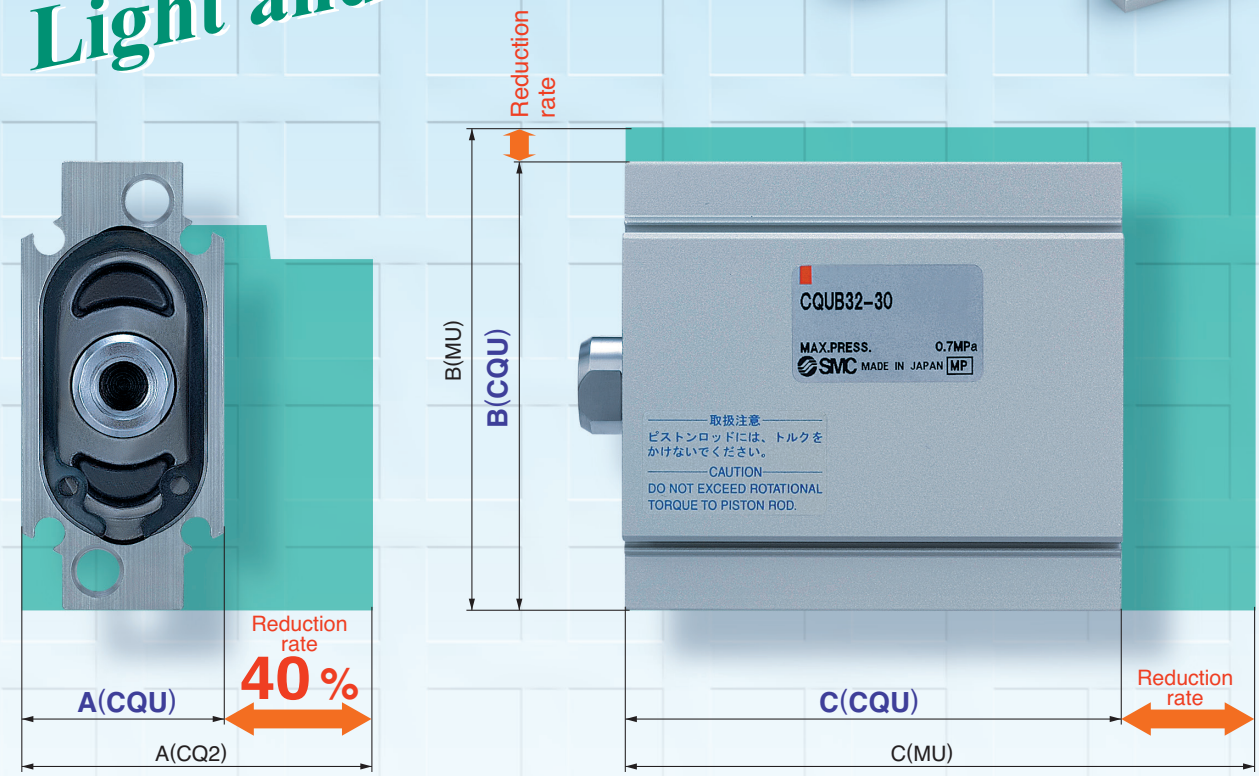
Compact Cylinder

Plate type Size: 20, 25, 32, 40

- Width: Reduced by up to **40%**
  (compared with SMC CQ2 series)
- Total length: Reduced by up to **15%**
- Volume: Reduced by up to **18%**
- Mass: Reduced by up to **36%**
  (compared with SMC MU series with 30 stroke)

Light and compact!



A Dimension Comparison

(mm)

Size	A		
	CQU	CQ2	Reduction rate
20	22	36	39%
25	24	40	40%
32	28	45	38%
40	32	52	38%

B/C Dimensions Comparison

(mm)

Size	B			C		
	CQU	MU	Reduction rate	CQU	MU	Reduction rate
20	47	—	—	72.5	—	—
25	53	54	2%	72.5	85	15%
32	62	68	9%	79.5	88	10%
40	80	86	7%	79.5	90	12%

∗ Comparison made with 30 stroke cylinder.

Mass Comparison

(g)

Size	Mass		
	CQU	MU	Reduction rate
20	153	—	—
25	180	252	29%
32	272	376	28%
40	351	552	36%

∗ Comparison made with 30 stroke cylinder.

Series CQU

SMC

CAT.EUS20-198A-UK

● Easy maintenance

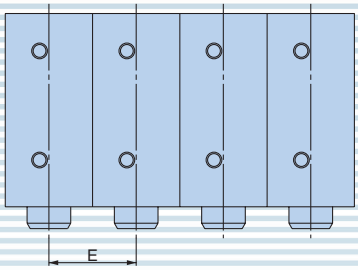
Seals can be replaced easily just by removing the retaining rings.

● A small type of auto switch can be mounted from 4 directions. No protrusion of auto switch from the mounting slot

● Auto switch can be mounted without removing a support bracket.

Allows smaller mounting pitch.

＊ Without auto switch

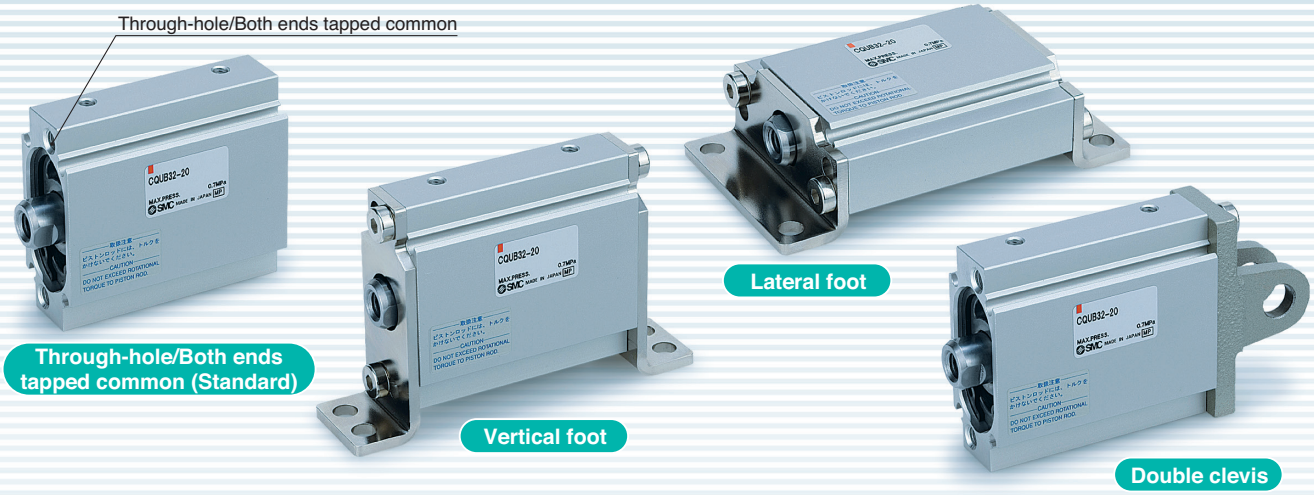


(mm)

Size	E
20	22
25	24
32	28
40	32

Note 1) Cylinder tube width tolerance: 0.2
Note 2) Minimum mounting pitch of auto switch is specified. Refer to back page 3.

Mounting



Variations

Model	Size	Stroke												Cushion	Mounting	Rod end
		5	10	15	20	25	30	35	40	45	50	75	100			
CQU	20	●	●	●	●	●	●	●	●	●	●	—	—	Rubber bumper	Through-hole/Both ends tapped common (Standard) Vertical foot Lateral foot Double clevis	Male thread Female thread
	25	●	●	●	●	●	●	●	●	●	●	—	—			
	32	●	●	●	●	●	●	●	●	●	●	●	●			
	40	●	●	●	●	●	●	●	●	●	●	●	●			

Compact Cylinder: Plate Type
Double Acting, Single Rod
Series CQU
Size: 20, 25, 32, 40

How to Order

CQU B 20 – 30 [ ] – M9BW [ ]

Mounting

B	Through-hole/Both ends tapped common (Standard)
L	Vertical foot
M	Lateral foot
D	Double clevis

∗ Support brackets are shipped together, (but not assembled).
∗ Cylinder mounting bolt is not included.
Order it separately from "Mounting Bolt for CQU" on page 3.

Number of auto switches

—	2 pcs.
S	1 pc.
n	"n" pcs.

Auto switch

—	Without auto switch (Built-in magnet)

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

Size

20	Piston area equivalent to 20 mm
25	Piston area equivalent to 25 mm
32	Piston area equivalent to 32 mm
40	Piston area equivalent to 40 mm

Rod end thread

—	Rod end female thread
M	Rod end male thread

Cylinder stroke (mm)

Size	Stroke
20, 25	5, 10, 15, 20, 25, 30, 35, 40, 45, 50
32, 40	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100

Applicable Auto Switches/Refer to pages 13 through to 16 for further information on auto switches.

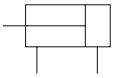
Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage DC		Load voltage AC	Auto switch model: Perpendicular	Auto switch model: In-line	Lead wire length (m): 0.5 (Nil)	1 (M)	3 (L)	5 (Z)	Pre-wired connector	Applicable load	
Solid state switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	**M9NV****	**M9N****	●	●	●	○	○	IC circuit	Relay, PLC
				3-wire (PNP)				**M9PV****	**M9P****	●	●	●	○	○		
				2-wire		12 V		**M9BV****	**M9B****	●	●	●	○	○	—	
	Diagnostic indication (2-colour indication)			3-wire (NPN)		5 V, 12 V		**M9NWV**	**M9NW**	●	●	●	○	○	IC circuit	
				3-wire (PNP)				**M9PWV**	**M9PW**	●	●	●	○	○		
				2-wire		12 V		**M9BWV**	**M9BW**	●	●	●	○	○	—	
	Water resistant (2-colour indication)			3-wire (NPN)		5 V, 12 V		**M9NAV*****	**M9NA*****	○	○	●	○	○	IC circuit	
				3-wire (PNP)				**M9PAV*****	**M9PA*****	○	○	●	○	○		
				2-wire		12 V		**M9BAV*****	**M9BA*****	○	○	●	○	○	—	
Reed switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	**A96V**	**A96**	●	—	●	—	—	IC circuit	—
			No	2-wire	24 V	12 V	100 V	**A93V**	**A93**	●	—	●	—	—	—	Relay, PLC
							100 V or less	**A90V**	**A90**	●	—	●	—	—	IC circuit	

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

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

∗ For details about the auto switch with pre-wired connector, refer to Best Pneumatics.
∗ Auto switches are shipped together, (but not assembled).
∗∗ The D-M9□M and M9□VM type (lead wire length: 1 m) will be available with products delivered from August 2008 onwards.
∗∗∗ The water resistant improved D-M9□A and M9□AV type can be mounted, but cylinders are not designed to be water resistant improved construction.
Note) The D-M9□V, M9□WV, M9□AV, and A9□V type cannot be mounted on the port surface depending on the cylinder's stroke and the fitting size for piping. Please confirm with SMC separately.

JIS Symbol



Specifications

Equivalent bore size (mm)	20	25	32	40
Action	Double acting, Single rod			
Fluid	Air			
Proof pressure	1.0 MPa			
Maximum operating pressure	0.7 MPa			
Minimum operating pressure	0.08 MPa	0.05 MPa		
Ambient and fluid temperature	Without auto switch: –10 to 70 °C (No freezing)			
	With auto switch: –10 to 60 °C (No freezing)			
Cushion	Rubber bumper			
Rod end thread	Female thread, Male thread			
Stroke length tolerance	$^{+1.4}_{0}$			
Mounting	Through-hole/Both ends tapped common			
Piston speed	50 to 500 mm/s			

∗ The stroke length tolerance does not include the changed amount of the rubber bumper due to compression.

Theoretical Output

Unit (N)

Size	Rod size (mm)	Operating direction	Piston area (mm^2)	Operating pressure (MPa)		
				0.3	0.5	0.7
20	10	IN	236	71	118	165
		OUT	314	94	157	220
25	10	IN	412	124	206	288
		OUT	491	147	246	344
32	14	IN	650	195	325	455
		OUT	804	241	402	563
40	14	IN	1103	331	552	772
		OUT	1256	377	628	879

Standard Stroke

Unit (mm)

Size	Standard stroke
20, 25	5, 10, 15, 20, 25, 30, 35, 40, 45, 50
32, 40	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100

∗ Other intermediate strokes can be manufactured upon receipt of order. Please contact SMC.

Support Bracket Part No.

Size	Vertical foot Note 1)		Lateral foot		Double clevis
	Rod end	Head end	Rod end	Head end	
20	CQU-LR20	CQU-LH20	CQU-MR20	CQU-MH20	CQU-D20
25	CQU-L25		CQU-M25		CQU-D25
32	CQU-L32		CQU-M32		CQU-D32
40	CQU-L40		CQU-M40		CQU-D40

Note 1) When ordering a foot bracket of size 20, check which end, (rod end or head end), it will be on. For other sizes, the part number is common to both ends.

Note 2) Parts belonging to each bracket are as follows.
Vertical foot, Lateral foot: Body mounting bolt
Double clevis: Clevis pin, C-type retaining ring for shaft, Body mounting bolt

Mass

Unit (g)

Size	Cylinder stroke (mm)											
	5	10	15	20	25	30	35	40	45	50	75	100
20	105	115	125	134	144	153	163	173	182	192	—	—
25	127	138	148	159	169	180	190	201	211	222	—	—
32	199	214	228	243	257	272	286	301	315	330	402	475
40	264	282	299	316	333	351	368	385	403	420	506	593

Additional Mass

Unit (g)

Size		**20**	**25**	**32**	**40**
Rod end male thread	Male thread	19	19	32	32
	Nut	4	4	10	10
Vertical foot (Including mounting bolt)		84	91	122	162
Lateral foot (Including mounting bolt)		105	113	145	203
Double clevis (Including pin, retaining ring, mounting bolt)		60	76	149	266

How to Calculate
(Example) **CQUD32-50M**
- Basic mass: CQUB32-50 ..... 330 g
- Additional mass: Rod end male thread ..... 42 g
  Double clevis ..... 149 g

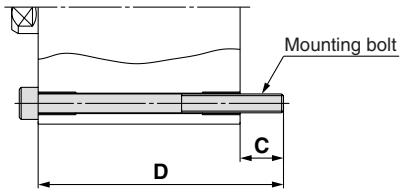
521 g

Mounting Bolt for CQU

How to Mount: Use this bolt for mounting into a through-hole.

How to Order: Add "Bolt" in front of the mounting bolt size.

Example) Bolt M5 x 60 L 2 pcs.



(mm)

Cylinder model	C	D	Mounting bolt size
CQUB20-5	7.5	55	M5 x 55 L
-10		60	x 60 L
-15		65	x 65 L
-20		70	x 70 L
-25		75	x 75 L
-30		80	x 80 L
-35		85	x 85 L
-40		90	x 90 L
-45		95	x 95 L
-50		100	x 100 L

(mm)

Cylinder model	C	D	Mounting bolt size
CQUB25-5	7.5	55	M5 x 55 L
-10		60	x 60 L
-15		65	x 65 L
-20		70	x 70 L
-25		75	x 75 L
-30		80	x 80 L
-35		85	x 85 L
-40		90	x 90 L
-45		95	x 95 L
-50		100	x 100 L

(mm)

Cylinder model	C	D	Mounting bolt size
CQUB32-5	10.5	65	M5 x 65 L
-10		70	x 70 L
-15		75	x 75 L
-20		80	x 80 L
-25		85	x 85 L
-30		90	x 90 L
-35		95	x 95 L
-40		100	x 100 L
-45		105	x 105 L
-50		110	x 110 L
-75		135	x 135 L
-100		160	x 160 L

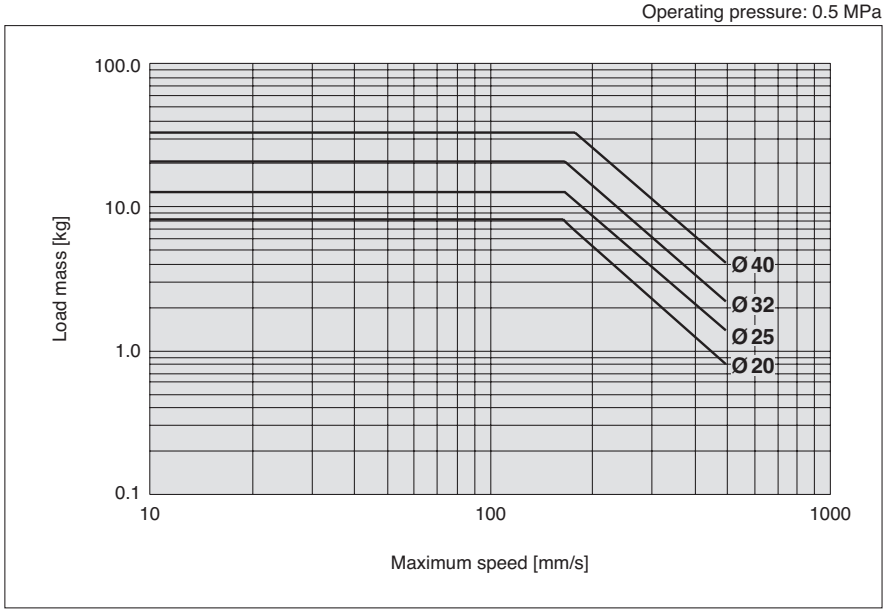
(mm)

Cylinder model	C	D	Mounting bolt size
CQUB40-5	10.5	65	M5 x 65 L
-10		70	x 70 L
-15		75	x 75 L
-20		80	x 80 L
-25		85	x 85 L
-30		90	x 90 L
-35		95	x 95 L
-40		100	x 100 L
-45		105	x 105 L
-50		110	x 110 L
-75		135	x 135 L
-100		160	x 160 L

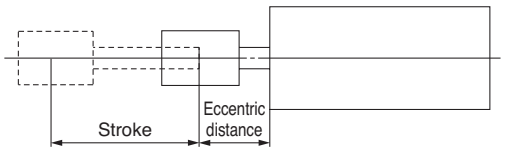
Material: Chromium molybdenum steel Surface treatment: Nickel plated

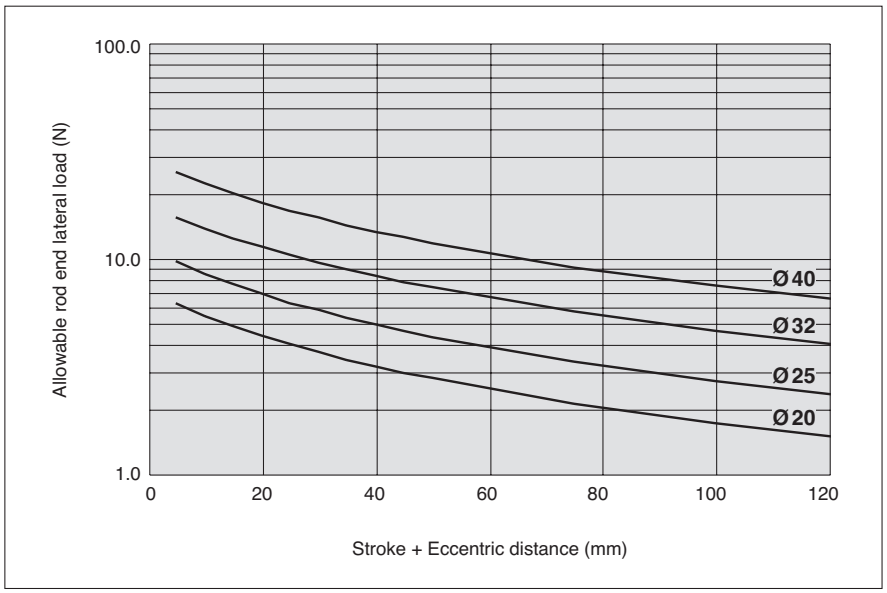
Allowable Kinetic Energy

Operating pressure: 0.5 MPa



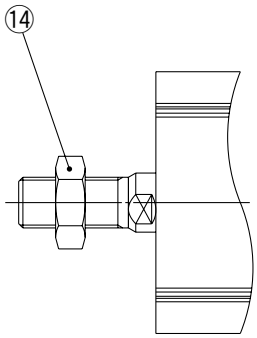
Allowable Rod End Lateral Load



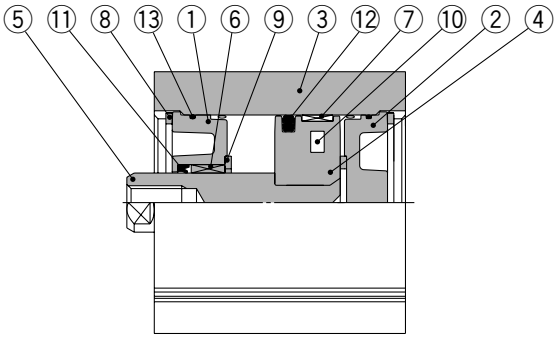


Allowable rod end lateral load can be found from the above graph. Do not apply a load beyond the line on the graph.

Construction



Rod end male thread



Component Parts

No.	Description	Material	Note
1	**Rod cover**	Aluminum die-casted	Chromated
2	**Head cover**	Aluminum die-casted	Chromated
3	**Cylinder tube**	Aluminum alloy	Hard anodized
4	**Piston**	Aluminum die-casted	Chromated
5	**Piston rod**	Carbon steel	Hard chrome plated
6	**Bushing**	Oil-impregnated sintered alloy	
7	**Wear ring**	Fluoropolymer	
8*	**N-type retaining ring**	Carbon tool steel	Phosphate coated
9	**Bumper**	Urethane	
10	**Magnet**	—	
11*	**Rod seal**	NBR	
12*	**Piston seal**	NBR	
13*	**O-ring**	NBR	Nickel plated
14	**Rod end nut**	Carbon steel	

Replacement Parts: Seal Kit

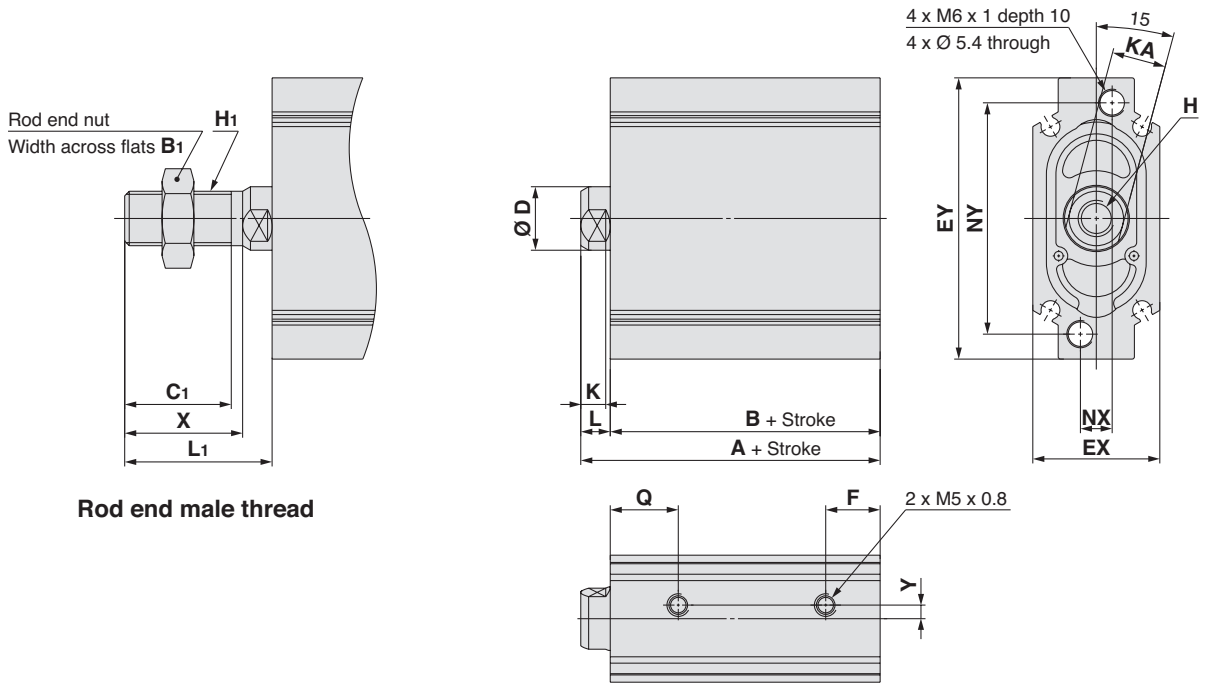
Size	Kit no.	Contents
20	CQUB20-PS	Set of component parts ⑧, ⑪, ⑫, ⑬
25	CQUB25-PS	
32	CQUB32-PS	
40	CQUB40-PS	

* Seal kit includes ⑧, ⑪, ⑫, ⑬. Order the seal kit, based on each size.
* Seal kit does not include a grease package. Order it separately.
* **Grease package part number: GR-S-010** (10 g)

Dimensions

∗ For auto switch mounting position and its mounting height, refer to page 9.

Basic (Through-hole/Both ends tapped common): CQUB



Rod end male thread

Basic

(mm)

Size	Stroke range (mm)	A	B	D	EX	EY	F	H	K	KA	L	NX	NY	Q	Y
20	5 to 50	49	42.5	10	22	47	11.5	M5 x 0.8 depth 8	5	8	6.5	5.5	36	15	3
25	5 to 50	49	42.5	10	24	53	11	M5 x 0.8 depth 8	5	8	6.5	5	41	14.5	4
32	5 to 100	56	49.5	14	28	62	12	M8 x 1.25 depth 13	6	12	6.5	7	51	15	3
40	5 to 100	56	49.5	14	31	80	12	M8 x 1.25 depth 13	6	12	6.5	7	69	15	3

Rod End Male Thread

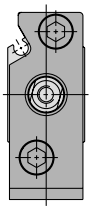
(mm)

Size	X	C1	B1	L1	H1
20	18	15.5	13	24.5	M8 x 1.25
25	18	15.5	13	24.5	M8 x 1.25
32	26	23.5	19	32.5	M12 x 1.25
40	26	23.5	19	32.5	M12 x 1.25

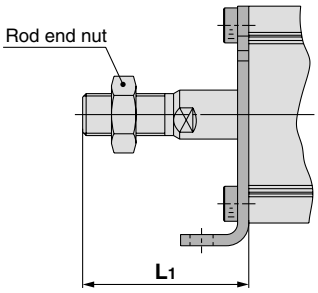
∗ For details about the rod end nut, refer to page 8.

Dimensions

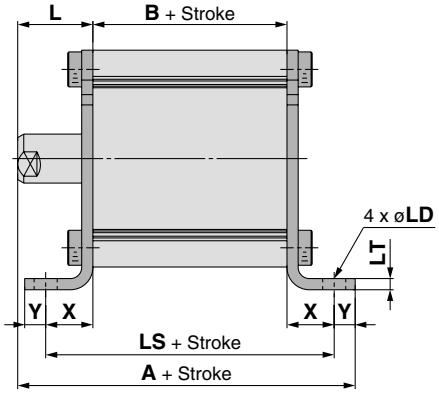
Vertical foot: CQUL

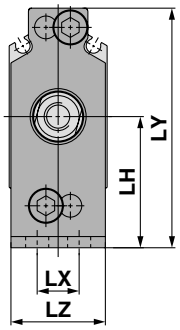


CQUL20



Rod end male thread





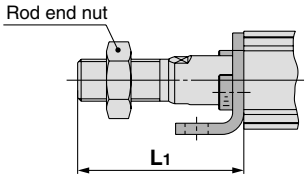
Vertical Foot

(mm)

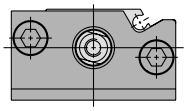
Size	Stroke range	A	B	L	L1	LD	LH	LS	LT	LX	LY	LZ	X	Y
20	5 to 50	82.5	42.5	21.5	39.5	6	30	67.5	3.2	11	53.5	21	12.5	6
25	5 to 50	82.5	42.5	21.5	39.5	6	32.5	67.5	3.2	11	59	23	12.5	6
32	5 to 100	90.5	49.5	21.5	47.5	7	37.5	76.5	3.2	12	68.5	27	13.5	6
40	5 to 100	99	49.5	26.5	52.5	9	46.5	79.5	3.2	15	86.5	30	15	8

Vertical foot bracket material: Carbon steel
Surface treatment: Nickel plated

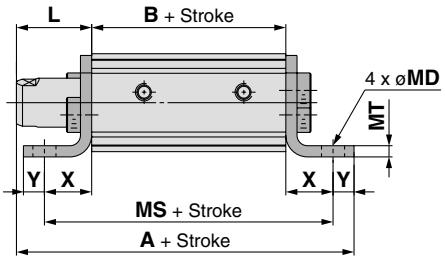
Lateral foot: CQUM

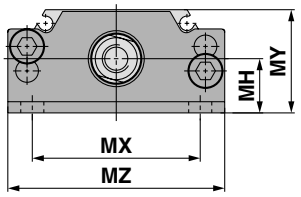


Rod end male thread



CQUM20





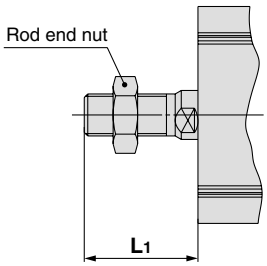
Lateral Foot

(mm)

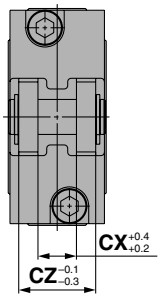
Size	Stroke range	A	B	L	L1	MD	MH	MS	MT	MX	MY	MZ	X	Y
20	5 to 50	82.5	42.5	21.5	39.5	6	15	67.5	3.2	36	26	47	12.5	6
25	5 to 50	82.5	42.5	21.5	39.5	6	14.5	67.5	3.2	42	26.5	53	12.5	6
32	5 to 100	90.5	49.5	21.5	47.5	7	15.5	76.5	3.2	48	29.5	62	13.5	6
40	5 to 100	99	49.5	26.5	52.5	9	16.5	79.5	3.2	63	32	80	15	8

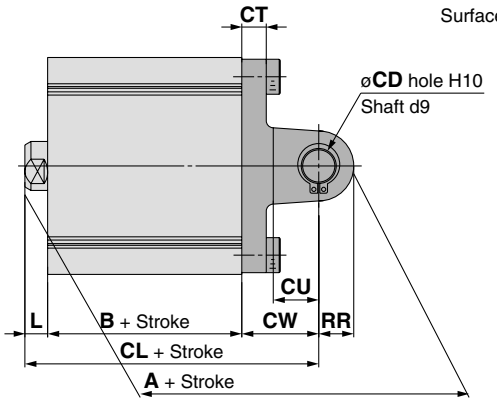
Lateral foot bracket material: Carbon steel
Surface treatment: Nickel plated

Double clevis: CQUD



Rod end male thread





Double Clevis

(mm)

Size	Stroke range	A	B	CD	CL	CT	CU	CW	CX	CZ	L	L1	RR
20	5 to 50	72	42.5	8	64	4	9	15	8	16	6.5	24.5	8
25	5 to 50	74	42.5	8	66	4	11	17	9	18	6.5	24.5	8
32	5 to 100	88	49.5	10	78	7	13	22	11	22	6.5	32.5	10
40	5 to 100	93	49.5	10	83	10	13	27	13	26	6.5	32.5	10

∗ For details about the rod end nut and accessory brackets, refer to page 8.

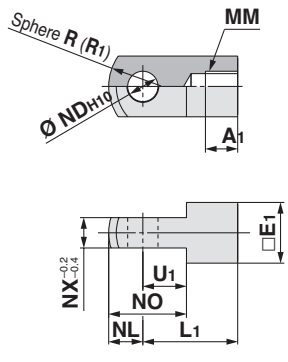
Double clevis bracket material: Carbon steel
Surface treatment: Metallic painted

Series CQU

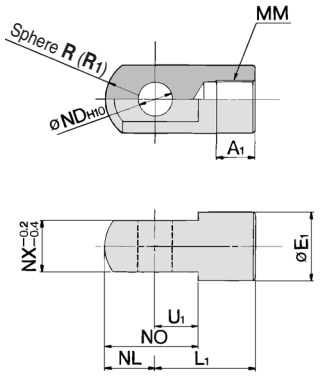
Accessory Brackets

Single Knuckle Joint

CQU20, CQU25



CQU32, CQU40



(mm)

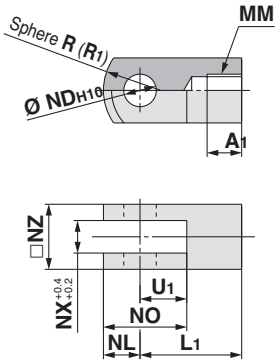
Part no.	Size	A_1	E_1	L_1	MM
I-G02	20, 25	8.5	16	25	M8 x 1.25
I-MU03	32, 40	12	18	31	M12 x 1.25

Part no.	ND_{H10}	NL	NO	NX	R_1	U_1
I-G02	$8^{+0.058}_{0}$	9	20.5	8	10.3	11.5
I-MU03	$10^{+0.058}_{0}$	10	24	11	10	14

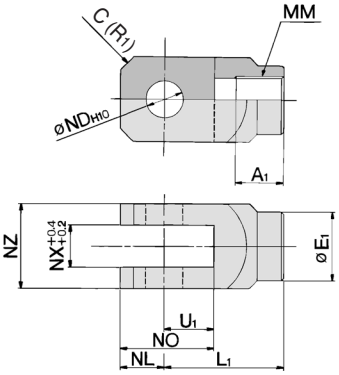
Single knuckle joint material: Rolled steel
Surface treatment: Nickel plated

Double Knuckle Joint

CQU20, CQU25



CQU32, CQU40



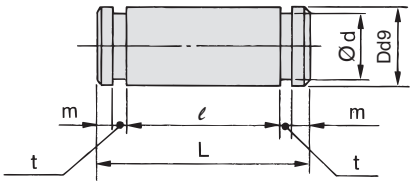
(mm)

Part no.	Size	A_1	E_1	L_1	MM	ND_{H10}
Y-G02	20, 25	8.5	—	25	M8 x 1.25	$8^{+0.058}_{0}$
Y-MU03	32, 40	12	18	31	M12 x 1.25	$10^{+0.058}_{0}$

Part no.	NL	NO	NX	NZ	R_1	U_1
Y-G02	9	20.5	8	16	10.3	11.5
Y-MU03	10	24	11	22	4	14

∗ Knuckle pin and retaining ring are included. Double knuckle joint material: Rolled steel
Surface treatment: Nickel plated

Knuckle Pin (Common with Double Clevis Pin)



(mm)

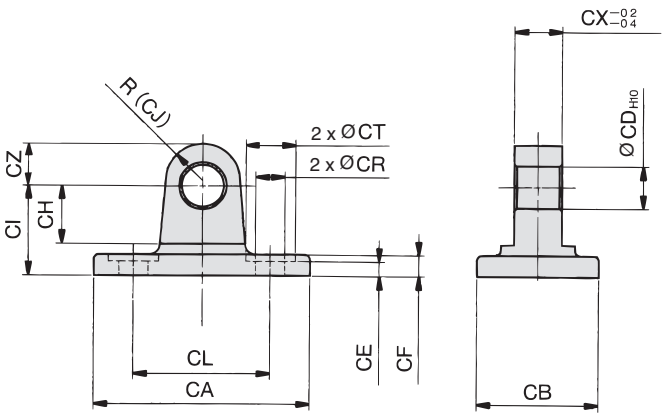
Part no.	Size	Dd9	L	d	ℓ
IY-G02	20	$8^{-0.040}_{-0.076}$	21	7.6	16.2
CD-MU02	25	$8^{-0.040}_{-0.076}$	23	7.6	18.2
CD-MU03	32	$10^{-0.040}_{-0.076}$	27	9.6	22.2
CD-MU04	40	$10^{-0.040}_{-0.076}$	31	9.6	26.2

Part no.	m	t	Applicable retaining ring
IY-G02	1.5	0.9	C-type 8 for shaft
CD-MU02	1.5	0.9	C-type 8 for shaft
CD-MU03	1.25	1.15	C-type 10 for shaft
CD-MU04	1.25	1.15	C-type 10 for shaft

Pin material: Carbon steel

∗ Knuckle pin is included in the double clevis and double knuckle joint as standard.
∗ C-type retaining ring for shaft is included.

Double Clevis Socket



(mm)

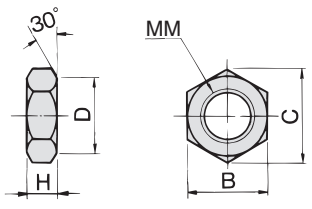
Part no.	Size	CA	CB	CD_{H10}	CE	CF	CH	CI	CJ
MU-C02	25	53	23	$8^{+0.058}_{0}$	3.5	4	11	17	7
MU-C03	32	67	27	$10^{+0.058}_{0}$	3.5	7	13	22	10
MU-C04	40	85	31	$10^{+0.058}_{0}$	3.5	10	13	27	10

Part no.	CL	CR	CT	CX	CZ
MU-C02	26	5.3	9.5	9	8
MU-C03	42	6.4	11	11	10
MU-C04	54	8.4	14	13	10

Double clevis socket material: Cast iron
Surface treatment: Painted

Note) Double clevis socket is available for sizes from 25 to 40.

Rod End Nut



(mm)

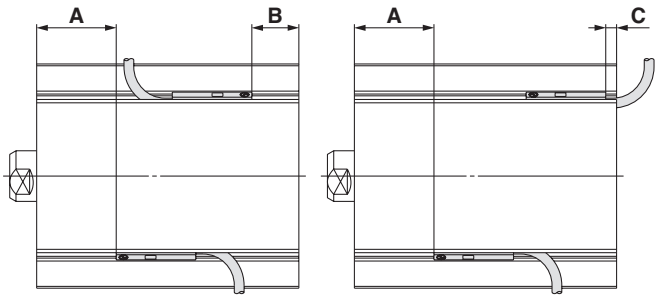
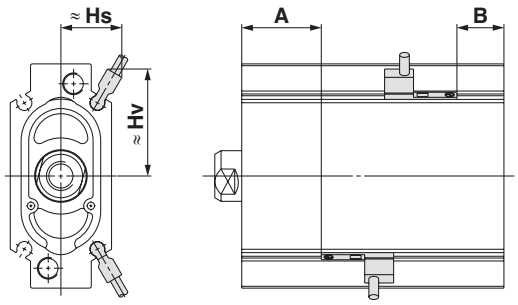
Part no.	Size	MM	H	B	C	D
NT-02	20, 25	M8 x 1.25	5	13	15.0	12.5
NT-MU03	32, 40	M12 x 1.25	7	19	21.9	18

∗ A nut is included in the rod end male thread as standard.

Rod end nut material: Carbon steel
Surface treatment: Nickel plated

CQU Series
Auto Switch Mounting

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

D-M9□ D-M9□W D-M9□A D-A9□	D-M9□V D-M9□WV D-M9□AV D-A9□V
	

(mm)

Size	D-M9□ D-M9□W D-M9□A			D-M9□V D-M9□WV D-M9□AV				D-A9□			D-A9□V			
	A	B	C	A	B	Hs	Hv	A	B	C	A	B	Hs	Hv
20	19	11.5	1.5	19	11.5	14	23	15	7.5	5.5 (3)	15	7.5	12.5	20.5
25	19	11.5	1.5	19	11.5	15.5	25	15	7.5	5.5 (3)	15	7.5	14	23
32	22	15	5	22	15	17	30	18.5	11	9 (6.5)	18.5	11	15.5	27.5
40	22	15	5	22	15	17.5	37.5	18.5	11	9 (6.5)	18.5	11	16.5	35

( ): D-A93

∗ For actual setting, check the operation of the auto switch and adjust as necessary.

Minimum Stroke for Auto Switch Mounting

(mm)

Number of auto switches	D-M9□ D-M9□V D-A9□ D-A9□V	D-M9□W D-M9□WV D-M9□A D-M9□AV
1 pc.	5	10
2 pcs.	10	15

Operating Range

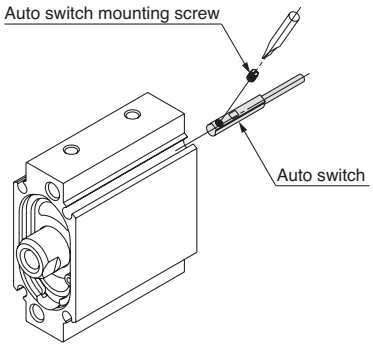
(mm)

Auto switch model	Size			
	20	**25**	**32**	**40**
D-M9□/M9□V Note)	2	2	2	2
D-M9□W/M9□WV **D-M9□A/M9□AV**	3	3	3.5	3
D-A9□/A9□V	6.5	6	6	5.5

∗ Since this is a guideline including hysteresis, not meant to be guaranteed. (Assuming approximately ±30% dispersion) Value may greatly change depending on the surrounding environment.

Note) In products delivered from August 2008 onwards, the value will be the same as the D-M9□W, M9□WV, M9□A, and M9□AV.

Auto Switch Mounting



Use a watchmaker's screwdriver with a grip diameter of 5 to 6 mm to tighten the auto switch mounting screw.

Tightening torque for auto switch mounting screw (N·m)

Auto switch model	Tightening torque
D-M9□(V) **D-M9□W(V)** **D-A93**	0.05 to 0.15
D-M9□A(V)	0.05 to 0.10
D-A9□(V) (Excludes the D-A93)	0.10 to 0.20

Before Operation
Auto Switch Common Specifications (1)

⚠ Specific Product Precautions

Before handling auto switches, refer to "Handling Precautions for SMC Products" (M-E03-3) for Auto Switches Precautions.

Auto Switch Common Specifications

Type	Reed switch	Solid state switch
Leakage current	None	3-wire: 100 A or less 2-wire: 0.8 mA or less
Operating time	1.2 ms	1 ms or less
Impact resistance	300 m/s^2	1000 m/s^2
Insulation resistance	50 M 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	IEC60529 standard IP67	

Lead Wire

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) 1 m (M): Available D-M9□□(V) only
The D-M9□M and M9□VM (lead wire length: 1 m) will be available with products delivered from August 2008 onwards.
Note 2) Lead wire length (Z): 5 m
Solid state switch: Manufactured upon receipt of order as standard.
Note 3) Tolerance of lead wire length

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

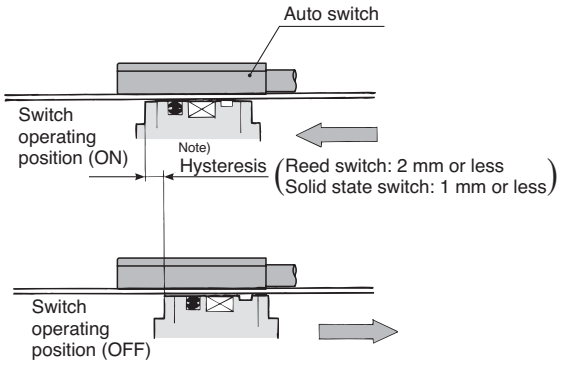
Before Operation
Auto Switch Common Specifications (2)

⚠ Specific Product Precautions

Before handling auto switches, refer to "Handling Precautions for SMC Products" (M-E03-3) for Auto Switches Precautions.

Auto Switch Hysteresis

Hysteresis is the distance between auto switch operating positions ON and OFF. The switch turns on when the piston moves, and it turns off when the piston moves to the opposite side. The operating range values (single side) partly include the hysteresis.



Note) Hysteresis will vary depending on the operating environment and cannot be guaranteed. Please contact SMC if hysteresis will be a problem when using auto switches.

Contact Protection Box: CD-P11, CD-P12

<Applicable switch model>

D-A9/A9□V type

The above auto switch type is not equipped with a built-in contact protection circuit. Also, due to the construction, solid state switches do not require a contact protection box.

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.**

Use a contact protection box for any of the above cases:
The contact life may be shortened (due to permanent energizing conditions).

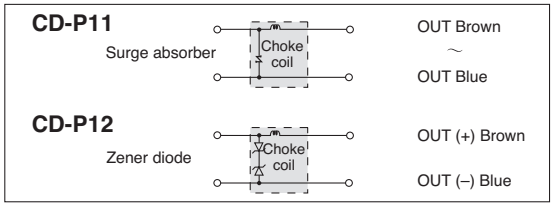
(Where the load voltage is 110 VAC)
When the load voltage is increased by 10 % to the rating of applicable auto switches above, use a contact protection box (CD-P11) to reduce the upper limit of the load current by 10 % so that it can be set within the range of the load current, enabling to use at 110 VAC.

Specifications

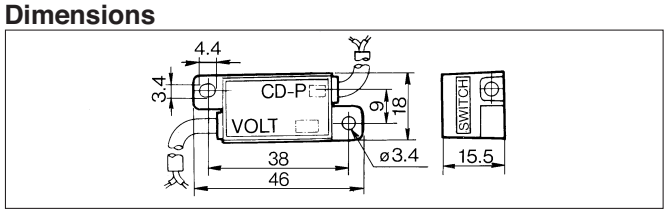
Part no.	CD-P11		CD-P12
Load voltage	100 VAC or less	200 VAC	24 VDC
Max. load current	25 mA	12.5 mA	50 mA

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

Internal Circuit



Dimensions



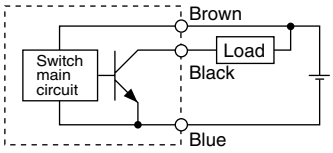
Connection

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 meter.

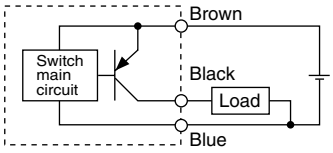
Before Operation
Auto Switch/Connections and Examples

Basic Wiring

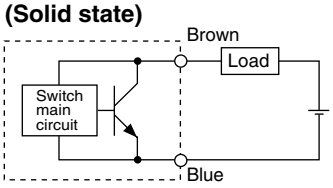
Solid state 3-wire, NPN



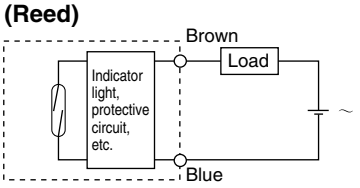
Solid state 3-wire, PNP



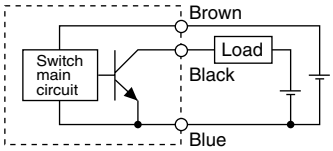
2-wire (Solid state)

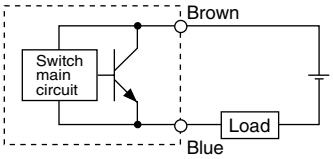


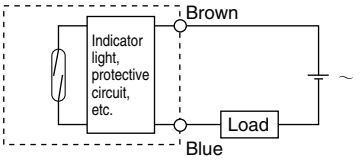
2-wire (Reed)



(Power supplies for switch and load are separate.)



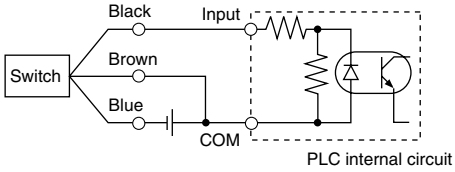




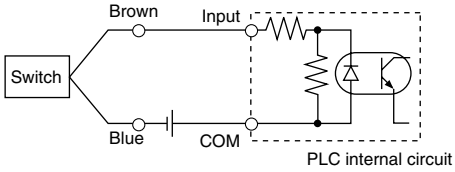
Example of Connection to PLC (Programmable Logic Controller)

• Sink input specification

3-wire, NPN

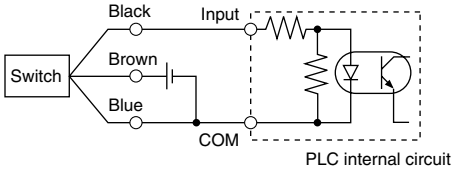


2-wire

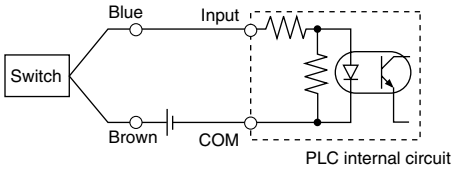


• Source input specification

3-wire, PNP



2-wire

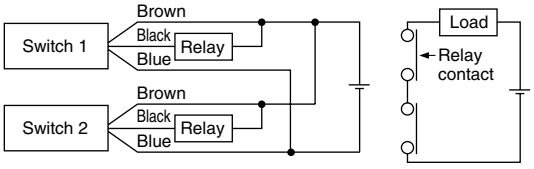


Connect according to the PLC input specifications, since the connection method will differ depending on the PLC input specifications.

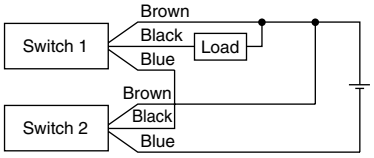
Example of AND (Serial) and OR (Parallel) Connection

• 3-wire

AND connection for NPN output (using relays)

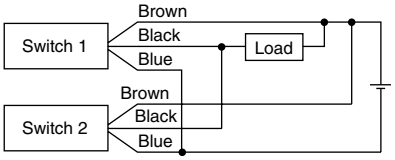


AND connection for NPN output (performed with switches only)



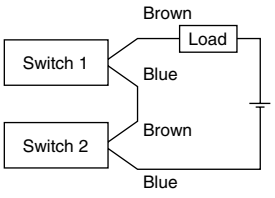
The indicator lights will illuminate when both switches are turned ON.

OR connection for NPN output



• 2-wire

2-switch AND connection

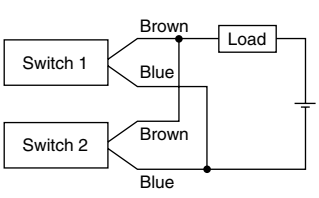


When two switches are connected in series, a load may malfunction because the load voltage will decrease in the ON state.
The indicator lights will illuminate if both switches are turned ON.

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 voltage: 24 VDC
Auto switch internal voltage drop: 4 V

2-switch OR connection



(Solid state)
When two switches are connected in parallel, malfunction may occur because the load voltage will increase 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: 3 kΩ
Auto switch leakage current: 1 mA

(Reed)
Because there is no leakage current, the load voltage will not increase in the OFF state. 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.

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

For details about certified products conforming to international standards, visit us at www.smc.eu

Grommet

- **2-wire load current is reduced (2.5 to 40 mA).**
- **Flexibility is 1.5 times greater than the conventional model (SMC comparison).**
- **Using flexible cable as standard specification**

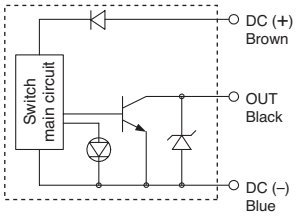
⚠Caution

Precautions

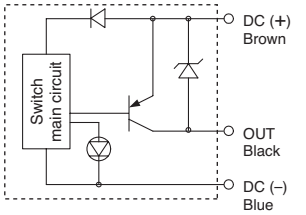
Fix the auto switch with the set screw attached to the auto switch body. The auto switch may be damaged if an unspecified screw is used.

Auto Switch Internal Circuit

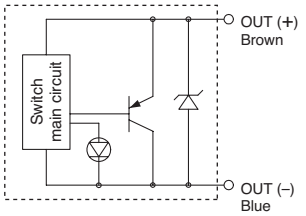
D-M9N(V)



D-M9P(V)



D-M9B(V)



Auto Switch Specifications

PLC: Programmable Logic Controller

D-M9□(V) (With indicator light)						
Auto switch model	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 at 10 mA (2 V or less at 40 mA)				4 V or less	
Leakage current	100 A or less at 24 VDC				0.8 mA or less	
Indicator light	Red LED illuminates when turned ON.					
Standard	CE marking					

- Lead wires — Oilproof heavy-duty vinyl cable: Ø 2.7 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 10 for solid state switch common specifications.
Note 2) Refer to page 10 for lead wire lengths.

Mass

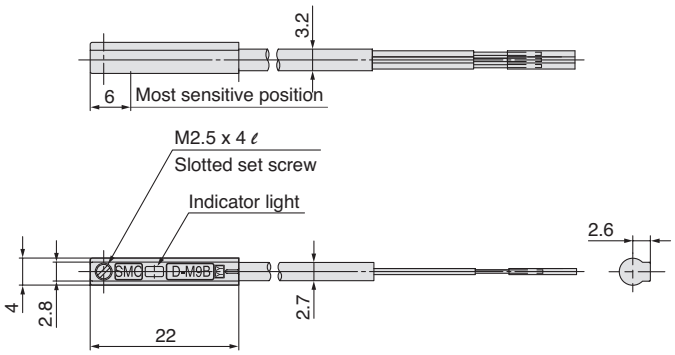
Unit: g

Auto switch model		D-M9N(V)	D-M9P(V)	D-M9B(V)
Lead wire length (m)	0.5	8	8	7
	1	14	14	13
	3	41	41	38
	5	68	68	63

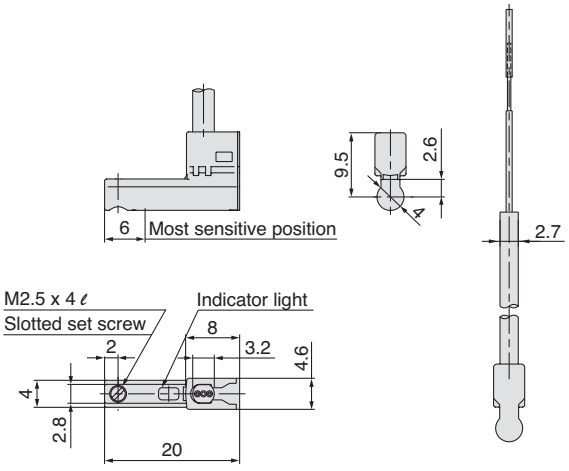
Dimensions

Unit: mm

D-M9□



D-M9□V



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).**
- **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)**

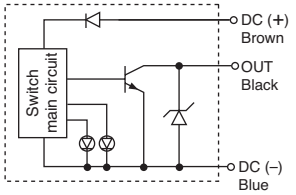
⚠Caution

Precautions

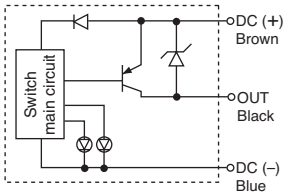
Fix the auto switch with the set screw attached to the auto switch body. The auto switch may be damaged if an unspecified screw is used.

Auto Switch Internal Circuit

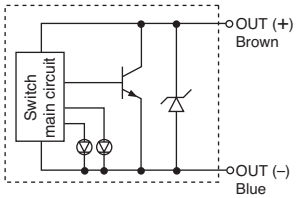
D-M9NW(V)



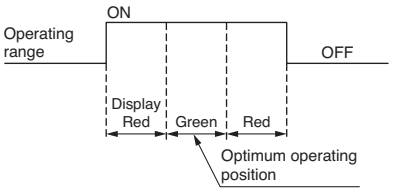
D-M9PW(V)



D-M9BW(V)



Indicator light / Display method



Auto Switch Specifications

For details about certified products conforming to international standards, visit us at www.smc.eu.

PLC: Programmable Logic Controller

D-M9□W(V) (With indicator light)						
Auto switch model	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 A or less at 24 VDC				0.8 mA or less	
Indicator light	Operating position ····· Red LED illuminates. Optimum operating position ····· Green LED illuminates.					
Standard	CE marking					

- Lead wires — Oilproof flexible heavy-duty vinyl cable: Ø 2.7 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 10 for solid state switch common specifications.
Note 2) Refer to page 10 for lead wire lengths.

Mass

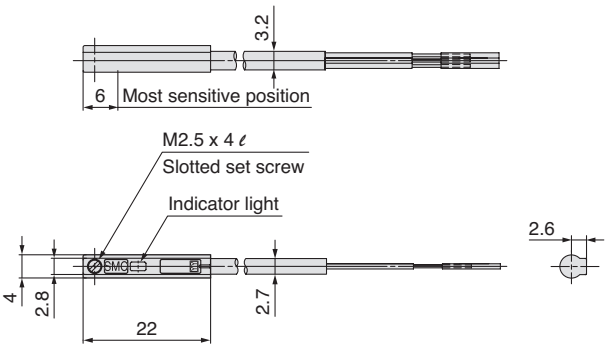
Unit: g

Auto switch model		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

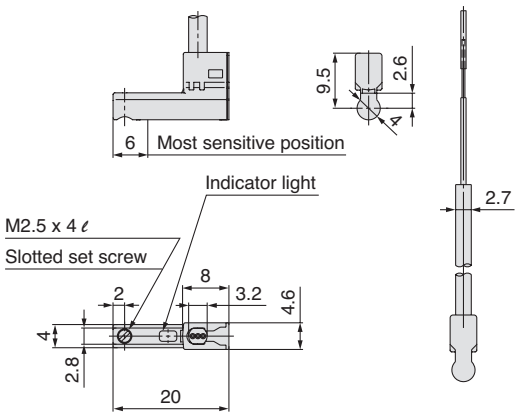
Dimensions

Unit: mm

D-M9□W



D-M9□WV

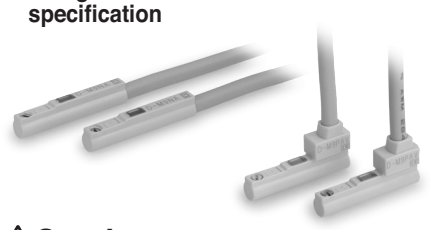


SMC

Water Resistant 2-Colour Indication Solid State Switch: Direct Mounting Style
D-M9NA(V)/D-M9PA(V)/D-M9BA(V) CE

Grommet

- Water (coolant) resistant type
- 2-wire load current is reduced (2.5 to 40 mA).
- The optimum operating position can be determined by the colour of the light. (Red Æ Green ¨ Red)
- Using flexible cable as standard specification



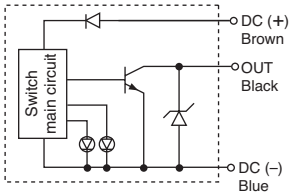
⚠Caution

Precautions

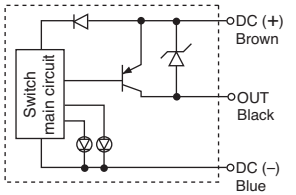
Fix the auto switch with the set screw attached to the auto switch body. The auto switch may be damaged if an unspecified screw is used.

Auto Switch Internal Circuit

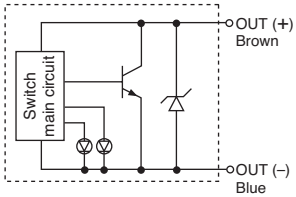
D-M9NA(V)



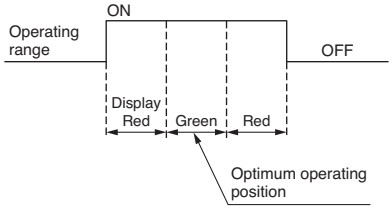
D-M9PA(V)



D-M9BA(V)



Indicator light / Display method



Auto Switch Specifications

PLC: Programmable Logic Controller

D-M9□A(V) (With indicator light)						
Auto switch model	D-M9NA	D-M9NAV	D-M9PA	D-M9PAV	D-M9BA	D-M9BAV
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 A or less at 24 VDC				0.8 mA or less	
Indicator light	Operating position ····· Red LED illuminates. Optimum operating position ····· Green LED illuminates.					
Standard	CE marking					

- Lead wires — Oilproof flexible heavy-duty vinyl cable: Ø 2.7 x 3.2 ellipse
  D-M9BA(V) 0.15 mm² x 2 cores
  D-M9NA(V), D-M9PA(V) 0.15 mm² x 3 cores

Note 1) Refer to page 10 for solid state switch common specifications.
Note 2) Refer to page 10 for lead wire lengths.

Mass

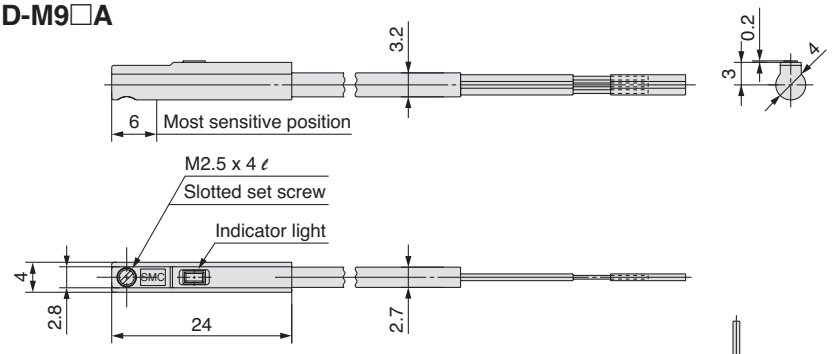
Unit: g

Auto switch model		D-M9NA(V)	D-M9PA(V)	D-M9BA(V)
Lead wire length (m)	0.5	8	8	7
	1	14	14	13
	3	41	41	38
	5	68	68	63

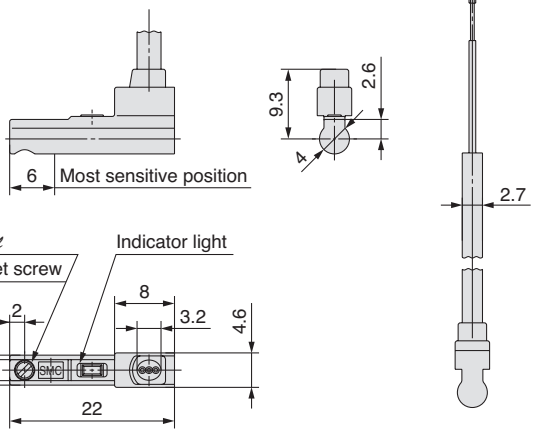
Dimensions

Unit: mm

D-M9□A



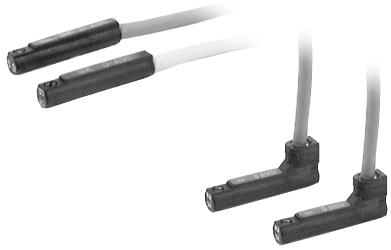
D-M9□AV



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

For details about certified products conforming to international standards, visit us at www.smc.eu.

Grommet



⚠Caution

Precautions

Fix the auto switch with the set screw attached to the auto switch body. The auto switch may be damaged if an unspecified screw is used.

Auto Switch Specifications

PLC: Programmable Logic Controller

D-A90(V) (Without indicator light)			
Auto switch model	D-A90/D-A90V		
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 or less (including lead wire length of 3 m)		
Standard	CE marking		

D-A93(V)/D-A96(V) (With indicator light)			
Auto switch model	D-A93/D-A93V		D-A96/D-A96V
Applicable load	Relay, PLC		IC circuit
Load voltage	24 VDC	100 VAC	4 to 8 VDC
Load current range and max. load current Note 3)	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	CE marking		

● Lead wires
D-A90(V)/D-A93(V) — Oilproof heavy-duty vinyl cable: Ø 2.7, 0.18 mm² x 2 cores (Brown, Blue), 0.5 m
D-A96(V) — Oilproof heavy-duty vinyl cable: Ø 2.7, 0.15 mm² x 3 cores (Brown, Black, Blue), 0.5 m

Note 1) Refer to page 10 for reed switch common specifications.
Note 2) Refer to page 10 for lead wire lengths.
Note 3) Under 5 mA, the visuality of an indicator light is worsen. Furthermore, although it could be impossible to recognize it under 2.5 mA, but there would be no problem only with 1 mA or more in terms of the contact output.

Mass

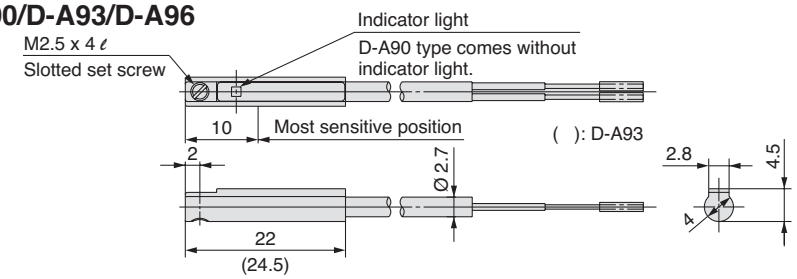
Unit: g

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

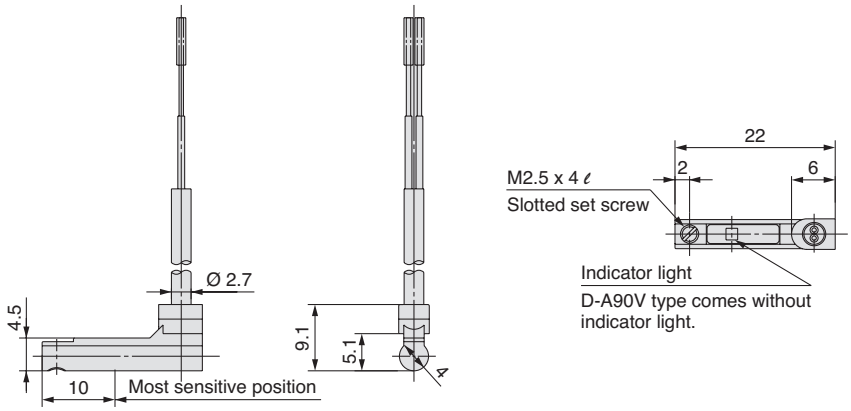
Dimensions

Unit: mm

D-A90/D-A93/D-A96

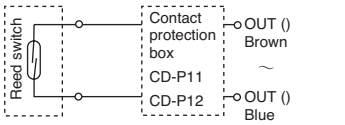


D-A90V/D-A93V/D-A96V

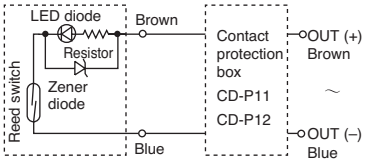


Auto Switch Internal Circuit

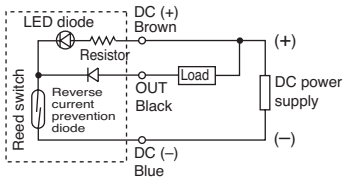
D-A90(V)



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 length is greater than 5 m.
③ In a case where the load voltage is 100 VAC.

Use a contact protection box for any of the above cases since the contact life may be shortened. (For details about the contact protection box, refer to page 11.)

Series CQU
Specific Product Precautions

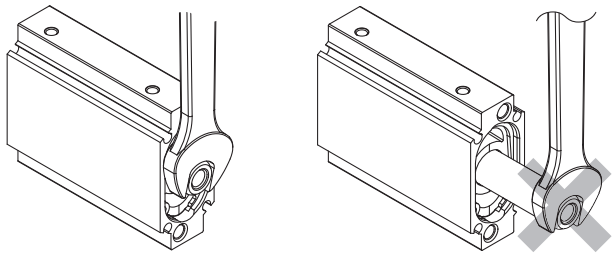
Be sure to read this before handling.
Refer to back page 2 for Safety Instructions, "Handling Precautions for SMC Products" (M-E03-3) for Actuators Precautions.

Precautions

⚠Caution

1. All loads to piston rod must be applied in axial direction only.
- When a lateral load is applied unavoidably, ensure that it should not exceed the allowable lateral load to the rod end as specified on page 4.
- When installing a cylinder, centring should be required accurately.
- Adoption of guide mechanism is strongly recommended for the case when the CQU is used as stopper to prevent non-rotating piston rod from side loads.

2. When securing a workpiece to the end of the piston rod, ensure that the piston rod is retracted entirely, and tighten using the width across flats on the rod end, making sure to avoid the application of rotational torque on the piston rod.



3. Operating the cylinder by connecting the piping directly to the cylinder can cause the piston speed to exceed the maximum operating speed of 500 mm/s. Therefore, to operate the cylinder, make sure to use an SMC speed controller and adjust the piston speed to 500 mm/s or less.

Retaining Ring Installation/Removal

⚠Caution

1. For installation and removal, use an appropriate pair of pliers (tool for installing a C-type retaining ring).

2. Even if a proper plier (tool for installing a C-type retaining ring) is used, it is likely to inflict damage to a human body or peripheral equipment, as a retaining ring may be flown out of the tip of a plier (tool for installing a C-type retaining ring). Be much careful with the popping of a retaining ring. Besides, be certain that a retaining ring is placed firmly into the groove of rod cover before supplying air at the time of installment.

3. Do not reuse the retaining ring once it has been removed. (The retaining ring is included in the seal kit.)

SMC Logo

⚠Caution

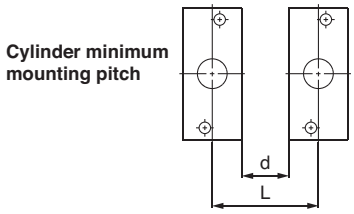
1. The direction of the SMC logo on the end face of the head cover is not specified in relation to the port position.

Handing of Auto Switches

Be sure to read this before handling.
Refer to "Handling Precautions for SMC Products" (M-E03-3) for Auto Switches Precautions.

⚠Warning

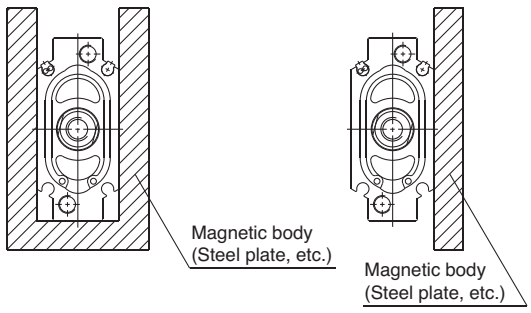
1. If multiple cylinders are operated adjacent to each other, the magnets that are enclosed in the adjacent cylinders could affect the operation of the auto switches, causing the switches to malfunction. Therefore, make sure that the mounting pitch of the cylinders is at least that indicated in the table below.



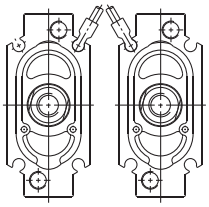
(mm)

Size	20	25	32	40
L	30	29	33	36
d	8	5	5	5

2. If the cylinder is used in an application in which a magnetic material is placed in close contact around the cylinder as shown in the graph below (including cases in which even one of the sides is in close contact) the operation of auto switches could become unstable. Therefore, please check with SMC for this type of application.



3. When multiple cylinders are installed close together and an auto switch with perpendicular entry for lead wire is used, the auto switch will protrude from the end of the tube, so take care to avoid interference. (Refer to page 9.)



Ⓐ Back page 1

⚠ Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of **"Caution," "Warning"** or **"Danger."** They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC) [1)], and other safety regulations.

⚠ **Danger:**	**Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
⚠ **Warning:**	**Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
⚠ **Caution:**	**Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

1) ISO 4414: Pneumatic fluid power – General rules and safety requirements for systems and their components.
ISO 4413: Hydraulic fluid power – General rules and safety requirements for systems and their components.
IEC 60204-1: Safety of machinery – Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.
etc.

⚠ Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.
Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.
The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/ equipment until safety is confirmed.
1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Our products cannot be used beyond their specifications.
Our products are not developed, designed, and manufactured to be used under the following conditions or environments.
Use under such conditions or environments is not covered.
1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, fuel equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogues and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.

⚠ Caution

We develop, design, and manufacture our products to be used for automatic control equipment, and provide them for peaceful use in manufacturing industries.
Use in non-manufacturing industries is not covered.
Products we manufacture and sell cannot be used for the purpose of transactions or certification specified in the Measurement Act.
The new Measurement Act prohibits use of any unit other than SI units in Japan.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first. [2)] Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided. This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.

2) Vacuum pads are excluded from this 1 year warranty.
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered. Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

SMC Corporation (Europe)

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Croatia	+385 (0)13707288	www.smc.hr	sales.hr@smc.com
Czech Republic	+420 541424611	www.smc.cz	office.at@smc.com
Denmark	+45 70252900	www.smcdk.com	smc.dk@smc.com
Estonia	+372 651 0370	www.smcee.ee	info.ee@smc.com
Finland	+358 207513513	www.smc.fi	smc.fi@smc.com
France	+33 (0)164761000	www.smc-france.fr	smc.fi@smc.com
Germany	+49 (0)61034020	www.smc.de	info.de@smc.com
Greece	+30 210 2717265	www.smchellas.gr	sales@smchellas.gr
Hungary	+36 23513000	www.smc.hu	office.hu@smc.com
Ireland	+353 (0)14039000	www.smcautomation.ie	technical.ie@smc.com
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