

Air Cylinder

ø32, ø40, ø50, ø63, ø80, ø100

New

RoHS

Weight **16%** lighter (ø63-100 stroke)

New Series **MB**

Existing model

1.69 kg <<< **2.01 kg**

Reduced weight by changing the shape of the rod cover and head cover.



Series MB



CAT.ES20-231A

New Part numbers with rod end bracket and/or pivot bracket available

Not necessary to order a bracket for the applicable cylinder separately
 Note) Mounting bracket is shipped together with the product, but not assembled.

Example) **MDBT**^D**40-100Z-N****V**-M9BW

Pivot bracket	
Nil	No bracket
N	Pivot bracket is shipped together with the product, but not assembled.

N: Kit of pivot bracket and double clevis



Kit of pivot bracket and trunnion

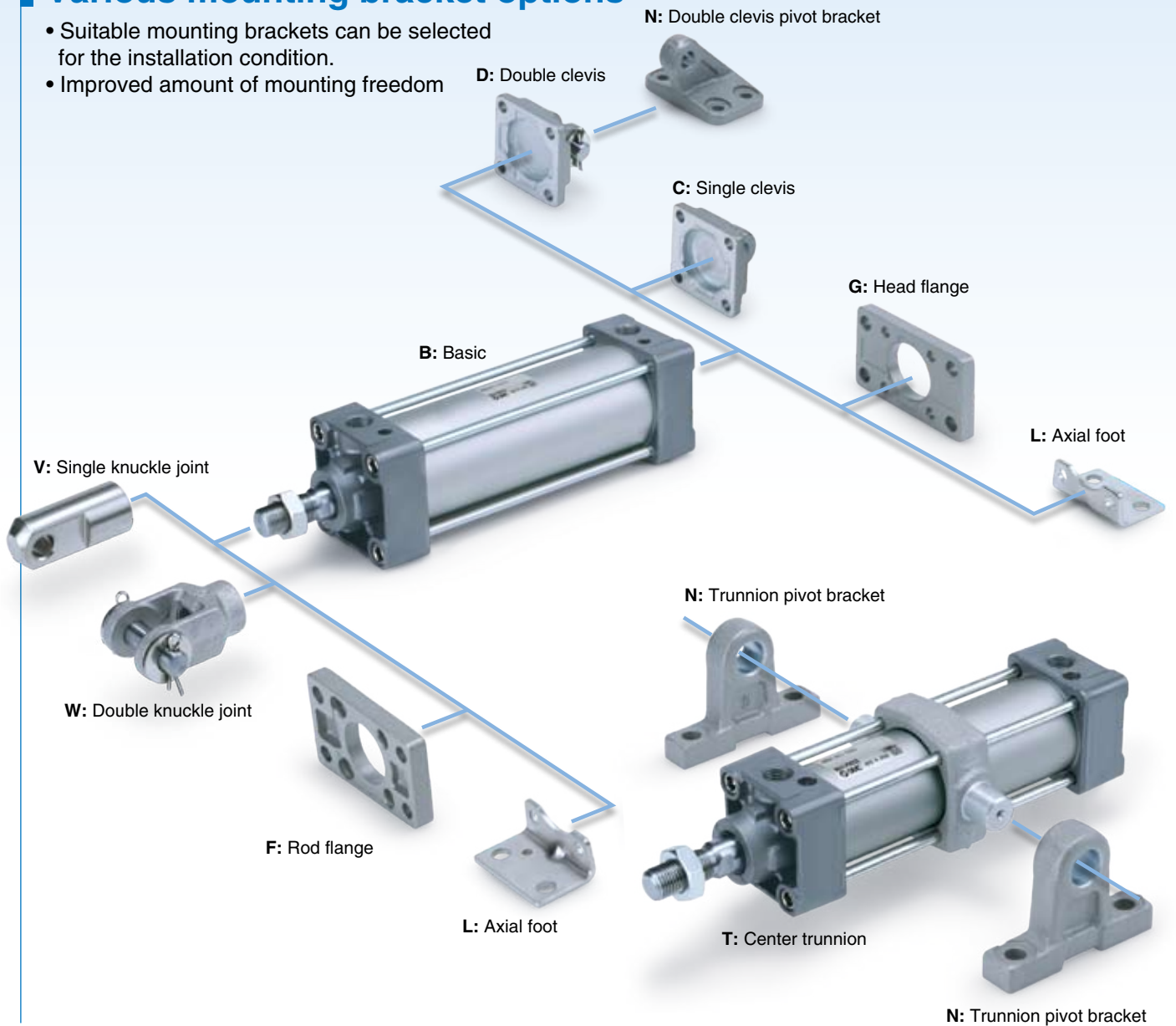


Rod end bracket	
Nil	No bracket
V	Single knuckle joint
W	Double knuckle joint

With rod end bracket
V: Single knuckle joint **W:** Double knuckle joint

Various mounting bracket options

- Suitable mounting brackets can be selected for the installation condition.
- Improved amount of mounting freedom



Lightweight

Reduced weight by changing the shape of the rod cover and head cover.

Bore size (mm)	New MB	Reduction rate	Existing model
32	0.59	18%	0.72
40	0.84	17%	1.01
50	1.43	16%	1.71
63	1.69	16%	2.01
80	2.95	17%	3.57
100	4.18	13%	4.82

(kg)

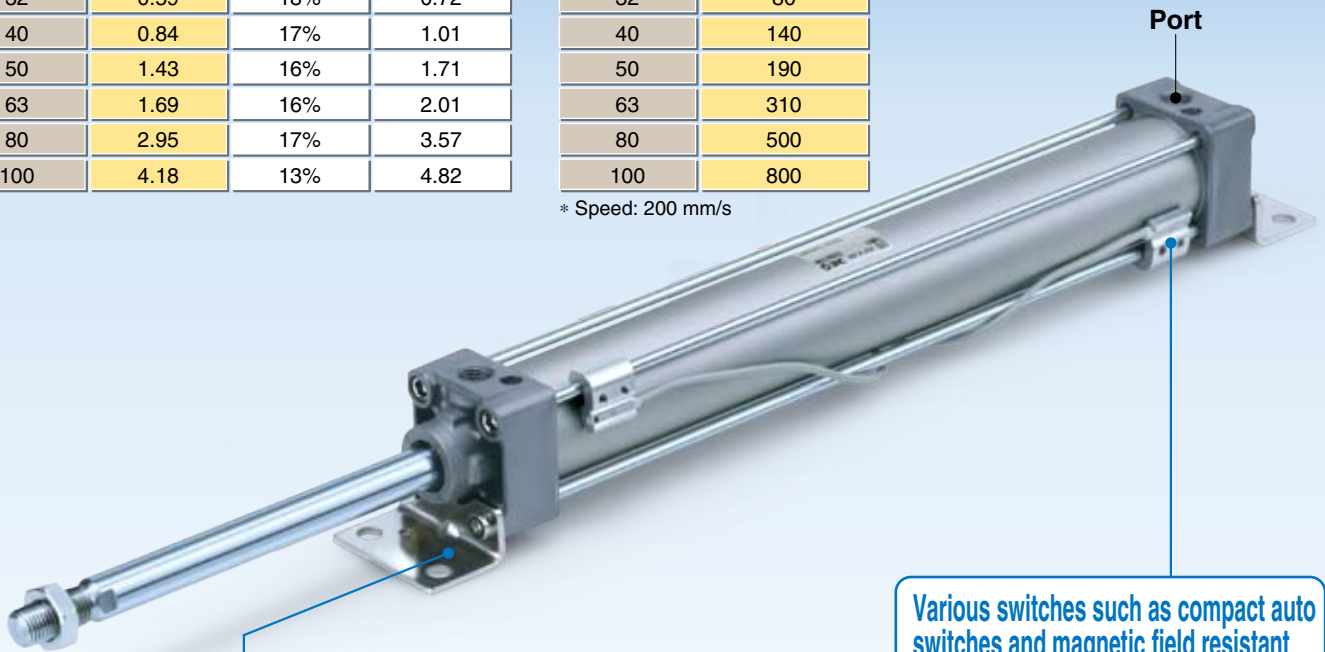
Applicable speed/load

- Piston speed: Max. 1000 mm/s (ø32 to ø100)
- Load yield: See table below.

Bore size (mm)	Maximum load mass
32	80
40	140
50	190
63	310
80	500
100	800

(kg)

* Speed: 200 mm/s



Mounting dimensions are the same as the existing product.

No environmental hazardous substances used

Lead free bushing is used as sliding material. Compliant with EU RoHS directive.

Various switches such as compact auto switches and magnetic field resistant auto switches can be mounted.

Compact auto switches

- D-M9□
- D-A9□



Magnetic field resistant auto switches

- D-P3DW
- D-P4DW



Series Variations

Series	Type	Cushion	Bore size (mm)							Built-in magnet	Rod boot	Catalogs
			32	40	50	63	80	100	125			
New MB Standard	Double acting, Single rod	Rubber	★	★	★	★	★	★	★	★		Page of this catalog Page 1
		Air	★	★	★	★	★	★	★	★	★	
MB Standard	Double acting, Single rod	Rubber	●	●	●	●	●	●	●	●	●	Best Pneumatics Page 290
		Air	●	●	●	●	●	●	●	●	●	
MBW Double rod	Double acting, Double rod	Rubber	●	●	●	●	●	●	●	●	●	Best Pneumatics Page 299
		Air	●	●	●	●	●	●	●	●	●	
MBK Non-rotating rod	Double acting, Single rod	Rubber	●	●	●	●	●	●	●	●	●	Best Pneumatics Page 305
		Air	●	●	●	●	●	●	●	●	●	
MB□Q Low friction	Double acting, Single rod	Rubber	●	●	●	●	●	●	●	●	●	Best Pneumatics Page 309
		Air	●	●	●	●	●	●	●	●	●	
MBB With end lock	Double acting, Single rod	Rubber	●	●	●	●	●	●	●	●	●	Best Pneumatics Page 315
		Air	●	●	●	●	●	●	●	●	●	

Air Cylinder Single Rod

Series MB

ø32, ø40, ø50, ø63, ø80, ø100



How to Order

With auto switch MB L 32 - 50 N Z - [] []

With auto switch (Built-in magnet) **MDB** D 32 - 50 [] Z - N V - M9BW []

Mounting

B	Basic
L	Axial foot
F	Rod flange
G	Head flange
C	Single clevis
D	Double clevis
T	Center trunnion

Bore size

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

Accessories 1

Nil	No bracket
N	Pivot bracket

* Only for D and T mounting types.
* Pivot bracket is shipped together with the product.

Cylinder suffix

Cushion	Nil	Air cushion on both ends
	N*	Without air cushion

* Model without air cushion is designed to include rubber bumpers. Since the bumpers are attached to the both sides of the piston, the overall length is longer than the cylinder with air cushion as follows:
ø32, ø40: +6 mm, ø50, ø63: +8 mm, ø80, ø100: +10 mm

Auto switch

Nil	Without auto switch
-----	---------------------

* For applicable auto switches, refer to the table below.

Accessories 2

Nil	No bracket
V	Single knuckle joint
W	Double knuckle joint

* A knuckle joint pin is not provided with the single knuckle joint.
* Rod end bracket is shipped together with the product.

Number of auto switches

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

Cylinder stroke (mm)
Refer to page 2 for standard strokes.

Built-in Magnet Cylinder Model
If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch. (Example) MDBB40-100Z

Applicable Auto Switches/Refer to pages 1263 to 1371 in Best Pneumatics No. 2 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage		Auto switch model		Lead wire length (m)				Pre-wired connector	Applicable load				
					DC	AC	Tie-rod mounting	Band mounting	0.5 (Nil)	1 (M)	3 (L)	5 (Z)		IC circuit	Relay, PLC			
Solid state auto switch	—	Grommet	—	3-wire (NPN)	24 V	5 V, 12 V	—	M9N	●	●	●	○	○			—	—	
				3-wire (PNP)				M9P	●	●	●	○	○					
		2-wire		100V, 200V	M9B	●	●	●	○	○	—	—						
		—			J51	●	●	○	—									
	Terminal conduit	—	—	—	3-wire (NPN)	24 V	5 V, 12 V	—	—	G39	—	—	—	—	—	—		
					2-wire				—	K39	—	—	—	—				
	Diagnostic indication (2-color indication)	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	M9NW	●	●	●	○	○	—	IC circuit		
					3-wire (PNP)				M9PW	●	●	●	○	○				
	Water resistant (2-color indication)	—	Grommet	Yes	2-wire	24 V	12 V	—	M9BW	●	●	●	○	○	—	—		
					3-wire (NPN)				M9NA**	—	○	○	●	○			○	
With diagnostic output (2-color indication)	—	Grommet	Yes	3-wire (PNP)	24 V	5 V, 12 V	—	M9PA**	—	○	○	●	○	—	IC circuit			
				2-wire				M9BA**	—	○	○	●	○			○		
Magnetic field resistant (2-color indication)	—	Grommet	Yes	4-wire (NPN)	24 V	5 V, 12 V	—	F59F	●	—	●	○	○	—	IC circuit			
				2-wire (Non-polar)				P3DW	—	●	—	●	●			○		
Reed auto switch	—	Grommet	No/Yes/No	3-wire (NPN)	24 V	5 V	—	A96	●	—	●	—	—	—	IC circuit			
				2-wire				100 V	A93	—	●	—	●			—	—	
								100 V or less	A90	—	●	—	●			—	—	
								100 V, 200 V	A54	—	●	—	●			●	—	
								200 V or less	A64	—	●	—	●			—	—	
		—		A33	—	—	—	—	—	—	—							
		Terminal conduit		—	—	Yes	2-wire	24 V	12 V	—	—	A33	—	—	—	—	—	—
											—	A34	—	—	—	—		
		DIN terminal		—	—	Yes	2-wire	24 V	12 V	—	—	A34	—	—	—	—	—	PLC
											—	A44	—	—	—	—		
Diagnostic indication (2-color indication)	—	Grommet	Yes	2-wire	24 V	12 V	—	—	A59W	●	—	●	—	—	Relay, PLC			
								—	—	—	—	—	—			—		

** Water-resistant type auto switch can be mounted on the above models, but in such case SMC cannot guarantee water resistance.
A water-resistant type cylinder is recommended for use in an environment which requires water resistance.

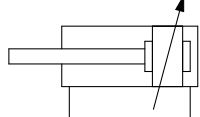
* Lead wire length symbols: 0.5 m.....Nil (Example) M9NW * Solid state auto switches marked with "○" are produced upon receipt of order.
1 m..... M (Example) M9NW
3 m..... L (Example) M9NL
5 m..... Z (Example) M9NZ

* Since there are other applicable auto switches then listed above, refer to page 16 for details.
* For details about auto switches with pre-wired connector, refer to pages 1328 and 1329 in Best Pneumatics No. 2.
For the D-P3DW□, refer to the catalog CAT.ES20-201.
* The D-A9□/M9□□□/P3DW auto switches are shipped together, (but not assembled). (However, auto switch mounting brackets are assembled for the D-A9□/M9□□□ before shipment.)

Specifications



JIS Symbol
Double acting



Bore size (mm)	32	40	50	63	80	100
Action	Double acting, Single rod					
Fluid	Air					
Proof pressure	1.5 MPa					
Maximum operating pressure	1.0 MPa					
Minimum operating pressure	0.05 MPa					
Ambient and fluid temperature	Without auto switch: -10 to 70°C (No freezing) With auto switch: -10 to 60°C					
Lubricant	Not required (Non-lube)					
Piston speed	50 to 1000 mm/s					
Stroke length tolerance	Up to 250: ^{+1.0} ₀ , 251 to 1000: ^{+1.4} ₀ , 1001 to 1500: ^{+1.8} ₀					
Cushion	Both sides (Air cushion) ^{Note)}					
Port size (Rc)	1/8	1/4	3/8	1/2		
Mounting	Basic, Axial foot, Rod flange, Head flange Single clevis, Double clevis, Center trunnion					

Note) Model without air cushion is designed to include rubber bumpers.

Standard Strokes

Refer to pages 11 to 16 for cylinders with auto switches
<ul style="list-style-type: none"> • Auto switch proper mounting position (detection at stroke end) and its mounting height • Operating range • Minimum stroke for auto switch mounting • Auto switch mounting brackets/Part no.

Bore size (mm)	Standard stroke (mm)	Max. 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	1000
63	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600	1000
80	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800	1000
100	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800	1000

Manufacture of intermediate strokes is possible. (Spacers are not used.) Produced upon receipt of order.

Accessories

Ordering Example of Cylinder Assembly

Cylinder model:
MDBD32-50Z-NW-M9BW

Mounting D: Double clevis
Pivot bracket N: Yes
Rod end bracket W: Double knuckle joint
Auto switch D-M9BW: 2 pcs.

* Pivot bracket, double knuckle joint and auto switch are shipped together with the product, but not assembled.

Mounting		Basic	Axial foot	Rod flange	Head flange	Single clevis	Double clevis	Center trunnion
Standard	Rod end nut	●	●	●	●	●	●	●
	Clevis pin	—	—	—	—	—	●	—
Option	Single knuckle joint	●	●	●	●	●	●	●
	Double knuckle joint (with pin)	●	●	●	●	●	●	●
	Rod boot	●	●	●	●	●	●	●

Mounting Brackets/Part No.

Bore size (mm)	32	40	50	63	80	100
Axial 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

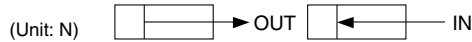
Note 1) Order two foot brackets per cylinder.

Note 2) Accessories for each mounting bracket are as follows:

Axial foot, flange, single clevis/body mounting bolt, double clevis/body mounting bolt, clevis pin, flat washers and split pins. → Refer to page 10 for details.

Series MB

Theoretical Force



Bore size (mm)	Rod diameter (mm)	Operating direction	Piston area (mm ²)	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

Note) Theoretical force (N) = Pressure (MPa) x Piston area (mm²)

Weights

Bore size (mm)		32	40	50	63	80	100
Basic weight	Basic	0.37	0.52	0.91	1.15	2.11	3.06
	Axial foot	0.49	0.66	1.13	1.43	2.61	3.72
	Flange	0.66	0.89	1.36	1.94	3.56	6.37
	Single clevis	0.62	0.75	1.25	1.78	3.22	6.23
	Double clevis	0.63	0.79	1.34	1.94	3.51	6.75
	Center trunnion	0.66	0.88	1.39	1.95	3.66	6.73
Additional weight per 50 mm of stroke	All mounting brackets	0.11	0.16	0.26	0.27	0.42	0.56
Accessories	Single knuckle joint	0.15	0.23	0.26	0.26	0.60	0.83
	Double knuckle joint (with pin)	0.22	0.37	0.43	0.43	0.87	1.27

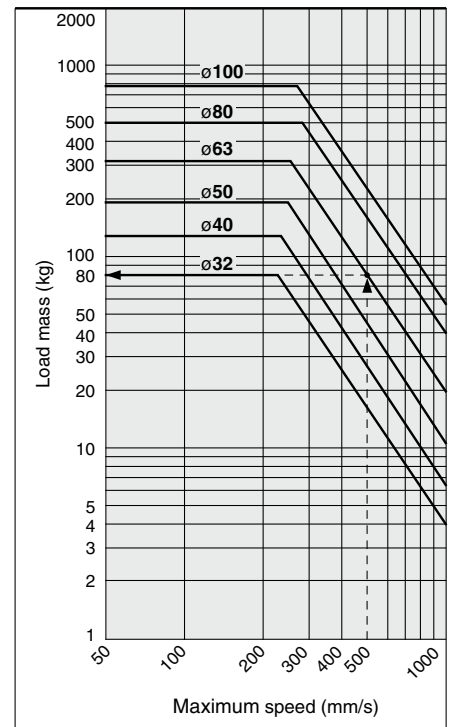
Calculation

Example) **MBB32-100Z** (Basic, ø32, 100 stroke)

- Basic weight.....0.37 (Basic, ø32)
- Additional weight.....0.11/50 stroke
- Cylinder stroke.....100 stroke

$$0.37 + 0.11 \times 100/50 = 0.59 \text{ kg}$$

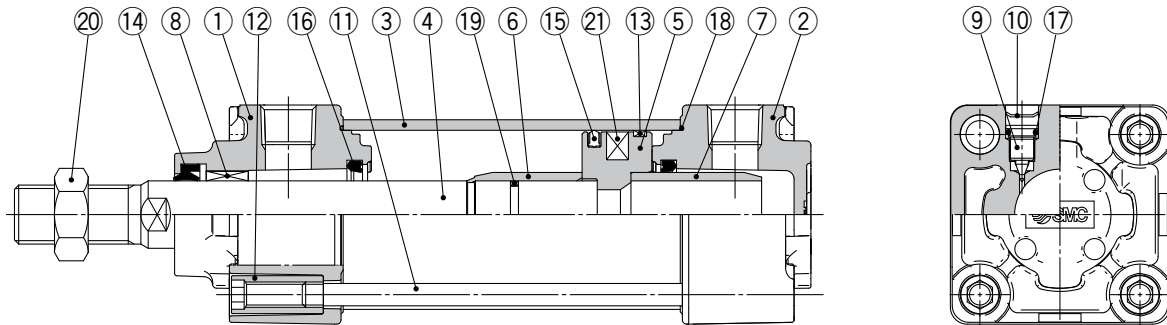
Allowable Kinetic Energy



(Example) Find the upper limit of rod end load when an air cylinder of ø63 is operated at 500 mm/s.

From a point indicating 500 mm/s on the axis of abscissas, extend a line upward and find a point where it intersects with a line for the 63 mm bore size. Extend a line from the intersection to the left and find a load mass 80 kg.

Construction



Component Parts

No.	Description	Material	Qty.	Note
1	Rod cover	Aluminum die-cast	1	Trivalent chromate
2	Head cover	Aluminum die-cast	1	Trivalent chromate
3	Cylinder tube	Aluminum alloy	1	Hard anodized
4	Piston rod	Carbon steel	1	Hard chrome plating
5	Piston	Aluminum alloy	1	
6	Cushion ring	Aluminum alloy	1	Anodized
7	Cushion ring B	Aluminum alloy	1	Anodized
8	Bushing	Bearing alloy	1	
9	Cushion valve	Steel wire	2	Nickel plating
10	Retaining ring	Steel for spring	2	ø40 to 100
11	Tie rod	Carbon steel	4	Trivalent zinc chromate
12	Tie rod nut	Carbon steel	8	Nickel plating
13	Wear ring	Resin	1	
14	Rod seal	NBR	1	
15	Piston seal	NBR	1	
16	Cushion seal	Urethane	2	
17	Cushion valve seal	NBR	2	
18	Cylinder tube gasket	NBR	2	
19	Piston gasket	NBR	1	O-ring
20	Rod end nut	Rolled steel	1	Trivalent zinc chromate
21	Magnet	—	(1)	

Replacement Parts/Seal Kit

Bore size (mm)	Kit no.	Contents
32	MB32Z-PS	Set of the nos. ⑭, ⑮, ⑯, ⑰
40	CA2-40Z-PS	
50	CA2-50Z-PS	
63	CA2-63Z-PS	
80	CA2-80Z-PS	
100	CA2-100Z-PS	

* Seal kits consist of items ⑭, ⑮, ⑯, ⑰, and can be ordered by using the seal kit number corresponding to each bore size.

* Center trunnion type should not be disassembled. (Refer to page 18.)

* The seal kit includes a grease pack (10 g for ø32 to ø50, 20 g for ø63 and ø80, 30 g for ø100).

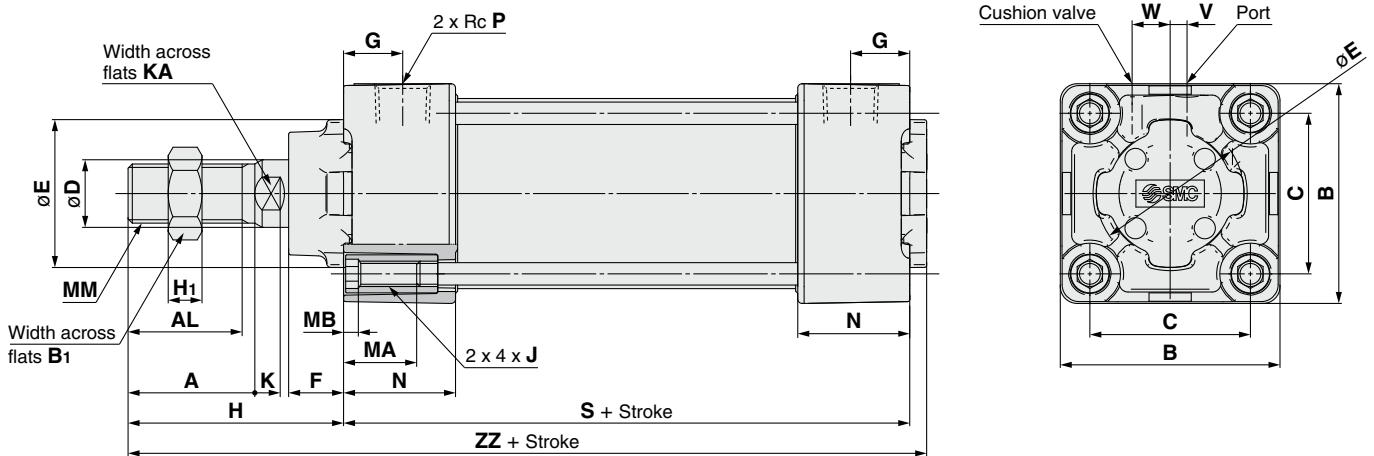
Order with the following part number when only the grease pack is needed.

Grease pack part number: GR-S-010 (10 g), GR-S-020 (20 g)

Series MB

Standard

Basic/(MBB)



Dimensions

(mm)

Bore size (mm)	Stroke range	A	AL	B	B ₁	C	D	E	F	G	H	H ₁	J	K	KA	MA	MB	MM	N	P	S	V	W	ZZ
32	Up to 700	22	19.5	46	17	32.5	12	30	13	13	47	6	M6 x 1	6	10	16	4	M10 x 1.25	26.5	1/8	84	4	6.5	135
40	Up to 800	30	27	52	22	38	16	35	13	14	51	8	M6 x 1	6	14	16	4	M14 x 1.5	26.5	1/4	84	4	9	139
50	Up to 1000	35	32	65	27	46.5	20	40	14	15.5	58	11	M8 x 1.25	7	18	16	4	M18 x 1.5	31	1/4	94	5	10.5	156
63	Up to 1000	35	32	75	27	56.5	20	45	14	16.5	58	11	M8 x 1.25	7	18	16	4	M18 x 1.5	31	3/8	94	9	12	156
80	Up to 1000	40	37	95	32	72	25	45	20	19	72	13	M10 x 1.5	10	22	16	5	M22 x 1.5	37.5	3/8	114	11.5	14	190
100	Up to 1000	40	37	114	41	89	30	55	20	19	72	16	M10 x 1.5	10	26	16	5	M26 x 1.5	37.5	1/2	114	17	15	190

Without Air Cushion

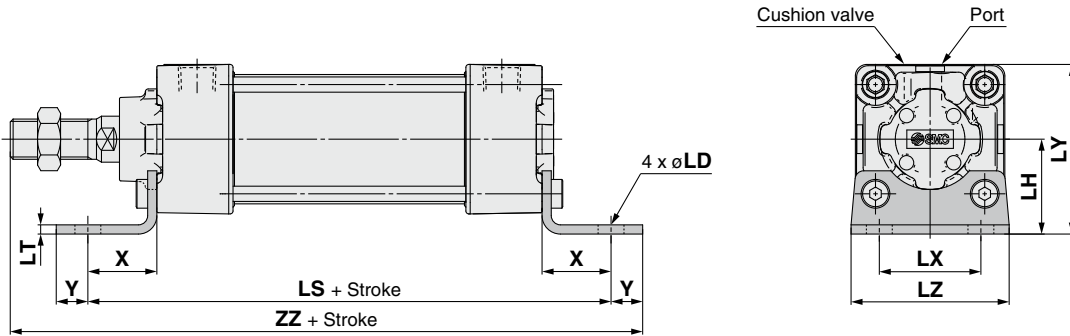
Bore size (mm)	S	ZZ
32	90	141
40	90	145
50	102	164
63	102	164
80	124	200
100	124	200

* Model without air cushion is designed to include rubber bumpers. Since the bumpers are attached to the both sides of the piston, the overall length is longer than the cylinder with air cushion as follows: ø32, ø40: +6 mm, ø50, ø63: +8 mm, ø80, ø100: +10 mm

Standard/With Mounting Bracket

* Refer to Basic (B) for other dimensions.

Axial foot/(MBL)



Axial Foot (mm)

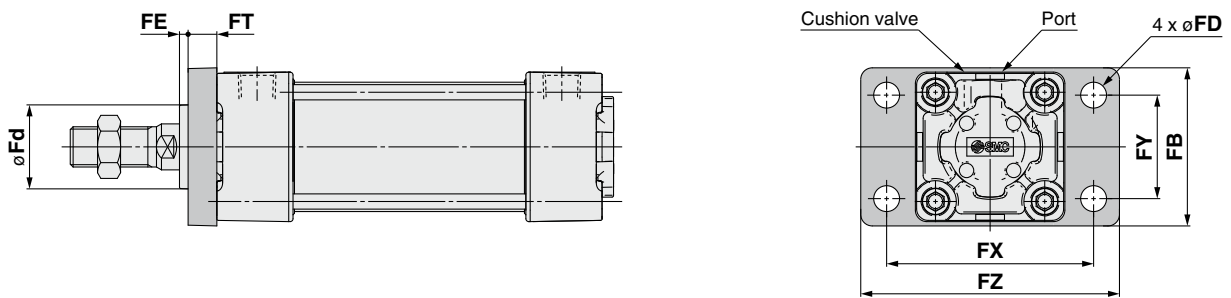
Bore size (mm)	Stroke range	LD	LH	LS	LT	LX	LY	LZ	X	Y	ZZ
32	Up to 700	7	30	128	3.2	32	53	50	22	9	162
40	Up to 800	9	33	132	3.2	38	59	55	24	11	170
50	Up to 1000	9	40	148	3.2	46	72.5	70	27	11	190
63	Up to 1000	12	45	148	3.6	56	82.5	80	27	14	193
80	Up to 1000	12	55	174	4.5	72	102.5	100	30	14	230
100	Up to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

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

* Model without air cushion is designed to include rubber bumpers. Since the bumpers are attached to the both sides of the piston, the overall length is longer than the cylinder with air cushion as follows:
 ø32, ø40: +6 mm, ø50, ø63: +8 mm, ø80, ø100: +10 mm

Rod flange/(MBF)



Rod Flange (mm)

Bore size (mm)	Stroke range	FB	FD	FE	FT	FX	FY	FZ	Fd
32	Up to 700	50	7	3	10	64	32	79	24.5
40	Up to 800	55	9	3	10	72	36	90	30.5
50	Up to 1000	70	9	2	12	90	45	110	36.5
63	Up to 1000	80	9	2	12	100	50	120	39.5
80	Up to 1000	100	12	4	16	126	63	153	39.5
100	Up to 1000	120	14	4	16	150	75	178	46.5

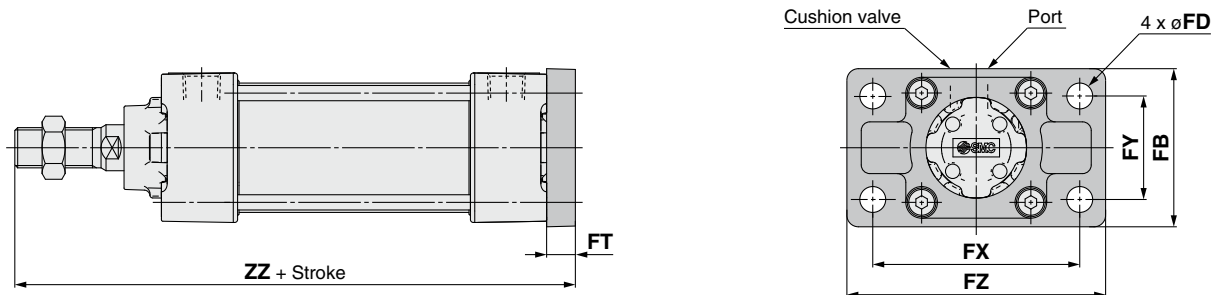
* Model without air cushion is designed to include rubber bumpers. Since the bumpers are attached to the both sides of the piston, the overall length is longer than the cylinder with air cushion as follows:
 ø32, ø40: +6 mm, ø50, ø63: +8 mm, ø80, ø100: +10 mm

Series MB

Standard/With Mounting Bracket

* Refer to Basic (B) for other dimensions.

Head flange/(MBG)



Head Flange

(mm)

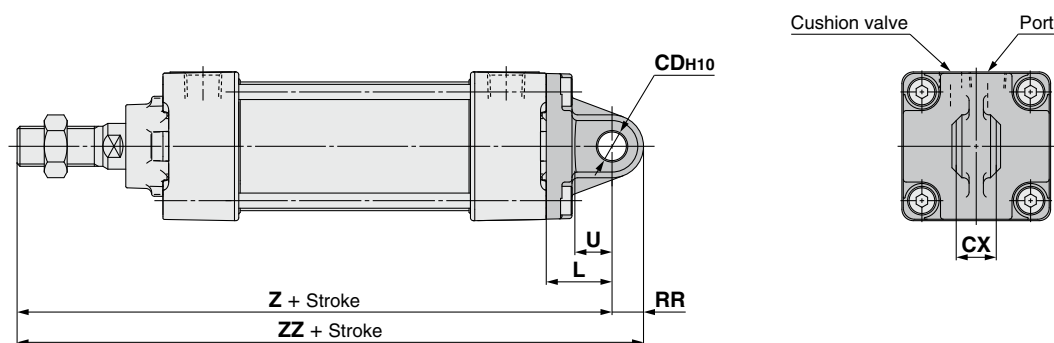
Bore size (mm)	Stroke range	FB	FD	FT	FX	FY	FZ	ZZ
32	Up to 700	50	7	10	64	32	79	141
40	Up to 800	55	9	10	72	36	90	145
50	Up to 1000	70	9	12	90	45	110	164
63	Up to 1000	80	9	12	100	50	120	164
80	Up to 1000	100	12	16	126	63	153	202
100	Up to 1000	120	14	16	150	75	178	202

Without Air Cushion

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

* Model without air cushion is designed to include rubber bumpers. Since the bumpers are attached to the both sides of the piston, the overall length is longer than the cylinder with air cushion as follows: ø32, ø40: +6 mm, ø50, ø63: +8 mm, ø80, ø100: +10 mm

Single clevis/(MBC)



Single Clevis

(mm)

Bore size (mm)	Stroke range	CDH10	CX	L	RR	U	Z	ZZ
32	Up to 700	10 ^{+0.058} ₀	14 ^{-0.1} _{-0.3}	23	10.5	13	154	164.5
40	Up to 800	10 ^{+0.058} ₀	14 ^{-0.1} _{-0.3}	23	11	13	158	169
50	Up to 1000	14 ^{+0.070} ₀	20 ^{-0.1} _{-0.3}	30	15	17	182	197
63	Up to 1000	14 ^{+0.070} ₀	20 ^{-0.1} _{-0.3}	30	15	17	182	197
80	Up to 1000	22 ^{+0.084} ₀	30 ^{-0.1} _{-0.3}	42	23	26	228	251
100	Up to 1000	22 ^{+0.084} ₀	30 ^{-0.1} _{-0.3}	42	23	26	228	251

Without Air Cushion

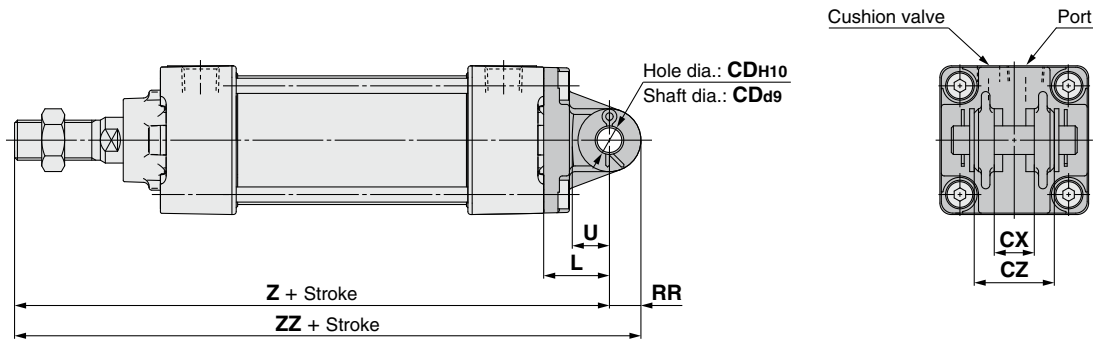
Bore size (mm)	Z	ZZ
32	160	170.5
40	164	175
50	190	205
63	190	205
80	238	261
100	238	261

* Model without air cushion is designed to include rubber bumpers. Since the bumpers are attached to the both sides of the piston, the overall length is longer than the cylinder with air cushion as follows: ø32, ø40: +6 mm, ø50, ø63: +8 mm, ø80, ø100: +10 mm

Standard/With Mounting Bracket

* Refer to Basic (B) for other dimensions.

Double clevis/(MBD)



Double Clevis (mm)

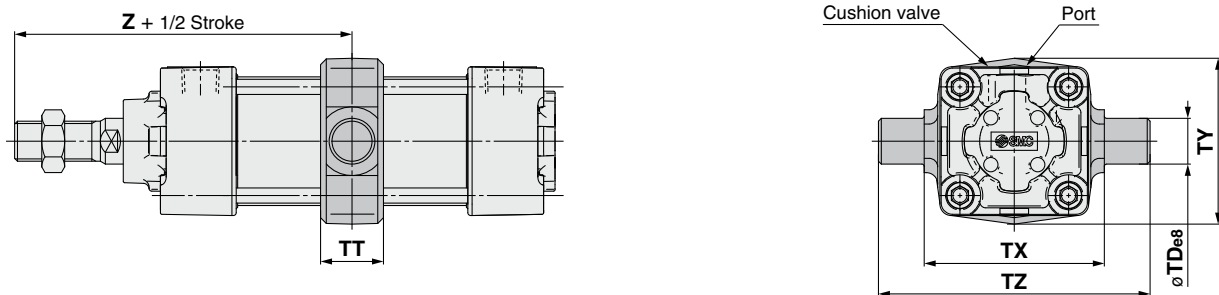
Bore size (mm)	Stroke range	CDH10	CDd9	CX	CZ	L	RR	U	Z	ZZ
32	Up to 700	10 ^{+0.058} ₀	10 ^{-0.040} _{-0.076}	14 ^{+0.3} _{+0.1}	28	23	10.5	13	154	164.5
40	Up to 800	10 ^{+0.058} ₀	10 ^{-0.040} _{-0.076}	14 ^{+0.3} _{+0.1}	28	23	11	13	158	169
50	Up to 1000	14 ^{+0.070} ₀	14 ^{-0.050} _{-0.093}	20 ^{+0.3} _{+0.1}	40	30	15	17	182	197
63	Up to 1000	14 ^{+0.070} ₀	14 ^{-0.050} _{-0.093}	20 ^{+0.3} _{+0.1}	40	30	15	17	182	197
80	Up to 1000	22 ^{+0.084} ₀	22 ^{-0.065} _{-0.117}	30 ^{+0.3} _{+0.1}	60	42	23	26	228	251
100	Up to 1000	22 ^{+0.084} ₀	22 ^{-0.065} _{-0.117}	30 ^{+0.3} _{+0.1}	60	42	23	26	228	251

Without Air Cushion

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

* Model without air cushion is designed to include rubber bumpers. Since the bumpers are attached to the both sides of the piston, the overall length is longer than the cylinder with air cushion as follows:
 ø32, ø40: +6 mm, ø50, ø63: +8 mm, ø80, ø100: +10 mm

Center trunnion/(MBT)



Center Trunnion (mm)

Bore size (mm)	Stroke range	TDø8	TT	TX	TY	TZ	Z
32	Up to 700	12 ^{-0.032} _{-0.059}	17	50	49	74	89
40	Up to 800	16 ^{-0.032} _{-0.059}	22	63	58	95	93
50	Up to 1000	16 ^{-0.032} _{-0.059}	22	75	71	107	105
63	Up to 1000	20 ^{-0.040} _{-0.073}	28	90	87	130	105
80	Up to 1000	20 ^{-0.040} _{-0.073}	34	110	110	150	129
100	Up to 1000	25 ^{-0.040} _{-0.073}	40	132	136	182	129

Without Air Cushion

Bore size (mm)	Z
32	92
40	96
50	109
63	109
80	134
100	134

* Model without air cushion is designed to include rubber bumpers. Since the bumpers are attached to the both sides of the piston, the "Z" dimension is longer than the cylinder with air cushion as follows:
 ø32, ø40: +3 mm, ø50, ø63: +4 mm, ø80, ø100: +5 mm

Series MB

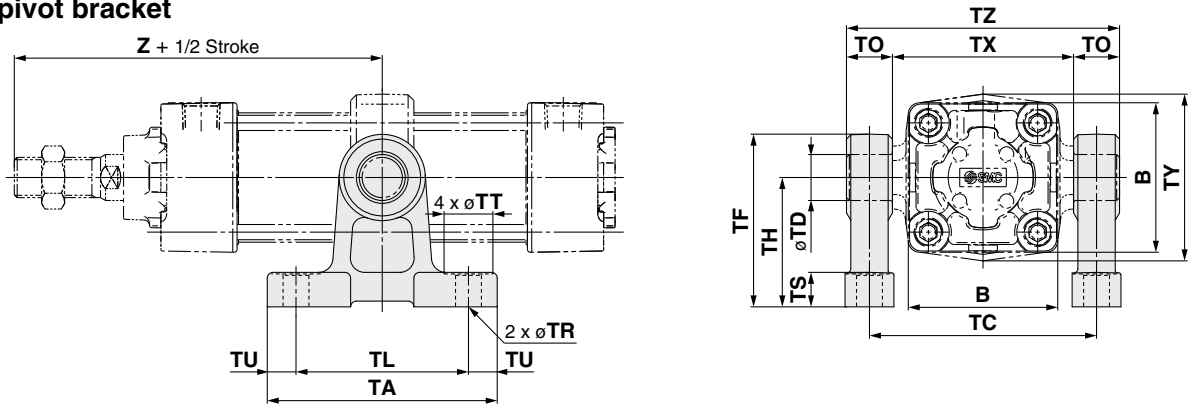
Pivot Bracket/Trunnion and Double Clevis Pivot Bracket

Part No.

Bore size	MB□32	MB□40	MB□50	MB□63	MB□80	MB□100
Description	MB-S03	MB-S04	MB-S04	MB-S06	MB-S06	MB-S10
Trunnion pivot bracket (Note)	MB-S03	MB-S04	MB-S04	MB-S06	MB-S06	MB-S10
Double clevis pivot bracket	MB-B03	MB-B03	MB-B05	MB-B05	MB-B08	MB-B08

Note) Order 2 trunnion pivot brackets per cylinder.

Trunnion pivot bracket

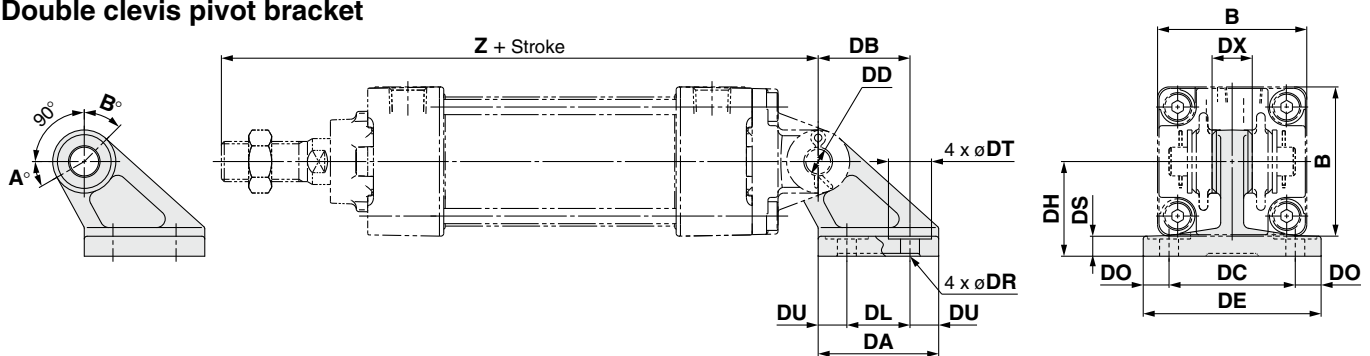


Part no.	Bore size (mm)	B	TA	TL	TU	TC	TX	TE	TO	TR	TT	TS	TH	TF	Z**	TD _{H10}
MB-S03	32	46	62	45	8.5	62	50	74	12	7	13	10	35	47	89	12 ^{+0.070} ₀
	40	52	80	60	10	80	63	97	17	9	17	12	45	60	93	16 ^{+0.070} ₀
MB-S04	50	65	80	60	10	92	75	109	17	9	17	12	45	60	105	16 ^{+0.070} ₀
	63	75	100	70	15	110	90	130	20	11	22	14	60	80	105	20 ^{+0.084} ₀
MB-S06	80	95	100	70	15	130	110	150	20	11	22	14	60	80	129	20 ^{+0.084} ₀
	100	114	120	90	15	158	132	184	26	13.5	24	17	75	100	129	25 ^{+0.084} ₀

Without Air Cushion

Bore size (mm)	Z
32	92
40	96
50	109
63	109
80	134
100	134

Double clevis pivot bracket



Part 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

Rotating Angle

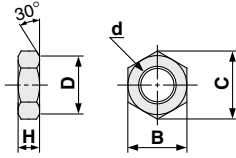
Bore size (mm)	A°	B°	A° + B° + 90°
32, 40	25°	45°	160°
50, 63	40°	60°	190°
80, 100	30°	55°	175°

** Model without air cushion is designed to include rubber bumpers. Since the bumpers are attached to the both sides of the piston, the "Z" dimension is longer than the cylinder with air cushion as follows: ø32, ø40: +3 mm, ø50, ø63: +4 mm, ø80, ø100: +5 mm

* Model without air cushion is designed to include rubber bumpers. Since the bumpers are attached to the both sides of the piston, the overall length is longer than the cylinder with air cushion as follows: ø32, ø40: +6 mm, ø50, ø63: +8 mm, ø80, ø100: +10 mm

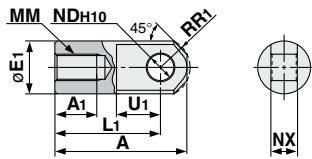
Dimensions of Accessories

Rod end nut
(Standard)



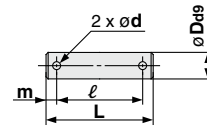
Part no.	Bore size (mm)	d	H	B	C	D
NT-03	32	M10 x 1.25	6	17	19.6	16.5
NT-04	40	M14 x 1.5	8	22	25.4	21
NT-05	50, 63	M18 x 1.5	11	27	31.2	26
NT-08	80	M22 x 1.5	13	32	37.0	31
NT-10	100	M26 x 1.5	16	41	47.3	39
NT-12M	125	M27 x 2	16	41	47.3	39

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}
I-12M	125	119	36	46	92	M27 x 2	28.5	34	25 ^{+0.084} ₀	32 ^{-0.10} _{-0.30}

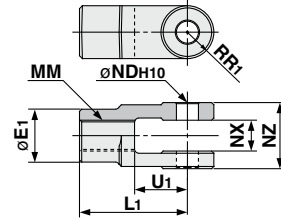
Knuckle joint pin
Clevis pin



Part no.	Bore size (mm) Clevis Knuckle	D _{øg}	L	ℓ	m	d (Dill through)	Applicable split pin
CD-M03 ^{Note 1)}	32, 40	10 ^{-0.040} _{-0.076}	44	36	4	3	ø3 x 18L
CD-M05 ^{Note 1)}	50, 63	14 ^{-0.050} _{-0.093}	60	51	4.5	4	ø4 x 25L
CD-M08 ^{Note 1)}	80, 100	22 ^{-0.065} _{-0.117}	82	72	5	4	ø4 x 35L
IY-12 ^{Note 2)}	125	25 ^{-0.085} _{-0.117}	79.5	69.5	5	4	ø4 x 40L

Note 1) Split pins and flat washers are included. Note 2) Only pin is shipped.

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 ^{Note 1)}	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 ^{Note 1)}	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 ^{Note 1)}	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 ^{Note 1)}	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 ^{Note 1)}	100	40	65	M26 x 1.5	20	34	22 ^{+0.084} ₀	30 ^{+0.30} _{+0.10}	60 ^{-0.10} _{-0.30}
Y-12M ^{Note 2)}	125	46	100	M27 x 2	27	42	25 ^{+0.084} ₀	32 ^{+0.30} _{+0.10}	64 ^{-0.10} _{-0.30}

Note 1) A pin, split pins and flat washers are included. Note 2) A pin and split pins are included.

Bracket Combinations

Bracket combination available Refer to the figure below.

Bracket for cylinder	Bracket for workpiece	Single clevis	Double clevis	Single knuckle joint	Double knuckle joint	Clevis pivot bracket
Single clevis	—	—	①	—	②	—
Double clevis	③	—	—	④	—	⑨
Single knuckle joint	—	—	⑤	—	⑥	—
Double knuckle joint	⑦	—	—	⑧	—	⑩

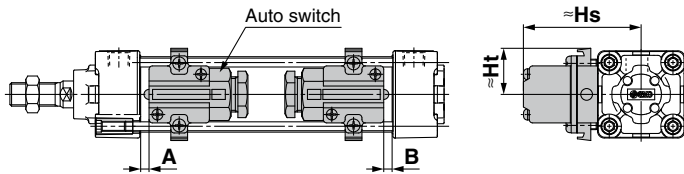
No.	Appearance	No.	Appearance
①	Single clevis + Double clevis	⑥	Single knuckle joint + Double knuckle joint
②	Single clevis + Double knuckle joint	⑦	Double knuckle joint + Single clevis
③	Double clevis + Single clevis	⑧	Double knuckle joint + Single knuckle joint
④	Double clevis + Single knuckle joint	⑨	Double clevis + Clevis pivot bracket
⑤	Single knuckle joint + Double clevis	⑩	Double knuckle joint + Clevis pivot bracket

Series MB Auto Switch Mounting

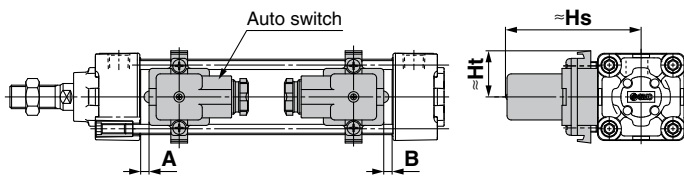
Auto Switch Proper Mounting Position (Detection at stroke end) and Its Mounting Height

<Band mounting>

D-A3□/G39/K39



D-A44



<Tie-rod mounting>

D-M9□/M9□V

D-M9□W/M9□WV

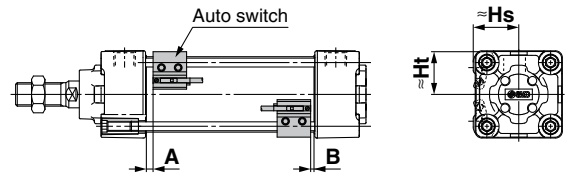
D-M9□A/M9□AV

D-A9□/A9□V

D-Z7□/Z80

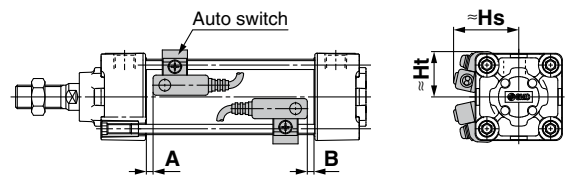
D-Y59□/Y69□/Y7P/Y7PV

D-Y7□W/Y7□WV/Y7BA



D-A5□/A6□

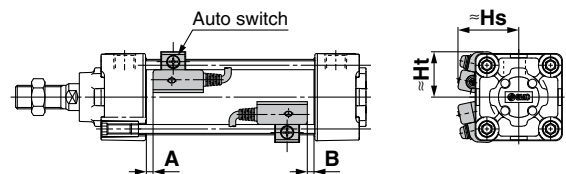
D-A59W



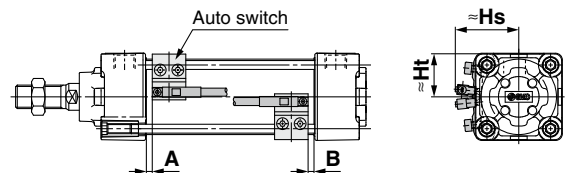
D-F5□/J5□

D-F5□W/J59W/F5BA

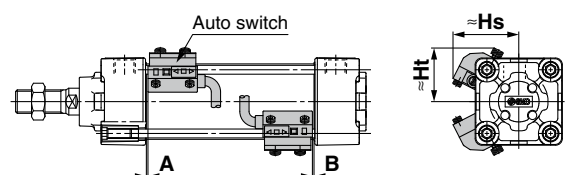
D-F59F/F5NT



D-P3DW



D-P4DW



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

Auto Switch Proper Mounting Position

(mm)

Auto switch model	D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□A D-M9□AV		D-A9□ D-A9□V		D-A5□ D-A6□		D-A59W		D-F5□ D-J5□ D-F59F		D-F5NT		D-J51		D-A3□ D-A44 D-G39 D-K39		D-Z7□ D-Z8□ D-Y59□ D-Y69□ D-Y7P D-Y7PV D-Y7H D-Y7□W D-Y7□WV		D-P3DW		D-P4DW	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
32	10	8	6	4	0	0	4	2	6.5	4.5	11.5	9.5	6	4	0	0	3.5	1.5	5.5	3.5	3	1
40	9	9	5	5	0	0	3	3	5.5	5.5	10.5	10.5	5	5	0	0	2.5	2.5	4.5	4.5	2	2
50	10	9	6	5	0	0	4	3	6.5	5.5	11.5	10.5	6	5	0	0	3.5	2.5	5.5	4.5	3	2
63	10	9	6	5	0	0	4	3	6.5	5.5	11.5	10.5	6	5	0	0	3.5	2.5	5.5	4.5	3	2
80	14.5	11.5	10.5	7.5	4.5	1.5	8.5	5.5	11	8	16	13	10.5	7.5	4.5	1.5	8	5	5.5	2	7.5	4.5
100	14	12	10	8	4	2	8	6	10.5	8.5	15.5	13.5	10	8	4	2	7.5	5.5	5	2.5	7	5

* Models without air cushion have different dimensions for auto switch proper mounting positions (A and B). Add the following values to both A and B: 3 mm (ø 32 and 40), 4 mm (ø50 and 63), 5 mm (ø80 and 100).

Note) Adjust the auto switch after confirming the operating conditions in the actual setting.

Auto Switch Proper Mounting Height

(mm)

Auto switch model	D-M9□ D-M9□W D-M9□A D-A9□		D-A9□V		D-M9□V D-M9□WV D-M9□AV		D-A5□ D-A6□ D-A59W		D-F5□ D-J5□ D-F59F D-F5□W D-J59W D-F5BA D-F5NT		D-A3□ D-G39 D-K39		D-A44		D-Z7□ D-Z80 D-Y59□ D-Y7P D-Y7□W D-Y7BA		D-Y69□ D-Y7PV D-Y7□WV		D-P3DW		D-P4DW	
	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht
32	24.5	23	27.5	23	30.5	23	35	24.5	32.5	25	67	27.5	77	27.5	25.5	23	26.5	23	34	23	38	31
40	28.5	25.5	31.5	25.5	34	25.5	38.5	27.5	36.5	27.5	71.5	27.5	81.5	27.5	29.5	26	30	26	38	26	42	33
50	33.5	31	36	31	38.5	31	43.5	34.5	41	34	77	—	87	—	33.5	31	34.5	31	42	31	46.5	39
63	38.5	36	40.5	36	43	36	48.5	39.5	46	39	83.5	—	93.5	—	39	36	40	36	50	36	51.5	44
80	46.5	45	49	45	52	45	55	46.5	52.5	46.5	92.5	—	103	—	47.5	45	48.5	45	56	45	58	51.5
100	54	53.5	57	53.5	59.5	53.5	62	55	59.5	55	103	—	113.5	—	55.5	53.5	56.5	53.5	63.5	53.5	65.5	60.5

Operating Range

(mm)

Auto switch model	Bore size						
	32	40	50	63	80	100	
D-M9□/M9□V D-M9□W/M9□WV D-M9□A/M9□AV	4	4.5	5	6	6	6	
D-A9□/A9□V	7	7.5	8.5	9.5	9.5	10.5	
D-Z7□/Z80	7.5	8.5	7.5	9.5	9.5	10.5	
D-A5□/A6□	9	9	10	11	11	11	
D-A59W	13	13	13	14	14	15	
D-A3□/A44	9	9	10	11	11	11	
D-Y59□/Y69□ D-Y7P/Y7□V D-Y7□W/Y7□WV D-Y7BA	5.5	5.5	7	7.5	6.5	5.5	
D-F5□/J5□ D-F5□W/J59W D-F5BA/F5NT D-F59F	3.5	4	4	4.5	4.5	4.5	
D-G39/K39	9	9	9	10	10	11	
D-P3DW	4.5	5	5	5.5	4	6.5	
D-P4DW	4	4	4	4.5	4	4.5	

* Values which include hysteresis are for guideline purposes only, they are not a guarantee (assuming approximately ±30% dispersion) and may change substantially depending on the ambient environment.

Minimum Stroke for Auto Switch Mounting/Mounting Brackets Except Center Trunnion

n: Number of auto switches (mm)

Auto switch model	Number of auto switches	Mounting brackets except center trunnion	
		ø32, ø40, ø50, ø63	ø80, ø100
D-M9□ D-M9□W	2 (Different surfaces, same surface) 1	15	
	n	$15 + 40 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	
D-M9□V D-M9□WV	2 (Different surfaces, same surface) 1	10	
	n	$10 + 30 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	
D-M9□A	2 (Different surfaces, same surface) 1	15	
	n	$15 + 40 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	
D-M9□AV	2 (Different surfaces, same surface) 1	15	
	n	$15 + 30 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	
D-A9□	2 (Different surfaces, same surface) 1	15	
	n	$15 + 40 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	
D-A9□V	2 (Different surfaces, same surface) 1	10	
	n	$10 + 30 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	
D-A3□ D-G39 D-K39	2 (Different surfaces)	35	
	2 (Same surface)	100	
	n (Different surfaces)	$35 + 30 (n - 2)$ (n = 2, 3, 4...)	
	n (Same surface)	$100 + 100 (n - 2)$ (n = 2, 3, 4...)	
D-A44	1	10	
	2 (Different surfaces)	35	
	2 (Same surface)	55	
	n (Different surfaces)	$35 + 30 (n - 2)$ (n = 2, 3, 4...)	
	n (Same surface)	$55 + 50 (n - 2)$ (n = 2, 3, 4...)	
D-A5□ D-A6□	2 (Different surfaces, same surface) 1	15	20
	n (Different surfaces)	$15 + 55 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	$20 + 55 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)
D-A59W	2 (Different surfaces, same surface)	20	25
	n (Same surface)	$20 + 55 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	$25 + 55 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)
	1	15	25
D-F5□ D-J5□ D-F5□W D-J59W D-F5BA D-F59F	2 (Different surfaces, same surface)	15	25
	n (Same surface)	$15 + 55 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	$25 + 55 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)
	1	10	25
D-F5NT	2 (Different surfaces, same surface)	15	25
	n (Same surface)	$15 + 55 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	$25 + 55 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)
	1	10	25
D-Z7□ D-Z80 D-Y59□ D-Y7P D-Y7□W	2 (Different surfaces, same surface) 1	15	
	n	$15 + 40 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	

Minimum Stroke for Auto Switch Mounting/Mounting Brackets Except Center Trunnion

n: Number of auto switches (mm)

Auto switch model	Number of auto switches	Mounting brackets except center trunnion		
		ø32, ø40	ø50, ø63	ø80, ø100
D-Y69□ D-Y7PV D-Y7□WV	2 (Different surfaces, same surface) 1	10		
	n	$10 + 30 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)		
D-Y7BA	2 (Different surfaces, same surface) 1	20		
	n	$20 + 45 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)		
D-P3DW	2 (Different surfaces), 1	25		
	2 (Same surface)	45	25	
	n (Different surfaces)	$25 + 50 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)		
	n (Same surface)	$45 + 50 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	$25 + 50 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	
D-P4DW	2 (Different surfaces, same surface) 1	15		
	n	$15 + 65 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)		

Minimum Stroke for Auto Switch Mounting/Center Trunnion

n: Number of auto switches (mm)

Auto switch model	Number of auto switches	Center trunnion					
		ø32	ø40	ø50	ø63	ø80	ø100
D-M9□ D-M9□W	2 (Different surfaces, same surface) 1	75	80		85	90	95
	n	$75 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$80 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)		$85 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$90 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$95 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
D-M9□V D-M9□WV	2 (Different surfaces, same surface) 1	50	55		60	65	70
	n	$50 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$55 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)		$60 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$65 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$70 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
D-M9□A	2 (Different surfaces, same surface) 1	80	85		90	95	100
	n	$80 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$85 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)		$90 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$95 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$100 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
D-M9□AV	2 (Different surfaces, same surface) 1	55	60		65	70	75
	n	$55 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$60 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)		$65 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$70 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$75 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
D-A9□	2 (Different surfaces, same surface) 1	70	75		80	85	95
	n	$70 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$75 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)		$80 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$85 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$95 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
D-A9□V	2 (Different surfaces, same surface) 1	45	50		55	60	70
	n	$45 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$50 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)		$55 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$60 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$70 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
D-A3□ D-G39 D-K39	2 (Different surfaces)	60	65		75	80	85
	2 (Same surface)	90	95		100	105	110
	n (Different surfaces)	$60 + 30(n-2)$ (n = 2, 4, 6, 8...)	$65 + 30(n-2)$ (n = 2, 4, 6, 8...)		$75 + 30(n-2)$ (n = 2, 4, 6, 8...)	$80 + 30(n-2)$ (n = 2, 4, 6, 8...)	$85 + 30(n-2)$ (n = 2, 4, 6, 8...)
	n (Same surface)	$90 + 100(n-2)$ (n = 2, 4, 6, 8...)	$95 + 100(n-2)$ (n = 2, 4, 6, 8...)		$100 + 100(n-2)$ (n = 2, 4, 6, 8...)	$105 + 100(n-2)$ (n = 2, 4, 6, 8...)	$110 + 100(n-2)$ (n = 2, 4, 6, 8...)
1	60	65		75	80	85	
D-A44	2 (Different surfaces)	70	75		80		85
	2 (Same surface)						
	n (Different surfaces)	$70 + 30(n-2)$ (n = 2, 4, 6, 8...)	$75 + 30(n-2)$ (n = 2, 4, 6, 8...)		$80 + 30(n-2)$ (n = 2, 4, 6, 8...)		$85 + 30(n-2)$ (n = 2, 4, 6, 8...)
	n (Same surface)	$70 + 50(n-2)$ (n = 2, 4, 6, 8...)	$75 + 50(n-2)$ (n = 2, 4, 6, 8...)		$80 + 50(n-2)$ (n = 2, 4, 6, 8...)		$85 + 50(n-2)$ (n = 2, 4, 6, 8...)
1	70	75		80		85	
D-A5□ D-A6□	2 (Different surfaces, same surface) 1	60		80	105	110	115
	n (Same surface)	$60 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)		$80 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$105 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$110 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$115 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
D-A59W	2 (Different surfaces, same surface)	60	70	85	110	115	120
	n (Same surface)	$60 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$70 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$85 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$110 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$115 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$120 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
	1	60	70	85	110	115	120
D-F5□/J5□ D-F5□W D-J59W D-F5BA D-F59F	2 (Different surfaces, same surface)	90	95		110	115	120
	n (Same surface)	$90 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$95 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)		$110 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$115 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$120 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
	1	90	95		110	115	120
D-F5NTL	2 (Different surfaces, same surface)	100	105		120	125	130
	n (Same surface)	$100 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$105 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)		$120 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$125 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$130 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
	1	100	105		120	125	130
D-Z7□ D-Z80 D-Y59□ D-Y7P D-Y7□W	2 (Different surfaces, same surface) 1	80	85	90		95	100
	n	$80 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$85 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$90 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)		$95 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$100 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
D-Y69□ D-Y7PV D-Y7□WV	2 (Different surfaces, same surface) 1	60	65		70	75	85
	n	$60 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$65 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)		$70 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$75 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$85 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)

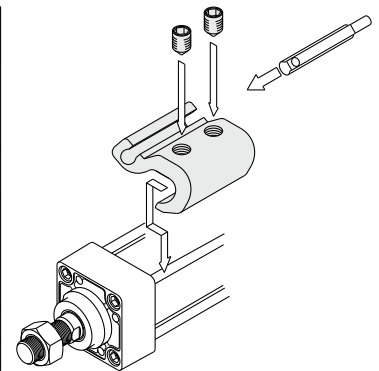
Minimum Stroke for Auto Switch Mounting/Center Trunnion

n: Number of auto switches (mm)

Auto switch model	Number of auto switches	Center trunnion				
		ø32	ø40	ø50	ø63	ø80
D-Y7BA	2 (Different surfaces, same surface) 1	85	90	100	105	110
	n	$85 + 45 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$90 + 45 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$100 + 45 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$105 + 45 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$110 + 45 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
D-P3DW	2 (Different surfaces, same surface) 1	80	85	90	95	
	n	$80 + 50 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$80 + 50 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$90 + 50 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$95 + 50 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	
D-P4DW	2 (Different surfaces, same surface) 1	120		130	140	
	n	$120 + 65 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)		$130 + 65 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$140 + 65 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	

Auto Switch Mounting Brackets/Part No.

Auto switch model	Bore size (mm)					
	32	40	50	63	80	100
D-M9□W/M9□WV D-M9□A/M9□AV D-A9□/A9□V D-M9□/M9□V	BMB5-032	BMB5-032	BA7-040	BA7-040	BA7-063	BA7-063
D-A3□/A44 D-G39/K39	BMB2-032	BMB2-040	BMB1-050	BMB1-063	BMB1-080	BMB1-100
D-A5□/A6□/A59W D-F5□/J5□ D-F5□W/J59W D-F59F/F5BA D-F5NT	BT-03	BT-03	BT-05	BT-05	BT-06	BT-06
D-P3DW	BMB9-032S	BMB9-032S	BMB9-050S	BMB9-050S	BA9T-063S	BA9T-063S
D-P4DW	BMB3T-040	BMB3T-040	BMB3T-050	BMB3T-050	BMB3T-080	BMB3T-080
D-Z7□/Z80 D-Y59□/Y69□ D-Y7P/Y7PV D-Y7□W/Y7□WV D-Y7BA	BMB4-032	BMB4-032	BMB4-050	BMB4-050	BA4-063	BA4-063



The figure shows the mounting example for the D-A9□(V)/M9□(V)/M9□W(V)/M9□A(V).

[Stainless Steel Mounting Screw]

The following stainless steel mounting screw kit (including set screws) is available. Use it in accordance with the operating environment. (Since the auto switch mounting bracket is not included, order it separately.)

BBA1: For D-A5/A6/F5/J5 types

Note 1) Refer to Best Pneumatics No. 2 for details on the BBA1.

The above stainless steel screws are used when a cylinder is shipped with the D-F5BA auto switch. When only on auto switch is shipped independently, the BBA1 is attached.

Note 2) When using the D-M9□A(V)L or Y7BA, do not use the steel set screws which are included with the auto switch mounting brackets above (BMB5-032, BA7-□□□, BMB4-□□□, BA4-□□□). Order a stainless steel screw kit (BBA1) separately, and use the M4 x 6L stainless steel set screws included in the BBA1.

Other than the applicable auto switches listed in "How to Order", the following auto switches are mountable.

Refer to Best Pneumatics No. 2 for the detailed specifications.

Type	Model	Electrical entry	Features
Reed	D-A93V/A96V	Grommet (Perpendicular)	—
	D-A90V		Without indicator light
	D-B35	Grommet (In-line)	—
	D-A53/A56/Z73/Z76		Without indicator light
	D-A67/Z80		
Solid state	D-M9NV/M9PV/M9BV	Grommet (Perpendicular)	—
	D-Y69A/Y69B/Y7PV		Diagnostic indication (2-color indication)
	D-M9NWV/M9PWV/M9BWW		Water resistant (2-color indication)
	D-Y7NWW/Y7PWV/Y7BWW		Magnetic field resistant (2-color indication)
	D-M9NAV/M9PAV/M9BAV		
	D-P4DW		
	D-F59/F5P/J59	Grommet (In-line)	—
	D-Y59A/Y59B/Y7P		Diagnostic indication (2-color indication)
	D-Y7H		Water resistant (2-color indication)
	D-F59W/F5PW/J59W		With timer
	D-Y7NW/Y7PW/Y7BW		Magnetic field resistant (2-color indication)
	D-F5BA/Y7BA		
	D-F5NT		
D-P5DW			

* With pre-wired connector is also available for solid state switches. For details, refer to Best Pneumatics No. 2.

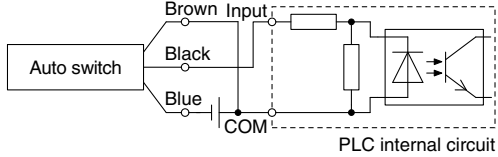
* Normally closed (NC = b contact) solid state auto switches (D-F9G/F9H/Y7G/Y7H) are also available. For details, refer to Best Pneumatics No. 2.

Prior to Use

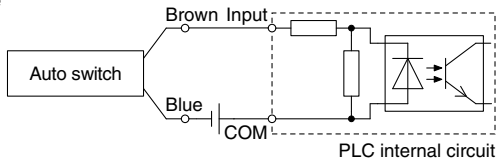
Auto Switch Connection and Example

Sink Input Specifications

3-wire, NPN

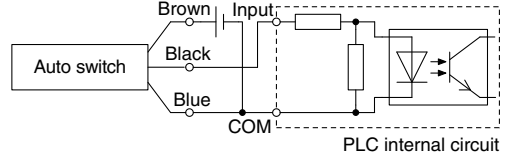


2-wire

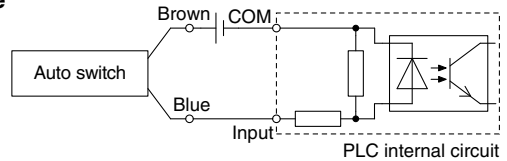


Source Input Specifications

3-wire, NPN



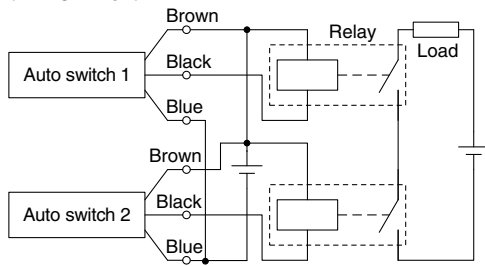
2-wire



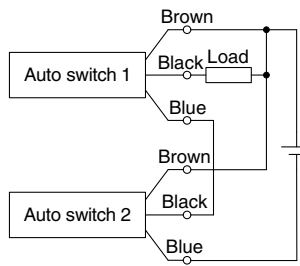
Connect according to the applicable PLC input specifications, as the connection method will vary depending on the PLC input specifications.

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

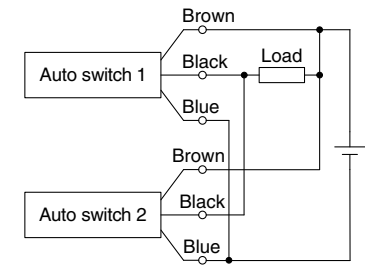
3-wire,
AND connection for NPN output
(Using relays)



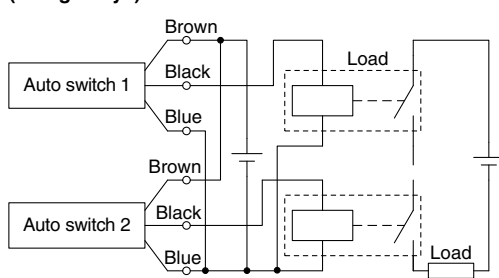
(Performed with auto switches only)



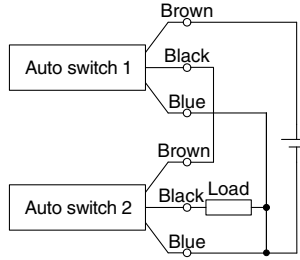
3-wire,
OR connection for NPN output



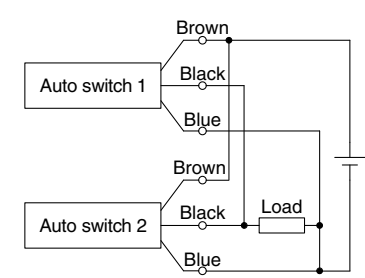
3-wire,
AND connection for NPN output
(Using relays)



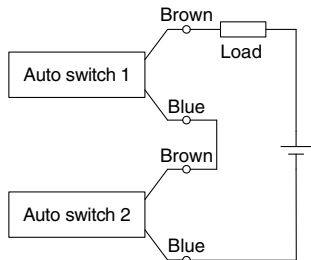
(Performed with auto switches only)



3-wire,
OR connection for PNP output



2-wire,
AND connection

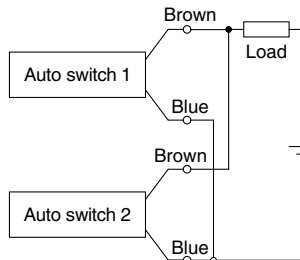


When two auto switches are connected in series, malfunction may occur because the load voltage will decrease in the ON state. The indicator lights will light up when both of the auto switches are in the ON state.

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

Example: Power supply voltage 24 VDC
Auto switch internal voltage drop 4 V

2-wire,
OR connection



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

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

Example: Load impedance 3 kΩ
Auto switch leakage current 1 mA

(Reed)
Because there is no leakage current, the load voltage will not increase in the OFF state. However, depending on the number of auto switches in the ON state, the indicator lights may sometimes grow dim or not light up, due to the dispersion and reduction of the current flowing to the auto switches.



Series MB

Specific Product Precautions

Be sure to read before handling. Refer to back cover for Safety Instructions, "Handling Precautions for SMC Products" (M-E03-3) and the Operation Manual for Actuator Precautions and Auto Switch Precautions.

Adjustment

⚠ Warning

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

Crimping ($\phi 32$) or a retaining ring ($\phi 40$ to $\phi 100$) is provided to prevent the accidental removal of the cushion valve. Do not open the valve beyond the mechanism. If air is supplied, the cushion valve may shoot out from the cover.

Bore (mm)	Cushion valve width across flats (mm)	Hexagon wrench
32, 40	2.5	JIS 4648 Hexagonal wrench key 2.5
50, 63	3	JIS 4648 Hexagonal wrench key 3
80, 100	4	JIS 4648 Hexagonal wrench key 4

2. Use the air cushion at the end of cylinder stroke.

Select the cylinder with bumper if the cushion valve is to be fully opened. Otherwise, tie-rods or piston assembly may be damaged.

3. When replacing mounting brackets, use a hexagon wrench.

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

4. When replacing mounting brackets, tie-rod nuts on the cylinder body become loosened.




After retightening the tie-rod nuts with the proper tightening torque (Refer to Adjustment 3.), mount a mounting bracket.

5. Do not disassemble the trunnion type cylinder because the mounting precision is required.

It is difficult to align the axial center of the trunnion with the axial center of the cylinder. Thus, if this type of cylinder is disassembled and reassembled, the required dimensional accuracy cannot be attained, which may lead to malfunctions.

Safety Instructions

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

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

- *1) ISO 4414: Pneumatic fluid power – General rules relating to systems.
ISO 4413: Hydraulic fluid power – General rules relating to systems.
IEC 60204-1: Safety of machinery – Electrical equipment of machines.
(Part 1: General requirements)
ISO 10218-1: Manipulating industrial robots – Safety.
etc.

Warning

- 1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.**
Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.
- 2. Only personnel with appropriate training should operate machinery and equipment.**
The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.
- 3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**
 1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
 2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
 3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.
- 4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**
 1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
 2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
 3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
 4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

Caution

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

Limited warranty and Disclaimer/ Compliance Requirements


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

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.*2)
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.
***2) Vacuum pads are excluded from this 1 year warranty.**
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.
Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

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

 **Safety Instructions** Be sure to read “Handling Precautions for SMC Products” (M-E03-3) before using.

SMC Corporation

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

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