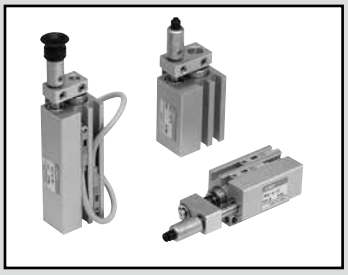


Small cylinder with suction pad double acting/single rod

MVC Series

● Bore size: ø6/ø10

JIS symbol

● Double acting

RoHS CAD

Specifications

Item	MVC	
Bore size mm	ø6	ø10
Actuation	Double acting	
Working fluid	Compressed air	
Max. working pressure MPa	0.7 (≈100 psi, 7 bar)	
Min. working pressure MPa	0.15 (≈22 psi, 1.5 bar)	0.1 (≈15 psi, 1 bar)
Proof pressure MPa	1.05 (≈150 psi, 10.5 bar)	
Vacuum port pressure	-101 kPa (≈-15 psi, -1.01 bar) to 0.6 MPa (≈87 psi, 6 bar) *1	
Ambient temperature °C	0 (32°F) to 60 (140°F) (no freezing) *2	
Port size	M3	M5
Stroke tolerance mm	+1.0 0	
Working piston speed mm/s	50 to 500	
Cushion	Rubber cushion	
Non-rotating accuracy °	±0.5 (*3)	
Lubrication	Not required (use turbine oil ISO VG32 if necessary for lubrication)	
Applicable pad	Refer to pages 1376 and 1381 for details.	
Allowable absorbed energy J	0.0046	0.035

*1: Application of pressure from the vacuum port can be performed only at vacuum burst. In addition, use burst pressure equal to the cylinder working pressure or less for this process.
*2: When using MVC with proximity switch, use the cylinder at an ambient temperature of 40°C or less. Failure to do so could lead to switch detection malfunction.
*3: Initial value at the pull end.

With buffer specifications

Specifications other than below are the same as above.

Item	MVC-*-*-B
Buffer stroke length mm	4
Buffer part spring load N	When set: 1.3 Operated: 1.62 (buffer stroke length of 4 mm operated)
Non-rotating accuracy (reference value)°	±2.6 (ø6), ±2.0 (ø10) (*2)

*1: Use the cylinder within buffer stroke length of 4 mm. Otherwise, malfunctions may result.
*2: Initial value at the pull end.

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
ø6	5/10/15/20/25/30	30	10	5(10)	5	5
ø10	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/F2V	F2S	F2YH/F2YV	F3H/F3V	F3S	F3PH/F3PV (Made to order)	F3YH/F3YV
Applications	Dedicated for programmable controller	Dedicated for programmable controller			For programmable controller, relay			
Output method	-	-			NPN output		PNP output	NPN output
Power supply voltage	-	-			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)	5 to 20 mA (*3)			50mA or less			
Indicator lamp	Yellow LED (Lit when ON)	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	1mA or less	1mA or less			10 μA or less			
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

(Unit: g)

Stroke length (mm) / Bore size (mm)	5	10	15	20	25	30	Weight per switch
ø6	30.8	35.6	40.4	45.2	50	54.8	10
ø10	43.8	50	54.7	59.4	64.1	68.8	10

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
ø6	Push	-	4.24	5.65	8.48	11.3	14.1	17.0	19.8
	Pull	-	2.36	3.14	4.71	6.28	7.85	9.42	11.0
ø10	Push	7.85	11.8	15.7	23.6	31.4	39.3	47.1	55.0
	Pull	5.03	7.54	10.1	15.1	20.1	25.1	30.2	35.2

How to order

● Without switch (built-in magnet for switch)

MVC - 6 - 10 ——— P2A - B

● With switch (built-in magnet for switch)

MVC - 6 - 10 - F2V - R - P2A - B

Model No. | Ⓐ Bore size | Ⓑ Stroke length | Ⓒ Switch model No. | Ⓓ Switch quantity | Ⓔ Pad | Ⓕ Buffer

[Example of model No.]

MVC-6-10-F0H-D-P2A-B

Ⓐ Bore size : ø6 mm
Ⓑ Stroke length : 10 mm
Ⓒ Switch model No.: Reed F0H switch, lead wire 1 m
Ⓓ Switch quantity : 2
Ⓔ Pad : Nitrile rubber, O.D. ø2 mm
Ⓕ Buffer : With buffer

How to order switch

SW - F0H

Switch model No.
(Item Ⓒ above)

How to order socket and pad assembling parts

(assembling parts: socket + pad + hexagon socket set screw)

MVC - P2A

Pad
(Item Ⓔ above)

How to order pads

MVC - P2A - PAD

Pad
(Item Ⓔ above)

Specifications for rechargeable battery (Catalog No. CC-1226A)

● Design compatible with rechargeable battery manufacturing process

MVC -.....- P4*

Code	Description
Ⓐ Bore size (mm)	
6	ø6
10	ø10
Ⓑ Stroke length (mm)	
5, 10, 15, 20, 25, 30	

Ⓒ Switch model No.

Axial lead wire	Radial lead wire	Contact	Voltage AC	Voltage DC	Display	Lead wire
F0H*	**F0V***	Reed		●	1-color display	2-wire
-	**F2S***	Prox.		●		
F2H*	**F2V***			●		
-	**F3S***			●		3-wire
F3H*	**F3V***			●		
F3PH*	**F3PV***			●	1-color display (PNP output) (custom)	
F2YH*	**F2YV***			●	2-color display	2-wire
F3YH*	**F3YV***			●		3-wire

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

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

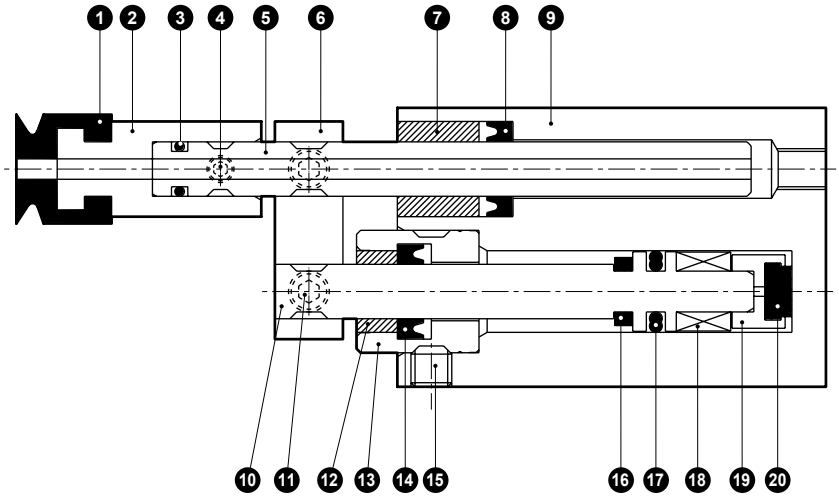
Ⓔ Pad	
Blank	Without pad
P2A	Material: Nitrile rubber
P3.5A	
P5A	
P6A	
P8A	
P10A	
P2AU	Material: Urethane rubber
P3.5AU	
P5AU	
P6AU	
P8AU	
P10AU	
P2AS	Material: Silicone rubber
P3.5AS	
P5AS	
P6AS	
P8AS	
P10AS	
P2AF	Material: Fluoro rubber
P3.5AF	
P5AF	
P6AF	
P8AF	
P10AF	

Ⓕ Buffer	
Blank	Without buffer
B	With buffer

* Consult with CKD as support is also available for pad other than the above.

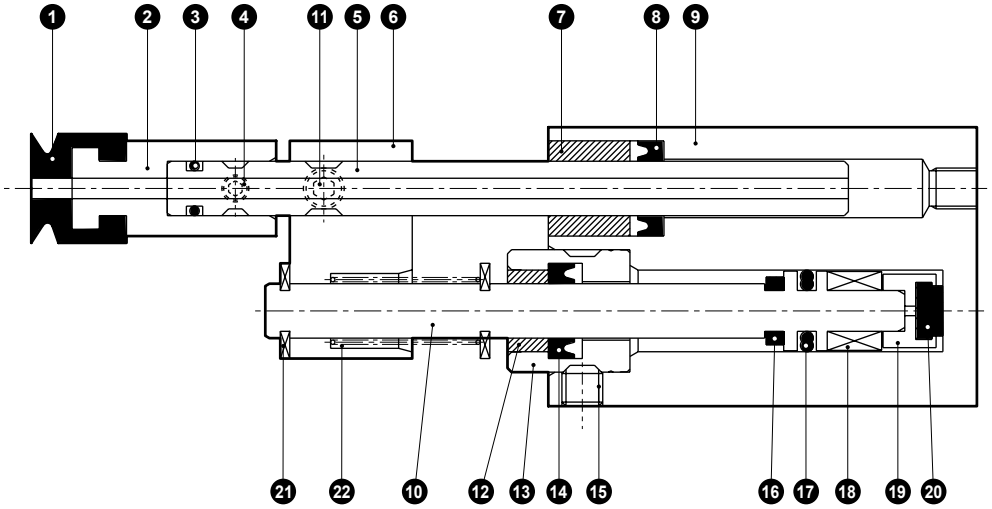
Internal structure and parts list

● MVC-6, 10



* The above figure shows the internal structure when with pad.
When without pad there is no ❶❷❹.

● MVC-6, 10-B (with buffer)



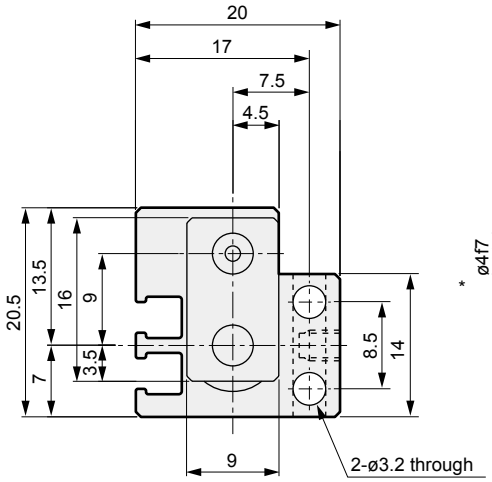
* The above figure shows the internal structure when with pad.
When without pad there is no ❶❷❹.

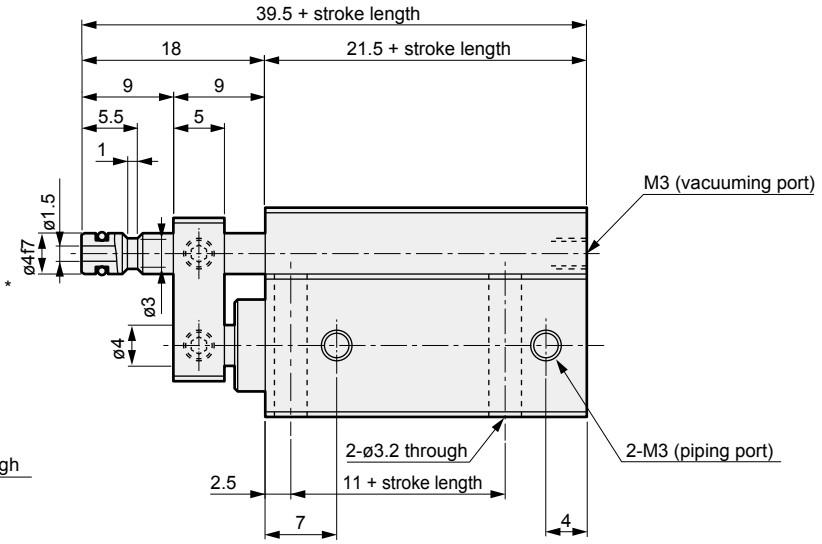
Cannot be disassembled

No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Pad			12	Bush	Oil-impregnated copper alloy	
2	Socket	Aluminum alloy	Chromate	13	Rod metal	Stainless steel	
3	O-ring	Nitrile rubber		14	Rod packing	Nitrile rubber	
4	Hexagon socket set screw	Stainless steel		15	Hexagon socket set screw	Stainless steel	
5	Guide rod	Stainless steel		16	Cushion rubber R	Urethane rubber	
6	Plate	Aluminum alloy	Chromate	17	Piston packing	Nitrile rubber	
7	Guide bush	Phosphor bronze		18	Magnet	Plastic	
8	Guide packing	Nitrile rubber		19	Adaptor	Aluminum alloy	
9	Cylinder body	Aluminum alloy	Hard alumite	20	Cushion rubber H	Urethane rubber	
10	Piston	Stainless steel		21	E ring	Stainless steel	
11	Hexagon socket set screw	Stainless steel		22	Spring	Piano wire	Electrodeposition

Dimensions CAD

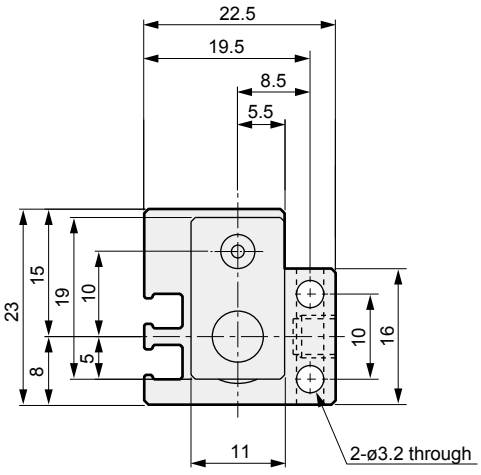
● MVC-6 (without pad)

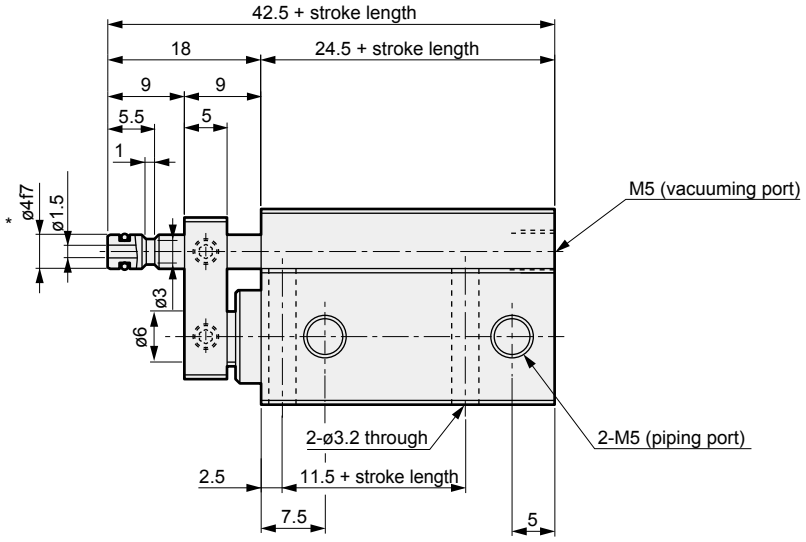




* Recommended inner diameter tolerance of the mating side's socket: H8

● MVC-10 (without pad)

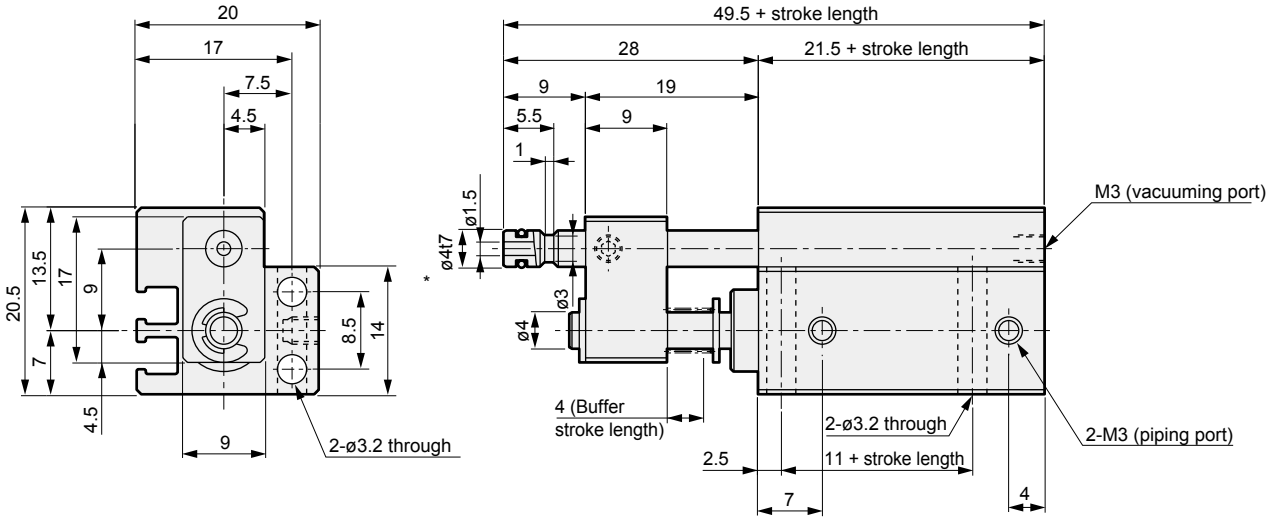




* Recommended inner diameter tolerance of the mating side's socket: H8

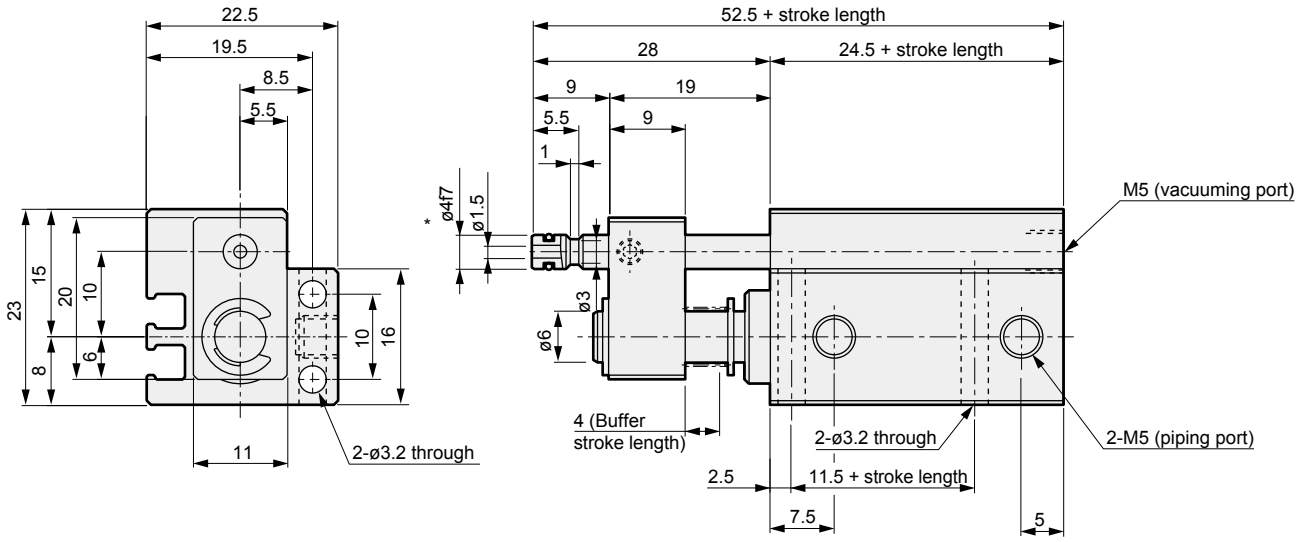
Dimensions CAD

● MVC-6-*-B (with buffer)



* Recommended inner diameter tolerance of the mating side's socket: H8

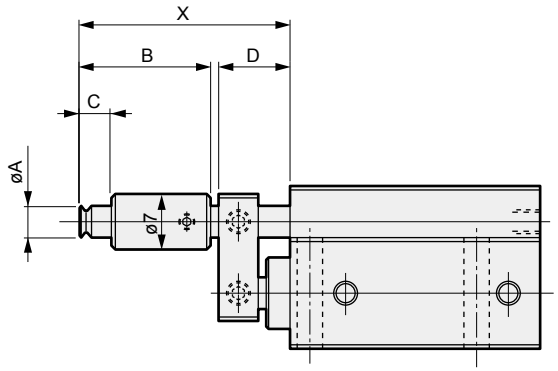
● MVC-10-*-B (with buffer)



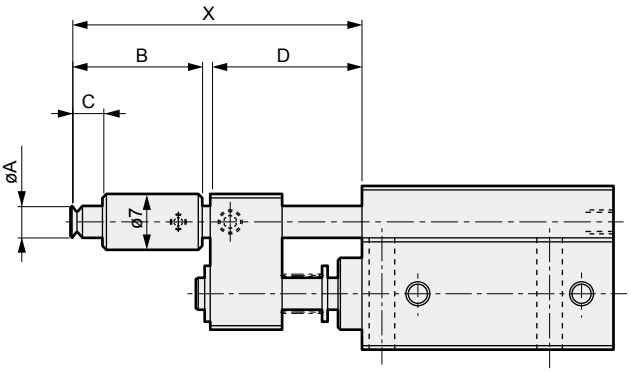
* Recommended inner diameter tolerance of the mating side's socket: H8

Dimensions CAD

● MVC-6/10 (with pad)

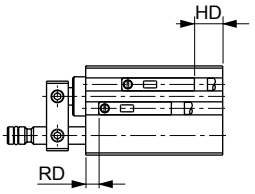
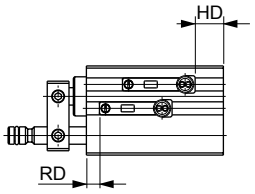
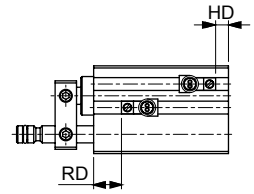
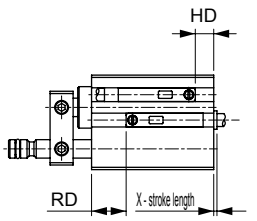
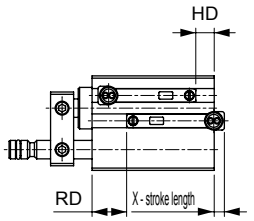


● MVC-6/10-B (with pad/with buffer)



Code	Without buffer					With buffer	
Pad shape	A	B	C	X	D	X	D
P2A	ø2	16.5	4	26.5	9	36.5	19
P3.5A	ø3.5	16.5	4	26.5	9	36.5	19
P5A	ø5	17.5	6.5	27.5	9	37.5	19
P6A	ø6	17.5	6.5	27.5	9	37.5	19
P8A	ø8	18	7	28	9	38	19
P10A	ø10	18.5	7.5	28.5	9	38.5	19

● Switch mounting position

Reed switch (F0)		Proximity switch (F2S, F3S)	Proximity switch (F2, F3, F2Y, F3Y, F3P)	
Axial lead wire (H)	Radial lead wire (V)		Axial lead wire (H)	Radial lead wire (V)
				

● Switch mounting position dimensions

(mm)

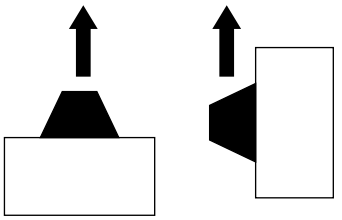
Switch installation dimensions	Reed switch		Proximity switch				
	$F0_H^V$		F2S, F3S		$F2_H^V$, $F3_H^V$, $F2Y_H^V$, $F3Y_H^V$, $F3P_H^V$		
Bore size	RD	HD	RD	HD	RD	HD	X (*4, *5)
ø6	3	1.5	6.5	3	7.5	4	5.7(10.2)
							2.7(7.2)
ø10	4.5	3	8	4.5	9	5.5	4.2(8.7)
							1.2(5.7)

*1: Min. stroke length with two reed switches is 10 mm.
*2: X-stroke dimensions indicate the protruding dimensions from the end surface of the switch body. (When the calculated value is negative, there is no protrusion from the end surface of body.) The upper column indicates X dimensions when axial lead wire is used and the lower column indicates X dimensions when radial lead wire is used.
*3: For F2Y, F3Y or F3P, X dimensions will be the dimensions in ( ).

■ Formula for lifting capacity

$$W = \frac{P \times A}{-101.3} \times \frac{1}{0.102}$$

where { W = Suspension capacity (N); P = Vacuum pressure KPa; A = Pad area cm^2 }



- The value obtained by this equation is a theoretical value. Calculate the value for the actual design with 4 times this value for horizontal suspension or 6 to 8 times or more for vertical suspension, as a safety factor.
- When lifting and then moving, ensure an adequate safety factor by considering the weight due to acceleration.
- Diameter of the pad under suction increases by approx. 10%.
- Pay attention to the position of center of gravity for the workpiece. If the workpiece inclines, the suction force will be extremely weakened.

■ Theoretical lifting force

● Circular pad

(N)

Pad diameter (ømm)	2	3.5	5	6	8	10
Suction area (cm^2) / Vacuum pressure	0.031	0.096	0.196	0.282	0.502	0.785
-93.3 KPa	0.284	0.873	1.765	2.550	4.511	7.061
-80.8 KPa	0.245	0.745	1.569	2.158	3.923	6.080
-66.7 KPa	0.206	0.618	1.275	1.863	3.236	5.099
-53.4 KPa	0.167	0.500	0.981	1.471	2.550	4.021
-40.0 KPa	0.118	0.373	0.785	1.079	1.961	3.040

Values in table are calculated values.

■ Pad material and characteristics

Item / Material	Hardness HS	Tensile strength N/cm^2	Tearing strength N/cm^2	Stretch %	Heat resist temp °C	Oil resistance	Sunlight resistance	Ozone resistance	Acid resistance	Alkali resistance	Abrasion resistance	Electrical insulation property	Gas permeation resistance
Nitrile rubber (NBR)	50° to 90°	686 to 1961	313 to 490	150 to 620	-26 to 120	◎	×	×	△	○	◎	×	○
Silicone rubber (SI)	54° to 80°	441 to 784	117 to 411	100 to 300	-60 to 250	△	◎	◎	△	○	×	◎	×
Urethane rubber (U)	50° to 80°	686 to 4315	588 to 1961	310 to 750	-20 to 75	△	◎	◎	×	×	◎	○	○
Fluoro rubber (FKM)	58° to 90°	931 to 1765	166 to 470	100 to 350	-10 to 230	◎	◎	◎	◎	△	◎	◎	◎

This table shows the general characteristics of synthetic rubber available from CKD.
◎: Ideal for use ○: Suitable for use △: Suitable for use under some conditions ×: Unsuitable for use

● Refer to “Vacuum system equipment SELVACS (Catalog No.CC-796A)” for selection of vacuum equipment.