicable for the axial foot and rod side flange types. If other mounting brackets are used or the length exceeds the long stroke limit, the maximum stroke should be determined based on the stroke selection table (technical data).

Cylinder Stroke (ø125 to ø160)

Unit: mm

Tube material	Aluminum alloy	Carbon steel piping	
Bore size (mm)	Basic type, Head side flange type, Single clevis type, Double clevis type, Center trunnion type, Foot type, Rod side flange type	Basic type, Head side flange type, Single clevis type, Double clevis type, Center trunnion type,	Foot type, Rod side flange type
125, 140	Up to 1000	Up to 1000	Up to 1600
160	Up to 1200	Up to 1200	Up to 1600

Cylinder Stroke/
Cylinder with Auto Switch (Built-in magnet)

Refer to the minimum auto switch mounting stroke (pages 844 and 846) for those with an auto switch.

Unit: mm

Bore size (mm)	Basic type, Head side flange type, Single clevis type, Double clevis type, Center trunnion type,	Foot type, Rod side flange type
125, 140	Up to 1000	Up to 1400
160	Up to 1200	Up to 1400

CLJ2
CLM2
CLG1
CL1
MLGC
CNG
MNB
CNA2
CNS
CLS
CLQ
RLQ
MLU
MLGP
ML1C
D-□
-X□

Accessory

Mounting		Basic type	Foot type	Rod side flange type	Head side flange type	Single clevis type	Double clevis type	Center trunnion type
Standard products	Rod end nut *	●	●	●	●	●	●	●
	Clevis pin	—	—	—	—	—	●	—
Option	Single knuckle joint	●	●	●	●	●	●	●
	Double knuckle joint (with pin)	●	●	●	●	●	●	●
	Rod boot	●	●	●	●	●	●	●

* ø125 to ø160: Option

Rod Boot Material

Symbol	Rod boot material	Max. ambient temperature
J	Nylon tarpaulin	70°C
K	Heat resistant tarpaulin	110°C*

* Maximum ambient temperature for the rod boot itself.

Weight

(kg)

Tubing Material		Aluminum tube							
Bore size (mm)		**40**	**50**	**63**	**80**	**100**	**125**	**140**	**160**
Locked-up unit mass		0.76	1.23	2.05	3.04	4.40	16.93	21.46	32.31
Basic weight	Basic type	1.66	2.55	4.12	6.56	9.49	30.88	38.25	55.72
	Foot type	1.83	2.75	4.42	7.36	10.43	32.21	40.83	59.09
	Rod side flange type	2.06	3.15	5.08	8.40	11.81	33.65	43.28	60.95
	Head side flange type	2.09	3.29	5.16	8.51	12.06	34.35	44.32	62.98
	Single clevis type	1.93	3.00	4.88	7.94	11.80	36.02	45.46	65.45
	Double clevis type	1.92	2.98	4.90	7.94	11.82	35.83	45.17	64.28
	Trunnion type	2.26	3.30	5.47	8.90	13.02	35.77	46.09	63.86
Additional weight per each 100 mm of stroke		0.44	0.56	0.74	1.04	1.30	1.77	1.90	2.39
Accessory bracket	Single knuckle	0.23	0.26	0.26	0.66	0.83	0.91	1.16	1.56
	Double knuckle (with pin)	0.37	0.43	0.43	0.87	1.27	1.37	1.81	2.48

Calculation: (Example) **CL1L125-500F**
- Basic weight ··········· 32.21 (ø125, Foot type)
- Additional weight ···· 1.77/100 st
  32.21 + 1.77/100 x 500 = 41.06 kg

* Add the lock-up unit weight for ø40 to ø100 and ø125 to ø160 steel tubes to the cylinder unit weight of CA2 and CS1 series listed in Best Pneumatics No. 2-1.

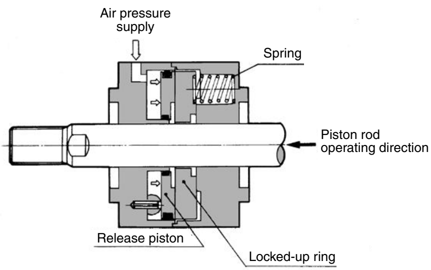
Mounting Bracket Part No.

Bore size (mm)		**40**	**50**	**63**	**80**	**100**	**125**	**140**	**160**
Foot type *	Rod side	CA-L04	CA-L05	CA-L06	CA-L08	CA-L10	CS1-L12	CS1-L14	CS1-L16
	Head side	CA1-L04	CA1-L05	CA1-L06	CA1-L08	CA1-L10			
Rod side flange type **		CA-F04	CA-F05	CA-F06	CA-F08	CA-F10	CS1-FL12	CS1-FL14	CS1-FL16
Head side flange type		CA1-F04	CA1-F05	CA1-F06	CA1-F08	CA1-F10	CS1-F12	CS1-F14	CS1-F16
Single clevis		CA1-C04	CA1-C05	CA1-C06	CA1-C08	CA1-C10	CS1-C12	CS1-C14	CS1-C16
Double clevis ***		CA1-D04	CA1-D05	CA1-D06	CA1-D08	CA1-D10	CS1-D12	CS1-D14	CS1-D16

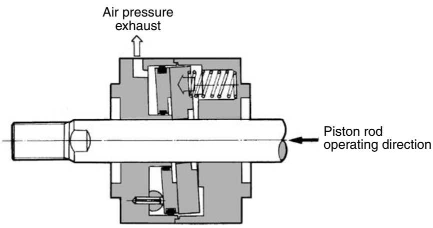
* When ordering foot bracket for 1 cylinder, order 1 foot bracket each for the rod side and the head side for ø40 to ø100 and 2 foot brackets for ø125 to ø160.
** The ø125 to ø160 rod side flange types use the long stroke flanges of the CS1 series.
*** Clevis pin, plain washer and cotter pin are shipped together with double clevis type.

Construction Principle

Unlocked state



Locked-up state

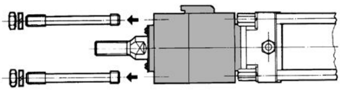


⚠ Caution
Caution on Changing the Lock-up Direction

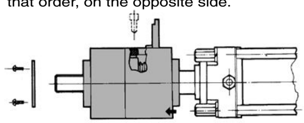
ø40 to ø100

The lock-up is unidirectional. However, the lock-up direction can be changed easily. To change the direction, pay particular attention to the following steps:
Loosening the tie-rods for the purpose of changing the direction could also loosen the nuts on the cylinder side. Therefore, before assembling the unit, make sure to verify that the nuts on the cylinder are not loose. Retighten the nuts if they are loose, and while turning the piston rod, apply a low pressure of 0.08 MPa to make sure that it operates smoothly in both the extending and retracting directions.

1. Loosen the tie-rod nuts and pull out the four tie-rods.



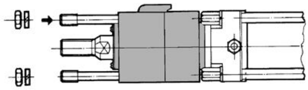
2. Open the rubber cap and screw in the unlocking bolt, which is provided as an accessory part. At this time, apply air pressure of 0.2 MPa to 0.3 MPa to disengage the lock and insert the bolt. (The operation to follow can be performed properly and easily with the application of air pressure.) After verifying that the bolt has been inserted properly, pull out the unit from the rod. Then, loosen the three screws in the scraper presser plate to remove the presser plate and the scraper. Install the scraper and the presser plate, in that order, on the opposite side.



⚠ Caution

When the lock-up unit is not secured by the tie-rods, the air pressure applied to the lock-up port should be between 0.2 MPa and 0.3 MPa. Never supply a higher air pressure as it could lead to equipment damage.

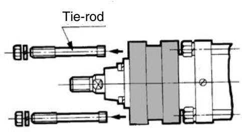
3. Turn the unit to the opposite end so that the end without the scraper is facing the cylinder rod cover. Then, securely insert the unit into the end boss portion of the rod cover.
4. Install four tie-rods, with their shorter threaded portion oriented towards the rod cover, and tighten them with uniform torque. Until the installation and adjustment have been completed, never pull out the unlocking bolt (or release the air pressure).



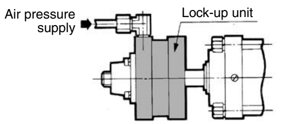
The processes described above complete the changing of the locked-up direction. Before using the cylinder, make sure that the lock-up operates properly.

ø125 to ø160

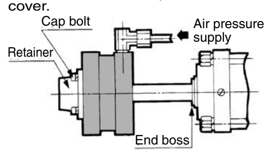
1. Loosen the tie-rod nuts and pull out the four tie-rods.



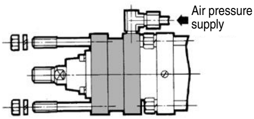
2. Apply air pressure of 0.2 MPa to 0.3 MPa to disengage the lock and pull out the lock-up unit from the piston rod.



3. Remove the retainer plate from the lock-up unit and install the retainer plate on the opposite end. Reapply the air pressure, and with the end on which the retainer plate had, until now, been facing towards the cylinder, insert the locked-up unit into the piston rod and fit it into the end boss portion of the rod cover.



4. Install the four tie-rods, with their shorter threaded portion oriented towards the rod cover, and tighten them with uniform torque.
Maintain the application of air pressure until the installation and adjustment have been completed, and never actuate the lock in the meantime.



⚠ Warning

1. Do not unlock manually until the safety is confirmed.
2. Perform the unlocking after the residual pressure inside the system has been exhausted.
3. Take measures to prevent the load from dropping when unlocking is performed.
   - Perform work with the load in its lowest position.
   - Take measures for drop prevention by strut, etc.

Manual Lock Release (ø40 to ø100)

To manually disengage the lock, perform the following steps:

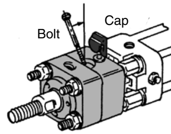
1. Open the rubber cap.
2. Apply 0.2 MPa to 0.3 MPa of air pressure to the locking port, and bring the tilted ring upright.
3. Screw a bolt of an appropriate length into the ring tap.
The bolt size is M5 for ø40 and ø50, and M6 for ø63, ø80, and ø100.

⚠ Caution

During installation adjustment, perform the operation by applying air pressure only to the lock-up port.

⚠ Caution

The lock is manually disengaged at the time the cylinder is shipped from the factory. Because the lock will not operate in this state, make sure to change it to the locked state before operation, after having adjusted the axial center for installation. (Only ø40 to ø100)



ø40 to ø100
(On cylinders ø125 to ø160, the lock cannot be disengaged manually.)

⚠ Caution Recommended Pneumatic Circuit/Caution on Handling

For Selection/recommended pneumatic circuit, stopping accuracy and caution on handling, refer to pages 786 to 789.

⚠ Caution

Stopping Accuracy

1. Load fluctuations during the reciprocal movement of the piston could cause the piston speed to change. A change in the piston speed could greatly increase the variance in the piston's stopping position. Therefore, take appropriate measures so that the piston speed becomes constant during the piston's reciprocal movement, particularly just before stopping.

2. During a cushioning stroke, or when the piston is in the acceleration region following the start of its travel, there is a large change in speed. Thus, the variance in the stopping position will also be large. Therefore, when effecting a step movement in which the stroke from the start of the operation to the next position is short, be aware of the possibility of being unable to attain the accuracy.

3. Precautions regarding lock-up after the piston has been stopped with an external stopper:
To apply the lock-up after the piston has been stopped by an external stopper other than the locked-up mechanism, including stoppage by the stroke end of the cylinder, be aware of the matters described below.
Due to the nature of the lock-up mechanism, there is an axial play of about 0.5 to 1.0 mm. Furthermore, due to pipe routing conditions, if it takes longer for the air to discharge through the lock-up port than for the balance pressure to stabilize, causing a delay in locking, the piston rod will move for an amount that is equivalent to the "play + delay".

Piston speed over 200 mm/s (When locking)

4. Immediately before a lock stop, drop the piston speed to 200 mm/s or lower by switching the speed controller (to the by-pass circuit). Then, operate the lock-up.

⚠ Caution

Caution on Handling

1. Flushing
Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove cutting chip, cutting oil and other debris from inside the pipe.

2. The load on the piston rod
Use the cylinder in the state in which the load to the piston rod is always applied in the axial direction. This must be more strictly adhered to than with ordinary air cylinders. Furthermore, use a guide to control the movement of the load so as not to cause chatter or twist.

3. A rotational force against the piston rod
Avoid applying a rotational force against the piston rod. In particular, the application of a rotational force must be prevented when in a lock-up state.

4. Protecting the sliding portion of the rod
Use caution that no scratch or dent will be given to the slide part of the guide rod, as this could damage the seals and lead to leaks or faulty lock-up.

5. Lubrication
It is not necessary to lubricate the CL series because it is the non-lube type. Never lubricate it because doing so will cause faulty lock-up.

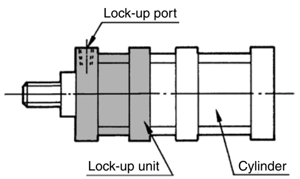
⚠ Caution

Recommended Pneumatic Circuit

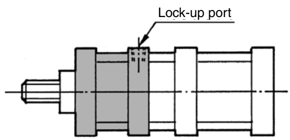
For recommended pneumatic circuits, refer to page 788.

1. Operating the pneumatic circuit
Instead of the current reciprocal air cylinder circuit, use an pneumatic circuit, such as the recommended circuit, in which measures are taken to prevent the piston from lurching after the lock-up has been disengaged.

2. Lock-up direction
The lock-up is unidirectional. The locking direction is in accordance with the position of the lock-up port, as shown in the figure below.



Extension locking



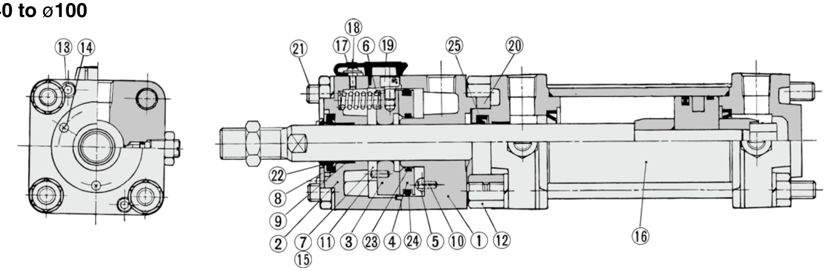
Retraction locking

ø125 to ø160
For cylinders ø40 to ø100, verify the portion that is stamped on the cap of the lock.

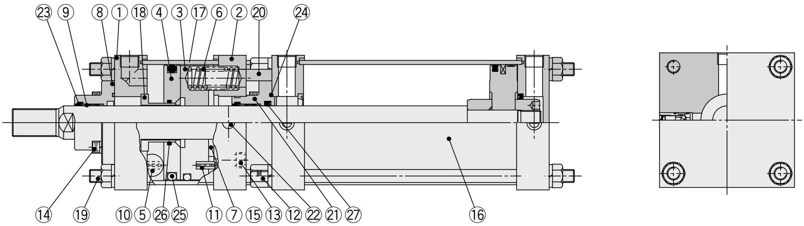
3. Maximum speed and maximum load
Never lock up a cylinder that involves a kinetic energy that exceeds the maximum speed or the maximum load indicated in the specifications.

Construction

CL1ø40 to ø100



CL1ø125 to ø160



Component Parts: CL1ø40 to ø100

No.	Description	Material	Note
1	**Body**	Aluminum alloy	Black painted
2	**Cover**	Aluminum alloy	Black painted
3	**Locked-up ring**	Carbon steel	Heat treated
4	**Release piston**	General rolled steel	Zinc chromated
5	**Pivot**	Carbon steel	Heat treated, zinc chromated
6	**Spring**	Steel wire	Zinc chromated
7	**Stopper**	Urethane	
8	**Retaining plate**	Rolled steel	Black zinc chromated
9	**Bushing**	Bearing alloy	
10	**Spring pin**	Carbon steel	
11	**Spring pin for non-rotating**	Carbon steel	
12	**Wing nut**	Rolled steel	
13	**Unit fixing hex. socket head cap screw**	Chromium molybdenum steel	
14	**Retainer machine screw**	Rolled steel	
15	**Hexagon socket countersunk head screw**	Chromium molybdenum steel	
16	**Non lube air cylinder**		CA1☐N series
17	**Cap**	Nylon	
18	**Cap screw**	Rolled steel	
19	**Release bolt**	Chromium molybdenum steel	
20	**Spacer**	Aluminum alloy	Black painted
21	**Unit holding tie-rod**	Carbon steel	Chromated
22	**Scraper**	NBR	
23	**O-ring**	NBR	
24	**O-ring**	NBR	
25	**Rod seal**	NBR	

Component Parts: CL1ø125 to ø160

No.	Description	Material	Note
1	**Body**	Rolled steel plate	Black painted
2	**Cover**	Rolled steel plate	Black painted
3	**Locked-up ring**	Carbon steel	Heat treated
4	**Release piston**	Rolled steel plate	Zinc chromated
5	**Pivot**	Carbon steel	Heat treated
6	**Spring**	Steel wire	Zinc chromated
7	**Stopper**	Urethane	
8	**Retaining plate**	Cast iron	Black painted
9	**Bushing**	Bearing alloy	—
10	**Spring pin**	Carbon steel	
11	**Spring pin**	Carbon steel	
12	**Wing nut**	Rolled steel	
13	**Unit fixing hex. socket head cap screw**	Chromium molybdenum steel	
14	**Hex. socket head cap screw**	Chromium molybdenum steel	
15	**Hexagon socket countersunk head screw**	Chromium molybdenum steel	
16	**Non lube air cylinder**	—	Serie CS1☐N
17	**Brake tube**	Carbon steel tube	Inside: Hard chrome plated
18	**Sleeve**	Rolled steel	Zinc chromated
19	**Unit holding tie-rod**	Carbon steel	Chromated
20	**Spacer**	Rolled steel	Black painted
21	**Retaining plate**	Cast iron	Black painted
22	**Element**	Sintered metallic BC	—
23	**Wiper ring**	NBR	
24	**Retaining plate gasket**	NBR	
25	**O-ring**	NBR	
26	**O-ring**	NBR	
27	**Rod seal**	NBR	

Replacement Parts: Seal Kit

Bore size (mm)	Kit no.	Bore size (mm)	Kit no.
40	CL40-PS	**100**	CL100-PS
50	CL50-PS	**125**	CL125-PS
63	CL63-PS	**140**	CL140-PS
80	CL80-PS	**160**	CL160-PS

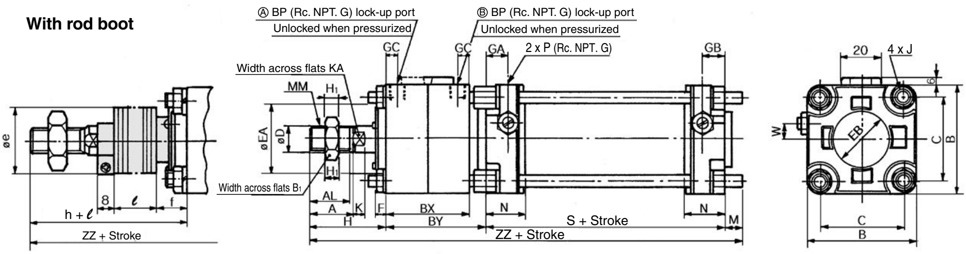
∗ Since the lock section for CL1 series is normally replaced as a unit, kits are for the cylinder section only. These can be ordered using the order number for each bore size.

∗ Seal kit includes a grease pack (ø40, ø50: 10 g, ø63, ø80: 20 g, ø100: 30 g, ø125 to ø160: 40 g).
Order with the following part number when only the grease pack is needed.
Grease pack part no.: GR-S-010 (10 g)**, GR-S-020** (20 g)

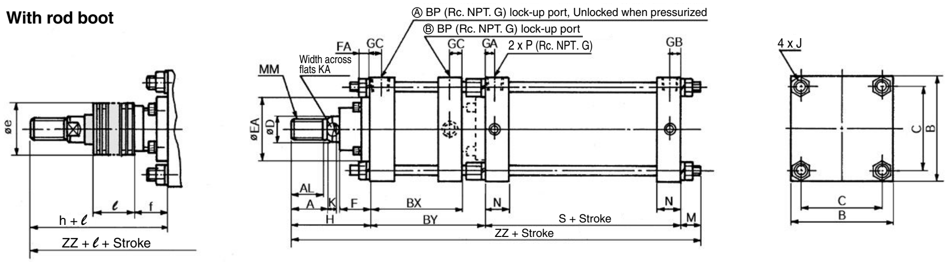
Basic Type (B)

ø40 to ø100

Ⓐ Lock-up at piston forward Ⓑ Lock-up at piston backward



ø125 to ø160



(mm)

Bore size (mm)	Stroke range (mm)		A	AL	B	B_1	BX	BY	BP	C	D	EA	EB	F	FA	GA	GB	GC	H_1	J	K	KA
	Without rod boot	With rod boot																				
40	Up to 500	20 to 500	30	27	60	22	59	69	¼	44	16	40	32	6.5	—	15	15	11	8	M8 x 1.25	6	14
50	Up to 600	20 to 600	35	32	70	27	67	78	¼	52	20	50	40	6.0	—	17	17	11	11	M8 x 1.25	7	18
63	Up to 600	20 to 600	35	32	86	27	73	84	¼	64	20	55	40	6.0	—	17	17	11	11	M10 x 1.25	7	18
80	Up to 750	20 to 750	40	37	102	32	77	92	¼	78	25	65	52	8.0	—	21	21	11	13	M12 x 1.75	11	22
100	Up to 750	20 to 750	40	37	116	41	85	100	¼	92	30	80	52	8.0	—	21	21	11	16	M12 x 1.75	11	26
125	Up to 1000	30 to 1000	50	47	145	—	112.5	141.5	½	115	36	90	—	43	14	16	16	16	—	M14 x 1.5	15	31
140	Up to 1000	30 to 1000	50	47	161	—	121	150	½	128	36	90	—	43	14	16	16	16	—	M14 x 1.5	15	31
160	Up to 1200	30 to 1200	56	53	182	—	133	167	¾	144	40	90	—	43	14	18.5	18.5	18.5	—	M16 x 1.5	17	36

Bore size (mm)	M	MM	N	P	S	W	Without rod boot		With rod boot				
							H	ZZ	e	f	h	ℓ	ZZ
40	11	M14 x 1.5	27	¼	84	8	51	215	36	16.5	59	¼ stroke	223
50	11	M18 x 1.5	30	⅜	90	0	58	237	45	16.0	66	¼ stroke	245
63	14	M18 x 1.5	31	⅜	98	0	58	254	45	16.0	66	¼ stroke	262
80	17	M22 x 1.5	37	½	116	0	71	296	60	18.0	80	¼ stroke	305
100	17	M26 x 1.5	40	½	126	0	72	315	60	18.0	81	¼ stroke	324
125	27	M30 x 1.5	35	½	98	—	110	376.5	75	40	133	⅕ stroke	399.5
140	27	M30 x 1.5	35	½	98	—	110	385	75	40	133	⅕ stroke	408
160	30.5	M36 x 1.5	39	¾	106	—	120	423.5	75	40	141	⅕ stroke	444.5

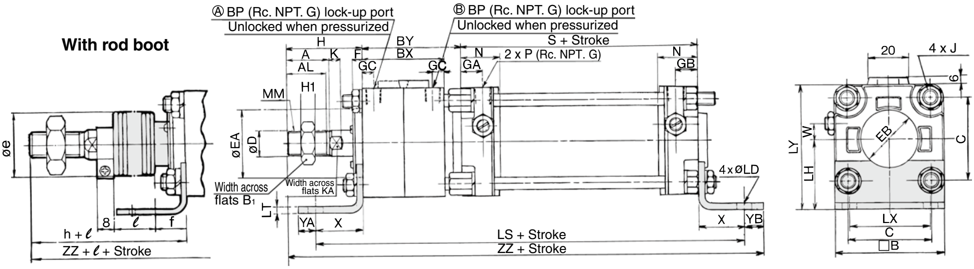
Note) In installing an air cylinder, if a hole must be made to accommodate the rod portion, make sure to machine a hole that is larger than the boot outer diameter "øe".

Axial Foot Type (L)

ø40 to ø100

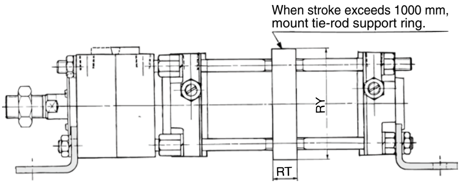
Ⓐ Lock-up at piston forward Ⓑ Lock-up at piston backward

With rod boot



Long stroke

ø50 to ø100



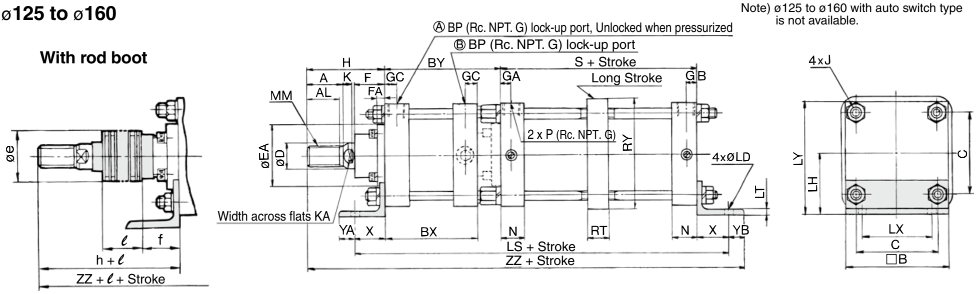
Long Stroke

Bore size (mm)	Stroke range (mm)	RT	RY
40	501 to 800	—	—
50	601 to 1000	—	—
	1001 to 1200	30	76
63	601 to 1000	—	—
	1001 to 1200	40	92
80	701 to 1000	—	—
	1001 to 1400	45	112
100	701 to 1000	—	—
	1001 to 1500	50	136
125	1401 to 1600	36	164
140	1401 to 1600	36	184
160	1401 to 1600	40	204

Note) ø125 to ø160 with auto switch type is not available.

ø125 to ø160

With rod boot



(mm)

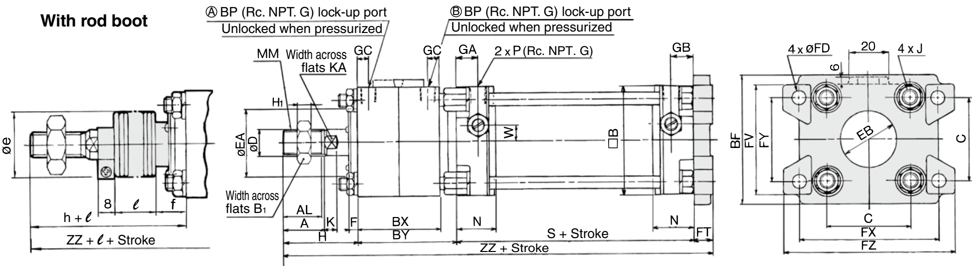
Bore size (mm)	Stroke range (mm)		A	AL	B	B_1	BX	BY	BP	C	D	EA	EB	F	FA	GA	GB	GC	H_1	J	K	KA	LD	LH
	Without rod boot	With rod boot																						
40	Up to 500	20 to 500	30	27	60	22	59	69	¼	44	16	40	32	6.5	—	15	15	11	8	M8 x 1.25	6	14	9	40
50	Up to 600	20 to 600	35	32	70	27	67	78	¼	52	20	50	40	6.0	—	17	17	11	11	M8 x 1.25	7	18	9	45
63	Up to 600	20 to 600	35	32	86	27	73	84	¼	64	20	55	40	6.0	—	17	17	11	11	M10 x 1.25	7	18	11.5	50
80	Up to 750	20 to 750	40	37	102	32	77	92	¼	78	25	65	52	8.0	—	21	21	11	13	M12 x 1.75	11	22	13.5	65
100	Up to 750	20 to 750	40	37	116	41	85	100	¼	92	30	80	52	8.0	—	21	21	11	16	M12 x 1.75	11	26	13.5	75
125	Up to 1400	30 to 1400	50	47	145	—	112.5	141.5	½	115	36	90	—	43	14	16	16	16	—	M14 x 1.5	15	31	19	85
140	Up to 1400	30 to 1400	50	47	161	—	121	150	½	128	36	90	—	43	14	16	16	16	—	M14 x 1.5	15	31	19	100
160	Up to 1400	30 to 1400	56	53	182	—	133	167	¾	144	40	90	—	43	14	18.5	18.5	18.5	—	M16 x 1.5	17	36	19	106

Bore size (mm)	LS	LT	LX	LY	MM	N	P	S	W	X	YA	YB	Without rod boot		With rod boot				
													H	ZZ	e	f	h	ℓ	ZZ
40	207	3.2	42	70	M14 x 1.5	27	¼	84	8	27	13	13	51	244	36	16.5	59	¼ stroke	252
50	222	3.2	50	80	M18 x 1.5	30	⅜	90	0	27	13	13	58	266	45	16.0	66	¼ stroke	274
63	250	3.2	59	93	M18 x 1.5	31	⅜	98	0	34	16	16	58	290	45	16.0	66	¼ stroke	298
80	296	4.5	76	116	M22 x 1.5	37	½	116	0	44	21	16	71	339	60	18.0	80	¼ stroke	348
100	312	6.0	92	133	M26 x 1.5	40	½	126	0	43	22	17	72	358	60	18.0	81	¼ stroke	367
125	329.5	8	100	157.5	M30 x 1.5	35	½	98	—	45	20	20	110	414.5	75	40	133	⅕ stroke	437.5
140	338	9	112	180.5	M30 x 1.5	35	½	98	—	45	30	30	110	433	75	40	133	⅕ stroke	456
160	373	9	118	197	M36 x 1.5	39	¾	106	—	50	25	25	120	468	75	40	141	⅕ stroke	489

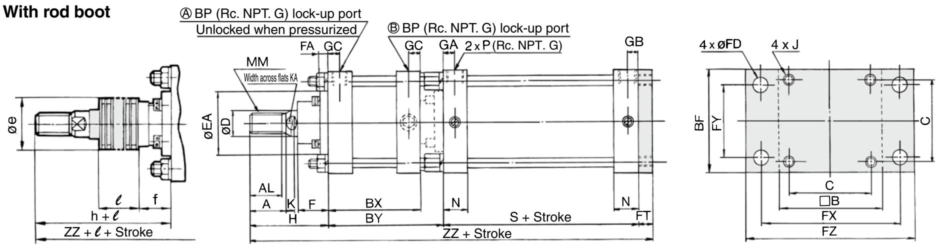
Head Side Flange Type (G)

ø40 to ø100

Ⓐ Lock-up at piston forward Ⓑ Lock-up at piston backward



ø125 to ø160



(mm)

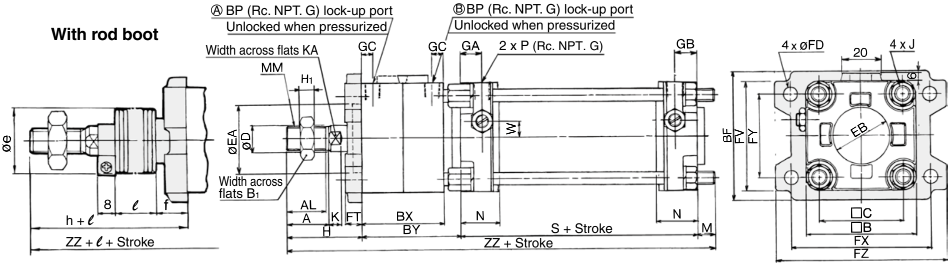
Bore size (mm)	Stroke range (mm)		A	AL	B	B1	BF	BP	BX	BY	C	D	EA	EB	F	FA	FD	FT	FX	FY	FZ	FV	GA	GB	GC	H1
	Without rod boot	With rod boot																								
40	Up to 500	20 to 500	30	27	60	22	71	1/4	59	69	44	16	40	32	6.5	—	9.0	12	80	42	100	60	15	15	11	8
50	Up to 600	20 to 600	35	32	70	27	81	1/4	67	78	52	20	50	40	6.0	—	9.0	12	90	50	110	70	17	17	11	11
63	Up to 600	20 to 600	35	32	86	27	101	1/4	73	84	64	20	55	40	6.0	—	11.5	15	105	59	130	86	17	17	11	11
80	Up to 750	20 to 750	40	37	102	32	119	1/4	77	92	78	25	65	52	8.0	—	13.5	18	130	76	160	102	21	21	11	13
100	Up to 750	20 to 750	40	37	116	41	133	1/4	85	100	92	30	80	52	8.0	—	13.5	18	150	92	180	116	21	21	11	16
125	Up to 1000	30 to 1000	50	47	145	—	145	1/2	112.5	141.5	115	36	90	—	43	14	19	14	190	100	230	—	16	16	16	—
140	Up to 1000	30 to 1000	50	47	161	—	160	1/2	121	150	128	36	90	—	43	14	19	20	212	112	255	—	16	16	16	—
160	Up to 1200	30 to 1200	56	53	182	—	180	3/4	133	167	144	40	90	—	43	14	19	20	236	118	275	—	18.5	18.5	18.5	—

Bore size (mm)	J	K	KA	MM	N	P	S	W	Without rod boot		With rod boot				
									H	ZZ	e	f	h	ℓ	ZZ
40	M8 x 1.25	6	14	M14 x 1.5	27	1/4	84	8	51	216	36	16.5	59	1/4 stroke	224
50	M8 x 1.25	7	18	M18 x 1.5	30	3/8	90	0	58	238	45	16.0	66	1/4 stroke	246
63	M10 x 1.25	7	18	M18 x 1.5	31	3/8	98	0	58	255	45	16.0	66	1/4 stroke	263
80	M12 x 1.75	11	22	M22 x 1.5	37	1/2	116	0	71	297	60	18.0	80	1/4 stroke	306
100	M12 x 1.75	11	26	M26 x 1.5	40	1/2	126	0	72	316	60	18.0	81	1/4 stroke	325
125	M14 x 1.5	15	31	M30 x 1.5	35	1/2	98	—	110	363.5	75	40	133	1/5 stroke	386.5
140	M14 x 1.5	15	31	M30 x 1.5	35	1/2	98	—	110	378	75	40	133	1/5 stroke	401
160	M16 x 1.5	17	36	M36 x 1.5	39	3/4	106	—	120	413	75	40	141	1/5 stroke	434

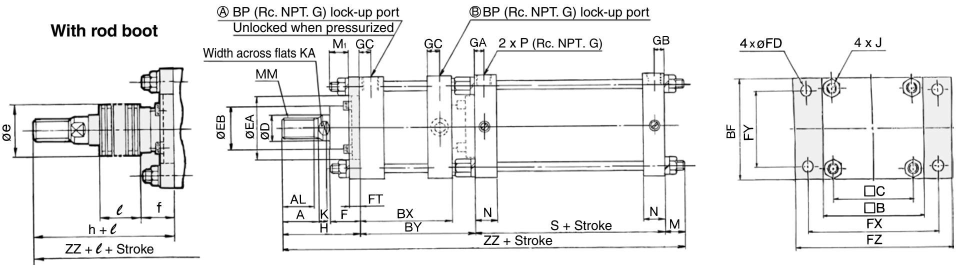
Rod Side Flange Type (F)

ø40 to ø100

Ⓐ Lock-up at piston forward Ⓑ Lock-up at piston backward



ø125 to ø160



(mm)

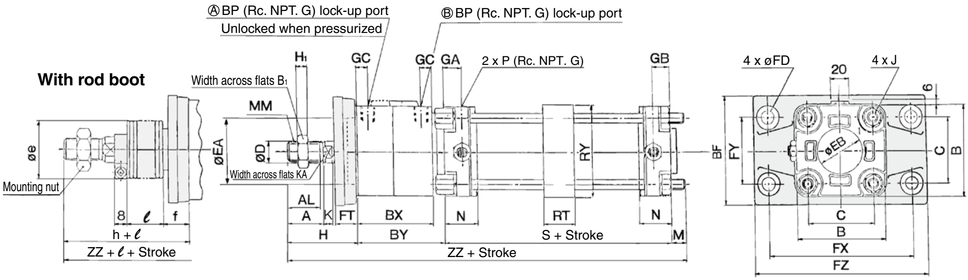
Bore size (mm)	Stroke range (mm) Without rod boot	Stroke range (mm) With rod boot	Long stroke range (mm)	A	AL	B	B_1	BF	BP	BX	BY	C	D	EA	EB	F	FD	FT	FX	FY	FZ
40	Up to 500	20 to 500	501 to 800	30	27	60	22	71	1/4	59	69	44	16	40	32	—	9.0	12	80	42	100
50	Up to 600	20 to 600	601 to 1000	35	32	70	27	81	1/4	67	78	52	20	50	40	—	9.0	12	90	50	110
63	Up to 600	20 to 600	601 to 1000	35	32	86	27	101	1/4	73	84	64	20	55	40	—	11.5	15	105	59	130
80	Up to 750	20 to 750	751 to 1000	40	37	102	32	119	1/4	77	92	78	25	65	52	—	13.5	18	130	76	160
100	Up to 750	20 to 750	751 to 1000	40	37	116	41	133	1/4	85	100	92	30	80	52	—	13.5	18	150	92	180
125	Up to 1400	30 to 1400	—	50	47	145	—	145	1/2	112.5	141.5	115	36	90	59	43	19	14	190	100	230
140	Up to 1400	30 to 1400	—	50	47	161	—	160	1/2	121	150	128	36	90	59	43	19	20	212	112	255
160	Up to 1400	30 to 1400	—	56	53	182	—	180	3/4	133	167	144	40	90	59	43	19	20	236	118	275

Bore size (mm)	FV	GA	GB	GC	H_1	J	K	KA	M	M_1	MM	N	P	S	W	Without rod boot H	Without rod boot ZZ	With rod boot e	With rod boot f	With rod boot h	With rod boot ℓ	With rod boot ZZ
40	60	15	15	11	8	M8 x 1.25	6	14	11	—	M14 x 1.5	27	1/4	84	8	51	215	36	16.5	59	1/4 stroke	223
50	70	17	17	11	11	M8 x 1.25	7	18	11	—	M18 x 1.5	30	3/8	90	0	58	237	45	16.0	66	1/4 stroke	245
63	86	17	17	11	11	M10 x 1.25	7	18	14	—	M18 x 1.5	31	3/8	98	0	58	254	45	16.0	66	1/4 stroke	262
80	102	21	21	11	13	M12 x 1.75	11	22	17	—	M22 x 1.5	37	1/2	116	0	71	296	60	18.0	80	1/4 stroke	305
100	116	21	21	11	16	M12 x 1.75	11	26	17	—	M26 x 1.5	40	1/2	126	0	72	315	60	18.0	81	1/4 stroke	324
125	—	16	16	16	—	M14 x 1.5	15	31	30	22	M30 x 1.5	35	1/2	98	—	110	379.5	75	40	133	1/5 stroke	402.5
140	—	16	16	16	—	M14 x 1.5	15	31	24	19	M30 x 1.5	35	1/2	98	—	110	382	75	40	133	1/5 stroke	405
160	—	18.5	18.5	18.5	—	M16 x 1.5	17	36	26	22	M36 x 1.5	39	3/4	106	—	120	419	75	40	141	1/5 stroke	440

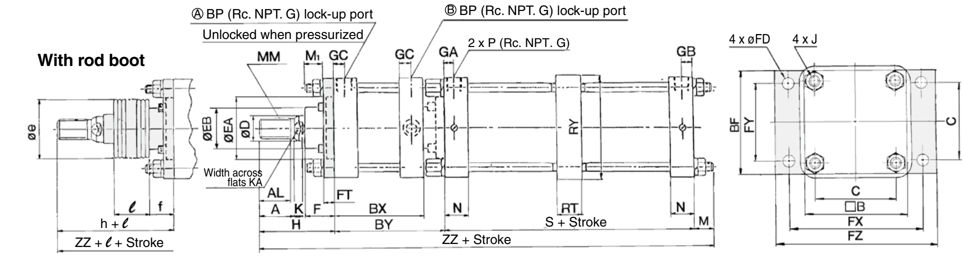
Rod Side Flange Type (F)/Long Stroke

ø50 to ø100

Ⓐ Lock-up at piston forward Ⓑ Lock-up at piston backward



ø125 to ø160



(mm)

Bore size (mm)	Stroke range (mm)	A	AL	B	B_1	BF	BP	BX	BY	C	D	EA	EB	F	FD	FT	FX	FY	FZ	GA	GB	GC	H_1	J	K	KA
50	1001 to 1200	35	32	70	27	88	1/4	67	78	52	20	50	40	—	9.0	20	120	58	144	17	17	11	11	M8 x 1.25	7	18
63	1001 to 1200	35	32	86	27	105	1/4	73	84	64	20	55	40	—	11.5	23	140	64	170	17	17	11	11	M10 x 1.25	7	18
80	1001 to 1400	40	37	102	32	124	1/4	77	92	78	25	65	52	—	13.5	28	164	84	198	21	21	11	13	M12 x 1.75	11	22
100	1001 to 1500	40	37	116	41	140	1/4	85	100	92	30	80	52	—	13.5	29	180	100	220	21	21	11	16	M12 x 1.75	11	26
125	1401 to 1600	50	47	145	—	145	1/2	112.5	141.5	115	36	90	59	43	19	14	190	100	230	16	16	16	—	M14 x 1.5	15	31
140	1401 to 1600	50	47	161	—	160	1/2	121	150	128	36	90	59	43	19	20	212	112	255	16	16	16	—	M14 x 1.5	15	31
160	1401 to 1600	56	53	182	—	180	3/4	133	167	144	40	90	59	43	19	20	236	118	275	18.5	18.5	18.5	—	M16 x 1.5	17	36

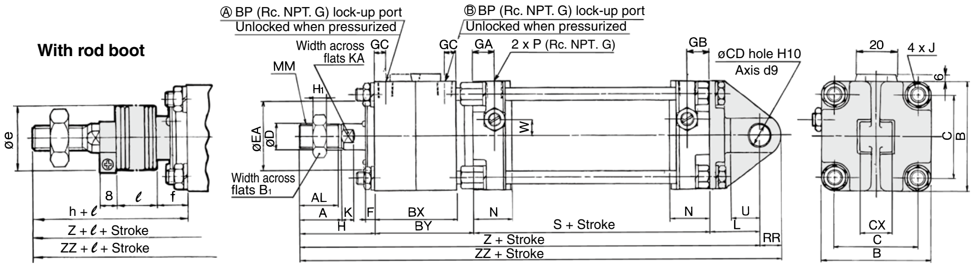
Bore size (mm)	Stroke range (mm)	M	M_1	MM	N	P	RT	RY	S	W	Without rod boot		With rod boot				
											H	ZZ	e	f	h	ℓ	ZZ
50	1001 to 1200	6	—	M18 x 1.5	30	3/8	30	76	90	0	67	241	45	16.0	66	1/4 stroke	240
63	1001 to 1200	10	—	M18 x 1.5	31	3/8	40	92	98	0	71	263	45	16.0	66	1/4 stroke	258
80	1001 to 1400	12	—	M22 x 1.5	37	1/2	45	112	116	0	87	307	60	18.0	80	1/4 stroke	300
100	1001 to 1500	12	—	M26 x 1.5	40	1/2	50	136	126	0	89	327	60	18.0	81	1/4 stroke	319
125	1401 to 1600	30	22	M30 x 1.5	35	1/2	36	164	98	—	110	379.5	75	40	133	1/5 stroke	402.5
140	1401 to 1600	24	19	M30 x 1.5	35	1/2	36	184	98	—	110	382	75	40	133	1/5 stroke	405
160	1401 to 1600	26	22	M36 x 1.5	39	3/4	45	204	106	—	120	419	75	40	141	1/5 stroke	440

Note) Bore size ø40 and bore sizes ø125 through ø160 with auto switch are not available.

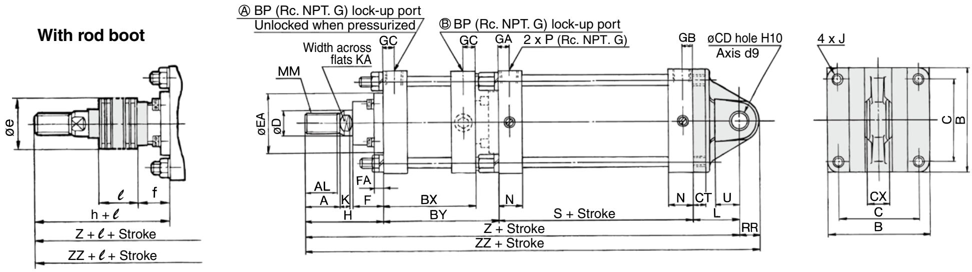
Single Clevis Type (C)

ø40 to ø100

Ⓐ Lock-up at piston forward Ⓑ Lock-up at piston backward



ø125 to ø160



(mm)

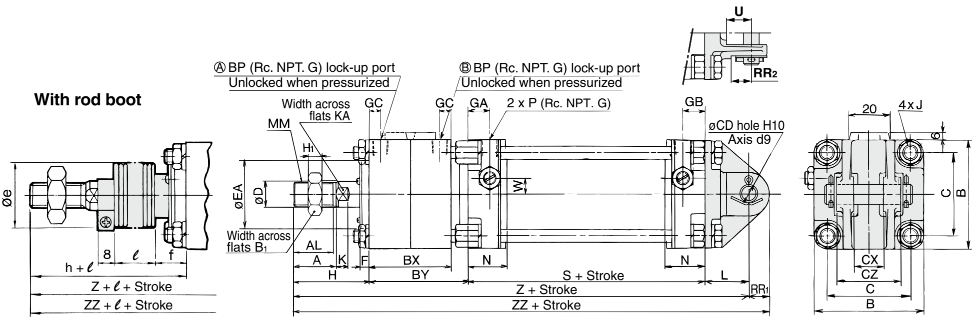
Bore size (mm)	Stroke range (mm) Without rod boot	With rod boot	A	AL	B	B1	BP	BX	BY	C	CD	CT	CX	D	EA	F	FA	GA	GB	GC	H1
40	Up to 500	20 to 500	30	27	60	22	1/4	59	69	44	10	—	$15.0^{-0.1}_{-0.3}$	16	40	6.5	—	15	15	11	8
50	Up to 600	20 to 600	35	32	70	27	1/4	67	78	52	12	—	$18.0^{-0.1}_{-0.3}$	20	50	6.0	—	17	17	11	11
63	Up to 600	20 to 600	35	32	86	27	1/4	73	84	64	16	—	$25.0^{-0.1}_{-0.3}$	20	55	6.0	—	17	17	11	11
80	Up to 700	20 to 700	40	37	102	32	1/4	77	92	78	20	—	$31.5^{-0.1}_{-0.3}$	25	65	8.0	—	21	21	11	13
100	Up to 700	20 to 700	40	37	116	41	1/4	85	100	92	25	—	$35.5^{-0.1}_{-0.3}$	30	80	8.0	—	21	21	11	16
125	Up to 1000	30 to 1000	50	47	145	—	1/2	112.5	141.5	115	25	17	$32.0^{-0.1}_{-0.3}$	36	90	43	14	16	16	16	—
140	Up to 1000	30 to 1000	50	47	161	—	1/2	121	150	128	28	17	$36.0^{-0.1}_{-0.3}$	36	90	43	14	16	16	16	—
160	Up to 1200	30 to 1200	56	53	182	—	3/4	133	167	144	32	20	$40.0^{-0.1}_{-0.3}$	40	90	43	14	18.5	18.5	18.5	—

Bore size (mm)	J	K	KA	L	MM	N	P	RR	S	U	W	Without rod boot H	Z	ZZ	With rod boot e	f	h	ℓ	Z	ZZ
40	M8 x 1.25	6	14	30	M14 x 1.5	27	1/4	10	84	16	8	51	234	244	36	16.5	59	1/4 stroke	242	252
50	M8 x 1.25	7	18	35	M18 x 1.5	30	3/8	12	90	19	0	58	261	273	45	16.0	66	1/4 stroke	269	281
63	M10 x 1.25	7	18	40	M18 x 1.5	31	3/8	16	98	23	0	58	280	296	45	16.0	66	1/4 stroke	288	304
80	M12 x 1.75	11	22	48	M22 x 1.5	37	1/2	20	116	28	0	71	327	347	60	18.0	80	1/4 stroke	336	356
100	M12 x 1.75	11	26	58	M26 x 1.5	40	1/2	25	126	36	—	72	356	381	60	18.0	81	1/4 stroke	365	390
125	M14 x 1.5	15	31	65	M30 x 1.5	35	1/2	29	98	35	—	110	414.5	443.5	75	40	133	1/5 stroke	437.5	466.5
140	M14 x 1.5	15	31	75	M30 x 1.5	35	1/2	32	98	40	—	110	433	465	75	40	133	1/5 stroke	456	488
160	M16 x 1.5	17	36	80	M36 x 1.5	39	3/4	36	106	45	—	120	473	509	75	40	141	1/5 stroke	494	530

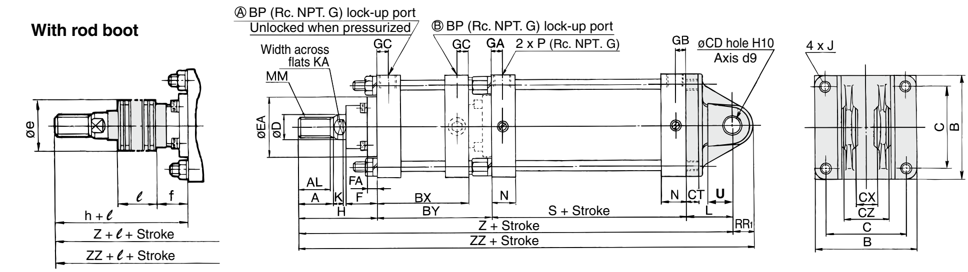
Double Clevis Type (D)

ø40 to ø100

Ⓐ Lock-up at piston forward Ⓑ Lock-up at piston backward



ø125 to ø160



(mm)

Bore size (mm)	Stroke range (mm)		A	AL	B	B_1	BP	BX	BY	C	CD	CT	CX	CZ	D	EA	F	FA	GA	GB
	Without rod boot	With rod boot																		
40	Up to 500	20 to 500	30	27	60	22	1/4	59	69	44	10	—	$15.0^{+0.3}_{+0.1}$	29.5	16	40	6.5	—	15	15
50	Up to 600	20 to 600	35	32	70	27	1/4	67	78	52	12	—	$18.0^{+0.3}_{+0.1}$	38	20	50	6.0	—	17	17
63	Up to 600	20 to 600	35	32	86	27	1/4	73	84	64	16	—	$25.0^{+0.3}_{+0.1}$	49	20	55	6.0	—	17	17
80	Up to 700	20 to 700	40	37	102	32	1/4	77	92	78	20	—	$31.5^{+0.3}_{+0.1}$	61	25	65	8.0	—	21	21
100	Up to 700	20 to 700	40	37	116	41	1/4	85	100	92	25	—	$35.5^{+0.3}_{+0.1}$	64	30	80	8.0	—	21	21
125	Up to 1000	30 to 1000	50	47	145	—	1/2	112.5	141.5	115	25	17	$32.0^{+0.3}_{+0.1}$	$64^{0}_{-0.2}$	36	90	43	14	16	16
140	Up to 1000	30 to 1000	50	47	161	—	1/2	121	150	128	28	17	$36.0^{+0.3}_{+0.1}$	$72^{0}_{-0.2}$	36	90	43	14	16	16
160	Up to 1200	30 to 1200	56	53	182	—	3/4	133	167	144	32	20	$40.0^{+0.3}_{+0.1}$	$80^{0}_{-0.2}$	40	90	43	14	18.5	18.5

Bore size (mm)	GC	H_1	J	K	KA	L	MM	N	P	RR_1	RR_2	S	U	W	Without rod boot			With rod boot					
															H	Z	ZZ	e	f	h	ℓ	Z	ZZ
40	11	8	M8 x 1.25	6	14	30	M14 x 1.5	27	1/4	10	16	84	16	8	51	234	244	36	16.5	59	1/4 stroke	242	252
50	11	11	M8 x 1.25	7	18	35	M18 x 1.5	30	3/8	12	19	90	19	0	58	261	273	45	16.0	66	1/4 stroke	269	281
63	11	11	M10 x 1.25	7	18	40	M18 x 1.5	31	3/8	16	23	98	23	0	58	280	296	45	16.0	66	1/4 stroke	288	304
80	11	13	M12 x 1.75	11	22	48	M22 x 1.5	37	1/2	20	28	116	28	0	71	327	347	60	18.0	80	1/4 stroke	336	356
100	11	16	M12 x 1.75	11	26	58	M26 x 1.5	40	1/2	25	23.5	126	36	0	72	356	381	60	18.0	81	1/4 stroke	365	390
125	16	—	M14 x 1.5	15	31	65	M30 x 1.5	35	1/2	29	—	98	35	—	110	414.5	443.5	75	40	133	1/5 stroke	437.5	466.5
140	16	—	M14 x 1.5	15	31	75	M30 x 1.5	35	1/2	32	—	98	40	—	110	433	465	75	40	133	1/5 stroke	456	488
160	18.5	—	M16 x 1.5	17	36	80	M36 x 1.5	39	3/4	36	—	106	45	—	120	473	509	75	40	141	1/5 stroke	494	530

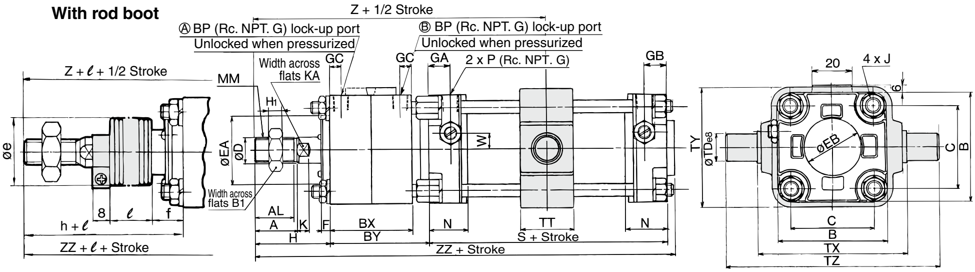
∗ Clevis pin, flat washer and cotter pin are attached.

Center Trunnion Type (T)

ø40 to ø100

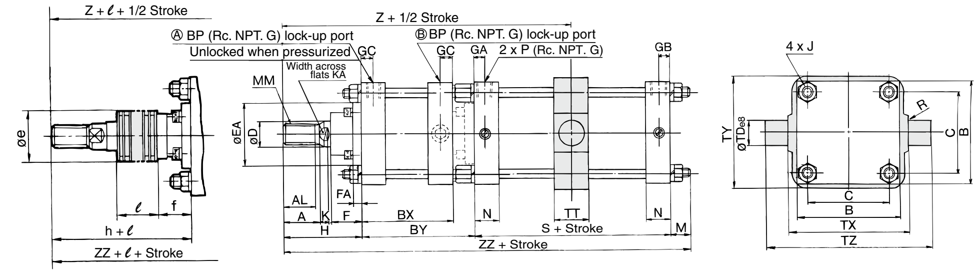
Ⓐ Lock-up at piston forward Ⓑ Lock-up at piston backward

With rod boot



ø125 to ø160

With rod boot



(mm)

Bore size (mm)	Stroke range (mm)		A	AL	B	B1	BP	BX	BY	C	D	EA	EB	F	FA	GA	GB	GC	H1	J	K	KA
	Without rod boot	With rod boot																				
40	Up to 500	20 to 500	30	27	60	22	¼	59	69	44	16	40	32	6.5	—	15	15	11	8	M8 x 1.25	6	14
50	Up to 600	20 to 600	35	32	70	27	¼	67	78	52	20	50	40	6.0	—	17	17	11	11	M8 x 1.25	7	18
63	Up to 600	20 to 600	35	32	86	27	¼	73	84	64	20	55	40	6.0	—	17	17	11	11	M10 x 1.25	7	18
80	Up to 700	20 to 700	40	37	102	32	¼	77	92	78	25	65	52	8.0	—	21	21	11	13	M12 x 1.75	11	22
100	Up to 700	20 to 700	40	37	116	41	¼	85	100	92	30	80	52	8.0	—	21	21	11	16	M12 x 1.75	11	26
125	25 to 1000	30 to 1000	50	47	145	—	½	112.5	141.5	115	36	90	—	43	14	16	16	16	—	M14 x 1.5	15	31
140	30 to 1000	30 to 1000	50	47	161	—	½	121	150	128	36	90	—	43	14	16	16	16	—	M14 x 1.5	15	31
160	35 to 1200	35 to 1200	56	53	182	—	¾	133	167	144	40	90	—	43	14	18.5	18.5	18.5	—	M16 x 1.5	17	36

Bore size (mm)	M	MM	N	P	R	S	TDe8	TT	TX	TY	TZ	W	Without rod boot			With rod boot					
													H	Z	ZZ	e	f	h	ℓ	Z	ZZ
40	—	M14 x 1.5	27	¼	—	84	$15^{-0.032}_{-0.059}$	22	85	62	117	8	51	162	209	36	16.5	59	¼ stroke	170	217
50	—	M18 x 1.5	30	⅜	—	90	$15^{-0.032}_{-0.059}$	22	95	74	127	0	58	181	232	45	16.0	66	¼ stroke	189	240
63	—	M18 x 1.5	31	⅜	—	98	$18^{-0.032}_{-0.059}$	28	110	90	148	0	58	191	246	45	16.0	66	¼ stroke	199	254
80	—	M22 x 1.5	37	½	—	116	$25^{-0.040}_{-0.073}$	34	140	110	192	0	71	221	286	60	18.0	80	¼ stroke	230	295
100	—	M26 x 1.5	40	½	—	126	$25^{-0.040}_{-0.073}$	40	162	130	214	0	72	235	306	60	18.0	81	¼ stroke	244	315
125	19	M30 x 1.5	35	½	1.0	98	$32^{-0.050}_{-0.089}$	50	170	164	234	—	110	300.5	368.5	75	40	133	⅕ stroke	323.5	391.5
140	19	M30 x 1.5	35	½	1.5	98	$36^{-0.050}_{-0.089}$	55	190	184	262	—	110	309	377	75	40	133	⅕ stroke	332	400
160	22	M36 x 1.5	39	¾	1.5	106	$40^{-0.050}_{-0.089}$	60	212	204	292	—	120	340	415	75	40	141	⅕ stroke	361	436

Auto Switch Mounting 1

Minimum Auto Switch Mounting Stroke

Applicable Model: CDL1 Brackets for types other than the center trunnion type

n: No. of auto switches

Auto switch model	No. of auto switches mounted		Brackets for types other than the center trunnion type ø40 to ø100	ø125 to ø160
D-M9□ D-M9□W	2 (Different surfaces, same surface) 1		15	15
	n		$15 + 40\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)	$15 + 40\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)
D-M9□V D-M9□WV	2 (Different surfaces, same surface) 1		10	10
	n		$10 + 30\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)	$10 + 30\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)
D-M9□A	2 (Different surfaces, same surface) 1		15	20
	n		$15 + 40\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)	$20 + 40\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)
D-M9□AV	2 (Different surfaces, same surface) 1		10	15
	n		$10 + 30\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)	$15 + 30\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)
D-A9□	2 (Different surfaces, same surface) 1		15	15
	n		$15 + 40\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)	$15 + 40\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)
D-A9□V	2 (Different surfaces, same surface) 1		10	10
	n		$10 + 30\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)	$10 + 30\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)
D-F5□/J5□ D-F5□W/J59W D-F5BA/F59F D-A5□/A6□	2 (Different surfaces, same surface) 1		15	25
	n		$15 + 55\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)	$25 + 55\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)
D-F5NT	2 (Different surfaces, same surface) 1		25	35
	n		$25 + 55\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)	$35 + 55\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)
D-A59W	2 (Different surfaces, same surface) 1		20	25
	n		$20 + 55\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)	$25 + 55\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)
D-G39 D-K39 D-A3□	2	Different surfaces	35	
		Same surface	100	
	n	Different surfaces	35 + 30(n – 2) (n = 2, 3, 4 ···)	
		Same surface	100 + 100(n – 2) (n = 2, 3, 4 ···)	
	1		10	15
D-A44	2	Different surfaces	35	
		Same surface	55	
	n	Different surfaces	35 + 30(n – 2) (n = 2, 3, 4 ···)	
		Same surface	55 + 50(n – 2) (n = 2, 3, 4 ···)	
	1		10	15

Auto switch model	No. of auto switches mounted		Brackets for types other than the center trunnion type ø40 to ø100	ø125 to ø160
D-G39C D-K39C D-A3□C	2	Different surfaces	20	—
		Same surface	100	
	n	Different surfaces	20 + 30(n – 2) (n = 2, 3, 4 ···)	
		Same surface	100 + 100(n – 2) (n = 2, 3, 4 ···)	
	1		10	
D-A44C	2	Different surfaces	20	—
		Same surface	55	
	n	Different surfaces	20 + 30(n – 2) (n = 2, 3, 4 ···)	
		Same surface	55 + 50(n – 2) (n = 2, 3, 4 ···)	
	1		10	
D-G5□/K59 D-G5□W D-K59W D-G5BA D-G59F D-G5NT D-B5□/B64	2	Different surfaces	15	—
		Same surface	75	
	n	Different surfaces	15 + 50(n – 2) (n = 2, 4, 6, 8 ···) Note 3)	
		Same surface	75 + 50(n – 2) (n = 2, 4, 6, 8 ···) Note 3)	
	1		10	
D-B59W	2	Different surfaces	20	—
		Same surface	75	
	n	Different surfaces	20 + 50(n – 2) (n = 2, 4, 6, 8 ···) Note 3)	
		Same surface	75 + 50(n – 2) (n = 2, 3, 4 ···)	
	1		10	
D-Y59□/Y7P D-Y7□W D-Z7□/Z80	2 (Different surfaces, same surface) 1		15	
	n		$15 + 40\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)	
D-Y69□/Y7PV D-Y7□WV	2 (Different surfaces, same surface) 1		10	
	n		$10 + 30\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)	
D-Y7BA	2 (Different surfaces, same surface) 1		20	
	n		$20 + 45\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)	
D-P4DW	2 (Different surfaces, same surface) 1		15	—
	n		$15 + 65\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 3)	

Note 1) Reed auto switches D-A9□/A9□V cannot be mounted on ø50.
Note 2) The following auto switches cannot be mounted on ø125 to ø160.
D-G39C, K39C, A3□C, A44C, G5□, K59, G5□W, K59W, G5BA, G59F, G5NT, B5□, B64, B59W, P4DW.
Note 3) When “n” is an odd number, an even number that is one larger than this odd number is used for the calculation.

Minimum Auto Switch Mounting Stroke

Applicable Model: CDL1 Center trunnion type only

n: No. of auto switches

Auto switch model	No. of auto switches mounted	Center trunnion type ø40	ø50	ø63	ø80	ø100	ø125	ø140	ø160
D-M9□ D-M9□W	2 (Different surfaces, same surface) 1	80		85	90	95	105	110	115
	n	$80 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)		$85 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$90 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$95 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$105 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$110 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$115 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)
D-M9□V D-M9□WV	2 (Different surfaces, same surface) 1	55		60	65	70	80	85	90
	n	$55 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)		$60 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$65 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$70 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$80 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$85 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$90 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)
D-M9□A	2 (Different surfaces, same surface) 1	80		85	95	100	115	120	
	n	$80 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)		$85 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$95 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$100 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$115 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$120 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	
D-M9□AV	2 (Different surfaces, same surface) 1	60		65	70	75	90	95	
	n	$60 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)		$65 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$70 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$75 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$90 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$95 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	
D-A9□	2 (Different surfaces, same surface) 1	75	—	80	85	90	100	105	110
	n	$75 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)		$80 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$85 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$90 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$100 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$105 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$110 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)
D-A9□V	2 (Different surfaces, same surface) 1	50	—	55	60	65	75	80	85
	n	$50 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)		$55 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$60 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$65 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$75 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$80 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$85 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)
D-F5□/J5□ D-F5□W/J59W D-F5BA/F59F D-A5□/A6□	2 (Different surfaces, same surface) 1	90		100	110	120	125	135	
	n	$90 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)		$100 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$110 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$120 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$125 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$135 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	
D-F5NT	2 (Different surfaces, same surface) 1	110		120	130	140	145	155	
	n	$110 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)		$120 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$130 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$140 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$145 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$155 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	
D-A59W	2 (Different surfaces, same surface) 1	90		100	110	120	125	135	
	n	$90 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)		$100 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$110 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$120 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$125 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$135 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	
D-G39 D-K39 D-A3□	2 Different surfaces	75		80	90		110		
	2 Same surface	100		100	100				
	n Different surfaces	75 + 30(n – 2) (n = 2, 4, 6, 8 ···) Note 3)		80 + 30(n – 2) (n = 2, 4, 6, 8 ···) Note 3)	90 + 30(n – 2) (n = 2, 4, 6, 8 ···) Note 3)		110 + 30(n – 2) (n = 2, 4, 6, 8 ···) Note 3)		
	n Same surface	100 + 100(n – 2) (n = 2, 4, 6, 8 ···) Note 3)							
	1	75		80	90		110		
D-A44	2 Different surfaces Same surface	75		80	90		110		
	n Different surfaces	75 + 30(n – 2) (n = 2, 4, 6, 8 ···) Note 3)		80 + 30(n – 2) (n = 2, 4, 6, 8 ···) Note 3)	90 + 30(n – 2) (n = 2, 4, 6, 8 ···) Note 3)		110 + 30(n – 2) (n = 2, 4, 6, 8 ···) Note 3)		
	n Same surface	75 + 50(n – 2) (n = 2, 4, 6, 8 ···) Note 3)		80 + 50(n – 2) (n = 2, 4, 6, 8 ···) Note 3)	90 + 50(n – 2) (n = 2, 4, 6, 8 ···) Note 3)		110 + 50(n – 2) (n = 2, 4, 6, 8 ···) Note 3)		
	1	75		80	90		110		

Note 1) Reed auto switches D-A9□/A9□V cannot be mounted on ø50.
Note 2) When "n" is an odd number, a multiple of 4 that is larger than this odd number is used for the calculation.
Note 3) When "n" is an odd number, an even number that is one larger than this odd number is used for the calculation.

Auto Switch Mounting 2

Minimum Auto Switch Mounting Stroke

Applicable Model: CDL1 Center trunnion type only

n: No. of auto switches

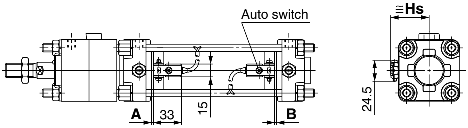
Auto switch model	No. of auto switches mounted		Center trunnion type							
			ø40	ø50	ø63	ø80	ø100	ø125	ø140	ø160
D-G39C D-K39C D-A3□C	2	Different surfaces	75		80	90		—	—	—
		Same surface	100		100	100				
	n	Different surfaces	75 + 35(n – 2) (n = 2, 4, 6, 8 ···) Note 3)		80 + 35(n – 2) (n = 2, 4, 6, 8 ···) Note 3)	90 + 35(n – 2) (n = 2, 4, 6, 8 ···) Note 3)				
		Same surface	100 + 100(n – 2) (n = 2, 4, 6, 8 ···)							
	1		75		80	90				
D-A44C	2	Different surfaces Same surface	75		80	90		—	—	—
	n	Different surfaces	75 + 35(n – 2) (n = 2, 4, 6, 8 ···) Note 3)		80 + 35(n – 2) (n = 2, 4, 6, 8 ···) Note 3)	90 + 35(n – 2) (n = 2, 4, 6, 8 ···) Note 3)				
		Same surface	75 + 50(n – 2) (n = 2, 4, 6, 8 ···) Note 3)		80 + 50(n – 2) (n = 2, 4, 6, 8 ···) Note 3)	90 + 50(n – 2) (n = 2, 4, 6, 8 ···) Note 3)				
	1		75		80	90				
D-G5□/K59 D-G5□W D-K59W D-G5BA D-G59F D-G5NT D-B5□/B64 D-B59W	2	Different surfaces Same surface	90		100	110		—	—	—
	n	Different surfaces	$90 + 50 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)		$100 + 50 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$110 + 50 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)				
		Same surface	90 + 50(n – 2) (n = 2, 4, 6, 8 ···) Note 3)		100 + 50(n – 2) (n = 2, 4, 6, 8 ···) Note 3)	110 + 50(n – 2) (n = 2, 4, 6, 8 ···) Note 3)				
	1		90		100	110				
D-Y59□/Y7P D-Y7□W D-Z7□/Z80	2 (Different surfaces, same surface) 1		80	85	90	95	105		110	115
	n		$80 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$85 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$90 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$95 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$105 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)		$110 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$115 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)
D-Y69□/Y7PV D-Y7□WV	2 (Different surfaces, same surface) 1		65		75	80	90		95	100
	n		$65 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)		$75 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$80 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$90 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)		$95 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$100 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)
D-Y7BA	2 (Different surfaces, same surface) 1		95		100	105	110		120	125
	n		$95 + 45 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)		$100 + 45 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$105 + 45 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$110 + 45 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)		$120 + 45 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$125 + 45 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)
D-P4DW	2 (Different surfaces, same surface) 1		120		130	140		—	—	—
	n		$120 + 65 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)		$130 + 65 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$140 + 65 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)				

Note 1) The following auto switches cannot be mounted on ø125 to ø160.
D-G39C, K39C, A3□C, A44C, G5□, K59, G5□W, K59W, G5BA, G59F, G5NT, B5□, B64, B59W, P4DW.
Note 2) When "n" is an odd number, a multiple of 4 that is larger than this odd number is used for the calculation.
Note 3) When "n" is an odd number, an even number that is one larger than this odd number is used for the calculation.

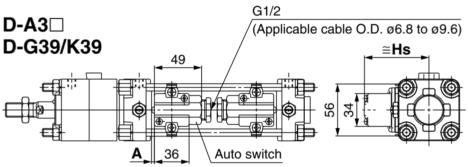
Auto Switch Proper Mounting Position (Detection at Stroke End) and Its Mounting Height

<Band Mounting> ø40 to ø100

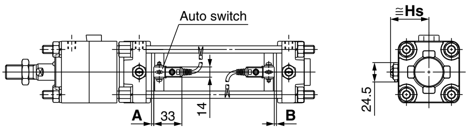
D-B5□/B64
D-B59W



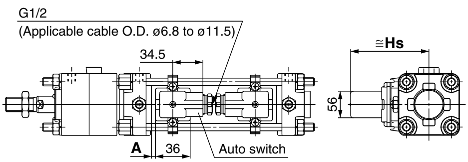
D-A3□
D-G39/K39



D-G5□/K59
D-G5□W/K59W
D-G5BA
D-G59F/G5NT

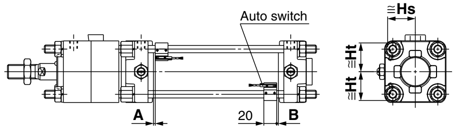


D-A44

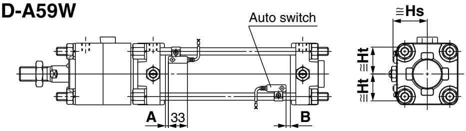


<Tie-rod Mounting> ø40 to ø100

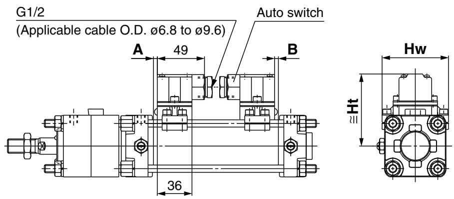
D-A9□/A9□V **D-Z7□/Z80**
D-M9□/M9□V **D-Y59□/Y69□/Y7P/Y7PV**
D-M9□W/M9□WV **D-Y7□W/Y7□WV**
D-M9□A/M9□AV **D-Y7BA**



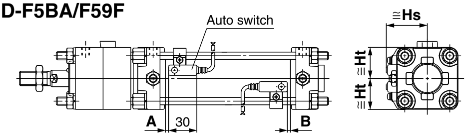
D-A5□/A6□
D-A59W



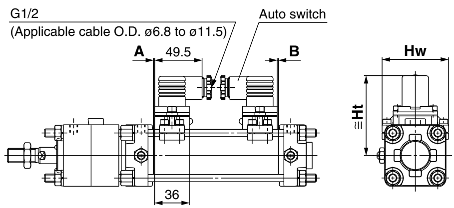
D-A3□C
D-G39C/K39C



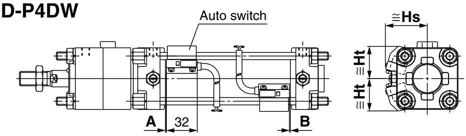
D-F5□/J5□
D-F5NT
D-F5□W/J59W
D-F5BA/F59F



D-A44C



D-P4DW

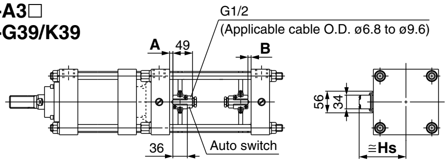


Auto Switch Mounting 3

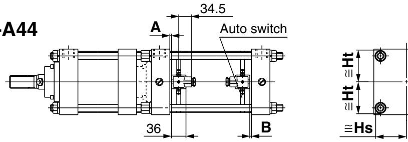
Auto Switch Proper Mounting Position (Detection at Stroke End) and Its Mounting Height

<Band Mounting> ø125 to ø160

D-A3□
D-G39/K39

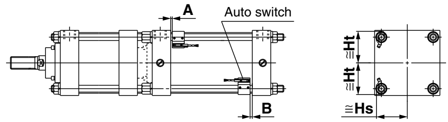


D-A44

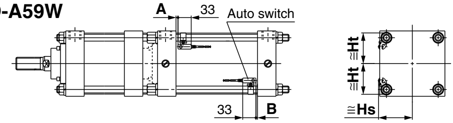


<Tie-rod Mounting> ø125 to ø160

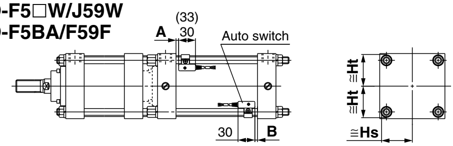
D-Y7□/Z80/A9□/A9□V
D-Y59□/Y69□/Y7P/Y7PV/M9□/M9□V
D-Y7□W/Y7□WV/F9□W/F9□WV
D-Y7BA/M9□A/M9□AV



D-A5□/A6□
D-A59W



D-F5□/J5□/D-F5NT
D-F5□W/J59W
D-F5BA/F59F



Auto Switch Proper Mounting Position

(mm)

Auto switch model / Bore size (mm)	D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□A D-M9□AV		D-A9□ D-A9□V		D-Y59□ D-Y69□ D-Y7P D-Y7PV D-Y7□W D-Y7□WV D-Y7BA D-Z7□ D-Z80		D-F5□ D-J5□ D-F59F D-F5□W D-J59W D-F5BA		D-F5NT		D-G39 D-K39 D-A3□ D-A44 D-A5□ D-A6□		D-A59W		D-P4DW		D-G39C D-K39C D-A3□C D-A44C		D-G5□ D-K59 D-G59F D-G5□W D-K59W D-G5BA D-G5NT		D-B5□ D-B64		D-B59W	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
40	10	8	6	4	3.5	1.5	6.5	4.5	11.5	9.5	0	0	4	2	3	1	0	0	2	0	0.5	0	3.5	1.5
50	10	8	6	4	3.5	1.5	6.5	4.5	11.5	9.5	0	0	4	2	3	1	0	0	2	0	0.5	0	3.5	1.5
63	12.5	11.5	8.5	7.5	6	5	9	8	14	13	2.5	1.5	6.5	5.5	5.5	4	2.5	1.5	4.5	3.5	3	2	6	5
80	16	14	12	10	9.5	7.5	4	10.5	17.5	15.5	6	4	10	8	9	7	6	4	8	6	6.5	4.5	9.5	7.5
100	17.5	16.5	13.5	12.5	11	10	14	13	19	18	7.5	6.5	11.5	10.5	10.5	9	7.5	6.5	9.5	8.5	8	7	11	10
125	8	8	4	4	1.5	1.5	4.5	4.5	9.5	9.5	0	0	2	2	—	—	—	—	—	—	—	—	—	—
140	8	8	4	4	1.5	1.5	4.5	4.5	9.5	9.5	0	0	2	2	—	—	—	—	—	—	—	—	—	—
160	8	8	4	4	1.5	1.5	4.5	4.5	9.5	9.5	0	0	2	2	—	—	—	—	—	—	—	—	—	—

Note 1) Adjust the auto switch after confirming the operating conditions in the actual setting.

Auto Switch Mounting Height

(mm)

Auto switch model / Bore size (mm)	D-M9□ D-M9□W D-M9□A D-A9□		D-M9□V D-M9□WV D-M9□AV		D-A9□V		D-Y59□ D-Y7P D-Y7□W D-Y7BA D-Z7□ D-Z80		D-Y69□ D-Y7PV D-Y7□WV		D-F5□ D-J5□ D-F59F D-F5□W D-J59W D-F5BA D-F5NT		D-A5□ D-A6□ D-A59W		D-G39 D-K39 D-A3□	D-A44	D-P4DW		D-G39C D-K39C D-A3□C		D-A44C		D-G5□ D-K59 D-G59F D-G5□W D-K59W D-G5BA D-G5NT D-B5□ D-B64 D-B59W
	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Hs	Hs	Ht	Hs	Ht	Hs	Ht	Hs
40	30	30	35	30	32	30	30	30	30.5	30	38.5	31	40	31	72.5	80.5	43	33.5	73	69	81	69	38
50	34	34	39	34	36.5	34	34	34	35	34	42.5	35	43.5	35	78	86	47	38	78.5	77	86.5	77	43.5
63	41	41	46	41	43.5	41	41	41	42.5	41	48	42	49	42	85	93	53	44	85.5	91	93.5	91	50.5
80	49.5	49	54	49	51.5	49	49.5	48.5	51	48.5	54	50	55.5	50	93.5	101.5	60	52	94	107	102	107	59
100	57	56	62.5	56	59.5	56	58.5	56	59	56	62	57.5	63	57.5	104	112	67	59	104	121	112	121	69.5
125	69	69.5	71.5	69.5	69	69.5	69	69.5	69	69.5	74.5	70	75.5	69.5	116	126	—	—	—	—	—	—	—
140	76	76	77.5	76	76	76	76	76	76	76	80	76.5	81	76.5	124	134	—	—	—	—	—	—	—
160	85	85	86	85	85	85	85	85	85	85	88	87.5	89	87.5	134.5	144.5	—	—	—	—	—	—	—

Note 2) D-A9□/A9□V cannot be mounted on ø50.
Note 3) The following auto switches cannot be mounted on ø125 to ø160.
D-G39C, K39C, A3□C, A44C, G5□, K59, G5□W, K59W, G5BA, G59F, G5NT, B5□, B64, B59W, P4DW.

Operating range

(mm)

Auto switch model	Bore size (mm)							
	40	50	63	80	100	125	140	160
D-M9□/M9□V **D-M9□W/M9□WV** **D-M9□A/M9□AV**	4.5	5	5.5	5	6	7	6.5	6.5
D-Y59□/Y69□ **D-Y7P/Y7□V** **D-Y7□W/Y7□WV** **D-Y7BA**	8	7	5.5	6.5	6.5	12	13	7
D-F5□/J5□/F59F **D-F5□W/J59W** **D-F5BA/F5NT**	4	4	4.5	4.5	4.5	5	5	5.5
D-G5□/K59/G59F **D-G5□W/K59W** **D-G5BA/G5NT**	5	6	6.5	6.5	7	—	—	—
D-G39/K39	9	9	10	10	11	11	11	10
D-G39C/K39C						—	—	—
D-P4DW	4	4	4.5	4	4.5	—	—	—
D-A9□/A9□V	7	—	9	9	9	12	12.5	11.5
D-Z7□/Z80	8	7	9	9.5	10.5	14	14.5	13
D-A3□/A44	9	10	11	11	11	10	10	10
D-A3□C/A44C						—	—	—
D-A5□/A6□						10	10	10
D-B5□/B64						—	—	—
D-A59W	13	13	14	14	15	17	17	17
D-B59W	14	14	17	16	18	—	—	—

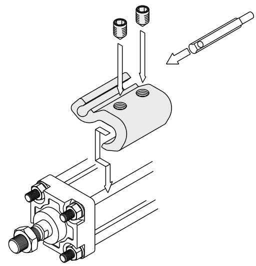
Note 1) D-A9□/A9□V cannot be mounted on ø50.
Note 2) The following auto switches cannot be mounted on ø125 to ø160.
D-G39C, K39C, A3□C, A44C, G5□, K59, G5□W, K59W, G5BA, G59F, G5NT, B5□, B64, B59W, P4DW.

∗ Since the operating range is provided as a guideline including hysteresis, it cannot be guaranteed (assuming approximately ±30% dispersion). It may vary substantially depending on an ambient environment.

Auto Switch Mounting Bracket: Part No.

<Tie-rod Mounting>

Auto switch	Bore size (mm)							
	ø40	ø50	ø63	ø80	ø100	ø125	ø140	ø160
D-M9□/M9□V **D-M9□W/M9□WV** **D-M9□A/M9□AV** **D-A9□/A9□V**	BA7-040	BA7-040 (1)	BA7-063	BA7-080	BA7-080	BS5-125	BS5-125	BS5-160
D-F5□/J5□ **D-F5□W/J59W** **D-F5BA/F59F/F5NT** **D-A5□/A6/A59W**	BT-04	BT-04	BT-06	BT-08	BT-08	BT-12	BT-12	BT-16
D-G39C/K39C **D-A3□C/A44C** (2), (3)	BA3-040	BA3-050	BA3-063	BA3-080	BA3-100	—	—	—
D-Y59□/Y7P/Y7□W **D-Y69□/Y7PV/Y7□WV** **D-Y7BA** **D-Z7□/Z80**	BA4-040	BA4-040	BA4-063	BA4-080	BA4-080	BS4-125	BS4-125	BS4-160
D-P4DW (2)	BAP2-040	BAP2-040	BAP2-063	BAP2-080	BAP2-080	—	—	—



• The above figures show the mounting example of D-A9□(V)/M9□(V)/M9□W(V)/M9□A(V).

<Band Mounting>

Auto switch	Bore size (mm)							
	ø40	ø50	ø63	ø80	ø100	ø125	ø140	ø160
D-G39/K39 **D-A3□/A44**	BD1-04M	BD1-05M	BD1-06M	BD1-08M	BD1-10M	BS1-125	BS1-140	BS1-160
D-G5□/K59 **D-G5□W/K59W** **D-G5BA/G59F/G5NT** **D-B5□/B64/B59W** (2)	BA-04	BA-05	BA-06	BA-08	BA-10	—	—	—

Note 1) D-A9□/A9□V cannot be mounted on ø50.
Note 2) The following auto switches cannot be mounted on ø125 to ø160.
D-G39C, K39C, A3□C, A44C, G5□, K59, G5□W, K59W, G5BA, G59F, G5NT, B5□, B64, B59W, P4DW.
Note 3) Auto switch mounting brackets are attached to D-G39C/K39C/A3□C/A44C.
When ordering, specify the part number as follows depending on the cylinder size.
(Example) ø40: D-A3□C-4, ø50: D-A3□C-5
ø63: D-A3□C-6, ø80: D-A3□C-8
ø100: D-A3□C-10
If auto switch mounting brackets are necessary, order them with the part numbers above.
Note 4) Cylinder tube thickness varies depending on the cylinder type. Take precautions when cylinder types change when band mounting type auto switches are used.

[Mounting screw set made of stainless steel]
The following set of mounting screws made of stainless steel is available. Use it in accordance with the operating environment.
(Please order the auto switch mounting bracket separately, since it is not included.)
BBA1: For D-F5/J5/A5/A6 types
BBA3: For D-G5/K5/B5/B6 types
Note 5) Refer to pages 1225 and 1233 for the details of BBA1 and BBA3.
D-F5BA/G5BA auto switches are set on the cylinder with the stainless steel screws above when shipped. When an auto switch is shipped independently, BBA1 or BBA3 is attached.
Note 6) When using D-M9□A(V)/Y7BA, do not use the steel set screws which is included with the auto switch mounting brackets above (BA7-□□□, BA4-□□□, BS5-□□□, BS4-□□□). Order a stainless steel screw set (BBA1) separately, and select and use the M4 x 6L stainless steel set screws included in the BBA1.

Auto Switch Mounting 4

Besides the models listed in How to Order, the following auto switches are applicable.
Refer to pages 1119 to 1245 for the detailed specifications.

Auto switch type	Part no.	Electrical entry (Feiching direction)	Features	Applicable bore size
Solid state	D-M9NV, M9PV, M9BV	Grommet (Perpendicular)	—	ø40 to ø160
	D-Y69A, Y69B, Y7PV			
	D-M9NWV, M9PWV, M9BWV		Diagnostic indication (2-color indicator)	
	D-Y7NWV, Y7PWV, Y7BWV			
	D-M9NAV, M9PAV, M9BAV		Water resistant (2-color indicator)	
	D-Y59A, Y59B, Y7P	Grommet (In-line)	—	
	D-F59, F5P, J59			
	D-Y7NW, Y7PW, Y7BW		Diagnostic indication (2-color indicator)	
	D-F59W, F5PW, J59W			
	D-F5BA, Y7BA		Water resistant (2-color indicator)	
	D-F5NT		With timer	
	D-G5NT			ø40 to ø100
	D-P5DW		Magnetic field resistant (2-color indicator)	
Reed	D-A93V, A96V	Grommet (Perpendicular)	—	ø40 to ø160
	D-A90V		Without indicator light	
	D-A67, Z80	Grommet (In-line)		
	D-A53, A56, Z73, Z76		—	
	D-B53			ø40 to ø100

∗ For solid state auto switches, auto switches with a pre-wired connector are also available. Refer to pages 1192 and 1193 for details.
∗ Normally closed (NC = b contact) solid state auto switches (D-F9G/F9H/Y7G/Y7H types) are also available. Refer to pages 1137 and 1139 for details.
∗ Wide range detection type, solid state auto switches (D-G5NB type) are also available. Refer to page 1182 for details.

CL1 Series

Made to Order: Individual Specifications

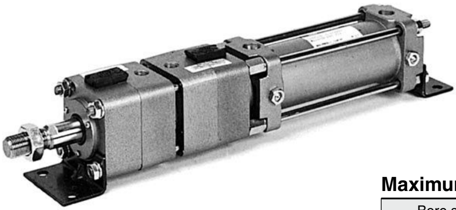
Please contact SMC for detailed dimensions, specifications and lead times.

Symbol
-X51

2 Both-direction Lock-up Cylinder

CL1 Mounting type Bore size — Stroke — Suffix — **X51**

A type of CA1 series (ø40 to ø100) and CS1 series (ø125 to ø160) air cylinder, this is a bi-directional locked-up cylinder in which two uni-directional locked-up units have been assembled by facing them away from each other.



Cylinder Specifications

Maximum operating pressure	ø40 to ø100	1.0 MPa
	ø125 to ø160	0.97 MPa
Minimum operating pressure	0.08 MPa	
Action	Double acting	
Piston speed *	50 to 200 mm/s	
Cushion	Equipped	

* A maximum speed of 500 mm/s is possible if the piston is locked in the stationary state for the purpose of drop prevention.
Make sure that the piston speed does not exceed 200 mm/s during locking.

Locked-up Unit Specifications

Locked-up releasing pressure	0.2 MPa or more (at no-load)
Locked-up starting pressure	0.05 MPa or less
Locked-up direction	Both directions
Maximum speed at locked-up	200 mm/s

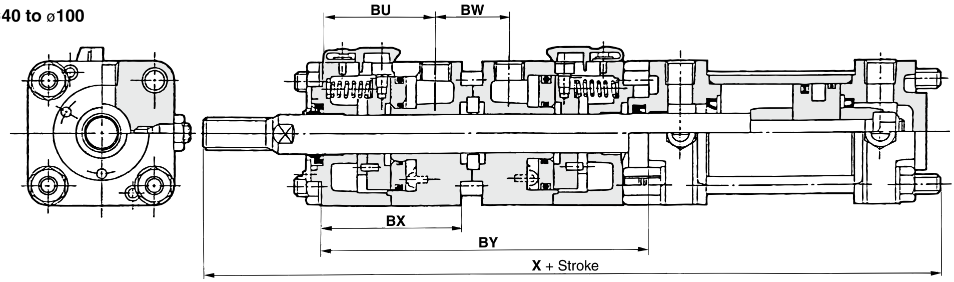
Maximum Load and Holding Force of Locking (Max. static load)

Bore size (mm)		40	50	63	80	100	125	140	160
Max. load according to mounting orientation (N)	Horizontal mounting	588	981	1470	2450	3820	6010	7540	9850
	Vertical mounting	294	490	735	1230	1910	3000	3770	4920
Holding force (N)		1230	1920	3060	4930	7700	12100	15100	19700

* The cylinder can be used to 1/2 of its holding force or below if only a stationary load is applied, such as for drop prevention.

Construction/Dimensions

ø40 to ø100

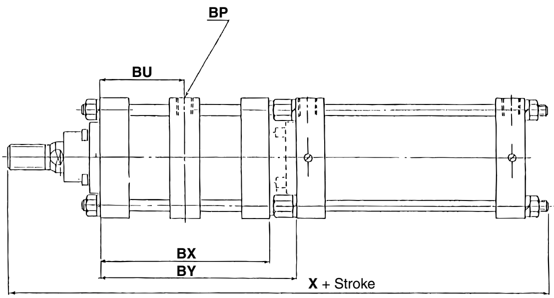


(mm)

Bore size (mm)	BU	BW	BX	BY	X
40	48	31	59	137	283
50	56	30	67	153	312
63	62	30	73	165	335
80	66	34	77	181	385
100	74	34	85	197	412

* For dimensions according to mounting type, refer to CL1 series.

ø125 to ø160



(mm)

Bore size (mm)	BU	BP	BX	BY	X
125	95.5	3/8	191	220	455
140	104.5	3/8	209	238	473
160	112.5	3/8	225	259	515.5

* For dimensions according to mounting type. refer to CS1 series.
* Added the length of BY for full length dimension.

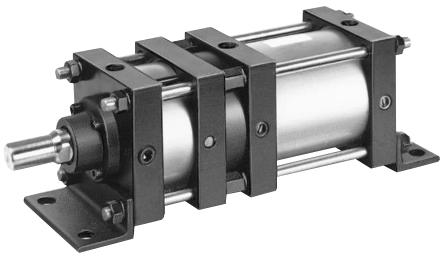
Note) Locked-up port: ø40 to ø100 — 2 positions, ø125 to ø160 — 1 position. In the case of lock releasing of ø40 to ø100, be sure to supply air to both locked-up ports and to release the lock.

CL1 Series
Related Products

Large Bore Lock-up Cylinder (ø180 to ø300)

- **This is a lock-up cylinder with a self-locking system that can be mounted onto a large bore air cylinder (CS1 series) from ø180 to ø300, and contains a ring that is tilted by a spring force, which is further tilted by the thrust of the cylinder to securely lock the piston rod.**

Produced upon receipt of order.
Please contact SMC for details.



Specifications

Applicable bore size	**ø180, ø200, ø250, ø300**
Maximum operating pressure	0.97 MPa
Locked-up releasing pressure	0.2 MPa or more (at no-load)
Locked-up starting pressure	0.05 MPa or less
Locked-up direction	One way (Locking direction is selectable.)
Mounting	Basic type, Foot type, Rod side flange type Head side flange type, Single clevis type Double clevis type, Center trunnion type
Maximum speed at locked-up	200 mm/sec

Maximum Load and Holding Force of Locking (Max. static load)

Bore size (mm)		**180**	**200**	**250**	**300**
Max. load according to mounting orientation (N)	Horizontal mounting	12250	14700	24000	29400
	Vertical mounting	6125	7350	12000	14700
Holding force (N)		24500	29400	48000	58800

∗ The cylinder can be used to 1/2 of its holding force or below if only a stationary load is applied, such as for drop prevention.