



Small compact cylinder double acting/single rod

MSD Series

● Bore size: $\phi 6/\phi 8$

JIS symbol



Double acting



Specifications

Item	MSD MSD-L (with switch)
Bore size mm	$\phi 6, \phi 8$
Actuation	Double acting
Working fluid	Compressed air
Max. working pressure MPa	1.0 (≈ 150 psi, 10 bar)
Min. working pressure MPa	0.15 (≈ 22 psi, 1.5 bar)
Proof pressure MPa	1.6 (≈ 230 psi, 16 bar)
Ambient temperature $^{\circ}\text{C}$	-10 (14°F) to 60 (140°F) (no freezing)
Port size	M3
Stroke tolerance mm	+0.5 0
Working piston speed mm/s	50 to 500
Cushion	None
Lubrication	Not required (use turbine oil ISO VG32 if necessary for lubrication)
Allowable absorbed energy J	This product cannot absorb the energy generated by an external load mounted on the cylinder. When using the product with no load, separately provide a shock absorber on the outside.

Stroke length

Bore size (mm)	Standard stroke length (mm)	Max. stroke length (mm)	Min. stroke length with two switches (mm)		Min. stroke length with one switch (mm)	
			Reed switch	Proximity switch	Reed switch	Proximity switch
$\phi 6$	5/10/15/20/25/30	30	10	5(10)	5	5
$\phi 8$	5/10/15/20/25/30	30	10	5(10)	5	5

*1: Products with stroke length other than standard stroke length are not available. *2: For F2Y, F3Y or F3P, the min. stroke length will be the dimensions in ().

Switch specifications

Item	Reed 2-wire	Proximity 2-wire			Proximity 3-wire			
	FOH/V	F2H/V	F2S	F2YH/V	F3H/V	F3S	F3PH/V (Made to order)	F3YH/V
Applications	Dedicated for programmable controller				For programmable controller, relay			
Output method	-				NPN output	NPN output	PNP output	NPN output
Power supply voltage	-	-	-	-	10 to 28 VDC	10 to 28 VDC	4.5 to 28 VDC	10 to 28 VDC
Load voltage	24 VDC	10 to 30 VDC	10 to 30 VDC	24 VDC ±10%	30 VDC or less			
Load current	5 to 20 mA (*3)				50 mA or less			
Current consumption	-	-	-	-	≤10 mA (ON) at 24 VDC	10 mA or less with 24 VDC		
Internal voltage drop	4V or less				0.5V or less		0.5 V or less at 30 mA	0.5V or less
Indicator lamp	Yellow LED (Lit when ON)		LED (Lit when ON)	Red/green LED (Lit when ON)	Yellow LED (Lit when ON)	LED (Lit when ON)	Yellow LED (Lit when ON)	Red/green LED (Lit when ON)
Leakage current	1 mA or less				10 μA or less			
Lead wire length	Standard 1 m (oil resistant vinyl cabtyre cable 2-conductor 0.15 mm ²)				Standard 1 m (oil resistant vinyl cabtyre cable 3-conductor 0.15 mm ²)			
Shock resistance	294 m/s ²	980 m/s ²						
Insulation resistance	20 MΩ and over with 500 VDC megger							
Withstand voltage	No failure after 1 minute of 1,000 VAC application.							
Ambient temperature	-10 to +60°C							
Degree of protection	IEC Standard IP67, JIS C0920 (water-tight), oil resistance							
Weight g	1 m:10 3 m:29							

*1: Refer to Ending Page 1 for detailed switch specifications and dimensions.

*2: Switches other than the above models, such as switches with connectors, are also available. Refer to Ending Page 1.

*3: The max. load current is 20 mA at 25 $^{\circ}\text{C}$. The current is lower than 20 mA if the operating ambient temperature around the switch is higher than 25 $^{\circ}\text{C}$.
(5 to 10 mA at 60 $^{\circ}\text{C}$)

*4: The F type switch uses a bend-resistant lead wire.

Cylinder weight table

(Unit: g)

Stroke length (mm)	5		10		15		20		25		30		Weight per switch
Bore size (mm)	No switch	With switch	No switch	With switch	No switch	With switch	No switch	With switch	No switch	With switch	No switch	With switch	
ø6	22	24	25	27	27	29	30	32	33	35	36	38	Refer to the weight in the switch specifications.
ø8	23	26	28	31	33	36	38	41	42	45	47	50	

Theoretical thrust table

(Unit: N)

Bore size (mm)	Operating direction	Working pressure MPa									
		0.15	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
ø6	Push	4.24	5.65	8.48	11.3	14.1	17.0	19.8	22.6	25.4	28.3
	Pull	2.36	3.14	4.71	6.28	7.85	9.42	11.0	12.6	14.1	15.7
ø8	Push	7.54	10.1	15.1	20.1	25.1	30.2	35.2	40.2	45.2	50.3
	Pull	4.59	6.13	9.19	12.3	15.3	18.4	21.4	24.5	27.6	30.6

SCP*3
CMK2
CMA2
SCM
SCG
SCA2
SCS2
CKV2
CAV2/ COVP/N2
SSD2
SSG
SSD
CAT
MDC2
MVC
SMG
MSD/ MSDG
FC*
STK
SRL3
SRG3
SRM3
SRT3
MRL2
MRG2
SM-25
ShkAbs
FJ
FK
Spd Contr
Ending

How to order

● Without switch (without magnet for switch)

MSD - **6** - **5** - **R**

● With switch (built-in magnet for switch)

MSD-L - **6** - **5** - **F0H** - **R** - **R**

A Model No.

B Bore size

C Stroke length

D Switch model No.

*1

E Switch quantity

⚠ Precautions for model No. selection

*1 : For ø6 or ø8 with switch, use a non-magnetic (stainless steel, etc.) mounting bolt.

*2 : For rear piping, body side installation is possible. Note that 2 bolts are used for rod side installation and head side installation.

F Option

*2

[Example of model No.]

MSD-L-6-5-F0H-R-R

A Model No. : Double acting/single rod with switch

B Bore size : ø6 mm

C Stroke length : 5 mm

D Switch model No. : Reed F0H switch, lead wire 1 m

E Switch quantity : 1 on rod side

F Option : Rear piping

How to order switch

SW - **F0H**

Switch model No.
(Item **D** above)

Code		Description				
A Model No.						
MSD		Double acting/single rod	Without switch			
MSD-L			With switch			
B Bore size (mm)						
6		ø6				
8		ø8				
C Stroke length (mm)						
5		5				
10		10				
15		15				
20		20				
25		25				
30		30				
D Switch model No.						
Axial lead wire	Radial lead wire	Contact	Voltage AC DC		Indicator lamp	Lead wire
F0H*	F0V*	Reed		●	1-color display	2-wire
-	F2S*			●		
F2H*	F2V*			●		
-	F3S*			●		
F3H*	F3V*	Proximity		●	1-color display (PNP output) (custom)	3-wire
F3PH*	F3PV*			●		
F2YH*	F2YV*			●	2-color display	2-wire
F3YH*	F3YV*			●		
* Lead wire length						
Blank		1 m (standard)				
3		3 m (option)				
E Switch quantity						
R		1 on rod side				
H		1 on head side				
D		2				
F Option						
Blank		Front piping				
R		Rear piping				

Specifications for rechargeable battery

(Catalog No. CC-1226A)

● Design compatible with rechargeable battery manufacturing process

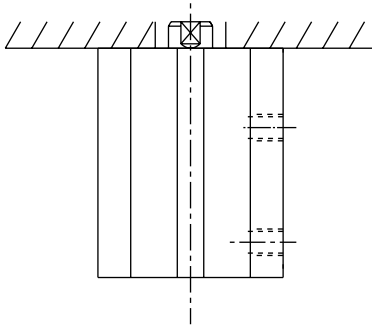
MSD - - **P4***

Switch selection table

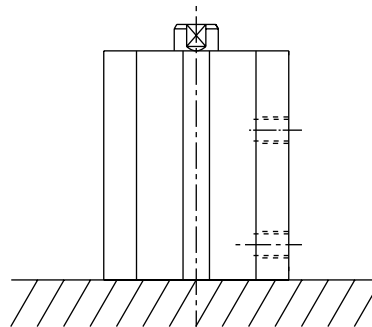
Switches may not be installable depending on relations between cylinder installation and stroke length.
Refer to the table below to select a switch.

Switches cannot be used for side mounting in the following combinations.

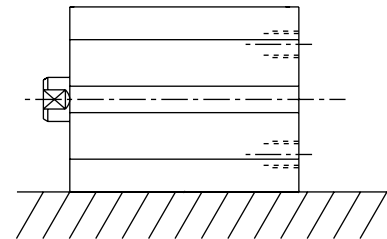
- Combinations in which F2YH/V, F3YH/V or F3PH/V is mounted at the switch mounting position H with stroke length 5 mm
- Combinations in which F2YH, F3YH or F3PH is mounted at the switch mounting position H with stroke length 10 mm
(Refer to page 1422 for the min. stroke length with switch)



For rod side installation



For head side installation



For side installation

● For rod side installation

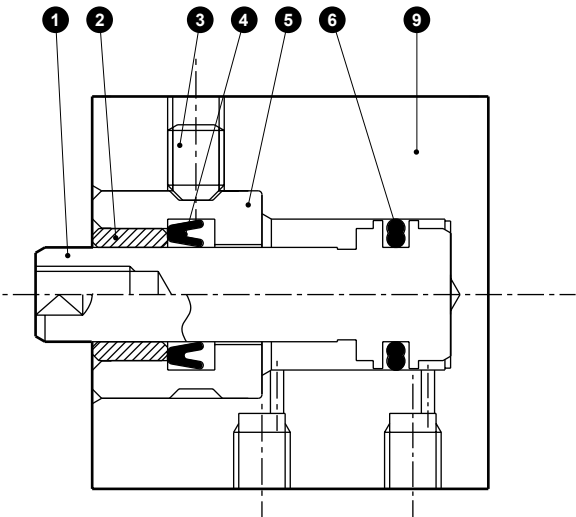
Bore size (mm)	Stroke length (mm)	Reed switch				Proximity switch									
		F0H		F0V		F2S/F3S		F2H/F3H		F2V/F3V		F2YH/F3YH/F3PH		F2YV/F3YV/F3PV	
		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position	
		R	H	R	H	R	H	R	H	R	H	R	H	R	H
ø6	5	○	○	○	○	○	○	○	×	○	○	○	×	○	×
	10	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	15 to	○	○	○	○	○	○	○	○	○	○	○	○	○	○
ø8	5	○	○	○	○	○	○	○	×	○	○	○	×	○	×
	10	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	15 to	○	○	○	○	○	○	○	○	○	○	○	○	○	○

● For head side installation

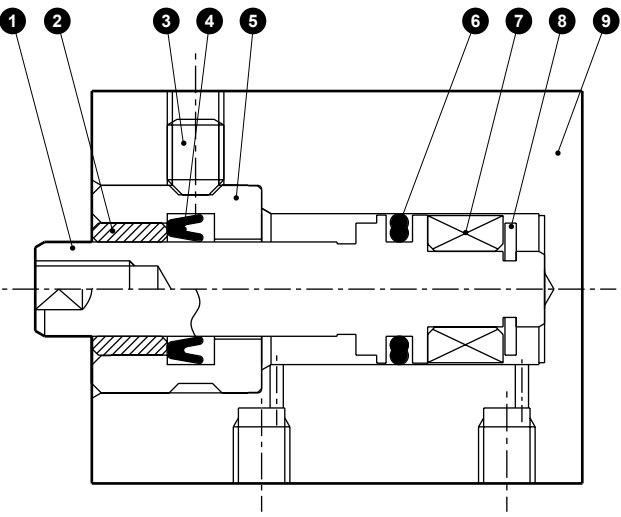
Bore size (mm)	Stroke length (mm)	Reed switch				Proximity switch									
		F0H		F0V		F2S/F3S		F2H/F3H		F2V/F3V		F2YH/F3YH/F3PH		F2YV/F3YV/F3PV	
		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position	
		R	H	R	H	R	H	R	H	R	H	R	H	R	H
ø6	5	×	×	○	○	○	○	×	○	○	○	×	×	○	×
	10	○	×	○	○	○	○	×	○	○	○	×	○	○	○
	15	○	×	○	○	○	○	○	○	○	○	×	○	○	○
	20 to	○	×	○	○	○	○	○	○	○	○	○	○	○	○
ø8	5	×	×	○	○	○	○	×	○	○	○	×	×	○	×
	10	○	×	○	○	○	○	×	○	○	○	×	○	○	○
	15	○	×	○	○	○	○	○	○	○	○	×	○	○	○
	20 to	○	×	○	○	○	○	○	○	○	○	○	○	○	○

Internal structure and parts list

● MSD-6/8



● MSD-L-6/8



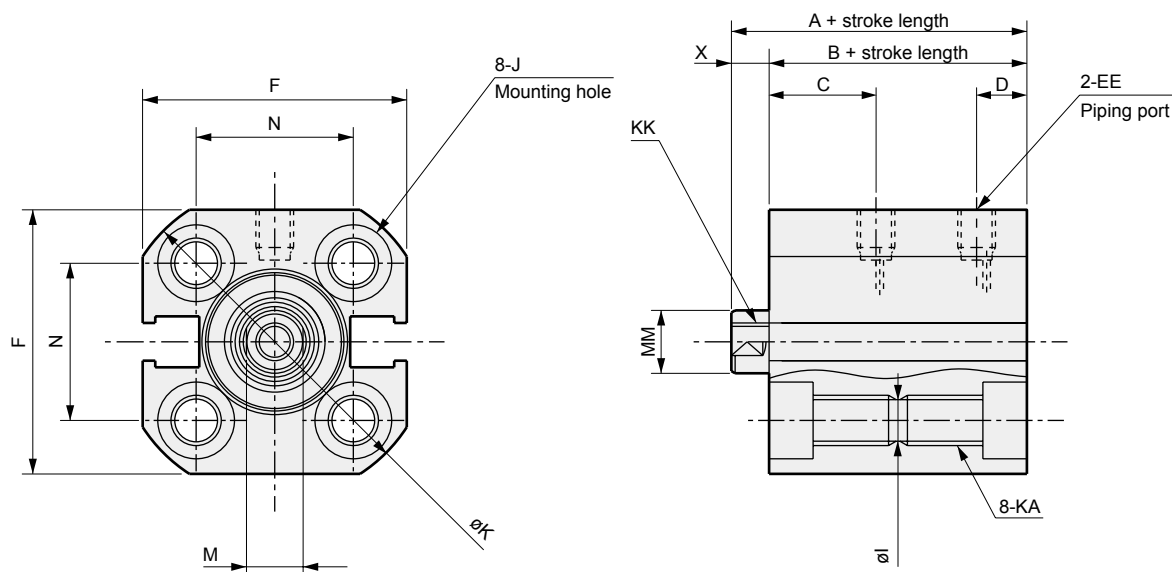
Cannot be disassembled

No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Piston	Stainless steel		6	Piston packing	Nitrile rubber	
2	Bush	Oil-impregnated copper alloy		7	Magnet	Plastic	
3	Hexagon socket set screw	Stainless steel		8	E type snap ring	Stainless steel	
4	Rod packing	Nitrile rubber		9	Body	Aluminum alloy	Hard alumite
5	Rod metal	Stainless steel					

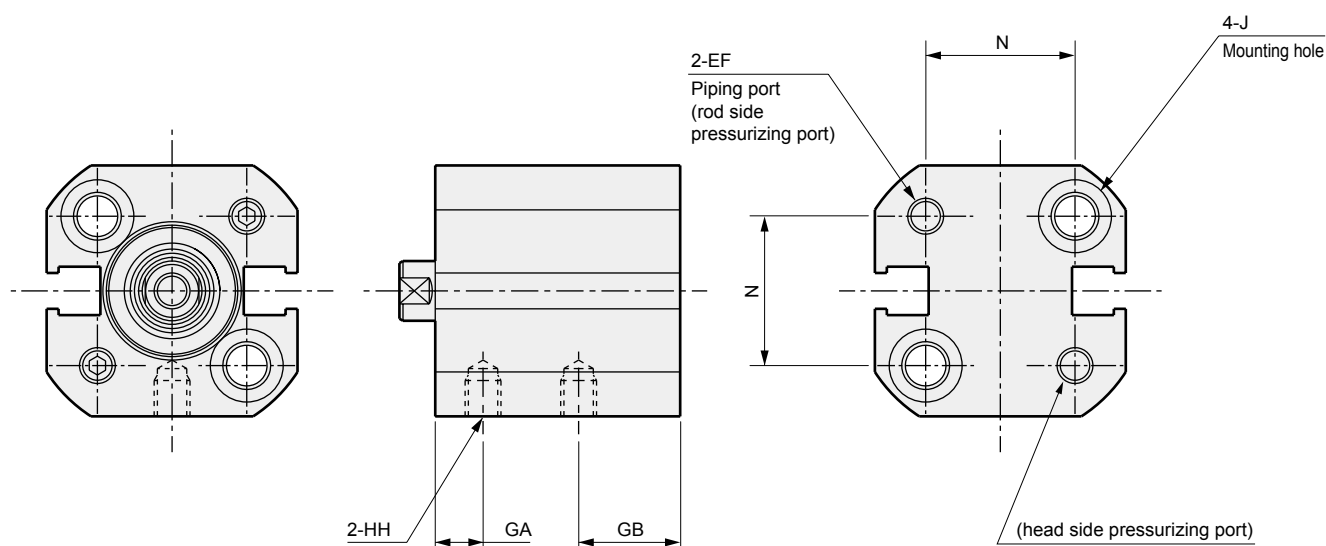
Dimensions



● MSD-(L)-6/8



● MSD-(L)-6/8-*-R (rear piping)

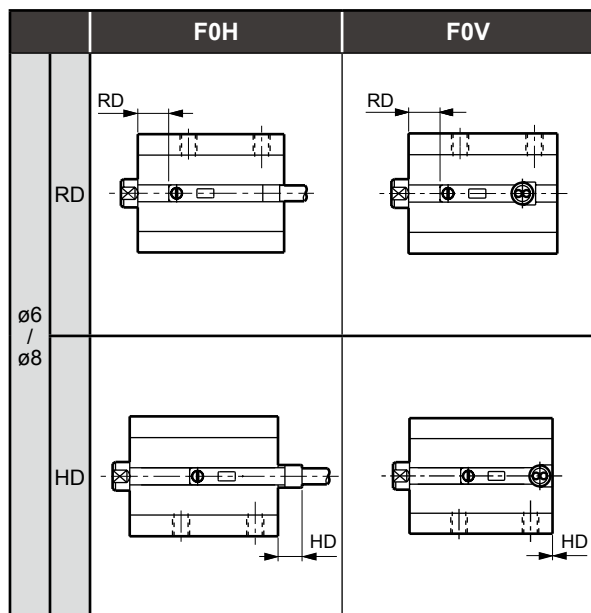


Bore size (mm)	Without switch		With switch		Common dimensions for types with/without switches											
	A	B	A	B	C	D	EE	EF	F	GA	GB	HH	I	J	K	KA
ø6	17.5	14.5	22.5	19.5	7.5	4	M3	M3	19	3	8.5	M3 depth 3	3.2	Spot face ø6.1 depth 3.5	22.5	M4 depth 6
ø8	19	16	24	21	9	4	M3	M3	21	4.5	8.5	M3 depth 3	3.2	Spot face ø6.1 depth 3.5	25	M4 depth 6

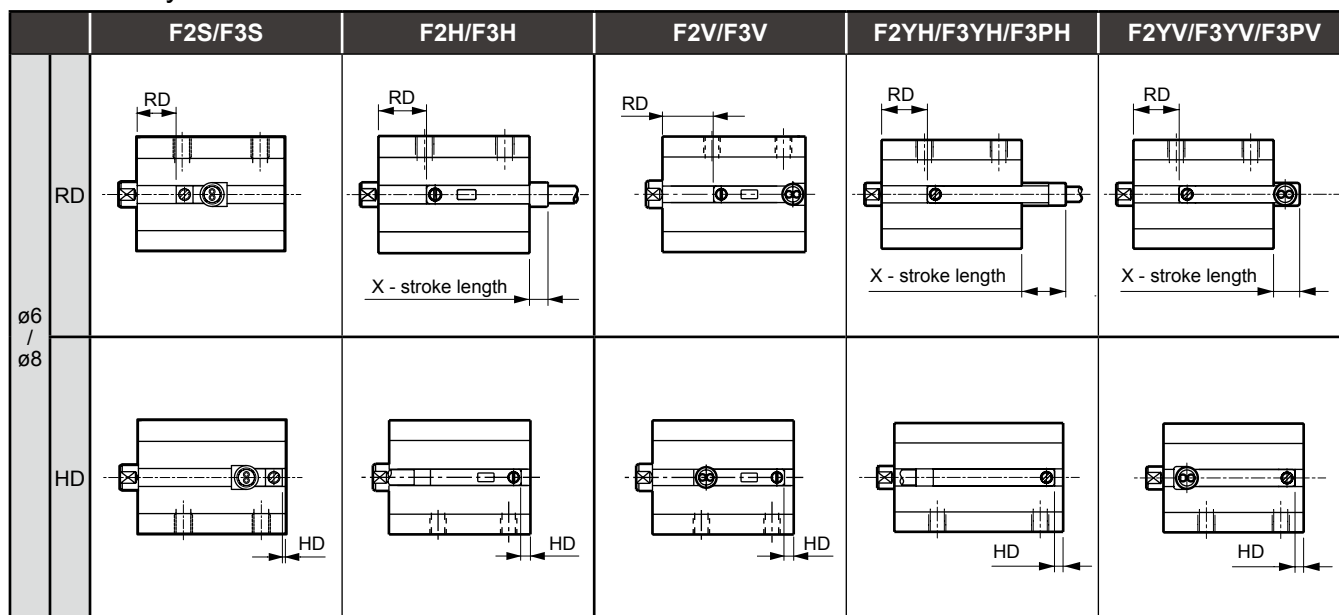
Bore size (mm)	Common parts for types with/without switches				
	KK	M	MM	N	X
ø6	M2.5 depth 4	3.5	4	11	3
ø8	M3 depth 5	4.5	5	12.5	3

Switch mounting position

● Reed switch



● Proximity switch



Switch mounting position dimensions

(Unit: mm)

Model	Bore size (mm)	Reed switch				Proximity switch												
		F0H		F0V		F2S/F3S		F2H/F3H			F2V/F3V		F2YH/F3YH/F3PH			F2YV/F3YV/F3PV		
		RD	HD	RD	HD	RD	HD	RD	HD	X (*1)	RD	HD	RD	HD	X (*1)	RD	HD	X (*1)
MSD-L	ø6	3.5	3.5	3.5	0.0	6.5	0.5	7.5	1.5	7.7	7.5	1.5	7.5	1.5	12.2	7.5	1.5	9.2
	ø8	5.5	4.0	5.5	0.0	8.5	0.0	9.5	1.0	8.2	9.5	1.0	9.5	1.0	12.7	9.5	1.0	9.7

*1: X dimensions indicate the switch protrusion from the body end surface. When the X-stroke length is negative, there is no protrusion from the body end surface.

SCP*3
CMK2
CMA2
SCM
SCG
SCA2
SCS2
CKV2
CAV2/ COVP/N2
SSD2
SSG
SSD
CAT
MDC2
MVC
SMG
MSD/ MSDG
FC*
STK
SRL3
SRG3
SRM3
SRT3
MRL2
MRG2
SM-25
ShkAbs
FJ
FK
Spd Contr
Ending

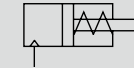


Small compact cylinder single acting/push
single acting/pull

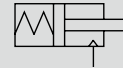
MSD-X_Y Series

● Bore size: $\phi 6/\phi 8$

JIS symbol



Single acting/push



Single acting/pull



Specifications

Item	MSD-X MSD-XL (with switch)	MSD-Y MSD-YL (with switch)
Bore size mm	$\phi 6$ $\phi 8$	$\phi 6$ $\phi 8$
Actuation	Single acting/push	Single acting/pull
Working fluid	Compressed air	
Max. working pressure MPa	1.0 (≈ 150 psi, 10 bar)	
Min. working pressure MPa	0.3 (≈ 44 psi, 3 bar)	0.4 (≈ 58 psi, 4 bar) 0.3 (≈ 44 psi, 3 bar)
Proof pressure MPa	1.6 (≈ 230 psi, 16 bar)	
Ambient temperature °C	-10 (14°F) to 60 (140°F) (no freezing)	
Port size	M3	
Stroke tolerance mm	+0.5 0	
Working piston speed mm/s	50 to 500	
Cushion	None	
Lubrication	Not required (use turbine oil ISO VG32 if necessary for lubrication)	
Allowable absorbed energy J	This product cannot absorb the energy generated by an external load mounted on the cylinder. When using the product with no load, separately provide a shock absorber on the outside.	

Stroke length

Bore size (mm)	Standard stroke length (mm)	Max. stroke length (mm)	Min. stroke length with two switches (mm)		Min. stroke length with one switch (mm)	
			Reed switch	Proximity switch	Reed switch	Proximity switch
$\phi 6$	5/10	10	10	5(10)	5	5
$\phi 8$	5/10	10	10	5(10)	5	5

*1: Products with stroke length other than standard stroke length are not available. *2: For F2Y, F3Y or F3P, the min. stroke length will be the dimensions in ().

Switch specifications

Item	Reed 2-wire	Proximity 2-wire			Proximity 3-wire			
	FOH/V	F2H/V	F2S	F2YH/V	F3H/V	F3S	F3PH/V (Made to order)	F3YH/V
Applications	Dedicated for programmable controller				For programmable controller, relay			
Output method	-				NPN output	NPN output	PNP output	NPN output
Power supply voltage	-	-	-	-	10 to 28 VDC	10 to 28 VDC	4.5 to 28 VDC	10 to 28 VDC
Load voltage	24 VDC	10 to 30 VDC	10 to 30 VDC	24 VDC ±10%	30 VDC or less			
Load current	5 to 20 mA (*3)				50 mA or less			
Current consumption	-	-	-	-	≤10 mA (ON) at 24 VDC	10 mA or less with 24 VDC		
Internal voltage drop	4V or less				0.5V or less		0.5 V or less at 30 mA	0.5V or less
Indicator lamp	Yellow LED (Lit when ON)		LED (Lit when ON)	Red/green LED (Lit when ON)	Yellow LED (Lit when ON)	LED (Lit when ON)	Yellow LED (Lit when ON)	Red/green LED (Lit when ON)
Leakage current	1 mA or less				10 μA or less			
Lead wire length	Standard 1 m (oil resistant vinyl cabtyre cable 2-conductor 0.15 mm ²)				Standard 1 m (oil resistant vinyl cabtyre cable 3-conductor 0.15 mm ²)			
Shock resistance	294 m/s ²	980 m/s ²						
Insulation resistance	20 MΩ and over with 500 VDC megger							
Withstand voltage	No failure after 1 minute of 1,000 VAC application.							
Ambient temperature	-10 to +60°C							
Degree of protection	IEC Standard IP67, JIS C0920 (water-tight), oil resistance							
Weight g	1 m:10 3 m:29							

*1: Refer to Ending Page 1 for detailed switch specifications and dimensions.

*2: Switches other than the above models, such as switches with connectors, are also available. Refer to Ending Page 1.

*3: The max. load current is 20 mA at 25°C. The current is lower than 20 mA if the operating ambient temperature around the switch is higher than 25°C.
(5 to 10 mA at 60°C)

*4: The F type switch uses a bend-resistant lead wire.

Cylinder weight table

● MSD-X/MSD-XL

(Unit: g)

Stroke length (mm)	5		10		Weight per switch
Bore size (mm)	No switch	With switch	No switch	With switch	
ø6	23	25	28	30	Refer to the weight in the switch specifications.
ø8	24	27	33	36	

● MSD-Y/MSD-YL

(Unit: g)

Stroke length (mm)	5		10		Weight per switch
Bore size (mm)	No switch	With switch	No switch	With switch	
ø6	25	27	31	33	Refer to the weight in the switch specifications.
ø8	28	31	38	41	

Spring load

(Unit: N)

Bore size (mm)	Stroke length (mm)	Spring load	
		Set	Operating
ø6	5	1.59	4.90
	10		
ø8	5	3.19	6.86
	10		

Theoretical thrust table

● MSD-X

(Unit: N)

Bore size (mm)	Working pressure MPa							
	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
ø6	3.58	6.41	9.24	12.1	14.9	17.7	20.5	23.4
ø8	8.22	13.2	18.3	23.3	28.3	33.4	38.4	43.4

● MSD-Y

(Unit: N)

Bore size (mm)	Working pressure MPa							
	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
ø6	-	1.38	2.95	4.52	6.10	7.67	9.24	10.8
ø8	2.33	5.39	8.46	11.5	14.6	17.6	20.7	23.8

SCP*3
CMK2
CMA2
SCM
SCG
SCA2
SCS2
CKV2
CAV2/ COVP/N2
SSD2
SSG
SSD
CAT
MDC2
MVC
SMG
MSD/ MSDG
FC*
STK
SRL3
SRG3
SRM3
SRT3
MRL2
MRG2
SM-25
ShkAbs
FJ
FK
Spd Contr
Ending

How to order

● Without switch (without magnet for switch)

MSD-X - **6** - **5** - **R**

● With switch (built-in magnet for switch)

MSD-XL - **6** - **5** - **F0H** - **R** - **R**

A Model No.

B Bore size

C Stroke length

D Switch model No.

*1

⚠ Precautions for model No. selection

*1 : For ø6 or ø8 with switch, use a non-magnetic (stainless steel, etc.) mounting bolt.

*2 : For rear piping, body side installation is possible. Note that 2 bolts are used for rod side installation and head side installation.

E Switch quantity

[Example of model No.]

MSD-XL-6-5-F0H-R-R

A Model No. : Single acting/push with switch

B Bore size : ø6 mm

C Stroke length : 5 mm

D Switch model No. : Reed F0H switch, lead wire 1 m

E Switch quantity : 1 on rod side

F Option : Rear piping

F Option

*2

How to order switch

SW - **F0H**

Switch model No.
(Item **D** above)

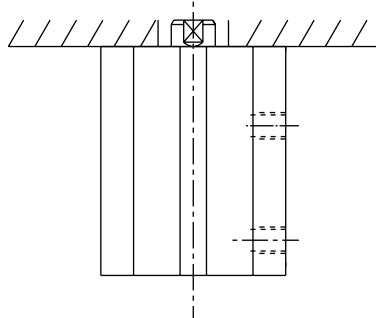
Code	Description						
A Model No.							
MSD-X	Single acting/push			Without switch			
MSD-Y	Single acting/pull						
MSD-XL	Single acting/push			With switch			
MSD-YL	Single acting/pull						
B Bore size (mm)							
6	ø6						
8	ø8						
C Stroke length (mm)							
5	5						
10	10						
D Switch model No.							
Axial lead wire	Radial lead wire	Contact	Voltage		Indicator lamp	Lead wire	
			AC	DC			
F0H*	F0V*	Reed		●	1-color display	2-wire	
-	F2S*	Proximity		●		1-color display (PNP output) (Made to order)	3-wire
F2H*	F2V*			●			
-	F3S*			●			
F3H*	F3V*			●			
F3PH*	F3PV*			●	2-color display	2-wire	
F2YH*	F2YV*			●		3-wire	
F3YH*	F3YV*			●			
* Lead wire length							
Blank	1 m (standard)						
3	3 m (option)						
E Switch quantity							
R	1 on rod side						
H	1 on head side						
D	2						
F Option							
Blank	Front piping						
R	Rear piping						

Switch selection table

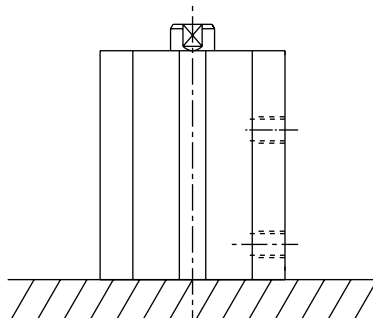
Switches may not be installable depending on relations between cylinder installation and stroke length.
Refer to the table below to select a switch.

Switches cannot be used for side mounting in the following combinations.

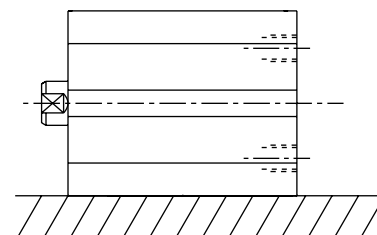
- Combinations in which F2YH/V, F3YH/V or F3PH/V is mounted at the switch mounting position H with X type or Y type stroke length 5 mm
- Combinations in which F2YH, F3YH or F3PH is mounted at the switch mounting position H with X type stroke length 10 mm
(Refer to page 1430 for the min. stroke length with switch)



For rod side installation



For head side installation



For side installation

● For MSD-XL rod side installation

Bore size (mm)	Stroke length (mm)	Reed switch				Proximity switch									
		F0H		F0V		F2S, F3S		F2H/F3H		F2V/F3V		F2YH/F3YH/F3PH		F2YV/F3YV/F3PV	
		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position	
		R	H	R	H	R	H	R	H	R	H	R	H	R	H
ø6	5	○	○	○	○	○	○	○	×	○	○	○	×	○	○
	10	○	○	○	○	○	○	○	○	○	○	○	○	○	○
ø8	5	○	○	○	○	○	○	○	×	○	○	○	×	○	○
	10	○	○	○	○	○	○	○	○	○	○	○	○	○	○

● For MSD-XL head side installation

Bore size (mm)	Stroke length (mm)	Reed switch				Proximity switch									
		F0H		F0V		F2S, F3S		F2H/F3H		F2V/F3V		F2YH/F3YH/F3PH		F2YV/F3YV/F3PV	
		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position	
		R	H	R	H	R	H	R	H	R	H	R	H	R	H
ø6	5	×	×	○	○	○	○	×	○	○	○	×	×	×	○
	10	○	×	○	○	○	○	×	○	○	○	×	○	○	○
ø8	5	×	×	○	○	○	○	×	○	○	○	×	×	×	○
	10	○	×	○	○	○	○	×	○	○	○	×	○	○	○

● For MSD-YL rod side installation

Bore size (mm)	Stroke length (mm)	Reed switch				Proximity switch									
		F0H		F0V		F2S, F3S		F2H/F3H		F2V/F3V		F2YH/F3YH/F3PH		F2YV/F3YV/F3PV	
		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position	
		R	H	R	H	R	H	R	H	R	H	R	H	R	H
ø6	5	○	○	○	○	○	○	○	×	○	○	○	×	○	○
	10	○	○	○	○	○	○	○	○	○	○	○	○	○	○
ø8	5	○	○	○	○	○	○	○	×	○	○	○	×	○	○
	10	○	○	○	○	○	○	○	○	○	○	○	○	○	○

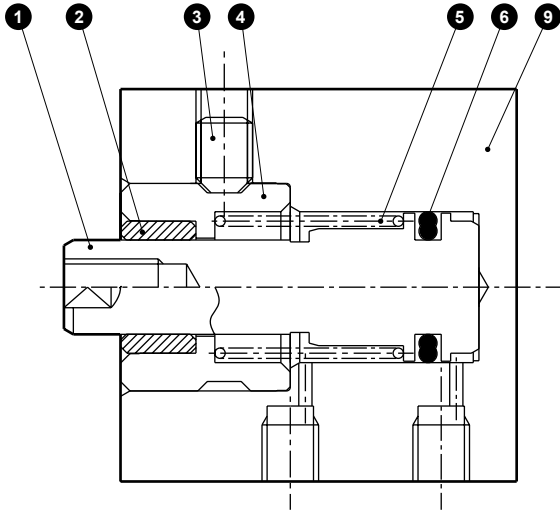
● For MSD-YL head side installation

Bore size (mm)	Stroke length (mm)	Reed switch				Proximity switch									
		F0H		F0V		F2S, F3S		F2H/F3H		F2V/F3V		F2YH/F3YH/F3PH		F2YV/F3YV/F3PV	
		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position	
		R	H	R	H	R	H	R	H	R	H	R	H	R	H
ø6	5	○	○	○	○	○	○	×	○	○	○	×	×	○	○
	10	○	○	○	○	○	○	○	○	○	○	×	○	○	○
ø8	5	○	○	○	○	○	○	×	○	○	○	×	×	○	×
	10	○	○	○	○	○	○	○	○	○	○	×	○	○	○

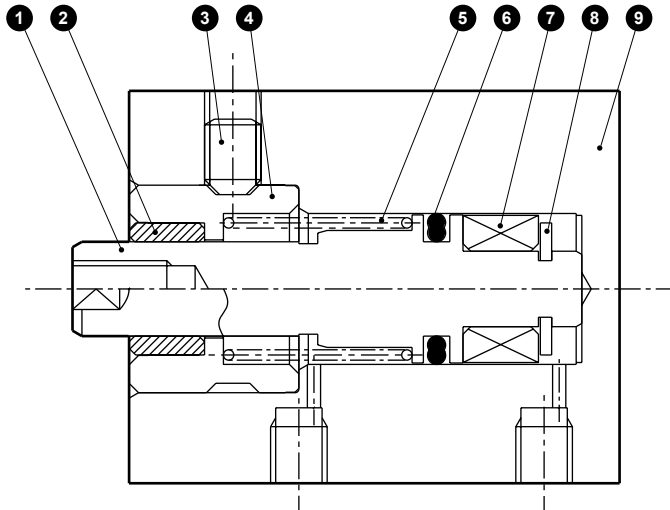
SCP*3
CMK2
CMA2
SCM
SCG
SCA2
SCS2
CKV2
CAV2/
COVPIN2
SSD2
SSG
SSD
CAT
MDC2
MVC
SMG
MSD/
MSDG
FC*
STK
SRL3
SRG3
SRM3
SRT3
MRL2
MRG2
SM-25
ShkAbs
FJ
FK
Spd
Contr
Ending

Internal structure and parts list

● MSD-X-6/8



● MSD-XL-6/8

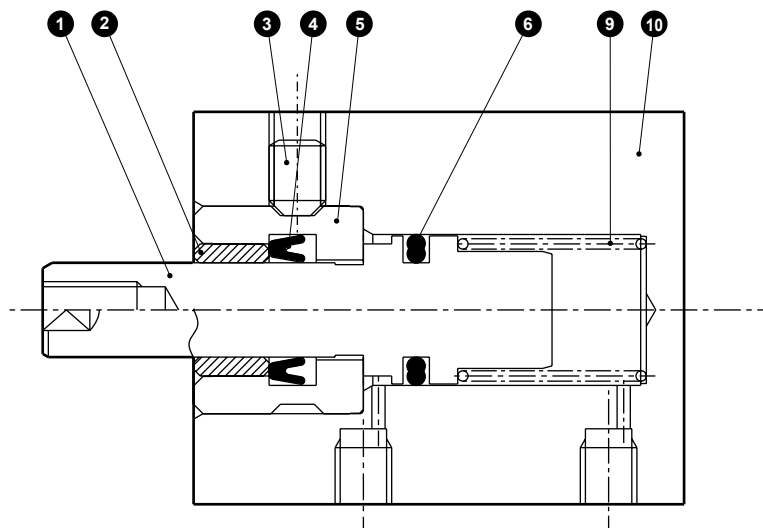


Cannot be disassembled

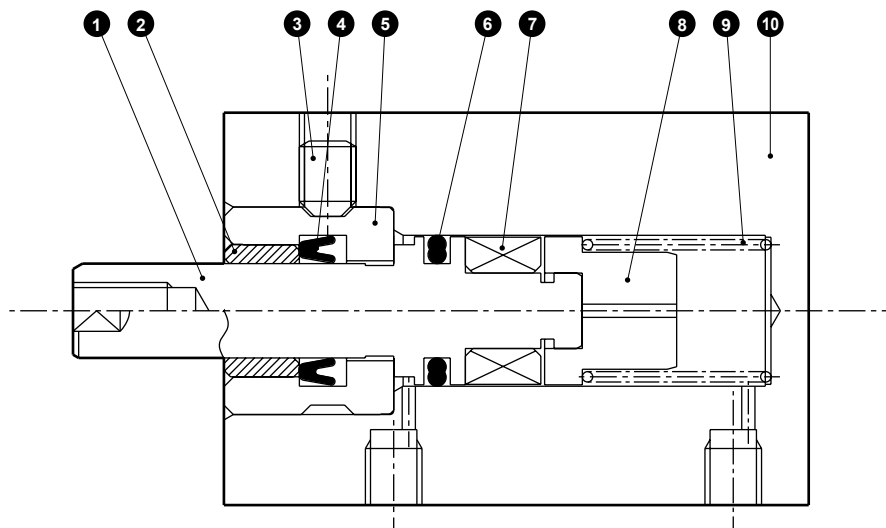
No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Piston	Stainless steel		6	Piston packing	Nitrile rubber	
2	Bush	Oil-impregnated copper alloy		7	Magnet	Plastic	
3	Hexagon socket set screw	Stainless steel		8	E type snap ring	Stainless steel	
4	Rod metal	Stainless steel		9	Body	Aluminum alloy	Hard alumite
5	Coil spring	Steel	Electrodeposition				

Internal structure and parts list

● MSD-Y-6/8



● MSD-YL-6/8



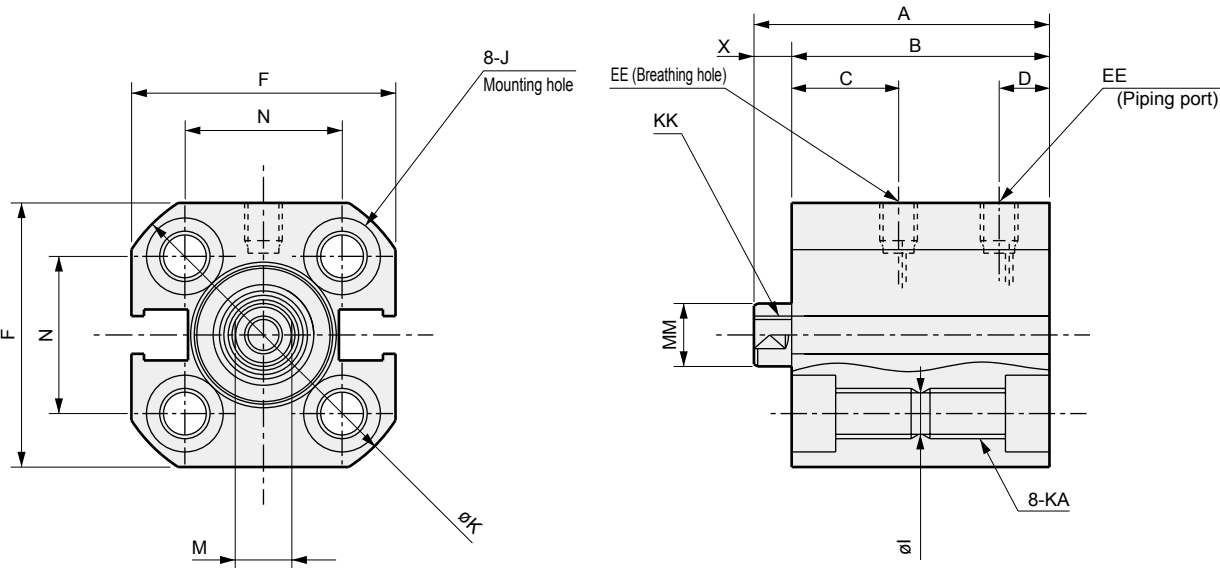
Cannot be disassembled

No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Piston	Stainless steel		6	Piston packing	Nitrile rubber	
2	Bush	Oil-impregnated copper alloy		7	Magnet	Plastic	
3	Hexagon socket set screw	Stainless steel		8	Spring holder	Stainless steel	
4	Rod packing	Nitrile rubber		9	Coil spring	Steel	Electrodeposition
5	Rod metal	Stainless steel		10	Body	Aluminum alloy	Hard alumite

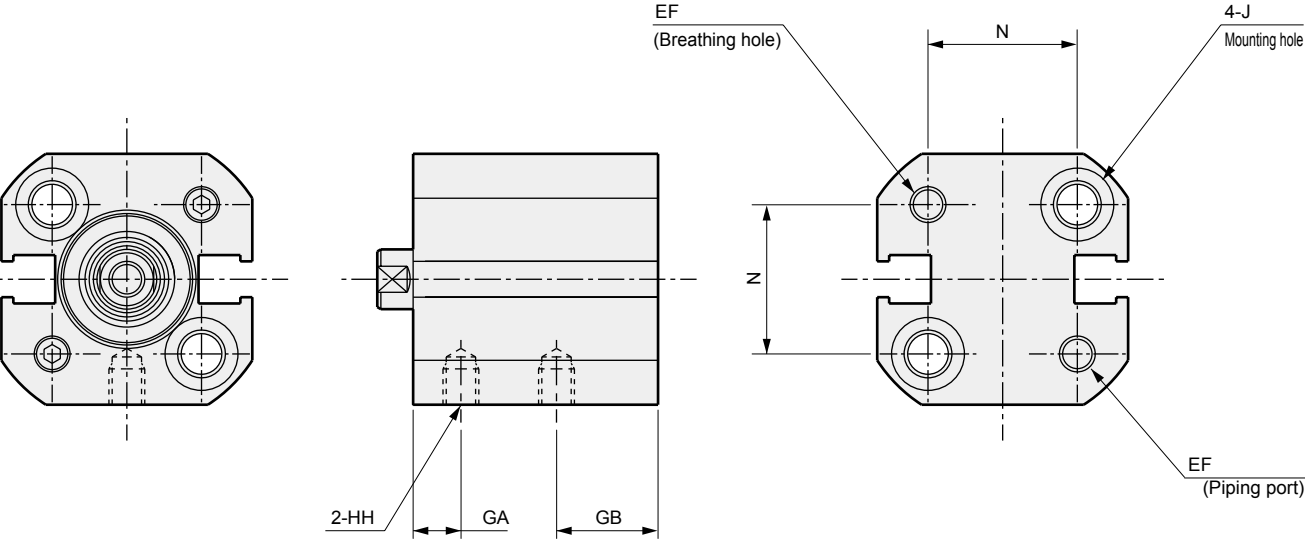
SCP*3
CMK2
CMA2
SCM
SCG
SCA2
SCS2
CKV2
CAV2/ COVP/IN2
SSD2
SSG
SSD
CAT
MDC2
MVC
SMG
MSD/ MSDG
FC*
STK
SRL3
SRG3
SRM3
SRT3
MRL2
MRG2
SM-25
ShkAbs
FJ
FK
Spd Contr
Ending

Dimensions

● MSD-X (L)-6/8



● MSD-X(L)-6/8-*-R (rear piping)

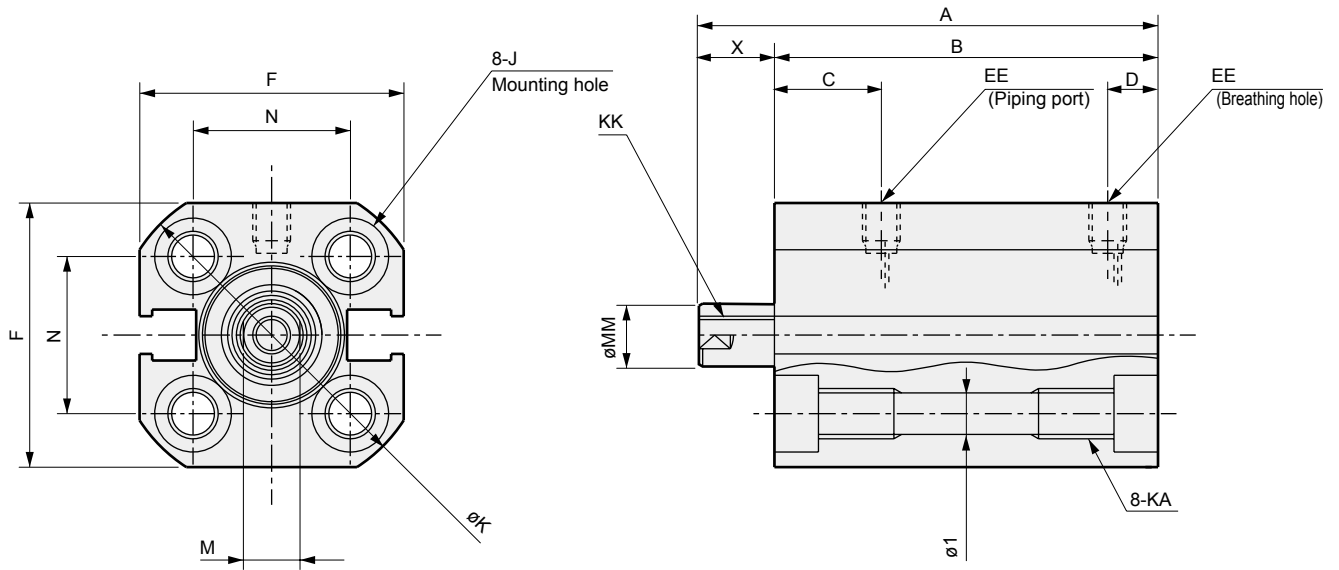


Code			Without switch		With switch		Common dimensions for types with/without switches																
Bore size (mm)			A	B	A	B	C	D	EE	EF	F	GA	GB	HH	I	J	K	KA	KK	M	MM	N	X
ø6	Stroke mm	5	22.5	19.5	27.5	24.5	7.5	4	M3	M3	19	3	8.5	M3 Depth 3	3.2	Spot face ø6.1 depth 3.5	22.5	M4 Depth 6	M2.5 Depth 4	3.5	4	11	3
		10	32.5	29.5	37.5	34.5																	
ø8	Stroke mm	5	24	21	29	26	9	4	M3	M3	21	4.5	8.5	M3 Depth 3	3.2	Spot face ø6.1 depth 3.5	25	M4 Depth 6	M3 Depth 5	4.5	5	12.5	3
		10	34	31	39	36																	

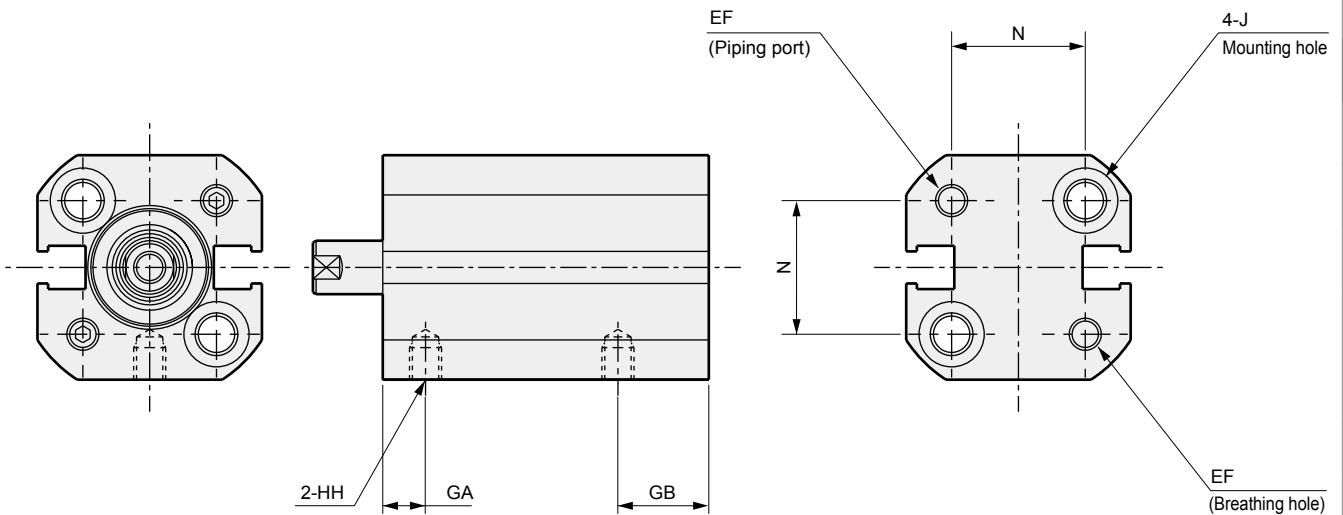
Dimensions



● MSD-Y (L)-6/8



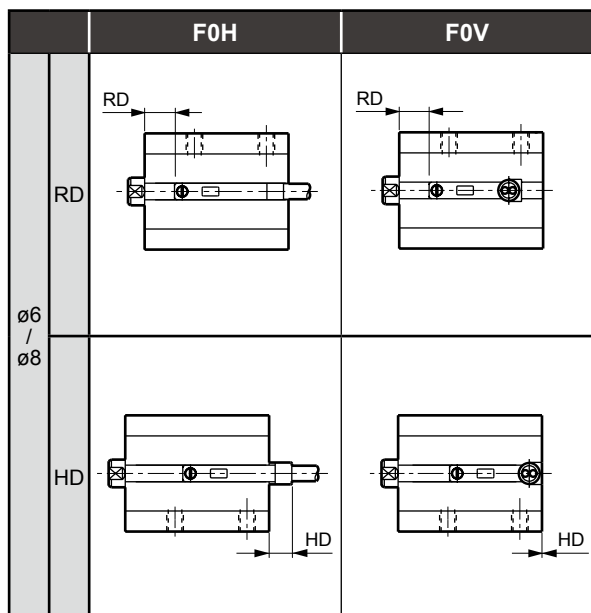
● MSD-Y(L)-6/8-*-R (rear piping)



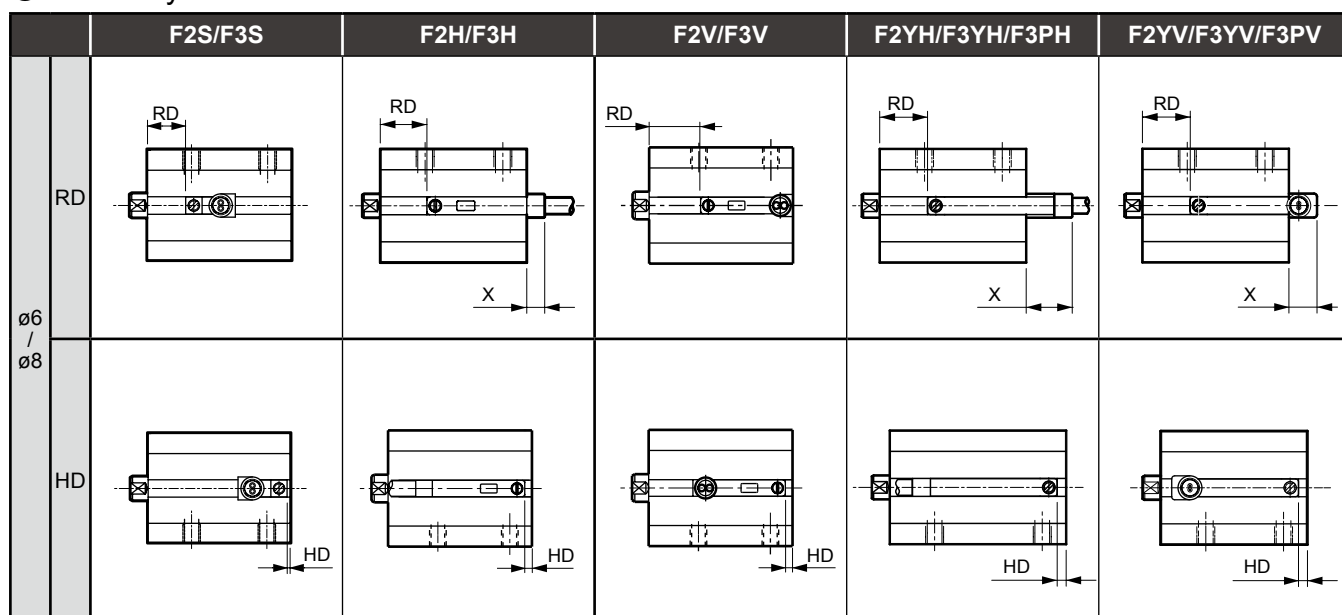
Code		Without switch		With switch		Common dimensions for types with/without switches																	
Bore size (mm)		A	B	A	B	C	D	EE	EF	F	GA	GB	HH	I	J	K	KA	KK	M	MM	N	X	
ø6	Stroke mm	5	32.5	24.5	37.5	29.5	7.5	4	M3	M3	19	3	8.5	M3 Depth 3	3.2	Spot face ø6.1 depth 3.5	22.5	M4 Depth 6	M2.5 Depth 4	3.5	4	11	8
		10	47.5	34.5	52.5	39.5																	13
ø8	Stroke mm	5	34	26	39	31	9	4	M3	M3	21	4.5	8.5	M3 Depth 3	3.2	Spot face ø6.1 depth 3.5	25	M4 Depth 6	M3 Depth 5	4.5	5	12.5	8
		10	49	36	54	41																	13

MSD-XL Switch mounting position

● Reed switch



● Proximity switch



Switch mounting position dimensions

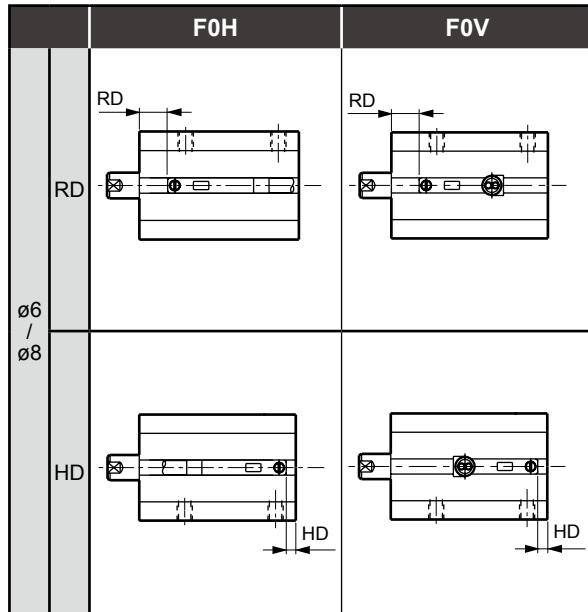
(Unit: mm)

Switch Switch model No. Max. sensitivity position Bore size Stroke length			Reed switch				Proximity switch												
			F0H		F0V		F2S/F3S		F2H/F3H			F2V/F3V		F2YH/F3YH/F3PH			F2YV/F3YV/F3PV		
			RD	HD	RD	HD	RD	HD	RD	HD	X (*1)	RD	HD	RD	HD	X (*1)	RD	HD	X (*1)
MSD-XL	ø6	5	4.0	4.0	4.0	0	6.5	0.5	7.5	1.5	3.0	7.5	1.5	7.5	1.5	7.5	7.5	1.5	4.5
		10	9.0	4.0	9.0	0	11.5	0.5	12.5	1.5	-	12.5	1.5	12.5	1.5	-	12.5	1.5	-
	ø8	5	5.5	4.0	5.5	0	8.0	0.5	9.0	1.5	3.0	9.0	1.5	9.0	1.5	7.5	9.0	1.5	4.5
		10	10.5	4.0	10.5	0	13.0	0.5	14.0	1.5	-	14.0	1.5	14.0	1.5	-	14.0	1.5	-

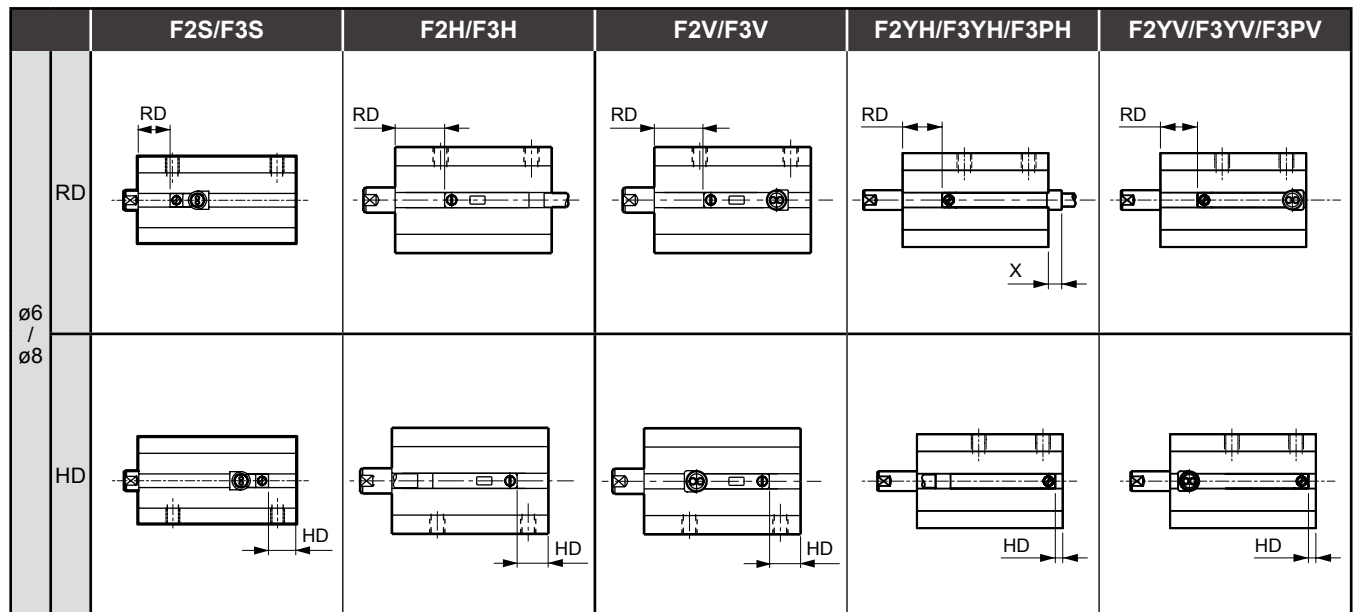
*1: X dimensions indicate the switch protrusion from the body end surface. When the X dimensions are not indicated, there is no protrusion from the body end surface.

MSD-YL Switch mounting position

● Reed switch



● Proximity switch



Switch mounting position dimensions

(Unit: mm)

Switch Switch model No. Bore size Stroke length Max. sensitivity position			Reed switch				Proximity switch											
			F0H		F0V		F2S/F3S		F2H/F3H		F2V/F3V		F2YH/F3YH/F3PH			F2YV/F3YV/F3PV		
			RD	HD	RD	HD	RD	HD	RD	HD	RD	HD	RD	HD	X (*1)	RD	HD	
MSD-YL	ø6	5	3.5	2.5	3.5	2.5	7.0	6.0	8.0	7.0	8.0	7.0	8.0	7.0	2.7	8.0	7.0	
		10	3.5	7.5	3.5	7.5	7.0	11.0	8.0	12.0	8.0	12.0	8.0	12.0	-	8.0	12.0	
	ø8	5	5.5	2.0	5.5	2.0	9.0	5.0	10.0	6.0	10.0	6.0	10.0	6.0	3.2	10.0	6.0	
		10	5.5	7.0	5.5	7.0	9.0	10.0	10.0	11.0	10.0	11.0	10.0	11.0	-	10.0	11.0	

*1: X dimensions indicate the switch protrusion from the body end surface. When the X dimensions are not indicated, there is no protrusion from the body end surface.



Small compact cylinder double acting/high load

MSD-K Series

● Bore size: $\phi 6/\phi 8/\phi 12/\phi 16$

JIS symbol



Double acting



Specifications

Item		MSD-K MSD-KL (with switch)			
Bore size mm		ø6	ø8	ø12	ø16
Actuation		Double acting			
Working fluid		Compressed air			
Max. working pressure MPa		1.0 (≈150 psi, 10 bar)			
Min. working pressure MPa		0.15 (≈22 psi, 1.5 bar)		0.1 (≈15 psi, 1 bar)	
Proof pressure MPa		1.6 (≈230 psi, 16 bar)			
Ambient temperature °C		-10 (14°F) to 60 (140°F) (no freezing)			
Connection bore size	Front piping	M3		M5	
	Rear piping	M3		M3	
Stroke tolerance mm		+2.0 0			
Working piston speed mm/s		50 to 500			
Cushion		With rubber cushion			
Lubrication		Not required (use turbine oil ISO VG32 if necessary for lubrication)			
Allowable absorbed energy J		0.004	0.014	0.044	0.110

Stroke length

Bore size (mm)	Standard stroke length (mm)	Max. stroke length (mm)	Min. stroke length with two switches (mm)		Min. stroke length with one switch (mm)	
			Reed switch	Proximity switch	Reed switch	Proximity switch
$\phi 6$	5/10/15/20/25/30	30	10	5(10)	5	5
$\phi 8$	5/10/15/20/25/30	30	10	5	5	5
$\phi 12$	5/10/15/20/25/30	30	10	5	5	5
$\phi 16$	5/10/15/20/25/30	30	10	5	5	5

*1: Products with stroke length other than standard stroke length are not available. *2: For F2Y, F3Y or F3P, the min. stroke length will be the dimensions in ().

Switch specifications

Item	Reed 2-wire	Proximity 2-wire			Proximity 3-wire			
	FOH/V	F2H/V	F2S	F2YH/V	F3H/V	F3S	F3PH/V (Made to order)	F3YH/V
Applications	Dedicated for programmable controller				For programmable controller, relay			
Output method	-				NPN output	NPN output	PNP output	NPN output
Power supply voltage	-	-	-	-	10 to 28 VDC	10 to 28 VDC	4.5 to 28 VDC	10 to 28 VDC
Load voltage	24 VDC	10 to 30 VDC		24 VDC ±10%	30 VDC or less			
Load current	5 to 20 mA (*3)				50 mA or less			
Current consumption	-	-	-	-	≤10 mA (ON) at 24 VDC	10 mA or less with 24 VDC		
Internal voltage drop	4V or less				0.5V or less	0.5V or less	0.5 V or less at 30 mA	0.5V or less
Indicator lamp	Yellow LED (Lit when ON)	LED (Lit when ON)	Red/green LED (Lit when ON)	Yellow LED (Lit when ON)	LED (Lit when ON)	Yellow LED (Lit when ON)	Red/green LED (Lit when ON)	Red/green LED (Lit when ON)
Leakage current	1 mA or less				10 μA or less			
Lead wire length	Standard 1 m (Oil resistance a 0.15 mm ²)				Standard 1 m (oil resistant vinyl cabtyre cable 3-conductor 0.15mm ²)			
Shock resistance	294 m/s ²	980 m/s ²						
Insulation resistance	20 MΩ and over with 500 VDC megger							
Withstand voltage	No failure after 1 minute of 1,000 VAC application.							
Ambient temperature	-10 to +60°C							
Degree of protection	IEC Standard IP67, JIS C0920 (water-tight), oil resistance							
Weight	g	1 m:10 3 m:29						

*1: Refer to Ending Page 1 for detailed switch specifications and dimensions.

*2: Switches other than the above models, such as switches with connectors, are also available. Refer to Ending Page 1.

*3: The max. load current is 20 mA at 25 $^{\circ}\text{C}$. The current is lower than 20 mA if the operating ambient temperature around the switch is higher than 25 $^{\circ}\text{C}$.
(5 to 10 mA at 60 $^{\circ}\text{C}$)

*4: The F type switch uses a bend-resistant lead wire.

Cylinder weight table

(Unit: g)

Stroke length (mm)	5		10		15		20		25		30		Weight per switch
Bore size (mm)	No switch	With switch	No switch	With switch	No switch	With switch	No switch	With switch	No switch	With switch	No switch	With switch	
ø6	27	29	30	32	32	34	35	37	38	40	41	43	Refer to the weight in the switch specifications.
ø8	29	32	34	37	39	42	44	47	48	51	53	56	
ø12	35	45	43	53	52	62	61	71	70	80	79	89	
ø16	54	70	66	82	79	95	92	108	104	120	117	133	

Theoretical thrust table

(Unit: N)

Bore size (mm)	Operating direction	Working pressure MPa										
		0.1	0.15	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
ø6	Push	-	4.24	5.65	8.48	11.3	14.1	17.0	19.8	22.6	25.4	28.3
	Pull	-	2.36	3.14	4.71	6.28	7.85	9.42	11.0	12.6	14.1	15.7
ø8	Push	-	7.54	10.1	15.1	20.1	25.1	30.2	35.2	40.2	45.2	50.3
	Pull	-	4.59	6.13	9.19	12.3	15.3	18.4	21.4	24.5	27.6	30.6
ø12	Push	11.3	17.0	22.6	33.9	45.2	56.5	67.9	79.2	90.5	1.02×10^2	1.13×10^2
	Pull	8.48	12.7	17.0	25.4	33.9	42.4	50.9	59.4	67.9	76.3	84.8
ø16	Push	20.1	30.2	40.2	60.3	80.4	1.01×10^2	1.21×10^2	1.41×10^2	1.61×10^2	1.81×10^2	2.01×10^2
	Pull	15.1	22.6	30.2	45.2	60.3	75.4	90.5	1.06×10^2	1.21×10^2	1.36×10^2	1.51×10^2

MSD-K Series

How to order

● Without switch (without magnet for switch)

MSD-K - 6 - 5 - R

● With switch (built-in magnet for switch)

MSD-KL - 6 - 5 - F0H - R - R

A Model No.

B Bore size

C Stroke length

D Switch model No.

*1

*2

E Switch quantity

F Option

*3

Note on model No. selection

*1 : For ø6 or ø8 with switch, use a non-magnetic (stainless steel, etc.) mounting bolt.

*2 : For ø12 or ø16 with proximity switch, use a non-magnetic (stainless steel, etc.) through bolt.

*3 : For rear piping, body side installation is possible. Note that 2 bolts are used for rod side installation and head side installation.

[Example of model No.]

MSD-KL-6-5-F0H-R-R

A Model No. : Double acting/high load/with switch

B Bore size : ø6 mm

C Stroke length : 5 mm

D Switch model No. : Reed F0H switch

E Switch quantity : 1 on rod side

F Option : Rear piping

How to order switch

SW - F0H

Switch model No.
(Item **D** above)

Code		Description					
A Model No.							
MSD-K	Double acting/high load	Without switch					
MSD-KL		With switch					
B Bore size (mm)							
6	ø6						
8	ø8						
12	ø12						
16	ø16						
C Stroke length (mm)							
5	5						
10	10						
15	15						
20	20						
25	25						
30	30						
D Switch model No.							
Axial lead wire	Radial lead wire	Contact	Voltage		Indicator lamp	Lead wire	
			AC	DC			
F0H*	F0V*	Reed		●	1-color display	2-wire	
-	F2S*			●			
F2H*	F2V*			●			
-	F3S*			●			
F3H*	F3V*	Proximity		●	1 color display (PNP output) (made to order)	3-wire	
F3PH*	F3PV*			●			
F2YH*	F2YV*			●			2-color display
F3YH*	F3YV*			●			
* Lead wire length							
Blank	1 m (standard)						
3	3 m (option)						
E Switch quantity							
R	1 on rod side						
H	1 on head side						
D	2						
F Option							
Blank	Front piping						
R	Rear piping						

Specifications for rechargeable battery

(Catalog No. CC-1226A)

● Design compatible with rechargeable battery manufacturing process

MSD-K - - P4*

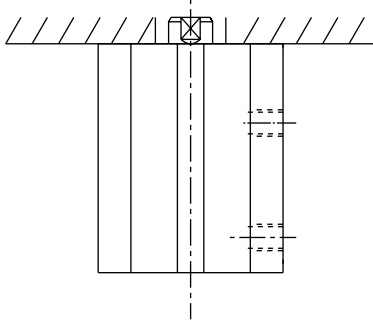
Switch selection table

Switches may not be installable depending on relations between cylinder installation and stroke length.

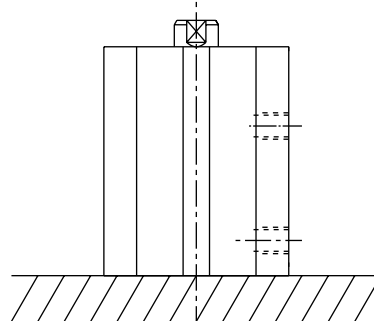
Refer to the table below to select a switch.

Switches cannot be used for side mounting in the following combinations.

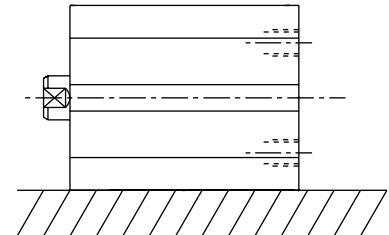
- Combinations in which F2YH, F3YH or F3PH is mounted at the switch mounting position H with stroke length 5 mm for $\phi 6$
- Combinations in which F2YH, F3YH or F3PH is mounted at the switch mounting position H with stroke length 5 mm for $\phi 8$ (Refer to page 1440 for the min. stroke length with switch)



For rod side installation



For head side installation



For side installation

● For rod side installation

Bore size (mm)	Stroke length (mm)	Reed switch				Proximity switch									
		F0H		F0V		F2S/F3S		F2H/F3H		F2V/F3V		F2YH/F3YH/F3PH		F2YV/F3YV/F3PV	
		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position	
		R	H	R	H	R	H	R	H	R	H	R	H	R	H
$\phi 6$	5	○	○	○	○	○	○	○	○	○	○	○	×	○	○
	10	○	○	○	○	○	○	○	○	○	○	○	×	○	○
	15 to	○	○	○	○	○	○	○	×	○	○	○	○	○	○
$\phi 8$	5	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	10	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	15 to	○	○	○	○	○	○	○	×	○	○	○	○	○	○
$\phi 12$	5	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	10	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	15 to	○	○	○	○	○	○	○	×	○	○	○	○	○	○
$\phi 16$	5	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	10	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	15 to	○	○	○	○	○	○	○	×	○	○	○	○	○	○

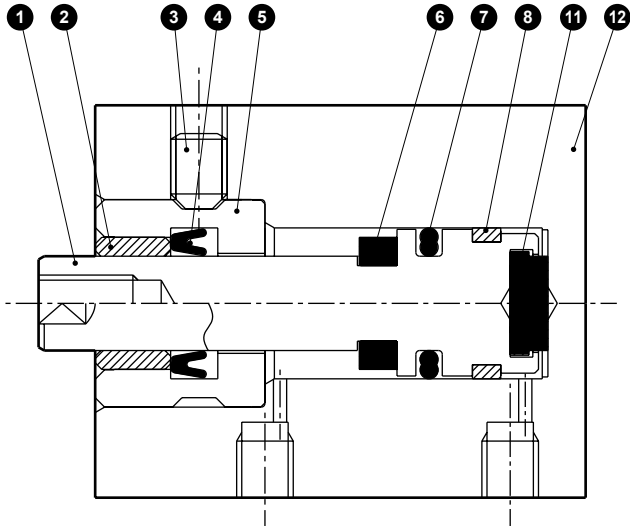
● For head side installation

Bore size (mm)	Stroke length (mm)	Reed switch				Proximity switch									
		F0H		F0V		F2S/F3S		F2H/F3H		F2V/F3V		F2YH/F3YH/F3PH		F2YV/F3YV/F3PV	
		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position	
		R	H	R	H	R	H	R	H	R	H	R	H	R	H
$\phi 6$	5	×	○	○	○	○	○	×	○	○	○	×	×	○	○
	10	○	○	○	○	○	○	×	○	○	○	×	○	○	○
	15 to	○	○	○	○	○	○	○	○	○	○	○	○	○	○
$\phi 8$	5	×	○	○	○	○	○	×	○	○	○	×	○	○	○
	10	○	○	○	○	○	○	×	○	○	○	×	○	○	○
	15 to	○	○	○	○	○	○	○	○	○	○	○	○	○	○
$\phi 12$	5	×	○	○	○	○	○	×	○	○	○	×	○	○	○
	10	○	○	○	○	○	○	○	○	○	○	×	○	○	○
	15 to	○	○	○	○	○	○	○	○	○	○	○	○	○	○
$\phi 16$	5	×	○	○	○	○	○	×	○	○	○	×	○	○	○
	10	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	15 to	○	○	○	○	○	○	○	○	○	○	○	○	○	○

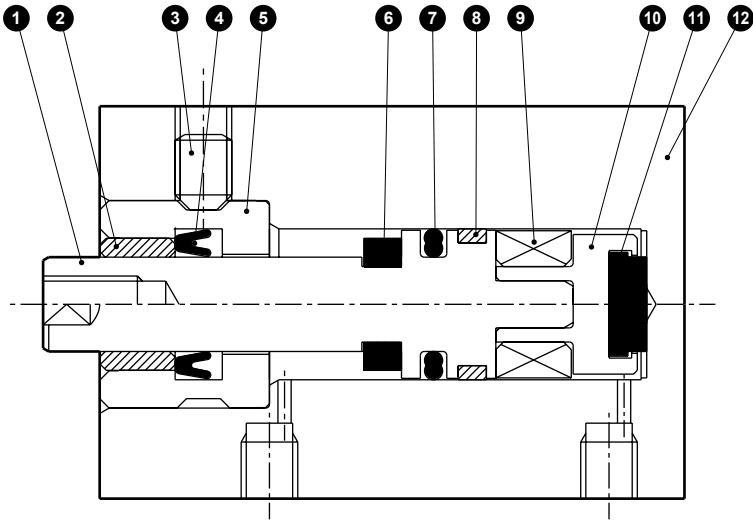
SCP*3
CMK2
CMA2
SCM
SCG
SCA2
SCS2
CKV2
CAV2/ COVPIN2
SSD2
SSG
SSD
CAT
MDC2
MVC
SMG
MSD/ MSDG
FC*
STK
SRL3
SRG3
SRM3
SRT3
MRL2
MRG2
SM-25
ShkAbs
FJ
FK
Spd Contr
Ending

Internal structure and parts list

● MSD-K-6/8/12



● MSD-KL-6/8/12

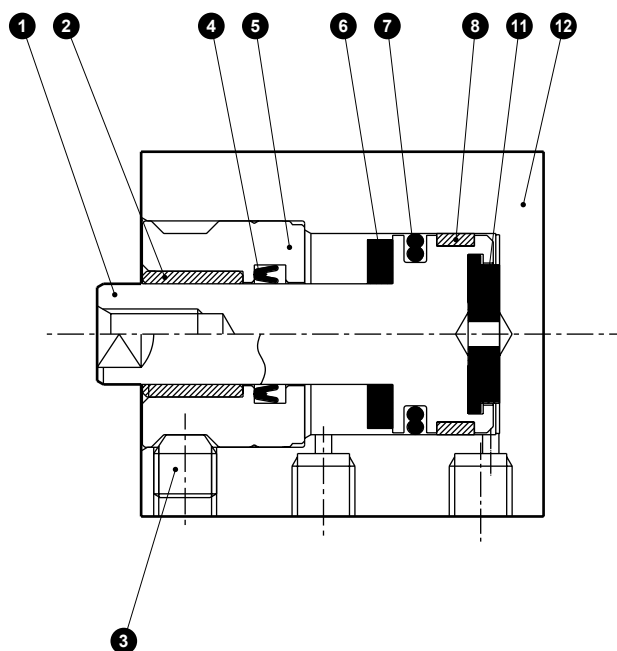


Cannot be disassembled

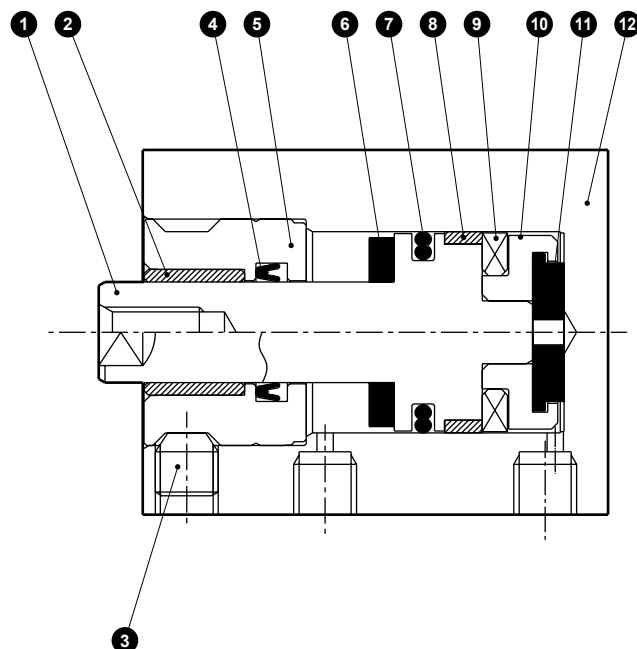
No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Piston	Stainless steel		7	Piston packing	Nitrile rubber	
2	Bush	Oil-impregnated copper alloy		8	Wear ring	Acetal resin	
3	Hexagon socket set screw	Stainless steel		9	Magnet	Plastic	
4	Rod packing	Nitrile rubber		10	Adaptor	Aluminum alloy	
5	Rod metal	Stainless steel		11	Cushion rubber H	Urethane rubber	
6	Cushion rubber R	Urethane rubber		12	Body	Aluminum alloy	Hard alumite

Internal structure and parts list

● MSD-K-16



● MSD-KL-16



Cannot be disassembled

No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Piston	Stainless steel		7	Piston packing	Nitrile rubber	
2	Bush	Oil-impregnated copper alloy		8	Wear ring	Acetal resin	
3	Hexagon socket set screw	Stainless steel		9	Magnet	Plastic	
4	Rod packing	Nitrile rubber		10	Adaptor	Aluminum alloy	
5	Rod metal	Stainless steel		11	Cushion rubber H	Urethane rubber	
6	Cushion rubber R	Urethane rubber		12	Body	Aluminum alloy	Hard alumite

SCP*3

CMK2

CMA2

SCM

SCG

SCA2

SCS2

CKV2

CAV2/
COVP/IN2

SSD2

SSG

SSD

CAT

MDC2

MVC

SMG

MSD/
MSDG

FC*

STK

SRL3

SRG3

SRM3

SRT3

MRL2

MRG2

SM-25

ShkAbs

FJ

FK

Spd
Contr

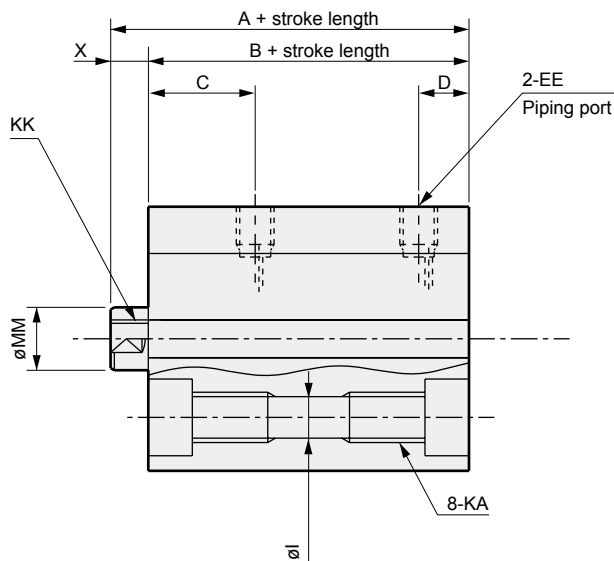
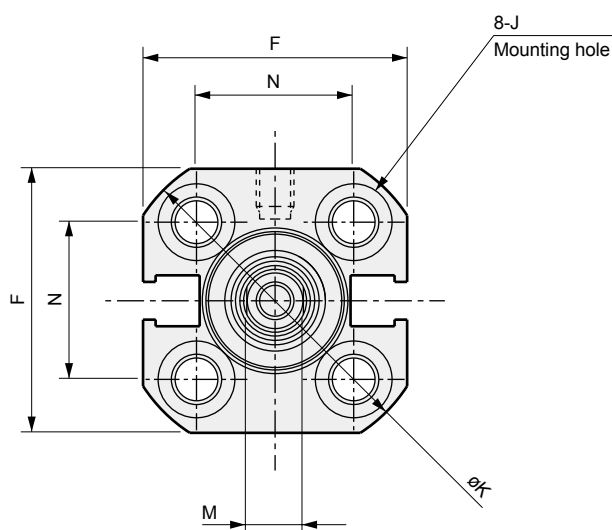
Ending

MSD-K Series

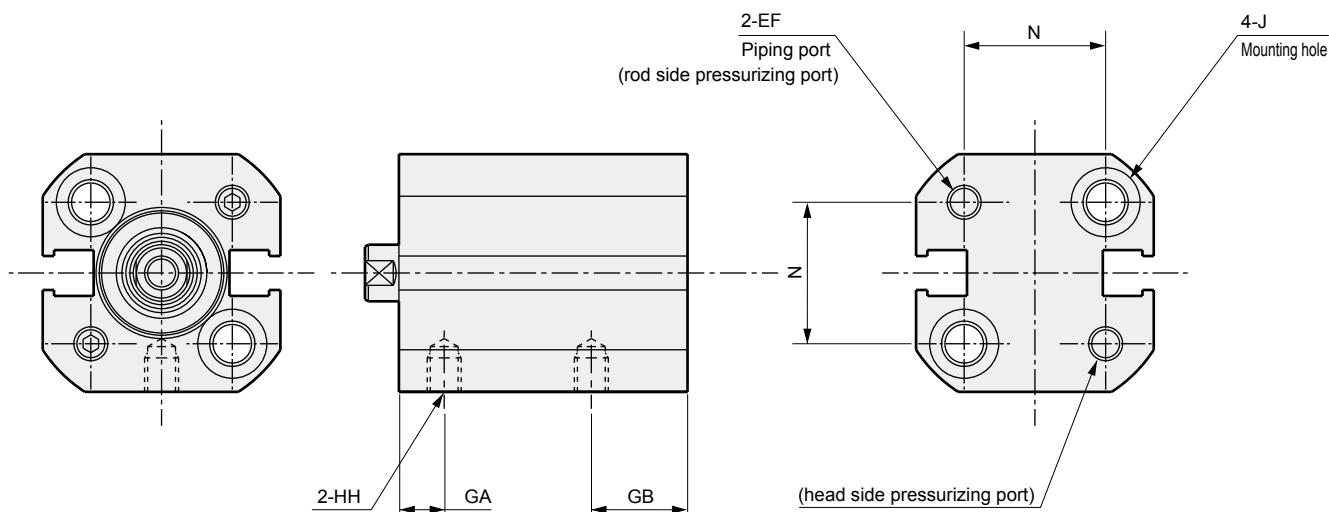
Dimensions



● MSD-K (L)-6/8/12



● MSD-K(L)-6/8/12-*R (rear piping)



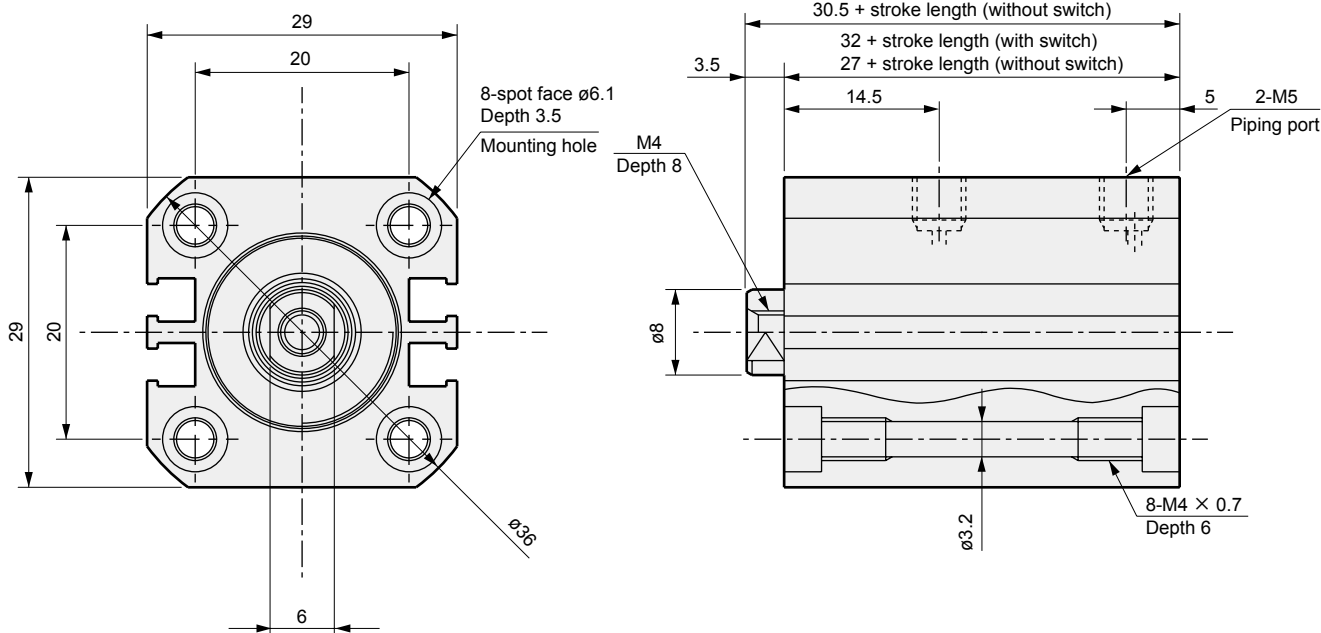
Bore size (mm)	Without switch		With switch		Common dimensions for types with/without switches											
	A	B	A	B	C	D	EE	EF	F	GA	GB	HH	I	J	K	KA
ø6	22.5	19.5	27.5	24.5	7.5	4	M3	M3	19	3	8.5	M3 depth 3	3.2	Spot face ø6.1 Depth 3.5	22.5	M4 depth 6
ø8	24	21	29	26	9	4	M3	M3	21	4.5	8.5	M3 depth 3	3.2	Spot face ø6.1 Depth 3.5	25	M4 depth 6
ø12	25.5	22	30.5	27	11.5	5	M5	M3	25	4	10.5	M3 depth 3	3.2	Spot face ø6.1 Depth 3.5	31	M4 depth 6

Bore size (mm)	Common dimensions for types with/without switches				
	KK	M	MM	N	X
ø6	M2.5 depth 4	3.5	4	11	3
ø8	M3 depth 5	4.5	5	12.5	3
ø12	M3 depth 6	5	6	15.5	3.5

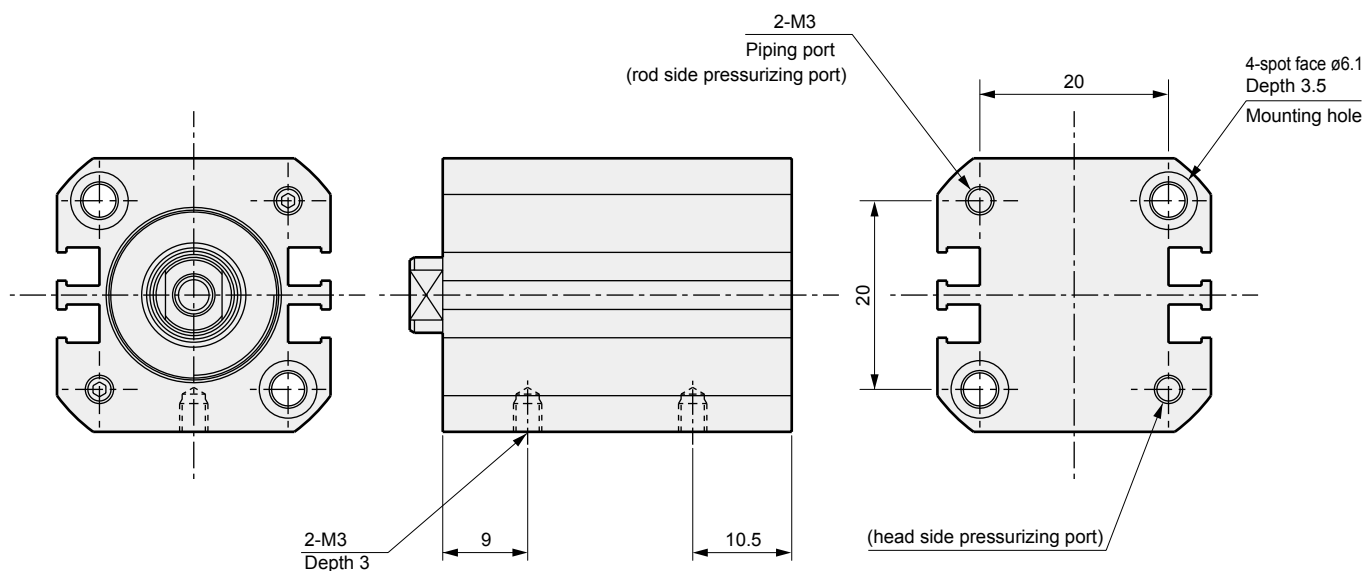
Dimensions



● MSD-K(L)-16



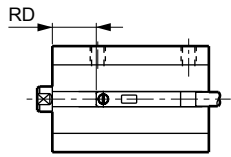
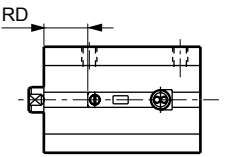
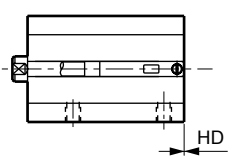
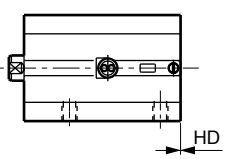
● MSD-K(L)-16-*-R (rear piping)



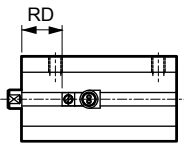
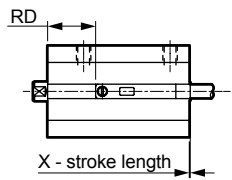
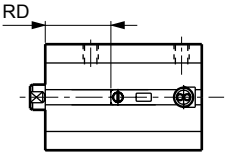
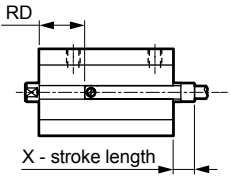
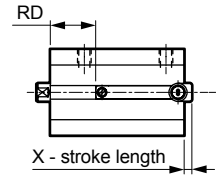
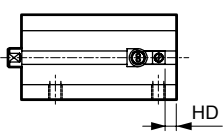
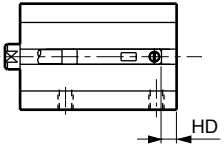
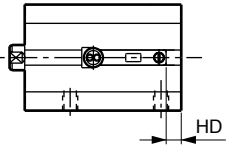
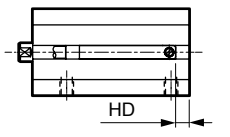
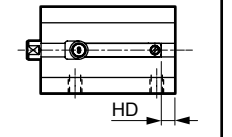
SCP*3
CMK2
CMA2
SCM
SCG
SCA2
SCS2
CKV2
CAV2/ COVP/N2
SSD2
SSG
SSD
CAT
MDC2
MVC
SMG
MSD/ MSDG
FC*
STK
SRL3
SRG3
SRM3
SRT3
MRL2
MRG2
SM-25
ShkAbs
FJ
FK
Spd Contr
Ending

Switch mounting position (ø6/ø8)

● Reed switch

		F0H	F0V
RD	ø6 / ø8		
HD	ø6 / ø8		

● Proximity switch

		F2S/F3S	F2H/F3H	F2V/F3V	F2YH/F3YH/F3PH	F2YV/F3YV/F3PV
RD	ø6 / ø8					
HD	ø6 / ø8					

Switch mounting position dimensions

(Unit: mm)

Model	Bore size (mm)	Reed switch				Proximity switch												
		F0H		F0V		F2S/F3S		F2H/F3H			F2V/F3V		F2YH/F3YH/F3PH			F2YV/F3YV/F3PV		
		RD	HD	RD	HD	RD	HD	RD	HD	X (*1)	RD	HD	RD	HD	X (*1)	RD	HD	X (*1)
MSD-KL	ø6	6.0	0	6.0	0	9	2.5	10	3.5	5.2	10	3.5	10	3.5	9.7	10	3.5	6.7
	ø8	8.5	0	8.5	0	11.5	1.5	12.5	2.5	6.2	12.5	2.5	12.5	2.5	10.7	12.5	2.5	7.7

*1: X dimensions indicate the switch protrusion from the body end surface. When the X-stroke length is negative, there is no protrusion from the body end surface.

Switch mounting position (ø12/ø16)

● Reed switch

		F0H	FOV
ø12	RD		
	HD		
ø16	RD		
	HD		

● Proximity switch

		F2S/F3S	F2H/F3H	F2V/F3V	F2YH/F3YH/F3PH	F2YV/F3YV/F3PV
ø12	RD					
	HD					
ø16	RD					
	HD					

Switch mounting position dimensions

(Unit: mm)

Model	Bore size (mm)	Reed switch				Proximity switch												
		F0H		F0V		F2S/F3S		F2H/F3H			F2V/F3V		F2YH/F3YH/F3PH			F2YV/F3YV/F3PV		
		RD	HD	RD	HD	RD	HD	RD	HD	X (*1)	RD	HD	RD	HD	X (*1)	RD	HD	X (*1)
MSD-KL	ø12	9.0	0	9.0	0	12	2.5	13	3.5	5.7	13	3.5	13	3.5	10.2	13	3.5	7.2
	ø16	14.0	0	14.0	0	16.5	2.5	17.5	3.5	5.2	17.5	3.5	17.5	3.5	9.7	17.5	3.5	6.7

*1: X dimensions indicate the switch protrusion from the body end surface. When the X-stroke length is negative, there is no protrusion from the body end surface.



Small compact cylinder double acting/fine speed

Single rod

MSD-F Series

- Bore size: $\phi 6$, $\phi 8$

High load

MSD-KF Series

- Bore size: $\phi 6$, $\phi 8$, $\phi 12$, $\phi 16$

JIS symbol



Double acting



Specifications

Item		MSD-F/MSD-LF (with switch)		MSD-KF/MSD-KLF (with switch)			
Bore size mm		ø6	ø8	ø6	ø8	ø12	ø16
Actuation		Double acting/single rod					
Working fluid		Compressed air					
Max. working pressure MPa		1.0 (≈150 psi, 10 bar)					
Min. working pressure MPa		0.15 (≈22 psi, 1.5 bar)		0.15 (≈22 psi, 1.5 bar)		0.1 (≈15 psi, 1 bar)	
Proof pressure MPa		1.6 (≈230 psi, 16 bar)					
Ambient temperature °C		5 (41°F) to 60 (140°F)					
Port size	Body side surface port	M3		M3		M5	
	Rear common port	_____		_____		M3	
Stroke tolerance mm		+0.5 0		+2.0 0			
Working piston speed mm/s		1 to 200					
Cushion		None		With rubber cushion			
Lubrication		Lubrication not possible					
Allowable absorbed energy J		This product cannot absorb the energy generated by an external load mounted on the cylinder. When using the product with no load, select high load or separately provide a shock absorber on the outside.		0.004	0.014	0.044	0.110

Stroke length

Bore size (mm)	Standard stroke length (mm)	Max. stroke length (mm)	Min. stroke length with two switches (mm)		Min. stroke length with one switch (mm)	
			Reed switch	Proximity switch	Reed switch	Proximity switch
$\phi 6$	5/10/15/20/25/30	30	10	5	5	5
$\phi 8$	5/10/15/20/25/30	30	10	5	5	5
$\phi 12$	5/10/15/20/25/30	30	10	5	5	5
$\phi 16$	5/10/15/20/25/30	30	10	5	5	5

Note: Products with stroke length other than standard stroke length are not available.

Switch specifications

Item	Reed 2-wire	Proximity 2-wire			Proximity 3-wire			
	FOH/V	F2H/V	F2S	F2YH/V	F3H/V	F3S	F3PH/V (Made to order)	F3YH/V
Applications	Dedicated for programmable controller				For programmable controller, relay			
Output method	-				NPN output	NPN output	PNP output	NPN output
Power supply voltage	-	-	-	-	10 to 28 VDC	10 to 28 VDC	4.5 to 28 VDC	10 to 28 VDC
Load voltage	24 VDC	10 to 30 VDC	10 to 30 VDC	24 VDC ±10%	30 VDC or less			
Load current	5 to 20 mA (*3)				50 mA or less			
Current consumption	-	-	-	-	≤10 mA (ON) at 24 VDC	10 mA or less with 24 VDC		
Internal voltage drop	4V or less				0.5V or less	0.5V or less	0.5 V or less at 30 mA	0.5V or less
Indicator lamp	Yellow LED (Lit when ON)	LED (Lit when ON)	Red/green LED (Lit when ON)	Yellow LED (Lit when ON)	LED (Lit when ON)	Yellow LED (Lit when ON)	Red/green LED (Lit when ON)	Red/green LED (Lit when ON)
Leakage current	1 mA or less				10 μA or less			
Lead wire length	Standard 1 m (oil resistant vinyl cabtyre cable 2-conductor 0.15 mm ²)				Standard 1 m (oil resistant vinyl cabtyre cable 3-conductor 0.15 mm ²)			
Shock resistance	294 m/s ²	980 m/s ²						
Insulation resistance	20 MΩ and over with 500 VDC megger							
Withstand voltage	No failure after 1 minute of 1,000 VAC application.							
Ambient temperature	-10 to +60°C							
Degree of protection	IEC Standard IP67, JIS C0920 (water-tight), oil resistance							
Weight	g	1 m:10 3 m:29						

*1: Refer to Ending Page 1 for detailed switch specifications and dimensions.

*2: Switches other than the above models, such as switches with connectors, are also available. Refer to Ending Page 1.

*3: The max. load current is 20 mA at 25 $^{\circ}\text{C}$. The current is lower than 20 mA if the operating ambient temperature around the switch is higher than 25 $^{\circ}\text{C}$.
(5 to 10 mA at 60 $^{\circ}\text{C}$)

*4: The F type switch uses a bend-resistant lead wire.

Cylinder weight table

Same as MSD Series (double acting/single rod) and MSD-K Series (double acting/high load). Refer to pages 1423 and 1441.

How to order

- Without switch (without magnet for switch)

MSD-F - 6 - 5 —————

- With switch (built-in magnet for switch)

MSD-LF - 6 - 5 - F2V - R —————

A Model No.

B Bore size

C Stroke length

D Switch model No.

*1

*2

Note on model No. selection

*1 : For ø6 or ø8 with switch, use a non-magnetic (stainless steel, etc.) mounting bolt.

*2 : For ø12 or ø16 with proximity switch, use a non-magnetic (stainless steel, etc.) through bolt.

*3 : For rear piping, body side installation is possible. Note that 2 bolts are used for rod side installation and head side installation.

[Example of model No.]

MSD-KLF-12-10-F0H-R-R

A Model No. : Double acting/fine speed/high load with switch

B Bore size : ø12 mm

C Stroke length : 10 mm

D Switch model No. : Reed switch F0H, lead wire 1 m

E Switch quantity : 1 on rod side

F Piping port position: Rear piping

E Switch quantity

F Option
*3

How to order switch

SW - F0H

Switch model No.
(Item D at right)

A Model No.	
Double acting/ single rod	Double acting/ high load
MSD-F MSD-LF	MSD-KF
MSD-KLF	

Code	Description		
B Bore size (mm)			
6	ø6	●	●
8	ø8	●	●
12	ø12		●
16	ø16		●

C Stroke length (mm)			
5	5	●	●
10	10	●	●
15	15	●	●
20	20	●	●
25	25	●	●
30	30	●	●

D Switch model No.							
Axial lead wire	Radial lead wire	Contact	Voltage	Indicator lamp	Lead wire		
			AC	DC			
F0H*	F0V*	Reed		●	1-color display	2-wire	●
-	F2S*			●			●
F2H*	F2V*			●			●
-	F3S*			●			●
F3H*	F3V*	Prox.		●	1-color display (PNP output) (custom)	3-wire	●
F3PH*	F3PV*			●			●
F2YH*	F2YV*			●		2-wire	●
F3YH*	F3YV*			●		3-wire	●

* Lead wire length			
Blank	1 m (standard)	●	●
3	3 m (option)	●	●

E Switch quantity			
R	1 on rod side	●	●
H	1 on head side	●	●
D	2	●	●

F Option							
Bore size (ø)						All bore sizes	
Blank	Front piping port	●	●	●	●	●	●
R	Rear piping port					●	●

Theoretical thrust table

(Unit: N)

Bore size (mm)	Operating direction	Working pressure MPa										
		0.1	0.15	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
ø6	Push	-	4.24	5.65	8.48	11.3	14.1	17.0	19.8	22.6	25.4	28.3
	Pull	-	2.36	3.14	4.71	6.28	7.85	9.42	11.0	12.6	14.1	15.7
ø8	Push	-	7.54	10.1	15.1	20.1	25.1	30.2	35.2	40.2	45.2	50.3
	Pull	-	4.59	6.13	9.19	12.3	15.3	18.4	21.4	24.5	27.6	30.6
ø12	Push	11.3	17.0	22.6	33.9	45.2	56.5	67.9	79.2	90.5	1.02 × 10 ²	1.13 × 10 ²
	Pull	8.48	12.7	17.0	25.4	33.9	42.4	50.9	59.4	67.9	76.3	84.8
ø16	Push	20.1	30.2	40.2	60.3	80.4	1.01 × 10 ²	1.21 × 10 ²	1.41 × 10 ²	1.61 × 10 ²	1.81 × 10 ²	2.01 × 10 ²
	Pull	15.1	22.6	30.2	45.2	60.3	75.4	90.5	1.06 × 10 ²	1.21 × 10 ²	1.36 × 10 ²	1.51 × 10 ²

Dimensions

Same as MSD Series (double acting/single rod) and MSD-K Series (double acting/high load).
Refer to pages 1427, 1446 and 1447.



Small guided compact cylinder
Double acting/guided/with switch

MSDG-L Series

● Bore size: $\phi 6/\phi 8/\phi 12/\phi 16$



Specifications

Item		MSDG-L (with switch)			
Bore size mm		ø6	ø8	ø12	ø16
Actuation		Double acting			
Working fluid		Compressed air			
Max. working pressure MPa		1.0 (≈150 psi, 10 bar)			
Min. working pressure MPa		0.2 (≈29 psi, 2 bar)	0.15 (≈22 psi, 1.5 bar)	0.1 (≈15 psi, 1 bar)	
Proof pressure MPa		1.6 (≈230 psi, 16 bar)			
Ambient temperature °C		5 (41°F) to 60 (140°F)			
Port size	Front piping	M3		M5	
	Rear piping	M3		M3	
Stroke tolerance mm		+2.0 0			
Working piston speed mm/s		50 to 500			
Cushion		With rubber cushion			
Lubrication		Not required (use turbine oil ISO VG32 if necessary for lubrication)			
Allowable absorbed energy J		0.004	0.014	0.044	0.110

Stroke length

Bore size (mm)	Standard stroke length (mm)	Max. stroke length (mm)	Min. stroke length with two switches (mm)		Min. stroke length with one switch (mm)	
			Reed switch	Proximity switch	Reed switch	Proximity switch
$\phi 6$	5/10/15/20/25/30	30	10	5	5	5
$\phi 8$	5/10/15/20/25/30	30	10	5	5	5
$\phi 12$	5/10/15/20/25/30	30	10	5	5	5
$\phi 16$	5/10/15/20/25/30	30	10	5	5	5

Note: Products with stroke length other than standard stroke length are not available.

Switch specifications

Item	Reed 2-wire	Proximity 2-wire			Proximity 3-wire			
	FOH/V	F2H/V	F2S	F2YH/V	F3H/V	F3S	F3PH/V (Made to order)	F3YH/V
Applications	Dedicated for programmable controller				For programmable controller, relay			
Output method	-				NPN output	NPN output	PNP output	NPN output
Power supply voltage	-	-	-	-	10 to 28 VDC	10 to 28 VDC	4.5 to 29 VDC	10 to 28 VDC
Load voltage	24 VDC	10 to 30 VDC		24 VDC ±10%	30 VDC or less			
Load current	5 to 20 mA (*3)				50 mA or less			
Current consumption	-	-	-	-	≤10 mA (ON) at 24 VDC	10 mA or less with 24 VDC		
Internal voltage drop	4V or less				0.5V or less		0.5 V or less at 30 mA	0.5V or less
Indicator lamp	Yellow LED (Lit when ON)		LED (Lit when ON)	Red/green LED (Lit when ON)	Yellow LED (Lit when ON)	LED (Lit when ON)	Yellow LED (Lit when ON)	Red/green LED (Lit when ON)
Leakage current	1 mA or less				10 μA or less			
Lead wire length	Standard 1 m (oil resistant vinyl cabtyre cable 2-conductor 0.15 mm ²)				Standard 1 m (oil resistant vinyl cabtyre cable 3-conductor 0.15 mm ²)			
Shock resistance	294 m/s ²	980 m/s ²						
Insulation resistance	20 MΩ and over with 500 VDC megger							
Withstand voltage	No failure after 1 minute of 1,000 VAC application.							
Ambient temperature	-10 to +60°C							
Degree of protection	IEC Standard IP67, JIS C0920 (water-tight), oil resistance							
Weight g	1 m:10 3 m:29							

*1: Refer to Ending Page 1 for detailed switch specifications and dimensions.

*2: Switches other than the above models, such as switches with connectors, are also available. Refer to Ending Page 1.

*3: The max. load current is 20 mA at 25 $^{\circ}\text{C}$. The current is lower than 20 mA if the operating ambient temperature around the switch is higher than 25 $^{\circ}\text{C}$.
(5 to 10 mA at 60 $^{\circ}\text{C}$)

*4: The F type switch uses a bend-resistant lead wire.

Cylinder weight table

(Unit: g)

Stroke length (mm)	5	10	15	20	25	30	Weight per switch
Bore size (mm)							
ø6	43	48	52	57	61	66	Refer to the weight in the switch specifications.
ø8	50	56	63	69	76	82	
ø12	76	88	100	112	124	136	
ø16	129	146	163	180	197	214	

Theoretical thrust table

(Unit: N)

Bore size (mm)	Operating direction	Working pressure MPa										
		0.1	0.15	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
ø6	Push	-	-	5.65	8.48	11.3	14.1	17.0	19.8	22.6	25.4	28.3
	Pull	-	-	3.14	4.71	6.28	7.85	9.42	11.0	12.6	14.1	15.7
ø8	Push	-	7.54	10.1	15.1	20.1	25.1	30.2	35.2	40.2	45.2	50.3
	Pull	-	4.59	6.13	9.19	12.3	15.3	18.4	21.4	24.5	27.6	30.6
ø12	Push	11.3	17.0	22.6	33.9	45.2	56.5	67.9	79.2	90.5	1.02×10^2	1.13×10^2
	Pull	8.48	12.7	17.0	25.4	33.9	42.4	50.9	59.4	67.9	76.3	84.8
ø16	Push	20.1	30.2	40.2	60.3	80.4	1.01×10^2	1.21×10^2	1.41×10^2	1.61×10^2	1.81×10^2	2.01×10^2
	Pull	15.1	22.6	30.2	45.2	60.3	75.4	90.5	1.06×10^2	1.21×10^2	1.36×10^2	1.51×10^2

SCP*3

CMK2

CMA2

SCM

SCG

SCA2

SCS2

CKV2

CAV2/
COVP/N2

SSD2

SSG

SSD

CAT

MDC2

MVC

SMG

MSD/
MSDG

FC*

STK

SRL3

SRG3

SRM3

SRT3

MRL2

MRG2

SM-25

ShkAbs

FJ

FK

Spd
Contr

Ending

MSDG-L Series

How to order

● With switch (built-in magnet for switch)

MSDG-L-6-30-F0H-D-R

Model No.

A Bore size

B Stroke length

C Switch model No.

*1

*2

D Switch quantity

E Option

*3

⚠ Precautions for model No. selection

*1 : For ø6 or ø8 with switch, use a non-magnetic (stainless steel, etc.) mounting bolt.

*2 : For ø12 or ø16 with proximity switch, use a non-magnetic (stainless steel, etc.) through bolt.

*3 : For rear piping, body side installation is possible.

[Example of model No.]

MSDG-L-6-30-F0H-D-R

Model No.: Double acting/guided with switch

A Bore size : ø6 mm

B Stroke length : 30 mm

C Switch model No. : Reed F0H switch

D Switch quantity : 2

E Option : Rear piping

How to order switch

SW - F0H

Switch model No.
(Item **C** above)

Code	Description
A Bore size (mm)	
6	ø6
8	ø8
12	ø12
16	ø16

B Stroke length (mm)	
5	5
10	10
15	15
20	20
25	25
30	30

C Switch model No.					
Axial lead wire	Radial lead wire	Contact	Voltage		Indicator lamp
			AC	DC	
F0H*	F0V*	Reed		●	1-color display
-	F2S*	Proximity		●	
F2H*	F2V*			●	
-	F3S*			●	
F3H*	F3V*	Proximity		●	1-color display (PNP output) (custom)
F3PH*	F3PV*			●	
F2YH*	F2YV*			●	2-color display
F3YH*	F3YV*			●	

* Lead wire length	
Blank	1 m (standard)
3	3 m (option)

D Switch quantity	
R	1 on rod side
H	1 on head side
D	2

E Option	
Blank	Front piping
R	Rear piping

Specifications for rechargeable battery

(Catalog No. CC-1226A)

● Design compatible with rechargeable battery manufacturing process

MSDG-L-..... P4*

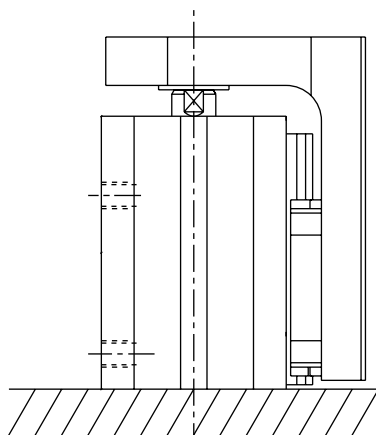
Switch selection table

Switches may not be installable depending on relations between cylinder installation and stroke length.

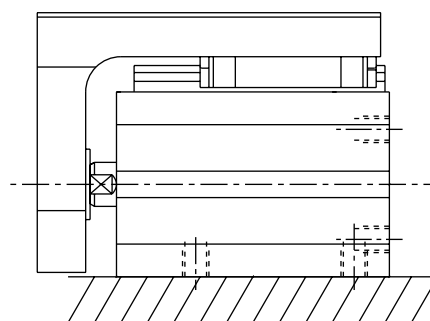
Refer to the table below to select a switch.

Switches cannot be used for side mounting in the following combinations.

- Combinations in which F2YH/V, F3YH/V or F3PH/V is mounted at the switch mounting position H with stroke length 5 mm
- Combinations in which F2YH, F3YH or F3PH is mounted at the switch mounting position H with stroke length 10 mm (Refer to page 1452 for the min. stroke length with switch)



For head side installation



For side installation

● For head side installation

Bore size (mm)	Stroke length (mm)	Reed switch				Proximity switch									
		F0H		F0V		F2S/F3S		F2H/F3H		F2V/F3V		F2YH/F3YH/F3PH		F2YV/F3YV/F3PV	
		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position		Switch position	
		R	H	R	H	R	H	R	H	R	H	R	H	R	H
ø6	5	×	○	○	○	○	○	×	○	○	○	×	×	○	○
	10	○	○	○	○	○	○	×	○	○	○	×	○	○	○
	15 to	○	○	○	○	○	○	○	○	○	○	○	○	○	○
ø8	5	×	○	○	○	○	○	×	○	○	○	×	×	○	○
	10	○	○	○	○	○	○	×	○	○	○	×	○	○	○
	15 to	○	○	○	○	○	○	○	○	○	○	○	○	○	○
ø12	5	×	○	○	○	○	○	×	○	○	○	×	○	○	○
	10	○	○	○	○	○	○	×	○	○	○	×	×	○	○
	15 to	○	○	○	○	○	○	○	○	○	○	○	○	○	○
ø16	5	×	○	○	○	○	○	×	○	○	○	×	○	○	○
	10	○	○	○	○	○	○	×	○	○	○	×	○	○	○
	15 to	○	○	○	○	○	○	○	○	○	○	○	○	○	○

SCP*3

CMK2

CMA2

SCM

SCG

SCA2

SCS2

CKV2

CAV2/
COVP/N2

SSD2

SSG

SSD

CAT

MDC2

MVC

SMG

MSD/
MSDG

FC*

STK

SRL3

SRG3

SRM3

SRT3

MRL2

MRG2

SM-25

ShkAbs

FJ

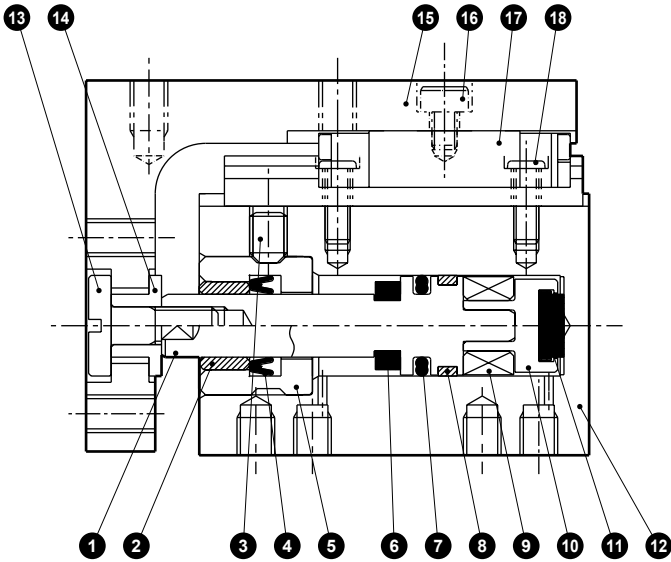
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Spd
Contr

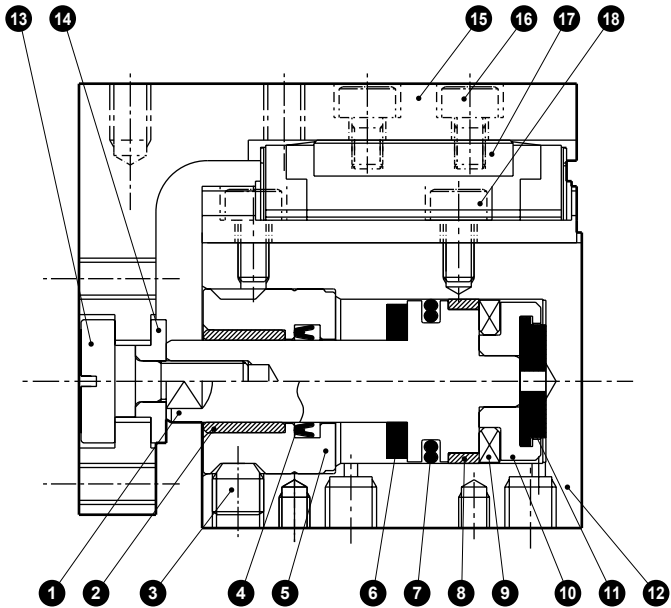
Ending

Internal structure and parts list

● MSDG-L-6/8/12



● MSDG-L-16



Cannot be disassembled

No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Piston	Stainless steel		10	Adaptor	Aluminum alloy	
2	Bush	Oil-impregnated copper alloy		11	Cushion rubber H	Urethane rubber	
3	Hexagon socket set screw	Stainless steel		12	Body	Aluminum alloy	Hard alumite
4	Rod packing	Nitrile rubber		13	Floating bolt	Steel	Nickeling
5	Rod metal	Stainless steel		14	Floating bush	Stainless steel	
6	Cushion rubber R	Urethane rubber		15	Table	Aluminum alloy	Alumite
7	Piston packing	Nitrile rubber		16	Hexagon socket head cap screw	Stainless steel	
8	Wear ring	Acetal resin		17	High precision guide	Stainless steel	
9	Magnet	Plastic		18	Bolt	Stainless steel	

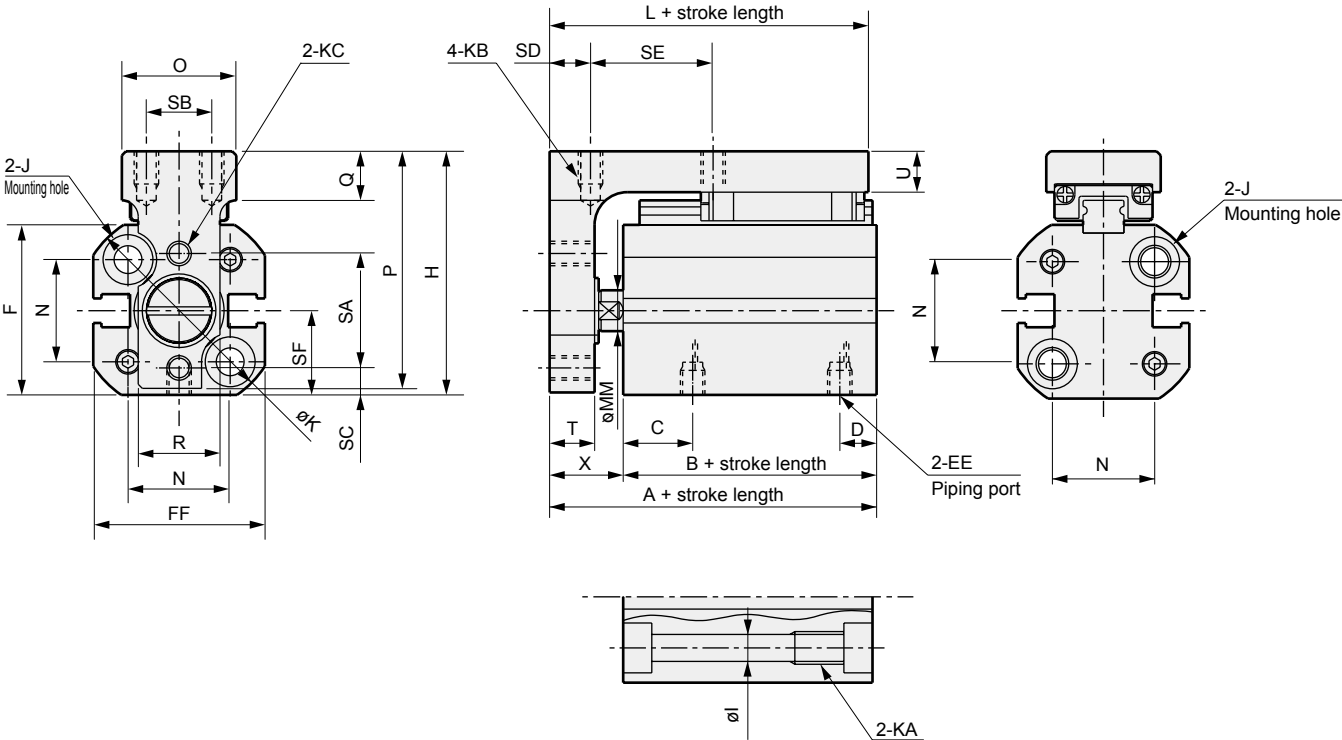
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CMK2
CMA2
SCM
SCG
SCA2
SCS2
CKV2
CAV2/ COVP/N2
SSD2
SSG
SSD
CAT
MDC2
MVC
SMG
MSD/ MSDG
FC*
STK
SRL3
SRG3
SRM3
SRT3
MRL2
MRG2
SM-25
ShkAbs
FJ
FK
Spd Contr
Ending

MSDG-L Series

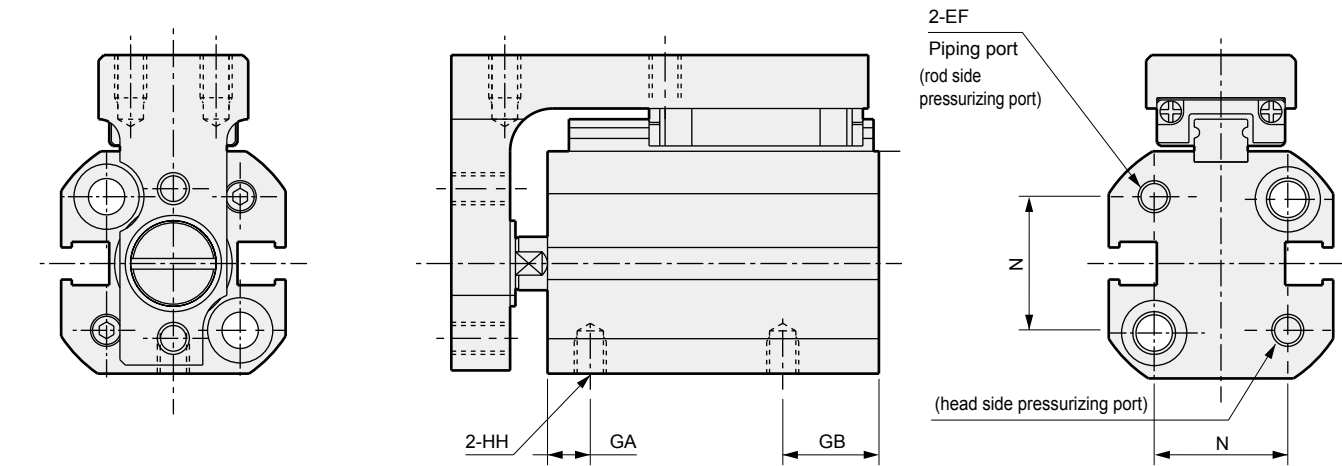
Dimensions



● MSDG-L-6/8/12



● MSDG-L-6/8/12-*R (Rear piping)



Code	A	B	C	D	EE	EF	F	FF	GA	GB	H	HH	I	J	K	KA	KB	KC
Bore size (mm)																		
ø6	33.5	24.5	7.5	4	M3	M3	18.8	19	3	8.5	27.8	M3 depth 3	3.2	Spot face ø6 / depth 3.5	22.5	M4 depth 6	M3 depth 4	M3 (through)
ø8	35	26	9	4	M3	M3	20.8	21	4.5	8.5	29.8	M3 depth 3	3.2	Spot face ø6 / depth 3.5	25	M4 depth 6	M3 depth 4	M3 (through)
ø12	38	27	11.5	5	M5	M3	24.8	25	4	10.5	36.3	M3 depth 3	3.2	Spot face ø6 / depth 3.5	31	M4 depth 6	M3 depth 4.5	M3 (through)

Code	L	MM	N	O	P	Q	R	SA	SB	SC	SD	SE	SF	T	U	X
Bore size (mm)																
ø6	32	4	11	14	27	6	9.5	12	8	3.3	5	15	9.3	5.5	5	9
ø8	33.5	5	12.5	14	29	6	10	14	8	3.3	5	15	10.3	5.5	5	9
ø12	36.5	6	15.5	19	35	6.5	13	15.5	12	4.5	5	15	12.3	7	6.5	11

Double acting/guided/with switch

Technical drawing of a 1/2" NPT 2-Port 150 PSI Brass Ball Valve, showing three views: front, side, and top.

Front View Dimensions:

- Overall width: 29
- Overall height: 43.3
- Top flange width: 23
- Top flange mounting hole diameter: $\phi 6.1$ (depth 3.5)
- Top flange mounting hole spacing: 15
- Top flange thickness: 7.5
- Body height: 42
- Body width: 20
- Body mounting hole diameter: $\phi 36$
- Body mounting hole spacing: 16
- Body mounting hole depth: 4.3
- Body mounting hole diameter: $\phi 36$

Side View Dimensions:

- Overall length: 42.5 + stroke length
- Top flange mounting hole diameter: $\phi 8$
- Top flange mounting hole spacing: 15
- Top flange thickness: 7.5
- Body length: 32 + stroke length
- Body width: 14.5
- Body mounting hole diameter: $\phi 8$
- Body mounting hole spacing: 12
- Body mounting hole depth: 5
- Body mounting hole diameter: $\phi 8$

Top View Dimensions:

- Overall width: 20
- Top flange mounting hole diameter: $\phi 6.1$ (depth 3.5)
- Top flange mounting hole spacing: 15
- Top flange thickness: 7.5
- Body width: 20
- Body mounting hole diameter: $\phi 36$
- Body mounting hole spacing: 16
- Body mounting hole depth: 4.3
- Body mounting hole diameter: $\phi 36$

Callouts:

- 4-M4 Depth 5.5
- 2-M4 x 0.7 (through)
- 2-spot face $\phi 6.1$ depth 3.5 Mounting hole
- 2-M5 Piping port
- 2-spot face $\phi 6.1$ depth 3.5 mounting hole
- 2-M4 x 0.7 depth 6

2-M3

Piping port
(rod side
pressurizing port)

20

(head side pressurizing port)

20

2-M3
Depth 3

9

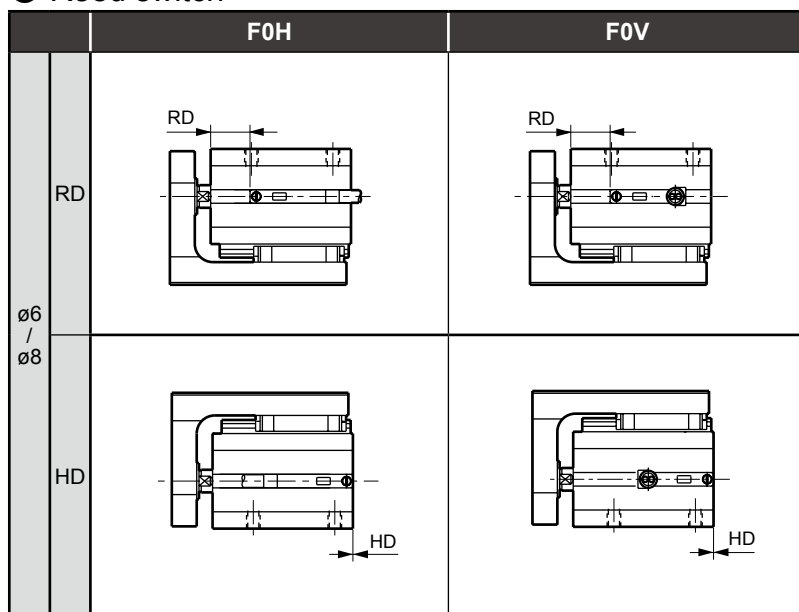
10.5

SCP*3
CMK2
CMA2
SCM
SCG
SCA2
SCS2
CKV2
CAV2/ COVP/N2
SSD2
SSG
SSD
CAT
MDC2
MVC
SMG
MSD/ MSDG
FC*
STK
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MRG2
SM-25
ShkAbs
FJ
FK
Spd Contr
Ending

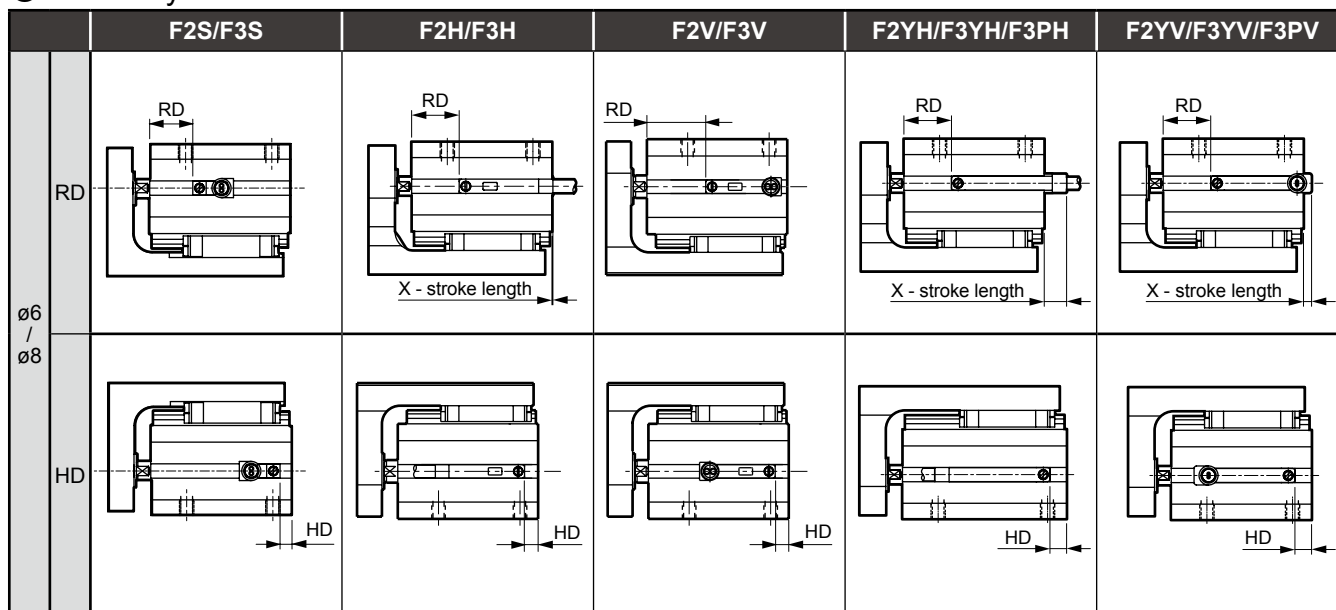
MSDG-L Series

Switch mounting position (ø6/ø8)

● Reed switch



● Proximity switch



Switch mounting position dimensions

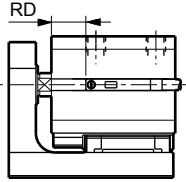
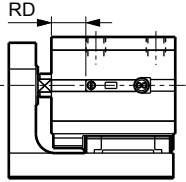
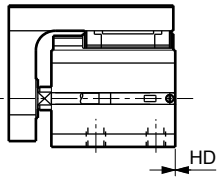
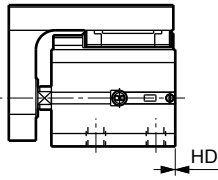
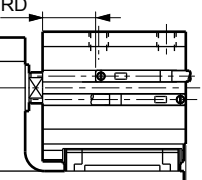
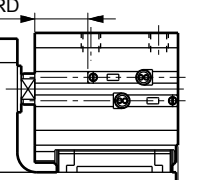
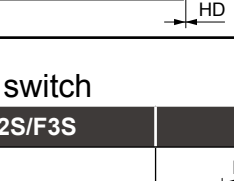
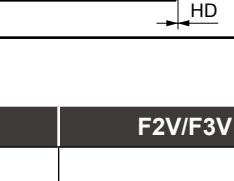
(Unit: mm)

Model	Bore size (mm)	Reed switch				Proximity switch												
		F0H		F0V		F2S/F3S		F2H/F3H		X (*1)	F2V/F3V		F2YH/F3YH/F3PH		X (*1)	F2YV/F3YV/F3PV		X (*1)
		RD	HD	RD	HD	RD	HD	RD	HD		RD	HD	RD	HD		RD	HD	
MSDG	ø6	6.0	0	6.0	0	9	2.5	10	3.5	5.2	10	3.5	10	3.5	9.7	10	3.5	6.7
-KL	ø8	8.5	0	8.5	0	11.5	1.5	12.5	2.5	6.2	12.5	2.5	12.5	2.5	10.7	12.5	2.5	7.7

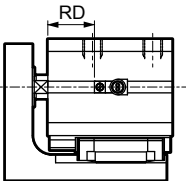
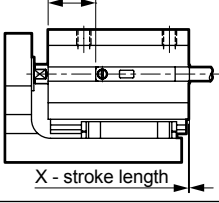
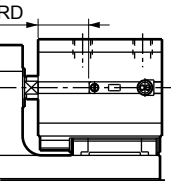
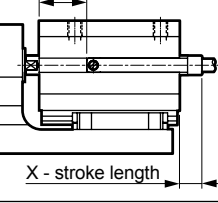
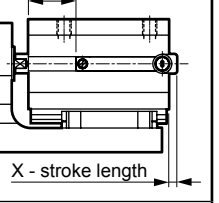
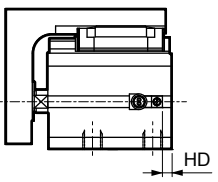
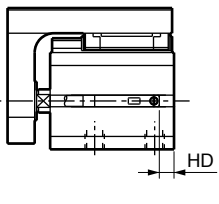
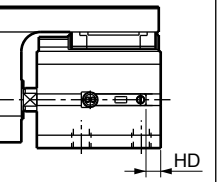
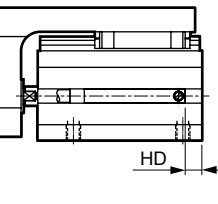
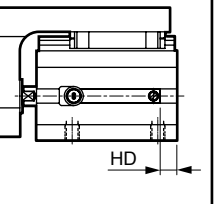
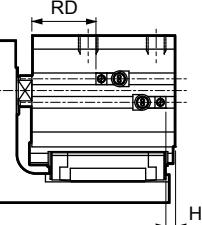
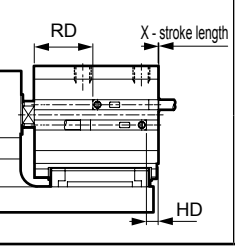
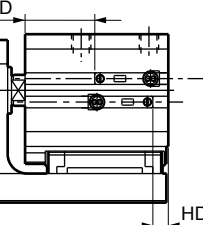
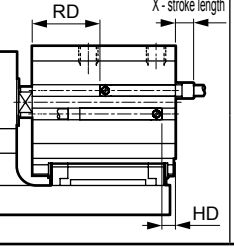
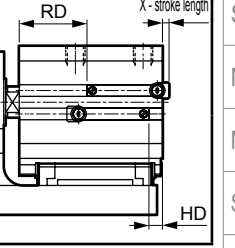
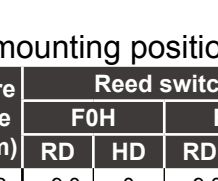
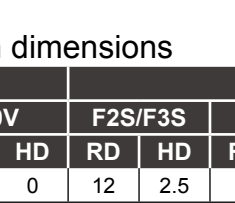
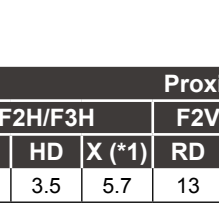
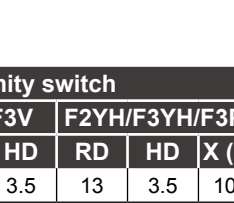
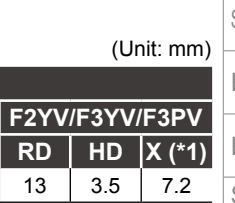
*1: X dimensions indicate the switch protrusion from the body end surface. When the X-stroke length is negative, there is no protrusion from the body end surface.

Switch mounting position (ø12/ø16)

● Reed switch

		F0H	F0V
ø12	RD		
	HD		
ø16	RD		
	HD		

● Proximity switch

		F2S/F3S	F2H/F3H	F2V/F3V	F2YH/F3YH/F3PH	F2YV/F3YV/F3PV
ø12	RD					
	HD					
ø16	RD					
	HD					

Switch mounting position dimensions

(Unit: mm)

Model	Bore size (mm)	Reed switch				Proximity switch												
		F0H		F0V		F2S/F3S		F2H/F3H			F2V/F3V		F2YH/F3YH/F3PH			F2YV/F3YV/F3PV		
		RD	HD	RD	HD	RD	HD	RD	HD	X (*1)	RD	HD	RD	HD	X (*1)	RD	HD	X (*1)
MSDG-KL	ø12	9.0	0	9.0	0	12	2.5	13	3.5	5.7	13	3.5	13	3.5	10.2	13	3.5	7.2
	ø16	14.0	0	14.0	0	16.5	2.5	17.5	3.5	5.2	17.5	3.5	17.5	3.5	9.7	17.5	3.5	6.7

*1: X dimensions indicate the switch protrusion from the body end surface. When the X-stroke length is negative, there is no protrusion from the body end surface.

SCP*3

CMK2

CMA2

SCM

SCG

SCA2

SCS2

CKV2

CAV2/COVP/N2

SSD2

SSG

SSD

CAT

MDC2

MVC

SMG

MSD/MSDG

FC*

STK

SRL3

SRG3

SRM3

SRT3

MRL2

MRG2

SM-25

ShkAbs

FJ

FK

Spd Contr

Ending



Small guided compact cylinder
Double acting/guided/with switch/fine speed

MSDG-LF Series

● Bore size: ø12/ø16



Specifications

Item	MSDG-LF	
Bore size mm	ø12	ø16
Actuation	Double acting/guided	
Working fluid	Compressed air	
Max. working pressure MPa	1.0 (≈150 psi, 10 bar)	
Min. working pressure MPa	0.1 (≈15 psi, 1 bar)	
Proof pressure MPa	1.6 (≈230 psi, 16 bar)	
Ambient temperature °C	5 (41°F) to 60 (140°F)	
Port size	Front piping	M5
	Rear piping	M3
Stroke tolerance mm	$^{+2.0}_0$	
Working piston speed mm/s	1 to 200	
Cushion	With rubber cushion	
Lubrication	Not available	
Allowable absorbed energy J	0.044	0.110

Stroke length

Bore size (mm)	Standard stroke length (mm)	Max. stroke length (mm)	Min. stroke length with two switches (mm)		Min. stroke length with one switch (mm)	
			Reed switch	Proximity switch	Reed switch	Proximity switch
ø12	5/10/15/20/25/30	30	10	5	5	5
ø16	5/10/15/20/25/30	30	10	5	5	5

Note: Products with stroke length other than standard stroke length are not available.

Switch specifications

Item	Reed 2-wire	Proximity 2-wire			Proximity 3-wire			
	FOH/V	F2H/V	F2S	F2YH/V	F3H/V	F3S	F3PH/V (Made to order)	F3YH/V
Applications	Dedicated for programmable controller				For programmable controller, relay			
Output method	-				NPN output	NPN output	PNP output	NPN output
Power supply voltage	-	-	-	-	10 to 28 VDC	10 to 28 VDC	4.5 to 28 VDC	10 to 28 VDC
Load voltage	24 VDC	10 to 30 VDC		24 VDC ±10%	30 VDC or less			
Load current	5 to 20 mA (*3)				50 mA or less			
Current consumption	-	-	-	-	≤10 mA (ON) at 24 VDC	10 mA or less with 24 VDC		
Internal voltage drop	4V or less				0.5V or less		0.5 V or less at 30 mA	0.5V or less
Indicator lamp	Yellow LED (Lit when ON)		LED (Lit when ON)	Red/green LED (Lit when ON)	Yellow LED (Lit when ON)	LED (Lit when ON)	Yellow LED (Lit when ON)	Red/green LED (Lit when ON)
Leakage current	1 mA or less				10 μA or less			
Lead wire length	Standard 1 m (oil resistant vinyl cabtyre cable 2-conductor 0.15 mm ²)				Standard 1 m (oil resistant vinyl cabtyre cable 3-conductor 0.15 mm ²)			
Shock resistance	294 m/s ²	980 m/s ²						
Insulation resistance	20 MΩ and over with 500 VDC megger							
Withstand voltage	No failure after 1 minute of 1,000 VAC application.							
Ambient temperature	-10 to +60°C							
Degree of protection	IEC Standard IP67, JIS C0920 (water-tight), oil resistance							
Weight	g	1 m:10 3 m:29						

*1: Refer to Ending Page 1 for detailed switch specifications and dimensions.

*2: Switches other than the above models, such as switches with connectors, are also available. Refer to Ending Page 1.

*3: The max. load current is 20 mA at 25°C. The current is lower than 20 mA if the operating ambient temperature around the switch is higher than 25°C. (5 to 10 mA at 60°C)

*4: The F type switch uses a bend-resistant lead wire.

Theoretical thrust table

(Unit: N)

Bore size (mm)	Operating direction	Working pressure MPa										
		0.1	0.15	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
ø12	Push	11.3	17.0	22.6	33.9	45.2	56.5	67.9	79.2	90.5	1.02 × 10 ²	1.13 × 10 ²
	Pull	8.48	12.7	17.0	25.4	33.9	42.4	50.9	59.4	67.9	76.3	84.8
ø16	Push	20.1	30.2	40.2	60.3	80.4	1.01 × 10 ²	1.21 × 10 ²	1.41 × 10 ²	1.61 × 10 ²	1.81 × 10 ²	2.01 × 10 ²
	Pull	15.1	22.6	30.2	45.2	60.3	75.4	90.5	1.06 × 10 ²	1.21 × 10 ²	1.36 × 10 ²	1.51 × 10 ²

How to order

- With switch (built-in magnet for switch)

MSDG-LF - 12 - 10 - F2V - R - R

Model No.

Ⓐ Bore size

Ⓑ Stroke length

Ⓒ Switch model No.

*1

⚠ Precautions for model No. selection

*1 : If with proximity switch and only when using through bolt, use the non-magnetic (stainless steel, etc.) mounting bolt.

*2 : For rear piping, body side installation is possible.

[Example of model No.]

MSDG-LF-12-10-F0H-R-R

Double acting/guided/fine speed with switch

- Ⓐ Bore size : $\phi 12$ mm
- Ⓑ Stroke length : 10 mm
- Ⓒ Switch model No. : Reed switch F0H, lead wire 1 m
- Ⓓ Switch quantity : 1 on rod side
- Ⓔ Piping port position : Rear common port

Ⓓ Switch quantity

Ⓔ Option

*2

Code		Description				
A Bore size (mm)						
12	ø12					
16	ø16					
B Stroke length (mm)						
5	5					
10	10					
15	15					
20	20					
25	25					
30	30					
C Switch model No.						
Axial lead wire	Radial lead wire	Contact	Voltage		Indicator lamp	Lead wire
			AC	DC		
F0H*	F0V*	Reed		●	1-color display	2-wire
-	F2S*			●		
F2H*	F2V*			●		
-	F3S*			●		
F3H*	F3V*			●		
F3PH*	F3PV*	Proximity		●	1-color display (PNP output) (custom)	3-wire
F2YH*	F2YV*			●		
F3YH*	F3YV*			●	2-color display	3-wire
* Lead wire length						
Blank	1 m (standard)					
3	3 m (option)					
D Switch quantity						
R	1 on rod side					
H	1 on head side					
D	2					
E Option						
Blank	Front piping					
R	Rear piping					

How to order switch

SW - F0H

Switch model No.
(Item Ⓒ above)

Dimensions

The same as double acting/guided MSDG-L series.
Refer to pages 1458 and 1459.

SCP*3

CMK2

CMA2

SCM

SCG

SCA2

SCS2

CKV2

CAV2/
COVP/N2

SSD2

SSG

SSD

CAT

MDC2

MVC

SMG

MSD/
MSDG

FC*

STK

SRL3

SRG3

SRM3

SRT3

MRL2

MRG2

SM-25

ShkAbs

FJ

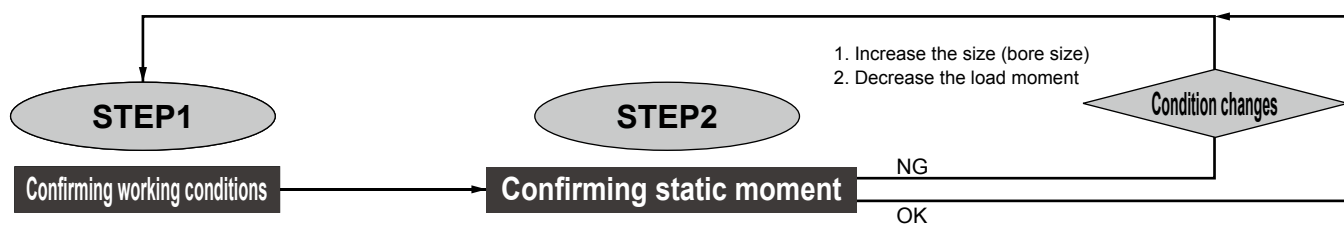
FK

Spd
Contr

Ending

MSD/MSDG Series

Selection guide



STEP1 Confirming working conditions

- | | | | |
|------------------------------|------------------------|---|------------------------------|
| 1. Bore size | : D (mm) | 6. Load moment | : M1, M2, M3 direction (N·m) |
| 2. Stroke length | : St (mm) | 7. Load weight | : m1, m2, m3(kg) |
| 3. Working pressure | : P (MPa) | 8. Amount of overhang | : L1, L2, L3(m) |
| 4. Travel time | : t (s) | 9. Length from center of guide to table end | : L(m) |
| 5. Cylinder travel direction | : Vertical, horizontal | 10. Length from table end to load | : A(m) |

STEP2 Confirming static moment

Depending on the mounting direction (M1/M2/M3 direction), the tolerance value of the moment varies. Calculate the value of moment to be applied by referring to the figure below.

- When there is only one load mounting direction
Check that the calculated value is within the tolerance value (Table 1).
- When there are more than one load mounting directions (complex moment)
Divide the value in each direction by the tolerance value of moment (Table 1) to obtain the moment ratio and check that the total value is 1.0 or less.

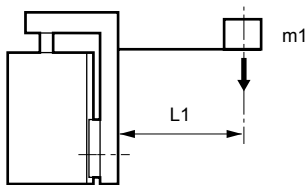
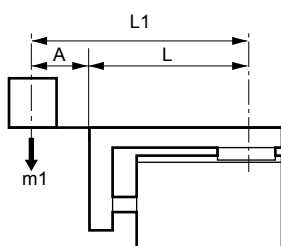
Table 1 Allowable moment in operation (Unit: N·m)

Bore size (mm)	M1	M2	M3
ø6	0.16	0.24	0.16
ø8	0.16	0.24	0.16
ø12	0.27	0.55	0.27
ø16	0.57	1.16	0.57

$$\frac{M1}{M1_{max}} + \frac{M2}{M2_{max}} + \frac{M3}{M3_{max}} \leq 1.0$$

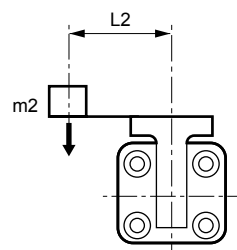
- Bending moment: M1

$$M1 (N·m) = 10 \times m1 (kg) \times L1 (m)$$



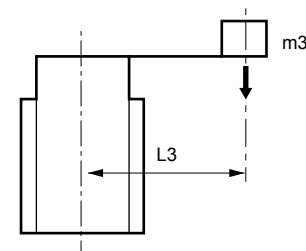
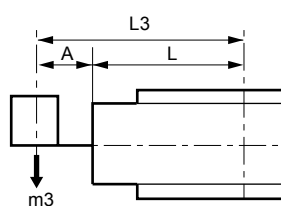
- Radial moment: M2

$$M2 (N·m) = 10 \times m2 (kg) \times L2 (m)$$



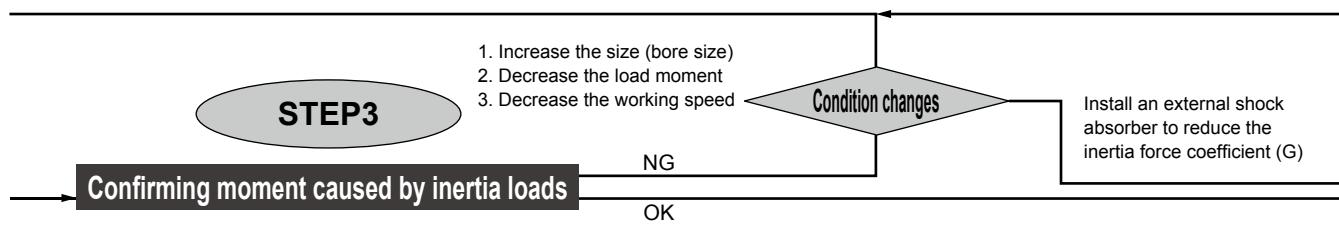
- Torsion moment: M3

$$M3 (N·m) = 10 \times m3 (kg) \times L3 (m)$$



L value (Unit: m)

Bore size (mm)	Stroke length					
	5	10	15	20	25	30
ø 6	0.027	0.032	0.037	0.042	0.047	0.052
ø 8	0.028	0.033	0.038	0.043	0.048	0.053
ø12	0.031	0.036	0.041	0.046	0.051	0.056
ø16	0.033	0.038	0.043	0.048	0.053	0.058



STEP3 Confirming moment caused by inertia loads

Depending on the mounting direction (M1/M2/M3 direction), moment caused by inertia load may be applied.
Calculate the value of moment caused by inertia load by referring to the figure below.

Moment caused by inertia load (M1'/M3') can be obtained from load weight (m1, m2, m3), overhang length (L1, L2, L3, L1', L3') and inertia force coefficient (G).

Inertia force coefficient (G) can be obtained from the relation between inertia force coefficient and stroke end speed (Fig. 1).

Check that the calculated value is within the tolerance value (Table 2).

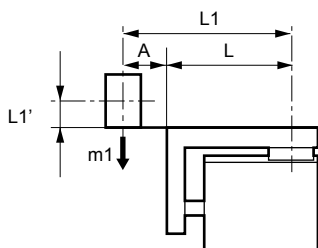
Table 2 Allowable moment when inertia load is applied (Unit: N·m)

Bore size (mm)	M1'	M2'	M3'
ø6	0.33	-	0.33
ø8	0.33	-	0.33
ø12	0.49	-	0.49
ø16	1.11	-	1.11

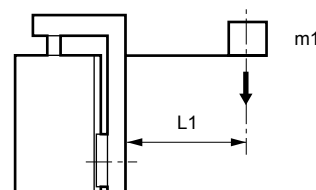
* Inertia load is not applied in M2 direction.

● Bending moment: M1

$$M1' = 10 \times m1 \times (L1 + G \times L1')$$

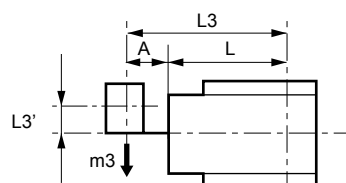


$$M1' = 10 \times m1 \times L1 \times (1 + G)$$

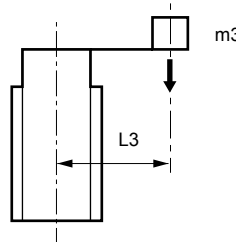


● Torsion moment: M3

$$M3' = 10 \times m3 \times (L3 + G \times L3')$$



$$M3' = 10 \times m3 \times L3 \times (1 + G)$$



$$M3' = 10 \times m2 \times G \times L2$$

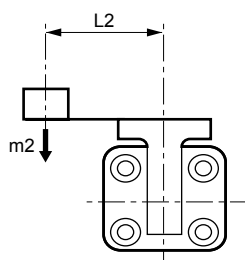
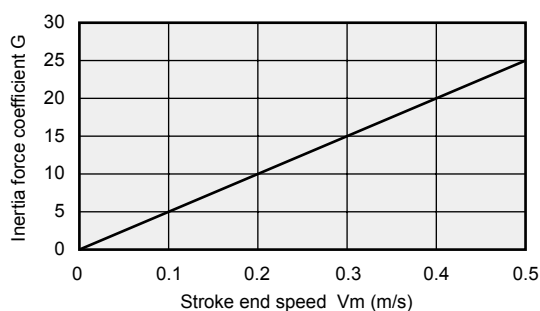


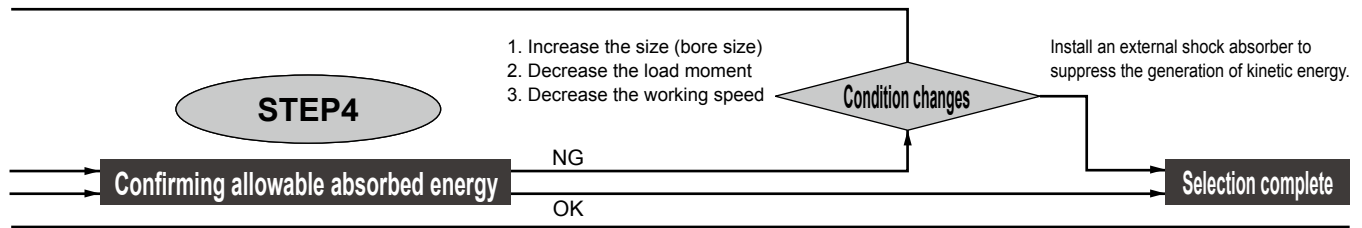
Fig. 1 Relation between inertia force coefficient and stroke end speed



(Note) Calculate the stroke end speed Vm from STEP 4.

MSD/MSDG Series

Selection guide



STEP4 Confirming allowable absorbed energy

First, obtain the kinetic energy of cylinder.

$$E = \frac{1}{2} \times m \times V_m^2$$

$$V_m = \frac{St \times 10^{-3}}{t} \times (1 + 1.5 \times \frac{\alpha}{100})$$

$$\alpha = \frac{F_n}{F} \times 100$$

$$F = F_0 \times \frac{\mu}{100}$$

E	: Kinetic energy	(J)
m	: Load weight	(kg)
V _m	: Stroke end speed	(m/s)
St	: Stroke length	(mm)
t	: Travel time	(S)
α	: Load factor	(%)
F _n	: Thrust required to move the workpiece	(N)
F	: Actual thrust	(N)
F ₀	: Theoretical thrust force (refer to Table 4)	(N)
μ	: Thrust efficiency	(%)

Table 3 Required thrust force (F_n)

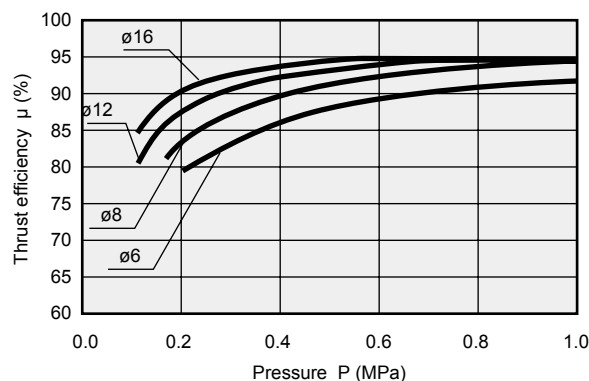
Cylinder movement direction	Horizontal direction	Vertical
Thrust	F _n = 0.2 × 10 × m	F _n = 1.2 × 10 × m

Table 4 Theoretical thrust table (F₀)

(Unit: N)

Bore size	Operating direction	Working pressure MPa										
		0.1	0.15	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
ø6	Push			6	8	11	14	17	20	23	25	28
	Pull			3	5	6	8	9	11	13	14	16
ø8	Push		8	10	15	20	25	30	35	40	45	50
	Pull		5	6	9	12	15	18	21	24	28	31
ø12	Push	11	17	23	34	45	57	68	79	90	102	113
	Pull	8	13	17	25	34	42	51	59	68	76	85
ø16	Push	20	30	40	60	80	100	121	141	161	181	201
	Pull	15	23	30	45	60	75	90	106	121	136	151

Fig. 2 Relation between thrust force efficiency and pressure



Check that the kinetic energy (E) is within the allowable absorbed energy value (E₀).

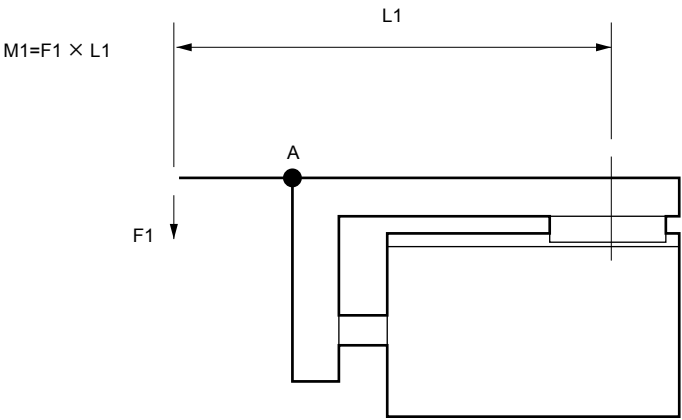
$$E \leq E_0$$

Table 5 Allowable absorbed energy value (E₀)

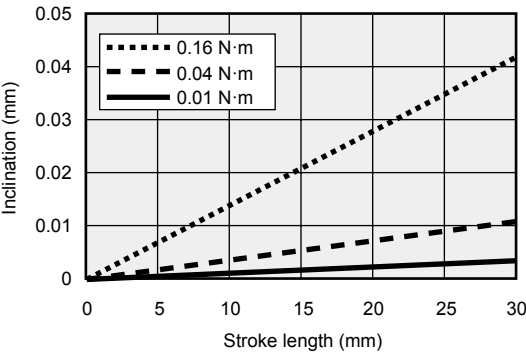
Bore size (mm)	Allowable absorbed energy E ₀ (J)
ø6	0.004
ø8	0.014
ø12	0.044
ø16	0.110

Table inclination (reference value)

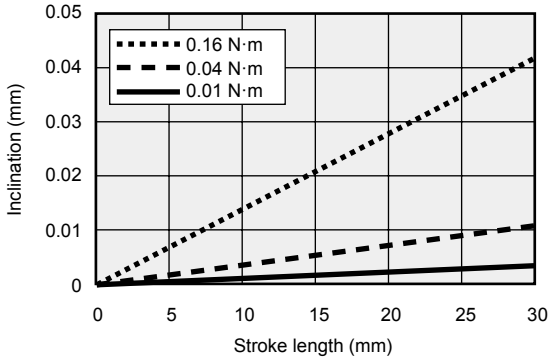
● Inclination at point A when M1 moment is applied



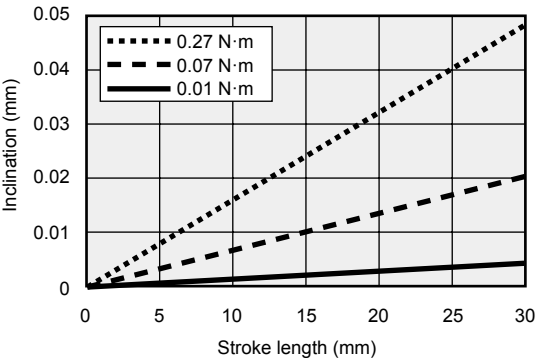
● MSDG-L-6



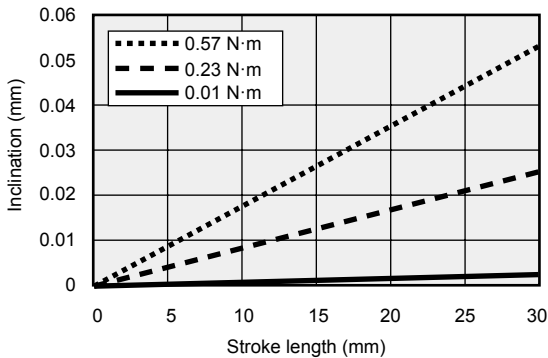
● MSDG-L-8



● MSDG-L-12



● MSDG-L-16



SCP*3

CMK2

CMA2

SCM

SCG

SCA2

SCS2

CKV2

CAV2/
COVP/N2

SSD2

SSG

SSD

CAT

MDC2

MVC

SMG

MSD/
MSDG

FC*

STK

SRL3

SRG3

SRM3

SRT3

MRL2

MRG2

SM-25

ShkAbs

FJ

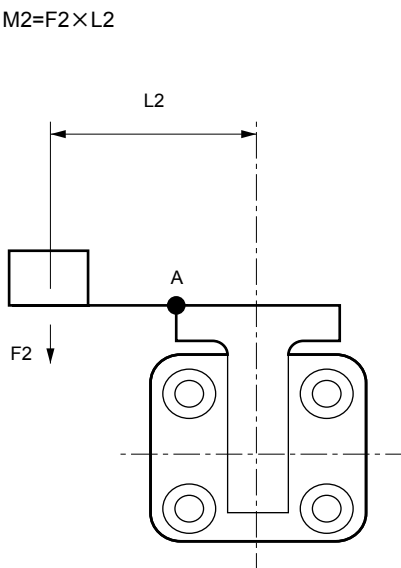
FK

Spd
Contr

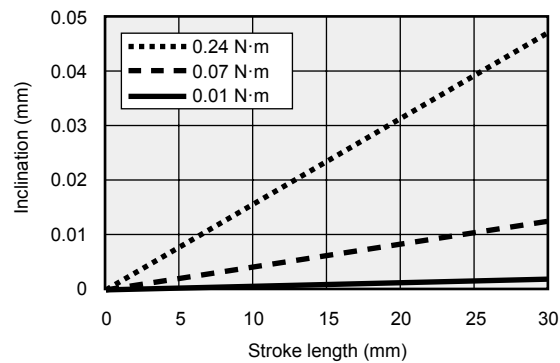
Ending

Table inclination (reference value)

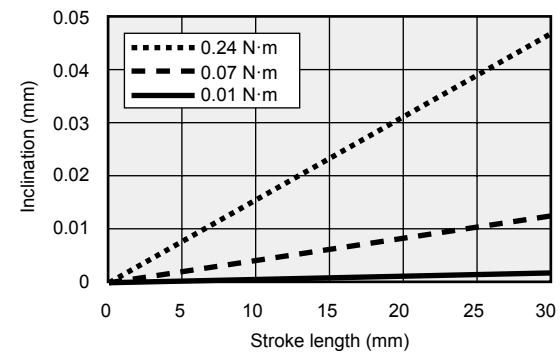
● Inclination at point A when M2 moment is applied



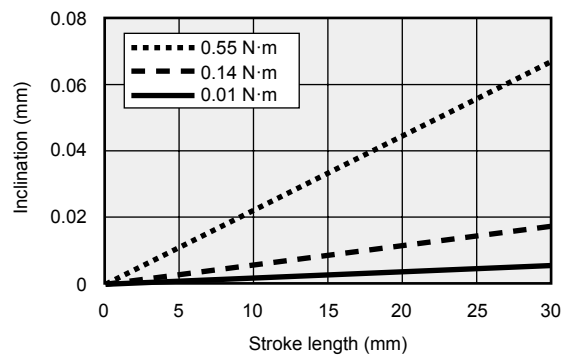
● MSDG-L-6



● MSDG-L-8



● MSDG-L-12



● MSDG-L-16

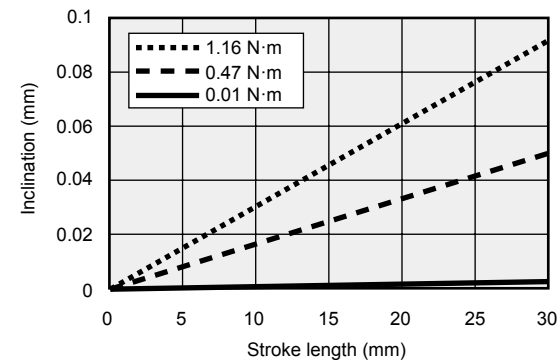
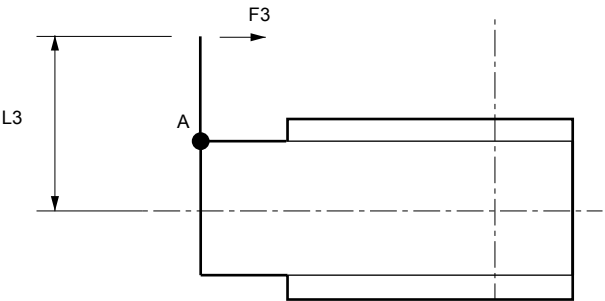


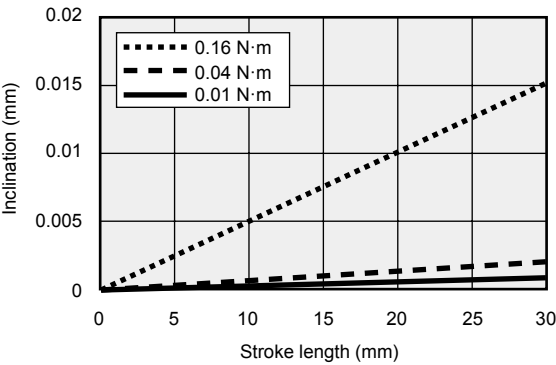
Table inclination (reference value)

● Inclination at point A when M3 moment is applied

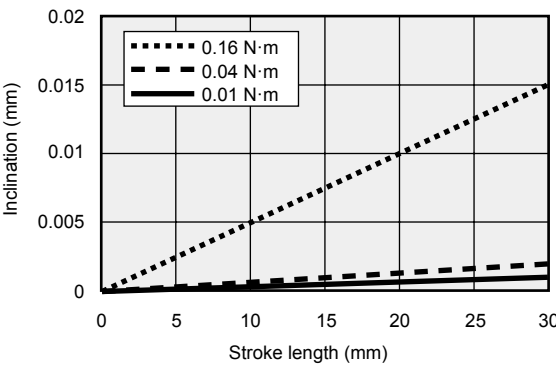
$M3 = F3 \times L3$



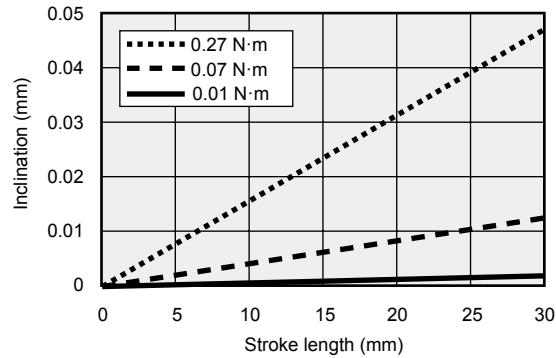
● MSDG-L-6



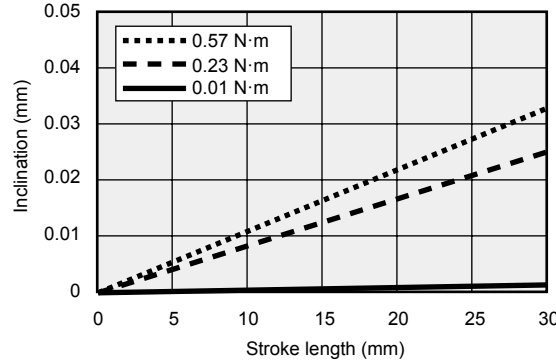
● MSDG-L-8



● MSDG-L-12



● MSDG-L-16



SCP*3

CMK2

CMA2

SCM

SCG

SCA2

SCS2

CKV2

CAV2/
COVP/N2

SSD2

SSG

SSD

CAT

MDC2

MVC

SMG

MSD/
MSDG

FC*

STK

SRL3

SRG3

SRM3

SRT3

MRL2

MRG2

SM-25

ShkAbs

FJ

FK

Spd
Contr

Ending