

Mini Free Mount Cylinder

Series *CUJ*

ø4, ø6, ø8, ø10



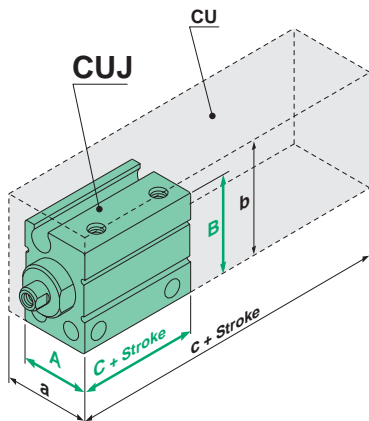
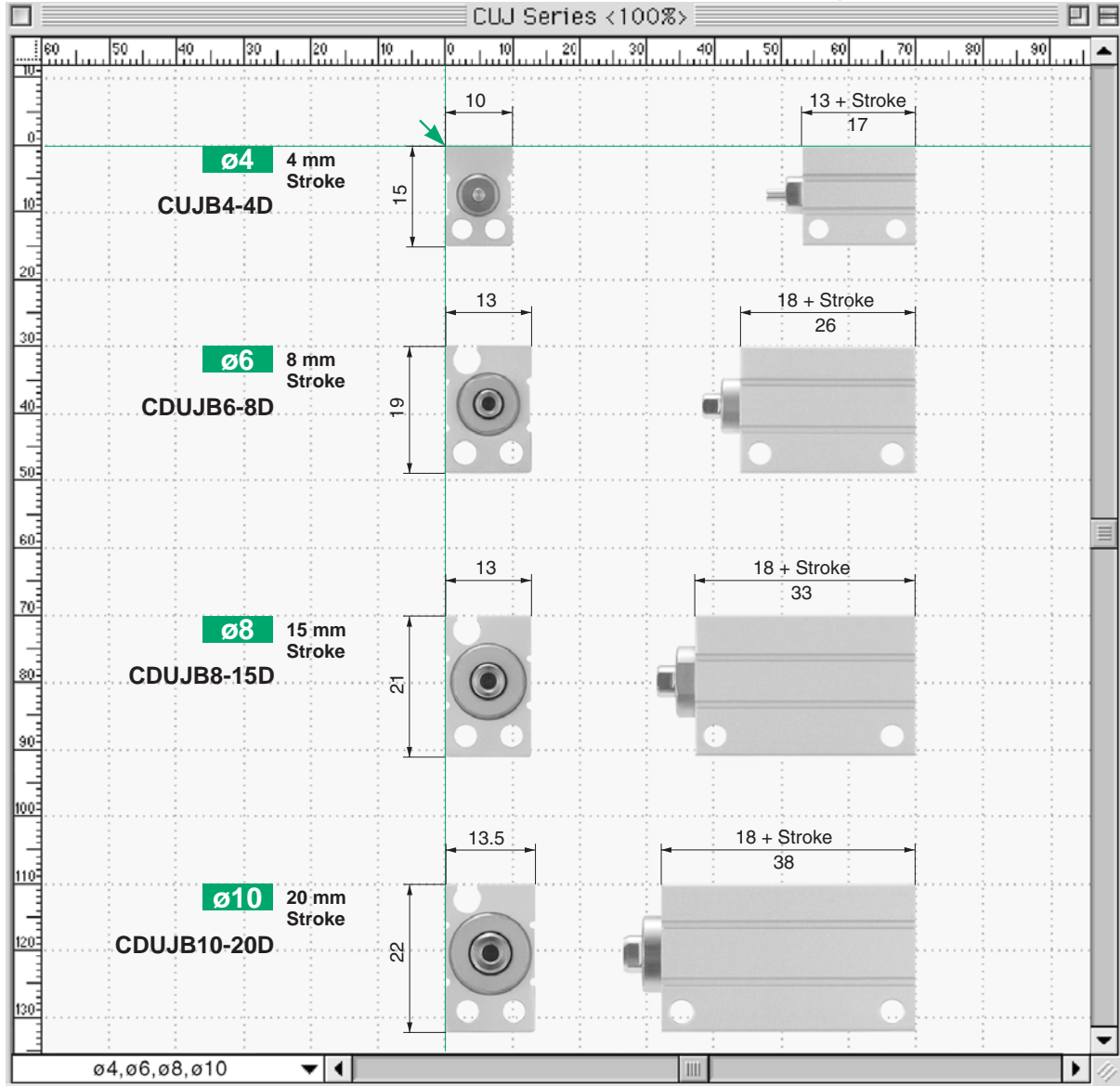
Expanded stroke variations



Series	Bore size (mm)	Action	Stroke (mm)							Clean series	Auto switch	Rod end configuration			
			4	6	8	10	15	20	25				30		
CUJ	4	Double acting	●	●	●	●	●	●				None	Male thread Without thread		
		Single acting, Spring return	●	●	●	●	●	●							
	6	Double acting	●	●	●	●	●	●	●	●	●		Solid state switch D-F8□ D-M9□	Female thread Male thread	
		Single acting, Spring return	●	●	●	●	●	●	●	●	●				
8	Double acting	●	●	●	●	●	●	●	●	●	●	Solid state switch D-F8□ D-M9□			Female thread Male thread
	Single acting, Spring return	●	●	●	●	●	●	●	●	●					
10	Double acting	●	●	●	●	●	●	●	●	●	●		Solid state switch D-F8□ D-M9□	Female thread Male thread	
	Single acting, Spring return	●	●	●	●	●	●	●	●	●					

●: Strokes newly added.

Miniature Body



- Length is shortened by approx. 64% max.
- Volume is reduced by approx. 70% max.

(As compared with SMC Series CU cylinders without magnet)

Dimensions (Without magnet) (mm)

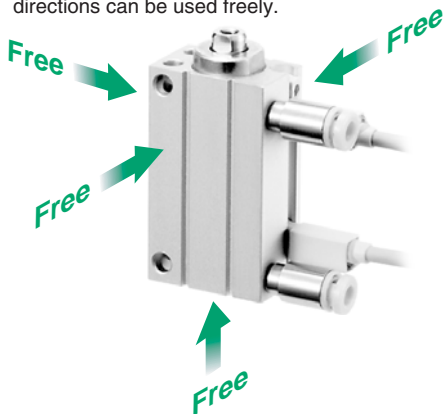
Bore size (mm)	A(a)	B(b)	C(c)
4	10(—)	15(—)	13(—)
6	13(13)	19(22)	13(33)
8	13(—)	21(—)	13(—)
10	13.5(15)	22(24)	13(36)

Numbers in parentheses are the dimensions of SMC Series CU cylinders.

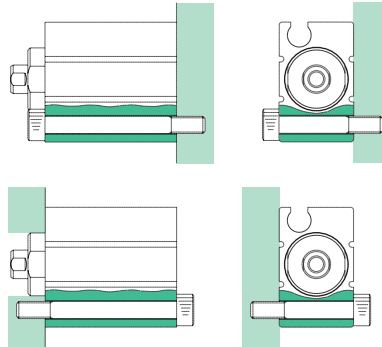
Series CUJ $\phi 4, \phi 6, \phi 8, \phi 10$

Concentrates wiring and piping on one side

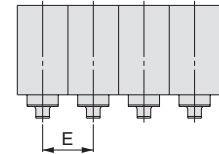
Allows more efficient installation, since four directions can be used freely.



Free mount design allows installation from four directions.



Short pitch mounting is possible.

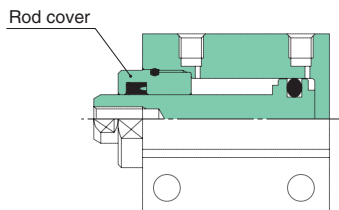


Pitch Dimensions (Without magnet) (mm)

Bore (mm)	E
4	10
6	13
8	13
10	13.5

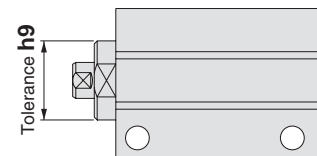
Easy seal replacement

Seals can be replaced easily by just removing the rod cover.

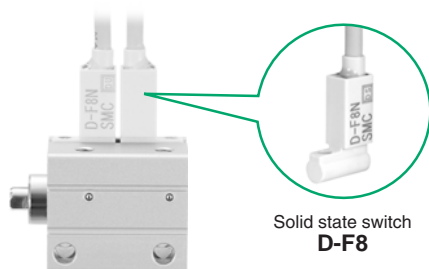


With boss (h9)

Centering can be done easily.



Two auto switches can be installed even for a 4 mm stroke.



Solid state switch D-F8

Clean room compliant Clean Series

10- 11- CUJ Series



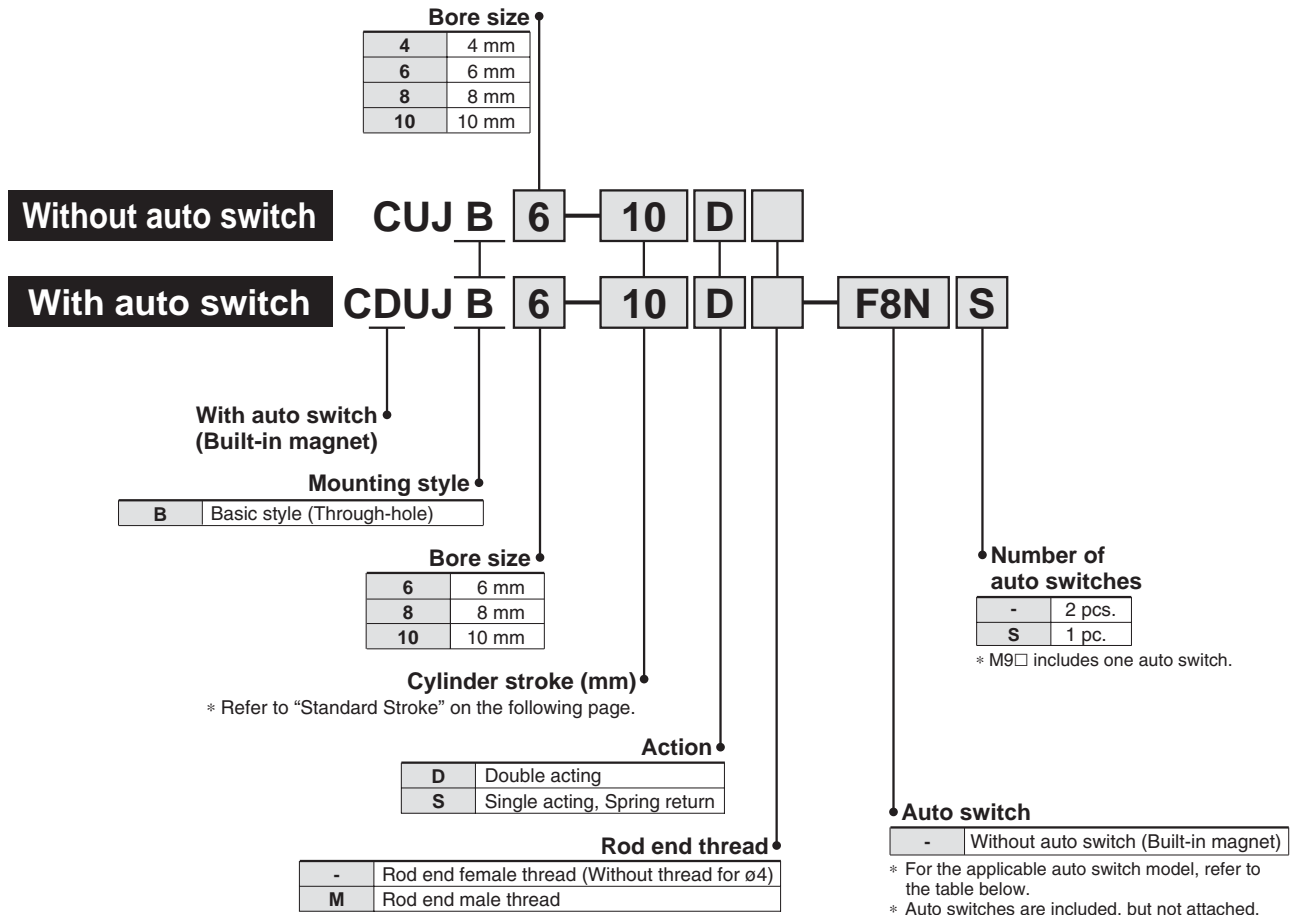
Mini Free Mount Cylinder

Series CUJ



ø4, ø6, ø8 ø10

How to Order



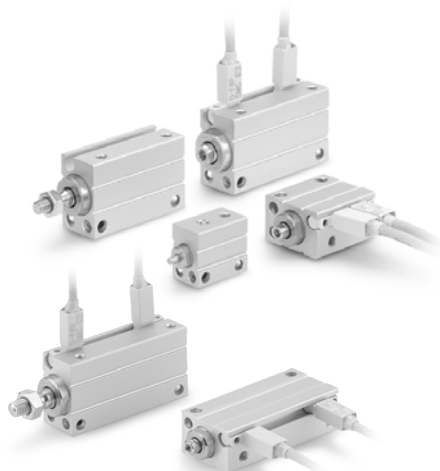
Applicable Auto Switches/Refer to page 11 for additional information on auto switches.

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	Electrical entry direction		0.5 (Nil)	3 (L)	5 (Z)			
							Perpendicular	In-line						
Solid state switch	—	Grommet	Yes	3-wire (NPN)	24 V	12 V	—	—	M9N	●	●	○	—	Relay, PLC
				F8N				—	●	●	○			
				—				M9P	●	●	○			
				F8P				—	●	●	○			
—	—	—	—	2-wire	—	—	—	M9B	●	●	○	—	—	
				F8B			—	●	●	○				

* Lead wire length symbols: 0.5 m..... Nil (Example) F8N
3 m..... L (Example) F8NL

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

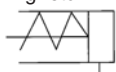
Specifications



JIS Symbol
Double acting,
Single rod



Single acting,
Spring return



Bore size (mm)		4	6	8	10
Action		Double acting/Single acting, Spring return			
Fluid		Air			
Proof pressure		1.05 MPa			
Minimum operating pressure	Double acting	0.15 MPa			0.1 MPa
	Single acting, Spring return	0.35 MPa	0.3 MPa		0.2 MPa
Maximum operating pressure		0.7 MPa			
Ambient and fluid temperature		Without auto switch: -10 to 70°C (No freezing) With auto switch: -10 to 60°C (No freezing)			
Cushion		None			
Lubrication		Non-lube			
Piston speed		50 to 500 mm/s			
Thread tolerance		JIS Class 2			
Stroke length tolerance		+0.5 0			
Mounting		Through-hole			

Theoretical Output/Double Acting

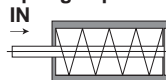


Unit: N

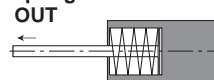
Bore size (mm)	Rod size (mm)	Operating direction	Piston area (mm ²)	Operating pressure (MPa)		
				0.3	0.5	0.7
4	2	OUT	12.6	3.76	6.28	8.79
		IN	9.4	2.82	4.71	6.59
6	4	OUT	28.3	8.48	14.13	19.79
		IN	15.7	4.71	7.85	10.99
8	5	OUT	50.3	15.07	25.13	35.18
		IN	30.6	9.18	15.31	21.44
10	6	OUT	78.5	23.56	39.26	54.97
		IN	50.3	15.07	25.13	35.18

Spring Reaction Force/Single Acting

Spring in pre-loaded condition



Spring in loaded condition



When the spring is set in the cylinder.

When the spring is contracted by applying air. Unit: N

Standard Stroke

Action	Bore size (mm)	Standard stroke (mm)
Double acting	4	4, 6, 8, 10, 15, 20
	6	4, 6, 8, 10, 15, 20, 25, 30
	8, 10	4, 6, 8, 10, 15, 20, 25, 30
Single acting, Spring return	4	4, 6
	6	4, 6, 8
	8, 10	4, 6, 8, 10



Made to Order Specifications
Please consult SMC for more information

Symbol	Specifications/Contents
-XB6	Heat resistant (150°C)

Weight/Double Acting

Unit: g

Bore size (mm)	Standard stroke (mm)								Additional weight	
	4	6	8	10	15	20	25	30	With magnet	Rod end male thread
CUJB4	7.2	7.9	8.6	9.3	11.1	12.8	—	—	—	0.4
CUJB6	12.4	13.6	14.8	16.0	18.9	21.8	24.7	27.6	2.7	0.8
CUJB8	15.6	17.0	18.4	19.7	23.0	26.4	29.9	33.4	3.0	1.5
CUJB10	17.9	19.4	20.8	22.3	25.9	29.5	33.1	36.7	3.2	2.6

Weight/Single Acting

Unit: g

Bore size (mm)	Standard stroke (mm)				Additional weight	
	4	6	8	10	With magnet	Rod end male thread
CUJB4	7.2	7.9	—	—	—	0.4
CUJB6	12.8	14.0	15.2	—	2.4	0.8
CUJB8	15.8	17.2	18.6	19.9	2.5	1.5
CUJB10	17.9	19.4	20.8	22.3	2.4	2.6

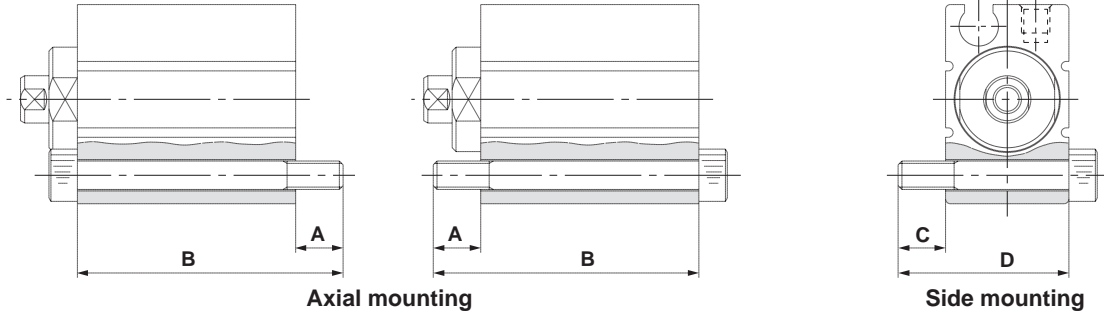
Series CUJ

Mounting

Through-hole mounting bolts are available for mounting a cylinder.

Ordering: Add the word "CUJ-" in front of the bolts to be used.

(Example) CUJ-M3 x 27 ℓ



Without Auto Switch

For Axial Mounting

Model	A	B	Mounting bolt
CUJB4-4	4	21	M2.5 x 21 ℓ
-6		23	M2.5 x 23 ℓ
-8		25	M2.5 x 25 ℓ
-10		27	M2.5 x 27 ℓ
-15		32	M2.5 x 32 ℓ
-20		37	M2.5 x 37 ℓ <small>Note 1)</small>
CUJB6-4	5	22	M3 x 22 ℓ
-6		24	M3 x 24 ℓ
-8		26	M3 x 26 ℓ
-10		28	M3 x 28 ℓ
-15		33	M3 x 33 ℓ
-20		38	M3 x 38 ℓ
-25		43	M3 x 43 ℓ
-30	48	M3 x 48 ℓ	
CUJB8-4	5	22	M3 x 22 ℓ
-6		24	M3 x 24 ℓ
-8		26	M3 x 26 ℓ
-10		28	M3 x 28 ℓ
-15		33	M3 x 33 ℓ
-20		38	M3 x 38 ℓ
-25		43	M3 x 43 ℓ
-30	48	M3 x 48 ℓ	
CUJB10-4	5	22	M3 x 22 ℓ
-6		24	M3 x 24 ℓ
-8		26	M3 x 26 ℓ
-10		28	M3 x 28 ℓ
-15		33	M3 x 33 ℓ
-20		38	M3 x 38 ℓ
-25		43	M3 x 43 ℓ
-30	48	M3 x 48 ℓ	

Note 1) M2.5 x 37 ℓ is only made of stainless steel.

For Side Mounting

Model	C	D	Mounting bolt
CUJB4-4	4	14	M2.5 x 14 ℓ
-6			
-8			
-10			
-15			
-20			
CUJB6-4	5	18	M3 x 18 ℓ
-6			
-8			
-10			
-15			
-20			
-25			
-30			
CUJB8-4	5	18	M3 x 18 ℓ
-6			
-8			
-10			
-15			
-20			
-25			
-30			
CUJB10-4	5	18	M3 x 18 ℓ
-6			
-8			
-10			
-15			
-20			
-25			
-30			

With Auto Switch

For Axial Mounting

Model	A	B	Mounting bolt
CDUJB6-4	5	27	M3 x 27 ℓ
-6		29	M3 x 29 ℓ
-8		31	M3 x 31 ℓ
-10		33	M3 x 33 ℓ
-15		38	M3 x 38 ℓ
-20		43	M3 x 43 ℓ
-25		48	M3 x 48 ℓ
-30	53	M3 x 53 ℓ	
CDUJB8-4	5	27	M3 x 27 ℓ
-6		29	M3 x 29 ℓ
-8		31	M3 x 31 ℓ
-10		33	M3 x 33 ℓ
-15		38	M3 x 38 ℓ
-20		43	M3 x 43 ℓ
-25		48	M3 x 48 ℓ
-30	53	M3 x 53 ℓ	
CDUJB10-4	5	27	M3 x 27 ℓ
-6		29	M3 x 29 ℓ
-8		31	M3 x 31 ℓ
-10		33	M3 x 33 ℓ
-15		38	M3 x 38 ℓ
-20		43	M3 x 43 ℓ
-25		48	M3 x 48 ℓ
-30	53	M3 x 53 ℓ	

For Side Mounting

Model	C	D	Mounting bolt
CDUJB6-4	5	18	M3 x 18 ℓ
-6			
-8			
-10			
-15			
-20			
-25			
-30			
CDUJB8-4	5	18	M3 x 18 ℓ
-6			
-8			
-10			
-15			
-20			
-25			
-30			
CDUJB10-4	5	18	M3 x 18 ℓ
-6			
-8			
-10			
-15			
-20			
-25			
-30			

■ Clean Series

How to Order

Double acting

10 — C — **D** — UJB — **6** — **8** — **D** — **F8N** —

Clean Series

10	Relief type
11	Vacuum suction type

Built-in magnet

-	None
D	Yes (Built-in)

Bore size

6	6 mm
8	8 mm
10	10 mm

Stroke

Bore size	Stroke (mm)					
	4	6	8	10	15	20
6	●	●	●	●	●	
8	●	●	●	●	●	●
10	●	●	●	●	●	●

* For strokes other than those shown above, please contact SMC.

Number of auto switches

-	2 pcs.
S	1 pc.

Auto switch

-	Without auto switch (Built-in magnet)
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* Applicable auto switch models are the same as those for the standard, double acting type. Refer to page 2.

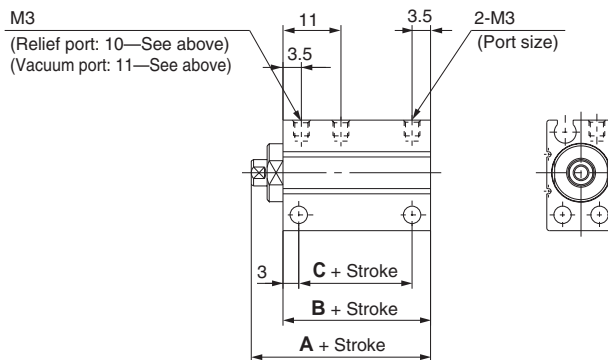
Rod end male thread

-	Rod end female thread
M	Rod end male thread

Specifications

The specifications are the same as those for the standard, double acting type. Refer to page 2.

Dimensions



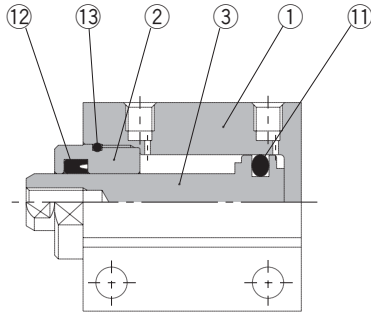
Bore size (mm)	Without auto switch			With auto switch		
	A	B	C	A	B	C
6, 8, 10	24	18	11.5	29	23	16.5



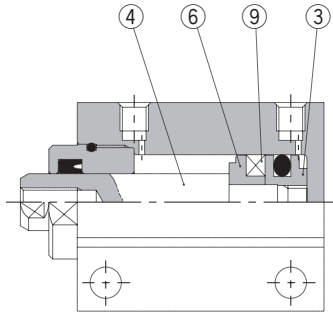
Series CUJ

Construction

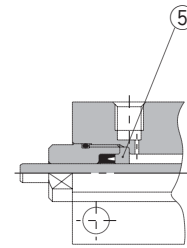
Double acting



Without magnet

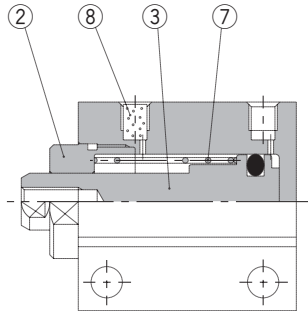


Built-in magnet

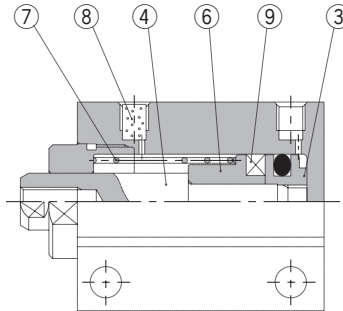


ø4

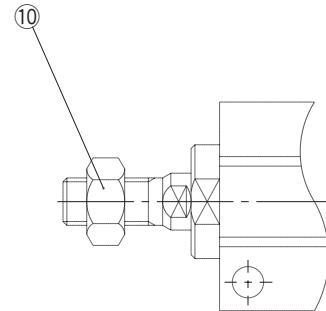
Single acting



Without magnet



Built-in magnet



Rod end male thread

Component Parts

No.	Description	Material	Note
1	Cylinder tube	Aluminum alloy	Hard anodized
2	Rod cover	Copper alloy	Electroless nickel plated
3	Piston	Without switch	Stainless steel
		With switch	Aluminum alloy
4	Piston rod	Stainless steel	
5	Seal retainer	Aluminum alloy	CUJB4 only
6	Magnet retainer	Aluminum alloy	Chromated
7	Return spring	Piano wire	
8	Bronze element	Sintered metallic BC	
9	Magnet	—	
10	Rod end nut	Steel	Nickel plated
11	Piston seal	NBR	
12	Rod seal	NBR	
13	Tube gasket	NBR	

Replacement Parts: Seal Kit (For double acting)

Bore size (mm)	Kit no.	Contents
4	CUJB4-PS	Set of nos. above ①, ⑫, ⑬ and an exclusive grease pack.
6	CUJB6-PS	
8	CUJB8-PS	
10	CUJB10-PS	

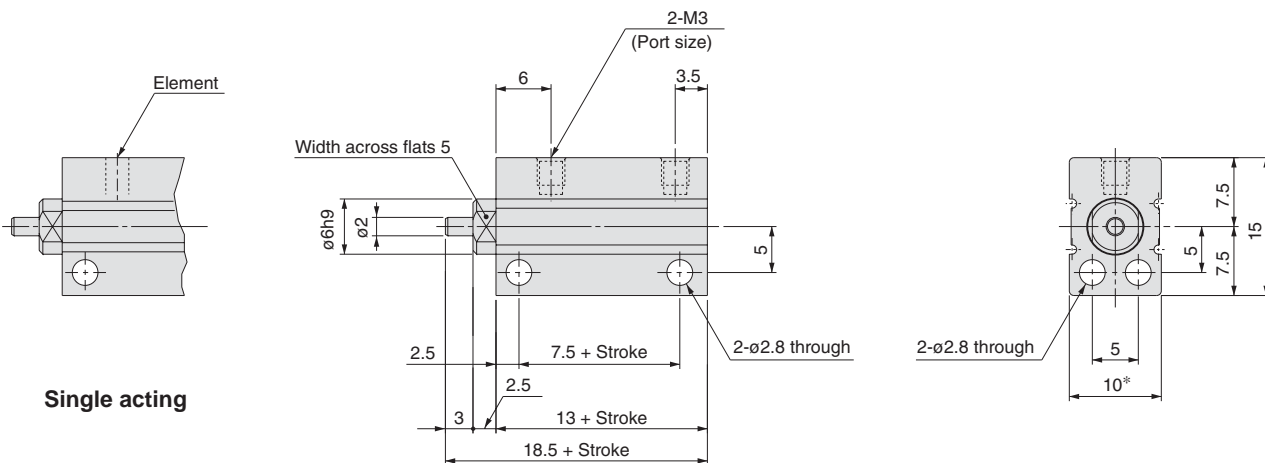
Replacement Parts: Seal Kit (For single acting)

Bore size (mm)	Kit no.	Contents
4	CUJB4-S-PS	Set of nos. above ⑪ and an exclusive grease pack.
6	CUJB6-S-PS	
8	CUJB8-S-PS	
10	CUJB10-S-PS	

Dimensions for $\phi 4$ Double Acting/Single Acting

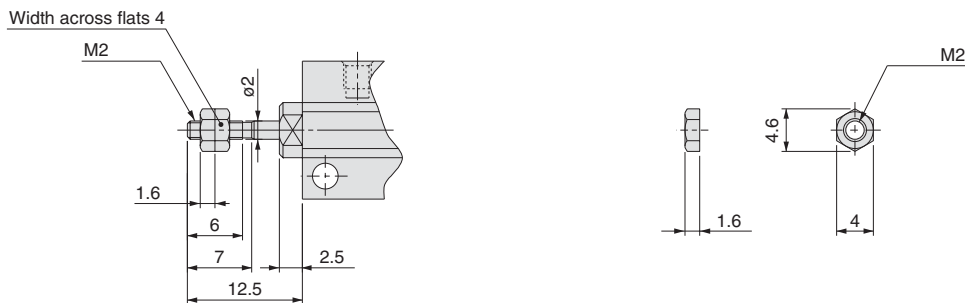
Without magnet: CUJB4

Note) The position of the width across flats may not be parallel to the cylinder tube.



Single acting

Rod end male thread



Rod end nut part no. : NTJ-004

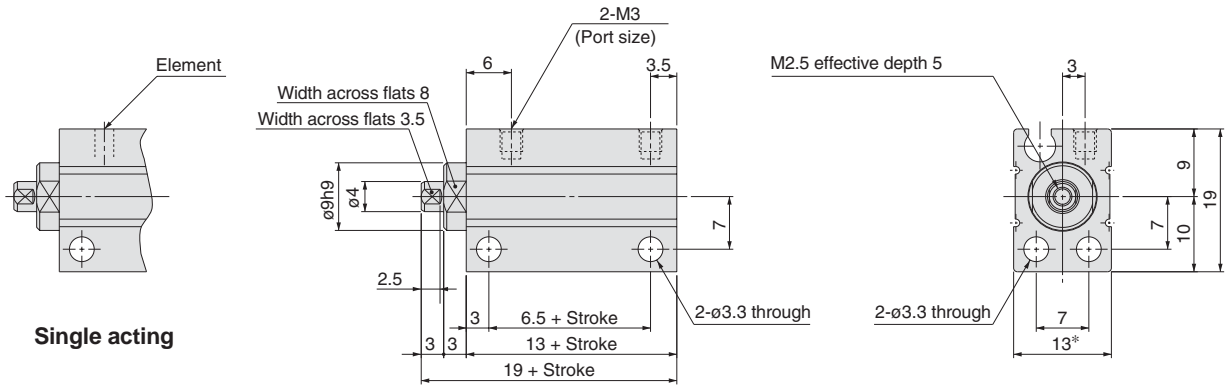
* Please use caution especially when multiple cylinders are used in parallel such as stacking because the body width dimensions have plus tolerances. Contact SMC for a product with body width dimensions having different tolerances.

Series CUJ

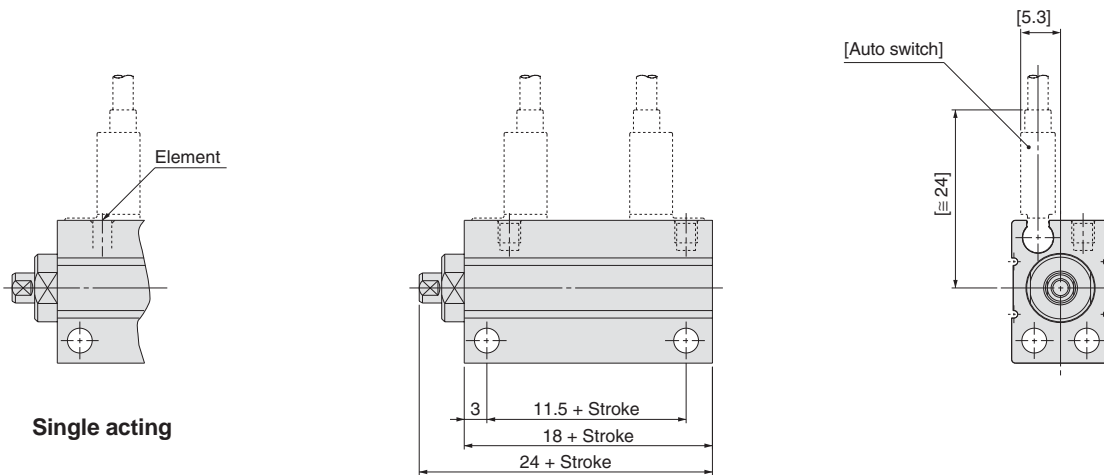
Dimensions for ø6 Double Acting/Single Acting

Without magnet: CUJB6

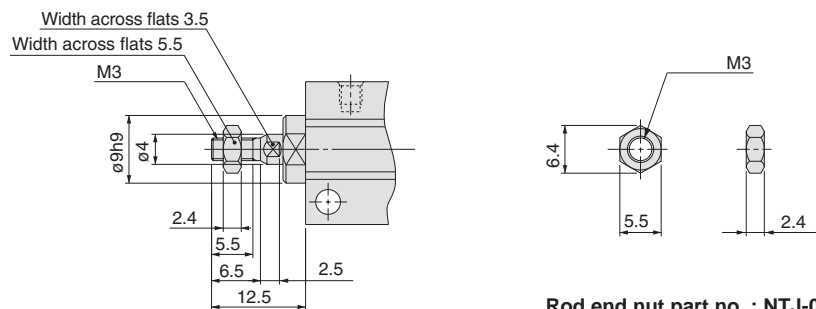
Note) The position of the width across flats may not be parallel to the cylinder tube.



Built-in magnet: CDUJB6



Rod end male thread

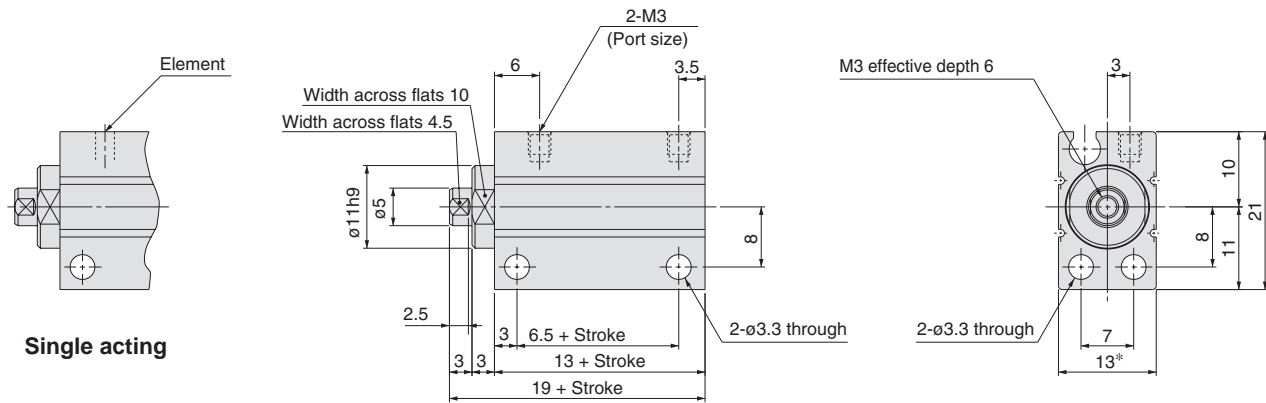


* Please use caution especially when multiple cylinders are used in parallel such as stacking because the body width dimensions have plus tolerances.
Contact SMC for a product with body width dimensions having different tolerances.

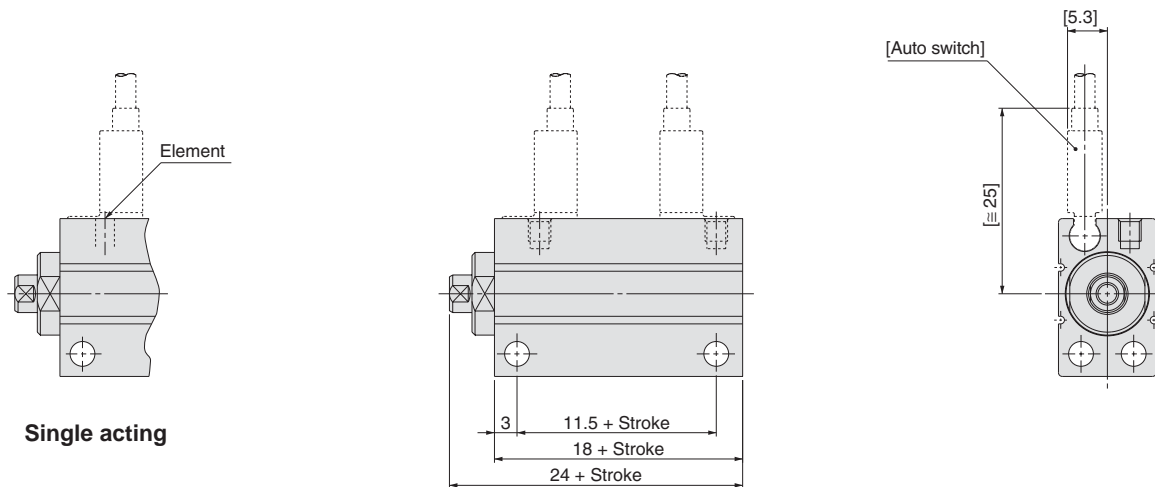
Dimensions for ø8 Double Acting/Single Acting

Without magnet: CUJB8

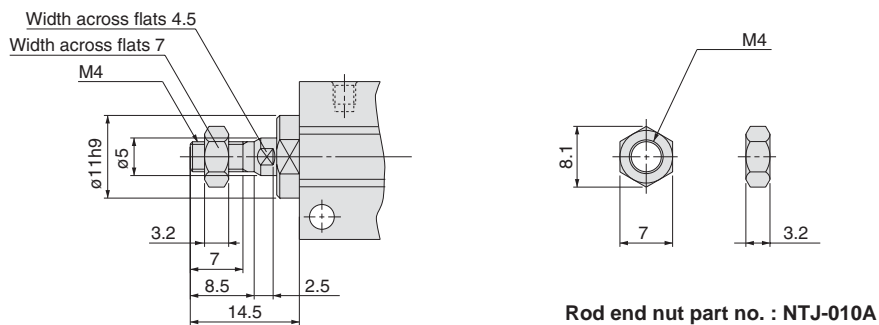
Note) The position of the width across flats may not be parallel to the cylinder tube.



Built-in magnet: CDUJB8



Rod end male thread



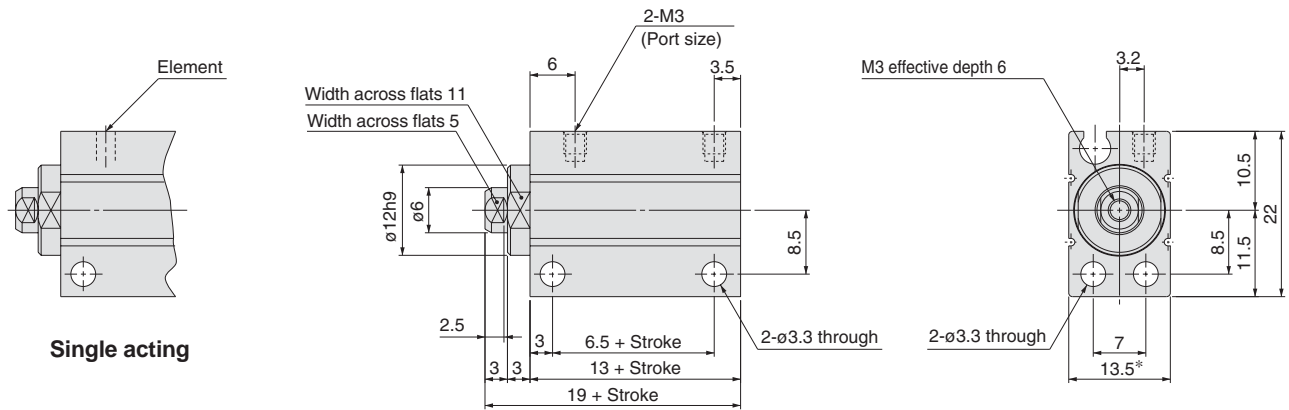
* Please use caution especially when multiple cylinders are used in parallel such as stacking because the body width dimensions have plus tolerances. Contact SMC for a product with body width dimensions having different tolerances.

Series CUJ

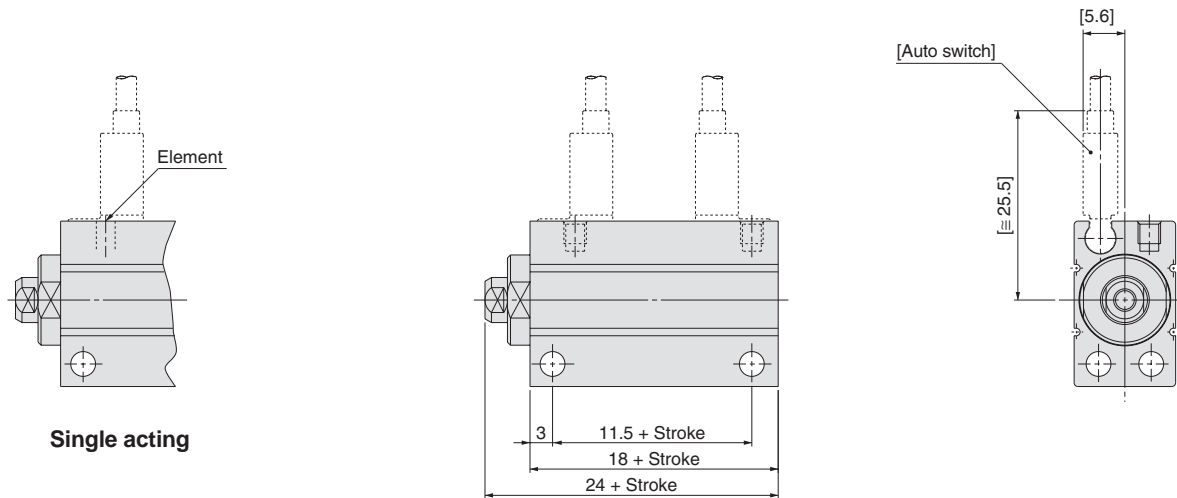
Dimensions for $\phi 10$ Double Acting/Single Acting

Without magnet: CUJB10

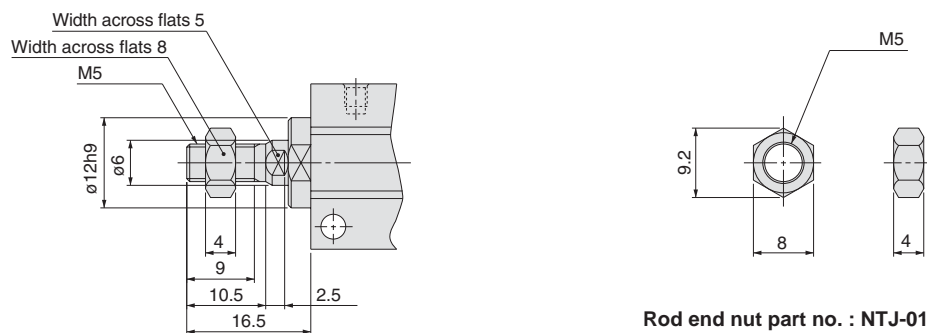
Note) The position of the width across flats may not be parallel to the cylinder tube.



Built-in magnet: CDUJB10



Rod end male thread

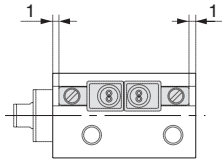


Rod end nut part no. : NTJ-015A

* Please use caution especially when multiple cylinders are used in parallel such as stacking because the body width dimensions have plus tolerances.
Contact SMC for a product with body width dimensions having different tolerances.

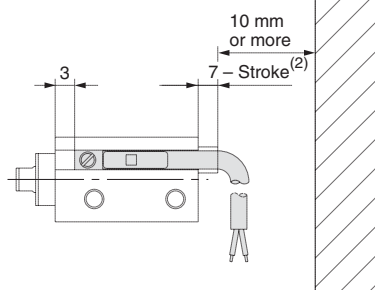
Proper Auto Switch Mounting Position (Detection at stroke end) (ø6, ø8, ø10 common)

D-F8N/F8P/F8B

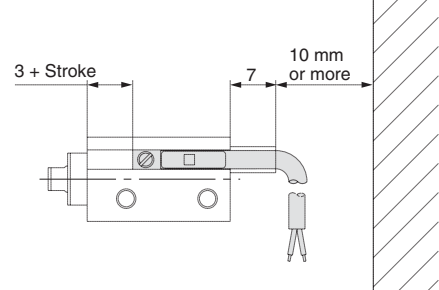


D-M9N/M9P/M9B

• When detecting extended stroke end

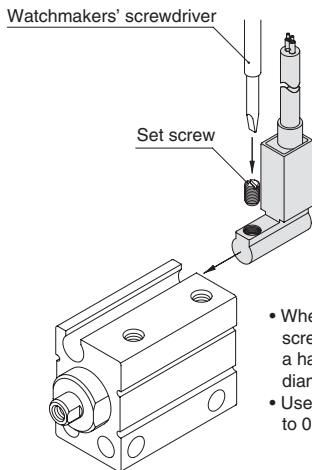


• When detecting retracted stroke end



Note 1) Solid state switch: D-M9□ includes one auto switch.
 Note 2) To prevent interference caused by the lead wire, provide a clearance of 10 mm or more in addition to the dimensions stated above.

Auto Switch Mounting



- When tightening an auto switch mounting screw, use a watchmakers' screwdriver with a handle of approximately 5 to 6 mm in diameter.
- Use a tightening torque of approximately 0.10 to 0.20 N·m.

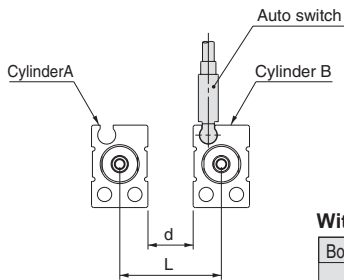
Operating Range

Auto switch model	Applicable bore size (mm)		
	6	8	10
D-F8□ D-M9□	2	2.5	2.5

Caution on Proximity Installation

1. When cylinders with auto switches are adjacent to one another as shown in the figure below, provide a space between them of at least, the amount shown in the tables below.

If the space is not sufficient, the magnets in adjacent cylinders may cause the auto switches to malfunction.



Without Shielding Plate

Bore (mm)	ø6	ø8	ø10
L	19	19	19.5
d	6	6	6

With Shielding Plate

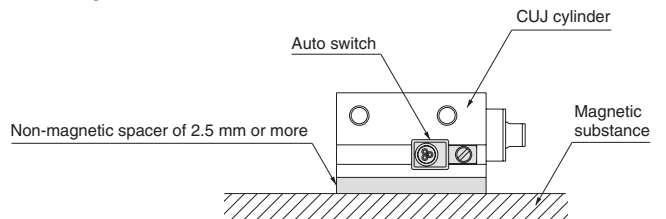
Bore (mm)	ø6	ø8	ø10
L	16	13.5	14
d	3	0.5	0.5

* The space can be reduced by attaching shielding plates (steel plates 0.2 to 0.3 mm thick) to the sides of the cylinders facing each other. In the case of a ø6 bore size, be sure to attach a plate on Cylinder A (on the surface opposite to the switch groove).

2. In the case of ø6 bore size cylinders with auto switches, keep the switch groove side surface at least 2.5 mm away from a magnetic substance.

If a magnetic material gets closer within 2.5 mm, the auto switches may malfunction due to a drop in magnetic force.

* If this surface is to be used for mounting, a spacer composed of a non-magnetic substance (aluminum, etc.) is required as shown in the figure below.



Series CUJ

Auto Switch Specifications

Auto Switch Common Specifications

Type	Solid state switch
Leakage current	3-wire: 100 μ A or less 2-wire: 0.8 mA or less
Operating time	1 ms or less
Impact resistance	1000 m/s ²
Insulation resistance	50 M Ω or more at 500 MVDC (between lead wire and case)
Withstand voltage	1000 VAC for 1 minute (between lead wire and case)
Ambient temperature	-10 to 60°C
Enclosure	IEC529 standard IP67, JIS C 0920 watertight construction

Lead Wire Length

Lead wire length indication

(Example) **F8N** **L**

Lead wire length

Nil	0.5 m
L	3 m
Z	5 m

To designate solid state switches with flexible specifications, add "-61" after the lead wire length.

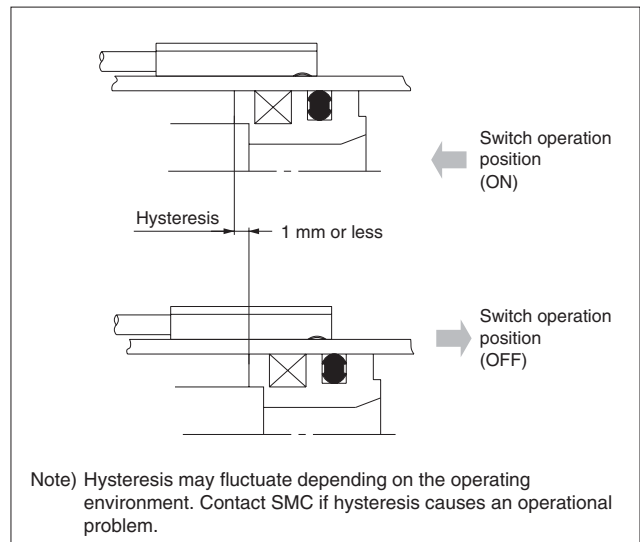
* Oilproof flexible heavy-duty cable is used for D-M9□ as standard. There is no need to add the suffix -61 to the end of part number.

(Example) D-F8NL-**61**

Flexible specification

Auto Switch Hysteresis

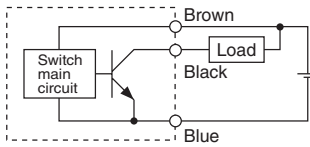
The hysteresis is the difference between the position of the auto switch as it turns "on" and as it turns "off". A part of operating range (one side) includes this hysteresis.



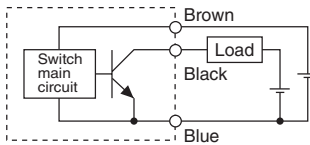
Series CUJ Auto Switch Connections and Examples

Basic Wiring

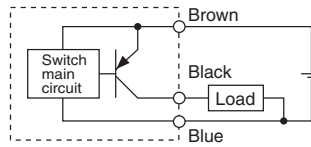
Solid state 3-wire, NPN



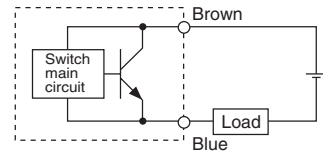
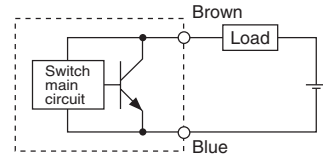
(Power supplies for switch and load are separate.)



Solid state 3-wire, PNP

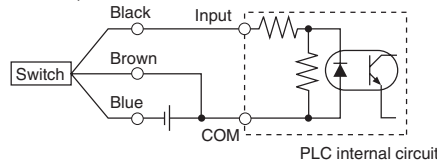


Solid state 2-wire

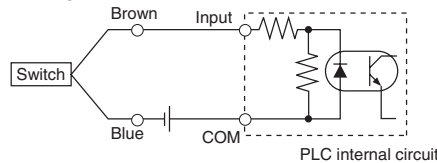


Examples of Connection to PLC (Programmable Logic Controller)

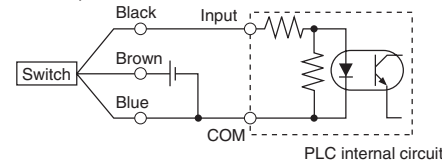
• Sink input specifications 3-wire, NPN



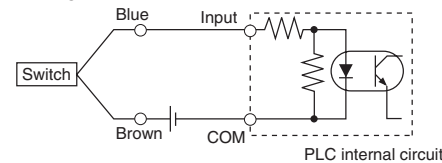
2-wire



• Source input specifications 3-wire, PNP



2-wire

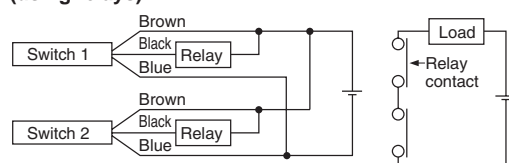


Connect according to the applicable PLC input specifications, since the connection method will vary depending on the PLC input specifications.

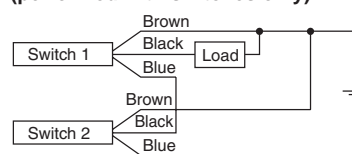
Examples of AND (Serial) and OR (Parallel) Connection

• 3-wire

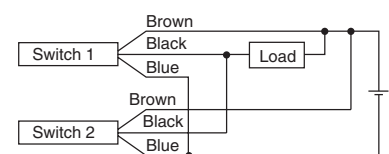
AND connection for NPN output (using relays)



AND connection for NPN output (performed with switches only)

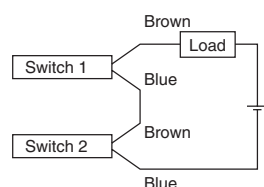


OR connection for NPN output



The indicator lights will light up when both switches are turned ON.

2-wire with 2-switch AND connection

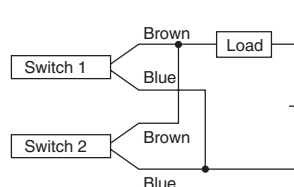


When two switches are connected in series, a load may malfunction because the load voltage will decline when in the ON state. The indicator lights will light up if both of the switches are in the ON state.

$$\begin{aligned} \text{Load voltage at ON} &= \text{Power supply voltage} - \text{Internal voltage drop} \times 2 \text{ pcs.} \\ &= 24 \text{ V} - 4 \text{ V} \times 2 \text{ pcs.} \\ &= 16 \text{ V} \end{aligned}$$

Example: Power supply is 24 VDC.
Internal voltage drop in switch is 4 V.

2-wire with 2-switch OR connection



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

$$\begin{aligned} \text{Load voltage at OFF} &= \text{Leakage current} \times 2 \text{ pcs.} \\ &\quad \times \text{Load impedance} \\ &= 1 \text{ mA} \times 2 \text{ pcs.} \times 3 \text{ k}\Omega \\ &= 6 \text{ V} \end{aligned}$$

Example: Load impedance is 3 kΩ.
Leakage current from switch is 1 mA.

Solid State Switch: Direct Mounting Style D-M9N/D-M9P/D-M9B



Grommet

- 2-wire load current is reduced (2.5 to 40 mA)
- Lead-free
- UL certified (style 2844) lead cable is used.



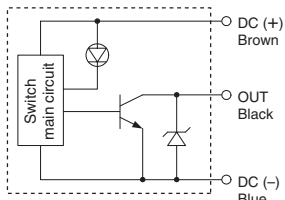
Caution

Operating Precautions

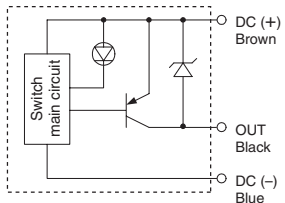
Fix the switch with the existing screw installed on the switch body. The switch may be damaged if a screw other than the one supplied, is used.

Auto Switch Internal Circuit

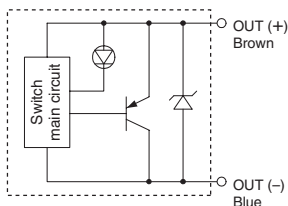
D-M9N



D-M9P



D-M9B



Auto Switch Specifications



For details about certified products conforming to international standards, visit us at www.smcworld.com.

PLC: Programmable Logic Controller

D-M9□/D-M9□V (With indicator light)			
Auto switch part no.	D-M9N	D-M9P	D-M9B
Electrical entry direction	In-line	In-line	In-line
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 illuminates when ON.		

● Lead wires

Oilproof heavy-duty vinyl cable: $\phi 2.7 \times 3.2$ ellipse

D-M9B(V) 0.15 mm² x 2 cores

D-M9N(V), D-M9P(V) 0.15 mm² x 3 cores

Note 1) Refer to page 11 for solid state switch common specifications.

Note 2) Refer to page 11 for lead wire lengths.

Weight

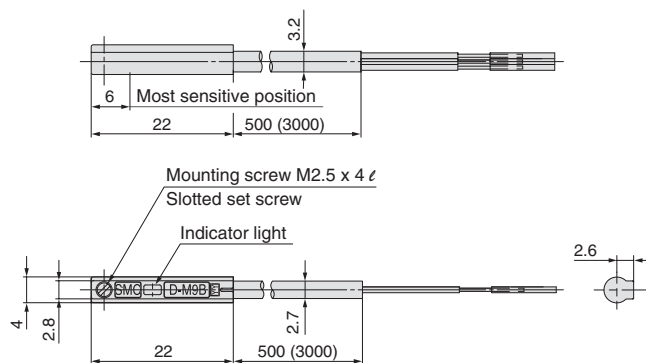
Unit: g

Auto switch model	D-M9N	D-M9P	D-M9B
Lead wire length (m)			
0.5	8	8	7
3	41	41	38
5	68	68	63

Dimensions

Unit: mm

D-M9□



Solid State Switch: Direct Mounting Style

D-F8N/D-F8P/D-F8B



For details about certified products conforming to international standards, visit us at www.smcworld.com.

Auto Switch Specifications

PLC: Programmable Logic Controller

Auto switch part no.	D-F8N	D-F8P	D-F8B
Electrical entry direction	In-line	Perpendicular	Perpendicular
Wiring type	3-wire		2-wire
Output type	NPN	PNP	—
Applicable load	IC circuit, 24 VDC relay, PLC		24 VDC relay, PLC
Power supply voltage	5, 12, 24 VDC (4.5 to 28 VDC)		—
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	2.5 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 μ A or less at 24 VDC		0.8 mA or less at 24 VDC
Indicator light	Red LED illuminates when ON.		

● Lead wires

- Oilproof heavy-duty vinyl cable: ϕ 2.7, 0.5 m
- D-F8N, D-F8P 0.15 mm² x 3 cores (Brown, Black, Blue)
- D-F8B 0.18 mm² x 2 cores (Brown, Blue)

Note 1) Refer to page 11 for solid state switch common specifications.

Note 2) Refer to page 11 for lead wire lengths.

Grommet

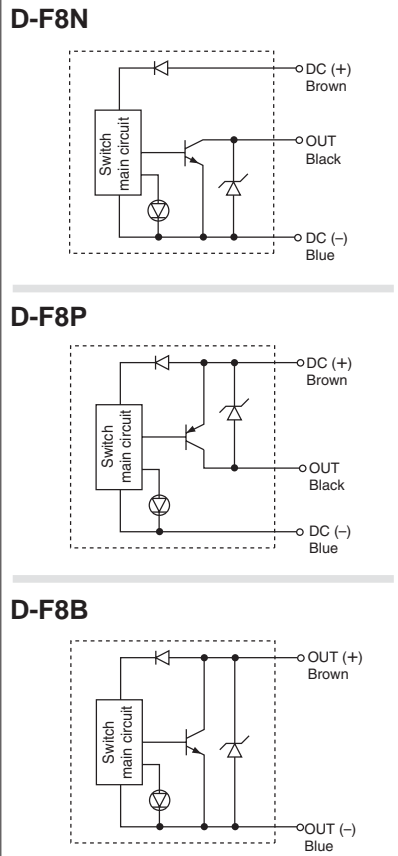


⚠ Caution

Operating Precautions

Fix the switch with the existing screw installed on the switch body. The switch may be damaged if a screw other than the one supplied, is used.

Auto Switch Internal Circuit



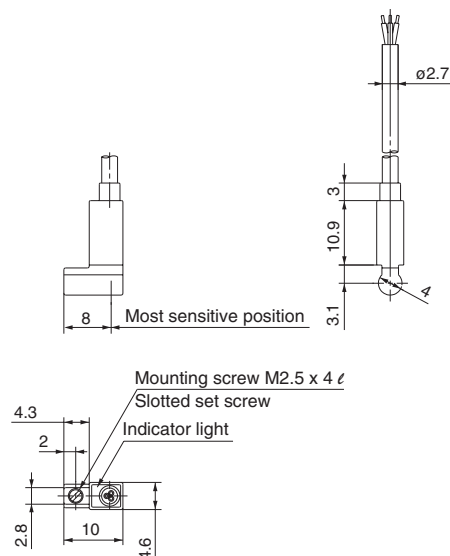
Weight

Unit: g

Auto switch model	D-F8N	D-F8P	D-F8B
Lead wire length (m)	7	7	7
0.5	32	32	32
3	52	52	52
5			

Dimensions


D-F8N/D-F8P/D-F8B







Series CUJ Safety Instructions

The following safety instructions are intended to prevent a hazardous situation and/or equipment damage. The instructions indicate the level of potential hazard by labels of "Caution", "Warning" or "Danger". To ensure safety, please observe all safety practices, including ISO 4414 ^{Note 1)} and JIS B 8370 ^{Note 2)}.

 **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: General Rules for Pneumatic Equipment

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 with a specific pneumatic system must be based on specifications, post analysis and/or tests to meet a specific requirement. The expected performance and safety assurance are the responsibility of the person who determines the compatibility of the system. This person should continuously review the suitability of all specified items by referring to the latest information in the catalogue and by taking into consideration the possibility of equipment failure when configuring the 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 once measures to prevent falling or runaway of the driven objects have been confirmed.

2. When equipment will be removed, confirm that all safety precautions have been followed. Turn off the supply pressure for this equipment and exhaust all residual compressed air in the system.

3. Before restarting any machinery/equipment, exercise caution to prevent quick extension of a cylinder piston rod, etc.

4. Contact SMC if the product will 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 a negative effect on people, property, or animals, requiring special safety analysis.



Series CUJ Actuators Precautions 1

Be sure to read this before handling.

Caution on 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 in the machinery, or damage to the machinery itself may occur. Therefore, the machine should be adjusted to operate smoothly and designed to avoid such dangers.

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

If a driven 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 at a 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 a high speed or the load is heavy, a cylinder's cushion will not be sufficient to absorb the impact. Install a deceleration circuit to reduce the speed before cushioning, or install an external shock absorber to relieve the impact.

In this case, the rigidity of the machinery should also be examined.

- 5. Consider a possible drop in circuit pressure due to a power outage, etc.**

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

- 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.**

When a cylinder is driven by an exhaust centered directional control valve or when starting up after residual pressure is exhausted from the circuit, etc., the piston and its driven object will lurch at a 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 there is a danger of human injury and/or damage to equipment when this occurs.

- 8. Consider emergency stops.**

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

Caution on Design

⚠ Warning

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

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

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

Selection

⚠ Warning

- 1. Confirm the specifications.**

The products featured in this catalogue are designed for use in industrial compressed air systems. If the products are used in conditions where pressure and/or temperature are outside the specification range, damage and/or malfunctions may occur. Do not use in these conditions. (Refer to the specifications.) Consult with SMC if a fluid other than compressed air is used

- 2. About intermediate stop**

In the case of a 3-position closed centered valve, it is difficult to make a piston stop at the required position as accurately and precisely as with hydraulic pressure due to the compressibility of air.

Furthermore, since valves and cylinders, etc. 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 the case it is necessary to hold a stopped position for an extended period.

⚠ Caution

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

Using outside the maximum stroke length will cause the piston rod to break.

For the maximum usable stroke, refer to the cylinder model selection procedures.

- 2. Operate the piston within 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 procedures 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.**

- 4. Provide intermediate supports for long stroke cylinders.**

An intermediate support should be provided in order to prevent damage to a cylinder having a long stroke, due to problems such as sagging of the rod, deflection of the cylinder tube, vibration and external load.



Series CUJ Actuators Precautions 2

Be sure to read this before handling.

Mounting

⚠ Caution

1. **Be certain to match the rod shaft center with the load and direction of movement when connecting.**

When not properly matched, problems may arise with the rod and tube, and damage may be caused due to friction on areas such as the inner tube surface, bushings, rod surface, and seals.

2. **Do not scratch or gouge the sliding parts of the cylinder tube or the piston rod by striking it with an object, or squeezing it.**

The tube bore is manufactured under precise tolerances. Thus, even a slight deformation could lead to a malfunction. Moreover, scratches or gouges, etc. in the piston rod may lead to damaged seals and cause air leakage.

3. **Do not use until you verify that the equipment can operate properly.**

After mounting, repairs, or modification, etc., connect the air supply and electric power, and then confirm proper mounting by means of appropriate function and leak tests.

4. **Instruction manual**

Install the products and operate them only after carefully reading the instruction manual and understanding its contents. Also keep the manual where it can be referred to as necessary.

Piping

⚠ Caution

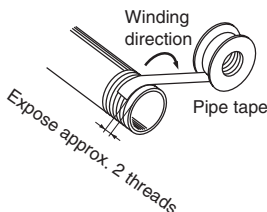
1. **Before piping**

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

2. **Wrapping of pipe tape**

When screwing together piping or fittings into ports, ensure that chips from the pipe threads or sealing material do not enter the piping.

Also, when pipe tape is used, leave 1.5 to 2 threads exposed at the end of the piping, etc.



Lubrication

⚠ Caution

1. **Lubrication of cylinder**

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

However, in the event that it is additionally lubricated, be sure to use Class 1 turbine oil (with no additive) ISO VG32.

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.

Air Supply

⚠ Warning

1. **Use clean air.**

Do not use compressed air which contains chemicals, synthetic oils containing organic solvents, salts or corrosive gases, etc., as this can cause damage or a malfunction.

⚠ Caution

1. **Install air filters.**

Install air filters close to valves on their upstream side. A filtration degree of 5 µm or less should be selected.

2. **Install an aftercooler, air dryer, or water separator (Drain Catch).**

Air that includes excessive drainage may cause the valves and other pneumatic equipment to malfunction. To prevent this, install an air dryer, aftercooler or water separator, etc.

3. **Use the product within the specified range of fluid and ambient temperature.**

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

For compressed air quality, refer to the "Air Preparation Equipment" catalogue.



Series CUJ Actuators Precautions 3

Be sure to read this before handling.

Operating Environment

Warning

1. Do not use in atmospheres or locations where corrosion hazards exist.

Refer to the construction drawings regarding cylinder materials.

2. In dusty locations or where water or oil, etc., splash on the equipment, attach a cover to protect the rod.
3. When using auto switches, do not operate in an environment with strong magnetic fields.

Maintenance

Warning

1. Perform maintenance procedures as shown in the instruction manual.

If it is handled incorrectly, malfunction or damage of machinery or equipment may occur.

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

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

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

Caution

1. Drain flushing

Remove drainage from air filters regularly.



Series CUJ

Auto Switches Precautions 1

Be sure to read this before handling.

Design and Selection

Warning

1. Check the specifications.

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

2. Use caution when multiple cylinders are used close to each other.

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 an allowable interval is specified for each cylinder series, use the indicated value.)

3. Use caution regarding 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. Wiring should be kept as short as possible.

Although the wire length should not affect the function of the switch, use a wire length of 100 m or less.

5. Use caution regarding the internal voltage drop of a switch.

Generally, the internal voltage drop will be greater with a 2-wire solid state auto switch than with a reed switch.

- If auto switches are connected in series as shown below, take note that there will be a large voltage drop. (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.

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

Also note that a 12 VDC relay is not applicable.

6. Use caution regarding the leakage current.

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.

Although a zener diode for surge protection is connected at the output side of a solid state auto switch, damage may still occur if the surge is applied repeatedly. When a load such as a relay or solenoid, which generates surge is directly driven, use a 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 avoid trouble by providing a mechanical protection function, or by also using another switch (sensor) together with the auto switch.

Also perform periodic maintenance inspections and confirm proper operation.

9. Ensure sufficient space for maintenance activities.

When designing an application, be sure to allow sufficient space for maintenance and inspection.

Mounting and Adjustment

Warning

1. Do not drop or bump.

Do not drop, bump, or apply excessive impacts (1000 m/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 fastening torque range, the mounting screws or switch may be damaged.

On the other hand, tightening below the fastening torque range may allow the switch to slip out of position. (Regarding switch mounting, moving, and fastening torque, etc, refer to page 10.)

Wiring

Warning

1. Avoid repeatedly bending or stretching the 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 (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow to a switch.



Series CUJ

Auto Switches Precautions 2

Be sure to read this before handling.

Wiring

Warning

4. Do not wire together with power lines and/or high voltage lines.

Avoid wiring in parallel with power lines and/or high voltage lines or using inside the same wire tubing. Wire separately, otherwise control circuits including auto switches can malfunction due to noise.

* Lead wire colour changes

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

2-wire

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

Solid State with Diagnostic Output

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

3-wire

	Old	New
Power supply (+)	Red	Brown
Power supply GND	Black	Blue
Output	White	Black

5. Do not allow short-circuiting of loads.

All PNP output switch models do not have a built-in short circuit prevention circuit. If a load is short circuited, the switch will be instantly damaged.

Use caution to avoid reverse wiring with the brown power supply line and the black output line on 3-wire type switches.

Wiring

6. Avoid incorrect wiring.

- 1) If connections are reversed on a 2-wire type switch, the switch will not be damaged by a protection circuit, but the switch will always stay in an ON state. However, it is still necessary to avoid reversed connections, since the switch could be damaged by a load short circuit in this condition.
- 2) If connections are reversed (power supply line (+) and power supply line (-)) 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 wire and the power supply line (-) is connected to the black wire, the switch will be damaged.

Operating Environment

Warning

1. Never use in the presence of explosive gases.

The construction of our auto switches does not make them explosion-proof. Never use them in the presence of an explosive gas, as 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 demagnetised.

3. Do not use in environments where the auto switches will be constantly exposed to water.

Although switches satisfy the IEC standard IP67 structure (JIS C 0920: water-tight construction), do not use switches in applications where it will be continually exposed to water splash or spray. Poor insulation or swelling of the potting resin inside the switches may cause a malfunction.

4. Do not use in environments with oil or chemicals.

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

Operating Environment

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 locations where surges are generated.

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

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

When a large amount of ferrous debris such as machining chips or spatter is accumulated, or a magnetic substance (something attracted by a magnet) is brought into close proximity with an auto switch cylinder, it 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 screws securely 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.

Other

Warning

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

Series CUJ Specific Product Precautions 1



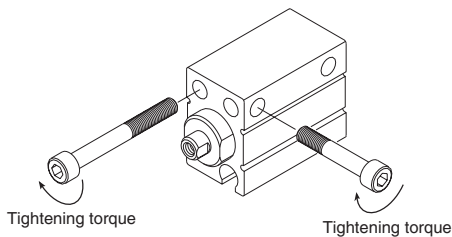
Be sure to read this before handling.
Refer to back pages 1 through to 6 for Safety Instructions, Actuators Precautions and Auto Switches Precautions.

Mounting

⚠ Caution

- When mounting a mini free mount cylinder, tighten the bolts with the proper tightening torque.

	Bolt	Proper tightening torque (N·m)
CUJB4	M2.5	0.54
C(D)UJB6	M3	1.06
C(D)UJB8		
C(D)UJB10		



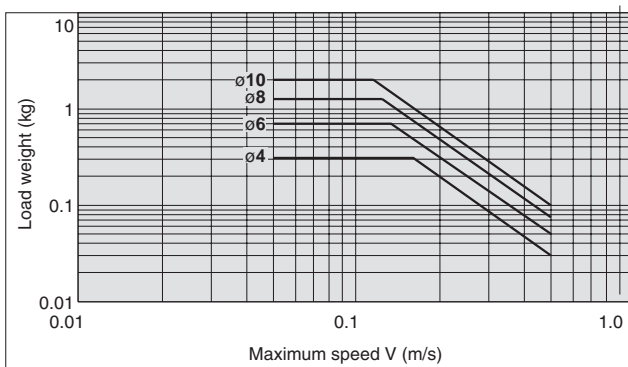
- Use caution especially when multiple cylinders are used in parallel such as stacking because the dimensions of the body's width have plus tolerances. Contact us for information on a product with body width dimensions having different tolerances.

Allowable Kinetic Energy

⚠ Caution

When driving an inertial load, operate a cylinder with kinetic energy within the allowable value. The range in the chart below that is delineated by bold solid lines indicates the relation between load weights and maximum driving speeds.

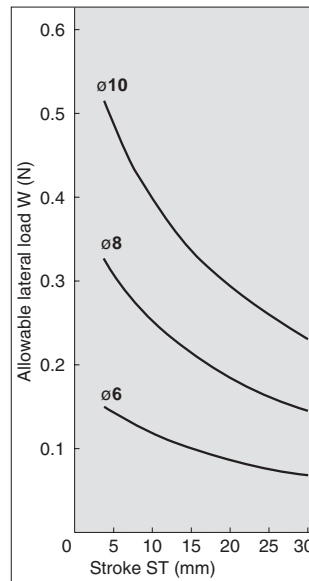
Bore size (mm)	4	6	8	10
Piston speed (m/s)	0.05 to 0.5			
Allowable kinetic energy (J)	3.8×10^{-3}	6.25×10^{-3}	9.35×10^{-3}	12.5×10^{-3}



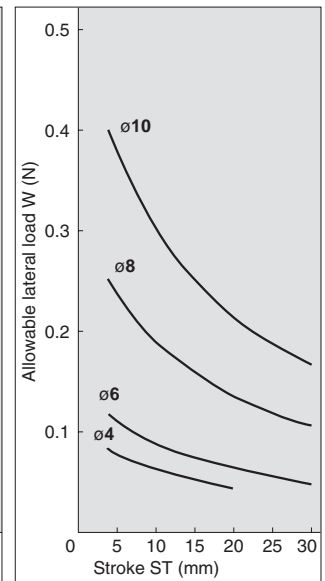
Selection

Strictly observe the limiting range of lateral load on a piston rod. (Refer to the graphs below.) If this product is used beyond the limits, it may shorten the machine life or cause damage.

With Auto Switch



Without Auto Switch





Series CUJ Specific Product Precautions 2

Be sure to read this before handling.
Refer to back pages 1 through to 6 for Safety Instructions, Actuators Precautions and Auto Switches Precautions.

Caution on Mounting Speed Controllers and Fittings

⚠ Caution

Since the cylinder port size of M3 is used, use the cylinder series models listed below when connecting speed controllers and fittings directly to cylinders.

- After manually tightening speed controllers and fittings, tighten approximately a quarter turn more using a tightening tool. In cases where there are gaskets in two places such as universal elbows, universal tees, etc., double the additional tightening to a half turn. If screws are tightened excessively, air leakage may result due to broken threads or a deformed gasket. If screws are tightened insufficiently, looseness and accompanying air leakage are likely to occur.

<Speed Controllers>

With Auto Switch

Bore size (mm)	6, 8, 10
Port size	M3
Stroke (mm)	4 or more
AS12□1F-M3-23	●
AS12□1F-M3-04	●
AS13□1F-M3-23	●
AS13□1F-M3-04	●

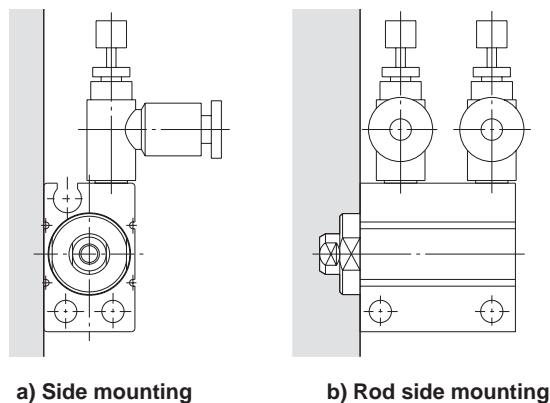
* Only applicable to the mounting position shown in Fig. (1) below.

Without Auto Switch

Bore size (mm)	4, 6, 8, 10	
Port size	M3	
Stroke (mm)	6	8 or more
AS12□1F-M3-23	●	●
AS12□1F-M3-04	—	●
AS13□1F-M3-23	●	●
AS13□1F-M3-04	—	●

* Only applicable to the mounting position shown in Fig. (1) below.

Fig. (1)



a) Side mounting

b) Rod side mounting

<One-touch Fittings and Hose Nipples>

With Auto Switch

Bore size (mm)		6, 8, 10	
Port size		M3	
Stroke (mm)		4	6 or more
One-touch fitting	KJS23-M3	●	●
Hose nipple	M-3AU	●	●
	M-3ALU	●	●

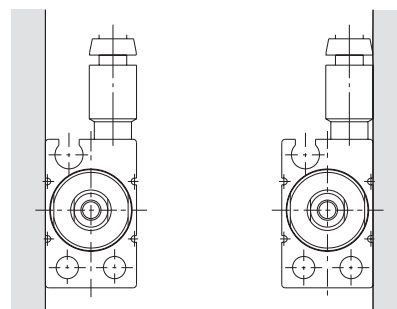
Without Auto Switch

Bore size (mm)		4		6, 8, 10	
Port size		M3			
Stroke (mm)		4	6 or more	4	6 or more
One-touch fitting	KJS23-M3	●	●	●	●
	KJS04-M3	—	○	—	△
	KJH23-M3	—	○	—	△
	KJH04-M3	—	○	—	△
	KJL23-M3	—	○	—	△
	KJL04-M3	—	○	—	△
	KJW23-M3	—	○	—	△
Hose nipple	M-3AU	●	●	●	●
	M-3ALU	●	●	●	●

● : Applicable to mounting positions 1, 2, 3 and 4.

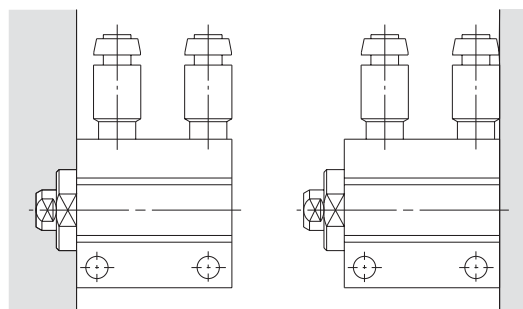
○ : Applicable to mounting positions 1, 2 and 3.

△ : Applicable to mounting positions 1 and 3.



Mounting condition 1

Mounting condition 2



Mounting condition 3

Mounting condition 4

* The above figures show the mounting positions with series KJS One-touch fittings installed.

** Refer to the sections from Best Pneumatics catalogue for details on One-touch fittings and hose nipples.

Series CUJ

Miniature Actuators and $\phi 2$ Piping Variations

Miniature guide rod cylinder



Model	Bore size	Guide rod diameter	Stroke				Cushion
			5	10	15	20	
MGJ	6	5	●	●	●		Rubber bumper (Both sides)
	10	6	●	●	●	●	

One-touch mini



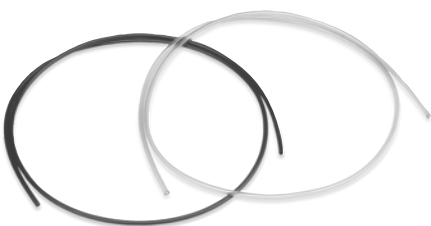
Model	Applicable tubing O.D.	Connection thread
KJ	$\phi 2$	M3 M5

Miniature fittings



Model	Applicable tubing	Type	Port size
M	$\phi 2 \times \phi 1.2$	Barb fitting	M3, M5
		Barb elbow	
		Barb One-touch	$\phi 3.2, \phi 4$
		Plug-in reducer	

Polyurethane tubing



Model	I.D. x O.D.	Material	Colour	Length
TU0212	$\phi 2 \times \phi 1.2$	Polyurethane	Black, White, Red, Blue, Yellow, Green, Clear	20 m



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