

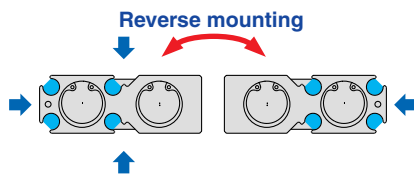
Compact Type Dual-Rod Cylinder

ø15, ø20, ø25, ø32
additionally released.

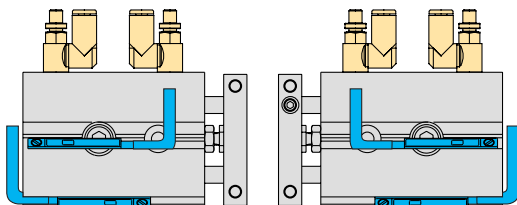


Series **CXSJ**/ø6, ø10, ø15, ø20, ø25, ø32

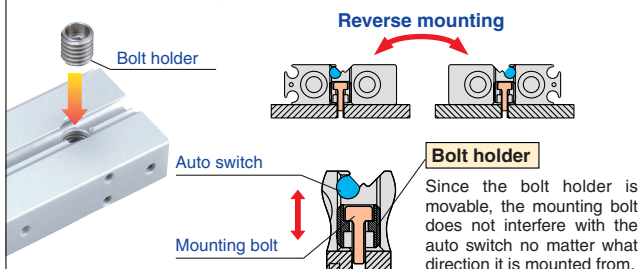
Auto switches can be installed from 3 directions.



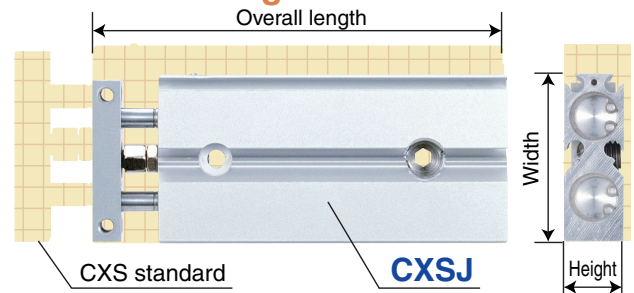
Symmetric mounting



Reverse mounting mechanism



Dimensions/Weight



Bore size (mm)	Series	Dimensions (mm)			Weight (kg) <small>Note)</small>
		Height	Width	Overall length	
ø6	CXSJ□6	13.4	32	42 + Stroke	0.057
	CXS□6	16	37	58.5 + Stroke	0.095
ø10	CXSJ□10	15	42	56 + Stroke	0.114
	CXS□10	17	46	72 + Stroke	0.170
ø15	CXSJ□15	19	54	70 + Stroke	0.219
	CXS□15	20	58	79 + Stroke	0.280
ø20	CXSJ□20	24	62	84 + Stroke	0.371
	CXS□20	25	64	94 + Stroke	0.440
ø25	CXSJ□25	29	73	87 + Stroke	0.544
	CXS□25	30	80	96 + Stroke	0.660
ø32	CXSJ□32	37	94	100.5 + Stroke	1.078
	CXS□32	38	98	112 + Stroke	1.230

Note) Slide bearing, 20 mm strokes

Axial piping available (ø6, ø10)

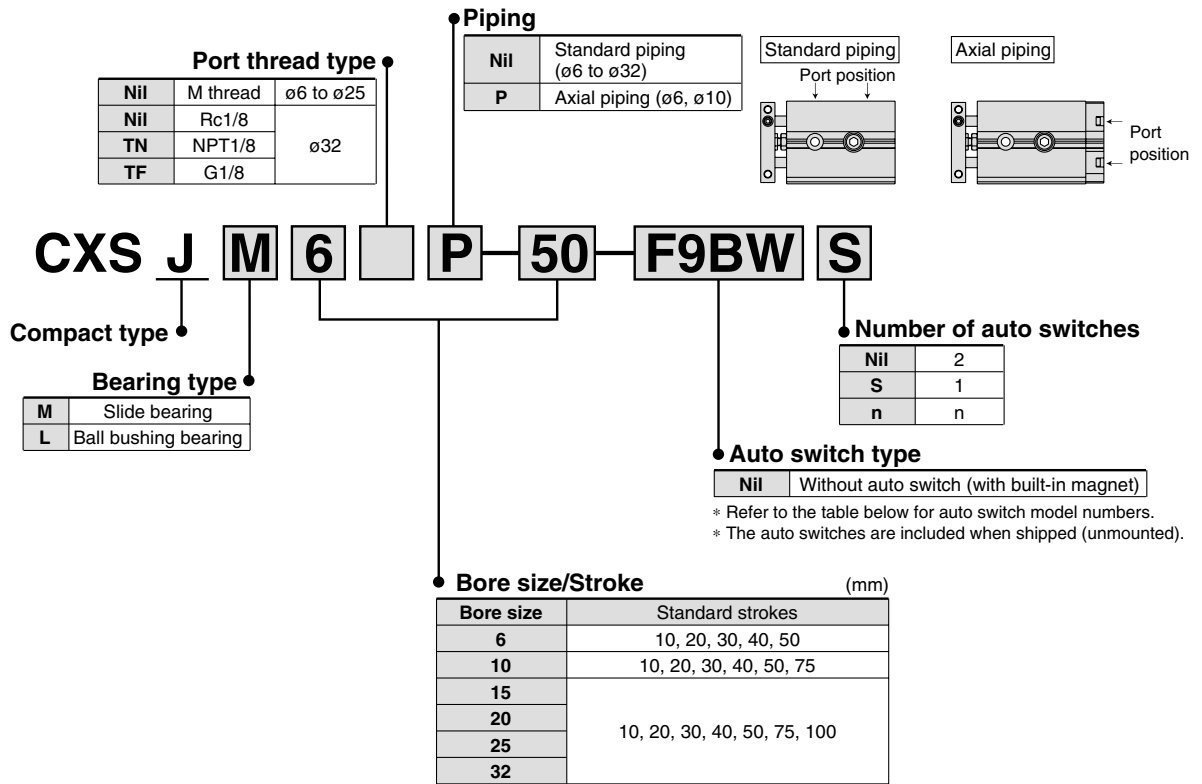
Allowable kinetic energy, allowable load, and non-rotating accuracy are equivalent to those of standard type CXS.

Compact Type Dual-Rod Cylinder

Series CXSJ

ø6, ø10, ø15, ø20, ø25, ø32

How to Order



Applicable Auto Switches/Refer to page 15 for detailed auto switch specifications.

Type	Special function	Electrical entry	Indicator light	Wiring (output)	Load voltage			Auto switch model		Lead wire length (m)*			Pre-wired connector	Applicable load		
					DC	AC	Perpendicular	In-line	0.5 (Nil)	3 (L)	5 (Z)	IC circuit		Relay, PLC		
															5 V	12 V
Reed switch	—	Grommet	Yes	3-wire (NPN equiv.)	—	5 V	—	A96V	A96	●	●	—	—	IC circuit	—	
				2-wire	24 V	12 V	100 V	A93V	A93	●	●	—	—	—	Relay, PLC	
Solid state switch	—	Grommet	Yes	3-wire (NPN)	5 V, 12 V	—	—	M9N	M9N	●	●	—	—	IC circuit	Relay, PLC	
				3-wire (PNP)						—	—	—	—	—		—
				2-wire	12 V					—	—	—	—	—		
				3-wire (NPN)	5 V, 12 V					●	●	○	○	—		IC circuit
				3-wire (PNP)						●	●	○	○	—		IC circuit
				2-wire	12 V					●	●	○	○	—		—
				3-wire (NPN)	5 V, 12 V					●	●	○	○	—		IC circuit
				3-wire (PNP)						●	●	○	○	—		IC circuit
				2-wire	12 V					●	●	○	○	—		—
				Diagnostic indication (2-color display)	3-wire (NPN)					5 V, 12 V	●	●	○	○		—
Water resistant (2-color display)	3-wire (PNP)	5 V, 12 V	●	●	○	○	—	IC circuit								
	2-wire	12 V	●	●	○	○	—	—								

* Lead wire length symbols
 0.5 m Nil (Example) A93
 3 m L (Example) A93L
 5 m Z (Example) F9NWZ

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

- Refer to page 14 for additional details and applicable auto switches other than the above types.
- Contact SMC for detailed auto switch with pre-wired connector.

Compact Type Dual-Rod Cylinder *Series CXSJ*

Specifications



Bore size (mm)	6	10	15	20	25	32
Fluid	Air (non-lube)					
Proof pressure	1.05 MPa					
Maximum operating pressure	0.7 MPa					
Minimum operating pressure	0.15 MPa	0.1 MPa		0.05 MPa		
Ambient and fluid temperature	-10 to 60°C (with no freezing)					
Piston speed	30 to 800 mm/s		30 to 700 mm/s		30 to 600 mm/s	
Cushion	Rubber bumper at both ends					
Stroke adjustable range	0 to -5 mm compared to the standard stroke					
Port size	M3 × 0.5	M5 × 0.8				Rc (NPT, PF) 1/8

* The maximum piston speed shown in the table above is for extension.
The maximum piston speed for retraction is approximately 70% that of extension.

Standard Stroke



Model	Standard strokes	Manufacturable stroke range
CXSJ□6	10, 20, 30, 40, 50	60 to 100
CXSJ□10	10, 20, 30, 40, 50, 75	80 to 150
CXSJ□15	10, 20, 30, 40, 50, 75, 100	110 to 150
CXSJ□20, 25, 32		110 to 200

* Strokes beyond the standard stroke range are available as a special order.

Theoretical Output

Bore size (mm)	Rod size (mm)	Operating direction	Piston area (mm ²)	Operating pressure (MPa)							
				0.1	0.15	0.2	0.3	0.4	0.5	0.6	0.7
CXS□6	4	OUT	56	—	8.4	11.2	16.8	22.4	28.0	33.6	39.2
		IN	31	—	4.6	6.2	9.3	12.4	15.5	18.6	21.7
CXS□10	6	OUT	157	15.7	—	31.4	47.1	62.8	78.5	94.2	110
		IN	100	10.0	—	20.0	30.0	40.0	50.0	60.0	70.0
CXS□15	8	OUT	353	35.3	—	70.6	106	141	177	212	247
		IN	252	25.2	—	50.4	75.6	101	126	151	176
CXS□20	10	OUT	628	62.8	—	126	188	251	314	377	440
		IN	471	47.1	—	94.2	141	188	236	283	330
CXS□25	12	OUT	982	98.2	—	196	295	393	491	589	687
		IN	756	75.6	—	151	227	302	378	454	529
CXS□32	16	OUT	1608	161	—	322	482	643	804	965	1126
		IN	1206	121	—	241	362	482	603	724	844

Note) Theoretical output (N) = Pressure (MPa) x Piston area (mm²)

Weight

Model	Standard stroke (mm)						
	10	20	30	40	50	75	100
CXSJM6	0.047	0.057	0.067	0.077	0.087	—	—
CXSJL6	0.048	0.058	0.068	0.078	0.088	—	—
CXSJM10	0.099	0.114	0.129	0.144	0.159	0.198	—
CXSJL10	0.106	0.121	0.136	0.151	0.166	0.205	—
CXSJM15	0.198	0.219	0.240	0.261	0.282	0.335	0.387
CXSJL15	0.218	0.239	0.260	0.281	0.302	0.355	0.407
CXSJM20	0.345	0.371	0.397	0.423	0.449	0.514	0.579
CXSJL20	0.375	0.401	0.427	0.453	0.479	0.544	0.609
CXSJM25	0.506	0.544	0.582	0.620	0.658	0.753	0.848
CXSJL25	0.516	0.554	0.592	0.630	0.668	0.763	0.858
CXSJM32	1.022	1.078	1.134	1.190	1.246	1.386	1.526
CXSJL32	1.032	1.088	1.144	1.200	1.256	1.396	1.536

Note) For axial piping of CXSJ□6P-□ and CXSJ□10P-□, please add the following weight.
CXSJ□6P-□: 0.009 kg, CXSJ□10P-□: 0.014 kg

Series CXSJ

Model Selections

⚠ Caution Theoretical output must be confirmed separately, referring to the table on page 2.

Vertical Mounting

Mounting orientation									
Max. speed (mm/s)		up to 200		up to 400		up to 600		up to 800	
Stroke (mm)		All strokes							
Selection graph	ø6	1		2		3		4	
	ø10								
	ø15								
	ø20								
	ø25								
ø32									

Horizontal Mounting

Mounting orientation						* Refer to the caution notes below.					
Stroke (mm)		up to 10		up to 30		up to 50		up to 75		up to 100	
Max. speed (mm/s)		up to 400	more than 400	up to 400	more than 400	up to 400	more than 400	up to 400	more than 400	up to 400	more than 400
Selection graph	ø6	5		6		7		14		15	
	ø10										
	ø15										
	ø20	8	9	10	11	12	13				
	ø25										
ø32											

* The maximum speeds for ø6 to ø32 are: ø6, 10: up to 800 mm/s; ø15, 20: up to 700 mm/s; ø25, 32: up to 600 mm/s

⚠ Caution

If the cylinder is horizontally mounted and the plate end does not reach the load's center of gravity, use the formula below to calculate the imaginary stroke L' that includes the distance between the load's center of gravity and the plate end. Select the graph that corresponds to the imaginary stroke L' .

Imaginary stroke $L' = (\text{Stroke}) + k + L$

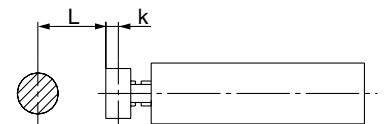
k : Distance between the center and end of the plate

ø6	2.75 mm
ø10	4 mm
ø15	5 mm
ø20	6 mm
ø25	
ø32	8 mm

(Example)

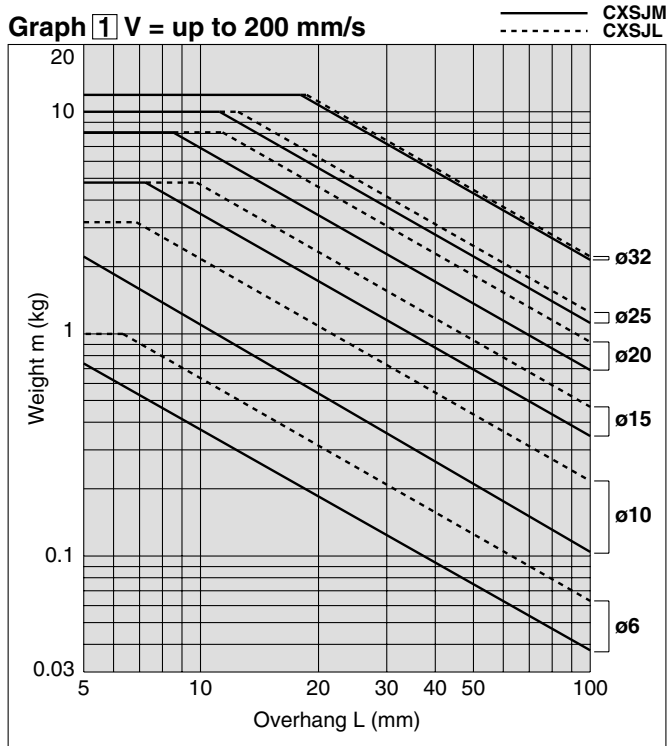
① When using CXSJM6-10 and $L = 15$ mm:
Imaginary stroke $L' = 10 + 2.75 + 15 = 27.75$
Therefore, the graph used for your model selection should be the one for CXSJM6-30 (6).

② When using CXSJM25-50 and $L = 10$ mm:
Imaginary stroke $L' = 50 + 6 + 15 = 71$
Therefore, the graph used for your model selection should be the one for CXSJM25-75 (14).

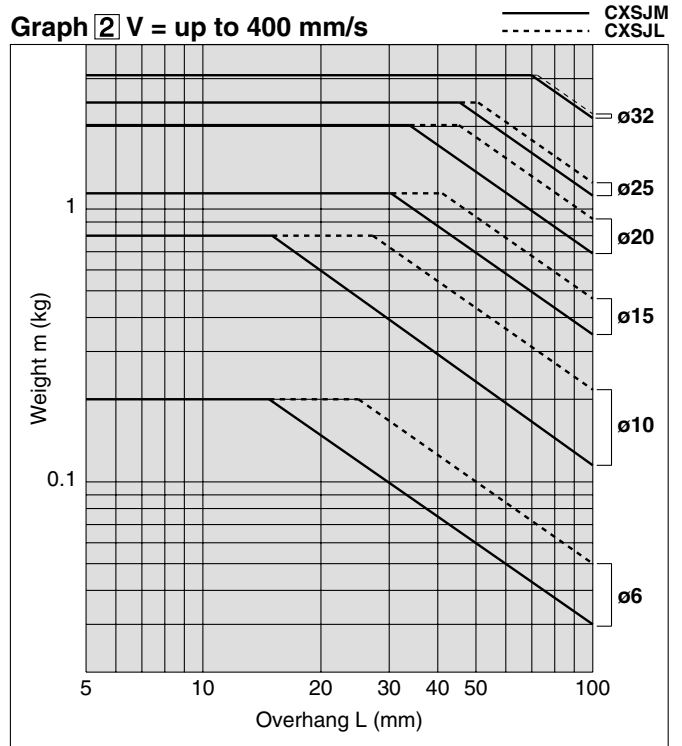


Vertical Mounting

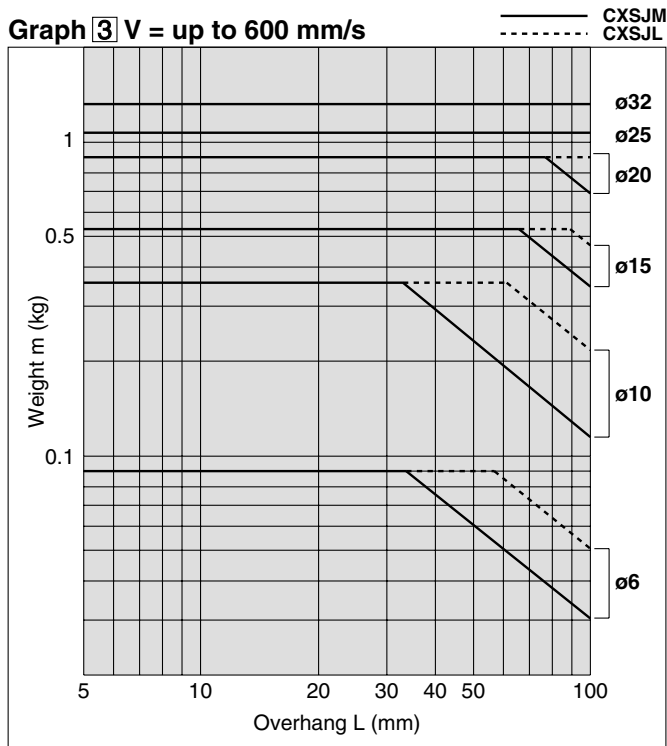
Graph 1 V = up to 200 mm/s



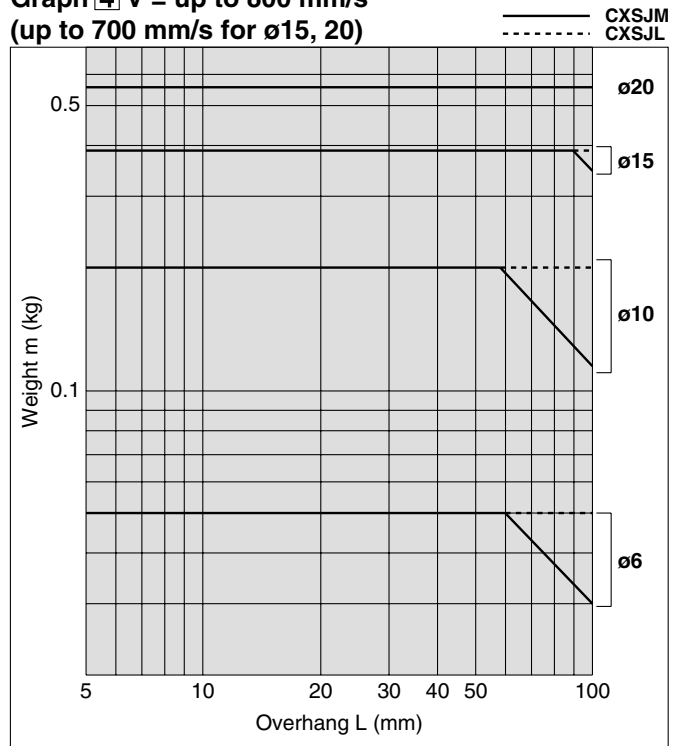
Graph 2 V = up to 400 mm/s



Graph 3 V = up to 600 mm/s



Graph 4 V = up to 800 mm/s (up to 700 mm/s for ø15, 20)

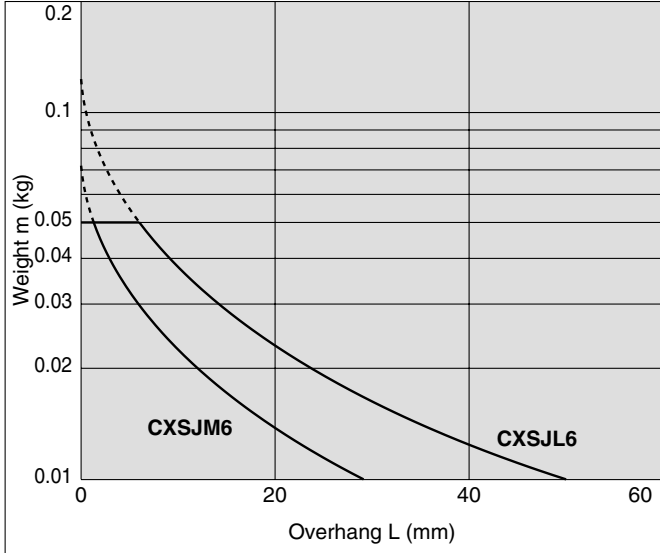


Note) V = 700 mm/s for ø15, ø20.

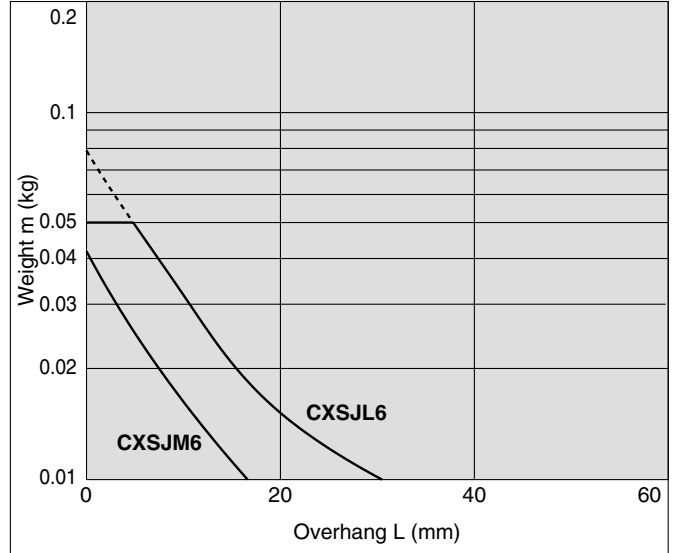
Series CXSJ

Horizontal Mounting

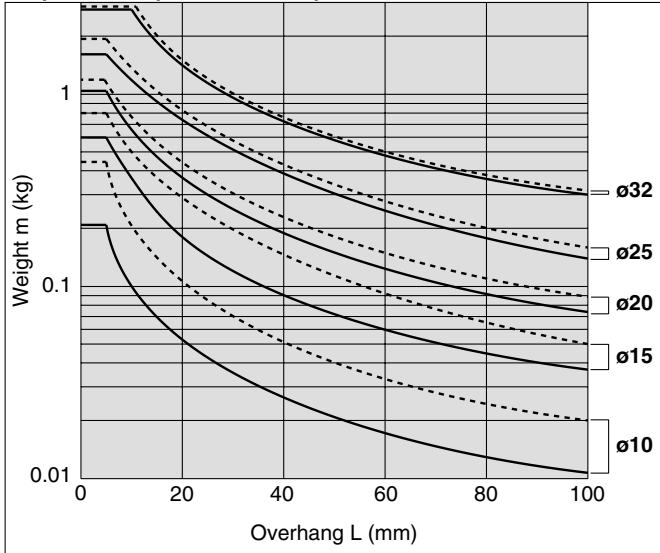
Graph 5 up to 10 mm stroke - - - - - V = up to 400 mm/s
 - - - - - V = up to 800 mm/s



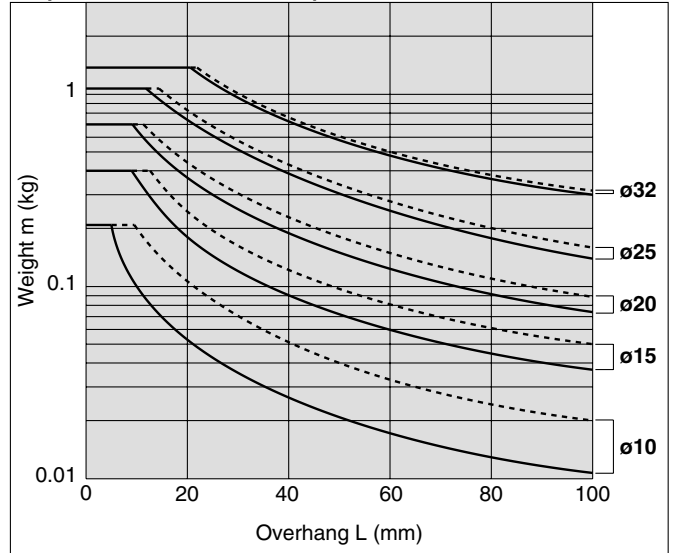
Graph 6 up to 30 mm stroke - - - - - V = up to 400 mm/s
 - - - - - V = up to 800 mm/s



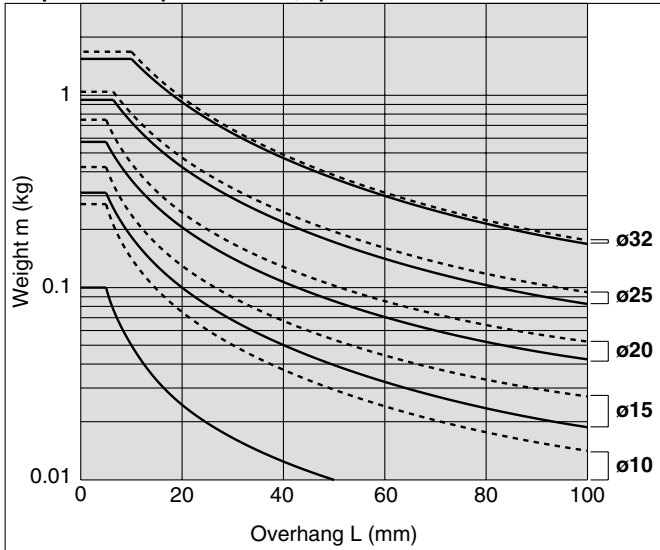
Graph 8 V = up to 400 mm/s; up to 10 mm stroke - - - - - CXSJM
 - - - - - CXSJL



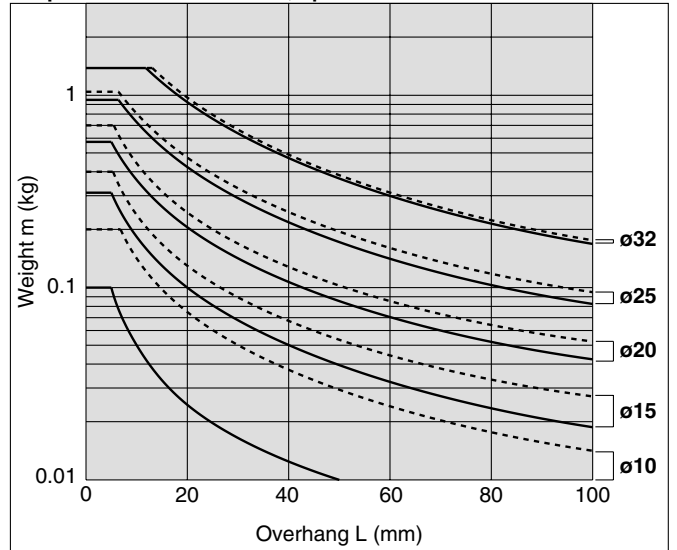
Graph 9 V = over 400 mm/s; up to 10 mm stroke - - - - - CXSJM
 - - - - - CXSJL



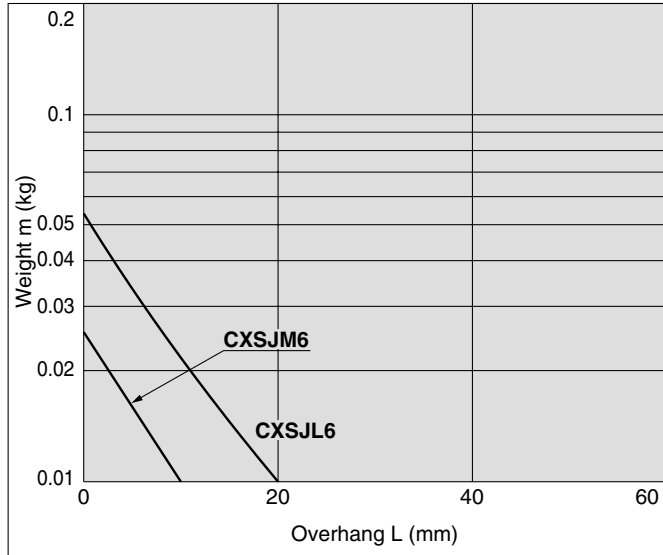
Graph 12 V = up to 400 mm/s; up to 50 mm stroke - - - - - CXSJM
 - - - - - CXSJL



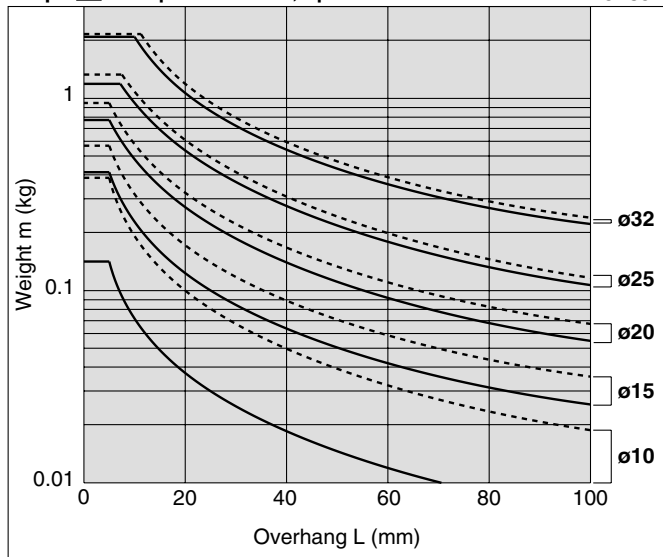
Graph 13 V = over 400 mm/s; up to 50 mm stroke - - - - - CXSJM
 - - - - - CXSJL



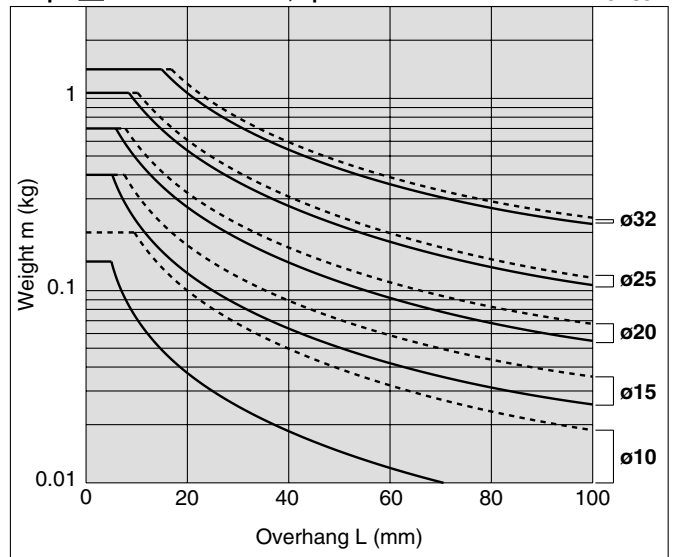
Graph 7 up to 50 mm stroke ——— V = up to 800mm/s



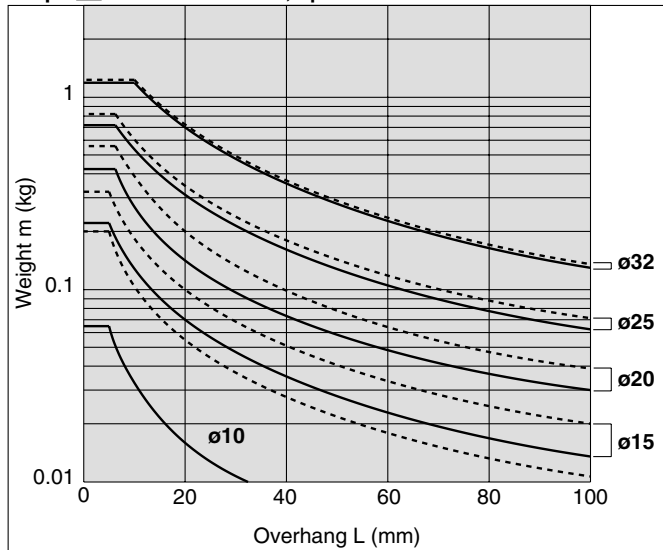
Graph 10 V = up to 400 mm/s; up to 30 mm stroke ——— CXSJM
----- CXSJL



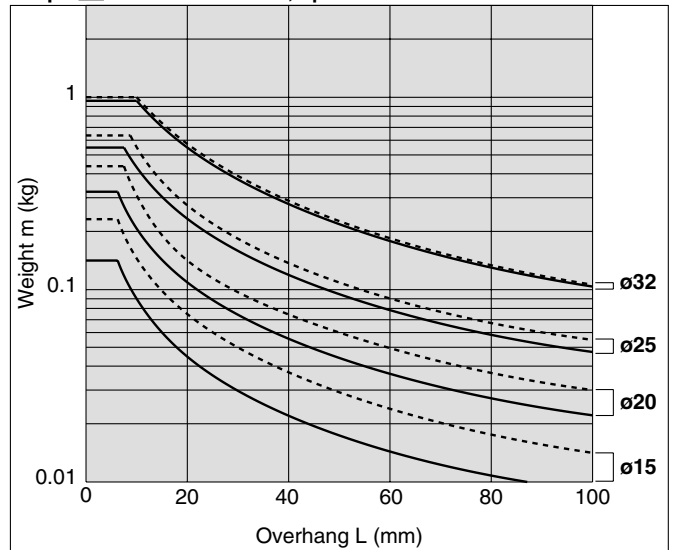
Graph 11 V = over 400 mm/s; up to 30 mm stroke ——— CXSJM
----- CXSJL



Graph 14 V = over 400 mm/s; up to 75 mm stroke ——— CXSJM
----- CXSJL



Graph 15 V = over 400 mm/s; up to 100 mm stroke ——— CXSJM
----- CXSJL

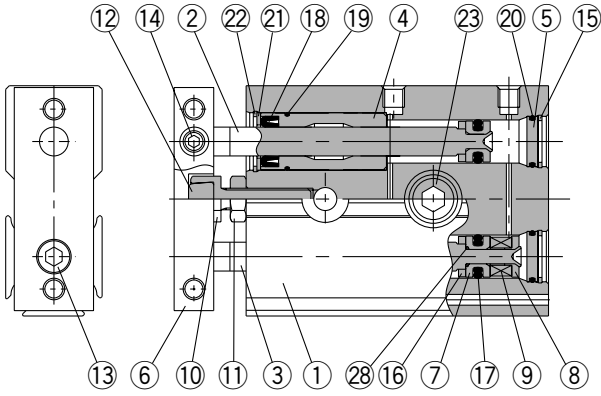


Series CXSJ

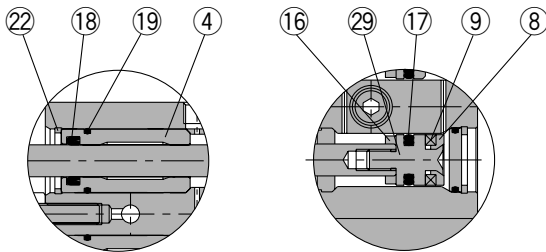
Construction: Standard Piping

CXSJM (Slide bearing)

CXSJM6



CXSJM10

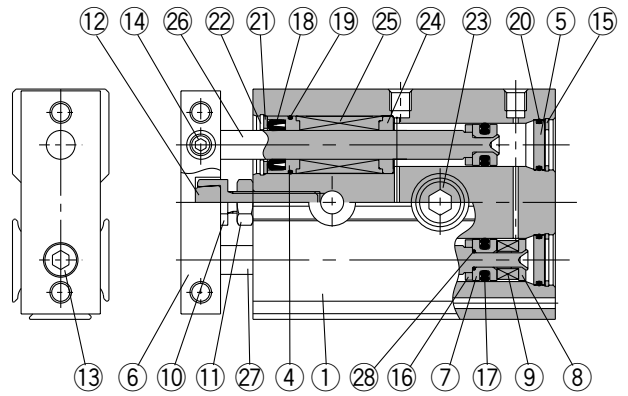


Rod cover

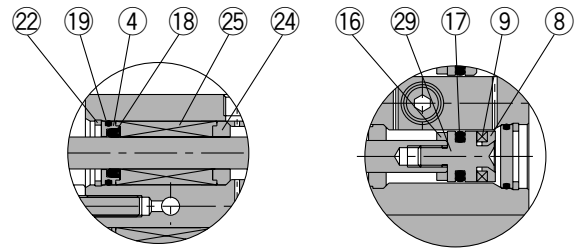
Piston rod B-side piston

CXSJL (Ball bushing bearing)

CXSJL6



CXSJL10



Rod cover

Piston rod B-side piston

Parts List: Standard Piping

No.	Description	Material	Note
1	Housing	Aluminum alloy	Hard anodized
2	Piston rod A	Carbon steel ^{Note 1)}	Hard chromium electroplated
3	Piston rod B	Carbon steel ^{Note 1)}	Hard chromium electroplated
4	Rod cover	Aluminum bearing alloy	
5	Head cover	Aluminum alloy	Anodized
6	Plate	Aluminum alloy	Glossy, self-coloring hard anodized
7	Piston A	Aluminum alloy	Chromated
8	Piston B	Aluminum alloy	Chromated
9	Magnet	Magnetic material	
10	Bumper bolt	Carbon steel	Nickel plated
11	Hexagon nut	Carbon steel	Nickel plated
12	Bumper	Polyurethane	
13	Hexagon socket head cap screw	Chromium steel	Nickel plated
14	Hexagon socket head set screw	Chromium steel	Nickel plated
15	Snap ring	Special steel	Nickel plated

Note 1) Stainless steel for CXSJ6.

No.	Description	Material	Note
16	Bumper B	Polyurethane	
17	Piston seal	NBR	
18	Rod seal	NBR	
19	O-ring	NBR	
20	O-ring	NBR	
21	Seal retainer	Stainless steel	
22	Snap ring B	Special steel	Nickel plated
23	Bolt holder	Stainless steel	
24	Bearing spacer	Aluminum bearing alloy	
25	Ball bushing	—	
26	Piston rod A	Special steel	Hard chromium electroplated
27	Piston rod B	Special steel	Hard chromium electroplated
28	O-ring	NBR	
29	Piston C	Stainless steel	
30	Bumper holder	Resin	

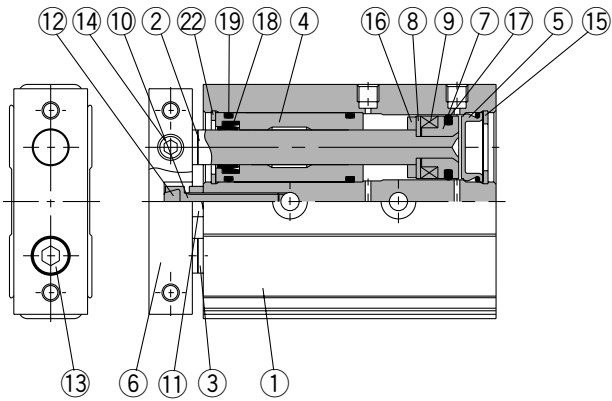
Replacement Parts: Seal Kits

Model	Seal kit No.	Content
CXSJ□6	CXSJ6-PS	Items 17, 18, and 20 from the chart above
CXSJ□10	CXSJ10-PS	

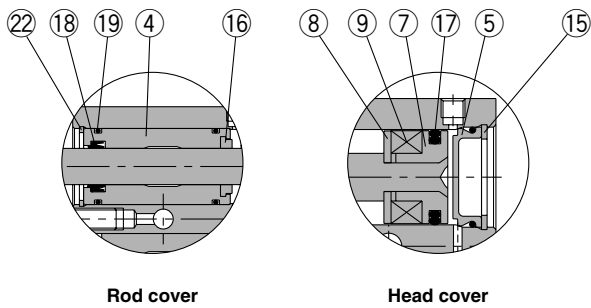
Construction: Standard Piping

CXSJM (Slide bearing)

CXSJM15

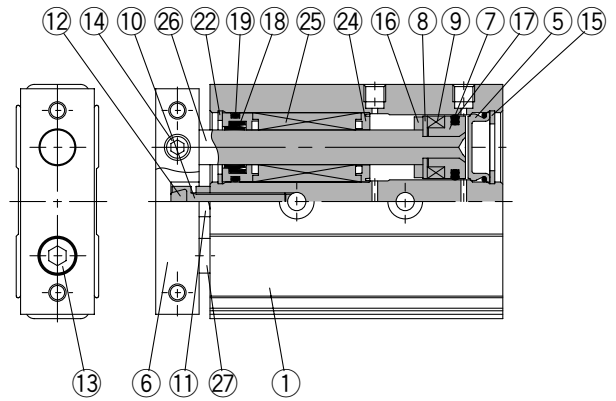


CXSJM20 to 32

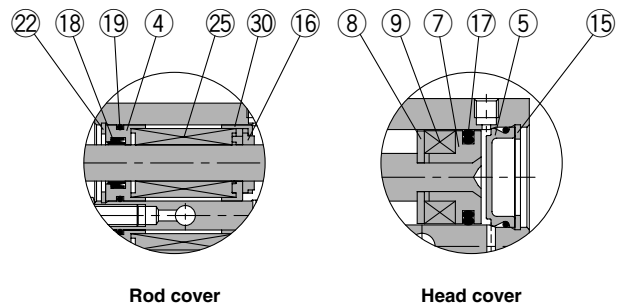


CXSJL (Ball bushing bearing)

CXSJL15



CXSJL20 to 32



Parts List: Standard Piping

No.	Description	Material	Note
1	Housing	Aluminum alloy	Hard anodized
2	Piston rod A	Carbon steel	Hard chromium electroplated
3	Piston rod B	Carbon steel	Hard chromium electroplated
4	Rod cover	Aluminum bearing alloy	
5	Head cover	Special steel	
6	Plate	Aluminum alloy	Glossy, self-coloring hard anodized
7	Piston A	Aluminum alloy	Chromated
8	Piston B	Stainless steel	
9	Magnet	Magnetic material	
10	Bumper bolt	Carbon steel	Nickel plated
11	Hexagon nut	Carbon steel	Nickel plated
12	Bumper	Polyurethane	
13	Hexagon socket head cap screw	Chromium steel	Nickel plated
14	Hexagon socket head set screw	Chromium steel	Nickel plated
15	Snap ring	Special steel	Nickel plated

No.	Description	Material	Note
16	Bumper B	Polyurethane	
17	Piston seal	NBR	
18	Rod seal	NBR	
19	O-ring	NBR	
20	O-ring	NBR	
21	Seal retainer	Stainless steel	
22	Snap ring B	Special steel	Nickel plated
23	Bolt holder	Stainless steel	
24	Bearing spacer	Resin	
25	Ball bushing	—	
26	Piston rod A	Special steel	Hard chromium electroplated
27	Piston rod B	Special steel	Hard chromium electroplated
28	O-ring	NBR	
29	Piston C	Stainless steel	
30	Bumper holder	Resin	

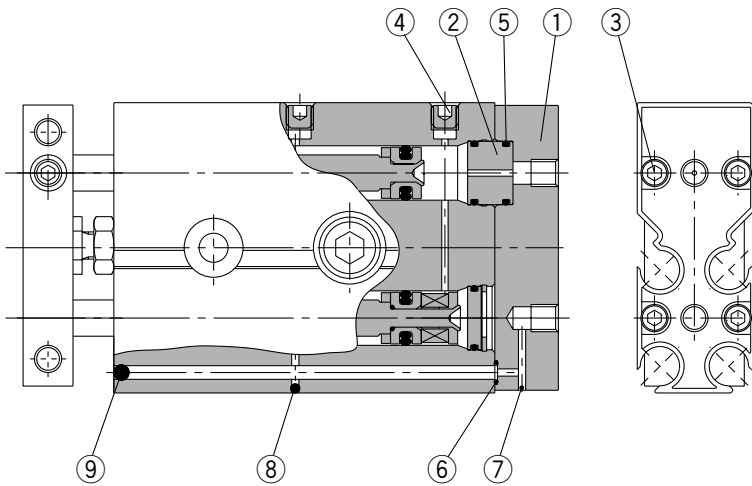
Replacement Parts: Seal Kits

Model	Seal kit No.	Content
CXSJM15	CXSM15-PS	Items 17, 18, and 19 from the chart above
CXSJM20	CXSM20-PS	
CXSJM25	CXSM25-PS	
CXSJM32	CXSM32-PS	
CXSJL15	CXSL15APS	
CXSJL20	CXSL20APS	
CXSJL25	CXSL25APS	
CXSJL32	CXSL32APS	

Series CXSJ

Construction: Axial Piping

CXSJ□6P, CXSJ□10P



Parts List: Axial Piping

No.	Description	Material	Note
1	Cover	Aluminum alloy	Hard anodized
2	Adapter	Aluminum alloy	Anodized
3	Hexagon socket head cap screw	Chromium steel	Nickel plated
4	Hexagon socket head plug	Chromium steel	Nickel plated
5	O-ring	NBR	
6	O-ring	NBR	
7	Steel ball	Special steel	Hard chromium electroplated
8	Steel ball	Special steel	Hard chromium electroplated
9	Steel ball	Special steel	Hard chromium electroplated

* Parts other than those listed above are the same as those for CXSJ basic type.

Clean Series

There are two types of cylinders, relieving type and vacuum type, available for a clean room environment. The relieving type specification with the double-seal construction of the rod section allows the cylinder to channel exhaust through the relief port directly to the outside of a clean room environment. The vacuum type specification allows for the application of a vacuum on the rod section while forced exhaust of air takes place through the vacuum port to the outside of a clean room environment.

How to Order

11 - CXSJ **M** Bore size - Stroke - Auto switch

● Bore size/Stroke

6	10, 20, 30, 40, 50
10	10, 20, 30, 40, 50

● Bearing type

M	Slide bearing
L*	Ball bushing bearing

* Only ball bushing bearing is available for "clean room specification 12-".

● Clean room specifications

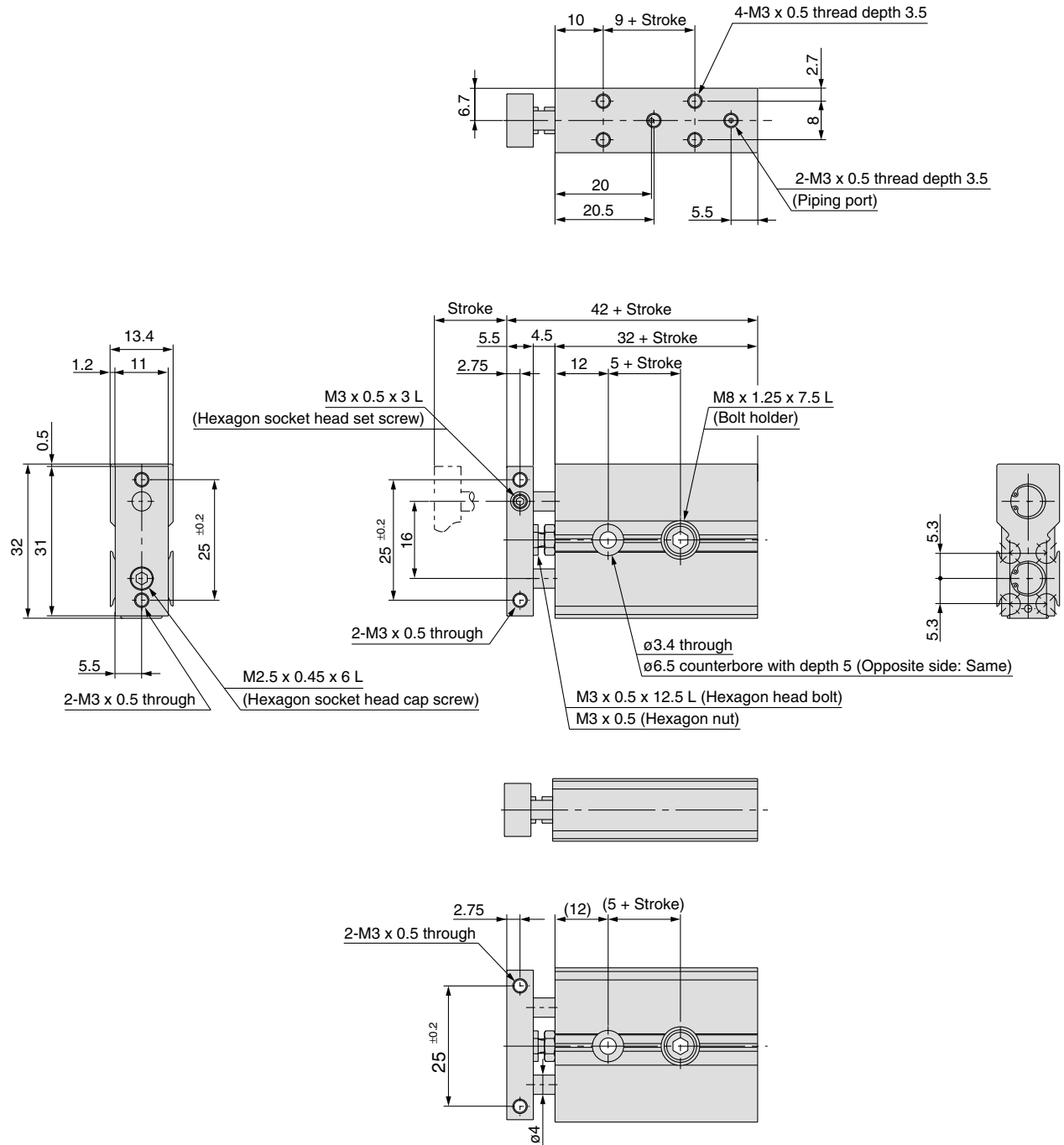
11	Vacuum type
12	Relieving type (with specially treated sliding parts)

Specifications

Bore size (mm)	6	10
Proof pressure	1.05 MPa	
Maximum operating pressure	0.7 MPa	
Minimum operating pressure	0.15 MPa	0.1 MPa
Ambient and fluid temperature	-10 to 60°C (with no freezing)	
Piston speed	30 to 400 mm/s	
Stroke adjustable range	0 to -5 mm compared to the standard stroke	
Bearing type	Slide bearing, Ball bushing bearing	

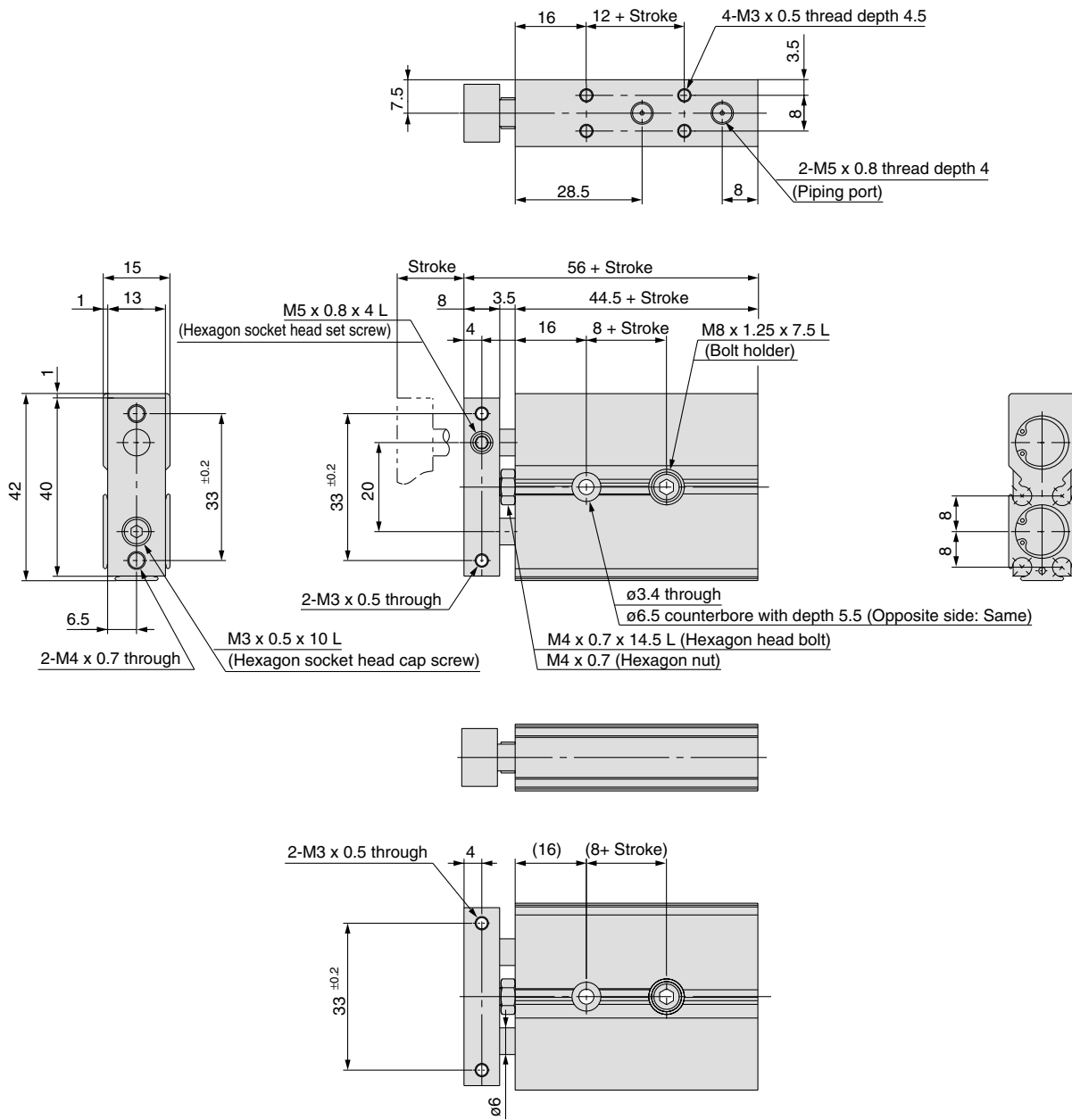
* Refer to the SMC Clean Series catalog for dimensions.

Dimensions: $\phi 6$ Standard Piping



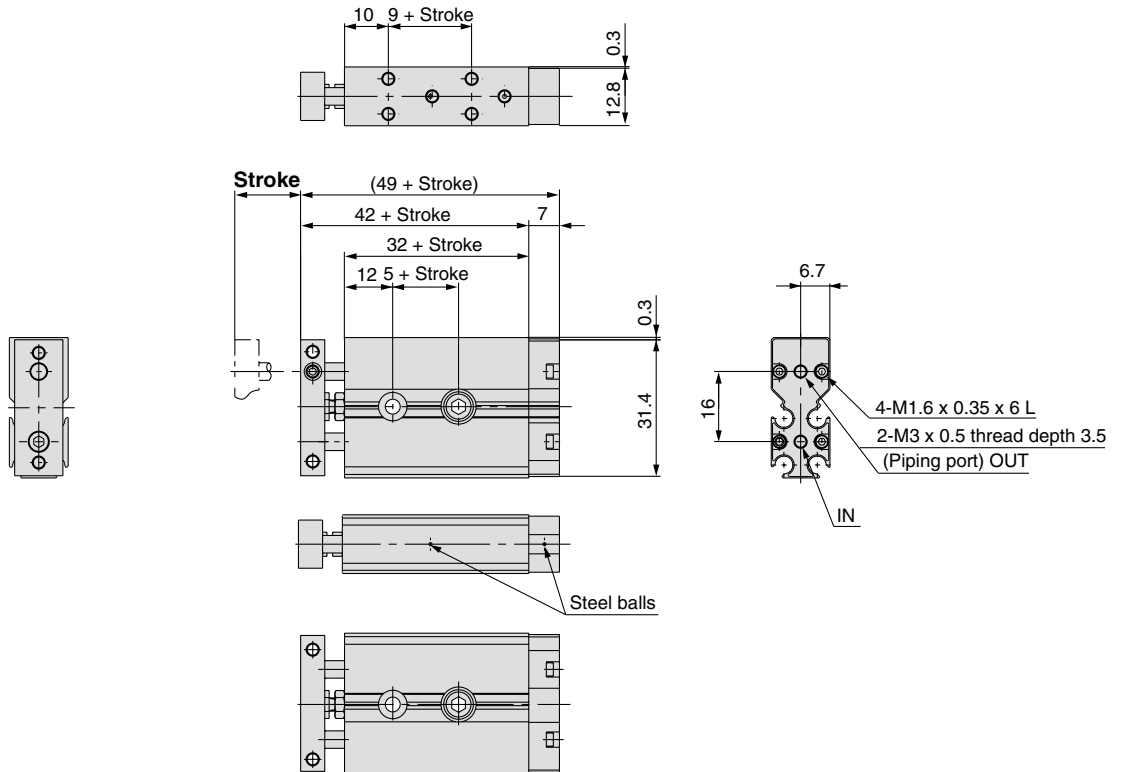
Series CXSJ

Dimensions: $\varnothing 10$ Standard Piping

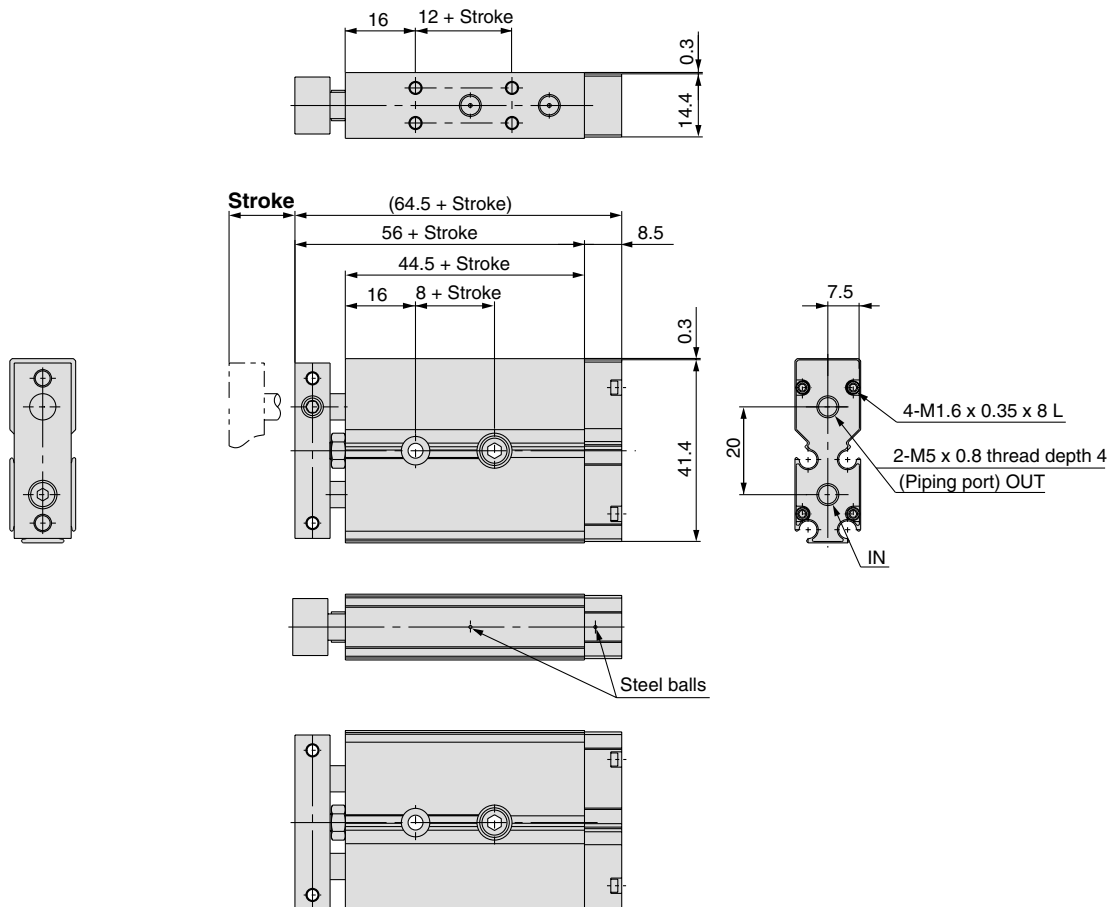


Dimensions: $\varnothing 6, \varnothing 10$ Axial Piping

CXSJ□6P

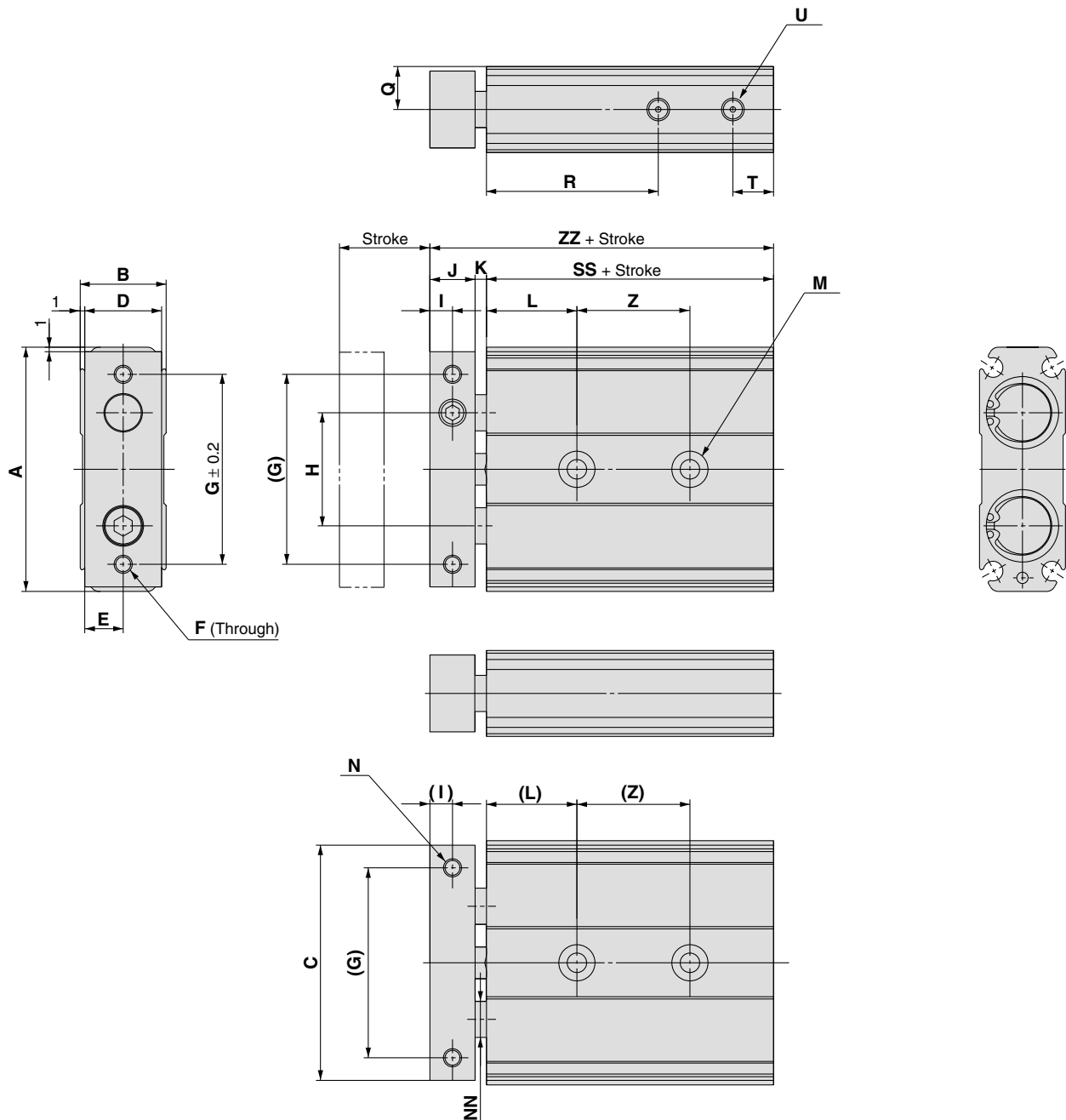


CXSJ□10P



Series CXSJ

Dimensions: $\varnothing 15$ to 32 Standard Piping

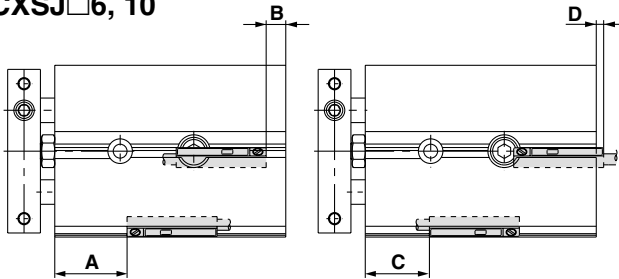


Bore size (mm)	A	B	ZZ	C	D	E	F	G	H	I	J	K	L	M	N	NN	Q	R	T	U	SS
15	54	19	70	52	17	8.5	2-M5 × 0.8	42	25	5	10	2.5	20	2 × 2- $\varnothing 4.3$ through 2 × 2- $\varnothing 8$ counterbore with depth 4.3	2-M4 × 0.7 with depth 6	$\varnothing 8$	9.5	38	9	2-M5 × 0.8 thread depth 4	57.5
20	62	24	84	60	22	11	2-M5 × 0.8	50	29	6	12	4.5	25	2 × 2- $\varnothing 5.5$ through 2 × 2- $\varnothing 9.5$ counterbore with depth 5.3	2-M4 × 0.7 with depth 6	$\varnothing 10$	12	45	9	2-M5 × 0.8 thread depth 4	67.5
25	73	29	87	71	27	13.5	2-M6 × 1.0	60	35	6	12	4.5	30	2 × 2- $\varnothing 6.5$ through 2 × 2- $\varnothing 11$ counterbore with depth 6.3	2-M5 × 0.8 with depth 7.5	$\varnothing 12$	14.5	46	9	2-M5 × 0.8 thread depth 4	70.5
32	94	37	100.5	92	35	17.5	2-M6 × 1.0	75	45	8	16	4	30	2 × 2- $\varnothing 6.5$ through 2 × 2- $\varnothing 11$ counterbore with depth 6.3	2-M5 × 0.8 with depth 7.5	$\varnothing 16$	18.5	56	10	2-Rc1/8 thread depth 5	80.5

Bore size (mm)	Z			
	10-20	30-40-50	75	100
15	25	35	45	55
20	30	40	60	60
25	30	40	60	60
32	40	50	70	70

Proper Auto Switch Mounting Position for Stroke End Detection

CXSJ□6, 10

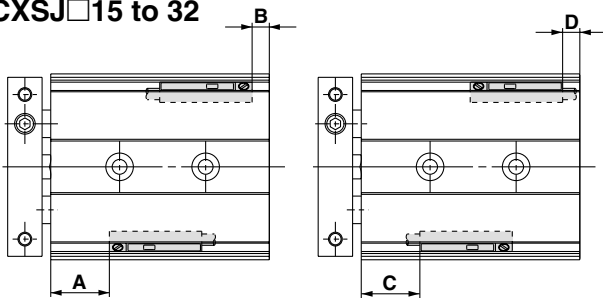


Operating range

Auto switch model	Bore size (mm)					
	6	10	15	20	25	32
D-A9□, A9□V	5	6	6	7.5	8	9
D-F9□, D-F9□W D-F9□V, D-F9□WV, D-M9□	2.5	3	3	5	5	4.5
D-F9BAL	2.5	3.5	3.5	5	5	5
D-M9□	2	2.5	3	4	4	4

* The operating ranges are provided as guidelines including hystereses and are not guaranteed values (assuming approximately ±30% variations). They may vary significantly with ambient environments.

CXSJ□15 to 32



Electrical entry direction:
Inward

Electrical entry direction:
Outward

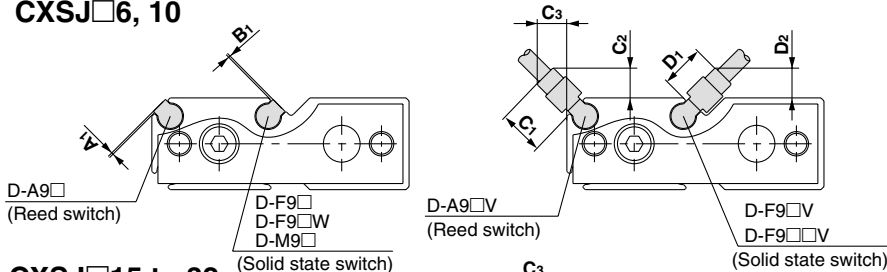
Bore size (mm)	D-A90 · D-A96				D-A93				D-F9□ · D-F9□W · D-M9□				D-F9□V · D-F9□WV			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
6	15.5	-	13.5	5.5	15.5	-	11	8	19.5	0.5	9.5	9.5	19.5	0.5	11.5	7.5
10	25.5	-	23.5	3	25.5	-	21	5.5	29.5	3	19.5	7	29.5	3	21.5	5
15	31.5	6	29.5	4	31.5	6	27	1.5	35.5	10	25.5	0	35.5	10	27.5	2
20	39	9	37	7	39	9	34.5	4.5	43	13	33	3	43	13	35	5
25	40	11	38	9	40	11	35.5	6.5	44	15	34	5	44	15	36	7
32	49	11.5	47	9.5	49	11.5	44.5	7	53	15.5	43	5.5	53	15.5	45	7.5

Bore size (mm)	D-F9BAL			
	A	B	C	D
6	18.5	-	0.5	18.5
10	28.5	2	10.5	16
15	34.5	9	16.5	-9
20	42	12	24	-6
25	43	14	25	-4
32	52	14.5	34	-3.5

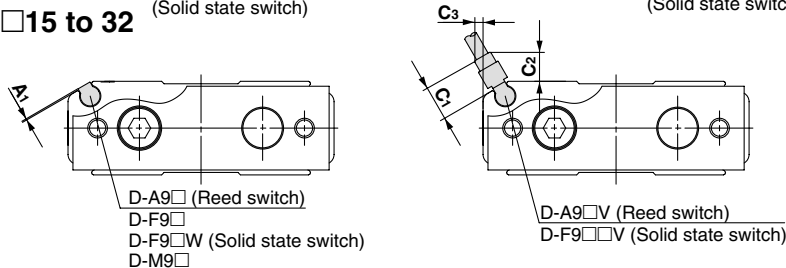
Note 1) ø6: D-A90, D-A96, D-A93, D-F9BAL
 ø10: D-A90, D-A96, D-A93
 Only outward electrical entry (D dimension) is available.
 Note 2) Minus value in D column (ø15, ø20, ø25, ø32) means that the auto switches are to be mounted beyond the cylinder body edges.

Auto Switch Mounting Dimensions

CXSJ□6, 10



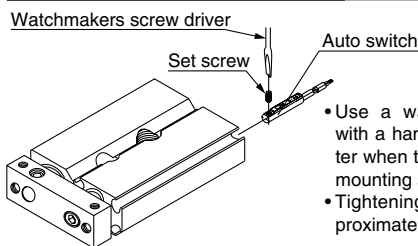
CXSJ□15 to 32



Auto switch model	Symbol	Bore size (mm)	
		6, 10	15, 20, 25, 32
D-A9□	A1	0.4	
D-F9□, D-F9□W, D-M9□	B1	0.4	
D-A9□V	C1	7.2	
D-F9□V, D-F9□□V	C2, C3	4.8	
	D1	7.2	
	D2	4.8	

Auto switch model	Symbol	Bore size (mm)			
		15	20	25	32
D-F9□, D-F9□W, D-M9□	A1	0.3	0.3	0.3	0.3
D-A9□V, D-F9□□V	C1	7.1	7.1	7.1	7.1
	C2	6.2	6.2	6.2	6.2
	C3	2.2	1.2	0.4	3.1

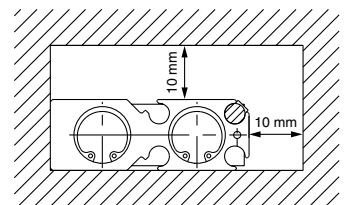
Auto Switch Mounting



- Use a watchmakers screwdriver with a handle 5 to 6 mm in diameter when tightening the auto switch mounting screw.
- Tightening torque should be approximately 0.10 to 0.20 N·m.

⚠ Caution

- ① **Avoid proximity to magnetic objects**
 When magnetic substances such as iron (including flange brackets) are in close proximity of an auto switch cylinder, be sure to provide a clearance between the magnetic substance and the cylinder body as shown in the drawing below. If the clearance is less than 10 mm, the auto switch may not function properly.



Besides the models listed in "How to Order," the following auto switches are applicable. Refer to page 21 for detailed specifications.

Auto switch type	Part no.	Electrical entry	Features
Reed	D-A90	Grommet (in-line)	Without indicator light
	D-A90V	Grommet (perpendicular)	

* Contact SMC for detailed normally closed solid (N.C. = b contact) state auto switches such as D-F9G and D-F9H.

Auto Switch Common Specifications

Auto Switch Common Specifications

Type	Reed switch	Solid state switch
Leakage current	None	3-wire: 100 μ A or less; 2-wire: 0.8 mA or less
Operating time	1.2 ms	1 ms or less
Impact resistance	300 m/s ²	1000 m/s ²
Insulation resistance	50 M Ω or more at 500 VDC (between lead wire and case)	
Withstand voltage	1500 VAC for 1 min. (between lead wire and case)	1000 VAC for 1 min. (between lead wire and case)
Ambient temperature	-10 to 60°C	
Enclosure	IEC529 standard IP67, JISC0920: Watertight construction	

Lead Wire Length

How to order lead wire length
(Example)

D-F9P **L**

Lead wire length

Nil	0.5 m
L	3 m
Z	5 m

Note 1) Lead wire length Z: 5 m applicable auto switch
Solid state switch: All types are produced upon receipt of order.
Note 2) To designate solid state switches with flexible specifications, add "-61" after the lead wire length.

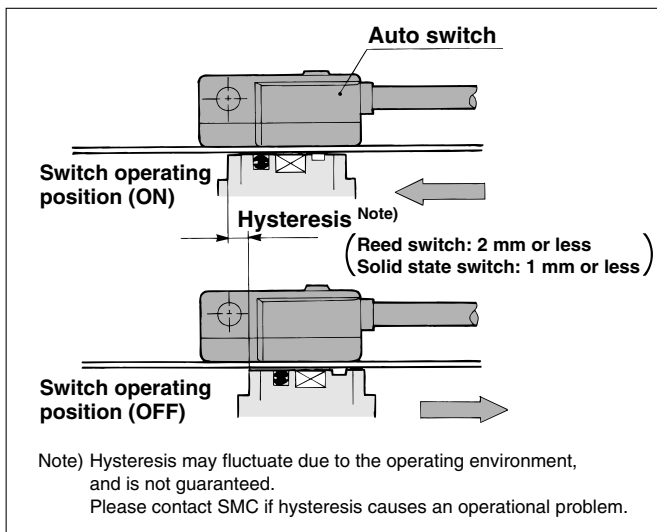
(Example) **D-F9PL-61**

Flexible specification

Note) For D-Y type, flexible specifications is standard, therefore it is not necessary to indicate "-61" when ordering.

Auto Switch Hysteresis

Hysteresis is the distance between the position at which piston movement operates an auto switch to the position at which reverse movement turns the switch off. This hysteresis is included in part of the operating range (one side).



Contact Protection Box/CD-P11, CD-P12

D-A9□ and D-A9□V do not have built-in contact protection circuits.

- a The operating load is an induction load.
 - b The length of wiring to the load is 5 m or more.
 - c The load voltage is 100 VAC.
- A contact protection box should be used in any of the above situations.

Specifications

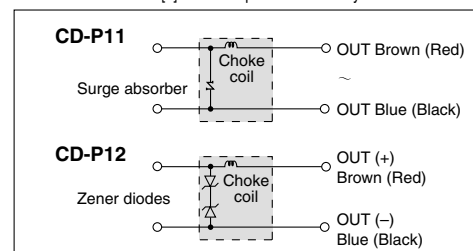
Part no.	CD-P11		CD-P12
Load voltage	100 VAC or less	200 VAC	24 VDC
Maximum load current	25 mA	12.5 mA	50 mA

* Lead wire length — Switch connection side 0.5 m
Load connection side 0.5 m

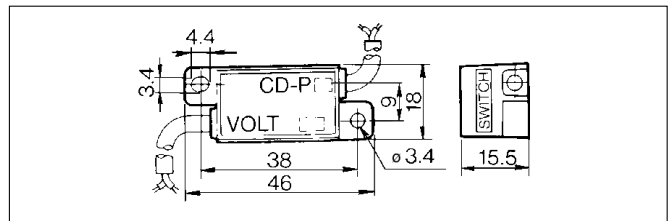


Internal circuits

Lead wire colors inside [] are those prior to conformity with IEC standards.



Dimensions



Connection

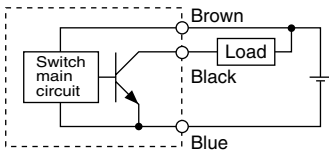
To connect a switch unit to a contact protection box, connect the lead wire from the side of the contact protection box marked SWITCH to the lead wire coming out of the switch unit.

Furthermore, the switch unit should be kept as close as possible to the contact protection box, with a lead wire length of no more than 1 meter between them.

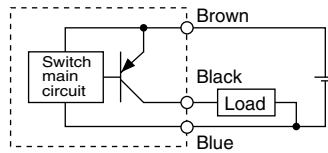
Auto Switch Connections and Examples

Basic Wiring

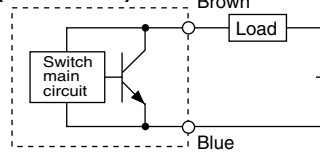
Solid state 3-wire, NPN



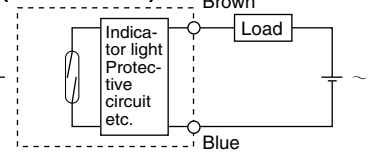
Solid state 3-wire, PNP



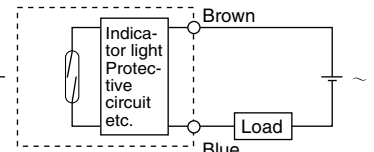
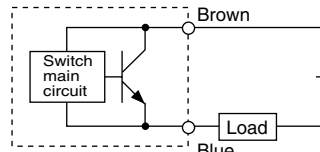
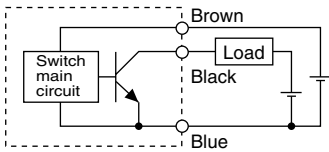
2-wire (Solid state)



2-wire (Reed switch)

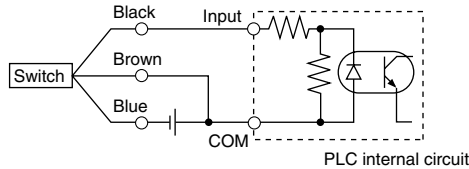


(Power supplies for switch and load are separate.)

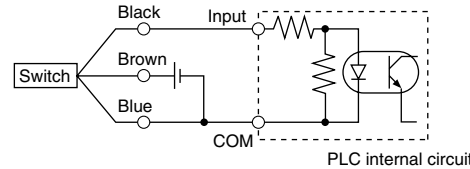


Examples of Connection to PLC (Programable Logic Controller)

• Sink input specifications 3-wire, NPN

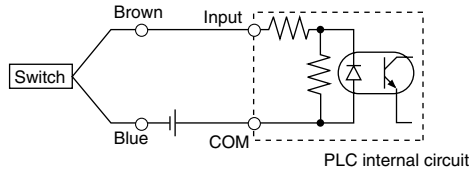


• Source input specifications 3-wire, PNP

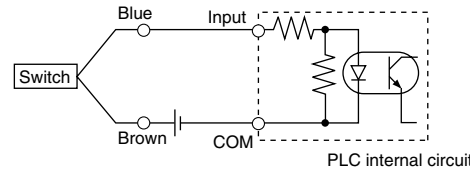


Connect according to the applicable PLC input specifications, as the connection method will vary depending on the PLC input specifications.

2-wire



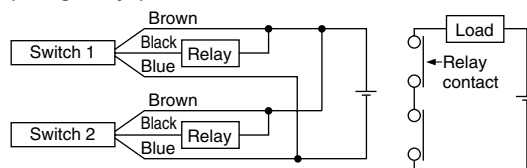
2-wire



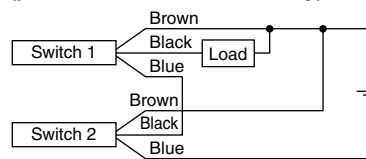
Connection Examples for AND (Series) and OR (Parallel)

• 3-wire

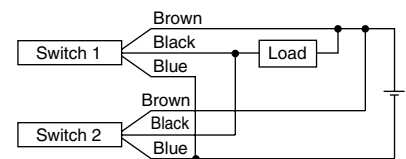
AND connection for NPN output (using relays)



AND connection for NPN output (performed with switches only)

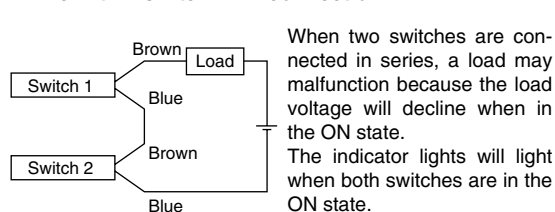


OR connection for NPN output



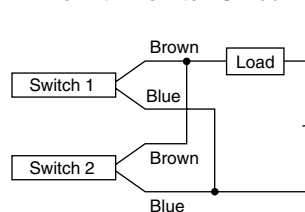
The indicator lights will light up when both switches are in the ON state.

2-wire with 2-switch AND connection



When two switches are connected in series, a load may malfunction because the load voltage will decline when in the ON state. The indicator lights will light when both switches are in the ON state.

2-wire with 2-switch OR connection



(Solid state)

When two switches are connected in parallel, malfunction may occur because the load voltage will increase when in the OFF state.

(Reed switch)

Because there is no current leakage, the load voltage will not increase when turned OFF. However, depending on the number of switches in the ON state, the indicator lights may sometimes grow dim or not light up because of the dispersion and reduction of the current flowing to the switches.

Load voltage at ON

$$= \text{Power supply voltage} - \text{Internal voltage drop} \times 2 \text{ pcs.}$$

$$= 24 \text{ V} - 4 \text{ V} \times 2 \text{ pcs.} = 16 \text{ V}$$

Example: Power supply is 24 VDC.

Internal voltage drop in switch is 4 V.

Load voltage at OFF

$$= \text{Leakage current} \times 2 \text{ pcs.} \times \text{Load impedance}$$

$$= 1 \text{ mA} \times 2 \text{ pcs.} \times 3 \text{ k}\Omega = 6 \text{ V}$$

Example: Load impedance is 3 kΩ.

Leakage current from switch is 1 mA.

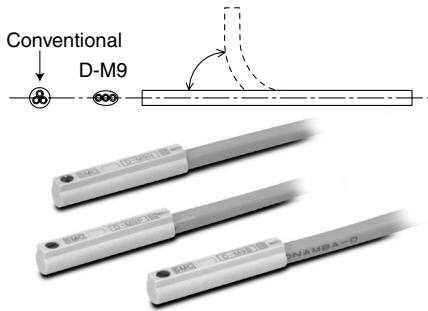
Solid State Switches: Direct Mounting Type D-M9N, D-M9P, D-M9B



Refer to www.smcworld.com for details of products compatible with overseas standards.

Grommet

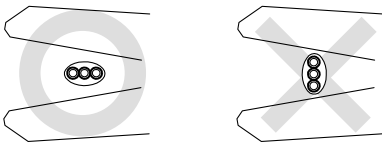
- ∇ 2-wire load current is reduced (2.5 to 40 mA).
- ∇ Lead-free
- ∇ Use of lead wire compliant with UL standards (style 2844)
- ∇ 1.5 times the flexibility compared with conventional products (comparison with other SMC products)



⚠ Caution

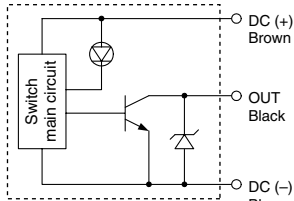
Operating Precautions

When the cable sheath is stripped, confirm the stripping direction.
The insulator may be split or damaged depending on the direction.

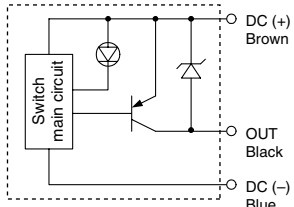


Auto Switch Internal Circuit

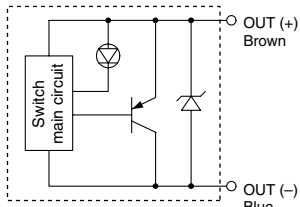
D-M9N



D-M9P



D-M9B



Auto Switch Specifications

PLC: Programmable Logic Controller

D-M9□ (with indicator light)			
Switch model	D-M9N	D-M9P	D-M9B
Wiring type	3-wire		2-wire
Output type	NPN	PNP	—
Applicable load	IC circuit, Relay, PLC		24 VDC relay, PLC
Power supply voltage	5, 12, 24 VDC (4.5 to 28 V)		
Current consumption	10 mA or less		
Load voltage	28 VDC or less	—	24 VDC (10 to 28 VDC)
Load current	40 mA or less		2.5 to 40 mA
Internal voltage drop	0.8 V or less		4 V or less
Leakage current	100 μA or less at 24 VDC		0.8 mA or less
Indicator light	Red LED lights when ON		

- Lead wire Oil proof heavy duty vinyl cord: 2.7 × 3.2 ellipse
- D-M9B 0.15 mm² × 2 cores
- D-M9N, D-M9P 0.15 mm² × 3 cores

Note 1) Refer to page 15 for solid state auto switch common specifications and lead wire length.

Weight

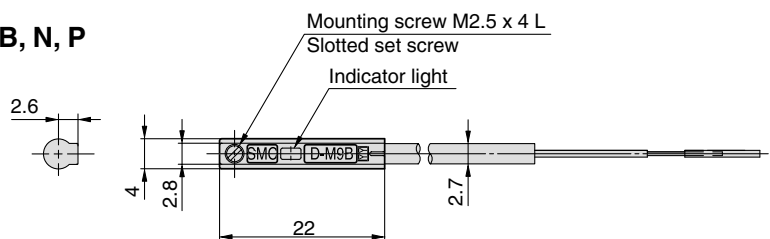
Unit: g

Auto switch model	D-M9N	D-M9P	D-M9B
Lead wire length m	0.5	8	7
	3	41	38

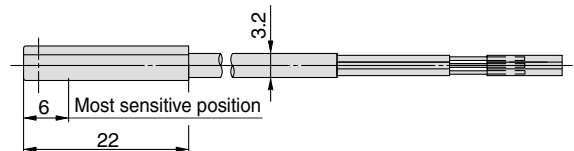
Dimensions

D-M9□

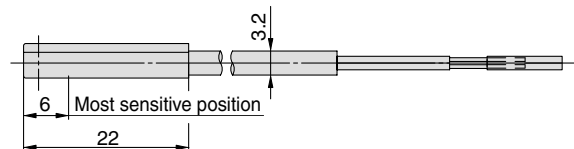
D-M9B, N, P



D-M9N, P (3-wire)



D-M9B (2-wire)



Solid State Switches: Direct Mounting Type D-F9N(V), D-F9P(V), D-F9B(V)



Refer to www.smcworld.com for details of products compatible with overseas standards.

Auto Switch Specifications

PLC: Programmable Logic Controller

D-F9□, D-F9□V (with indicator light)						
Switch model	D-F9N	D-F9NV	D-F9P	D-F9PV	D-F9B	D-F9BV
Electrical entry direction	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Wiring type	3-wire			2-wire		
Output type	NPN		PNP		—	
Applicable load	IC circuit, Relay, PLC				24 VDC relay, PLC	
Power supply voltage	5, 12, 24 VDC (4.5 to 28 V)					—
Current consumption	10 mA or less					—
Load voltage	28 VDC or less		—		24 VDC (10 to 28 VDC)	
Load current	40 mA or less		80 mA or less		5 to 40 mA	
Internal voltage drop	1.5 V or less (0.8 V or less at 10 mA load current)		0.8 V or less		4 V or less 0.8 mA or less	
Leakage current	100 μA or less at 24 VDC					—
Indicator light	Red LED lights when ON					

- Lead wire ----- Oil proof heavy duty vinyl cord: $\phi 2.7$, 3 cores (Brown, Black, Blue [Red, White, Black]), 0.15 mm², 2 cores (Brown, Blue [Red, Black]), 0.18mm², 0.5 m
- Note 1) Refer to page 15 for solid state auto switch common specifications and lead wire length.

Grommet



Caution

Operating Precautions

Fix the switch with appropriate screw installed on the switch body. If using other screws, switch will be damaged.

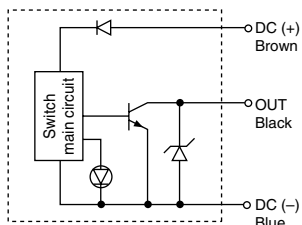
Weight

Unit: g

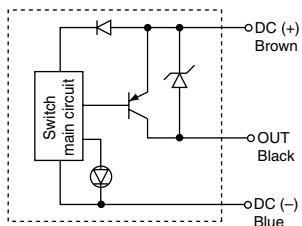
Auto switch model	D-F9N (V)	D-F9P (V)	D-F9B (V)
Lead wire length m	0.5	7	6
	3	37	31
	5	61	51

Auto Switch Internal Circuit

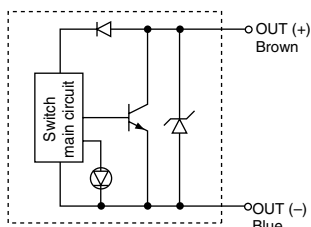
D-F9N, F9NV



D-F9P, F9PV

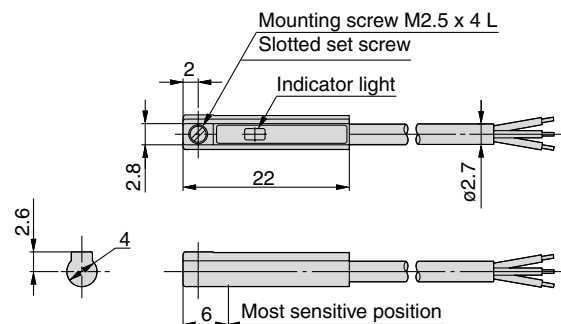


D-F9B, F9BV

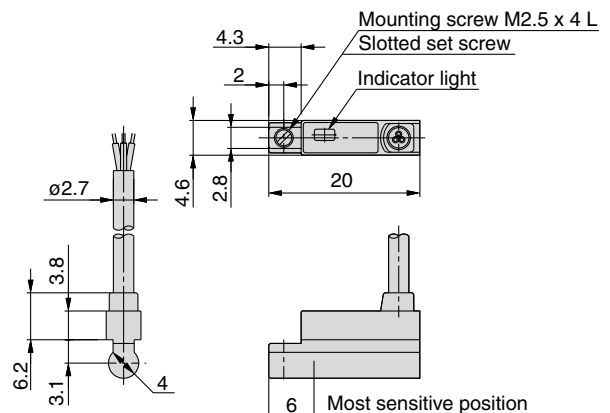


Dimensions

D-F9□



D-F9□V



Solid State Switches with 2-Color Display: Direct Mounting Type

D-F9NW(V), D-F9PW(V), D-F9BW(V)



Refer to www.smcworld.com for details of products compatible with overseas standards.

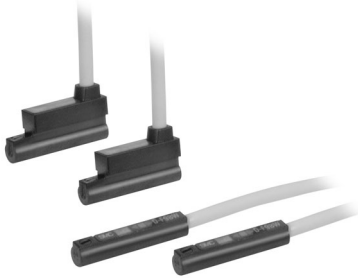
Auto Switch Specifications

PLC: Programmable Logic Controller

D-F9□W, D-F9□WV (with indicator light)						
Switch model	D-F9NW	D-F9NWV	D-F9PW	D-F9PWV	D-F9BW	D-F9BWV
Electrical entry direction	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Wiring type	3-wire				2-wire	
Output type	NPN		PNP		—	
Applicable load	IC circuit, Relay IC, PLC				24 VDC relay, PLC	
Power supply voltage	5, 12, 24 VDC (4.5 to 28 V)				—	
Current consumption	10 mA or less				—	
Load voltage	28 VDC or less		—		24 VDC (10 to 28 VDC)	
Load current	40 mA or less		80 mA or less		5 to 40 mA	
Internal voltage drop	1.5 V or less (0.8 V or less at 10 mA load current)		0.8 V or less		4 V or less	
Leakage current	100 μA or less at 24 VDC				0.8 mA or less	
Indicator light	Operating position Red LED lights up Optimum operating position Green LED lights up					

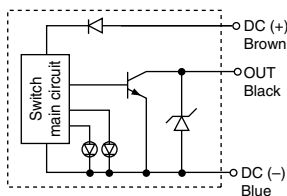
- Lead wire Oil proof heavy duty vinyl cord: $\phi 2.7$, 3 cores (Brown, Black, Blue [Red, White, Black]), 0.15 mm², 2 cores (Brown, Blue [Red, Black]), 0.18mm², 0.5 m
- Note 1) Refer to page 15 for solid state auto switch common specifications and lead wire length.

Grommet

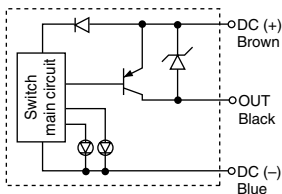


Auto Switch Internal Circuit

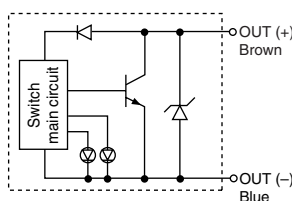
D-F9NW, F9NWV



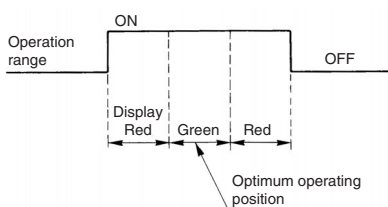
D-F9PW, F9PWV



D-F9BW, F9BWV



Indicator light



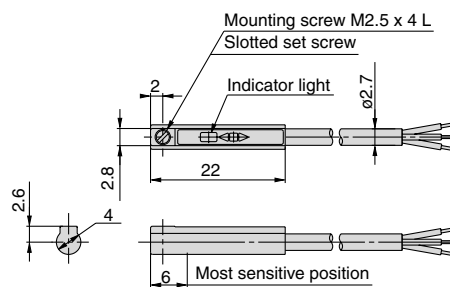
Weight

Unit: g

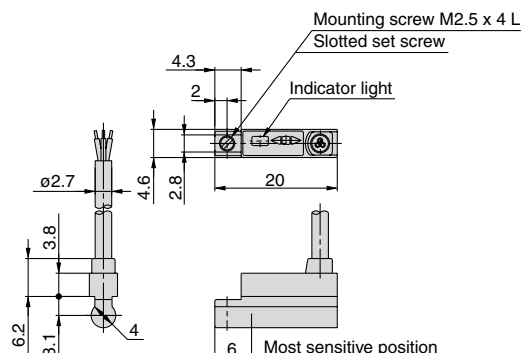
Auto switch model	D-F9NW(V)	D-F9PW(V)	D-F9BW(V)
Lead wire length m	0.5	7	7
	3	34	34
	5	56	56

Dimensions

D-F9□W



D-F9□WV



Water-Resistant Solid State Switch with 2-Color Display: Direct Mounting Type D-F9BAL



Refer to www.smcworld.com for details of products compatible with overseas standards.

Auto Switch Specifications

PLC: Programmable Logic Controller

D-F9BAL (with indicator light)	
Switch model	D-F9BAL
Wiring type	2-wire
Output type	—
Applicable load	24 VDC relay, PLC
Power supply voltage	—
Current consumption	—
Load voltage	24 VDC (10 to 28 VDC)
Load current	5 to 30 mA
Internal voltage drop	5 V or less
Leakage current	1 mA or less at 24 VDC
Indicator light	Operating position Red LED lights up Optimum operating position Green LED lights up

● Lead wire Oil proof heavy duty vinyl cord: $\phi 2.7$, 2 cores (Brown, Blue), 0.18 mm², 0.5 m
Note 1) Refer to page 15 for solid state auto switch common specifications and lead wire length.

Grommet

Water (coolant) resistant type



Caution

Operating Precautions

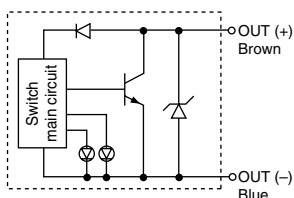
Please consult SMC if using coolant liquid other than water based solution.

Weight

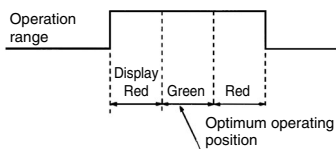
Unit: g

Auto switch model		D-F9BA
Lead wire length m	0.5	—
	3	37
	5	57

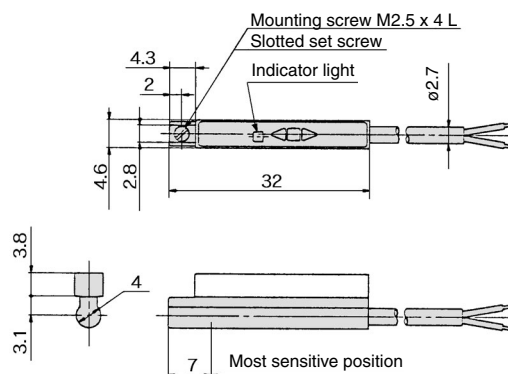
Auto Switch Internal Circuit



Indicator light



Dimensions



Reed Switches: Direct Mounting Type

D-A90(V), D-A93(V), D-A96(V) C €



Refer to www.smcworld.com for details of products compatible with overseas standards.

Grommet Electrical entry:In-line



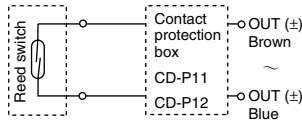
Caution

Operating Precautions

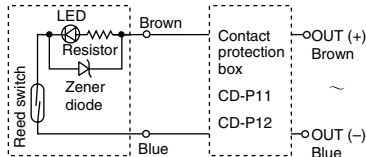
Fix the switch with appropriate screw installed on the switch body. If using other screws, switch may be damaged.

Auto Switch Internal Circuit

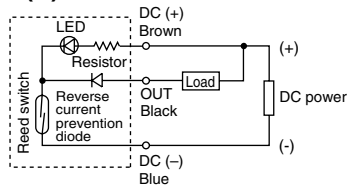
D-A90(V)



D-A93(V)



D-A96(V)



Note) A contact protection box should be used in any of the following conditions to prevent the shortening of the working life of the switch. (Refer to page 15 regarding the detailed specification for contact protection box):

- ① In the case operation load is an inductive load.
- ② In the case the wiring length to load is more than 5 m.
- ③ In the case the load voltage is 100 VAC.

Auto Switch Specifications

PLC: Programmable Logic Controller

D-A90, D-A90V (without indicator light)			
Switch model	D-A90, D-A90V		
Applicable load	IC circuit, Relay, PLC		
Load voltage	24 V _{DC} ^{AC} or less	48 V _{DC} ^{AC} or less	100 V _{DC} ^{AC} or less
Maximum load current	50 mA	40 mA	20 mA
Contact protection circuit	None		
Internal resistance	1 Ω or less (including lead wire length of 3 m)		
D-A93, D-A93V, D-A96, D-A96V (with indicator light)			
Switch model	D-A93, D-A93V		D-A96, D-A96V
Applicable load	Relay, PLC		IC circuit
Load voltage	24 VDC	100 VAC	4 to 8 VDC
Load current range and Maximum load current ^{Note 2)}	5 to 40 mA	5 to 20 mA	20 mA
Contact protection circuit	None		
Internal voltage drop	D-A93 — 2.4 V or less (up to 20 mA)/ 3 V or less (up to 40 mA) D-A93V — 2.7 V or less		0.8 V or less
Indicator light	Red LED lights when ON		

● Lead wire

D-A90(V)/D-A93(V) — Oilproof vinyl heavy insulation cable, $\phi 2.7$, 0.18 mm² × 2 cores (Brown, Blue), 0.5 m
D-A96(V) — Oilproof vinyl heavy insulation cable, $\phi 2.7$, 0.15 mm² × 3 cores (Brown, Black, Blue), 0.5 m

Note 1) Refer to page 15 for reed auto switch common specifications.

Note 2) With a load current of less than 5 mA, the visibility may be impaired, with loads of less than 2.5 mA it is likely to be unreadable, however, it will not cause any problem affecting the reed switch output.

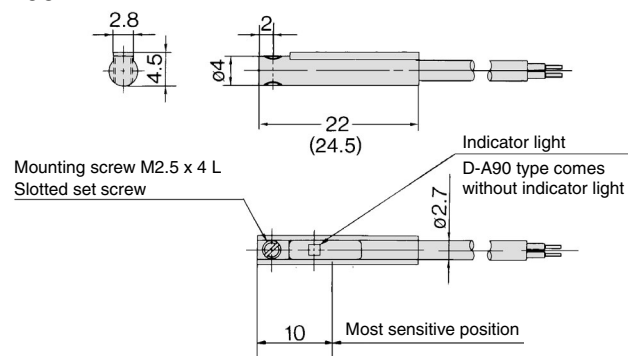
Weight

Unit: g

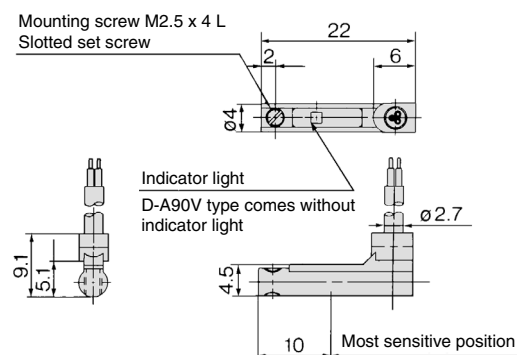
Model	D-A90	D-A90V	D-A93	D-A93V	D-A96	D-A96V
Lead wire length: 0.5 m	6	6	6	6	8	8
Lead wire length: 3 m	30	30	30	30	41	41

Dimensions

D-A90, D-A93, D-A96



D-A90V, D-A93V, D-A96V








Series CXSJ

Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of "**Caution**", "**Warning**" or "**Danger**". To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

 **Caution** : Operator error could result in injury or equipment damage.

 **Warning** : Operator error could result in serious injury or loss of life.

 **Danger** : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – General rules relating to systems

Note 2) JIS B 8370: Pneumatic system axiom

Warning

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalog information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if handled incorrectly. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.

1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc.

4. Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuits in press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.



Series CXSJ Actuator Precautions 1

Be sure to read before handling.

Design

⚠ Warning

1. There is a possibility of dangerous sudden action by air cylinders if sliding parts of machinery are twisted due to external forces, etc.

In such cases, human injury may occur; e.g., by catching hands or feet get caught in the machinery, or damage to the machinery itself may occur. Therefore, the machine should be designed to prevent such dangers.

2. A protective cover is recommended to minimize the risk of personal injury.

If a stationary object and moving parts of a cylinder are in close proximity, personal injury may occur. Design the structure to avoid contact with the human body.

3. Securely tighten all stationary parts and connected parts so that they will not become loose.

Especially when a cylinder operates with high frequency or is installed where there is a lot of vibration, ensure that all parts remain secure.

4. A deceleration circuit or shock absorber may be required.

When a driven object is operated at high speed or the load is heavy, a cylinder's cushion will not be sufficient to absorb impact. Install a deceleration circuit to reduce the speed before cushioning, or install an external shock absorber to relieve impact. In this case, the rigidity of the machinery should also be examined.

5. Consider a possible drop in operating pressure due to a power outage.

When a cylinder is used as a clamping mechanism, there is a danger of work pieces dropping if there is a decrease in clamping force due to a drop in circuit pressure caused by a power outage. Therefore, safety equipment should be installed to prevent human injury or damage to machinery. Suspension mechanisms and lifting devices also require for drop prevention measures.

6. Consider a possible loss of power source.

Measures should be taken to protect against bodily injury and equipment damage in the event that there is a loss of power to equipment controlled by pneumatics, electricity, or hydraulics.

7. Design circuitry to prevent sudden lurching of driven objects.

Take special care when a cylinder is operated by an exhaust center type directional control valve or when it is starting up after residual pressure is exhausted from the circuit. The piston and its driven object will lurch at high speed if pressure is applied to one side of the cylinder because of the absence of air pressure inside the cylinder. Therefore, equipment should be selected and circuits designed to prevent sudden lurching because when this occurs, there is a danger of bodily injury, particularly to limbs, and/or damage to equipment.

8. Consider emergency stops.

Design so that human injury and/or damage to machinery and equipment will not be caused when machinery is stopped by a safety device under abnormal conditions, a power outage or a manual emergency stop.

9. Consider the action when operation is restarted after an emergency or abnormal stop.

Design the machinery so that human injury or equipment damage will not occur upon restart of operation.

When the cylinder has to be reset at the starting position, install manual safety equipment.

Selection

⚠ Warning

1. Check the specifications.

The products advertised in this catalog are designed according to use in industrial compressed air systems. If the products are used in conditions where pressure, temperature, etc., are out of specification, damage and/or malfunction may be caused. Do not use in these conditions. (Refer to specifications.) Consult with SMC if you use a fluid other than compressed air.

2. Intermediate stops

When intermediate stopping of a cylinder piston is performed with a 3-position closed center type directional control valve, it is difficult to achieve stopping positions as accurately and precisely as with hydraulic pressure due to the compressibility of air.

Furthermore, since valves and cylinders are not guaranteed for zero air leakage, it may not be possible to hold a stopped position for an extended period of time. Contact SMC in case it is necessary to hold a stopped position for an extended period.

⚠ Caution

1. Operate within the limits of the maximum usable stroke.

The piston rod will be damaged if operated beyond the maximum stroke. Refer to the cylinder model selection procedure for the maximum usable stroke.

2. Operate the piston with in a range such that collision damage will not occur at the stroke end.

The operation range should prevent damage from occurring when a piston, having inertial force, stops by striking the cover at the stroke end. Refer to the cylinder model selection procedure for the maximum usable stroke.

3. Use a speed controller to adjust the cylinder drive speed, gradually increasing from a low speed to the desired speed setting.

Piping

⚠ Caution

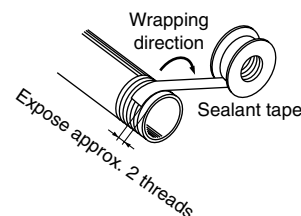
1. Preparation before piping

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

2. Wrapping of pipe tape

When screwing together pipes and fittings, be certain that chips from the pipe threads and sealing material do not get inside the piping.

Also, when sealant tape is used, leave 1.5 to 2 thread ridges exposed at the end of the pipe.





Series CXSJ Actuator Precautions 2

Be sure to read before handling.

Mounting

⚠ Caution

1. Do not scratch or gouge the cylinder tube or the sliding parts of the piston rod by striking or grasping them with other objects.

Cylinder bores are manufactured to precise tolerances, so that even a slight deformation may cause faulty operation.

Moreover, scratches or gouges, etc. in the piston rod may lead to damaged seals and cause air leakage.

2. When attaching and tightening a work piece to the end of the plate, the plate should be secured while the piston rod is fully retracted to avoid excessive torque applied to the piston rod.
3. Do not use until you can verify that equipment can operate properly.

Following mounting, repairs, or conversions, verify correct mounting by conducting suitable function and leakage tests after piping and power connections have been made.

4. Instruction manual

The product should be mounted and operated after the instruction manual is thoroughly read and its contents are understood. Keep the instruction manual where it can be referred to as needed.

Lubrication

⚠ Caution

1. Lubrication of non-lube type cylinder

The cylinder is lubricated for life at the factory and can be used without any further lubrication.

However, in the event that additional cylinder lubrication is required, be sure to use ISO VG32 Class 1 turbine oil (with no additives).

Stopping lubrication later may lead to malfunctions because the new lubricant will cancel out the original lubricant. Therefore, lubrication must be continued once it has been started.

Lubrication

⚠ Warning

1. Use clean air.

Do not use compressed air that includes chemicals, synthetic oils containing organic solvents, salt or corrosive gases, etc., as it can cause damage or malfunction.

⚠ Caution

1. Install air filters.

Install air filters at the upstream side of valves. The filtration degree should be 5 μm or finer.

2. Install an after-cooler air dryer or water separator, etc.

Air that includes much drainage can cause malfunction of valves and other pneumatic equipment. To prevent this, install an after-cooler, air dryer or water separator, etc.

Air Supply

⚠ Caution

1. Use the product within the range of specifications for fluid temperature and ambient temperature.

Take measures to prevent freezing when below 5°C, since moisture in circuits can freeze and cause damage to seals and lead to malfunctions.

Refer to SMC's Best Pneumatics catalog Vol. 4 for further details on compressed air quality.

Operating Environment

⚠ Warning

1. Do not use in environments where there is a danger of corrosion.

Refer to the construction drawings regarding cylinder materials.

2. In dusty conditions or where water or oil splashing is a regular occurrence, protect the rod by installing a rod cover.

In dusty locations, use a coil scraper type (available through special order). When there is splashing or spraying of liquid, use a water-resistant cylinder (available through special order).

3. When using auto switches, do not operate in an environment where there are strong magnetic fields.

Maintenance

⚠ Warning

1. Perform maintenance inspection according to the procedures indicated in the instruction manual.

If handled improperly, malfunction and damage of machinery or equipment may occur.

2. Removal of equipment, and supply and exhaust of compressed air

Before any machinery or equipment is removed, first ensure that the appropriate measures are in place to prevent the fall or erratic movement of driven objects and equipment, then cut off the electric power and reduce the pressure in the system to zero. Only then should you proceed with the removal of any machinery and equipment.

When machinery is restarted, proceed with caution after confirming that appropriate measures are in place to prevent cylinders from sudden movement.

⚠ Caution

1. Filter flushing

Remove drainage from air filters regularly.



Series CXSJ Auto Switch Precautions 1

Be sure to read before handling.

Design and Selection

Warning

1. Confirm the specifications.

Read the specifications carefully and use this product appropriately. The product may be damaged or malfunction if it is used outside the range of specifications of current load, voltage, temperature or impact.

2. Take precautions when multiple cylinders are used close together.

When two or more auto switch cylinders are lined up in close proximity to each other, magnetic field interference may cause the switches to malfunction. Maintain a minimum cylinder separation of 40 mm. (When the allowable interval is specified for each cylinder series, use the indicated value.)

3. Pay attention to the length of time that a switch is on at an intermediate stroke position.

When an auto switch is placed at an intermediate position of the stroke and a load is driven at the time the piston passes, the auto switch will operate, but if the speed is too great, the operating time will be shortened and the load may not operate properly. The maximum detectable piston speed is:

$$V \text{ (mm/s)} = \frac{\text{Auto switch operating range (mm)}}{\text{Load operating time (ms)}} \times 1000$$

4. Keep wiring as short as possible.

<Reed switch>

As the length of the wiring to a load gets longer, the rush current at switching ON becomes greater, and this may shorten the product's life. (The switch will stay ON all the time.)

- 1) Use a contact protection box when the wire length is 5 m or longer.

<Solid state switch>

- 2) Although wire length should not affect switch function, use a wire that is 100 m or shorter.

5. Take precautions for the internal voltage drop of the switch.

<Reed switch>

- 1) Switches with an indicator light (Except D-A96, A96V)
 - If auto switches are connected in series as shown below, take note that there will be a large voltage drop because of internal resistance in the light emitting diodes. (Refer to internal voltage drop in the auto switch specifications.) [The voltage drop will be "n" times larger when "n" auto switches are connected.] Even though an auto switch operates normally, the load may not operate.



- Similarly, when operating below a specified voltage, it is possible that the load may be ineffective even though the auto switch function is normal. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

$$\text{Supply voltage} - \text{Internal voltage drop of switch} > \text{Minimum operating voltage of load}$$

- 2) If the internal resistance of a light emitting diode causes a problem, select a switch without an indicator light (Model A90, A90V).

<Solid state switch>

- 3) Generally, the internal voltage drop will be greater with a 2-wire solid state auto switch than with a reed switch. Take the same precautions as in 1) above. Also, note that a 12 VDC relay is not applicable.

6. Pay attention to leakage current.

<Solid state switch>

With a 2-wire solid state auto switch, current (leakage current) flows to the load to operate the internal circuit even when in the OFF state.

$$\text{Current to operate load (OFF condition)} > \text{Leakage current}$$

If the condition given in the above formula is not met, it will not reset correctly (stays ON). Use a 3-wire switch if this specification cannot be satisfied.

Moreover, leakage current flow to the load will be "n" times larger when "n" auto switches are connected in parallel.

7. Do not use a load that generates surge voltage.

<Reed switch>

If driving a load such as a relay that generates a surge voltage, use a contact protection box.

<Solid state switch>

Although a zener diode for surge protection is connected at the output side of a solid state auto switch, damage may still occur if a surge is applied repeatedly. When directly driving a load which generates surge, such as a relay or solenoid valve, use a type of switch with a built-in surge absorbing element.

8. Cautions for use in an interlock circuit

When an auto switch is used for an interlock signal requiring high reliability, devise a double interlock system to safeguard against malfunctions by providing a mechanical protection function, or by also using another switch (sensor) together with the auto switch. Also perform periodic inspection and confirm proper operation.

9. Ensure sufficient clearance for maintenance activities.

When designing an application, be sure to allow sufficient clearance for maintenance and inspections.



Series CXSJ Auto Switch Precautions 2

Be sure to read before handling.

Mounting and Adjustment

Warning

1. Do not drop or bump.

Do not drop, bump or apply excessive impacts (300m/s² or more for reed switches and 1000m/s² or more for solid state switches) while handling.

Although the body of the switch may not be damaged, the inside of the switch could be damaged and cause a malfunction.

2. Do not carry a cylinder by the auto switch lead wires.

Never carry a cylinder by its lead wires. This may not only cause broken lead wires, but it may cause internal elements of the switch to be damaged by the stress.

3. Mount switches using the proper tightening torque.

When a switch is tightened beyond the range of tightening torque, the mounting screws, or switch may be damaged. On the other hand, tightening below torque range may allow the switch to slip out of position.

4. Mount a switch at the center of the operating range.

Adjust the mounting position of an auto switch so that the piston stops at the center of the operating range (the range in which a switch is ON). (The mounting positions shown in the catalog indicate the optimum position at stroke end.) If mounted at the end of the operating range (around the borderline of ON and OFF), operation will be unstable.

Wiring

Warning

1. Avoid repeatedly bending or stretching lead wires.

Broken lead wires will result from repeatedly applying bending stress or stretching force to the lead wires.

2. Be sure to connect the load before power is applied.

<2-wire type>

If the power is turned ON when an auto switch is not connected to a load, the switch will be instantly damaged because of excess current.

3. Confirm proper insulation of wiring.

Be certain that there is no faulty wiring insulation (such as contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

4. Do not wire in conjunction with power lines or high voltage lines.

Wire separately from power lines or high voltage lines, avoiding parallel wiring or wiring in the same conduit with these lines. Control circuits containing auto switches may malfunction due to noise from these other lines.

Wiring

5. Do not allow short circuit of loads.

<Reed switch>

If the power is turned ON with a load in a short circuited condition, the switch will be instantly damaged because of excess current flow into the switch.

<Solid state switch>

D-M9□, D-F9□(V), F9□W(V), and all models of PNP output type switches do not have built-in short circuit protection circuits. If loads are short circuited, the switches will be instantly damaged, as in the case of reed switches.

Take special care to avoid reverse wiring with the brown [red] power supply line and the black [white] output line on 3-wire type switches.

6. Avoid incorrect wiring.

<Reed switch>

A 24 VDC switch with indicator light has polarity. The brown [red] lead wire is (+), and the blue [black] lead wire is (-).

1) If connections are reversed, the switch will still operate, but the light emitting diode will not light up.

Also note that a current greater than the maximum specified one will damage a light emitting diode and make it inoperable.

Applicable models: D-A93, A93V

<Solid state switch>

1) Even if connections are reversed on a 2-wire type switch, the switch will not be damaged because it is protected by a protection circuit, but it will remain in a normally ON state. But reverse wiring in a load short circuit condition should be avoided to protect the switch from being damaged.

2) Even if (+) and (-) power supply line connections are reversed on a 3-wire type switch, the switch will be protected by a protection circuit. However, if the (+) power supply line is connected to the blue [black] wire and the (-) power supply line is connected to the black [white] wire, the switch will be damaged.

* Lead wire color changes

Lead wire colors of SMC switches have been changed in order to meet NECA Standard 0402 for production beginning September, 1996 and thereafter. Please refer to the tables provided. Special care should be taken regarding wire polarity during the time that the old colors still coexist with the new colors.

2-wire

	Old	New
Output (+)	Red	Brown
Output (s)	Black	Blue

3-wire

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black

Solid state with diagnostic output

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black
Diagnostic output	Yellow	Orange

Solid state with latch type diagnostic output

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black
Latch type diagnostic output	Yellow	Orange



Series CXSJ Auto Switch Precautions 3

Be sure to read before handling.

Operating Environment

⚠ Warning

1. Never use in an atmosphere of explosive gases.

The construction of auto switches is not intended to prevent explosion. Never use in an atmosphere with an explosive gas since this may cause a serious explosion.

2. Do not use in an area where a magnetic field is generated.

Auto switches will malfunction or magnets inside cylinders will become demagnetized if used in such an environment.

3. Do not use in an environment where the auto switch will be continually exposed to water.

Switches satisfy IEC standard IP67 construction (JIS C 0920: watertight construction). Nevertheless, they should not be used in applications where they are continually exposed to water splash or spray. This may cause deterioration of the insulation or swelling of the potting resin inside switches may cause malfunction.

4. Do not use in an environment with oil or chemicals.

Consult with SMC if auto switches will be used in an environment laden with coolant, cleaning solvent, various oils or chemicals. If auto switches are used under these conditions for even a short time, they may be adversely affected by a deterioration of the insulation, a malfunction due to swelling of the potting resin, or hardening of the lead wires.

5. Do not use in an environment with temperature cycles.

Consult with SMC if switches are to be used where there are temperature cycles other than normal temperature changes, as they may be adversely affected internally.

6. Do not use in an environment where there is excessive impact shock.

<Reed switch>

When excessive impact (300 m/s² or more) is applied to a reed switch during operation, the contact point may malfunction and generate or cut off a signal momentarily (1 ms or less). Consult with SMC regarding the need to use a solid state switch depending upon the environment.

7. Do not use in an area where surges are generated.

<Solid state switch>

When there are units (such as solenoid type lifters, high frequency induction furnaces, motors, etc.) that generate a large amount of surge in the area around cylinders with solid state auto switches, their proximity or pressure may cause deterioration or damage to the internal circuit elements of the switches. Avoid sources of surge generation and crossed lines.

8. Avoid accumulation of iron debris or close contact with magnetic substances.

When a large accumulated amount of ferrous waste such as machining chips or welding spatter, or a magnetic substance (something attracted by a magnet) is brought into close proximity to an cylinder with auto switches, this may cause the auto switches to malfunction due to a loss of the magnetic force inside the cylinder.

Maintenance

⚠ Warning

1. Perform the following maintenance periodically in order to prevent possible danger due to unexpected auto switch malfunction.

1) Securely tighten switch mounting screws.

If screws become loose or the mounting position is dislocated, retighten them after readjusting the mounting position.

2) Confirm that there is no damage to lead wires.

To prevent faulty insulation, replace switches or repair lead wires, etc., if damage is discovered.

3) Confirm that the green light on the 2-color display type switch lights up.

Confirm that the green LED is ON when stopped at the set position. If the red LED is ON, when stopped at the set position, the mounting position is not appropriate. Readjust the mounting position until the green LED lights up.

Other

⚠ Warning

1. Consult with SMC concerning water resistance, elasticity of lead wires and usage at welding sites, etc.



Series CXSJ Specific Product Precautions

Be sure to read before handling.

Mounting

⚠ Caution

1. Make sure that the surface on which the cylinder is to be mounted is flat (reference value for flatness: 0.05 or less).

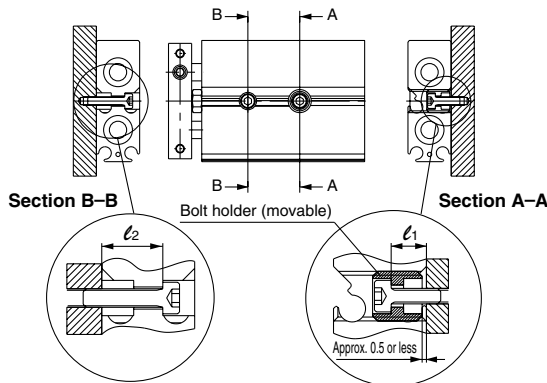
Dual-rod cylinders can be mounted from 3 directions, however, make sure that the surface on which the cylinder is to be mounted is flat (reference value for flatness: 0.05 or less). Otherwise, the accuracy of the piston rod operation is not achieved, and malfunctioning can occur.

2. The piston rod must be retracted when mounting the cylinder.

Scratches or gouges in the piston rod may lead to damaged bearings and seals and cause malfunctions or air leakage.

3. CXSJ (ø6, ø10)

Adjust the bolt holder using a hexagon wrench 3 mm in width across flats so that it does not protrude from the cylinder surface (approx. 0.5 mm depth from the cylinder surface to the top of the holder). If the bolt holder is not properly adjusted, it can interfere with the switch rail, hindering the auto switch mounting. The required length of the mounting bolt for a bolt holder and mounting hole in the rod cover side varies depending on the bearing surface position for the mounting bolt. Refer to dimensions l_1 and l_2 provided below to select the appropriate mounting bolt length.



	l_1 (mm)	l_2 (mm)
CXSJ□6	5	8.4
CXSJ□10	5	9.5

Piping

1. For axial piping, the side port of the standard cylinder is plugged. However, a plugged port can be switched according to the operating conditions. When switching the plugged port, check the air leakage. If small air leakage is detected, unplug the port, then check the seat surface, and reassemble it.

Stroke Adjustment

⚠ Caution

1. After adjusting the stroke, make sure to tighten the hexagon nut to prevent it from loosening.

Dual-rod cylinders have a bolt to adjust 0 to -5 mm strokes on the retracted end (IN).

Loosen the hexagon nut to adjust the stroke; however, make sure to tighten the hexagon nut after making an adjustment.

2. Never operate a cylinder with its bumper bolt removed. Also, do not attempt to tighten the bumper bolt without using a nut.

If the bumper bolt is removed, the piston hits the head cover causing damage to the cylinder. Therefore, do not use a cylinder without a bumper bolt.

Furthermore, if the bumper bolt is tightened without a nut, the piston seal is caught in the leveled part, damaging the seal.

3. A bumper at the end of the bumper bolt is replaceable.

In case a missing bumper, or a bumper has a permanent settling, use a following part numbers for ordering.

Bore size (mm)	6	10, 15	20, 25	32
Part no.	CXS06-34 -A5157	CXS10-34A 28747	CXS20-34A 28749	CXS32-34A 28751
Qty.	1			

Disassembly and Maintenance

⚠ Caution

1. Never use a cylinder with its plate removed.
When removing the hexagon socket head cap screw on the end plate, the piston rod must be secured to prevent from rotating. However, if the sliding parts of the piston rod are scratched and gouged, a malfunction may occur.
2. When disassembling and reassembling the cylinder, contact SMC or refer to the separate instruction manual.

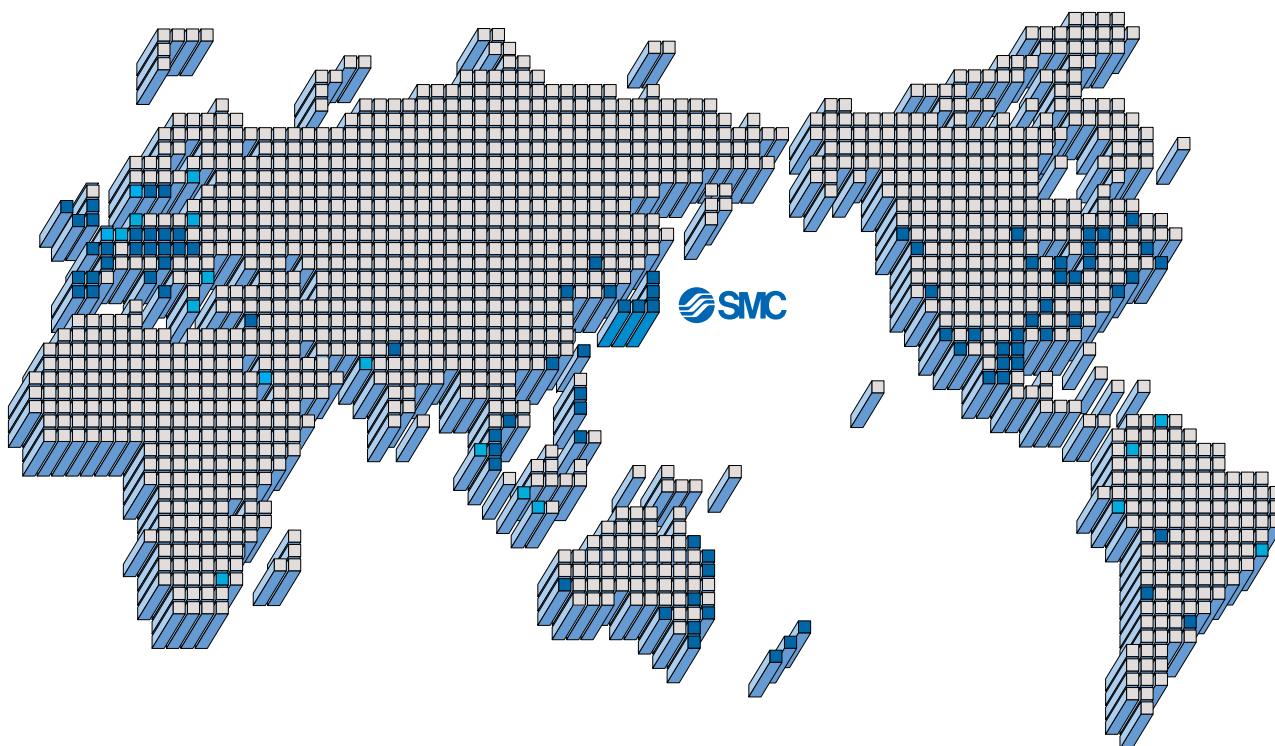
⚠ Warning

1. Take precautions when your hands are near the plate and housing.

When the cylinder is operated, take extra precautions to avoid getting your hands and fingers caught between the plate and housing, that can cause a bodily injury.



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