CKD

For inspection and implementation field meeting high-functionalization **New Product**

Magnetic Spring Buffer

FBU2 Series

TENSION CONTROLLING BUFFER FBU2 SERIES

CKD Corporation

CC-787A 3

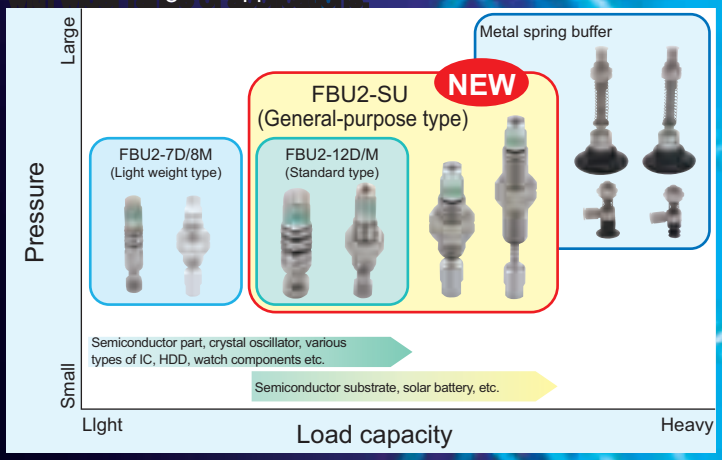
Problems with metal springs solved

This completely new interference unit uses suction of a magnet at the buffer.
Soft contact and stable pressing leave workpieces damage-free.
Ideal for handling miniature devices and fragile workpieces undamaged.

NEW

General-purpose type is available

FBU2-SU series with 200 g of load
Increase the strength of the movable part and compatible with wider range of applications.

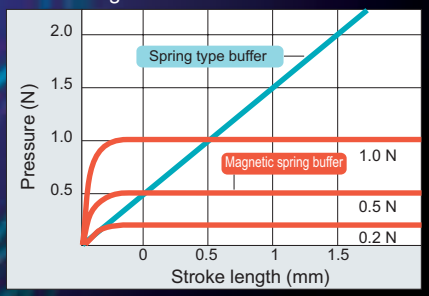


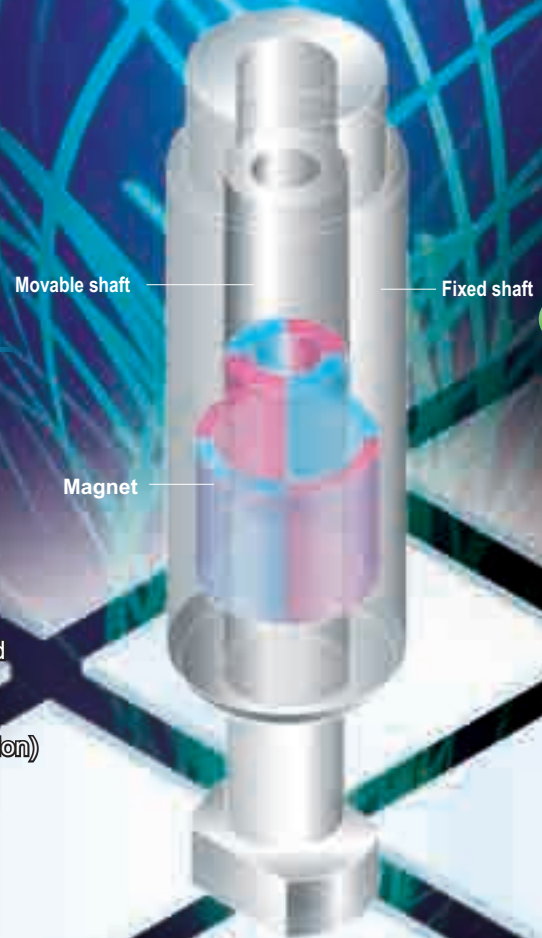
Constant pressure

If the magnet assembled in the movable or fixed shaft deviates, an inclined magnetic line is generated to counter the axial part force.

Continuous magnetic return applied axially

Pressure characteristics
Pressure generated by magnetic force can be selected from 0.2 N, 0.5 N, or 1.0 N depending on the model. Pressure is constant regardless of stroke.





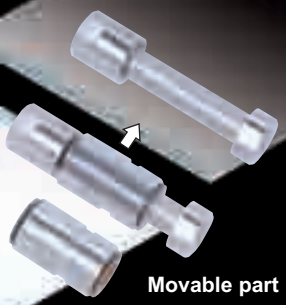
Rotation prevention

A 4-pole spline magnet on the inner side of the fixed shaft and the outer side of the movable shaft generates magnetic attraction to function and return to the origin.

Magnetic return applied rotationally (magnetic rotation prevention)

Compact, light weight (FBU2 Series)

Using just two components -- a movable part and a fixed part -- achieves compact ultra light weight -- 5 g or less = FBU2-7D.
The light moveble part touches workpieces gently and reduces shock.



Fine Buffer FBU2 Series

CKD's original absorption magnetic spring uses magnetic attraction realizing stable pushing, low particle generation, and long life in this compact, highly accurate fine buffer FBU2 Series.

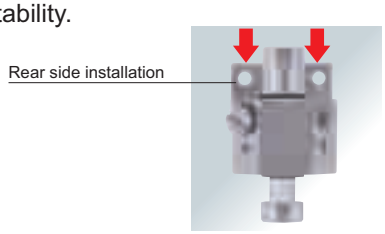
CKD Green Technology

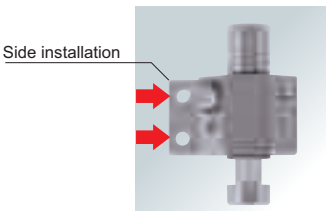
High precision bearing added to lineup

Standard and high-accuracy types are available for rod guides.
The bearing type can be selected based on repeated X-Y return accuracy of the movable shaft.
(Only standard for FBU2-SU)

Vacuum supply brackets available

Standard and high-accuracy brackets are available.
The high-accuracy HV can be used to supply vacuum from the bracket.
Reaction from piping tubing, etc., is eliminated, further improving pressing stability.





Clean and long life

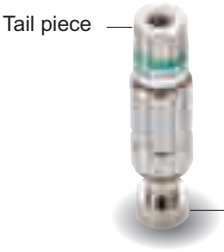
Fewer particles than generated in conventional metal spring use because there is no metal contact and movable contact area is small.
Thurust is generated magnetically, eliminating metal spring fatigue and lengthening life and stable performance.

Support secondary battery manufacturing process

Restrict copper materials of air flow path and sliding part as standard (equivalent to P4 specification) and the structure allows to be used in secondary battery manufacturing process.

Free head and tail combination

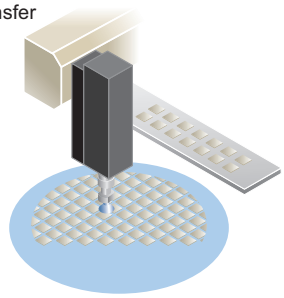
The fine buffer's head and tail shapes can be combined to suit the application.



Diverse applications

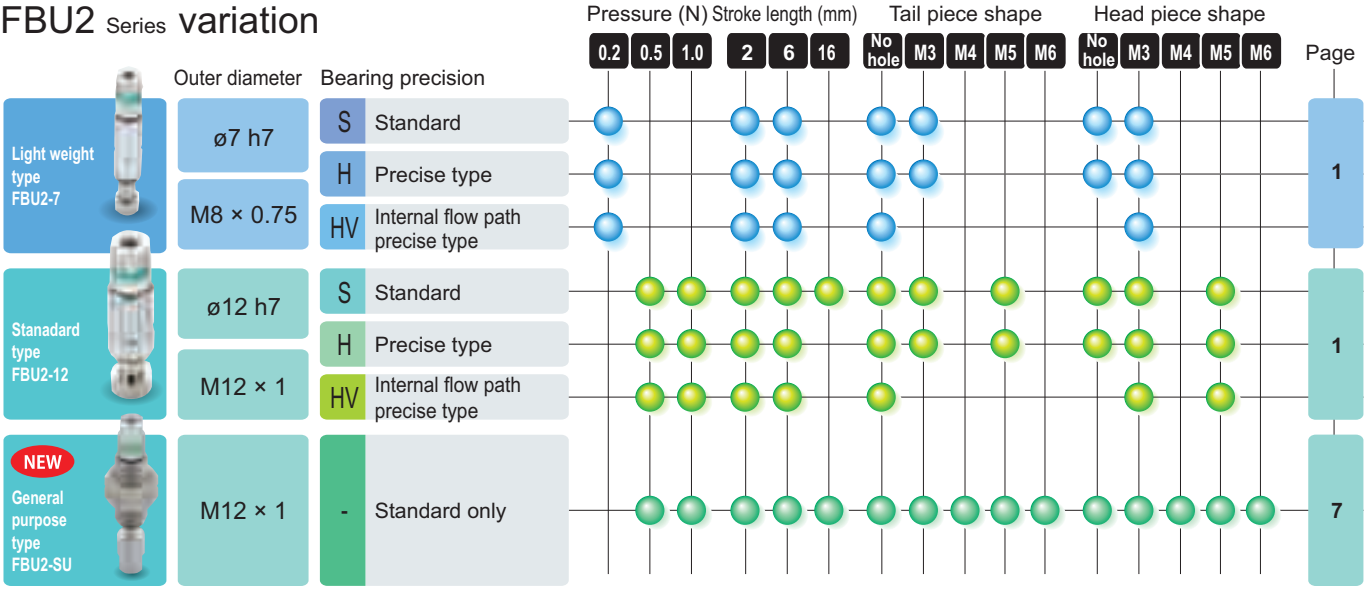
Wide variety of uses are available including vacuum parts pick-and-place, transport, transfer, press-fit workpiece, and insert parts.

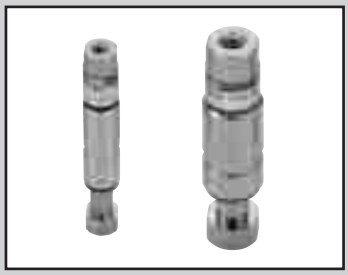
● Device transfer



- DVD, HDD transfer
- Flexible PCB suction transfer
- Liquid crystal device suction transfer
- Part insertion
- Portable button pressure inspection

FBU2 Series variation





Magnetic spring buffer

FBU2 Series

Outer diameter: M8, M12, ø7, ø12
Load capacity: 30, 80 g

RoHS

Specifications

Values at room temperature of 23˚C

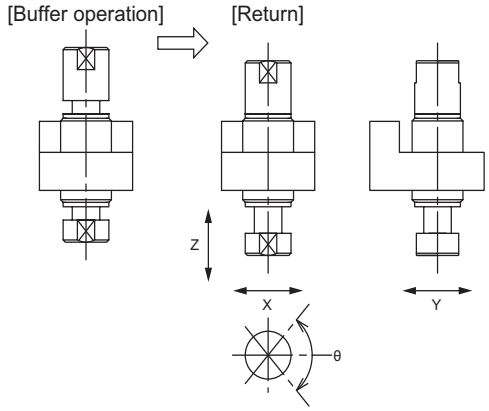
Descriptions			FBU2-7D				FBU2-8M		FBU2-12D					FBU2-12M		
			S		H/HV		S		S			H/HV		S		
Outer diameter			ø7h7				M8 × 0.75		ø12h7					M12 × 1		
Appearance			S/H 		HV 				S/H 			HV 				
Buffer pressure		N	0.1 to 0.2				0.1 to 0.2		0.4 to 0.6, 0.9 to 1.1					0.4 to 0.6, 0.9 to 1.1		
Pressure displacement Note 1			±15% or less													
Buffer stroke			2	6	2	6	2	6	2	6	16	2	6	2	6	16
Ambient temperature range		˚C	5 to 50		5 to 40		5 to 50		5 to 50			5 to 40		5 to 50		
Bearing clearance		mm	0.2 or less		0.05 or less		0.2 or less		0.2 or less			0.05 or less		0.2 or less		
Max. holding torque Note 2		N • cm	0.25 and over (reference value)						Note 3					Note 3		
Return positioning accuracy Note 4	X-Y	mm	±0.1 or less		±0.05 or less		±0.1 or less		±0.1 or less			±0.05 or less		±0.1 or less		
	Z	mm	±0.1 or less													
	θ	°	3 or less													
Load capacity		g	30 or less						80 or less							

Note 1: Indicates pressure variation within the stroke. Pressure cannot be proportional to the stroke.
Note 2: If torque exceeding maximum holding torque is applied to movable shaft, the shaft may run out and reverse by 180.
* Holding torque: Forth to return to the original position, if force is applied to the θ direction (Fig.1) to deviate the movable shaft position.
Note 3: Refer to the table at right for FBU2-12M/12D holding to rque.
Note 4: Refer to Fig. 1 for return positioning accuracy.
The figure shows buer return accuracy.
Note 5: Consult with CKD for requirements not complying with specifications.
Note 6: Load capacity indicates the maximum load value installed on the head piece (jig and sucked part).

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

Pressure (N)	Stroke length (mm)	Holding torque (N·cm)
0.5	2	0.5 and over
	6	0.5 and over
	16	1.2 and over
1	2	1.2 and over
	6	1.2 and over
	16	2.5 and over

Indicates holding torque on extended end.



(Fig. 1) Recovery detailed drawing

How to order

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

- Model no.
- Ⓐ Outer diameter
- Ⓑ Bearing precision
- Ⓒ Pressure
- Ⓓ Buffer stroke
- Ⓔ Tail piece shape
- Ⓕ Head piece shape

Symbol	Description	Model no. FBU2-7D	FBU2-8M	FBU2-12D	FBU2-12M
Ⓐ Outer diameter					
7D	ø7h7 socket and spigot type	●			
8M	M8 × 0.75 full thread type		●		
12D	ø12h7 socket and spigot type			●	
12M	M12×1 full thread type				●
Ⓑ Bearing precision					
S	Standard (bearing clearance 0.2 mm or less)	●	●	●	●
H	Precise (bearing clearance 0.05 mm or less)	●		●	
HV	Internal flow path type precise (Bearing clearance 0.05 mm or less)	●		●	
Ⓒ Pressure (N)					
02	0.2	●	●		
05	0.5			●	●
10	1.0			●	●
Ⓓ Buffer stroke(mm)					
2	2	●	●	●	●
6	6	●	●	●	●
16	16			●	●
Ⓔ Tail piece shape					
TB	No hole	●	●	●	●
T3	M3 female thread depth 3	●	●	●	●
T5	M5 female thread depth 4			●	●
Ⓕ Head piece shape					
HB	No hole	●	●	●	●
H3	M3 female thread depth 3	●	●	●	●
H5	M5 female thread depth 4			●	●

<Example of model number>

O.D. ø12h7 socket and spigot type

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

- Ⓐ Outer diameter : ø12h7 socket and spigot type
- Ⓑ Bearing precision : Internal flow path type precise
- Ⓒ Pressure (N) : 0.5 N
- Ⓓ Buffer stroke : 6 mm
- Ⓔ Tail piece shape : No hole
- Ⓕ Head piece shape : M5 female thread depth 4

Combination of bearing precision, buffer stroke, tail piece shape, and head peace shaped vacuum system.

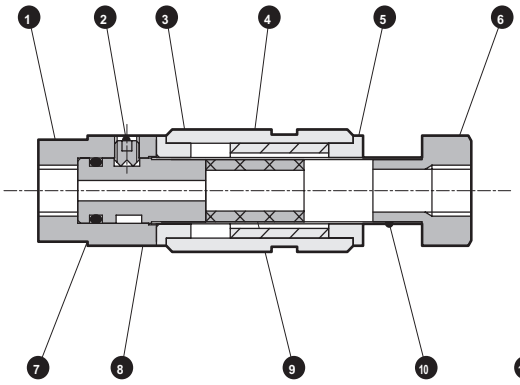
		Ⓑ Bearing precision S	H	HV
Ⓓ Buffer stroke	**2**	●	●	●
	6	●	●	●
	16	●		
Ⓔ Tail piece shape	**TB**	●	●	●
	T3	●	●	
	T5	●	●	
Ⓕ Head piece shape	**HB**	●	●	
	H3	●	●	●
	H5	●	●	●

Mounting bracket for socket and spigot type model no.

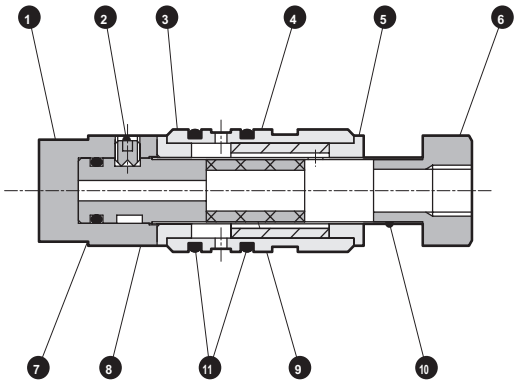
Ⓐ Outer diameter	Discrete bracket model no. L type installation	Straight installation
7D	FBU2- 7D-B1	FBU2- 7D-B2
12D	FBU2- 12D-B1	FBU2- 12D-B2

Internal structure and parts list

● FBU2-*-S (standard)
-*-H (precise)



● FBU2-*-HV (precise internal flow path type)



No.	Parts name	Material	Remarks	No.	Parts name	Mateial	Remarks
1	Tail piece	Aluminum alloy	Electroless nickeling	7	Oring	Nitrile rubber	
2	Hexagon socket head set screw	Stainless steel		8	Tail fitting	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	Inner flow path type
		Polyester resin	Inner flow path type	12	Hexagon nut	Carbon steel	
6	Head piece	Aluminum alloy	Electroless nickeling				

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 part	Movable part (Note 1)	Tail piece (movable part)		Head piece (movable part)		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	–	–
FBU2-8M-S-02-6		1.3						
FBU2-7D-S-02-2	2.2	1.2					8.9	13.1
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 part = movable part + tail piece + head piece, product weight = fixing part + movable part + tail piece + head piece
Note 2: Plug and fixing screw are included to bracket.

● FBU2-12M/12D

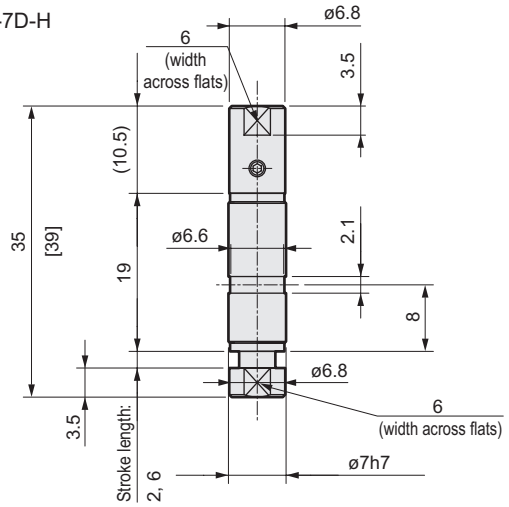
(Unit: g)

Model no.	Fixed part	Movable part (Note 1)	Tail piece (movable part)			Head piece (movable part)			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	–	–
FBU2-12M-S-05/10-6		2.5								
FBU2-12M-S-05/10-16	14.0	3.9								
FBU2-12D-S-05/10-2	8.3	2.4							18.3	28.6
FBU2-12D-S-05/10-6		2.5								
FBU2-12D-S-05/10-16	12.9	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 part = movable part + tail piece + head piece, product weight = fixing part + movable part + tail piece + head piece
Note 2: Plug and fixing screw are included to bracket.

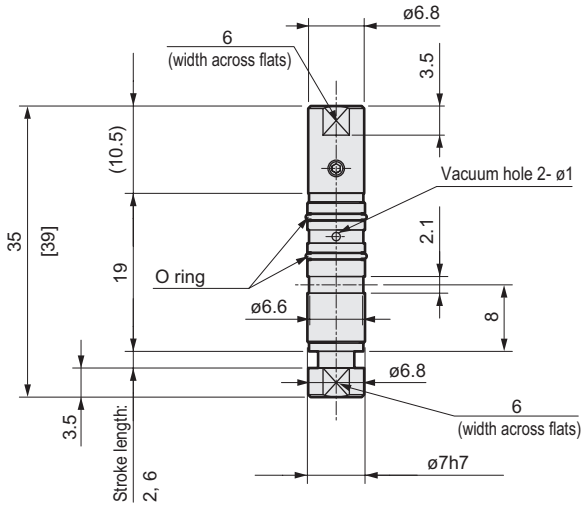
Dimensions (FBU2-7D, FBU2-8M)

● FBU2-7D-S
● FBU2-7D-H



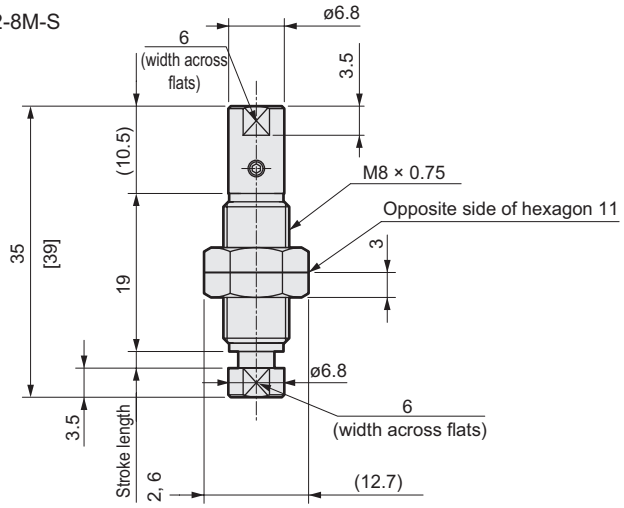
Note: Values in parentheses are dimensions for the 6 strokes.

● FBU2-7D-HV



Note: Values in parentheses are dimensions for the 6 strokes.
Note: The O ring is shipped installed.
Apply a light coat of lubricant, such as grease, to the O ring to maintain sealing.
Note: Drawing dimensions are the same regardless of head and tail shape.

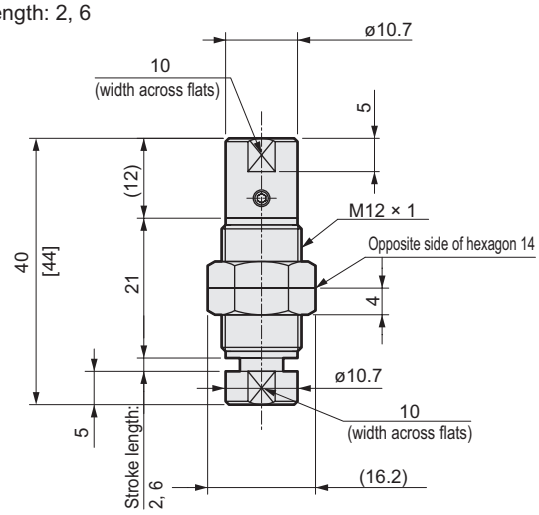
● FBU2-8M-S



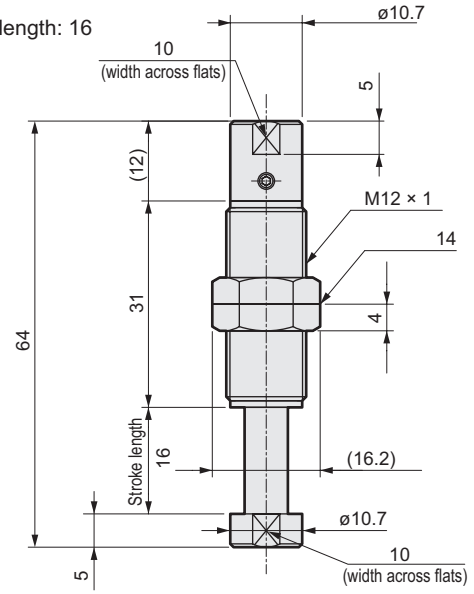
Note: Values in parentheses are dimensions for the 6 strokes.

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

● FBU2-12M-S
Stroke length: 2, 6

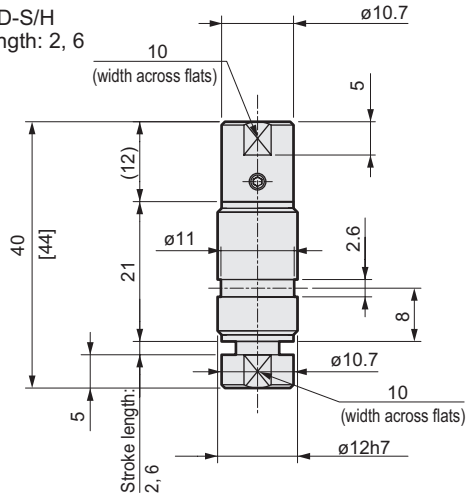


Stroke length: 16

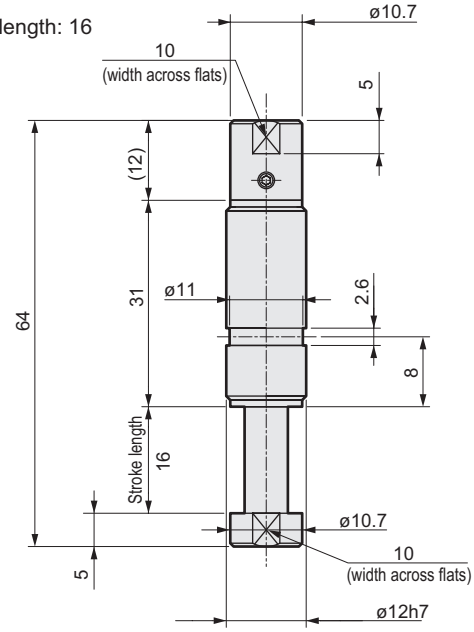


Note: Values in parentheses are dimensions for the 6 strokes.

● FBU2-12D-S/H
Stroke length: 2, 6

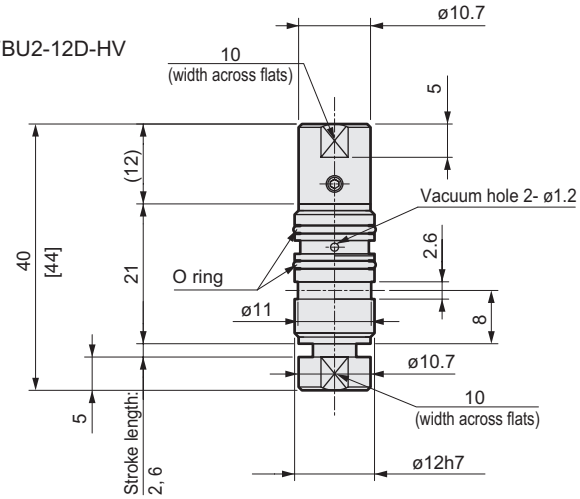


Stroke length: 16



Note: Values in parentheses are dimensions for the 6 strokes.

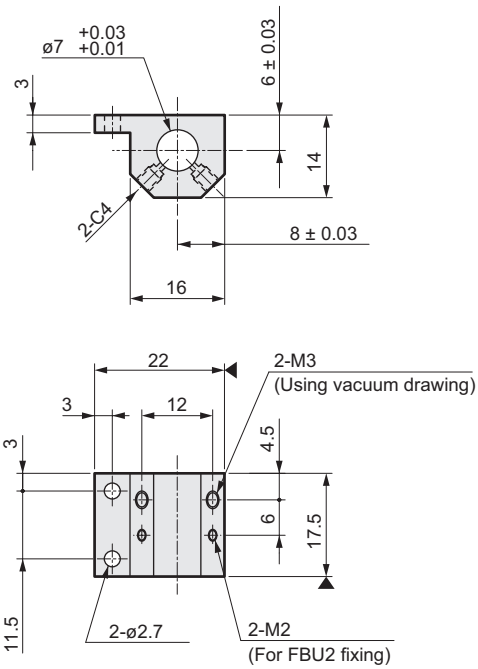
● FBU2-12D-HV



Note: Values in parentheses are dimensions for the 6 strokes.
Note: The O ring is shipped installed. Apply a light coat of lubricant, such as grease, to the O ring to maintain sealing.
Note: Drawing dimensions are the same regardless of head and tail shape.

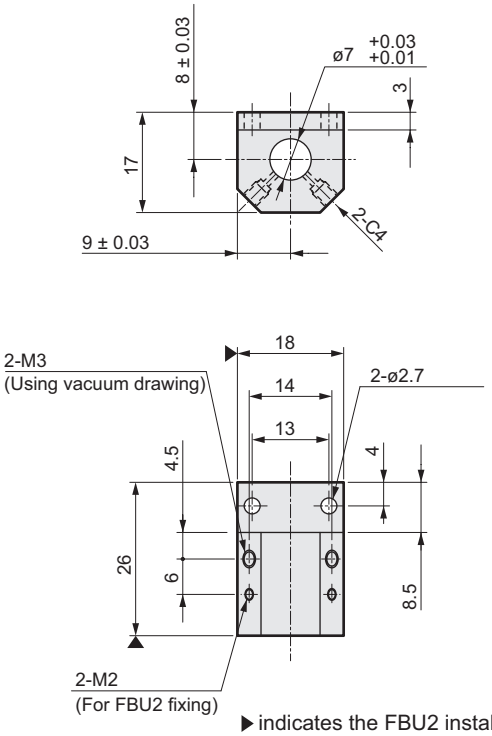
Bracket dimensions

●FBU2-7D-B2
(Attachment: FPL-M3, set screw M2 x 2)



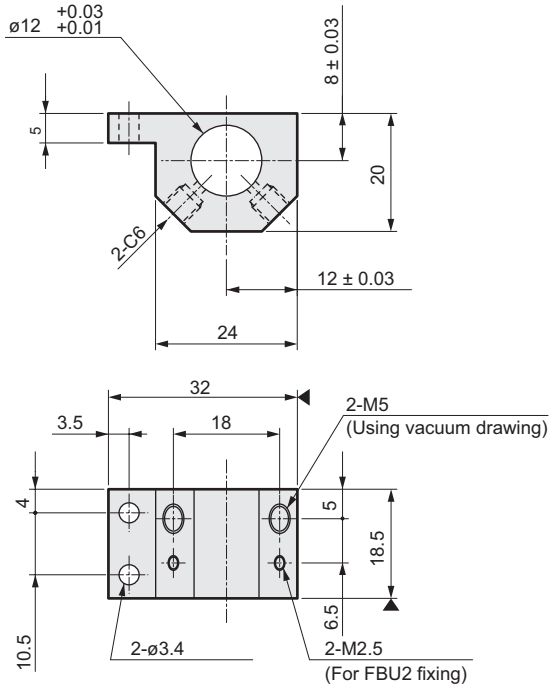
▶indicates the FBU2 installation reference surface.

● FBU2-7D-B2
(Attachment: FPL-M3, set screw M2 x 2)



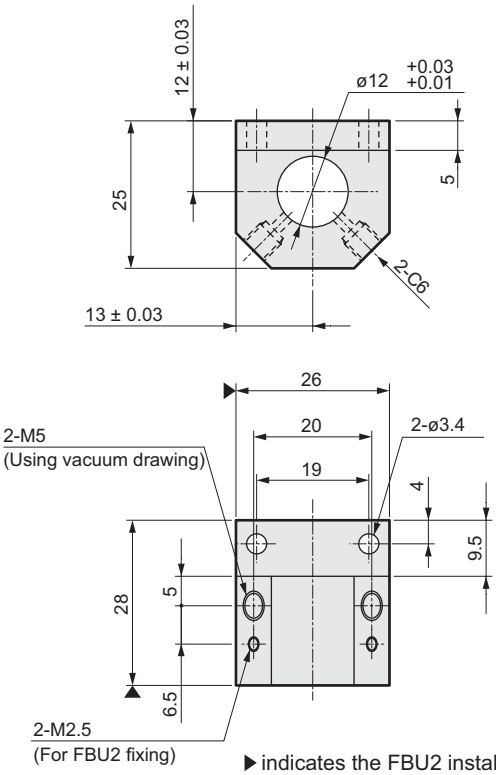
▶indicates the FBU2 installation reference surface.

● FBU2-12D-B2
(Attachment: FPL-M5, set screw M2.5 x 2.5)



▶indicates the FBU2 installation reference surface.

● FBU2-12D-B2
(Attachment: FPL-M5, set screw M2.5 x 2.5)



▶indicates the FBU2 installation reference surface.

Note: When using for a vacuum drawing, tighten plugs (FPL-M3, M5) in empty screw holes (M3, M5).

Magnetic spring buffer

FBU2-SU Series

Outer diameter: M12, full thread type
Load capacity: 200 g

RoHS

Specifications

Descriptions			FBU2-SU
Outer diameter			M12 × 1
Buffer pressure		N	0.4 to 0.6, 0.9 to 1.1
Pressure displacement Note 1)			±15% or less
Buffer stroke		mm	2, 6, 16
Ambient temperature		°C	5 to 50
Bearing clearance		mm	0.2 or less
Max. holding torqu		N·cm	Note 2)
Return position accuracy Note 3)	X-Y	mm	±0.1 or less
	Z	mm	±0.1 or less
	θ	°	3 or less
Load capacity		g	200 or less

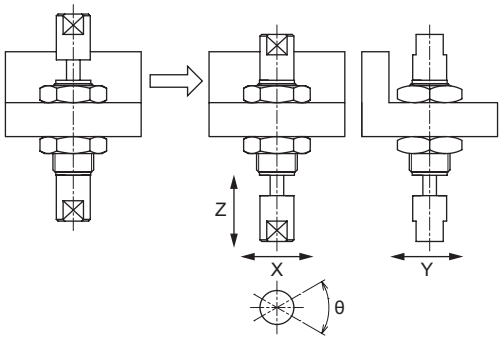
Note 1: Indicates pressure variation within the stroke. Pressure cannot be proportional to the stroke.
Note 2: If torque exceeding maximum holding torque is applied to movable shaft, the shaft could run out and reverse by 180°.
* Holding torque: Force to return to the original position, if force is applied in the θ direction to deviate the movable shaft position.
Note 3: Refer to Fig. 1 for return positioning accuracy. The figure shows buffer return accuracy.
Note 4: Consult with CKD for requirements not complying with specifications.

<FBU2-SU Maximum holding torque (reference value)>

Pressure (N)	Stroke length (mm)	Holding torque (N·cm)
0.5	2	0.5 and over
	6	0.5 and over
	16	1.2 and over
1	2	1.2 and over
	6	1.2 and over
	16	2.5 and over

Indicates holding torque on extended end.

[Buffer operation] [Return]



How to order

FBU2 - SU - 05 - 6 - T3 - H3

Model no. Ⓐ Pressure Ⓑ Buffer stroke Ⓒ Tail shape Ⓓ Head shape

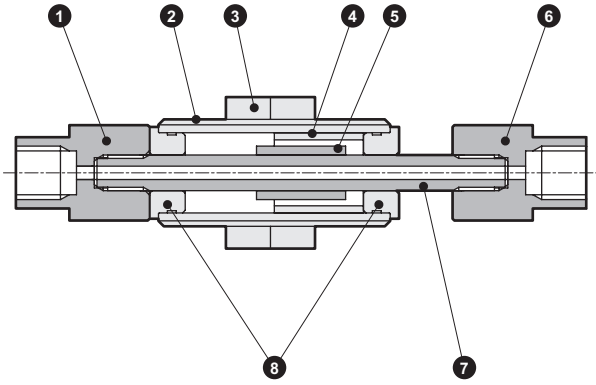
Symbol	Descriptions
Ⓐ Pressure (N)	
05	0.5
10	1.0
Ⓑ Buffer stroke mm	
2	2
6	6
16	16
Ⓒ Tail shape	
TB	No hole
T3	M3 female thread depth 3
T4	M4 female thread depth 4
T5	M5 female thread depth 4
T6	M6 female thread depth 5
Ⓓ Head shape	
HB	No hole
H3	M3 female thread depth 3
H4	M4 female thread depth 4
H5	M5 female thread depth 4
H6	M6 female thread depth 5

<Example of model number>

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

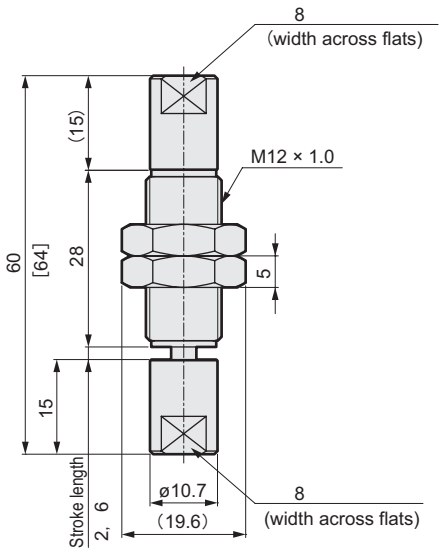
Internal structure and parts list



No	Parts name	Material	Remarks	No	Parts name	Material	Remarks
1	Adaptor (tail)	Aluminium allooy	Trivalent chromate treatment	5	Ring magnet	Plastic magnet	
2	Fixed shaft	Stainless steel		6	Adaptor (head)	Aluminium alloy	Trivalent chromate treatment
3	Hexagon nut	Steel	Zinc plating Trivalent chromate treatment	7	Rod	Stainless steel	
4	Ring magnet	Plastic magnet		8	Bearing	Polyphenylene sulfide	With filler

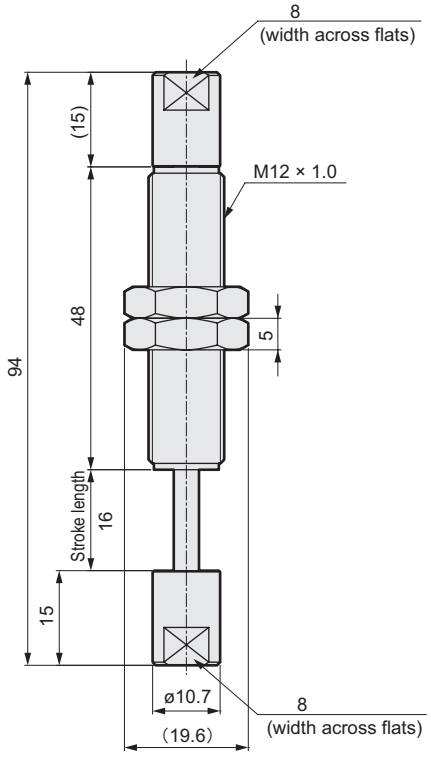
Dimensions Any width across flats position for adaptor(tale) and adaptor (head) are selectable.

● FBU2-SU-12M-05/10-6



Note: Value in parentheses are dimensions for the 6 strokes.

● FBU2-SU-12M-05/10-16



Weight

(Unit: g)

Model no.	Fixed part	Movable part
FBU2-SU-12M-05/10-2	19.1	4.2
FBU2-SU-12M-05/10-6	19.1	4.5
FBU2-SU-12M-05/10-16	25.2	7.9

(Unit: g)

Adaptor				
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

Note 1:Total weight of movable part = movable part + adaptor (tail side) + adaptor (head end), product weight = fixed part + movable part + adaptor (tail side) + adapter (head end)

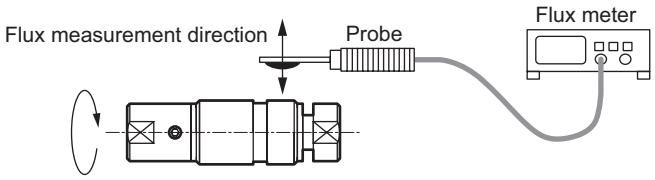
1 Leakage flux

[Measuring instrument]

Magnetic flux
Probe

[Measurement procedure]

(1) Touch the probe to each measurement point on the FBU2.
(2) Rotate the FBU2 at center shaft standards, and measure maximum flux density.



[Target]

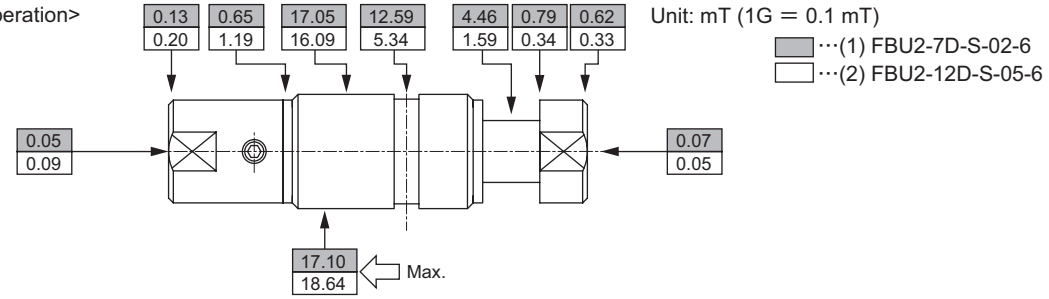
(1) FBU2-7D-S-02-6
(2) FBU2-12D-S-05-6
(3) FBU2-12D-S-05-16

[Result]

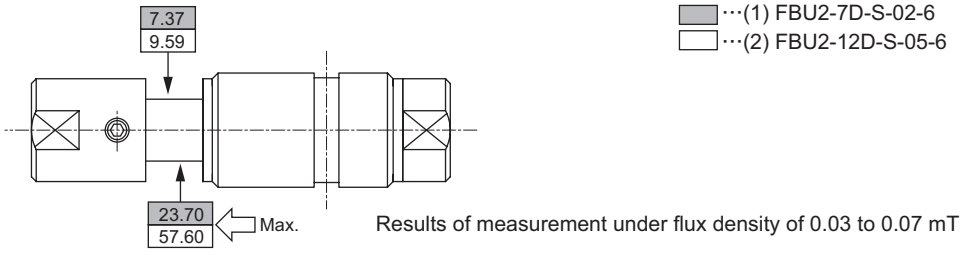
・Magnetic flux at each position

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

<Before buffer operation>



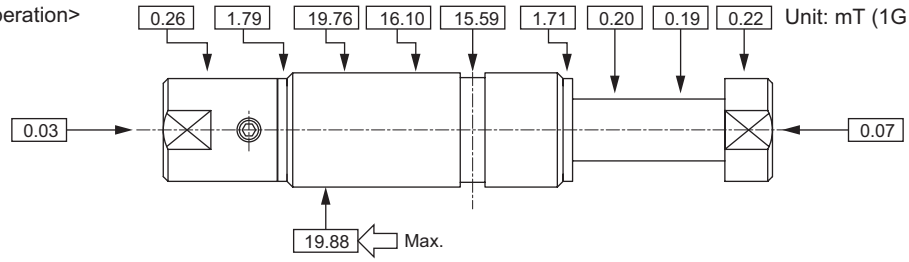
<After buffer operation>



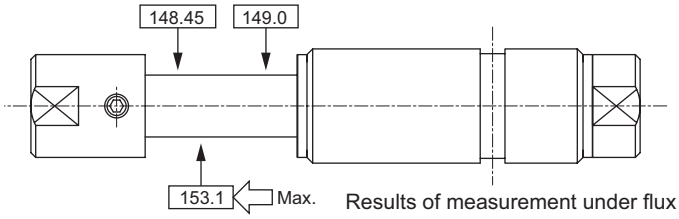
Results of measurement under flux density of 0.03 to 0.07 mT

(3) FBU2-12D-S-05-16

<Before buffer operation>



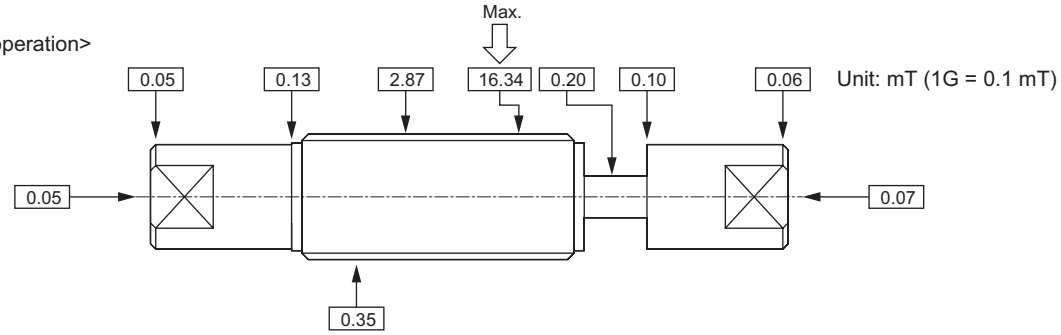
<After buffer operation>



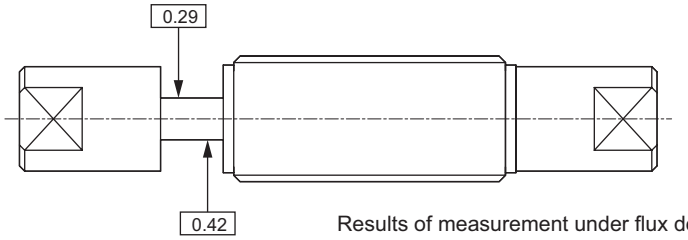
Results of measurement under flux density of 0.03 to 0.07 mT

(4) FBU2-SU-05-6

<Before buffer operation>



<After buffer operation>



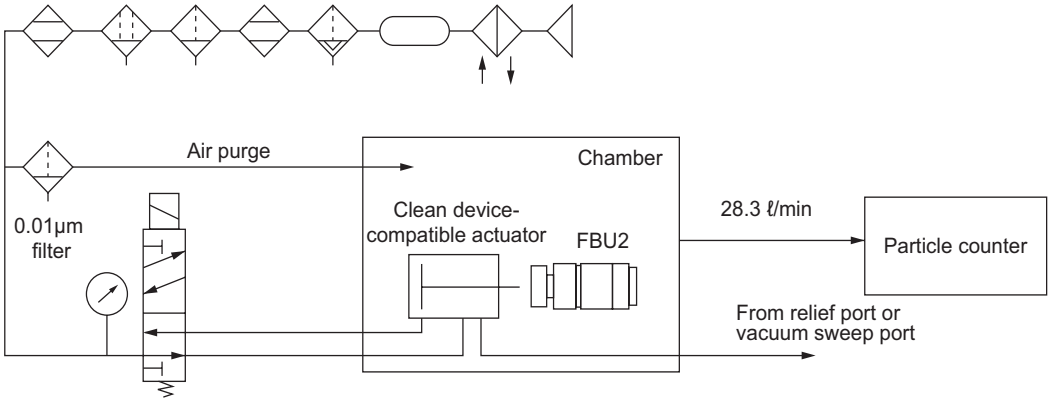
Results of measurement under flux density of 0.03 to 0.07 mT

2 Particle occurrence rate

[Measuring instrument]

Particle counter	: Laser dust monitor
Minimum measurable particle diameter	: 0.1 µm
Suction rate	: 28.3ℓ/min

[Test circuit]



[Measurement procedure]

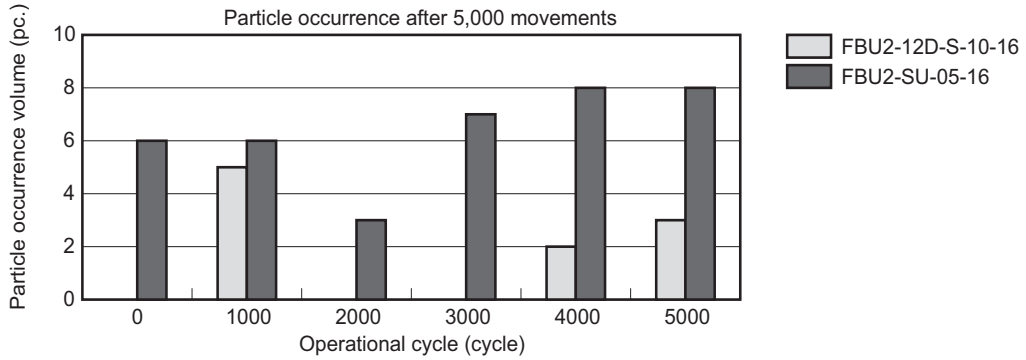
(1) Set a test sample in a stainless steel antistatic chamber.
(2) Send clean air passed through a 0.01 µm filter at the same flow rate as the particle counter suction rate (28.3 ℓ/min).
(3) Confirm that the particle counter value is 0 in the immobile state.
(4) Move the test sample, and measure particles generated during movement.

* A sealed chamber is used so that particles other than those generated from the test sample do not enter the chamber.
* Confirm that the particle occurrence rate of the clean devicecompatible actuator (vacuum sweep) to be used is 0 before starting.-

[Measuring condition]

・Quality of air Purge	: "grade 1.2.1" + 0.01 m gas filter
・FBU2 operation speed	: 50 mm/s
・Operation conditions	: Install with no load parallel to the purge flow
・Measuring frequency	: One minute measurement /1,000 movements
・Sample:	FBU2-12D-S-10-16 FBU2-SU-05-16

[Result]



FBU2-12D-S-10-16

Particle diameter	Operational cycle					
	0	1000	2000	3000	4000	5000
0.1 µm and over	0	5	0	0	0	2
0.2 µm and over	0	0	0	0	1	0
0.3 µm and over	0	0	0	0	1	1
0.5 µm and over	0	0	0	0	0	0
1.0 µm and over	0	0	0	0	0	0
2.0 µm and over	0	0	0	0	0	0
Total particle occurrence volume	0	5	0	0	2	3

FBU2-SU-05-16

Partible diameter	Operational cycle					
	0	1000	2000	3000	4000	5000
0.1 µm and over	6	6	3	7	8	8
0.2 µm and over	0	0	0	0	0	0
0.3 µm and over	0	0	0	0	0	0
0.5 µm and over	0	0	0	0	0	0
1.0 µm and over	0	0	0	0	0	0
2.0 µm and over	0	0	0	0	0	0
Total particle occurrence volume	6	6	3	7	8	8

3 Stop position precision (X-Y)

[Measuring instrument]

Laser position sensor

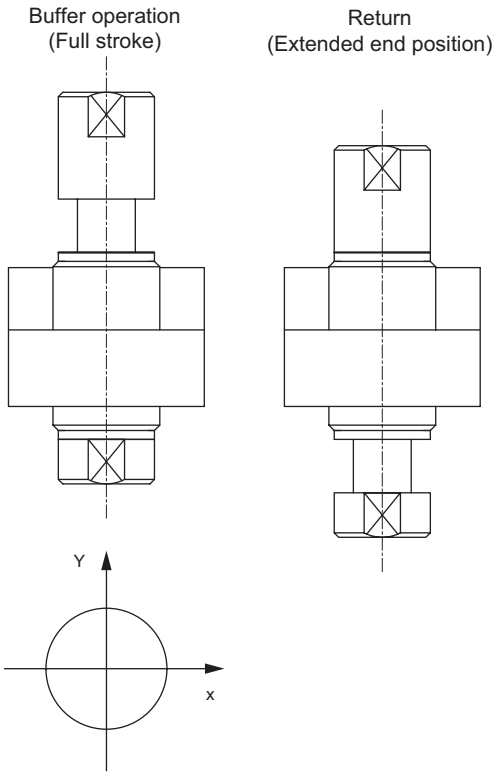
[Measurement procedure]

Measure X-Y positioning accuracy
when manually moving the fullstroke
Load : Loadless
Installation attitude : Downward
Degree of vacuum : Non vacuum
Piping : None

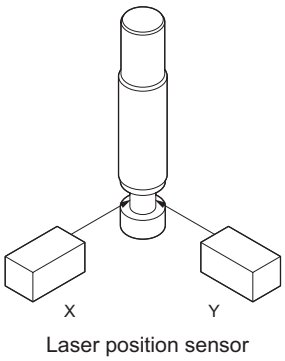
[Target]

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

(Measuring overview fig)

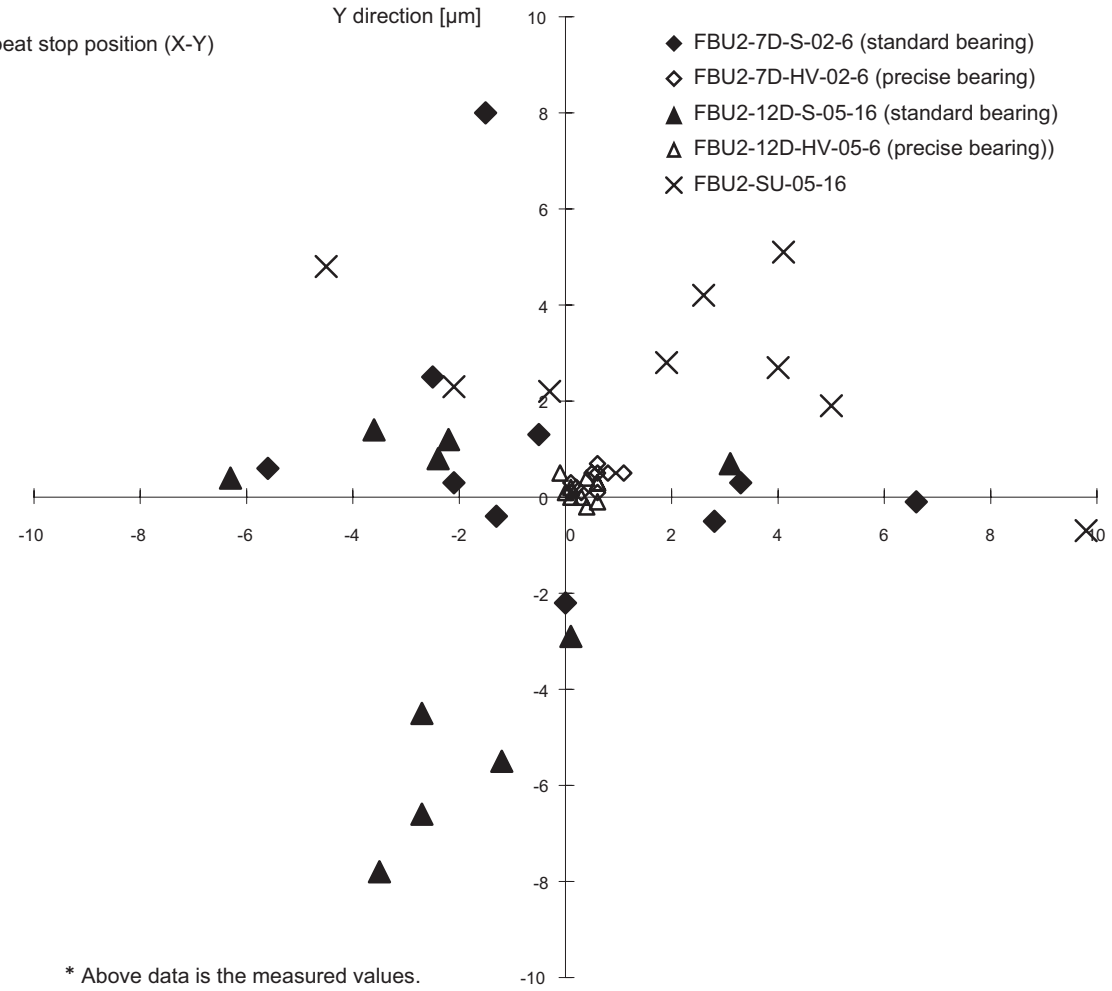


[Measurement procedure]



[Result]

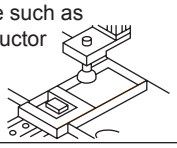
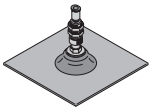
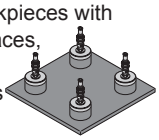
Repeat stop position (X-Y)

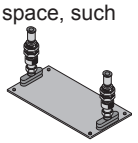


* Above data is the measured values.

List of vacuum pad

■ List of vacuum pad

Pad shape	Applications	Pad size									Pad material								Position locking
		ø0.7	ø1	ø1.5	ø2	ø3	ø4	ø6	ø8	ø10	N	S	U	F	SE	E	G	FS	
Standard compact type VSP-ME*RM 	Appropriate for compact workpiece such as semiconductor part etc. 	●	●	●	●	●	●				●	●	●	●	●	●	●		●
Standard general type VSP-ME*R VSP-E*R* 	Ideal for thick, flat workpieces 		●		●	●	●	●	●		●	●	●	●	●	●	●		●
Thin type VSP-ME*P VSP-E*P* 	Ideal for transferring thin workpieces such as photocopy paper and vinyl. 								●	●	●								
Sponge type VSPG-*S*A 	Ideal for workpieces with uneven surfaces, such as exterior walls 									●	Only chloroprene								

Pad shape	Applications	Pad size				Pad material								Position locking
		4 × 10	4 × 20	5 × 10	6 × 10	N	S	U	F	SE	E	G	FS	
Oval type VSPG-*E*A 	Ideal for workpieces with limited suction space, such as IC circuit boards 	●	●	●	●	●	●				●			

Pad material	
N	Nitrile rubber
S	Silicon rubber
U	Urethane rubber
F	Fluoro rubber
SE	Antistatic silicon rubber
E	Antistatic butadiene rubber (low resistance type)
G	Food Sanitation Law compliant NBR
FS	Fluoro silicon

■ Characteristics of each pad

Descriptions \ Pad material			Nitrile rubber	Silicon rubber	Urethane rubber	Fluoro rubber	Fluoro silicon	Butadiene rubber (Low resistance type)	Cloroplane rubber (Sponge type)
			NBR	Si	U	FKM	FSi	BR	CR
Pad color			Black*2	White	Blue	Gray	Light blown	Black	Black
Properties	Surface hardness (Shear A)		40 to 60	40 to 50	60	60	40	60	-
	High temperature working limit temperature		110	180	60	230	180	100	80
	High temperature working limit temperature		-30	-40	-20	-10	-50	-50	-45
	Weather resistance		△	◎	○	○	○	○	○
	Ozone resistance		△	◎	◎	◎	◎	×	○
	Acid resistance		△	○	×	◎	○	△	△
	Alkaline resistance		○	◎	×	×	◎	○	◎
	Oil resistant	(gasoline, light oil)	◎	△	◎	◎	△	×	×
		(Benzene, toluene)	△	△	△	◎	△	×	△

Reading evaluation➡◎: Best, ○: Appropriate, △: Acceptable, ×: Incompatible

*1: Surface resistivity of low-resistivity type pad is 200 Ω or less.

*2: Food Sanitation Law compliant pads are gray.

Note 1: The listed properties are the characteristics of typical synthetic rubber used for pad material.

Note 2: The working limit temperature is an instant temperature. This must be carefully confirmed if the temperature continues for a set time.

■ List of conformity

	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	ø0.7	●	●	●		●		●		
	VSP-ME1RM*-M3	ø1	●	●	●		●		●		
	VSP-ME1.5RM*-M3	ø1.5	●	●	●		●		●		
	VSP-ME2RM*-M3	ø2	●	●	●		●		●		
	VSP-ME3RM*-M3	ø3	●	●	●		●		●		
	VSP-ME4RM*-M3	ø4	●	●	●		●		●		
General	VSP-ME6R*-M5	ø6				●		●		●	
	VSP-ME8R*-M5	ø8				●		●		●	
	VSP-E1R*	ø1	●	●	●		●		●		
	VSP-E2R*	ø2	●	●	●		●		●		
	VSP-E3R*	ø3	●	●	●		●		●		
	VSP-E4R*	ø4	●	●	●		●		●		
	VSP-E6R*	ø6				●		●		●	
	VSP-E8R*	ø8				●		●		●	
Thin	VSP-ME8P-M5	ø8				●		●		●	
	VSP-ME10P-M5	ø10				●		●		●	
	VSP-E8P*	ø8				●		●		●	
	VSP-E10P*	ø10				●		●		●	
Sponge	VSPG-10SA	ø10									●
Oval	VSPG-4*10E*A	4 × 10									●
	VSPG-4*20E*A	4 × 20									●
	VSPG-5*10E*A	5 × 10									●
	VSPG-6*10E*A	6 × 10									●

Note) Use under the load capacity of FBU2.
Usage over the load capacity could cause damage the product.

Variety of sucking pad available

■ Theoretical lift force is obtained with the pad area and the vacuum generated when using that pad.

<kPa. N display>

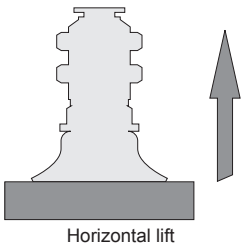
$$W = \frac{C \times P}{101} \times 10.13 \times f$$

W: Theoretical lift force (N)
C: Suction area (cm^2)
P: Vacuum (-kPa)
f: Safety factor

<mmHg, kg display>

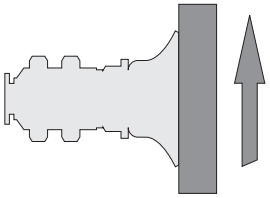
$$W = \frac{C \times P}{760} \times 1.0332 \times f$$

W: Theoretical lift force (N)
C: Suction area (cm^2)
P: Vacuum (-mmHg)
f: Safety factor



Horizontal lift

*1: When using a sponge pad, the value is calculated with the inner diameter of the sponge pad so see the separate table.
*2: Due to the characteristics of the pad, the suction of the bellows type (multistage bellows) and soft type (soft bellows) pad may differ from the theoretical lift force.
*3: The theoretical lift force is a value calculated under static conditions. When actually using the value, provide a 1/4 safety factor for the horizontal suspension, and a 1/8 safety factor for a vertical suspension. Acceleration when moving must also be considered. (Refer to right figure)



Vertical suspension

Safety precautions

Always read this section before starting 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 in handling.

2 Use this product in accordance of specifications.

This product must be used within its stated specifications. It must not be modified or machined.
This product is intended for use as a general-purpose industrial device or part. It is not intended for use outdoors or for use under the following conditions or environment.
(Note that this product can be used when CKD is consulted prior to use and the customer consents to CKD product specifications. The customer must provide safety measures to avoid risks in the event of problems.)

❶Use for special applications requiring safety including nuclear energy, railroad, aviation, ship, vehicle, medical equipment, equipment or applications coming into contact with beverage or food, amusement equipment, emergency shutoff circuits, press machine, brake circuits, or for safeguard.
❷Use for applications where life or assets could be adversely affected, and special safety measures are required.

3 Observe corporate standards and regulations, etc., related to the safety of device design and control, etc.

ISO 4414, JIS B 8370 (pneumatic system rules)
JFPS2008 (Principles for pneumatic cylinder selection and use)
Including High Pressure Gas Maintenance Law, Occupational Safety and Sanitation Laws, other safety rules, body standards and regulations, etc.

4 Do not handle, pipe, or remove devices before confirming safety.

❶Inspect and service the machine and devices after confirming safety of the entire system related to this product.
❷Note that there may be hot or charged sections even after operation is stopped.
❸When 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.
❹When starting or restarting a machine or device that incorporates pneumatic components, confirm the safety of the system, such as pop-out prevention measures, is secured.

5 Observe warnings and cautions on the pages below to prevent accidents.

■ The safety cautions areranked 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, or when there is a high degree of emergency to a warning.
⚠ WARNING	When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries.
⚠ 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.
In any case, important information that must be observed is explained.

Disclaimer

1 Term of warranty

"Warranty Period" is one (1) year from the first delivery to the customer.

2 Scope of warranty

In case any defect attributable to CKD is found during the Warranty Period, CKD shall, at its own discretion, repair the defect or replace the relevant product in whole or in part, according to its own judgment.
Note that the following faults are excluded from the warranty term:
(1) Product abuse/misuse contrary to conditions/environment recommended in its catalogs/specifications
(2) Failure caused by other than the delivered product
(3) Use other than original design purposes.
(4) Third-party repair/modification
(5) Faults caused by matters that could not be predicted with the technology applied when the product was delivered.
(6) Failure attributable to force majeure.
In no event shall CKD be liable for business interruptions, loss of profits, personal injury, costs of delay or for any other special, indirect, incidental or consequential losses, costs or damages.

3 Compatibility confirmation

In no event shall CKD be liable for merchantability or fitness for a particular purpose, notwithstanding any disclosure to CKD of the use to which the product is to be put.

Pneumatic components

Safety precautions

Be sure to read the instructions before use.
Refer to "Pneumatic, vacuum and auxiliary components No. CB-024SA" for general precautions.

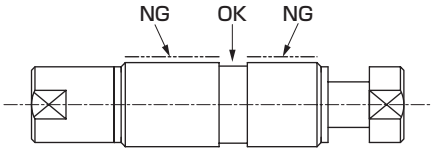
Design & Selection

⚠ WARNING

■The working temperature range differs with the bearing type. Be sure to use within the specified range.
・Standard bearing type (S): 5 to 50°C
・Precise bearing (H/HV) : 5 to 40°C
Note) Standard bearing type is used for FBU2-SU.

■This product has a built-in magnet.
Do not use this product where magnetic swarf or dust is present.
Otherwise it could be damaged or malfunction.

■Fix the product in place with a nut (full thread: 8M, 12M, and SU) or hexagon socket set screw (socket and spigot type: 7D and 12D). When using the set screw, use the groove on the fixed shaft.



■Prior to use, make sure that the movement is smooth after the installation of this product and piping. Connecting a hard tube or a small bent R piping a small bent R cause incorrect operations and failure.

■Use vertical forinstallation attitude.
Providinga vertical loador momentcould cause characteristics to change and shorten life.

⚠ CAUTION

■If used for a vacuum application, tension caused by piping is added to the pressure, therefore, a tube with low piping tension is recommended.
Recommended tube: UP series
(Antistatic tube, fiber tube)

■The load (jig and 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

■Use 4G or less acceleration for transferring workpieces.
Excessive acceleration could cause damage to the product.

■When used for a rotating application, note the maximum holding torque of the magnet.
If a force exceeding maximum holding torque is applied, the shaft could run out and reverse by 180°.

■The internal flow path high accuracy (HV) product has a leak.
Clearance sealing improves pressure stability and return position accuracy. This causes the vacuum to leak. (Pressure drop within 10 kPa compared to -80 kPa initial pressure.)

Installation & Adjustment

⚠ WARNING

■Before starting operation, check for loosening or problems at load or joint connections.

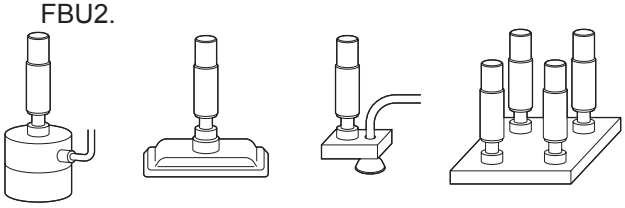
■Start operation after confirming that devices operate correctly.
After installing, repairing, or modifying the product, conduct a function inspection and confirm that the product is correctly installed.

■Confirm that there is no machine interference and that the actuation system is normal.

■Do not drop and give excessive shock to the product. Impact load causes damage to the product.

● FBU2-7D/8M and FBU2-12D/12M series

■The following usage even with equal to or less load capacity provides moment to the movable axis and causes faulty operation and damage.
1. When a larger jig other than the sucking pad is installed to the head piece.
2. When a large size or wrong shaped sucking pad is installed.
3. When the usage provides eccentric load to the movable axis.
4. When holding one jig and workpiece with multiple FBU2.



When using with the above method, FBU2-SU is recommended to use with the load capacity as the limit.

Pneumatic components

Safety precautions

Be sure to read the instructions before use.
Refer to "Pneumatic, vacuum and auxiliary components No. CB-024SA" for general precautions.

Installation & Adjustment

⚠ CAUTION

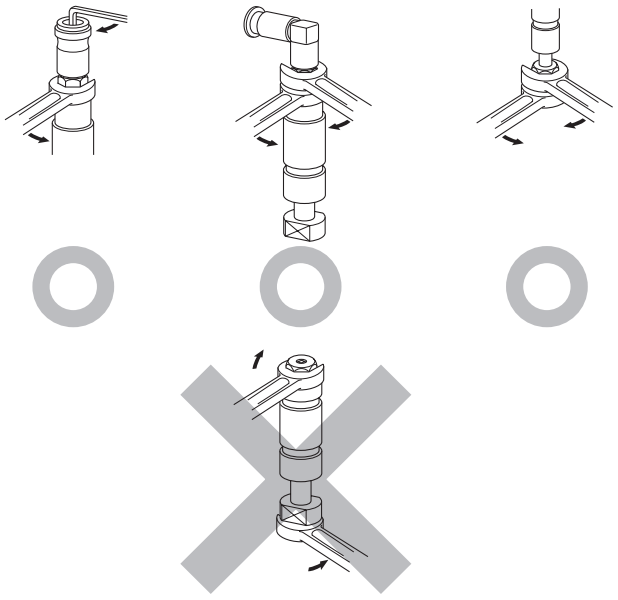
■ Do not remove the product from the package until just before piping.
Foreign matter could enter from the piping port or shaft clearance and cause faults or malfunctions.

■ When piping, flush pipes with air to remove foreign matter, swarf, etc.

■ Apply adequate torque when connecting pipes.

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 tubeand rod.
Functions could be changed.

■ Do not hit the guide tube or cause scratches or indents.
The guide tube is thin-walled copper that deforms easily. Handle it with care.
Scratches or indents on the guide tube could damage bearings and lead to faults or malfunctions.
(Excluding FBU2-SU)

■ Read the instruction manual before use.
Familiarize yourself with details before using the product.

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

Product nominal	Set screw size	Tightening torque (N•m)
FBU2-7	M2 hexagon socket head set screw	0.10 to 0.12
FBU2-12	M2.5 hexagon socket head set screw	0.18 to 0.20

During 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.
Insufficient maintenance could lower product functions, shorten product life, or result in damage or incorrect operations.

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

MEMO

MEMO

Related products

Push-in fitting for fiber tube®

Catalog No.CC-784 (Jpn.)

Air fiber UP/EH

- Power saving and space saving with extremely narrow size, external diameter ø1.8 x inner diameter ø1.2
- Tubing reaction after piping is similar to leads, greatly reducing the effect on device accuracy.
- New series of clean models that adopt high corrosion resistant materials (tube: special polyolefin, fitting: stainless steel)
- All substances adversely affecting environment have been eliminated from materials.
- Flexible piping
- Resistant to static electricity and dust build-up

Push-in fittings for fiber tube PG/CG

- Mounting and removing only by inserting or removing the tube while pushing the push ring of the fitting. PP resin incorporated as standard.

Vacuum system components SELVACS

Catalog No.CC-796A

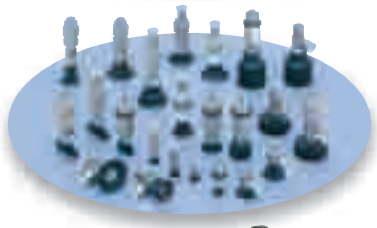
- Compact design
  Compact components save space.
- Broad series of models and variations
  Broad series of models and variations enable use in different fields and applications.
- Unitization/Modularization
  The core vacuum ejector and vacuum unit is designed with unitization and modularization to save space and facilitate use.

Elector system/Vacuum pump system

The vacuum ejector and vacuum unit function as the core of the vacuum system.
Different types available include discrete to unit types combining different related components.

Vacuum pad

Attachment that directly vacuums workpieces.
Different materials, shapes, and pad diameters match target workpiece size, weight, and characteristics.



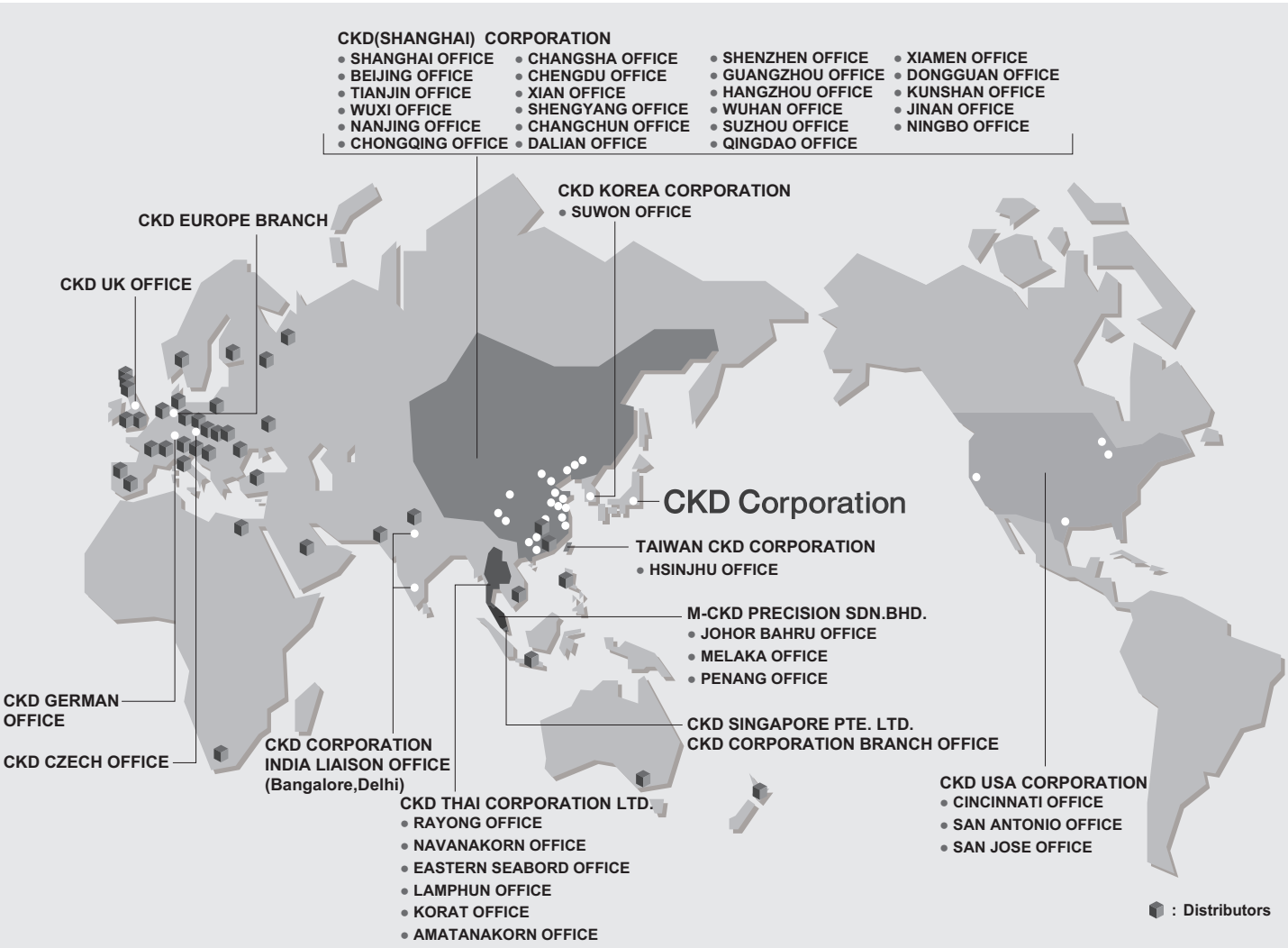
Vacuum related components

Different components including vacuum release valves, vacuum sensors, and vacuum filters to match vacuum system applications.

Related components

Components suitable for creating an advanced vacuum system including vacuum filters, vacuum regulators, quick valves, precision suction plates, and buffers.

WORLD-NETWORK



CKD Corporation

Website http://www.ckd.co.jp/

□OVERSEAS SALES ADMINISTRATION DPT.
OVERSEAS BUSINESS DIV. 2-250 Ouji Komaki, Aichi 485-8551, Japan
□PHONE +81-(0)568-74-1338 FAX +81-(0)568-77-3461

U.S.A.
CKD USA CORPORATION
• HEADQUARTERS
4080 Winnetka Avenue, Rolling Meadows, IL 60008 USA
PHONE +1-847-368-0539 FAX +1-847-788-0575

EUROPE
CKD EUROPE BRANCH
De Fruittuinen 28 Hoofddorp 2132NZ The Netherlands
PHONE +31-(0) 23-5541490 FAX +31-(0) 23-5541491

Malaysia
M-CKD PRECISION SDN.BHD.
• HEADQUARTERS
Lot No.6,Jalan Modal 23/2, Seksyen 23, Kawasan, MIEL,
Fasa 8, 40300 Shah Alam,Selangor Darul Ehsan, Malaysia
PHONE +60-(0) 3-5541-1468 FAX +60-(0) 3-5541-1533

Thailand
CKD THAI CORPORATION LTD.
• SALES HEADQUARTERS-BANGKOK OFFICE
Suwan Tower, 14/1 Soi Saladaeng 1, North Sathorn Rd., Bangrak,
Bangkok 10500 Thailand
PHONE +66-(0) 2-267-6300 FAX +66-(0) 2-267-6305

Singapore
CKD SINGAPORE PTE. LTD.
No.33 Tannery Lane #04-01 Hoesteel Industrial Building Singapore 347789
PHONE +65-67442623 FAX +65-67442486
CKD CORPORATION BRANCH OFFICE
No.33 Tannery Lane #04-01 Hoesteel Industrial Building Singapore 347789
PHONE +65-67447260 FAX +65-68421022

Taiwan
TAIWAN CKD CORPORATION
16F-3,No.109,Sec.1Jhongshan RD.,Shinjhuang Dist., New Taipei City,
24250,Taiwan(R.O.C)
PHONE +886-(0) 2-8522-8198 FAX +886-(0) 2-8522-8128

China
CKD (SHANGHAI) CORPORATION
• SALES HEADQUARTERS / SHANGHAI OFFICE
Room 601,Yuan Zhong Scientific Reseach Building,
1905 Hongmei Road,Shanghai, 200233, China
PHONE +86-(0) 21-61911888 FAX +86-(0) 21-60905356

Korea
CKD KOREA CORPORATION
• HEADQUARTERS
3rd FL, Sam Young B/D, 371-20
Sinsu-Dong, Mapo-Gu, Seoul, 121-110, Korea
PHONE +82-(0) 2-783-5201 to 5203 FAX +82-(0) 2-783-5204

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