



Air Cylinder

CLA Series

Fine Lock Model



High Intermediate Stopping Accuracy
3 Types of Locking Mechanisms
Locks in Either Extended or Retracted Direction
5 Bore Sizes Available
Auto Switch Capable

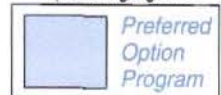
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The Preferred Option Program: "Quick Delivery and Service Assurance"

Options highlighted:



The product series in this catalog utilizes SMC's Preferred Option Program, a unique program intended to emphasize the model configurations that are most readily available where the catalog presents an extensive variety of choice. All other options are available, whereas they may be stocked in lesser quantities or manufactured to order. Special arrangements can be made for repeating (blanket) orders of these product models. Contact your sales representative for further details.

Series CLA – Fine Lock

ø40, ø50, ø63, ø80, ø100

High accuracy of stoppage with three way lock-up unit Series CLA

Stop Accuracy

(Variation in control system is not included) (mm)

| Type of locking | Piston Speed (mm/sec) | | | |
|---|-----------------------|------|------|------|
| | 50 | 100 | 300 | 500 |
| Spring lock | ±0.4 | ±0.5 | ±1.0 | ±2.0 |
| Air pressure lock Spring•Air pressure lock | ±0.2 | ±0.3 | ±0.5 | ±1.5 |

Condition/Load: 25% of thrust at 5kgf/cm²
Solenoid valve: Mount on lock-port

Max. piston speed: 500mm/sec

If the application is within the allowable kinetic energy specified, the Fine Lock Cylinder can operate at velocities between 50–500mm/sec.

Compact with no need for additional mounting space

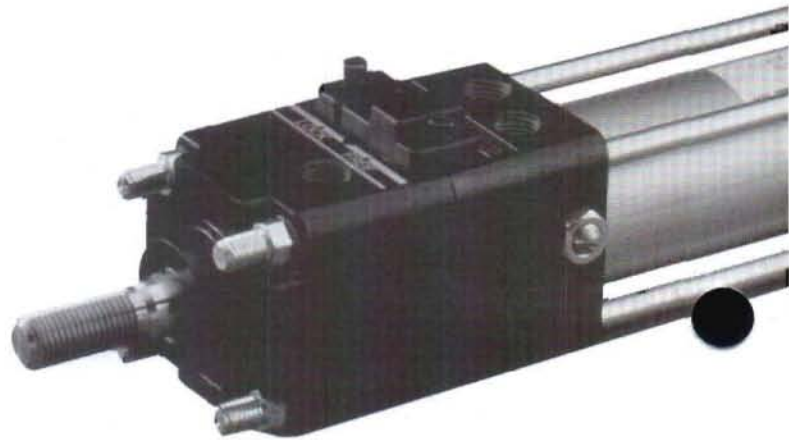
Lock-up unit adds to length but other dimensions are the same as standard type (Series CA1)

Longer life

The newly designed friction diminishing material on brake shoe serves to prevent damaging piston rod and lengthens service life.

Simple maintenance and overhauling

It is easy to disassemble and simple to release lock-up unit by manual override.



Two way lock-up possible

Two way lock-up possible for cylinder stroke.

Warranty

18 months/1800 service miles.
(2897 km)

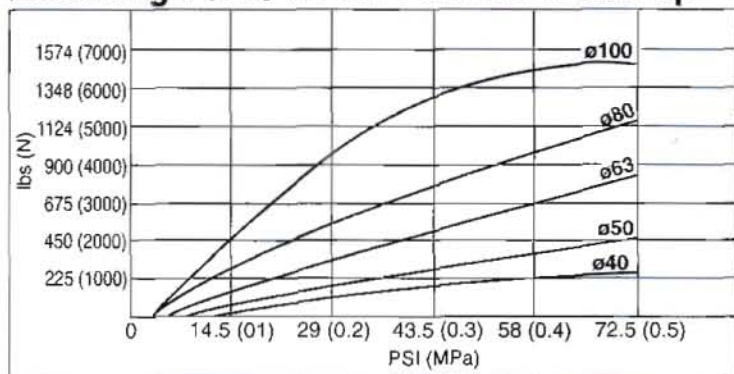
Accurate Mid-Position Stop

Ideal for fail safe applications

High retaining force is applied to piston rod until brake and receives air signal to release. If air pressure is lost, cylinder will maintain position.

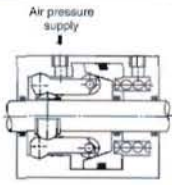
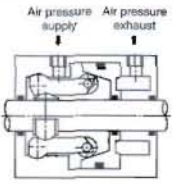
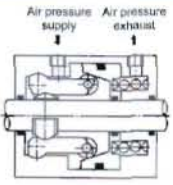
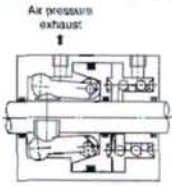
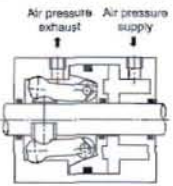
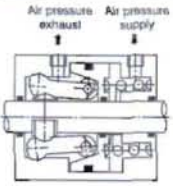


Retaining Force Of Air Pressure Lock-up



1N=0.101972 kg_f
1Mpa=10.1972 kg/cm₂

Lock operation options

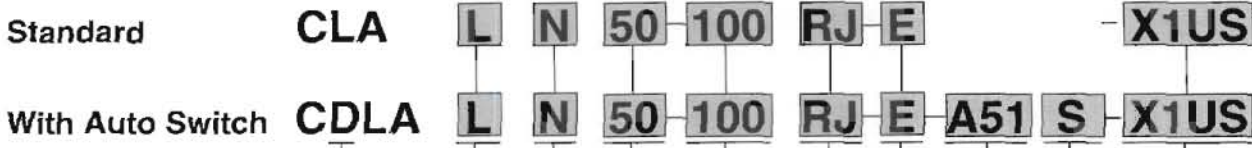
| Locking | Spring lock-up | Air pressure lock-up | Spring-air pressure lock-up |
|-------------------|---|--|--|
| Stoppage accuracy | ±1.0mm | ±0.5mm | |
| Features | Operate towards safety ride (exhaust lock) | <ul style="list-style-type: none"> •High accuracy •Retaining force interchangeable at option •Operate towards safety side | <ul style="list-style-type: none"> •High accuracy •Retaining force interchangeable |
| Releasing |  |  |  |
| Locking |  |  |  |

Series CLA

Air Cylinder with Brake

ø40, ø50, ø63, ø80, ø100

How To Order



Built-in magnet

Mounting

| | |
|---|-----------------|
| B | Basic |
| L | Foot |
| F | Front flange |
| G | Rear flange |
| C | Single clevis |
| D | Double clevis |
| T | Center trunnion |

Type

| | |
|---|---------------|
| — | Lube type* |
| N | Non-lube type |
| F | Iron lube* |

*Not available on X1US

Bore size

| | |
|-----|-------|
| 40 | 40mm |
| 50 | 50mm |
| 63 | 63mm |
| 80 | 80mm |
| 100 | 100mm |

Cylinder stroke (mm)

Please refer to page 7 for standard stroke.

Suffix symbol for cylinder

| | | |
|----------|---|------------------|
| Rod boot | J | Nylon tarpaulin* |
| | K | Neoprene cloth* |
| Cushion | — | Both ends |
| | N | None |
| | R | Rod end only |
| | H | Head end only |

*Not available on X1US

Port Threads (cyl. ports/lock units)

| | |
|------|---|
| — | PT Thread |
| X1US | NPT Thread (See Std. Rod Thread/ Port Thread Chart) |

* X1US not available with lube type or iron lube

Number of auto switch

| | |
|---|-------|
| — | 2 pcs |
| S | 1 pc |
| 3 | 3 pcs |
| n | n pcs |

Applicable Auto Switch

*Refer to table below for selection of applicable auto switch

| | |
|---|---------------------|
| — | Without auto switch |
|---|---------------------|

Type of locking

| | |
|---|-----------------------------------|
| E | Spring lock-up (Exhaust lock) |
| P | Air pressure lock-up (Press lock) |
| D | Spring/Air pressure lock-up |

Note: Cylinder is unlocked at time of shipment
See page 9 for notes and instructions of engaging lock unit.

Applicable auto switch/Tie rod mounted

| Tie rod | Band | Out put | Lead wire | Switch type | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|-------|-------------------|-----------|-------------|-------------------|-----------|---------------|---------|-------------------|-----------|-------------------|---------|---------------|---------|-------------------|---------|-------------------|---------|---------------|---------|-------------------|---------|-------------------|---------|-------------------|---------|-------------------|---------|
| A56 | — | 3 wire system | Grommet | Reed | | | | | | | | | | | | | | | | | | | | | | | | |
| A53 | B53 | 2 wire system | | | Connector | | | | | | | | | | | | | | | | | | | | | | | |
| A54 | B54 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A67 | — | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A64 | B64 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A33C | A33 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A34C | A34 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A44C | A44 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A59W | B59W | 3 wire system/NPN | Grommet | Solid State | | | | | | | | | | | | | | | | | | | | | | | | |
| F59 | G59 | | | | 3 wire system/PNP | Connector | | | | | | | | | | | | | | | | | | | | | | |
| F5P | G5P | | | | | | 2 wire system | Grommet | | | | | | | | | | | | | | | | | | | | |
| J51 | — | | | | | | | | 3 wire system/NPN | Connector | | | | | | | | | | | | | | | | | | |
| J59 | K59 | | | | | | | | | | 3 wire system/PNP | Grommet | | | | | | | | | | | | | | | | |
| G39C | G39 | | | | | | | | | | | | 2 wire system | Grommet | | | | | | | | | | | | | | |
| K39C | K39 | | | | | | | | | | | | | | 3 wire system/NPN | Grommet | | | | | | | | | | | | |
| F59W | G59W | | | | | | | | | | | | | | | | 3 wire system/PNP | Grommet | | | | | | | | | | |
| F5PW | G5PW | | | | | | | | | | | | | | | | | | 2 wire system | Grommet | | | | | | | | |
| J59W | K59W | | | | | | | | | | | | | | | | | | | | 3 wire system/NPN | Grommet | | | | | | |
| F5BAL | G5BAL | | | | | | | | | | | | | | | | | | | | | | 4 wire system/NPN | Grommet | | | | |
| F5NTL | G5NTL | | | | | | | | | | | | | | | | | | | | | | | | 4 wire system/NPN | Grommet | | |
| F59F | G59F | | | | | | | | | | | | | | | | | | | | | | | | | | 4 wire system/NPN | Grommet |
| F5LF | — | | | | | | | | | | | | | | | | | | | | | | | | | | | |

*For complete auto switch specification please see pgs. 18-20.

*Lead wire length 0.5m.....—(Example: A53)
3m.....L (Example: A53L)
5m.....Z (Example: A53Z)



| Bore size (mm) | 40 | 50 | 63 | 80 | 100 |
|----------------|---------|---------|---------|---------|---------|
| Foot | CA1-L04 | CA1-L05 | CA1-L06 | CA1-L08 | CA1-L10 |
| Flange | CA1-F04 | CA1-F05 | CA1-F06 | CA1-F08 | CA1-F10 |
| Single Clevis | CA1-C04 | CA1-C05 | CA1-C06 | CA1-C08 | CA1-C10 |
| Double Clevis | CA1-D04 | CA1-D05 | CA1-D06 | CA1-D08 | CA1-D10 |

* If foot bracket is required, order 2 pcs. per cylinder.

** The clevis mount comes with clevis pin, flat washer and split pin.



Model

| Series | Type | Action | Bore size (mm) | Type of locking |
|--------|---------------|--------|-----------------|-----------------------------|
| CLAO | Lube type | Double | 40,50,63,80,100 | Spring lock-up |
| CLAON | Non-lube type | | | Air pressure lock-up |
| | | | | Spring/Air pressure lock-up |

Cylinder Specifications

For Lock Unit specifications see page 8

| Media | Air | |
|---------------------------------|---|---------------------|
| Proof pressure | 217 PSI (1.5 MPa) | |
| Max. operating pressure | 145 PSI (1.0 MPa) | |
| Min. operating pressure | 12 PSI (0.08 MPa) | |
| Operating piston speed | 2~20in/sec *(50~500mm/sec) | |
| Ambient and fluid temperature | Standard | 14~158°F (-10~70°C) |
| | Switch Capable | 14~140°F (-10~60°C) |
| Cushion | Both ends (Air cushion) | |
| Thread tolerance | JIS 2 class | |
| Allowable stroke tolerance (mm) | -250: ⁺¹⁰ , 251~1000: ⁺¹⁶ , 1001~1500: ⁺¹⁸ | |
| Mounting | Basic, Foot, Front flange, Rear flange Single clevis, Rear trunnion | |

* Max. piston speed at which locking is possible is limited by the max. allowable Kinetic energy.

1Mpa=10.1972 kgf/cm²

Locking Specifications

| Locking | Spring lock-up (Exhaust lock) | Spring-Air pressure lock-up | Air pressure lock-up (Press lock) |
|--|-------------------------------|-----------------------------|-----------------------------------|
| Releasing pressure PSI (kgf/cm ²) | 43.5 (3.1) or more | | 14.5 (1.0) or more |
| Locking pressure PSI (kgf/cm ²) | 36.3 (2.5) or less | | 7.3 (0.5) or more |
| Max. operating pressure PSI (kgf/cm ²) | 72.5 (5.1) | | |
| Locking direction | Both ways | | |

Standard Stroke

| Bore size (mm) | Standard stroke (mm)* |
|----------------|--|
| 40 | 25,50,75,100,125,150,175,200,250,300,250,400,450,500 |
| 50 | 25,50,75,100,125,150,175,200,250,300,250,400,450,500,600 |
| 63 | 25,50,75,100,125,150,175,200,250,300,250,400,450,500,600 |
| 80 | 25,50,75,100,125,150,175,200,250,300,250,400,450,500,600,700 |
| 100 | 25,50,75,100,125,150,175,200,250,300,250,400,450,500,600,700 |

* See table on page 14 for long stroke

Minimum Allowable Stroke When Mounting Auto Switches

Refer to page 24 on "Minimum Allowable Stroke when Mounting Auto Switches"

Weight/Aluminum Tube (Iron Tube)

(lbs)

| | | Bore size (mm) | 40 | 50 | 63 | 80 | 100 |
|--------------------------------------|-------------------|--|-------------|-------------|---------------|---------------|---------------|
| Standard | Basic | | 4.01 (4.12) | 6.15 (6.24) | 9.72 (9.81) | 15.87 (16.23) | 22.69 (23.15) |
| | Foot | | 4.43 (4.54) | 6.64 (6.72) | 10.47 (10.56) | 17.35 (17.70) | 24.87 (25.33) |
| | Flange | | 4.83 (4.94) | 7.14 (7.23) | 11.46 (11.55) | 19.07 (19.42) | 26.92 (27.38) |
| | Single Clevis | | 4.52 (4.63) | 6.90 (6.99) | 11.11 (11.20) | 18.32 (18.67) | 26.61 (27.07) |
| | Double Clevis | | 4.61 (4.72) | 7.10 (7.19) | 11.46 (11.55) | 18.96 (19.31) | 27.76 (28.22) |
| | Trunnion | | 5.00 (5.22) | 7.32 (7.54) | 11.68 (12.13) | 19.62 (20.26) | 27.98 (28.84) |
| Additional weight for each 50 stroke | Aluminum tube | All mounting bracket | 0.49 | 0.62 | 0.82 | 1.15 | 1.43 |
| | Iron tube | All mounting bracket (except trunnion iron tube) | 0.62 | 0.77 | 0.95 | 1.54 | 1.92 |
| | | Trunnion or Iron tube | 0.79 | 1.01 | 1.43 | 1.90 | 2.36 |
| Option | Single rod clevis | | 0.51 | 0.57 | 0.57 | 1.32 | 1.83 |
| | Double rod clevis | | 0.71 | 0.84 | 0.84 | 1.61 | 2.38 |
| | Rod clevis pin | | 0.11 | 0.11 | 0.11 | 0.31 | 0.42 |

Example) CLAL40-100-E

• Basic weight 4.42 (Foot ø40)
• Additional weight48/50 Stroke

• Cylinder stroke 100 stroke
4.42+.48X(100/50)=5.38 lbs.

Accessories

Rod end nut (Standard), single knuckle joint, Double knuckle joint,

* Standard: Only double knuckle or double clevis

See page 25 for dimensional drawings

Allowable Kinetic Energy at Locking

| Bore size (mm) | 40 | 50 | 63 | 80 | 100 |
|--|------|------|------|------|------|
| Allowable kinetic energy at locking (in*lbs) | 12.6 | 19.6 | 31.2 | 50.3 | 78.1 |

① The above listed kinetic energy corresponds to a load factor of 50% at 5 kgf/cm² and piston speed of 300mm/sec from viewpoint of practical application of load. Therefore, if the conditions of application fall within these factors, the calculation is not necessary.

● Kinetic energy at load will be worked out as follows:

Ek: Kinetic energy at load (kgf-cm)

$$E_k = \frac{W}{2g} V^2$$

w: Load weight (kgf)

g: Acceleration of gravity 980 (cm/s²)

v: Piston speed (cm/s)

(Average speed × 1.2, refer to particle 3)

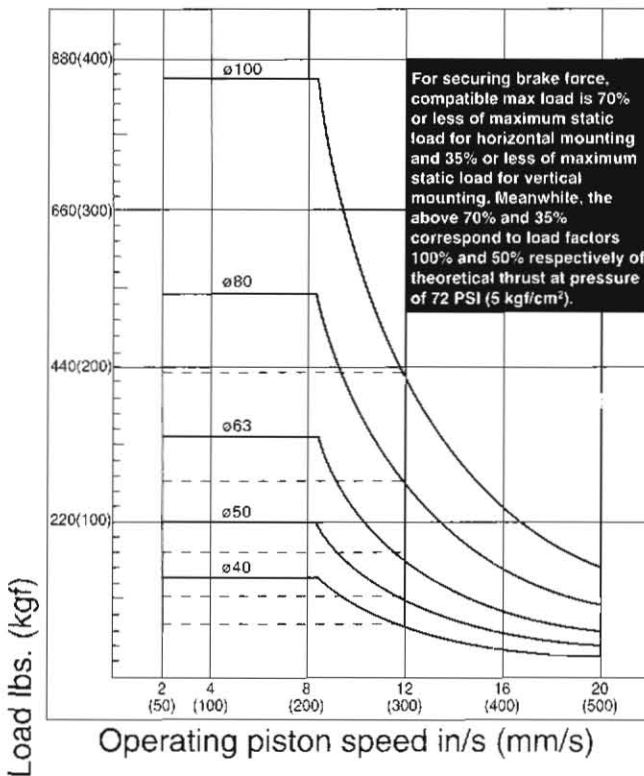
② If piston speed exceeds average speed before locking. The calculation of standard piston speed for kinetic energy at load is the average speed × 1.2.

③ The relation between speed and load is as illustrated below. The range of kinetic energy is under the line.

④ At locking, lock-up unit absorbs not only kinetic energy, but also thrust of cylinder itself.

Therefore, for securing lock force, load has an upper limit even if it falls within allowable kinetic energy.

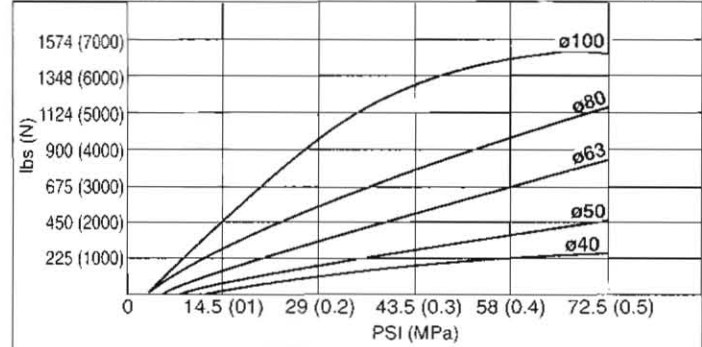
The compatible range will be under the solid line for horizontal mounting, and under the dotted line for vertical mounting.



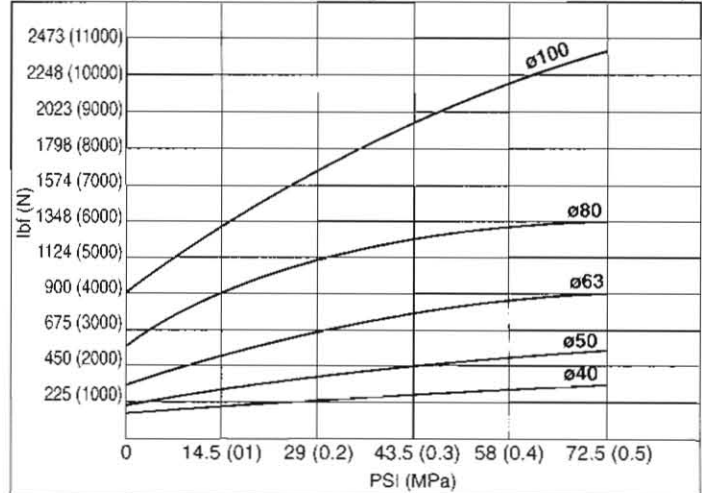
Retaining Force Of Air Pressure Lock-up (Max. Static Load)

| Bore size (mm) | 40 | 50 | 63 | 80 | 100 |
|---------------------------|----------|-----------|-----------|-----------|------------|
| Retaining force lbs (kgf) | 195 (90) | 308 (140) | 485 (220) | 772 (350) | 1213 (550) |

Retaining Force Of Air Pressure Lock-up



Retaining Force Of Spring-Air Pressure Lock-up



Retaining force is the capability that can retain a static load with no vibration or impact after locking. Therefore, when used at near the upper limit, the following guide will be helpful.

- Slip exceeding retaining force may damage brake shoe, which could lead to reduced retaining force, resulting in its shorter life.
- Cylinder loading should be within 35% of holding force when the brake is used for drop protection.
- Do not apply any impact when you load the cylinder in the locked position.

Stoppage Accuracy

(Variation in control system is not included)

mm (IN)

| Type of locking | Piston speed mm/sec (in/sec) | | | |
|--------------------------|------------------------------|---------------|--------------|--------------|
| | 50 (2) | 100 (4) | 300 (12) | 500 (20) |
| Spring lock | ±0.4 (±0.016) | ±0.5 (±0.02) | ±1.0 (±0.04) | ±2.0 (±0.08) |
| Air pressure lock | ±0.2 (±0.008) | ±0.3 (±0.012) | ±0.5 (±0.02) | ±1.5 (±0.06) |
| Spring-Air pressure lock | ±0.2 (±0.008) | ±0.3 (±0.012) | ±0.5 (±0.02) | ±1.5 (±0.06) |

Condition/Load: 25% of thrust at 75psi

Solenoid valve Mount on lock-port

Locking Specifications

Locking Mechanism/Manual Override Operating Instructions

Note: The cylinder is unlocked at time of shipment. The locking mechanism is disabled in this condition. After adjusting the axial alignment during mounting, remember to switch the cylinder to the locked status prior to use.

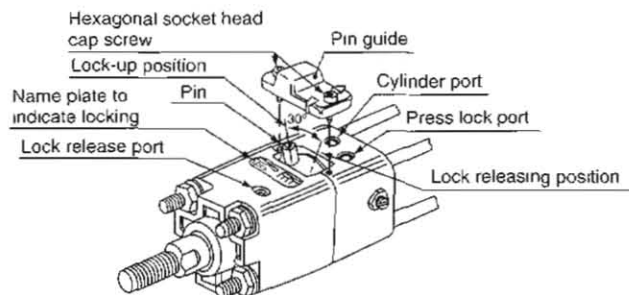
Use the following steps:

Guide to change to lock-up condition

- ❶ Unscrew the 2 socket head cap screws and remove the pin guide.
- ❷ When viewed from the rod end, you should find the pin slanting 15° right of the center axis.
- ❸ Pressurize the lock release port to 44 PSI (3.1 kg/cm²) or more.
- ❹ Rotate the pin 30° counter-clockwise (when viewed from the rod end) using a wooden or plastic handle, taking care not to damage the pin or lock unit. **Note: Do not hit the pin to rotate or the pin could be bent or damaged as a result. Be careful when pushing the pin as it may be slippery.**
- ❺ Align the pin with the oval hole on the bottom of the pin guide and secure the pin guide with the two cap screws. The crown of the pin guide will align with the LOCK indication.

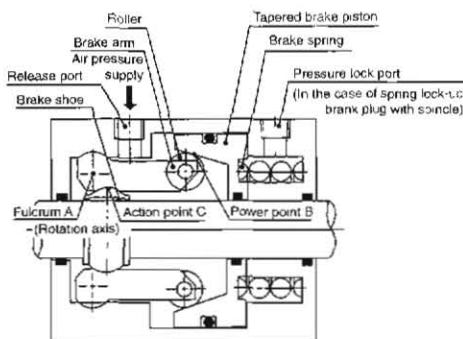
Lock release by manual override

- ❶ Unscrew the 2 socket head cap screws and remove the pin guide.
- ❷ When viewed from the rod end, you should find the pin slanting 15° left of the center axis.
- ❸ It is not required that the lock release port be pressurized to unlock the device, but it will make the task easier. Pressurize to 44 PSI (3.1 kg/cm²) or more if desired.
- ❹ Rotate the pin 30° clockwise (when viewed from the rod end) using a wooden or plastic handle, taking care not to damage the pin or lock unit. **Note: Do not hit the pin to rotate or the pin could be bent or damaged as a result. Be careful when pushing the pin as it may be slippery.**
- ❺ Align the pin with the oval hole on the bottom of the pin guide and secure the pin guide with the two cap screws. The crown of the pin guide will align with the FREE indication.

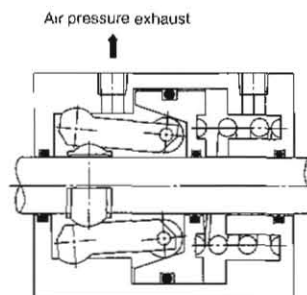


Construction

Spring lock-up



Lock releasing

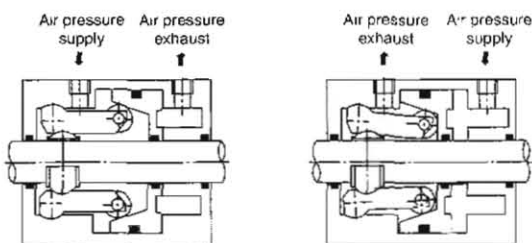


Locking

Spring force applied to the tapered brake piston is amplified by the wedge effect $\frac{AB}{AC}$ times by the effect of lever, works on the brake shoe, then turns into a large gripping force which tightens on the piston rod to lock it.

To release lock up, apply air pressure to releasing port to eliminate the spring force.

Air pressure lock-up

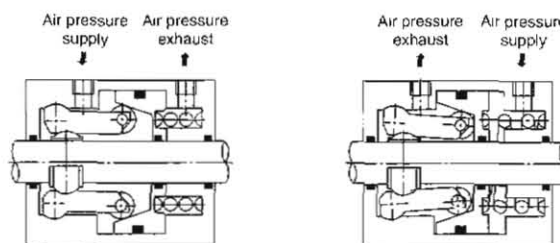


Lock releasing

Locking

Air pressure drives the lock piston.

Spring with air pressure lock-up



Lock releasing

Locking

Air pressure and spring force combine to drive lock piston.

Recommended circuit

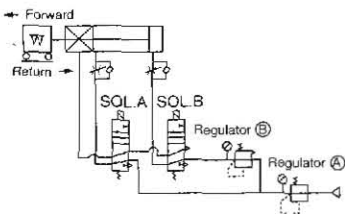
- Assemble circuit as shown in diagrams 1 to 6.

While in lock-up, cylinder piston receives on both sides, balance pressure of load which is balanced by means of regulator (B), therefore it prevents the piston rod from rapidly advancing when released and safety is insured.

Diagram 1~3 will be helpful for the application of spring lock-up, and diagram 4~6 are for Air pressure lock-up and Spring with Air pressure lock-up.

- Every circuit applied to respective mounting will also be compatible with other mountings, however, care should be taken to check operation position of load balance regulator (B) and features of circuits before use.
- When air-pressure on main line fluctuates or lose its balance due to the use of other pneumatic components, the use of regulator (A) will be recommended.

Diagram 1. Horizontal mounting (Use Spring lock-up)



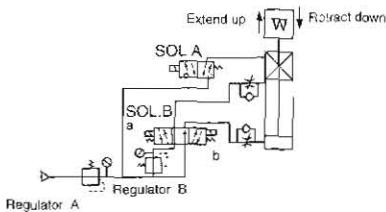
| Sol. A | Sol. B | Operation |
|--------|--------|-----------|
| ON | OFF | Forward |
| OFF | OFF | Locking |
| ON | OFF | Forward |
| OFF | ON | Return |
| OFF | OFF | Locking |
| OFF | ON | Return |

Lock releasing signal of this circuit is designed to synchronize with two way signals of cylinder, therefore, this circuit is of higher safety. But it is common that the distance between cylinder and solenoid valve become longer, which may delay the start of locking.

Especially when used for vertical mounting, sometimes a time delay can result in proportionate dropping. Therefore, be sure to keep the distance between cylinder and solenoid valve and piping connections as short as possible.

When the circuit is used for vertical application, be sure to keep load factors 3 kgf/cm² or more since balance pressure set by regulator (B) is to become releasing pressure. Both Sol A and Sol B can accept direct-operated type or pilot operated type.

Diagram 2. Vertical upward mounting (Use Spring lock-up)



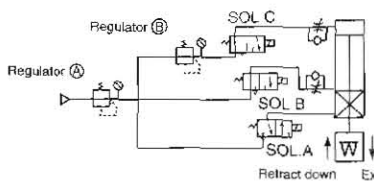
| Sol. A | Sol. B a | Sol. B b | Operation |
|--------|----------|----------|--------------|
| ON | ON | OFF | Extend up |
| OFF | OFF | OFF | Locking |
| ON | ON | OFF | Extend up |
| ON | OFF | ON | Retract down |
| OFF | OFF | OFF | Locking |
| ON | OFF | ON | Retract down |

Since this circuit is not designed for the lock releasing signal to be synchronized with two way signals of cylinder, control system side should send lock releasing signal before or in time with two way signals of cylinder, if delayed rod will rapidly advance, which should be taken into your consideration.

As you find that Solenoid valve Sol A for lock releasing is independent, you can use a compact 3-way valve and mount it directly to lock-port by means of a nipple so that you can get the time delay of locking as short as possible.

Operation of Sol A can release locking independently. Sol A can accept direct-operated type or pilot-operated type, while Sol B direct-operated type only.

Diagram 3. Vertical downward mounting (Use Spring lock-up)

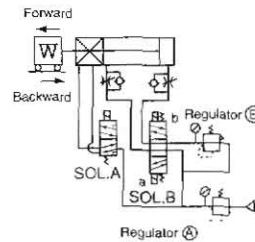


| Sol. A | Sol. B | Sol. C | Operation |
|--------|--------|--------|--------------|
| ON | ON | OFF | Retract down |
| OFF | OFF | OFF | Locking |
| ON | ON | OFF | Retract down |
| ON | OFF | ON | Extend up |
| OFF | OFF | OFF | Locking |
| ON | OFF | ON | Extend up |

As compared with Diagram 2, this circuit employs 3-port 2 position solenoid valve instead of 5-port 3 position solenoid valve leaving the others unchanged.

Sol A, B and C can accept direct-operated type or pilot-operated type.

Diagram 4. Horizontal mounting (Use air pressure lock-up or spring with air pressure lock-up)

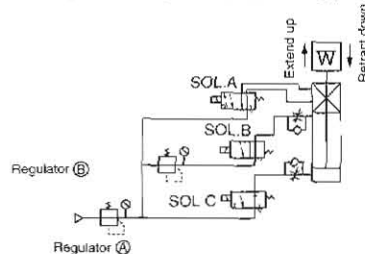


| Sol. A | Sol. B a | Sol. B b | Operation |
|--------|----------|----------|-----------|
| ON | ON | OFF | Forward |
| OFF | OFF | OFF | Locking |
| ON | ON | OFF | Forward |
| ON | OFF | ON | Backward |
| OFF | OFF | OFF | Locking |
| ON | OFF | ON | Backward |

As compared with Diagram 2, this circuit employs 5-port valve instead of Sol A leaving the others changed.

Be sure to set regulator (A) 3.5 kgf/cm² or more for Spring with air pressure lock-up and 1 kgf/cm² or more for Air pressure lock-up. Sol A accept direct-operated type or pilot-operated type, while Sol B direct-operated type only.

Diagram 5. Vertical upward mounting (Use air pressure lock-up or spring with air pressure lock-up)

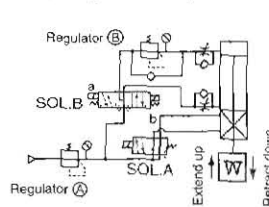


| Sol. A | Sol. B | Sol. C | Operation |
|--------|--------|--------|--------------|
| ON | ON | OFF | Extend up |
| OFF | OFF | OFF | Locking |
| ON | ON | OFF | Extend up |
| ON | OFF | ON | Retract down |
| OFF | OFF | OFF | Locking |
| ON | OFF | ON | Retract down |

As compared with Diagram 3, this circuit employs 5-port valve instead of Sol A leaving the other unchanged.

Be sure to set regulator (A) 3.5 kgf/cm² or more for spring with air pressure lock-up and 1 kgf/cm² or more for Air pressure lock-up. Sol A, B & C accept direct-operated type or pilot operated type.

Diagram 6. Vertical downward mounting (Use air pressure lock-up or spring with air pressure lock-up)



| Sol. A | Sol. B a | Sol. B b | Operation |
|--------|----------|----------|--------------|
| ON | ON | OFF | Retract down |
| OFF | OFF | OFF | Locking |
| ON | ON | OFF | Retract down |
| ON | OFF | ON | Extend up |
| OFF | OFF | OFF | Locking |
| ON | OFF | ON | Extend up |

As compared with Diagram 3, this circuit employs 5-port instead of Sol A and 5-port 3 position solenoid valve (pressure center) instead of Sol B.

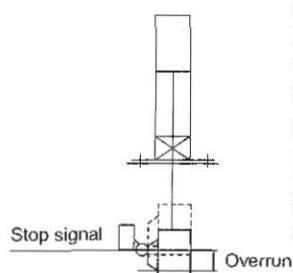
Be sure to use a regulator (B) that has check valve. (reverse flow) Set regulator (A) 3.5 kgf/cm² or more for spring with air pressure lock-up and 1 kgf/cm² or more for air pressure lock-up. Sol A accept direct-operated type and pilot-operated type.

Stop accuracy and overrun

Due to mechanical lock-up, this cylinder has time delay before it stops due to stop signal. Cylinder stroke subjected to this time delay is referred to as "overrun".

* This distance between max. and min. overrun is stoppage accuracy.

This relation is as illustrated below.



Set limit switch in front of expected stop position equal to overrun. Limit switch should have such a detection length (dog length) as overrun plus α .

SMC auto switch operates within the range of 8-14 mm (depending upon the type of switch). When overrun exceeds this range, contact self retaining should be worked out on the switch load side.

* For more details about stoppage accuracy, please refer to series CLA (P8).

Precautions on stoppage accuracy

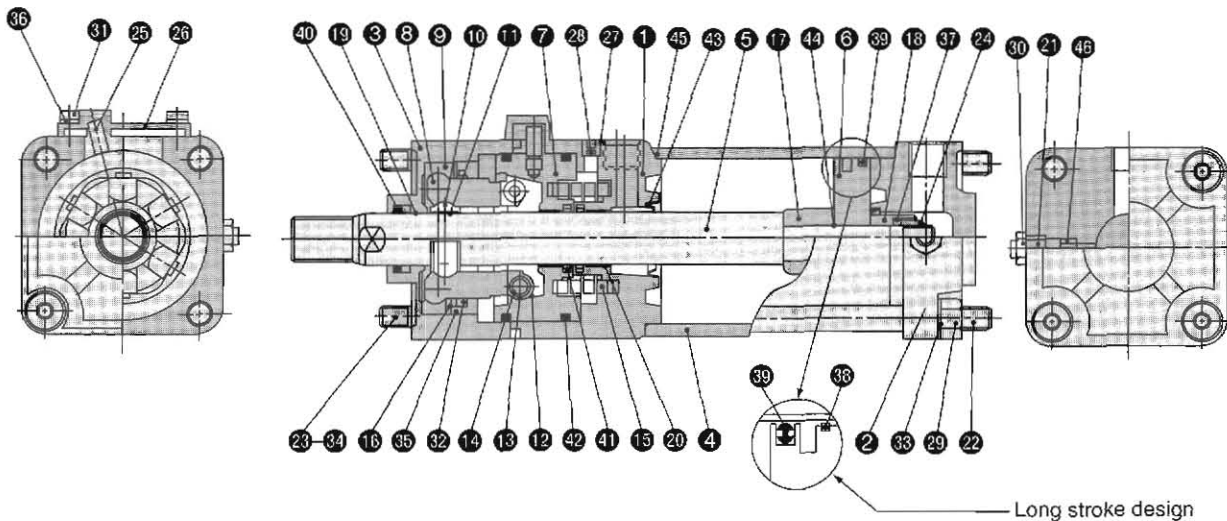
① In order to get higher stoppage accuracy, we recommend air pressure lock-up or spring with air pressure lock-up. If you even want higher stoppage accuracy, it is important to cut the time between signal and stop. The counter-measure is as follows. Select control circuit and solenoid valve that are of direct current drive and of good response time.

Make the distance between solenoid valve and cylinder as short as possible and especially the lock-up solenoid valve should be connected to lock port as directly as possible.

② Load fluctuation during two way stroke of cylinder can cause piston to change its speed, which makes the stop position of cylinder fluctuate.

Therefore, adjust mounting properly so that load fluctuation may never take place during two way stroke of cylinder, especially just before it stops.

③ Since speed of cylinder changes considerably during the process of cushion and during its start and next stop, stop position varies widely. Therefore, in the case of short step movement during its start and next stop, accuracy specified (depending upon the cases, but 300 mm will be the standard) sometimes will not come true, please take into consideration.



Parts List

| No. | Description | Material | Notes |
|-----|---------------------------------|------------------------|---------------------------|
| 1 | Rod cover | Aluminum alloy | Hard black anodized |
| 2 | Head cover | Aluminum alloy | |
| 3 | Cover | Aluminum alloy | Hard black anodized |
| 4 | Cylinder tube | Aluminum alloy | Hard anodized |
| 5 | Piston rod | Carbon steel | Hard chrome plated |
| 6 | Piston | Aluminum alloy | Chromate |
| 7 | Brake piston | Carbon steel | Nitrided |
| 8 | Brake arm | Carbon steel | Nitrided |
| 9 | Arm holder | Carbon steel | Nitrided |
| 10 | Brake shoe holder | Carbon steel | Nitrided |
| 11 | Brake shoe | Special brake material | |
| 12 | Roller | Cr. Mb. steel | Nitrided |
| 13 | Pin | Carbon steel | heat treatment |
| 14 | Snap ring | Carbon steel | Nickel plated |
| 15 | Brake spring | Spring wire | |
| 16 | Nose cap | Roller steel | Zinc chromate plated |
| 17 | Cushion ring A | Roller steel | Zinc chromate plated |
| 18 | Cushion ring B | Roller steel | Zinc chromate plated |
| 19 | Bushing | Bronze casting | |
| 20 | Bushing | Bronze casting | |
| 21 | Cushion valve | Rolled bronze | Electroless nickel plated |
| 22 | Tie-rod | Carbon steel | Uni-chromate |
| 23 | Tie-rod for fixing lock up unit | Carbon steel | Uni-chromate |

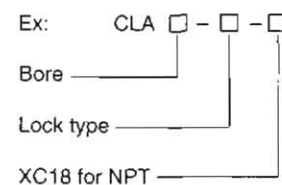
| No. | Description | Material | Notes |
|-----|-------------------------------|---------------|---------------------|
| 24 | Piston nut | Rolled steel | Zinc chromate |
| 25 | Non-rotating pin | Carbon steel | Induction hardening |
| 26 | Pin guide | Carbon steel | Nitrided |
| 27 | Hexagon socket | Cr. Mb. steel | Black zinc chromate |
| 28 | Element | Bronze | |
| 29 | Tie-rod nut | Carbon steel | Black zinc chromate |
| 30 | Lock nut | Carbon steel | Nickel plating |
| 31 | Hexagon socket head cap screw | Cr. Mb. steel | Black zinc chromate |
| 32 | Hexagon socket head cap screw | Stainless | Nickel plated |
| 33 | Spring washer | Steel wire | Black zinc chromate |
| 34 | Spring washer | Steel wire | Black zinc chromate |
| 35 | Spring washer | Steel wire | Black zinc chromate |
| 36 | Spring washer | Steel wire | Black zinc chromate |
| 37 | Spring washer | Steel wire | Zinc chromate |
| 38 | Wearing | Phenol | |
| 39* | Piston seal | NBR | |
| 40* | Rod seal A | NBR | |
| 41* | Rod seal B | NBR | |
| 42* | Brake piston seal | NBR | |
| 43 | Cushion seal | NBR | |
| 44 | Piston gasket | NBR | |
| 45* | Tube gasket | NBR | |
| 46* | Cushion valve seal | NBR | |

Seal Kit List

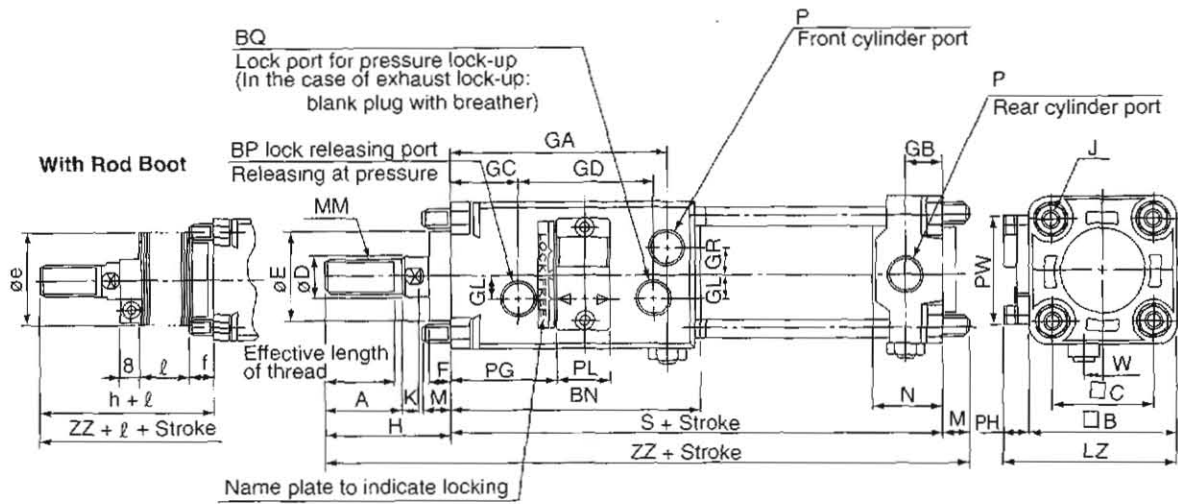
| Bore Size (mm) | Seal kit part number | | Contents |
|----------------|----------------------|-----------|---------------------------------------|
| | Non-lube | Lube | |
| 40 | CLAN40-PS | CLA40-PS | Set of the No. 39, 40, 41, 42, 45, 46 |
| 50 | CLAN50-PS | CLA50-PS | |
| 63 | CLAN63-PS | CLA63-PS | |
| 80 | CLAN80-PS | CLA80-PS | |
| 100 | CLAN100-PS | CLA100-PS | |

*The seal kit includes: 1-piston seal, 1-rod seal A, 2-rod seals B, 1-brake piston seal, 2-tube gaskets, and 2-cushion valve seals

Note: There are no replacement parts available for brake. Entire brake unit must be replaced.



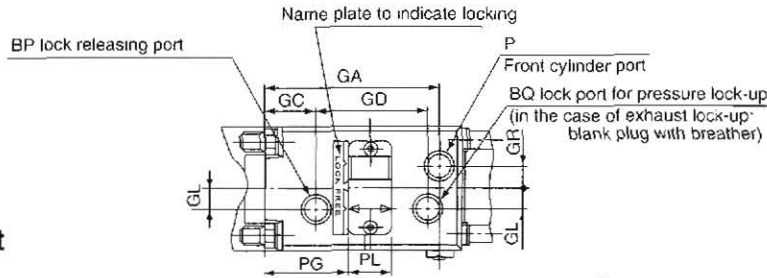
Basic Type/CLAB



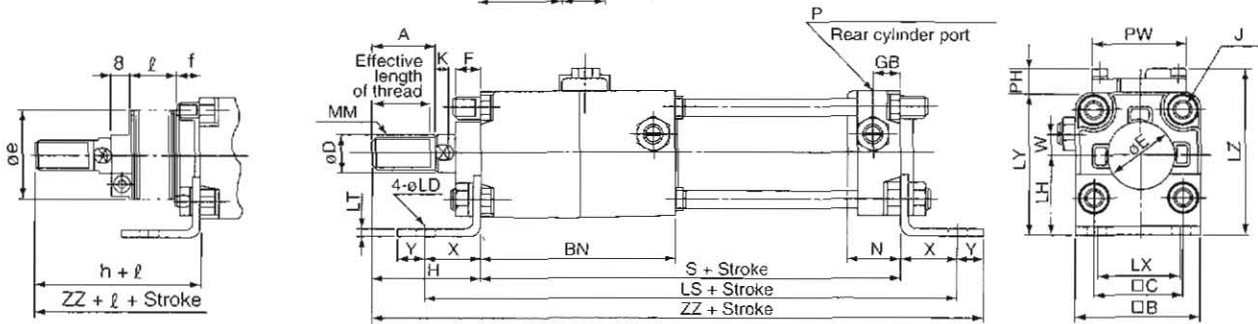
| Bore size (mm) | Stroke range (mm) | | Effective length of thread | A | □B | BN | BP | BQ | □C | øD | øE | F | GA | GB | GC | GD | GL | GR | J |
|----------------|-------------------|-----------|----------------------------|----|-----|-----|----|----|----|----|----|----|-----|----|----|----|----|----|----------|
| | without boot | With boot | | | | | | | | | | | | | | | | | |
| 40 | ~500 | 20~500 | 27 | 30 | 60 | 96 | ¼ | ¼ | 44 | 16 | 32 | 10 | 85 | 15 | 26 | 54 | 10 | 10 | M8×1.25 |
| 50 | ~600 | 20~600 | 32 | 35 | 70 | 108 | ¼ | ¼ | 52 | 20 | 40 | 10 | 95 | 17 | 27 | 59 | 13 | 12 | M8×1.25 |
| 63 | ~600 | 20~600 | 32 | 35 | 86 | 115 | ¼ | ¼ | 64 | 20 | 40 | 10 | 102 | 17 | 26 | 67 | 18 | 15 | M10×1.25 |
| 80 | ~750 | 20~750 | 37 | 40 | 102 | 129 | ¼ | ¼ | 78 | 25 | 52 | 14 | 113 | 21 | 30 | 72 | 23 | 17 | M12×1.75 |
| 100 | ~750 | 20~750 | 37 | 40 | 116 | 140 | ¼ | ¼ | 92 | 30 | 52 | 14 | 124 | 21 | 31 | 76 | 25 | 19 | M12×1.75 |

| Bore size (mm) | K | LZ | M | MM | MM X1US | N | P | PG | PH | PL | PW | S | W | Without boot | | With boot | | | | |
|----------------|----|-----|----|---------|-----------|----|-----|------|----|----|----|-----|---|--------------|-----|-----------|------|----|----------|-----|
| | | | | | | | | | | | | | | H | ZZ | øe | f | h | ℓ | zz |
| 40 | 6 | 71 | 11 | M14×1.5 | 7/16 - 20 | 27 | ¼ | 42 | 11 | 20 | 45 | 153 | 8 | 51 | 215 | 43 | 11.2 | 59 | ¼ stroke | 223 |
| 50 | 7 | 80 | 11 | M18×1.5 | ¾ - 16 | 30 | 3/8 | 46 | 10 | 21 | 50 | 168 | 0 | 58 | 237 | 52 | 11.2 | 66 | | 245 |
| 63 | 7 | 99 | 14 | M18×1.5 | | 31 | 3/8 | 48.5 | 13 | 23 | 60 | 182 | 0 | 58 | 254 | 52 | 11.2 | 66 | | 262 |
| 80 | 11 | 117 | 17 | M22×1.5 | | 37 | ½ | 55 | 15 | 23 | 70 | 208 | 0 | 71 | 296 | 65 | 12.5 | 80 | | 305 |
| 100 | 11 | 131 | 17 | M26×1.5 | 1 - 14 | 40 | ½ | 56.5 | 15 | 25 | 80 | 226 | 0 | 72 | 315 | 65 | 14 | 81 | | 324 |

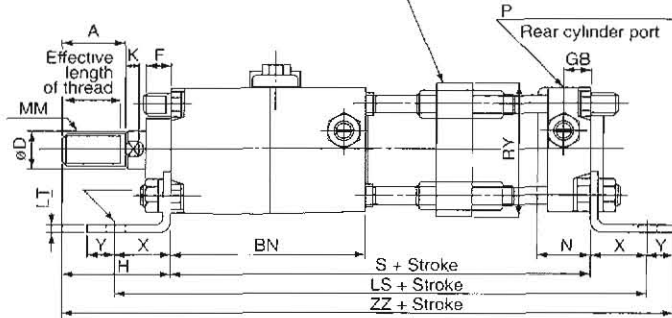
Foot type/CLAL



with Rod Boot



In the case of stroke exceeding 1001, mount reinforcing ring for tie-rod.



Long Stroke (ø50~ø100)

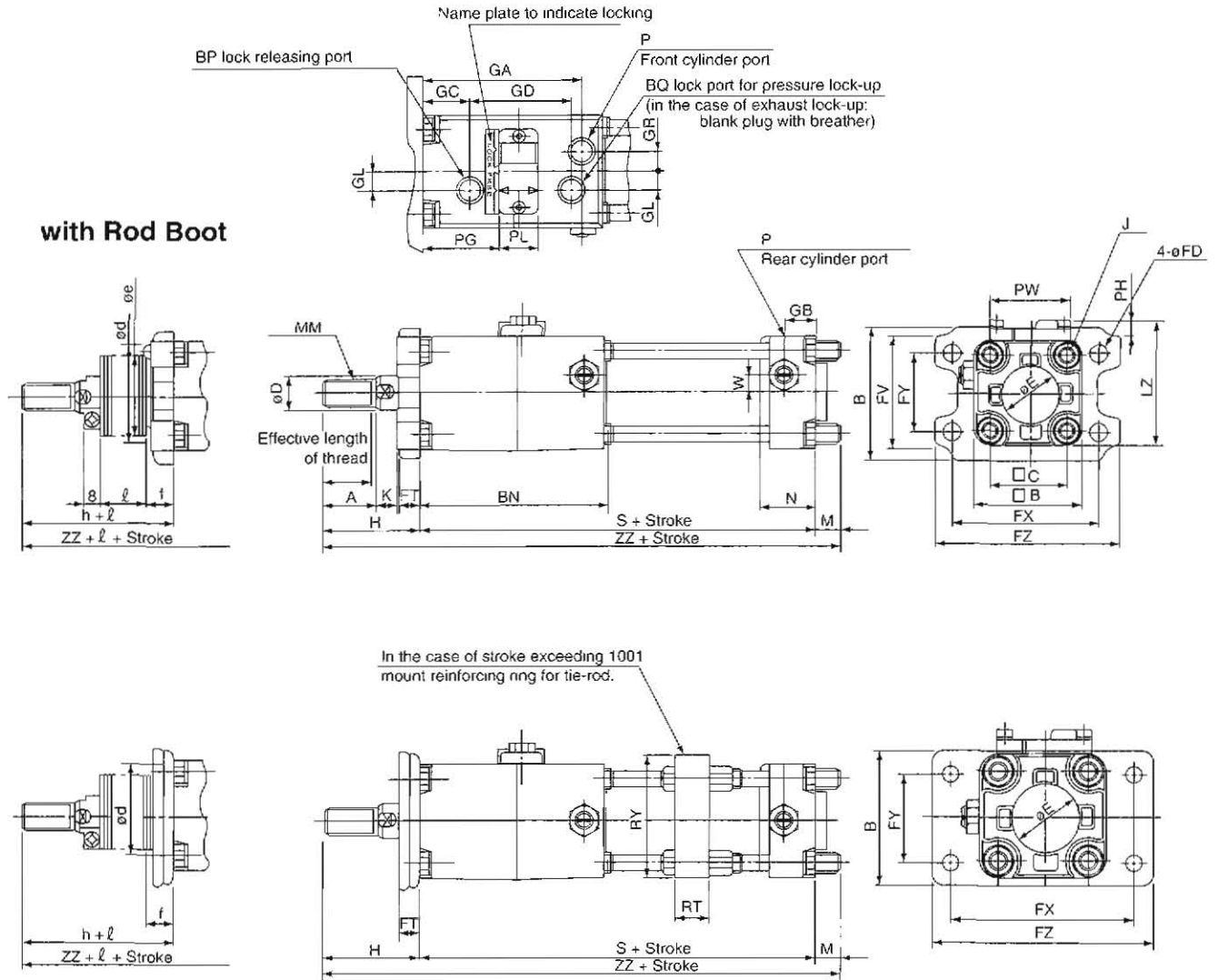
Long Stroke

| Bore size (mm) | Stroke range (mm) | RT | RY |
|----------------|-------------------|----|-----|
| 40 | 501~800 | - | - |
| | 601~1000 | - | - |
| 50 | 1001~1200 | 30 | 76 |
| | 601~1000 | - | - |
| 63 | 1001~1200 | 40 | 92 |
| | 751~1000 | - | - |
| 80 | 1001~1400 | 45 | 112 |
| | 751~1000 | - | - |
| 100 | 1001~1500 | 50 | 136 |

| Bore Size (mm) | Stroke range (mm) | | Effective length of thread | A | □B | BN | BP | BQ | □C | øD | øE | F | GA | GB | GC | GD | GL | GR | J | K | MM |
|----------------|-------------------|-----------|----------------------------|----|-----|-----|----|----|----|----|----|----|-----|----|----|----|----|----|----------|----|---------|
| | Without boot | With boot | | | | | | | | | | | | | | | | | | | |
| 40 | ~500 | 20~500 | 27 | 30 | 60 | 96 | ¼ | ¼ | 44 | 16 | 32 | 10 | 85 | 15 | 26 | 54 | 10 | 10 | M8×1.25 | 6 | M14×1.5 |
| 50 | ~600 | 20~600 | 32 | 35 | 70 | 108 | ¼ | ¼ | 52 | 20 | 40 | 10 | 95 | 17 | 27 | 59 | 13 | 12 | M8×1.25 | 7 | M18×1.5 |
| 63 | ~600 | 20~600 | 32 | 35 | 86 | 115 | ¼ | ¼ | 64 | 20 | 40 | 10 | 102 | 17 | 26 | 67 | 18 | 15 | M10×1.25 | 7 | M18×1.5 |
| 80 | ~750 | 20~750 | 37 | 40 | 102 | 129 | ¼ | ¼ | 78 | 25 | 52 | 14 | 113 | 21 | 30 | 72 | 23 | 17 | M12×1.75 | 11 | M22×1.5 |
| 100 | ~750 | 20~750 | 37 | 40 | 116 | 140 | ¼ | ¼ | 92 | 30 | 52 | 14 | 124 | 21 | 31 | 76 | 25 | 19 | M12×1.75 | 11 | M26×1.5 |

| Bore Size (mm) | MM X1US | N | P | PG | PH | PL | PW | S | W | X | Y | øLD | LH | LS | LT | LX | LY | LZ | Without Boot | | With Boot | | | | |
|----------------|-----------|----|---|------|----|----|----|-----|---|----|----|------|----|-----|-----|----|-----|-----|--------------|-----|-----------|------|----|----------|-----|
| | | | | | | | | | | | | | | | | | | | H | ZZ | øe | f | h | ℓ | ZZ |
| 40 | 7/16 - 20 | 27 | ¼ | 42 | 11 | 20 | 45 | 153 | 8 | 27 | 13 | 9 | 40 | 207 | 3.2 | 42 | 70 | 81 | 51 | 244 | 43 | 11.2 | 59 | ¼ Stroke | 252 |
| 50 | ¾ - 16 | 30 | ⅜ | 46 | 10 | 21 | 50 | 168 | 0 | 27 | 13 | 9 | 45 | 222 | 3.2 | 50 | 80 | 90 | 58 | 266 | 52 | 11.2 | 66 | | 274 |
| 63 | | 31 | ⅜ | 48.5 | 13 | 23 | 60 | 182 | 0 | 34 | 16 | 11.5 | 50 | 250 | 3.2 | 59 | 93 | 106 | 58 | 290 | 52 | 11.2 | 66 | | 298 |
| 80 | | 37 | ½ | 55 | 15 | 23 | 70 | 208 | 0 | 44 | 16 | 13.5 | 65 | 296 | 4.5 | 76 | 116 | 131 | 71 | 339 | 65 | 12.5 | 80 | | 348 |
| 100 | 1 - 14 | 40 | ½ | 56.5 | 15 | 25 | 80 | 226 | 0 | 43 | 17 | 13.5 | 75 | 312 | 6 | 92 | 133 | 148 | 72 | 358 | 65 | 14.0 | 81 | | 367 |

Front flange/CLAF



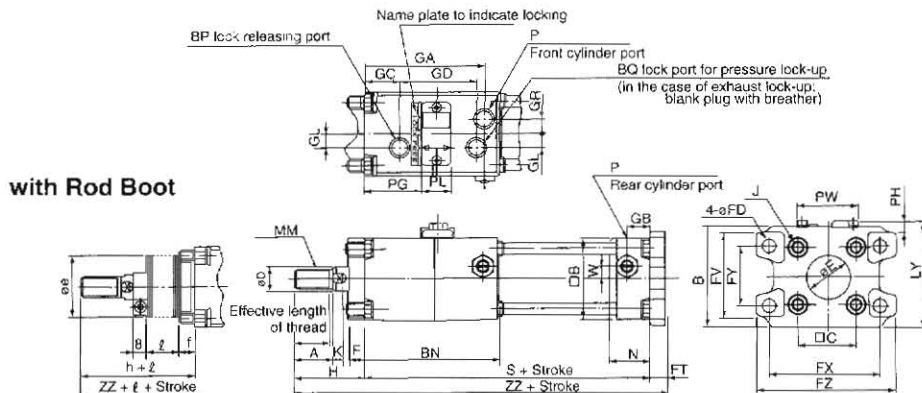
Long Stroke

| Bore size (mm) | Stroke range (mm) | | | | | | | | | | | Without boot | | With boot | |
|----------------|-------------------|-----|----|----|-----|----|-----|-----|-----|----|-----|--------------|-----|-----------|--|
| | | B | M | RT | RY | FT | FX | FY | FZ | H | ZZ | f | ZZ | | |
| 50 | 1001-1200 | 88 | 6 | 30 | 76 | 20 | 120 | 58 | 144 | 67 | 241 | 19 | 240 | | |
| 63 | 1001-1200 | 105 | 10 | 40 | 92 | 23 | 140 | 64 | 170 | 71 | 263 | 19 | 258 | | |
| 80 | 1001-1400 | 124 | 12 | 45 | 112 | 28 | 164 | 84 | 198 | 87 | 307 | 21 | 300 | | |
| 100 | 1001-1500 | 140 | 12 | 50 | 136 | 29 | 180 | 100 | 220 | 89 | 327 | 21 | 319 | | |

| Bore size (mm) | Stroke range (mm) | | Effective length of thread | | | | | | | | | | | | | | | | | Without boot | | With boot | |
|----------------|-------------------|-----------|----------------------------|----|-----|-----|-----|----|----|----|----|----|-----|----|----|----|----|----|----------|--------------|-----|-----------|---------|
| | Without boot | With boot | | A | B | □B | BN | BP | BQ | □C | øD | øE | GA | GB | GC | GD | GL | GR | J | K | LZ | M | MM |
| 40 | ~800 | 20~800 | 27 | 30 | 71 | 60 | 96 | ¼ | ¼ | 44 | 16 | 32 | 85 | 15 | 26 | 54 | 10 | 10 | M8×1.25 | 6 | 71 | 11 | M41×1.5 |
| 50 | ~1000 | 20~1000 | 32 | 35 | 81 | 70 | 108 | ¼ | ¼ | 52 | 20 | 40 | 95 | 17 | 27 | 59 | 13 | 12 | M8×1.25 | 7 | 80 | 11 | M18×1.5 |
| 63 | ~1000 | 20~1000 | 32 | 35 | 101 | 86 | 115 | ¼ | ¼ | 64 | 20 | 40 | 102 | 17 | 26 | 67 | 18 | 15 | M10×1.25 | 7 | 99 | 14 | M18×1.5 |
| 80 | ~1000 | 20~1000 | 37 | 40 | 119 | 102 | 129 | ¼ | ¼ | 78 | 25 | 52 | 113 | 21 | 30 | 72 | 23 | 17 | M12×1.75 | 11 | 117 | 17 | M22×1.5 |
| 100 | ~1000 | 20~1000 | 37 | 40 | 133 | 116 | 140 | ¼ | ¼ | 92 | 30 | 52 | 124 | 21 | 31 | 76 | 25 | 19 | M12×1.75 | 11 | 131 | 17 | M26×1.5 |

| Bore size (mm) | MM X1US | N | P | PG | PH | PL | PW | S | W | FV | øFD | FT | FX | FY | FZ | Without boot | | With boot | | | | | |
|----------------|-----------|----|---|------|----|----|----|-----|---|-----|------|----|-----|----|-----|--------------|-----|-----------|----|------|----|-----|----|
| | | | | | | | | | | | | | | | | H | ZZ | ød | øe | f | h | ℓ | ZZ |
| 40 | 7/16 - 20 | 27 | ¼ | 42 | 11 | 20 | 45 | 153 | 8 | 60 | 9 | 12 | 80 | 42 | 100 | 51 | 215 | 52 | 43 | 15 | 59 | 223 | |
| 50 | ¾ - 16 | 30 | ⅜ | 46 | 10 | 21 | 50 | 168 | 0 | 70 | 9 | 12 | 90 | 50 | 110 | 58 | 237 | 58 | 52 | 15 | 66 | 245 | |
| 63 | | 31 | ⅜ | 48.5 | 13 | 23 | 60 | 182 | 0 | 86 | 11.5 | 15 | 105 | 59 | 130 | 58 | 254 | 58 | 52 | 17.5 | 66 | 262 | |
| 80 | | 37 | ½ | 55 | 15 | 23 | 70 | 208 | 0 | 102 | 13.5 | 18 | 130 | 76 | 160 | 71 | 296 | 80 | 65 | 21.5 | 80 | 305 | |
| 100 | 1 - 14 | 40 | ½ | 56.5 | 15 | 25 | 80 | 226 | 0 | 116 | 13.5 | 18 | 150 | 92 | 180 | 72 | 315 | 80 | 65 | 21.5 | 81 | 324 | |

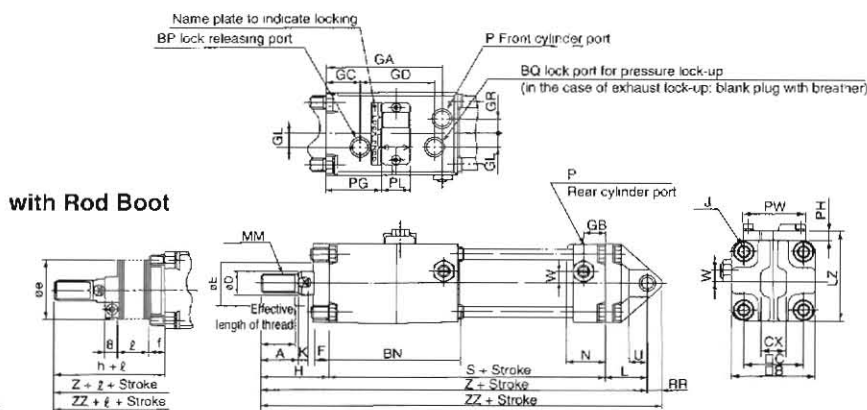
Rear Flange Type/CLAG



| Bore size (mm) | Stroke range (mm) | | Effective length of thread | A | B | □B | BN | BP | BQ | □C | øD | øE | F | GA | GB | GC | GD | GL | GR | J | K | LY | MM |
|----------------|-------------------|-----------|----------------------------|----|-----|-----|-----|----|----|----|----|----|----|-----|----|----|----|----|----|----------|----|-------|---------|
| | Without boot | With boot | | | | | | | | | | | | | | | | | | | | | |
| 40 | ~500 | 20~500 | 27 | 30 | 70 | 60 | 96 | ¼ | ¼ | 44 | 16 | 32 | 10 | 85 | 15 | 26 | 54 | 10 | 10 | M8X1.25 | 6 | 76.5 | M14X1.5 |
| 50 | ~600 | 20~600 | 32 | 35 | 81 | 70 | 108 | ¼ | ¼ | 52 | 20 | 40 | 10 | 95 | 17 | 27 | 59 | 13 | 12 | M8X1.25 | 7 | 85.5 | M18X1.5 |
| 63 | ~600 | 20~600 | 32 | 35 | 101 | 86 | 115 | ¼ | ¼ | 64 | 20 | 40 | 10 | 102 | 17 | 26 | 67 | 18 | 15 | M10X1.25 | 7 | 106.5 | M18X1.5 |
| 80 | ~750 | 20~750 | 37 | 40 | 119 | 102 | 129 | ¼ | ¼ | 78 | 25 | 52 | 14 | 113 | 21 | 30 | 72 | 23 | 17 | M12X1.75 | 11 | 125.5 | M22X1.5 |
| 100 | ~750 | 20~750 | 37 | 40 | 133 | 116 | 140 | ¼ | ¼ | 92 | 30 | 52 | 14 | 124 | 21 | 31 | 76 | 25 | 19 | M12X1.75 | 11 | 139.5 | M26X1.5 |

| Bore size (mm) | MM X1US | N | P | PG | PH | PL | PW | S | W | FV | øFD | FT | FX | FY | FZ | Without boot | | | | With boot | | | |
|----------------|-----------|----|-----|------|----|----|----|-----|---|-----|------|----|-----|----|-----|--------------|-----|----|------|-----------|---|----|-----|
| | | | | | | | | | | | | | | | | H | ZZ | øe | f | h | ℓ | ZZ | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 40 | 1/16 - 20 | 27 | 1/4 | 42 | 11 | 20 | 45 | 153 | 8 | 60 | 9 | 12 | 80 | 42 | 100 | 51 | 216 | 43 | 11.2 | 59 | | | 224 |
| 50 | | 30 | 3/8 | 46 | 10 | 21 | 50 | 168 | 0 | 70 | 9 | 12 | 90 | 50 | 110 | 58 | 238 | 52 | 11.2 | 66 | | | 246 |
| 63 | 3/8 - 16 | 31 | 3/8 | 48.5 | 13 | 23 | 60 | 182 | 0 | 86 | 11.5 | 15 | 105 | 59 | 130 | 58 | 255 | 52 | 11.2 | 66 | | | 263 |
| 80 | | 37 | 1/2 | 55 | 15 | 23 | 70 | 208 | 0 | 102 | 13.5 | 18 | 130 | 76 | 160 | 71 | 297 | 65 | 12.5 | 80 | | | 306 |
| 100 | 1 - 14 | 40 | 1/2 | 56.5 | 15 | 25 | 80 | 226 | 0 | 116 | 13.5 | 18 | 150 | 92 | 180 | 72 | 316 | 65 | 14.0 | 81 | | | 325 |

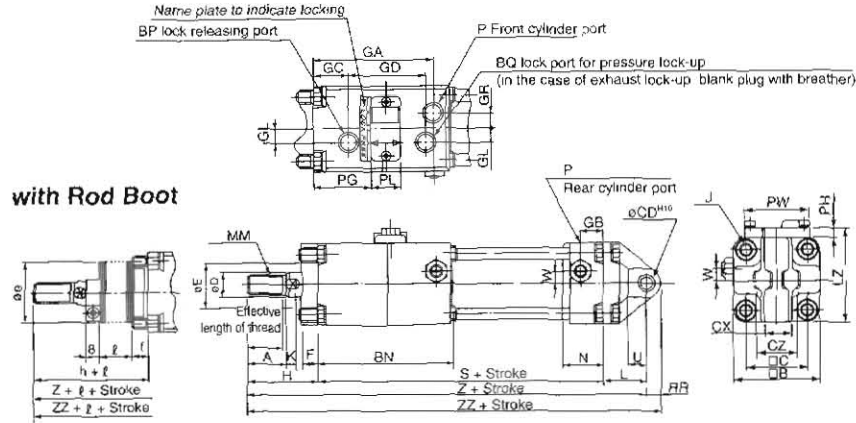
Single Clevis Type/CLAC



| Bore size (mm) | Stroke range (mm) | | Effective length of thread | A | □B | BN | BP | BQ | □C | øD | øE | F | GA | GB | GC | GD | GL | GR | J | K | L | LZ | MM |
|----------------|-------------------|-----------|----------------------------|----|-----|-----|----|----|----|----|----|----|-----|----|----|----|----|----|----------|----|----|-----|---------|
| | Without boot | With boot | | | | | | | | | | | | | | | | | | | | | |
| 40 | ~500 | 20~500 | 27 | 30 | 60 | 96 | ¼ | ¼ | 44 | 16 | 32 | 10 | 85 | 15 | 26 | 54 | 10 | 10 | M8X1.25 | 6 | 30 | 71 | M14X1.5 |
| 50 | ~600 | 20~600 | 32 | 35 | 70 | 108 | ¼ | ¼ | 52 | 20 | 40 | 10 | 95 | 17 | 27 | 59 | 13 | 12 | M8X1.25 | 7 | 30 | 80 | M18X1.5 |
| 63 | ~600 | 20~600 | 32 | 35 | 86 | 115 | ¼ | ¼ | 64 | 20 | 40 | 10 | 102 | 17 | 26 | 67 | 18 | 15 | M10X1.25 | 7 | 40 | 99 | M18X1.5 |
| 80 | ~750 | 20~750 | 37 | 40 | 102 | 129 | ¼ | ¼ | 78 | 25 | 52 | 14 | 113 | 21 | 30 | 72 | 23 | 17 | M12X1.75 | 11 | 48 | 117 | M22X1.5 |
| 100 | ~750 | 20~750 | 37 | 40 | 116 | 140 | ¼ | ¼ | 92 | 30 | 52 | 14 | 124 | 21 | 31 | 76 | 25 | 19 | M12X1.75 | 11 | 58 | 131 | M26X1.5 |

| Bore size (mm) | MM X1US | N | P | PG | PH | PL | PW | RR | S | U | W | øCD H10 | CX | Without boot | | | | With boot | | | | | |
|----------------|-----------|----|-----|------|----|----|----|----|-----|----|---|-----------------------------------|----------------------|--------------|-----|-----|----|-----------|----|---|---|------------|-----|
| | | | | | | | | | | | | | | H | Z | ZZ | øe | f | h | ℓ | Z | ZZ | |
| | | | | | | | | | | | | | | | | | | | | | | 1/4 Stroke | |
| 40 | 1/16 - 20 | 27 | 1/4 | 42 | 11 | 20 | 45 | 10 | 153 | 16 | 8 | 10 ^{+0.058} ₀ | 15.8 ^{±0.3} | 51 | 234 | 244 | 43 | 11.2 | 59 | | | 242 | 252 |
| 50 | | 30 | 3/8 | 46 | 10 | 21 | 50 | 12 | 168 | 19 | 0 | 10 ^{+0.070} ₀ | 18.8 ^{±0.3} | 58 | 261 | 273 | 52 | 11.2 | 66 | | | 269 | 281 |
| 63 | 3/8 - 16 | 31 | 3/8 | 48.5 | 13 | 23 | 60 | 16 | 182 | 23 | C | 16 ^{+0.070} ₀ | 25.8 ^{±0.3} | 58 | 280 | 296 | 52 | 11.2 | 66 | | | 288 | 304 |
| 80 | | 37 | 1/2 | 55 | 15 | 23 | 70 | 20 | 208 | 28 | 0 | 20 ^{+0.054} ₀ | 31.5 ^{±0.3} | 71 | 327 | 347 | 65 | 12.5 | 80 | | | 336 | 356 |
| 100 | 1 - 14 | 40 | 1/2 | 56.5 | 15 | 25 | 80 | 25 | 226 | 36 | 0 | 25 ^{+0.054} ₀ | 35.5 ^{±0.3} | 72 | 256 | 281 | 65 | 14.0 | 81 | | | 365 | 390 |

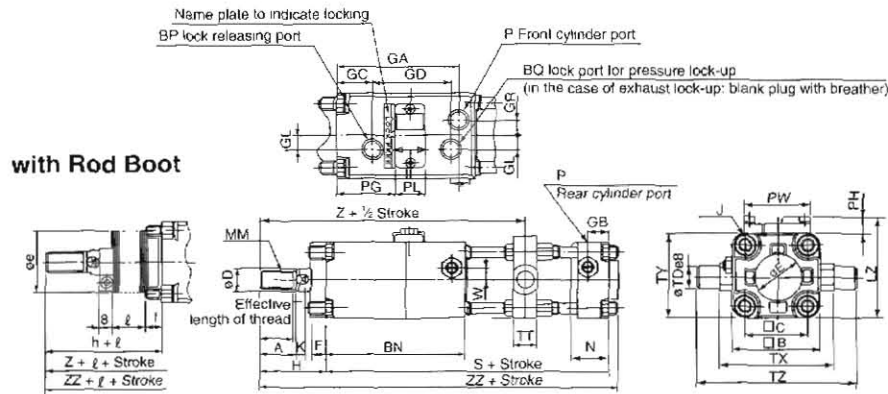
Double Clevis Type/CLAD



| Bore size (mm) | Stroke range (mm) | | Effective length of thread | A | B | BN | BP | BQ | C | eD | eE | F | GA | GB | GC | GD | GL | GR | J | K | L | LZ | MM |
|----------------|-------------------|-----------|----------------------------|----|-----|-----|-----|-----|----|----|----|----|-----|----|----|----|----|----|----------|----|----|-----|---------|
| | Without boot | With boot | | | | | | | | | | | | | | | | | | | | | |
| 40 | ~500 | 20~500 | 27 | 30 | 60 | 96 | 1/4 | 1/4 | 44 | 16 | 32 | 10 | 85 | 15 | 26 | 54 | 10 | 10 | M8x1.25 | 6 | 30 | 71 | M14x1.5 |
| 50 | ~600 | 20~600 | 32 | 35 | 70 | 108 | 1/4 | 1/4 | 52 | 20 | 40 | 10 | 95 | 17 | 27 | 59 | 13 | 12 | M8x1.25 | 7 | 30 | 80 | M18x1.5 |
| 63 | ~600 | 20~600 | 32 | 35 | 86 | 115 | 1/4 | 1/4 | 64 | 20 | 40 | 10 | 102 | 17 | 26 | 67 | 18 | 15 | M10x1.25 | 7 | 40 | 99 | M18x1.5 |
| 80 | ~750 | 20~750 | 37 | 40 | 102 | 129 | 1/4 | 1/4 | 78 | 25 | 52 | 14 | 113 | 21 | 30 | 72 | 23 | 17 | M12x1.75 | 11 | 48 | 117 | M22x1.5 |
| 100 | ~750 | 20~750 | 37 | 40 | 116 | 140 | 1/4 | 1/4 | 92 | 30 | 52 | 14 | 124 | 21 | 31 | 76 | 25 | 19 | M12x1.75 | 11 | 58 | 131 | M26x1.5 |

| Bore size (mm) | MM X1US | N | P | PG | PH | PL | PW | RR | S | U | W | eCD ^{H10} | CX | CZ | Without boot | | | With boot | | | | | |
|----------------|-----------|----|-----|------|----|----|----|----|-----|----|---|-----------------------------------|-----------------------------------|------|--------------|-----|-----|-----------|------|----|------------|-----|-----|
| | | | | | | | | | | | | | | | H | Z | ZZ | eE | f | h | l | Z | ZZ |
| 40 | 1/16 - 20 | 27 | 1/4 | 42 | 11 | 20 | 45 | 10 | 153 | 16 | 8 | 10 ^{+0.068} ₀ | 15.8 ^{+0.1} ₀ | 29.5 | 51 | 234 | 244 | 43 | 11.2 | 59 | 1/4 Stroke | 242 | 252 |
| 50 | 3/4 - 16 | 30 | 3/8 | 46 | 10 | 21 | 50 | 12 | 168 | 19 | 0 | 10 ^{+0.070} ₀ | 18.8 ^{+0.1} ₀ | 38 | 58 | 261 | 273 | 52 | 11.2 | 66 | | 269 | 281 |
| 63 | | 31 | 3/8 | 48.5 | 13 | 23 | 60 | 16 | 182 | 23 | 0 | 16 ^{+0.070} ₀ | 25.8 ^{+0.1} ₀ | 49 | 58 | 280 | 296 | 52 | 11.2 | 66 | | 288 | 304 |
| 80 | | 37 | 1/2 | 55 | 15 | 23 | 70 | 20 | 208 | 28 | 0 | 20 ^{+0.084} ₀ | 31.5 ^{+0.1} ₀ | 61 | 71 | 327 | 347 | 65 | 12.5 | 80 | | 336 | 356 |
| 100 | 1 - 14 | 40 | 1/2 | 56.5 | 15 | 25 | 80 | 25 | 226 | 36 | 0 | 25 ^{+0.084} ₀ | 35.5 ^{+0.1} ₀ | 64 | 72 | 356 | 381 | 65 | 14.0 | 81 | 365 | 390 | |

Trunnion Type/CLAT



| Bore size (mm) | Stroke range (mm) | | Effective length of thread | A | B | BN | BP | BQ | C | eD | eE | F | GA | GB | GC | GD | GL | GR | J | K | LZ | MM |
|----------------|-------------------|-----------|----------------------------|----|-----|-----|-----|-----|----|----|----|----|-----|----|----|----|----|----|----------|----|-----|---------|
| | Without boot | With boot | | | | | | | | | | | | | | | | | | | | |
| 40 | ~500 | 25~500 | 27 | 30 | 60 | 96 | 1/4 | 1/4 | 44 | 16 | 32 | 10 | 85 | 15 | 26 | 54 | 10 | 10 | M8x1.25 | 6 | 71 | M14x1.5 |
| 50 | ~600 | 25~600 | 32 | 35 | 70 | 108 | 1/4 | 1/4 | 52 | 20 | 40 | 10 | 95 | 17 | 27 | 59 | 13 | 12 | M8x1.25 | 7 | 80 | M18x1.5 |
| 63 | ~600 | 32~600 | 32 | 35 | 86 | 115 | 1/4 | 1/4 | 64 | 20 | 40 | 10 | 102 | 17 | 26 | 67 | 18 | 15 | M10x1.25 | 7 | 99 | M18x1.5 |
| 80 | ~750 | 41~750 | 37 | 40 | 102 | 129 | 1/4 | 1/4 | 78 | 25 | 52 | 14 | 113 | 21 | 30 | 72 | 23 | 17 | M12x1.75 | 11 | 117 | M22x1.5 |
| 100 | ~750 | 45~750 | 37 | 40 | 116 | 140 | 1/4 | 1/4 | 92 | 30 | 52 | 14 | 124 | 21 | 31 | 76 | 25 | 19 | M12x1.75 | 11 | 131 | M26x1.5 |

| Bore size (mm) | MM X1US | N | P | PG | PH | PL | PW | S | W | eTDe8 | TT | TX | TY | TZ | Without boot | | | With boot | | | | | |
|----------------|-----------|----|-----|------|----|----|----|-----|---|-----------------------------------|----|-----|-----|-----|--------------|-----|-----|-----------|------|----|------------|-----|-----|
| | | | | | | | | | | | | | | | H | Z | ZZ | eE | f | h | l | Z | ZZ |
| 40 | 1/16 - 20 | 27 | 1/4 | 42 | 11 | 20 | 45 | 153 | 8 | 15 ^{+0.088} ₀ | 22 | 85 | 62 | 117 | 51 | 162 | 209 | 43 | 11.2 | 59 | 1/3 Stroke | 170 | 217 |
| 50 | 3/4 - 16 | 30 | 3/8 | 46 | 10 | 21 | 50 | 168 | 0 | 15 ^{+0.092} ₀ | 22 | 95 | 74 | 127 | 58 | 181 | 232 | 52 | 11.2 | 66 | | 189 | 240 |
| 63 | | 31 | 3/8 | 48.5 | 13 | 23 | 60 | 182 | 0 | 18 ^{+0.092} ₀ | 28 | 110 | 90 | 148 | 58 | 191 | 248 | 52 | 11.2 | 66 | | 199 | 256 |
| 80 | | 37 | 1/2 | 55 | 15 | 23 | 70 | 208 | 0 | 25 ^{+0.046} ₀ | 34 | 140 | 110 | 192 | 71 | 221 | 286 | 65 | 12.5 | 80 | | 230 | 295 |
| 100 | 1 - 14 | 40 | 1/2 | 56.5 | 15 | 25 | 80 | 226 | 0 | 25 ^{+0.046} ₀ | 40 | 162 | 130 | 214 | 72 | 235 | 306 | 65 | 14.0 | 81 | 244 | 315 | |



Standard Specifications — Reed

| | |
|-----------------------|---|
| Lead wire | Oil proof vinyl |
| Impact resistance | 300m/S ² (30 G) |
| Insulation resistance | 50MΩ or more under the test voltage 500VDC (Between case and cable) |
| Withstand voltage | Note 1) 1500VAC 1 min (Between case and cable) |
| Ambient temperature | 14~140°F (-10~60°C) |
| Protection structure | Note 2) IEC spec IP67 JISC0920 (Water proof) Oil Proof |

Note 1) Lead wire entry: connector type and D-9 type: 1000VAC 1 min (Between case and cable).
 Note 2) Terminal conduit type (D-A3, A3*A, A3*C, G39, G39A, G39C, K39A, and K39C) are compiled with IEC529, IP63, and JISC0920 (Water proof) structure. D-F9*V comply with IEC529, IP65, and JISC0920 Jet stream proof structure.

Standard Specifications — Solid State

| | |
|-----------------------|---|
| Lead wire | Oil proof vinyl |
| Impact resistance | 1000m/S ² (102 G) |
| Insulation resistance | 50MΩ or more under the test voltage 500VDC (Between case and cable) |
| Withstand voltage | 1000VAC 1 min (Between case and cable) |
| Ambient temperature | 14~140°F (-10~60°C) |
| Protection structure | Note 1) IEC Spec IP67, JISC0920 (Water proof). Oil proof |

Note 1) Terminal conduit type (D-A3, A3*A, A3*C, G39, G39A, G39C, K39A, and K39C) are compiled with IEC529, IP63, and JISC0920 (Water proof) structure. D-F9*V comply with IEC529, IP65, and JISC0920 Jet stream proof structure.

Auto Switch Mounting

| Auto switch | Bore size | | | | |
|---|-----------|---------|---------|---------|---------|
| | 40 | 50 | 63 | 80 | 100 |
| D-A5/A6/A59W D-F5□/J5□/F5□W/J59W D-F5NTL, F5BAL, F59F | BT-04 | BT-04 | BT-06 | BT-08 | BT-08 |
| D-A3/A44/G39/K39 | BD1-04M | BD1-05M | BD1-06M | BD1-08M | BD1-10M |
| D-B5/B6/B59W D-G5□/K59/G5□W/K59W D-G5BAL/G59F/G5NTL | BA-04 | BA-05 | BA-06 | BA-08 | BA-10 |
| D-A3□C/A44C/G39C/K39C | BA3-040 | BA3-050 | BA3-063 | BA3-080 | BA3-100 |

* D-A3□C/A44C/G39C/K39C: come with mounting brackets. Please specify the mounting bracket by cylinder bore size shown following example
 example) ø40-DA3□-4, ø50-D-A3□C-5, ø63-D-A3□C-6, ø80-D-A3□C-8, ø100-D-A3□C-10
 If extra mounting bracket is required, please order by specifying part numbers shown in table above.

Auto Switch Specifications

Reed Switch Type

| Auto switch model | D-A64, D-B64 | | | D-A34(C), D-A44(C), D-A54, F-B54 | | |
|---|------------------------|-----------|-------------|----------------------------------|--------|----------|
| Application | Relay, PLC | | | Relay, PLC | | |
| Load voltage | 24VAC/VDC or less | 100VAC | 200VAC | 24VDC | 100VAC | 200VAC |
| Max. load current or load current range | Max. 50mA | Max. 25mA | Max. 12.5mA | 5~50mA | 5~25mA | 5~12.5mA |
| Contact Protection Circuit | Built in | | | Built in | | |
| Internal voltage drop | — | | | 2.4V or less | | |
| Impedance | 10Ω or less | | | — | | |
| Leak current | 100μA or less at 24VDC | | | none | | |
| Indicator lamp | — | | | ON: red light emitting diode | | |
| Lead wire entry | Grommet | | | Grommet | | |
| Response time | 1.2 mS | | | 1.2 mS | | |

Reed Switch Type

| Auto switch model | D-A33(C), D-A53, D-B53 | D-A56 | D-A67 | D-A59W, D-B59W two color indicator |
|---|------------------------------|------------------------------|-------------------------------------|---|
| Application | PLC | IC circuit | PLC, IC circuit | Relay, PLC |
| Load voltage | 24VDC | 4-8VDC | 24VDC or less | 24VDC |
| Max. load current or load current range | 5-50mA | Max. 20mA | Max. 30mA | 5-40mA |
| Contact Protection Circuit | None | None | None | Built in |
| Internal voltage drop | 2.4V or less | 0.8V or less | — | 4V or less |
| Impedance | — | — | 1Ω or less (including 3m lead wire) | — |
| Leak current | None | None | None | None |
| Indicator lamp | ON: red light emitting diode | ON: red light emitting diode | — | Response position: Red: ON Green: Best position |
| Lead wire entry | Grommet [D-A33(c): DIN] | Grommet | Grommet | Grommet |
| Response time | 1.2 mS | 1.2 mS | 1.2 mS | 1.2 mS |

Solid State Switch Type

| Auto switch model | D-F59, D-G59 | D-F5P, D-G5P | D-K39(C), D-J59, D-K59 | D-J51 |
|---|---|------------------------------|------------------------------|------------------------------|
| Wire type | 3 Wire | 3 Wire | 2 Wire | 2 Wire |
| Output | NPN | PNP | — | — |
| Application | Relay, PLC IC circuit | Relay, PLC IC circuit | 24VDC Relay, PLC | AC Relay, PLC |
| Operating voltage | 5, 12, 24VDC (4.5-28VDC) | 5, 12, 24VDC (4.5-28VDC) | — | — |
| Current consumption | 12mA or less | 15mA or less | — | — |
| Load voltage | 28VDC or less | — | 24VDC (10-28VDC) | 80-260VAC |
| Max. load current or load current range | Max. 40mA | Max. 80mA | 5-40mA | 5-80mA |
| Internal voltage drop | 1.5V or less (0.8V or less at 10mA of load current) | 0.8V or less | 4V or less | 14V or less |
| Leak current | 100μA or less at 24VDC | 100μA or less at 24VDC | 0.8mA or less at 24VDC | 100μA or less at 24VDC |
| Indicator lamp | ON: red light emitting diode | ON: red light emitting diode | ON: red light emitting diode | ON: red light emitting diode |
| Lead wire entry | Grommet | Grommet | Grommet [D-K39(c): DIN] | Grommet |
| Response time | 1 mS or less | 1 mS or less | 1 mS or less | 5 mS or less |
| Output response | — | — | — | — |
| Off-Delay time | — | — | — | — |

Solid State Switch Type

| Auto switch model | D-F59W, D-G59W two color indicator | D-F5PW, D-G5PW two color indicator | D-J59W, D-K59W two color indicator | D-F5BAL, D-G5BAL two color indicator |
|---|---|---|---|---|
| Wire type | 3 Wire | 3 Wire | 2 Wire | 2 Wire |
| Output | NPN | PNP | — | — |
| Application | Relay, PLC IC circuit | Relay, PLC IC circuit | 24VDC Relay, PLC | 24VDC Relay, PLC |
| Operating voltage | 5, 12, 24VDC (4.5-28VDC) | 5, 12, 24VDC (4.5-28VDC) | — | — |
| Current consumption | 10mA or less | 12mA or less | — | — |
| Load voltage | 28VDC or less | — | 24VDC (10-28VDC) | 24VDC (10-28VDC) |
| Max. load current or load current range | Max. 40mA | Max. 80mA | 5-40mA | 5-40mA |
| Internal voltage drop | 1.5V or less (0.8V or less at 10mA of load current) | 0.8V or less | 4V or less | 4V or less |
| Leak current | 100μA or less at 24VDC | 100μA or less at 24VDC | 0.8mA or less at 24VDC | 0.8mA or less at 24VDC |
| Indicator lamp | Response position: Red: ON Green: Best position | Response position: Red: ON Green: Best position | Response position: Red: ON Green: Best position | Response position: Red: ON Green: Best position |
| Lead wire entry | Grommet | Grommet | Grommet | Grommet |
| Response time | 1 mS or less | 1 mS or less | 1 mS or less | 1 mS or less |
| Output response | — | — | — | — |
| Off-Delay time | — | — | — | — |

Solid State Switch Type

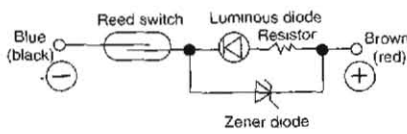
| Auto switch model | D-F5LF two color indicator (latch diagnostic type) | D-F59F two color indicator (diagnostic) | D-G59F two color indicator (diagnostic) |
|---|--|--|--|
| Wire type | 4 Wire | 4 Wire | 4 Wire |
| Output | NPN | NPN | NPN |
| Application | 24VDC Relay, PLC | Relay, PLC, IC circuit | Relay, PLC, IC circuit |
| Operating voltage | 24VDC (10-26VDC) | 5, 12, 24VDC (4.5-28VDC) | — |
| Current consumption | 20mA or less | 10mA or less | 10mA or less |
| Load voltage | 26VDC or less | 28VDC or less | 28VDC or less |
| Max. load current or load current range | Max 40mA | Max. 40mA | Max. 40 mA |
| Internal voltage drop | 0.8V or less | 1.5V or less (0.8V or less at 10mA of load current) | 1.5V or less (0.8V or less at 10mA of load current) |
| Leak current | 100µA or less at 24VDC | 100µA or less at 24VDC | 100µA or less at 24VDC |
| Indicator lamp | Response position: Red: ON Green: Best position | Response position. Red: ON Green: Best position | Response position: Red: ON Green: Best position |
| Lead wire entry | Grommet | Grommet | Grommet |
| Response time | 1 mS or less | 1 mS or less | 1 mS or less |
| Output response | — | — | — |
| Off-Delay time | — | — | — |

Solid State Switch Type

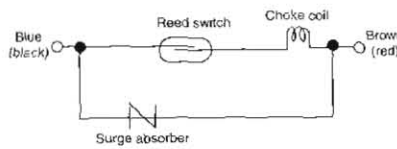
| Auto switch model | D-F5NTL, D-G5NTL time delay | D-G39 (C) |
|---|--------------------------------------|--|
| Wire type | 3 Wire | 3 Wire |
| Output | NPN | — |
| Application | Relay, PLC, IC circuit | Relay, PLC, IC circuit |
| Operating voltage | 5, 12, 24VDC (4.5-28VDC) | 5, 12, 24VDC (4.5-28VDC) |
| Current consumption | 10mA or less | 12mA or less |
| Load voltage | 28VDC or less | 28VDC or less |
| Max. load current or load current range | Max. 80 mA | Max. 40mA |
| Internal voltage drop | 2V or less (0.8V or less at 10mA) | 1.5V or less (0.8V or less at 10mA of load current) |
| Leak current | 100µA or less at 24VDC | 100µA or less at 24VDC |
| Indicator lamp | ON: red light emitting diode | ON: red light emitting diode |
| Lead wire entry | Grommet | DIN |
| Response time | 1 mS or less | 1 mS or less |
| Output response | Off-Delay | — |
| Off-Delay time | 200 ± 50 mS | — |

Reed Type Internal Circuit

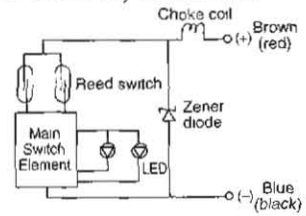
D-B53, D-A53



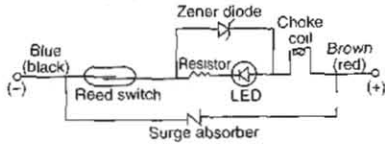
D-A64, D-B64



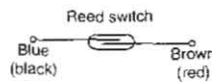
D-A59W, D-B59W



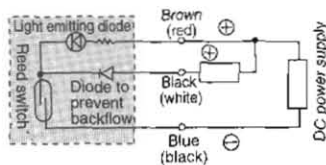
D-A54, D-B54,
D-A44(C), D-A34(C)



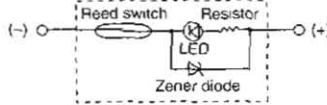
D-A67



D-A56

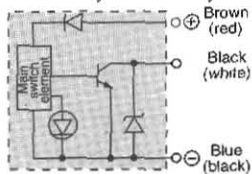


D-A33(C)

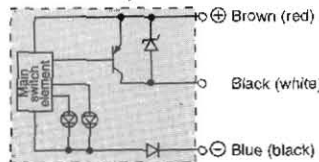


Solid State Type Internal Circuit

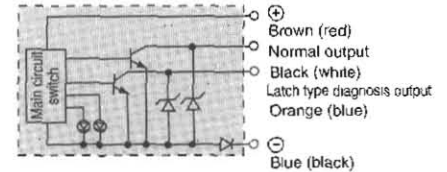
D-F59, D-G59, D-G39(C)



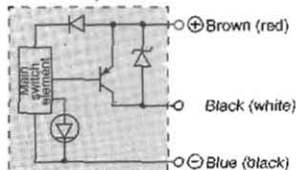
D-F5PW, D-G5PW



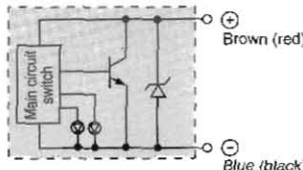
D-F5LF



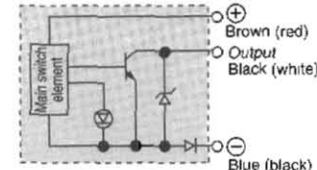
D-F5P, D-G5P



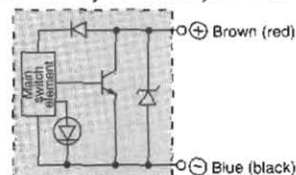
D-F5BAL, D-G5BAL,
D-K59W, D-J59W



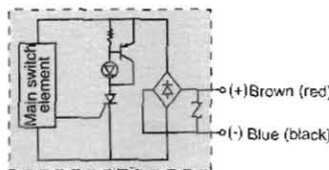
D-F5NTL, D-G5NTL



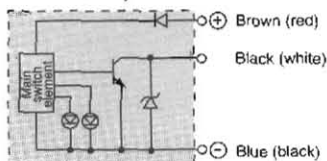
D-J59, D-K59, D-K39(C)



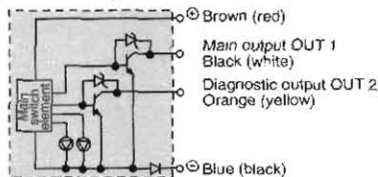
D-J51



D-F59W, D-G59W



D-F59F, D-G59F

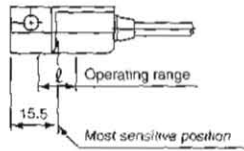


(): Previous color

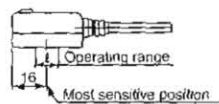
Most Sensitive Position/ Operating Range

Reed Switch Type

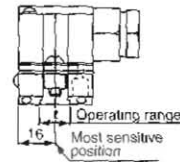
D-B5



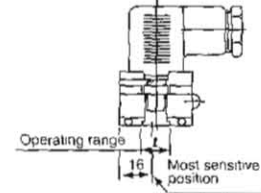
D-A5 • A6



D-A3

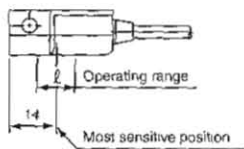


D-A4

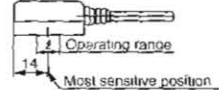


Solid State Type

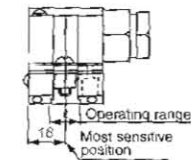
D-G59 • K59 • G5P



D-F59 • J51 • J59 • F5P

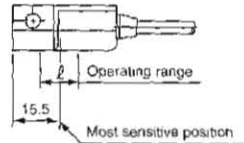


D-G39 • K39

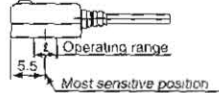


Two Color Signs Type

D-G59W • K59W • G5PW
G59F • G5BAL

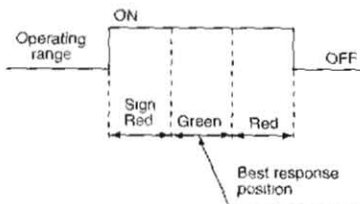


D-F59W • J59W • F59F
F5BAL • F5PW



Indicator light/Operation

D-A59W, D-B59W, D-F5*W, D-G5*W, D-HJ59W, D-F5*F, D-J59W, D-K59W, D-*5BAL



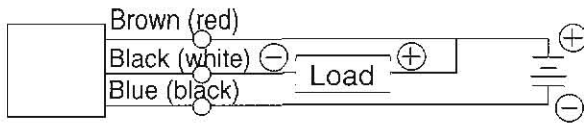
| Auto Switch Type | Auto Switch Model | Operating range (mm) ℓ | | | | |
|------------------|---|-----------------------------|----|-----|-----|-----|
| | | Bore size | | | | |
| | | 40 | 50 | 63 | 80 | 100 |
| Reed Switch | D-A56 • A54 • B64 D-A53 • A64 • A67 D-B53 • B54 • A44(C) D-A33(C) • A34(C) | 9 | 10 | 11 | 11 | 11 |
| | D-A59W | 13 | 13 | 14 | 14 | 15 |
| | D-B59W | 14 | 14 | 17 | 16 | 18 |
| Solid State | D-F59 • F5P • F5NTL D-J59 • J51 | 4 | 4 | 4.5 | 4.5 | 4.5 |
| | D-G59 • G5P D-K59 • G5NTL | 5 | 6 | 6.5 | 6.5 | 7 |
| | D-G39(C) • K39(C) | 9 | 10 | 11 | 11 | 11 |
| | D-F49W • F5PW • F59F D-J59W • F5BAL | 5.5 | 5 | 5.5 | 5.5 | 5.5 |
| | D-G59W • G5PW D-K59W • G59F | 6 | 7 | 7.5 | 7.5 | 8 |
| | D-G5BAL | 6 | 7 | 7.5 | 7.5 | 8 |

Caution

- Never use load exceeding maximum contact capacity of switch.
- Always connect switch to load before turning on power.
- D-A57 and D-A59 have polarity. The Brown (red) lead wire is (+), and Blue (black) lead wire is (-). If connection is reversed, switch will operate, but light emitting diode will not turn on, and if operated in excess of the operating current range, LED will be damaged.
- For the D-A5* model (with indicator lamp), if used at less than the operating current range, LED will not turn on, but switch will operate properly.
- The switches of this series have no leakage current. Therefore, they work properly even if used in parallel, however,
 - If D-A5* model is incompatible due to the internal resistance of LED, D-A6* model will take the place.
- When handling, please avoid dropping, cylinder nicks, and excessive shock.
- Avoid use in magnetically contaminated areas.
- If auto switch cylinders are used in parallel, maintain a distance between tubes of 40mm or greater.

Auto Switch Connection/Solid State Type

3 Wire (when power source for switch and load is common.)



Brown (red) lead wire:

Connect to power source ⊕ (Power source ⊕ terminal) to operate main circuit of switch. In case of 2 wire systems connect with ⊖ side of load.

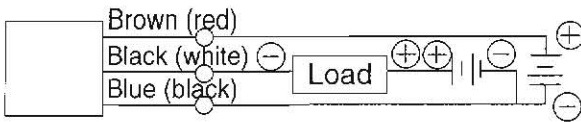
Black (white) lead wire:

Connect to load (to input of programmable controller and outlet relay).

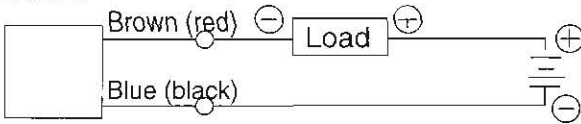
Blue (black) lead wire:

Connect to power source ⊖ (Power source GND terminal).

3 Wire (when power source for switch and load is not common.)



2 Wire



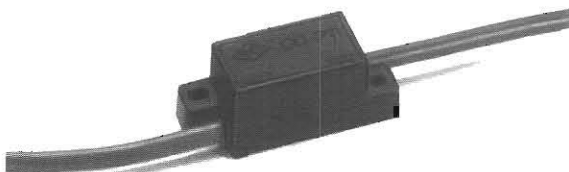
(): Previous color

Contact Protection

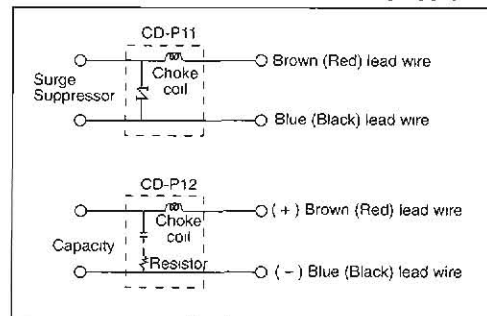
D-A33(c), A53, B53, A56, and A67 type have no built-in contact protection circuit. Use this box for induction loads, 5 meters or more of lead wires, or 100VAC applications.

| Model | Operating voltage | Length of lead wire |
|--------|-------------------|-----------------------------|
| CD-P11 | 100VAC | Switch connecting side 0.5m |
| CD-P12 | 200VDC | Load connecting side 0.5m |

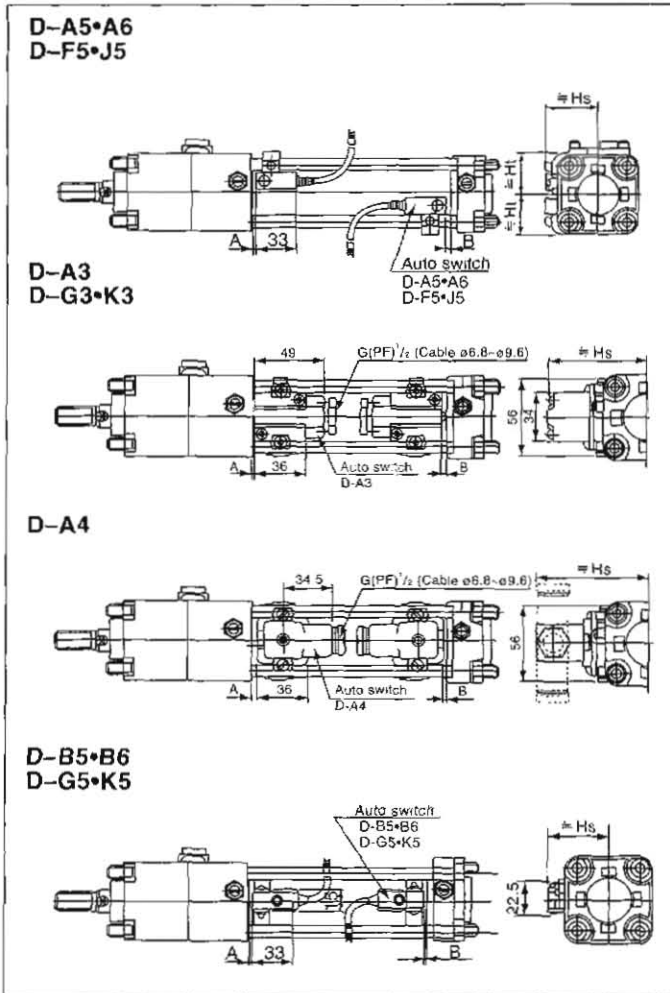
* D-A8 type switches are used for 100VAC or less: since there is no voltage limitation, you can select a suitable model for your needs.



Contact Protection Box/Internal Circuit



Auto Switch Mounting Position (At Stroke end)



Minimum Auto Switch Mountable Stroke

Minimum auto switch mounting strokes are as follows due to the space necessary to mount it.

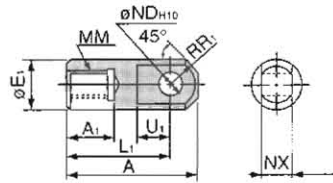
n: No. of auto switches

| Auto switch model | No. of Auto switch | Mounting bracket except trunnion | Center trunnion | | | |
|------------------------------|---|---|---|--------------------------------|-----------------------------------|--------------------------------|
| | | | ø40,ø50 | ø63 | ø80 | ø100 |
| D-A5 D-A6 D-F5 D-J5 | With 2 switches (different, same surface) with 1 switch | 15 | 90 | 100 | 110 | 120 |
| | With n switches (same surface) | $15+55(n-2)$ n=1,2,3,4... | $90+55(n-2)$ n=4,8,12,... | $100+55(n-2)$ n=4,8,12,... | $110+55(n-2)$ n=4,8,12,... | $120+55(n-2)$ n=4,8,12,... |
| D-B5 D-B6 D-G5 D-K5 | With 2 switches | Different surface: 15 Same surface: 75 | 90 | 100 | 110 | 110 |
| | With n switches | Different surface: $15+50(n-2)$ Same surface: $75+50(n-2)$ | $90+100(n-2)$ n=1,2,3,4... n=2,4,8,8... | $100+100(n-2)$ n=4,8,12,... | $110+100(n-2)$ n=4,8,12,16,... | $110+50(n-2)$ n=2,4,6,8... |
| | With 1 switch | 10 | 90 | 100 | 110 | 110 |
| D-A3 D-G3 D-K3 | With 2 switches | Different surface: 35 Same surface: 100 | 75 | 80 | 90 | 100 |
| | With n switches | Different surface: $35+30(n-2)$ Same surface: $100+100(n-2)$ | $75+30(n-2)$ n=2,3,4,5... n=2,4,6,8... | $80+30(n-2)$ n=2,4,6,8... | $90+30(n-2)$ n=2,4,6,8... | $100+100(n-2)$ n=1,2,3,4... |
| | With 1 switch | 10 | 75 | 80 | 90 | $100+100(n-2)$, n=2,4,5,8... |
| D-A4 | With 2 switches | Different surface: 35 Same surface: 35 | 75 | 80 | 90 | 90 |
| | With n switches | Different surface: $35+30(n-2)$ Same surface: $55+50(n-2)$ | $75+30(n-2)$ n=1,2,3,4... n=2,4,6,8... | $80+30(n-2)$ n=2,4,6,8... | $90+30(n-2)$ n=2,4,6,8... | $90+50(n-2)$ n=2,4,6,8... |
| | With 1 switch | 10 | 75 | 80 | 90 | 90 |

| Auto switch model | Auto switch mounting position | Auto switch placement dimensions (mm) | | | | |
|--------------------------|-------------------------------|---------------------------------------|--------|----------|----------|-----------|
| | | 40 | 50 | 63 | 80 | 100 |
| D-A5 D-A6 | A | 0(0) | 0(0) | 0(2.5) | 2(6) | 4(7.5) |
| | B | 1(0) | 1(0) | 5(1.5) | 8(4) | 10(6.5) |
| | ≅ Hs | 40 | 43.5 | 49 | 55.5 | 63 |
| D-A3 | A | 0(0) | 0(0) | 0(2.5) | 2(6) | 4(7.5) |
| | B | 1(0) | 1(0) | 5(1.5) | 8(4) | 10(6.5) |
| | ≅ Hs | 71.5 | 76.5 | 84.0 | 92.5 | 102.5 |
| D-A4 | A | 0(0) | 0(0) | 0(2.5) | 2(6) | 4(7.5) |
| | B | 1(0) | 1(0) | 5(1.5) | 8(4) | 10(6.5) |
| | ≅ Hs | 83 | 88 | 95.5 | 104 | 114 |
| D-G5, D-B5 D-B6, D-K5 | A | 0(0) | 0(0) | 0(3) | 2.5(6.5) | 4.5(8) |
| | B | 1.5(0) | 1.5(0) | 5.5(2) | 8.5(4.5) | 10.5(7) |
| | ≅ Hs | 38 | 43.5 | 50.5 | 59 | 69.5 |
| D-F5 D-J5 | A | 0(0) | 0(0) | 0(4.5) | 3(8) | 6(9.5) |
| | B | 3(0) | 3(0) | 7(3.5) | 10(6) | 12(8.5) |
| | ≅ Hs | 40 | 43.5 | 49 | 55.5 | 63 |
| D-G5 D-K5 | A | 0(0) | 0(0) | 0(4.5) | 3(8) | 6(9.5) |
| | B | 3(0) | 3(0) | 7(3.5) | 10(6) | 12(8.5) |
| | ≅ Hs | 38 | 43.5 | 50.5 | 59 | 69.5 |
| D-F59W D-J59W | A | 0(2) | 0(2) | 1(4.5) | 4(8) | 6(9.5) |
| | B | 3(0) | 3(0) | 7.5(3.5) | 10.5(6) | 12.5(8.5) |
| | ≅ Hs | 40 | 43.5 | 49 | 55.5 | 63 |
| | ≅ Ht | 31 | 35 | 42 | 50 | 57.5 |

Dimensions Of Accessories

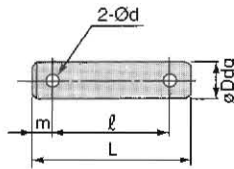
I Type Single Knuckle Joint



Material: Free cutting sulfur steel

| Parts no. | Applicable bore size (mm) | A | A ₁ | øE ₁ | L ₁ | MM | R ₁ | U ₁ | øND ^{H10} | NX |
|-----------|---------------------------|-----|----------------|-----------------|----------------|---------|----------------|----------------|-----------------------------------|------------------------------------|
| I-04 | 40 | 69 | 22 | 24 | 55 | M14×1.5 | 15.5 | 20 | 12 ^{+0.070} ₀ | 16 ^{+0.1} _{-0.3} |
| I-05 | 50 * 63 | 74 | 27 | 28 | 60 | M18×1.5 | 15.5 | 20 | 12 ^{+0.070} ₀ | 16 ^{+0.1} _{-0.3} |
| I-08 | 80 | 91 | 37 | 36 | 71 | M22×1.5 | 22.5 | 26 | 18 ^{+0.070} ₀ | 28 ^{+0.1} _{-0.3} |
| I-10 | 100 | 105 | 37 | 40 | 83 | M26×1.5 | 24.5 | 28 | 20 ^{+0.084} ₀ | 30 ^{+0.1} _{-0.3} |

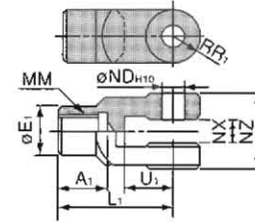
I Type Single Knuckle Joint



Material: Carbon steel

| Parts No. | Applicable bore size (mm) | | øDd9 | L | l | m | ød through hole diameter | Applicable split pin |
|-----------|---------------------------|----------|--|------|------|---|--------------------------|----------------------|
| | Clevis | knuckle | | | | | | |
| CDP-2A | 40 | — | 10 ^{+0.046} _{-0.076} | 46 | 38 | 4 | 3 | ø3×18ℓ |
| CDP-3A | 50 | 40*50*63 | 12 ^{+0.090} _{-0.095} | 55.5 | 47.5 | 4 | 3 | ø3×18ℓ |
| CDP-4A | 63 | — | 16 ^{+0.090} _{-0.095} | 71 | 61 | 5 | 4 | ø4×25ℓ |
| CDP-5A | — | 80 | 18 ^{+0.090} _{-0.095} | 76.5 | 66.5 | 5 | 4 | ø4×25ℓ |
| CDP-6A | 80 | 100 | 20 ^{+0.065} _{-0.117} | 83 | 73 | 5 | 4 | ø4×25ℓ |
| CDP-7A | 100 | — | 25 ^{+0.095} _{-0.117} | 88 | 78 | 6 | 4 | ø4×36ℓ |

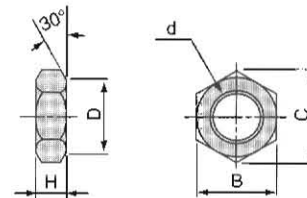
Y Type Double Knuckle Joint



Material: Cast iron

| Parts No. | Applicable bore size (mm) | A ₁ | øE ₁ | L ₁ | MM | R ₁ | U ₁ | øND ^{H10} | NX | NZ |
|-----------|---------------------------|----------------|-----------------|----------------|---------|----------------|----------------|-----------------------------------|------------------------------------|----|
| Y-04d | 40 | 22 | 24 | 55 | M14×1.5 | 13 | 25 | 12 ^{+0.070} ₀ | 16 ^{+0.1} _{-0.3} | 38 |
| Y-05d | 50 * 63 | 27 | 28 | 60 | M18×1.5 | 15 | 27 | 12 ^{+0.070} ₀ | 16 ^{+0.1} _{-0.3} | 38 |
| Y-08d | 80 | 37 | 36 | 71 | M22×1.5 | 19 | 28 | 18 ^{+0.070} ₀ | 28 ^{+0.1} _{-0.3} | 55 |
| Y-10d | 100 | 37 | 40 | 83 | M26×1.5 | 21 | 38 | 20 ^{+0.084} ₀ | 30 ^{+0.1} _{-0.3} | 61 |

Y Type Double Knuckle Joint



Material: Rolled steel

| Parts No. | Applicable bore size (mm) | d | H | B | C | D |
|-----------|---------------------------|---------|----|----|------|----|
| NT-04 | 40 | M14×1.5 | 8 | 22 | 25.4 | 21 |
| NT-05 | 50 * 63 | M18×1.5 | 11 | 27 | 31.2 | 26 |
| NT-08 | 80 | M22×1.5 | 13 | 32 | 37.0 | 31 |
| NT-10 | 100 | M26×1.5 | 16 | 41 | 47.3 | 39 |

Precautions

① Flushing

When mounting, completely flush the piping and be careful that dust and chips do not enter the cylinder and valve.

② Load on piston rod

Pay special attention to the fact that the load of piston rod should always be aligned parallel with the cylinder axis.

③ Rotational torque to piston rod

Avoid applying rotational torque to the piston rod, especially during locking.

④ Avoid damaging (Scratches, nicks) on the piston rod which, could lead to damage of rod seal, resulting in air leakage and disabling lock-up.

⑤ Lubrication

<Lube type>

Use non-additive turbine oil No. 1 (ISOVG32).

Never use machine oil, nor spindle oil.

<Non-lube type>

Lubrication is not required.

Although line system may need lubrication, this lock-up unit has nothing to do with it, and please note that over-lubrication and suspension of lubrication should be avoided.

⑥ Harmful environment

When used in a dusty environment, a shield should be used to prevent dust from entering the cylinder. Ambient temperature range should be 14–140°F (-10–60°C).

Please contact SMC for cases other than this range.

⑦ Operating air pressure circuit

Air pressure circuit should be in accordance with the ones recommended as per page 10 which is designed to prevent piston rod from flying out after releasing lock-up.

⑧ Maximum speed and maximum load

Be careful not to exceed allowable kinetic energy indicated in the specifications on page 8.

Conversion Chart

Metric to English

(Multiply _____ by _____ To Obtain _____)

Length

| | | |
|----|--------|------|
| mm | 0.0394 | mils |
| mm | 0.0394 | in |
| cm | 0.3937 | in |
| m | 3.2810 | ft |

Area

| | | |
|-----------------|--------|-----------------|
| mm ² | 0.0016 | in ² |
| cm ² | 0.1550 | in ² |
| m ² | 10.765 | ft ² |

Volume

| | | |
|----------------------|-------------------------|-----------------|
| mm ³ | 6.10 x 10 ⁻⁵ | in ³ |
| cm ³ (cc) | 0.0610 | in ³ |
| m ³ | 35.320 | ft ³ |
| L | 0.0353 | ft ³ |
| L | 0.2642 | gal (U.S.) |

Weight

| | | |
|----|--------|----|
| g | 0.0353 | oz |
| kg | 2.2046 | lb |

Force

| | | |
|-----|--------------------------|-----|
| gf | 2.205 x 10 ⁻³ | lbf |
| kgf | 2.2046 | lbf |
| N | 0.2248 | lbf |

Key

μm = micron (micrometer)
 mm = millimeter
 cm = centimeter
 m = meter
 mils = 0.001 inch
 in = inch
 ft = foot
 cc = cubic centimeter
 L = liter
 gal (U.S.) = U.S. gallon
 g = gram
 kg = kilogram
 oz = ounce
 lb = pound

Torque

| | | |
|--------|--------|---------|
| N • m | 0.7375 | ft • lb |
| kg • m | 7.2330 | ft • lb |

Pressure

| | | |
|----------------------|---------|-----|
| mm(H ₂ O) | 0.00142 | psi |
| mm(Hg) | 0.0197 | psi |
| torr | 0.0197 | psi |
| kPa | 0.145 | psi |
| bar | 14.50 | psi |
| kg cm ² | 14.224 | psi |
| atm | 14.7 | psi |

Energy

| | | |
|-------|--------|---------|
| N • m | 0.7375 | ft • lb |
| J | 0.7375 | ft • lb |
| MJ | 0.2778 | kWh |

Power

| | | |
|----|--------|-----------|
| W | 0.7376 | ft • lb/s |
| kW | 1.341 | hp |

Temperature

°F = (1.8 x °C) + 32

Flow rate

NI/min x 0.035 = SCFM

gf = gram - force
 kgf = kilogram - force
 N = newton
 lbf = pound - force
 N • m = newton - meter
 kg • m = kilogram - meter
 ft • lb = foot - pound
 mm (H₂O) = millimeter water column
 in (H₂O) = inches water column
 mm (H) = millimeter mercury column
 in (Hg) = inches mercury column

English to Metric

(Multiply _____ by _____ To Obtain _____)

Length

| | | |
|------|--------|----|
| mils | 2.54 | mm |
| in | 25.4 | mm |
| in | 2.54 | cm |
| ft | 0.3048 | m |

Area

| | | |
|-----------------|--------|-----------------|
| in ² | 645.16 | mm ² |
| in ² | 6.4516 | cm ² |
| ft ² | 0.0929 | m ² |

Volume

| | | |
|-----------------|--------|----------------------|
| in ³ | 16387 | mm ³ |
| in ³ | 16.387 | cm ³ (cc) |
| ft ³ | 0.0283 | m ³ |
| ft ³ | 28.329 | L |
| gal(U.S.) | 3.785 | L |

Weight

| | | |
|----|--------|----|
| oz | 28.329 | g |
| lb | 0.4536 | kg |

Force

| | | |
|-----|--------|-----|
| lbf | 453.6 | gf |
| lbf | 0.4536 | kgf |
| lbf | 4.4482 | N |

psi = pounds per square inch
 kPa = kilopascals
 atm = atmospheres
 J = joule
 MJ = megajoule
 W = watt
 kW = kilowatt
 kWh = kilowatt-hour
 hp = horsepower
 °C = degrees Centigrade
 °F = degrees Fahrenheit
 s = seconds
 NI/min = Normal liters per minute

Torque

| | | |
|---------|--------|--------|
| ft • lb | 1.3559 | N • m |
| ft • lb | 0.1383 | kg • m |

Pressure

| | | |
|----------------------|---------------------------|--------------------|
| in(H ₂ O) | 2.5357 x 10 ⁻³ | kg/cm ² |
| in(Hg) | 0.03518 | kg/cm ² |
| psi | 6.897 | kPa |
| psi | 0.06897 | bar |
| psi | 0.0703 | kg/cm ² |

Energy

| | | |
|---------|-------|-------|
| ft • lb | 1.356 | N • m |
| ft • lb | 1.356 | J |
| kWh | 3.6 | MJ |

Power

| | | |
|-----------|--------|----|
| ft • lb/s | 1.356 | W |
| hp | 0.7457 | kW |

Temperature

°C = 5/9(°F-32)

Flow rate

SCFM x 28.57 = NI/min
 Cv1.0 = Kv 0.856

SCFM = Std. cubic feet per minute

Basic Formulas

Circle circumference = πD = 2πr
 Circle area = πr²
 Force = Pressure x Area
 Cylinder Volume (rod side) = (piston area - rod cross-section area) x stroke
 Cylinder Volume (head end) = piston area x stroke
 Torque = force x perpendicular distance from shaft

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