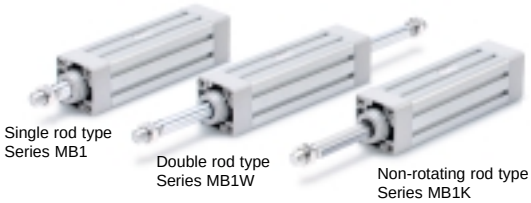
SMC

Square Tube Type Air Cylinder



Single rod type
Series MB1

Double rod type
Series MB1W

Non-rotating rod type
Series MB1K

Series MB1

ø32, ø40, ø50, ø63, ø80, ø100

Employs a square tube with enclosed tie-rods

Series MB1 / MB1W

MB1 Double Acting Single Rod Type

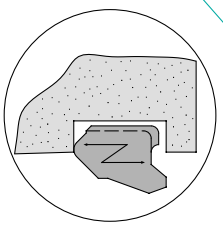
MB1W Double Acting Double Rod Type

Increased kinetic energy absorption

The absorption of kintectic energy has been increased by nearly 30% compared to the CA1 series, through increased cushion volume and the use of a new cushion seal. In addition, the life of the cushion seal is approximately 5 times longer.

Improved cushion capacity

Piston rod lurching, due to cracking pressure at start up, has been eliminated by means of a floating seal mechanism.

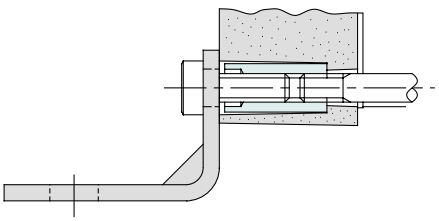


Compact and light weight

The height and width of the covers has been reduced by nearly 10%, and in an addition, die casting of the covers has reduced the weight by 10 to 25% compared to the CA1 series.

Improved mounting accuracy

High precision has been achieved in the cylinder unit and the mounting brackets. Improved mounting accuracy simplifies the mounting process and also extends cylinder life.



Piston rod sagging reduced

Sagging of the piston rod has been reduced by increasing the precision of the bushing and piston rod, and reducing their clearances.

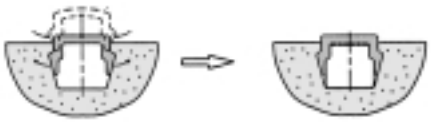
MB1K

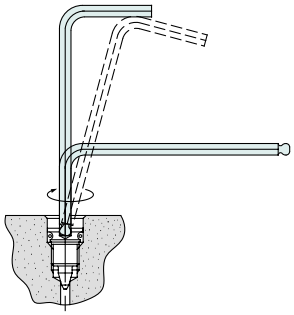
Double Acting Non-Rotating Rod

ø32, ø40, ø50, ø63, ø80, ø100

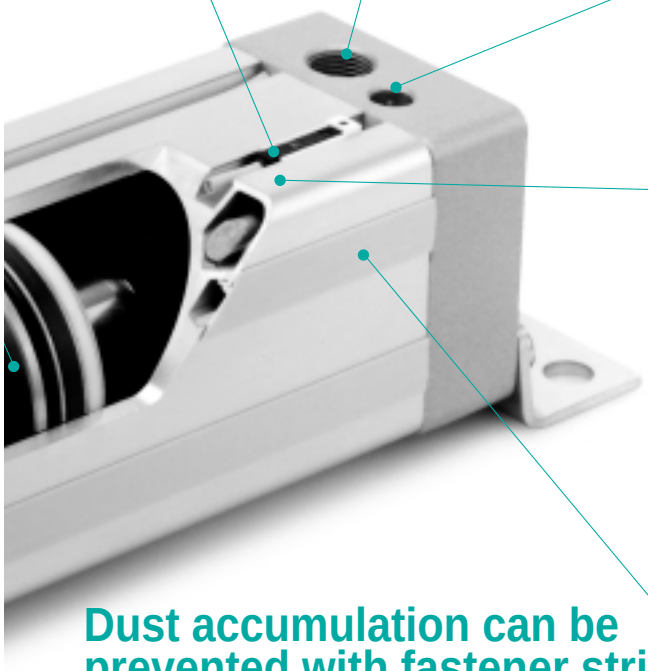
Space saving auto switch mounting

Space is saved by setting switches into grooves provided on 4 surfaces. This is also effective to prevent loosening and damage, etc.





Port aperture



Easy cushion valve adjustment

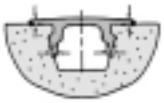
Since adjustment of the cushion valve is performed with a hexagon wrench key, even fine control can be easily accomplished. Furthermore, the cushion valve has been recessed so that it does not protrude from the cover.

Appearance improved by enclosing the tie-rods

Tie-rods are enclosed in a rectangular tube, which is integrated with both covers to achieve an attractive, unified appearance.

Dust accumulation can be prevented with fastener strips

Auto switch mounting grooves can be covered with resin fastener strips, which adhere tightly to the tube (optional) to prevent the entry and accumulation of dirt.

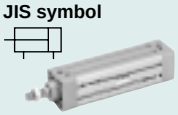
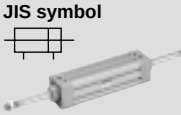
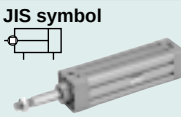


A full range of order made specifications

No.	Symbol	Specification/Content
1	-XA0 to XA30	Modification of rod end shape
2	-XB5	Heavy duty rod
3	-XB6	Heat resistant cylinder (to 150°C)
4	-XB13	Low speed cylinder
5	-XC3	Special port locations
6	-XC4	With heavy duty scraper
7	-XC5	Heat resistant cylinder (to 110°C)
8	-XC6	Stainless steel piston rod and rod end nut
9	-XC7	Stainless steel tie-rods, tie-rod nuts, cushion valve, etc.
10	-XC8	Adjustable stroke cylinder (adjustable extension type)
11	-XC9	Adjustable stroke cylinder (adjustable retraction type)
12	-XC10	Dual stroke cylinder (double rod type)
13	-XC11	Dual stroke cylinder (single rod type)
14	-XC12	Tandem type cylinder
15	-XC18	NPT ports
16	-XC22	Fluoro rubber seals
17	-XC30	Front trunnion mounted on front of rod cover
18	-XC35	With coil scraper
19	-X846	Fastener strips mounted on switch mounting grooves

Series variations

Standard type/double acting

	JIS symbol	Bore size	Standard stroke (mm) 25 50 75 100 125 150 175 200 250 300 350 400 450 500 600	Built-in magnet	Rod boot	Mounting brackets	Accessories	
Single rod type Series MB1		32	• • • • • • • • • • • • • •	•	•	Basic type Axial foot type Front flange type Rear flange type Single clevis type Double clevis type Center trunnion type	(Standard) Rod end nut (Optional) Knuckle joint pin Clevis pin Single knuckle joint Double knuckle joint Trunnion mounting bracket Double clevis mounting plate	Page 1
		40	• • • • • • • • • • • • • •					
Double rod type Series MB1W		50	• • • • • • • • • • • • • • •	•	•	Basic type Foot type Flange type Center trunnion type	(Standard) Rod end nut (Optional) Knuckle joint pin Single knuckle joint Double knuckle joint Trunnion mounting bracket	Page 13
Non-Rotating Rod Series MB1K		63	• • • • • • • • • • • • • • •	•	•	Basic type Axial foot type Front flange type Rear flange type Single clevis type Double clevis type Center trunnion type	(Standard) Rod end nut (Optional) Knuckle joint pin Clevis pin Single knuckle joint Double knuckle joint Trunnion mounting bracket Double clevis mounting bracket	Page 18

Square Tube Type
Air Cylinder/Standard (Double Acting: Single Rod)

Series MB1

ø32, ø40, ø50, ø63, ø80, ø100

How to Order

Standard type MB1 L 32 — 50 ☐

With auto switch MDB1 L 32 — 50 ☐ — Z73 ☐

Built-in magnet

Mounting bracket

B	Basic type
L	Axial foot type
F	Front flange type
G	Rear flange type
C	Single clevis type
D	Double clevis type

Bore size

32	32mm
40	40mm
50	50mm
63	63mm
80	80mm
100	100mm

Stroke (mm)
Refer to the standard stroke table on page 2.

Rod boot/Air cushion

Rod boot	Nil	Without rod boot
	J	Nylon tarpaulin
	K	Heat resistant tarpaulin
Air cushion	Nil	Air cushion at both ends
	N Note)	Without air cushion

Note) When there is no air cushion, the unit is equipped with rubber bumpers.
Moreover, due to the fact that bumpers are installed at each end of the piston, overall length is increased by 6mm for ø32 and ø40, 8mm for ø50 and ø63, and by 10mm for ø80 and ø100.

Type of auto switch

Nil	Without auto switch

∗ Select an applicable auto switch model from the table below.

Number of auto switches

Nil	2pcs.
S	1pc.
3	3pcs.
n	"n" pcs.

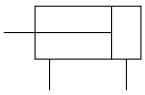
Applicable auto switches/direct mounting type

Type	Special function	Electrical entry	Indicator light	Wiring (output)	Load voltage			Auto switch model		Lead wire length (m) Note)			Applicable load	
					DC		AC	Electrical entry direction: Vertical	Electrical entry direction: Lateral	0.5 (Nil)	3 (L)	5 (Z)		
Reed switch	—	Grommet	Yes	3 wire	—	5V	—	—	Z76	●	●	—	IC circuit	—
				2 wire	24V	—	100V	—	Z73	●	●	●	—	Relay PLC
			No			5V, 12V	100V or less	—	Z80	●	●	—	IC circuit	
Solid state switch	—	Grommet	Yes	3 wire (NPN)	24V	5V, 12V	—	Y69A	Y59A	●	●	○	IC circuit	Relay PLC
				3 wire (PNP)				Y7PV	Y7P	●	●	○		
				2 wire		12V		Y69B	Y59B	●	●	○	—	
	Diagnostic indication (2 color indicator)			3 wire (NPN)		5V, 12V		Y7NWV	Y7NW	●	●	○	IC circuit	
				3 wire (PNP)				Y7PWV	Y7PW	●	●	○		
				2 wire		12V		Y7BWV	Y7BW	●	●	○	—	
	Water resistant (2 color indicator)							—	Y7BA	—	●	—		

Note) Lead wire length symbol 0.5m ..... Nil (Example) Y69B
3m ..... L (Example) Y69BL
5m ..... Z (Example) Y69BZ

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

JIS symbol
Double acting type



Specifications

1MPa: Approx. 10.2kgf/cm²

Bore size (mm)	32	40	50	63	80	100
Type	Non-lube type					
Action	Double acting single rod					
Fluid	Air					
Proof pressure	1.5MPa {15.3kgf/cm²}					
Maximum operating pressure	1.0MPa {10.2kgf/cm²}					
Minimum operating pressure	0.05MPa {0.5kgf/cm²}					
Ambient and fluid temperature	Without auto switch –10 to 70°C (without freezing)					
	With auto switch –10 to 60°C (without freezing)					
Lubrication	Not required (non-lube)					
Piston speed	50 to 1000mm/s					
Stroke length tolerance	to 250 : $^{+1.0}_{0}$, 251 to 1000 : $^{+1.4}_{0}$, 1001 to 500 : $^{+1.8}_{0}$					
Cushion	Both ends (air cushion) Note)					
Thread tolerance	JIS class 2					
Port size	Rc(PT)1/8	Rc(PT)1/4	Rc(PT)1/4	Rc(PT)3/8	Rc(PT)3/8	Rc(PT)1/2
Mounting bracket	Basic type, Foot type, Front flange type, Rear flange type Single clevis type, Double clevis type					

Note) When there is no air cushion, the unit is equipped with rubber bumpers. (Refer to Rod boot/Air cushion on page1.)

Minimum strokes for auto switch mounting

Refer to page 9 regarding the minimum strokes for the mounting of auto switches.

Standard stroke table

Bore size (mm)	Standard stroke (mm)	Maximum stroke
32	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500	700
40	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500	800
50	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600	1200
63	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600	1200
80	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800	1400
100	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800	1500

Note) Intermediate strokes are also available.

Rod boot material

Symbol	Rod boot material	Max. ambient temp.
J	Nylon tarpaulin	60°C
K	Heat resistant tarpaulin	110°C Note)

Note) Maximum ambient temperature for the rod boot itself.

Accessories

Mounting bracket		Basic type	Foot type	Front flange type	Rear flange type	Single clevis type	Double clevis type
Standard equipment	Rod end nut	●	●	●	●	●	●
	Clevis pin	–	–	–	–	–	●
Options	Single knuckle joint	●	●	●	●	●	●
	Double knuckle joint (with pin)	●	●	●	●	●	●
	Rod boot	●	●	●	●	●	●

Switch spacers

Applicable bore size (mm)	32, 40	50, 63	80, 100
Switch spacer	BMP1-032		

Mounting brackets

Bore size (mm)	32	40	50	63	80	100
Foot Note1)	MB-L03	MB-L04	MB-L05	MB-L06	MB-L08	MB-L10
Flange	MB-F03	MB-F04	MB-F05	MB-F06	MB-F08	MB-F10
Single clevis	MB-C03	MB-C04	MB-C05	MB-C06	MB-C08	MB-C10
Double clevis	MB-D03	MB-D04	MB-D05	MB-D06	MB-D08	MB-D10

Note 1) When ordering foot type brackets, 2pcs. should be ordered for each cylinder.
Note 2) The parts included with each mounting bracket are as follows.
Foot, Flange, Single clevis: Body mounting bolts
Double clevis: Clevis pin & Cotter pin

Theoretical output table

(Unit: N) OUT IN

Bore size (mm)	Rod diameter (mm)	Operating direction	Piston area (mm²)	Operating pressure (MPa)								
				0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
32	12	OUT	804	161	241	322	402	482	563	643	724	804
		IN	691	138	207	276	346	415	484	553	622	691
40	16	OUT	1257	251	377	503	629	754	880	1006	1131	1257
		IN	1056	211	317	422	528	634	739	845	950	1056
50	20	OUT	1963	393	589	785	982	1178	1374	1570	1767	1963
		IN	1649	330	495	660	825	989	1154	1319	1484	1649
63	20	OUT	3117	623	935	1247	1559	1870	2182	2494	2805	3117
		IN	2803	561	841	1121	1402	1682	1962	2242	2523	2803
80	25	OUT	5027	1005	1508	2011	2514	3016	3519	4022	4524	5027
		IN	4536	907	1361	1814	2268	2722	3175	3629	4082	4536
100	30	OUT	7854	1571	2356	3142	3927	4712	5498	6283	7069	7854
		IN	7147	1429	2144	2859	3574	4288	5003	5718	6432	7147

1N: approx. 0.102kgf 1MPa: approx. 10.2kgf/cm²
Note) Theoretical output (N) = Pressure (MPa) x Piston area (mm²).

Weight table

(kg)

Bore size (mm)		**32**	**40**	**50**	**63**	**80**	**100**
Basic weight	Basic type	0.53	0.72	1.24	1.54	2.84	3.83
	Foot type	0.65	0.86	1.46	1.82	3.34	4.49
	Flange type	0.82	1.09	1.69	2.33	4.29	7.14
	Single clevis type	0.78	0.95	1.58	2.17	3.95	7.0
	Double clevis type	0.79	0.99	1.67	2.33	4.24	7.52
Additional weight per 50mm stroke	All mounting brackets	0.16	0.21	0.33	0.37	0.56	0.72
Accessories	Single knuckle	0.15	0.23	0.26	0.26	0.60	0.83
	Double knuckle (with pin)	0.22	0.37	0.43	0.43	0.87	1.27

Calculation method
Example) **MB1B32-100** (basic type/ø32,100st)
- Basic weight ..... 0.53 (basic type, ø32)
- Additional weight ..... 0.16/50mm stroke
- Cylinder stroke ..... 100mm stroke

0.53 + 0.16 x 100/50 = 0.85kg

Consideration of the cushion

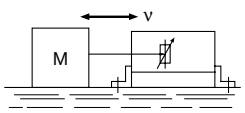
Refer to "Best Pneumatics No. 2" for further information on kinetic energy that can be absorbed by the cushion mechanism and regarding cylinders with air cushion.

Kinetic energy absorbable by cushion mechanism

Bore size (mm)	Effective cushion length (mm)	Absorbable kinetic energy J
32	18.8	2.2
40	18.8	3.4
50	21.3	5.9
63	21.3	11
80	30.3	20
100	29.3	29

1J: approx. 10.2kgf·cm

Cylinders with air cushion
At the stroke end, when stopping a large amount of kinetic energy generated by a large load and high speed operation, compression of air is used to absorb the impact without transmitting vibration to the surroundings. The purpose of an air cushion is not to reduce the speed of a piston as it nears the stroke end. The kinetic energy of a load can be found using the following formula.

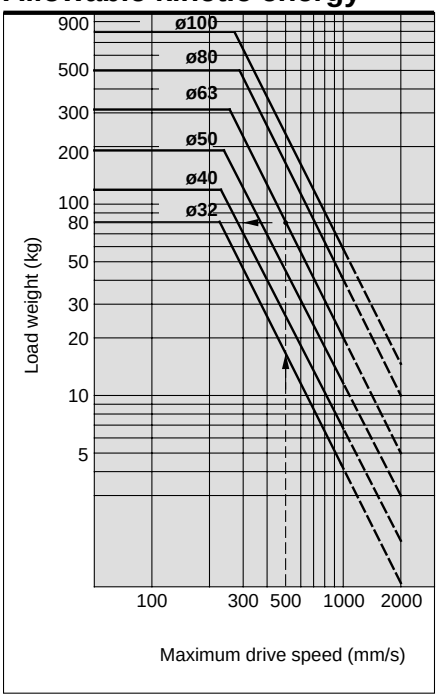


$$Ek = \frac{M}{2}V^2$$

Ek: Kinetic energy (J)
M: Weight of load (kg)
V: Piston speed (m/s)

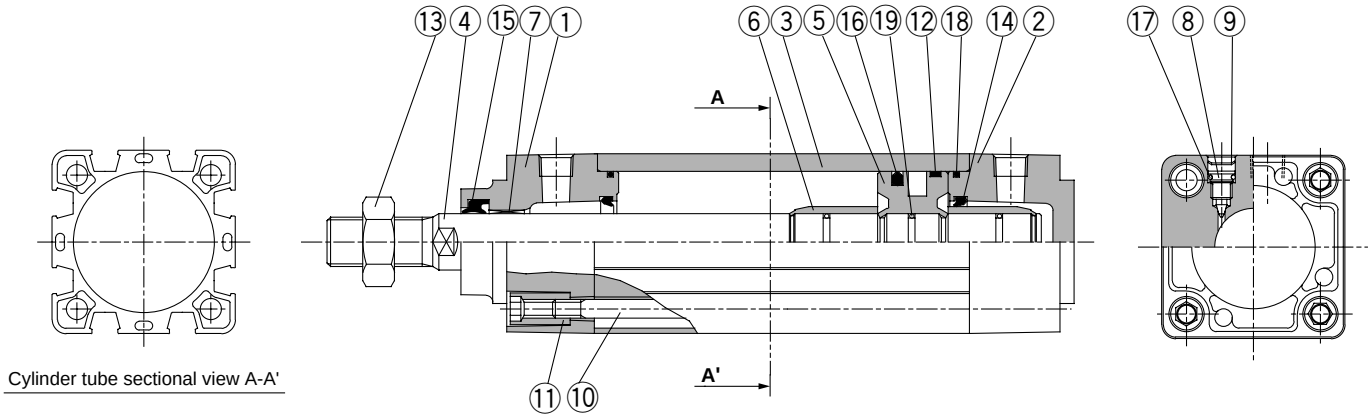
If the kinetic energy obtained is no greater than the absorbable kinetic energy shown in the table above, the life of the cushion seal will be 10 million cycles or more.

Allowable kinetic energy



Example)
Find the rod end load limit when a ø63 air cylinder is operated at a maximum drive speed of 500mm/s.
Extend upward from 500mm/s on the horizontal axis of the graph to the intersection point with the line for a tube bore of 63mm, and then extend leftward from this point to find the load of 80kg.

Construction



Cylinder tube sectional view A-A'

Parts list

No.	Description	Material	Note
①	**Rod cover**	Die-cast aluminum	Metallic coated
②	**Head cover**	Die-cast aluminum	Metallic coated
③	**Cylinder tube**	Aluminum alloy	Hard anodized
④	**Piston rod**	Carbon steel	Hard chrome plated
⑤	**Piston**	Aluminum alloy	Chromated
⑥	**Cushion ring**	Brass	
⑦	**Bushing**	Lead-bronze casting	
⑧	**Cushion valve**	Steel wire	Nickel plated
⑨	**Snap ring**	Spring steel	ø40 to ø100
⑩	**Tie-rod**	Carbon steel	Chromated
⑪	**Tie-rod nut**	Carbon steel	Nickel plated
⑫	**Wear ring**	Resin	
⑬	**Rod end nut**	Carbon steel	Nickel plated

No.	Description	Material	Note
∗⑭	**Cushion seal**	Urethane	
∗⑮	**Rod seal**	NBR	
∗⑯	**Piston seal**	NBR	
⑰	**Cushion valve seal**	NBR	
∗⑱	**Cylinder tube gasket**	NBR	
⑲	**Piston gasket**	NBR	

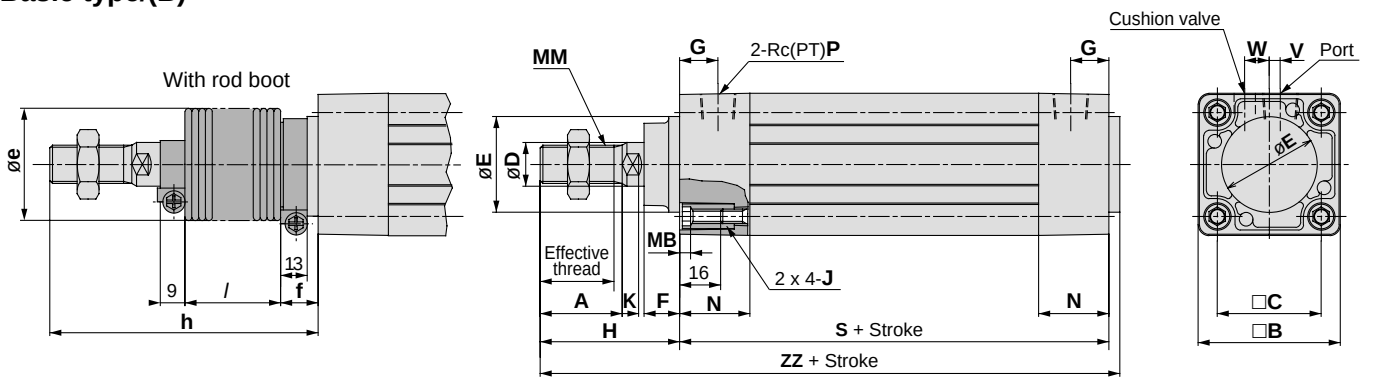
Replaceable parts: Seal kits

Bore size (mm)	Order No.	Contents
32	MB32-PS	Kits include items 14 (2pcs.), 15, 16 & 18 from the table above.
40	MB40-PS	
50	MB50-PS	
63	MB63-PS	
80	MB80-PS	
100	MB100-PS	

∗ Seal kits consist of items 14, 15, 16 and 18 contained in one kit, and can be ordered using the order number for each respective tube bore size.

Standard Type

Basic type/(B)



∗ When there is no air cushion, the unit is equipped with rubber bumpers.
Moreover, due to the fact that bumpers are installed at each end of the piston, overall length is increased by 6mm for ø32 and ø40, 8mm for ø50 and ø63, and by 10mm for ø80 and ø100.

Without air cushion

Bore size (mm)	S	ZZ	Bore size (mm)	S	ZZ
32	90	141	**63**	102	164
40	90	145	**80**	124	200
50	102	164	**100**	124	200

Bore size (mm)	Stroke range	Effective thread length	Width across flats	A	□B	□C	D	Ee11	F	G	H	MB	J	K	MM	N	P	∗ S	V	W	∗ ZZ
32	to 500	19.5	10	22	46	32.5	12	30	13	13	47	4	M6 x 1.0	6	M10 x 1.25	26.5	1/8	84	4	6.5	135
40	to 500	27	14	30	52	38	16	35	13	14	51	4	M6 x 1.0	6	M14 x 1.5	26.5	1/4	84	4	9	139
50	to 600	32	18	35	65	46.5	20	40	14	15.5	58	5	M8 x 1.25	7	M18 x 1.5	31	1/4	94	5	10.5	156
63	to 600	32	18	35	75	56.5	20	45	14	16.5	58	5	M8 x 1.25	7	M18 x 1.5	31	3/8	94	9	12	156
80	to 800	37	22	40	95	72	25	45	20	19	72	5	M10 x 1.5	10	M22 x 1.5	37.5	3/8	114	11.5	14	190
100	to 800	37	26	40	114	89	30	55	20	19	72	5	M10 x 1.5	10	M26 x 1.5	37.5	1/2	114	17	15	190

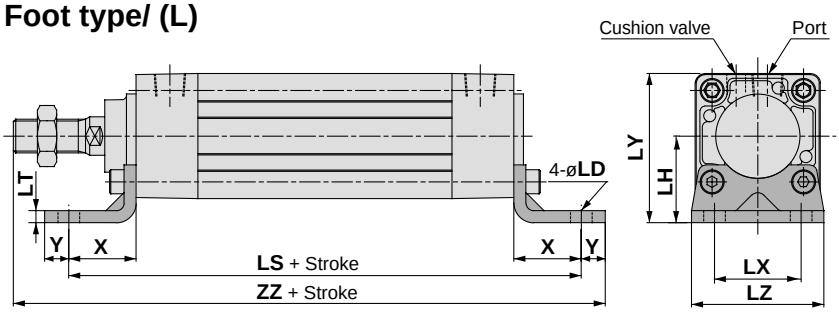
With rod boot (mm)

Bore size (mm)	e	f	l										h									
			1 to 50	51 to 100	101 to 150	151 to 200	201 to 300	301 to 400	401 to 500	501 to 600	601 to 700	701 to 800	1 to 50	51 to 100	101 to 150	151 to 200	201 to 300	301 to 400	401 to 500	501 to 600	601 to 700	701 to 800
32	36	23	12.5	25	37.5	50	75	100	125	—	—	—	73	86	98	111	136	161	186	—	—	—
40	41	23	12.5	25	37.5	50	75	100	125	—	—	—	81	94	106	119	144	169	194	—	—	—
50	51	25	12.5	25	37.5	50	75	100	125	150	—	—	89	102	114	127	152	177	202	227	—	—
63	51	25	12.5	25	37.5	50	75	100	125	150	—	—	89	102	114	127	152	177	202	227	—	—
80	56	29	12.5	25	37.5	50	75	100	125	150	175	200	101	114	126	139	164	189	214	239	264	289
100	61	29	12.5	25	37.5	50	75	100	125	150	175	200	101	114	126	139	164	189	214	239	264	289

Standard Type/with Mounting Brackets

∗ Dimensions not shown are the same as the basic type (drawing above).

Foot type/ (L)



∗ When there is no air cushion, the unit is equipped with rubber bumpers. Moreover, due to the fact that bumpers are installed at each end of the piston, overall length is increased by 6mm for ø32 and ø40, 8mm for ø50 and ø63, and by 10mm for ø80 and ø100.

Without air cushion

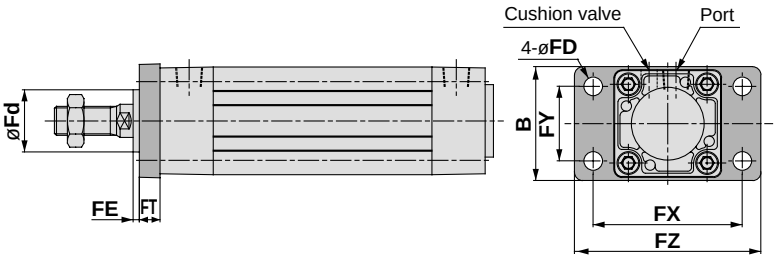
Bore size (mm)	LS	ZZ
32	134	168
40	138	176
50	156	198
63	156	201
80	184	240
100	188	244

Foot type (mm)

Bore size (mm)	Stroke range	X	Y	LD	LH	∗ LS	LT	LX	LY	LZ	∗ ZZ
32	700	22	9	7	30	128	3.2	32	53	50	162
40	800	24	11	9	33	132	3.2	38	59	55	170
50	1000	27	11	9	40	148	3.2	46	72.5	70	190
63	1000	27	14	12	45	148	3.6	56	82.5	80	193
80	1000	30	14	12	55	174	4.5	72	102.5	100	230
100	1000	32	16	14	65	178	4.5	89	122	120	234

Standard Type/with Mounting Brackets

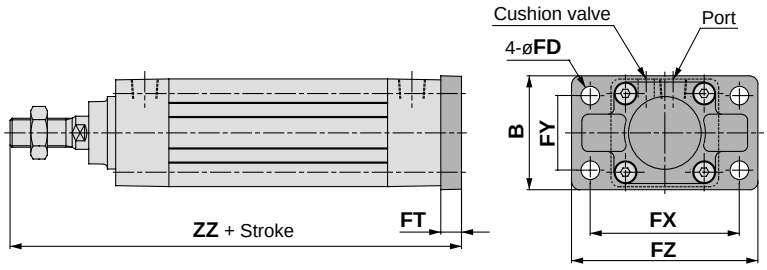
Front flange type/(F)



Front flange type

Bore size (mm)	Stroke range	B	FD	FE	FT	FX	FY	FZ	Fd
32	to 700	50	7	3	10	64	32	79	25
40	to 800	55	9	3	10	72	36	90	31
50	to 1000	70	9	2	12	90	45	110	38.5
63	to 1000	80	9	2	12	100	50	120	39.5
80	to 1000	100	12	4	16	126	63	153	45.5
100	to 1000	120	14	4	16	150	75	178	54

Rear flange type/(G)



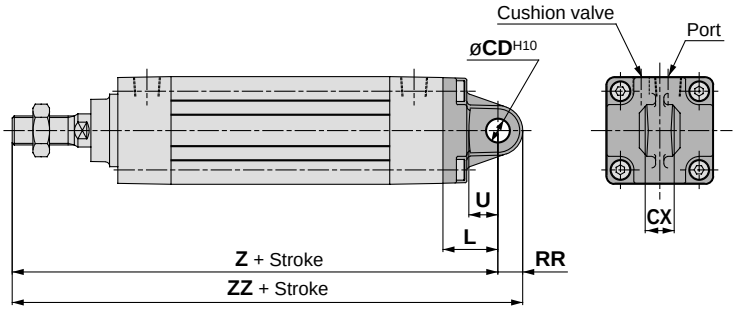
Without air cushion

Bore size (mm)	ZZ
32	147
40	151
50, 63	172
80, 100	212

Rear flange type

Bore size (mm)	Stroke range	B	FD	FT	FX	FY	FZ	ZZ*
32	to 500	50	7	10	64	32	79	141
40	to 500	55	9	10	72	36	90	145
50	to 600	70	9	12	90	45	110	164
63	to 600	80	9	12	100	50	120	164
80	to 750	100	12	16	126	63	153	202
100	to 750	120	14	16	150	75	178	202

Single clevis type/(C)



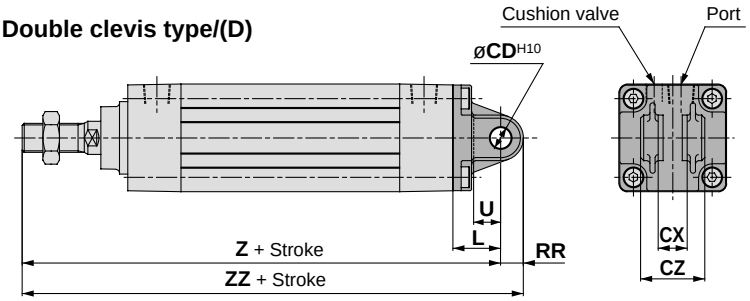
Without air cushion

Bore size (mm)	Z	ZZ
32	160	170.5
40	164	175
50, 63	190	205
80, 100	238	261

Single clevis type

Bore size (mm)	Stroke range	L	RR	U	CD H10	CX −0.1 −0.3	Z*	ZZ*
32	to 500	23	10.5	13	10	14	154	164.5
40	to 500	23	11	13	10	14	158	169
50	to 600	30	15	17	14	20	182	197
63	to 600	30	15	17	14	20	182	197
80	to 750	42	23	26	22	30	228	251
100	to 750	42	23	26	22	30	228	251

Double clevis type/(D)



Overall length of front/rear flange, single/double clevis, and method for longitudinal mounting
* When there is no air cushion, the unit is equipped with rubber bumpers.
Moreover, due to the fact that bumpers are installed at each end of the piston, overall length is increased by 6mm for ø32 and ø40, 8mm for ø50 and ø63, and by 10mm for ø80 and ø100.

Without air cushion

Bore size (mm)	Z	ZZ
32	160	170.5
40	164	175
50, 63	190	205
80, 100	238	261

Double clevis type

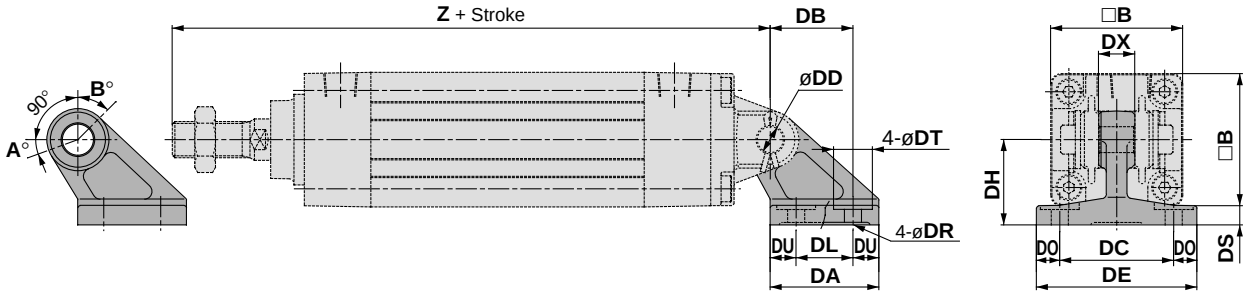
Bore size (mm)	Stroke range	L	RR	U	CD H10	CX +0.3 +0.1	CZ	Z*	ZZ*
32	to 500	23	10.5	13	10	14	28	154	164.5
40	to 500	23	11	13	10	14	28	158	169
50	to 600	30	15	17	14	20	40	182	197
63	to 600	30	15	17	14	20	40	182	197
80	to 750	42	23	26	22	30	60	228	251
100	to 750	42	23	26	22	30	60	228	251

Cushion Bracket/Double Clevis Mounting Bracket

Models

Description \ Bore size	MB□32	MB□40	MB□50	MB□63	MB□80	MB□100
Double clevis mounting bracket	MB-B03		MB-B05		MB-B08	

Double clevis mounting bracket



(mm)

No.	Bore size (mm)	□B	DA	DB	DL	DU	DC	DX	DE	DO	DR	DT	DS	DH	*Z	DD H10
MB-B03	**32**	46	42	32	22	10	44	14	62	9	6.6	15	7	33	154	$10^{+0.058}_{0}$
	40	52	42	32	22	10	44	14	62	9	6.6	15	7	33	158	$10^{+0.058}_{0}$
MB-B05	**50**	65	53	43	30	11.5	60	20	81	10.5	9	18	8	45	182	$14^{+0.070}_{0}$
	63	75	53	43	30	11.5	60	20	81	10.5	9	18	8	45	182	$14^{+0.070}_{0}$
MB-B08	**80**	95	73	64	45	14	86	30	111	12.5	11	22	10	65	228	$22^{+0.084}_{0}$
	100	114	73	64	45	14	86	30	111	12.5	11	22	10	65	228	$22^{+0.084}_{0}$

Without air cushion

Bore size (mm)	Z
32	160
40	164
50	190
63	190
80	238
100	238

Rotation

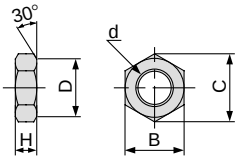
Bore size (mm)	A°	B°	A°+B°+90°
32, 40	25°	45°	160°
50, 63	40°	60°	190°
80, 100	30°	55°	175°

Method for longitudinal mounting of clevis bracket

∗ When there is no air cushion, the unit is equipped with rubber bumpers.
Moreover, due to the fact that bumpers are installed at each end of the piston, overall length is increased by 6mm for ø32 and ø40, 8mm for ø50 and ø63, and by 10mm for ø80 and ø100.

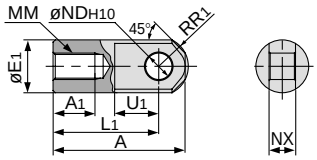
Accessory Dimensions

Rod end nut
(standard equipment)



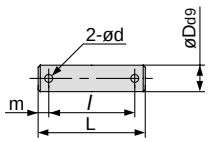
Part No.	Bore size (mm)	d	H	B	C	D
NT-03	32	M10 x 1.25	6	17	19.6	16.5
NT-04	40	M14 x 1.5	8	22	25.4	21
NT-05	50, 63	M18 x 1.5	11	27	31.2	26
NT-08	80	M22 x 1.5	13	32	37.0	31
NT-10	100	M26 x 1.5	16	41	47.3	39

I type single
knuckle joint



Part No.	Bore size (mm)	A	A_1	E_1	L_1	MM	R_1	U_1	ND_{H10}	NX
I-03M	32	40	14	20	30	M10 x 1.25	12	16	$10^{+0.058}_{0}$	$14^{-0.10}_{-0.30}$
I-04M	40	50	19	22	40	M14 x 1.5	12.5	19	$10^{+0.058}_{0}$	$14^{-0.10}_{-0.30}$
I-05M	50, 63	64	24	28	50	M18 x 1.5	16.5	24	$14^{+0.070}_{0}$	$20^{-0.10}_{-0.30}$
I-08M	80	80	26	40	60	M22 x 1.5	23.5	34	$22^{+0.084}_{0}$	$30^{-0.10}_{-0.30}$
I-10M	100	80	26	40	60	M26 x 1.5	23.5	34	$22^{+0.084}_{0}$	$30^{-0.10}_{-0.30}$

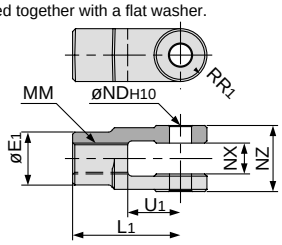
Knuckle joint pin
Clevis pin



Part No.	Bore size (mm)		D_{d9}	L	l	m	d (Cut through)	Cotter pin Note 1)
	Clevis	Knuckle						
CD-M03	32, 40		$10^{-0.040}_{-0.076}$	44	36	4	3	ø3 x 18*l*
CD-M05	50, 63		$14^{-0.050}_{-0.093}$	60	51	4.5	4	ø4 x 25*l*
CD-M08	80, 100		$22^{-0.065}_{-0.117}$	82	72	5	4	ø4 x 35*l*

Note 1) Cotter pin should be used together with a flat washer.

Y type double
knuckle joint



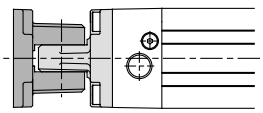
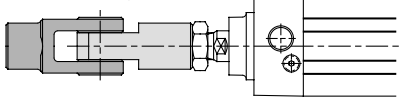
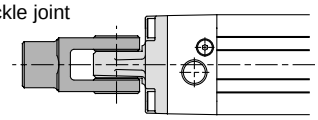
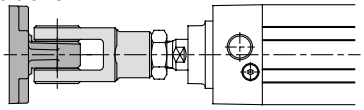
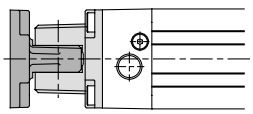
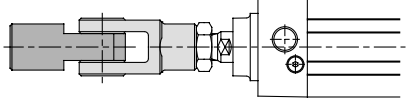
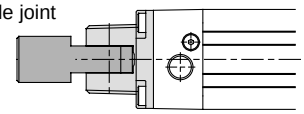
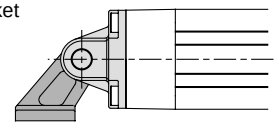
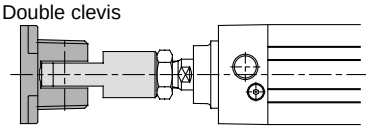
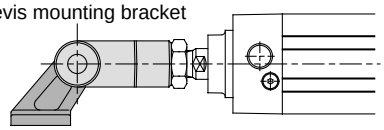
Part No.	Bore size (mm)	E_1	L_1	MM	R_1	U_1	ND_{H10}	NX	NZ
Y-03M	32	20	30	M10 x 1.25	10	16	$10^{+0.058}_{0}$	$14^{+0.30}_{+0.10}$	$28^{-0.10}_{-0.30}$
Y-04M	40	22	40	M14 x 1.5	11	19	$10^{+0.058}_{0}$	$14^{+0.30}_{+0.10}$	$28^{-0.10}_{-0.30}$
Y-05M	50, 63	28	50	M18 x 1.5	14	24	$14^{+0.070}_{0}$	$20^{+0.30}_{+0.10}$	$40^{-0.10}_{-0.30}$
Y-08M	80	40	65	M22 x 1.5	20	34	$22^{+0.084}_{0}$	$30^{+0.30}_{+0.10}$	$60^{-0.10}_{-0.30}$
Y-10M	100	40	65	M26 x 1.5	20	34	$22^{+0.084}_{0}$	$30^{+0.30}_{+0.10}$	$60^{-0.10}_{-0.30}$

Note) Pin, cotter pin and flat washer are included with the double knuckle joint.

Bracket Combinations

Bracket combination table ----------▶ Refer to table together with combination drawings.

Cylinder side mounting bracket \ Work side mounting bracket	Single clevis	Double clevis	Single knuckle joint	Double knuckle joint	Clevis mounting bracket
Single clevis	—	**1**	—	**2**	—
Double clevis	**3**	—	**4**	—	**9**
Single knuckle joint	—	**5**	—	**6**	—
Double knuckle joint	**7**	—	**8**	—	**0**

No.	Appearance	No.	Appearance
1	Single clevis + Double clevis 	**6**	Single knuckle joint + Double knuckle joint 
2	Single clevis + Double knuckle joint 	**7**	Double knuckle joint + Single clevis 
3	Double clevis + Single clevis 	**8**	Double knuckle joint + Single knuckle joint 
4	Double clevis + Single knuckle joint 	**9**	Double clevis + Clevis mounting bracket 
5	Single knuckle joint + Double clevis 	**0**	Double knuckle joint + Clevis mounting bracket 

Series MDB1
Auto Switch Specifications
Direct Mounting Type

Applicable auto switch models

Auto switch type	Auto switch model	Electrical entry
Reed switch	**D-Z7□, Z80**	Grommet
Solid state switch	**D-Y59□, Y69□, Y7P□**	Grommet
	D-Y7NW□, Y7PW□, Y7BW□	Grommet (2 color indication, with diagnostic output)
	D-Y7BAL	Grommet (2 color indication, water resistant)

⚠ Specific Product Precautions

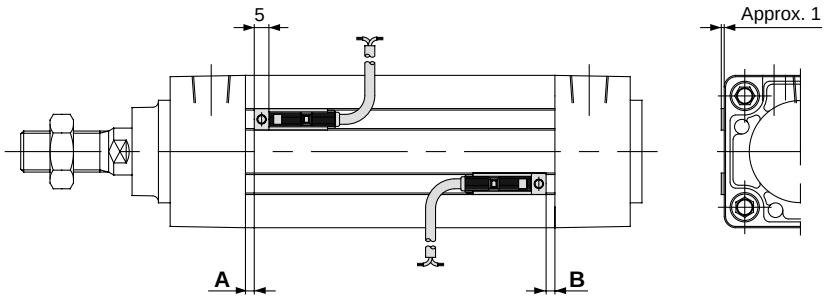
Be sure to read before handling.
Refer to pages 29 through 31 for auto switch precautions.

Minimum stroke for mounting of auto switches

Auto switch type	Auto switch model	Number of auto switches	ø32	ø40	ø50	ø63	ø80	ø100
Reed switch	**D-Z73, Z76, Z80**	2pcs. (different sides, same side)	25				15	
		1pc.						
Solid state switch	**D-Y59A(B), Y69A(B), Y7P(V)**	2pcs. (different sides, same side)	25				15	
		1pc.						
	D-Y7NW(V), Y7PW(V), Y7BW(V)	2pcs. (different sides, same side)	25				20	
		1pc.						
	D-Y7BAL	2pcs. (different sides, same side)	30				20	
		1pc.						

Center trunnion is not included.

Auto Switches/Proper Mounting Positions for Stroke End Detection

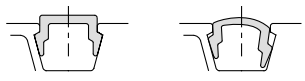


Bore size (mm)	D-Z7□, Z80 D-Y59□, Y69□, Y7P□ D-Y7NW□, Y7PW□, Y7BW□ D-Y7BAL	
	A	**B**
32	4	1
40	4	1
50	4	2
63	4	2
80	5.5	7.5
100	5.5	7.5

Mounting of Auto Switches

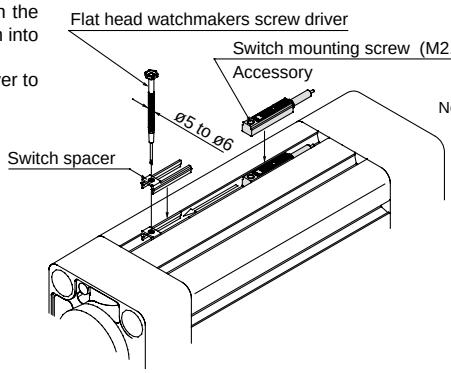
1N·m: approx. 10.2kgf·cm

When attaching an auto switch, first take a switch spacer between your fingers and press it into a switch mounting groove. When doing this, confirm that it is set in the correct mounting orientation, or reattach if necessary. Next, insert an auto switch into the groove and slide it until it is positioned under the switch spacer.
After establishing the mounting position, use a watchmakers flat head screw driver to tighten the switch mounting screw which is included.



Correct **Incorrect**

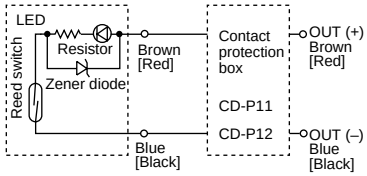
∗ Refer to page 2 for switch spacer types.



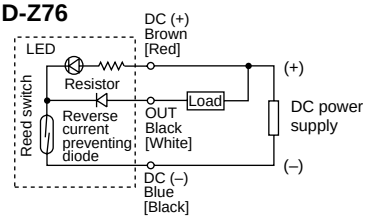
Note) When tightening the auto switch mounting screw, use a watchmakers screw driver with a handle about 5 to 6mm in diameter.
Also, tighten to a torque of approximately 0.05 to 0.1N·m (0.51 to 1.02kgf·cm).
As a rule, it is turned about 90° past the point at which tightening can be felt.

Reed Switch Internal Circuits

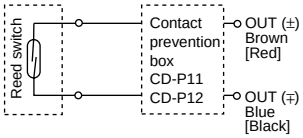
D-Z73



D-Z76

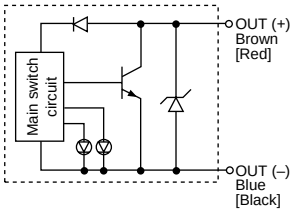


D-Z80

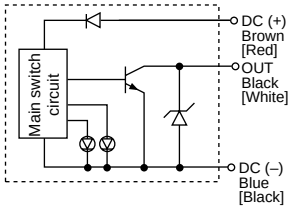


Solid State Switch Internal Circuits

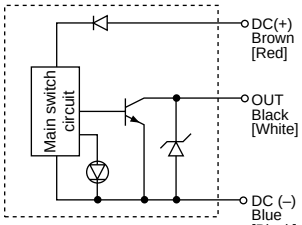
D-Y7BAL



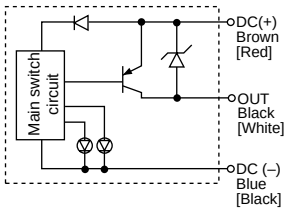
D-Y7NW(V)



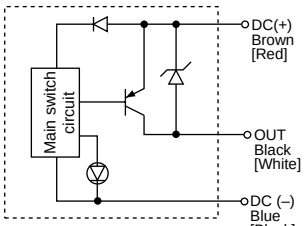
D-Y59A, Y69A



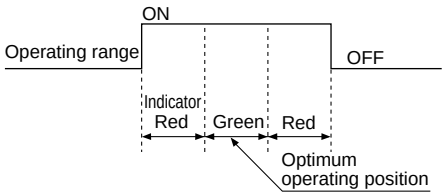
D-Y7PW(V)



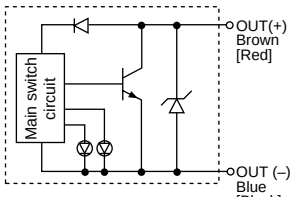
D-Y7P(V)



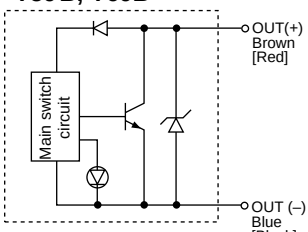
Indicator light



D-Y7BW(V)



D-Y59B, Y69B



Contact Protection Box/CD-P11, CD-P12

<Applicable switch models>

D-Z7, Z8

The above auto switches do not have internal contact protection circuits.

(1) Operating load is an induction load.

(2) The length of wiring to the load is 5m or more.

(3) The load voltage is 100VAC.

If any of the above situations apply, use a contact protection box.

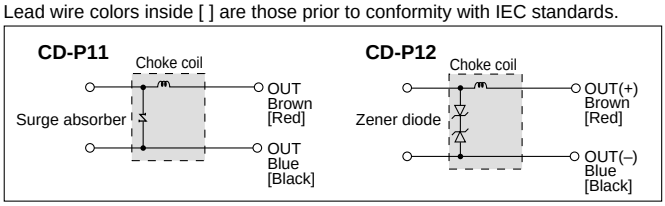
Contact protection box specifications

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

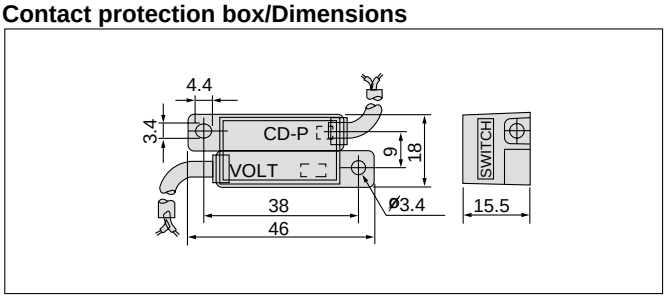
∗ Lead wire length -------- Switch contact side 0.5m
Load contact side 0.5m

Contact protection box internal circuits

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



Contact protection box/Dimensions



Contact protection box/Connection method

To connect a switch unit to a contact protection box, the lead wire on the side of the contact protection box marked SWITCH should be connected to the lead wire coming out of the switch unit. Furthermore, the length of lead wire between the switch unit and the contact protection box should be as short as possible, with a maximum of 1m.

Square Tube Type
Air Cylinder/Standard (Double Acting: Double Rod)

Series MB1W

ø32, ø40, ø50, ø63, ø80, ø100

How to Order

Standard type MB1W L 32 150 ☐

With auto switch MDB1W L 32 150 ☐ Z73 ☐

Built-in magnet

Mounting bracket

B	Basic type
L	Foot type
F	Flange type

Bore size

32	32mm
40	40mm
50	50mm
63	63mm
80	80mm
100	100mm

Stroke (mm)

Refer to the standard stroke table on Page 12.

Number of auto switches

Nil	2pcs.
S	1pc.
3	3pcs.
n	"n" pcs.

Type of auto switch

Nil	Without auto switch

∗ Select an applicable auto switch model from the table below.

Rod boot/Air cushion

Rod boot	Nil	Without rod boot
	J	Nylon tarpaulin (one end)
	JJ	Nylon tarpaulin (both ends)
	K	Heat resistant tarpaulin (one end)
	KK	Heat resistant tarpaulin (both ends)
Air cushion	Nil	Air cushion at both ends
	N Note)	Without air cushion

Note) When there is no air cushion, the unit is equipped with rubber bumpers.
Moreover, due to the fact that bumpers are installed at each end of the piston, overall length is increased by 6mm for ø32 and ø40, 8mm for ø50 and ø63, and by 10mm for ø80 and ø100.

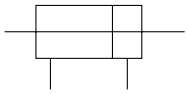
Applicable auto switches/direct mounting type

Type	Special function	Electrical entry	Indicator light	Wiring (output)	Load voltage			Auto switch model		Lead wire length (m) Note)			Applicable load	
					DC		AC	Electrical entry direction: Vertical	Electrical entry direction: Lateral	0.5 (Nil)	3 (L)	5 (Z)		
Reed switch	—	Grommet	Yes	3 wire	—	5V	—	—	Z76	●	●	—	IC circuit	—
				2 wire	24V	—	100V	—	Z73	●	●	●	—	Relay PLC
			No			5V, 12V	100V or less	—	Z80	●	●	—	IC circuit	
Solid state switch	—	Grommet	Yes	3 wire (NPN)	24V	5V, 12V	—	Y69A	Y59A	●	●	○	IC circuit	Relay PLC
				3 wire (PNP)				Y7PV	Y7P	●	●	○		
				2 wire		12V		Y69B	Y59B	●	●	○	—	
	Diagnostic indication (2 color indicator)			3 wire (NPN)		5V, 12V		Y7NWV	Y7NW	●	●	○	IC circuit	
				3 wire (PNP)				Y7PWV	Y7PW	●	●	○		
				2 wire		12V		Y7BWV	Y7BW	●	●	○	—	
	Water resistant (2 color indicator)							—	Y7BA	—	●	—		

Note) Lead wire length symbol 0.5m ..... Nil (Example) Y69B
3m ..... L (Example) Y69BL
5m ..... Z (Example) Y69BZ

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

JIS symbol
Double acting type



Standard stroke table

Bore size (mm)	Standard stroke (mm)
32	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500
40	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500
50	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600
63	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600
80	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800
100	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800

Intermediate strokes are also available.

Minimum strokes for auto switch mounting

Refer to page 9 regarding the minimum strokes for the mounting of auto switches.

Rod boot material

Symbol	Rod boot material	Max. ambient temp.
J	Nylon tarpaulin	60°C
K	Heat resistant tarpaulin	110°C Note)

Note) Maximum ambient temperature for the rod boot itself.

Switch spacers

Applicable bore size (mm)	**32, 40**	**50, 63**	**80, 100**
Switch spacer	BMP1-032		

Mounting brackets/Part nos.

Bore size (mm)	**32**	**40**	**50**
Foot	MB-L03	MB-L04	MB-L05
Flange	MB-F03	MB-F04	MB-F05

Bore size (mm)	**63**	**80**	**100**
Foot	MB-L06	MB-L08	MB-L10
Flange	MB-F06	MB-F08	MB-F10

Note) When ordering foot type brackets, 2pcs. should be arranged for each cylinder.

Specifications

1MPa: Approx. 10.2kgf/cm²

Bore size (mm)	**32**	**40**	**50**	**63**	**80**	**100**
Type	Non-lube type air cylinder					
Action	Double acting double rod					
Fluid	Air					
Proof pressure	1.5MPa {15.3kgf/cm²}					
Maximum operating pressure	1.0MPa {10.2kgf/cm²}					
Minimum operating pressure	0.05MPa {0.5kgf/cm²}					
Ambient and fluid temperature	Without auto switch –10 to 70°C (without freezing)					
	With auto switch –10 to 60°C (without freezing)					
Lubrication	Not required (non-lube)					
Piston speed	50 to 1000mm/s					
Stroke length tolerance	to 250 : $^{+1.0}_{0}$, 251 to 1000 : $^{+1.4}_{0}$					
Cushion Note)	Both ends (air cushion) Note)					
Thread tolerance	JIS class 2					
Port size	Rc(PT)1/8	Rc(PT)1/4	Rc(PT)1/4	Rc(PT)3/8	Rc(PT)3/8	Rc(PT)1/2
Mounting bracket	Basic type, Foot type, Flange type					

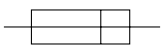
Note) When there is no air cushion, the unit is equipped with rubber bumpers. (Refer to Rod boot/Air cushion on page 11.)
The kinetic energy which can be absorbed by the cushion mechanism is the same as the double acting single rod type.

Accessories

Mounting bracket		Basic type	Foot type	Flange type
Standard equipment	Rod end nut	●	●	●
Options	Single knuckle joint	●	●	●
	Double knuckle joint (with pin)	●	●	●
	Rod boot	●	●	●

Theoretical output table

(Unit: N) OUT ← IN →



Bore size (mm)	Rod diameter (mm)	Operating direction	Piston area (mm²)	Operating pressure (MPa)								
				0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
32	12	IN·OUT	691	138	207	276	346	415	484	553	622	691
40	16	IN·OUT	1056	211	317	422	528	634	739	845	950	1056
50	20	IN·OUT	1649	330	495	660	825	989	1154	1319	1484	1649
63	20	IN·OUT	2803	561	841	1121	1402	1682	1962	2242	2523	2803
80	25	IN·OUT	4536	907	1361	1814	2268	2722	3175	3629	4082	4536
100	30	IN·OUT	7147	1429	2144	2859	3574	4288	5003	5718	6432	7147

1N: approx. 0.102kgf 1MPa: approx. 10.2kgf/cm²
Note) Theoretical output (N) = Pressure (MPa) x Piston area (mm²).

Weight table

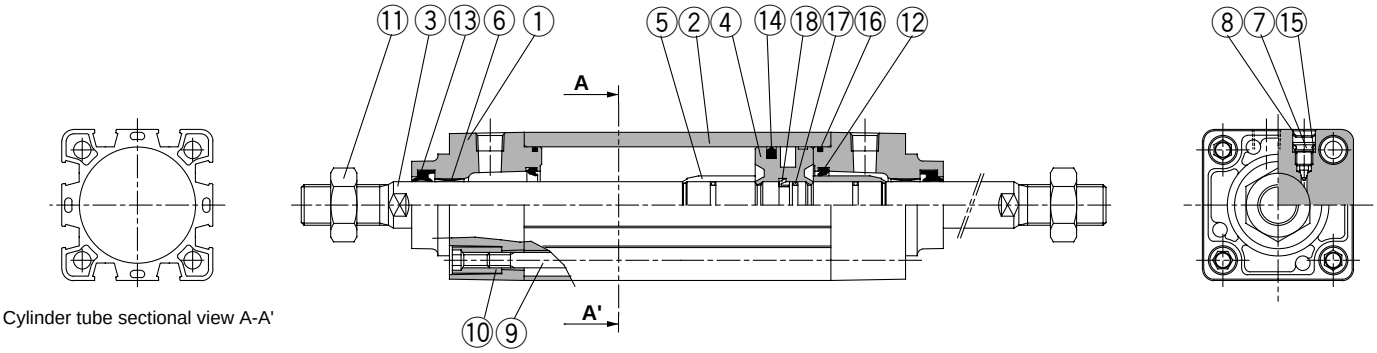
(kg)

Bore size (mm)		**32**	**40**	**50**	**63**	**80**	**100**
Basic weight	Basic type	0.59	0.82	1.39	1.72	3.22	4.27
	Foot type	0.71	0.96	1.61	2.0	3.72	4.93
	Flange type	0.88	1.19	1.84	2.51	4.67	7.58
Additional weight per 50mm stroke	All mounting brackets	0.20	0.29	0.41	0.45	0.75	1.0
Accessories	Single knuckle	0.15	0.23	0.26	0.26	0.60	0.83
	Double knuckle (with pin)	0.22	0.37	0.43	0.43	0.87	1.27

Calculation method
Example) **MB1B32-100** (basic type/ø32,100st)
- Basic weight 0.59kg
- Additional weight ..... 0.20/50mm stroke
- Cylinder stroke .....100mm stroke

0.59 + 0.20 x 100/50 = 0.99kg

Construction



Cylinder tube sectional view A-A'

Parts list

No.	Description	Material	Note
①	**Rod cover**	Die-cast aluminum	Metallic coated
②	**Cylinder tube**	Aluminum alloy	Hard anodized
③	**Piston rod**	Carbon steel	Hard chrome plated
④	**Piston**	Aluminum alloy	Chromated
⑤	**Cushion ring**	Brass	
⑥	**Bushing**	Lead-bronze casting	
⑦	**Cushion valve**	Steel wire	Nickel plated
⑧	**Snap ring**	Spring steel	ø40 to ø100
⑨	**Tie-rod**	Carbon steel	Chromated
⑩	**Tie-rod nut**	Carbon steel	Nickel plated
⑪	**Rod end nut**	Carbon steel	Nickel plated

No.	Description	Material	Note
∗⑫	**Cushion seal**	Urethane	
∗⑬	**Rod seal**	NBR	
∗⑭	**Piston seal**	NBR	
⑮	**Cushion valve seal**	NBR	
∗⑯	**Cylinder tube gasket**	NBR	
⑰	**Piston gasket**	NBR	
⑱	**Piston holder**	Urethane	

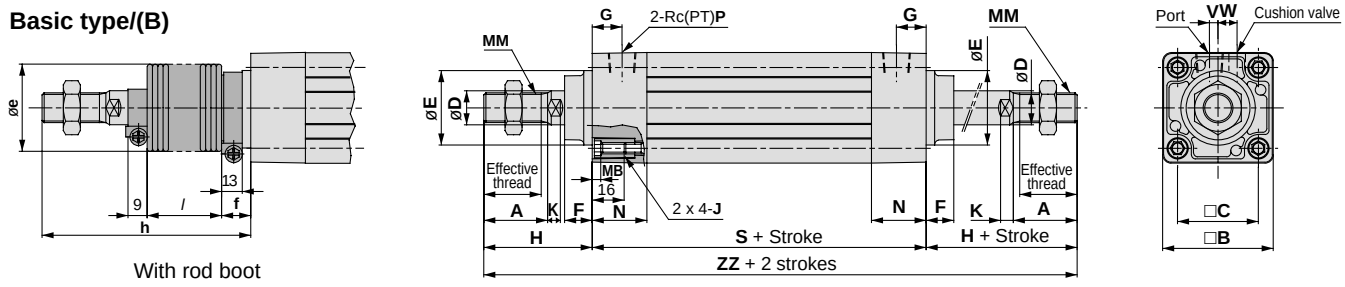
Replaceable parts: Seal kits

Bore size (mm)	Order No.	Contents
32	MBW32-PS	Kits include items 12 (2pcs.), 13, 14 & 16 from the table above.
40	MBW40-PS	
50	MBW50-PS	
63	MBW63-PS	
80	MBW80-PS	
100	MBW100-PS	

∗ Seal kits consist of items 12, 13, 14 and 16 contained in one kit, and can be ordered using the order number for each respective tube bore size.

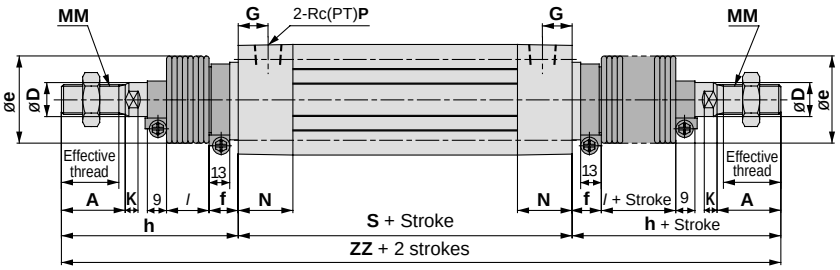
Standard Type

Basic type/(B)



* When there is no air cushion, the unit is equipped with rubber bumpers.
Moreover, due to the fact that bumpers are installed at each end of the piston, overall length is increased by 6mm for ø32 and ø40, 8mm for ø50 and ø63, and by 10mm for ø80 and ø100.

** When there is no air cushion, the unit is equipped with rubber bumpers.
Moreover, due to the fact that bumpers are installed at each end of the piston, the Z dimension is increased by 3mm for ø32 and ø40, 4mm for ø50 and ø63, and by 5mm for ø80 and ø100 (with trunnion and trunnion bracket).



Bore size (mm)	Stroke range	Effective thread length	Width across flats	A	□B	□C	D	Ee11	F	G	H	MB	J	K	MM	N	P	*S	V	W	*ZZ	Without air cushion S	Without air cushion ZZ
32	to 500	19.5	10	22	46	32.5	12	30	13	13	47	4	M6 x 1.0	6	M10 x 1.25	26.5	1/8	84	4	6.5	178	90	184
40	to 500	27	14	30	52	38	16	35	13	14	51	4	M6 x 1.0	6	M14 x 1.5	26.5	1/4	84	4	9	186	90	192
50	to 600	32	18	35	65	46.5	20	40	14	15.5	58	5	M8 x 1.25	7	M18 x 1.5	31	1/4	94	5	10.5	210	102	218
63	to 600	32	18	35	75	56.5	20	45	14	16.5	58	5	M8 x 1.25	7	M18 x 1.5	31	3/8	94	9	12	210	102	218
80	to 800	37	22	40	95	72	25	45	20	19	72	5	M10 x 1.5	10	M22 x 1.5	37.5	3/8	114	11.5	14	258	124	268
100	to 800	37	26	40	114	89	30	55	20	19	72	5	M10 x 1.5	10	M26 x 1.5	37.5	1/2	114	17	15	258	124	268

With rod boot

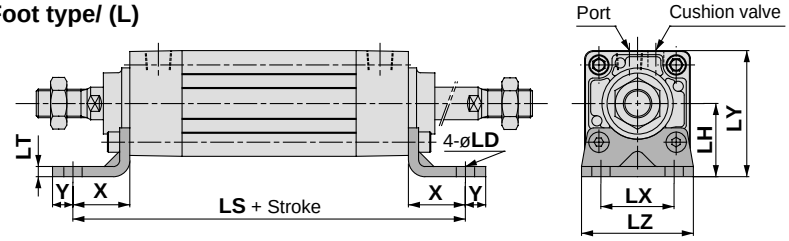
Note) ZZ indicates the dimension for the double rod boot type.

Bore size (mm)	e	f	l										h										ZZ Note)									
			1 to 50	51 to 100	101 to 150	151 to 200	201 to 300	301 to 400	401 to 500	501 to 600	601 to 700	701 to 800	1 to 50	51 to 100	101 to 150	151 to 200	201 to 300	301 to 400	401 to 500	501 to 600	601 to 700	701 to 750	1 to 50	51 to 100	101 to 150	151 to 200	201 to 300	301 to 400	401 to 500	501 to 600	601 to 700	701 to 800
32	36	23	12.5	25	37.5	50	75	100	125	–	–	–	73	86	98	111	136	161	186	–	–	–	230	256	280	306	356	406	456	–	–	–
40	41	23	12.5	25	37.5	50	75	100	125	–	–	–	81	94	106	119	144	169	194	–	–	–	246	272	296	322	372	422	472	–	–	–
50	51	25	12.5	25	37.5	50	75	100	125	150	–	–	89	102	114	127	152	177	202	227	–	–	272	298	322	348	398	448	498	548	–	–
63	51	25	12.5	25	37.5	50	75	100	125	150	–	–	89	102	114	127	152	177	202	227	–	–	272	298	322	348	398	448	498	548	–	–
80	56	29	12.5	25	37.5	50	75	100	125	150	175	200	101	114	126	139	164	189	214	239	264	276	316	342	366	392	442	492	542	592	642	692
100	61	29	12.5	25	37.5	50	75	100	125	150	175	200	101	114	126	139	164	189	214	239	264	276	316	342	366	392	442	492	542	592	642	692

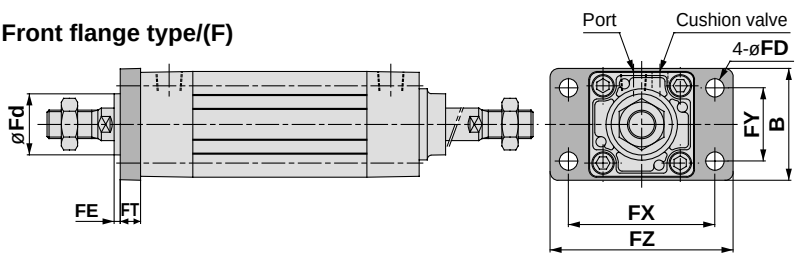
Standard Type/with Mounting Brackets

* Dimensions not shown are the same as the basic type (drawing above).

Foot type/ (L)



Front flange type/(F)



Foot type

Bore size (mm)	Stroke range	Effective thread length	X	Y	LD	LH	*LS	LT	LX	LY	LZ
32	to 500	19.5	22	9	7	30	128	3.2	32	53	50
40	to 500	27	24	11	9	33	132	3.2	38	59	55
50	to 600	32	27	11	9	40	148	3.2	46	72.5	70
63	to 600	32	27	14	12	45	148	3.6	56	82.5	80
80	to 750	37	30	14	12	55	174	4.5	72	102.5	100
100	to 750	37	32	16	14	65	178	4.5	89	122	120

Front flange type

Bore size (mm)	Stroke range	Effective thread length	B	FD	FT	FX	FY	FZ	Fd
32	to 500	19.5	50	7	10	64	32	79	25
40	to 500	27	55	9	10	72	36	90	31
50	to 600	32	70	9	12	90	45	110	38.5
63	to 600	32	80	9	12	100	50	120	39.5
80	to 750	37	100	12	16	126	63	153	45.5
100	to 750	37	120	14	16	150	75	178	54

Square Tube Type
Air Cylinder/Non-Rotating Rod (Double Acting: Single Rod)

Series MB1K

ø32, ø40, ø50, ø63, ø80, ø100

How to Order

Non-rotating type MB1K [L] [32] — [50] [ ]

With auto switch MDB1K [L] [32] — [50] [ ] — [Z73] [ ]

Built-in magnet

Mounting bracket

B	Basic type
L	Axial foot type
F	Front flange type
G	Rear flange type
C	Single clevis type
D	Double clevis type

Bore size

32	32mm
40	40mm
50	50mm
63	63mm
80	80mm
100	100mm

Stroke (mm)
Refer to the standard stroke table on page 16.

Number of auto switches

Nil	2pcs.
S	1pc.
3	3pcs.
n	"n" pcs.

Type of auto switch

Nil	Without auto switch

∗ Select an applicable auto switch model from the table below.

Rod boot/Air cushion

Rod boot	Nil	Without rod boot
	J	Nylon tarpaulin
	K	Heat resistant tarpaulin
Air cushion	Nil	Air cushion at both ends
	N Note)	Without air cushion

Note) When there is no air cushion, the unit is equipped with rubber bumpers.
Moreover, due to the fact that bumpers are installed at each end of the piston, overall length is increased by 6mm for ø32 and ø40, 8mm for ø50 and ø63, and by 10mm for ø80 and ø100.

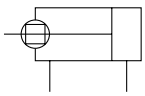
Applicable auto switches/direct mounting type

Type	Special function	Electrical entry	Indicator light	Wiring (output)	Load voltage DC		Load voltage AC	Auto switch model: Electrical entry direction Vertical	Auto switch model: Electrical entry direction Lateral	Lead wire length (m) Note) 0.5 (Nil)	3 (L)	5 (Z)	Applicable load	
Reed switch	—	Grommet	Yes	3 wire	—	5V	—	—	Z76	●	●	—	IC circuit	—
				2 wire	24V	—	100V	—	Z73	●	●	●	—	Relay PLC
			No			5V, 12V	100V or less	—	Z80	●	●	—	IC circuit	
Solid state switch	—	Grommet	Yes	3 wire (NPN)	24V	5V, 12V	—	Y69A	Y59A	●	●	○	IC circuit	Relay PLC
				3 wire (PNP)				Y7PV	Y7P	●	●	○		
				2 wire		12V		Y69B	Y59B	●	●	○	—	
	Diagnostic indication (2 color indicator)			3 wire (NPN)		5V, 12V		Y7NWV	Y7NW	●	●	○	IC circuit	
				3 wire (PNP)				Y7PWV	Y7PW	●	●	○		
				2 wire		12V		Y7BWV	Y7BW	●	●	○	—	
	Water resistant (2 color indicator)							—	Y7BA	—	●	—		

Note) Lead wire length symbol 0.5m ..... Nil (Example) Y69B
3m ..... L (Example) Y69BL
5m ..... Z (Example) Y69BZ

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

JIS symbol



Specifications

1MPa: Approx. 10.2kgf/cm²

Bore size (mm)	32	40	50	63	80	100
Type	Non-lube type air cylinder					
Action	Double acting single rod					
Fluid	Air					
Proof pressure	1.5MPa {15.3kgf/cm²}					
Maximum operating pressure	1.0MPa {10.2kgf/cm²}					
Minimum operating pressure	0.05MPa {0.5kgf/cm²}					
Ambient and fluid temperature	Without auto switch –10 to 70°C (without freezing)					
	With auto switch –10 to 60°C (without freezing)					
Lubrication	Non-lube					
Piston speed	50 to 1000mm/s					
Stroke length tolerance	to 250 : $^{+1.0}_{0}$, 251 to 1000 : $^{+1.4}_{0}$, 1001 to 1500 : $^{+1.8}_{0}$					
Cushion Note)	Both ends (air cushion) Note)					
Thread tolerance	JIS class 2					
Port size	Rc(PT)1/8	Rc(PT)1/4	Rc(PT)1/4	Rc(PT)3/8	Rc(PT)3/8	Rc(PT)1/2
Mounting bracket	Basic type, Foot type, Front flange type, Rear flange type Single clevis type, Double clevis type					

Rod non-rotating accuracy	ø32, ø40	±0.5°
	ø50, ø63	±0.5°
	ø80, ø100	±0.3°

Allowable rotational torque N·m or less	ø32	0.25	ø80	0.79
	ø40	0.45	ø100	0.93
	ø50, ø63	0.64	—	—

Note) When there is no air cushion, the unit is equipped with rubber bumpers.
The kinetic energy which can be absorbed by the cushion mechanism is the same as for the double acting single rod type.

Switch spacers

Applicable bore size (mm)	32, 40	50, 63	80, 100
Switch spacer	BMP1-032		

Mounting brackets/Part nos.

Bore size (mm)	32	40	50
Foot Note)	MB-L03	MB-L04	MB-L05
Flange	MB-F03	MB-F04	MB-F05
Single clevis	MB-C03	MB-C04	MB-C05
Double clevis	MB-D03	MB-D04	MB-D05

Bore size (mm)	63	80	100
Foot Note)	MB-L06	MB-L08	MB-L10
Flange	MB-F06	MB-F08	MB-F10
Single clevis	MB-C06	MB-C08	MB-C10
Double clevis	MB-D06	MB-D08	MB-D10

Note 1) When ordering foot type brackets, 2pcs. should be arranged for each cylinder.
Note 2) The parts included with each mounting bracket are as follows.
Foot, Flange, Single clevis: Body mounting bolts
Double clevis: Clevis pin & Cotter pin
Refer to page 8.

Accessories

Mounting bracket		Basic type	Foot type	Front flange type	Rear flange type	Single clevis type	Double clevis type
Standard equipment	Rod end nut	●	●	●	●	●	●
	Clevis pin	–	–	–	–	–	●
Options	Single knuckle joint	●	●	●	●	●	●
	Double knuckle joint (with pin)	●	●	●	●	●	●
	Rod boot	●	●	●	●	●	●

Standard stroke table

Bore size (mm)	Standard stroke (mm)
32	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500
40	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500
50	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600
63	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600
80	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800
100	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800

Intermediate strokes are also available.

Minimum strokes for mounting of auto switches

Refer to page 9 regarding the minimum stroke for the mounting of auto switches.

Rod boot material

Symbol	Rod boot material	Max. ambient temp.
J	Nylon tarpaulin	60°C
K	Heat resistant tarpaulin	110°C Note)

Note) Maximum ambient temperature for the rod boot itself.

Theoretical output table

The value at the OUT side is the same as the double acting single rod type, but the value at the IN side is different. Refer to the table below.

Bore size (mm)	Piston area (mm²)	Bore size (mm)	Piston area (mm²)
32	675	**63**	2804
40	1082	**80**	4568
50	1651	**100**	7223

Theoretical output (N) =Pressure (MPa) x Piston area (mm²).
1N: approx. 0.102kgf 1MPa: approx. 10.2kgf/cm²

Weight table

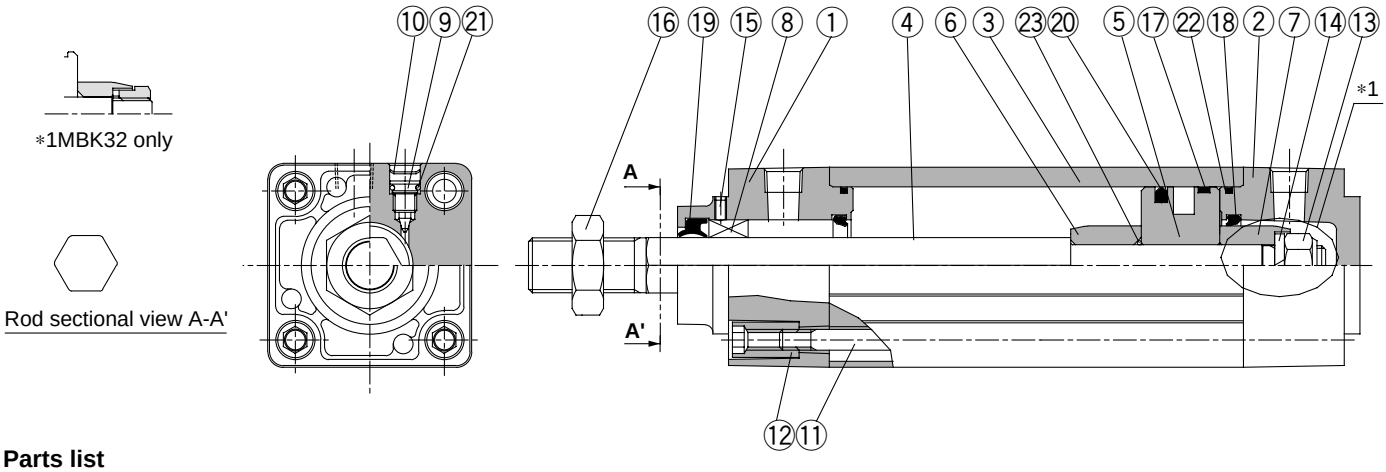
(kg)

Bore size (mm)		32	40	50	63	80	100
Basic weight	Basic type	0.53	0.69	1.26	1.58	2.69	3.86
	Foot type	0.65	0.83	1.48	1.86	3.19	4.52
	Flange type	0.82	1.06	1.69	2.37	4.14	7.17
	Single clevis type	0.78	0.92	1.60	2.21	3.8	7.03
	Double clevis type	0.79	0.96	1.69	2.37	4.09	7.55
Additional weight per 50mm stroke	All mounting brackets	0.16	0.21	0.33	0.37	0.56	0.72
Accessories	Single knuckle	0.15	0.23	0.26	0.26	0.60	0.83
	Double knuckle (with pin)	0.22	0.37	0.43	0.43	0.87	1.27

Calculation method
Example) **MB1K32-100** (basic type/ø32,100st)
- Basic weight 0.53kg
- Additional weight ..... 0.16/50mm stroke
- Cylinder stroke ..... 100mm stroke

0.53 + 0.16 x 100/50 = 0.85kg

Construction



Parts list

No.	Description	Material	Note
①	**Rod cover**	Die-cast aluminum	Metallic coated
②	**Head cover**	Die-cast aluminum	Metallic coated
③	**Cylinder tube**	Aluminum alloy	Hard anodized
④	**Piston rod**	Stainless steel	
⑤	**Piston**	Aluminum alloy	Chromated
⑥	**Cushion ring A**	Rolled steel	
⑦	**Cushion ring B**	Rolled steel	
⑧	**Detent guide**	Oil-impregnated sintered alloy	
⑨	**Cushion valve**	Steel wire	Nickel plated
⑩	**Snap ring**	Spring steel	ø40 to ø100
⑪	**Tie-rod**	Carbon steel	Chromated
⑫	**Tie-rod nut**	Carbon steel	Nickel plated

No.	Description	Material	Note
⑬	**Piston nut**	Rolled steel	
⑭	**Spring washer**	Steel wire	
⑮	**Set screw**	Steel wire	
⑯	**Rod end nut**	Carbon steel	Nickel plated
⑰	**Wear ring**	Resin	
∗⑱	**Cushion seal**	Urethane	
∗⑲	**Rod seal**	NBR	
∗⑳	**Piston seal**	NBR	
㉑	**Cushion valve seal**	NBR	
∗㉒	**Cylinder tube gasket**	NBR	
㉓	**Piston gasket**	NBR	

Replaceable parts: Seal kits

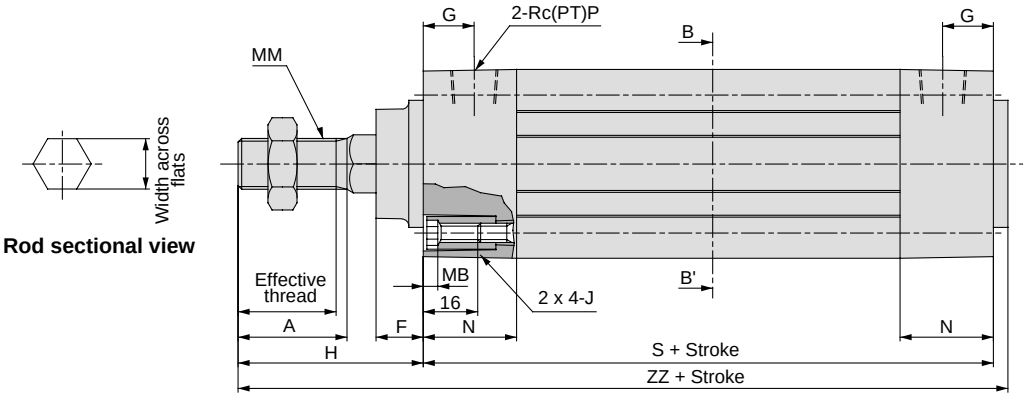
Bore size (mm)	Order No.	Order No.
32	MBK32-PS	Kits include items 18 (2pcs.), 19, 20 & 22 from the table above.
40	MBK40-PS	
50	MBK50-PS	
63	MBK63-PS	
80	MBK80-PS	
100	MBK100-PS	

∗ Seal kits consist of items 18, 19, 20 and 22 contained in one kit, and can be ordered using the order number for each respective tube bore size.

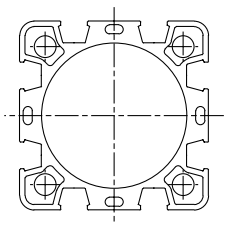
∗ When there is no air cushion, the unit is equipped with rubber bumpers.
Moreover, due to the fact that bumpers are installed at each end of the piston, overall length is increased by 6mm for ø32 and ø40, 8mm for ø50 and ø63, and by 10mm for ø80 and ø100.

Standard Type

Basic type/ (B)



Rod sectional view



Cylinder tube sectional view B-B'

Bore size (mm)	Stroke range	Effective thread length	Width across flats	A	□B	□C	E	F	G	MB	J	MM	N	P	S	V	W	H	ZZ
32	to 500	19.5	12.2	22	46	32.5	30	13	13	4	M6 x 1.0	M10 x 1.25	26.5	1/8	84	4	6.5	47	135
40	to 500	27	14.2	30	52	38	35	13	14	4	M6 x 1.0	M14 x 1.5	26.5	1/4	84	4	9	51	139
50	to 600	32	19	35	65	46.5	40	14	15.5	5	M8 x 1.25	M18 x 1.5	31	1/4	94	5	10.5	58	156
63	to 600	32	19	35	75	56.5	45	14	16.5	5	M8 x 1.25	M18 x 1.5	31	3/8	94	9	12	58	156
80	to 750	37	23	40	95	72	45	20	19	5	M10 x 1.5	M22 x 1.5	37.5	3/8	114	11.5	14	72	190
100	to 750	37	27	40	114	89	55	20	19	5	M10 x 1.5	M26 x 1.5	37.5	1/2	114	17	15	72	190

Series MB1
Order Made Specifications

Contact SMC for detailed specifications, lead times and prices.

	Symbol	Specification/Content
1	–XA0 to XA30	Modification of rod end shape
2	–XB6	Heat resistant cylinder (to 150°C)
3	–XB13	Low speed cylinder
4	–XB5	Heavy duty rod cylinder
5	–XC3	Special port locations
6	–XC4	With heavy duty scraper
7	–XC5	Heat resistant cylinder (to 110°C)
8	–XC6	Stainless steel piston rod and rod end nut
9	–XC7	Stainless steel tie-rods, tie-rod nuts, cushion valve, etc.
10	–XC8	Adjustable stroke cylinder (adjustable extension type)
11	–XC9	Adjustable stroke cylinder (adjustable retraction type)
12	–XC10	Dual stroke cylinder (double rod type)
13	–XC11	Dual stroke cylinder (single rod type)
14	–XC12	Tandem type cylinder
15	–XC18	NPT ports
16	–XC22	Fluoro rubber seals
17	–XC30	Front trunnion mounted on front of rod cover
18	–XC35	With coil scraper
19	–X846	Fastener strips mounted on switch mounting grooves

Modification of rod end shape

1 –XA0 to XA30

The rod end shape is changed to a non-standard pattern.

MB1 Standard part number **– X A1**

● **Rod end shape pattern symbol**

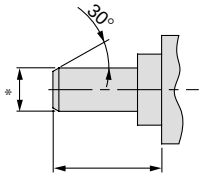
∗ Dimensions, tolerances and finishing not shown in the drawings are arranged by SMC.

∗ Dimensions marked with a "∗" in the drawings are rod diameter (D) $^{D\leq 25}_{D>25}$ $^{2mm}_{4mm}$. Enter any dimensions which are to be different.

Rod end shape patterns

Symbol: A0 When the rod end shape is the same as the standard type and only the "H" dimensions are different, indicate the desired dimensions.

Symbol: A1



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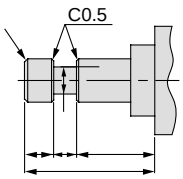

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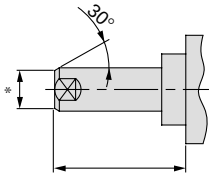

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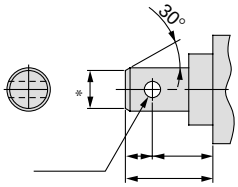

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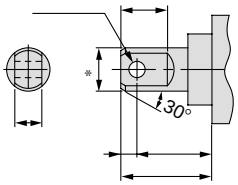

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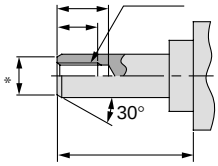

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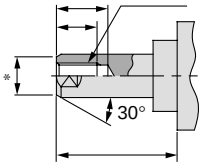

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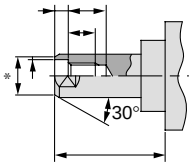

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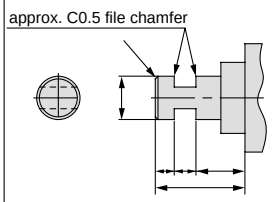

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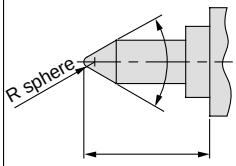

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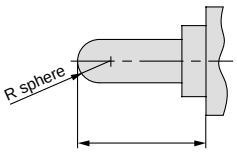

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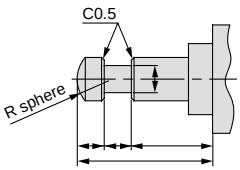

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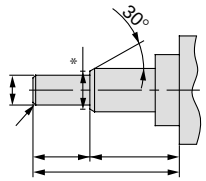

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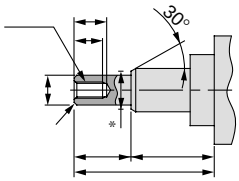

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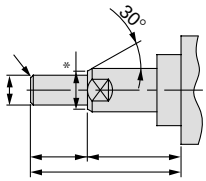

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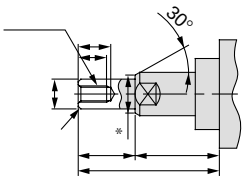

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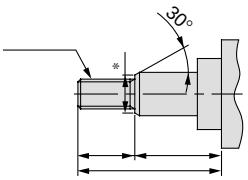

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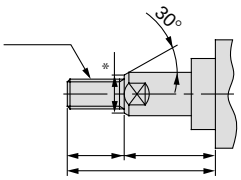

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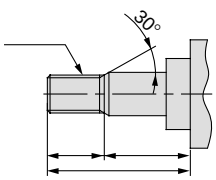

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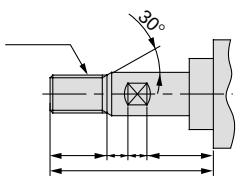

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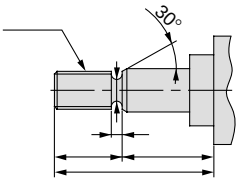

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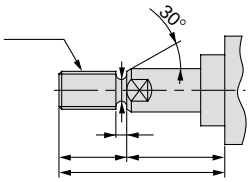

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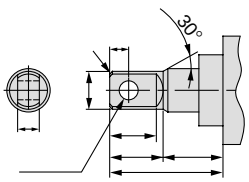

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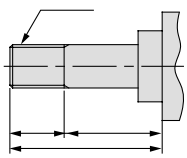

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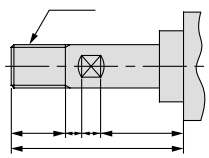

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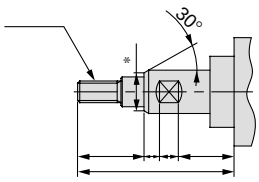

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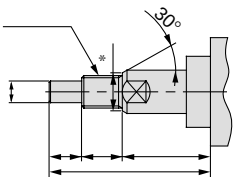

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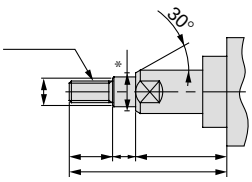

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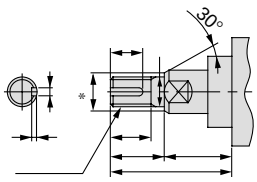

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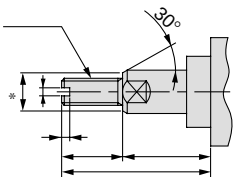


Heat resistant cylinder (to 150°C)

2 –XB6

The cylinder seals are changed to a heat resistant (to 150°C) material, for use under severe conditions which exceed the standard specifications of –10°C to +70°C.

MB1 | Standard part number | —XB6

● Heat resistant cylinder (to 150°C)

Specifications

Action	Double acting single rod/double rod
Ambient temperature range	–10°C to 150°C
Auto switch	Not mountable
Cushion	Air cushion
Seal material	Fluoro rubber
Grease	Fluororesin

Specifications and dimensions other than the above are the same as the standard type.

Low speed cylinder

3 –XB13

Even at speeds as low as 5 to 50mm/s, the entire stroke drives at a smooth and steady speed, without sticking and slipping.
Avoid lubrication of this cylinder.

MB1 | Standard part number | —XB13

● Low speed cylinder

Specifications

Action	Double acting single rod
Piston speed	5 to 50mm/sec

Specifications and dimensions other than the above are the same as the standard type.

Heavy duty rod cylinder

4 –XB5

The strength of the cylinder is increased by increasing the diameter of the piston rod.
This cylinder is used when the stroke is long, and there is a danger of the piston rod bending or buckling, etc.

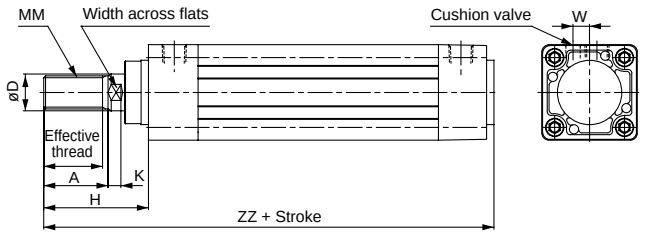
MB1 | Standard part number | —XB5

● Heavy duty rod cylinder

Specifications

Action	Double acting single rod
Bore size (mm)	32, 40, 50, 63, 80, 100
Auto switch	Mountable

Dimensions



Bore size (mm)	Effective thread length	Width across flats	A	D	H	K	MM	W	ZZ
32	27	14	30	16	51	6	M14 x 1.5	7.2	139
40	32	18	35	20	58	7	M18 x 1.5	9.7	146
50	37	22	40	25	68	10	M22 x 1.5	10.5	166
63	37	22	40	25	68	10	M22 x 1.5	12	166
80	37	26	40	30	74	10	M26 x 1.5	14	192
100	47	31	50	36	90	16	M30 x 1.5	15	208

Special port locations

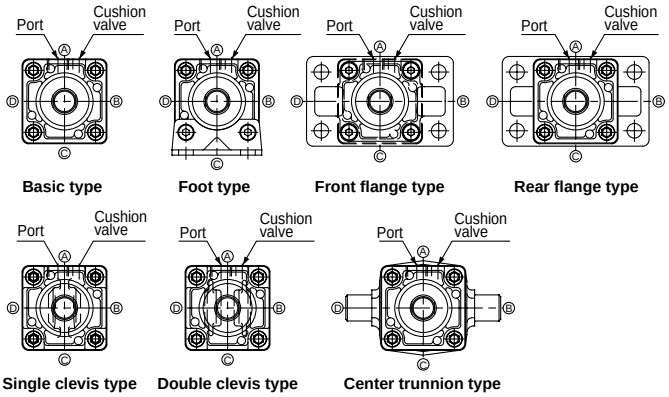
5 –XC3

The positions of ports and cushion valves on the rod cover and head cover are changed from those of the standard type.

MB1 | Standard part number | —XC3 | A | C

● Special port locations
● Port location viewed from rod side
● Cushion valve location viewed from rod side

Relation of port locations and cushion valve locations



1. The port and cushion valve position symbols are determined as viewed from the rod side (in the case of a standard type cylinder, the ports are always located on the top) shown in the above drawings, with "A" at the top and "B", "C" and "D" following clockwise.
2. This port and cushion valve combination model generally applies only when the positions of ports and cushion valves on the rod cover and head cover are changed to the same positions as those of the mounting brackets.
3. The part number "XC3AA" does not exist with regard to port and cushion valve positions, because this is a standard model.

With heavy duty scraper

6 –XC4

Using a heavy duty scraper as a wiper ring, this series is ideal for use in severe environments where cylinders are exposed to dust, dirt and sand.
Applicable to casting machines, construction equipment and industrialvehicles, etc.

MB1 | Standard part number | —XC4

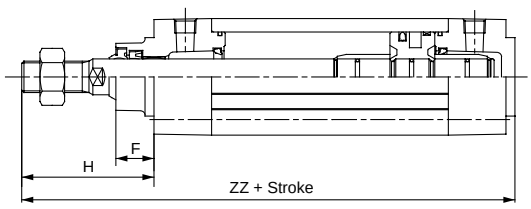
● With heavy duty scraper

Specifications

Action	Double acting single rod
Cushion	Air cushion/Rubber bumper
Wiper ring	SCB scaper

Specifications other than the above are the same as the standard type.

Dimensions



Bore size (mm)	F	H	ZZ
32	15	47	135
40	17	58	146
50	19	67	165

Bore size (mm)	F	H	ZZ
63	19	67	165
80	25	81	199
100	25	81	199

Heat resistant cylinder (to 110°C)

7 –XC5

The cylinder seals are changed to a heat resistant (to 110°C) material, for use under severe temperature conditions which exceed the standard specifications of –10°C to +70°C.

MB1 Standard part number **–XC5**

Heat resistant cylinder (to 110°C)

Specifications

Action	Double acting single rod/double rod
Ambient temperature range	–10°C to 110°C
Auto switch	Not mountable
Cushion	Air cushion
Seal material	Fluoro rubber

Specifications and dimensions other than the above are the same as the standard type.

Stainless steel piston rod and rod end nut

8 –XC6

Applicable in cases where there is concern about rust or corrosion, etc., such as when the piston rod end gets wet when extended.

MB1 Standard part number **–XC6**

Stainless steel piston rod and rod end nut

Specifications

Action	Double acting single rod
Cushion	Air cushion

Specifications and dimensions other than the above are the same as the standard type.

Stainless steel tie-rod nuts, cushion valve, etc.

9 –XC7

Certain parts are changed from standard materials to stainless steel, when used in locations where there is a danger of rust or corrosion, etc.

MB1 Standard part number **–XC7**

Stainless steel tie-rod nuts, cushion valve, etc.

Specifications

Action	Double acting single rod
Cushion	Air cushion

Specifications and dimensions other than the above are the same as the standard type.

Adjustable stroke cylinder (adjustable extension type)

10 –XC8

The extending stroke of the cylinder can be adjusted from a full stroke to (0 to 25)mm, or (0 to 50)mm.
A stroke adjustment mechanism is provided on the head side to adjust the extending stroke.

MB1 Mounting | Bore size | – | Stroke | Suffix | Stroke adjustment | **–XC8**

Stroke adjustment symbol

A	Stroke adjustment 0 to 25mm
B	Stroke adjustment 0 to 50mm

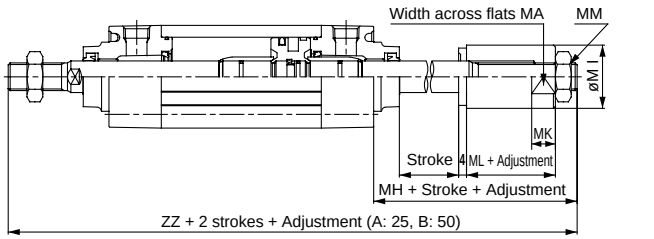
Adjustable stroke cylinder adjustable extension type

Specifications

Action	Double acting single rod
Mounting bracket	B, L, F, T type (G, C, D not available)
Stroke adjustment method	Stopper adjustment
Stroke adjustment range	A: 0 to 25mm B: 0 to 50mm

Specifications other than the above are the same as the standard type.

Dimensions



Bore size (mm)	MA	MK	MI	MH	ML	MM	ZZ
32	21	10	24	44	18	10	175
40	27	12	32	48	20	14	183
50	32	15	38	53	21	18	205
63	32	15	38	53	21	18	205
80	36	20	45	72	32	22	258
100	46	20	55	75	32	26	261

Adjustable stroke cylinder (adjustable retraction type)

11 –XC9

The retracting stroke of the cylinder can be adjusted to (0 to 25)mm or (0 to 50)mm by an adjustment bolt which performs the adjustable setting on the return stroke.

MB1 Mounting | Bore size | – | Stroke | Suffix | Stroke adjustment | **–XC9**

Stroke adjustment symbol

A	Stroke adjustment 0 to 25mm
B	Stroke adjustment 0 to 50mm

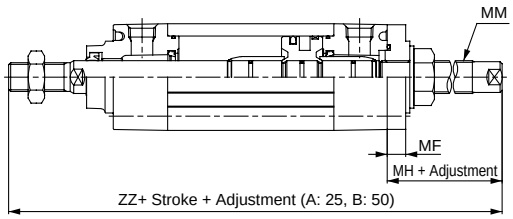
Adjustable stroke cylinder adjustable retraction type

Specifications

Action	Double acting single rod
Mounting bracket	B, L, F, T type (G, C, D not available)
Stroke adjustment method	Adjustment bolt
Stroke adjustment range	A: 0 to 25mm B: 0 to 50mm

Specifications other than the above are the same as the standard type.

Dimensions



Bore size	MH	MF	MM	ZZ
32	41.5	9.5	M12 x 1.25	172
40	41.5	9.5	M12 x 1.25	176
50	52.5	11.5	M20 x 1.5	204
63	52.5	11.5	M20 x 1.5	204
80	62.5	15.5	M24 x 1.5	248
100	62.5	15.5	M24 x 1.5	248

Dual stroke cylinder/double rod type

12 –XC10

Two cylinders are combined in a back-to-back configuration, allowing the two reciprocating cylinder strokes to be controlled in three steps.

MB1 [Mounting type] [Bore size] – [Stroke A] [Suffix] + [Stroke B] [Suffix] –XC10

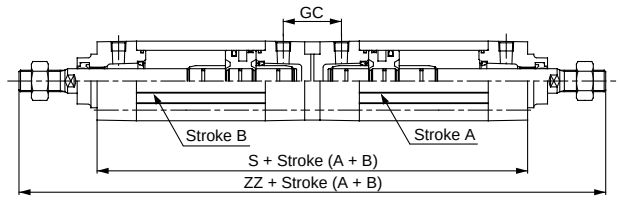
Dual stroke cylinder double rod type

Specifications

Action	Double acting single rod
Cushion	Air cushion, Rubber bumber
Mounting bracket	B, L, F, G type (C, D, T not available)
Maximum available stroke (A+B)	ø32: to 600 ø40: to 700 ø50 to ø100: to 900

Specifications other than the above are the same as the standard type.

Dimensions



Bore size (mm)	GC	S	ZZ
32	36	178	272
40	38	178	280
50	41	198	314
63	43	198	314
80	52	242	386
100	52	242	386

Dual stroke cylinder/single rod type

13 –XC11

Two cylinders are combined in an in-line configuration, allowing the two reciprocating cylinder strokes to be controlled in two steps, or making it possible to double the cylinder output.

MB1 [Mounting type] [Bore size] – [Stroke A] [Suffix] + [Stroke B] [Suffix] –XC11

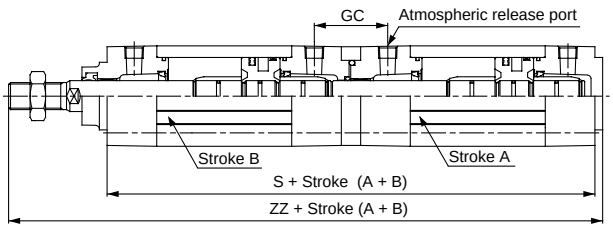
Dual stroke cylinder single rod type

Specifications

Action	Double acting single rod
Cushion	Air cushion, Rubber bumber
Mounting bracket	B, L, F, G, C, D type (T not available)

Specifications other than the above are the same as the standard type.

Dimensions



Bore size (mm)	GC	S	ZZ
32	36	179	230
40	38	179	234
50	41	199	261
63	43	199	261
80	52	243	319
100	52	243	319

Tandem type cylinder

14 –XC12

Two cylinders are connected in-line, allowing cylinder output to be doubled.

MB1 [Standard part number] –XC12

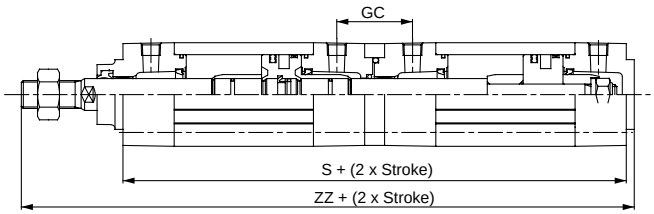
Tandem type cylinder

Specifications

Action	Double acting single rod
Minimum operating pressure	0.1MPa {1.0kgf/cm²}
Cushion	Air cushion
Mounting bracket	B, L, F, G, C, D type (T not available)

Specifications other than the above are the same as the standard type.

Dimensions



Bore size (mm)	GC	S	ZZ
32	36	180	231
40	38	180	235
50	41	200	262

Bore size (mm)	GC	S	ZZ
63	43	200	262
80	52	244	320
100	52	244	320

NPT ports

15 –XC18

Piping ports of the air cylinder are changed from Rc(PT) thread to NPT thread.

MB1 [Standard part number] –XC18

NPT ports

Fluoro rubber seals

16 –XC22

Seal material is changed to fluoro rubber for superior chemical resistance.

MB1 [Standard part number] –XC22

Fluoro rubber seals

Specifications

Action	Double acting single rod
Seals	Fluoro rubber

Specifications and dimensions other than the above are the same as the standard type.

Front trunnion mounted on front of rod cover

17 –XC30

When a standard double acting single rod cylinder with a support type front trunnion has a long stroke, the distance from the fulcrum to the rod end is reduced by mounting the trunnion on the front of the cylinder's rod cover.

MB1T Standard part number **—XC30**

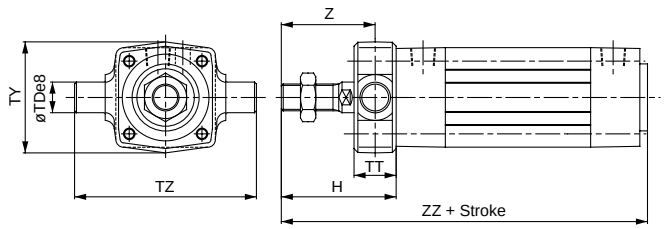
● **Front trunnion mounted on front of rod cover**

Specifications

Action	Double acting single rod
Mounting bracket	T-bracket only

Specifications other than the above are the same as the standard type.

Dimensions



Bore size (mm)	TDe8	TT	TY	TZ	H	Z	ZZ
32	12 -0.032 -0.059	17	49	74	47	38.5	135
40	16 -0.032 -0.059	22	58	95	60	49	148
50	16 -0.032 -0.059	22	71	107	66	55	164
63	20 -0.040 -0.073	28	87	130	72	58	170
80	20 -0.040 -0.073	34	110	150	86	69	204
100	25 -0.040 -0.073	40	136	182	92	72	210

With coil scraper

18 –XC35

Seals are protected by removing frost, welding spatter or cutting chips, etc. that adhere to the piston rod.

MB1 Standard part number **—XC35**

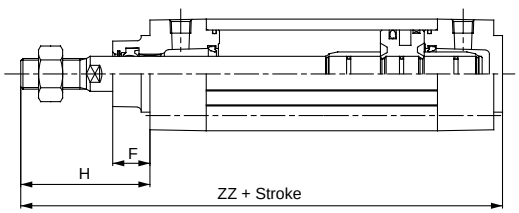
● **With coil scraper**

Specifications

Action	Double acting single rod
Cushion	Air cushion, Rubber bumper
Wiper ring	Coil scraper (metal)

Specifications other than the above are the same as the standard type.

Dimensions



Bore size (mm)	F	H	ZZ
32	15	47	135
40	17	58	146
50	19	67	165

Bore size (mm)	F	H	ZZ
63	19	67	165
80	25	81	199
100	25	81	199

Fastener strips mounted on switch mounting grooves

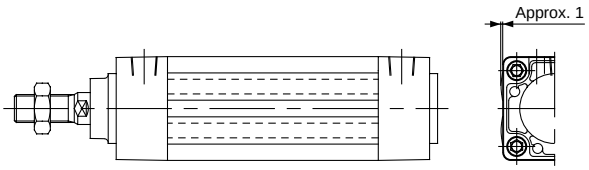
19 –X846

Prevents water or dust, etc. that fall on the cylinder unit from entering and accumulating in the auto switch mounting grooves.

MB1
MDB1 Standard part number **—X846**

● **With fasteners**

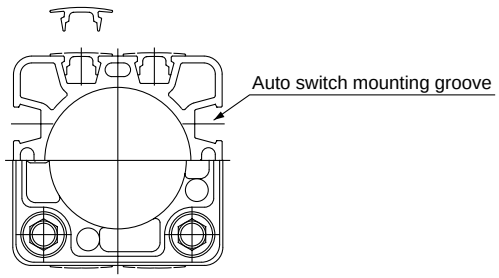
Dimensions



Fastener specifications

Quantity	8pcs. (6pcs. when auto switches are mounted) Note)
Material	Vinyl chloride
Color	Urban white

Note) These cannot be installed on switch mounting grooves where auto switches have been mounted.



Sectional view

Series MB1

Safety Instructions

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

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

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

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

Note 1) ISO 4414 : Pneumatic fluid power – Recommendations for the application of equipment to transmission and control systems.

Note 2) JIS B 8370 : Pneumatic system axiom.

⚠ Warning

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

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.

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

Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

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

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

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

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

Series MB1
Actuator Precautions 1
Be sure to read before handling.

Precautions on design

⚠ Warning

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

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

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

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

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

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

4. A deceleration circuit or shock absorber, etc., 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 shock. Install a deceleration circuit to reduce the speed before cushioning, or install an external shock absorber to relieve the shock. In this case, the rigidity of the machinery should also be examined.

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

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

6. Consider a possible loss of power source.

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

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

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

8. Consider emergency stops.

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

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

Design the machinery so that human injury or equipment damage will not occur upon restart of operation. When the cylinder has to be reset at the starting position, install manual safety equipment.

Selection

⚠ Warning

1. Check the specifications.

The products advertised in this catalog are designed according to use in industrial compressed air systems. If the products are used in conditions where pressure, temperature, etc., are out of specification, damage and/or malfunction may be caused. Do not use in these conditions.

Consult SMC if you use a fluid other than compressed air.

2. Intermediate stops.

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

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

⚠ Caution

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

The piston rod will be damaged if operated beyond the maximum stroke. Refer to the selection procedures for the type of air cylinder to be used for the maximum usable stroke.

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

Operate within a range such that damage will not occur when the piston having inertial force stops by striking the cover at the stroke end. Refer to the cylinder type selection procedure for the range within which damage will not occur.

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

4. Provide an intermediate support for cylinders having a long stroke length.

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

Series MB1
Actuator Precautions 2
Be sure to read before handling.

Mounting

⚠ Caution

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

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

2. When an external guide is used, 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 dent the sliding parts of the cylinder tube or piston rod, etc., by striking or grasping them with other objects.

Cylinder bores are manufactured to precise tolerances, so that even a slight deformation may cause faulty operation. Moreover, scratches or dents, etc. in the piston rod may lead to damaged seals and cause air leakage.

4. Prevent the seizure of rotating parts.

Prevent the seizure of rotating parts (pins, etc.) by applying grease.

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

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

6. Instruction manual.

The product should be mounted and operated after thoroughly reading the manual and understanding its contents.

Keep the instruction manual where it can be referred to as needed.

Piping

⚠ Caution

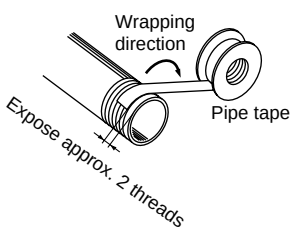
1. Preparation before piping.

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

2. Wrapping of pipe tape.

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

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



Cushions

⚠ Caution

1. Readjust using the cushion valve.

Cushions are adjusted at the time of shipment, however, the cushion valve on the cover should be readjusted when the product is put into service, based upon factors such as the size of the load and the operating speed. When the cushion valve is turned clockwise, the cushion contracts and its effectiveness is increased. Tighten the lock nut securely after adjustment.

2. Do not operate with the cushion valve in a fully closed condition.

This will cause damage to the seals.

Lubrication

⚠ Caution

1. Lubrication of non-lube type cylinder.

The cylinder is prelubricated and can be used without any further lubrication.

However, in the event that it will be lubricated, use turbine oil class 1 (with no additives) ISO VG32.

Stopping lubrication later may lead to malfunction due to the loss of the original lubricant. Therefore, lubrication must be continued once it has been started.

Air Supply

⚠ Warning

1. Use clean air.

If compressed air includes chemicals, synthetic oils containing organic solvents, salt or corrosive gases, etc., it can cause damage or malfunction.

⚠ Caution

1. Install air filters.

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

2. Install an air dryer, after cooler, etc.

Air that includes much condensate causes malfunction of valves and other pneumatic equipment. To prevent this, install an air dryer, after cooler, etc.

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

Take measures to prevent freezing, since moisture in circuits will be frozen under -5°C, and this may cause damage to seals and lead to malfunction.

Refer to the “Air Cleaning Equipment” catalog for details on compressed air quality.

Series MB1
Actuator Precautions 3
Be sure to read before handling.

Operating Environment

⚠ Warning

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

Refer to the construction drawings regarding cylinder materials.

2. In dirty areas, such as dusty locations or where water, oil, etc. splash on the equipment, take suitable measures to protect the rod.

In dusty locations, use the heavy duty scraper (-XC4) type. In locations with liquid spray, use a water resistant cylinder.

Maintenance

⚠ Warning

1. Maintenance should be done according to the procedure indicated in the operating manual.

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

2. Machine maintenance, and supply and exhaust of compressed air.

When machinery is serviced, first check measures to prevent dropping of driven objects and run-away of equipment, etc. Then cut off the supply pressure and electric power, and exhaust all compressed air from the system.

When machinery is restarted, check that operation is normal with actuators in the proper positions.

⚠ Caution

1. Drain flushing.

Remove condensate from air filters regularly. (Refer to specifications.)

Series MB1
Auto Switch Precautions 1
Be sure to read before handling.

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 range of specifications of current load, voltage, temperature or impact.

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

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

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

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

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

In cases of high piston speed, the use of an auto switch (D-F5NT, 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. Take precautions for the internal voltage drop of the switch.

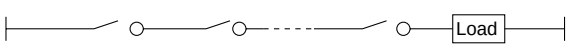
<Reed switch>

1) Switches with an indicator light (Except D-Z76)

• If auto switches are connected in series as shown below, take note that there will be a large voltage drop because of internal resistance in the light emitting diode. (Refer to internal voltage drop in the auto switch specifications.)

[The voltage drop will be "n" times larger when "n" auto switches are connected.]

Even though an auto switch operates normally, the load may not operate.



⚠ Warning

• In the same way, when operating under a specified voltage, although an auto switch may operate normally, the load may not operate. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

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

2) If the internal resistance of a light emitting diode causes a problem, select a switch without an indicator light (Model D-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, note that a 12VDC relay is not applicable.

6. Pay attention to leakage current.

<Solid state switch>

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

Operating current of load (OFF condition) > Leakage current

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

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

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

<Reed switch>

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

<Solid state switch>

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

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 and confirm proper operation.

9. Ensure sufficient clearance for maintenance activities.

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

Series MB1
Auto Switch Precautions 2
Be sure to read before handling.

Mounting & Adjustment

⚠ Warning

1. Do not drop or bump.

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

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

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

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

3. Mount switches using the proper fastening torque.

When a switch is tightened beyond the range of fastening torque, the mounting screws, mounting bracket or switch may be damaged. On the other hand, tightening below the range of fastening torque may allow the switch to slip out of position. (Refer to pages 9 & 10 regarding mounting, moving, and fastening torque, etc. of switches.)

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

Adjust the mounting position of an auto switch so that the piston stops at the center of the operating range (the range in which a switch is ON).

(The mounting position shown in a catalog indicates the optimum position at stroke end.) If mounted at the end of the operating range (around the borderline of ON and OFF), operation will be unstable.

Wiring

⚠ Warning

1. Avoid repeatedly bending or stretching lead wires.

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

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

<2 wire type>

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

3. Confirm proper insulation of wiring.

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

5. Do not allow short circuit of loads.

<Reed switch>

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

Wiring

⚠ Warning

<Solid state switch>

Model D-J51 and all models of PNP output type switches do not have built-in short circuit prevention circuits. If loads are short circuited, the switches will be instantly damaged.
Take special care to avoid reverse wiring with the brown (red) power supply line and the black (white) output line on 3 wire type switches.

6. Avoid incorrect wiring.

<Reed switch>

A 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 (-).

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

Also note that a current greater than that specified will damage a light emitting diode and it will no longer operate.

Applicable models: D-Z73

2) Note however, that in the case of 2 color indicator type auto switches (D-A59W), if the wiring is reversed, the switch will be in a normally ON condition.

<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 (black) wire and the power supply line (-) is connected to the black (white) wire, the switch will be damaged.

∗ Lead wire color changes

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

2 wire

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

3 wire

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

Solid state switch with diagnostic output

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

Solid state switch latch type with diagnostic output

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

Series MB1
Auto Switch Precautions 3
Be sure to read before handling.

Operating Environment

⚠ Warning

1. Never use in an atmosphere of explosive gases.

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

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

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

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

Although switches 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 an environment with oil or chemicals.

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

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

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

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

<Reed switch>

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

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

<Solid state switch>

When there are units (solenoid type lifter, high frequency induction furnace, motor, 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 switch. Avoid sources of surge generation and disorganized lines.

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

When a large amount of ferrous powder such as machining chips or spatter is accumulated, or a magnetic substance (something attracted by a magnet) is brought into close proximity with an auto switch cylinder, it may cause the auto switch 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) Secure and tighten switch mounting screws.

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

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

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

3) Confirm the lighting of the green light on the 2 color indicator type switch.

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

Other

⚠ Warning

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

Adjustment

⚠ Warning

1. Do not open the cushion valve above the stopper.

Cushion valves are provided with a crimp (ø32) or a retaining ring (ø40 to ø100) as a stopping mechanism, and the cushion valve should not be opened above that point.

If air is supplied and operation started without confirming the above condition, the cushion valve may be ejected from the cover.

Bore size (mm)	Cushion valve	Width across flats	Hexagon wrench
32, 50, 50	MB-32-10-C1247	2.5	Hexagon wrench key 2.5
63, 80, 100	MB-63-10-C1250	4	Hexagon wrench key 4

2. Be certain to activate the air cushion at the stroke end.

When it is intended to use the cushion valve in the fully open position, select the type with damper. If this is not done, the tie-rods or piston rod assembly will be damaged.

3. When replacing brackets, use the hexagon wrenches shown below.

Bore size (mm)		Bolt	Width across flats	Tightening torque
32, 40		MB-32-48-C1247	4	5.1
50, 63		MB-50-48-C1249	5	11
80, 100	Foot	MB-80-48AC1251	6	25
	Other	MB-80-48BC1251		

With Rod Detent (Double Acting: Single Rod)

Operating Precautions

⚠ Caution

1. Do not apply more than the allowable rotating torque to the piston rod.

If more than the allowable rotating torque is applied, the detent guide will be deformed and there will be a significant loss of rotational accuracy. This may cause damage to the machinery.

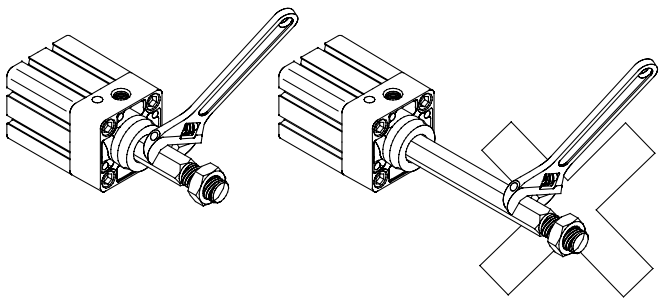
Mounting & Piping

⚠ Caution

1. Mounting of a work piece at the rod end.

When screwing a fitting or nut, etc. onto the threads at the end of the piston rod, push the piston rod into its fully retracted position, and grasp the protruding section with a wrench.

Furthermore, when tightening is performed, take care that tightening torque is not applied to the detent guide.



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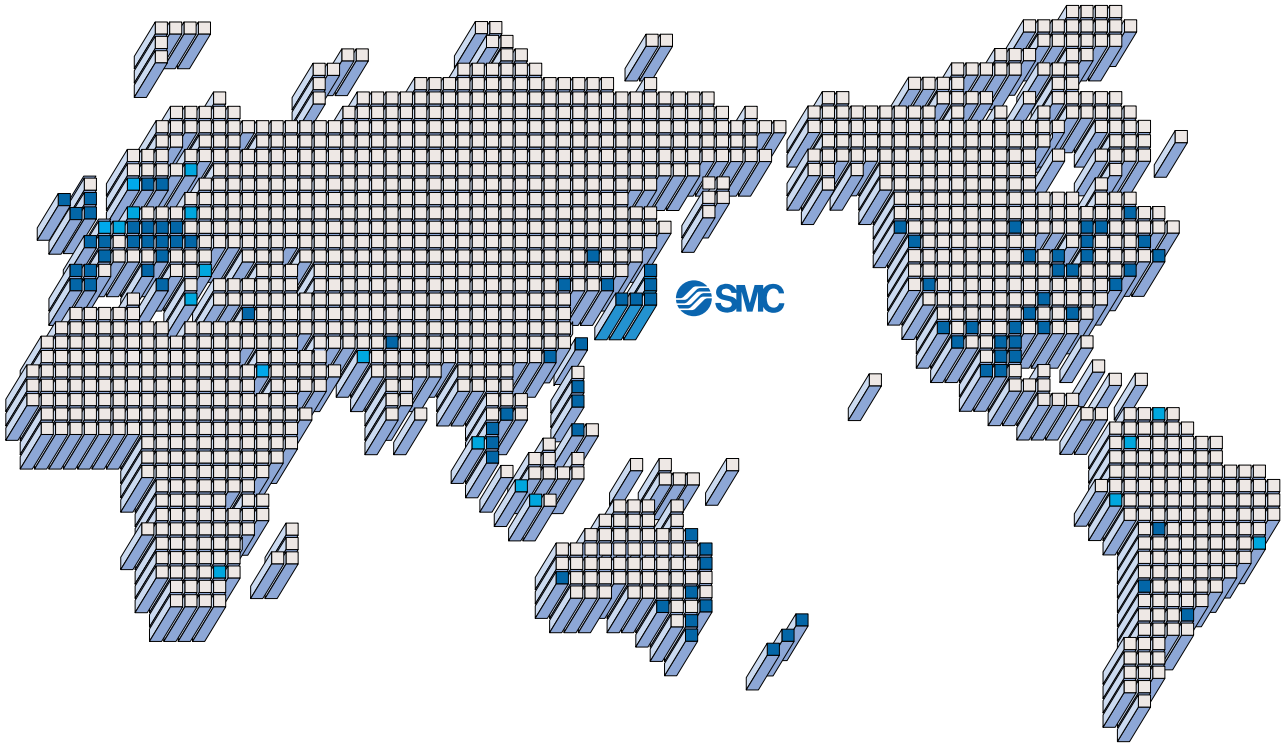

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SMC CORPORATION

1-16-4 Shimbashi, Minato-ku, Tokyo 105 JAPAN
Tel: 03-3502-2740 Fax: 03-3508-2480

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