MVC

Small cylinder with suction pad

ø6/ø10

Space saving structure

Overview

This cylinder is a compact cylinder whose end is equipped with a suction pad. Because the suction pad port is attached to the body, the piping is not moved when the cylinder activates. The ideal cylinder for pick & place.

Features

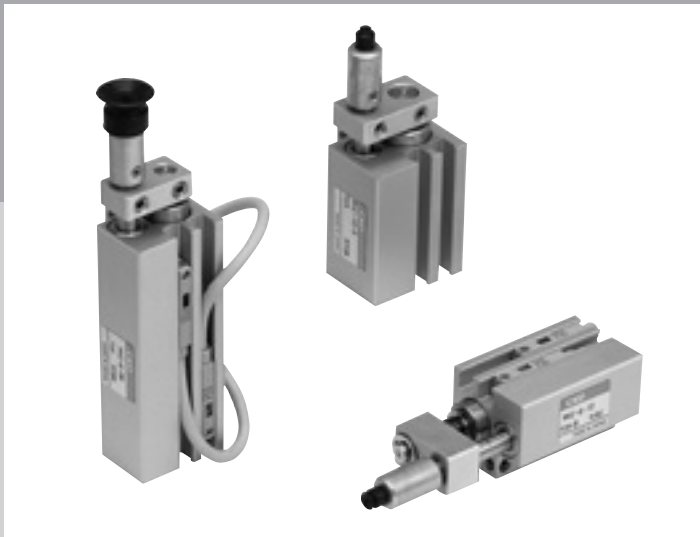
Workpiece suction portion and vacuum path are provided on the guide rod as standard.

Guide rod for rotation-stop is provided as standard.

Socket suction pad (ø2 to ø10) can be mounted on the rod end.

Can be mounted directly from 2 directions, with its square body.

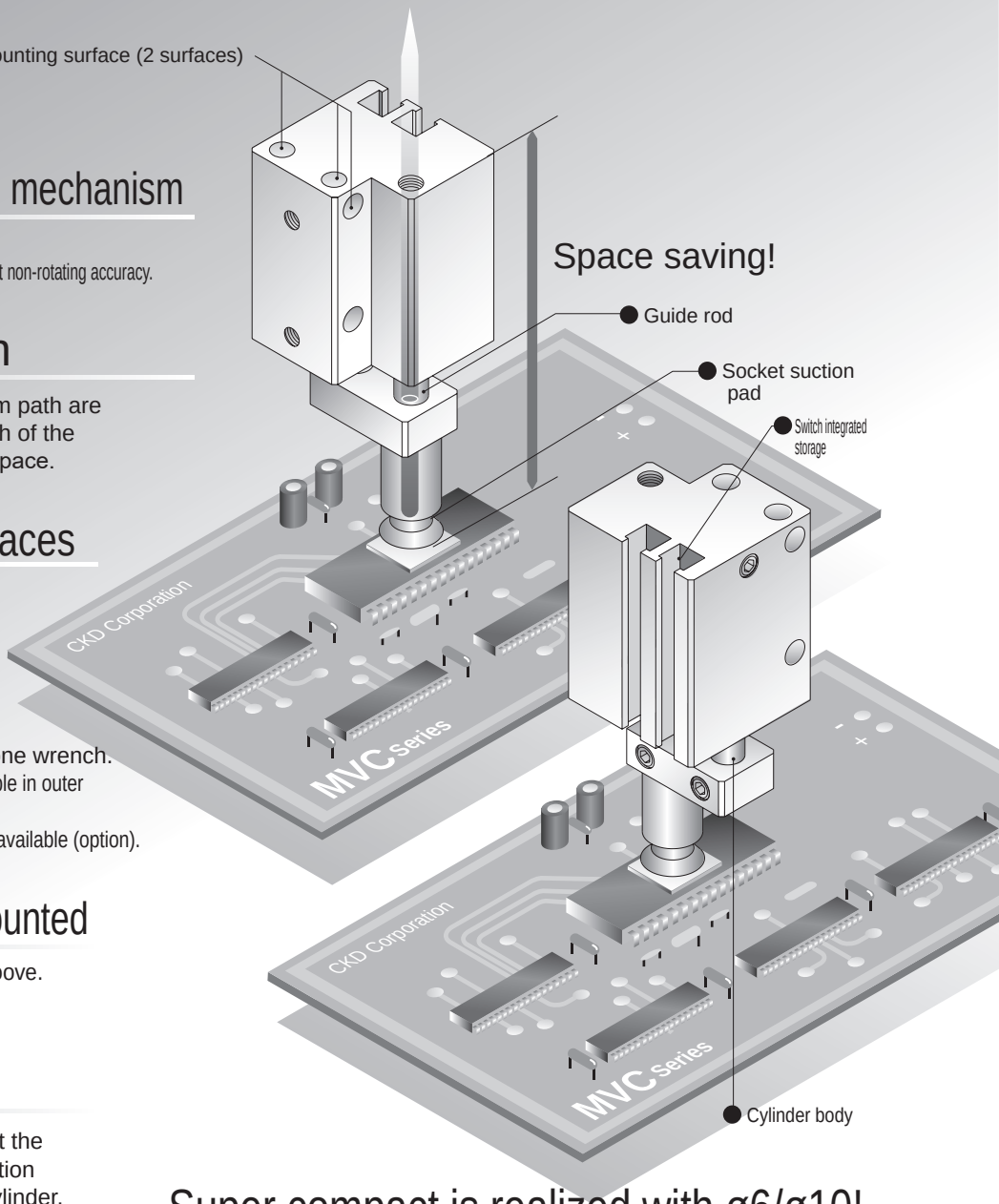
Miniature cylinder switch is integrated into the body groove.



CONTENTS

For compact and space saving features.

Total length in the cylinder shaft direction is reduced.
Small cylinder with suction pad/MVC Series with a new level of compact and space saving features.
The ideal cylinder for suction/transport process of electronic parts or precision parts.



High precision rotation-stop mechanism

Guide rod for rotation-stop is provided.
Prevents rotation of the rod (suctioned object) with an excellent non-rotating accuracy.

Space saving design

As workpiece suction portion and vacuum path are provided on the guide rod, the total length of the cylinder is reduced significantly, saving space.

Direct mounting on 2 surfaces

Can be mounted directly from 2 directions, with its square body.

Wide selection of suction pads

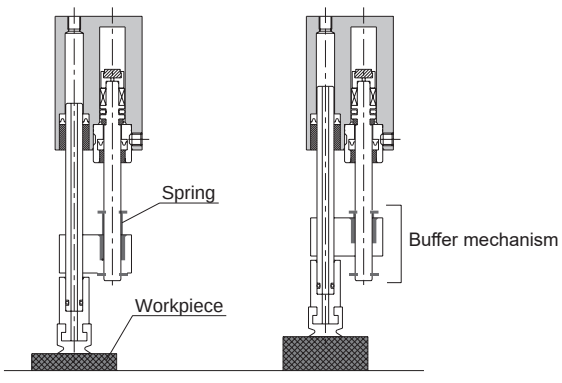
Easily mounted to the rod end with just one wrench.
In addition, the socket suction pad is widely available in outer diameter of ø2 to ø10.
Depending on applications, a total of 24 types are available (option).

Miniature switch can be mounted

F-switch can be integrated into the body groove.

With buffer function

Even if the suction portion strikes against the workpiece when pushing, the buffer function activates to protect the workpiece and cylinder.

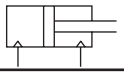


Super compact is realized with ø6/ø10!
Ideal for suction/transport process of electronic parts or precision parts!

Series variation

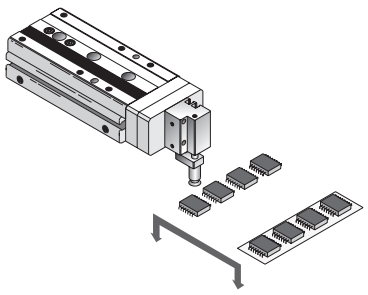
Small cylinder with suction pad MVC Series

●: Standard, ◎: Option

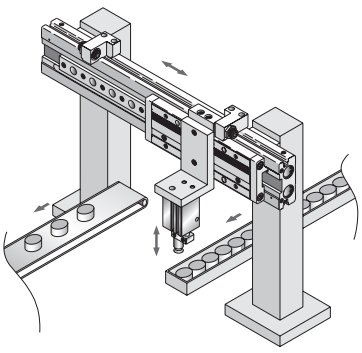
Variation	Model No. JIS symbol	Bore size (mm)	Standard stroke (mm)						Min. stroke (mm)	Max. stroke (mm)	Pad				Option	Switch	Page
			5	10	15	20	25	30			Material Nitrile rubber P*A	Material Urethane rubber P*A-U	Material Silicone rubber P*A-SI	Material Fluoro rubber P*A-FKM	With buffer B		
Double acting/ single rod	MVC 	ø6/ø10	●	●	●	●	●	●	5	30	◎	◎	◎	◎	◎	◎	1374

Applications

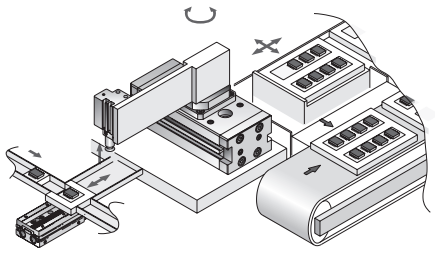
● Suction/transport of electronic parts

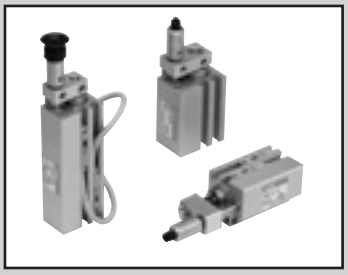


● Transport system of small parts



● Transport system of electronic parts





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

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

Stroke

Bore size (mm)	Standard stroke (mm)	Max. stroke (mm)	Min. stroke with two switches (mm)		Min. stroke 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 other than standard stroke are not available.
*2: For F2Y, F3Y or F3P, the min. stroke will be the dimensions in ( ).

Switch specifications

Item	2-wire reed	2-wire proximity			3-wire proximity			
	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	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-switch uses a bend-resistant lead wire.

Cylinder weight table

(Unit: g)

Stroke (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

● No 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 | Ⓒ Switch model No. | Ⓓ Switch quantity | Ⓔ Pad | Ⓕ Buffer

[Example of model No.]

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

Ⓐ Bore size : ø6 mm
Ⓑ Stroke : 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 (mm)	
5, 10, 15, 20, 25, 30	

Ⓒ Switch model No.

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

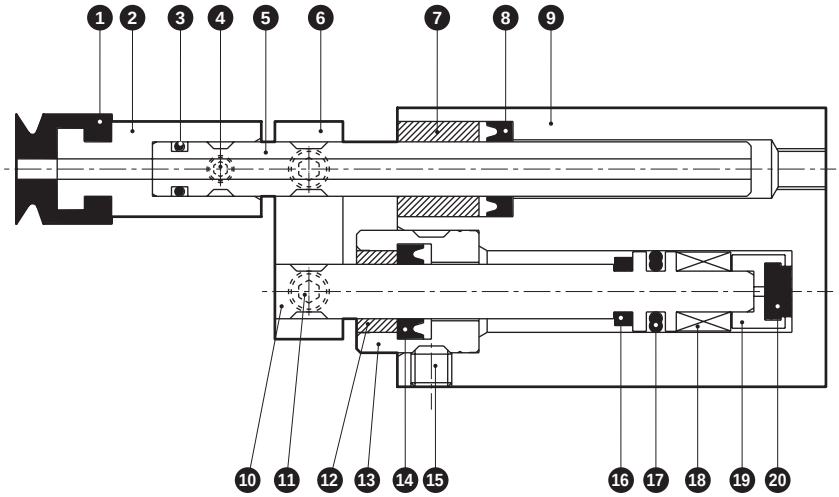
Ⓔ Pad	
Blank	Without pad
P2A	Material: Nitrile rubber
P3.5A	
P5A	
P6A	
P8A	
P10A	
P2AU	Material: Urethane rubber
P3.5AU	
P5AU	
P6AU	
P8AU	
P10AU	
P2AS	Material: Silicone rubber
P3.5AS	
P5AS	
P6AS	
P8AS	
P10AS	
P2AF	Material: Fluoro rubber
P3.5AF	
P5AF	
P6AF	
P8AF	
P10AF	

Ⓕ Buffer	
Blank	Without buffer
B	With buffer

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

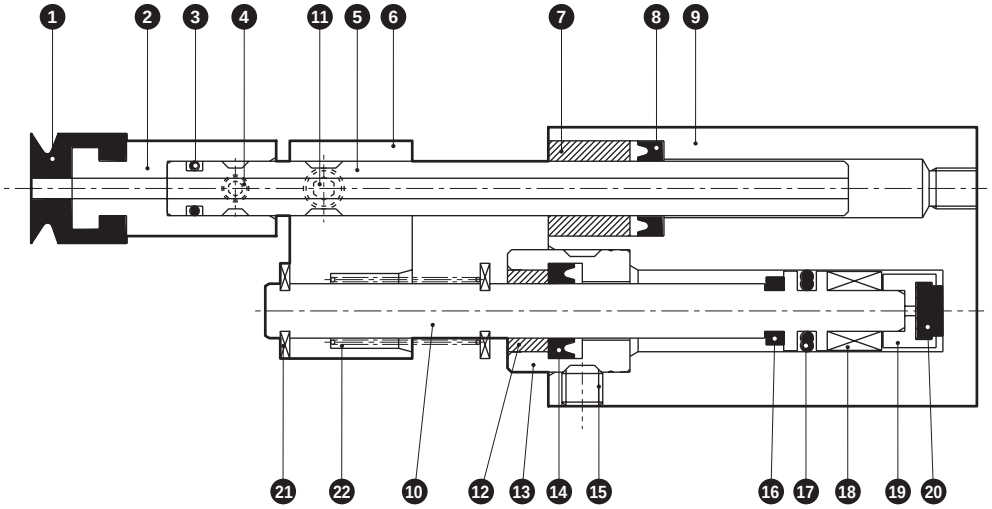
Internal structure and parts list

● 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)



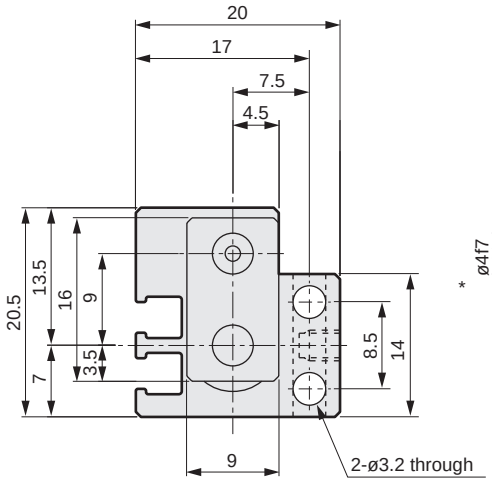
* The above figure shows the internal structure when with pad.
When without pad there is no ❶❷❹.

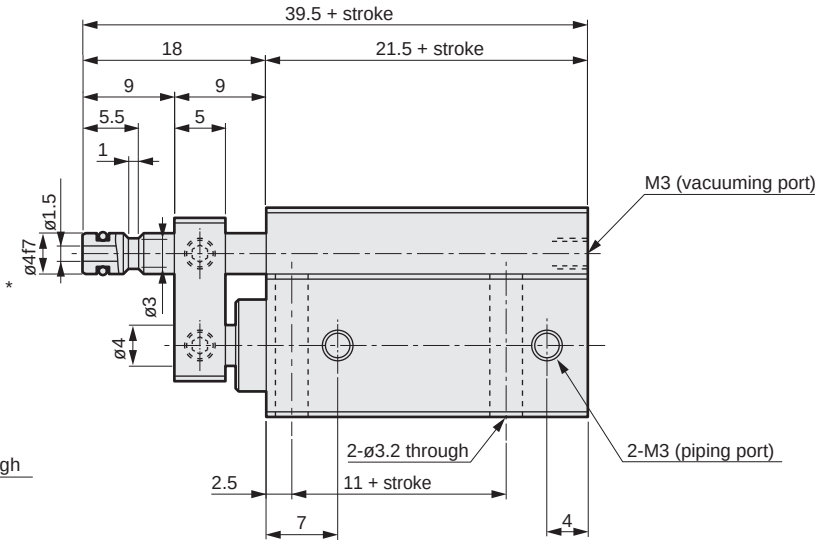
Cannot be disassembled

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

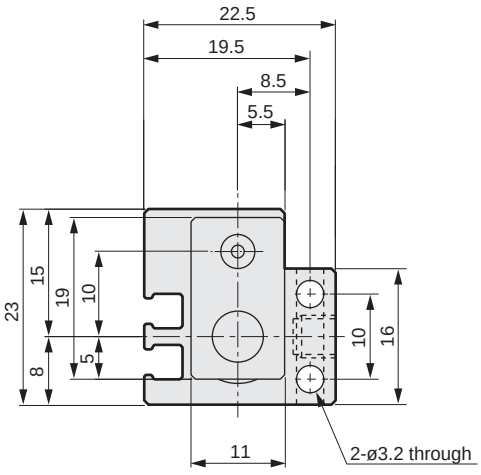
● MVC-6 (without pad)

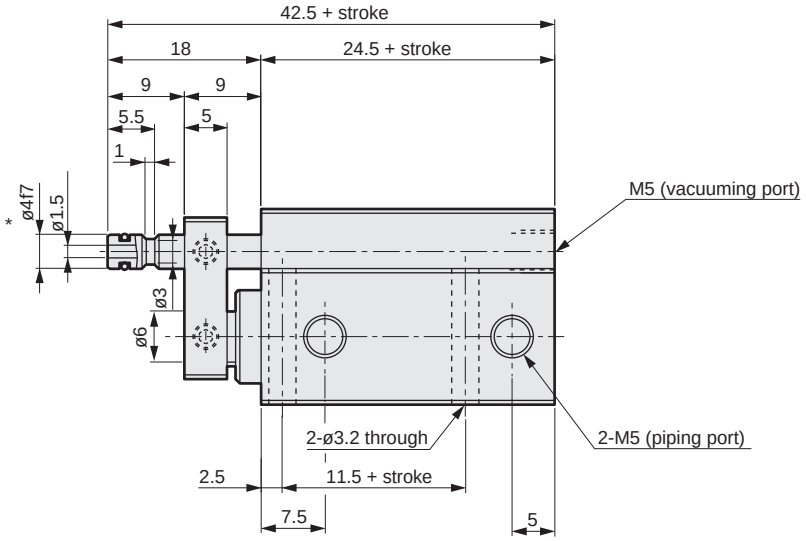




* Recommended inner diameter tolerance of the mating side's socket: H8

● MVC-10 (without pad)

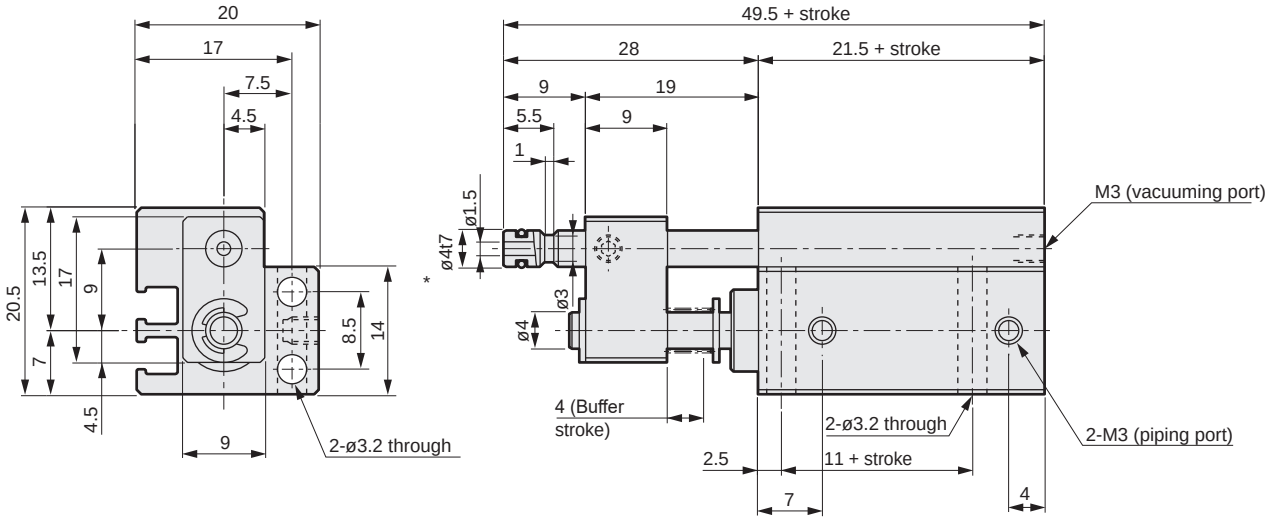




* Recommended inner diameter tolerance of the mating side's socket: H8

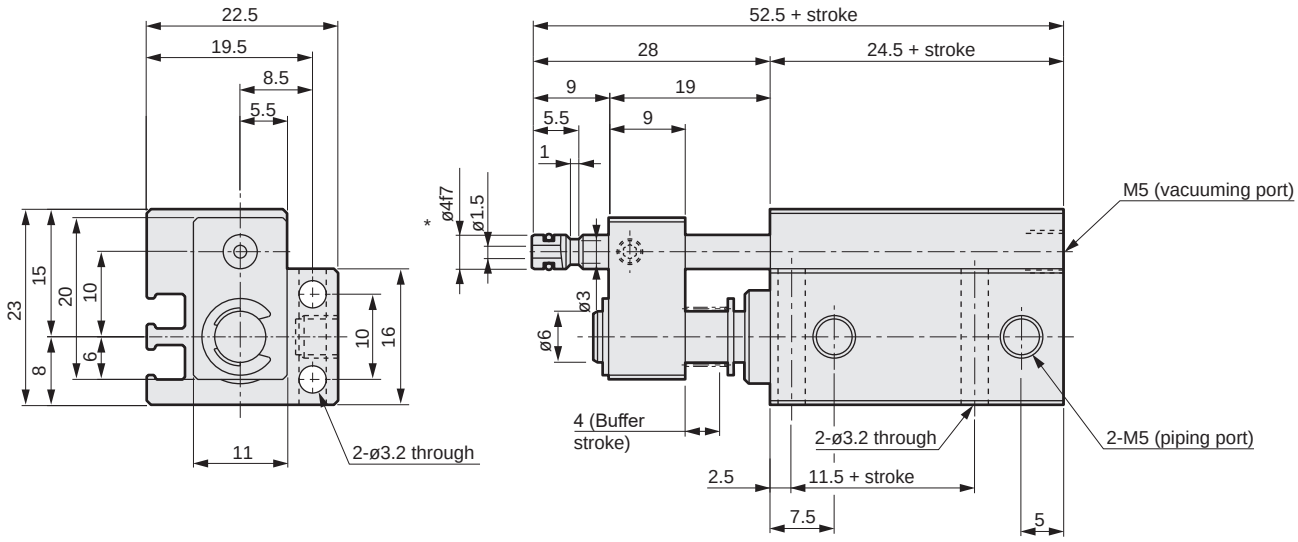
Dimensions CAD

● MVC-6-*-B (with buffer)



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

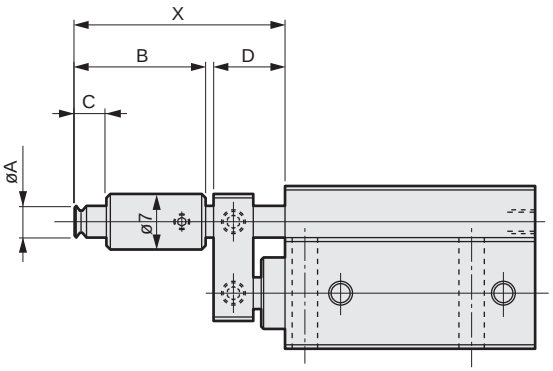
● MVC-10-*-B (with buffer)



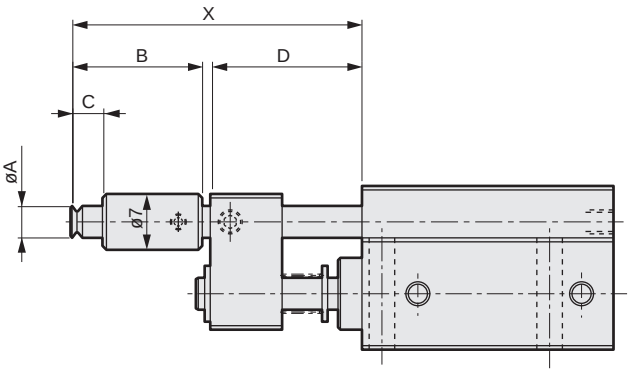
* Recommended inner diameter tolerance of the mating side's socket: H8

Dimensions CAD

● MVC-6/10 (with pad)

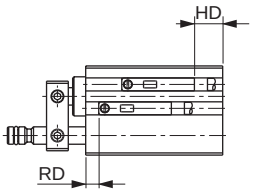
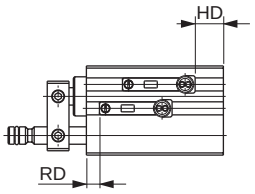
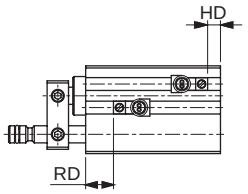
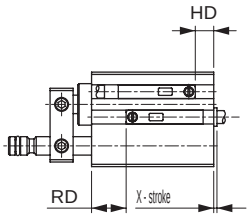
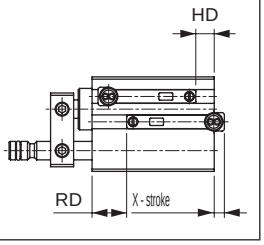


● MVC-6/10-B (with pad/with buffer)



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)	L-shaped lead wire (V)		Axial lead wire (H)	L-shaped lead wire (V)
				

● Switch mounting position dimensions

(mm)

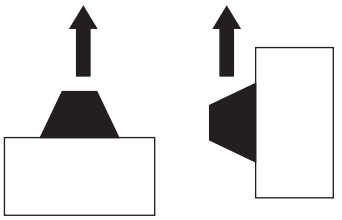
Switch installation dimensions	Reed switch		Proximity switch				
	$F0_H^V$		F2S, F3S		$F2_H^V$, $F3_H^V$, $F2Y_H^V$, $F3Y_H^V$, $F3P_H^V$		
Bore size	RD	HD	RD	HD	RD	HD	X (*4, *5)
ø6	3	1.5	6.5	3	7.5	4	5.7(10.2)
							2.7(7.2)
ø10	4.5	3	8	4.5	9	5.5	4.2(8.7)
							1.2(5.7)

*1: Min. stroke 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 L-shaped lead wire is used.*3: For F2Y, F3Y or F3P, X dimensions will be the dimensions in ( ).

■ Formula for lifting capacity

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

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



Horizontal lifting　　Vertical lifting

- 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	◎	x	x	△	○	◎	x	○
Silicone rubber (SI)	54° to 80°	441 to 784	117 to 411	100 to 300	-60 to 250	△	◎	◎	△	○	x	◎	x
Urethane rubber (U)	50° to 80°	686 to 4315	588 to 1961	310 to 750	-20 to 75	△	◎	◎	x	x	◎	○	○
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　x: Unsuitable for use

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

Safety Precautions

Be sure to read this section before use.

Refer to Intro Page 73 for general information of the cylinder, and to Intro Page 80 for general information of the cylinder switch.

Product-specific cautions: Small cylinder with suction pad MVC Series

Design/selection

⚠WARNING

■ If dropping an adsorbed workpiece when using a system with a vacuum ejector could be dangerous, provide mechanical locking for safety.

⚠CAUTION

■ Select a vacuum ejector, etc., that has an appropriate suction flow rate. If the suction flow rate is low, a vacuum failure will occur.

■ When using the product with MVC cylinder buffer, the buffer stroke must be within 4 mm. Use the product within 4 mm of the stroke.

Mounting, installation and adjustment

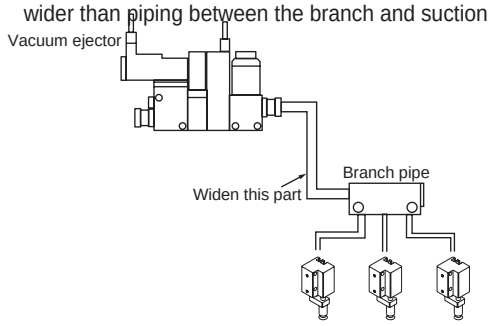
⚠CAUTION

■ Do not use a spiral hose. Especially when used at the vacuum side, malfunction due to the piping resistance will occur as below.

(1) Delay of vacuum achievement time
(2) Loss of vacuum at the suction end due to lowering of flow rate
(3) Unstable operation of the vacuum switch

■ Note the following points when connecting more than one MVC cylinder to one vacuum ejector.

(1) If one suction pad leaks, vacuum will drop and cause suction failure of all pads.
(2) Piping between the vacuum ejector and branch must be wider than piping between the branch and suction pad.



■ Perform piping with a sufficient effective cross-sectional area. For the vacuum piping side, select a piping with sufficient effective cross-sectional area to allow the flow of the max. suction flow rate to the ejector.

■ When using MVC with reed switch, the cylinder cannot be mounted on a magnetic substance (iron plate, etc.). This could lead to switch detection malfunction.

Use/maintenance

1. Common

⚠CAUTION

■ Do not disassemble the product.