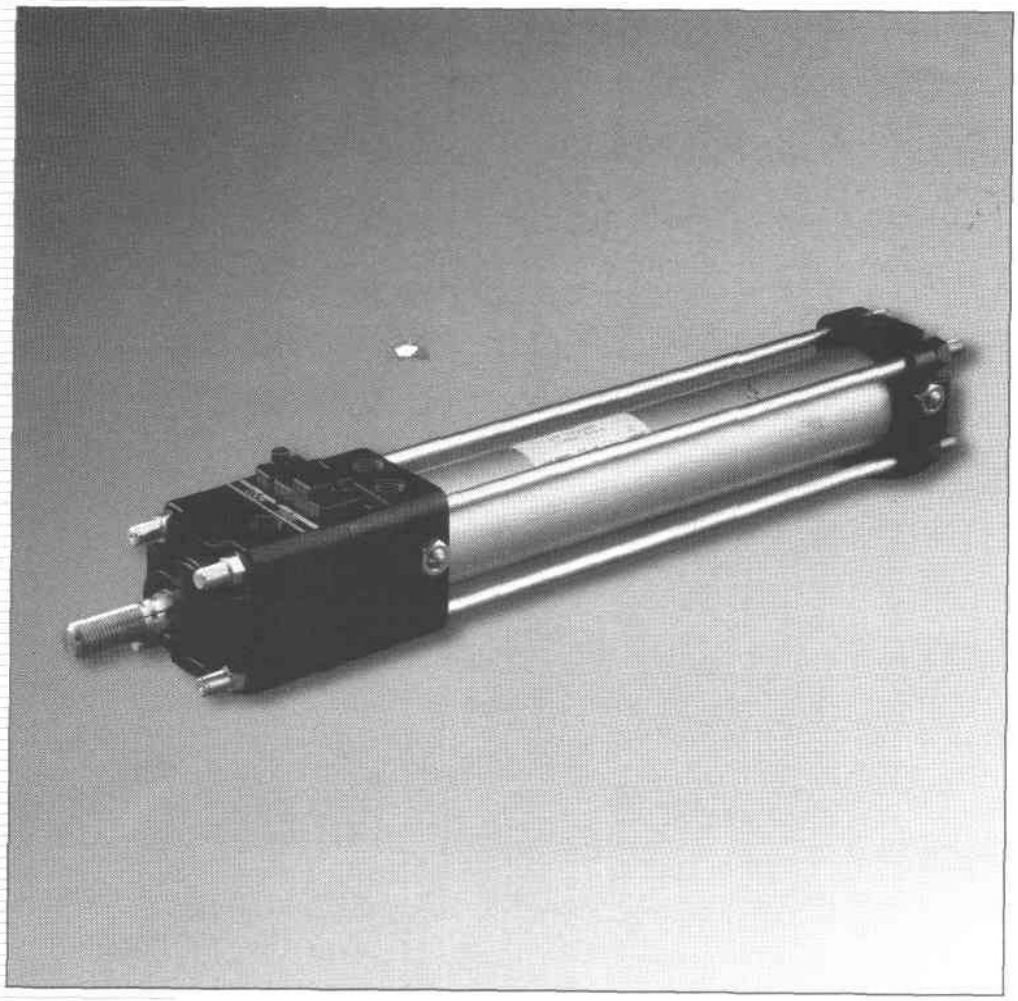
SMC®

Air Cylinder

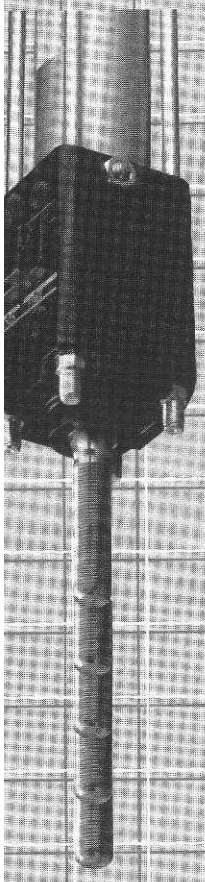
CLA Series

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

Table of Contents



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

Options highlighted:

Preferred Option Program

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

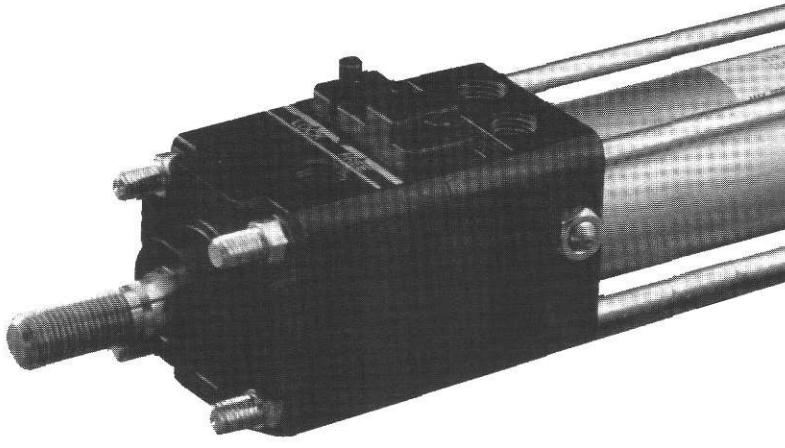
Condition/Load: 25% of thrust at 5kgf/cm2
Solenoid valve: Mount on lock-port

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.

Simple maintenance and overhauling

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



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)

Two way lock-up possible

Two way lock-up possible for cylinder stroke.

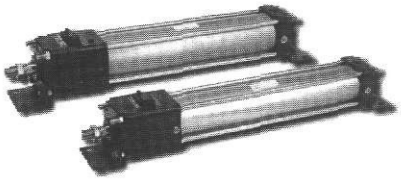
Longer life

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

Warranty

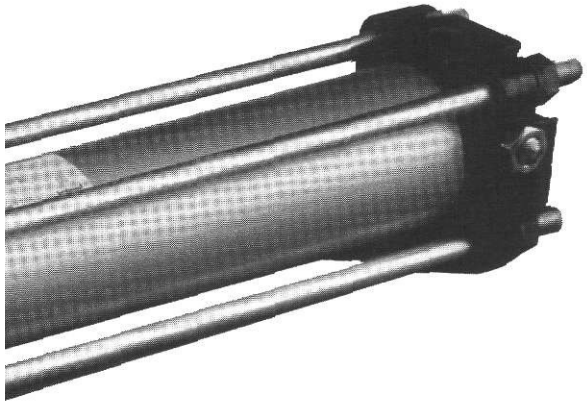
18 months/1800 service miles.
(2897 km)

Accurate Mid-Position Stop

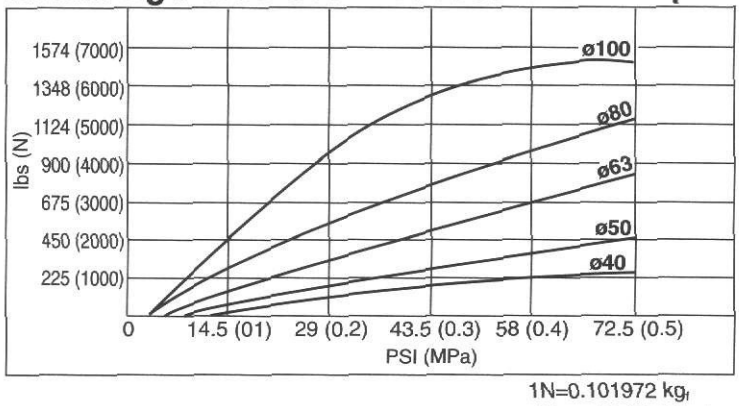


Ideal for fail safe applications

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.

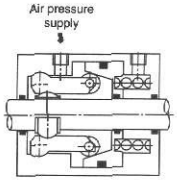
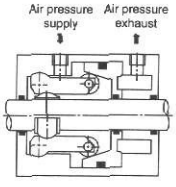
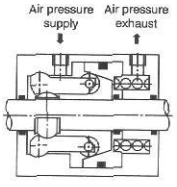
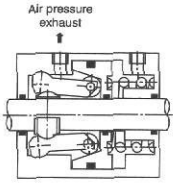
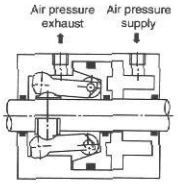
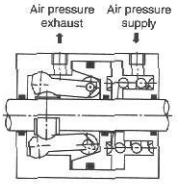


Retaining Force Of Air Pressure Lock-up



1N=0.101972 kg_f
1Mpa=10.1972 kg_f/cm_2

Brake 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)	•High accuracy •Retaining force interchangeable at option at option •Operate towards safety side	•High accuracy •Retaining force interchangeable
Releasing			
Locking			

Series CLA

Air Cylinder with Brake

ø40, ø50, ø63, ø80, ø100

How To Order

Standard CLA — L N 50 100 RJ E — X1US

With Auto Switch CDLA — L N 50 100 RJ E A51 S X1US

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 tube**

*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

Type of locking

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

Applicable Auto Switch

*Refer to table below for selection of applicable auto switch

—	*Without auto switch*

Number of auto switch

—	2 pcs
S	1 pc
3	3 pcs
n	n pcs

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 tube

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		
A54	B54			
A67	—			
A64	B64			
A33C	A33		Connector	
A34C	A34			
A44C	A44		DIN	
A59W	B59W		Grommet	
F59	G59	3 wire system/NPN	Grommet	Solid State
F5P	G5P	3 wire system/PNP		
J51	—	2 wire system		
J59	K59			
G39C	G39	3 wire system/NPN	Connector	
K39C	K39	2 wire system		
F59W	G59W	3 wire system/NPN	Grommet	
F5PW	G5PW	3 wire system/PNP		
J59W	K59W	2 wire system		
F5BAL	G5BAL			
F5NTL	G5NTL	3 wire system/NPN		
F59F	G59F	4 wire system/NPN		
F5LF	—	4 wire system/NPN		

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

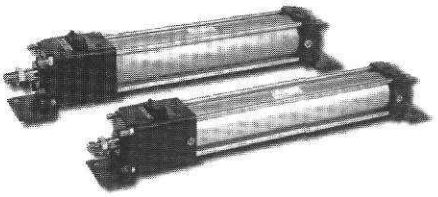
*Lead wire length 0.5m.....—(Example: A53)
3m .....L (Example: A53L)
5m .....Z (Example: A53Z)

Preferred Option Program

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 sputpin.



Model

Series	Type	Action	Bore size (mm)	Type of locking
CLAO	Lube type	Double	40,50,63,80,100	Spring lock-up
CLAO N	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:$^{+1.0}_{0}$, 251~1000:$^{+1.4}_{0}$, 1001~1500:$^{+1.8}_{0}$	
Mounting	Basic, Foot, Front flange, Rear flange Single clevis, Rear trunnion	

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

1Mpa=10.1972 kgf/cm^2

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
		Trunion 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 weight ..... .48/50 Stroke
- Cylinder stroke ..... 100 stroke

4.42+.48×(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

Locking Specifications

Locking	Spring lock-up (Exhaust lock)	Spring-Air pressure lock-up	Air pressure lock-up (Press lock)
Releasing pressure PSI (kgf/cm²)	43.5 (3.1) or more		14.5 (1.0) or more
Locking pressure PSI (kgf/cm²)	36.3 (2.5) or less		7.3 (0.5) or more
Max. operating pressure PSI (kgf/cm²)	72.5 (5.1)		
Locking direction	Both ways		

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

❶ 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:

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

Ek: Kinetic energy at load (kgf-cm)
w: Load weight (kgf)
g: Acceleration of gravity 980 (cm/s²)
v: Piston speed (cm/s)
(Average speed × 1.2, refer to particle 3)

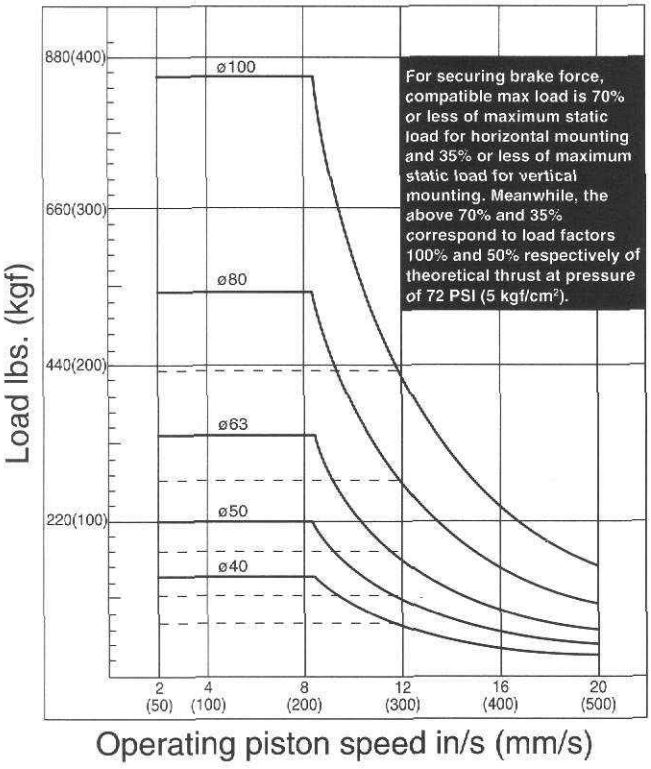
❷ If piston speed exceeds average speed before locking. The calculation of standard piston speed for kinetic energy at load is the average speed ×1.2.

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

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

Therefore, for securing brake 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.



Stoppage Accuracy

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

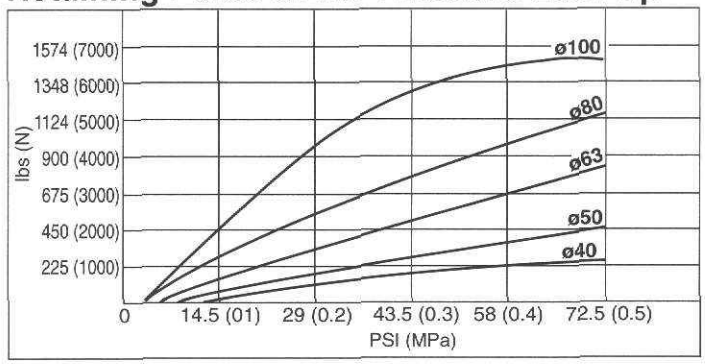
Type of locking	Piston speed mm/sec (in/sec)			
	50 (2)	100 (4)	300 (12)	500 (20)
Spring lock	±0.4 (±0.016)	±0.5 (±0.02)	±1.0 (±0.04)	±2.0 (±0.08)
Air pressure lock Spring•Air pressure lock	±0.2 (±0.008)	±0.3 (±0.012)	±0.5 (±0.02)	±1.5 (±0.06)

Condition/Load: 25% of thrust at 75psi
Solenoid valve: Mount on lock-port

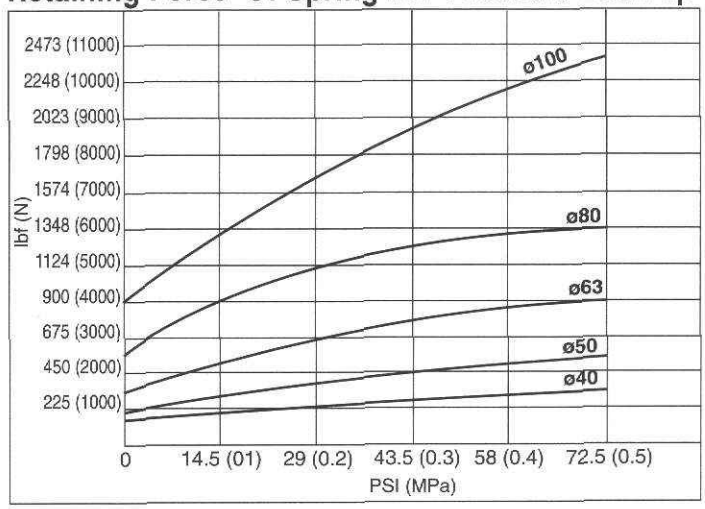
Retaining Force Of Air Pressure Lock-up (Max. Static Load)

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.

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_f/cm^2) 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

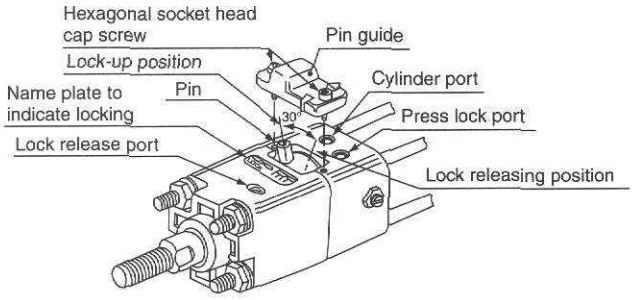
❶ Unscrew the 2 socket head cap screws and remove the pin guide.

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_f/cm^2) or more if desired.

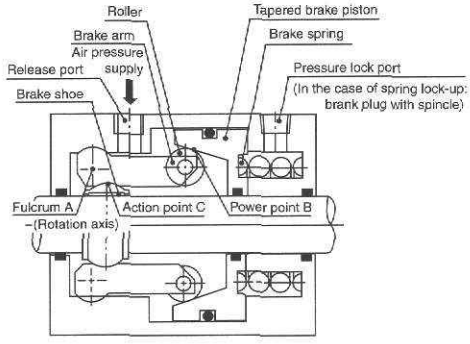
❹ Rotate the pin 30° clockwise (when viewed from the rod end) using *a wooden or plastic handle, taking care not to damage the pin or* lock unit. **Note: *Do not hit the pin to rotate or the pin could be bent or damaged as a result. Be careful when pushing the pin as it may be slippery.***

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.

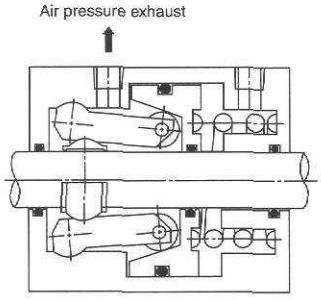


Construction

Spring lock-up



Lock releasing

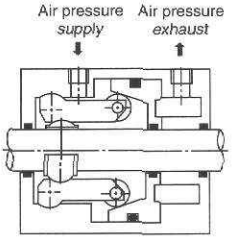


Locking

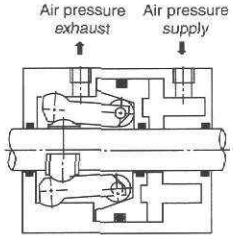
Spring force applied to the tapered brake piston is amplified by the wedge effect $\frac{AB}{AC}$ times by the effect of lever, works on the brake shoe, then turns into a large gripping force which tightens on the piston rod to lock it.

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

Air pressure lock-up



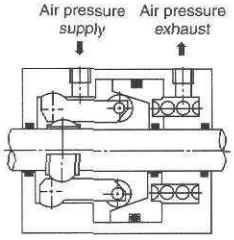
Lock releasing



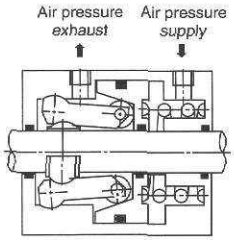
Locking

Air pressure drives the brake piston.

Spring with air pressure lock-up



Lock releasing



Locking

Air pressure and spring force combine to drive brake piston.

Recommended circuit

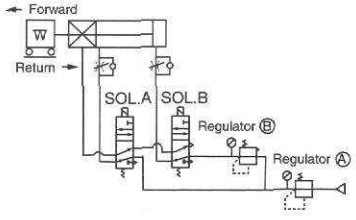
- Assemble circuit as shown in diagrams 1 to 6.

  While in lock-up, cylinder piston receives on both sides, balance pressure of load which is balanced by means of regulator Ⓑ, 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 Ⓑ 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 Ⓐ will be recommended.

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



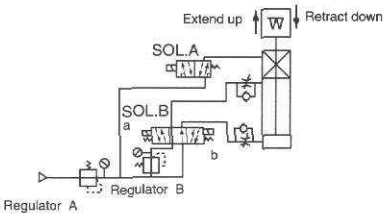
Sol. A	Sol. B	Operation
ON	OFF	Forward
OFF	OFF	Locking
ON	OFF	Forward
OFF	ON	Return
OFF	OFF	Locking
OFF	ON	Return

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 Ⓑ 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)



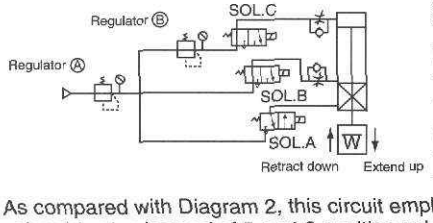
Sol. A	Sol. B a	Sol. B b	Operation
ON	ON	OFF	Extend up
OFF	OFF	OFF	Locking
ON	ON	OFF	Extend up
ON	OFF	ON	Retract down
OFF	OFF	OFF	Locking
ON	OFF	ON	Retract down

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)

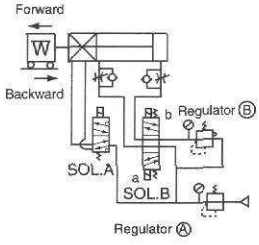


Sol.A	Sol.B	Sol.C	Operation
ON	ON	OFF	Retract down
OFF	OFF	OFF	Locking
ON	ON	OFF	Retract down
ON	OFF	ON	Extend up
OFF	OFF	OFF	Locking
ON	OFF	ON	Extend up

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)

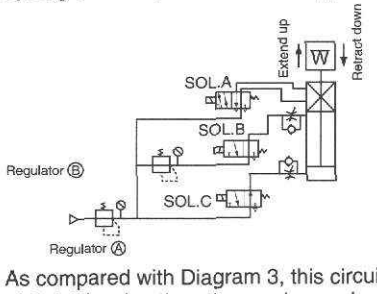


Sol. A	Sol. B a	Sol. B b	Operation
ON	ON	OFF	Forward
OFF	OFF	OFF	Locking
ON	ON	OFF	Forward
ON	OFF	ON	Backward
OFF	OFF	OFF	Locking
ON	OFF	ON	Backward

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

Be sure to set regulator Ⓐ 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)

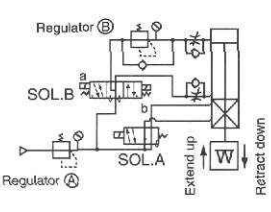


Sol.A	Sol.B	Sol.C	Operation
ON	ON	OFF	Extend up
OFF	OFF	OFF	Locking
ON	ON	OFF	Extend up
ON	OFF	ON	Retract down
OFF	OFF	OFF	Locking
ON	OFF	ON	Retract down

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

Be sure to set regulator Ⓐ 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.

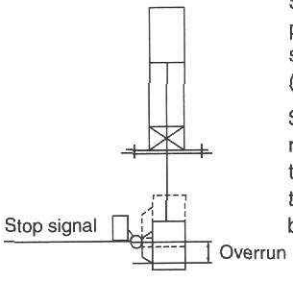
Be sure to use a regulator Ⓑ that has check valve. (reverse flow) Set regulator Ⓐ 3.5 kgf/cm² or more for spring with air pressure lock-up and 1 kgf/cm² or more for air pressure lock-up. Sol A accept direct-operated type and pilot-operated type.

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

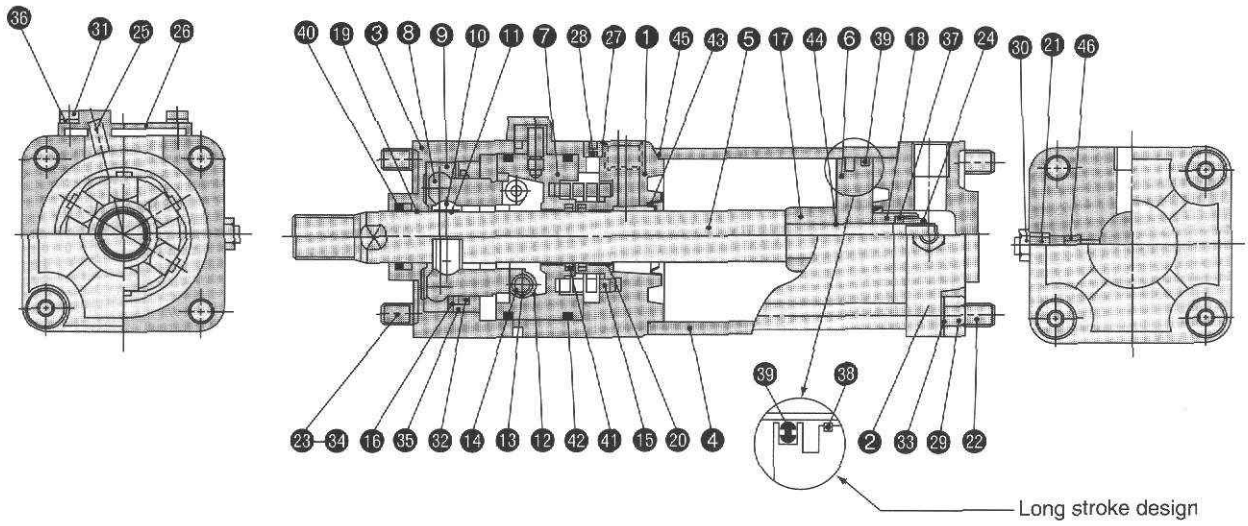
❶In order to get higher stoppage accuracy, we recommend air pressure lock-up or spring with air pressure lock-up. If you even want higher stoppage accuracy, it is important to cut the time between signal and stop. The counter-measure is as follows. Select control circuit and solenoid valve that are of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

❷Load 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.

❸Since 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-break 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.

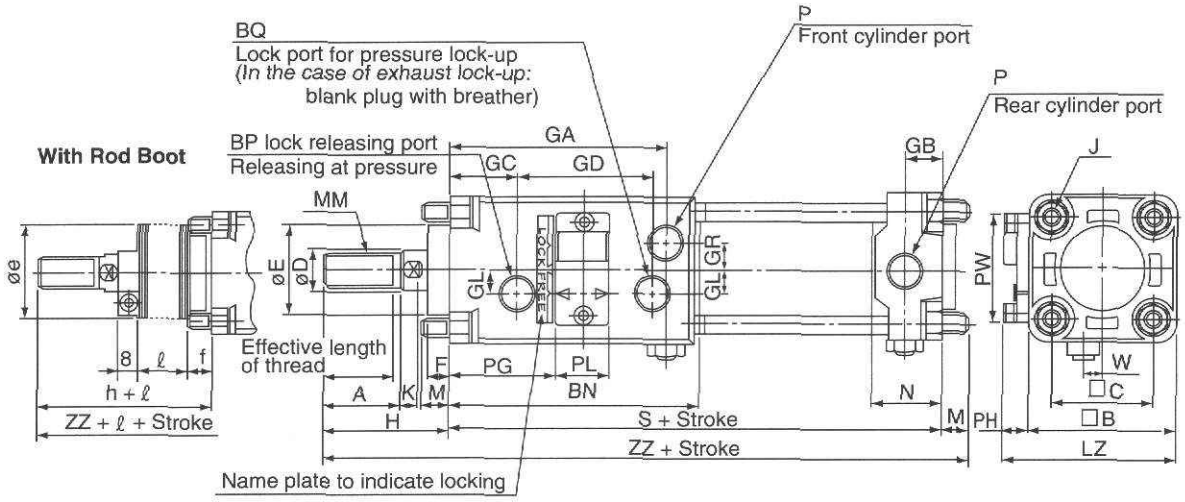
Ex: CLA □ – □ – □

Bore

Lock type

XC18 for NPT

Basic Type/CLAB

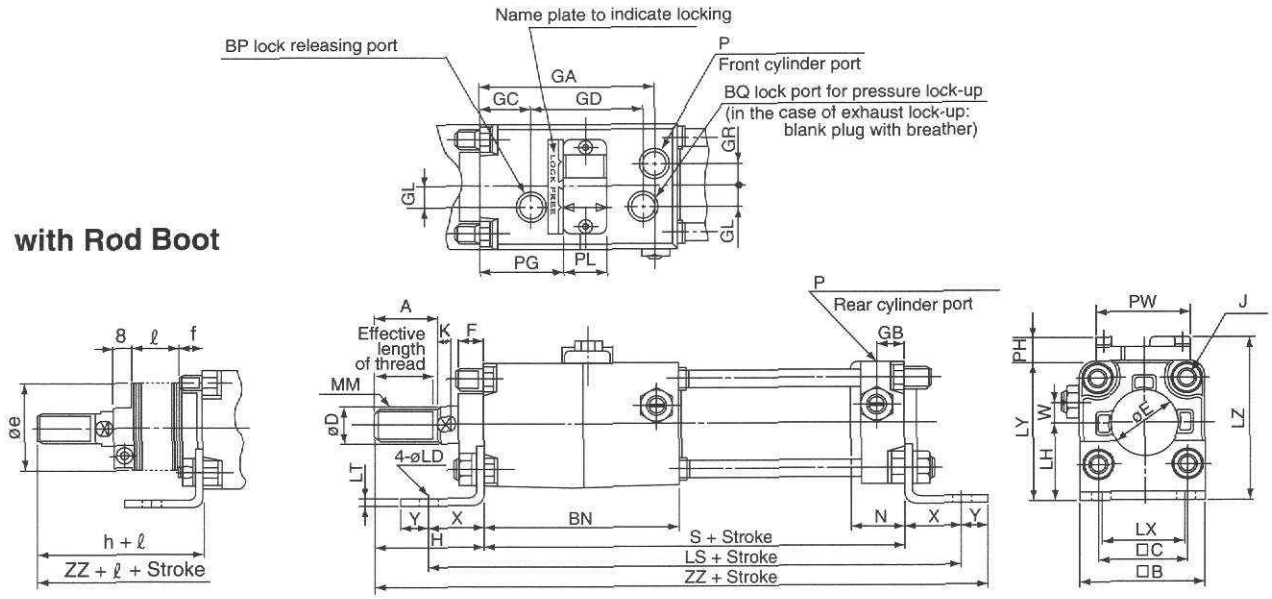


Bore size (mm)	Stroke range (mm)		Effective length of thread	A	□B	BN	BP	BQ	□C	øD	øE	F	GA	GB	GC	GD	GL	GR	J
	without boot	With boot																	
40	~500	20~500	27	30	60	96	1/4	1/4	44	16	32	10	85	15	26	54	10	10	M8X1.25
50	~600	20~600	32	35	70	108	1/4	1/4	52	20	40	10	95	17	27	59	13	12	M8X1.25
63	~600	20~600	32	35	86	115	1/4	1/4	64	20	40	10	102	17	26	67	18	15	M10X1.25
80	~750	20~750	37	40	102	129	1/4	1/4	78	25	52	14	113	21	30	72	23	17	M12X1.75
100	~750	20~750	37	40	116	140	1/4	1/4	92	30	52	14	124	21	31	76	25	19	M12X1.75

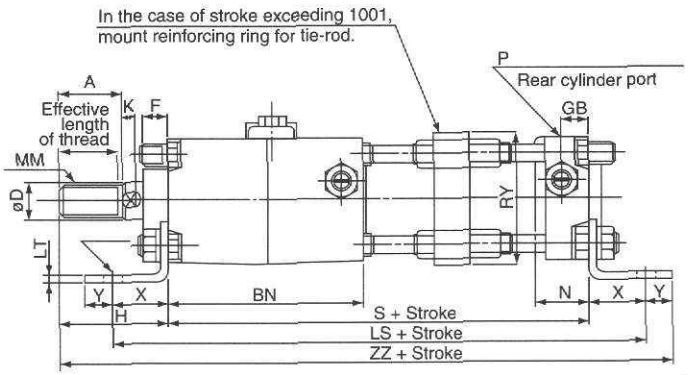
Bore size (mm)	K	LZ	M	MM	MM X1US	N	P	PG	PH	PL	PW	S	W	Without boot		With boot				
														H	ZZ	øe	f	h	ℓ	zz
40	6	71	11	M14X1.5	7/16 - 20	27	1/4	42	11	20	45	153	8	51	215	43	11.2	59	1/4 stroke	223
50	7	80	11	M18X1.5	3/4 - 16	30	3/8	46	10	21	50	168	0	58	237	52	11.2	66		245
63	7	99	14	M18X1.5		31	3/8	48.5	13	23	60	182	0	58	254	52	11.2	66		262
80	11	117	17	M22X1.5		37	1/2	55	15	23	70	208	0	71	296	65	12.5	80		305
100	11	131	17	M26X1.5	1 - 14	40	1/2	56.5	15	25	80	226	0	72	315	65	14	81		324

Foot type/CLAL

with Rod Boot



Long Stroke (ø50~ø100)



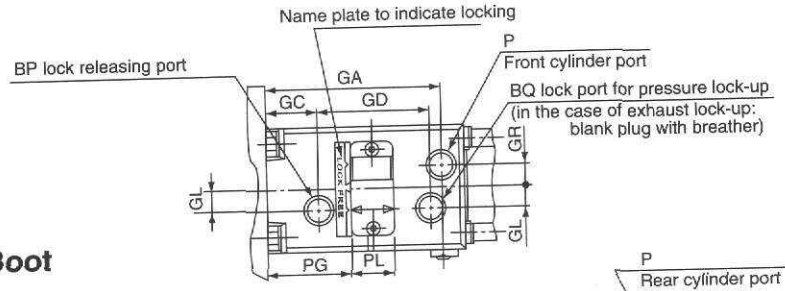
Long Stroke

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

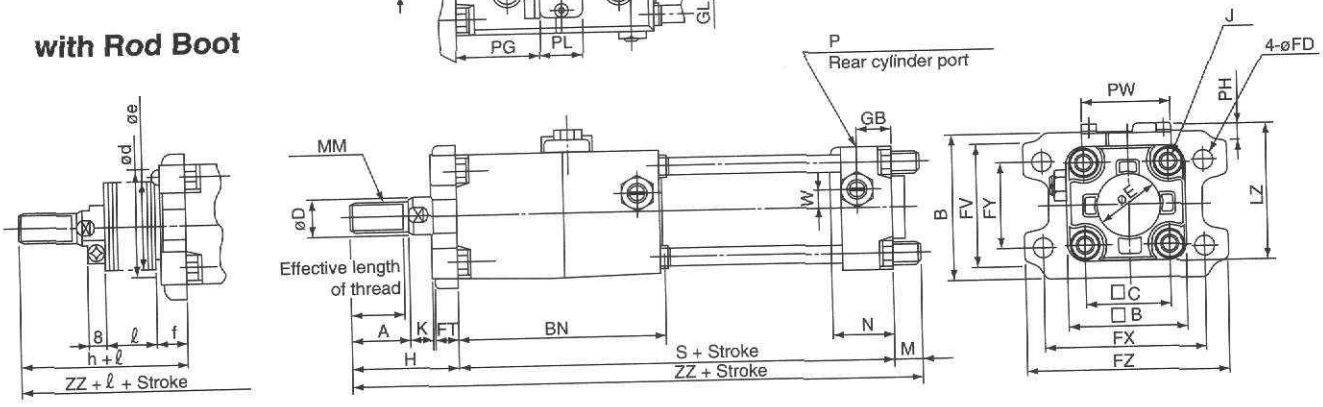
Bore Size (mm)	Stroke range (mm)		Effective length of thread	A	□B	BN	BP	BQ	□C	øD	øE	F	GA	GB	GC	GD	GL	GR	J	K	MM
	Without boot	With boot																			
40	~500	20~500	27	30	60	96	1/4	1/4	44	16	32	10	85	15	26	54	10	10	M8X1.25	6	M14X1.5
50	~600	20~600	32	35	70	108	1/4	1/4	52	20	40	10	95	17	27	59	13	12	M8X1.25	7	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	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	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	M26X1.5

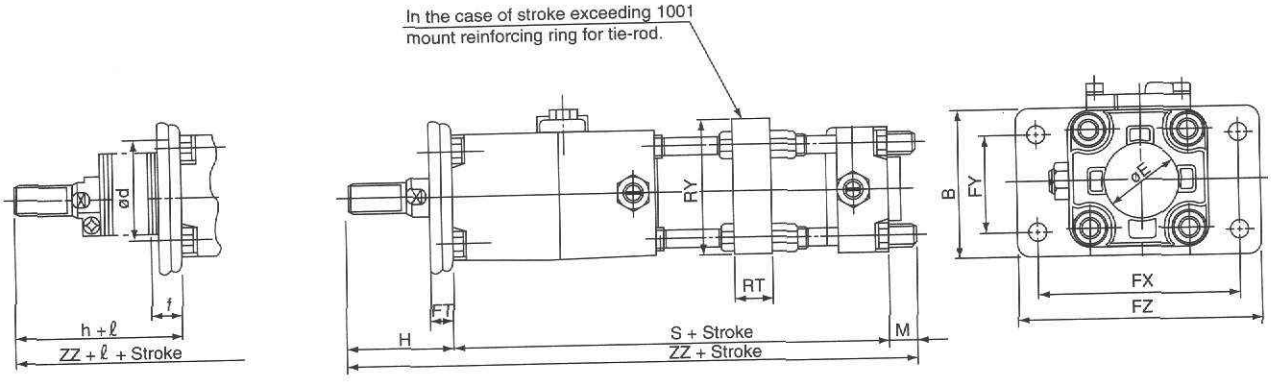
Bore Size (mm)	MM X1US	N	P	PG	PH	PL	PW	S	W	X	Y	øL D	LH	LS	LT	LX	LY	LZ	Without Boot H	With Boot ZZ	øe	f	h	ℓ	ZZ
40	7/16 - 20	27	1/4	42	11	20	45	153	8	27	13		40	207	3.2	42	70	81	51	244	43	11.2	59		252
50		30	3/8	46	10	21	50	168	0	27	13	9	45	222	3.2	50	80	90	58	266	52	11.2	66		274
63	3/4 - 16	31	3/8	48.5	13	23	60	182	0	34	16	9	50	250	3.2	59	93	106	58	290	52	11.2	66	1/4 Stroke	298
80		37	1/2	55	15	23	70	208	0	44	16	11.5	65	296	4.5	76	116	131	71	339	65	12.5	80		348
100	1 - 14	40	1/2	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



with Rod Boot





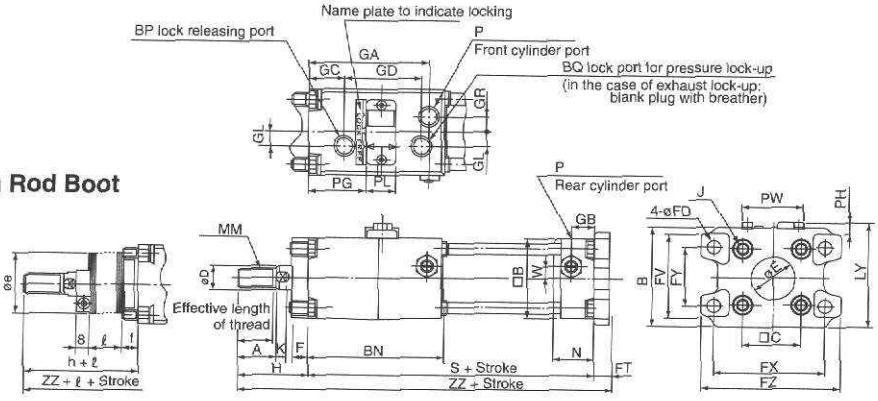
Long Stroke

Bore size (mm)	Stroke range (mm)	B	M	RT	RY	FT	FX	FY	FZ	Without boot		With boot	
										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	A	B	□B	BN	BP	BQ	□C	øD	øE	GA	GB	GC	GD	GL	GR	J	K	LZ	M	MM
	Without boot	With boot																					
40	~800	20~800	27	30	71	60	96	1/4	1/4	44	16	32	85	15	26	54	10	10	M8X1.25	6	71	11	M41X1.5
50	~1000	20~1000	32	35	81	70	108	1/4	1/4	52	20	40	95	17	27	59	13	12	M8X1.25	7	80	11	M18X1.5
63	~1000	20~1000	32	35	101	86	115	1/4	1/4	64	20	40	102	17	26	67	18	15	M10X1.25	7	99	14	M18X1.5
80	~1000	20~1000	37	40	119	102	129	1/4	1/4	78	25	52	113	21	30	72	23	17	M12X1.75	11	117	17	M22X1.5
100	~1000	20~1000	37	40	133	116	140	1/4	1/4	92	30	52	124	21	31	76	25	19	M12X1.75	11	131	17	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	ød	øe	f	h	ℓ	ZZ
40	7/16 - 20	27	1/4	42	11	20	45	153	8	60	9	12	80	42	100	51	215	52	43	15	59	1/4 Stroke	223
50	3/4 - 16	30	3/8	46	10	21	50	168	0	70	9	12	90	50	110	58	237	58	52	15	66		245
63		31	3/8	48.5	13	23	60	182	0	86	11.5	15	105	59	130	58	254	58	52	17.5	66		262
80		37	1/2	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	1/2	56.5	15	25	80	226	0	116	13.5	18	150	92	180	72	315	80	65	21.5	81		324

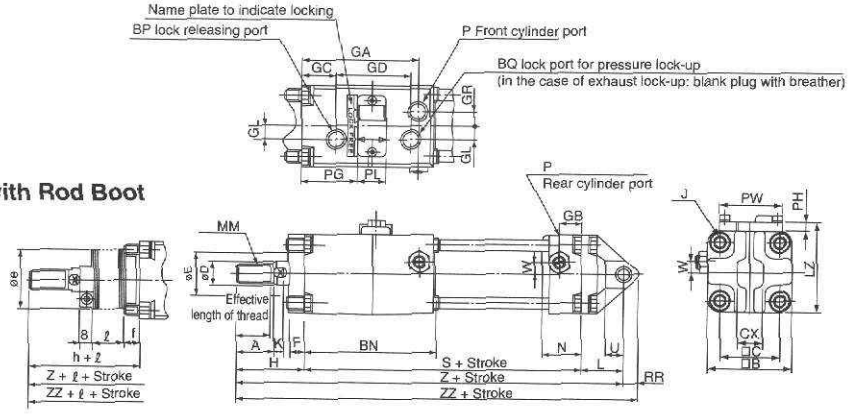
Rear Flange Type/CLAG



Bore size (mm)	Stroke range (mm) Without boot	With boot	Effective length of thread	A	B	□B	BN	BP	BQ	□C	øD	øE	F	GA	GB	GC	GD	GL	GR	J	K	LY	MM
40	~500	20~500	27	30	70	60	96	1/4	1/4	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	1/4	1/4	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	1/4	1/4	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	1/4	1/4	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	1/4	1/4	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 H	Without boot ZZ	With boot øe	With boot f	With boot h	With boot ℓ	With boot ZZ
40	7/16 - 20	27	1/4	42	11	20	45	153	8	60	9	12	80	42	100	51	216	43	11.2	59		224
550		30	3/8	46	10	21	50	168	0	70	9	12	90	50	110	58	238	52	11.2	66		246
63	3/4 - 16	31	3/8	48.5	13	23	60	182	0	86	11.5	15	105	59	130	58	255	52	11.2	66	1/4 Stroke	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

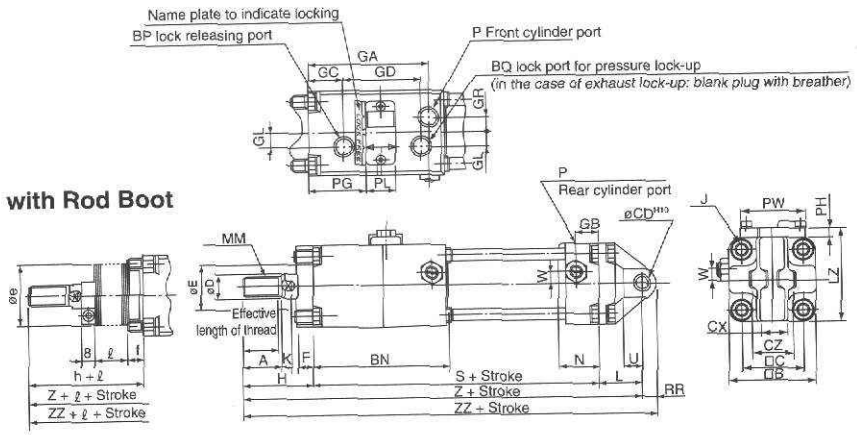
Single Clevis Type/CLAC



Bore size (mm)	Stroke range (mm) Without boot	With boot	Effective length of thread	A	□B	BN	BP	BQ	□C	øD	øE	F	GA	GB	GC	GD	GL	GR	J	K	L	LZ	MM
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	øCD H10	CX	Without boot H	Without boot Z	Without boot ZZ	With boot øe	With boot f	With boot h	With boot ℓ	With boot Z	With boot ZZ
40	7/16 - 20	27	1/4	42	11	20	45	10	153	16	8	$10^{+0.058}_{0}$	$15^{0.1}_{0.3}$	51	234	244	43	11.2	59		242	252
50		30	3/8	46	10	21	50	12	168	19	0	$10^{+0.070}_{0}$	$18^{0.1}_{0.3}$	58	261	273	52	11.2	66		269	281
63	3/4 - 16	31	3/8	48.5	13	23	60	16	182	23	0	$16^{+0.070}_{0}$	$25^{0.1}_{0.3}$	58	280	296	52	11.2	66	1/4 Stroke	288	304
80		37	1/2	55	15	23	70	20	208	28	0	$20^{+0.084}_{0}$	$31.5^{0.1}_{0.3}$	71	327	347	65	12.5	80		36	356
100	1 - 14	40	1/2	56.5	15	25	80	25	226	36	0	$25^{+0.084}_{0}$	$35.5^{0.1}_{0.3}$	72	256	281	65	14.0	81		265	390

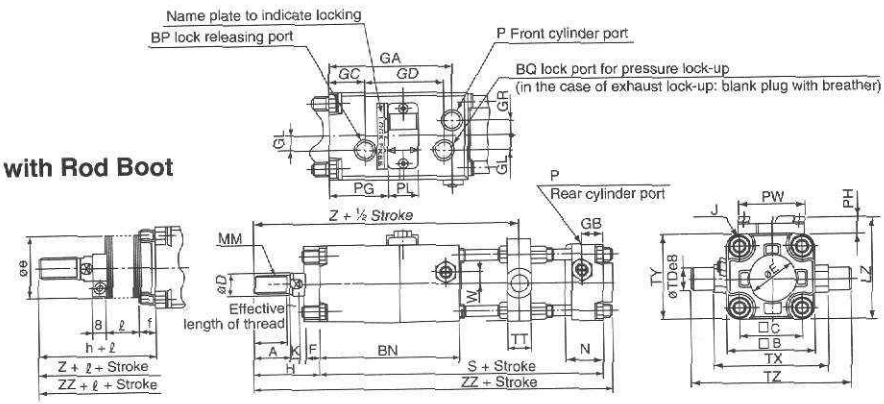
Double Clevis Type/CLAD



Bore size (mm)	Stroke range (mm) Without boot	With boot	Effective length of thread	A	□B	BN	BP	BQ	□C	øD	øE	F	GA	GB	GC	GD	GL	GR	J	K	L	LZ	MM
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

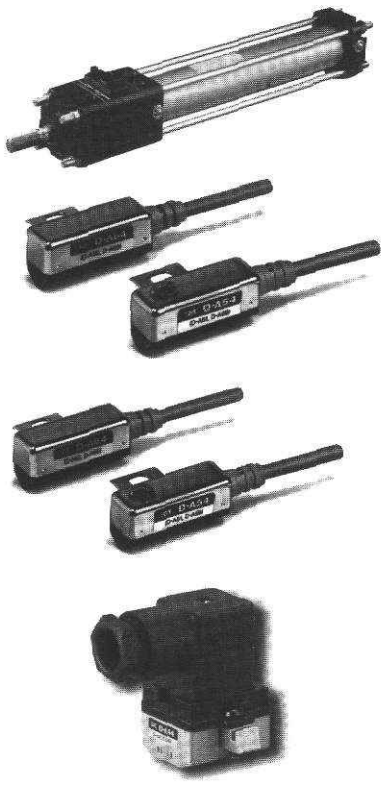
Bore size (mm)	MM X1US	N	P	PG	PH	PL	PW	RR	S	U	W	øCD H10	CX	CZ	Without boot H	Z	ZZ	With boot øe	f	h	ℓ	Z	ZZ
40	7/16 - 20	27	1/4	42	11	20	45	10	153	16	8	$10^{+0.058}_{0}$	$15^{-0.1}_{-0.3}$	29.5	51	234	244	43	11.2	59	1/4 Stroke	242	252
50	3/4 - 16	30	3/8	46	10	21	50	12	168	19	0	$10^{+0.070}_{0}$	$18^{-0.1}_{-0.3}$	38	58	261	273	52	11.2	66		269	281
63		31	3/8	48.5	13	23	60	16	182	23	0	$16^{+0.070}_{0}$	$25^{-0.1}_{-0.3}$	49	58	280	296	52	11.2	66		288	304
80		37	1/2	55	15	23	70	20	208	28	0	$20^{+0.084}_{0}$	$31.5^{-0.1}_{-0.3}$	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	$25^{+0.084}_{0}$	$35.5^{-0.1}_{-0.3}$	64	72	256	281	65	14.0	81		365	390

Trunnion Type/CLAT



Bore size (mm)	Stroke range (mm) Without boot	With boot	Effective length of thread	A	□B	BN	BP	BQ	□C	øD	øE	F	GA	GB	GC	GD	GL	GR	J	K	LZ	MM
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	øTDe8	TT	TX	TY	TZ	Without boot H	Z	ZZ	With boot øe	f	h	ℓ	Z	ZZ
40	7/16 - 20	27	1/4	42	11	20	45	153	8	$15^{-0.032}_{-0.059}$	22	85	62	117	51	162	209	43	11.2	59	1/4 Stroke	170	217
50	3/4 - 16	30	3/8	46	10	21	50	168	0	$15^{-0.032}_{-0.059}$	22	95	74	127	58	181	232	52	11.2	66		189	240
63		31	3/8	48.5	13	23	60	182	0	$18^{-0.032}_{-0.059}$	28	110	90	148	58	191	248	52	11.2	66		199	256
80		37	1/2	55	15	23	70	208	0	$25^{-0.040}_{-0.073}$	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	$25^{-0.040}_{-0.073}$	40	162	130	214	72	235	306	65	14.0	81		244	315



Standard specifications — Reed

Lead wire	Oil proof vinyl
Impact resistance	300m/S² {30 G}
Insulation resistance	50MΩ or more under the test voltage 500 VDC (Between case and cable)
Withstand voltage	Note 1) 1500 VAC 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: 1000 VAC 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 specification — Solid State

Lead wire	Oil proof vinyl
Impact resistance	1000m/S² {102 G}
Insulation resistance	50MΩ or more under the test voltage 500VDC (Between case and cable)
Withstand voltage	1000 VAC 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-B64, D-A64			D-A34(C), D-A44(C), D-A54, D-B54		
Application	Relay, Sequence control			Relay, Sequence control		
Load voltage	24 VAC/DC	100 VAC	200 VAC	24 VDC	100 VAC	200 VAC
Max. load current or load current range	Max. 50mA	Max. 25mA	Max. 12.5mA	5~50mA	5~25mA	5~12.5mA
Contract Protection Circuit	Built in			Built in		
Internal voltage drop	---			2.4 V or less		
Impedance	10Ω or less			---		
Leak current	none			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	Sequence control	IC circuit	Sequence control, IC circuit	Relay, Sequence control
Load voltage	24 VDC	4~8 VDC	Max. 24 VAC	24 VDC
Max. load current or load current range	5~50mA	20mA	Max. 30mA	5~40mA
Contact Protection Circuit	None	None	None	Built in
Internal voltage drop	2.4 V or less	0.8 V or less	---	4 V 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, Sequence control IC circuit	Relay, Sequence control IC circuit	24 VDC Relay, Sequence control	AC Relay, Sequence control
Operating voltage	5, 12, 24 VDC (4.5~28 VDC)	5, 12, 24 VDC (4.5~28 VDC)	---	---
Current consumption	12mA or less	15mA or less	---	---
Load voltage	28 VDC	---	24 VDC (10~28 VDC)	80~260 VAC
Max. load current or load current range	150mA	100mA	5~150mA	5~80mA
Internal voltage drop	0.8 V or less	0.8 V or less	3 V or less	14 V or less
Leak current	24 VDC: 10μA or less	24 VDC: 10μA or less	24 VDC: 1mA or less	100 VAC: 1mA or less 200 VAC: 1.5mA or less
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, Sequence control IC circuit	Relay, Sequence control IC circuit	24 VDC Relay, Sequence control	24 VDC Relay, Sequence control
Operating voltage	5, 12, 24 VDC (4.5~28 VDC)	5, 12, 24 VDC (4.5~28 VDC)	---	---
Current consumption	10mA or less	12mA or less	---	---
Load voltage	28 VDC	---	24 VDC (10~28 VDC)	24 VDC (10~28 VDC)
Max. load current or load current range	80mA	80mA	5~40mA	5~40mA
Internal voltage drop	2V or less (10mA: 0.8 V or less)	0.8 V or less	4 V or less	4 V or less
Leak current	24 VDC: 10μA or less	24 VDC: 10μA or less	24 VDC: 1 mA or less	24 VDC: 1 mA or less
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

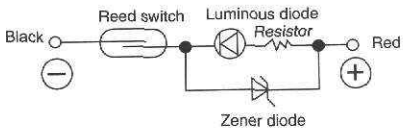
Auto switch model	D-F5LF two color indicator (latch diagnostic type)	D-F59F two color indicator (diagnostic)	D-G59F two color indicator (diagnostic)
Wire type	4 Wire	4 Wire	4 Wire
Output	NPN	NPN	NPN
Application	24 VDC Relay, Sequence control	Relay, Sequence control IC circuit	Relay, Sequence control IC circuit
Operating voltage	24 VDC (10~26 VDC)	5, 12, 24 VDC (4.5~28 VDC)	---
Current consumption	20mA or less	10mA or less	10mA or less
Load voltage	26 VDC	28 VDC	28 VDC
Max. load current or load current range	40mA	40mA	40mA
Internal voltage drop	0.8 V or less	1.5 V or less (10mA: 0.8 V or less)	1.5 V or less (10mA: 0.8 V or less)
Leak current	24 VDC: 10μA or less	24 VDC: 10μA or less	24 VDC: 10μA or less
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

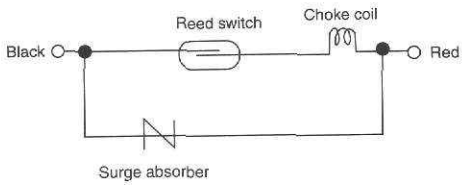
Auto switch model	D-F5NTL D-G5NTL time delay	D-G39 (C)
Wire type	3 Wire	3 Wire
Output	NPN	---
Application	Relay, Sequence control IC circuit	Relay, Sequence control IC circuit
Operating voltage	5, 12, 24, VDC (4.5~28 VDC)	5, 12, 24 VDC (4.5~28 VDC)
Current consumption	10mA or less	12mA or less
Load voltage	28 VDC or less	28 VDC
Max. load current or load current range	80mA	150mA
Internal voltage drop	2 V or less (10mA: 0.8 V or less)	0.8 V or less
Leak current	24 VDC: 10μA or less	24 VDC: 10μA or less
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

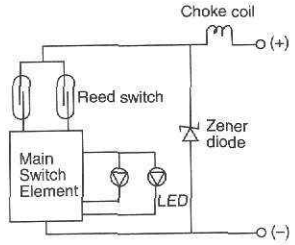
D-B53, D-A53



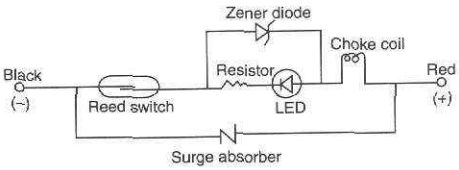
D-A64, D-B64



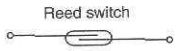
D-A59W, D-B59W



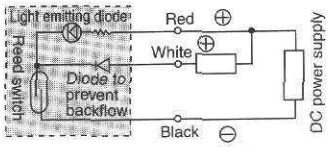
D-A54, D-B54, D-A44(C), D-A34(C)



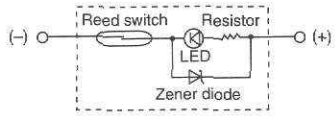
D-A67



D-A56

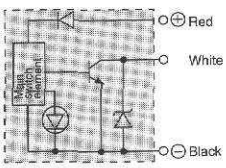


D-A33(C)

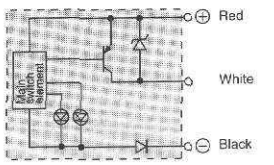


Solid State Type Internal Circuit

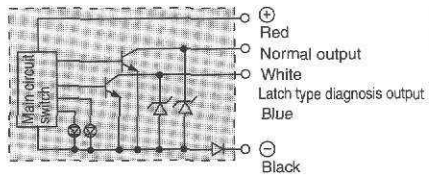
D-F59, D-G59, D-G39(C)



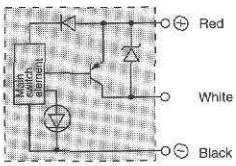
D-F5PW, D-G5PW



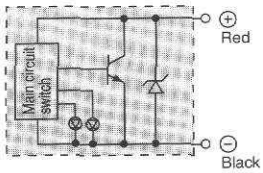
D-F5LF



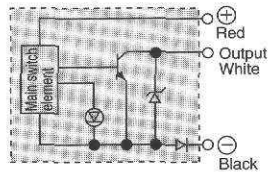
D-F5P, D-G5P



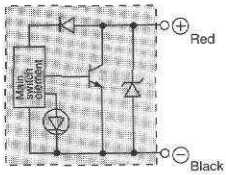
D-F5BAL, D-G5BAL, D-K59W, D-J59W



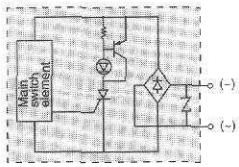
D-F5NTL, D-G5NTL



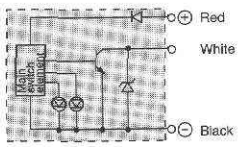
D-J59, D-K59, D-K39(C)



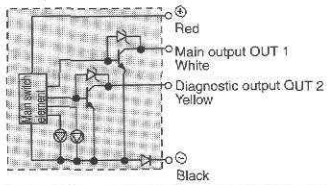
D-J51



D-F59W, D-G59W



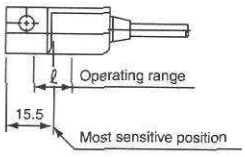
D-F59F, D-G59F



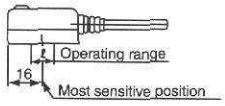
Most Sensitive Position/Operating Range

Reed Switch Type

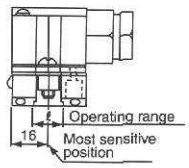
D-B5



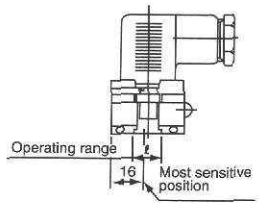
D-A5 • A6



D-A3

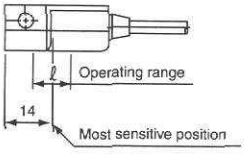


D-A4

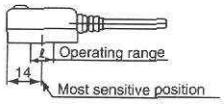


Solid State Type

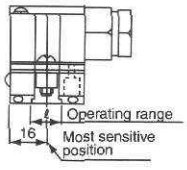
D-G59 • K59 • G5P



D-F59 • J51 • J59 • F5P

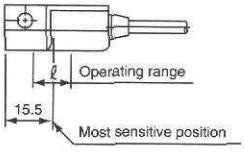


D-G39 • K39

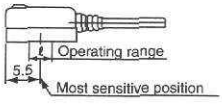


Two Color Signs Type

D-G59W • K59W • G5PW
G59F • G5BAL



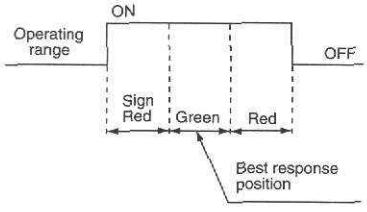
D-F59W • J59W • F59F
F5BAL • F5PW



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

Indicator light / Operation

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



Caution

❶ Never use load exceeding maximum contact capacity of switch.

❷ Always connect switch to load before turning on power.

❸ D-A57 and D-A59 have polarity. The red lead wire is (+), and 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.

❹ 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.

❺ 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.

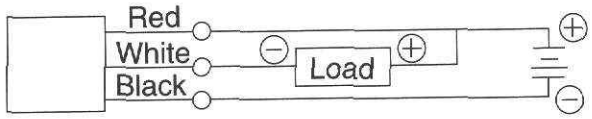
❻ When handling, please avoid dropping, cylinder nicks, and excessive shock.

❼ Avoid use in magnetically contaminated areas.

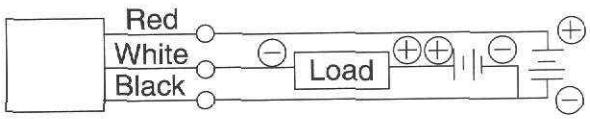
❽ If auto switch cylinders are used in parallel, maintain a distance between tubes of 40mm or greater.

Auto Switch Connection / Solid State Type

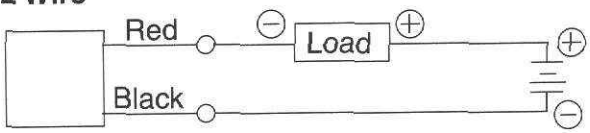
3 Wire (when power source for switch and load is common.)



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



2 Wire



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.

White lead wire:

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

Black lead wire:

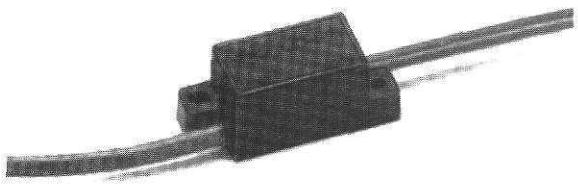
Connect to power source⊖(Power source GND terminal).

Contact Protection

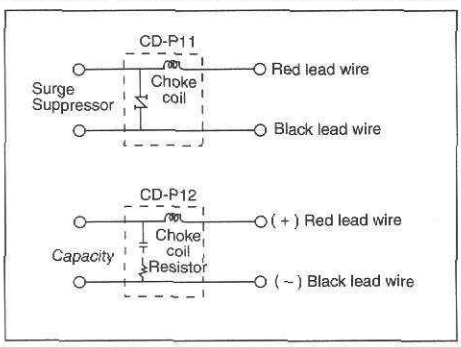
D-A33(c), A53, B53, A56, and A67 type have no built-in contact protection circuit. Use this box for induction loads, 5 meters or more of lead wires, or 100VAC applications.

Model	Operating voltage	Length of lead wire
CD-P11	100 VAC	Switch connecting side 0.5m
CD-P12	24VDC	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.

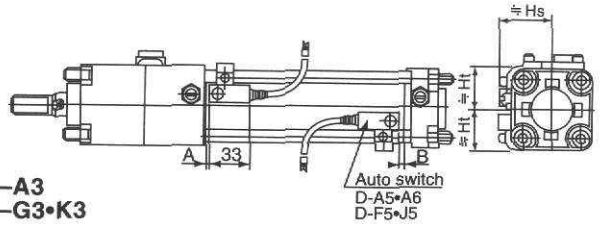


Contact Protection Box/Internal Circuit

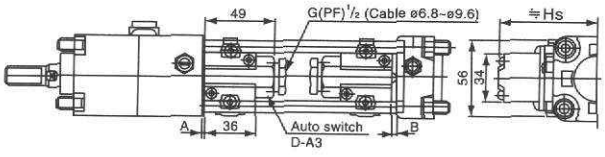


Auto Switch Mounting Position (At Stroke end)

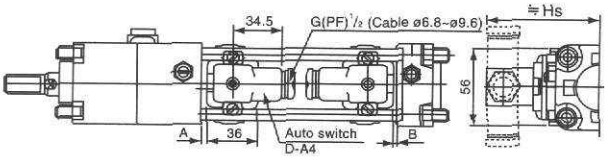
D–A5•A6
D–F5•J5



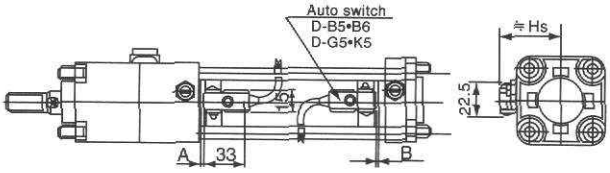
D–A3
D–G3•K3



D–A4



D–B5•B6
D–G5•K5



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
	≒Ht	31	35	42	50	57.5
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 D-G3 D-K3	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
	≒Ht	31	35	42	50	57.5
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

Minimum Auto Switch Mountable Stroke

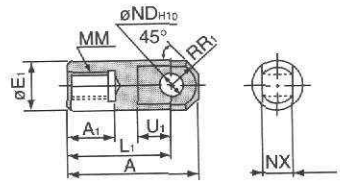
Minimum auto switch mounting strokes are as follows due to the space necessary to mount it.

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...	$90+55^{(n-4)}$ n=4,8,12,...	$100+55^{(n-4)}$ n=4,8,12,...	$110+55^{(n-4)}$ n=4,8,12,...	$120+55^{(n-4)}$ n=4,8,12,...
D-B5 D-B6 D-G5 D-K5	With 2 switches	Different surface	15	90	100	110	
		Same surface	75	90	100	110	
	With n switches	Different surface	$15+50^{(n-2)}$ n=1,2,3,4...	$90+100^{(n-4)}$ n=4,8,12,...	$100+100^{(n-4)}$ n=4,8,12,...	$110+100^{(n-4)}$ n=4,8,12,16...	
		Same surface	75+50(n-2) n=2,3,4,...	90+50(n-2) n=2,4,6,8...	100+50(n-2) n=2,4,6,8...	110+50 (n-2) n=2,4,6,8...	
	With 1 switch		10	90	100	110	
D-A3 D-G3 D-K3	With 2 switches	Different surface	35	75	80	90	
		Same surface	100	100	100	100	
	With n switches	Different surface	35+30(n-2) n=2,3,4,5...	75+30(n-2) n=2,4,6,8...	80+30(n-2) n=2,4,6,8...	90+30(n-2) n=2,4,6,8...	
		Same surface	100+100(n-2) n=1,2,3,4...	100+100(n – 2), n=2,4,5,8...			
	With 1 switch		10	75	80	90	
D-A4	With 2 switches	Different surface	35	75	80	90	
		Same surface	35	75	80	90	
	With n switches	Different surface	35+30(n-2) n=1,2,3,4...	75+30(n-2) n=2,4,6,8...	80+30(n-2) n=2,4,6,8...	90+30(n-2) n=2,4,6,8...	
		Same surface	55+50(n-2) n=1,2,3,4...	75+50(n-2) n=2,4,6,8...	80+50(n-2) n=2,4,6,8...	90+50(n-2) n=2,4,6,8...	
	With 1 switch		10	75	80	90	

Dimensions Of Accessories

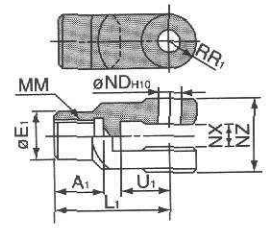
Type Single Knuckle Joint



Material: Free cutting sulfer 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	M14X1.5	15.5	20	$12^{+0.070}_{0}$	$16^{-0.1}_{-0.3}$
I-05	50 • 63	74	27	28	60	M18X1.5	15.5	20	$12^{+0.070}_{0}$	$16^{-0.1}_{-0.3}$
I-08	80	91	37	36	71	M22X1.5	22.5	26	$18^{+0.070}_{0}$	$28^{-0.1}_{-0.3}$
I-10	100	105	37	40	83	M26X1.5	24.5	28	$20^{+0.084}_{0}$	$30^{-0.1}_{-0.3}$

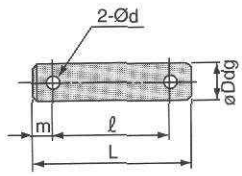
Y Type Double Knuckle Joint



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	M14X1.5	13	25	$12^{+0.070}_{0}$	$16^{+0.3}_{+0.1}$	38
Y-05d	50 • 63	27	28	60	M18X1.5	15	27	$12^{+0.070}_{0}$	$16^{+0.3}_{+0.1}$	38
Y-08d	80	37	36	71	M22X1.5	19	28	$18^{+0.070}_{0}$	$28^{+0.3}_{+0.1}$	55
Y-10d	100	37	40	83	M26X1.5	21	38	$20^{+0.084}_{0}$	$30^{+0.3}_{+0.1}$	61

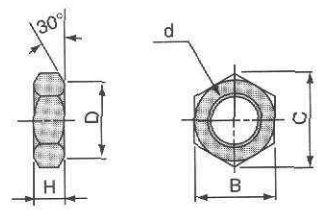
Type Single Knuckle Joint



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	–	$10^{-0.040}_{-0.076}$	46	38	4	3	ø3X18ℓ
CDP-3A	50	40•50•63	$12^{-0.050}_{-0.093}$	55.5	47.5	4	3	ø3X18ℓ
CDP-4A	63	–	$16^{-0.050}_{-0.093}$	71	61	5	4	ø4X25ℓ
CDP-5A	–	80	$18^{-0.050}_{-0.093}$	76.5	66.5	5	4	ø4X25ℓ
CDP-6A	80	100	$20^{-0.065}_{-0.117}$	83	73	5	4	ø4X25ℓ
CDP-7A	100	–	$25^{-0.065}_{-0.117}$	88	78	6	4	ø4X36ℓ

Y Type Double Knuckle Joint



Material: Rolled steel

Parts No.	Applicable bore size (mm)	d	H	B	C	D
NT-04	40	M14X1.5	8	22	25.4	21
NT-05	50 • 63	M18X1.5	11	27	31.2	26
NT-08	80	M22X1.5	13	32	37.0	31
NT-10	100	M26X1.5	16	41	47.3	39

Precautions

❶ Flushing

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

❷ 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.

❸ Rotational torque to piston rod

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

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

❺ 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.

❻ 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.

❼ 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.

❽ 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

Torque

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

Pressure

$mm(H_2O)$	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

Nl/min x 0.035 = SCFM

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*

Torque

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

Pressure

$in(H_2O)$	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 = Nl/min

Cv1.0 = Kv 0.856

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

gf = gram - force
kgf = kilogram - force
N = newton
lbf = pound - force
N • m = newton - meter
kg • m = kilogram - meter
ft • lb = foot - pound
mm (H_2O) = millimeter water column
in (H_2O) = inches water column
mm (H) = millimeter mercury column
in (Hg) = inches mercury column

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
Nl/min = Normal liters per *minute*

SCFM = Std. cubic feet per minute

Basic Formulas

Circle circumference = $\pi D = 2\pi r$
Circle area = πr^2
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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