Fine Buffer

FBU2

■ Precision Components

CONTENTS

Product Introduction 68

● Lightweight FBU2-7 70
● Standard FBU2-12 70
● General purpose FBU2-SU 80

Technical Data 84
⚠ Precautions for Use 90

FBU2 Series

Spring buffer Eliminates defects

Adopts a magnetic spring utilizing the attractive force of magnets in the buffer section. Prevents damage to micro-devices and fragile workpieces with soft and stable pushing pressure.

Comparison between Fine Buffer and Spring Buffer. What are the benefits of using Fine Buffer?

Fine Buffer

Spring Buffer

Clean

Fine Buffer

Minimal particle generation due to no metal contact

Spring Buffer

Abrasion powder generated by metal contact

Reduces defect rate due to contamination

Long Life

Fine Buffer

No settling of movable parts due to magnetic thrust

Spring Buffer

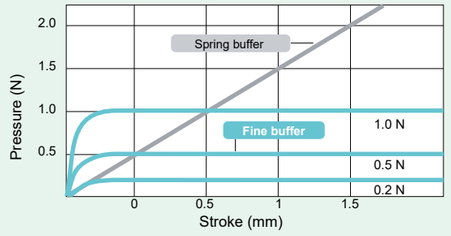
Spring settling occurs with repeated operation

Reduces replacement frequency
Reduces maintenance costs

Constant Pushing Pressure

Fine Buffer

Constant pushing pressure even if stroke changes



Spring Buffer

Pushing pressure changes when stroke changes

Unstable height
Reduces suction defect rate for workpieces
Reduces pad height adjustment time

With Anti-rotation Function

Fine Buffer

With anti-rotation function by magnetic return force

Magnetic restoring force in the rotation direction due to 4-axis spline magnetization (Magnetic Anti-rotation)

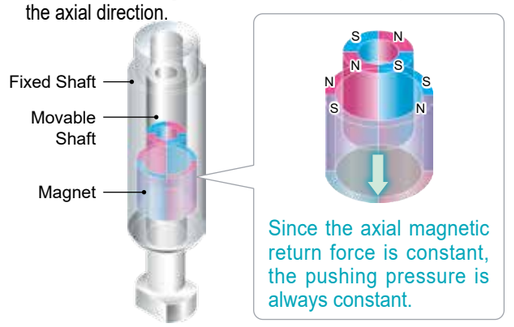
Spring Buffer

No anti-rotation function, separate installation required

Reduces design and assembly man-hours

Structure of Magnetic Spring

When the magnets incorporated in the movable shaft and fixed shaft are displaced, diagonal magnetic field lines are generated, creating a constant force that attempts to return to the axial direction.



Since the axial magnetic return force is constant, the pushing pressure is always constant.

Soft Pushing Pressure

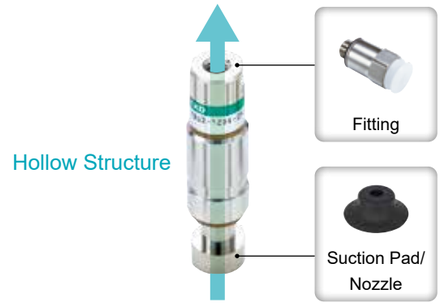
Achieved soft pushing pressure from 0.2 N by adopting a magnetic spring and reducing the weight of the movable shaft.

High Return Position Accuracy

Return position accuracy in X-Y direction of ±0.05 mm or less realizes high-precision handling. (Value for high-precision bearing type)

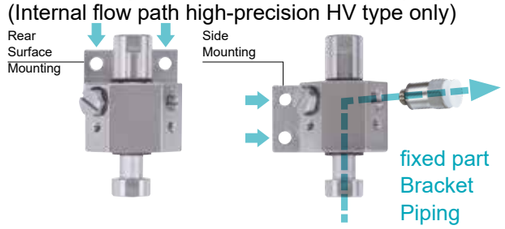
Easily made into a suction unit

Fittings can be attached to the tail side, and suction pads or nozzles directly to the head side, easily creating a suction unit.



Improved stability with dedicated bracket

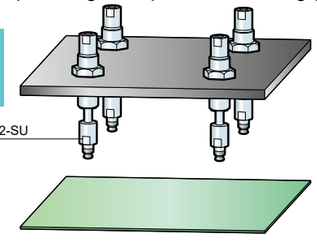
Piping can be done to the fixed dedicated bracket, unaffected by reaction forces from the piping tube. (Internal flow path high-precision HV type only)



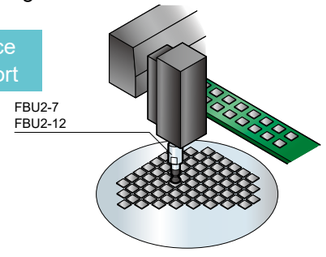
Application Example

In addition to vacuum suction, it has a track record in various applications utilizing constant pushing pressure, such as pressing workpieces, inserting parts, and continuity testing of contacts.

PCB/ Flexible substrate transport



Electronic Device Suction Transport



FBU2 Series variations

	Outer Diameter	Total length	Payload	Pushing Pressure	Bearing Accuracy	Stroke	Tail Piece Shape	Head Piece Shape	Page
 Lightweight FBU2-7	ø7 h7	35 to 39 mm	30 g	0.2 N	S Standard	2 mm 6 mm	No hole M3	No hole M3	70
	M8 x 0.75				H High accuracy				
					HV Internal flow path high accuracy		No hole	M3	
 Standard FBU2-12	ø12 h7	40 to 64 mm	80 g	0.5 N 1.0 N	S Standard	2 mm 6 mm 16 mm	No hole M3 M5	No hole M3 M5	70
	M12 x 1				H High accuracy	2 mm 6 mm			
					HV Internal flow path high accuracy		No hole	M3 M5	
 General purpose FBU2-SU	M12 x 1	60 to 94 mm	200 g	0.5 N 1.0 N	- Standard only	2 mm 6 mm 16 mm	No hole M3 M4 M5 M6	No hole M3 M4 M5 M6	80

Fine Buffer

FBU2 Series

Outer Diameter: M8, M12, ø7, ø12
Payload: 30, 80 g

RoHS

Model No. Notation

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

- FBU2: Model No.
- 12D: ❶ Outer Diameter
- S: ❷ Bearing Accuracy
- 10: ❸ Pushing Pressure
- 6: ❹ Buffer Stroke
- T3: ❺ Tail Piece Shape
- H3: ❻ Head Piece Shape

❶ Outer Diameter

Code	Content
7D	ø7h7 Spigot Joint Type
8M	M8x0.75 Fully Threaded Type
12D	ø12h7 Spigot Joint Type
12M	M12x1 Fully Threaded Type

❷ Bearing Accuracy

	Code	Content
	S	Standard (Bearing clearance 0.2 mm or less)
*1	H	High Precision (Bearing clearance 0.05 mm or less)
*1	HV	Internal Flow PatH-type High Precision (Bearing clearance 0.05 mm or less)

*1: For H, HV, outer diameters 8M, 12M cannot be selected.

❸ Pushing Pressure

	Code	Content
*1	02	0.2 N
*2	05	0.5 N
*2	10	1.0 N

*1: For 02, outer diameters 12D, 12M cannot be selected.
*2: For 05, 10, outer diameters 7D, 8M cannot be selected.

❹ Buffer Stroke

	Code	Content
	2	2 mm
	6	6 mm
*1	16	16 mm

*1: For 16, outer diameters 7D, 8M cannot be selected.

❺ Tail Piece Shape

	Code	Content	
	TB	No hole	
	T3	M3 Female Thread Depth 3	
*1	T5	M5 Female Thread Depth 4	

*1: For T5, outer diameters 7D, 8M cannot be selected.

❻ Head Piece Shape

	Code	Content	
	HB	No hole	
	H3	M3 Female Thread Depth 3	
*1	H5	M5 Female Thread Depth 4	

*1: For H5, outer diameters 7D, 8M cannot be selected.

Combination of Bearing Accuracy, Buffer Stroke, Tail Piece Shape, Head Piece Shape

		❷Bearing Accuracy		
		S	H	HV
❹Buffer Stroke	2	●	●	●
	6	●	●	●
	16	●		
❺Tail Piece Shape	TB	●	●	●
	T3	●	●	
	T5	●	●	
❻Head Piece Shape	HB	●	●	
	H3	●	●	●
	H5	●	●	●

Mounting Bracket Single Item Model No. for Spigot Joint Type

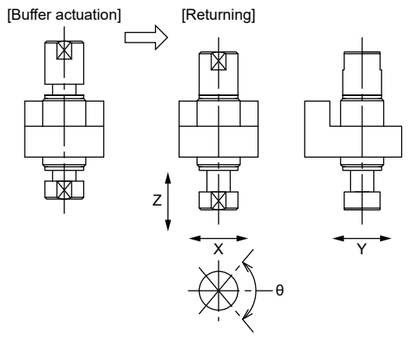
❶Outer Diameter	Mounting	Bracket Single Item Model No.	
7D	L-type	FBU2-7D-B1	
	Straight	FBU2-7D-B2	
12D	L-type	FBU2-12D-B1	
	Straight	FBU2-12D-B2	

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		ø7h7				M8 × 0.75		ø12h7					M12 × 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)		±15% or less													
Buffer stroke		2	6	2	6	2	6	2	6	16	2	6	2	6	16
Operating ambient temperature	°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		
Maximum torque sustained (Note 2)	N•cm	0.25 or more (reference value)						Note 3					Note 3		
Accuracy of origin return position 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: 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 looses 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.



(Figure 1) Returning accuracy detail

[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.

Weight

● FBU2-8M /7D (Unit: g)

Model no.	Fixed section	Movable section (*1)	Tail piece (movable section)		Head piece (movable section)		Bracket (*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								

*1: Total weight of movable section = Movable section + Tail piece + Head piece,
Product weight = Fixed section + Movable section + Tail piece + Head piece
*2: A bracket includes a plug and a fixing screw.

● FBU2-12M/12D (Unit: g)

Model no.	Fixed section	Movable section (*1)	Tail piece (movable section)			Head piece (movable section)			Bracket (*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								

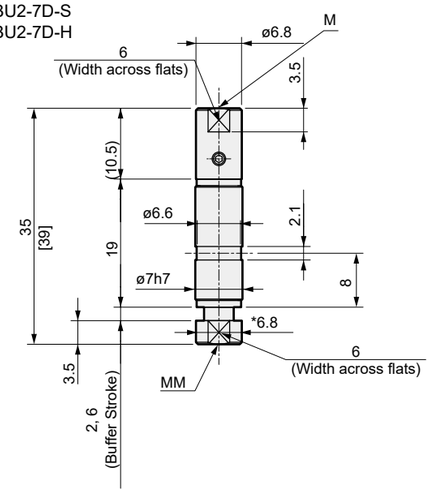
*1: Total weight of movable section = Movable section + Tail piece + Head piece, Product weight = Fixed section + Movable section + Tail piece + Head piece
*2: A bracket includes a plug and a fixing screw.

MEMO

Precision Components
LBC
GFM
PVP
FBU2
AFB-RB
Ending

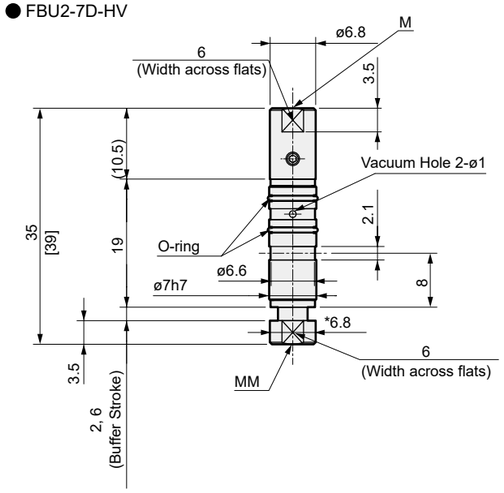
Outline Dimension Drawing (FBU2-7D, FBU2-8M)

● FBU2-7D-S
● FBU2-7D-H



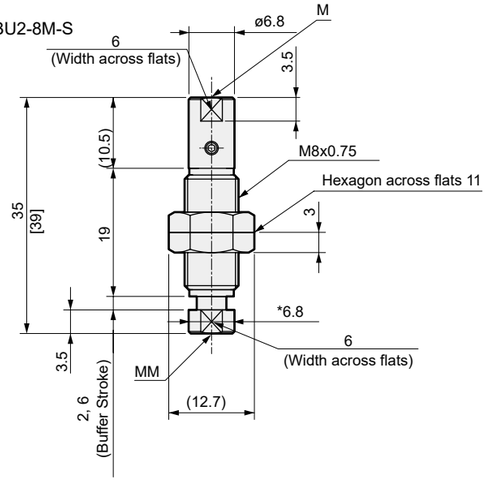
* Dimensions in [ ] are for 6 stroke.

● FBU2-7D-HV



* Dimensions in [ ] are for 6 stroke.
* O-rings are shipped installed. To maintain sealing performance, apply a thin coat of lubricant such as grease to the O-ring before use.
* Illustrated dimensions are the same regardless of tail piece and head piece shape.

● FBU2-8M-S



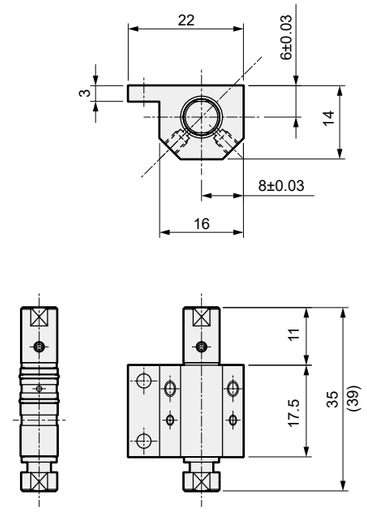
* Dimensions in [ ] are for 6 stroke.

Thread Shape

Tail Piece Shape	M	Head Piece Shape	MM
TB	No hole	HB	No hole
T3	M3 Thread Depth 3	H3	M3 Thread Depth 3

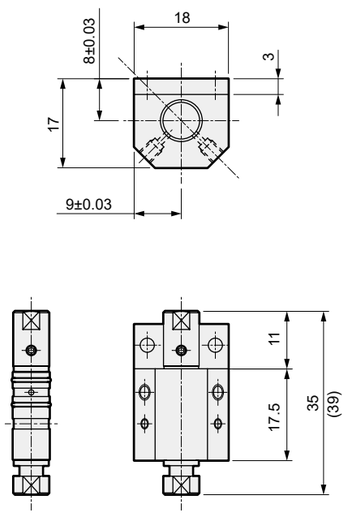
Outline Dimension Drawing with Bracket (FBU2-7D-B1/B2)

● FBU2-7D-B1



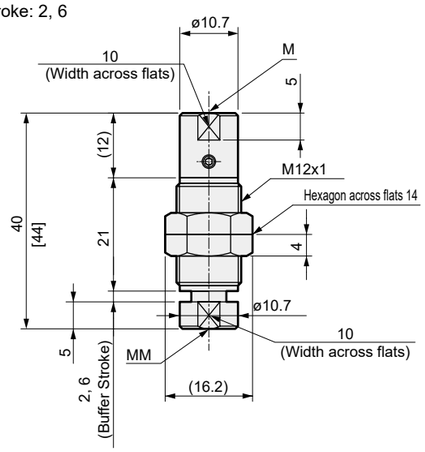
* Dimensions in [ ] are for 6 stroke.

● FBU2-7D-B2

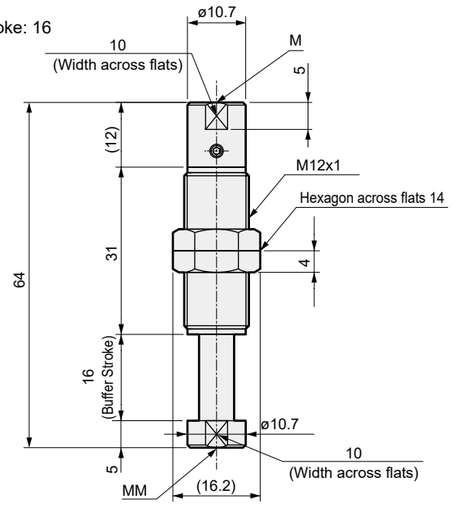


Outline Dimension Drawing (FBU2-12M, FBU2-12D)

● FBU2-12M-S
Buffer Stroke: 2, 6

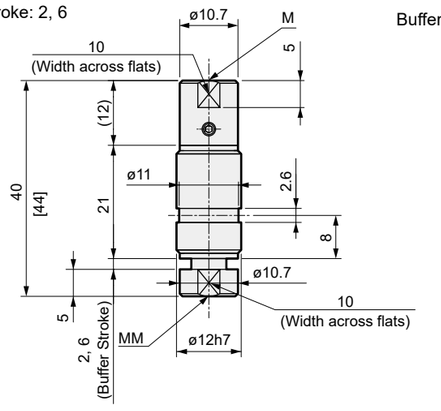


Buffer Stroke: 16

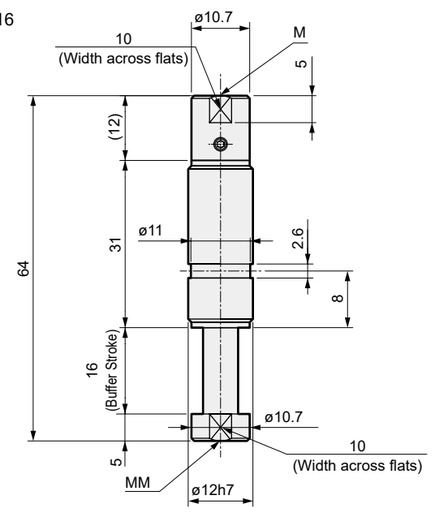


* Dimensions in [ ] are for 6 stroke.

● FBU2-12D-S/H
Buffer Stroke: 2, 6

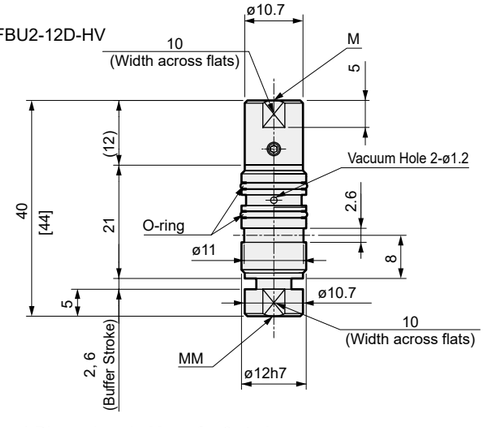


Buffer Stroke: 16



* Dimensions in [ ] are for 6 stroke.

● FBU2-12D-HV



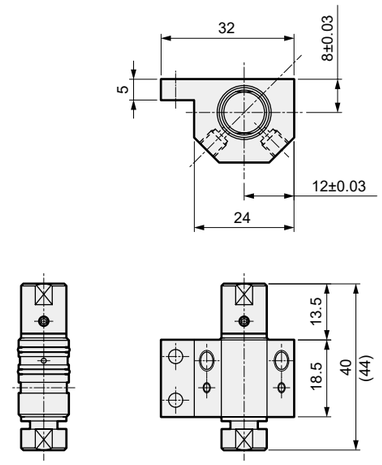
Thread Shape

Tail Piece Shape	M	Head Piece Shape	MM
TB	No hole	HB	No hole
T3	M3 Thread Depth 3	H3	M3 Thread Depth 3
T5	M5 Thread Depth 4	H5	M5 Thread Depth 4

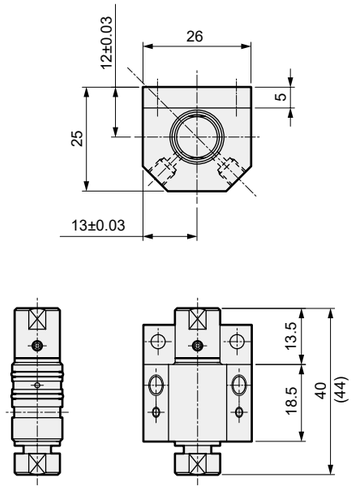
* Dimensions in [ ] are for 6 stroke.
* O-rings are shipped installed. To maintain sealing performance, apply a thin coat of lubricant such as grease to the O-ring before use.
* Illustrated dimensions are the same regardless of tail piece and head piece shape.

Outline Dimension Drawing with Bracket (FBU2-12D-B1/B2)

● FBU2-12D-B1



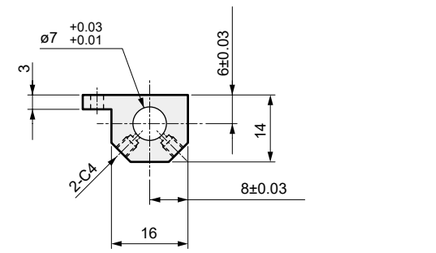
● FBU2-12D-B2

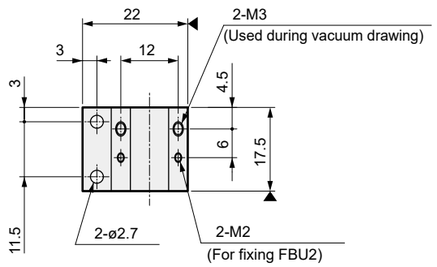


* Dimensions in [ ] are for 6 stroke.

Bracket Outline Dimension Drawing

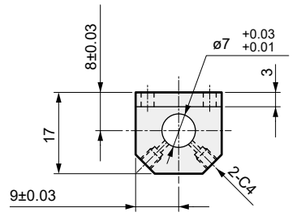
● FBU2-7D-B1
(Attached Parts: Plug FPL-M3 1 pc., Set Screw 1 pc. M2x2)

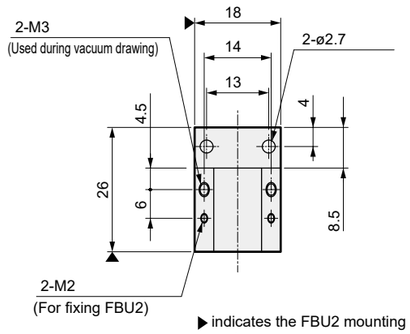




▶ indicates the FBU2 mounting reference surface.

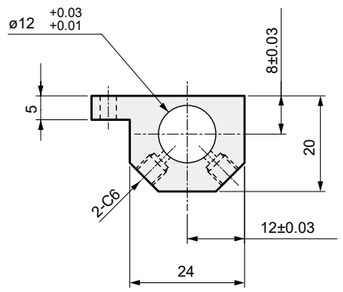
● FBU2-7D-B2
(Attached Parts: Plug FPL-M3 1 pc., Set Screw 1 pc. M2x2)

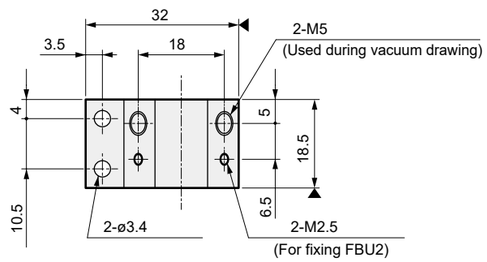




▶ indicates the FBU2 mounting reference surface.

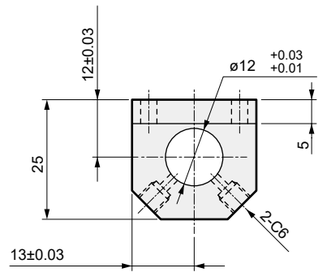
● FBU2-12D-B1
(Attached Parts: Plug FPL-M5 1 pc., Set Screw 1 pc. M2.5x2.5)

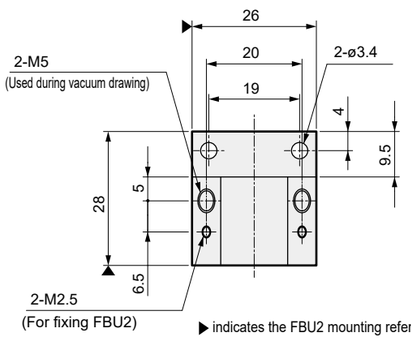




▶ indicates the FBU2 mounting reference surface.

● FBU2-12D-B2
(Attached Parts: Plug FPL-M5 1 pc., Set Screw 1 pc. M2.5x2.5)



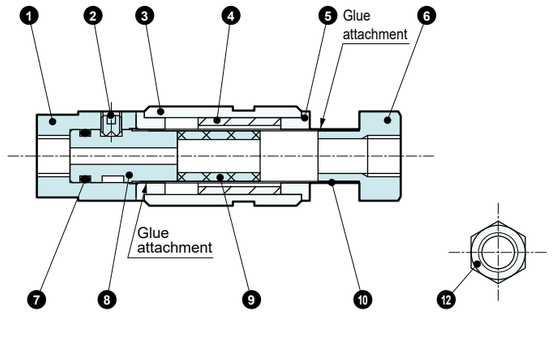


▶ indicates the FBU2 mounting reference surface.

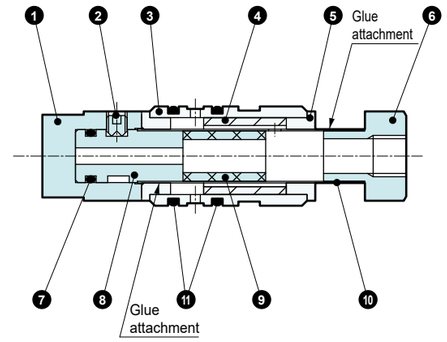
* When using for vacuum drawing, tighten the plugs (FPL-M3, M5) into the unused threads (M3, M5).

Internal structure and parts list

●FBU2-□-S (standard)
-□-H (high-precision)



●FBU2-□-HV (high-precision internal flow path type)



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	12	Hexagon nut	Carbon steel	Electroless nickeling (all-screw type only)
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		

Fine Buffer

FBU2-SU Series

Outer Diameter: M12, Fully Threaded Type
Payload: 200 g

RoHS

Model No. Notation

FBU2-SU - 05 - 6 - T3 - H3

- FBU2-SU: Model No.
- 05: ❶ Pushing Pressure
- 6: ❷ Buffer Stroke
- T3: ❸ Tail Piece Shape
- H3: ❹ Head Piece Shape

❶ Pushing Pressure

Code	Content
05	0.5 N
10	1.0 N

❷ Buffer Stroke

Code	Content
2	2 mm
6	6 mm
16	16 mm

❸ Tail Piece Shape

Code	Content	
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	

❹ Head Piece Shape

Code	Content	
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	

Specifications

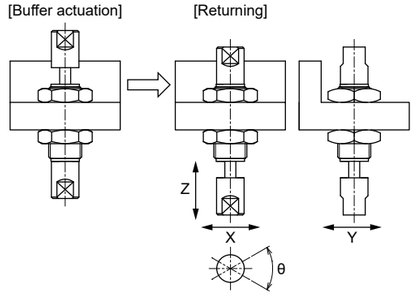
Item			FBU2-SU
Outer Diameter			M12x1
Pushing Pressure		N	0.4 to 0.6, 0.9 to 1.1
Pushing Pressure Variation		*1)	±15% or less
Buffer Stroke		mm	2, 6, 16
Operating Ambient Temperature		°C	5 to 50
Bearing Clearance		mm	0.2 or less
Max. Holding Torque		N·cm	*2)
Return Position Accuracy *3)	X-Y	mm	±0.1 or less
	Z	mm	±0.1 or less
	θ	°	3 or less
Payload		g	200 or less

*1: Indicates the amount of pushing pressure fluctuation during the stroke. It does not mean that the pushing pressure is proportional to the buffer stroke.
*2: If rotational torque exceeding the maximum holding torque is applied to the movable shaft, the movable shaft will step out and reverse 180°.
*Holding torque...Force which applies force in the θ direction (Fig. 1) to return to the original position even if the movable shaft position is displaced
*3: Refer to (Fig. 1) for return position accuracy. Indicates the return accuracy during buffering.
*4: For requests not conforming to specifications, please consult CKD.

[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.

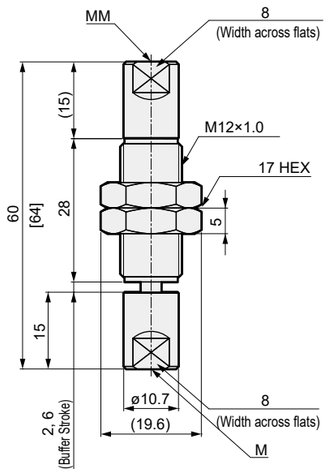


(Fig. 1) Detailed Diagram of Return Position Accuracy

External Dimension Drawings

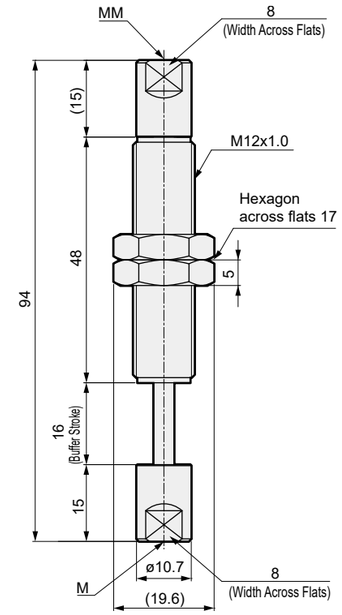
* The width-across-flats position of the tail piece and head piece is arbitrary.

●FBU2-SU-05/10-6



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

●FBU2-SU-05/10-16



Thread Shape

Tail Piece Shape	M	Head Piece Shape	MM
TB	No hole	HB	No hole
T3	M3 Thread Depth 3	H3	M3 Thread Depth 3
T4	M4 Thread Depth 4	H4	M4 Thread Depth 4
T5	M5 Thread Depth 4	H5	M5 Thread Depth 4
T6	M6 Thread Depth 5	H6	M6 Thread Depth 5

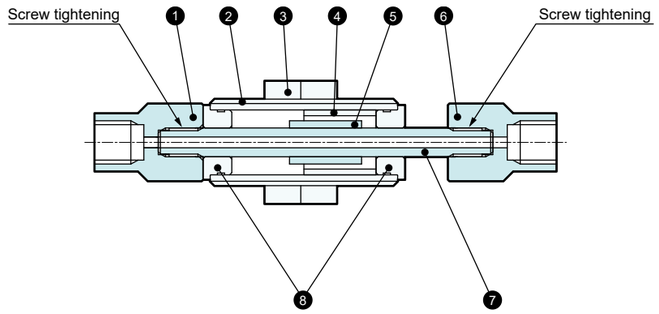
*1: Total Weight of Movable Parts = Movable Part + Tail Piece + Head Piece, Product Weight = Fixed Part + Movable Part + Tail Piece + Head Piece.

Weight

(Unit: g)

Model No.	Fixed Part	Movable Part	Tail Piece					Head Piece				
			TB	T3	T4	T5	T6	HB	H3	H4	H5	H6
FBU2-SU-05/10-2	19.1	4.2	3.4	3.3	3.2	3.1	2.9	3.4	3.3	3.2	3.1	2.9
FBU2-SU-05/10-6	19.1	4.5										
FBU2-SU-05/10-16	25.2	7.9										

Internal Structure Diagram/Materials



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

MEMO

Precision Components
LBC
GFM
PVP
FBU2
AFB-RB
Ending

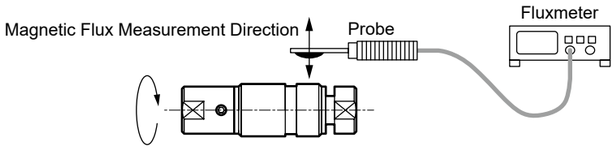
1 Leakage Magnetic Flux

[Measuring Instrument]

Fluxmeter
Probe

[Measurement Method]

① Touch the probe to each measurement point of FBU2.
② Rotate FBU2 around its central axis and measure the maximum magnetic flux density.



[Target]

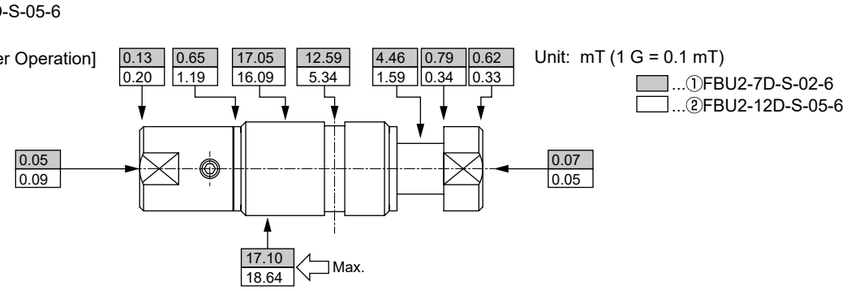
①FBU2-7D-S-02-6
②FBU2-12D-S-05-6
③FBU2-12D-S-05-16

[Results]

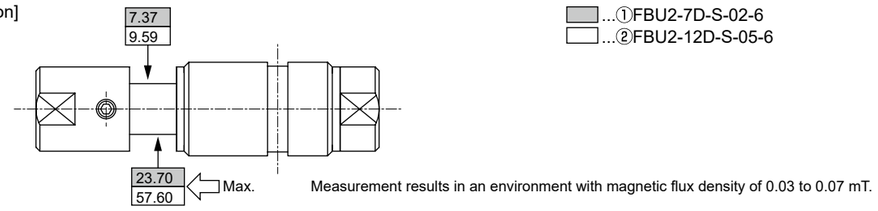
* Magnetic Flux Density at Each Position

①FBU2-7D-S-02-6
②FBU2-12D-S-05-6

[Before Buffer Operation] Unit: mT (1 G = 0.1 mT)



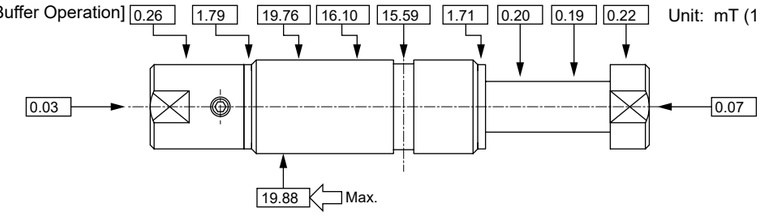
[After Buffer Operation]



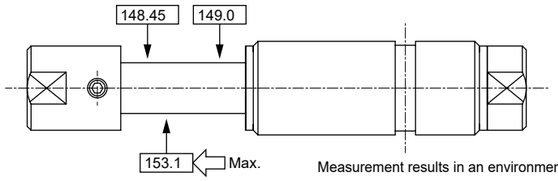
Measurement results in an environment with magnetic flux density of 0.03 to 0.07 mT.

③FBU2-12D-S-05-16

[Before Buffer Operation] Unit: mT (1 G = 0.1 mT)



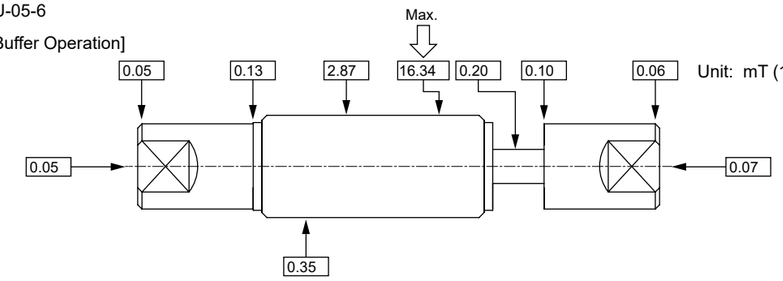
[After Buffer Operation]



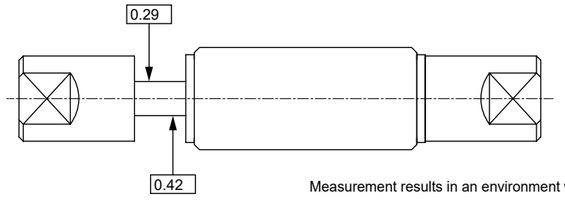
Measurement results in an environment with magnetic flux density of 0.03 to 0.07 mT.

④FBU2-SU-05-6

[Before Buffer Operation] Unit: mT (1 G = 0.1 mT)



[After Buffer Operation]



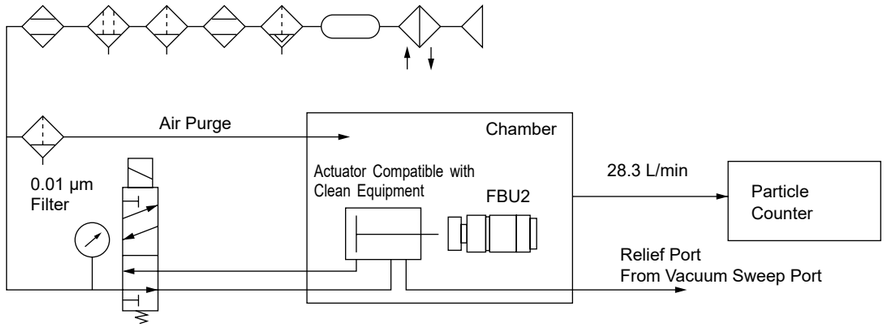
Measurement results in an environment with magnetic flux density of 0.03 to 0.07 mT.

2 Particle Generation Amount

[Measuring Instrument]

Particle Counter: Laser Dust Monitor
Minimum Measurable Particle Size: 0.1 μm
Suction Amount: 28.3 L/min

[Test Circuit]



[Measurement Method]

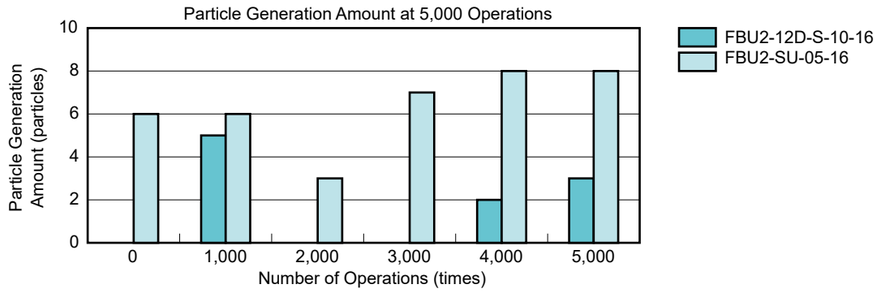
① Place the test sample inside an antistatic chamber (stainless steel).
② Supply clean air (air passed through a 0.01 μm filter) at the same flow rate as the particle counter's suction rate (28.3 L/min).
③ Confirm that the particle counter reading becomes "0" when not operated.
④ Operate the test sample and measure the particles generated during operation.

*Use a sealed chamber to prevent particles other than those from the test sample from entering the chamber.
*Confirm beforehand that the particle generation amount of the clean equipment compatible actuator (vacuum sweep type) to be used is 0.

[Measurement Conditions]

* Air Quality
For Purge: Grade 1.2.1 + 0.01 μm Gas Filter
• FBU2 Operating Speed: 50 mm/s
• Operating Conditions: No load, installed parallel to purge flow
• Measurement Frequency: 1 minute measurement / 1,000 operations
• Sample: FBU2-12D-S-10-16
FBU2-SU-05-16

[Measurement Results]



FBU2-12D-S-10-16

Particle Size	Number of Operations					
	0	1,000	2,000	3,000	4,000	5,000
0.1 μm or more	0	5	0	0	0	2
0.2 μm or more	0	0	0	0	1	0
0.3 μm or more	0	0	0	0	1	1
0.5 μm or more	0	0	0	0	0	0
1.0 μm or more	0	0	0	0	0	0
2.0 μm or more	0	0	0	0	0	0
Total Particle Generation Amount	0	5	0	0	2	3

FBU2-SU-05-16

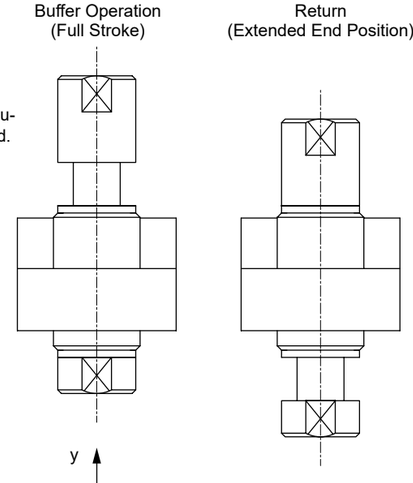
Particle Size	Number of Operations					
	0	1,000	2,000	3,000	4,000	5,000
0.1 μm or more	6	6	3	7	8	8
0.2 μm or more	0	0	0	0	0	0
0.3 μm or more	0	0	0	0	0	0
0.5 μm or more	0	0	0	0	0	0
1.0 μm or more	0	0	0	0	0	0
2.0 μm or more	0	0	0	0	0	0
Total Particle Generation Amount	6	6	3	7	8	8

3 Return Position Accuracy (X-Y)

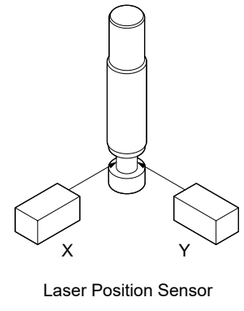
[Measuring Instrument]

Laser Position Sensor

[Measurement Overview Diagram]



[Measurement Method]



[Measurement Method]

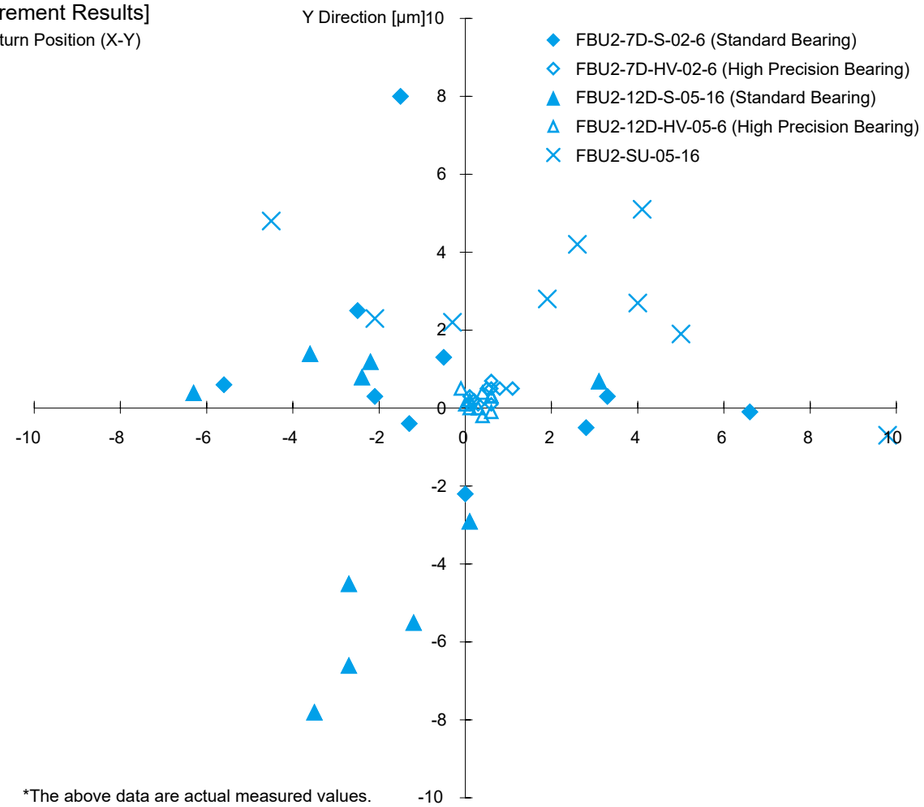
Measure the X-Y position accuracy when manually operated for a full stroke and then returned.
Load: No Load
Installation Direction: Downward
Vacuum Level: Non-vacuum
Piping: None

[Target]

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

[Measurement Results]

Return Position (X-Y)



*The above data are actual measured values.

This is a list of suction pads that can be directly attached to the Fine Buffer. After selecting the pad, select the head piece model No. that matches the pad.

Pad Shape	Pad Shape	Application	Pad Diameter	Model No. *Select the pad material	Head Piece Code	Pad Material N	S	U	F	HN	EP	SE	NE	G	FS
Standard Type Compact Type		Ideal for small workpieces such as semiconductor parts	ø0.7	VSP-ME0.7RM□-M3	H3 (M3 Female Thread)	●	●	●	●	●	●	●	●	●	-
			ø1	VSP-ME1RM□-M3											
			ø1.5	VSP-ME1.5RM□-M3											
			ø2	VSP-ME2RM□-M3											
			ø3	VSP-ME3RM□-M3											
			ø4	VSP-ME4RM□-M3											
Standard Type General		Ideal for thick, flat workpieces	ø1	VSP-E1R□	H3 (M3 Female Thread)	●	●	●	●	●	●	●	●	●	-
			ø2	VSP-E2R□											
			ø3	VSP-E3R□											
			ø4	VSP-E4R□											
			ø6	VSP-ME6R□-M5	H5 (M5 Female Thread)										
			ø6	VSP-E6R□											
			ø8	VSP-ME8R□-M5											
			ø8	VSP-E8R□											
			ø10	VSPG-10RøA	H4 (M4 Female Thread)										
For Thin Objects Type		Ideal for thin workpieces such as vinyl	ø8	VSP-ME8P□-M5	H5 (M5 Female Thread)	●	●	●	●	-	-	-	●	-	●
			ø8	VSP-E8P□											
			ø10	VSP-ME10P□-M5											
			ø10	VSP-E10P□											
Sponge-type		Ideal for workpieces with uneven surfaces such as exterior wall materials	ø10	VSPG-10SøA	H6 (M6 Female Thread)	Blank: Chloroprene Rubber S: Silicone									
Oval-type		Ideal for long workpieces like boards and semiconductor parts	2x4	VSPG-2x4EøA	H6 (M6 Female Thread)	●	●	●	●	●	●	●	●	-	-
			3.5x7	VSPG-3.5x7EøA											
			4x10	VSPG-4x10EøA											
			4x20	VSPG-4x20EøA											
			5x10	VSPG-5x10EøA											
			6x10	VSPG-6x10EøA											
Flat Type Flat Increased Suction Flow Type		Thin workpieces like sheets and vinyl	ø10	VSPG-10FøA	H4 (M4 Female Thread)	●	●	●	●	-	-	●	●	-	-
			ø15	VSPG-15FøA											
			ø10	VSPG-10FHøA											
			ø15	VSPG-15FHøA											

Pad Material

Ordering Code	Pad Material
N	Nitrile rubber
S	Silicone Rubber
U	Urethane rubber
F	Fluororubber
HN	HNBR
EP	EPDM
SE	Conductive Silicone Rubber
NE	Conductive NBR (Low Resistance-type)
G	Food Sanitation Act Compliant NBR
FS	Fluorosilicone Rubber

When selecting a surface treatment option, add the Code after the rubber material.

Surface Treatment

Content	Compatible Pad Material N	S	F	SE	NE	Code
No surface treatment	All pad materials, all pad diameters					Blank
Anti-Adhesion Special Coating		●	●	●		-DL
Suction Mark Reduction Surface Modification	●				●	-ER
Fluorine Coating		●		●		-FG

*Surface treatment cannot be selected for sponge-type.
*Anti-adhesion special coating cannot be selected for standard type compact.

Model No. Notation

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

Head Piece Shape

Head Piece Shape

Code	Content	
H3	M3 Female Thread Depth 3	
H5	M5 Female Thread Depth 4	

Model No. Notation

FBU2-SU - 05 - 6 - T3 - H3

Head Piece Shape

Head Piece Shape

Code	Content	
H3	M3 Female Thread Depth 3	
H4	M4 Female Thread Depth 4	
H5	M5 Female Thread Depth 4	
H6	M6 Female Thread Depth 5	

Characteristics of Each Pad Material

■Rubber material, sponge material

Item	Ordering Code	Nitrile rubber N	Food Sanitation Act Compliant NBR G	HNBR HN	Silicone Rubber S	Conductive Silicone Rubber SE	Urethane rubber U	Fluororubber F	Fluorosilicone Rubber FS	EPDM EP	Conductive NBR (Low Resistance-type) NE	Chloroprene Rubber (Sponge-type) Blank	Silicone Rubber (Sponge-type) S
Application		Cardboard, Plywood Steel Plate, Food Related, Other General Workpieces		Cardboard, Plywood, Steel Plate, Food Related Other General Workpieces Low Concentration Ozone Use in Environment	Semiconductor Mold Ejection Thin Workpieces Food Related		Cardboard Plywood Steel Plate	Chemical Atmospheres, High Temperature Workpieces	Mold Ejection Ejection	Applications requiring highly ozone resistance, use in humid atmospheres	Semiconductor	With uneven surfaces Workpieces	Workpieces with uneven surfaces Food Related
Pad Color		Black	Light Gray	Black	Clear White	Black	Dark Blue	Gray	Dark Orange	Black	Black	Black	Dark Orange
Various Properties: Table by Pad Shape Surface Hardness (Shore A)	Standard Type	50° to 80°	60° to 70°	50° to 70°	50°	60°	55° to 70°	60° to 70°	-	50° to 70°	60° to 70°	-	–
	Oval-type	40° to 50°	–	50°	40° to 50°	50° to 60°	55°	50°	–	50°	70°	–	–
	Flat Type	60°	–	–	40°	40°	50°	50°	–	–	60°	–	–
	Flat Increased Suction Flow Type						–						
	For Thin Objects Type	40°	–	–	40°	–	55°	50°	40°	–	60°	–	–
Various Properties: High Temp. Operating Limit		110°C		140°C	180°C		60°C	230°C	180°C	150°C	110°C	80°C	180°C
Various Properties: Low Temp. Operating Limit		-30°C		-30°C	-40°C		-20°C	-10°C	-50°C	-40°C	-30°C	-45°C	-40°C
Various Properties: Weather Resistance		△		○	◎		○	○	○	◎	△	○	◎
Various Properties: Ozone Resistance		x		○	◎		◎	◎	◎	◎	x	○	◎
Various Properties: Acid Resistance		△		△	○		x	◎	○	◎	△	△	○
Various Properties: Alkali Resistance		○		○	◎		x	x	◎	◎	○	◎	◎
Various Properties: Oil Resistance	(Gasoline/Diesel)	◎		◎	△		◎	◎	△	x	◎	x	△
	(Benzene/Toluene)	△		x	△		△	◎	△	x	△	△	△
Various Properties: Volume Resistivity		–		–	–	≤10⁸ Ω·cm	–	–	–	–	≤200 Ω·cm	–	–

Evaluation Guide → ◎: Optimal, ○: Suitable, △: Good, x: Unsuitable
*1: Various properties indicate the characteristics of general synthetic rubber used for the pad material.
*2: Actual use at the operating limit temperature is instantaneous; if continuing for a certain period, confirm sufficiently before use.
*3: When the fiber flocked type surface treatment (option) is selected, the high-temperature operating limit for fluororubber becomes 200°C.
*4: Use within the Fine Buffer's operating ambient temperature range.
Other pad shapes and materials are also available. Also refer to P. 408, 409.

Suction Pad Selection Method

Theoretical Suction Force

Theoretical suction force is determined by the pad area and the vacuum pressure generated when using that pad. Use calculated values as reference; perform actual suction tests as needed for confirmation. Theoretical suction force is a value under static conditions. Allow sufficient margin considering the workpiece Weight and forces due to acceleration during movement (lifting, stopping, rotating, etc.). Also, allow sufficient margin when determining the number and placement of pads.

(1)Calculation Formula

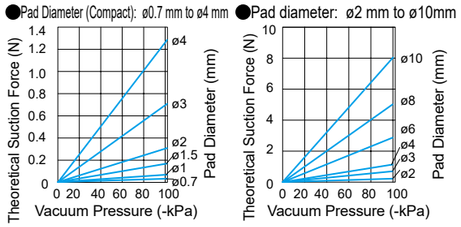
$$W = x10.13xf\frac{C \times P}{101}$$

W: Suction Force (N)
C: Pad Area (cm²)
P: Vacuum Pressure (-kPa)
f: Safety Factor Horizontal Lifting (See figure on right): 1/4
Vertical Lifting (See figure on right): 1/8

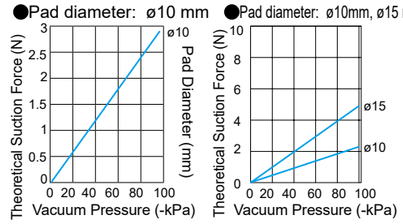
*1: For sponge-type pads, calculate using the inner diameter of the sponge pad part, referring to the table below.
*2: For flat type pads, calculate using the grooves on the suction surface, referring to the table below.
*3: Regarding the suction force of the thin object type pad, due to pad characteristics, the theoretical suction force may exceed the pad's own strength depending on the vacuum level. Please confirm with the actual machine.

(2) Theoretical Suction Force Graph [Please apply a safety factor to the values obtained from the graph.]

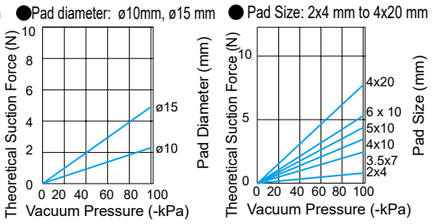
Standard/Thin Object Type



Sponge Pad



Flat Pad



Oval Pad

To Use This Product Safely

Be sure to read this before use.
For general pneumatic components precautions, refer to Intro 15 for details.

Design / Selection

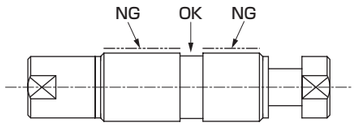
Warning

■Working ambient temperature ranges differ depending on bearing. Be sure to use within the specified range.
- Standard Bearing Type (S): 5 to 50°C
- High Precision Bearing (H/HV): 5 to 40°C

Note) FBU2-SU is a standard bearing type.

■This product has a built-in magnet.
Do not use in locations with magnetic chips, dust, etc. This can cause damage or malfunction.

■Fix the product in place with a nut (full thread: 8M, 12M, SU) or hexagon socket head set screws (Spigot joint type: 7D, 12D). When using set screws, utilize the groove part of the fixed shaft. Follow the mounting precautions on the next page during installation.



■Mounting orientationUse vertically.
Lateral load or moment force on the movable shaft affects characteristics variation and lifespan.

Caution

■When using for vacuum applications, use a tube with low piping tension as the tension resulting from the piping tube is added to the pressure.
Recommended Tubing: UP Series
(Antistatic Tubing, Air Fiber)

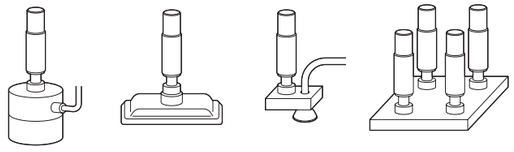
■The load (jig and suctioned workpiece) on the movable shaft must not exceed the load capacity.
- FBU2-7D/8M: 30 g or less
- FBU2-12D/12M: 80 g or less
- FBU2-SU: 200 g or less

■When conveying the workpiece, acceleration should not be more than 4 G. Excessive acceleration may cause product damage.

■When used for a rotating application, note the max. holding torque of the magnet. If force exceeding the maximum holding torque is applied, it may step out and reverse 180°.

■The internal flow path high accuracy (HV) product has a leak.
A gap seal structure is adopted to improve pushing pressure stability and return position accuracy. Therefore, vacuum leakage occurs. (Pressure drop within 10 kPa relative to initial pressure -80 kPa)

■ Using the product in the following way can cause moment force on the movable axis even at below load capacity, leading to malfunctions or failure.
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.

For precautions regarding mounting, installation, adjustment, operation, and maintenance, please refer to the CKD Equipment Product Site (https: //www.ckd.co.jp/kiki/en/) → 'model No.' →Instruction Manual

MEMO