

Fine Buffers FBU2 Series

Constant Pressure Achieved with
Magnetic Spring Technology

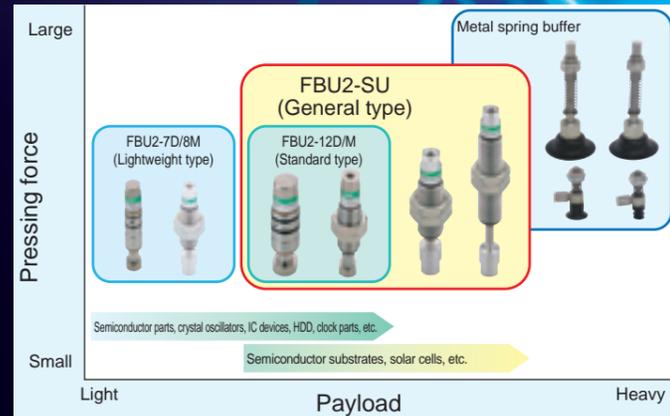


Resolving drawback of metal spring method

This series is a completely new non-conventional buffering unit, which uses the magnetic attraction force for the buffering section. With soft contacting and stable pressing forces, it resolves the problem of damaging target works. This series is best suited to damage-free handling of minute devices and fragile works.

Lineup of general type

FBU2-SU Series with a 200 g payload has been added. This series has a stronger movable section to provide wider applications.



Constant pressing force

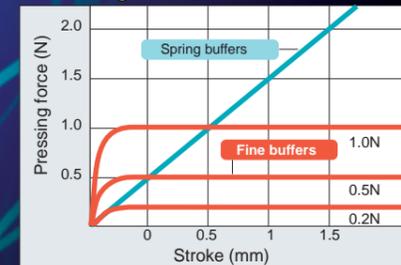
A magnetic line emerges in an oblique direction when the magnet within the movable shaft shifts relative to the fixed shaft. The shaft-direction element of this oblique force acts as the returning force.

Constant magnetic returning force in the shaft direction



Pressing force profile

The magnetic pressing forces of 0.2 N, 0.5 N, and 1.0 N are selectable depending on the model. These pressing forces are almost constant regardless of the stroke.



Rotation prevention mechanism

With a 4-pole spline made by the magnetization on the inner surface of the fixed shaft and the outer surface of the movable shaft, the shafts are attracted to the origin position by the magnetic attraction force.



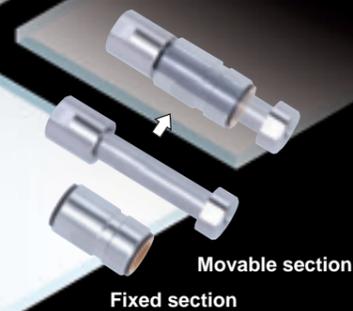
Magnetic returning force in the rotating direction (magnetic prevention of rotation)

Movable shaft Fixed shaft

Magnet

Compact and lightweight (FBU2)

The FBU2 Series has only two parts: the movable section and the fixed section. This realizes the compact and ultra-lightweight (FBU2-7D: 5 g or less) body. The lightweight movable section provides soft touching and reduced impact on works.



Movable section

Fixed section

Fine Buffer FBU2 Series

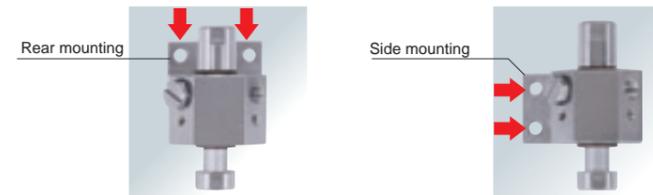
Compact and high-precision fine buffer FBU2 Series that adopts magnetic springs with proprietary cushioning mechanism that utilizes the magnetic pulling force to achieve stable pressing force, low dust generation and long service life.

A high-precision bearing is available

Standard and high-precision types are available for the rod guide. Bearings can be selected depending on the X-Y direction repeated return accuracy of the movable shaft. (FBU2-SU is standard only)

Vacuum supply bracket is available

Brackets are available for the spigot type. For the high precision HV type, vacuum supply is enabled from the bracket, eliminating the reaction force of the piping tube and the like and further improving the pressing pressure stability.



Clean & long life

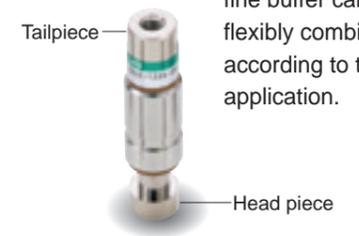
Dust generation rate is reduced as there is no metal-to-metal contact and the movable contact area is very small compared with the conventional metal spring. Moreover, since the thrust is generated by magnetic force, less fatigue occurs compared with metal springs and the like, achieving long service life and stable performance.

Compatible with rechargeable battery manufacturing processes

As it has limited the use of copper-based materials for the air flow paths and sliding parts (P4 specification or equivalent) as standard, it has a design compatible with the rechargeable battery manufacturing process.

Flexible head and tail combination

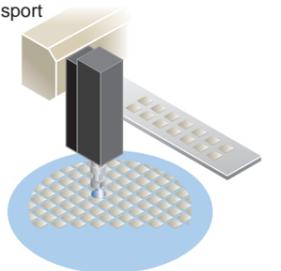
The shape of the head and tail of the fine buffer can be flexibly combined according to the application.



Flexible head and tail combination

Enables various usages including pick-and-place or transport of parts through vacuum suction, pressing of workpieces and insertion of parts.

● Device transport



- DVD, HDD transport
- Flexible substrate suction transport
- Crystal device suction transport
- Component insertion
- Pressing inspection for mobile phone buttons

FBU2 Series Variations

Model	O.D.	Bearing precision	Pressure (N)			Stroke (mm)			Tailpiece form				Head piece shape				page
			0.2	0.5	1.0	2	6	16	Without hole	M3	M4	M5	M6	Without hole	M3	M4	
Lightweight FBU2-7	ø7 h7	S Standard	●	●	●	●	●	●	●	●	●	●	●	●	●	●	1
	M8x0.75	H High precision	●	●	●	●	●	●	●	●	●	●	●	●	●	●	1
		HV Internal flow, high precision	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Standard FBU2-12	ø12 h7	S Standard	●	●	●	●	●	●	●	●	●	●	●	●	●	●	1
	M12x1	H High precision	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
		HV Internal flow, high precision	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
General purpose FBU2-SU	M12x1	- Standard only	●	●	●	●	●	●	●	●	●	●	●	●	●	●	7



Fine Buffers

FBU2 Series

O.D.: M8, M12, $\phi 7$, $\phi 12$
 Payload: 30, 80 g



Specifications

Values are for an ambient temperature of 23°C.

Descriptions	FBU2-7D		FBU2-8M	FBU2-12D		FBU2-12M
	S	H/HV	S	S	H/HV	S
Outer diameter	$\phi 7h7$		M8 \times 0.75	$\phi 12h7$		M12 \times 1
External view	S/H 	HV 		S/H 	HV 	
Buffer pressing force N	0.1 to 0.2		0.1 to 0.2	0.4 to 0.6, 0.9 to 1.1		0.4 to 0.6, 0.9 to 1.1
Pressing force fluctuation (Note 1)	$\pm 15\%$ or less					
Buffer stroke	2	6	2	6	2	6
Operating ambient temperature °C	5 to 50		5 to 50	5 to 50		5 to 50
Bearing clearance mm	0.2 or less		0.2 or less	0.2 or less		0.2 or less
Maximum torque sustained (Note 2) N·cm	0.25 or more (reference value)			Note 3		Note 3
Accuracy of origin return position	X-Y mm	± 0.1 or less	± 0.05 or less	± 0.1 or less	± 0.1 or less	± 0.05 or less
	Z mm	± 0.1 or less				
Note 4 θ °	3 or less					
Load capacity g	30 or less			80 or less		

Note 1: This item indicates the fluctuation of the pressing force in the stroke. The pressing force is not proportional to the stroke.

Note 2: With a rotation torque on the movable shaft that exceeds the maximum torque sustained, the movable shaft loses synchronism and rotates 180°.

* Torque sustained: Force in the θ direction (Figure 1) with which the movable shaft may be misaligned but it will recover the original position

Note 3: For sustained torques of FBU2-12M/12D, see the table on the right.

Note 4: For the returning position accuracy, see the figure below (Figure 1).

This item indicates the returning accuracy during buffering.

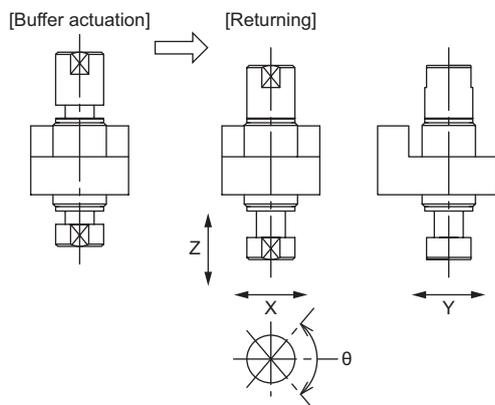
Note 5: Contact CKD for any requirement not fulfilled by the specification.

Note 6: The load capacity is the maximum load (of a bracket or a suction object) on the head piece.

<FBU2-12M/12D Maximum torque sustained (reference)>

Pressing force (N)	Stroke (mm)	Torque sustained (N·cm)
0.5	2	0.5 or more
	6	0.5 or more
	16	1.2 or more
1	2	1.2 or more
	6	1.2 or more
	16	2.5 or more

Indicates the torque sustained at the tip.



(Figure 1) Returning accuracy detail

How to order

FBU2 - **12D** - **S** - **10** - **6** - **T3** - **H3**

Model No.

A Outer diameter

B Bearing accuracy

C Pressing force

D Buffer stroke

E Tail piece shape

F Head piece shape

[Example of model number]

Outer diameter ϕ 12h7, spigot type

FBU2-12D-HV-05-6-TB-H5

- A** Outer diameter : ϕ 12h7, spigot type
- B** Bearing accuracy : High-precision internal flow path type
- C** Pressing force (N) : 0.5 N
- D** Buffer stroke : 6 mm
- E** Tail piece shape : No hole
- F** Head piece shape : M5 female screw, depth 4

Code	Descriptions	Model No.			
		FBU2 - 7D	FBU2 - 8M	FBU2 - 12D	FBU2 - 8M
A Outer diameter					
7D	ϕ 7h7, spigot type	●			
8M	M8 \times 0.75, all-screw type		●		
12D	ϕ 12h7, spigot type			●	
12M	M12 \times 1, all-screw type				●
B Bearing accuracy					
S	Standard (bearing clearance of 0.2 mm or less)	●	●	●	●
H	High-precision (bearing clearance of 0.05 mm or less)	●		●	
HV	High-precision internal flow path type (bearing clearance of 0.05 mm or less)	●		●	
C Pressing force (N)					
02	0.2	●	●		
05	0.5			●	●
10	1.0			●	●
D Buffer stroke (mm)					
2	2	●	●	●	●
6	6	●	●	●	●
16	16			●	●
E Tail piece shape					
TB	No hole	●	●	●	●
T3	M3 female screw, depth 3	●	●	●	●
T5	M5 female screw, depth 4			●	●
F Head piece shape					
HB	No hole	●	●	●	●
H3	M3 female screw, depth 3	●	●	●	●
H5	M5 female screw, depth 4			●	●

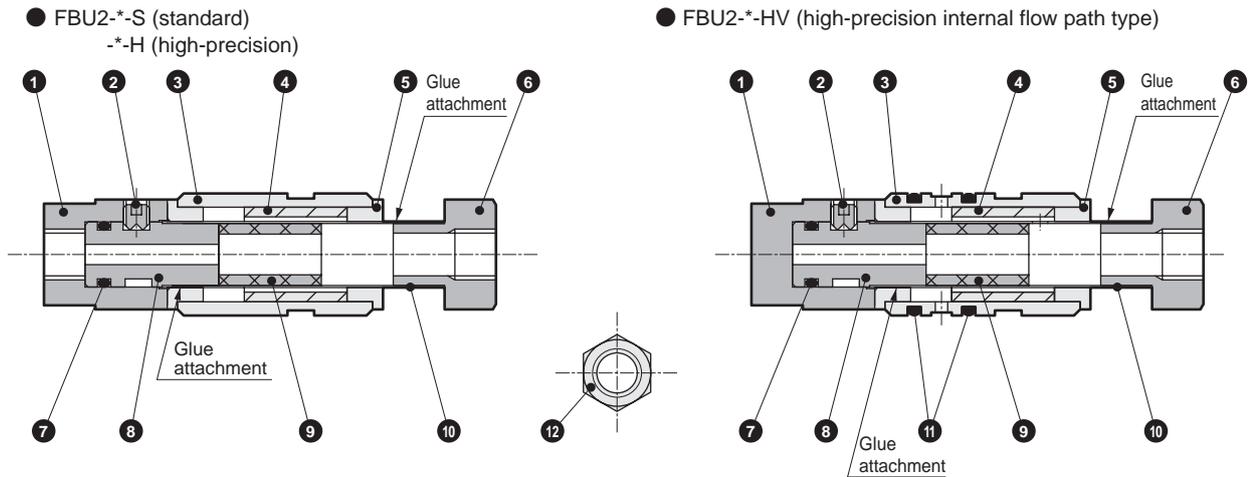
Combinations of bearing accuracy and buffer stroke, tail piece shape, and head piece shape

		B Bearing accuracy		
		S	H	HV
D Buffer stroke	2	●	●	●
	6	●	●	●
	16	●	●	●
E Tail piece shape	TB	●	●	●
	T3	●	●	
	T5	●	●	
F Head piece shape	HB	●	●	
	H3	●	●	●
	H5	●	●	●

Model codes for standalone brackets for spigot types

A Outer diameter	Standalone bracket model codes	
	L-shaped attachment	Straight attachment
7D	FBU2- 7D-B1	FBU2- 7D-B2
12D	FBU2-12D-B1	FBU2-12D-B2

Internal structure and parts list



No.	Parts name	Material	Remarks	No.	Parts name	Material	Remarks
1	Tail piece	Aluminum alloy	Electroless nickeling	7	O ring	Nitrile rubber	
2	Hexagon socket screw	Stainless steel		8	Tail joint	Aluminum alloy	Trivalent chromate treatment
3	Fixed shaft	Stainless steel		9	Ring magnet	Plastic magnet	
4	Ring magnet	Plastic magnet		10	Guide tube	Stainless steel	
5	Bearing	Fluorine resin	Standard bearing type	11	O ring	Nitrile rubber	Internal flow path type
		Polyester resin	Internal flow path type			Carbon steel	Electroless nickeling (all-screw type only)
6	Head piece	Aluminum alloy	Electroless nickeling	12	Hexagon nut	Carbon steel	Electroless nickeling (all-screw type only)

Bracket material

Model no.	Material	Remarks
FBU2- 7D -B1	Aluminum alloy	Electroless nickeling
FBU2- 7D -B2		
FBU2- 12D -B1		
FBU2- 12D -B2		

Weight

● FBU2-8M /7D

(Unit: g)

Model no.	Fixed section	Movable section (Note 1)	Tail piece (movable section)		Head piece (movable section)		Bracket (Note 2)		
			TB	T3	HB	H3	B1	B2	
FBU2-8M-S-02-2	5.5	1.2	0.7	0.7	0.4	0.3	8.9	13.1	
FBU2-8M-S-02-6		1.3							
FBU2-7D-S-02-2	2.2	1.2							
FBU2-7D-S-02-6		1.3							
FBU2-7D-H-02-2		1.0							
FBU2-7D-H-02-6									
FBU2-7D-HV-02-2	2.1								
FBU2-7D-HV-02-6									

Note 1: Total weight of movable section = Movable section + Tail piece + Head piece,

Product weight = Fixed section + Movable section + Tail piece + Head piece

Note 2: A bracket includes a plug and a fixing screw.

● FBU2-12M/12D

(Unit: g)

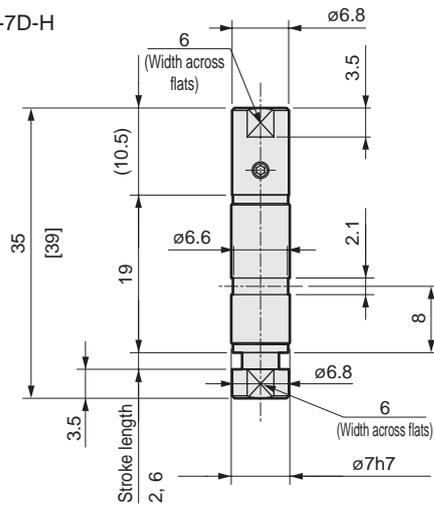
Model no.	Fixed section	Movable section (Note 1)	Tail piece (movable section)			Head piece (movable section)			Bracket (Note 2)	
			TB	T3	T5	HB	H3	H5	B1	B2
FBU2-12M-S-05/10-2	10.2	2.4	2.2	2.2	2.0	1.2	1.2	1.1	18.3	28.6
FBU2-12M-S-05/10-6		2.5								
FBU2-12M-S-05/10-16		3.9								
FBU2-12D-S-05/10-2	8.3	2.4								
FBU2-12D-S-05/10-6		2.5								
FBU2-12D-S-05/10-16		3.9								
FBU2-12D-H-05/10-2	8.1	2.4								
FBU2-12D-H-05/10-6		2.5								
FBU2-12D-HV-05/10-2	7.1	2.4								
FBU2-12D-HV-05/10-6		2.5								

Note 1: Total weight of movable section = Movable section + Tail piece + Head piece, Product weight = Fixed section + Movable section + Tail piece + Head piece

Note 2: A bracket includes a plug and a fixing screw.

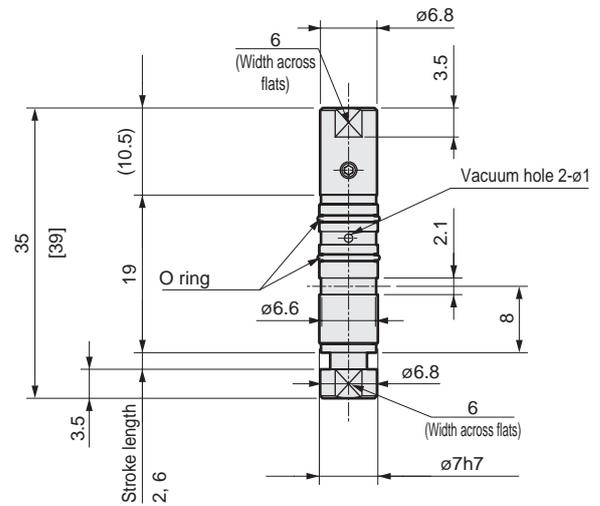
Dimensions (FBU2-7D, FBU2-8M)

- FBU2-7D-S
- FBU2-7D-H



Note: Values in [] are dimensions for 6 stroke.

- FBU2-7D-HV

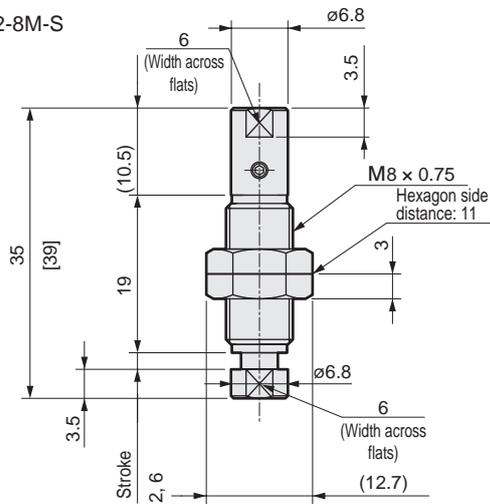


Note: Values in [] are dimensions for 6 stroke.

Note: O-rings are attached to the body before being shipped. Make sure that lubricant does not adhere to guide tubes and bearings. It may affect the functionality.

Note: The indicated dimensions are the same regardless of the shapes of the head piece and the tail piece.

- FBU2-8M-S

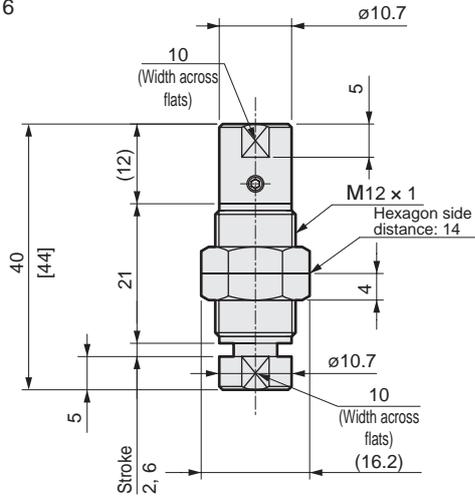


Note: Values in [] are dimensions for 6 stroke.

Dimensions (FBU2-12M, FBU2-12D)

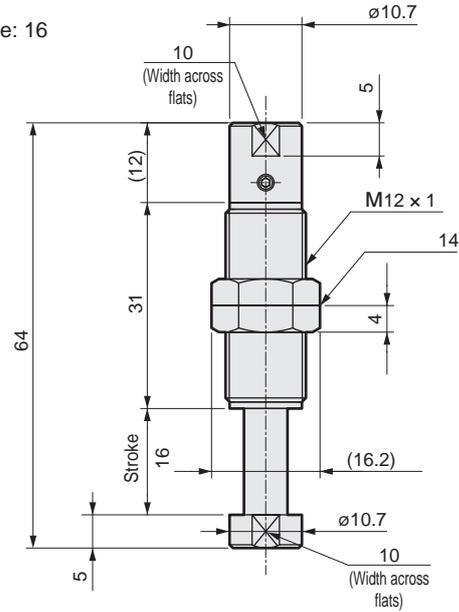
● FBU2-12M-S

Stroke: 2, 6



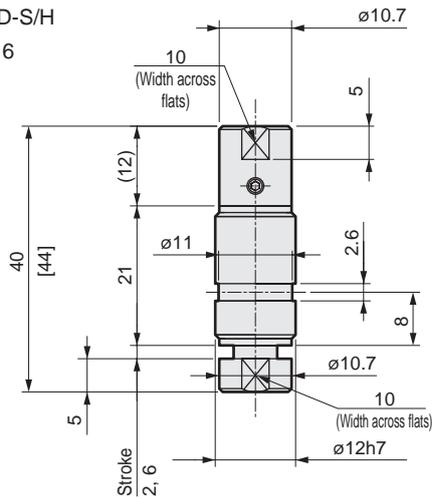
Note: Values in [] are dimensions for 6 stroke.

Stroke: 16



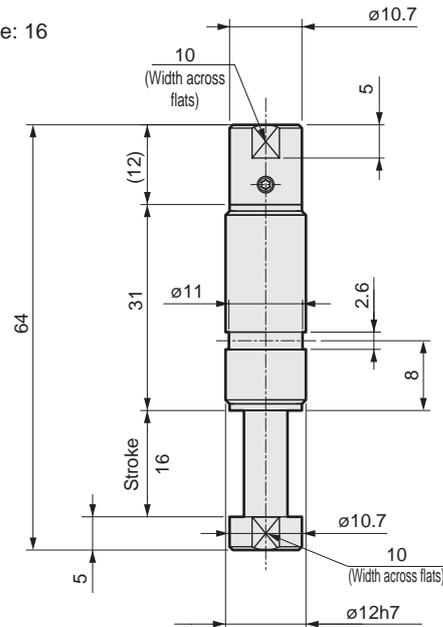
● FBU2-12D-S/H

Stroke: 2, 6

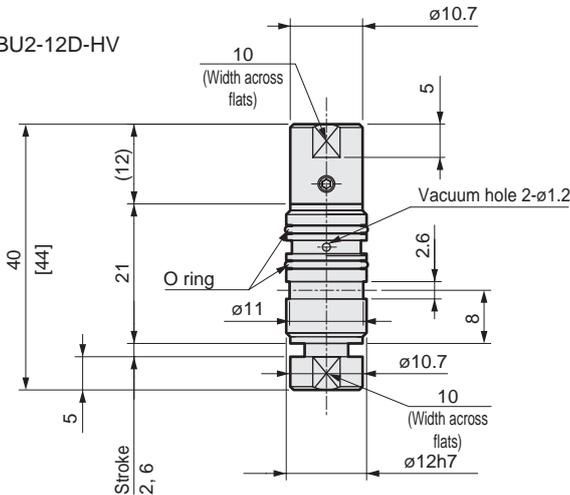


Note: Values in [] are dimensions for 6 stroke.

Stroke: 16



● FBU2-12D-HV



Note: Values in [] are dimensions for 6 stroke.

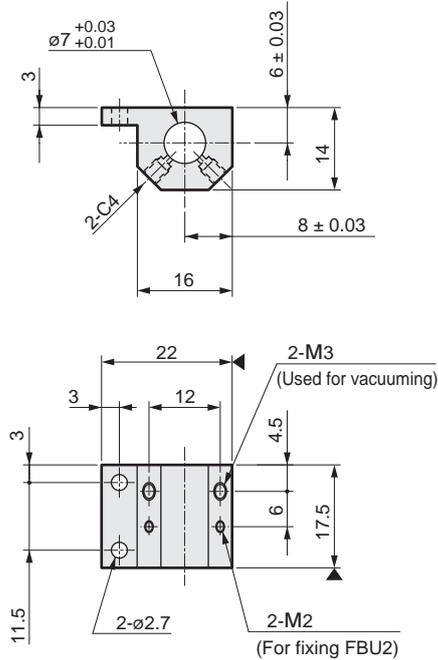
Note: O-rings are attached to the body before being shipped. Make sure that lubricant does not adhere to guide tubes and bearings. It may affect the functionality.

Note: The indicated dimensions are the same regardless of the shapes of the head piece and the tail piece.

Bracket dimensions

● FBU2-7D-B1

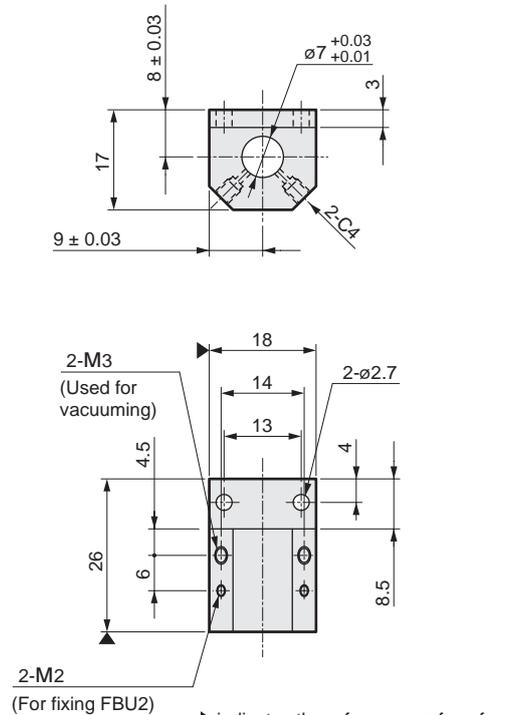
(Attachments: FPL-M3 1 pcs, fixing screw M2 × 2.1 pcs)



► indicates the reference surface for FBU2 installation.

● FBU2-7D-B2

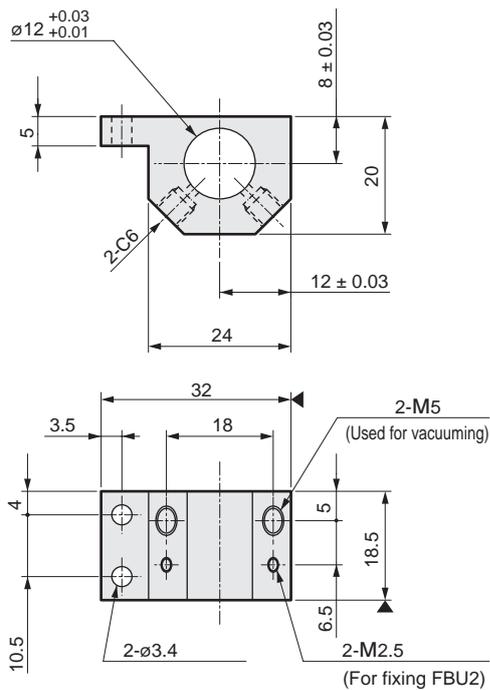
(Attachments: FPL-M3 1 pcs, fixing screw M2 × 2.1 pcs)



► indicates the reference surface for FBU2 installation.

● FBU2-12D-B1

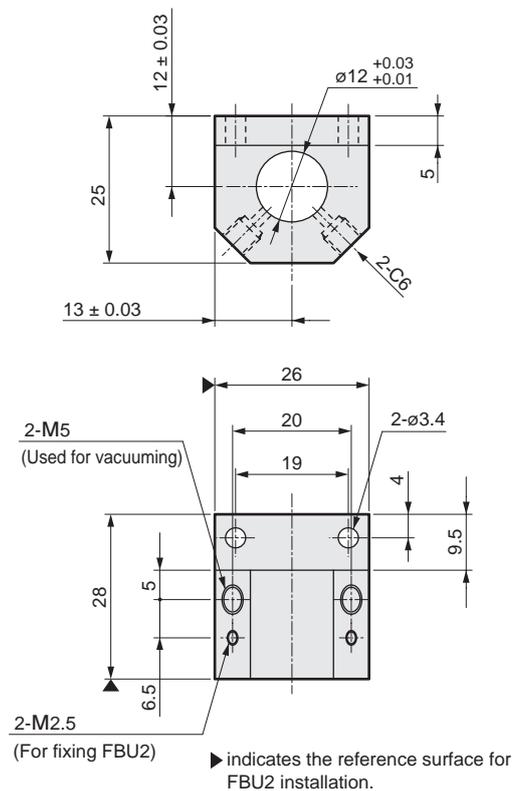
(Attachments: FPL-M5 1 pcs, fixing screw M2.5 × 2.5 1 pcs)



► indicates the reference surface for FBU2 installation.

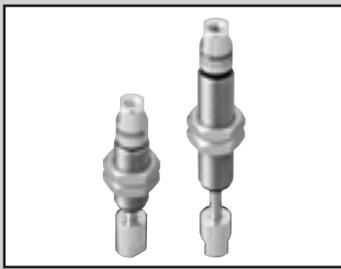
● FBU2-12D-B2

(Attachments: FPL-M5 1 pcs, fixing screw M2.5 × 2.5 1 pcs)



► indicates the reference surface for FBU2 installation.

Note: When using for vacuuming, put plugs (FPL-M3, M5) on unused screws (M3, M5).



Fine Buffers

FBU2-SU Series

O.D.: M12, Full thread
Load capacity: 200 g



Specifications

Item		FBU2-SU
O.D.		M12x1
Buffer pressure	N	0.4 to 0.6, 0.9 to 1.1
Pressure variation *1)		±15% or less
Buffer stroke	mm	2, 6, 16
Operating ambient temperature		°C
		5 to 50
Bearing clearance		mm
		0.2 or less
Max. holding torque		N·cm
		*2)
Return positioning accuracy *3)	X-Y	mm
	Z	mm
	θ °	
Load capacity		g
		200 or less

*1: Indicates pressure fluctuations within the stroke. Pressure is not proportional to the stroke.

*2: If a rotary torque exceeding the max. holding torque is applied on the moving axis, the moving axis will step out and rotate 180°.

*Holding torque: Force applied in the θ direction (Figure 1) that allows the movable axis to return to its original position even if its position is displaced.

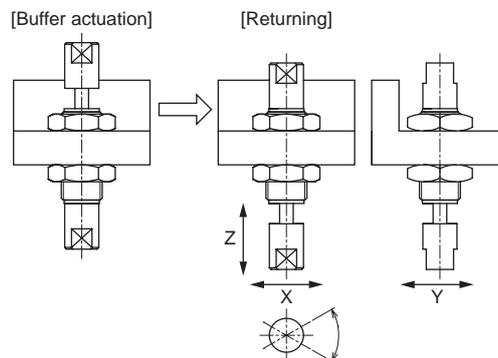
*3: Refer to the figure below for return positioning accuracy. The figure shows buffer return accuracy.

*4: Consult with CKD for requirements not complying with specifications.

[FBU2-SU Maximum torque sustained (reference)]

Pressing force (N)	Stroke (mm)	Torque sustained (N·m)
0.5	2	0.5 or more
	6	0.5 or more
	16	1.2 or more
1	2	1.2 or more
	6	1.2 or more
	16	2.5 or more

Indicates the torque sustained at the tip.



How to Order

FBU2 - SU - **05** - **6** - **T3** - **H3**

Model No.

Ⓐ Pressure

Ⓑ Buffer stroke

Ⓒ Tail shape

Ⓓ Head shape

[Example of model No.]

FBU2-SU-05-16-T5-H3

Ⓐ Pressure (N) : 0.5 N

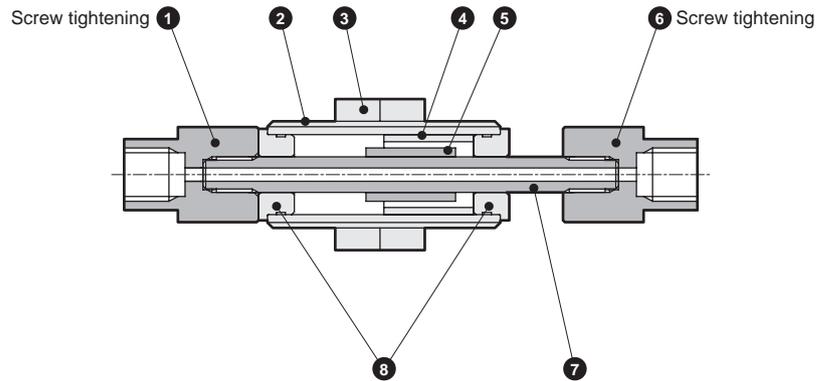
Ⓑ Buffer stroke (mm) : 16 mm

Ⓒ Tail shape : M5 female thread depth 4

Ⓓ Head shape : M3 female thread depth 3

Code	Description
Ⓐ Pressure (N)	
05	0.5
10	1.0
Ⓑ Buffer stroke (mm)	
2	2
6	6
16	16
Ⓒ Tail shape	
TB	Without hole
T3	M3 female thread depth 3
T4	M4 female thread depth 4
T5	M5 female thread depth 4
T6	M6 female thread depth 5
Ⓓ Head shape	
HB	Without hole
H3	M3 female thread depth 3
H4	M4 female thread depth 4
H5	M5 female thread depth 4
H6	M6 female thread depth 5

Internal structure diagram and parts list

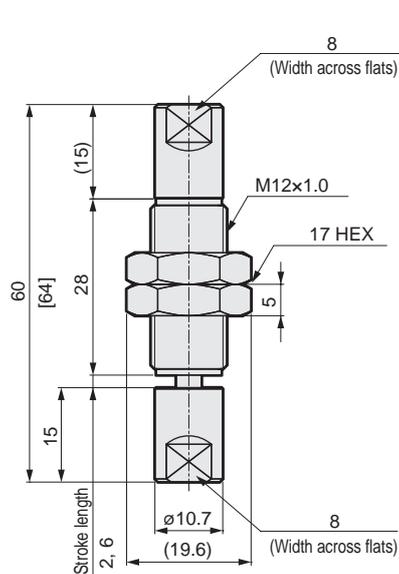


No.	Parts name	Material	Remarks	No.	Parts name	Material	Remarks
1	Adapter (tail)	Aluminum alloy	Trivalent chromate treatment	5	Ring magnet	Plastic magnet	
2	Fixed shaft	Stainless steel		6	Adapter (head)	Aluminum alloy	Trivalent chromate treatment
3	Hexagon nut	Steel	Zinc plating, trivalent chromate finish	7	Rod	Stainless steel	
4	Ring magnet	Plastic magnet		8	Bearing	Polyphenylene sulfide	With a filler

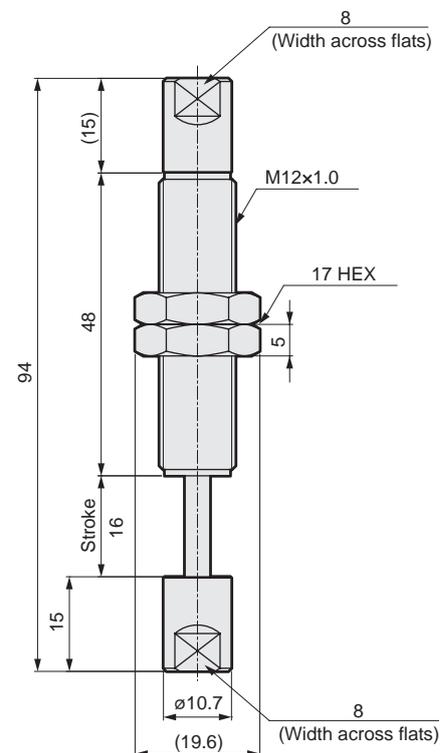
Dimensions Note: The width across flats for adaptor (tail) or adaptor (head) is arbitrary.

● FBU2-SU-05/10-6

● FBU2-SU-05/10-16



Note: Values in [] are dimensions for 6 strokes.



Weight

Model No.	(Unit: g)	
	Fixed part	Movable part
FBU2-SU-05/10-2	19.1	4.2
FBU2-SU-05/10-6	19.1	4.5
FBU2-SU-05/10-16	25.2	7.9

(Unit: g)				
Adapter				
T/H B	T/H 3	T/H 4	T/H 5	T/H 6
3.4	3.3	3.2	3.1	2.9

*1: Total weight of movable part = movable part + adaptor (tail side) + adaptor (head side),
Product weight = fixed part + movable part + adaptor (tail side) + adaptor (head side).

FBU2 Series

Technical data (reference value)

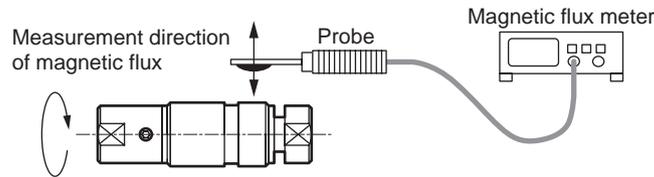
1 Leakage magnetic flux

[Measurement instruments]

Magnetic flux meter
probe

[Measurement method]

- ① Put a probe on each measurement point of FBU2.
- ② Rotate FBU2 around the center axis to measure the maximum magnetic flux density.



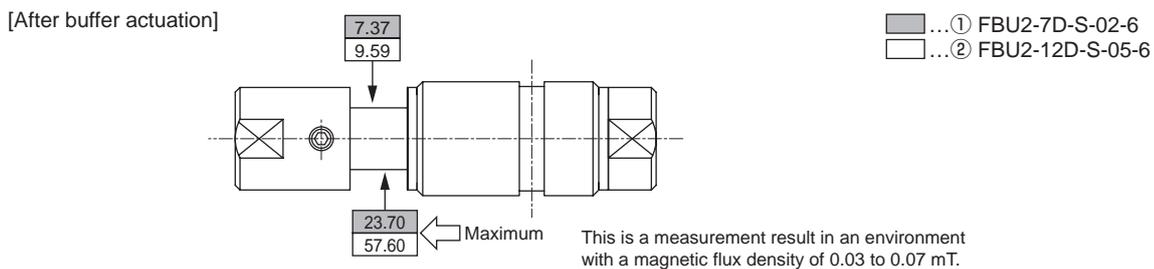
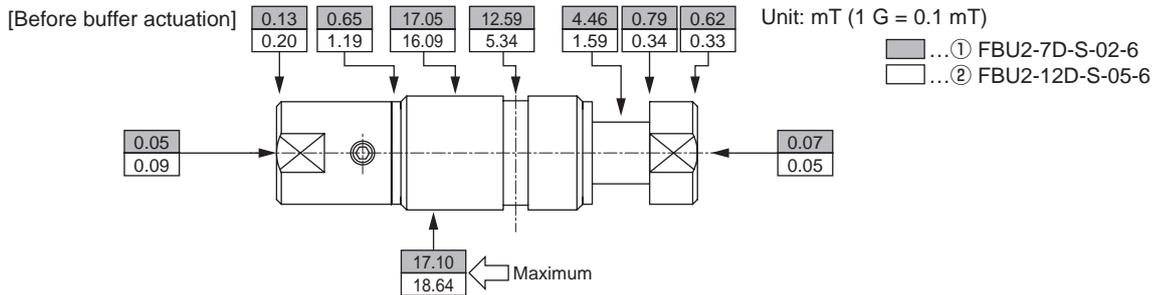
[Targets]

- ① FBU2-7D-S-02-6
- ② FBU2-12D-S-05-6
- ③ FBU2-12D-S-05-16

[Results]

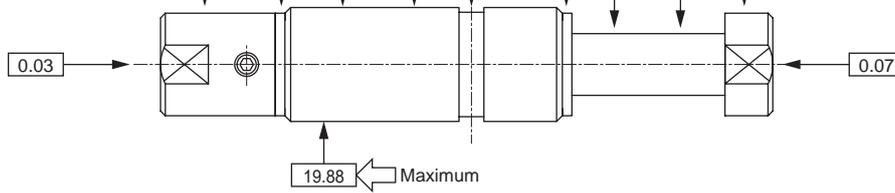
- Magnetic flux densities in different positions

- ① FBU2-7D-S-02-6
- ② FBU2-12D-S-05-6

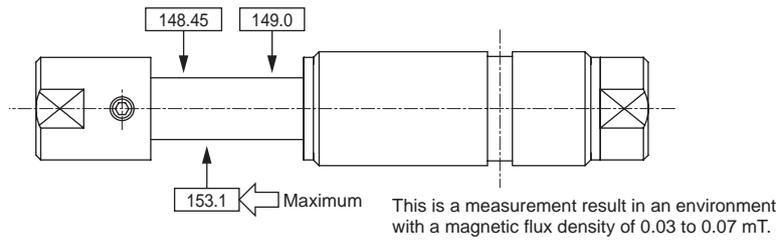


③ FBU2-12D-S-05-16

<Before buffer actuation> 0.26 1.79 19.76 16.10 15.59 1.71 0.20 0.19 0.22 Unit: mT (1 G = 0.1 mT)

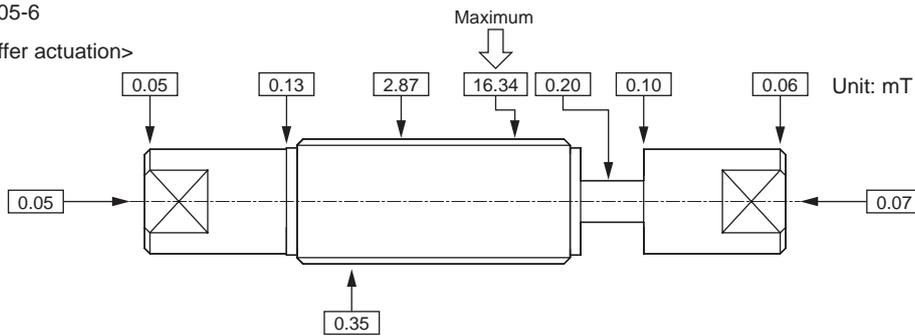


<After buffer actuation>

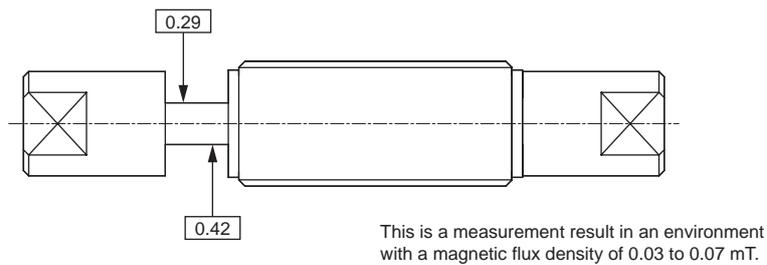


④ FBU2-SU-05-6

<Before buffer actuation> 0.05 0.13 2.87 16.34 0.20 0.10 0.06 Unit: mT (1 G = 0.1 mT)



<After buffer actuation>

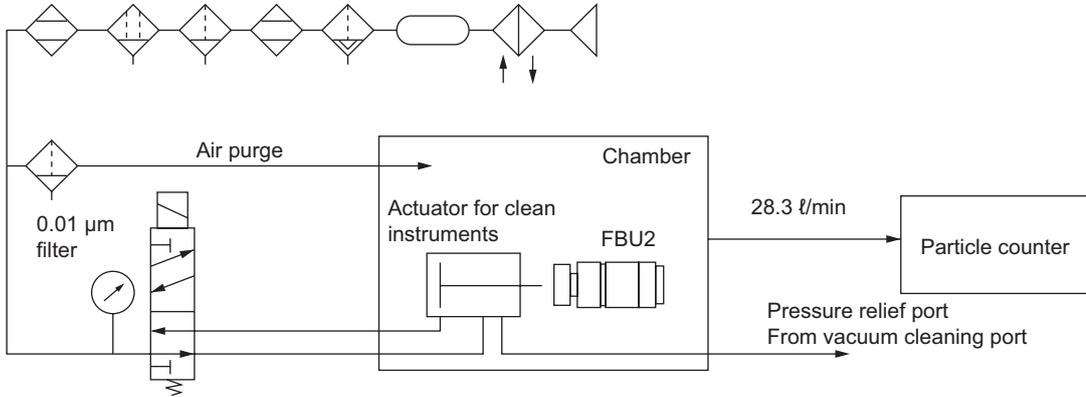


2 Dust emission

[Measurement instruments]

Particle counter : Laser dust monitor
 Smallest measurable particle diameter : 0.1 μm
 Air intake : 28.3 l/min

[Test circuit]



[Measurement method]

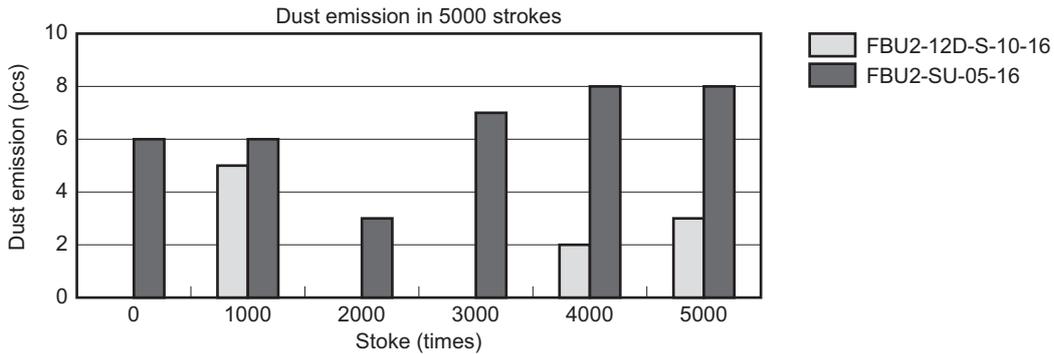
- ① Put a test sample in a static-free chamber (stainless steel).
- ② Provide a clear air flow (through a 0.01 μm filter) with a flow intensity as much as the particle counter take in (23.8 l/min).
- ③ Confirm that the particle counter reading is 0 when the test sample is not operating.
- ④ Start the test sample operation, and measure the particle count during operation.

* Use a sealed chamber so that particles do not enter the chamber except for those from the test sample.
 * Confirm in advance that the dust emission is 0 coming from the actuator (vacuum cleaning type) to be used for clean instruments.

[Measurement conditions]

- Air quality
 For purge : "Grade 1.2.1" + 0.01-μm gas filter
- FBU2 stroke speed : 50 mm/s
- Stroke condition : No load, placed parallel to the purge flow direction
- Measurement period : 1 minute, during which 1000 strokes are made
- Sample : FBU2-12D-S-10-16
 FBU2-SU-05-16

[Measurement result]



FBU2-12D-S-10-16

Particle diameter	Number of strokes					
	0	1000	2000	3000	4000	5000
0.1 μm or larger	0	5	0	0	0	2
0.2 μm or larger	0	0	0	0	1	0
0.3 μm or larger	0	0	0	0	1	1
0.5 μm or larger	0	0	0	0	0	0
1.0 μm or larger	0	0	0	0	0	0
2.0 μm or larger	0	0	0	0	0	0
Total dust emission	0	5	0	0	2	3

FBU2-SU-05-16

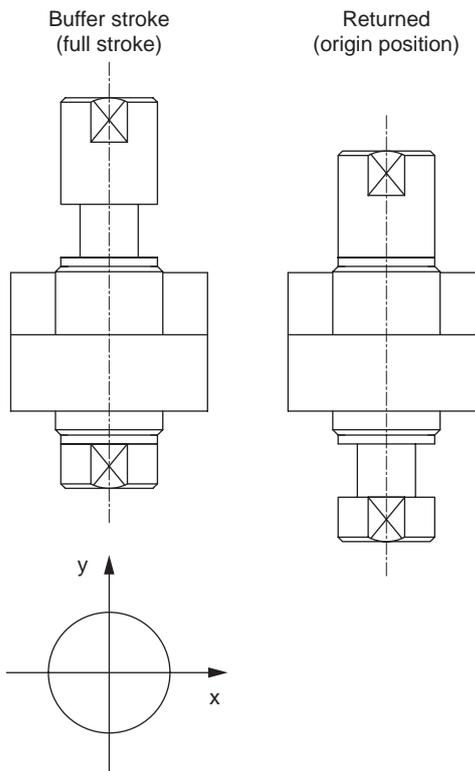
Particle diameter	Number of strokes					
	0	1000	2000	3000	4000	5000
0.1 μm or larger	6	6	3	7	8	8
0.2 μm or larger	0	0	0	0	0	0
0.3 μm or larger	0	0	0	0	0	0
0.5 μm or larger	0	0	0	0	0	0
1.0 μm or larger	0	0	0	0	0	0
2.0 μm or larger	0	0	0	0	0	0
Total dust emission	6	6	3	7	8	8

3 Stop position accuracy (X-Y)

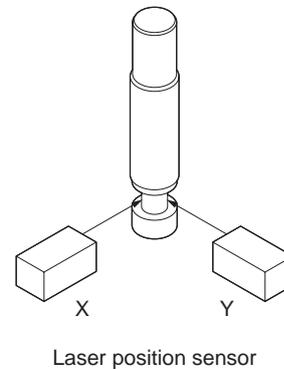
[Measurement instruments]

Laser position sensor

[Measurement overview]



[Measurement method]



[Measurement method]

Measure the accuracy of X and Y positions when the test sample is given a full stroke manually.

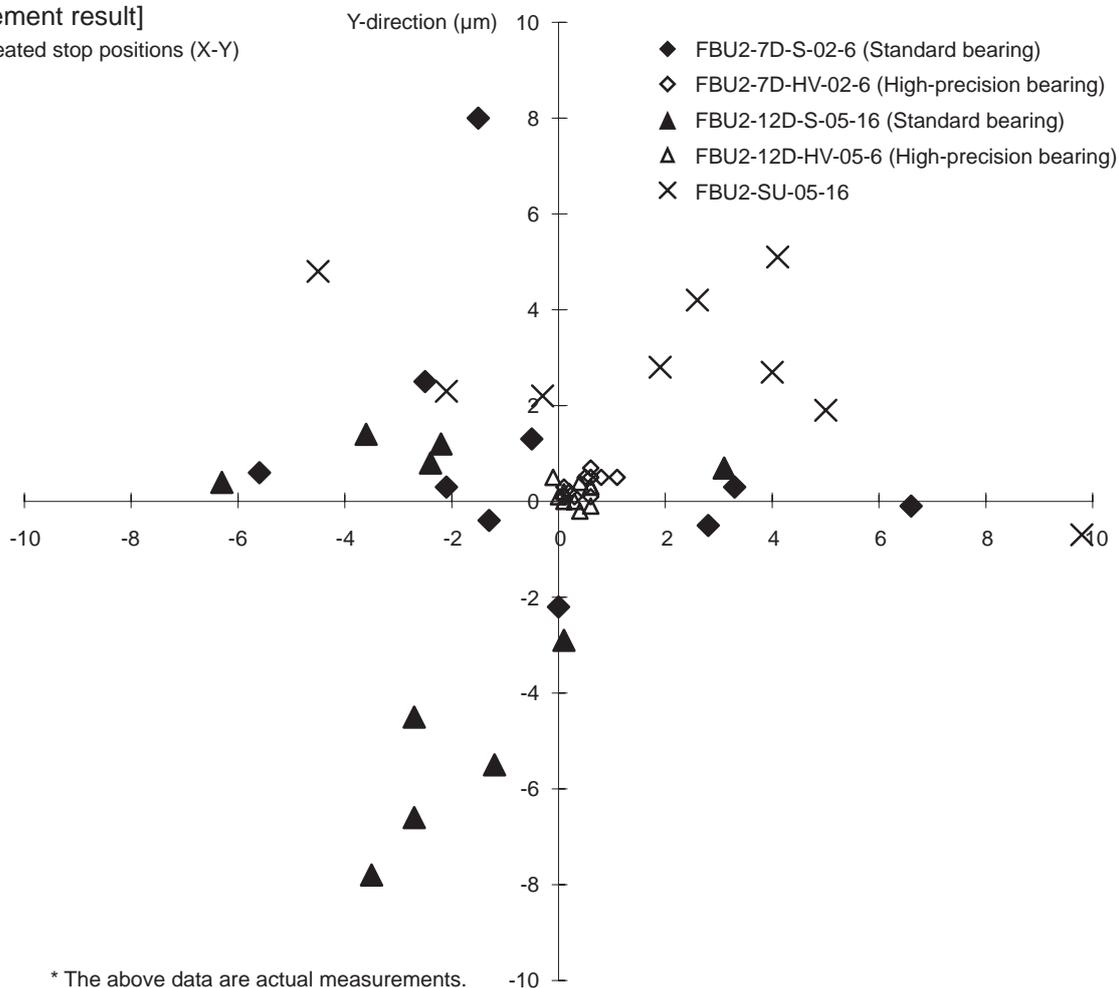
- Load : None
- Installation orientation : Downward
- Degree of vacuum : Not vacuum
- Piping : None

[Targets]

- FBU2-7D-S-02-6
- FBU2-7D-HV-02-6
- FBU2-12D-S-05-16
- FBU2-12D-HV-05-6

[Measurement result]

Repeated stop positions (X-Y)



* The above data are actual measurements.

FBU2 Series

Suction pad list

■Suction pad list

Pad shape	Applications	Pad size									Pad material								Drop prevention	
		ø0.7	ø1	ø1.5	ø2	ø3	ø4	ø6	ø8	ø10	N	S	U	F	SE	E	G	FS		
Standard, compact VSP-ME *RM 	Ideal for compact workpieces such as semiconductor components	●	●	●	●	●	●					●	●	●	●	●	●			●
Standard Conventional Sha VSP-ME *R VSP-E *R* 	Ideal for thick and flat workpieces		●		●	●	●	●	●			●	●	●	●	●	●			●
Thin object type VSP-ME *P VSP-E *P* 	Ideal for transport of thin workpieces such as copy paper and plastic, etc.									●	●	●							●	
Sponge VSPG- *S *A 	Ideal for work with uneven surfaces such as exterior wall materials									●	Only chloroprene									

Pad material

N	Nitrile Rubber
S	Silicone rubber
U	Urethane rubber
F	Fluoro rubber
SE	Antistatic silicone rubber
E	Antistatic butadiene rubber (low resistance)
G	NBR compatible with the Food Sanitation Act
FS	Fluorosilicone rubber

■Characteristics of each pad

Item	Pad material	Nitrile Rubber	Silicone rubber	Urethane rubber	Fluoro rubber	Fluorosilicone rubber	Butadiene rubber (Low resistance)	Chloroprene rubber (Sponge)
		NBR	Si	U	FKM	FSi	BR	CR
Pad color		Black ^{*2}	White	Blue	Gray	Light brown	Black	Black
Characteristics	Surface hardness (Shore A)	40 to 60	40 to 50	60	60	40	60	-
	High-temperature usage limits	110	180	60	230	180	100	80
	Low-temperature usage limits	-30	-40	-20	-10	-50	-50	-45
	Weather resistance	△	◎	○	○	○	○	○
	Ozone resistance	△	◎	◎	◎	◎	X	○
	Acid resistance	△	○	X	◎	○	△	△
	Alkali resistance	○	◎	X	X	◎	○	◎
	Oil resistance	(Gasoline / Light oil)	◎	△	◎	◎	△	X
(Benzene / Toluene)		△	△	△	◎	△	X	△

How to read the evaluation → ◎: Ideal, ○: Suitable, △: Acceptable, X: Unsuitable

*1: Surface resistance of low resistance pad is 200 Ω or less.

*2: The pad color compatible with the Food Sanitation Act is gray.

*1: Characteristics of general synthetic rubbers used for the pad material are indicated in the table of characteristics.

*2: The use at the maximum operating temperatures should only be for a short period. If continuous use is required, please ensure sufficient verification before use.

Compatibility Table

Model No.	Pad diameter	FBU2-7D	FBU2-8M	FBU2-12D		FBU2-12M		FBU2-SU		
		M3 Female thread	M3 Female thread	M3 Female thread	M5 female thread	M3 Female thread	M5 female thread	M3 Female thread	M5 female thread	M6 female thread
Compact	VSP-ME0.7RM *-M3	●	●	●		●		●		
	VSP-ME1RM *-M3	●	●	●		●		●		
	VSP-ME1.5RM *-M3	●	●	●		●		●		
	VSP-ME2RM *-M3	●	●	●		●		●		
	VSP-ME3RM *-M3	●	●	●		●		●		
	VSP-ME4RM *-M3	●	●	●		●		●		
General	VSP-ME6R *-M5				●		●		●	
	VSP-ME8R *-M5				●		●		●	
	VSP-E1R *	●	●	●		●		●		
	VSP-E2R *	●	●	●		●		●		
	VSP-E3R *	●	●	●		●		●		
	VSP-E4R *	●	●	●		●		●		
	VSP-E6R *				●		●		●	
	VSP-E8R *				●		●		●	
Thin object	VSP-ME8P-M5				●		●		●	
	VSP-ME10P-M5				●		●		●	
	VSP-E8P *				●		●		●	
	VSP-E10P *				●		●		●	
Sponge	VSPG-10SA									●
Oval	VSPG-4 * 10E * A									●
	VSPG-4 * 20E * A									●
	VSPG-5 * 10E * A									●
	VSPG-6 * 10E * A									●

Note) Use with load capacity for FBU2 or less.
Use exceeding the load capacity may result in product damage.

Selection method for suction pad

The theoretical lifting force can be obtained from the area of the pad and the vacuum pressure generated when using this pad.

[kPa, N display]

$$W = \frac{CXP}{101} \times 10.13Xf$$

W: Theoretical lifting force (N)

C: Suction area (cm²)

P: Vacuum pressure (-kPa)

F: Safety factor

[mmHg, kg display]

$$W = \frac{CXP}{760} \times 1.0332Xf$$

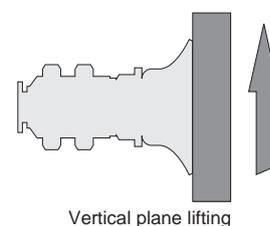
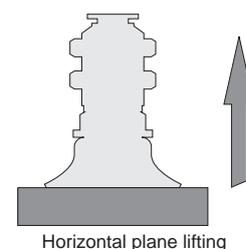
W: Theoretical lifting force (kg)

C: Suction area (cm²)

P: Vacuum pressure (-mmHg)

F: Safety factor

- *1: For the sponge pad, refer to the appended table because calculation is made using the inner diameter of the sponge pad section.
- *2: For the lifting force of the bellows (multi-stage bellows) type/soft (soft bellows) type pad, note that the lifting force may be different from the theoretical lifting force due to the pad characteristics.
- *3: Because the theoretical lifting force is the value during static conditions, adopt a safety factor of 1/4 for the horizontal lifting and 1/8 for perpendicular lifting in actual use. In addition, take acceleration into consideration when transporting. (Refer to the figure at right.)





Safety Precautions

Be sure to read this section before use.

When designing and manufacturing a device using CKD products, the manufacturer is obligated to check that device safety mechanism, pneumatic control circuit, or water control circuit and the system operated by electrical control that controls the devices is secured.

It is important to select, use, handle and maintain the product appropriately to ensure that the CKD product is used safely.

Observe warnings and precautions to ensure device safety.

Check that device safety is ensured, and manufacture a safe device.

WARNING

- 1** This product is designed and manufactured as a general industrial machine part. It must be handled by an operator having sufficient knowledge and experience.
 - 2** Use this product in accordance with specifications.
This product must be used within its stated specifications. In addition, never modify or additionally machine this product. This product is intended for use in general industrial machinery equipment or parts. It is not intended for use outdoors (except for products with outdoor specifications) or for use under the following conditions or environments. (Note that this product can be used when CKD is consulted prior to its usage and the customer consents to CKD product specifications. The customer should provide safety measures to avoid danger in the event of problems.)
 - 1** Use for applications requiring safety, including nuclear energy, railways, aircraft, marine vessels, vehicles, medical devices, devices or applications in contact with beverages or foodstuffs, amusement devices, emergency cutoff circuits, press machines, brake circuits, or safety devices or applications.
 - 2** Use for applications where life or assets could be significantly affected, and special safety measures are required.
 - 3** Observe organization standards and regulations, etc., related to the safety of device design and control, etc. ISO4414, JIS B 8370 (Pneumatics fluid power - General rules and safety requirements for systems and their components) JFPS2008 (Principles for pneumatic cylinder selection and use) Including the High Pressure Gas Safety Act, Industrial Safety and Health Act, other safety rules, organization standards and regulations, etc.
 - 4** Do not handle, pipe, or remove devices before confirming safety.
 - 1** Inspect and service the machine and devices after confirming safety of all systems related to this product.
 - 2** Note that there may be hot or charged sections even after operation is stopped.
 - 3** When inspecting or servicing the device, turn OFF the energy source (air supply or water supply), and turn OFF power to the facility. Discharge any compressed air from the system, and pay attention to possible water leakage and leakage of electricity.
 - 4** When starting or restarting a machine or device that incorporates pneumatic components, make sure that the system safety, such as pop-out prevention measures, is secured.
 - 5** Observe warnings and cautions in the following pages to prevent accidents.
- The precautions are ranked as "DANGER", "WARNING" and "CAUTION" in this section.

 **DANGER:** When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries, and when there is a high degree of emergency to a warning.

 **WARNING:** If handled incorrectly, a dangerous situation may occur, resulting in death or serious injury.

 **CAUTION:** When a dangerous situation may occur if handling is mistaken leading to minor injuries or physical damage.

Note that some items described as "CAUTION" may lead to serious results depending on the situation. Every item provides important information and must be observed.

Warranty

- 1** **Warranty period**
The product specified herein is warranted for one (1) year from the date of delivery to the location specified by the customer.
- 2** **Warranty coverage**
If the product specified herein fails for reasons attributable to CKD within the warranty period specified above, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge. However, following failures are excluded from this warranty:
 - 1) Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or the Instruction Manual.
 - 2) Failure caused by use of the product exceeding its durability (cycles, distance, time, etc.) or caused by consumable parts.
 - 3) Failure not caused by the product.
 - 4) Failure caused by use not intended for the product.
 - 5) Failure caused by modifications/alterations or repairs not carried out by CKD.
 - 6) Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
 - 7) Failure caused by acts of nature and disasters beyond control of CKD.The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.
Note: For details on the durability and consumable parts, contact your nearest CKD sales office.
- 3** **Compatibility check**
The customer is responsible for confirming the compatibility of CKD products with the customer's systems, machines and equipment.



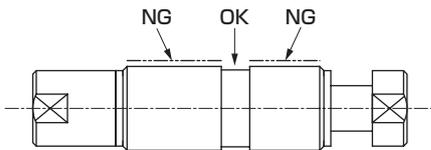
Safety Precautions

Be sure to read this section before use. Refer to "Pneumatic, Vacuum and Auxiliary Components" for general precautions No. CB-024SA

Design / Selection

⚠ WARNING

- The operating ambient temperature varies depending on the bearing type, so use within the specification range.
 - Standard bearing (S): 5 to 50°C
 - Precision bearing (H/HV): 5 to 40°C
 Note) FBU2-SU is a standard bearing.
- This product has a built-in magnet. Do not use where magnetic swarf or dust is present. Otherwise it could be damaged or cause malfunction.
- Fix the product in place with a nut (all thread types: 8M, 12M, SU) or hexagon socket set screw (spigot: 7D, 12D). When using a set screw, use the groove on the fixed shaft. Observe the precautions on the following page when mounting.



- Mounting orientation should be vertical. Lateral loads or moment forces on the movable shaft affect the variability of properties and life.

⚠ CAUTION

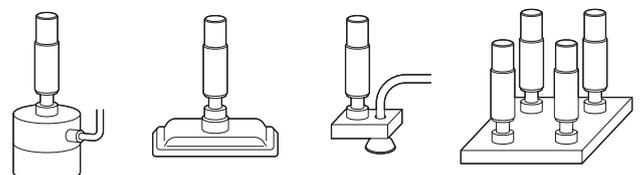
- When used in vacuum applications, the tension from the piping tube will be added to the push pressure, so use a tube with low piping tension.
 - Recommended tubes: UP Series (Antistatic, air fiber tubes)
- The load (jig and suctioned workpiece) on the movable shaft must not exceed the load capacity.
 - FBU2-7D/8M: 30 g or less
 - FBU2-12D/12M: 80 g or less
 - FBU2-SU: 200 g or less
- When conveying the workpiece, acceleration should not be more than 4G. Excessive acceleration could result in breakage of the product.
- When used for a rotating application, note the max. holding torque of the magnet. If force exceeding the maximum holding torque is applied, the shaft could slip out of synchronization and rotate 180° in reverse.
- The internal flow path high accuracy (HV) product has a leak. Clearance sealing improves pressure stability and return accuracy. This causes the vacuum to leak. (Pressure drop of 10 kPa or less compared to initial pressure of -80 kPa.)

Mounting, Installation and Adjustment

⚠ WARNING

- Before starting operation, check for loosening or abnormalities at load or fitting connections.
- Start operation after confirming that devices operate correctly. After installing, repairing, or modifying the product, conduct a function inspection and confirm that the product is correctly installed.
- Confirm that there is no machine interference and that the actuation system is normal.
- Do not apply impact to the product by dropping it, etc. Impact load can damage the product.
- After installing the product and piping, check that its movement is smooth before using. Connection using hard tubing or piping with a small bending radius could cause improper operation or failure.

- Applying load in the rotation direction due to piping tube tension at side take-out may cause damage to the product, , and so be careful.
- The following usage may cause malfunctions and failures due to moment forces on the movable shaft, even if the payload is less than the payload capacity.
 1. When a large jig other than the suction pad is attached to the head piece.
 2. When a large or irregularly shaped suction pad is attached.
 3. When using in ways which apply eccentric load to the movable axis.
 4. When holding one jig or workpiece with several FBU2 units.



Consult with CKD when using this unit with the method above.



Safety Precautions

Be sure to read this section before use. Refer to "Pneumatic, Vacuum and Auxiliary Components" for general precautions No. CB-024SA

Mounting, Installation and Adjustment

CAUTION

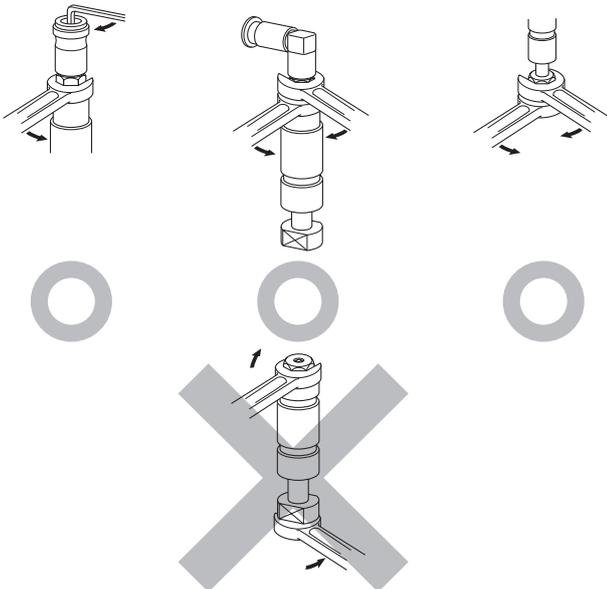
■ Do not remove the product from the package until just before piping. Foreign matter could enter from the piping port or shaft clearance and cause faults or malfunctions.

■ Before installation of the piping, air-flush the piping to remove all foreign matter and cutting chips.

■ Tighten pipes with the appropriate torque.

Port thread	Tightening torque (N·m)
M3	0.3 to 0.6
M4	0.9 to 1.1
M5	1.0 to 1.5
M6	2 to 2.7

When tightening, be sure to use the width across flats at the section to be tightened. Using the width across flats for a different section could cause structural damage.



■ Do not apply lubricant to the guide tube. Functions may fluctuate.

■ Do not scratch or indent the guide tube by hitting objects against it. The guide tube is thin-walled copper that deforms easily. Handle with care. Scratches or indents on the guide tube could damage bearings and lead to faults or malfunctions. (excluding FBU2-SU)

■ Be sure to read the instruction manual carefully. Fully understand contents before starting use.

■ Use a hexagon socket set screw to fix the outer diameter spigot type (7D, 12D) in place and tighten with proper torque. Excessive tightening could damage the body or bearings and lead to faults or malfunctions.

Product nominal	Fixing screw size	Tightening torque (N·m)
FBU2-7	M2 Hexagon socket set screw	0.10 to 0.12
FBU2-12	M2.5 Hexagon socket set screw	0.18 to 0.20

Use / Maintenance

WARNING

■ Refer to the instruction manual and conduct careful maintenance and inspection. Incorrect handling could result in device or system damage or operation faults.

CAUTION

■ Conduct daily inspections and regular inspections to ensure that maintenance control is done correctly. If maintenance is not sufficient, the product's functions could deteriorate markedly and lead to a shortened service life, faults and accidents.

■ Stop use if leakage increases or if the device does not function correctly. After installing, repairing, or modifying the product, conduct a functional inspection and confirm that the product is correctly installed.

For other precautions, check the materials below.

1. Instruction manual
Fine buffer FBU 2 Series

Fiber tube[®] for push-in fitting

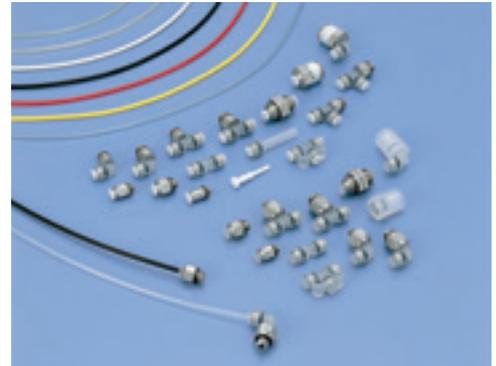
Fiber tube UP/EH

- O.D. $\phi 1.8 \times$ I.D. $\phi 1.2$ ultra-fine size saves energy and space
- As the tube stress after piping is only the same level as that of lead wire, the effect on device accuracy is extremely small.
- Clean-room specifications with highly corrosion-resistant materials (tube: special polyolefin, fitting: stainless steel).
- All substances which adversely affect the global environment have been eliminated from the materials.
- Flexible piping
- Resistant to static electricity and dust build-up

Push-in fitting for fiber tube PG/CG

- Push and hold the push ring of the fitting and attach or detach the tube. Polypropylene (PP) resin is incorporated as standard to improve corrosion resistance.

Catalog No. CC-784A



Vacuum System Components SELVACS

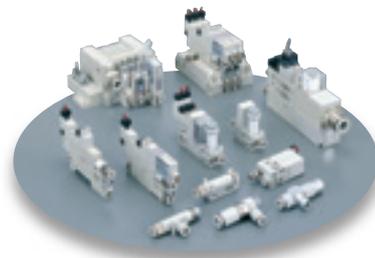
- Compact design
Each component has been compactly designed to save space.
- A wide variety of models
Extensive model series and variations handle a wide range of fields and applications.
- Unitized / Modularized
The ejector system/vacuum pump system which form the core are unitized and modularized, designed to save space and increase ease of use.

Catalog No. CC-796A



Ejector systems / vacuum pump systems

Vacuum ejectors and vacuum units are the core of vacuum systems. Various types are available, from stand-alone types to unit types combined with various related components.



Suction pad

Attachments that directly suction workpieces. A wide variety of materials, shapes, and pad diameters are available to suit the size, weight, and characteristics of the workpiece.



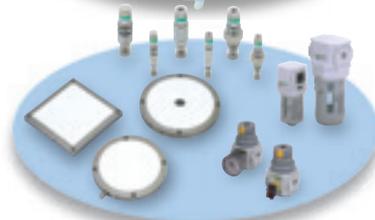
Vacuum-related products

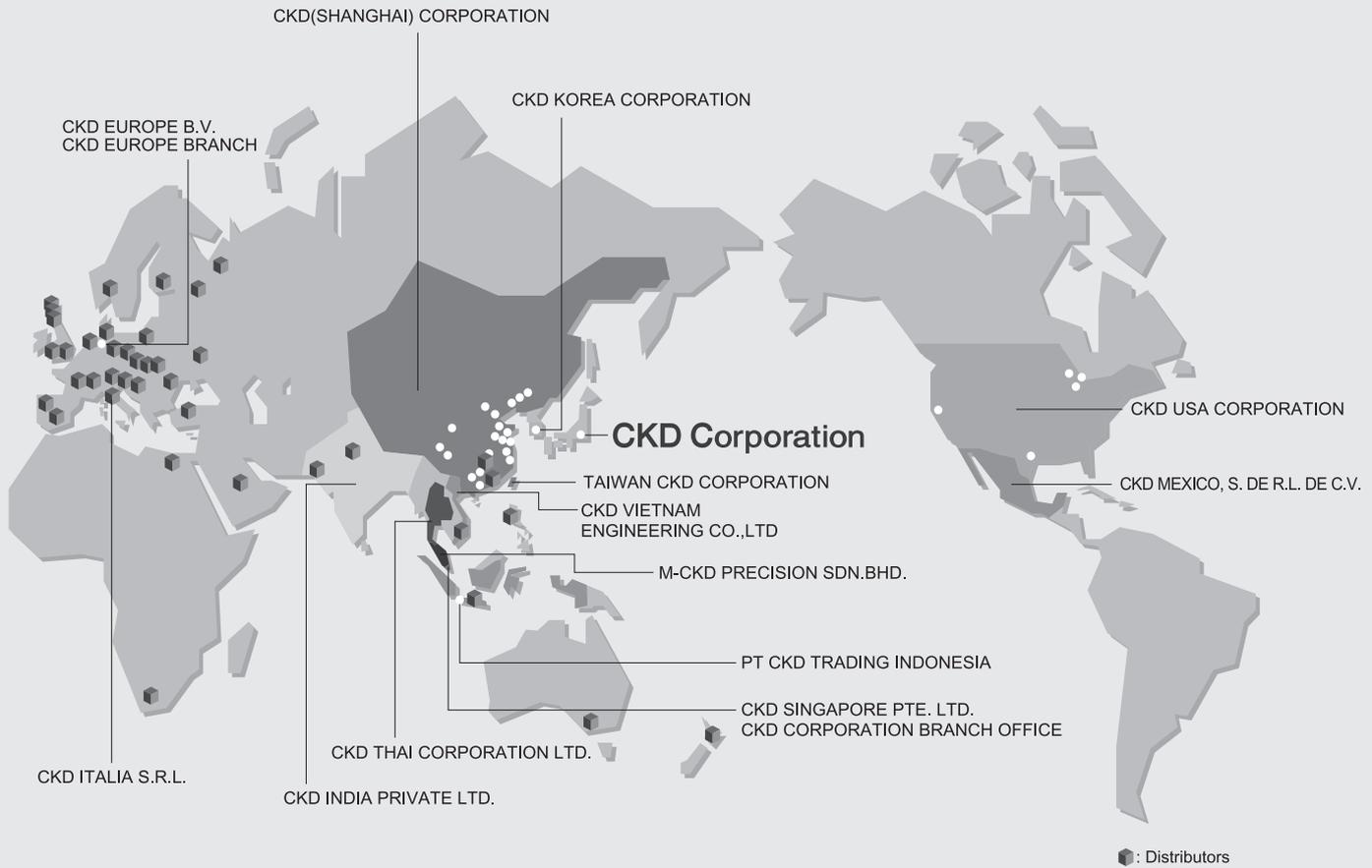
Vacuum break valves, vacuum pressure switches, vacuum filters, and other related components are available for use with vacuum systems.



Related products

Related components suitable for more advanced vacuum systems such as filters for vacuum, vacuum regulators, quick valves, precision suction plates, buffer units, etc., are available.





CKD Corporation

Website <https://www.ckd.co.jp/en/>

ASIA

喜開理(上海)機器有限公司

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