Free Mount Cylinder

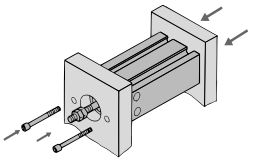
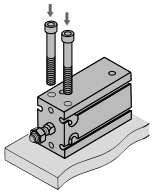
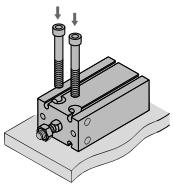
Series CU

A space-saving air cylinder with multiple surfaces capable of mounting directly. Offered in rich variations.

Space-saving

The multiple surface direct mounting with a square body and no brackets allows the freedom of the mounting surface.
This enables space-saving designs for equipment.

Mounting

Axial mounting (Body tapped)	Vertical mounting (Body through-holes)	Lateral mounting (Body through-holes)
		

Series Variations

Series	Action	Rod	Bore size (mm)	Page
Standard *Series CU* 	Double acting	Single rod	6, 10, 16, 20, 25, 32	483
		Double rod		490
	Single acting	Single rod (Spring return/Extend)		495
Non-rotating *Series CUK* 	Double acting	Single rod		502
		Double rod		506
	Single acting	Single rod (Spring return/Extend)		510
Long stroke *Series CU* 	Double acting	Single rod		516
Long stroke, Non-rotating rod *Series CUK* 	Double acting	Single rod		520
With air cushion *Series CU-A* 	Double acting	Single rod	20, 25, 32	524
For vacuum *Series ZCUK* 	Double acting	Single rod	10, 16, 20, 25, 32	533

Combinations of Standard Products and Made

Series CU

●: Standard
◎: Made to Order specifications
○: Special product (Contact SMC for details.)
—: Not available

Symbol	Specification	Applicable bore size	CU (Standard)			CUK (Non-rotating)			
			Double acting		Single acting	Double acting		Single acting	
			Single rod	Double rod	Single rod	Single rod	Double rod	Single rod	
			ø6 to ø32						
Standard	Standard	ø6 to ø32	●	●	●	●	●	●	
D	Built-in magnet		●	●	●	●	●	●	
10-, 11-, 21-, 22-	Clean series	ø6 to ø25	●	—	—	—	—	—	
20-	Copper and Fluorine-free	ø6 to ø32	●	○	○	●	○	○	
XB6	Heat-resistant cylinder (–10 to 150 °C)	ø6 to ø32	◎	○	—	◎	○	—	
XB7	Cold-resistant cylinder (–40 to 70 °C)		◎	○	—	◎	○	—	
XB9	Low-speed cylinder (5 to 50 mm/s)		◎	○	—	◎	○	—	
XB13	Low-speed cylinder (5 to 50 mm/s)		◎	○	—	◎	○	—	
XC19	Intermediate stroke (5 mm spacer)		◎	○	—	◎	○	—	
XC22	Fluororubber seals		◎	○	◎	◎	○	◎	
XC34	Rod not extending beyond non-rotating plate		—	—	—	◎	○	◎	

Note) Refer to Best Pneumatics No. 3 for low-speed cylinders.

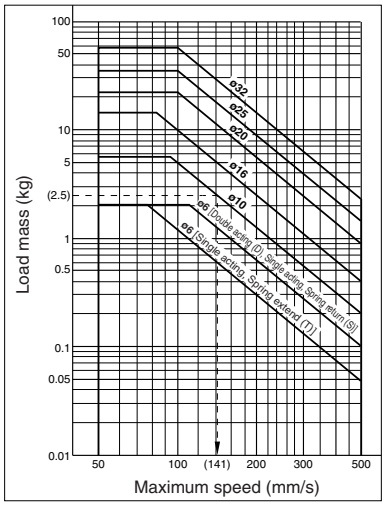
	CU (Long stroke)		CUK (Long stroke, Non-rotating)		CU-A (Air cushion)	ZCUK (For vacuum)	CUX (Low-speed cylinder) Note)
	Double acting		Double acting		Double acting	Double acting	Double acting
	Single rod	Double rod	Single rod	Double rod	Single rod	Single rod	Single rod
	ø6 to ø32				ø20 to ø32	ø10 to ø32	
	●	●	●	●	●	●	●
	●	●	●	●	●	●	●
	—	—	—	—	—	—	○ (ø16 or more)
	●	○	●	○	○	○	—
	◎	○	◎	○	—	○	—
	◎	○	◎	○	—	○	—
	◎	○	◎	○	—	○	—
	◎	○	◎	○	—	○	—
	◎	○	◎	○	—	○	○
	◎	○	◎	○	—	○	—
	—	—	◎	○	—	○	—

Precautions on Free Mount

1. Operating speed

Make sure to connect a speed controller to the cylinder and adjust its speed to 500 mm/s or less.
If a load is to be attached to the end of the rod, adjust the speed to the maximum speed shown in Graph (1) or less, in accordance with the added mass.

Graph (1) Load Mass and Maximum Speed



How to read the graph
- Using the CU10 to drive a load weighing 2.5 kg: From the vertical axis in the graph on the left, extend the horizontally from 2.5 kg., and drop down from the point at which it intersects with the tube bore ø10. The maximum speed will be 141 mm/s.

2. Rod end allowable lateral load

Make sure that the lateral load that is applied to the rod end will be no more than the values shown in the tables.
The tables show the value for a single rod. For double rods, please contact SMC.

Standard Double Acting, Single Rod

Without auto switch: CU□-□D (N)

Model	Stroke (mm)												
	5	10	15	20	25	30	40	50	60	70	80	90	100
CU6	0.085	0.075	0.068	0.061	0.056	0.052	0.045	0.039	0.035	—	—	—	—
CU10	0.34	0.30	0.27	0.25	0.23	0.21	0.18	0.16	0.15	—	—	—	—
CU16	0.69	0.61	0.55	0.50	0.46	0.43	0.37	0.33	0.29	—	—	—	—
CU20	2.2	2.0	1.8	1.6	1.5	1.4	1.2	1.1	1.0	0.92	0.85	0.78	0.73
CU25	3.5	3.2	3.0	2.7	2.6	2.4	2.1	1.9	1.7	1.6	1.4	1.3	1.2
CU32	5.4	4.9	4.6	4.3	4.0	3.8	3.3	3.0	2.8	2.5	2.3	2.2	2.0

With auto switch: CDU□-□D (N)

Model	Stroke (mm)												
	5	10	15	20	25	30	40	50	60	70	80	90	100
CDU6	0.085	0.075	0.068	0.061	0.056	0.052	0.045	0.039	0.035	—	—	—	—
CDU10	0.34	0.30	0.27	0.25	0.23	0.21	0.18	0.16	0.15	—	—	—	—
CDU16	0.99	0.89	0.81	0.74	0.69	0.64	0.56	0.50	0.45	—	—	—	—
CDU20	3.0	2.7	2.5	2.3	2.1	2.0	1.8	1.6	1.4	1.3	1.2	1.1	1.0
CDU25	4.7	4.3	4.0	3.7	3.5	3.2	2.9	2.6	2.4	2.2	2.0	1.9	1.7
CDU32	7.1	6.6	6.1	5.7	5.4	5.1	4.6	4.1	3.8	3.5	3.2	3.0	2.8

Non-rotating Rod Type

Without auto switch: CUK□-□D (N)

Model	Stroke (mm)												
	5	10	15	20	25	30	40	50	60	70	80	90	100
CUK6	0.075	0.068	0.061	0.056	0.052	0.048	0.042	0.037	0.033	—	—	—	—
CUK10	0.30	0.27	0.25	0.23	0.21	0.20	0.17	0.15	0.14	—	—	—	—
CUK16	0.55	0.50	0.46	0.43	0.40	0.37	0.33	0.29	0.26	—	—	—	—
CUK20	1.8	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.92	0.85	0.78	0.73	0.68
CUK25	3.0	2.7	2.6	2.4	2.2	2.1	1.9	1.7	1.6	1.4	1.3	1.2	1.2
CUK32	4.3	4.0	3.8	3.5	3.3	3.2	2.9	2.6	2.4	2.2	2.1	2.0	1.8

With auto switch: CDUK□-□D (N)

Model	Stroke (mm)												
	5	10	15	20	25	30	40	50	60	70	80	90	100
CDUK6	0.075	0.068	0.061	0.056	0.052	0.048	0.042	0.037	0.033	—	—	—	—
CDUK10	0.30	0.27	0.25	0.23	0.21	0.20	0.17	0.15	0.14	—	—	—	—
CDUK16	0.81	0.74	0.69	0.64	0.60	0.56	0.50	0.45	0.41	—	—	—	—
CDUK20	2.5	2.3	2.1	2.0	1.9	1.8	1.6	1.4	1.3	1.2	1.1	1.0	1.0
CDUK25	4.0	3.7	3.5	3.2	3.1	2.9	2.6	2.4	2.2	2.0	1.9	1.7	1.6
CDUK32	5.7	5.4	5.1	4.8	4.6	4.4	4.0	3.6	3.4	3.1	2.9	2.7	2.6

Single Acting, Spring Return (S)

Without auto switch: CU□-□S (N)

Model	Stroke (mm)		
	5	10	15
CU6	0.19	0.17	0.15
CU10	0.66	0.59	0.60
CU16	1.4	1.3	1.3
CU20	4.7	4.2	4.4
CU25	6.8	6.2	6.5
CU32	10	9.8	10

With auto switch: CDU□-□S (N)

Model	Stroke (mm)		
	5	10	15
CDU6	0.17	0.15	0.13
CDU10	0.66	0.59	0.60
CDU16	1.6	1.5	1.5
CDU20	5.3	4.8	4.9
CDU25	7.6	7.0	7.2
CDU32	12	11	11

Single Acting, Spring Extend (T)

Without auto switch: CU□-□T (N)

Model	Stroke (mm)		
	5	10	15
CU6	0.067	0.059	0.052
CU10	0.29	0.26	0.24
CU16	0.99	0.89	0.81
CU20	2.2	2.0	1.8
CU25	3.5	3.2	3.0
CU32	5.4	4.9	4.6

With auto switch: CDU□-□T (N)

Model	Stroke (mm)		
	5	10	15
CDU6	0.062	0.055	0.049
CDU10	0.29	0.26	0.24
CDU16	0.99	0.89	0.81
CDU20	3.0	2.7	2.5
CDU25	4.7	4.3	4.0
CDU32	7.1	6.6	6.1

Non-rotating Rod Type

Single Acting, Spring Return (S)

Without auto switch: CUK□-□S (N)

Model	Stroke (mm)		
	5	10	15
CUK6	0.17	0.15	0.14
CUK10	0.59	0.54	0.56
CUK16	1.1	1.0	1.1
CUK20	3.9	3.6	3.8
CUK25	5.7	5.3	5.7
CUK32	8.5	7.9	8.6

With auto switch: CDUK□-□S (N)

Model	Stroke (mm)		
	5	10	15
CDUK6	0.15	0.13	0.12
CDUK10	0.59	0.54	0.56
CDUK16	1.3	1.2	1.3
CDUK20	4.4	4.1	4.3
CDUK25	6.5	6.1	6.4
CDUK32	9.7	9.1	9.6

Non-rotating Rod Type

Single Acting, Spring Extend (T)

Without auto switch: CUK□-□T (N)

Model	Stroke (mm)		
	5	10	15
CUK6	0.059	0.052	0.047
CUK10	0.26	0.24	0.22
CUK16	0.81	0.74	0.69
CUK20	1.8	1.6	1.5
CUK25	3.0	2.7	2.6
CUK32	4.3	4.0	3.8

With auto switch: CDUK□-□T (N)

Model	Stroke (mm)		
	5	10	15
CDUK6	0.055	0.049	0.044
CDUK10	0.26	0.24	0.22
CDUK16	0.81	0.74	0.69
CDUK20	2.5	2.3	2.1
CDUK25	4.0	3.7	3.5
CDUK32	5.7	5.4	5.1

Free Mount Cylinder
Double Acting, Single Rod
Series CU
ø6, ø10, ø16, ø20, ø25, ø32

How to Order

CU **6** **[ ]** – **30** **D** – **[ ]**

With auto switch **CDU** **6** **[ ]** – **30** **D** – **M9BW** **[ ]** – **[ ]**

Built-in magnet

Bore size

6	6 mm
10	10 mm
16	16 mm
20	20 mm
25	25 mm
32	32 mm

Port thread type

Symbol	Type	Bore size
Nil	M5 x 0.8	ø6, ø10, ø16, ø20, ø25
	Rc 1/8	ø32
TN	NPT 1/8	ø32
TF	G 1/8	ø32

Standard stroke (mm)

ø6, ø10, ø16	5, 10, 15, 20, 25, 30
ø20, ø25, ø32	5, 10, 15, 20, 25, 30, 40, 50

Action

D	Double acting

Auto switch

Nil	Without auto switch

∗ Refer to the table below for applicable auto switches.

Number of auto switches

Nil	2 pcs.
S	1 pc.

Made to order

∗ Refer to page 484 for the Made to Order specifications.

Built-in Magnet Cylinder Model

If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch.
(Example): CDU20-25D

Applicable Auto Switches/Refer to pages 1263 to 1371 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-color indication)			3-wire (NPN)		5 V, 12 V		**M9NWV**	**M9NW**	●	●	●	○	○	IC circuit	
				3-wire (PNP)				**M9PWV**	**M9PW**	●	●	●	○	○		
				2-wire		12 V		**M9BWV**	**M9BW**	●	●	●	○	○	—	
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 ····· Nil (Example) M9NW
1 m ····· M (Example) M9NWM
3 m ····· L (Example) M9NWL
5 m ····· Z (Example) M9NWZ

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

∗ Since there are applicable auto switches other than the above, refer to page 538 for details.
∗ For detail about auto switches with pre-wired connector, refer to pages 1328 to 1329.
∗ Auto switches are shipped together but not assembled.

JIS Symbol

Double acting,
Single rod

Specifications

Bore size (mm)	6	10	16	20	25	32
Fluid	Air					
Proof pressure	1.05 MPa					
Maximum operating pressure	0.7 MPa					
Minimum operating pressure	0.12 MPa	0.06 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)					
Lubrication	Non-lube					
Piston speed	50 to 500 mm/s					
Cushion	Rubber bumper					
Rod end thread	Male thread					
Stroke length tolerance	$^{+1.0}_{0}$ mm					

Standard Stroke

Bore size (mm)	Standard stroke (mm)
6, **10**, **16**	5, 10, 15, 20, 25, 30
20, **25**, **32**	5, 10, 15, 20, 25, 30, 40, 50

For "Long Stroke", refer to page 516.

Theoretical Output

(N)

Bore size (mm)	Rod size (mm)	Operating direction	Piston area (mm^2)	Operating pressure (MPa)		
				0.3	0.5	0.7
6	**3**	OUT	28.3	8.49	14.2	19.8
		IN	21.2	6.36	10.6	14.8
10	**4**	OUT	78.5	23.6	39.3	55.0
		IN	66.0	19.8	33.0	46.2
16	**6**	OUT	201	60.3	101	141
		IN	172	51.6	86.0	121
20	**8**	OUT	314	94.2	157	220
		IN	264	79.2	132	185
25	**10**	OUT	491	147	246	344
		IN	412	124	206	288
32	**12**	OUT	804	241	402	563
		IN	691	207	346	454

Made to Order Specifications

(For details, refer to pages 1395 to 1498.)

Symbol	Specifications
-XB6	Heat resistant (–10 to 150°C)
-XB7	Cold resistant (–40 to 70°C)
-XB9	Low speed (10 to 50 mm/s)
-XB13	Low speed (5 to 50 mm/s)
-XC19	Intermediate stroke (5 mm spacer)
-XC22	Fluororubber seals

Tightening Torque/

When mounting Series CU, refer to the below table.

Bore size (mm)	Hexagon socket head cap screw dia.	Proper tightening torque (N·m)
6, 10	M3	1.08 ±10%
16	M4	2.45 ±10%
20, 25	M5	5.10 ±10%
32	M6	8.04 ±10%

Mass

/( ): Denotes the values with D-A93.

(g)

Model	Cylinder stroke (mm)							
	5	10	15	20	25	30	40	50
C(D)U6-□D	22 (27)	25 (35)	28 (38)	31 (41)	34 (44)	37 (47)	—	—
C(D)U10-□D	36 (41)	40 (50)	44 (54)	48 (58)	52 (62)	56 (66)	—	—
C(D)U16-□D	50 (75)	56 (86)	62 (92)	68 (98)	74 (104)	80 (110)	—	—
C(D)U20-□D	95 (128)	106 (143)	117 (154)	128 (165)	139 (176)	150 (187)	172 (209)	194 (231)
C(D)U25-□D	176 (230)	193 (252)	210 (269)	227 (286)	244 (303)	261 (320)	295 (354)	329 (388)
C(D)U32-□D	262 (335)	286 (364)	310 (388)	334 (412)	358 (436)	382 (460)	430 (508)	478 (556)

∗ For the auto switch mass, refer to page 1263.

Copper and Fluorine-free

20-CU | **Bore size** | – | **Stroke** | **D**

•Copper and Fluorine-free

This cylinder eliminates any influences of copper ions or fluoro resins on color CRTs. Copper materials have been nickel plated or replaced with non-copper materials to prevent the generation of copper ions.

Minimum Operating Pressure

(MPa)

Bore size (mm)	6	10, 16	20, 25, 32
Minimum operating pressure	0.12	0.06	0.05

Specifications

Action	Double acting, Single rod
Bore size (mm)	6, 10, 16, 20, 25, 32
Maximum operating pressure	1.05 MPa
Cushion	Rubber bumper
Stroke	Same as standard (Refer to page 484.)
Auto switch	Mountable

Low-speed Cylinder

CU X | **Mounting bracket** | **Bore size** | – | **Stroke**

•Low-speed Cylinder

Smooth operation with a little sticking and slipping at low speed.
Can start smoothly with a little ejection even after being rendered for hours.

Specifications

Bore size (mm)	10	16	20	25	32
Fluid	Air				
Proof pressure	1.05 MPa				
Max. operating pressure	0.7 MPa				
Ambient and fluid temperature	Without auto switch: –10 to 70°C (No freezing) With auto switch: –10 to 60°C (No freezing)				
Lubricant	Not applicable (Non-lube)				
Piston speed	ø10, ø16: 1 to 300 mm/s ø20 to ø32: 0.5 to 300 mm/s				
Cushion	Rubber bumper on both ends				
Rod end thread	Male thread				
Stroke length tolerance	$^{+1.0}_{0}$ Note)				
Mounting bracket	Basic				

Note) Hysteresis $^{+1.0}_{0}$

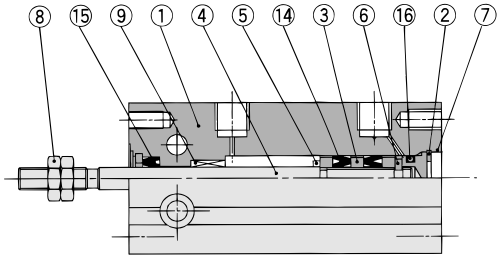
Minimum Operating Pressure

Bore size (mm)	10	16	20	25	32
Minimum Operating Pressure (MPa)	0.06	0.06	0.05	0.05	0.05

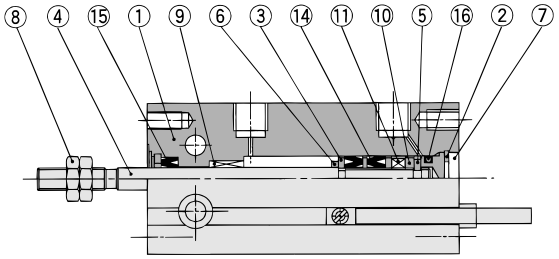
Refer to Best Pneumatics No. 3 for details.

Construction

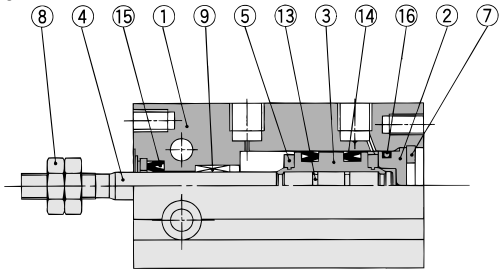
ø6

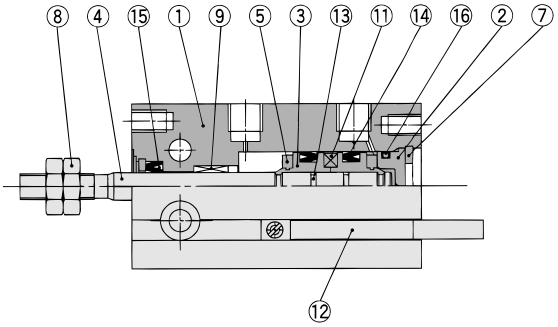


With auto switch

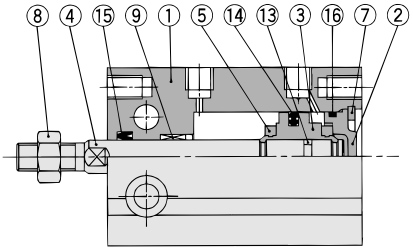


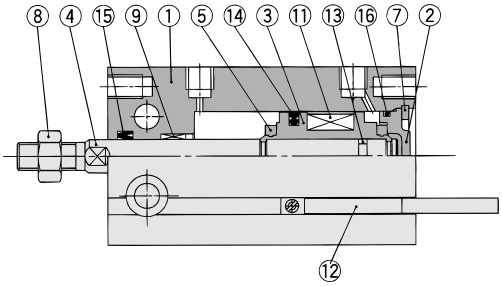
ø10





ø16 to ø32





Component Parts

No.	Description	Material	Note
1	**Cylinder tube**	Aluminum alloy	Hard anodized
2	**Head cover**	Brass	ø6 to ø10, Electroless nickel plated
		Aluminum alloy	ø16 to ø32, Chromated
3	**Piston**	Brass	ø6 to ø10
		Aluminum alloy	ø16 to ø32, Chromated
4	**Piston rod**	Stainless steel	
5	**Bumper A**	Urethane	
6	**Bumper B**	Urethane	
7	**Retaining ring**	Carbon tool steel	Phosphate coated

Component Parts

No.	Description	Material	Note
8	**Rod end nut**	Carbon steel	Nickel plated
9	**Bushing**	Oil-impregnated sintered alloy	
10	**Magnet holder**	Brass	ø6
11	**Magnet**	—	
12	**Auto switch**	—	
13	**Piston gasket**	NBR	
14*	**Piston seal**		
15*	**Rod seal**		
16*	**Gasket**		

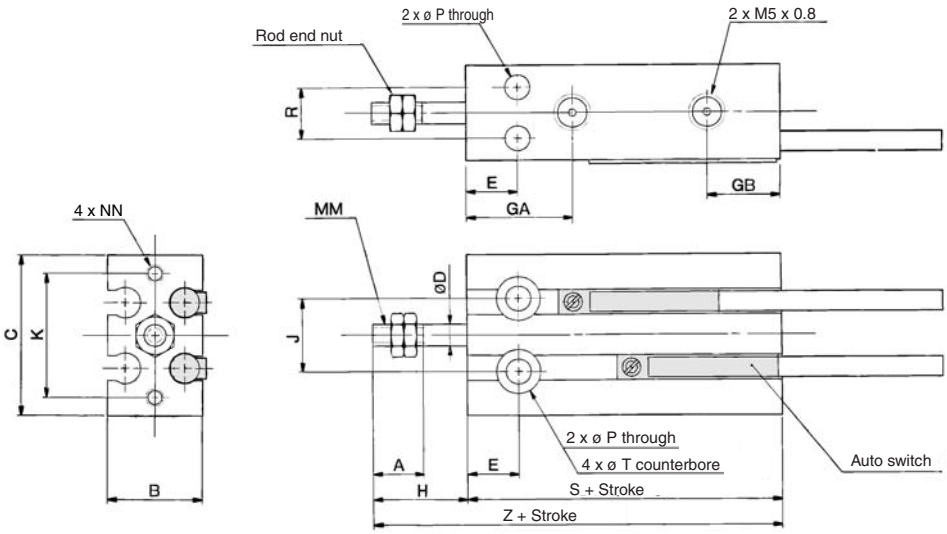
Replacement Parts: Seal Kit

Bore size (mm)	Kit no.	Contents
10	CU10D-PS	Set of nos. above ⑭, ⑮, ⑯
16	CU16D-PS	
20	CU20D-PS	
25	CU25D-PS	
32	CU32D-PS	

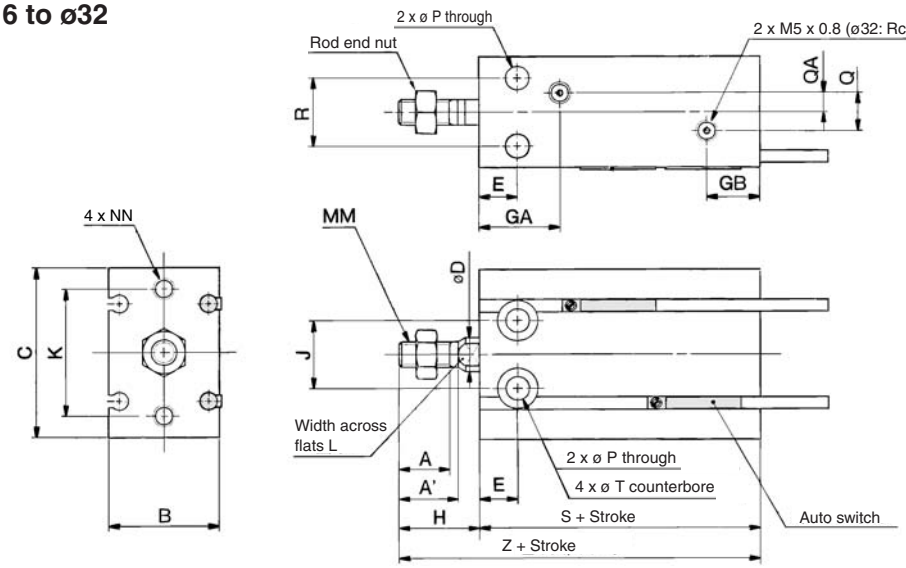
* Seal kit includes ⑭, ⑮, ⑯. Order the seal kit, based on each bore size.
* Seal kit includes a grease pack (10 g).
Order with the following part number when only the grease pack is needed.
Grease pack part number: GR-S-010 (10 g)

Dimensions: Double Acting, Single Rod

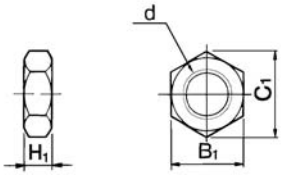
ø6, ø10



ø16 to ø32



Rod End Nut/Accessory



Material: Carbon steel

Part no.	Applicable bore size (mm)	d	H_1	B_1	C_1
NTP-006	**6**	M3 x 0.5	1.8	5.5	6.4
NTP-010	**10**	M4 x 0.7	2.4	7	8.1
NTJ-015A	**16**	M5 x 0.8	4	8	9.2
NT-015A	**20**	M6 x 1.0	5	10	11.5
NT-02	**25**	M8 x 1.25	5	13	15.0
NT-03	**32**	M10 x 1.25	6	17	19.6

(mm)

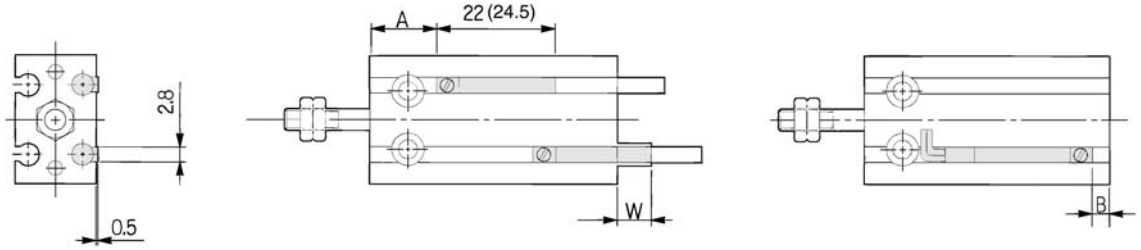
Bore size (mm)	A	A'	B	C	D	E	GA	GB	H	J	K	L	MM	NN	P	Q	QA
6	7	—	13	22	3	7	15	10	13	10	17	—	M3 x 0.5	M3 x 0.5 depth 5	3.2	—	—
10	10	—	15	24	4	7	16.5	10	16	11	18	—	M4 x 0.7	M3 x 0.5 depth 5	3.2	—	—
16	11	12.5	20	32	6	7	16.5[Note]	11.5	16	14	25	5	M5 x 0.8	M4 x 0.7 depth 6	4.5	4	2
20	12	14	26	40	8	9	19	12.5	19	16	30	6	M6 x 1.0	M5 x 0.8 depth 8	5.5	9	4.5
25	15.5	18	32	50	10	10	21.5	13	23	20	38	8	M8 x 1.25	M5 x 0.8 depth 8	5.5	9	4.5
32	19.5	22	40	62	12	11	23	12.5	27	24	48	10	M10 x 1.25	M6 x 1.0 depth 9	6.6	13.5	4.5

Bore size (mm)	R	T	Without auto switch		With auto switch	
			S	Z	S	Z
6	7	6 depth 4.8	33	46	33	46
10	9	6 depth 5	36	52	36	52
16	12	7.6 depth 6.5	30	46	40	56
20	16	9.3 depth 8	36	55	46	65
25	20	9.3 depth 9	40	63	50	73
32	24	11 depth 11.5	42	69	52	79

Note) 5 stroke (CU16-5D): 14.5 mm

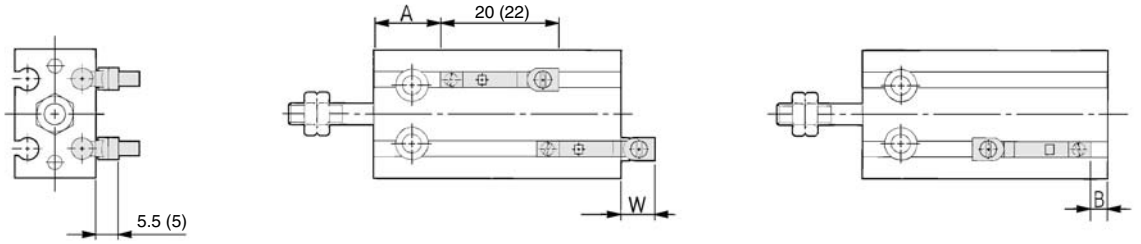
Proper Auto Switch Mounting Position (Detection at stroke end) and Its Mounting Height

D-A9□
D-M9□
D-M9□W



( ): Denotes the values of D-A93.

D-A9□V
D-M9□V
D-M9□WV



( ): Denotes the values of D-A9□V.

(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	W	A	B	W
6	13.5	–0.5	2.5 (5)	17.5	3.5	6.5	17.5	3.5	4.5
10	12.5	3.5	–1.5 (1)	16.5	7.5	2.5	16.5	7.5	0.5
16	16	4	–2 (0.5)	20	8	1.5	20	8	–0.5
20	20	6	–4 (–1.5)	24	10	0	24	10	–2
25	22.5	7	–5.5 (–3)	26.5	11	–1.5	26.5	11	–3.5
32	23.5	8.5	–6.5 (–4)	27.5	12.5	–2.5	27.5	12.5	–4.5

Note 1) Figures in the table above are used as a reference when mounting the auto switches for stroke end detection. In the case of actually setting the auto switches, adjust them after confirming their operation.
Note 2) Negative figures in the table W indicate an auto switch is mounted inward from the edge of the cylinder body.
Note 3) In the case of the 5 stroke or the 10 stroke, there are times in which the switch will not turn OFF or 2 switches will turn ON simultaneously due to their movement range. Therefore, set the position approximately 1 to 4 mm outward from the values given in the table above. Then, perform an operation inspection to make sure that the switches operate normally (if 1 switch is used, make sure that it turns ON and OFF properly; if 2 switches are used, make sure that both switches turn ON).
Note 4) ( ) in column W is the dimensions of D-A93.

Operating Range

(mm)

Auto switch model	Bore size					
	6	**10**	**16**	**20**	**25**	**32**
D-A9□, A9□V	5	6	9	11	12.5	14
D-M9□, M9□V **D-M9□W, M9□WV**	3	4	5.5	7	7	7.5

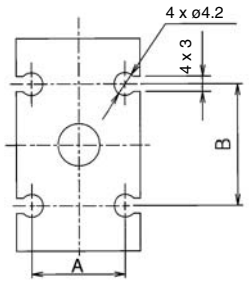
∗ Since the operating range is provided as a guideline including hysteresis, it cannot be guaranteed (assuming approximately ±30% dispersion). It may vary substantially depending on an ambient environment.

Minimum Stroke for Auto Switch Mounting

(mm)

No. of auto switches mounted	Applicable auto switch		
	D-A9□, D-A9□V	**D-M9□, D-M9□V**	**D-M9□W, D-M9□WV**
1 pc.	5	5	5
2 pcs.	10	5	10

Auto Switch Groove Position

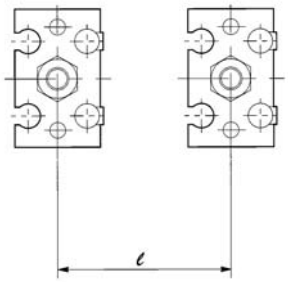


(mm)

Bore size (mm)	**A**	**B**
6	8.2	9
10	10.3	13
16	15	18
20	21	23
25	27	25
32	35	27

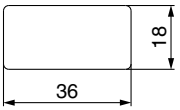
Caution on Proximity Installation

When free mounting cylinders equipped with auto switches are used, the auto switches could activate unintentionally if the installed distance is less than the dimensions shown in the table. Therefore, make sure to provide a greater clearance. Due to unavoidable circumstances, if they must be used with less distance than the dimensions given in the table, the cylinders must be shielded. Therefore, affix a steel plate or a magnetic shield plate (MU-S025) to the area on the cylinder that corresponds to the adjacent auto switch. (Please contact SMC for details.) Auto switches may malfunction if a shield plate is not used.



Bore size (mm)	Mounting pitch ℓ (mm)
6	18
10	20
16	33
20	40
25	46
32	56

Dimensions of shield plate (MU-S025) that is sold separately are indicated as reference.



Material: Ferrite stainless steel, Thickness: 0.3 mm
The product can be attached to the cylinder since the bottom side is a seal type.

Free Mount Cylinder
Double Acting, Double Rod
Series CUW
ø6, ø10, ø16, ø20, ø25, ø32

How to Order

CUW [6] [ ] – [30] [D]

With auto switch **CDUW** [6] [ ] – [30] [D] – [M9BW] [ ]

Built-in magnet

Double rod

Bore size

6	6 mm
10	10 mm
16	16 mm
20	20 mm
25	25 mm
32	32 mm

Port thread type

Symbol	Type	Bore size
Nil	M5 x 0.8	ø6, ø10, ø16, ø20, ø25
	Rc 1/8	ø32
TN	NPT 1/8	ø32
TF	G 1/8	ø32

Action

D	Double acting

Standard stroke (mm)

ø6, ø10, ø16	5, 10, 15, 20, 25, 30, 40, 50, 60
ø20, ø25, ø32	5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100

Auto switch

Nil	Without auto switch

∗ Refer to the table below for applicable auto switches.

Number of auto switches

Nil	2 pcs.
S	1 pc.

Built-in Magnet Cylinder Model

If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch.
(Example): CDUW20-30D

Applicable Auto Switches/Refer to pages 1263 to 1371 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage DC	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-color indication)			3-wire (NPN)		5 V, 12 V		**M9NWV**	**M9NW**	●	●	●	○	○	IC circuit	
				3-wire (PNP)				**M9PWV**	**M9PW**	●	●	●	○	○		
				2-wire		12 V		**M9BWV**	**M9BW**	●	●	●	○	○	—	
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 ····· Nil (Example) M9NW
1 m ····· M (Example) M9NWM
3 m ····· L (Example) M9NWL
5 m ····· Z (Example) M9NWZ

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

∗ Since there are applicable auto switches other than the above, refer to page 538 for details.
∗ For detail about auto switches with pre-wired connector, refer to pages 1328 to 1329.
∗ Auto switches are shipped together but not assembled.

Specifications

Bore size (mm)	6	10	16	20	25	32
Fluid	Air					
Proof pressure	1.05 MPa					
Maximum operating pressure	0.7 MPa					
Minimum operating pressure	0.15 MPa	0.10 MPa		0.08 MPa		
Ambient and fluid temperature	Without auto switch: –10 to 70°C (No freezing) With auto switch: –10 to 60°C (No freezing)					
Lubrication	Non-lube					
Piston speed	50 to 500 mm/s					
Cushion	Rubber bumper					
Rod end thread	Male thread					
Stroke length tolerance	$^{+1.0}_{0}$ mm					

Standard Stroke

Bore size (mm)	Standard stroke (mm)
6, **10**, **16**	5, 10, 15, 20, 25, 30, 40, 50, 60
20, **25**, **32**	5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100

JIS Symbol
Double acting,
Double rod

Theoretical Output

(N)

Bore size (mm)	Rod size (mm)	Piston area (mm^2)	Operating pressure (MPa)		
			0.3	0.5	0.7
6	3	21.2	6.36	10.6	14.8
10	4	66.0	19.8	33.0	46.2
16	6	172	51.6	86.0	121
20	8	264	79.2	132	185
25	10	412	124	206	288
32	12	691	207	346	484

Mass

/( ): Denotes the values with D-A93.

(g)

Model	Stroke (mm)												
	5	10	15	20	25	30	40	50	60	70	80	90	100
C(D)UW6-□D	27 (32)	30 (40)	34 (44)	37 (47)	40 (50)	44 (54)	51 (61)	58 (68)	65 (75)	—	—	—	—
C(D)UW10-□D	44 (49)	49 (59)	53 (63)	58 (68)	62 (72)	67 (77)	76 (86)	85 (95)	94 (104)	—	—	—	—
C(D)UW16-□D	74 (99)	81 (111)	88 (118)	95 (125)	102 (132)	109 (139)	123 (153)	137 (167)	151 (181)	—	—	—	—
C(D)UW20-□D	132 (165)	145 (182)	158 (195)	171 (208)	184 (221)	197 (234)	223 (260)	250 (287)	275 (312)	301 (338)	327 (364)	353 (390)	379 (416)
C(D)UW25-□D	240 (294)	260 (319)	280 (339)	300 (359)	321 (380)	341 (400)	381 (440)	421 (480)	461 (520)	501 (560)	541 (600)	581 (640)	621 (680)
C(D)UW32-□D	365 (438)	394 (472)	422 (500)	451 (529)	479 (557)	508 (586)	586 (664)	622 (700)	679 (757)	736 (814)	793 (871)	850 (928)	907 (985)

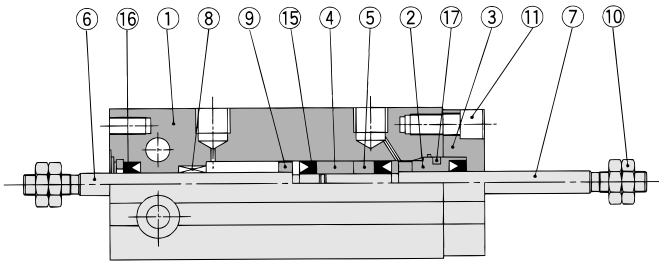
∗ For the auto switch mass, refer to page 1263.

Tightening Torque

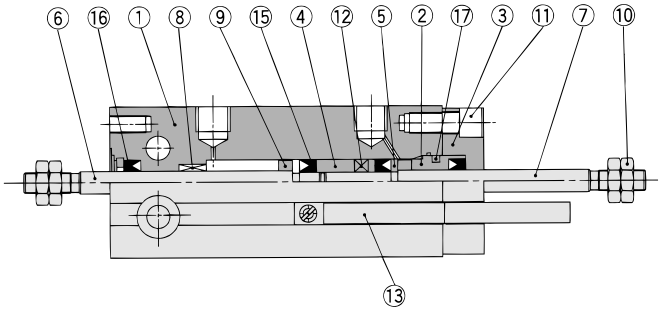
When mounting Series CUW, refer to page 484.

Construction

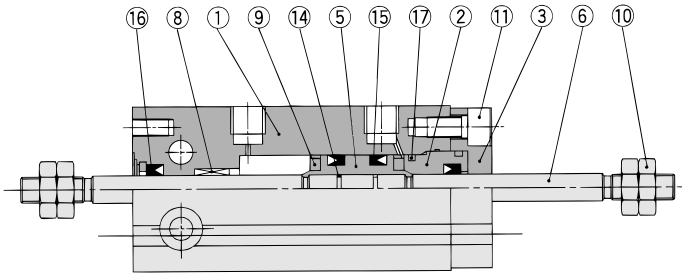
ø6

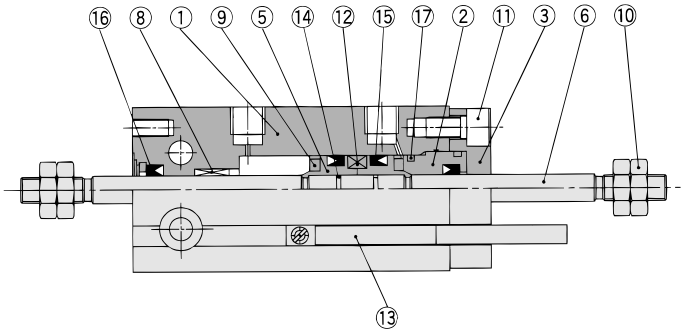


With auto switch

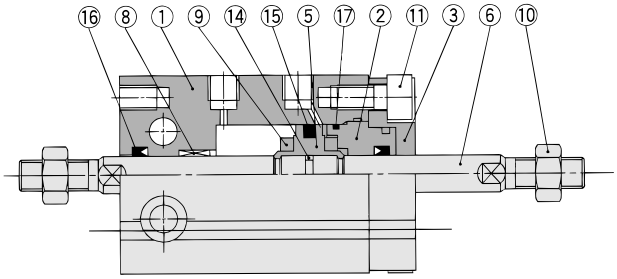


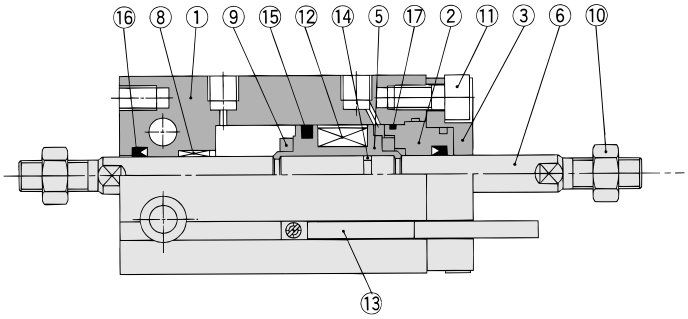
ø10





ø16 to 32





Component Parts

No.	Description	Material	Note
1	**Cylinder tube**	Aluminum alloy	Hard anodized
2	**Rod cover**	Aluminum alloy	Chromated
3	**Rod cover retainer**	Aluminum alloy	Anodized
4	**Piston**	Brass	ø6
5	**Piston**	Brass	ø6, ø10
		Aluminum alloy	ø16 to ø32, Chromated
6	**Piston rod**	Stainless steel	
7	**Piston rod**	Stainless steel	ø6
8	**Bushing**	Oil-impregnated sintered alloy	

Component Parts

No.	Description	Material	Note
9	**Bumper**	Urethane	
10	**Rod end nut**	Carbon steel	Nickel plated
11	**Hexagon socket head cap screw**	Carbon steel	Nickel plated
12	**Magnet**	—	
13	**Auto switch**	—	
14	**Piston gasket**	NBR	
15*	**Piston seal**		
16*	**Rod seal**		
17*	**Gasket**		

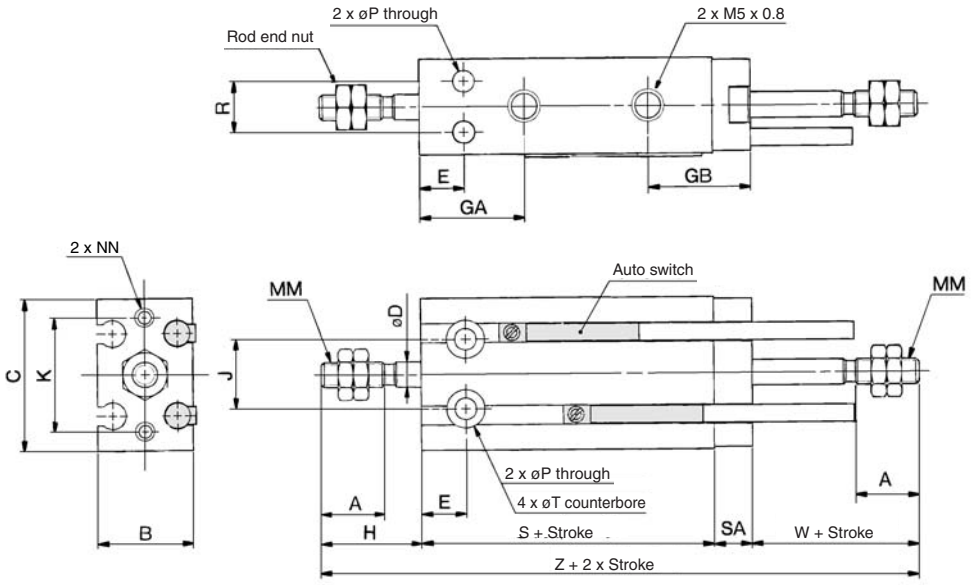
Replacement Parts: Seal Kit

	Bore size (mm) / Part no.				
	10	**16**	**20**	**25**	**32**
Kit no.	CUW10D-PS	CUW16D-PS	CUW20D-PS	CUW25D-PS	CUW32D-PS

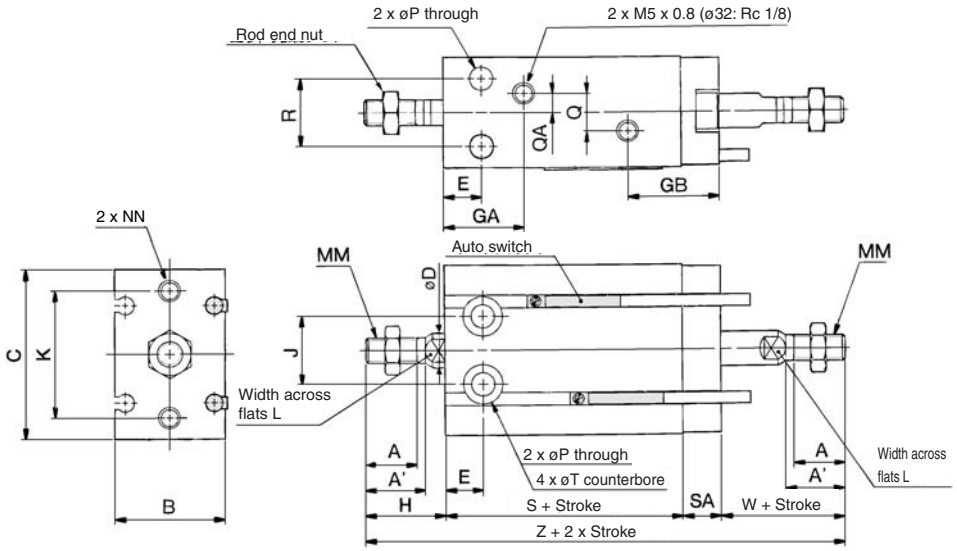
* Seal kit includes ⑮, ⑯, ⑰. Order the seal kit, based on each bore size.
* Seal kit includes a grease pack (10 g).
Order with the following part number when only the grease pack is needed.
Grease pack part number: GR-S-010 (10 g)

Dimensions: Double Acting, Double Rod

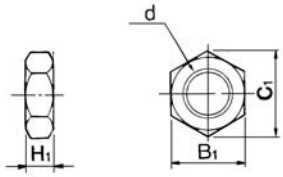
ø6, ø10



ø16 to ø32



Rod End Nut/Accessory



Material: Carbon steel

Part no.	Applicable bore size (mm)	d	H_1	B_1	C_1
NTP-006	**6**	M3 x 0.5	1.8	5.5	6.4
NTP-010	**10**	M4 x 0.7	2.4	7	8.1
NTJ-015A	**16**	M5 x 0.8	4	8	9.2
NT-015A	**20**	M6 x 1.0	5	10	11.5
NT-02	**25**	M8 x 1.25	5	13	15.0
NT-03	**32**	M10 x 1.25	6	17	19.6

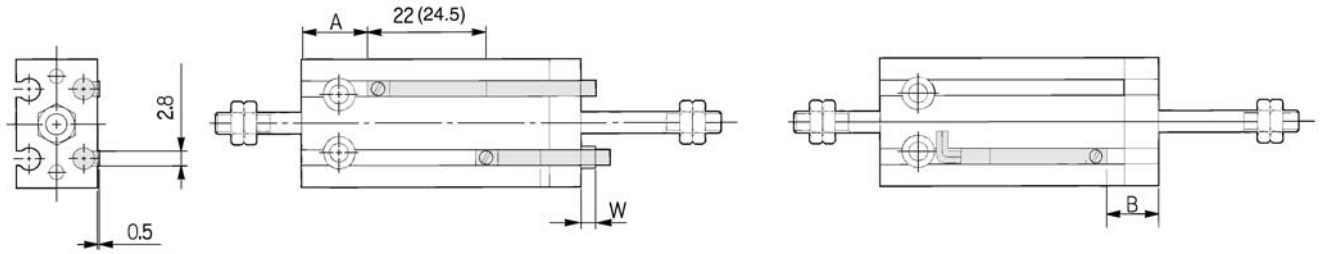
Bore size (mm)	A	A'	B	C	D	E	GA	GB	H	J	K	L	MM	NN	P	Q	QA
6	7	—	13	22	3	7	15	16	13	10	17	—	M3 x 0.5	M3 x 0.5 depth 5	3.2	—	—
10	10	—	15	24	4	7	16.5	16	16	11	18	—	M4 x 0.7	M3 x 0.5 depth 5	3.2	—	—
16	11	12.5	20	32	6	7	16.5 Note)	19	16	14	25	5	M5 x 0.8	M4 x 0.7 depth 6	4.5	4	2
20	12	14	26	40	8	9	19	21.5	19	16	30	6	M6 x 1.0	M5 x 0.8 depth 8	5.5	9	4.5
25	15.5	18	32	50	10	10	21.5	22	23	20	38	8	M8 x 1.25	M5 x 0.8 depth 8	5.5	9	4.5
32	19.5	22	40	62	12	11	23	22.5	27	24	48	10	M10 x 1.25	M6 x 1.0 depth 9	6.6	13.5	4.5

Bore size (mm)	R	SA	T	W	Without auto switch		With auto switch	
					S	Z	S	Z
6	7	6	6 depth 4.8	13	38	70	38	70
10	9	6	6 depth 5	16	36	74	36	74
16	12	7.5	7.6 depth 6.5	16	30	69.5	40	79.5
20	16	9	9.3 depth 8	19	36	83	46	93
25	20	9	9.3 depth 9	23	40	95	50	105
32	24	10	11 depth 11.5	27	42	106	52	116

Note 1) 5 stroke (CUW16-5D): GA = 14.5
Note 2) The two chamfered positions for the double rod type are not identical.

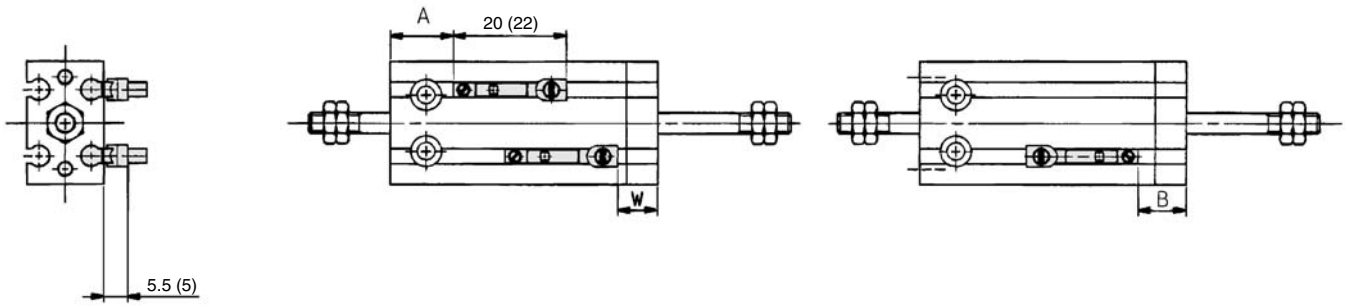
Proper Auto Switch Mounting Position (Detection at stroke end) and Its Mounting Height

D-A9□
D-M9□
D-M9□W



( ): Denotes the values of D-A93.

D-A9□V
D-M9□V
D-M9□WV



( ): Denotes the values of D-A9□V.

(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	W	A	B	W
6	13.5	5.5	–3.5 (–1)	17.5	9.5	0.5	17.5	9.5	–1.5
10	12.5	9.5	–7.5 (–5)	16.5	13.5	–3.5	16.5	13.5	–5.5
16	16	11.5	–9.5 (–7)	20	15.5	5.5	20	15.5	–7.5
20	20	15	–13 (–10.5)	24	19	–9	24	19	–11
25	22.5	16	–14.5 (–12)	26.5	20	–10.5	26.5	20	–12.5
32	23.5	18.5	–16.5 (–14)	27.5	22.5	–12.5	27.5	22.5	–14.5

Note 1) Figures in the table above are used as a reference when mounting the auto switches for stroke end detection. In the case of actually setting the auto switches, adjust them after confirming their operation.
Note 2) Negative figures in the table W indicate an auto switch is mounted inward from the edge of the cylinder body.
Note 3) In the case of the 5 stroke or the 10 stroke, there are times in which the switch will not turn OFF or 2 switches will turn ON simultaneously due to their movement range. Therefore, set the position approximately 1 to 4 mm outward from the values given in the table above. Then, perform an operation inspection to make sure that the switches operate normally (if 1 switch is used, make sure that it turns ON and OFF properly; if 2 switches are used, make sure that both switches turn ON).
Note 4) ( ) in column W is the dimensions of D-A93.

Operating Range

(mm)

Auto switch model	Bore size (mm)					
	6	10	16	20	25	32
D-A9□, A9□V	5	6	9	11	12.5	14
D-M9□, M9□V D-M9□W, M9□WV	3	4	5.5	7	7	7.5

∗ Since the operating range is provided as a guideline including hysteresis, it cannot be guaranteed (assuming approximately ±30% dispersion). It may vary substantially depending on an ambient environment.

Minimum Stroke for Auto Switch Mounting

(mm)

No. of auto switches mounted	Applicable auto switch		
	D-A9□, D-A9□V	D-M9□, D-M9□V	D-M9□W, D-M9□WV
1 pc.	5	5	5
2 pcs.	10	5	10

Free Mount Cylinder
Single Acting, Single Rod, Spring Return/Extend
Series CU
ø6, ø10, ø16, ø20, ø25, ø32

How to Order

CU 10 □ – 15 S –

With auto switch: CDU 10 □ – 15 S – M9BW □ – □

Built-in magnet

Bore size

6	6 mm
10	10 mm
16	16 mm
20	20 mm
25	25 mm
32	32 mm

Port thread type

Symbol	Type	Bore size
Nil	M5 x 0.8	ø6, ø10, ø16, ø20, ø25
	Rc 1/8	ø32
TN	NPT 1/8	ø32
TF	G 1/8	ø32

Standard stroke (mm)

ø6, ø10, ø16 ø20, ø25, ø32	5, 10, 15

Action

S	Single acting, Spring return
T	Single acting, Spring extend

Auto switch

Nil	Without auto switch

∗ Refer to the table below for applicable auto switches.

Number of auto switches

Nil	2 pcs.
S	1 pc.

Made to order

∗ Refer to page 496 for the Made to Order specifications.

Built-in Magnet Cylinder Model

If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch.
(Example): CDU20-10S

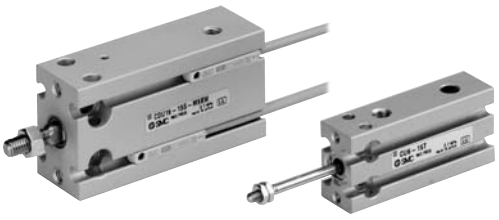
Applicable Auto Switches/Refer to pages 1263 to 1371 for further information on auto switches.

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-color indication)			3-wire (NPN)		5 V, 12 V		**M9NWV**	**M9NW**	●	●	●	○	○	IC circuit	
				3-wire (PNP)				**M9PWV**	**M9PW**	●	●	●	○	○		
				2-wire		12 V		**M9BWV**	**M9BW**	●	●	●	○	○	—	
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 ····· Nil (Example) M9NW
1 m ····· M (Example) M9NWM
3 m ····· L (Example) M9NWL
5 m ····· Z (Example) M9NWZ

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

∗ Since there are applicable auto switches other than the above, refer to page 538 for details.
∗ For detail about auto switches with pre-wired connector, refer to pages 1328 to 1329.
∗ Auto switches are shipped together but not assembled.



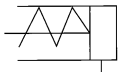
Specifications

Bore size (mm)	6	10	16	20	25	32
Fluid	Air					
Proof pressure	1.05 MPa					
Maximum operating pressure	0.7 MPa					
Minimum operating pressure	0.2 MPa	0.15 MPa		0.13 MPa		
Ambient and fluid temperature	Without auto switch: –10 to 70°C (No freezing) With auto switch: –10 to 60°C (No freezing)					
Lubrication	Non-lube					
Piston speed	50 to 500 mm/s					
Cushion	Rubber bumper					
Rod end thread	Male thread					
Stroke length tolerance	$^{+1.0}_{0}$ mm					

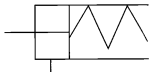
Note) ø6 with auto switch type: One side rubber bumper

JIS Symbol

Single acting, Spring return



Single acting, Spring extend



Standard Stroke

Bore size (mm)	Standard stroke (mm)
6, **10**, **16**, **20**, **25**, **32**	5, 10, 15

Theoretical Output

(N)

Action	Bore size (mm)	Operating pressure (MPa)		
		0.3	0.5	0.7
Spring return (S)	**ø6**	4.99	10.7	16.3
	ø10	16.7	32.4	48.1
	ø16	45.6	86.3	126
	ø20	73	136	199
	ø25	119	218	316
	ø32	207	368	529
Spring extend (T)	**ø6**	2.86	7.10	11.3
	ø10	12.9	26.1	39.3
	ø16	37.2	71.8	106
	ø20	58	111	164
	ø25	95	178	260
	ø32	173	312	450

For the reactive force of spring return, refer to page 1569.

Made to Order Specifications

(For details, refer to page 1462.)

Symbol	Specifications
-XC22	Fluororubber seals

Mass

/( ): Denotes the values with D-A93.

(g)

Model	Stroke (mm)		
	5	10	15
C(D)U6-□S,T	22 (27)	25 (35)	28 (38)
C(D)U10-□S,T	36 (41)	40 (50)	48 (58)
C(D)U16-□S,T	50 (75)	56 (86)	71 (101)
C(D)U20-□S,T	95 (128)	106 (143)	133 (170)
C(D)U25-□S,T	176 (230)	193 (252)	235 (294)
C(D)U32-□S,T	262 (335)	286 (364)	347 (425)

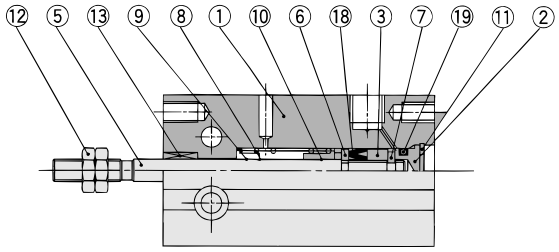
∗ For the mass of auto switch, refer to page 1263.

Tightening Torque

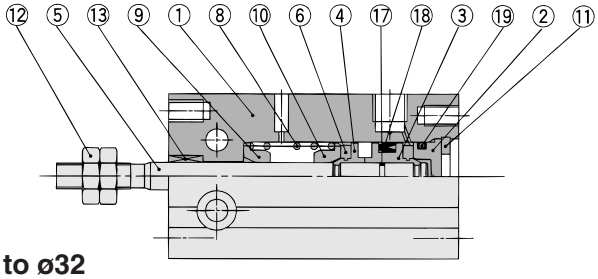
When mounting a CU single acting series, refer to page 484.

Construction

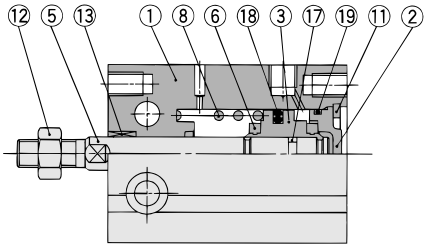
Single acting, Spring return



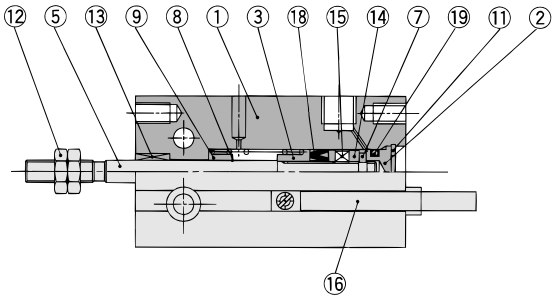
ø10

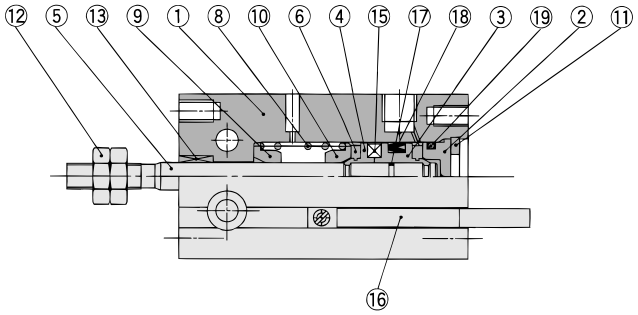


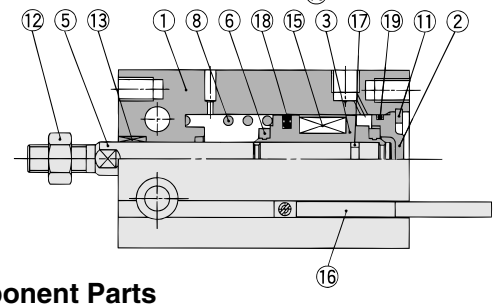
ø16 to ø32



With auto switch







Component Parts

No.	Description	Material	Note
1	**Cylinder tube**	Aluminum alloy	Hard anodized
2	**Head cover**	Brass	ø6 to ø10, Electroless nickel plated
		Aluminum alloy	ø16 to ø32, Chromated
3	**Piston**	Brass	ø6 to ø10
		Aluminum alloy	ø16 to ø32, Chromated
4	**Piston**	Brass	ø10
5	**Piston rod**	Stainless steel	
6	**Bumper A**	Urethane	
7	**Bumper B**	Urethane	
8	**Return spring**	Piano wire	Zinc chromated

Component Parts

No.	Description	Material	Note
9	**Spring seat**	Brass	
10	**Spring seat**	Brass	
11	**Retaining ring**	Carbon tool steel	Phosphate coated
12	**Rod end nut**	Carbon steel	Nickel plated
13	**Bushing**	Oil-impregnated sintered alloy	
14	**Magnet holder**	Brass	ø6
15	**Magnet**	—	
16	**Auto switch**	—	
17	**Piston gasket**	NBR	
18*	**Piston seal**		
19*	**Gasket**		

Replacement Parts: Seal Kit

	Bore size (mm) / Part no.				
	10	**16**	**20**	**25**	**32**
Kit no.	CU10S-PS	CU16S-PS	CU20S-PS	CU25S-PS	CU32S-PS

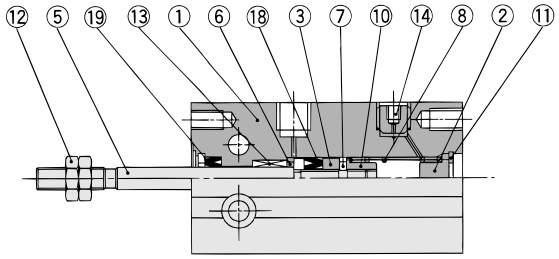
* Seal kit includes ⑱, ⑲. Order the seal kit, based on each bore size.
* Seal kit includes a grease pack (10 g).
Order with the following part number when only the grease pack is needed.
Grease pack part number: GR-S-010 (10 g)

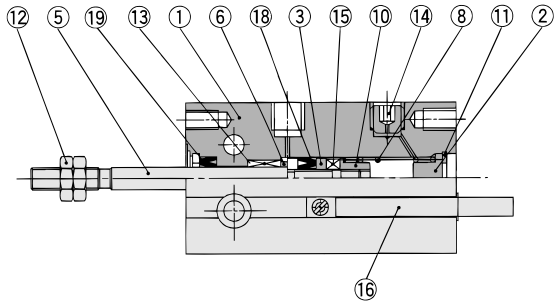
Construction

Single acting, Spring extend

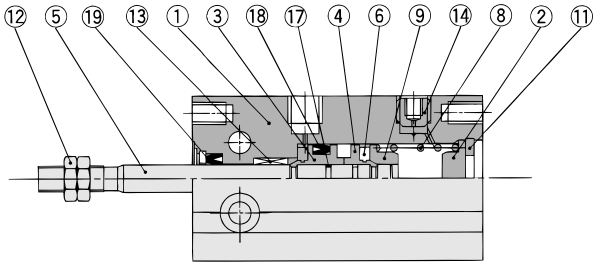
With auto switch

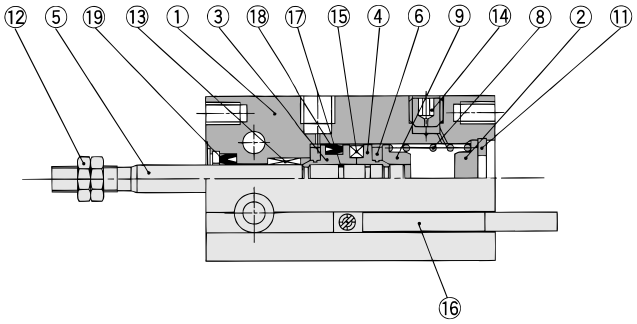
ø6



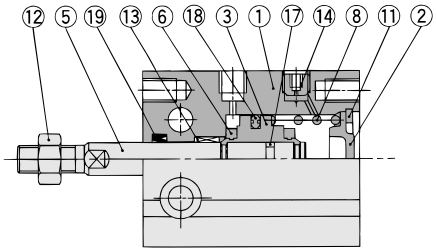


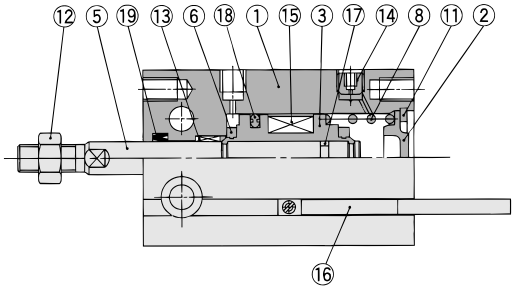
ø10





ø16 to ø32





Component Parts

No.	Description	Material	Note
1	**Cylinder tube**	Aluminum alloy	Hard anodized
2	**Head cover**	Brass	ø6 to ø10, Electroless nickel plated
		Aluminum alloy	ø16 to ø32, Chromated
3	**Piston**	Brass	ø6 to ø10
		Aluminum alloy	ø16 to ø32, Chromated
4	**Piston**	Brass	ø10
5	**Piston rod**	Stainless steel	
6	**Bumper A**	Urethane	
7	**Bumper B**	Urethane	
8	**Return spring**	Piano wire	Zinc chromated

Component Parts

No.	Description	Material	Note
9	**Spring seat**	Brass	
10	**Stopper**	Brass	ø6
11	**Retaining ring**	Carbon tool steel	Phosphate coated
12	**Rod end nut**	Carbon steel	Nickel plated
13	**Bushing**	Oil-impregnated sintered alloy	
14	**Plug with fixed orifice**	Alloy steel	Black dyed
15	**Magnet**	—	
16	**Auto switch**	—	
17	**Piston gasket**	NBR	
18*	**Piston seal**		
19*	**Rod seal**		

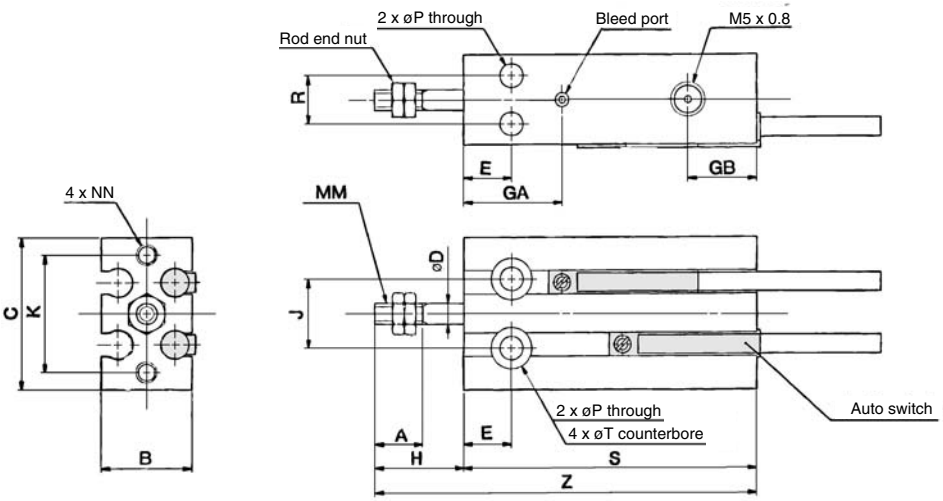
Replacement Parts: Seal Kit

	Bore size (mm) / Part no.				
	10	**16**	**20**	**25**	**32**
Kit no.	CU10T-PS	CU16T-PS	CU20T-PS	CU25T-PS	CU32T-PS

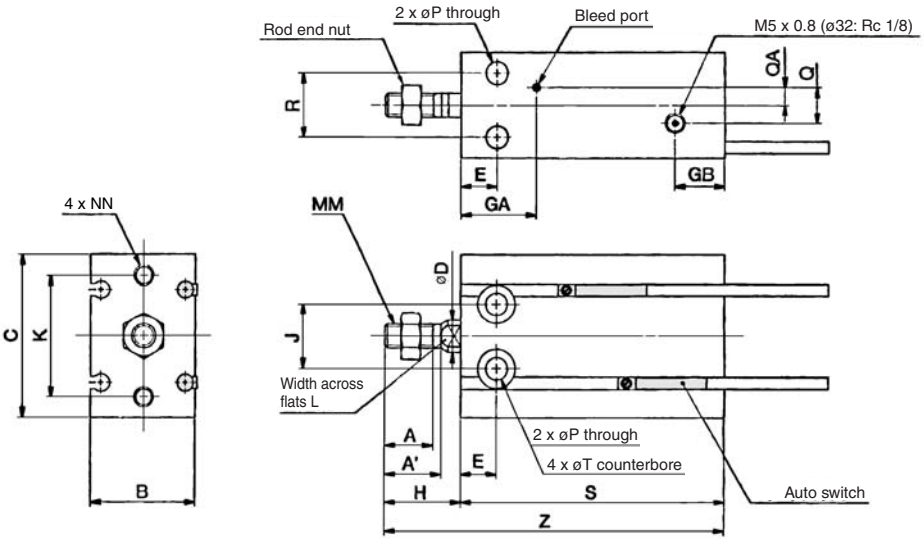
* Seal kit includes ⑱, ⑲. Order the seal kit, based on each bore size.
* Seal kit includes a grease pack (10 g).
Order with the following part number when only the grease pack is needed.
Grease pack part number: GR-S-010 (10 g)

Dimensions: Single Acting, Spring Return

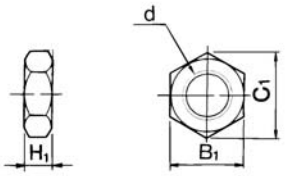
ø6, ø10



ø16 to ø32



Rod End Nut/Accessory



Material: Carbon steel

Part no.	Applicable bore size (mm)	d	H_1	B_1	C_1
NTP-006	**6**	M3 x 0.5	1.8	5.5	6.4
NTP-010	**10**	M4 x 0.7	2.4	7	8.1
NTJ-015A	**16**	M5 x 0.8	4	8	9.2
NT-015A	**20**	M6 x 1.0	5	10	11.5
NT-02	**25**	M8 x 1.25	5	13	15.0
NT-03	**32**	M10 x 1.25	6	17	19.6

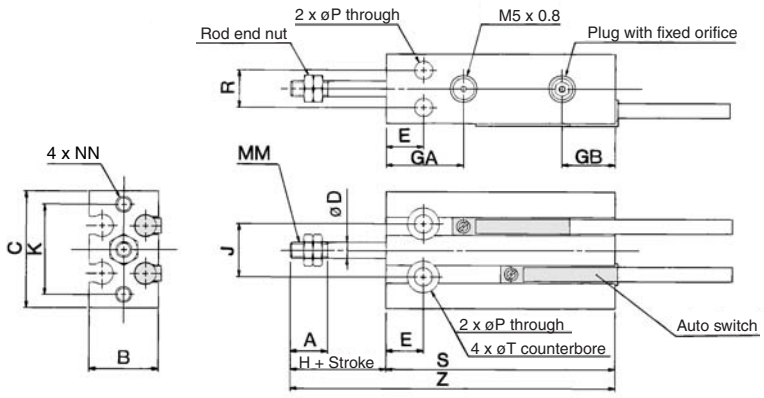
(mm)

Bore size (mm)	A	A'	B	C	D	E	GA	GB	H	J	K	L	MM	NN	P	Q	QA	R	T
6	7	—	13	22	3	7	15	10	13	10	17	—	M3 x 0.5	M3 x 0.5 depth 5	3.2	—	—	7	6 depth 4.8
10	10	—	15	24	4	7	16.5	10	16	11	18	—	M4 x 0.7	M3 x 0.5 depth 5	3.2	—	—	9	6 depth 5
16	11	12.5	20	32	6	7	16.5	11.5	16	14	25	5	M5 x 0.8	M4 x 0.7 depth 6	4.5	4	2	12	7.6 depth 6.5
20	12	14	26	40	8	9	19	12.5	19	16	30	6	M6 x 1.0	M5 x 0.8 depth 8	5.5	9	4.5	16	9.3 depth 8
25	15.5	18	32	50	10	10	21.5	13	23	20	38	8	M8 x 1.25	M5 x 0.8 depth 8	5.5	9	4.5	20	9.3 depth 9
32	19.5	22	40	62	12	11	23	12.5	27	24	48	10	M10 x 1.25	M6 x 1.0 depth 9	6.6	13.5	4.5	24	11 depth 11.5

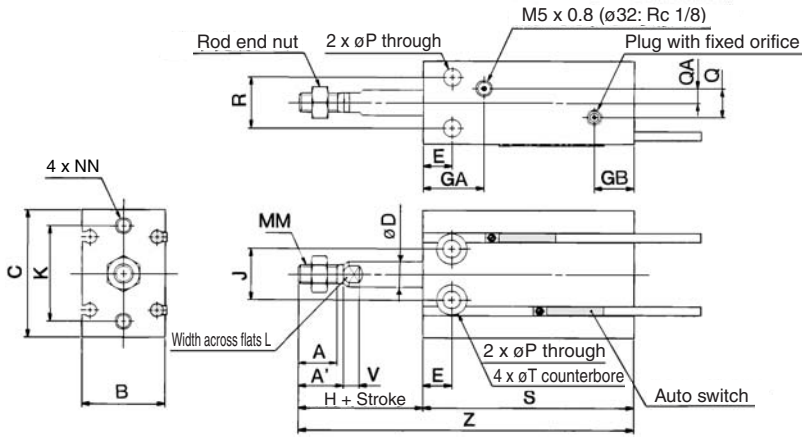
Bore size (mm)	Without auto switch						With auto switch					
	S			Z			S			Z		
	5 st	10 st	15 st	5 st	10 st	15 st	5 st	10 st	15 st	5 st	10 st	15 st
6	38	43	48	51	56	61	38	43	48	51	56	61
10	41	46	56	57	62	72	41	46	56	57	62	72
16	35	40	50	51	56	66	45	50	60	61	66	76
20	41	46	56	60	65	75	51	56	66	70	75	85
25	45	50	60	68	73	83	55	60	70	78	83	93
32	47	52	62	74	79	89	57	62	72	84	89	99

Dimensions: Single Acting, Spring Extend

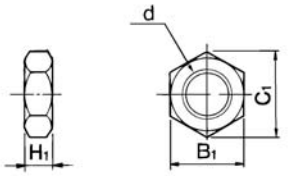
ø6, ø10



ø16 to ø32



Rod End Nut/Accessory



Material: Carbon steel

Part no.	Applicable bore size (mm)	d	H_1	B_1	C_1
NTP-006	**6**	M3 x 0.5	1.8	5.5	6.4
NTP-010	**10**	M4 x 0.7	2.4	7	8.1
NTJ-015A	**16**	M5 x 0.8	4	8	9.2
NT-015A	**20**	M6 x 1.0	5	10	11.5
NT-02	**25**	M8 x 1.25	5	13	15.0
NT-03	**32**	M10 x 1.25	6	17	19.6

(mm)

Bore size (mm)	A	A'	B	C	D	E	GA	GB	H	J	K	L	MM	NN	P	Q	QA	R	T	V
6	7	—	13	22	3	7	15	10	13	10	17	—	M3 x 0.5	M3 x 0.5 depth 5	3.2	—	—	7	6 depth 4.8	—
10	10	—	15	24	4	7	16.5	10	16	11	18	—	M4 x 0.7	M3 x 0.5 depth 5	3.2	—	—	9	6 depth 5	—
16	11	12.5	20	32	6	7	16.5	11.5	16	14	25	5	M5 x 0.8	M4 x 0.7 depth 6	4.5	4	2	12	7.6 depth 6.5	3.5
20	12	14	26	40	8	9	19	12.5	19	16	30	6	M6 x 1.0	M5 x 0.8 depth 8	5.5	9	4.5	16	9.3 depth 8	5
25	15.5	18	32	50	10	10	21.5	13	23	20	38	8	M8 x 1.25	M5 x 0.8 depth 8	5.5	9	4.5	20	9.3 depth 9	5
32	19.5	22	40	62	12	11	23	12.5	27	24	48	10	M10 x 1.25	M6 x 1.0 depth 9	6.6	13.5	4.5	24	11 depth 11.5	5

Bore size (mm)	Without auto switch						With auto switch					
	S			Z			S			Z		
	5 st	10 st	15 st	5 st	10 st	15 st	5 st	10 st	15 st	5 st	10 st	15 st
6	38	43	48	56	66	76	38	43	48	56	66	76
10	41	46	56	62	72	87	41	46	56	62	72	87
16	45	50	60	66	76	91	45	50	60	66	76	91
20	41	46	56	65	75	90	51	56	66	75	85	100
25	45	50	60	73	83	98	55	60	70	83	93	108
32	47	52	62	79	89	104	57	62	72	89	99	114

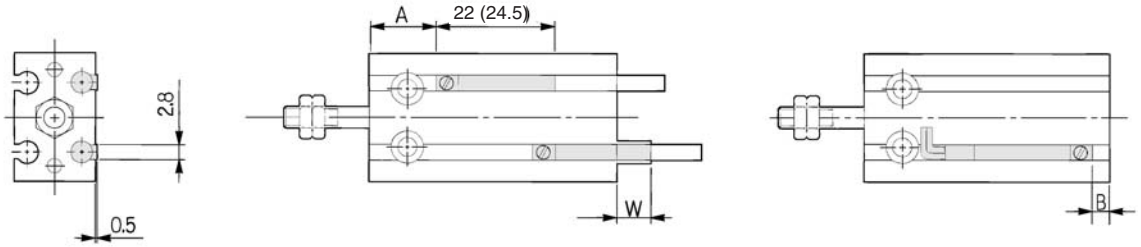
Minimum Stroke for Auto Switch Mounting

(mm)

No. of auto switches mounted	Applicable auto switch		
	D-A9□, D-A9□V	D-M9□, D-M9□V	D-M9□W, D-M9□WV
1 pc.	5	5	5
2 pcs.	10	5	10

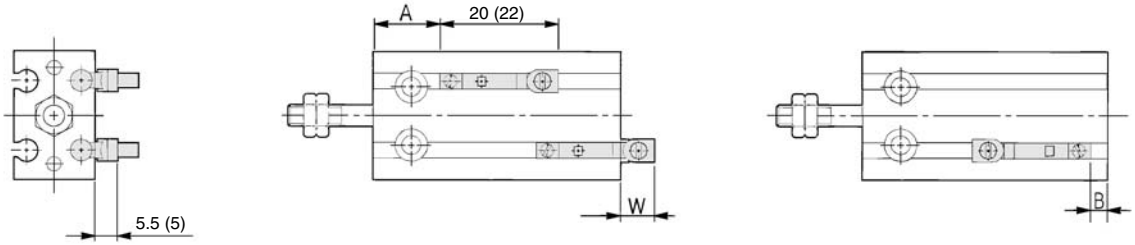
Proper Auto Switch Mounting Position (Detection at Stroke End) and Its Mounting Height: Single Acting, Spring Return

D-A9□
D-M9□
D-M9□W



( ): Denotes the values of D-A93.

D-A9□V
D-M9□V
D-M9□WV



( ): Denotes the values of D-A9□V.

Single Acting, Spring Return

(mm)

Bore size (mm)	Stroke	D-A9□, D-A9□V			D-M9□, D-M9□W			D-M9□V, D-M9□WV		
		A	B	W	A	B	W	A	B	W
6	All stroke	13.5	0	2.5 (5)	17.5	4	6.5	17.5	4	4.5
10	5, 10	12.5	3.5	–1.5 (1)	16.5	7.5	2.5	16.5	7.5	0.5
	15	17.5			21.5			21.5		
16	5, 10	16	4	–2 (0.5)	20	8	2	20	8	–0.5
	15	21			25			25		
20	5, 10	20	6	–4 (–1.5)	24	10	0	24	10	–2
	15	25			29			29		
25	5, 10	22.5	7	–5.5 (–3)	26.5	11	–1.5	26.5	11	–3.5
	15	27.5			31.5			31.5		
32	5, 10	23.5	8.5	–6.5 (–4)	27.5	12.5	–2.5	27.5	12.5	–4.5
	15	28.5			32.5			32.5		

Single Acting, Spring Extend

(mm)

Bore size (mm)	Stroke	D-A9□, D-A9□V			D-M9□, D-M9□W			D-M9□V, D-M9□WV		
		A	B	W	A	B	W	A	B	W
6	All stroke	10.5	1.5	0.5 (3)	14.5	5.5	4.5	14.5	5.5	2.5
10	5, 10	12.5	3.5	-1.5 (1)	16.5	7.5	2.5	16.5	7.5	0.5
	15		8.5	-6.5 (-4)		12.5	-2.5		12.5	-4.5
16	5, 10	16	4	-2 (0.5)	20	8	2	20	8	0
	15		9	-7 (-4.5)		13	-3		13	-5
20	5, 10	20	6	-4 (-1.5)	24	10	0	24	10	-2
	15		11	-9 (-6.5)		15	-5		15	-7
25	5, 10	22.5	7	-5.5 (-3)	26.5	11	-1.5	26.5	11	-3.5
	15		12	-10.5 (-8)		16	-6.5		16	-8.5
32	5, 10	23.5	8.5	-6.5 (-4)	27.5	12.5	-2.5	27.5	12.5	-4.5
	15		13.5	-11.5 (-9)		17.5	-7.5		17.5	-9.5

Note 1) Figures in the table above are used as a reference when mounting the auto switches for stroke end detection. In the case of actually setting the auto switches, adjust them after confirming their operation.
Note 2) Negative figures in the table W indicate an auto switch is mounted inward from the edge of the cylinder body.
Note 3) In the case of the 5 stroke or the 10 stroke, there are times in which the switch will not turn OFF or 2 switches will turn ON simultaneously due to their movement range. Therefore, set the position approximately 1 to 4 mm outward from the values given in the table above. Then, perform an operation inspection to make sure that the switches operate normally (if 1 switch is used, make sure that it turns ON and OFF properly; if 2 switches are used, make sure that both switches turn ON).
Note 4) ( ) in column W is the dimensions of D-A93.

Free Mount Cylinder: Non-rotating Rod Type
Double Acting, Single Rod
Series CUK
ø6, ø10, ø16, ø20, ø25, ø32

How to Order

Without auto switch: CUK [6] [ ] – [30] D – [ ]

With auto switch: CDUK [6] [ ] – [30] D – [M9BW] [ ] – [ ]

Built-in magnet

Non-rotating rod type

Bore size

6	6 mm
10	10 mm
16	16 mm
20	20 mm
25	25 mm
32	32 mm

Port thread type

Symbol	Type	Bore size
Nil	M5 x 0.8	ø6, ø10, ø16, ø20, ø25
	Rc 1/8	ø32
TN	NPT 1/8	ø32
TF	G 1/8	ø32

Standard stroke (mm)

ø6, ø10, ø16	5, 10, 15, 20, 25, 30
ø20, ø25, ø32	5, 10, 15, 20, 25, 30, 40, 50

Action

D	Double acting

Auto switch

Nil	Without auto switch

∗ Refer to the table below for applicable auto switches.

Number of auto switches

Nil	2 pcs.
S	1 pc.

Made to order

∗ Refer to page 503 for the Made to Order specifications.

Built-in Magnet Cylinder Model

If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch.
(Example): CDUK20-25D

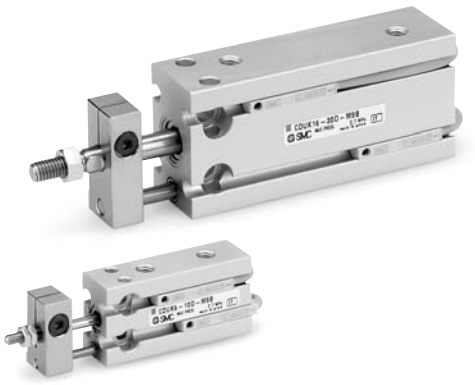
Applicable Auto Switches/Refer to pages 1263 to 1371 for further information on auto switches.

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-color indication)			3-wire (NPN)		5 V, 12 V		M9NWV	M9NW	●	●	●	○	○	IC circuit	
				3-wire (PNP)				M9PWV	M9PW	●	●	●	○	○		
				2-wire		12 V		M9BWV	M9BW	●	●	●	○	○	—	
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 ····· Nil (Example) M9NW
1 m ····· M (Example) M9NWM
3 m ····· L (Example) M9NWL
5 m ····· Z (Example) M9NWZ

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

∗ Since there are applicable auto switches other than the above, refer to page 538 for details.
∗ For detail about auto switches with pre-wired connector, refer to pages 1328 to 1329.
∗ Auto switches are shipped together but not assembled.



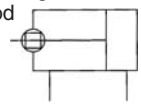
Specifications

Bore size (mm)	6	10	16	20	25	32
Fluid	Air					
Proof pressure	1.05 MPa					
Maximum operating pressure	0.7 MPa					
Minimum operating pressure	0.15 MPa	0.10 MPa		0.08 MPa		
Ambient and fluid temperature	Without auto switch: –10 to 70°C (No freezing) With auto switch: –10 to 60°C (No freezing)					
Lubrication	Non-lube					
Piston speed	50 to 500 mm/s					
Cushion	Rubber bumper					
Rod end thread	Male thread					
Stroke length tolerance	$^{+1.0}_{0}$ mm					
Rod non-rotating accuracy Note)	±0.8°			±0.5°		

Note) No load: Rod at retracted

JIS Symbol

Double acting,
Single rod



Standard Stroke

Bore size (mm)	Standard stroke (mm)	
6, **10**, **16**	5, 10, 15, 20, 25, 30	For long stroke, refer to page 520.
20, **25**, **32**	5, 10, 15, 20, 25, 30, 40, 50	

Minimum Stroke for Auto Switch Mounting

(mm)

No. of auto switches mounted	Applicable auto switch		
	D-A9□, D-A9□V	**D-M9□, D-M9□V**	**D-M9□W, D-M9□WV**
1 pc.	5	5	5
2 pcs.	10	5	10

Mass

/( ): Denotes the values with D-A93. (g)

Bore size (mm)	Stroke (mm)							
	5	10	15	20	25	30	40	50
C(D)UK6-□D	28 (33)	31 (41)	34 (44)	37 (47)	40 (50)	43 (53)	—	—
C(D)UK10-□D	43 (48)	47 (57)	51 (61)	55 (65)	59 (69)	63 (73)	—	—
C(D)UK16-□D	60 (85)	66 (96)	72 (102)	78 (108)	84 (114)	90 (120)	—	—
C(D)UK20-□D	113 (147)	124 (164)	136 (176)	148 (188)	160 (200)	172 (211)	195 (235)	219 (260)
C(D)UK25-□D	212 (266)	229 (288)	246 (305)	263 (322)	280 (339)	297 (356)	335 (390)	370 (424)
C(D)UK32-□D	331 (404)	357 (435)	383 (461)	409 (487)	435 (513)	461 (539)	513 (591)	565 (643)

∗ For the auto switch mass, refer to page 1263.

Allowable Rotational Torque

Bore size (mm)	6	10	16	20	25	32
Allowable rotational torque (N·m)	0.0015	0.02	0.04	0.10	0.15	0.20

Made to Order Specifications

(For details, refer to pages 1395 to 1498.)

Symbol	Specifications
-XB6	Heat resistant (–10 to 150°C)
-XB7	Cold resistant (– 40 to 700°C)
-XB9	Low speed (10 to 50 mm/s)
-XB13	Low speed (5 to 50 mm/s)
-XC19	Intermediate stroke (5 mm spacer)
-XC22	Fluororubber seals
-XC34	Non-rotating plate with work piece mounting screw (No extended part on the rod end)

⚠ Precautions

**Be sure to read before handling.
Refer to front matters 54 and 55 for Safety Instructions and pages 3 to 11 for Actuator and Auto Switch Precautions.**

Operating Precautions

⚠ Caution

1. Do not place your fingers in the clearance between the non-rotating plate and the cylinder tube.
Your fingers could get caught between the non-rotating plate and the cylinder tube when the piston rod retracts. Therefore, never place your finger in this area.
Because the cylinder outputs a great force, it could lead to injury if precautions are not taken to prevent your fingers from getting caught.

2. When using the non-rotating style, make sure that rotational torque is not applied to the piston rod. If rotational torque must be applied due to unavoidable circumstances, make sure to use it at the allowable rotational torque or less, which is shown in the table on the right.

Tightening Torque

When mounting Series CUK, refer to page 484.

Theoretical Output

Specifications are the same as CU series double acting, single rod. Refer to page 484.

Auto Switch Mounting Position

For the auto switch mounting position of Series CDUK, refer to page 488, since specifications are the same as standard type, double acting, single rod type.

Copper and Fluorine-free

20-CUK | **Bore size** | – | **Stroke** | **D**

•Copper and Fluorine-free

This cylinder eliminates any influences of copper ions or fluoro resins on color CRTs. Copper materials have been nickel plated or replaced with non-copper materials to prevent the generation of copper ions.

Minimum Operating Pressure

(MPa)

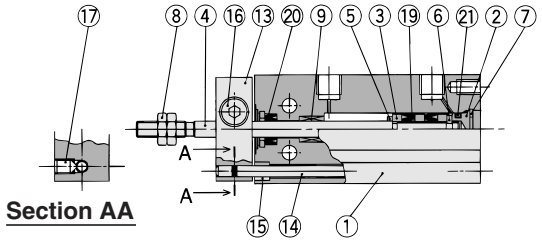
Bore size (mm)	6	10, 16	20, 25, 32
Minimum operating pressure	0.15	0.10	0.08

Specifications

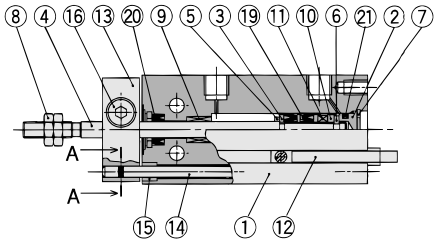
Action	Double acting, Single rod
Bore size (mm)	6, 10, 16, 20, 25, 32
Maximum operating pressure	1.05 MPa
Cushion	Rubber bumper
Stroke	Same as standard type (Refer to page 484.)
Auto switch	Mountable

Construction

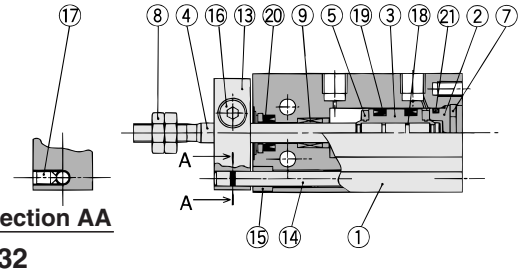
ø6

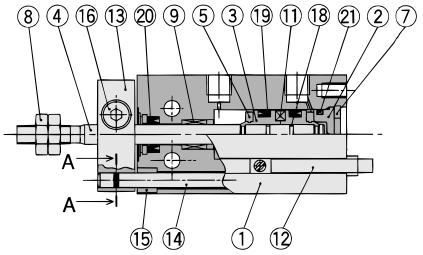


With auto switch

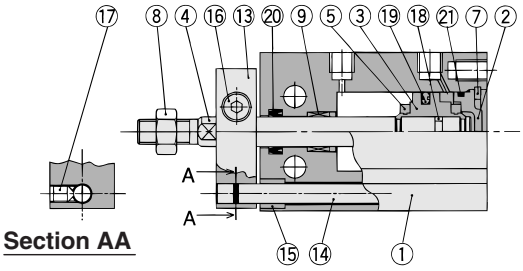


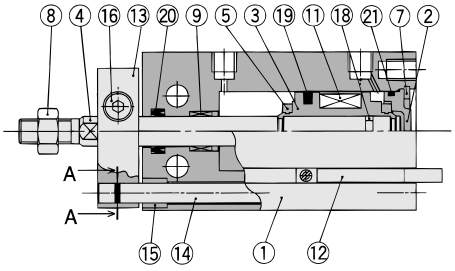
ø10





ø16 to ø32





Component Parts

No.	Description	Material	Note
1	**Cylinder tube**	Aluminum alloy	Hard anodized
2	**Head cover**	Brass	ø6 to ø10, Electroless nickel plated
		Aluminum alloy	ø16 to ø32, Chromated
3	**Piston**	Brass	ø6 to ø10
		Aluminum alloy	ø16 to ø32, Chromated
4	**Piston rod**	Stainless steel	
5	**Bumper A**	Urethane	
6	**Bumper B**	Urethane	
7	**Retaining ring**	Carbon tool steel	Phosphate coated
8	**Rod end nut**	Carbon steel	Nickel plated
9	**Bushing**	Oil-impregnated sintered alloy	
10	**Magnet holder**	Brass	ø6

Component Parts

No.	Description	Material	Note
11	**Magnet**	—	
12	**Auto switch**	—	
13	**Non-rotating plate**	Aluminum alloy	Nickel plated
14	**Guide rod**	Stainless steel	
15	**Bushing**	Oil-impregnated sintered alloy	
16	**Hexagon socket head cap screw**	Carbon steel	Black zinc chromated
17	**Hexagon socket head set screw**	Carbon steel	Black zinc chromated
18	**Piston gasket**	NBR	
19*	**Piston seal**		
20*	**Rod seal**		
21*	**Gasket**		

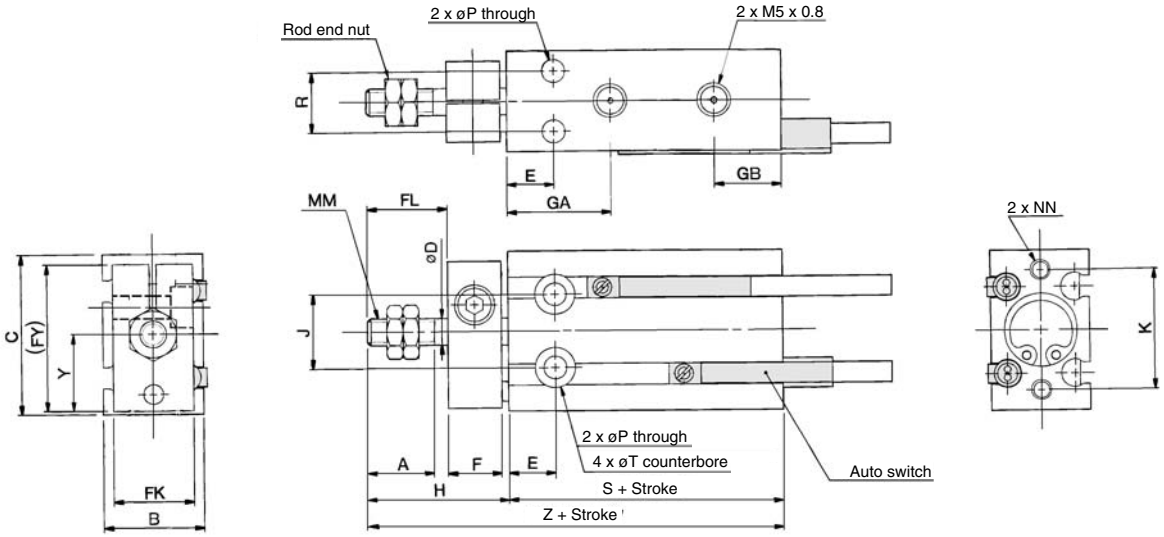
Replacement Parts: Seal Kit

Bore size (mm)	Kit no.	Contents
10	CU10D-PS	Set of nos. above ⑲, ⑳, ㉑.
16	CU16D-PS	
20	CU20D-PS	
25	CU25D-PS	
32	CU32D-PS	

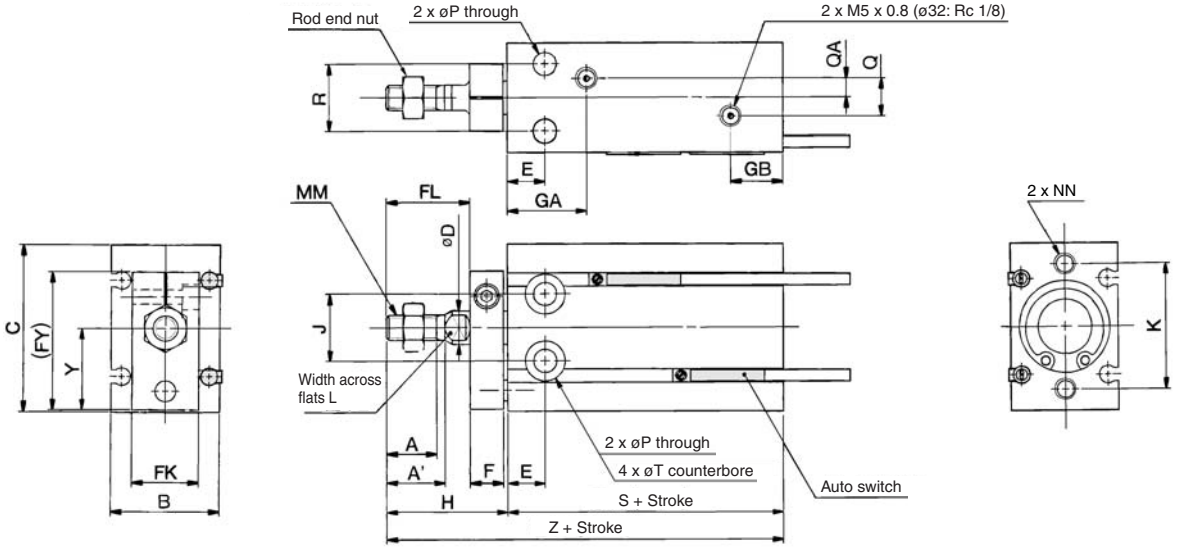
* Seal kit includes ⑲, ⑳, ㉑. Order the seal kit, based on each bore size.
* Seal kit includes a grease pack (10 g).
Order with the following part number when only the grease pack is needed.
Grease pack part number: GR-S-010 (10 g)

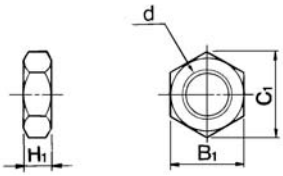
Dimensions: Non-rotating Rod Type; Double Acting, Single Rod

ø6, ø10



ø16 to ø32





Rod End Nut/Accessory Material: Carbon steel

Part no.	Applicable bore size (mm)	d	H_1	B_1	C_1
NTP-006	**6**	M3 x 0.5	1.8	5.5	6.4
NTP-010	**10**	M4 x 0.7	2.4	7	8.1
NTJ-015A	**16**	M5 x 0.8	4	8	9.2
NT-015A	**20**	M6 x 1.0	5	10	11.5
NT-02	**25**	M8 x 1.25	5	13	15.0
NT-03	**32**	M10 x 1.25	6	17	19.6

(mm)

Bore size (mm)	A	A'	B	C	D	E	F	FL	FK	FY	GA	GB	H	J	K	L	MM
6	7	—	13	22	3	7	8	9	11	20.5	15	10	18	10	17	—	M3 x 0.5
10	10	—	15	24	4	7	8	12	12	22	16.5	10	21	11	18	—	M4 x 0.7
16	11	12.5	20	32	6	7	8	17	13	28	16.5 Note)	11.5	26	14	25	5	M5 x 0.8
20	12	14	26	40	8	9	8	20	16	33	19	12.5	29	16	30	6	M6 x 1.0
25	15.5	18	32	50	10	10	10	22	20	43.5	21.5	13	33	20	38	8	M8 x 1.25
32	19.5	22	40	62	12	11	12	29	24	51.5	23	12.5	42	24	48	10	M10 x 1.25

Bore size (mm)	NN	P	Q	QA	R	T	Y	Without auto switch		With auto switch	
								S	Z	S	Z
6	M3 x 0.5 depth 5	3.2	—	—	7	6 depth 4.8	10.5	33	51	33	51
10	M3 x 0.5 depth 5	3.2	—	—	9	6 depth 5	11.5	36	57	36	57
16	M4 x 0.7 depth 6	4.5	4	2	12	7.6 depth 6.5	15.5	30	56	40	66
20	M5 x 0.8 depth 8	5.5	9	4.5	16	9.3 depth 8	19.5	36	65	46	75
25	M5 x 0.8 depth 8	5.5	9	4.5	20	9.3 depth 9	24.5	40	73	50	83
32	M6 x 1.0 depth 9	6.6	13.5	4.5	24	11 depth 11.5	30.5	42	84	52	94

Note) 5 stroke (CUK16-5D): GA = 14.5

Free Mount Cylinder: Non-rotating Rod Type
Double Acting, Double Rod
Series CUKW
ø6, ø10, ø16, ø20, ø25, ø32

How to Order

CUKW **6** **□** **–** **30** **D**

With auto switch **CDUKW** **6** **□** **–** **30** **D** **–** **M9BW** **□**

Built-in magnet

Non-rotating rod type

Double rod

Bore size

6	6 mm
10	10 mm
16	16 mm
20	20 mm
25	25 mm
32	32 mm

Port thread type

Symbol	Type	Bore size
Nil	M5 x 0.8	ø6, ø10, ø16, ø20, ø25
	Rc 1/8	ø32
TN	NPT 1/8	ø32
TF	G 1/8	ø32

Standard stroke (mm)

ø6, ø10, ø16	5, 10, 15, 20, 25, 30, 40, 50, 60
ø20, ø25, ø32	5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100

Action

D	Double acting

Auto switch

Nil	Without auto switch

∗ Refer to the table below for applicable auto switches.

Number of auto switches

Nil	2 pcs.
S	1 pc.

Built-in Magnet Cylinder Model

If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch.
(Example): CDUKW20-25D

Applicable Auto Switches/Refer to pages 1263 to 1371 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-color indication)			3-wire (NPN)		5 V, 12 V		**M9NWV**	**M9NW**	●	●	●	○	○	IC circuit	
				3-wire (PNP)				**M9PWV**	**M9PW**	●	●	●	○	○		
				2-wire		12 V		**M9BWV**	**M9BW**	●	●	●	○	○	—	
Reed switch	——	Grommet	Yes	3-wire (NPN equivalent)	—	5V	—	**A96V**	**A96**	●	—	●	—	—	IC circuit	—
				2-wire	24 V	12 V	100 V	**A93V**	**A93**	●	—	●	—	—	—	Relay, PLC
			No				100 V or less	**A90V**	**A90**	●	—	●	—	—	IC circuit	

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

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

∗ Since there are applicable auto switches other than the above, refer to page 538 for details.
∗ For detail about auto switches with pre-wired connector, refer to pages 1328 to 1329.
∗ Auto switches are shipped together but not assembled.

Specifications

Bore size (mm)	6	10	16	20	25	32
Fluid	Air					
Proof pressure	1.05 MPa					
Maximum operating pressure	0.7 MPa					
Minimum operating pressure	0.18 MPa	0.13 MPa		0.11 MPa		
Ambient and fluid temperature	Without auto switch: –10 to 70°C (No freezing) With auto switch: –10 to 60°C (No freezing)					
Lubrication	Non-lube					
Piston speed	50 to 500 mm/s					
Cushion	Rubber bumper					
Rod end thread	Male thread					
Stroke length tolerance	$^{+1.0}_{0}$ mm					
Rod non-rotating accuracy Note)	±0.8°				±0.5°	

Note) No load: Rod in the non-rotating plate side at retracted

Standard Stroke

Bore size (mm)	Standard stroke (mm)
6, **10**, **16**	5, 10, 15, 20, 25, 30, 40, 50, 60
20, **25**, **32**	5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100

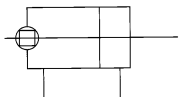
Minimum Stroke for Auto Switch Mounting

(mm)

No. of auto switches mounted	Applicable auto switch		
	D-A9□, D-A9□V	**D-M9□, D-M9□V**	**D-M9□W, D-M9□WV**
1 pc.	5	5	5
2 pcs.	10	5	10

JIS Symbol

Non-rotating rod



Mass/( ): Denotes the values with D-A93.

(g)

Model	Stroke (mm)												
	5	10	15	20	25	30	40	50	60	70	80	90	100
C(D)UKW6-□D	33 (38)	36 (46)	40 (50)	43 (53)	46 (56)	50 (60)	57 (67)	64 (74)	71 (81)	—	—	—	—
C(D)UKW10-□D	51 (56)	56 (66)	60 (70)	65 (75)	69 (79)	74 (84)	83 (93)	92 (102)	101 (111)	—	—	—	—
C(D)UKW16-□D	84 (109)	91 (121)	98 (128)	105 (135)	112 (142)	119 (149)	133 (163)	147 (177)	161 (191)	—	—	—	—
C(D)UKW20-□D	150 (185)	163 (203)	177 (217)	191 (231)	205 (245)	219 (259)	247 (286)	275 (315)	303 (343)	331 (371)	359 (399)	387 (427)	415 (455)
C(D)UKW25-□D	276 (330)	296 (355)	316 (375)	336 (395)	357 (416)	377 (436)	421 (476)	462 (516)	500 (559)	541 (600)	582 (641)	623 (682)	664 (723)
C(D)UKW32-□D	434 (507)	465 (543)	495 (573)	526 (604)	556 (634)	587 (665)	669 (747)	709 (787)	770 (848)	831 (909)	892 (970)	953 (1031)	1014 (1092)

* For the auto switch mass, refer to page 1263.

Theoretical Output

Specifications are the same as double acting, double rod (Series CUW). Refer to page 491.

Tightening Torque

When mounting Series CUKW, refer to page 484.

Allowable Rotational Torque

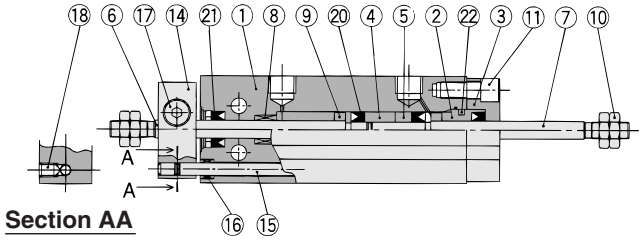
Ensure that rotational torque is not applied to the piston rod of Series CUKW. If rotational torque are applied unavoidably, refer to page 503.

Auto Switch Mounting Position

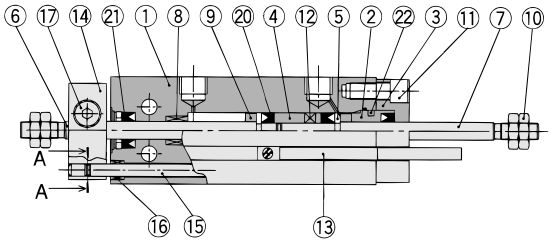
For the auto switch mounting position of Series CUKW, refer to page 494, since specifications are the same as double acting, double rod type.

Construction

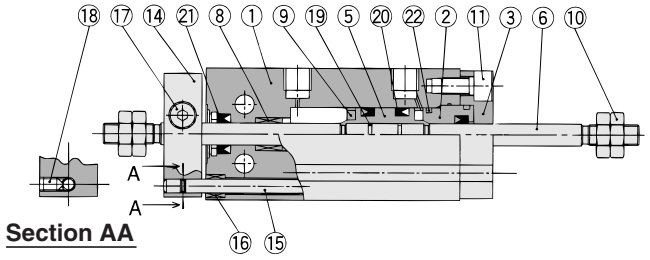
ø6

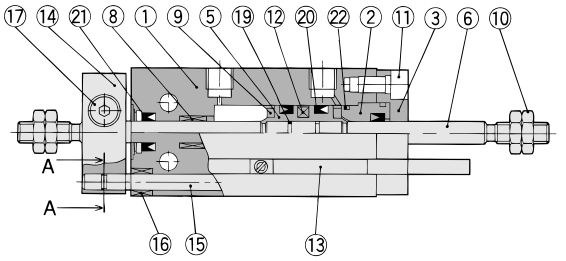


With auto switch

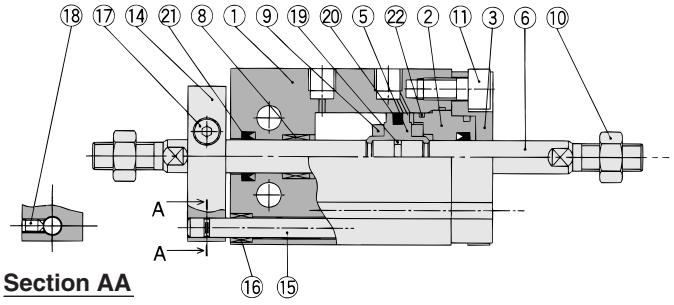


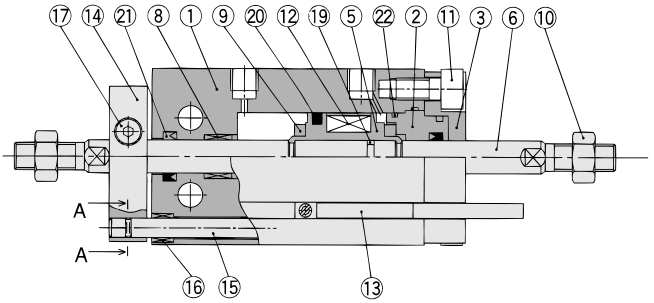
ø10





ø16 to ø32





Component Parts

No.	Description	Material	Note
1	**Cylinder tube**	Aluminum alloy	Hard anodized
2	**Rod cover**	Aluminum alloy	Chromated
3	**Rod cover retainer**	Aluminum alloy	Anodized
4	**Piston**	Brass	ø6
5	**Piston**	Brass	ø6, ø10
		Aluminum alloy	ø16 to ø32, Chromated
6	**Piston rod**	Stainless steel	
7	**Piston rod**	Stainless steel	ø6
8	**Bushing**	Oil-impregnated sintered alloy	
9	**Bumper**	Urethane	
10	**Rod end nut**	Carbon steel	Nickel plated
11	**Hexagon socket head cap screw**	Carbon steel	Nickel plated

Component Parts

No.	Description	Material	Note
12	**Magnet**	—	
13	**Auto switch**	—	
14	**Non-rotating plate**	Aluminum alloy	Nickel plated
15	**Guide rod**	Stainless steel	
16	**Bushing**	Oil-impregnated sintered alloy	
17	**Hexagon socket head cap screw**	Carbon steel	Black zinc chromated
18	**Hexagon socket head set screw**	Carbon steel	Black zinc chromated
19	**Piston gasket**	NBR	
20*	**Piston seal**		
21*	**Rod seal**		
22*	**Gasket**		

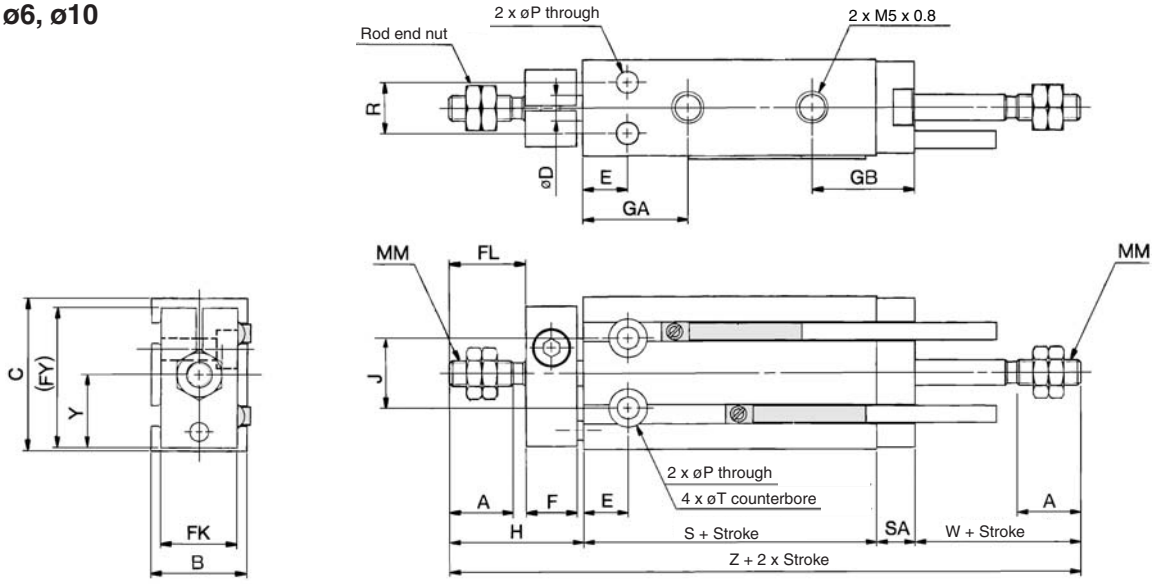
Replacement Parts: Seal Kit

	Bore size (mm) / Part no.				
	10	**16**	**20**	**25**	**32**
Kit no.	CUW10D-PS	CUW16D-PS	CUW20D-PS	CUW25D-PS	CUW32D-PS

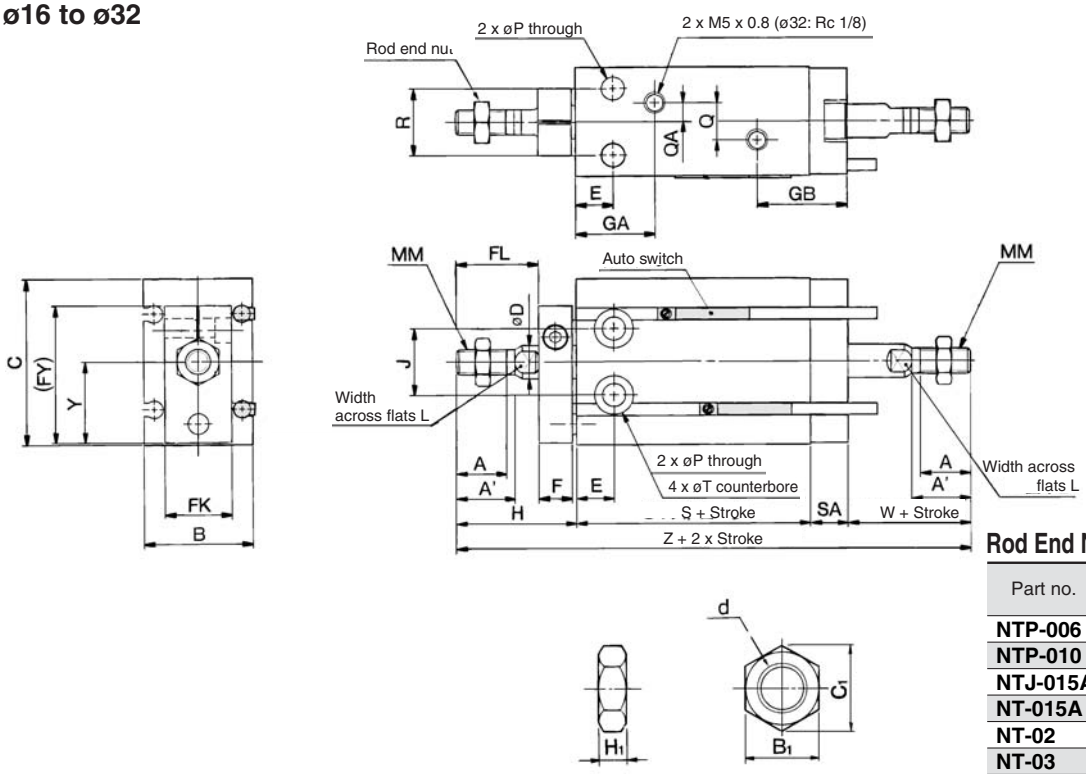
* Seal kit includes ⑳, ㉑, ㉒. Order the seal kit, based on each bore size.
* Seal kit includes a grease pack (10 g).
Order with the following part number when only the grease pack is needed.
Grease pack part number: GR-S-010 (10 g)

Dimensions: Non-rotating Rod Type; Double Acting, Double Rod

ø6, ø10



ø16 to ø32



Rod End Nut/Accessory Material: Carbon steel

Part no.	Applicable bore size (mm)	d	H_1	B_1	C_1
NTP-006	**6**	M3 x 0.5	1.8	5.5	6.4
NTP-010	**10**	M4 x 0.7	2.4	7	8.1
NTJ-015A	**16**	M5 x 0.8	4	8	9.2
NT-015A	**20**	M6 x 1.0	5	10	11.5
NT-02	**25**	M8 x 1.25	5	13	15.0
NT-03	**32**	M10 x 1.25	6	17	19.6

Bore size (mm)	A	A'	B	C	D	E	F	FL	FK	FY	GA	GB	H	J	L	MM
6	7	—	13	22	3	7	8	9	11	20.5	15	16	18	10	—	M3 x 0.5
10	10	—	15	24	4	7	8	12	12	22	16.5	16	21	11	—	M4 x 0.7
16	11	12.5	20	32	6	7	8	17	13	28	16.5 Note)	19	26	14	5	M5 x 0.8
20	12	14	26	40	8	9	8	20	16	33	19	21.5	29	16	6	M6 x 1.0
25	15.5	18	32	50	10	10	10	22	20	43.5	21.5	22	33	20	8	M8 x 1.25
32	19.5	22	40	62	12	11	12	29	24	51.5	23	22.5	42	24	10	M10 x 1.25

Bore size (mm)	P	Q	QA	R	SA	T	W	Y	Without auto switch		With auto switch	
									S	Z	S	Z
6	3.2	—	—	7	6	6 depth 4.8	13	10.5	38	75	38	75
10	3.2	—	—	9	6	6 depth 5	16	11.5	36	79	36	79
16	4.5	4	2	12	7.5	7.6 depth 6.5	16	15.5	30	79.5	40	89.5
20	5.5	9	4.5	16	9	9.3 depth 8	19	19.5	36	93	46	103
25	5.5	9	4.5	20	9	9.3 depth 9	23	24.5	40	105	50	115
32	6.6	13.5	4.5	24	10	11 depth 11.5	27	30.5	42	121	52	131

Note 1) 5 stroke (CUKW16-5D): GA = 14.5

Note 2) The two chamfered positions for the double rod type are not identical.

Free Mount Cylinder: Non-rotating Rod Type
Single Acting, Spring Return/Extend
Series CUK
ø6, ø10, ø16, ø20, ø25, ø32

How to Order

CUK 10 □ – 15 S – □

With auto switch **CDUK** 10 □ – 15 S – **M9BW** □ – □

Built-in magnet

Non-rotating rod type

Bore size

6	6 mm
10	10 mm
16	16 mm
20	20 mm
25	25 mm
32	32 mm

Port thread type

Symbol	Type	Bore size
Nil	M5 x 0.8	ø6, ø10, ø16, ø20, ø25
	Rc 1/8	ø32
TN	NPT 1/8	ø32
TF	G 1/8	ø32

Standard stroke (mm)

ø6, ø10, ø16 ø20, ø25, ø32	5, 10, 15

Action

S	Single acting, Spring return
T	Single acting, Spring extend

Auto switch

Nil	Without auto switch

∗ Refer to the table below for applicable auto switches.

Number of auto switches

Nil	2 pcs.
S	1 pc.

Made to order

∗ Refer to page 511 for the Made to Order specifications.

Built-in Magnet Cylinder Model

If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch.
(Example): CDUK20-10S

Applicable Auto Switches/Refer to pages 1263 to 1371 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage			Auto switch model		Lead wire length (m)				Pre-wired connector	Applicable load	
					DC		AC	Perpendicular	In-line	0.5 (Nil)	1 (M)	3 (L)	5 (Z)			
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**	●	●	●	○	○	—	
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 ····· Nil (Example) M9NW
1 m ····· M (Example) M9NWM
3 m ····· L (Example) M9NWL
5 m ····· Z (Example) M9NWZ

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

∗ Since there are applicable auto switches other than the above, refer to page 538 for details.
∗ For detail about auto switches with pre-wired connector, refer to pages 1328 to 1329.
∗ Auto switches are shipped together but not assembled.

Specifications

Bore size (mm)	6	10	16	20	25	32
Fluid	Air					
Proof pressure	1.05 MPa					
Maximum operating pressure	0.7 MPa					
Minimum operating pressure	0.23 MPa	0.18 MPa		0.16 MPa		
Ambient and fluid temperature	Without auto switch: –10 to 70°C (No freezing) With auto switch: –10 to 60°C (No freezing)					
Lubrication	Non-lube					
Piston speed	50 to 500 mm/s					
Cushion Note 1)	Rubber bumper on both ends					
Rod end thread	Male thread					
Stroke length tolerance	$^{+1.0}_{0}$ mm					
Rod non-rotating accuracy Note 2)	±0.8°			±0.5°		

Note 1) ø6: With auto switch, single rubber bumper
Note 2) No load: Rod at retracted

Standard Stroke

(mm)

Bore size (mm)	Standard stroke (mm)
6, 10, 16, 20, 25, 32	5, 10, 15

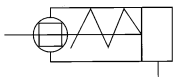
Minimum Stroke for Auto Switch Mounting

(mm)

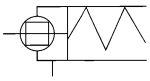
No. of auto switches mounted	Applicable auto switch		
	D-A9□, D-A9□V	**D-M9□, D-M9□V**	**D-M9□W, D-M9□WV**
1 pc.	5	5	5
2 pcs.	10	5	10

JIS Symbol

Single acting, Spring return



Single acting, Spring extend



Mass

/( ): Denotes the values with D-A93.

(g)

Model	Stroke (mm)		
	5	10	15
C(D)UK6-□S/T	28 (33)	31 (41)	34 (44)
C(D)UK10-□S/T	43 (48)	47 (57)	55 (65)
C(D)UK16-□S/T	60 (85)	66 (90)	81 (111)
C(D)UK20-□S/T	113 (147)	124 (164)	153 (193)
C(D)UK25-□S/T	212 (266)	229 (288)	271 (330)
C(D)UK32-□S/T	331 (404)	357 (435)	422 (500)

∗ For the auto switch mass, refer to page 1263.

Made to Order Specifications

(For details, refer to pages 1462 and 1469.)

Symbol	Specifications
-XC22	Fluororubber seals
-XC34	Non-rotating plate with work piece mounting screw (No extended part on the rod end)

Tightening Torque

When mounting a CUK single acting series, refer to page 484.

Theoretical Output

Specifications are the same as single acting, spring return/spring extend type (Series CU). Refer to page 496.

Spring Reaction Force

For the reactive force of spring return, refer to page 1569.

Auto Switch Mounting Position

For the auto switch mounting position of CDUK series single acting, spring return/spring extend, refer to page 501, since specification are the same as standard type, single acting, spring return/spring extend type.

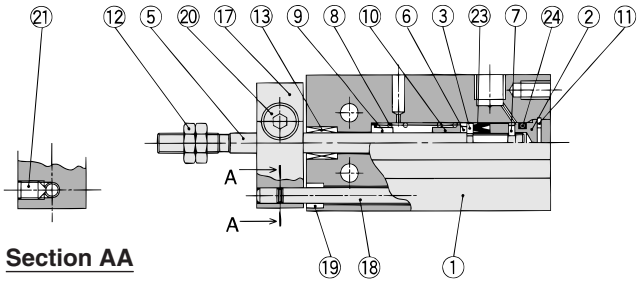
Allowable Rotational Torque

Make sure that rotational torque is not applied to the piston rod of the CUK series single acting type cylinder. If the rotation torque were applied unavoidably, refer to page 503.

Construction

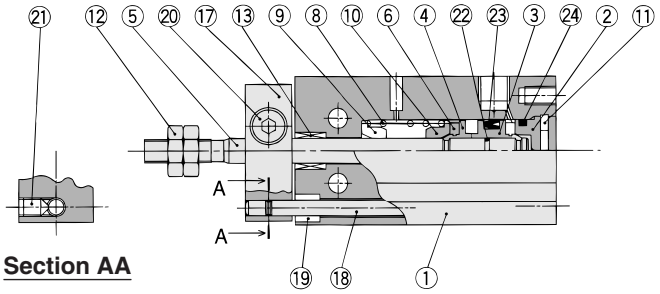
Single acting, Spring return

ø6



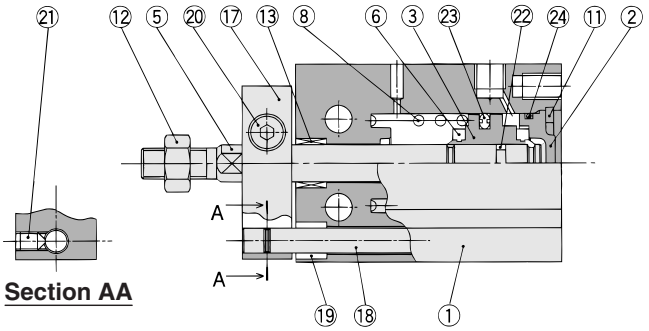
Section AA

ø10



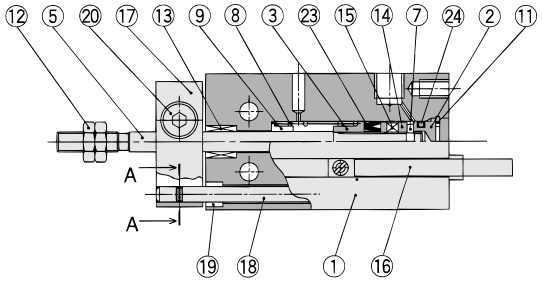
Section AA

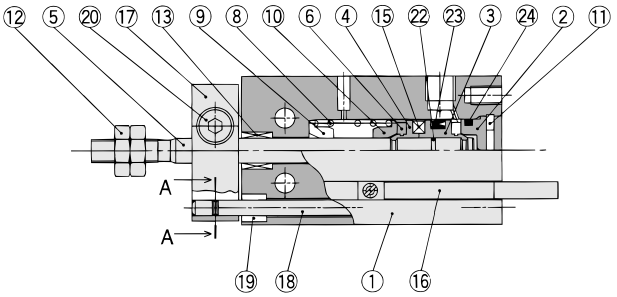
ø16 to ø32

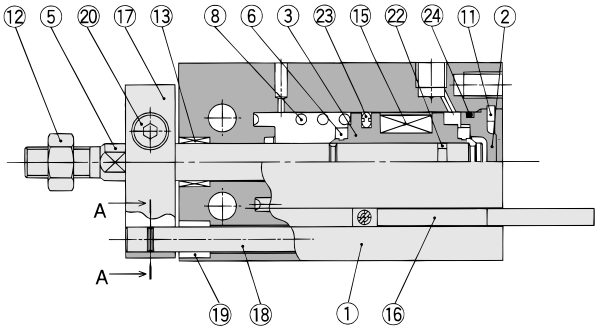


Section AA

With auto switch







Component Parts

No.	Description	Material	Note
1	**Cylinder tube**	Aluminum alloy	Hard anodized
2	**Head cover**	Brass	ø6 to ø10, Electroless nickel plated
		Aluminum alloy	ø16 to ø32, Chromated
3	**Piston**	Brass	ø6 to ø10
		Aluminum alloy	ø16 to ø32, Chromated
4	**Piston**	Brass	ø10
5	**Piston rod**	Stainless steel	
6	**Bumper A**	Urethane	
7	**Bumper B**	Urethane	
8	**Return spring**	Piano wire	Zinc chromated
9	**Spring seat**	Brass	
10	**Spring seat**	Brass	

Component Parts

No.	Description	Material	Note
11	**Retaining ring**	Carbon tool steel	Phosphate coated
12	**Rod end nut**	Carbon steel	Nickel plated
13	**Bushing**	Oil-impregnated sintered alloy	
14	**Magnet holder**	Brass	ø6
15	**Magnet**	—	
16	**Auto switch**	—	
17	**Non-rotating plate**	Aluminum alloy	Nickel plated
18	**Guide rod**	Stainless steel	
19	**Bushing**	Oil-impregnated sintered alloy	Black zinc chromated
20	**Hexagon socket head cap screw**	Carbon steel	Black zinc chromated
21	**Hexagon socket head set screw**	Carbon steel	
22	**Piston gasket**	NBR	
23*	**Piston seal**		
24*	**Gasket**		

Replacement Parts: Seal Kit

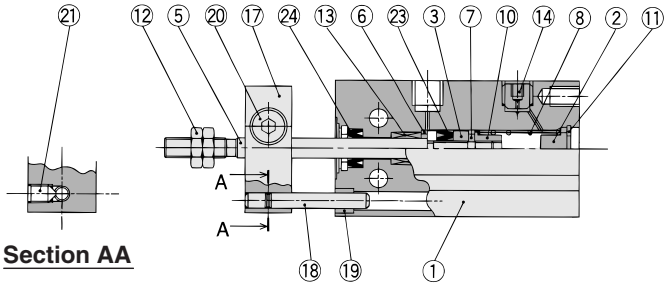
	Bore size (mm) / Part no.				
	10	**16**	**20**	**25**	**32**
Kit no.	CU10S-PS	CU16S-PS	CU20S-PS	CU25S-PS	CU32S-PS

* Seal kit includes ㉓, ㉔. Order the seal kit, based on each bore size.
* Seal kit includes a grease pack (10 g).
Order with the following part number when only the grease pack is needed.
Grease pack part number: GR-S-010 (10 g)

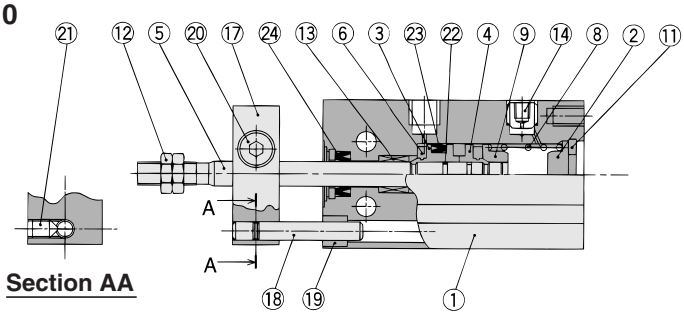
Construction

Single acting, Spring extend

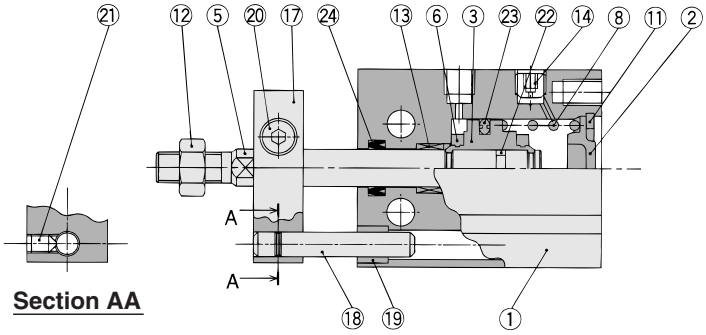
ø6



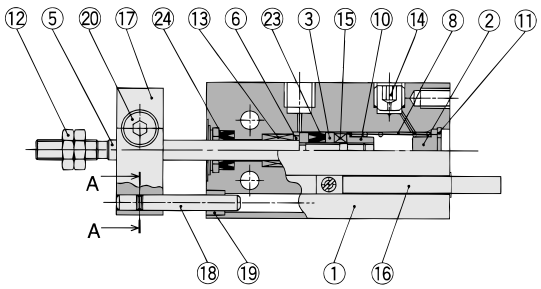
ø10

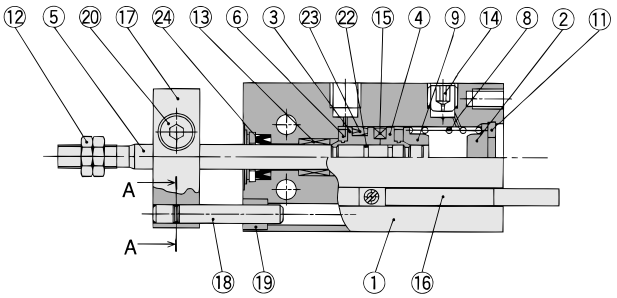


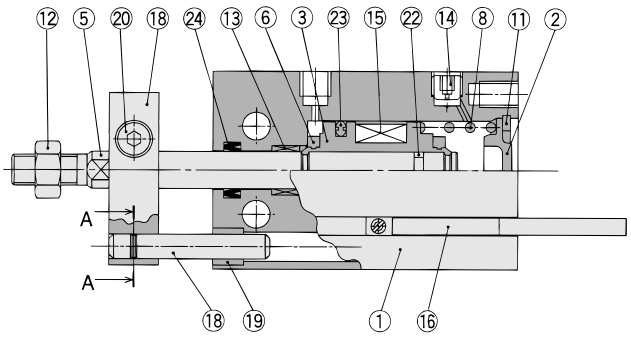
ø16 to ø32



With auto switch







Component Parts

No.	Description	Material	Note
1	**Cylinder tube**	Aluminum alloy	Hard anodized
2	**Head cover**	Brass	ø6 to ø10, Electroless nickel plated
		Aluminum alloy	ø16 to ø32, Chromated
3	**Piston**	Brass	ø6 to ø10
		Aluminum alloy	ø16 to ø32, Chromated
4	**Piston**	Brass	ø10
5	**Piston rod**	Stainless steel	
6	**Bumper A**	Urethane	
7	**Bumper B**	Urethane	
8	**Return spring**	Piano wire	Zinc chromated
9	**Spring seat**	Brass	
10	**Stopper**	Brass	ø6
11	**Retaining ring**	Carbon tool steel	Phosphate coated

Component Parts

No.	Description	Material	Note
12	**Rod end nut**	Carbon steel	Nickel plated
13	**Bushing**	Oil-impregnated sintered alloy	
14	**Plug with fixed orifice**	Alloy steel	Black dyed
15	**Magnet**	—	
16	**Auto switch**	—	
17	**Non-rotating plate**	Aluminum alloy	Nickel plated
18	**Guide rod**	Stainless steel	
19	**Bushing**	Oil-impregnated sintered alloy	Black zinc chromated
20	**Hexagon socket head cap screw**	Carbon steel	Black zinc chromated
21	**Hexagon socket head set screw**	Carbon steel	
22	**Piston gasket**	NBR	
23*	**Piston seal**		
24*	**Rod seal**		

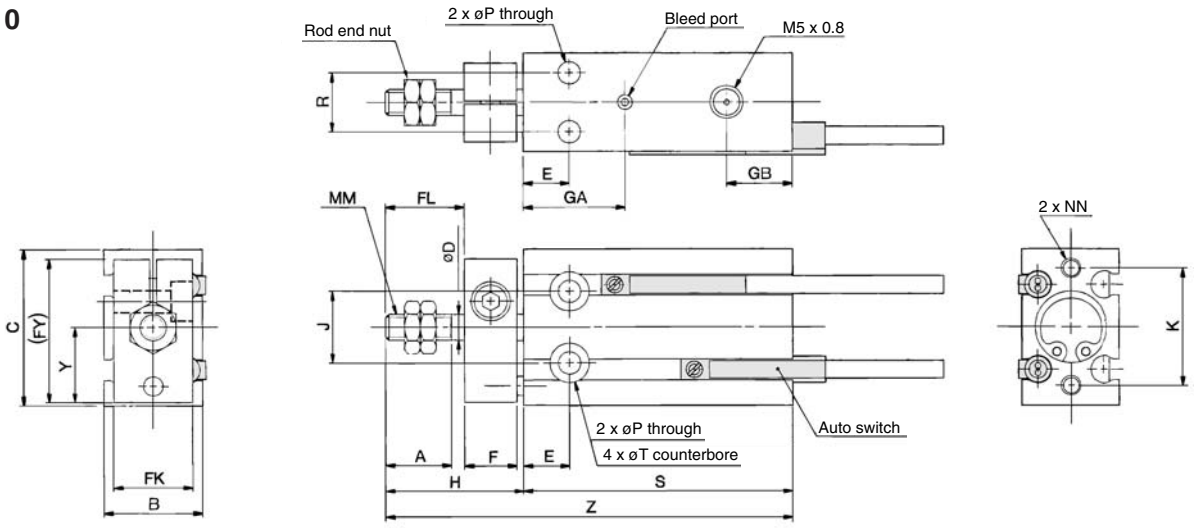
Replacement Parts: Seal Kit

	Bore size (mm) / Part no.				
	10	**16**	**20**	**25**	**32**
Kit no.	CU10T-PS	CU16T-PS	CU20T-PS	CU25T-PS	CU32T-PS

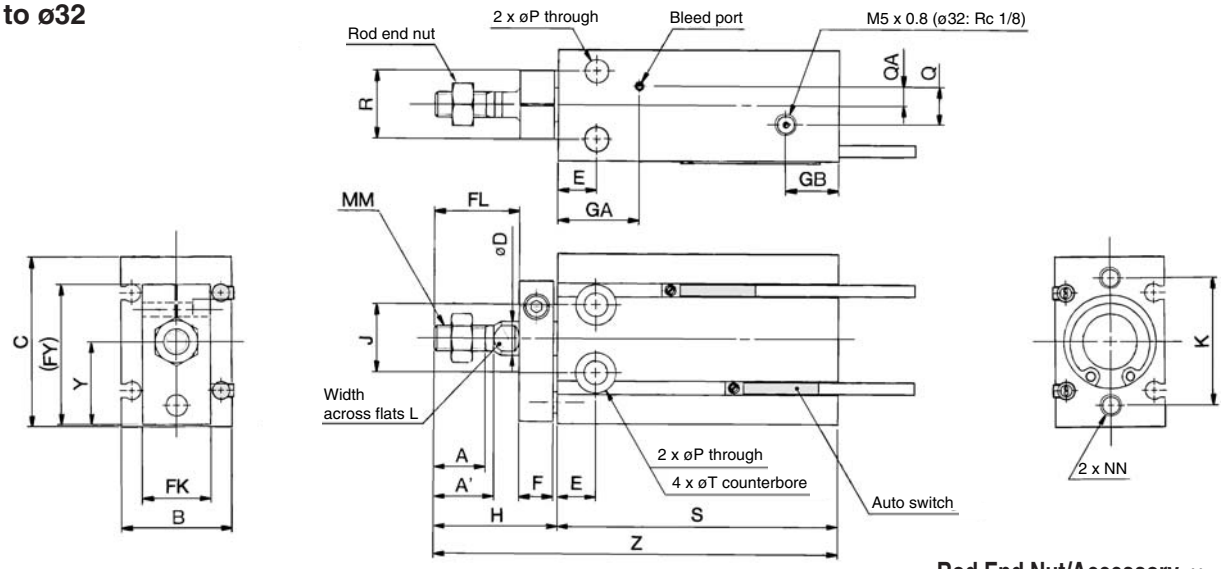
* Seal kit includes ㉓, ㉔. Order the seal kit, based on each bore size.
* Seal kit includes a grease pack (10 g).
Order with the following part number when only the grease pack is needed.
Grease pack part number: GR-S-010 (10 g)

Dimensions: Non-rotating Rod Type; Single Acting, Spring Return

ø6, ø10



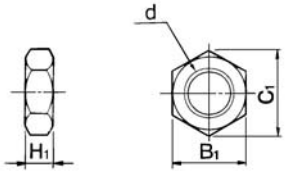
ø16 to ø32



Rod End Nut/Accessory

Material: Carbon steel

Part no.	Applicable bore size (mm)	d	H_1	B_1	C_1
NTP-006	6	M3 x 0.5	1.8	5.5	6.4
NTP-010	10	M4 x 0.7	2.4	7	8.1
NTJ-015A	16	M5 x 0.8	4	8	9.2
NT-015A	20	M6 x 1.0	5	10	11.5
NT-02	25	M8 x 1.25	5	13	15.0
NT-03	32	M10 x 1.25	6	17	19.6

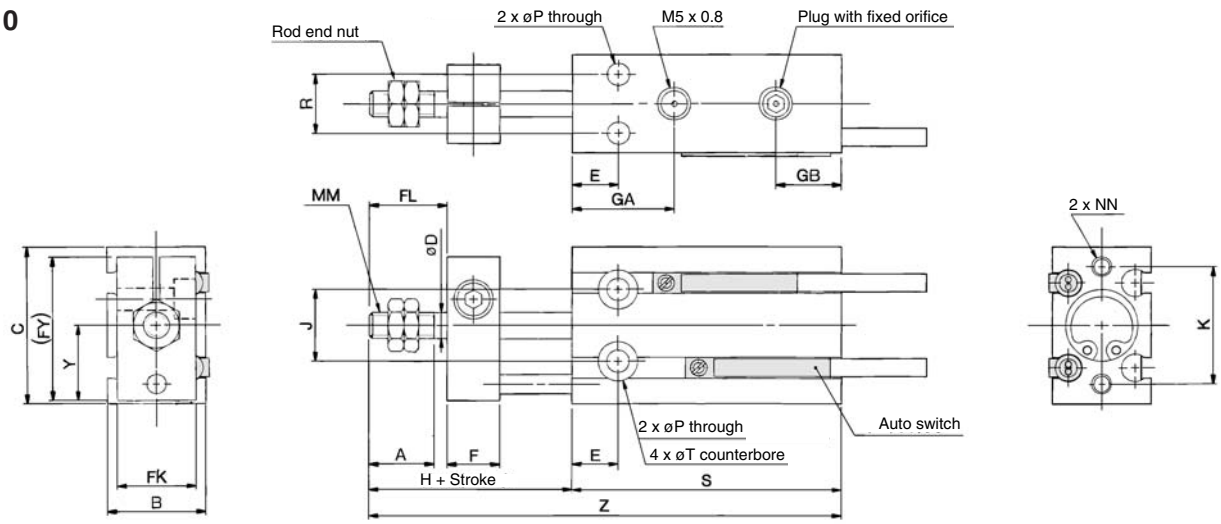


Bore size (mm)	A	A'	B	C	D	E	F	FL	FK	FY	GA	GB	H	J	K	L	MM	NN
6	7	—	13	22	3	7	8	9	11	20.5	15	10	18	10	17	—	M3 x 0.5	M3 x 0.5 depth 5
10	10	—	15	24	4	7	8	12	12	22	16.5	10	21	11	18	—	M4 x 0.7	M3 x 0.5 depth 5
16	11	12.5	20	32	6	7	8	17	13	28	16.5	11.5	26	14	25	5	M5 x 0.8	M4 x 0.7 depth 6
20	12	14	26	40	8	9	8	20	16	33	19	12.5	29	16	30	6	M6 x 1.0	M5 x 0.8 depth 8
25	15.5	18	32	50	10	10	10	22	20	43.5	21.5	13	33	20	38	8	M8 x 1.25	M5 x 0.8 depth 8
32	19.5	22	40	62	12	11	12	29	24	51.5	23	12.5	42	24	48	10	M10 x 1.25	M6 x 1.0 depth 9

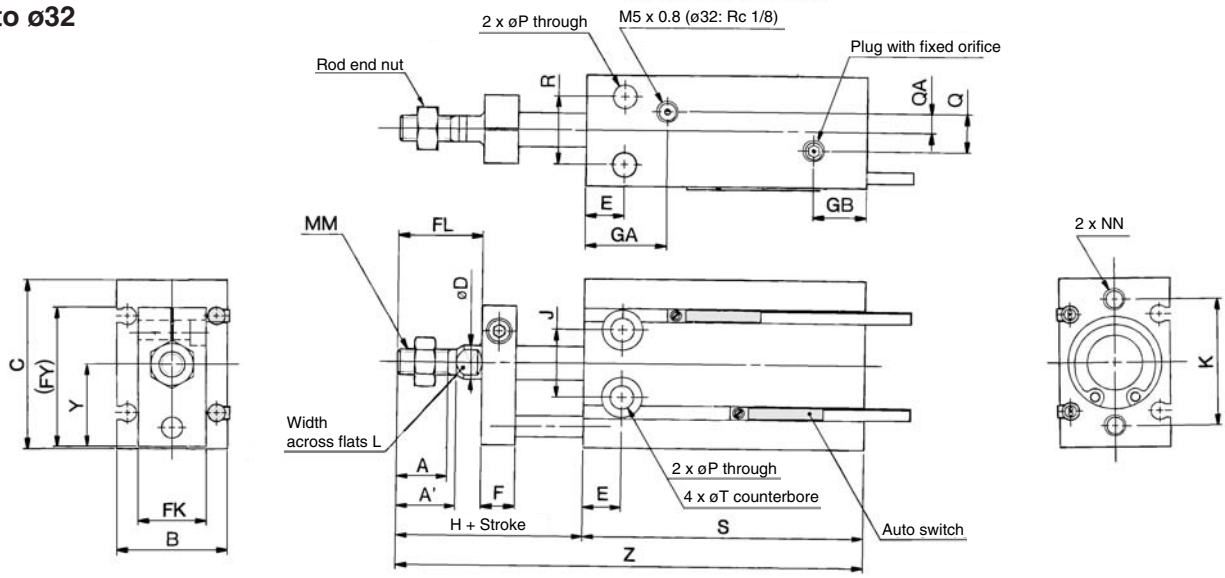
Bore size (mm)	P	Q	QA	R	T	Y	Without auto switch						With auto switch					
							S			Z			S			Z		
							5 st	10 st	15 st	5 st	10 st	15 st	5 st	10 st	15 st	5 st	10 st	15 st
6	3.2	—	—	7	6 depth 4.8	10.5	38	43	48	56	61	66	38	43	48	56	61	66
10	3.2	—	—	9	6 depth 5	11.5	41	46	56	62	67	77	41	46	56	62	67	77
16	4.5	4	2	12	7.6 depth 6.5	15.5	35	40	50	61	66	76	45	50	60	71	76	86
20	5.5	9	4.5	16	9.3 depth 8	19.5	41	46	56	70	75	85	51	56	66	80	85	95
25	5.5	9	4.5	20	9.3 depth 9	24.5	45	50	60	78	83	93	55	60	70	88	93	103
32	6.6	13.5	4.5	24	11 depth 11.5	30.5	47	52	62	89	94	104	57	62	72	99	104	114

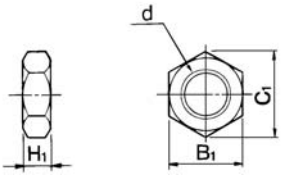
Dimensions: Non-rotating Rod Type; Single Acting, Spring Extend

ø6, ø10



ø16 to ø32





Rod End Nut/Accessory Material: Carbon steel

Part no.	Applicable bore size (mm)	d	H_1	B_1	C_1
NTP-006	**6**	M3 x 0.5	1.8	5.5	6.4
NTP-010	**10**	M4 x 0.7	2.4	7	8.1
NTJ-015A	**16**	M5 x 0.8	4	8	9.2
NT-015A	**20**	M6 x 1.0	5	10	11.5
NT-02	**25**	M8 x 1.25	5	13	15.0
NT-03	**32**	M10 x 1.25	6	17	19.6

Bore size (mm)	A	A'	B	C	D	E	F	FL	FK	FY	GA	GB	H	J	K	L	MM	NN
6	7	—	13	22	3	7	8	9	11	20.5	15	10	18	10	17	—	M3 x 0.5	M3 x 0.5 depth 5
10	10	—	15	24	4	7	8	12	12	22	16.5	10	21	11	18	—	M4 x 0.7	M3 x 0.5 depth 5
16	11	12.5	20	32	6	7	8	17	13	28	16.5	11.5	26	14	25	5	M5 x 0.8	M4 x 0.7 depth 6
20	12	14	26	40	8	9	8	20	16	33	19	12.5	29	16	30	6	M6 x 1.0	M5 x 0.8 depth 8
25	15.5	18	32	50	10	10	10	22	20	43.5	21.5	13	33	20	38	8	M8 x 1.25	M5 x 0.8 depth 8
32	19.5	22	40	62	12	11	12	29	24	51.5	23	12.5	42	24	48	10	M10 x 1.25	M6 x 1.0 depth 9

Bore size (mm)	P	Q	QA	R	T	Y	Without auto switch						With auto switch					
							S			Z			S			Z		
							5 st	10 st	15 st	5 st	10 st	15 st	5 st	10 st	15 st	5 st	10 st	15st
6	3.2	—	—	7	6 depth 4.8	10.5	38	43	48	61	71	81	38	43	48	61	71	81
10	3.2	—	—	9	6 depth 5	11.5	41	46	56	67	77	92	41	46	56	67	77	92
16	4.5	4	2	12	7.6 depth 6.5	15.5	45	50	60	76	86	101	45	50	60	76	86	101
20	5.5	9	4.5	16	9.3 depth 8	19.5	41	46	56	75	85	100	51	56	66	85	95	110
25	5.5	9	4.5	20	9.3 depth 9	24.5	45	50	60	83	93	108	55	60	70	93	103	118
32	6.6	13.5	4.5	24	11 depth 11.5	30.5	47	52	62	94	104	119	57	62	72	104	114	129

Free Mount Cylinder: Long Stroke Type
Double Acting, Single Rod
Series CU
ø6, ø10, ø16, ø20, ø25, ø32

How to Order

Without auto switch: CU 6 □ – 60 D – □

With auto switch: CDU 6 □ – 60 D – M9BW □ – □

Built-in magnet

Bore size

6	6 mm
10	10 mm
16	16 mm
20	20 mm
25	25 mm
32	32 mm

Port thread type

Symbol	Type	Bore size
Nil	M5 x 0.8	ø6, ø10, ø16, ø20, ø25
	Rc 1/8	ø32
TN	NPT 1/8	ø32
TF	G 1/8	ø32

Long stroke (mm)

ø6, ø10, ø16	40, 50, 60
ø20, ø25, ø32	60, 70, 80, 90, 100

Action

D	Double acting

Auto switch

Nil	Without auto switch

∗ Refer to the table below for applicable auto switches.

Number of auto switches

Nil	2 pcs.
S	1 pc.

Made to order

∗ Refer to page 517 for the Made to Order specifications.

Built-in Magnet Cylinder Model

If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch.
(Example): CDU20-80D

Applicable Auto Switches/Refer to pages 1263 to 1371 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage DC	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-color indication)			3-wire (NPN)		5 V, 12 V		M9NWV	M9NW	●	●	●	○	○	IC circuit	
				3-wire (PNP)				M9PWV	M9PW	●	●	●	○	○		
				2-wire		12 V		M9BWV	M9BW	●	●	●	○	○	—	
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 ····· Nil (Example) M9NW
1 m ····· M (Example) M9NWM
3 m ····· L (Example) M9NWL
5 m ····· Z (Example) M9NWZ

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

∗ Since there are applicable auto switches other than the above, refer to page 538 for details.
∗ For detail about auto switches with pre-wired connector, refer to pages 1328 to 1329.
∗ Auto switches are shipped together but not assembled.

Specifications

Bore size (mm)	6	10	16	20	25	32
Fluid	Air					
Proof pressure	1.05 MPa					
Maximum operating pressure	0.7 MPa					
Minimum operating pressure	0.12 MPa	0.06 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)					
Lubrication	Non-lube					
Piston speed	50 to 500 mm/s					
Cushion	Rubber bumper					
Rod end thread	Male thread					
Stroke length tolerance	$^{+1.0}_{0}$ mm					

Standard Stroke

Bore size (mm)	Standard stroke (mm)
6, **10**, **16**	40, 50, 60
20, **25**, **32**	60, 70, 80, 90, 100

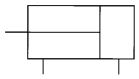
Mass

/( ): Denotes the values with D-A93. (g)

Model	Stroke (mm)						
	40	50	60	70	80	90	100
C(D)U6-□D	43 (53)	49 (59)	55 (65)	—	—	—	—
C(D)U10-□D	64 (74)	72 (82)	80 (90)	—	—	—	—
C(D)U16-□D	92 (122)	104 (134)	116 (146)	—	—	—	—
C(D)U20-□D	—	—	216 (253)	238 (275)	260 (297)	282 (319)	304 (341)
C(D)U25-□D	—	—	363 (422)	397 (456)	431 (490)	465 (524)	499 (558)
C(D)U32-□D	—	—	526 (604)	574 (652)	622 (700)	670 (748)	718 (796)

∗ For the auto switch mass, refer to page 1263.

JIS Symbol
Double acting,
Spring rod



Made to Order Specifications

(For details, refer to pages 1395 to 1498.)

Symbol	Specifications
-XB6	Heat resistant (–10 to 150°C)
-XB7	Cold resistant (–40 to 70°C)
-XB9	Low speed (10 to 50 mm/s)
-XB13	Low speed (5 to 50 mm/s)
-XC19	Intermediate stroke (5 mm spacer)
-XC22	Fluororubber seals

Auto Switch Mounting Position

For the auto switch mounting position of CDU long stroke series, refer to page 488, since specifications are the same as standard type, double acting, single rod type.

Tightening Torque

Refer to page 484 for mounting a long stroke type.

Theoretical Output

Specifications are the same as CU series double acting, single rod. Refer to page 484.

Copper and Fluorine-free

20-CU | **Bore size** | – | **Stroke** | **D**

• **Copper and Fluorine-free**

This cylinder eliminates any influences of copper ions or fluoro resins on color CRTs. Copper materials have been nickel plated or replaced with non-copper materials to prevent the generation of copper ions.

Minimum Operating Pressure

(MPa)

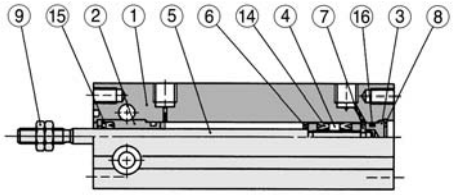
Bore size (mm)	6	10, 16	20, 25, 32
Minimum operating pressure	0.12	0.12	0.05

Specifications

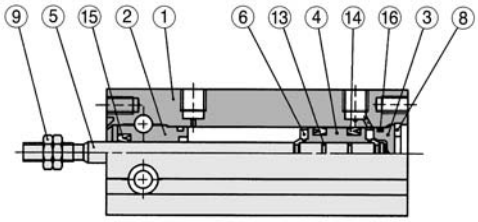
Action	Double acting, Single rod
Bore size (mm)	6, 10, 16, 20, 25, 32
Maximum operating pressure	1.05 MPa
Cushion	Rubber bumper
Stroke	Same as standard type (Refer to page 484.)
Auto switch	Mountable

Construction

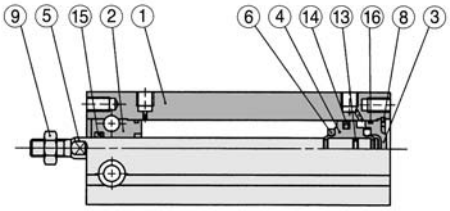
ø6



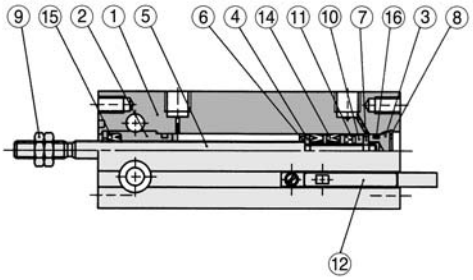
ø10

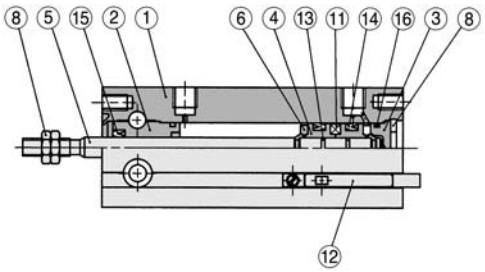


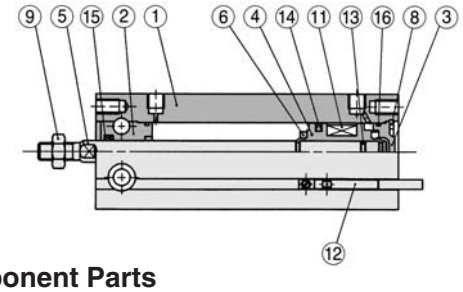
ø16 to ø32



With auto switch







Component Parts

No.	Description	Material	Note
1	**Cylinder tube**	Aluminum alloy	Hard anodized
2	**Rod cover**	Aluminum alloy	Hard anodized
3	**Head cover**	Brass	ø6 to ø10, Electroless nickel plated
		Aluminum alloy	ø16 to ø32, Chromated
4	**Piston**	Brass	ø6 to ø10
		Aluminum alloy	ø16 to ø32, Chromated
5	**Piston rod**	Stainless steel	
6	**Bumper A**	Urethane	
7	**Bumper B**	Urethane	

Component Parts

No.	Description	Material	Note
8	**Retaining ring**	Carbon tool steel	Phosphate coated
9	**Rod end nut**	Carbon steel	Nickel plated
10	**Magnet holder**	Brass	ø6
11	**Magnet**	—	
12	**Auto switch**	—	
13	**Piston gasket**	NBR	
14*	**Piston seal**		
15*	**Rod seal**		
16*	**Gasket**		

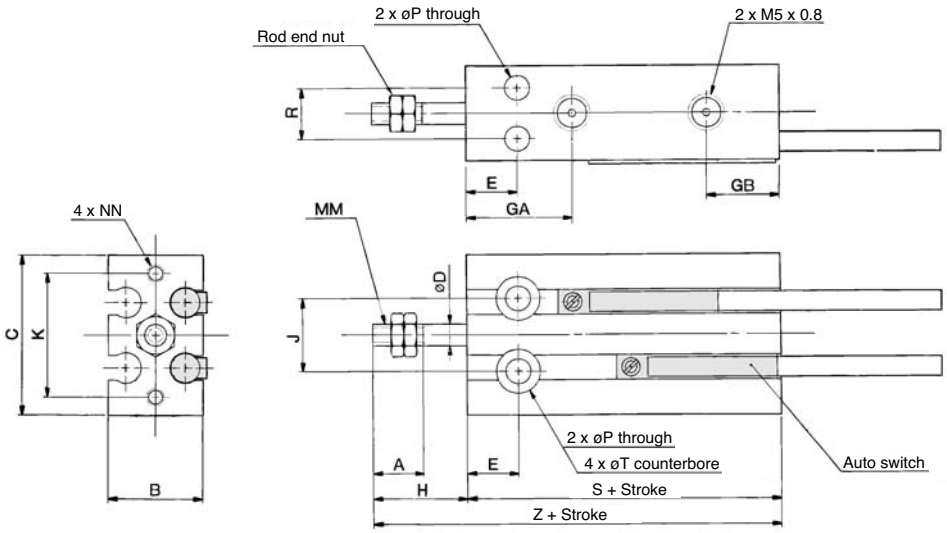
Replacement Parts: Seal Kit

Bore size (mm)	Kit no.	Contents
10	CU10D-PS	Set of nos. above ⑭, ⑮, ⑯.
16	CU16D-PS	
20	CU20D-PS	
25	CU25D-PS	
32	CU32D-PS	

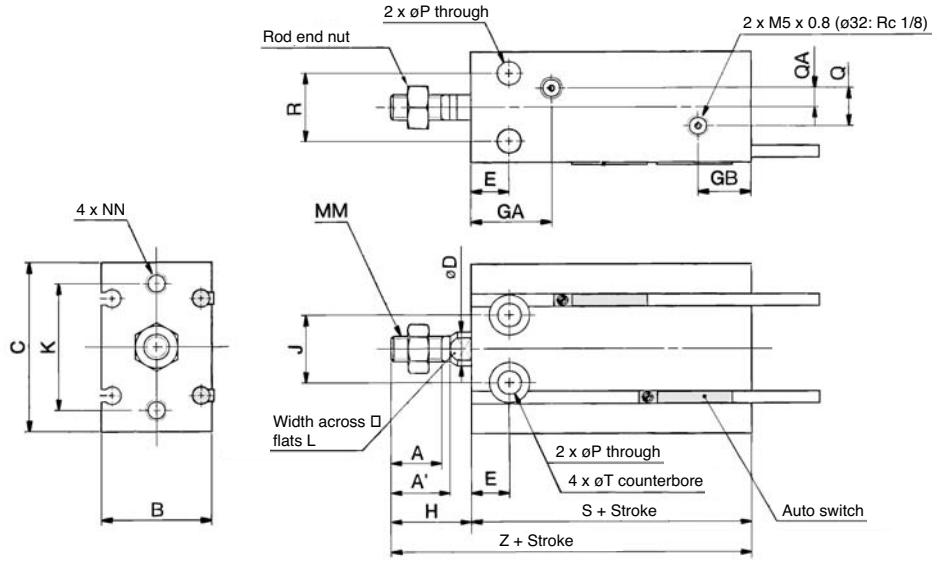
* Seal kit includes ⑭, ⑮, ⑯. Order the seal kit, based on each bore size.
* Seal kit includes a grease pack (10 g).
Order with the following part number when only the grease pack is needed.
Grease pack part number: GR-S-010 (10 g)

Dimensions: Double Acting, Single Rod

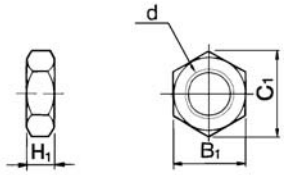
ø6, ø10



ø16 to ø32



Rod End Nut/Accessory



Material: Carbon steel

Part no.	Applicable bore (mm)	d	H_1	B_1	C_1
NTP-006	6	M3 x 0.5	1.8	5.5	6.4
NTP-010	10	M4 x 0.7	2.4	7	8.1
NTJ-015A	16	M5 x 0.8	4	8	9.2
NT-015A	20	M6 x 1.0	5	10	11.5
NT-02	25	M8 x 1.25	5	13	15.0
NT-03	32	M10 x 1.25	6	17	19.6

(mm)

Bore size (mm)	A	A'	B	C	D	E	GA	GB	H	J	K	L	MM	NN	P	Q	QA
6	7	—	13	22	3	7	15	10	13	10	17	—	M3 x 0.5	M3 x 0.5 depth 5	3.2	—	—
10	10	—	15	24	4	7	16.5	10	16	11	18	—	M4 x 0.7	M3 x 0.5 depth 5	3.2	—	—
16	11	12.5	20	32	6	7	16.5	11.5	16	14	25	5	M5 x 0.8	M4 x 0.7 depth 6	4.5	4	2
20	12	14	26	40	8	9	19	12.5	19	16	30	6	M6 x 1.0	M5 x 0.8 depth 8	5.5	9	4.5
25	15.5	18	32	50	10	10	21.5	13	23	20	38	8	M8 x 1.25	M5 x 0.8 depth 8	5.5	9	4.5
32	19.5	22	40	62	12	11	23	12.5	27	24	48	10	M10 x 1.25	M6 x 1.0 depth 9	6.6	13.5	4.5

Bore size (mm)	R	T	Without auto switch		With auto switch	
			S	Z	S	Z
6	7	6 depth 4.8	33	46	33	46
10	9	6 depth 5	36	52	36	52
16	12	7.6 depth 6.5	30	46	40	56
20	16	9.3 depth 8	36	55	46	65
25	20	9.3 depth 9	40	63	50	73
32	24	11 depth 11.5	42	69	52	79

Free Mount Cylinder: Long Stroke Type
Non-rotating Rod, Double Acting, Single Rod
Series CUK
ø6, ø10, ø16, ø20, ø25, ø32

How to Order

CUK **6** **□** **–** **60** **D** **–** **□**

With auto switch

CDUK **6** **□** **–** **60** **D** **–** **M9BW** **□** **–** **□**

Built-in magnet

Non-rotating rod type

Bore size

6	6 mm
10	10 mm
16	16 mm
20	20 mm
25	25 mm
32	32 mm

Port thread type

Symbol	Type	Bore size
Nil	M5 x 0.8	ø6, ø10, ø16, ø20, ø25
	Rc 1/8	ø32
TN	NPT 1/8	ø32
TF	G 1/8	ø32

Cylinder stroke (mm)

ø6, ø10, ø16	40, 50, 60
ø20, ø25, ø32	60, 70, 80, 90, 100

Action

D	Double acting

Auto switch

Nil	Without auto switch

∗ Refer to the table below for applicable auto switches.

Number of auto switches

Nil	2 pcs.
S	1 pc.

Made to order

∗ Refer to page 521 for the Made to Order specifications.

Built-in Magnet Cylinder Model

If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch.
(Example): CDUK20-80D

Applicable Auto Switches/Refer to pages 1263 to 1371 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage			Auto switch model		Lead wire length (m)				Pre-wired connector	Applicable load	
					DC		AC	Perpendicular	In-line	0.5 (Nil)	1 (M)	3 (L)	5 (Z)			
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**	●	●	●	○	○	—	
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 ····· Nil (Example) M9NW
1 m ····· M (Example) M9NWM
3 m ····· L (Example) M9NWL
5 m ····· Z (Example) M9NWZ

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

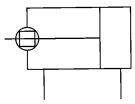
∗ Since there are applicable auto switches other than the above, refer to page 538 for details.
∗ For detail about auto switches with pre-wired connector, refer to pages 1328 to 1329.
∗ Auto switches are shipped together but not assembled.

Specifications

Bore size (mm)	6	10	16	20	25	32
Fluid	Air					
Proof pressure	1.05 MPa					
Maximum operating pressure	0.7 MPa					
Minimum operating pressure	0.15 MPa		0.10 MPa		0.08 MPa	
Ambient and fluid temperature	Without auto switch: –10 to 70°C (No freezing) With auto switch: –10 to 60°C (No freezing)					
Lubrication	Non-lube					
Piston speed	50 to 500 mm/s					
Cushion	Rubber bumper					
Rod end thread	Male thread					
Stroke length tolerance	$^{+1.0}_{0}$ mm					
Rod non-rotating accuracy Note)	±0.8°			±0.5°		

Note) No load: Rod at retracted

JIS Symbol
Double acting,
Single rod



Standard Stroke

(mm)

Bore size (mm)	Standard stroke (mm)
6, **10**, **16**	40, 50, 60
20, **25**, **32**	60, 70, 80, 90, 100

Mass

/( ): Denotes the values with D-A93. (g)

Model	Stroke (mm)						
	40	50	60	70	80	90	100
C(D)UK6-□D	49 (59)	55 (65)	61 (71)	—	—	—	—
C(D)UK10-□D	71 (81)	79 (89)	87 (97)	—	—	—	—
C(D)UK16-□D	102 (132)	114 (144)	126 (156)	—	—	—	—
C(D)UK20-□D	—	—	243 (284)	267 (308)	291 (332)	315 (356)	339 (380)
C(D)UK25-□D	—	—	405 (460)	440 (495)	475 (530)	510 (565)	545 (600)
C(D)UK32-□D	—	—	617 (695)	669 (747)	721 (799)	773 (851)	825 (903)

∗ For the auto switch mass, refer to page 1263.

Made to Order Specifications

(For details, refer to pages 1395 to 1498.)

Symbol	Specifications
-XB6	Heat resistant (–10 to 150°C)
-XB7	Cold resistant (–40 to 70°C)
-XB9	Low speed (10 to 50 mm/s)
-XB13	Low speed (5 to 50 mm/s)
-XC19	Intermediate stroke (5 mm spacer)
-XC22	Fluororubber seals
-XC34	Non-rotating plate with work piece mounting screw (No extended part on the rod end)

Allowable Rotational Torque

Make sure that rotational torque is not applied to the piston rod of a long stroke type cylinder. If the rotation torque were applied unavoidably, refer to page 503 for details.

Tightening Torque

When mounting a CUK long stroke series, refer to page 484.

Theoretical Output

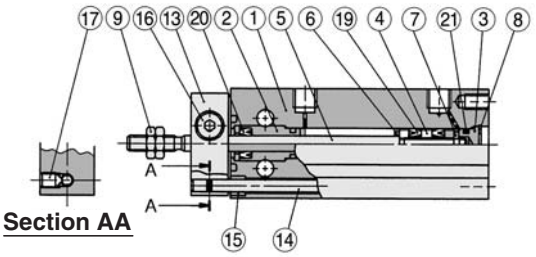
Specifications are the same as CU series double acting, single rod. Refer to page 484.

Auto Switch Mounting Position

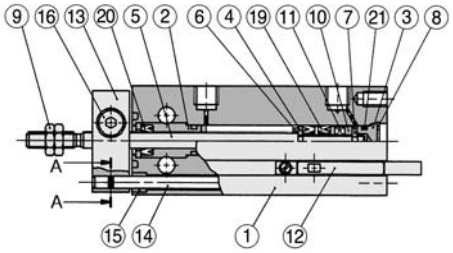
For the auto switch mounting position of CDUK long stroke series, refer to page 488, since specifications are the same as standard type, double acting, single rod type.

Construction

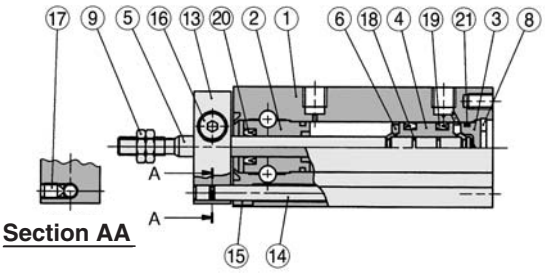
ø6

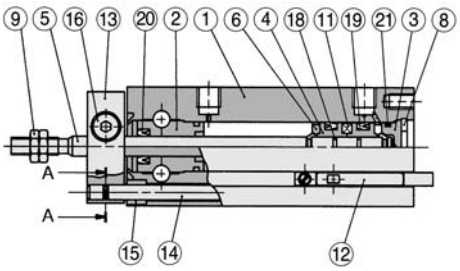


With auto switch

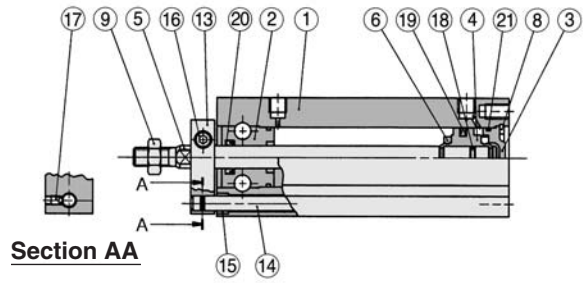


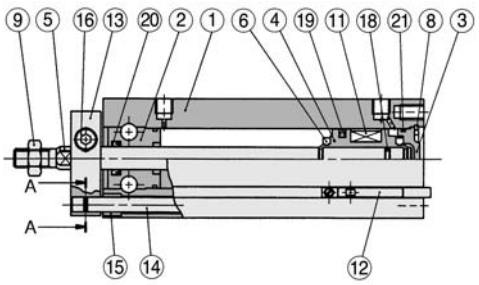
ø10





ø16 to ø32





Component Parts

No.	Description	Material	Note
1	**Cylinder tube**	Aluminum alloy	Hard anodized
2	**Rod cover**	Aluminum alloy	Hard anodized
3	**Head cover**	Brass	ø6 to ø10, Electroless nickel plated
		Aluminum alloy	ø16 to ø32, Chromated
4	**Piston**	Brass	ø6 to ø10
		Aluminum alloy	ø16 to ø32, Chromated
5	**Piston rod**	Stainless steel	
6	**Bumper A**	Urethane	
7	**Bumper B**	Urethane	
8	**Retaining ring**	Carbon tool steel	Phosphate coated
9	**Rod end nut**	Carbon steel	Nickel plated
10	**Magnet holder**	Brass	ø6

Component Parts

No.	Description	Material	Note
11	**Magnet**	—	
12	**Auto switch**	—	
13	**Non-rotating plate**	Aluminum alloy	Nickel plated
14	**Guide rod**	Stainless steel	
15	**Bushing**	Oil-impregnated sintered alloy	Black zinc chromated
16	**Hexagon socket head cap screw**	Carbon steel	Black zinc chromated
17	**Hexagon socket head set screw**	Carbon steel	
18	**Piston gasket**	NBR	
19*	**Piston seal**		
20*	**Rod seal**		
21*	**Gasket**		

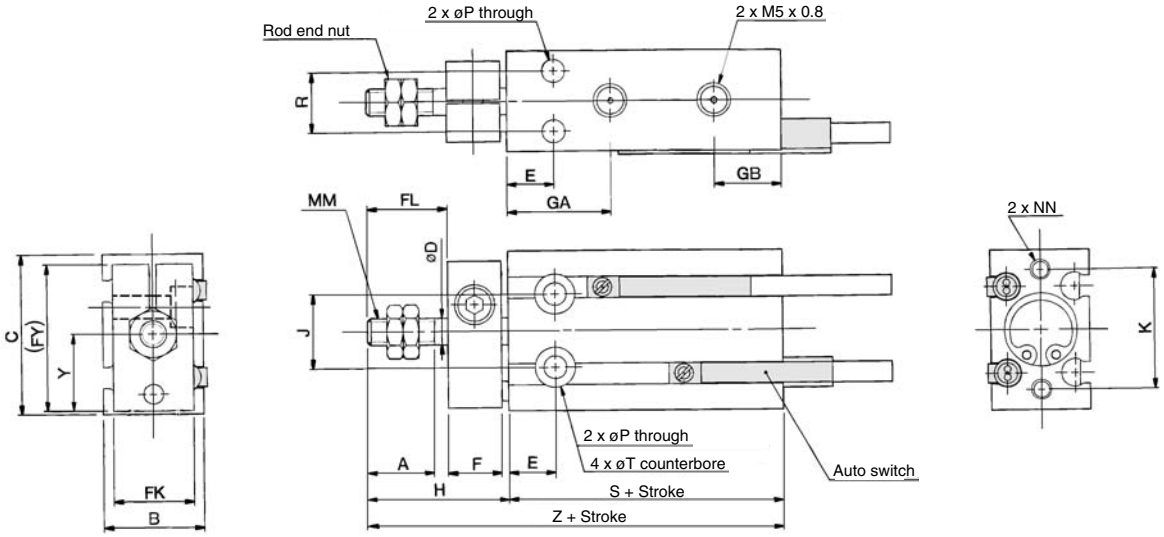
Replacement Parts: Seal Kit

Bore size (mm)	Kit no.	Contents
10	CU10D-PS	Set of nos. above ⑲, ⑳, ㉑.
16	CU16D-PS	
20	CU20D-PS	
25	CU25D-PS	
32	CU32D-PS	

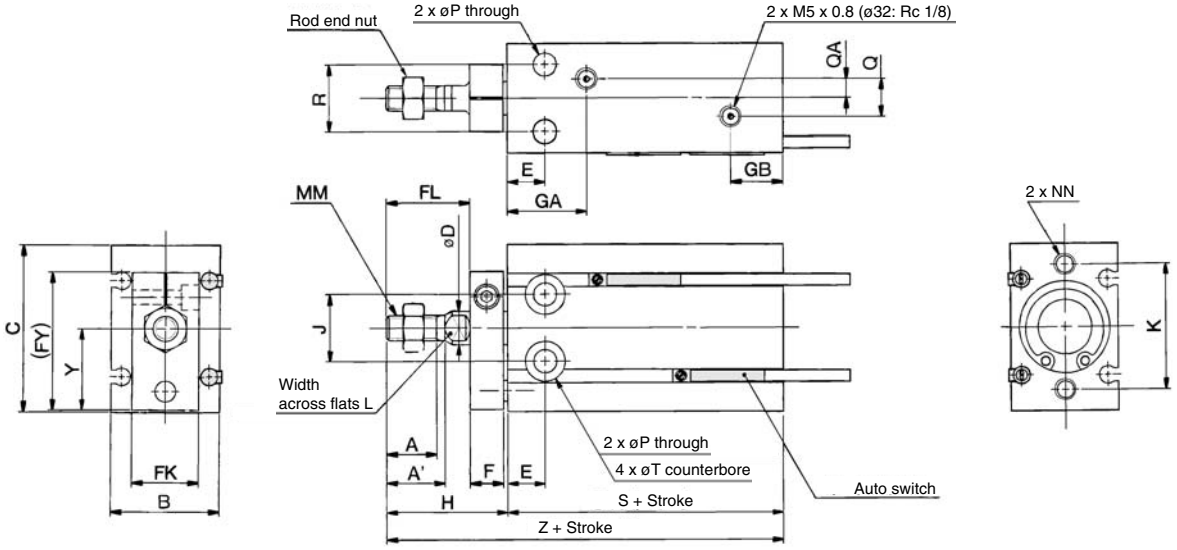
* Seal kit includes ⑲, ⑳, ㉑. Order the seal kit, based on each bore size.
* Seal kit includes a grease pack (10 g).
Order with the following part number when only the grease pack is needed.
Grease pack part number: GR-S-010 (10 g)

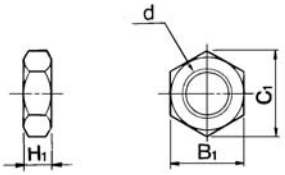
Dimensions: Non-rotating Rod Type; Double Acting, Single Rod

ø6, ø10



ø16 to ø32





Rod End Nut/Accessory Material: Carbon steel

Part no.	Applicable bore size (mm)	d	H_1	B_1	C_1
NTP-006	**6**	M3 x 0.5	1.8	5.5	6.4
NTP-010	**10**	M4 x 0.7	2.4	7	8.1
NTJ-015A	**16**	M5 x 0.8	4	8	9.2
NT-015A	**20**	M6 x 1.0	5	10	11.5
NT-02	**25**	M8 x 1.25	5	13	15.0
NT-03	**32**	M10 x 1.25	6	17	19.6

Bore size (mm)	A	A'	B	C	D	E	F	FL	FK	FY	GA	GB	H	J	K	L	MM
6	7	—	13	22	3	7	8	9	11	20.5	15	10	18	10	17	—	M3 x 0.5
10	10	—	15	24	4	7	8	12	12	22	16.5	10	21	11	18	—	M4 x 0.7
16	11	12.5	20	32	6	7	8	17	13	28	16.5	11.5	26	14	25	5	M5 x 0.8
20	12	14	26	40	8	9	8	20	16	33	19	12.5	29	16	30	6	M6 x 1.0
25	15.5	18	32	50	10	10	10	22	20	43.5	21.5	13	33	20	38	8	M8 x 1.25
32	19.5	22	40	62	12	11	12	29	24	51.5	23	12.5	42	24	48	10	M10 x 1.25

Bore size (mm)	NN	P	Q	QA	R	T	Y	Without auto switch		With auto switch	
								S	Z	S	Z
6	M3 x 0.5 depth 5	3.2	—	—	7	6 depth 4.8	10.5	33	51	33	51
10	M3 x 0.5 depth 5	3.2	—	—	9	6 depth 5	11.5	36	57	36	57
16	M4 x 0.7 depth 6	4.5	4	2	12	7.6 depth 6.5	15.5	30	56	40	66
20	M5 x 0.8 depth 8	5.5	9	4.5	16	9.3 depth 8	19.5	36	65	46	75
25	M5 x 0.8 depth 8	5.5	9	4.5	20	9.3 depth 9	24.5	40	73	50	83
32	M6 x 1.0 depth 9	6.6	13.5	4.5	24	11 depth 11.5	30.5	42	84	52	94

Free Mount Cylinder with Air Cushion

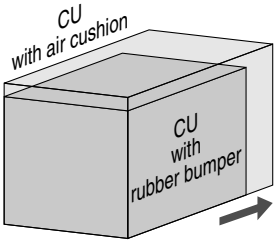
Series CU

New air cushion mechanism

Extended dimensions (compared to the standard *CU* models) are hardly noticeable.

(with rubber bumper)

- Overall length: ***+1.5 to 7 mm***
- Overall height: ***+0 to 2 mm***
  No air cushion protrusion.
- Overall width: not affected

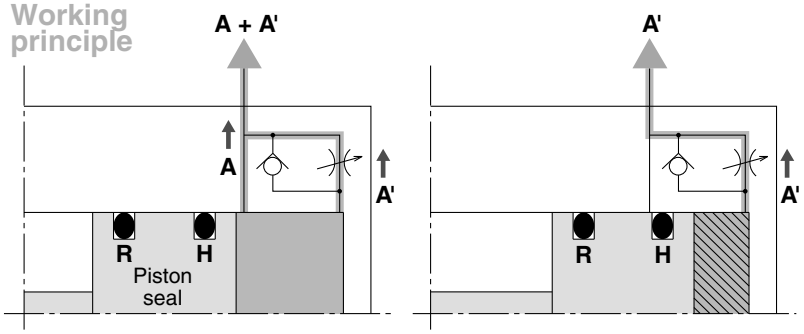


(mm)

Bore size	Extended dimensions	
	Length	Height
ø20	7	2
ø25	1.5	0
ø32	4	0

Unique air cushion construction requires no cushion ring.

Working principle



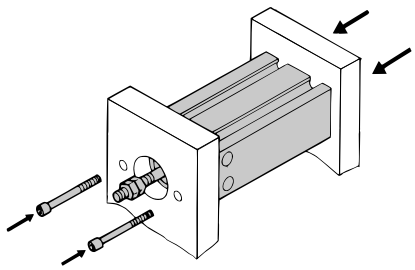
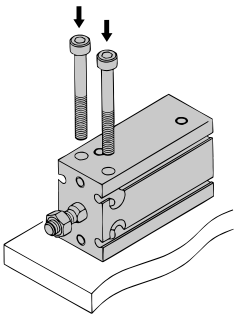
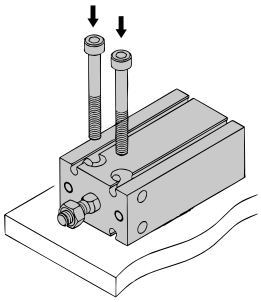
① When the piston is retracting, air is exhausted through both A and A' until piston seal H passes air passage A.

② After piston seal H has passed air passage A, air is exhausted only through A'. The section marked with slanted lines becomes a cushion chamber, and an air cushion effect is achieved.

③ When air is supplied for the piston extension, the check valve opens and the piston extends with no delay.

Free mounting

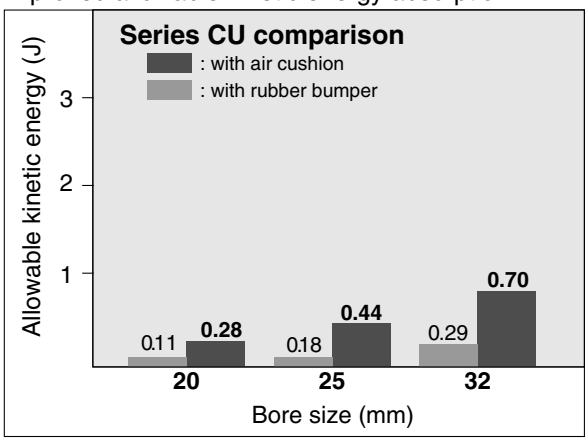
3 types of mounting orientations can be accommodated depending on the installation conditions.

Axial mounting (Tapped hole)	Vertical mounting (Body through-hole)	Lateral mounting (Body through-hole)
		

Approximately 2.4 times of allowable kinetic energy

(Compared to the old Series CU with rubber bumper)

Improved allowable kinetic energy absorption.



Improved repeatability

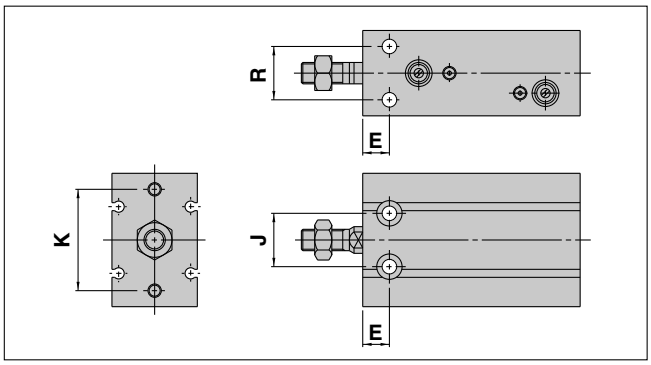
When compared to rubber bumper type actuators, air cushion type cylinders are less likely to be affected by pressure fluctuations, and therefore better able to achieve a stable and smooth stroke.

Improved sound insulation
(Reduced impact noise at the stroke end)

- Noise reduction of more than 11 dB is possible (compared to Series CU20 with rubber bumper).

Interchangeable mounting

Mounting dimensions (J, K, R, and E) are the same as the rubber bumper type Series CU.



Size Variations

Model	Standard stroke									Auto switch
	20	30	40	50	60	70	80	90	100	
C(D)U20	●	●	●	●	●	●	●	●	●	• ø20 to ø32 Direct mounting style auto switch
C(D)U25	●	●	●	●	●	●	●	●	●	
C(D)U32	●	●	●	●	●	●	●	●	●	

Free Mount Cylinder with Air Cushion

Series CU

ø20, ø25, ø32

How to Order

CU 32 □ – 50 A

With auto switch CDU 32 □ – 50 A – M9BW □

With auto switch (Built-in magnet)

Bore size

20	20 mm
25	25 mm
32	32 mm

Thread type

Symbol	Type	Bore size
Nil	M5 x 0.8	ø20, ø25
	Rc 1/8	ø32
TN	NPT 1/8	ø32
TF	G 1/8	

Air cushion

A	With air cushion

Cylinder stroke (mm)
Refer to next page for "Standard Stroke".

Auto switch

Nil	Without auto switch

∗ Refer to the table below for applicable auto switches.

Number of auto switches

Nil	2 pcs.
S	1 pc.

Built-in Magnet Cylinder Model

If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch.
(Example): CDU25-50A

Applicable Auto Switches/Refer to pages 1263 to 1371 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage			Auto switch model		Lead wire length (m)				Pre-wired connector	Applicable load	
					DC		AC	Perpendicular	In-line	0.5 (Nil)	1 (M)	3 (L)	5 (Z)			
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**	●	●	●	○	○	IC circuit	
				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**	●	●	●	○	○	IC circuit	
				2-wire		12 V		**M9BWV**	**M9BW**	●	●	●	○	○	—	
Reed switch	——	Grommet	Yes	3-wire (NPN equivalent)	—	5V	—	**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 ····· Nil (Example) M9NW
1 m ····· M (Example) M9NWM
3 m ····· L (Example) M9NWL
5 m ····· Z (Example) M9NWZ

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

∗ Since there are applicable auto switches other than the above, refer to page 538 for details.
∗ For detail about auto switches with pre-wired connector, refer to pages 1328 to 1329.
∗ Auto switches are shipped together but not assembled.

Specifications

Type	Pneumatic (Non-lube)
Fluid	Air
Proof pressure	1.0 MPa
Maximum operating pressure	0.7 MPa
Minimum operating pressure	0.08 MPa
Ambient and fluid temperature	Without auto switch: –10°C to 70°C (No freezing)
	With auto switch: –10°C to 60°C (No freezing)
Rod end thread	Male thread
Stroke length tolerance	$^{+1.0}_{0}$
Piston speed	50 to 500 mm/s

Effective Cushion Length

Bore size (mm)	**20**	**25**	**32**
Effective cushion length (mm)	6.6	6.7	7.7

Standard Stroke

Bore size (mm)	Standard stroke (mm)
20, 25, 32	20, 30, 40, 50, 60, 70, 80, 90, 100

∗ Intermediate strokes are also available upon receipt of order. Please contact SMC.
Minimum stroke length is 20 mm.

Tightening Torque/ When mounting Series CU refer to the table below.

Bore size (mm)	Hexagon socket head cap screw size	Proper tightening torque (N·m)
20, 25	M5	5.10 ±10%
32	M6	8.04 ±10%

Allowable Kinetic Energy

Refer to "Selection" on page 532 regarding allowable kinetic energy.

Theoretical Output

(N)

Bore size (mm)	Operating direction	Operating pressure (MPa)		
		0.3	0.5	0.7
20	OUT	94.2	157	220
	IN	79.2	132	185
25	OUT	147	246	344
	IN	124	206	288
32	OUT	241	402	563
	IN	207	346	454

Mass

Basic Mass

(g)

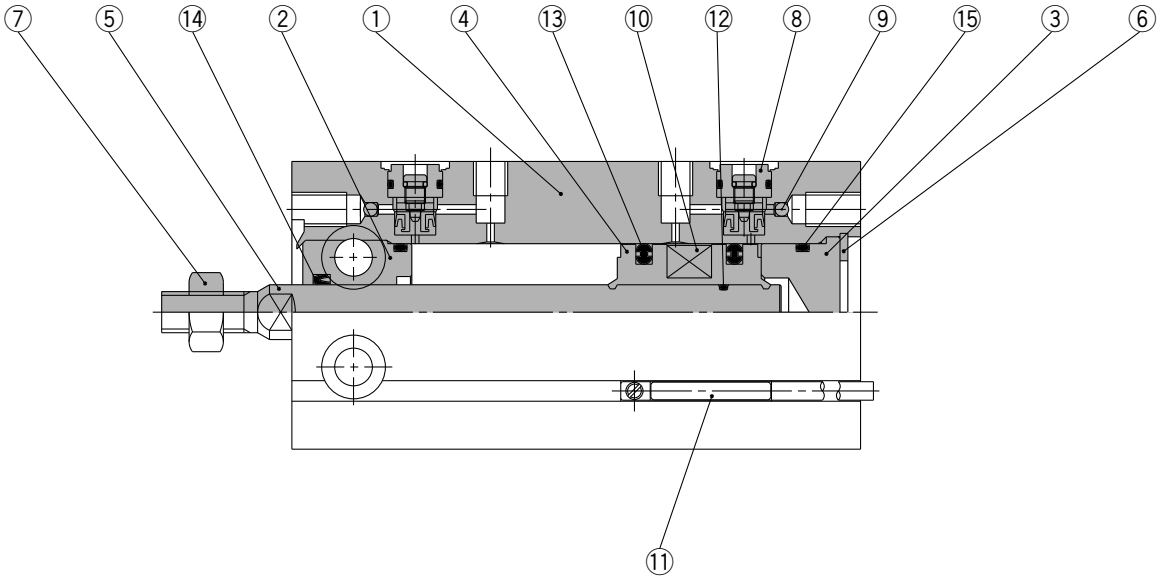
Bore size (mm)	Standard stroke (mm)								
	20	30	40	50	60	70	80	90	100
20	186	208	230	252	274	296	318	340	362
25	289	323	357	391	425	459	493	527	561
32	464	512	560	608	656	704	752	800	848

Additional Mass

(g)

Bore size (mm)	Magnet
20	5
25	6
32	11

Construction



Component Parts

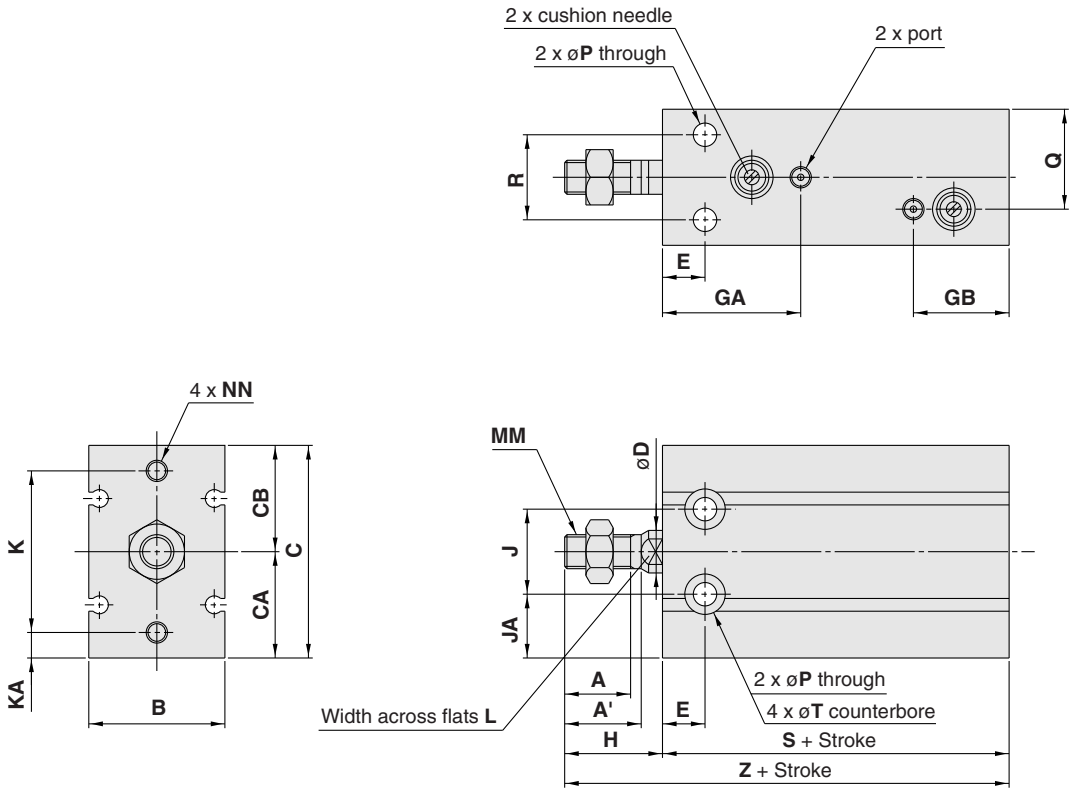
No.	Description	Material	No. of pcs.	Note
1	**Cylinder tube**	Aluminum alloy	1	Hard anodized
2	**Rod cover**	Aluminum alloy	1	Hard anodized
3	**Head cover**	Aluminum alloy	1	Clear chromated
4	**Piston**	Aluminum alloy	1	Chromated
5	**Piston rod**	Stainless steel	1	
6	**Retaining ring**	Carbon tool steel	1	Phosphate coated
7	**Rod end nut**	Carbon steel	1	Nickel plated
8	**Cushion needle assembly**	—	(2)	
9	**Steel ball**	Carbon steel	2	
10	**Magnet**	—	1	
11	**Auto switch**	—	(2)	
12	**Piston gasket**	NBR	1	
13*	**Piston seal**	NBR	2	
14*	**Rod seal**	NBR	1	
15*	**Gasket**	NBR	1	

Replacement Parts: Seal Kit

Bore size (mm)	Kit no.	Contents
ø20	CU20A-PS	Set of nos. above ⑬, ⑭, ⑮.
ø25	CU25A-PS	
ø32	CU32A-PS	

* Seal kit includes ⑬, ⑭, ⑮. Order the seal kit, based on each bore size.
* Seal kit includes a grease pack (10 g).
  Order with the following part number when only the grease pack is needed.
  Grease pack part number: GR-S-010 (10 g)

Dimensions

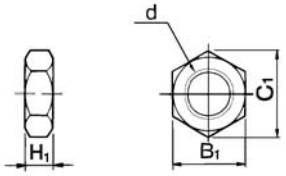


(mm)

Bore size (mm)	Port size	A	A'	B	C	CA	CB	D	E	GA	GB	H	J	JA
20	M5 x 0.8	12	14	26	42	20	22	8	9	29	27	19	16	12
25	M5 x 0.8	15.5	18	32	50	25	25	10	10	32.5	22.5	23	20	15
32	1/8	19.5	22	40	62	31	31	12	11	35	25	27	24	19

Bore size (mm)	K	KA	L	MM	NN	P	Q	R	T	S	Z	Standard stroke
20	30	5	6	M6 x 1.0	M5 x 0.8 depth 8	5.5	13	16	9.3 depth 8	53	72	20, 30, 40, 50, 60, 70, 80, 90, 100
25	38	6	8	M8 x 1.25	M5 x 0.8 depth 8	5.5	23.5	20	9.3 depth 9	51.5	74.5	
32	48	7	10	M10 x 1.25	M6 x 1.0 depth 9	6.6	29	24	11 depth 11.5	56	83	

Rod End Nut/Accessory

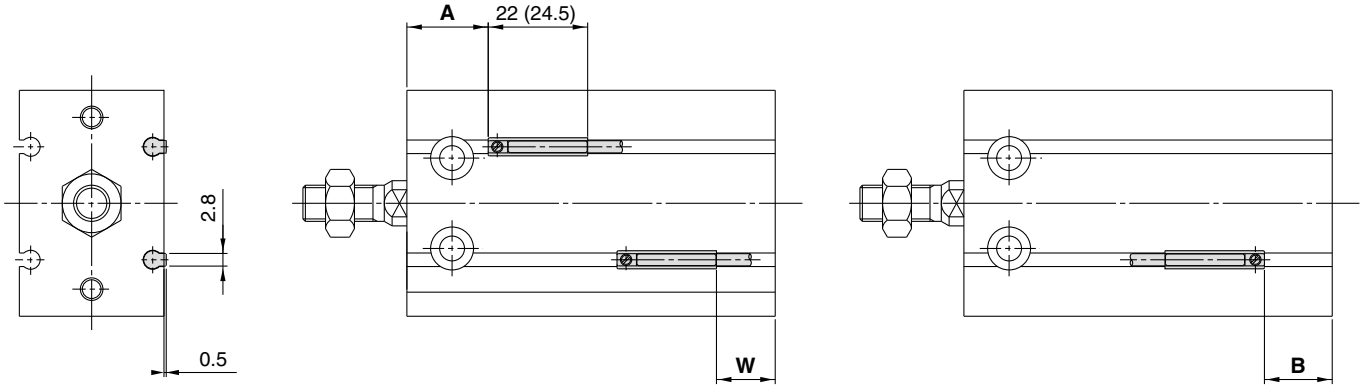


Material: Carbon steel

Part no.	Applicable bore size (mm)	d	H_1	B_1	C_1
NT-015A	**20**	M6 x 1.0	5	10	11.5
NT-02	**25**	M8 x 1.25	5	13	15.0
NT-03	**32**	M10 x 1.25	6	17	19.6

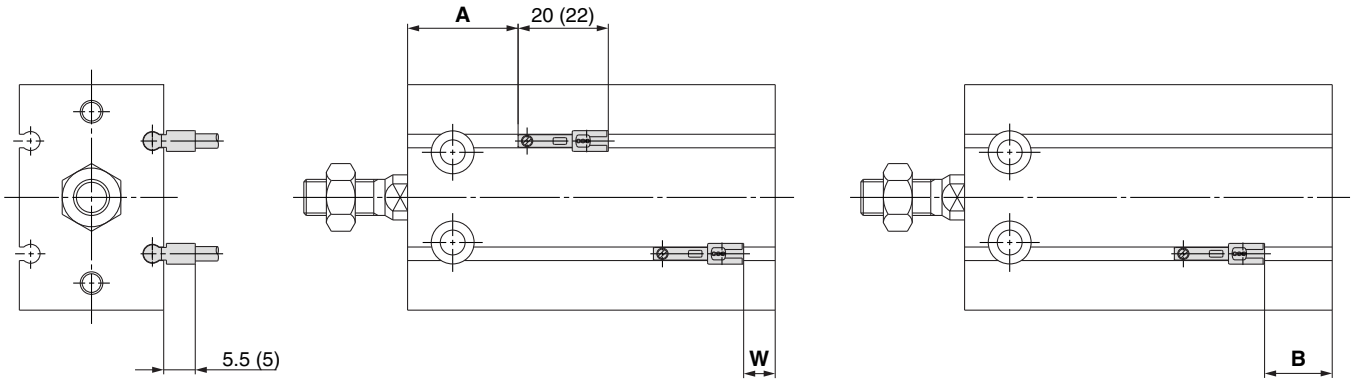
Proper Auto Switch Mounting Position (Detection at stroke end) and Its Mounting Height

D-A9□
D-M9□
D-M9□W



( ): Denotes the values of D-A93.

D-A9□V
D-M9□V
D-M9□WV



( ): Denotes the values of D-M9□V, D-M9□WV.

(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	W	A	B	W
20	18	15	13 (10.5)	22	19	9	22	19	11
25	20	11	9 (6.5)	24.5	15	5	24.5	15	7
32	22.5	13.5	11.5 (9)	26.5	17.5	7.5	26.5	17.5	9.5

Note 1) Figures in the table above are used as a reference when mounting the auto switches for stroke end detection. In the case of actually setting the auto switches, adjust them after confirming their operation.
Note 2) Values in ( ) are dimensions for D-A93 type.

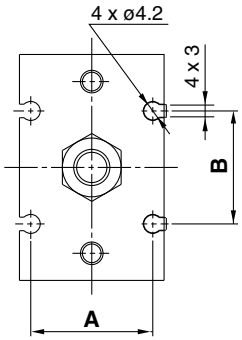
Operating Range

(mm)

Switch model	Bore size (mm)		
	20	**25**	**32**
D-A9□, A9□V	11	12.5	14
D-M9□, M9□V **D-M9□W, M9□WV**	7	7	7.5

∗ Since the operating range is provided as a guideline including hysteresis, it cannot be guaranteed (assuming approximately ±30% dispersion).
It may vary substantially depending on an ambient environment.

Auto Switch Rail Position



(mm)

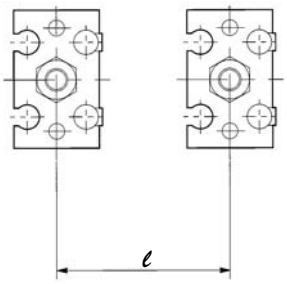
Bore size (mm)	A	B
20	21	23
25	27	25
32	35	27

Caution on Proximity Installation

When free mounting cylinders equipped with auto switches are used, the auto switches could activate unintentionally if the installed distance is less than the dimensions shown in the table. Therefore, make sure to provide a greater clearance. Due to unavoidable circumstances, if they must be used with less distance than the dimensions given in the table, the cylinders must be shielded. Therefore, affix a steel plate or a magnetic shielding plate (MU-S025) to the area on the cylinder that corresponds to the adjacent auto switch. (Please contact SMC for details.) Auto switches may malfunction if a shielding plate is not used.

Dimensions of shielding plate (MU-S025) that is sold separately are indicated as reference.

Material: Ferrite stainless steel, Thickness: 0.3 mm
The product can be attached to the cylinder since the bottom side is a seal type.



Bore size (mm)	Mounting pitch ℓ (mm)
20	40
25	46
32	56

Specific Product Precautions

Be sure to read before handling. Refer to front matters 54 and 55 for Safety Instructions and pages 3 to 11 for Actuator and Auto Switch Precautions.

Installation and Removal of Retaining Rings

⚠Caution

1. Use appropriate pliers (Type C retaining ring installing tool) for installation and removal of retaining rings.

2. Even when using appropriate pliers (Type C retaining ring installing tool), proceed with caution as there is a danger of the retaining ring flying off the end of the pliers (tool) and causing bodily injury or damage to nearby equipment. After installation, make sure that the retaining ring is securely seated into the retaining ring groove before supplying air.

Mounting

⚠Caution

1. Refer to the below table for mounting cylinders.

Tightening Torque

Bore sizes (mm)	Hexagon socket head cap screw (mm)	Proper tightening torque (N·m)
20, 25	M5	5.10 ±10%
32	M6	8.04 ±10%

Selection

⚠Caution

1. Operate the cylinder to the stroke end.

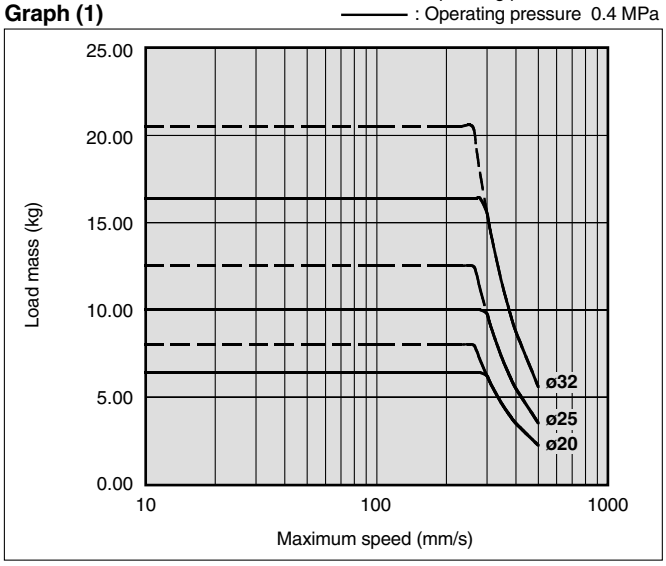
When the stroke is restricted by an external stopper or a clamped workpiece, sufficient cushioning and noise reduction may not be achieved.

2. Strictly observe the limiting ranges for load mass and maximum speed (Graph (1)). Also, the limiting ranges provided here are based on the condition that the cylinder is operated to the stroke end with a proper cushion needle adjustment.

If operated beyond the limiting ranges, excessive impact will occur and this may cause damage to equipment.

Graph (1)

– – – : Operating pressure 0.5 MPa
——— : Operating pressure 0.4 MPa



Selection

⚠Caution

3. Adjust the cushion needle to reduce excessive kinetic energy from the piston impact at the stroke end by allowing it to absorb sufficient kinetic energy during the cushion stroke.

If due to improper adjustment, the piston impacts the stroke end with excessive kinetic energy (values above those given in Table (1)), an excessive impact will occur and this may cause damages to equipment.

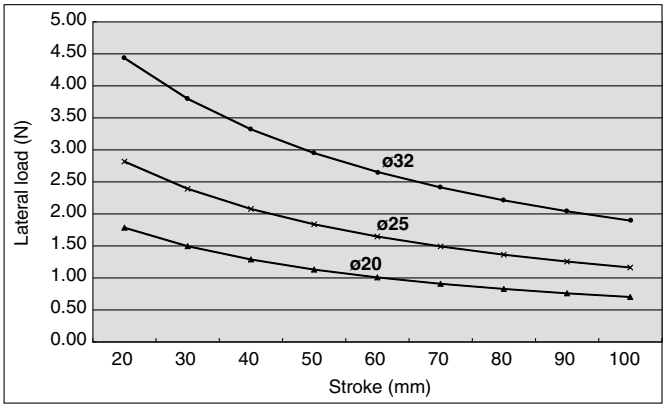
Table (1) Allowable Kinetic Energy at Piston Impact (J)

	20	25	32
Piston speed	50 to 500 mm/s		
Allowable kinetic energy	0.055	0.09	0.15

4. Strictly observe the limiting ranges for the piston rod lateral load (Graph (2)).

If operated beyond the limiting ranges, equipment life may be reduced or damage to equipment may occur.

Piston Rod Lateral Load (Graph (2))



Cushion Needle Adjustment

⚠Caution

1. Keep the adjustment range for the cushion needle between the fully closed position and the rotations shown below.

	Rotations
ø20 to ø32	2.5 rotations or less

Use a 3 mm flat head watchmakers' screwdriver to adjust the cushion needle. The adjustment range for the cushion needle must be between the fully closed position and the open position ranges indicated in the above table. A retaining mechanism prevents the cushion needle from slipping out; however, it may spring out during operation if it is rotated beyond the ranges shown above.

Low Speed Cylinder
Double Acting, Single Rod
Series CUX
ø10, ø16, ø20, ø25, ø32

How to Order

CUX **10** **□** – **30** **D**

With auto switch **CDUX** **10** **□** – **30** **D** – **M9BW** **□**

With auto switch
(Built-in magnet)

Low speed cylinder

Bore size

10	10 mm
16	16 mm
20	20 mm
25	25 mm
32	32 mm

Port thread type

Symbol	Type	Bore size
Nil	M5 x 0.8	ø10, ø16, ø20, ø25
	Rc 1/8	ø32
TN	NPT 1/8	ø32
TF	G 1/8	ø32

Standard stroke (mm)

10, 16	5, 10, 15, 20, 25, 30
20, 25, 32	5, 10, 15, 20, 25, 30, 40, 50

Action

D	Double acting

Auto switch

Nil	Without auto switch

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

Number of auto switches

Nil	2 pcs.
S	1 pc.

Built-in Magnet Cylinder Model

If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch.
(Example) CDUX20-25D

Applicable Auto Switch/Refer to pages 1719 to 1827 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-color indication)			3-wire (NPN)		5 V, 12 V		**M9NWV**	**M9NW**	●	●	●	○	○	IC circuit	
				3-wire (PNP)				**M9PWV**	**M9PW**	●	●	●	○	○		
				2-wire		12 V		**M9BWV**	**M9BW**	●	●	●	○	○	—	
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 ····· Nil (Example) M9NW
1 m ····· M (Example) M9NWM
3 m ····· L (Example) M9NWL
5 m ····· Z (Example) M9NWZ

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

∗ Since there are other applicable auto switches than listed, refer to page 1128 for details.
∗ For details about auto switches with pre-wired connector, refer to pages 1784 and 1785.
∗ Auto switches are shipped together (not assembled).

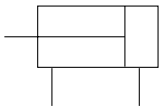
Specifications

Bore size (mm)	10	16	20	25	32
Fluid	Air				
Proof pressure	1.05 MPa				
Maximum operating pressure	0.7 MPa				
Ambient and fluid temperature	Without auto switch: –10 to 70°C (No freezing) With auto switch: –10 to 60°C (No freezing)				
Lubrication	Not required (Non-lube)				
Piston speed	ø10, ø16: 1 to 300 mm/s ø20 to ø32: 0.5 to 300 mm/s				
Cushion	Rubber bumper on both ends				
Rod end thread	Male thread				
Stroke length tolerance	$^{+1.0}_{0}$ Note)				
Mounting	Basic style				

Note) Tolerance $^{+1.0}_{0}$

JIS Symbol

Double acting, Single rod



Minimum Operating Pressure

Bore size (mm)	10	16	20	25	32
Min. operating pressure (MPa)	0.06	0.06	0.05	0.05	0.05

Standard Stroke

Bore size (mm)	Standard stroke (mm)
10, 16	5, 10, 15, 20, 25, 30
20, 25, 32	5, 10, 15, 20, 25, 30, 40, 50

⚠Precautions

Be sure to read before handling.
Refer to front matters 42 and 43 for Safety Instructions and pages 3 to 11 for Actuator and Auto Switch Precautions.

Mounting

⚠Caution

1. Tightening the cylinder beyond the range of the indicated torque (shown in the table below) may affect operation. Apply Loctite® (no. 242, Blue) to the mounting threads.

Bore size (mm)	Hexagon socket head (mm)	Proper tightening torque (N·m) (Cylinder body)
10	M3	0.54 ±10%
16	M4	1.23 ±10%
20, 25	M5	2.55 ±10%
32	M6	4.02 ±10%

Operating Precautions

⚠Warning

1. It might not be able to control CUX10 by meter-out at a low speed operation.

⚠Caution

1. For CUX10, up to 0.1 Nℓ/min (ANR) of internal leakage is anticipated due to cylinder structure.

Maintenance

⚠Caution

1. Replacement parts/Seal kit
Order it in accordance with the bore size.

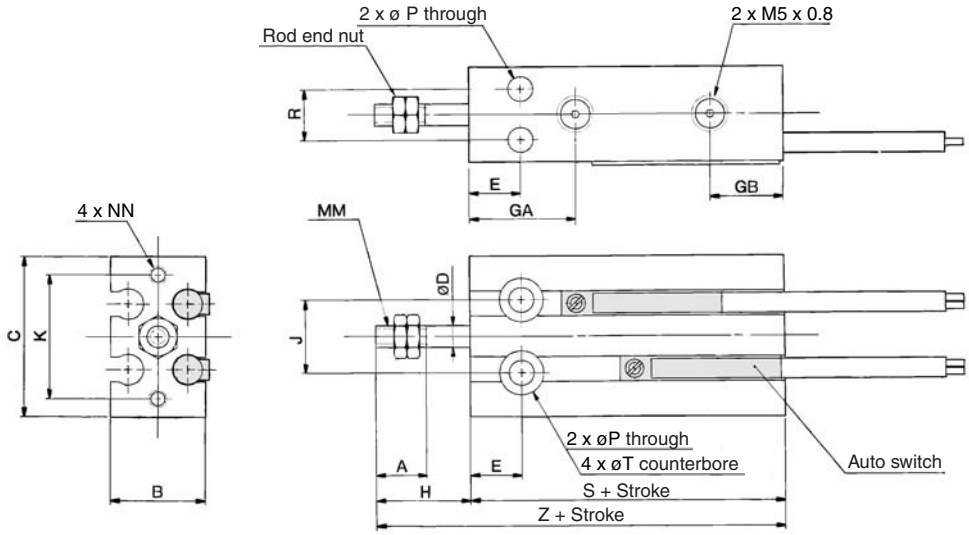
Bore size (mm)	Kit no.	Contents	
16	CUX16-PS	Piston seal:	1 pc.
20	CUX20-PS	Rod seal:	1 pc.
25	CUX25-PS	Gasket:	1 pc.
32	CUX32-PS	Grease pack (10 g):	1 pc.

∗ It is impossible to replace seals in bore size 10 mm.

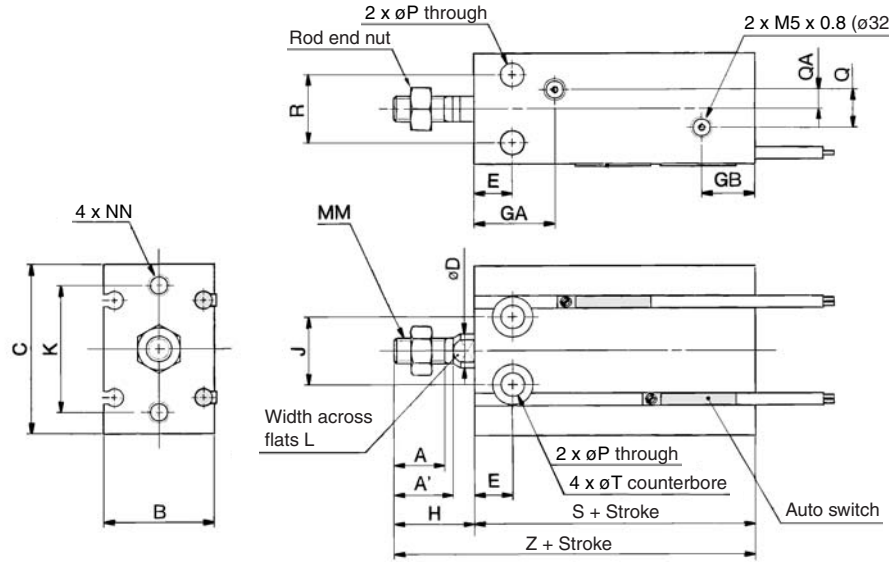
2. Grease pack
When maintenance requires only grease, use the following part numbers to order.
Grease pack part no.:
GR-L-005 (5 g)
GR-L-010 (10 g)
GR-L-150 (150 g)

Dimensions: Double Acting, Single Rod

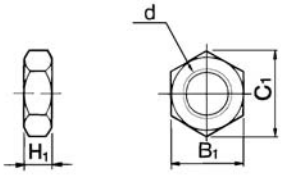
ø10



ø16 to ø32



Rod End Nut/Accessory



Material: Carbon steel

Part no.	Applicable bore (mm)	d	H_1	B_1	C_1
NTP-010	**10**	M4 x 0.7	2.4	7	8.1
NTJ-015A	**16**	M5 x 0.8	4	8	9.2
NT-015A	**20**	M6 x 1.0	5	10	11.5
NT-02	**25**	M8 x 1.25	5	13	15.0
NT-03	**32**	M10 x 1.25	6	17	19.6

(mm)

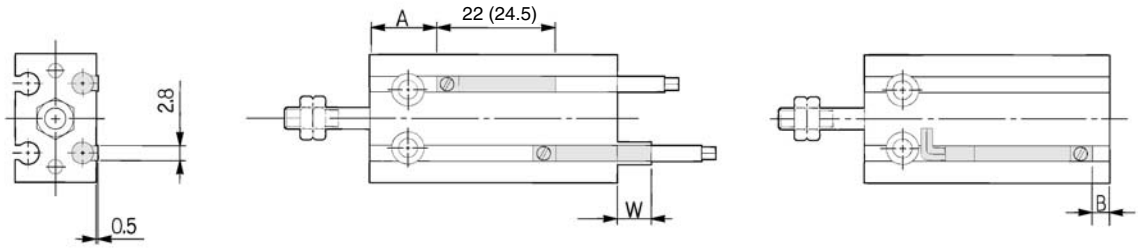
Bore size (mm)	A	A'	B	C	D	E	GA	GB	H	J	K	L	MM	NN	P	Q	QA
10	10	—	15	24	4	7	16.5	10	16	11	18	—	M4 x 0.7	M3 x 0.5 depth 5	3.2	—	—
16	11	12.5	20	32	6	7	16.5 Note)	11.5	16	14	25	5	M5 x 0.8	M4 x 0.7 depth 6	4.5	4	2
20	12	14	26	40	8	9	19	12.5	19	16	30	6	M6 x 1.0	M5 x 0.8 depth 8	5.5	9	4.5
25	15.5	18	32	50	10	10	21.5	13	23	20	38	8	M8 x 1.25	M5 x 0.8 depth 8	5.5	9	4.5
32	19.5	22	40	62	12	11	23	12.5	27	24	48	10	M10 x 1.25	M6 x 1.0 depth 9	6.6	13.5	4.5

Bore size (mm)	R	T	Without auto switch		With auto switch	
			S	Z	S	Z
10	9	6 depth 5	36	52	36	52
16	12	7.6 depth 6.5	30	46	40	56
20	16	9.3 depth 8	36	55	46	65
25	20	9.3 depth 9	40	63	50	73
32	24	11 depth 11.5	42	69	52	79

Note) 5 stroke (CUX16-5D): 14.5 mm

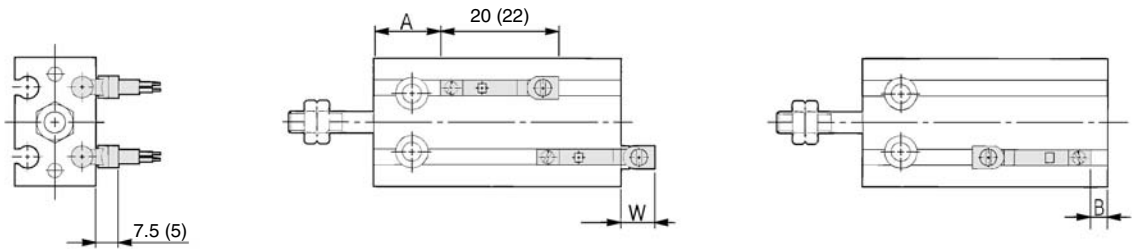
Auto Switch Proper Mounting Position (Detection at Stroke End) and Its Mounting Height

D-A9□
D-M9□
D-M9□W



( ): Denotes the values of D-A93.

D-A9□V
D-M9□V
D-M9□WV



( ): Denotes the values of D-A9□V.

CDU Double Acting, Single Rod

(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	W	A	B	W
10	12.5	3.5	–1.5 (1)	16.5	7.5	2.5	16.5	7.5	0.5
16	16	4	–2 (0.5)	20	8	1.5	20	8	–0.5
20	20	6	–4 (–1.5)	24	10	0	24	10	–2
25	22.5	7	–5.5 (–3)	26.5	11	–1.5	26.5	11	–3.5
32	23.5	8.5	–6.5 (–4)	27.5	12.5	–2.5	27.5	12.5	–4.5

Note 1) Figures in the table above are used as a reference when mounting the auto switches for stroke end detection. In the case of actually setting the auto switches, adjust them after confirming their operation.
Note 2) Negative figures in the table W indicate an auto switch is mounted inward from the edge of the cylinder body.
Note 3) In the case of the 5 stroke or the 10 stroke, there are times in which the switch will not turn OFF or 2 switches will turn ON simultaneously due to their movement range. Therefore, set the position approximately 1 to 4 mm outward from the values given in the table above. Then, perform an operation inspection to make sure that the switches operate normally (if 1 switch is used, make sure that it turns ON and OFF properly; if 2 switches are used, make sure that both switches turn ON).
Note 4) ( ) in column W is the dimensions of D-A93.

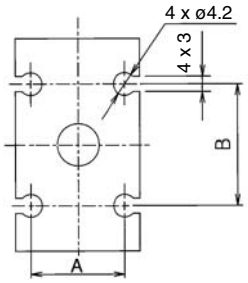
Operating Range

(mm)

Auto switch model	Bore size (mm)				
	10	**16**	**20**	**25**	**32**
D-A9□, A9□V	6	9	11	12.5	14
D-M9□, M9□V **D-M9□W, M9□WV**	4	5.5	7	7	7.5

∗ Since this is a guideline including hysteresis, not meant to be guaranteed.
(assuming approximately ±30% dispersion.)
There may be the case it will vary substantially depending on an ambient environment.

Auto Switch Groove



(mm)

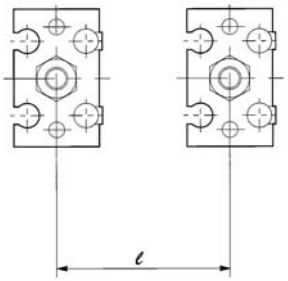
Bore size (mm)	A	B
10	10.3	13
16	15	18
20	21	23
25	27	25
32	35	27

Other than the applicable auto switches listed in “How to Order”, the following auto switches can be mounted.

∗ Normally closed (NC = b contact), solid state auto switches (D-F9G, F9H type) are also available. For details, refer to page 1746.

Caution on Proximity Installation

When free mounting cylinders equipped with auto switches are used, the auto switches could activate unintentionally if the installed distance is less than the dimensions shown in the table. Therefore, make sure to provide a greater clearance. Due to unavoidable circumstances, if they must be used with less distance than the dimensions given in the table, the cylinders must be shielded. Therefore, affix a steel plate or a magnetic shielding plate (MU-S025) to the area on the cylinder that corresponds to the adjacent auto switch. (Please contact SMC for details.) Auto switches may malfunction if a shield plate is not used.



Bore size (mm)	Mounting pitch ℓ (mm)
10	30
16	33
20	40
25	46
32	56

Dimensions of shielding plate (MU-S025) that is sold separately are indicated as reference.

Material: Ferrite stainless steel, Thickness: 0.3 mm
Since the back side is treated with adhesive, it is possible to attach to the cylinder.

Related Products:
Speed Controller for Low Speed Operation

The effective area of controlled flow is approximately 1/10 of the standard type.
These controllers are suitable for controlling the speed of microspeed cylinders.
The dual type speed controller is especially suitable for cylinders with a small bore size.

Elbow/Universal Type

Air Flow/Effective Area

Model		AS12□1FM-M5 AS13□1FM-M5	AS22□1FM-□01 AS23□1FM-□01		AS22□1FM-□02 AS23□1FM-□02		
Tubing O.D.	Metric size	ø3.2, ø4, ø6	ø3.2, ø4	ø6, ø8	ø4	ø6	ø8, ø10
	Inch size	ø1/8", ø5/32", ø3/16" ø1/4"	ø1/8", ø5/32"	ø3/16", ø1/4" ø5/16"	ø5/32"	ø3/16"	ø1/4", ø5/16" ø3/8"
Controlled flow	Air flow (ℓ/min (ANR))	7	12		38		
	Effective area (mm²)	0.1	0.2		0.6		
Free flow	Flow rate (ℓ/min (ANR))	100	180	230	260	390	460
	Effective area (mm²)	1.5	2.7	3.5	4	6	7

Note) Supply pressure: 0.5 MPa, Temperature: 20°C

In-line Type

Air Flow/Effective Area

Model		AS1001FM	AS2001FM		AS2051FM	
Tubing O.D.	Metric size	ø3.2, ø4, ø6	ø4	ø6	ø6	ø8
	Inch size	ø1/8", ø5/32", ø3/16" ø1/4"	ø5/32"	ø3/16", ø1/4"	ø3/16"	ø1/4", ø5/16"
Controlled flow	Air flow (ℓ/min (ANR))	7	12		38	
	Effective area (mm²)	0.1	0.2		0.6	
Free flow	Flow rate (ℓ/min (ANR))	100	130	230	290	460
	Effective area (mm²)	1.5	2	3.5	4.5	7

Note) Supply pressure: 0.5 MPa, Temperature: 20°C

Elbow Type (Metal body)

Air Flow/Effective Area

Model			AS12□0M		AS22□0M-□01		AS22□0M-□02	
Port size		Cylinder side	M5 x 0.8	10-32 UNF	R 1/8	NPT 1/8	R 1/4	NPT 1/4
		Tube side			Rc 1/8		Rc 1/4	
Controlled flow	Air flow (ℓ/min (ANR))		7		12		38	
	Effective area (mm²)		0.1		0.2		0.6	
Free flow	Flow rate (ℓ/min (ANR))		105		280		420	
	Effective area (mm²)		1.6		4.3		6.5	

Note) Supply pressure: 0.5 MPa, Temperature: 20°C

Dual Type

Air Flow/Effective Area

Model		ASD230FM-M5	ASD330FM-□01	ASD430FM-□02	
Tubing O.D.	Metric size	ø4, ø6	ø6, ø8	ø6	ø8, ø10
	Inch size	ø1/8", ø5/32" ø3/16", ø1/4"	ø3/16", ø1/4"	—	ø1/4", ø5/16" ø3/8"
Controlled flow (Free flow)	Air flow (ℓ/min (ANR))	7	12	38	
	Effective area (mm²)	0.1	0.2	0.6	

Note) Supply pressure: 0.5 MPa, Temperature: 20°C

Low Speed Cylinder Specific Product Precautions

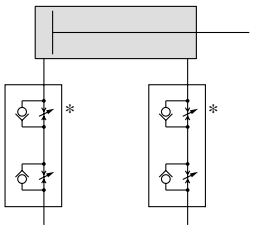
Be sure to read before handling.
Refer to front matters 42 and 43 for Safety Instructions and pages 3 to 11 for Actuator and Auto Switch Precautions.

Recommended Pneumatic Circuit

⚠Warning

Horizontal Operation

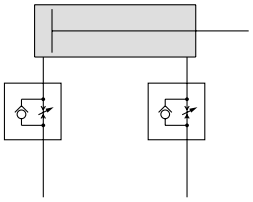
I



Dual speed controller

Speed is controlled by meter-out circuit. Using concurrently the meter-in circuit can alleviate the stick-slip. More stable low speed operation can be achieved than meter-in circuit alone.

II

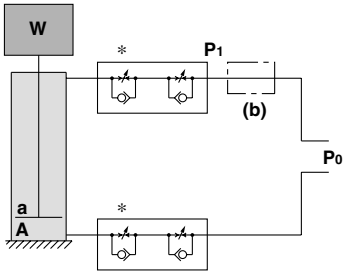


Meter-in speed controller

Meter-in speed controllers can reduce lurching while controlling the speed. The two adjustment needles facilitate adjustment.

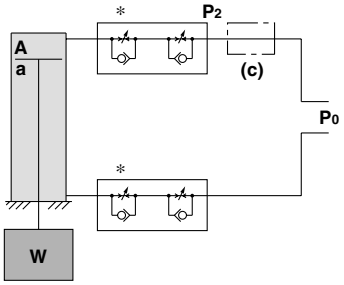
Vertical Operation

I



(1) Speed is controlled by meter-out circuit. Using concurrently the meter-in circuit can alleviate the stick-slip.*
(2) Depending on the size of the load, installing a regulator with check valve at position **(b)** can deduce lurching during descent and operation delay during ascent.
As a guide,
when **W + P0a>P0A**,
adjust **P1** to make **W + P1a = P0A**.

II



(1) Speed is controlled by meter-out circuit. Using concurrently the meter-in circuit can alleviate the stick-slip.*
(2) Installing a regulator with check valve at position **(c)** can reduce lurching during descent and operation delay during ascent.
As a guide,
adjust **P2** to make **W + P2A = P0a**.

W: Load (N) **P0**: Operating pressure (MPa) **P1, P2**: Reduced pressure (MPa) **a**: Rod side piston area (mm^2) **A**: Head side piston area (mm^2)

⚠Warning

Since **C□J2X**, **C□UX10** are subject to internal leakage due to their construction, the speed may not be fully controlled with the meter-out controller (*) during low speed operation.

Selection

⚠Caution

1. **Operate within the standard strokes.**
   Operating with the stroke exceeding the standard stroke may cause malfunction.
2. **Provide a construction that does not apply a lateral load to the cylinder.**
   Applying a lateral load to the cylinder may cause malfunction.
3. **Do not use the product at a high frequency.**
   Use it at 30 cpm or less as a guideline.
4. **Do not wipe out the grease in the sliding part of the air cylinder.**
   Doing so forcefully may cause malfunction.

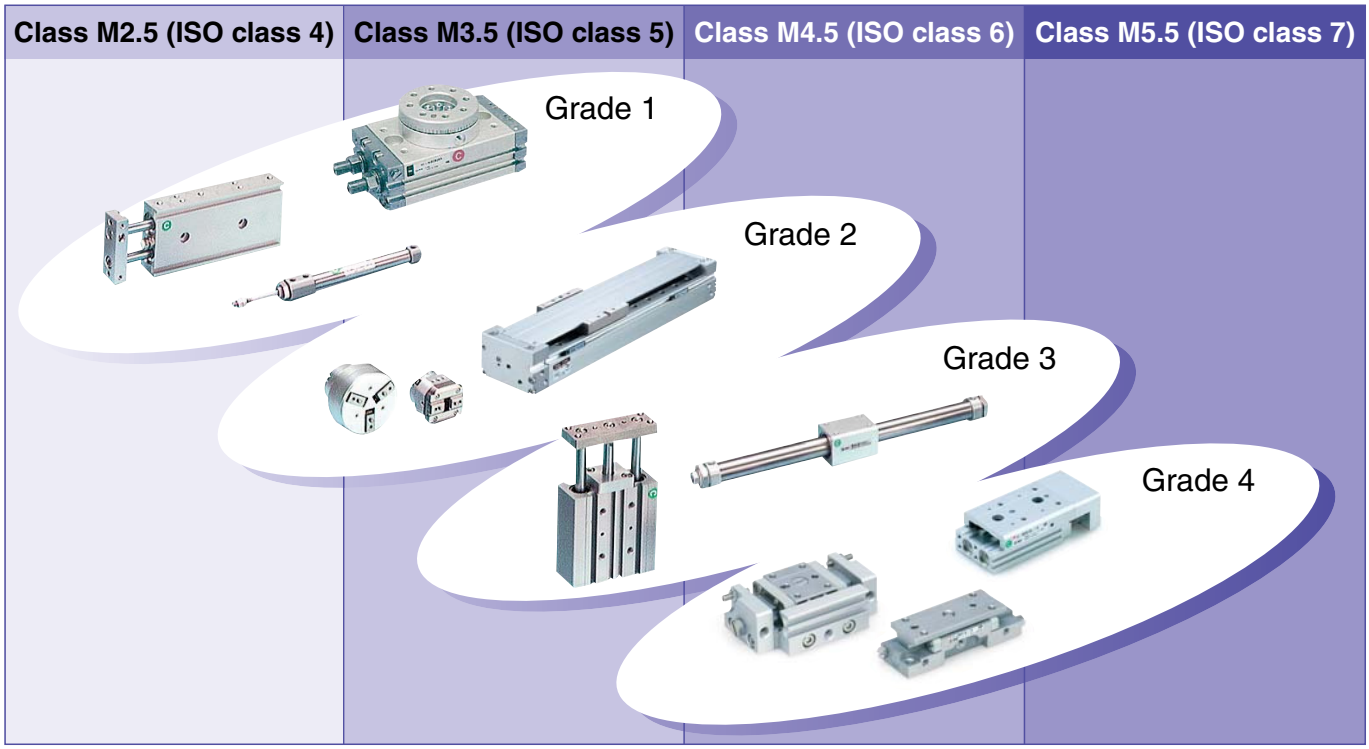
Pneumatic Circuit

⚠Caution

1. **The piping length between the speed controller and the cylinder port must be kept as short as possible.**
   If the speed controller and the cylinder port are far apart, speed adjustment may be unstable.
2. **Use a low speed controller to easily adjust for low speed operation or a dual speed controller (Series ASD) to prevent cylinders from popping out.**
   (When the low speed controller is used, the maximum speed may be limited.)

SMC Pneumatic Clean Series

Particle generation level of SMC pneumatic clean series equipment can be classified into 1-4 grades by the particle generation measurement test, and each equipment can be used according to the clean room cleanliness class.



The view above shows an image. Refer to front matter 13 to 22 and the specifications for particle generation grade of each equipment.

Clean Series *Series 10-/11-/12-/13-*

Available for clean environment.
Particle generation in a clean room can be prevented.

Applicable model

Actuator, (Air cylinder, Rotary actuator, Air gripper), Directional control valve, Flow control equipment,Filter & Pressure control equipment, Fittings & Tubing, Air preparation equipment, Pressure switch, Clean gas filter

Note) 11-/12-/13- are available only for actuators.

Special Clean Series

Special clean series pursues improvement of cleanliness than the clean series.
This series was developed considering construction, material and assembly environment for use in a clean environment.

Applicable model

Clean rodless cylinder, Clean regulator, Clean one-touch fitting, Clean tubing,
Clean gas filter

Copper, Fluorine, and Silicon free + Low particle generation *Series 21-/22-*

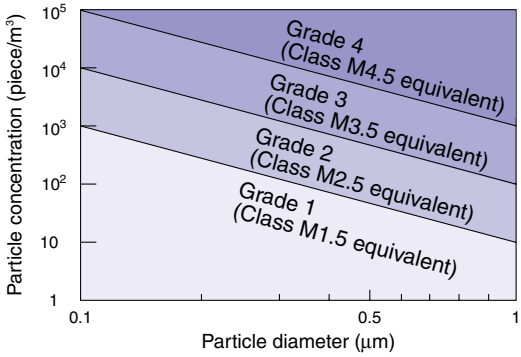
For the environment in which the use of copper, fluorine and silicon are restricted.
The same structure as clean series. (Grease and package style are different.)

Applicable model

Actuator (Air cylinder, Rotary actuator, Air gripper), Directional control valve, Flow control equipment,Pressure control equipment, Fittings & Tubing

Note) 22-: Available only for actuators.

Particle generation grade classification



Cleanliness class

SMC	Fed.Std.209E SI unit	ISO 14644-1
Grade 1	M1.5	ISO class 3
Grade 2	M2.5	ISO class 4
Grade 3	M3.5	ISO class 5
Grade 4	M4.5	ISO class 6
	M5.5	ISO class 7
	M6.5	ISO class 8

The grade classification is the SMC original method. The smaller the grade no., the less the particle generation.
The upper concentration limit of the cleanliness class based on Fed. Std. 209E-1992 is shown in parentheses.

(Refer to Front matter 23 "Particle generation measuring method" and Front matter 24 "Comparison of cleanliness standards" for details.)

Note) Do not use one-touch fittings 10-KQ (including solenoid valves with built-in one-touch fittings and speed controllers with one-touch fittings) in Grade 1 or Grade 2 areas because internal pressure change may move the collet chuck slightly, which may cause particle generation. This does not apply to insert fittings (KF), miniature fittings (M, MS), clean one-touch fittings (KP,KPQ,KPG) and speed controllers with clean one-touch fittings (AS-FPQ/FPG).

No dust is carried into the clean room.

After inspection, products are blown with high purity air (clean bench/class M3.5) in a clean environment. Products are sealed and shipped in anti-static double bags.

10-/11-/12-/13- (Clean series.)

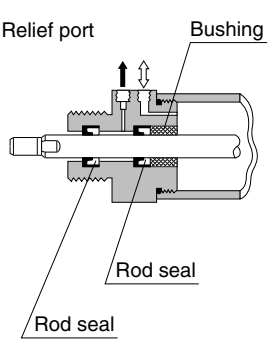
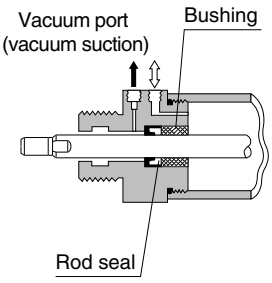
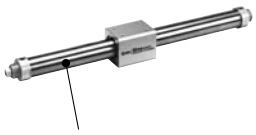
Assembly and inspection in a workshop
↓
Clean room Class M6.5
Wipe the surface with alcohol to remove oil.
↓
Clean room Class 100.000
Clean booth Class M3.5
Internal packaging after giving blow to the surface with clean air (countermeasure against static electricity)
↓
Clean room Class M6.5
External packaging (double packaging)
↓
Shipment

Products assembled in a clean room (Special clean series)

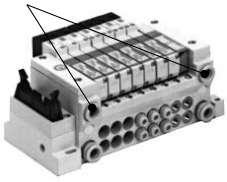
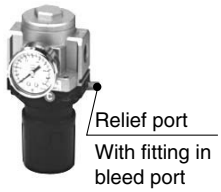
Clean booth Class M3.5
Parts cleaning
↓
Assembly and inspection
↓
Clean bench Class M3.5 in a clean room Class M5.5
Double packaging
↓
Shipment

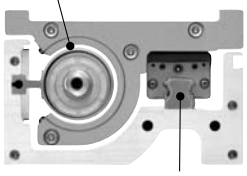
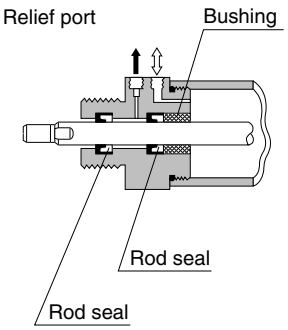
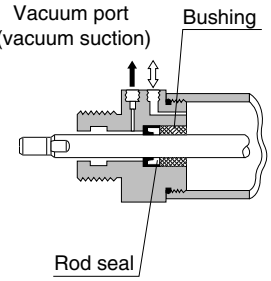
21-/22-series are packed in an usual manner (assembly and inspection in a workshop — packaging — shipment). Please contact SMC for clean packaging.

Basic specifications of actuator

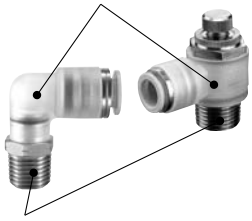
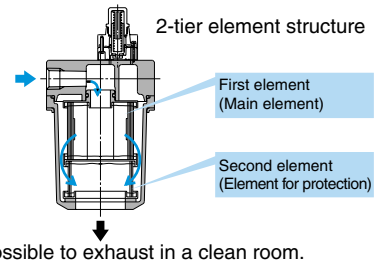
	Series 10-	Series 11-	Series 12-	
Construction	· **Double seal type / release to atmosphere** 	· **Single seal type / vacuum suction** 	· **Guide cylinder** · **Dual rod cylinder** Double seal type / release to atmosphere (Series 10- equivalent) and specially treated guide  Ball bushing guide Linear guide	· **Rodless cylinder** Specially treated cylinder tube exterior 
Restricted material	No			
Grease	Fluorine grease			
Assembly environment	General environment (Assembly and inspection in a workshop)			
Packaging style	Clean packaging: Products are sealed in anti-static double bags after giving			

Basic specifications of other equipment

	Series 10-			
Construction	· **Directional control valve** Main valve and pilot valve common exhaust  · **Pressure control equipment** 	· **Air filter**  Fitting, speed controller, pressure switch, etc. have the same structure as those of standard.	· **Clean regulator** All wetted parts are made of stainless steel, FPM and PTFE, and exterior metal parts are made of anodized aluminum, which provides high corrosion resistance. 	· **Clean one-touch fittings(for blow)**  · **Clean tubing** Polyolefin Resin
Restricted material	No			
Grease	Fluorine grease		—	—
Assembly environment	General environment (Assembly and inspection in a workshop)		Parts are cleaned and	
Packaging style	Clean packaging: Products are sealed in anti-static double bags after			

Series 13-	Special clean series	Series 21-	Series 22-
· **Guide cylinder** · **Air slide table** Single seal type/ vacuum suction (Series 11- equivalent) and specially treated guide  Ball bushing guide Linear guide	· **Clean rodless cylinder** No contact between the cylinder tube exterior and the slider interior  Linear guide Special treatment	· **Double seal type / release to atmosphere** 	· **Single seal type/ vacuum suction** 
	No	Copper, fluorine and silicon-free	
	Fluorine grease	Lithium soap base grease	
	Parts are cleaned and assembled in a clean room.	General environment (Assembly and inspection in a workshop)	
blow to the surface with clean air.		Standard packaging Note)	

Note) Contact SMC for clean packaging.

Special clean		Series 21-	
· **Clean one-touch fittings(for drive system air piping)** · **Clean speed controller** Polypropylene resin  Metal part Brass (Electroless nickel plated) or Stainless steel 304	· **Exhaust cleaner for clean room**  Possible to exhaust in a clean room. · **Clean gas filter PTFE membrane element** 	· **Directional control valve** · **Pressure control equipment** · **The same construction as Series 10-**	· **Clean one-touch fittings (for drive system air piping)** · **Clean speed controller** No seal to the thread parts ∗ Available for uni thread. (Made to Order)
No		Copper, fluorine and silicon-free	
Fluorine grease	—	Lithium soap base grease	
assembled in a clean room.		General environment (Assembly and inspection in a workshop)	Parts are cleaned and assembled in a clean room.
giving blow to the surface with clean air.		Standard packaging Note)	

Note) Contact SMC for clean packaging.

Clean Series INDEX

Cylinder

Air Cylinder P.2

Type	Model	Size
Standard	10-/11-21-/22-**CJ2**	6, 10, 16
Double rod	10-/11-21-/22-**CJ2W**	10, 16
Direct mount type	10-/11-21-/22-**CJ2RA**	

Air Cylinder P.14

Type	Model	Size
Standard	10-/11-21-/22-**CM2**	20, 25 32, 40
Double rod	10-/11-21-/22-**CM2W**	
Direct mount type	10-/11-21-/22-**CM2R**	
End lock	10-/11-21-/22-**CBM2**	

Air Cylinder P.34

Type	Model	Size
Standard	10-/11-21-/22-**CG1**	20, 25, 32 40, 50, 63 80, 100
Double rod	10-/11-21-/22-**CG1W**	
Direct mount type	10-/11-21-/22-**CG1R**	20, 25, 32 40, 50, 63

Air Cylinder P.46

Model	Size
10-/11-21-/22-**CA2**	40, 50, 63

Mini-free Mount Cylinder P.50

Model	Size
10-11-**CUJ**	6, 8, 10

Free Mount Cylinder P.53

Model	Size
10-/11-21-/22-**CDU**	6, 10, 16, 20, 25

Compact Cylinder P.56

Model	Size
10-/11-21-/22-**CQS**	12, 16, 20, 25

Compact Cylinder P.64

Model	Size
10-/11-21-/22-**CQ2**	32, 40, 50, 63, 80, 100

Sine Cylinder P.72

Model	Size
10-11-**REC**	20, 25, 32, 40

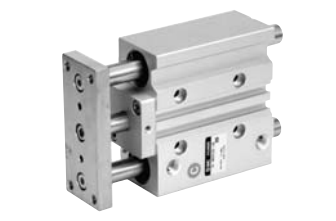
Dual Rod Cylinder P.76

Model	Size
11-/12-21-/22-**CXSJ**	6, 10

Dual Rod Cylinder P.80

Model	Size
10-/11-/12-21-/22-**CXS**	6, 10, 15, 20, 25, 32

Compact Guide Cylinder P.89

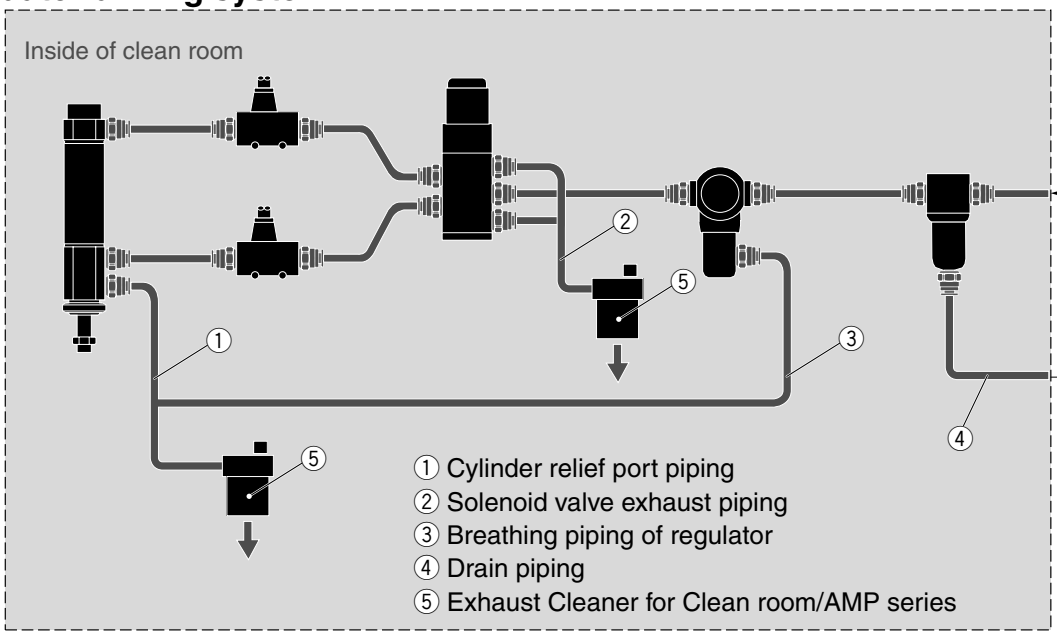


Model	Size
12-/13-21-/22-**MGPL**	12, 16, 20, 25, 32, 40, 50, 63

System Circuit in Clean Room

Following are the actuator driving system and circuit configuration of blow system employed to reduce particle generation when using pneumatic equipment in a clean room.

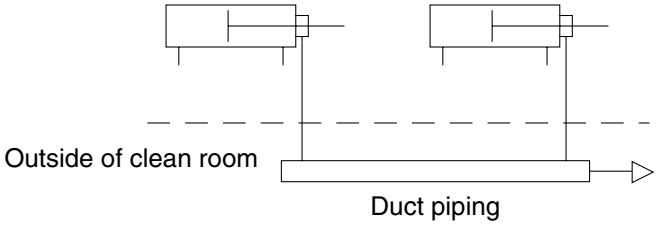
• Actuator driving system



• Cylinder relief port piping

Series 10-/12-/21- (atmospheric release type)

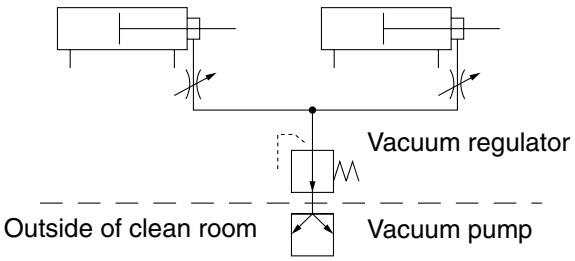
Connect the relief port piping with the dedicated duct piping installed outside the clean room or with the exhaust cleaner for clean room/AMP series.



Series 11-/13-/22- (Vacuum suction type)

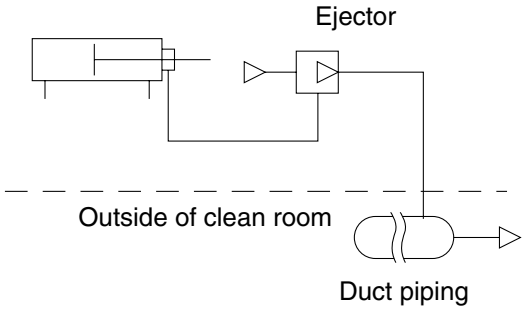
With a vacuum pump

When several air cylinders are used together or a model with high vacuum suction flow is used.



With an ejector

When a few air cylinders are locally used.

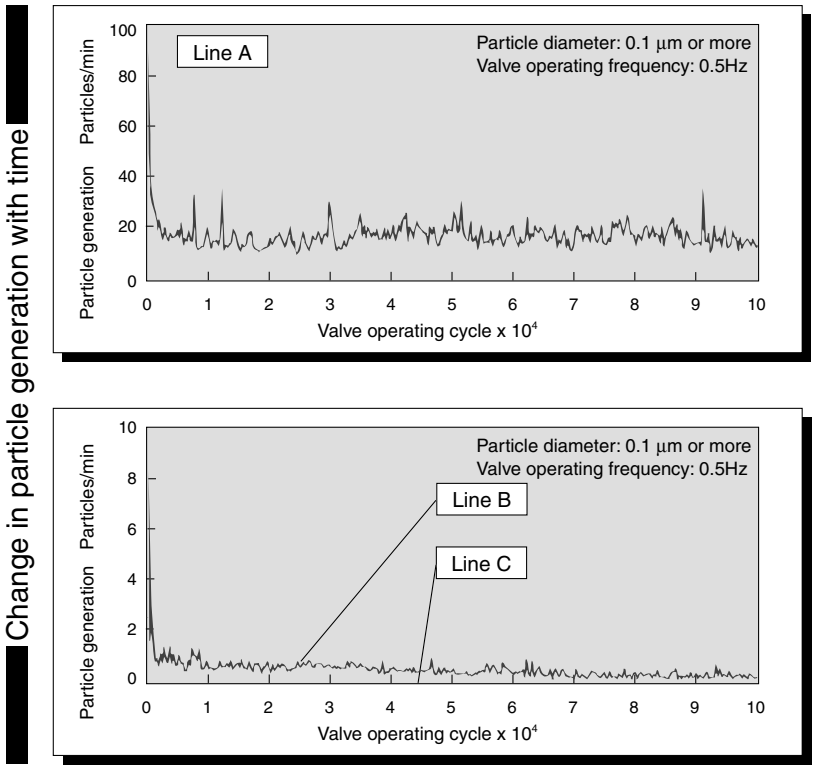


System Circuit in Clean Room

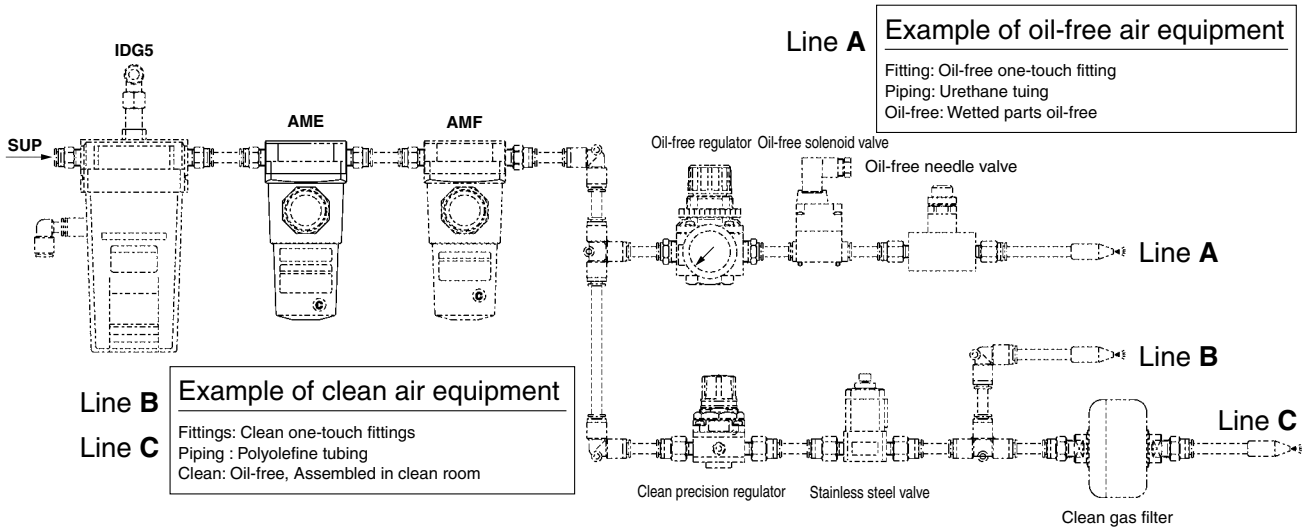
• Clean blow system

Example of equipment to suit each clean blow grade

Line A: For oil-free air blow
Line B: For clean blow
Line C: For clean blow
(With clean gas filter)
Line D: For N_2 blow



• Example of air line equipment



Line **A**

Example of oil-free air equipment

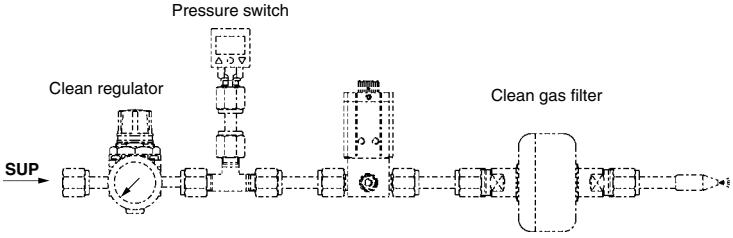
Fitting: Oil-free one-touch fitting
Piping: Urethane tuing
Oil-free: Wetted parts oil-free

Line **B**
Line **C**

Example of clean air equipment

Fittings: Clean one-touch fittings
Piping : Polyolefine tubing
Clean: Oil-free, Assembled in clean room

• Example of N_2 equipment



Line **D**

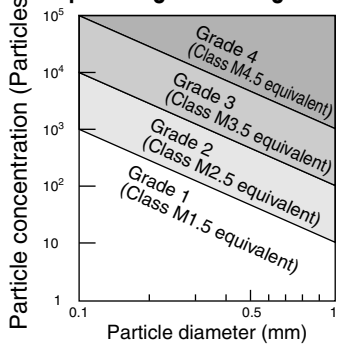
Feature (Line D)

Excellent corrosion resistance (Body SUS316L)
Integral fitting type
Seal material : Fluoro resin or Stainless steel
Precision cleaning, Assembly in a clean room

The position of the pneumatic equipment to the workpiece is determined by the particle generation degree.

Particle generation grade no. of the pneumatic equipment ≦ The article concentration grade no. around the workpiece

Classification of particle generation grades



The grade classification is the SMC original method. The smaller the grade number, the less the particle generation. The upper concentration limit of the cleanliness class based on Fed. Std. 209E-1992 is shown in parentheses. (Refer to Front matter 23 "Particle generation measuring method"and Front matter 24 "Comparison of cleanliness standards" for details.)

Note) Do not use one-touch fittings 10-KQ (including solenoid valves with built-in one-touch fittings and speed controllers with one-touch fittings) in Grade 1 or Grade 2 areas because internal pressure change may cause slight move of the collet chuck, which may cause particle generation. This does not apply to insert fittings (KF), miniature fittings (M, MS), clean one-touch fittings (KP, KPQ, KPG) and speed controllers with clean one-touch fittings (AS-FPQ/FPG).

Cleanliness class

SMC	Fed.Std.209E SI unit	ISO 14644-1
Grade 1	M1.5	ISO class 3
Grade 2	M2.5	ISO class 4
Grade 3	M3.5	ISO class 5
Grade 4	M4.5	ISO class 6
–	M5.5	ISO class 7
–	M6.5	ISO class 8

Selection procedure

(1) Required clean room cleanliness? ····· Class M2.5 or Class M3.5 or Class M4.5?

↓

(2) Air flow to the workpiece (Refer to Diagram 1.) ····· Diagram 1 Air flow

↓

(3) Where is the pneumatic equipment located? (Refer to Diagram 2.) ····· Diagram 2 Installation location of equipment

↓

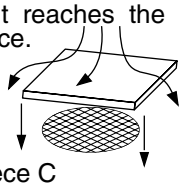
(4) Determine the particle concentration grade no. around the workpiece based on above (1) to (3). (Refer to Table 1.)

↓

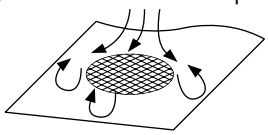
(5) Select the equipment to be used. (Refer to Front matter 13 to 22.)

Diagram 1 Air flow

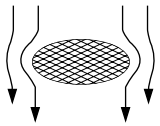
Workpiece A
The air flow is blocked before it reaches the workpiece.



Workpiece B
Convection currents are frequently generated around the workpiece.



Workpiece C
The air flows freely.



Workpiece D
The air is sucked under the workpiece.

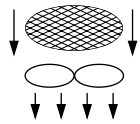


Diagram 2 Installation location of equipment

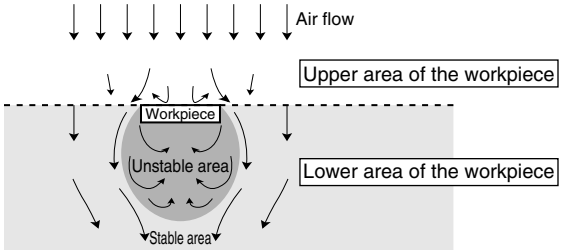


Table 1 Particle concentration grade around the workpiece

(2) Workpiece		A,B			C			D		
(3) Position of the equipment to be used		Upper area of the workpiece	Lower area of the workpiece		Upper area of the workpiece	Lower area of the workpiece		Upper area of the workpiece	Lower area of the workpiece	
			Unstable area	Stable area		Unstable area	Stable area		Unstable area	Stable area
(1) Cleanliness	Class M2.5	▨			Grade 1		Grade 2	Grade 1	Grade 2	
	Class M3.5					Grade 2	Grade 3			Grade 3
	Class M4.5	Grade 1	Grade 2	Grade 3	Grade 2	Grade 3	Grade 4	Grade 2	Grade 3	Grade 4

▨:Class M2.5 and M3.5 levels of cleanliness cannot be achieved in area due to dust accumulation or flotation.

Particle Generation Grade

Cylinder

Description			Model	Particle generation grade by series						
				Standard	10-	11-	12-	13-	21-	22-
	Air Cylinder	Standard	10-/11-21-/22-**CJ2**	3	2	1			2	1
		Double rod	10-/11-21-/22-**CJ2W**							
		Direct mount type	10-/11-21-/22-**CJ2RA**							
	Air Cylinder	Standard	10-/11-21-/22-**CM2**	3	2	1			3	1
		Double rod	10-/11-21-/22-**CM2W**							
		Direct mount type	10-/11-21-/22-**CM2R**							
		End lock	10-/11-21-/22-**CBM2**							
	Air Cylinder	Standard	10-/11-21-/22-**CG1**	3	2	1			3	1
		Double rod	10-/11-21-/22-**CG1W**							
		Direct mount type	10-/11-21-/22-**CG1R**							
	Air Cylinder Standard		10-/11-21-/22-**CA2**	3	2	1			3	1
	Mini-free Mount Cylinder		10-11-**CUJ**	3	2	1				
	Free Mount Cylinder		10-/11-21-/22-**CDU**	3	2	1			3	1
	Compact Cylinder		10-/11-21-/22-**CQS**	3	2	1			2	1
			10-/11-21-/22-**CQ2**	3	2	1			2	1
	Sine Cylinder		10-11-**REC**	3	2	1				
	Dual Rod Cylinder		11-/12-21-/22-**CXSJ**	3, 4 Note)		1	2		3	1
			10-/11-/12-21-/22-**CXS**	3, 4 Note)	2	1	2		3	1

Note) Grade is different depending on the type of the ball bearing.

Values in ▭ show grades.

▭ No grade applies to the blanks.

CXSJ

Model	Bearing type	Standard
CXSJL	Ball bushing bearing	**3**
CXSJM	Slide bearing	**4**

CXS

Model	Bearing type	Standard
CXSL	Ball bushing bearing	**3**
CXSM	Slide bearing	**4**

Particle Generation Measuring Method

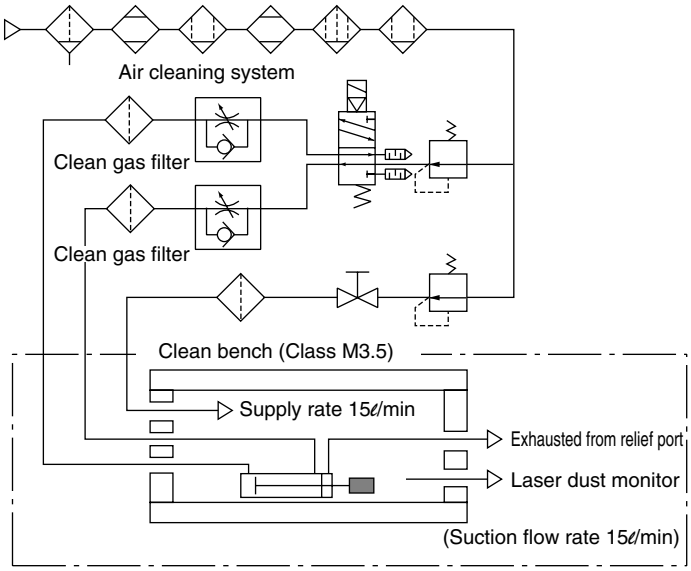
The particle generation data for SMC CLEAN SERIES are measured in the following test method.

Test method (Example)

Place the specimen in the acrylic resin chamber and operate it while supplying the same flow rate of clean air as the suction flow rate of the measuring instrument (15ℓ/min). Measure the changes of the particle concentration over time until the number of cycles reaches the specified point.The chamber is placed in a Class M3.5 clean bench.

Measuring conditions

Chamber	Internal volume	15ℓ
	Supply air quality	Same quality as the supply air for driving
Measuring instrument	Description	Laser dust monitor (Automatic particle counter by light-scattering method)
	Model no.	TS-1500
	Minimum measurable particle diameter	0.17μm
	Suction flow rate	15ℓ/min
	Manufacturer	Hitachi Electronics Engineering Co. Ltd.
Setting conditions	Sampling time	5min
	Interval time	55min
	Sampling air flow	75ℓ



Particle generation measuring circuit

Evaluation method

To obtain the measured values of particle concentration, the accumulated value Note 1) of particles captured every 5 minutes, by the laser dust monitor, is converted into the particle concentration in every $1m^3$.

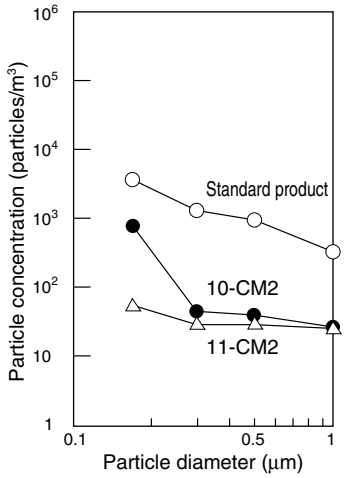
When determining particle generation grades, the 95% upper confidence limit of the average particle concentration (average value), when each specimen is operated at a specified number of cycles Note 2) is considered.

The plots in the graphs indicate the 95% upper confidence limit of the average particle concentration of particles with a diameter within the horizontal axis range.

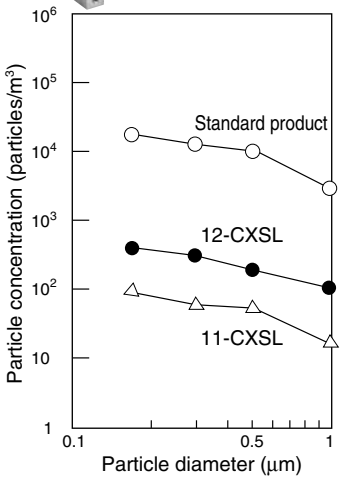
Note 1) Sampling air flow rate: Number of particles contained in 75ℓ of air

Note 2) Actuator: 1 million cycles
Solenoid valve: 2 million cycles

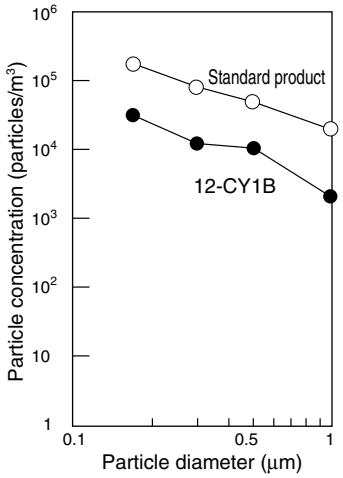
■Particle generation characteristics of CM2



■Particle generation characteristics of CXSL

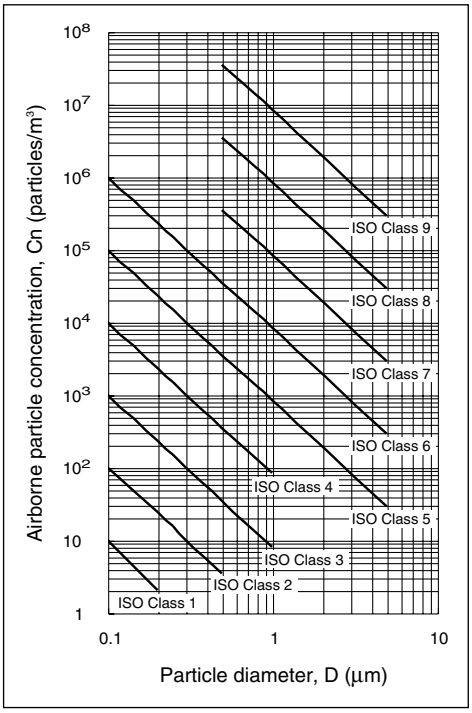


■Particle generation characteristics of CY1B



Comparison of Cleanliness Standards

Standard		Fed.Std.209E		ISO 14644-1
Cleanliness classes		British unit: Class 1 to 100.000 SI unit: Class M1 to M7 U descriptor: Particles diameter smaller than 0.1 μm		ISO Cass 1 to 9 Intermediate classes available U descriptor: Particles smaller than 0.1 μm M descriptor: Particles larger than 5.0 μm
	Corresponding class indication	(British unit)	(SI unit)	
				ISO Class 1
				ISO Class 2
		1	M1.5	ISO Class 3
		10	M2.5	ISO Class 4
		100	M3.5	ISO Class 5
		1000	M4.5	ISO Class 6
		10000	M5.5	ISO Class 7
		100000	M6.5	ISO Class 8
				ISO Class 9
Cleanliness class indication		The number of particles diameter larger than 0.5 μm in an air volume of $1m^3$ is expressed in 10M or coefficient Nc. Cleanliness class: Nc or M		The number of particles larger than 0.1 μm in an air volume of $1m^3$ is expressed in 10^N. ISO Class N: Occupancy state: Considered particle size
Calculation of the maximum permitted concentration of particulate cleanliness classes		British unit: Number of particles/ft^3 = Nc x $(0.5/D)^{22}$ SI unit: Number of particles/m^3 = 10M x $(0.5/D)^{22}$		Cn = 10^N x $(0.1/D)^{2.08}$
Evaluation method using a simple sampling		① Number of sampling locations: 2 to 9 95% UCL of the mean and the mean of the averages ② Number of sampling locations: 10 or more The mean		① Number of sampling locations: 2 to 9 95% UCL of the mean and the mean of the averages ② Number of sampling locations: 1, or 10 or more The mean
Number of sampling locations		① Non-unidirectional airflow: at least two locations $N_L = A \times 64/(10M)^{0.5}$ ② Unidirectional airflow: at least two locations Smaller value between $N_L=A/2.32$ and $N_L=A \times 64/(10M)^{0.5}$		Derive it from the area of the cleanroom or clean air controlled space. The number of sampling locations $N_L = (A)^{0.5}$ At least one location
Min. sampling air flow volume		2 litters or a sufficient volume of air that a minimum of 20 particles could be counted if the particle concentration were at the class limit.		2 litters or a sufficient volume of air that a minimum of 20 particles could be counted if the particle concentration were at the class limit. Min. sampling time: 1 minute
Number of samplings		Total number of samplings in each clean zone: 5 times or more		Where only one sampling location is required, take a minimum of three single sample volumes at that location.
Sampling method		5.0 μm and larger: Constant velocity and suction in the same direction of the air flow 0.5 to 5 μm: Correction possible when it is sucked at a nonconstant velocity		Suction in the same direction as the airflow If the direction of the airflow is not predictable, the inlet of the sampling probe shall be directed vertically upward.



Cleanliness class (N)		Maximum concentration limit (particles/m^3) Considered particle diameter (μm)					
		0.1	0.2	0.3	0.5	1	5
ISO Class	1	10	2				
	2	100	24	10	4		
	3	1000	237	102	35	8	
	4	10000	2370	1020	352	83	
	5	100000	23700	10200	3520	832	29
	6	1000000	237000	102000	35200	8320	293
	7				352000	83200	2930
	8				3520000	832000	29300
	9				35200000	8320000	293000

Note) Concentration data with no more than three significant figures be used in determining the classification level.

$Cn = 10^N \times (0.1/D)^{2.08}$

Cn: The maximum permitted concentration of airborne particles that are equal to or larger than the considered particle size (D). Cn is rounded down to the nearest whole number, using no more than three significant figures.

N: Class no.(1 to 9), intermediate class (1.1 to 8.9)

D: Measured particle diameter (μm)

0.1: Constant number (μm)

Series 10-/11-/21-/22-CDU

Free mount cylinder / ø6, ø10, ø16, ø20, ø25

How to Order

Clean series

10	Relief type
11	Vacuum suction type

Built-in magnet

D	Built-in magnet

Bore size (mm)

10-C D U 16 - 30 D - M9B □

21-C D U 16 - 30 D - M9B □

Cylinder stroke (mm)

Copper, fluorine and silicon-free + low particle generation

21	Relief type
22	Vacuum suction type

Number of auto switches

Nil	2 pcs.
S	1 pc.
n	n pcs.

Type of auto switch

Reed switch	D-A93
Solid state switch	D-M9N, D-M9B

Action

D	Double acting

Model

Model		Cushion Bore size (mm)	Port size	Lubrication	Action	Standard stroke (mm)	Auto switch mounting	Cushion	
								Rubber	Air
Relief type	**10-/21-CDU6**	6	M5 x 0.8	Non-lube	Double acting single rod	5, 10, 15, 20, 25, 30	○	○	—
	10-/21-CDU10	10							
	10-/21-CDU16	16							
	10-/21-CDU20	20				5, 10, 15, 20, 25, 30, 40, 50			
	10-/21-CDU25	25							
Vacuum suction type	**11-/22-CDU6**	6				5, 10, 15, 20, 25, 30			
	11-/22-CDU10	10							
	11-/22-CDU16	16							
	11-/22-CDU20	20				5, 10, 15, 20, 25, 30, 40, 50			
	11-/22-CDU25	25							

Specifications

Item \ Bore size (mm)	6	10/16	20/25
Proof pressure	1.05MPa		
Max. operating pressure	0.7MPa		
Min. operating pressure	0.12MPa	0.06MPa	0.05MPa
Ambient and fluid temperature	Without auto switch : –10°C to 70°C With auto switch : –10°C to 60°C (With no condensation)		
Piston speed	50 to 400mm/s		
Stroke length tolerance	$^{+1.0}_{0}$		
Grease	10-/11-: Fluorine grease 21-/22-: Lithium soap base grease		
Particle generation grade (Refer to front matter pages 13 to 22 for details.)	10-: Grade 2, 21-: Grade 3		
	11-/22-: Grade 1		

Suction flow rate of vacuum suction type (Reference values)

Size	Suction flow rate ℓ/min (ANR)
6	6
10	10
16/20/25	12

Auto switch specifications (Refer to Best Pneumatics catalog for detailed specifications and auto switches not in the following table.)

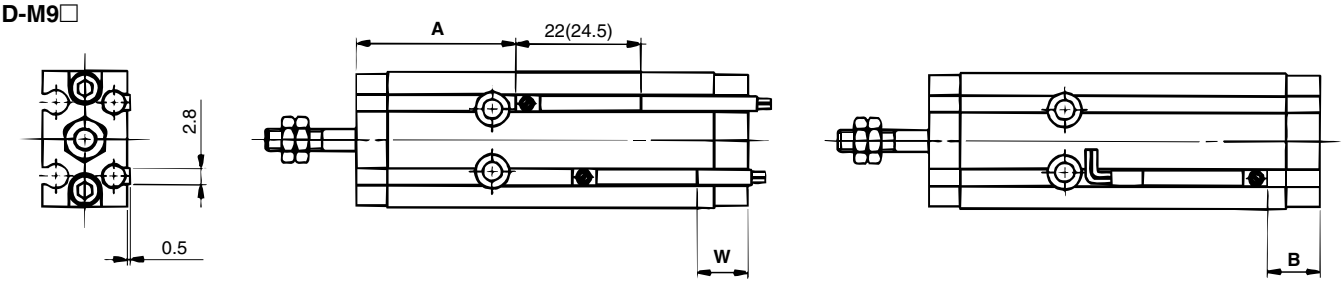
Switch type		Auto switch part no.	Load voltage	Load current range	Indicator light	Application
Reed switch		**D-A93**	24 VDC	5 to 40mA (24 VDC)	○	Relay, PLC
Solid state switch	2-wire type	**D-M9B**	28 VDC or less	40mA or less	○	IC circuit, Relay, PLC
	3-wire type	**D-M9N**	24 VDC (10 to 28 VDC)	5 to 40mA	○	24 VDC Relay, PLC

Refer to applicable auto switch list — Page 182.

PLC: Programmable Logic Controller

Auto switches / Proper mounting position at stroke end detection

D-A9□
D-M9□



( ): Dimensions for D-A93

Bore size (mm)	D-A9□			D-M9□		
	A	**B**	**W**	**A**	**B**	**W**
6	29.5	5.5	-3.5(-1)	33.5	9.5	0.5
10	29.5	9.5	-7.5(-5)	33.5	13.5	-3.5
16	36	11.5	-9.5(-7)	40	15.5	-5.5
20	41	15	-13(-10.5)	45	19	-9
25	40.5	16.5	-14.5(-12)	45.5	20.5	-10.5

Note) The above mentioned values are indicated as a guide for auto switch mounting position for stroke end detection. When actually mounting an auto switch, adjust the position after confirming the operating state of the auto switch.
Note 2) The negative values in the table indicate that the auto switch is mounted inside the cylinder body in case of W and outside in case of B.
Note 3) In case of 5mm stroke (with 1 pc.) or 10mm stroke (2 pcs.), the switch(es) may not go off or more than one switch may turn on simultaneously. Set them at 1 to 4mm out of the values in the above table.
Note 4) ( ): Dimensions for D-A93.

Specific Product Precautions

Be sure to read before handling.

Mounting

⚠Caution

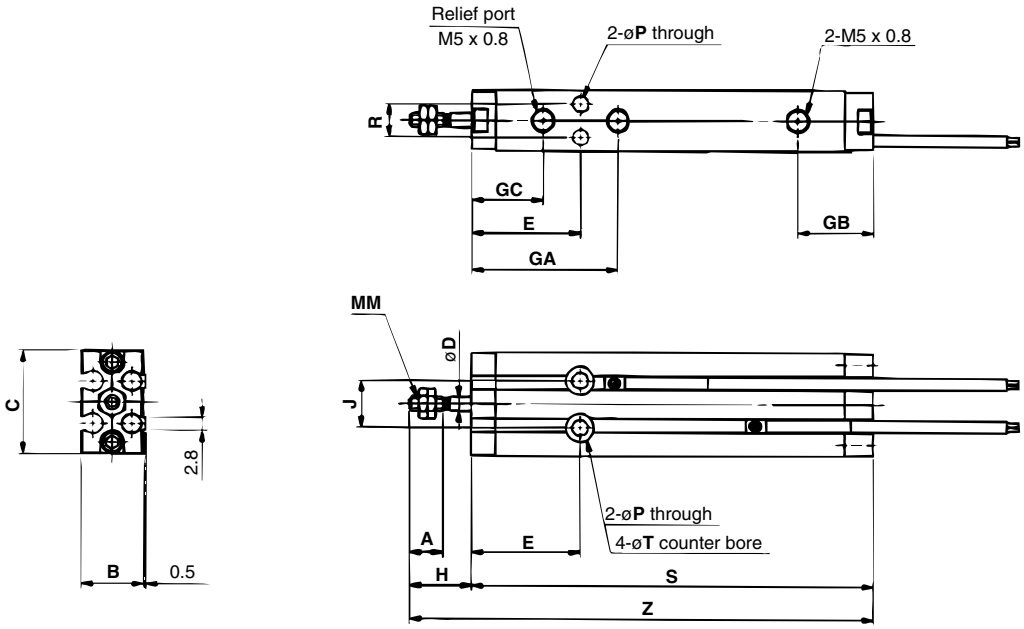
1. Observe the proper tightening torque in the right table in mounting.

Appropriate tightening torque

Bore size (mm)	Hexagon socket head cap bolt size(mm)	Appropriate tightening torque N·m
ø6, ø10	M3	1.08 ±10%
ø16	M4	2.45 ±10%
ø20, ø25	M5	5.10 ±10%

10-11-CDU6 to 25, 21-22-CDU6 to 25

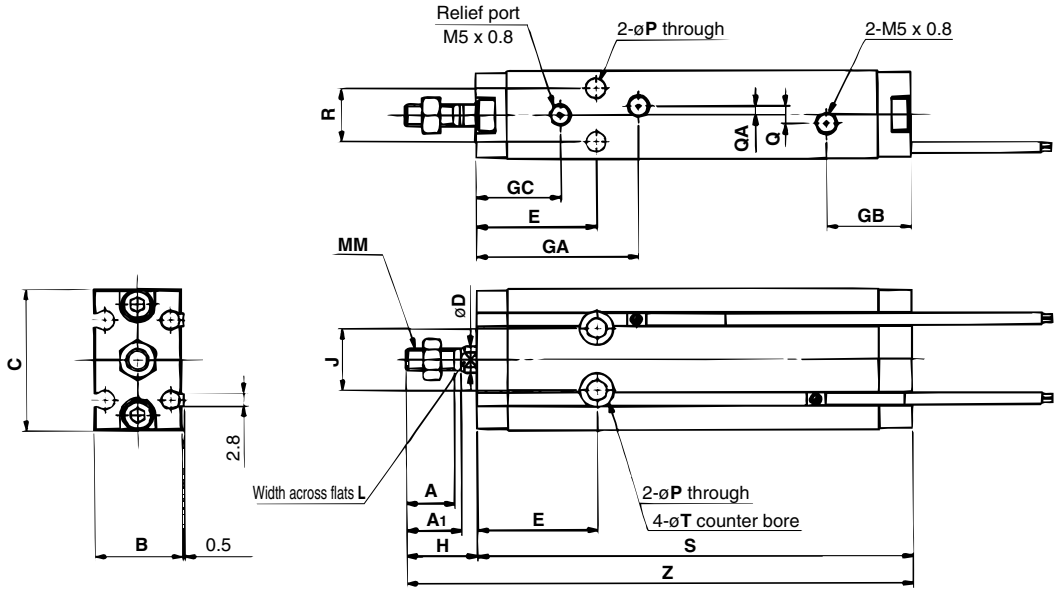
ø6/ø10



(mm)

Bore size	A	B	C	D	E	GA	GB	GC	H	J	MM	P	R	T	S						Z					
															5	10	15	20	25	30	5	10	15	20	25	30
6	7	13	22	3	23	31	16	15	13	10	M3 x 0.5	3.2	7	6 depth 4.8	60	65	70	75	80	85	73	78	83	88	93	98
10	10	15	24	4	24	33.5	16	15.5	16	11	M4 x 0.7	3.2	9	6 depth 5	64	69	74	79	84	89	80	85	90	95	100	105

ø16 to ø25



(mm)

Bore size	A	A1	B	C	D	E	GA	GB	GC	H	J	L	MM	P	Q	QA	R	T	S								Z							
																			5	10	15	20	25	30	40	50	5	10	15	20	25	30	40	50
16	11	12.5	20	32	6	27	36.5	19	19	16	14	5	M5 x 0.8	4.5	4	2	12	7.6 depth 6.5	72.5	77.5	82.5	87.5	92.5	97.5	—	—	88.5	93.5	98.5	103.5	108.5	113.5	—	—
20	12	14	26	40	8	30	40	21.5	22	19	16	6	M6 x 1.0	5.5	9	4.5	16	9.5 depth 8	81	86	91	96	101	106	116	126	100	105	110	115	120	125	135	145
25	15.5	18	32	50	10	29	40.5	22	22	23	20	8	M8 x 1.25	5.5	9	4.5	20	9.5 depth 9	83	88	93	98	103	108	118	128	106	111	116	121	126	131	141	151

Actuator / Common Precautions 1

Be sure to read before handling. Refer to the main text for precautions for each series.

Precaution on designing

⚠ Warning

1. There is a possibility of dangerous sudden action by air cylinders if sliding parts of machinery are twisted due to external forces, etc.
In such cases, personal injury by catching hands or feet in the machinery, or damage to the machinery itself may occur. Therefore, the machine should be adjusted to operate smoothly and designed to avoid such dangers.

2. A protective cover is recommended to minimize the risk of personal injury.
If a driven object and moving parts of a cylinder are in close proximity, personal injury may occur. Design the structure to avoid contact with the human body.

3. Securely tighten all stationary parts and connected parts so that they will not become loose.
Particularly when a cylinder operates at a high frequency or is installed in a place where there is a lot of vibration, ensure that all parts remain secure.

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

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

6. Consider a possible loss of power source.
Measures should be taken to avoid personal injury and equipment damage in the event that there is a loss of power to equipment controlled by pneumatics, electricity, or hydraulics.

7. Design circuitry to prevent the sudden lurching of driven objects.
When a cylinder is driven by an exhaust center type directional control valve or when it is started up after residual pressure is exhausted from the circuit, etc., the piston and its driven object will lurch when the cylinder is operated at high speed if pressure is applied to one side of the cylinder, due to the absence of air pressure inside the cylinder. Therefore, equipment should be selected and circuits should be designed to prevent this sudden lurching, because there is a danger of personal injury and/or damage to equipment when this occurs.

8. Consider emergency stops.
Design the machinery so that personal injury and/or damage to machinery and equipment will not occur when the machinery is stopped by a safety device under abnormal conditions, such as a power outage or a manual emergency stop.

9. Consider the action when operation is restarted after an emergency stop or abnormal stop.
Design the machinery so that personal injury or equipment damage will not occur upon restart of operation.
When the cylinder has to be reset at the start position, install safety manual control equipment.

Selection

⚠ Warning

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

2. Intermediate Stops
With a 3-position closed center type valve, it is difficult to accurately and precisely stop a piston at the required position in the same way as can be done with hydraulic pressure due to the compressibility of air.
Furthermore, since valves and cylinders, etc. are not guaranteed for zero air leakage, it may not be possible to hold a stopped position for an extended period of time. Please contact with SMC when it is necessary to hold a stopped position for an extended period of time.

⚠ Caution

1. Operate within the limits of the maximum feasible stroke.
Operation that exceeds the maximum stroke may damage a piston rod. Refer to the air cylinder model selection procedures for the maximum feasible strokes.

2. Operate a cylinder within a range such that collision damage will not occur to a piston at the stroke end.
Operate a cylinder within a range so that a piston having inertial force will not be damaged when it collides against the cover at the stroke end. Refer to the air cylinder model selection procedures for the maximum feasible strokes.

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

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

Actuator / Common Precautions 2

Be sure to read before handling. Refer to the main text for precautions for each series.

Mounting

⚠ Caution

1. Be certain to match the rod shaft center with the load and direction of movement when connecting.
When not properly matched, problems may arise with the rod and tube, and damage may be caused due to friction on areas such as the inner tube surface, bushings, rod surface, and seals.

2. When using an external guide, connect the rod end and the load in such a way that there is no interference at any point within the stroke.

3. Do not scratch or gouge the sliding portion of the cylinder tube or the piston rod by striking it with an object, or squeezing it.
The tube bore is manufactured under precise tolerances. Thus, even a slight deformation could lead to a malfunction.
Moreover, scratches or gouges, etc. in the piston rod may lead to damaged seals and cause air leakage.

4. Do not use until you verify that the equipment can operate properly.
After mounting, repairs, or modification, etc., connect the air supply and electric power, and then confirm proper mounting by means of appropriate function and leak tests.

5. 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.

Cushion

⚠ Caution

1. Readjust with a cushion needle.
Cushions are adjusted at the time of shipment; however, the cushion needle on the cover should be readjusted, when the product is put into service based on factors such as the size of the load and the operating speed. When the cushion needle is turned clockwise, the restriction becomes smaller and the cushion's effectiveness is increased. Tighten the lock nut securely after adjustment is performed.

2. Do not operate the actuator with the cushion needle fully closed.
This could damage the seals.

Air Supply

⚠ Warning

1. Use clean air.
Do not use compressed air which contains chemicals, synthetic oil containing organic solvents, salts or corrosive gases, etc. as this may cause damage or malfunction.

⚠ Caution

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

2. Install an aftercooler, air dryer, or water separator (Drain Catch).
Compressed air that includes excessive drainage may cause malfunction of valves and other pneumatic equipment. To prevent this, install an air dryer, aftercooler or water separator (drain catch), etc.

3. Use the product within the specified range of fluid and ambient temperature.
Take measures to prevent freezing at temperature below 5°C, since moisture in circuits may freeze and cause damage to seals and lead to malfunctions.

Actuator / Common Precautions 3

Be sure to read before handling. Refer to the main text for precautions for each series.

Operating Environment

⚠ Warning

1. **Do not use in atmospheres or locations where corrosion hazards exist.**
   Refer to the construction drawings regarding cylinder materials.
2. **In locations where ultrapure water or cleaning solvent, etc. splashes on the equipment, take suitable measures to protect the rod.**

Maintenance

⚠ Warning

1. **Perform maintenance procedures as shown in the instruction manual.**
   Improper handling may result in malfunction and damage of machinery or equipment.
2. **Removal of equipment, and supply / exhaust of compressed air**
   Before any machinery or equipment is removed, first ensure that the appropriate measures are in place to prevent the fall or erratic movement of driven objects and equipment, then cut off the electric power and release the compressed air in the system.
   When machinery is restarted, proceed with caution after confirming that appropriate measures are in place to prevent cylinders from sudden movement.

⚠ Caution

1. **Drain flushing**
   Remove drainage from air filters regularly.

Auto switch / Common Precautions 1

Be sure to read before handling. Refer to the main text for precautions for each series.

Design/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 specifications of current voltage, temperature or impact.

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

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

3. Use caution to the ON time of a switch at the intermediate position of stroke.

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

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

In cases of high piston speed, the use of an auto switch (D-F5NT, F7NT, G5NT and M5□T) with a built-in OFF delay timer (approx. 200ms) makes it possible to extend the load operating time.

4. Wiring should be kept as short as possible.

<Reed switch>

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

1) For an auto switch without a contact protection circuit, use a contact protection box when the wire length is 5m or longer.
2) Even if an auto switch has a built-in contact protection circuit, when the wiring is more than 30m long, it is not able to adequately absorb the rush current and its life may be reduced. It is again necessary to connect a contact protection box in order to extend its life. Please contact SMC in this case.

<Solid state switch>

3) Although wire length should not affect switch function, use a wire 100m or shorter.

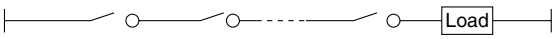
5. Use caution to internal voltage drop of a switch.

<Reed switch>

1. Switches with an indicator light (except D-A56/A76H/ A96/A96V/C76/E76A/Z76)

- If auto switches are connected in series as shown below, please 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.]

The load may be ineffective even though the auto switch function is normal.



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

Power voltage – Internal voltage drop of switch > 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 (D-A6□, A80, A80H, A90, A90V, C80, R80, 90, E80A, Z80).

<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 please note that a 12VDC relay is not applicable.

6. Use caution to the 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.

Current to operate load (OFF condition) > Leakage current

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

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

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

<Reed switch>

When driving a load such as a relay that generates a surge voltage, use a switch with a built-in contact protection circuit or a contact protection box.

<Solid state switch>

Although a zener diode for surge protection is connected to 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.

8. Cautions for use in an interlock circuit

When an auto switch is used for an interlock signal requiring high reliability, devise a double interlock system to avoid trouble by providing a mechanical protection function, or by also using another switch (sensor) together with the auto switch.

Also perform periodic maintenance inspections and confirm proper operation.

9. Ensure sufficient space for maintenance activities.

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

Auto switch / Common Precautions 2

Be sure to read before handling. Refer to the main text for precautions for each series.

Mounting/Adjustment

⚠ Warning

1. Do not drop or bump.

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

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

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

3. Mount switches using the proper tightening torque.

When a switch is tightened beyond the range of tightening torque, the mounting screws or switch may be damaged.

On the other hand, tightening below the range of tightening torque may allow the switch to slip out of position.

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

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

<D-M9□>

If this auto switch replaces the conventional model, it may not function depending on the application (shown below) because its operation range is shorter.

- **Applications where at the end, the stopping position shifting range is larger than the operation range**
  e.g. Workpiece pushing, pressing into a hole, or clamping
- **Applications where an auto switch is used to detect intermediate stopping positions (Detecting time is shortened).**

As indicated above, mount a switch at the center of the operating range.

Wiring

⚠ Warning

1. Avoid repeatedly bending or stretching lead wires.

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

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

<2-wire type>

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

3. Confirm proper insulation of wiring.

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

4. 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

Wiring

⚠ Warning

5. Do not allow short circuiting 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>

Models M-F9□(V), F9□W(V), J51, G5NB and all models of PNP output switches do not have built-in short circuit prevention circuits. If loads are short circuited, the switches will be instantly damaged.

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

6. Avoid incorrect wiring.

<Reed switch>

A 24VDC switch with indicator light has polarity. The brown lead wire or terminal No.1 is (+), and the blue lead wire or terminal No.2 is (–).

[In the case of model D-97, the side without indicator is (+) and the blue line side is (–).]

1) If connections are reversed, a switch will operate, however, the light emitting diode will not light up.
   Also please note that a current greater than the maximum specified one will damage a light emitting diode and make it inoperable.
   Applicable models
   D-A73, A73H, A73C, C73, C73C, E73A, Z73, R73
   D-97, 93A, A93, A93V
   D-A33, A34, A33A, A34A, A44, A44A
   D-A53, A54, B53, B54

2) However, when using a 2 color indication auto switch (D-A79W, A59W, B59W), be aware that the switch will constantly remain ON if the connections are reversed.

<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□>

D-M9□ does not have built-in short-circuit prevention circuits. Reverse connection of power supply line (+) and (–) may damage the switch.

Auto switch / Common Precautions 3

Be sure to read before handling. Refer to the main text for precautions for each series.

Environment

⚠Warning

1. Never use in the presence of explosive gases.

Our auto switches are not explosion proof. Never use them in the presence of explosive gas, as this may cause a serious explosion.

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

Auto switches will malfunction or magnets inside cylinders will become demagnetized. (Please consult with SMC regarding the availability of a magnetic field resistant auto switch.)

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

Although switches except D-A3□/A44□/G39□/K39□ satisfy the IEC standard IP67 structure (JIS C 0920: anti-immersion structure), 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 environments with oil or chemicals.

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

5. Do not use in environments with temperature cycles.

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

6. Do not use in environments 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 may malfunction and generate or cut off a signal momentarily (1ms or less). Please consult with SMC regarding the need to use a solid state switch depending on the environment.

7. Do not use in locations where surges are generated.

<Solid state switch>

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

8. Avoid close contact with magnetic substances.

When a magnetic substance (substance attracted by a magnet) is brought into close proximity with an auto switch cylinder, it may cause the auto switches to malfunction due to a loss of the magnetic force inside the cylinder.

Maintenance

⚠Warning

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

1) Securely tighten switch mounting screws.
If screws become loose or the mounting position is dislocated, retighten screws securely after readjusting the mounting position.

2) Confirm that there is no damage to lead wires.
To prevent faulty insulation, replace switches or repair lead wires if damage is discovered.

3) Confirm that the green light on the 2-color indicator type switch lights up.
Confirm that the green LED is ON when stopped at the set position. If the red LED is ON when stopped at the set position, the mounting position is not appropriate. Readjust the mounting position until the green LED lights up.

Other

⚠Warning

1. Please consult with SMC concerning water resistance, elasticity of lead wires, etc.

∗Lead wire color changes

Lead wire colors of SMC auto switches have been changed in order to meet NECA (Nippon Electric Control Equipment Industries Association) Standard 0402 for production beginning September, 1996 and thereafter.Special care should be taken regarding wire polarity during the time that both old and new colors exist.

2-wire system

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

3-wire system

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

Solid state with diagnostic output

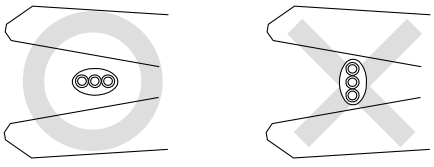
	Old	New
Power supply +	Red	Brown
Power supply GND	Black	Blue
Output	White	Black
Diagnostic output	Yellow	Orange

Solid state with latch type diagnostic output

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

⚠Caution

1. When stripping the cable clad, take care with the orientation of the cable being stripped. The insulator may accidentally be torn or damaged depending on the orientation.(D-M9□ only)



Recommended tools are shown below.

Manufacturer	Model name	Model no.
VESSEL	Wire stripper	No 3000G
TOKYO IDEAL	Strip master	45-089

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

Cylinder
Applicable auto switch list

	Cylinder series	CDJ2		CDM2	CDBM2	CDG1		CDA2	CUJ	CDU	CDQS	CDQ2	REC	CXSJ	CXS	MGP	MGF	MXP	MXQ	MXS	CYP	CDQSX	CDQ2X	CDM2X
	Bore size	ø6	ø10/ø16	ø20 to ø40	ø20 to ø40	ø20 to ø63	ø80/ø100	ø40 to ø63	ø6 to ø10	ø6 to ø25	ø12 to ø25	ø32 to ø100	ø20 to ø40	ø6-ø10	ø6 to ø32	ø12 to ø63	ø40/ø63/ø100	ø6 to ø16	ø6 to ø25	ø6 to ø25	ø15/ø32	ø12 to ø25	ø32 to ø63	ø20 to ø40
Reed switch	D-C7/C8	■	■	■	■	■							■											■
	D-C73C/C80C	■	■	■	■	■							■											■
	D-B5/B6			■	■	■	■	■					■											■
	D-B59W			■	■	■	■	■					■											■
	D-A3/A4							■					■											
	D-A3□A/A44A			■	■																			■
	D-A3□C/A44C							■																
	D-A7/A8		■									■											■	
	D-A7□H/A80H		■									■											■	
	D-A73C/A80C		■									■											■	
	D-A79W		■									■											■	
	D-A5/A6							■																
	D-A59W							■																
	D-A9	✻	✻	✻	✻	✻	✻	✻		■	■	■	✻	■		✻		■	■	■		■	■	✻
	D-A9□V							✻		■	■	■		■		✻								
	D-Z7/Z8							■							■	■	■				■			
Solid state switch	D-H7	■	■	■	■	■							■											■
	D-H7C	■	■	■	■	■							■											■
	D-H7BAL	■	■	■	■	■							■											
	D-H7□F	■	■	■	■	■							■											■
	D-H7□W	■	■	■	■	■							■											■
	D-G5/K5						■	■																
	D-G5BAL				■		■	■																
	D-G59F						■	■																
	D-G5NTL			■	■		■	■					■											
	D-G5□W/K59W						■	■																
	D-G39/K39							■					■											
	D-G39A/K39A			■	■																			■
	D-F7/J7		■									■											■	
	D-J79C		■									■											■	
	D-F7□F		■									■											■	
	D-F7BAL		■									■											■	
	D-F7BAVL		■									■											■	
	D-F7□V		■									■											■	
	D-F7NTL		■									■											■	
	D-F7□W (V)		■									■											■	
	D-F5/J5							■																
	D-F5BAL							■																
	D-F5□W/J59W							■																
	D-F5□F							■																
	D-F5NTL							■																
	D-G39C/K39C							■																
	D-M9	✻	✻	✻	✻	✻	✻	✻	■	■	■	■	✻	■		✻		■	■	■		■	■	✻
	D-M9□V							✻	■	■	■	■		■		✻		■	■	■		■	■	
	D-F9□W	✻	✻	✻	✻	✻	✻	✻		■	■	■	✻	■		✻		■	■	■		■	■	✻
	D-F9□WV							✻		■	■	■		■		✻		■	■	■		■	■	
	D-F9BAL							✻			■	■		■		✻						■	■	
	D-Y59A/Y7P/Y59B							■							■	■	■				■			
	D-Y69A/Y7PV/Y69B							■							■	■	■				■			
	D-Y7□W							■							■	■	■				■			
	D-Y7□WV							■							■	■	■				■			
	D-Y7BAL							■								■	■							
	D-P5□WL							■				■				■								
	D-F9G/H	✻	✻	✻	✻	✻	✻	✻		■	■	■	✻	■		✻		■	■	■		■	■	✻
	D-Y7G/H							■							■	■	■				■			
	D-G5NBL			■			■	■																
	D-F8□								■															

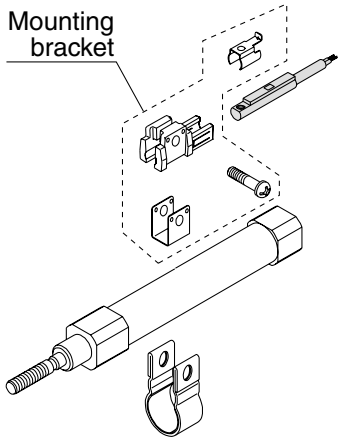
Please refer to the next page for applicable auto switches and cylinders in the fields marked with asterisks (✻).

Compact auto switch mounting bracket

Mounting brackets used for installing the compact auto switches D-A9/M9/F9 onto band mounting / tie-rod mounting / groove mounting style cylinders are available.

Band mounting

Applicable cylinder
10-/11-/21-/22-CDJ2 Series
10-/11-/21-/22-CDM2 Series
10-/11-/21-/22-CDG1 Series
10-/11-REC Series
10-/11-CDM2X Series



Applicable auto switch

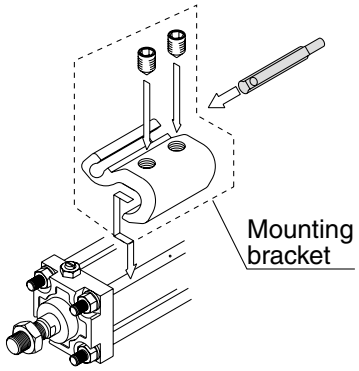
Solid state switch
D-M9
D-F9□W (2-color indication)

Reed switch
D-A9

Perpendicular entry is unavailable.

Tie-rod mounting

Applicable cylinder
10-/11-/21-/22-CDA2 Series



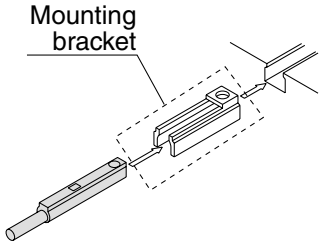
Applicable auto switch

Solid state switch
D-M9/M9□V
D-F9□W/F9□WV (2-color indication)
D-F9BAL (water resistant type)

Reed switch
D-A9/D-A9□V

Groove mounting

Applicable cylinder
12-/13-/21-/22-MGP Series



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), Japan Industrial Standards (JIS)*1) and other safety regulations*2).

* 1) ISO 4414: Pneumatic fluid power – General rules relating to systems.
ISO 4413: Hydraulic fluid power – General rules relating to systems.
IEC 60204-1: Safety of machinery – Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1992: Manipulating industrial robots -Safety.
JIS B 8370: General rules for pneumatic equipment.
JIS B 8361: General rules for hydraulic equipment.
JIS B 9960-1: Safety of machinery – Electrical equipment of machines. (Part 1: General requirements)
JIS B 8433-1993: Manipulating industrial robots - Safety.
etc.
* 2) Labor Safety and Sanitation Law, etc.

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

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

⚠ Danger : In extreme conditions, there is a possibility of serious injury or loss of life.

⚠ 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 catalog 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. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

Safety Instructions

⚠ Caution

The product is provided for use in manufacturing industries.
The product herein described is basically provided for peaceful use in manufacturing industries.
If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary. If anything is unclear, contact your nearest sales branch.

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.**∗**3)**
   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 catalog for the particular products.**

∗ **3) 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

When the product is exported, strictly follow the laws required by the Ministry of Economy, Trade and Industry (Foreign Exchange and Foreign Trade Control Law).

Clean series: Common Precautions 1

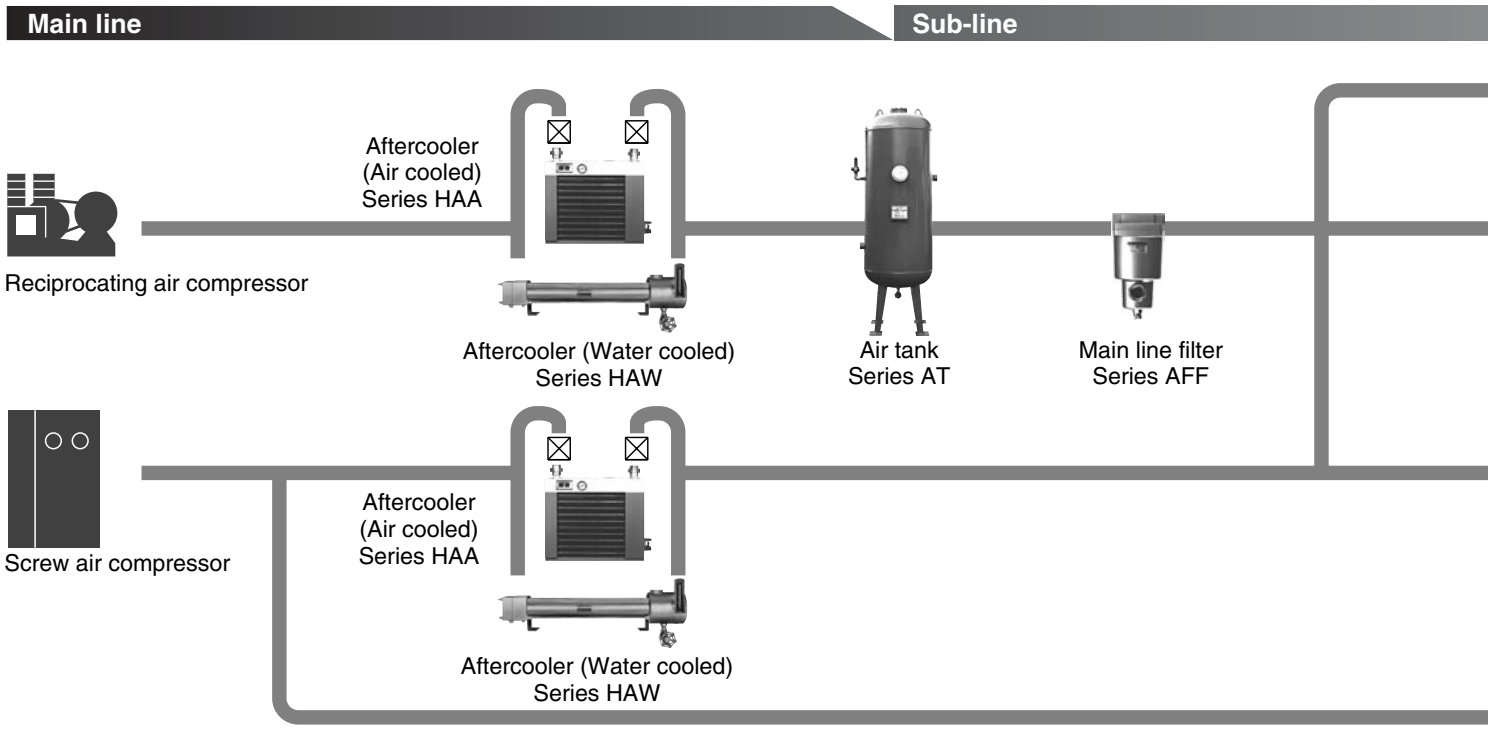
Be sure to read before handling.
Refer to the main text for detailed precautions on every series.

Air Supply

⚠ Caution

System Configuration

Refer to the "Air Preparation System" below for the quality of compressed air before configuring the system.



Piping

1. Provide an inclination of 1cm per meter in the direction of the air flow to the main piping.

2. If there is a line branching from the main piping, provide an outlet of compressed air on top using a tee so that drainage accumulated in the piping will not flow out.

3. Provide a drainage mechanism at every recessed point or dead end to prevent drain accumulation.

4. For future piping extensions, plug the end of the piping with a tee.

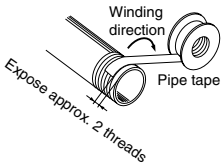
5. Before piping

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

6. Wrapping of pipe tape

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

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



7. If air with a low dew point (–40°C or less) is required, do not use nylon tube or resin fitting (except for fluorine resin) for the outlet side of the membrane air dryer or heatless air dryer. Nylon tubing could be affected by the ambient air and it thus might not be possible to achieve the prescribed low dew point at the end of the tube. Therefore, for low dew point air, use stainless steel or fluorine tube.

Maintenance

1. If the heatless air dryer Series ID is left unused for a long period, the absorbent may be moistened. Prior to use, close the valve on the outlet side of the dryer for regeneration and drying.

Caution on Design

Employ a safe design, so that the following unexpected conditions will not occur.

⚠ Warning

1. Provide a design that prevents high-temperature compressed air from flowing into the outlet side of the cooling equipment.

If the flow of the coolant water in a water-cooled aftercooler is stopped or if the fan motor of an air cooled aftercooler is stopped, the high-temperature compressed air will flow to the outlet side of the cooling equipment, causing the equipment on the outlet side (such as the AFF, AM, AD, or IDF series) to be damaged or to malfunction.

2. Provide a design in which interruptions in the supply of compressed air are taken into consideration.

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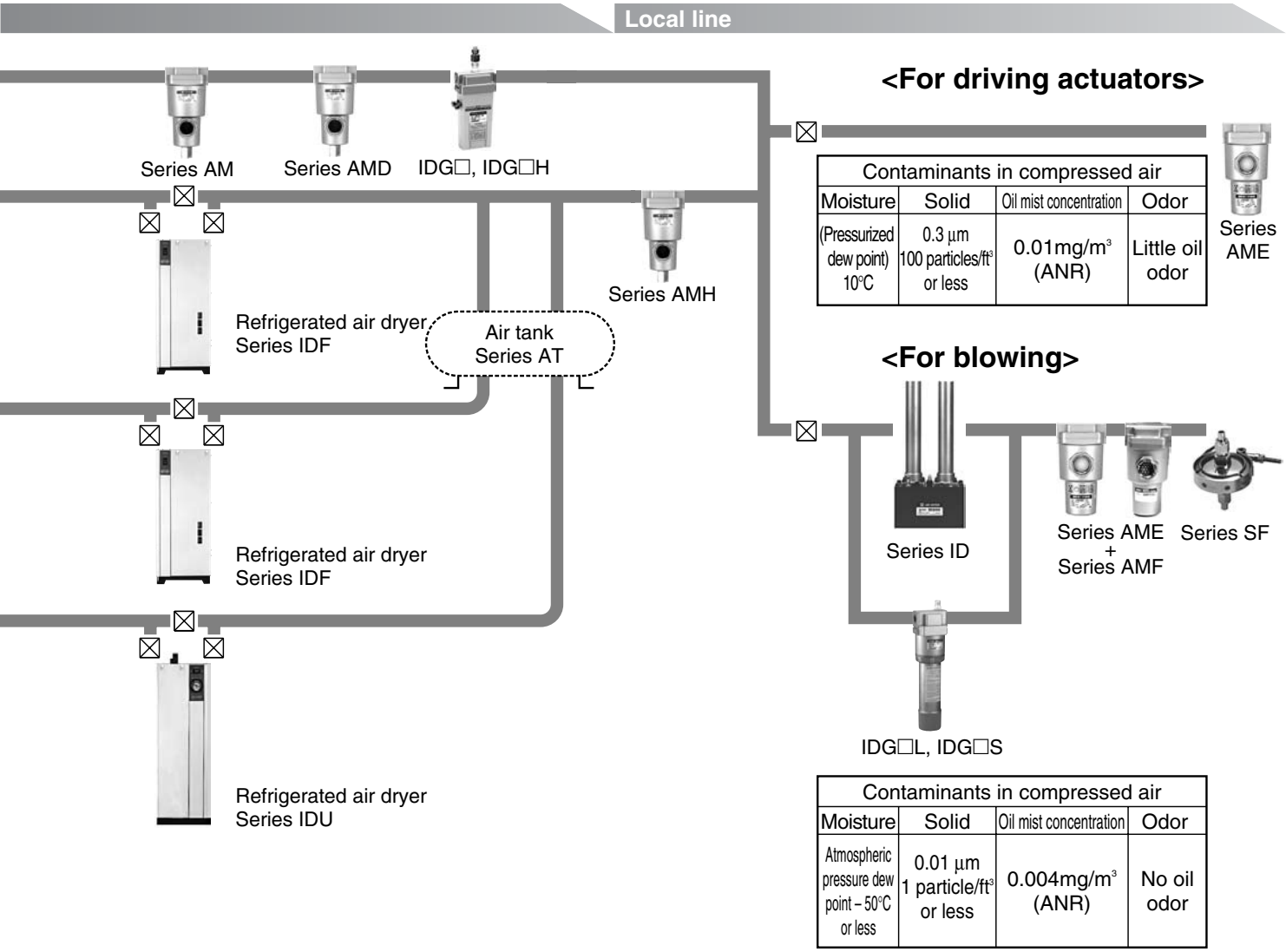


There are cases in which compressed air cannot flow due to the freezing of the refrigerated air dryer or a malfunction (heatless dryer) in the switching valve.

⚠ Caution

3. Design a layout in which the leakage of the coolant water and the dripping of condensation are taken into consideration.

A water-cooled aftercooler that uses coolant water could lead to water leakage due to freezing. Depending on the operating conditions, the refrigerated air dryer and its downstream pipes could create a dripping of water droplets due to condensation formed by supercooling.

4. Provide a design that prevents back pressure and backflow.

The generation of back pressure and backflow could lead to equipment damage.

Take appropriate safety measures, including the proper installation methods.

5. Depending on the model and operating conditions, the life span of air cylinders may be shortened when they are used in an environment of super dry air (atmospheric pressure dew point: –50°C) or high-purity nitrogen gas or when such super dry air or high-purity nitrogen gas is used as the fluid.

Please contact with SMC for further details on applicable series, models, operating conditions and life spans.

6. Blowing system

Even a small amount of dust can be a problem for blowing systems.

Install Clean Gas Filter Series SF to the end of the blowing line.

Clean series: Common Precautions 2

Be sure to read before handling.
Refer to the main text for detailed precautions on every series.

Piping: Inside of Clean Room

⚠ Caution

1. **Do not make the piping for the air cylinder relief port and regulator breathing vent piping common with solenoid valve exhaust piping.**
   This can cause malfunctions in the air cylinder or regulator pressure change.

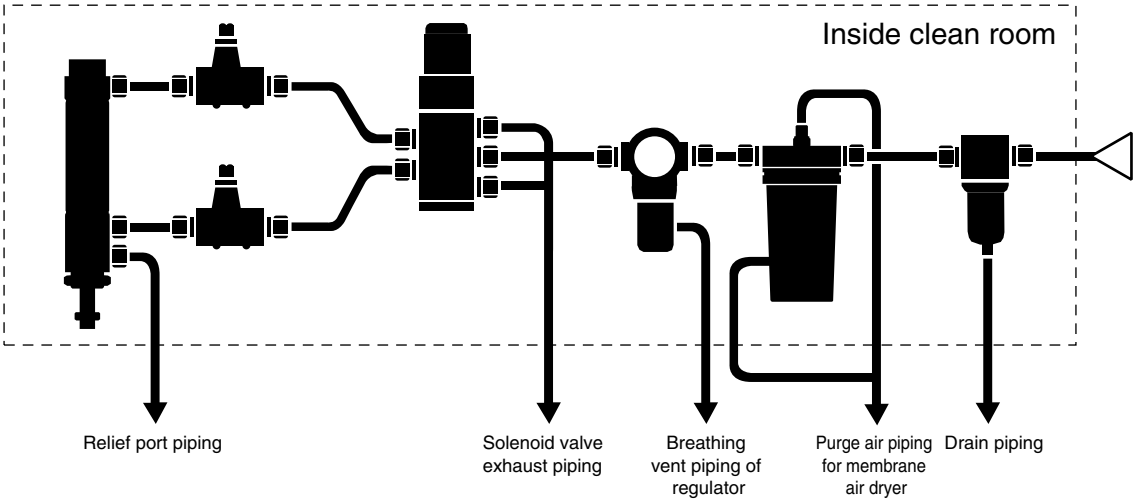
2. **Arrange the piping so that the exhaust air of the solenoid valves is exhausted outside of the clean room.**

3. **Air filter drain piping**
   Exhaust drainage outside the clean room through piping from the drain guide of the air filter.

4. **Arrange the membrane dryer air purge piping using a standard size tubing so that air is exhausted outside the clean room.**

5. **Take precautions so that the threaded portion of the piping connection or the tubing connection will not be loosened.**
   Take sufficient precautions against the piping shaking along with the vibration of the equipment.

6. **Use polyurethane tubing containing no plasticizer.**



Handling

⚠ Caution

1. **The inner bag of a double-packed clean series package should be opened in a clean room or clean environment.**

2. **When standard pneumatic equipment is brought into a clean room, spray high-purity air upon it and remove dust thoroughly by wiping the external surfaces of the cylinder tube, solenoid valves and air line equipment with alcohol.**

3. **To replace parts or disassemble the product in a clean room, first exhaust the compressed air inside the piping to the outside of the clean room before the work.**

4. **Do not use rotation type mounting brackets such as clevises, trunnions, etc.. They will generate a considerable amount of particulate matter due to the sliding friction between the metal parts.**

Lubrication / In the Case of Actuator

⚠ Warning

Be sure to wash your hands after handling fluororesin grease.
The grease itself is not hazardous but it can produce a hazardous gas at temperatures exceeding 260°C.

⚠ Caution

1. **Do not use any greases but those specified by SMC.**
   Use of greases not specified will cause malfunctions or particle generation.

2. **Do not lubricate the products since they are of a nonlubricant type.**
   As the clean series actuators are lubricated at the factory with fluororesin grease, the product specifications may not be satisfied if turbine oil or other such lubricants are applied.

Piston speed

⚠ Caution

The cylinder speed upper limit that retains the particle generation grade is 400 mm/s.

Clean series: Common Precautions 3

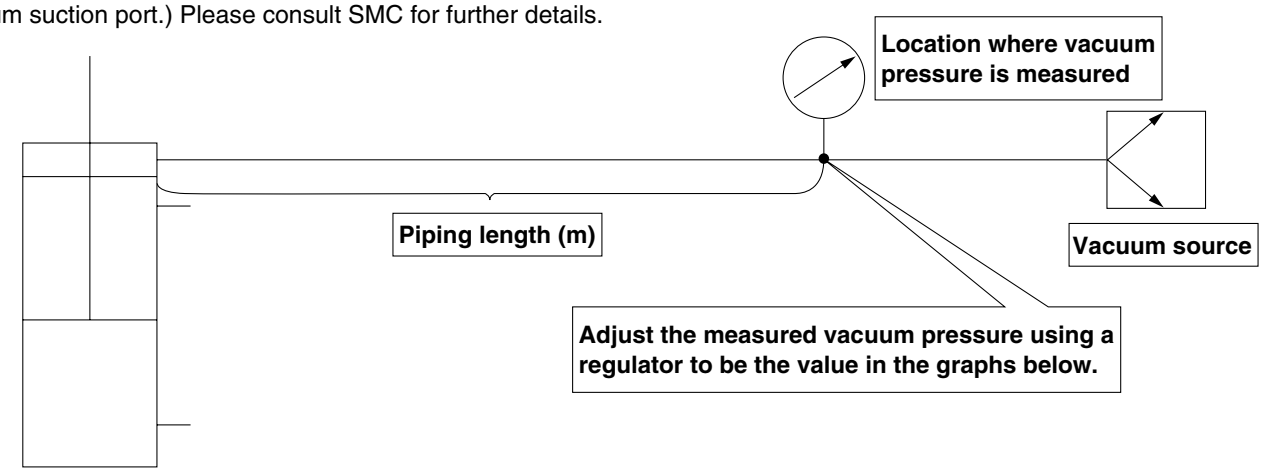
Be sure to read before handling.
Refer to the main text for detailed precautions for every series.

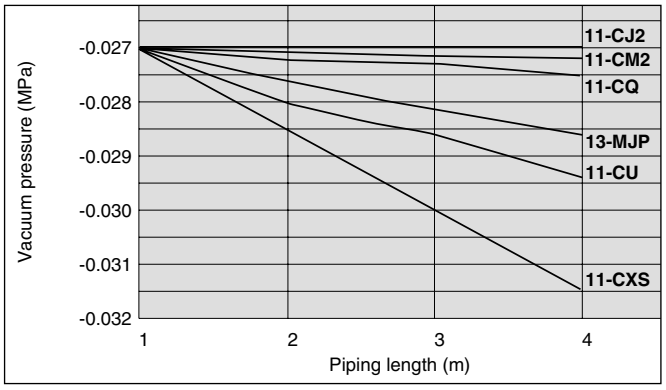
Suction flow rate of vacuum suction types

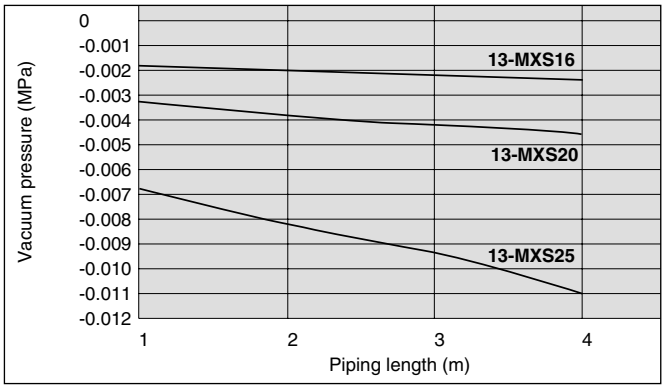
⚠ Caution

For the vacuum suction types (Series 11-/13-/22-), perform vacuum suction at the vacuum port to retain the particle generation grade.

The optimum suction flow rate varies depending on series and sizes. Refer to "Suction flow rate of vacuum suction type (Reference values)" for each series. (The vacuum pressure will be approximately -27 kPa at around 1 m from the vacuum suction port.) Please consult SMC for further details.







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Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.

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