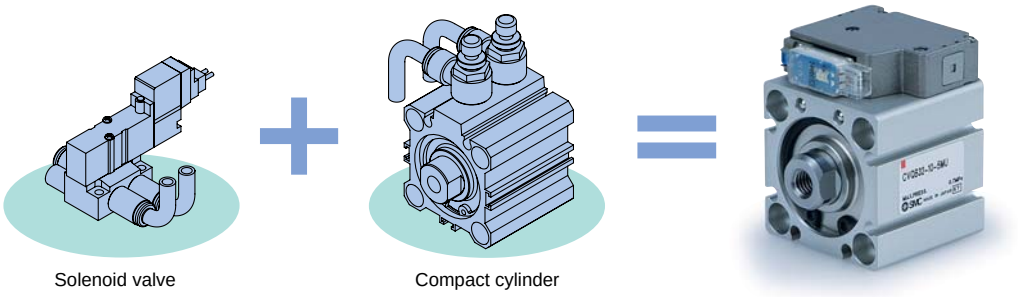
Compact Cylinder With Solenoid Valve

Valve and compact cylinder integrated for compactness



Solenoid valve

Compact cylinder

Labour saving

- No need to select the valve size
- Less piping work

Space saving

Small mounting space with a valve integrated into the structure

Energy saving

Low air consumption between the valve and cylinder

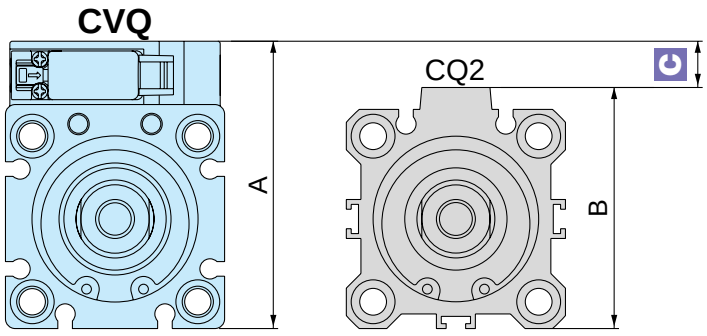
Series CVQ

SMC

CAT.EUS20-182A-UK

Easy Mounting

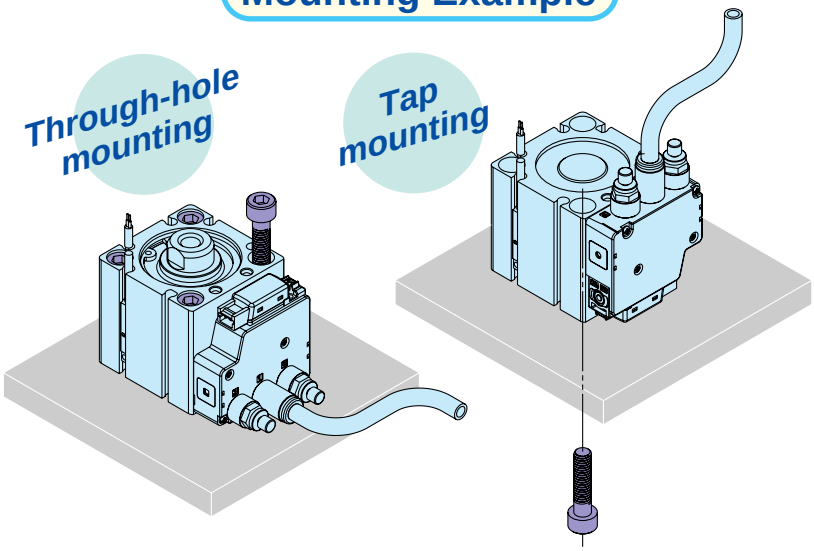
Height Comparison (Dimensional difference: C)



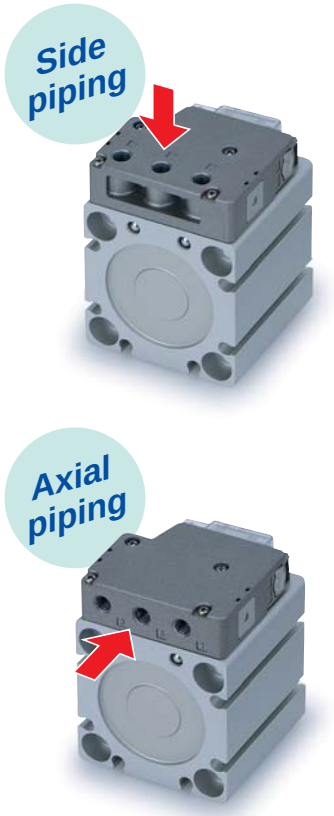
(mm)

Bore size	A	B	C
32	59	49.5	**9.5**
40	67	57	**10**

Mounting Example



Selectable Piping Direction



Low Air Consumption

Approx. 50 % reduction in air consumption by reducing the piping between the valve and cylinder

- Cylinder bore size: ø32 mm
- Cylinder stroke: 30 mm
- Piping: I.D. ø4 mm
  Length 2 m

Variation

Bore size (mm)	Standard stroke (mm)											
	5	10	15	20	25	30	35	40	45	50	75	100
32	●	●	●	●	●	●	●	●	●	●	●	●
40	●	●	●	●	●	●	●	●	●	●	●	●

Compact Cylinder
With Solenoid Valve
Series CVQ
ø32, ø40

CE

How to Order

CVQ **B** **32** – **30** **□** – **M9BW** **□** – **5** **M** **□** **□** **□**

Mounting

B	Through-hole, Both ends tapped (Standard)
L	Foot
F	Rod flange
G	Head flange
D	Double clevis

∗ Mounting brackets are included, (but not assembled).

Bore size

32	32 mm
40	40 mm

Cylinder stroke (mm)

Please refer to the next page for "Standard Stroke" and "Intermediate Stroke".

Body option

-	Standard (Rod end female thread)
F	With boss in head end
M	Rod end male thread

The combination of body options is available.
Example) FM

Auto switch

-	Without auto switch (Built-in magnet)

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

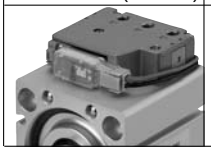
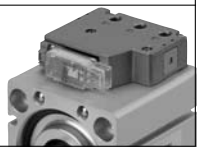
Number of auto switches

-	2 pcs.
S	1 pc.
N	"n" pcs.

Rated voltage

5	24 VDC
6	12 VDC

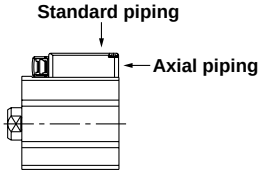
Electrical entry

M	**MO**
M-type plug connector with lead wire (300 mm)	M-type plug connector without connector
	

∗ For lead wire lengths other than 300 mm, refer to the plug connector lead wire (page 5).

Piping

-	Standard
P	Axial



Manual override

-	Non-locking push type
B	Locking slotted type

Surge voltage suppressor

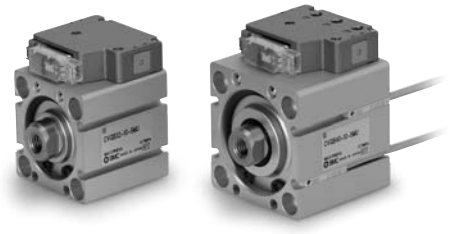
-	Without surge voltage suppressor
S	With surge voltage suppressor
Z	With light/surge voltage suppressor
R	With surge voltage suppressor (Non-polar type)
U	With light/surge voltage suppressor (Non-polar type)

Applicable Auto Switches / Refer to pages 11 through to 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	Electrical entry: Perpendicular	Electrical entry: In-line	0.5 (-)	1 (M)	3 (L)	5 (Z)			
Reed switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	**A96V**	**A96**	●	—	●	—	—	IC circuit	—
				2-wire	24 V	12 V	100 V	**A93V**	**A93**	●	—	●	—	—	—	Relay, PLC
			—			5 V, 12 V	100 V or less	**A90V**	**A90**	●	—	●	—	—	IC circuit	
Solid state switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	**M9NV**	**M9N**	●	—	●	○	○	IC circuit	Relay, PLC
				3-wire (PNP)				**M9PV**	**M9P**	●	—	●	○	○		
				2-wire		12 V		**M9BV**	**M9B**	●	—	●	○	○	—	
	Diagnostic indication (2-color indication)			3-wire (NPN)		5 V, 12 V		**M9NWV**	**M9NW**	●	●	●	○	○	IC circuit	
				3-wire (PNP)				**M9PWV**	**M9PW**	●	●	●	○	○		
				2-wire		12 V		**M9BWV**	**M9BW**	●	●	●	○	○	—	

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

∗ Solid state switches marked with "○" are produced upon receipt of order.
∗ For details about auto switches with pre-wired connector, refer to SMC's "Best Pneumatics" catalogue.
∗ Auto switches are included, (but not assembled).

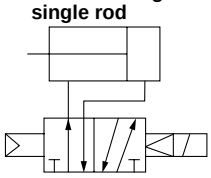


⚠Caution

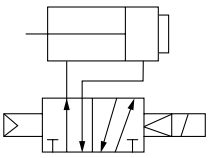
Do not separate the cylinder from the valve.

JIS Symbol

Double acting: single rod



With boss in head end



Standard Stroke

(mm)

Bore size (mm)	Standard stroke
32∗	5, 10, 15, 20, 25, 30, 35 40, 45, 50, 75, 100
40	5, 10, 15, 20, 25, 30, 35 40, 45, 50, 75, 100

∗ The overall dimensions for the 5 mm stroke cylinder will be the same as those for the 10 mm stroke.

Intermediate Stroke

Part no.		Refer to "How to Order" for standard model numbers (previous page).	
Description		Intermediate strokes with 1 mm increments are available by using spacers with standard stroke cylinders.	
Stroke range (mm)	Bore size	**32**	**40**
	Stroke range	6 to 99	6 to 99
Applicable example		Part no.: CVQB32-47 A 3 mm spacer in width is installed in the standard cylinder CVQB32-50. The overall dimensions will be the same as those for 50 mm stroke.	

Mounting Bracket Part No.

Bore size (mm)	Foot Note)	Flange	Double clevis
32	CVQ-L032	CVQ-F032	CVQ-D032
40	CVQ-L040	CVQ-F040	CVQ-D040

Note) Order two foot brackets per cylinder.
∗ Parts belonging to each bracket are as follows.
Foot, Flange: Body mounting screws
Double clevis: Clevis pin, C-type retaining ring for shaft, Body mounting screws

Cylinder Specifications

Bore size	**32**	**40**
Action	Double acting, single rod	
Fluid	Air (Non-lube)	
Proof pressure	1.0 MPa	
Maximum operating pressure	0.7 MPa	
Minimum operating pressure	0.15 MPa	
Ambient and fluid temperature	–10 to 50°C (No freezing)	
Rod end thread tolerance	JIS Class 2	
Stroke tolerance	0 to +1.0 mm	
Mounting method	Through-hole / Both ends tapped	
Piston speed	50 to 500 mm/s	
Cushion	Rubber bumper	

Valve Specifications

Type of actuation	2 position single
Manual override	Non-locking push type / Locking slotted type
Pilot exhaust	Main/Pilot valve common exhaust type
Mounting orientation	Unrestricted (based on cylinder mounting orientation)
Enclosure	Dustproof

Solenoid Specifications

Electrical entry		M-type plug connector
Coil rated voltage	**DC**	24/12 (V)
Allowable voltage fluctuation Note)		±10% of the rated voltage
Power consumption	**DC**	0.35 (With light: 0.4) W
Surge voltage suppressor		Diode (Non-polar type: Varistor)
Indicator light		LED

Note) The S and Z types of surge voltage suppressor have an internal circuit allowing voltage drop, so use within the following allowable voltage fluctuation range.
S, Z type 24 VDC: –7% to +10%
12 VDC: –4% to +10%

Theoretical Output

Unit: N

Bore size (mm)	Operating direction	Operating pressure (MPa)		
		0.3	0.5	0.7
32	IN	181	302	422
	OUT	241	402	563
40	IN	317	528	739
	OUT	377	628	880

Weight

Weight

Unit (g)

Bore size (mm)	Stroke											
	5	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**75**	**100**
32	295	288	310	332	354	376	398	420	442	464	575	686
40	365	391	417	443	469	495	521	547	573	599	726	853

Calculation: (Example) CVQB32-20M
- Basic moving part weight: CVQB32-20 ····· 88 g
- Additional weight: Rod end male thread ····· 43 g

131 g

Additional Weight

Unit (g)

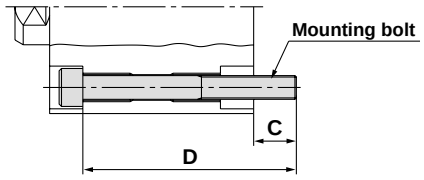
Bore size (mm)		**32**	**40**
Axial piping		5	5
Connector (300 mm)		3	3
Rod end male thread	Male thread	26	27
	Nut	17	17
With boss in head end		5	7
Foot (including mounting bolt)		148	160
Rod flange (including mounting bolt)		185	219
Head flange (including mounting bolt)		170	203
Double clevis (including pin, retaining ring, bolt)		156	201

Mounting Bolt for CVQ

Mounting: Be sure to use it as through-hole when mounting.

Ordering: Add the word, "Bolt" in front of the bolts to be used.

Example) Bolt M5 x 40L: 4 pcs.

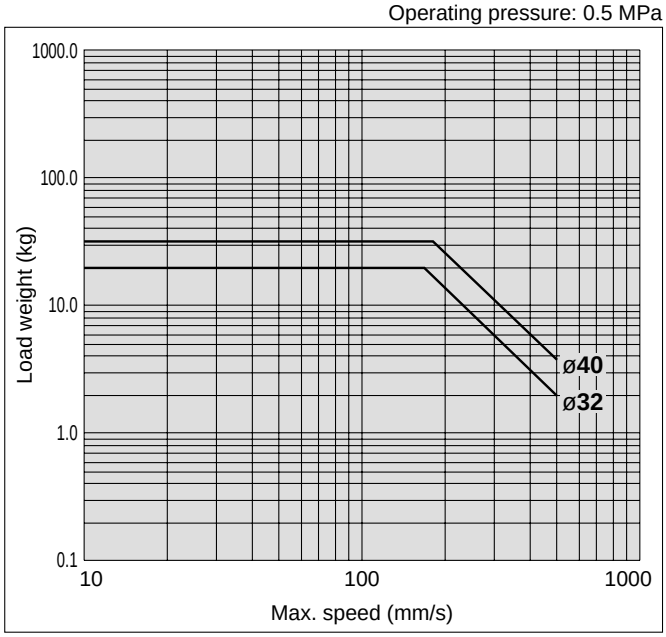


(mm)

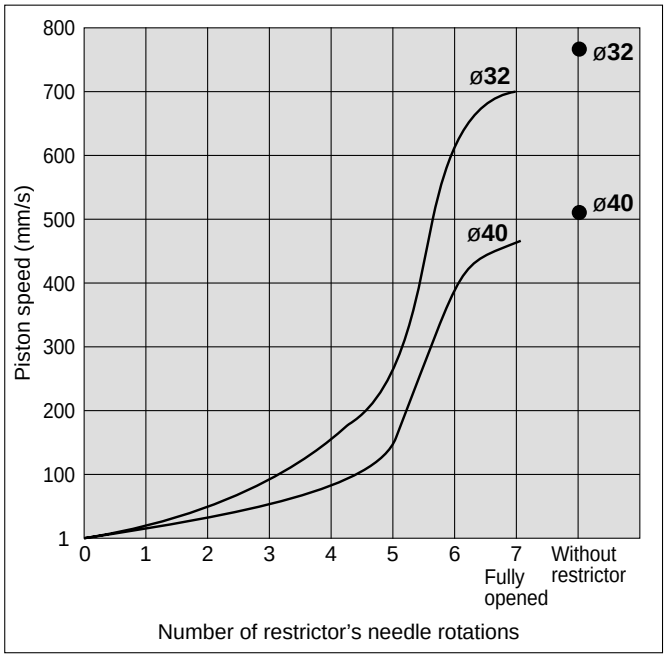
Cylinder model	**C**	**D**	Mounting bolt size
CVQB32- 5	9	45	M5 x 45L
- 10		45	x 45L
- 15		50	x 50L
- 20		55	x 55L
- 25		60	x 60L
- 30		65	x 65L
- 35		70	x 70L
- 40		75	x 75L
- 45		80	x 80L
- 50		85	x 85L
- 75		110	x 110L
-100		135	x 135L
CVQB40- 5	7.5	45	M5 x 45L
- 10		50	x 50L
- 15		55	x 55L
- 20		60	x 60L
- 25		65	x 65L
- 30		70	x 70L
- 35		75	x 75L
- 40		80	x 80L
- 45		85	x 85L
- 50		90	x 90L
- 75		115	x 115L
-100		140	x 140L

Allowable Kinetic Energy

Operating pressure: 0.5 MPa



Relationship between Number of Needle Rotations and Piston Speed

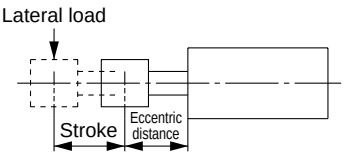


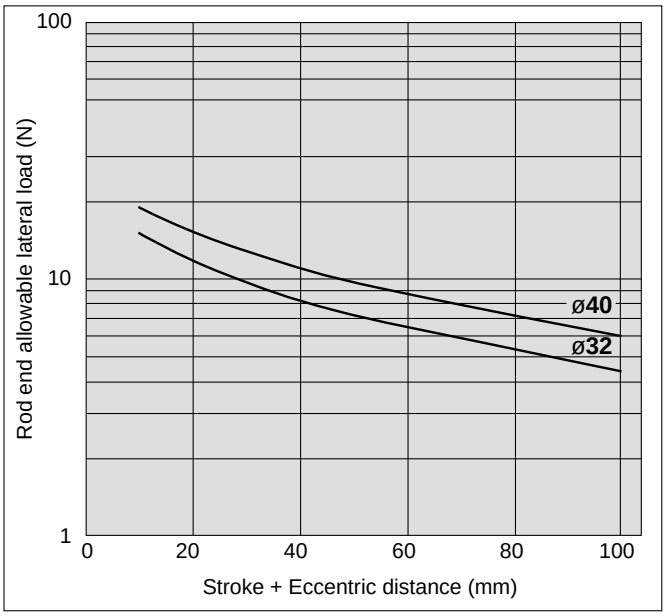
Restrictor: ASN2-M5
Pressure: 0.5 MPa
Mounting orientation: Horizontal, with no load, piston extended
∗ The above piston speed is for reference purpose only.

<Exhaust restrictor with silencer>

Model	Port size	Effective area (mm^2)	Weight (g)
ASN2-M5	M5	1.8	5

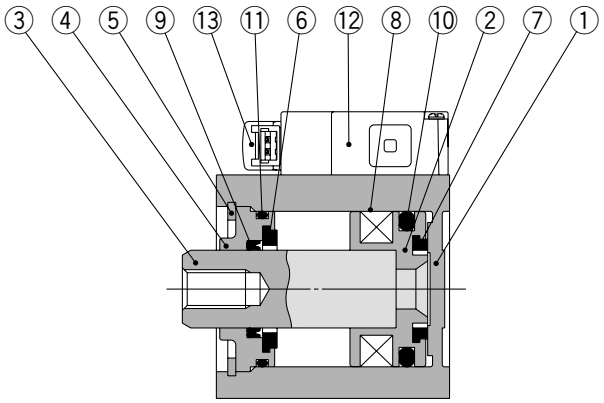
Rod End Allowable Lateral Load



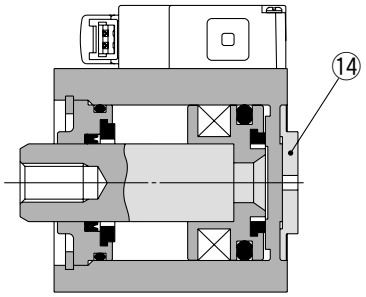


The allowable lateral load applied to the rod end is as shown above. Do not exceed the values shown in the graph.

Construction



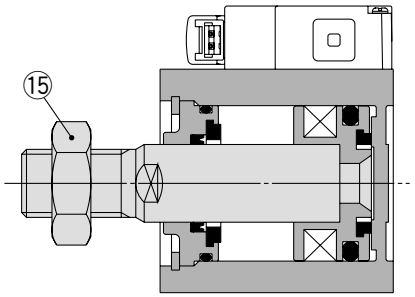
With boss in head end

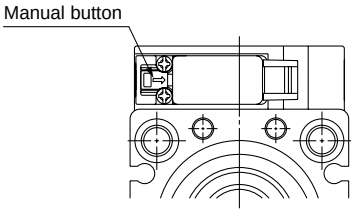


Component Parts

No.	Description	Material	Note
1	**Cylinder tube**	Aluminum alloy	Hard anodized
2	**Piston**	Aluminum alloy	Chromated
3	**Piston rod**	Carbon steel	Hard chrome plated
4	**Collar**	Aluminum alloy	Anodized
5	**Retaining ring**	Carbon tool steel	Phosphate coated
6	**Bumper A**	Urethane	
7	**Bumper B**	Urethane	
8	**Magnet**	—	
9	**Rod seal**	NBR	
10	**Piston seal**	NBR	
11	**Gasket**	NBR	
12	**Solenoid valve**	—	
13	**Pilot valve**	—	
14	**Boss ring**	Aluminum alloy	Hard anodized
15	**Rod end nut**	Carbon steel	Nickel plated

Rod end male thread





Replacement parts: Seal Kit

Bore size (mm)	Order no.	Set contents
32	CQ2B32-PS	Parts list no. ⑥⑦⑧
40	CQ2B40-PS	

∗ Seal kit includes ⑥, ⑦, ⑧. Order the seal kit, based on each bore size.

Length of plug connector lead wire

The standard length of the plug connector with a lead wire is 300 mm, but other lengths are available as follows.

How to Order Pilot Valve Assembly

V111M- □ □ □ □

Rated voltage

5	24 VDC
6	12 VDC

Manual override

-	Non-locking push type
B	Locking slotted type

Surge voltage suppressor

-	Without light/surge voltage suppressor
S	With surge voltage suppressor
Z	With light/surge voltage suppressor
R	With surge voltage suppressor (Non-polar type)
U	With light/surge voltage suppressor (Non-polar type)

Electrical entry

M	M-type plug connector with lead wire (Lead wire length 300 mm)
MO	M-type plug connector without connector

How to Order Connector Assembly

With lead wire: **SY100-30-4A-** □

Lead wire length

-	300 mm
6	600 mm
10	1000 mm
15	1500 mm
20	2000 mm
25	2500 mm
30	3000 mm
50	5000 mm

How to Order

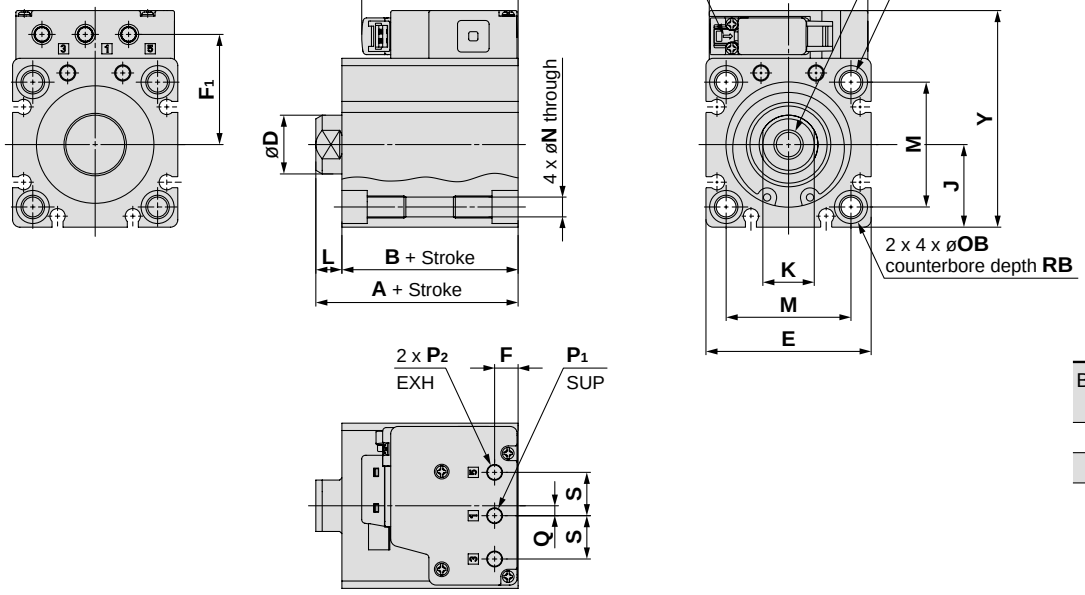
Indicate the part number of the connector assembly in addition to the part number of the solenoid valve without the connector for the plug connector.
Example) Lead wire length 2000 mm

When ordering cylinder with valve
CVQB32-30-M9B-5MOZ
SY100-30-4A-20

Dimensions: ø32, ø40

Basic: CVQB

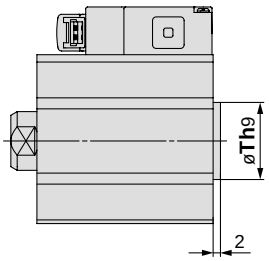
Axial piping



(mm)

Bore size (mm)	F_1
32	30
40	34

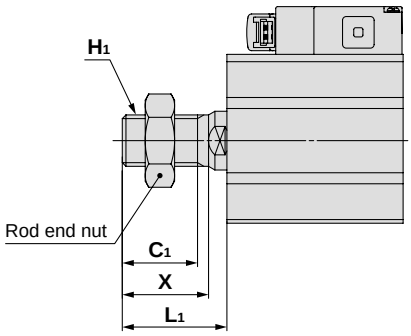
With boss in head end



(mm)

Bore size (mm)	Th9
32	$21^{\ 0}_{-0.052}$
40	$28^{\ 0}_{-0.052}$

Rod end male thread



(mm)

Bore size (mm)	C_1	X	H_1	L_1
32	20.5	23.5	M14 x 1.5	28.5
40	20.5	23.5	M14 x 1.5	28.5

(mm)

Bore size (mm)	Stroke range (mm)	A	B	C	D	E	F	H	J	K	L	M	N	OA	OB	P_1	P_2	Q	RA	RB
32	5 to 100	40 Note)	33 Note)	13	16	45	6.5	M8	22.5	14	7	34	5.4	M6	9	M5	M5	2.5	10	7
40	5 to 100	46.5	39.5	13	16	52	7	M8	26	14	7	40	5.4	M6	9	M5	M5	2.5	10	7

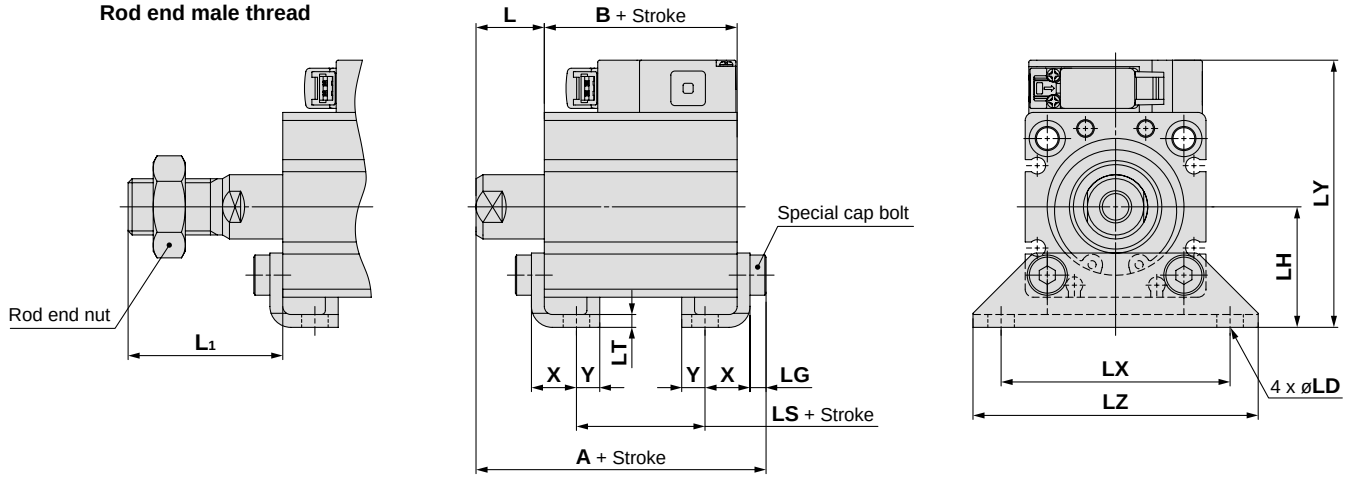
Bore size (mm)	Stroke range (mm)	S	V	W	Y
32	5 to 100	12	42.5	43.5	59
40	5 to 100	12	43	43.5	67

Note) The dimensions (A + stroke) and (B + stroke) for 5 mm stroke will be the same as those for 10 mm stroke.

Dimensions: ø32, ø40

Foot: CVQL

Rod end male thread



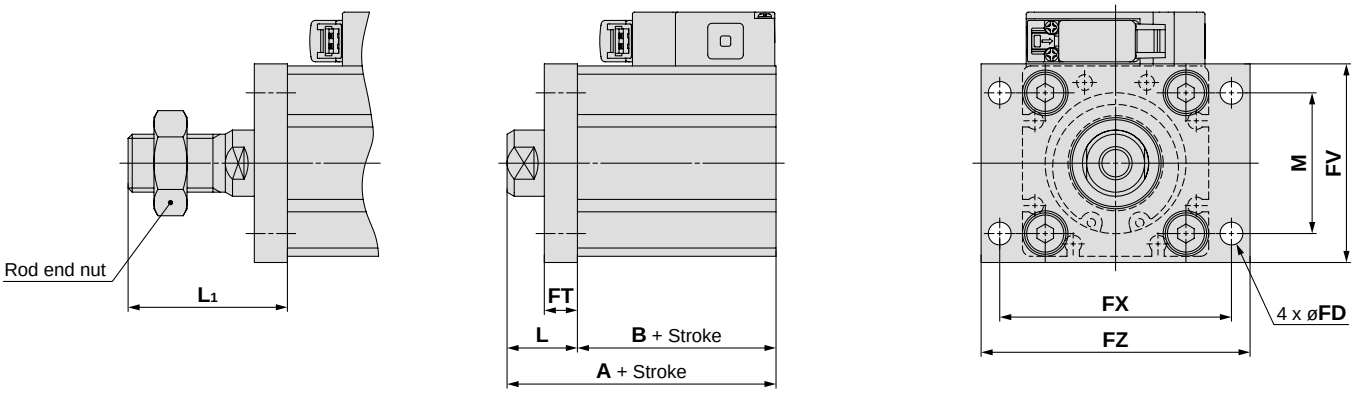
(mm)

Bore size (mm)	Stroke range (mm)	A	B	LS	L	L1	LD	LG	LH	LT	LX	LY	LZ	X	Y
32	5 to 100	57.2 Note)	33 Note)	17 Note)	17	38.5	6.6	4	30	3.2	57	66.5	71	11.2	5.8
40	5 to 100	63.7	39.5	23.5	17	38.5	6.6	4	33	3.2	64	74	78	11.2	7

Note) The dimensions (A + stroke), (B + stroke) and (LS + stroke) for 5 mm stroke will be the same as those for 10 mm stroke.

Rod flange: CVQF

Rod end male thread



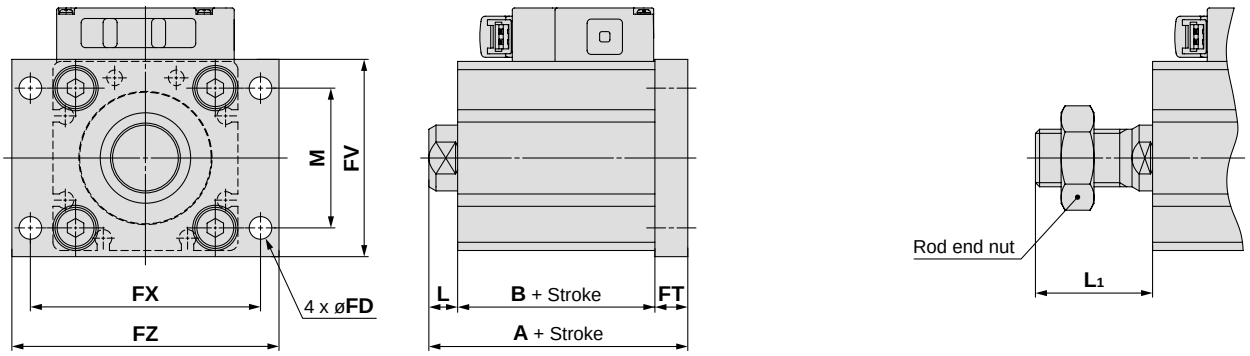
(mm)

Bore size (mm)	Stroke range (mm)	A	B	FD	FT	FV	FX	FZ	L	L1	M
32	5 to 100	50 Note)	33 Note)	5.5	8	48	56	65	17	38.5	34
40	5 to 100	56.5	39.5	5.5	8	54	62	72	17	38.5	40

Note) The dimensions (A + stroke) and (B + stroke) for 5 mm stroke will be the same as those for 10 mm stroke.

Dimensions: ø32, ø40

Head flange: CVQG

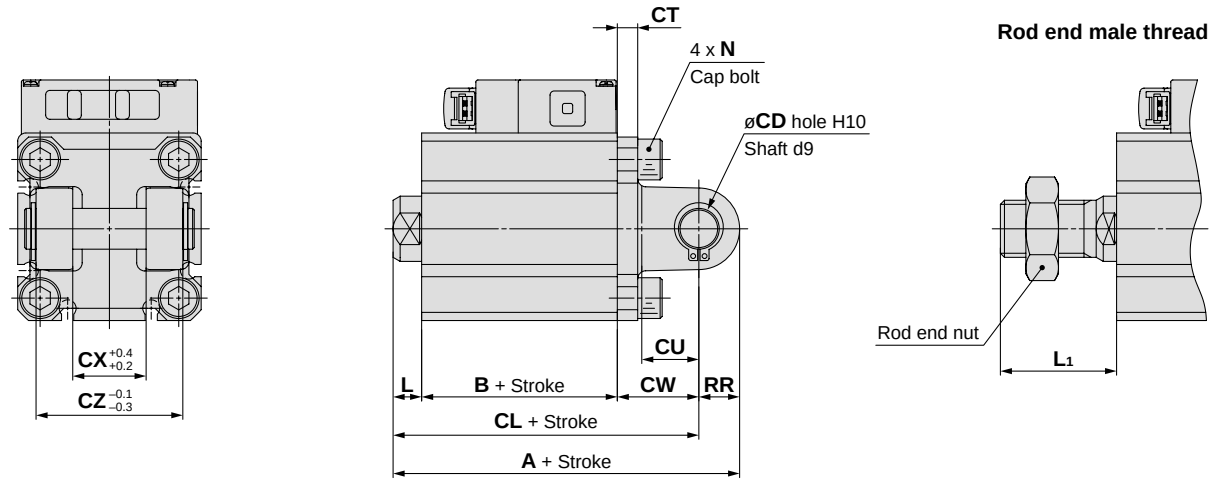


(mm)

Bore size (mm)	Stroke range (mm)	A	B	FD	FT	FV	FX	FZ	L	L_1	M
32	5 to 100	48 Note)	33 Note)	5.5	8	48	56	65	7	28.5	34
40	5 to 100	54.5	39.5	5.5	8	54	62	72	7	28.5	40

Note) The dimensions (A + stroke) and (B + stroke) for 5 mm stroke will be the same as those for 10 mm stroke.

Double clevis: CVQD



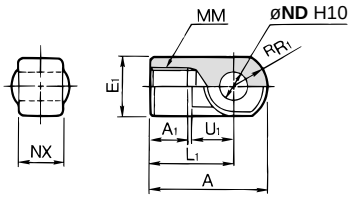
(mm)

Bore size (mm)	Stroke range (mm)	A	B	CL	CD	CT	CU	CW	CX	CZ	L	L_1	N	RR
32	5 to 100	70 Note)	33 Note)	60	10	5	14	20	18	36	7	28.5	M6 x 1	10
40	5 to 100	78.5	39.5	68.5	10	6	14	22	18	36	7	28.5	M6 x 1	10

Note) The dimensions (A + stroke), (B + stroke) and (CL + stroke) for 5 mm stroke will be the same as those for 10 mm stroke.

Accessory Bracket

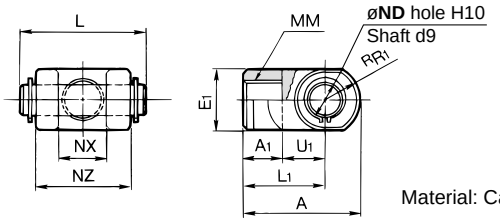
Single knuckle joint



Material: Cast iron
(mm)

Part no.	Applicable bore size (mm)	A	A_1	E_1	L_1	MM	$^{R}R_1$	U_1	ND_{H10}	NX
I-G04	**32, 40**	42	14	ø22	30	M14 x 1.5	12	14	$10^{+0.058}_{0}$	$18^{-0.3}_{-0.5}$

Double knuckle joint

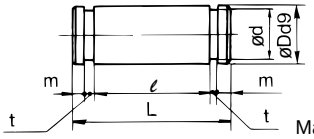


Material: Cast iron
(mm)

Part no.	Applicable bore size (mm)	A	A_1	E_1	L_1	MM	$^{R}R_1$	U_1	ND_{H10}	NX	NZ	L	Applicable pin part no.
Y-G04	**32, 40**	42	16	ø22	30	M14 x 1.5	12	14	$10^{+0.058}_{0}$	$18^{+0.5}_{+0.3}$	36	41.6	IY-G04

∗ Knuckle pin and retaining ring are included.

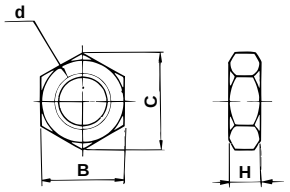
Knuckle pin (Common with double clevis pin)



Material: Carbon steel
(mm)

Part no.	Applicable bore size (mm)	Dd9	L	d	ℓ	m	t	Retaining ring
IY-G04	**32, 40**	$10^{-0.040}_{-0.076}$	41.6	9.6	36.2	1.55	1.15	10 C-type for shaft

Rod end nut



Material: Carbon steel
(mm)

Part no.	Applicable bore size (mm)	d	H	B	C
NT-04	**32, 40**	M14 x 1.5	8	22	25.4

Simple Joint / ø32, ø40

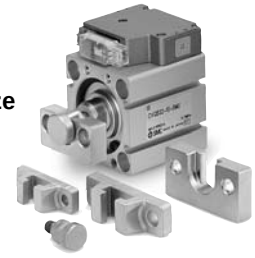
Joint and mounting bracket (A/B-type) part no.

YA – **03**

- **Mounting bracket**
- **Applicable air cylinder bore size**

YA	A-type mounting bracket
YB	B-type mounting bracket
YU	Joint

03	For ø32, ø40



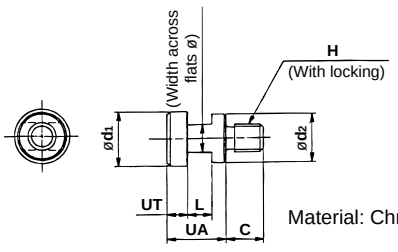
Allowable Eccentricity (mm)

Bore size	ø32	ø40
Eccentricity tolerance	±1	
Backlash	0.5	

<Ordering>
• Joints are not included with the A- or B-type mounting brackets. Order them separately.
(Example)
• Bore size for ø40 — Order number
• A-type mounting bracket part number ····· YA-03
• Joint ····· YU-03

Joint Part No.

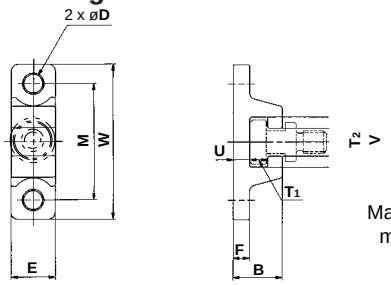
Bore size (mm)	Joint part no.	Applicable mounting bracket		Weight (g)
		A-type mounting bracket	B-type mounting bracket	
32, 40	**YU-03**	**YA-03**	**YB-03**	25



Material: Chromium molybdenum steel
(Nickel plated)
(mm)

Part no.	Applicable bore size (mm)	UA	C	d_1	d_2	H	K	L	UT	Weight (g)
YU-03	**32, 40**	17	11	15.8	14	M8	8	7	6	25

A-type mounting bracket

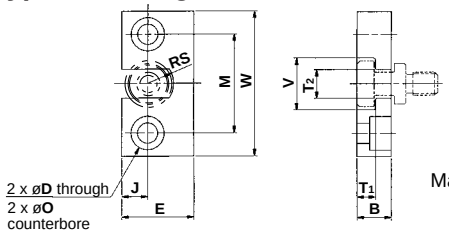


Material: Chromium molybdenum steel
(Nickel plated)
(mm)

Part no.	Bore size (mm)	B	D	E	F	M	T_1	T_2
YA-03	**32, 40**	18	6.8	16	6	42	6.5	10

Part no.	Bore size (mm)	U	V	W	Weight (g)
YA-03	**32, 40**	6	18	56	55

B-type mounting bracket



Material: Carbon steel
(Nickel plated)
(mm)

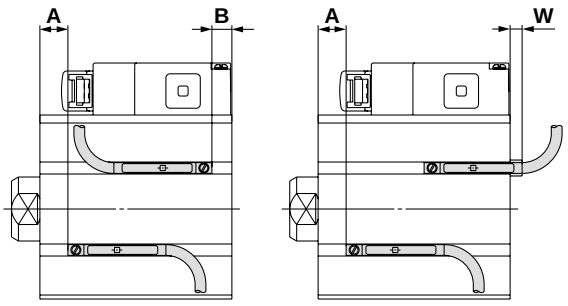
Part no.	Bore size (mm)	B	D	E	J	M	øO
YB-03	**32, 40**	12	7	25	9	34	11.5 depth 7.5

Part no.	Bore size (mm)	T_1	T_2	V	W	RS	Weight (g)
YB-03	**32, 40**	6.5	10	18	50	9	80

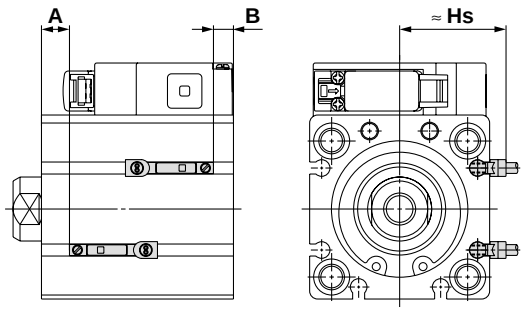
Auto Switch Proper Mounting Position (Detection at Stroke End) and Its Mounting Height

ø32, ø40

D-A9□ type
D-M9□ type
D-M9□W type



D-A9□V type
D-M9□V type
D-M9□WV type



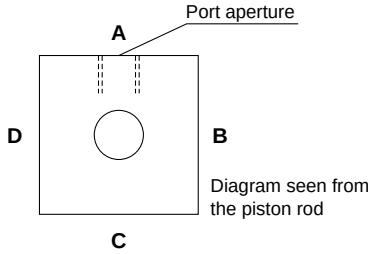
(mm)

Bore size (mm)	D-A9□			D-A9□V			D-M9□ D-M9□W			D-M9□V D-M9□WV		
	A	B	W	A	B	Hs	A	B	W	A	B	Hs
32	8	5	–3 (–0.5)	8 [13]	5	27	12 [17]	9	1	12 [17]	9	29
40	12	7.5	–5.5 (–3)	12	7.5	30.5	16	11.5	–1.5	16	11.5	32.5

The value in parentheses [ ] is for 5 mm stroke with ø32.
( ): Denotes the values for D-A93.
∗ The negative indication in the table for W shows the mounting inside the cylinder body.
∗ For the actual setting, check the operating condition of the auto switch and adjust.

Auto Switch Mountable Surface, Mounting Groove Number (Direct Mounting)

The table below shows which surfaces of the cylinder an auto switch can be mounted on, and the number of slots for the direct mounting type auto switch.



Switch model	D-A9□(V), M9□(V), M9□W(V)			
Bore size (mm)	A (Mounting groove number)	B (Mounting groove number)	C (Mounting groove number)	D (Mounting groove number)
32	—	○ (2)	○ (2)	○ (2)
40	—	○ (2)	○ (2)	○ (2)

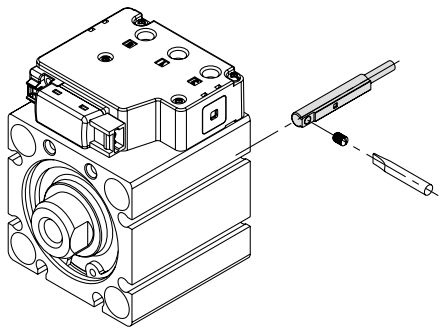
Operating Range

(mm)

Auto switch model	Bore size	
	32	**40**
D-A9□, D-A9□V	9.5	9.5
D-M9□, D-M9□V	3	3
D-M9□V, D-M9□W, D-M9□WV	6	6

∗ This is a guideline including hysteresis, it is not meant to be guaranteed.
(Assuming approximately ±30% dispersion.)
Therefore it may vary substantially depending on the ambient environment.

Auto Switch Mounting



Minimum Stroke for Auto Switch Mounting

(mm)

No. of auto switch mounted	Bore size (mm)	D-A9□	D-A9□V	D-M9□	D-M9□V	D-M9□W	D-M9□WV
With 1 pc.	**32**∗	10	5	5	5	15	15
	40	10	10	10	5	15	15
With 2 pcs.	**32**∗	10	10	5	5	15	15
	40	10	10	5	5	15	15

∗ The overall dimensions for the 5 mm stroke cylinder will be the same as those for the 10 mm stroke.

Series CVQ
Auto Switch Specifications

Auto Switch Common Specifications

Type	Reed switch	Solid state switch
Leakage current	None	3-wire: 100 μA 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 MΩ or more at 500 VDC Mega (between lead wire and case)	
Withstand voltage	1500 VAC for 1 minute (between lead wire and case)	1000 VAC for 1 minute (between lead wire and case)
Ambient temperature	–10 to 60°C	
Enclosure	IEC529 standard IP67, JIS C 0920 waterproof construction	
Standard	Conforming to CE Standards	

Lead Wire Length

Lead wire length indication

(Example) **D-M9BW L**

Lead wire length

-	0.5 m
M	1 m
L	3 m
Z	5 m

Note 1) Applicable auto switch with 5 m lead wire "Z"
Solid state switch: Manufactured upon receipt of order as standard.
Note 2) 1 m (M): D-M9□W(V) only.
Note 3) Lead wire tolerance

Lead wire length	Tolerance
0.5 m	±15 mm
1 m	±30 mm
3 m	±90 mm
5 m	±150 mm

Contact Protection Boxes: CD-P11, CD-P12

<Applicable switch model>

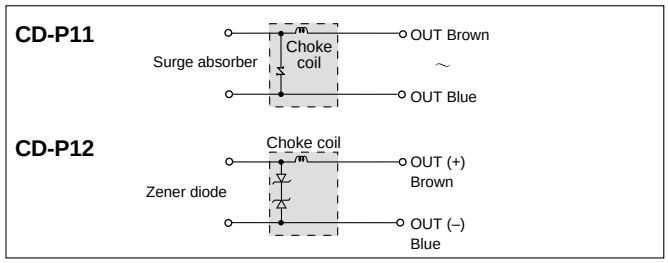
D-A9/A9□V type
The auto switches above do not have a built-in contact protection circuit. Therefore, please use a contact protection box with the switch for any of the following cases:
① **Where the operation load is an inductive load.**
② **Where the wiring length to load is greater than 5 m.**
③ **Where the load voltage is 100 VAC.**
The contact life may be shortened (due to permanent energising conditions).

Specifications

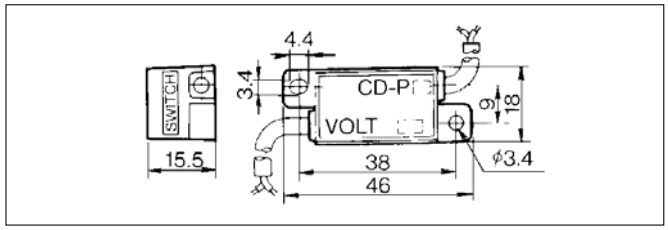
Part no.	CD-P11		CD-P12
Load voltage	100 VAC	200 VAC	24 VDC
Max. load current	25 mA	12.5 mA	50 mA

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

Internal Circuit



Dimensions



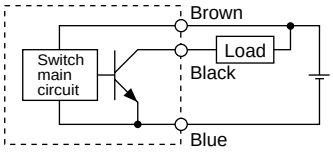
Connection

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. Keep the switch as close as possible to the contact protection box, with a lead wire length of no more than 1 metre.

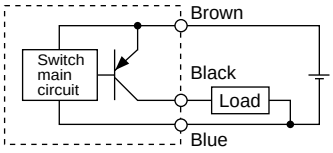
Auto Switch Connections and Examples

Basic Wiring

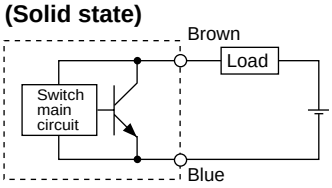
Solid state 3-wire, NPN



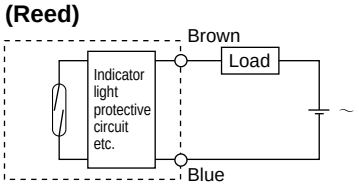
Solid state 3-wire, PNP



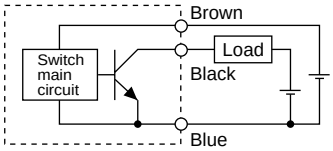
2-wire (Solid state)

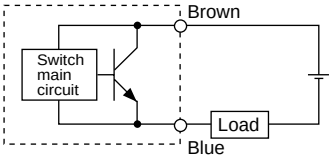


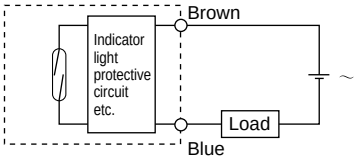
2-wire (Reed)



(Power supplies for switch and load are separate.)

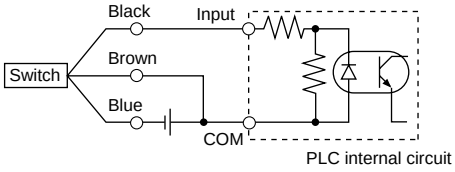




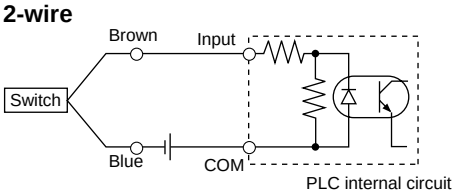


Example of Connection to PLC (Programmable Logic Controller)

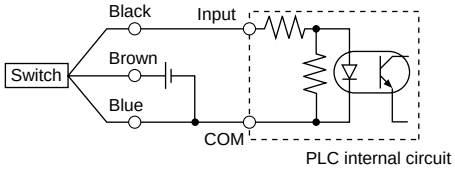
• Sink input specification
3-wire, NPN



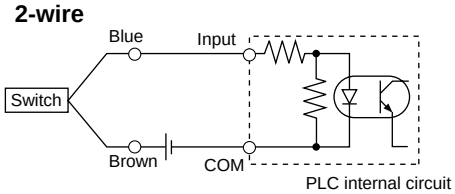
2-wire



• Source input specification
3-wire, PNP



2-wire

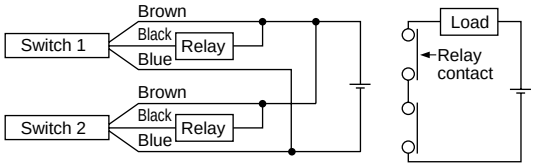


Connect according to the applicable PLC input specifications, since the connection method will vary depending on the PLC input specifications.

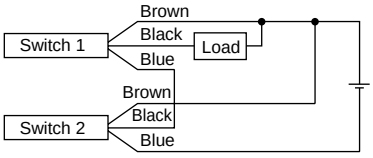
Example of AND (Serial) and OR (Parallel) Connection

• 3-wire

AND connection for NPN output (using relays)

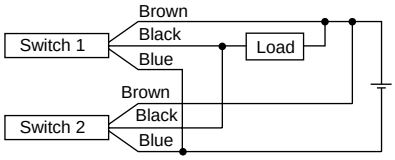


AND connection for NPN output (performed with switches only)

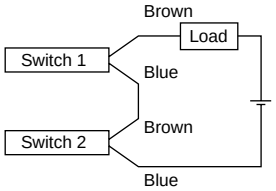


The indicator lights will illuminate when both switches are turned ON.

OR connection for NPN output



2-wire with 2-switch AND connection

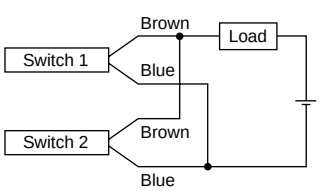


When two switches are connected in series, a load may malfunction because the load voltage will decrease when in the ON state.
The indicator lights will illuminate if both of the switches are in the ON state.

Load voltage at ON = $\frac{\text{Power supply voltage}}{} - \frac{\text{Residual voltage}}{}$ x 2 pcs.
= 24 V - 4 V x 2 pcs.
= 16 V

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

2-wire with 2-switch OR connection



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

Load voltage at OFF = Leakage current x 2 pcs.
x Load impedance
= 1 mA x 2 pcs. x 3 kΩ
= 6 V

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

(Reed)
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 dim or not light because of the dispersion and reduction of the current flowing to the switches.

Reed Switch: Direct Mounting Style
D-A90(V)/D-A93(V)/D-A96(V)

Grommet

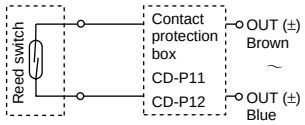
⚠Caution

Operating Precautions

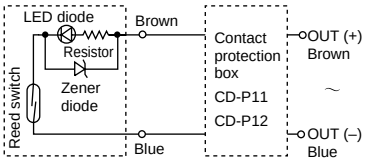
Fix the switch with the existing screw installed on the switch body. The switch may be damaged if a screw other than the one supplied is used.

Auto Switch Internal Circuit

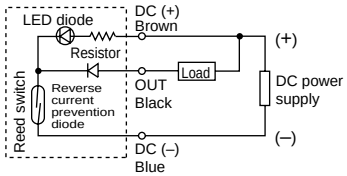
D-A90(V)



D-A93(V)



D-A96(V)



Note) ① In a case where the operation load is an inductive load.
② In a case where the wiring load is greater than 5 m.
③ In a case where the load voltage is 100 VAC.

Use the auto switch with a contact protection box in any of the above mentioned cases. (For details about the contact protection box, refer to page 11.)

Auto Switch Specifications

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

PLC: Programmable Logic Controller

D-A90/D-A90V (Without indicator light)						
Auto switch part no.	**D-A90**	**D-A90V**	**D-A90**	**D-A90V**	**D-A90**	**D-A90V**
Electrical entry direction	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Applicable load	IC circuit, Relay, PLC					
Load voltage	24 VAC/DC or less		48 VAC/DC or less		100 VAC/DC 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)						
Auto switch part no.	**D-A93**	**D-A93V**	**D-A93**	**D-A93V**	**D-A96**	**D-A96V**
Electrical entry direction	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Applicable load	Relay, PLC				IC circuit	
Load voltage	24 VDC		100 VAC		4 to 8 VDC	
Load current range and max. load current	5 to 40 mA		5 to 20 mA		20 mA	
Contact protection circuit	None					
Internal voltage drop	D-A93 — 2.4 V or less (to 20 mA)/3 V or less (to 40 mA) D-A93V — 2.7 V or less				0.8 V or less	
Indicator light	Red LED illuminates when turned ON.					
Standard	Conforming to CE Standards					

● Lead wires
D-A90(V)/D-A93(V) — Oilproof heavy-duty vinyl cable: ø2.7, 0.18 mm² x 2 cores (Brown, Blue), 0.5 m
D-A96(V) — Oilproof heavy-duty vinyl cable: ø2.7, 0.15 mm² x 3 cores (Brown, Black, Blue), 0.5 m
Note 1) Refer to page 11 for reed switch common specifications.
Note 2) Refer to page 11 for lead wire lengths.

Weight

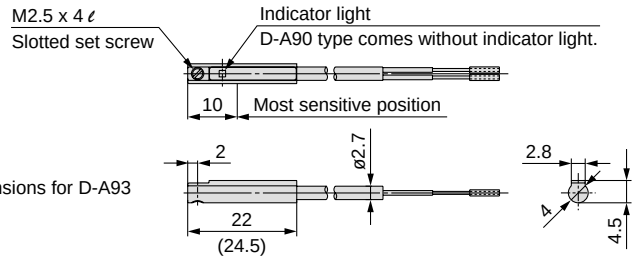
Unit: g

Auto switch part no.		**D-A90(V)**	**D-A93(V)**	**D-A96(V)**
Lead wire length (m)	0.5	6	6	8
	3	30	30	41

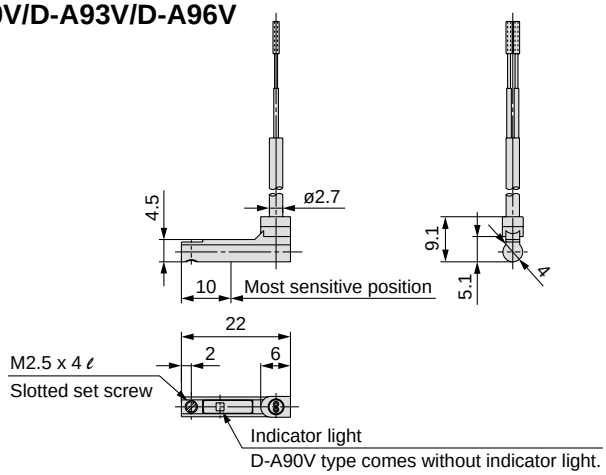
Dimensions

Unit: mm

D-A90/D-A93/D-A96



D-A90V/D-A93V/D-A96V



Solid State Switch: Direct Mounting Style
D-M9N(V)/D-M9P(V)/D-M9B(V) CE

Grommet

- **2-wire load current is reduced (2.5 to 40 mA).**
- **Lead-free**
- **UL certified (style 2844) lead cable is used.**
- **Flexibility is 1.5 times greater than the conventional model (SMC comparison).**
- **Using flexible cable as standard spec.**

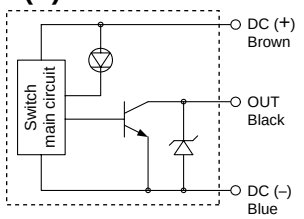
⚠Caution

Operating Precautions

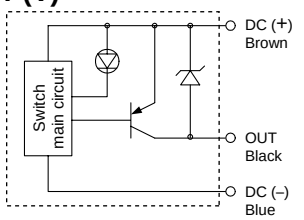
Fix the switch with the existing screw installed on the switch body. The switch may be damaged if a screw other than the one supplied is used.

Auto Switch Internal Circuit

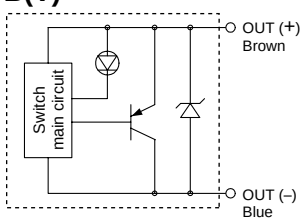
D-M9N(V)



D-M9P(V)



D-M9B(V)



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-M9NV	D-M9P	D-M9PV	D-M9B	D-M9BV
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				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 turned ON.					
Standard	Conforming to CE Standards					

- Lead wires — Oilproof heavy-duty vinyl cable: ø2.7 x 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

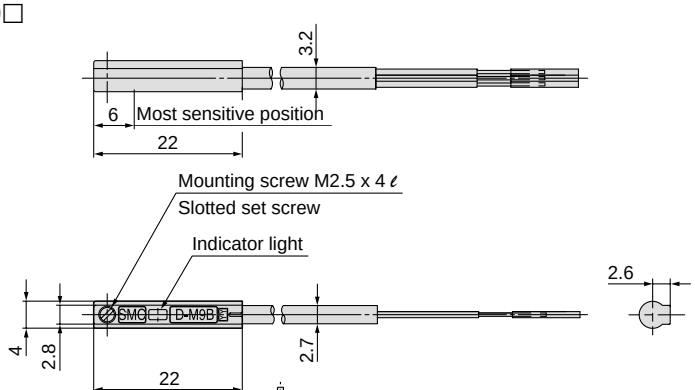
Unit: g

Auto switch part no.		D-M9N(V)	D-M9P(V)	D-M9B(V)
Lead wire length (m)	0.5	8	8	7
	3	41	41	38
	5	68	68	63

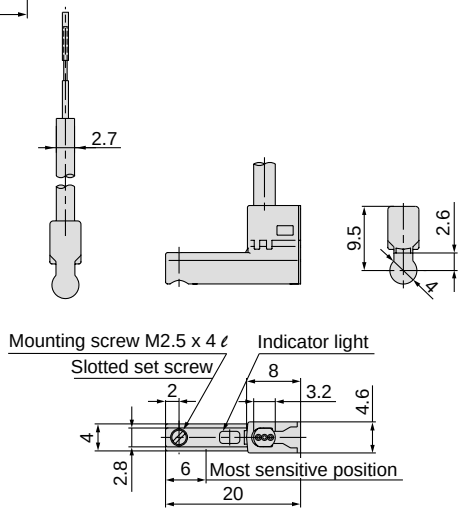
Dimensions

Unit: mm

D-M9□



D-M9□V



SMC

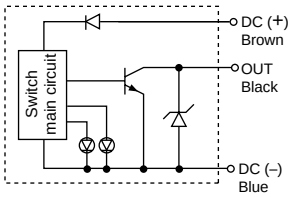
2-Colour Indication Solid State Switch: Direct Mounting Style
D-M9NW(V)/D-M9PW(V)/D-M9BW(V)

Grommet

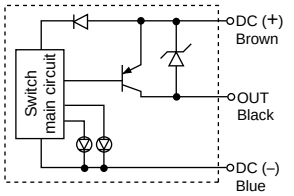
- **2-wire load current is reduced (2.5 to 40 mA).**
- **RoHS compliant**
- **UL certified (style 2844) lead cable is used.**
- **Flexibility is 1.5 times greater than the conventional model (SMC comparison).**
- **Using flexible cable as standard spec.**
- **The optimum operating position can be determined by the colour of the light. (Red → Green → Red)**

Auto Switch Internal Circuit

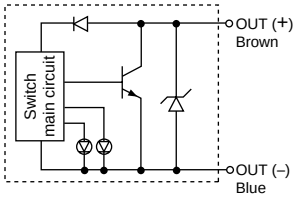
D-M9NW(V)



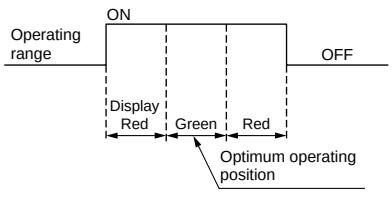
D-M9PW(V)



D-M9BW(V)



Indicator light / Display method



Auto Switch Specifications

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

PLC: Programmable Logic Controller

D-M9□W/D-M9□WV (With indicator light)						
Auto switch part no.	D-M9NW	D-M9NWV	D-M9PW	D-M9PWV	D-M9BW	D-M9BWV
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				2.5 to 40 mA	
Internal voltage drop	0.8 V or less at 10 mA (2 V or less at 40 mA)				4 V or less	
Leakage current	100 μA or less at 24 VDC				0.8 mA or less	
Indicator light	Operating position ····· Red LED illuminates. Optimum operating position ····· Green LED illuminates.					
Standard	Conforming to CE Standards					

- Lead wires — Oilproof heavy-duty vinyl cable: ø2.7 x 3.2 ellipse
  D-M9BW(V) 0.15 mm² x 2 cores
  D-M9NW(V), D-M9PW(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

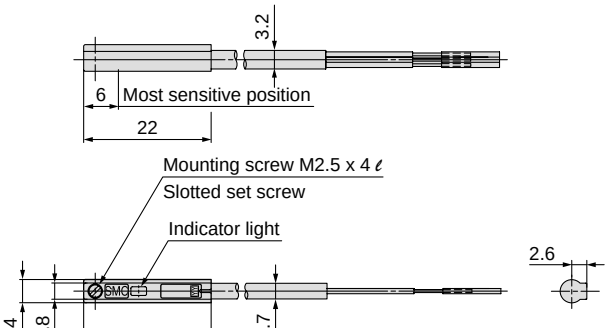
Unit: g

Auto switch part no.		D-M9NW(V)	D-M9PW(V)	D-M9BW(V)
Lead wire length (m)	0.5	8	8	7
	1	14	14	13
	3	41	41	38
	5	68	68	63

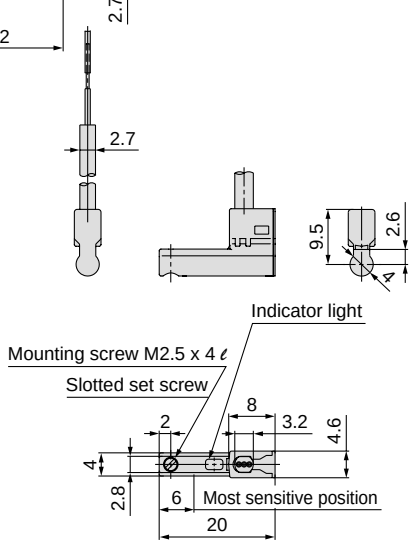
Dimensions

Unit: mm

D-M9□W



D-M9□WV



Series CVQ
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 labels 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.

■ Explanation of the Labels

Labels	Explanation of the labels
⚠ **Danger**	In extreme conditions, there is a possible result of serious injury or loss of life.
⚠ **Warning**	Operator error could result in serious injury or loss of life.
⚠ **Caution**	Operator error could result in injury Note 3) or equipment damage. Note 4)

Note 1) ISO 4414: Pneumatic fluid power – General rules relating to systems
Note 2) JIS B 8370: General Rules for Pneumatic Equipment
Note 3) Injury indicates light wounds, burns and electrical shocks that do not require hospitalisation or hospital visits for long-term medical treatment.
Note 4) Equipment damage refers to extensive damage to the equipment and surrounding devices.

■ Selection/Handling/Applications

1. The compatibility of the 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 post analysis and/or tests to meet the specific requirements. The expected performance and safety assurance are 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 catalogue 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. (Understanding JIS B 8370 General Rules for Pneumatic Equipment, and other safety rules are included.)

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 is removed, confirm that safety process as mentioned above. Turn off the supply pressure for this equipment and exhaust all residual compressed air in the system, and release all the energy (liquid pressure, spring, condenser, gravity).
3. Before machinery/equipment is restarted, take measures to prevent quick extension of a cylinder piston rod, etc.

4. If the equipment will be used in the following conditions or environment, please contact SMC first and be sure to take all necessary safety precautions.
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, requiring special safety analysis.
4. If the products are used in an interlock circuit, prepare a double interlock style circuit with a mechanical protection function for the prevention of a breakdown. And, examine the devices periodically if they function normally or not.

■ Exemption from Liability

1. SMC, its officers and employees shall be exempted from liability for any loss or damage arising out of earthquakes or fire, action by a third person, accidents, customer error with or without intention, product misuse, and any other damages caused by abnormal operating conditions.

2. SMC, its officers and employees shall be exempted from liability for any direct or indirect loss or damage, including consequential loss or damage, loss of profits, or loss of chance, claims, demands, proceedings, costs, expenses, awards, judgments and any other liability whatsoever including legal costs and expenses, which may be suffered or incurred, whether in tort (including negligence), contract, breach of statutory duty, equity or otherwise.

3. SMC is exempted from liability for any damages caused by operations not contained in the catalogues and/or instruction manuals, and operations outside of the specification range.

4. SMC is exempted from liability for any loss or damage whatsoever caused by malfunctions of its products when combined with other devices or software.

Series CVQ
Specific Product Precautions 1

Be sure to read this before handling.
For Safety Instructions, Actuators Precautions and 3/4/5 Port Solenoid Valves Precautions, refer to "Precautions for Handling Pneumatic Devices" (M-03-E3A).

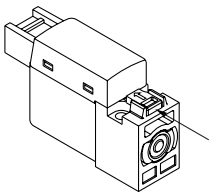
Manual Override

⚠Warning

A connected actuator can be operated manually. Use the manual override after confirming that there is no danger.

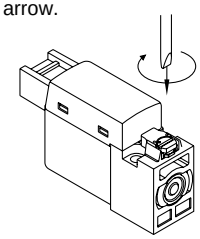
■ **Non-locking push type**
[Standard]

Press in the direction of the arrow



■ **Locking slotted type**
[B type]

Turn 90° in the direction of arrow.



⚠ Caution

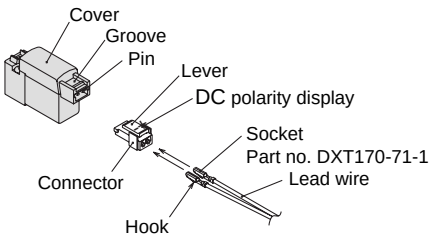
When operating with a screwdriver, turn it gently using a watchmaker's screwdriver. (Torque: Less than 0.1 N•m)

How to Use Plug Connector

⚠Caution

1. Attaching and detaching connectors

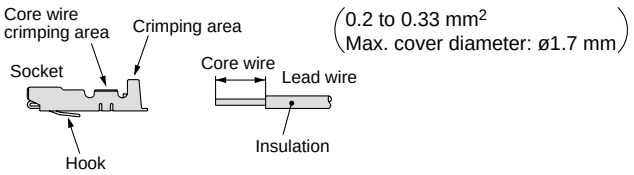
- To attach a connector, hold the lever and connector unit between your fingers and insert it straight onto the pins of the solenoid valve.
- To detach a connector, remove the pawl from the groove by pushing the lever downward with your thumb, and pull the connector straight out.



2. Crimping of lead wires and sockets

Not necessary if ordering the lead wire pre-connected model. Strip 3.2 to 3.7 mm off the end of the lead wires, insert the ends of the core wires evenly into the sockets, and then crimp with a crimping tool. When this is done, take care that the coverings of the lead wires do not enter the core wire crimping area.

For crimping, use a specific tool. (For special crimping tool, please contact SMC.)



How to Use Plug Connector

⚠Caution

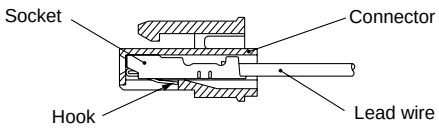
2. Attaching and detaching sockets with lead wires

• Attaching

Insert the sockets into the square holes of the connector (⊕, ⊖ indication), and continue to push the sockets all the way in until they lock by hooking into the seats in the connector. (When they are pushed in, their hooks open and they are locked automatically.) Then confirm that they are locked by pulling lightly on the lead wires.

• Detaching

To detach a socket from a connector, pull out the lead wire while pressing the socket's hook with a stick having a thin tip (approx. 1 mm). If the socket will be used again, first spread the hook outward.



4. Do not apply bending force or tensile force repeatedly to the lead wire.

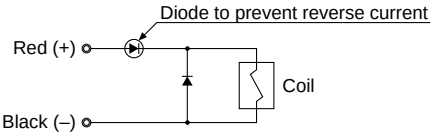
This can cause disconnection of the connector and breakage of the lead wire. If this is unavoidable due to the application, keep the bending radius of the lead wire R8 mm at least.

Surge Voltage Suppressor

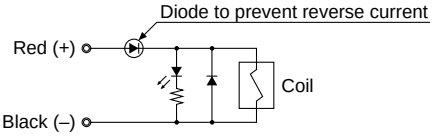
⚠Caution

■ **Standard (with polarity)**

With surge voltage suppressor (□S)

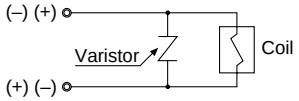


With light/surge voltage suppressor (□Z)

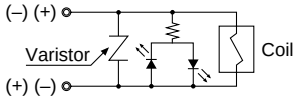


■ **Non-polar type**

With surge voltage suppressor (□R)



With light/surge voltage suppressor (□U)



- For standard type, connect so that polarity is matched to the connector's (+), (–). (For non-polar type, the lead wires can be connected to either one.)
- Solenoids whose lead wires have been pre-wired: positive side red and negative side black.

Series CVQ
Specific Product Precautions 2

Be sure to read this before handling.
For Safety Instructions, Actuators Precautions and 3/4/5 Port Solenoid Valves Precautions, refer to “Precautions for Handling Pneumatic Devices” (M-03-E3A).

Snap Ring Installation/Removal

⚠Caution

1. **To remove or install the snap ring, use an appropriate pair of pliers (tool for installing C-type retaining ring).**
2. **Even if proper pliers (tool for installing C-type retaining ring) are used, it is likely to inflict damage to a human body or peripheral equipment, as the snap ring may fly out from the tip of the pliers (tool for installing C-type retaining ring). Be careful with the popping of the snap ring. Additionally, be certain that the snap ring is placed firmly into the groove of rod cover before supplying air at the time of installing.**

Other

⚠Caution

1. **Do not separate the cylinder from the valve.**

Series CVQ
Auto Switches Precautions 1

Be sure to read this 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. We do not guarantee any damage in any case the product is used outside of the specification range.

2. 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. However 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:

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

3. 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.)
Use a contact protection box when the wire length is 5 m or longer.

<Solid state switch>

Although wire length should not affect switch function, use a wire 100 m or shorter.
If the wiring is longer it will likely increase noise although the length is less than 100 m.
When the wire length is long, we recommend attaching the ferrite core to the both ends of the cable to prevent excess noise.

4. Do not use a load that generates surge voltage. If a surge voltage is generated, the discharge occurs at the contact, possibly resulting in the shortening of product life.

<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 the surge is applied repeatedly. When a load, such as a relay or solenoid, which generates surge is directly driven, use a type of switch with a built-in surge absorbing element.

5. 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 and confirm proper operation.

6. Do not make any modifications (including exchanging the printed circuit boards) to the product.

It may cause human injuries and damage.

⚠Caution

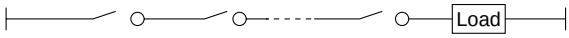
1. Take precautions when multiple actuators are used close together.

When two or more actuators 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.) The auto switches may malfunction due to the interference from the magnetic fields.

2. Take note of 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.



   - In the same way, when operating under a specified voltage, although an auto switch may operate normally, the load may not operate. 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 D-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).
   Also, note that a 12 VDC relay is not applicable.

3. 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.

$$\text{Operating current of load (OFF condition)} > \text{Leakage current}$$

If the criteria given in the above formula are not met, it will not reset correctly (stays ON). Use a 3-wire switch if this specification will not be satisfied.
Moreover, leakage current flow to the load will be "n" times larger when "n" auto switches are connected in parallel. Refer to page 12.

Series CVQ
Auto Switches Precautions 2

Be sure to read this before handling.

Design and Selection

⚠Caution

4. Ensure sufficient clearance for maintenance activities.

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

5. Minimum stroke for auto switch mounting

The minimum stroke value for mounting one or two auto switches is obtained when the switch can detect at the cylinder stroke ends.

However, even if the switch is mounted at the proper position within the minimum stroke range, it may not be able to detect when the piston stops in the middle of the stroke due to a stopper, etc. It may also turn on in the middle of a stroke.

6. When multiple auto switches are required

"n" indicates the number of switches which can be physically mounted. Detection intervals depends on the switch mounting structure and set position therefore some required interval and set positions may not be available.

7. Limitations of detectable positioning

When using certain mounting brackets, the surface and position where an auto switch can be mounted may be restricted due to physical interference (bottom side of foot bracket etc.).

8. Use the cylinder and switch in proper combination.

The auto switch is pre-adjusted to activate properly for an auto-switch-capable SMC cylinder.

If the auto switch is mounted improperly, used for another brand of cylinder or used after the alternation of the machine installation, the switch may not activate properly.

Mounting and Adjustment

⚠Warning

1. Instruction manual

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

2. Do not drop or bump.

Do not drop, bump or apply excessive impacts (300 m/s^2 or more for reed switches and 1000 m/s^2 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.

3. Mount switches using the proper fastening torque.

When a switch is tightened beyond the range of fastening torque, the mounting screws, mounting bracket or switch may be damaged. On the other hand, tightening below the range of fastening torque may allow the switch to slip out of position. (For mounting and moving auto switches, tightening torque, etc., refer to each series.)

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 position shown in a catalogue indicates 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 or the service life will be shortened.

<D-M9□(V)>

When the D-M9□(V) auto switch is used to replace old series auto switch, it may not activate depending on operating condition because of its shorter operating range.

Such as

- **Application where the stop position of actuator may vary and exceed the operating range of the auto switch, for example, pushing, pressing, clamping operation, etc.**
- **Application where the auto switch is used for detecting an intermediate stop position of the actuator. (In this case the detecting time will be reduced.)**

In these applications, set the auto switch to the center of the required detecting range.

⚠Caution

1. Do not carry an actuator by the auto switch lead wires.

Never carry a cylinder (actuator) 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.

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

Series CVQ
Auto Switches Precautions 3

Be sure to read this before handling.

Wiring

⚠Warning

1. 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 into a switch.

2. Do not wire 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, including auto switches, may malfunction due to noise from these other lines.

⚠Caution

1. Avoid repeatedly bending or stretching lead wires.

Repeated bending or tensile force applied to the lead wire may cause the sheath to fall off or disconnection of the wire.
If bending or tensile force are not avoidable, fix the lead wire close to the switch and allow a bend radius of R40 to 80 mm or larger. Please consult SMC for details. Stress and tensile force applied to the connection between the cable and switch increases the possibility of the sheath to fall off or disconnection.
Fix the cable in the middle so that it is not movable in the area where it connects with the switch.

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.
It is the same as when the 2-wire brown cord (+, output) is directly connected to the (+) power supply terminal.

3. 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>

Model D-M9□(V) and all models of PNP output type switches do not have built-in short circuit prevention 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 power supply line (brown) and the output line (black) on 3-wire type switches.

⚠Caution

4. Avoid incorrect wiring.

<Reed switch>

A 24 VDC switch with indicator light has polarity. The brown lead wire is (+) and the blue lead wire is (–).

1) If connections are reversed, a switch will operate, however, the light emitting diode will not light up.
Also note that a current greater than that specified will damage a light emitting diode and it will no longer operate.

Applicable models:
D-A93, A93V

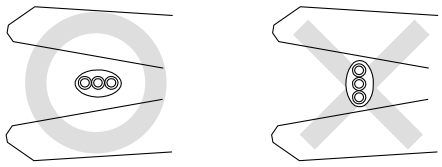
<Solid state switch>

1) If connections are reversed on a 2-wire type switch, the switch will not be damaged if protected 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.

<D-M9□(V)>

The D-M9□(V) does not have a built-in short circuit protection circuit. Be aware that if the power supply connection is reversed (e.g. (+) power supply wire and (–) power supply wire connection is reversed), the switch will be damaged.

5. When the cable sheath is stripped, confirm the stripping direction. The insulator may be split or damaged depending on the direction. (D-M9□(V) only)



Recommended Tool

Model name	Model no.
Wire stripper	D-M9N-SWY

∗ Stripper for a round cable (ø2.0) can be used for the 2-wire type cable.

Series CVQ
Auto Switches Precautions 4

Be sure to read this 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 actuators will become demagnetised.

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

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

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

Please consult SMC if auto switches will be used in an environment 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 improper insulation, malfunction due to swelling of the potting resin, or hardening of the lead wires.

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

Please consult SMC if switches are 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/s^2 or more) is applied to a reed switch during operation, the contact point will malfunction and generate or cut off a signal momentarily (1 ms or less). Please consult 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 (solenoid type lifter, high frequency induction furnace, motor, radio equipment etc.) which generate large surges or electromagnetic waves in the area around actuators with solid state auto switches, this may cause deterioration or damage to the switches. Avoid sources of surge generation and crossed lines.

⚠Caution

1. 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 actuator, it may cause the auto switch to malfunction due to a loss of the magnetic force inside the actuator.

2. Please consult SMC concerning water resistance, elasticity of lead wires, usage at welding sites, etc.

3. Do not use in direct sunlight.

4. Do not mount the product in locations where it is exposed to radiant heat.

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 the lighting of the green light on the 2-colour indicator type switch.
Confirm that the green LED is turned on when stopped at the established position. If the red LED is turned on, the mounting position is not appropriate. Readjust the mounting position until the green LED lights up.

2. Maintenance procedures are outlined in the operation manual.

Not following proper procedures could cause the product to malfunction and could lead to damage to the equipment or machine.

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