

# Leading to compact and space saving.

Overall length of axial cylinder is reduced.  
New compact, space saving small vacuum suction cylinders, MVC series  
This is optimum for suction or transfer process of electric parts and precise parts.

## High precision non-rotating mechanism

Non-rotating guide rod equipped.  
This series is suited for the sucking and transfer of electric parts and precise parts, etc.

## Space saving design

Work piece sucking section and vacuum passage are provided at guide rod. This enables short overall length of cylinder and results in dramatic space saving.

## Direct 2 surfaces mount

Square shaped body enables direct mount on 2 surfaces.

## A variety of sucking pad available

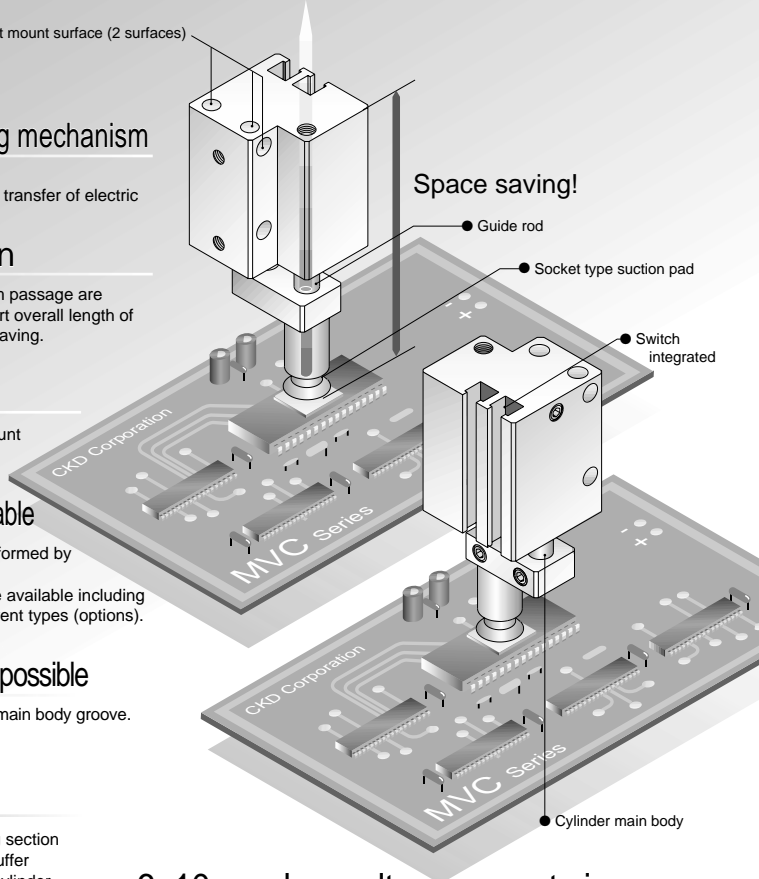
Installation onto the rod end can be performed by just one piece of wrench.  
A variety of socket type sucking pad are available including 2 to 10 mm outer diameter and 24 different types (options).

## Miniature switch installation possible

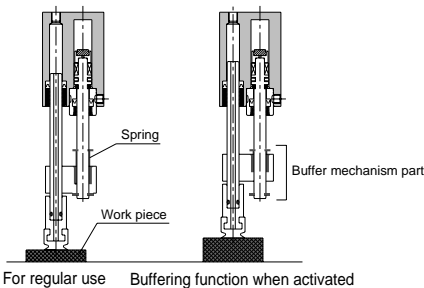
F type switch can be integrated into the main body groove.

## Buffering function

When cylinder advances, even if driving section (sucking part) and work piece collide, buffer function protects a work piece and the cylinder.



6, 10 mm bore ultra compact size.  
Optimum for sucking and transfer process of precise parts!




# Series variation



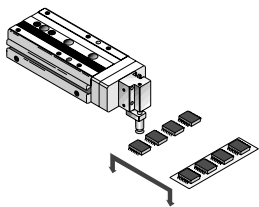
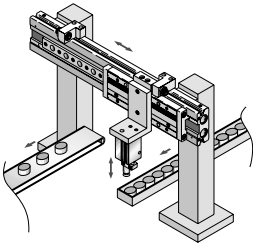
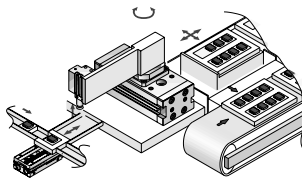
## Small cylinder with vacuum pad MVC series

●: Standard, ○: Option

Variation	Model No.  JIS symbol	Bore size  (mm)	Stroke length  (mm)						Pad type					Option		Page	
									Max. stroke  (mm)	Material	Material	Material	Material	Buffer	Switch		
										Nitrile rubber	Urethane rubber	Silicon rubber	Fluoro rubber				
Double acting/ single rod type	MVC 	6, 10 dia.	5	10	15	20	25	30	30	○	○	○	○	○	○	○	538

- SCP \* 2
- CMK2
- CMA2
- SCM
- SCA2
- SCS
- CKV2
- CAV2/  
COV \* 2
- CAT
- MDC2
- MVC**
- SMD2
- MSP/  
MSDG
- SSD
- SSD  
(large)
- FC \*
- ULKP/  
ULK
- JSK2/  
JSM2
- JSC3  
(medium)
- JSC3  
(large)
- JSB3
- UCAC
- STS/  
STL
- LCS
- LCY
- STR2
- UCA2
- STK
- USSD
- USC
- MFC
- GLC
- SHC
- CAC3
- HCM
- HCA
- MRL2
- SRL2
- SRG
- SRM
- SRT
- SRB2

### Application

<p>• Sucking/transfer of electric parts</p> 	<p>• Transfer system of small parts</p> 	<p>• Transfer system of electric parts</p> 
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Space saving structure  
Small cylinder with vacuum pad



## Pneumatic Components

# Safety Precautions

Always read before starting use  
Refer to Intro 45 for general details on the cylinder, and to Intro 52 for details on the cylinder switch.

Small cylinder with vacuum pad MVC Series

### WARNING

### Design & Selection

- 1** If a hazardous situation may occur when using a system with a vacuum generator and the suctioned workpiece is dropped, provide a mechanical position locking measure for safety.
- 2** Do not use in areas containing corrosive or combustible gases. Do not suction these materials.
- 3** Select a vacuum generator with an appropriate suction flow. A low suction flow may result in a suction fault.
- 4** When using several MVC cylinders simultaneously, consider air consumption.
- 5** When using the MVC cylinder with buffer, the buffer stroke is 4 mm maximum. Do not use in applications exceeding 4 mm.

### CAUTION

### Installation & Adjustment

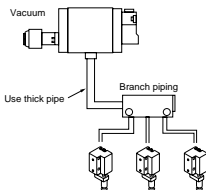
#### Piping

- 1** Do not use a spiral hose. If used on the vacuum side, the following faults may occur because of piping resistance:

- (1) Delay in vacuum attainment time
- (2) Drop in degree of vacuum at suction end due to drop in flow
- (3) Unstable operation of vacuum switch

- 2** Note the following when using more than 2 MVC cylinder for 1 vacuum.

- (1) If air leaks from 1 vacuum pad, the degree of vacuum drops and a suction fault occurs.
- (2) Piping between the vacuum and branch must be thicker than piping between the branch and suction pad.



- 3** Use piping with a sufficient effective sectional area. Select pipes for the vacuum side having a sufficient effective section area so that the ejector's maximum suction flow can pass.

- 4** Measures against entry of foreign matter

Most problems in pneumatic devices are caused by the entry of foreign matter such as oil, cutting chips, burrs, and dirt. Flush air with the following procedures to prevent foreign matter from entering:

- Flush air (blow air) into pipe parts to remove cutting chips, etc., entering during machining.

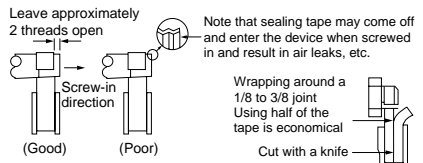


- 5** Measures against air leaks

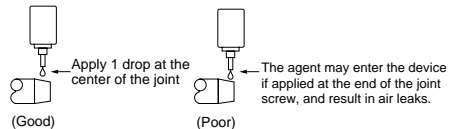
If the seal at joints, etc., in the vacuum line is incomplete, the vacuum may drop due to air leaks and cause the workpiece being suctioned and transferred to drop. Use sealing tape or a sealant as shown below to prevent this.

- (1) Wrapping sealing tape

When using a right-handed screw, wrap the tape leftward from the screw-in direction

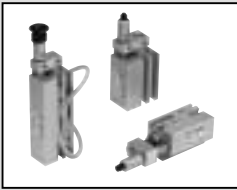


- (2) Applying sealant



- 6** Install a switch with the designated tightening torque. If the tightening torque range is exceeded, the set screw, bracket, or switch, etc., may be damaged. If installed with a tightening torque less than the designated value, the switch installation position may deviate.

- Tightening torque: 29.4 (N-mm)



Small cylinder with vacuum pad, double acting/single rod type

# MVC Series

• Bore size: 6, 10 mm bore

JIS symbol



CAD DATA AVAILABLE.

## Specifications

Descriptions		MVC	
Bore size	mm	6 dia.	10 dia.
Actuation		Double acting/single rod type	
Working fluid		Compressed air	
Max. working pressure	MPa	0.7	
Min. working pressure	MPa	0.15	0.1
Withstanding pressure	MPa	1.05	
Vacuum port pressure		-101KPa to 0.6MPa Note 1	
Ambient temperature	°C	0 to 60 (to be unfrozen) Note 2	
Port size		M3	M5
Stroke length tolerance	mm	+ 1.0 0	
Working piston speed	mm/s	50 to 500	
Cushion		Rubber cushion	
Revolvable angle tolerance	Degree	±0.5	
Lubrication		Not required (when lubrication, use turbine oil ISOVG32.)	
Application pad		Please refer to Page 540, 545 about details.	
Allowable energy absorption	J	0.0046	0.035

Note 1. Pressurize vacuum port only when vacuum break. The burst pressure should not be greater than the working pressure of cylinder.

Note 2. MVC with proximity switch should be used at ambient temperature 40 °C or less. Failure to observe this may cause switch detection defective.

## Except buffer specifications

The specifications other than followings are as same as above.

Descriptions		MVC-**-*-B
Buffer stroke length	mm	4
Buffer section spring load	N	Initial: 0.8 During operation: 1.12 (for buffer stroke length 4mm)
Revolvable angle tolerance (reference value)	Degree	±2.6 (6 mm bore), ±2.0 (10 mm bore)

Note 1. Do not use this with more than 4mm buffer stroke length. Failure to observe this may cause malfunctions.

Note 2. Revolvable angle tolerance of types with a buffer is the value at retracted end (Pull). The value at extended end (Push) may vary depending on stroke length. Please consult with CKD.

## Stroke length

Bore size (mm)	Standard stroke length (mm)	Max. stroke length (mm)	For 2 switches, minimum stroke length (mm)		For one switch, minimum stroke length (mm)	
			Reed switch	Proximity switch	Reed switch	Proximity switch
6 dia.	5, 10, 15, 20, 25, 30	30	10	5	5	5
10 dia.	5, 10, 15, 20, 25, 30	30	10	5	5	5

### Switch specifications

Descriptions	Reed 2 wire		Proximity 2 wire		Proximity 3 wire	
	F0H/V		F2H/V		F3H/V	
Applications	Programmable controller				Programmable controller, relay	
Power voltage V	-		-		DC10 to 28	
Load voltage V	DC24		DC10 to 30		DC30 or less	
Load current mA	5 to 20 (Note 1)		5 to 20 (Note 1)		50 or less	
Current consumption mA	-		-		10 or less (at ON state) at DC24V	
Internal voltage drop V	4 or less				0.5 or less	
Light	Yellow LED (ON lighting)					
Leakage current	1mA or less					10 micron A or less
Lead wire length (standard)	Standard 1m (oil resistant vinyl cabtire code 2 conductor 0.15mm <sup>2</sup> )				Standard 1m (oil resistant vinyl cabtire code 3 conductor 0.15mm <sup>2</sup> )	
Max. shock resistance m/s <sup>2</sup>	294(30G)			980 (100G)		
Insulation resistance	20MΩ over at DC500V megger					
Withstand voltage	No failure at AC1000V for one minute.					
Ambient temperature °C	-10 to + 60					
Protection structure	IEC standards IP67, JIS C 0920 (water tight type), oil resistance					

Note 1: Maximum load current 20mA is the value at 25 °C. When ambient temperature around switch is higher than 25 °C, the value is lower than 20mA. (5 to 10mA at 60 °C)

### Cylinder mass sheet

Stroke length (mm)	5	10	15	20	25	30	Mass per switch
6 dia.	30.8	35.6	40.4	45.2	50	54.8	10.2
10 dia.	43.8	50	54.7	59.4	64.1	68.8	10.2

SCP \* 2  
 CMK2  
 CMA2  
 SCM  
 SCA2  
 SCS  
 CKV2  
 CAV2/  
 COV \* 2  
 CAT  
 MDC2  
**MVC**  
 SMD2  
 MSP/  
 MSDG  
 SSD  
 SSD  
 (large)  
 FC \*  
 ULKP/  
 ULK  
 JSK2/  
 JSM2  
 JSC3  
 (medium)  
 JSC3  
 (large)  
 JSB3  
 UCAC  
 STS/  
 STL  
 LCS  
 LCY  
 STR2  
 UCA2  
 STK  
 USSD  
 USC  
 MFC  
 GLC  
 SHC  
 CAC3  
 HCM  
 HCA  
 MRL2  
 SRL2  
 SRG  
 SRM  
 SRT  
 SRB2

Space saving structure  
 Small cylinder with vacuum pad

## How to order

• Without switch



• With switch



Model

**A** Bore size

**B** Stroke length

**C** Switch model No.

**D** Switch quantity

**E** Pad type



### Cautions for model No. selection

Note 1: Minimum stroke length of types with two reed switch is 10mm.

Note 2: MVC with reed switch cannot be installed on magnetic substance (iron plate etc.). Failure to observe this may cause switch detection defective.

Note 3: MVC with proximity switch should be used at ambient temperature 40 °C or less. Failure to observe this may cause switch detection defective.

<Example of model number>

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

- A** Bore size : 6 mm
- B** Stroke length : 10 mm
- C** Switch model No. : F0H reed, lead wire 1m
- D** Switch quantity : Two
- E** Pad type : PFG-2A
- F** Buffer : With buffer

## How to order switch



**C** Switch model No.

## How to order socket & pad assembly

(Assembly part: Socket + pad + set screw with hexagon socket)



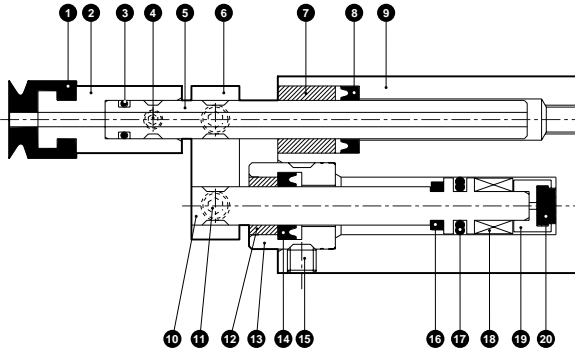
**E** Pad type

Symbol	Descriptions				
<b>A Bore size (mm)</b>					
6	6 dia.				
10	10 dia.				
<b>B Stroke length (mm)</b>					
5, 10, 15, 20, 25, 30					
<b>C Switch model No.</b>					
Lead wire Straight type	Lead wire Radial type	Contact	Display	Lead wire	
F0H *	F0V *	Reed	1 color indicator	2 wire	
F2H *	F2V *	Proximity		3 wire	
F3H *	F3V *				
<b>*Lead wire length</b>					
Blank	1m (standard)				
3	3m (option)				
<b>D Switch quantity</b>					
R	One on rod side				
H	One on head side				
D	Two				
<b>E Pad type</b>					
Blank	No pad				
P2A	PFG-2A				Material: Nitrile rubber
P3.5A	PFG-3.5A				
P5A	PFG-5A				
P6A	PFG-6A				
P8A	PFG-8A				
P10A	PFG-10A				
P2AU	PFG-2A-U				Material: Urethane rubber
P3.5AU	PFG-3.5A-U				
P5AU	PFG-5A-U				
P6AU	PFG-6A-U				
P8AU	PFG-8A-U				
P10AU	PFG-10A-U				
P2AS	PFG-2A-SI				Material: Silicon rubber
P3.5AS	PFG-3.5A-SI				
P5AS	PFG-5A-SI				
P6AS	PFG-6A-SI				
P8AS	PFG-8A-SI				
P10AS	PFG-10A-SI				
P2AF	PFG-2A-FKM				Material: Fluoro rubber
P3.5AF	PFG-3.5A-FKM				
P5AF	PFG-5A-FKM				
P6AF	PFG-6A-FKM				
P8AF	PFG-8A-FKM				
P10AF	PFG-10A-FKM				
<b>F Buffer</b>					
Blank	No buffer				
B	Buffer				

• Pad types other than above are available. Consult with CKD.

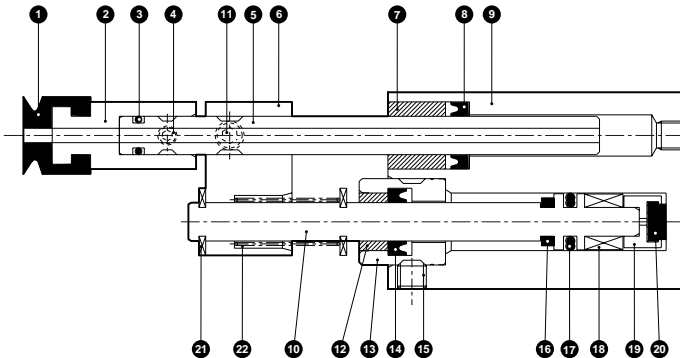
### Internal structure and parts list

• MVC-6, 10



• The drawing above shows the internal structure of pad.  
When no pad, 1, 2 and 4 are not provided.

• MVC-6, 10-B (buffer)




• The drawing above shows the internal structure of pad.  
When no pad, 1, 2 and 4 are not provided.

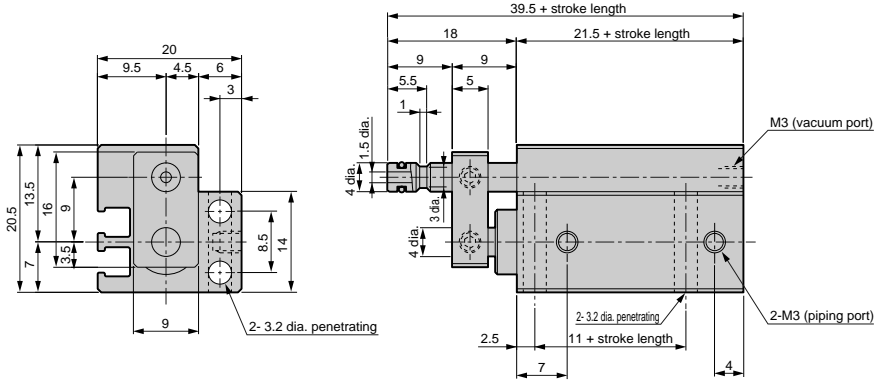
No.	Parts name	Material	Remarks	No.	Parts name	Material	Remarks
1	Pad			12	Bush	Oil impregnated copper alloy	
2	Socket	Aluminum alloy		13	Rod bushing	Stainless steel	
3	O ring	Nitrile rubber		14	Rod packing	Nitrile rubber	
4	Set screw with hexagon socket	Stainless steel		15	Set screw with hexagon socket	Stainless steel	
5	Guide rod	Stainless steel		16	Cushion rubber R	Urethane rubber	
6	Plate	Aluminum alloy		17	Piston seal	Nitrile rubber	
7	Guide bush	Phosphor bronze		18	Piston magnet		
8	Guide packing seal	Nitrile rubber		19	Adaptor	Aluminum alloy	
9	Main body	Aluminum alloy	Hard alumite disposal	20	Cushion rubber H	Urethane rubber	
10	Piston	Stainless steel		21	E type ring	Stainless steel	
11	Set screw with hexagon socket	Stainless steel		22	Spring	Piano wire	


SCP \* 2  
CMK2  
CMA2  
SCM  
SCA2  
SCS  
CKV2  
CAV2/  
COV \* 2  
CAT  
MDC2  
MVC  
SMD2  
MSD/  
MSDG  
SSD  
SSD  
(large)  
FC \*  
ULKP/  
ULK  
JSK2/  
JSM2  
JSC3  
(medium)  
JSC3  
(large)  
JSB3  
UCAC  
STS/  
STL  
LCS  
LCY  
STR2  
UCA2  
STK  
USSD  
USC  
MFC  
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SRM  
SRT  
SRB2

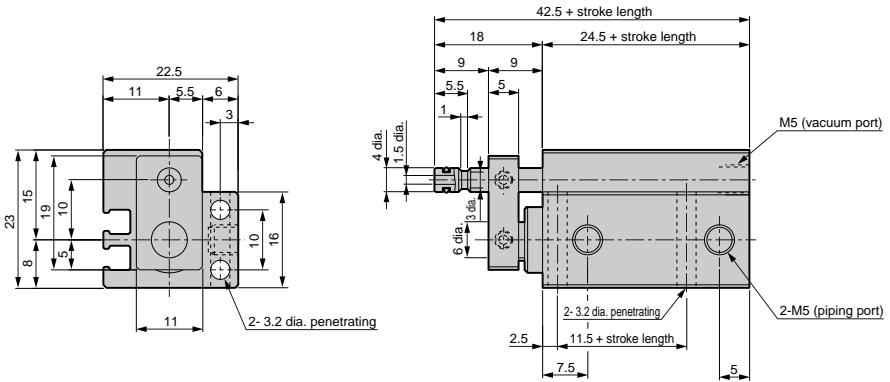
Space saving structure  
Small cylinder with vacuum pad

## Dimensions

- MVC-6 (no pad)  (File name: Page 546 or Ending 120)



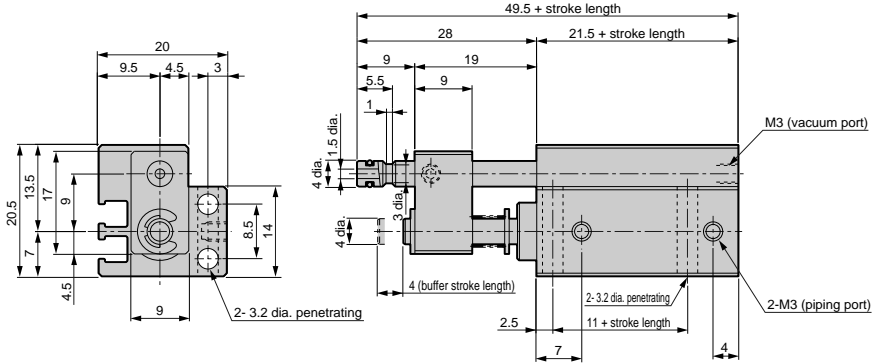
- MVC-10 (no pad)  (File name: Page 546 or Ending 120)



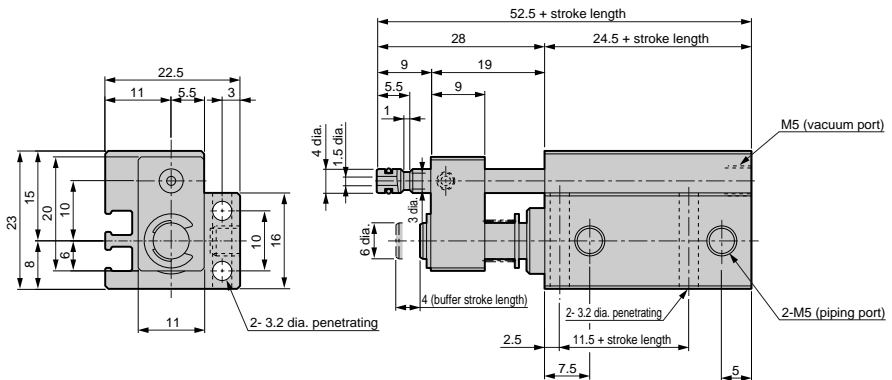


### Dimensions

- MVC-6- \* -B (buffer)  (File name: Page 546 or Ending 120)



- MVC-10- \* -B (buffer)  (File name: Page 546 or Ending 120)




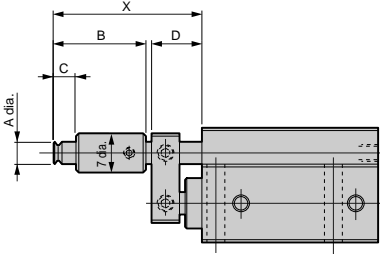
SCP * 2
CMK2
CMA2
SCM
SCA2
SCS
CKV2
CAV2/ COV * 2
CAT
MDC2
<b>MVC</b>
SMD2
MSD/ MSDG
SSD
SSD (large)
FC *
ULKP/ ULK
JSK2/ JSM2
JSC3 (medium)
JSC3 (large)
JSB3
UCAC
STS/ STL
LCS
LCY
STR2
UCA2
STK
USSD
USC
MFC
GLC
SHC
CAC3
HCM
HCA
MRL2
SRL2
SRG
SRM
SRT
SRB2

Space saving structure  
Small cylinder with vacuum pad

## Dimensions

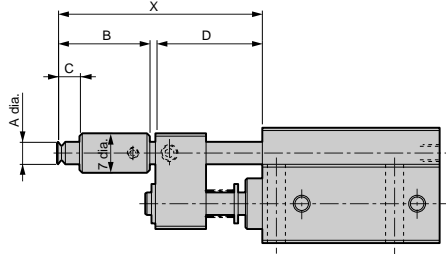
- MVC-6/10 (pad)

 (File name: Page 546 or Ending 120)



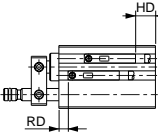
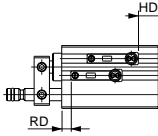
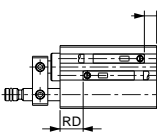
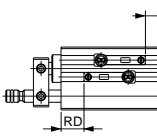
- MVC-6/10-B (with pad/with buffer)

 (File name: Page 546 or Ending 120)



Symbol	No buffer					With buffer	
	A	B	C	X	D	X	D
P2A	2 dia.	16.5	4	26.5	9	36.5	19
P3.5A	3.5 dia.	16.5	4	26.5	9	36.5	19
P5A	5 dia.	17.5	6.5	27.5	9	37.5	19
P6A	6 dia.	17.5	6.5	27.5	9	37.5	19
P8A	8 dia.	18	7	28	9	38	19
P10A	10 dia.	18.5	7.5	28.5	9	38.5	19

## • Switch installation position

Reed switch (F0)		Proximity switch (F2, F3)	
Axial lead wire (H)	Radial lead wire (V)	Axial lead wire (H)	Radial lead wire (V)
			

Note: This indicates switch installation position at shipment.

## • Switch installation position dimensions

Switch mounting dimensions	Reed switch		Proximity switch	
	$F0_H^V$	HD	$F2_H^V, F3_H^V$	HD
Bore size	RD	HD	RD	HD
6 dia.	3	1.5	7.5	4
10 dia.	4.5	3	9	5.5

Note 1. Minimum stroke length of types with two reed switches is 10mm.

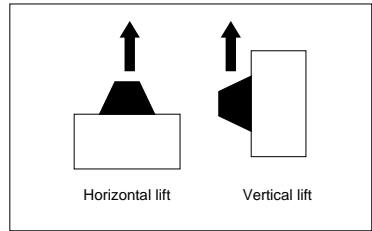
Note 2. MVC with reed switch cannot be installed on magnetic substance (iron plate etc.). Failure to observe this may cause switch detection defective.

Note 3. MVC with proximity switch should be used at ambient temperature 40 °C or less. Failure to observe this may cause switch detection defective.

### Formula of lifting capacity

$$W = \frac{P \times A}{-101.3} \times \frac{1}{0.102} \quad \text{Where } \begin{cases} W = \text{lifting capacity (N)} \\ P = \text{vacuum (KPa)} \\ A = \text{pad area (cm}^2\text{)} \end{cases}$$

- The value calculated by this formula is the average static lifting capacity without sideslips. This is a just theoretical value. When the actual design stage, use a safety factor such as 4 times for horizontal lifting, while 6 to 8 times for vertical lift
- When lifting up a work piece, consider a weighting by acceleration, and decide a sufficient safety factor.
- Pad diameter during sucking is approximate 10% larger.
- Be careful for center of gravity of a work piece. If a work piece leans, the suction force is remarkably reduced.



### Theoretical lift force

- Round pad

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

Values on the table are calculated values.

### Pad material and characteristics

Descriptions	Hardness HS	Tensile strength N/cm <sup>2</sup>	Tearing strength N/cm <sup>2</sup>	Elongation %	Heat proof temperature °C	Oil resistance	Day light resistance	Ozone resistance	Acid resistance	Alkaline resistance	Abrasion resistance	Insulation	Gas permeability proof
Nitrile rubber (NBR)	50° to 90°	686 to 1961	313 to 490	150 to 620	-26 to 120	◎	×	×	△	○	◎	×	○
Silicon 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 characteristics of synthetic rubber that CKD handles.

◎: Possible to use, ○: Normally possible to use, △: Possible to use depending on conditions, ×: Impossible to use

- Refer to the catalog of "Pneumatic, vacuum and auxiliary components" about selection of vacuum components.

SCP \* 2  
CMK2  
CMA2  
SCM  
SCA2  
SCS  
CKV2  
CAV2/  
COV \* 2  
CAT  
MDC2  
MVC  
SMD2  
MSD/  
MSDG  
SSD  
SSD  
(large)  
FC \*  
(N)  
ULKP/  
ULK  
JSK2/  
JSM2  
JSC3  
(medium)  
JSC3  
(large)  
JSB3  
UCAC  
STS/  
STL  
LCS  
LCY  
STR2  
UCA2  
STK  
USSD  
USC  
MFC  
GLC  
SHC  
CAC3  
HCM  
HCA  
MRL2  
SRL2  
SRG  
SRM  
SRT  
SRB2

Space saving structure  
Small cylinder with vacuum pad