

FUJI LATEX PRODUCT CATALOG

The Key of controlling the motion

ROTARY DAMPERS

SHOCK ABSORBERS

HELICAL ISOLATORS



Motion Control & Design



FUJI LATEX CO., LTD.

Index

07	1 Soft Absorber
10	Principles
11	Structure Absorption characteristics of Soft Absorbers
12	Structure
14	Model selecting procedure
15	Model selecting method
16	Equations for the selection of Soft absorbers
18	Sample calculations for selecting Soft absorbers
25	Calculation reference for selecting Soft absorber
27	Caution for use
30	FPD-07 Series
32	FPD-08 Series
34	FPD-1006/1008 Series
36	FPD-1012 Series
38	FPD-1016 Series
40	FPD-1018 Series
42	FPD-1030/1050/1060/1070/10100/10150 Series
44	FPR-1040 Series
46	FPA-1475 Series
48	FA-1212L Series
50	FA-1010D/FA-1215B Series
52	FA-0805/FA-1005/FA-1008/FA-1210 Series
54	FA-0806 Series
56	FA-1008VB/FA-1008VD/FWM-1008VBD Series
58	FA-1210MB/FA-1210MD/FWM-1210MBD Series
60	FA-1410RB/FA-1410RD/FWM-1410RBD Series
62	FA-1612XB/FA-1612XD/FWM-1612XBD Series
64	FA-1612X Series
66	FA-2016EB/FA-2016ED/FWM-2016EBD Series
68	FA-2016E Series
70	FA-2530GB/FA-2530GD/FWM-2530GBD Series
72	FA-2530G/FA-2530SL Series
74	FA-2540LB/FA-2540LD/FWM-2540LBD Series
76	FA-2725FB/FA-2725FD/FWM-2725FBD/FA-2725SL Series
78	FA-3035TD/FWM-3035TBD/FA-3035SL Series
80	FA-3625A/FA-3650A/FA-3625SL/FA-3650SL Series

82	FA-3650UD/FWM-3650UBD Series
84	FA-4225B/FA-4250B/FA-4225SL/FA-4250SL/FA-4275B Series
87	FA-4250YD/FWM-4250YBD Series
88	FA-6450/64100/64150 Series
90	FA-2016EA/FA-2725FA Series
92	FA-S Series (Dust seal specification)
94	FWM-S Series (Dust seal specification)
96	FA-F/FWM-F Series
98	FA/FWM-B Series
	FK Series
100	(M4~M16)
102	(M20~M25)
104	(M27~M36)
106	FK-4225B/FK-4250B/FK-4275B Series
107	Optional parts
109	FK-6450/FK-64100/FK-64150/FK-64200 Series
110	FK Series(M64)
111	FK-80200-C-□□□/FK-80300-C-□□□/FK-80400-C-□□□ Series
112	Optional parts
	FL Series
116	(M12~M16)
111	Dimension•Optional parts
118	FW Series(M12~M25)
120	FS Series
121	FV Series
122	FED Series
123	FSB Series
124	FES Series

127 2 Rotary Damper

130	Basic Structure and Principle
131	Selection / Key to Model Number
	Rotary damper

Index

132	FRT-E2/E9 Series
133	FRT-G2 Series
134	FRT/FRN-C2 Series
135	FRT/FRN-D3 Series
136	FRT-S1 Series
137	FRT-N1 Series
138	FRT-L1 Series
139	FRT/FRN-K2 Series
140	FRT/FRN-F2 Series
142	FRN-P2 Series (Adjustable Torque variable)
144	FRT-W1 Series
	Disk damper
146	FDT-47A/FDN-47A Series
147	FDT-57A/FDN-57A Series
148	FDT-63A/FDN-63A Series
149	FDT-70A/FDN-70A Series
	Vane damper
150	FYN-M1 Series
152	FYN-P1 Series
154	FYN-N2 Series
156	FYN-B1 Series
158	FYN-U1 Series
160	FYN-C1 Series
162	FYN-D3 Series
164	FYT/FYN-D1 (D2) Series
	Adjustable vane damper
166	FYT/FYN-H1 (H2) Series
	Self adjustable vane damper
168	FYN-S1 Series
170	FYN-X2 Series
172	FYN-Z2 Series
174	FYN-A2 Series
	Adjustable vane damper
176	FYT/FYN-LA3 Series
	Hinge Damper
178	FHD-A1 Series
	Friction Hinge Damper
179	FHD-B1/B2 Series

	Friction damper
180	FFD-25FS/FW/SS/SW Series
181	FFD-28FS/FW/SS/SW Series
182	FFD-30FS/FW/SS/SW Series
184	MRF Damper FMR-70S-403
186	Reference Table for the Selection of a Rotary Damper/Vane Damper Customizable Torque Chart for Rotary Dampers

187 3 Magnum Series

190	Structure/Outlines (FMC, FMA Series) Self-compensation Type/Adjustable Type
192	FMC33, FMA/FML33 Series
193	FMC36, FMA/FML36 Series
194	FMC45, FMA/FML45 Series
195	FMC64, FMA/FML64 Series
196	How to Mount/Precautions for Mounting External Tank/Check Valve

199 4 Speed Controller

202	Structure/Outlines FVC Series Adjustable Speed Controller
203	FVC Series
204	AE Series
205	Application Examples FVC/AE Series

207 5 Helical Isolators

210	Introduction of Helical Vibration Absorber Type Indication
212	Applications
214	How to Select
216	Geometry of Mounting

Index

217	FH10016 Series
218	FH10024 Series
219	FH10032 Series
220	FH10040 Series
221	FH10048 Series
222	FH08064 Series
223	FHM08375 Series
224	FHM08500 Series
225	FHM08625 Series
226	FHM08875 Series

227	6 Model Selection Form
228	Rotary damper / Vane damper Soft absorber
229	For linear motion
230	For rotating motion
231	For Helical vibration absorber

1

Soft Absorber

A hydraulic shock absorber aiming at mitigation of shock caused by the enhanced speed of automatic devices

Worry-free use of satisfactory product for a customer based on our accumulated technologies over 30 years

A rich variation is provided for any fields and situations including tailored manufacture

Read these instructions before use

This owner's manual lists the various precautions for safe and proper use of the product and for prevention of safety hazards to the operators and damage to the plant/machines. Please thoroughly read before using the product.



Warning

Definition of Warning

"Warning" applies to situations in which death or serious injuries may occur to the user, etc. if the potential dangers of the products are not avoided.

Please judge the suitable soft absorber by the person who designs or determines the specification of application.

- Due to the reasons of a diversity of usages and circumstances, please let judge the model selection by the person who designs and determines the specification of device and decide after performance verification and life cycle test.

Do not use the soft absorber out of specification range.

- It causes malfunction or corruption to use out of specification range.

Implementation of safety measures under the following use

- If you would like to use soft absorber under the circumstance such like below, please consult us before using.
 - 1) To use soft absorber under the circumstance which is not mentioned on this catalog or under direct sunlight and/or outdoor.
 - 2) To use soft absorber for the equipment related to nuclear power, the equipment involved directly or indirectly in the operation and running of the vehicle of the rail and ship, equipment related to aviation and space, equipment related to the military, the equipment involved in the medical, equipment exposed to the beverage and food, combustion equipment, entertainment equipment related influence on people and property in the equipment, emergency stop circuits, press equipment, other, is expected to exert a major impact on people, property, or the use of the equipment and applications which require special safety measures to be adopted.

Do not throw into a fire

- As the products contain oil, throwing them into a fire may cause them to ignite, resulting in injuries.



Caution

Definition of "Caution"

"Caution" applies to situations in which minor injuries or property damage may result if the operation or maintenance procedures are not strictly followed.

Do not operate without sufficient mounting strength

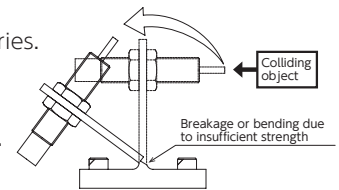
- Operating with insufficient mounting strength may damage the main machine and cause injuries.
- Ensure sufficient mounting strength of maximum drag x safety factor (Regarding maximum drag, please refer to the catalogue or contact our sales department.)

Do not operate without an external stopper ※Excluding FSB series and part of FK series.

- Without an external stopper, the main machine may become damaged due to bottoming
- Ensure that an external stopper is set in the prescribed location for each type before operating the product.

Do not attach using incorrect tightening torque

- Using an incorrect tightening torque when attaching may cause operational failure and damage to the main machine.
- When tightening an attachment screw for a soft absorber, please use the tightening torque as listed below.



External diameter of the screw (mm)	M4×0.5	M6×0.75	M8×0.75 M8×1	M10×1	M12×1 M12×1.75	M14×1.5 M14×2.0	M16×1.5 M16×2.0	M20×1.5	M25×1.5 M25×2.0	M27×1.5 M27×3.0	M30×1.5	M36×1.5	M42×1.5	M64×2
Tightening torque for the bolt (N·m)	0.35	0.85	3.9	7.8	※1 7.8	9.8	14.7	※2 29.4	49	58.8	※3 78.4	98	392	420

※1 FA-1212 series tightening torque : 1.5N·m (In case to fix directly at ψ 14.6, tightening torque shall be 1N·m)

※2 FED-2010M-C tightening torque : 15N·m

※3 FED-3020M-C tightening torque : 30N·m

Please adjust the torque for the adjustable soft absorber.

- For the adjustable typed soft absorber, please adjust and use at the optimal position. Note that soft absorber and/or application might be broken even within the specification range in case of improper adjustment.

Oil

- Soft absorber contains oil in inside and sealed to prevent oil leakage but it is not guarantee a complete seal. Thus, you cannot use soft absorber under the circumstance which hates oil.

Model selection

- Please select the model with acknowledging all the content of the latest catalog and technical document.
- Along with the number of times of use, reduction of internal oil, due to wear of parts, energy absorption capacity will decrease. Concerning it, we recommend selecting a size which is margin 20 to 40% or more with respect to the maximum absorption energy.
- Parallel use of adjustable soft absorber, please refrain it because it is difficult to tune the torques of all the absorber. For the parallel use, please choose the fixed type.
- Please limit the number of use of FED series, please limit up to 100 times.

Scattering pieces due to cap damage

- Failure to adhere to the specifications listed in the catalogue may cause the cap to break, resulting in scattering pieces that may cause injuries.
- Please install an anti-scattering cover

Pay attention to a loose retaining ring

- Any out of specification use may cause an abnormally increased internal pressure of the soft absorber and jump out of implemented parts by a disengaged retaining ring. Accordingly, as well as using within specification, please step away from the product to a distant place where safety is secured during operation.

Product Main Unit

- Please carefully handle the piston rod and do not scratch or stain with lubricating oil. Degraded durability or defective return will be caused.
- Please carefully handle the spring for an external spring type model to avoid damage by scratching. Breakage of the spring will be caused.
- Please do not turn the screw for oil supply port on the bottom of the soft absorber. Malfunctioning or scattering of oil will be caused due to oil leakage.
- Please never turn the piston rod for a product adopting the bellofram seal type. Oil leakage will be caused.

Eccentric load and eccentric angle

- A collision of a load with inclination angle larger than $\pm 2.5^\circ$ will cause the degradation of performance due to defective return of bent piston rod or local friction of sliding contacts, and the mother machine will be damaged.

* Types FK-2050, FK-2550, FA/FK-64100, FA/FK-64150 and FA-64200 shall be used within the inclination angle range of $\pm 1^\circ$

- A collision shall be aligned to the centerline of the piston rod. If the inclination angle exceeds $\pm 2.5^\circ$, please use with an inclination angle adapter. Adaptable up to $\pm 10^\circ$

Operating temperature

- Please use within the temperature range for use. Any use outside the range will lead to a shortened lifetime. Please use in an ambient temperature of $-5^\circ\text{C} - +70^\circ\text{C}$.

※ Some of the models have a different temperature range; please check the table of specifications for a specific model. Storage shall be in an ambient temperature $-10^\circ\text{C} - +80^\circ\text{C}$.

※ Models FA-1212, 1010 and 1215 shall be in $-20^\circ\text{C} - +50^\circ\text{C}$, Series FPD and FPR in $-10^\circ\text{C} - +60^\circ\text{C}$.

- Please use in the atmospheric environment. The use in vacuum or high pressure will cause oil leakage or damage.
- Use in a place where ozone is generated will cause the shortened lifetime.
- Please do not use in such an environment where cut chips, cutting oil, water, etc. contacts the piston rod. Malfunctioning or damage to mother machine will be caused by oil leakage due to packing damage.
- ※ The coolant proof specification may be applicable under some of the environments where cutting oil contacts. (Refer to a catalog for details)

Daily Inspection and Maintenance

- Performance and functions of a product will be degraded with the lifetime. Please carry out daily inspection and confirm that the required functions are satisfied and prevent the occurrence of an accident.
- Please check for looseness of mounting nuts. Any use with loose parts will cause damage or an accident.
- Please pay attention to abnormal vibration noises and vibrations. When a shock noise or vibration abnormally increases, please replace the unit because it is an indication of the lifetime limit.
A continued use will cause damage to a device on which this product is mounted.
- Please check the oil leakage and returning of piston rod. If a large quantity of oil leakage or defective returning of piston rod is observed, please replace if a problem occurs. The continued use under this condition will cause damage to machine in which the product is implemented. A continued use will cause damage to a device on which this product is mounted.
- The maintenance, such as disassembling, re-assembling, or oil replenishment, is not possible for a soft absorber from the structural reason.

A continued use will cause damage to a device on which this product is mounted.

- Any remodeling on the product (additional working, coating, welding, hardening, etc.) will void all warranties by our company.

How to Adjust an Adjustable Soft Absorber

- A soft absorber is adjusted by turning the "adjusting shaft" on the bottom of main unit. (Loosen the lock screw for turning the adjusting shaft) Two types of adjusting scale indications, 1-3 and 1-7 are provided according to the model.

Note : Please be sure to protect the soft absorber using an external stopper or a stopper nut for adjusting. When the adjustment is complete, please be sure to tighten the locking screw. The use without locking will rotate the adjusting shaft and a variation of property occurs. There are some models that do not have a locking mechanism. When using a model without a locking screw mechanism, the adjusting shaft will not be rotated by an ordinary use, but any use in a place where vibration is generated may cause the rotation of adjusting shaft. Please determine if a model can be used or not after confirmation with a real product.

Disposal

- When a soft absorber is no more necessary, please follow a proper disposal procedure in accordance with the local ordinance, rules, etc. as an industrial waste.

Selection of a Soft Absorber

- Please refer to an item "Compact Soft Absorbers" in the catalog for selection of a soft absorber
- [A "soft absorber selection software" is prepared as well. Please contact our sales department.

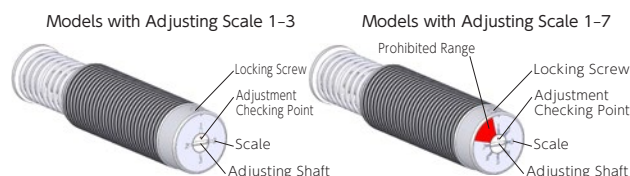
※ The selection can be made in our website as well. URL: <http://www.fujilatex.co.jp>

List of Optional Parts

A lineup of optional parts are provided as below. Please use in reference to the catalog.

- Inclined Angular Adapter, Stopper Nut, Urethane Cap, Nut, Drip-Proof Cap, Switched Holder, Flange, Side Mount

Note : Not all the optional parts are prepared for all models. Please understand this and use the optional parts prepared for only a specific model.



- Set the adjusting shaft to an "intermediate position of 1-2" first and observe a collision. If the Torque is felt strong turn in the direction of "1" of the scale, if the Torque is felt weak turn in the direction of "3" (Weaker Torque) 1 → 2 → 3 (Stronger Torque)
- The adjusting shaft can be rotated in 360° and is locked at any position.

- Set the adjusting shaft to approximately "2" first and observe a collision. If the Torque is felt strong turn in the direction of "1" of the scale, if the Torque is felt weak turn in the direction of "7" (Weaker Torque) 1 → 2 → 7 (Stronger Torque)
- The adjusting shaft can be rotated in 360° and is locked at any position, but please do not use or lock in the prohibited range.

Fuji Latex Co., Ltd. assumes no responsibility for any secondary disasters caused by a soft absorber. Please enforce a preventive measure against any secondary disasters.

Principles of Soft Absorbers

What is a Soft Absorber?

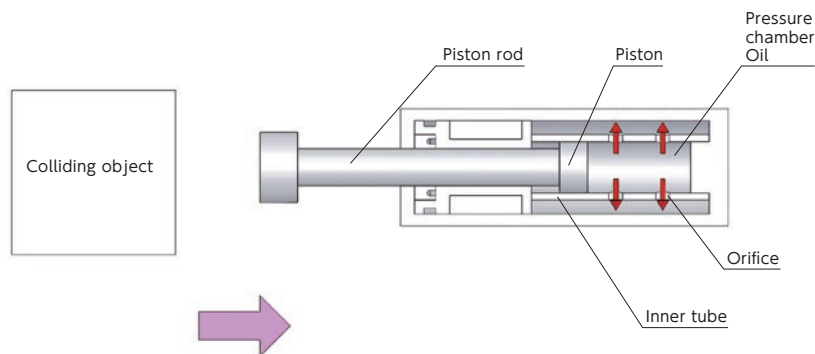
In order to increase the productivity of industrial machines, such as automatic assembling machines, various transportation machines, machines tools, and so on, their operating parts have been made to work faster. However, the resulting impact, vibration, and noise have caused adverse effects on the machine's performance and on the working environment. A soft absorber is an extremely convenient hydraulic buffer that can solve such problems. There are similar devices made of rubber, springs, or devices that use pneumatic pressure, but none of them rival the impact absorption characteristics of the hydraulic type, as illustrated below.

Rubber 	The rubber's elastic deformation captures the impact energy, and this energy is then accumulated in the rubber. As a result, the accumulated energy works as a repulsive force, and there is a high risk of a rebound being generated. Therefore, it is not an efficient impact absorber. On the other hand, it is extremely affordable and its installation is easy.	
Spring A	Like the rubber type, it captures the impact through elastic deformation and stores it as elastic energy. Once the impelling force is diminished, the stored energy is likely to repel as it does in the rubber type, causing a rebound.	
Pneumatic pressure B	It uses pneumatic pressure to absorb impact similar to the rubber and spring types, but because the compressed air is released to the atmosphere through an orifice, the energy does not accumulate. However, unless the rapid compression and releasing action through the orifice is well balanced, a rebound occurs as it does in the spring type.	
Hydraulic pressure C D E	It uses oil's velocity-squared resistance as well as viscosity resistance to absorb the energy, which is then converted into heat energy and released into the atmosphere. As a result, extremely efficient impact absorption is possible. A relatively compact design is capable of absorbing large impacts, and depending on its structure, the impact absorption characteristics can be modified as well.	

Comparison of Properties according to the Shock Absorbing Materials

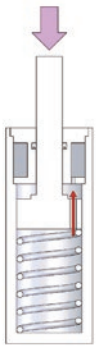
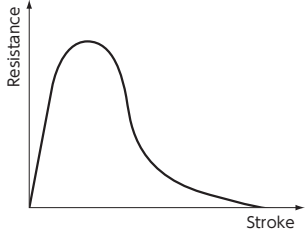
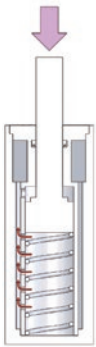
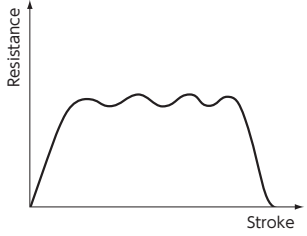
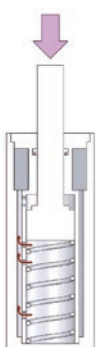
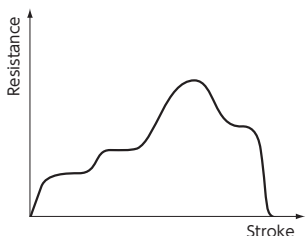
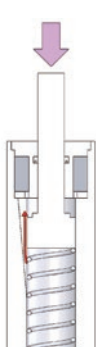
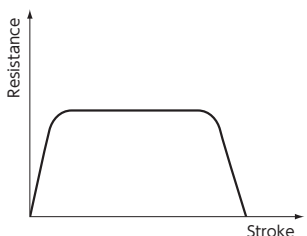
<Principles of Energy Absorption>

As shown below, when an object hits the piston rod, the motion is transferred to the oil in the pressure chamber through the piston rod. As a result, the oil inside the pressure chamber flows out of the orifices located in the inner tube. This causes compression in the pressure chamber. The product of this hydraulic pressure and the pressure-applied area of the piston is resistance, which acts on the colliding object. Soft absorbers use this resistance to apply the brake to the colliding object, slowing it down. The hydraulic pressure generated inside the pressure chamber is proportional to the square velocity of the colliding object, as long as the orifice size, oil viscosity, etc. are constant. This is called velocity-squared resistance.



Structural Absorption Characteristics of Soft Absorbers

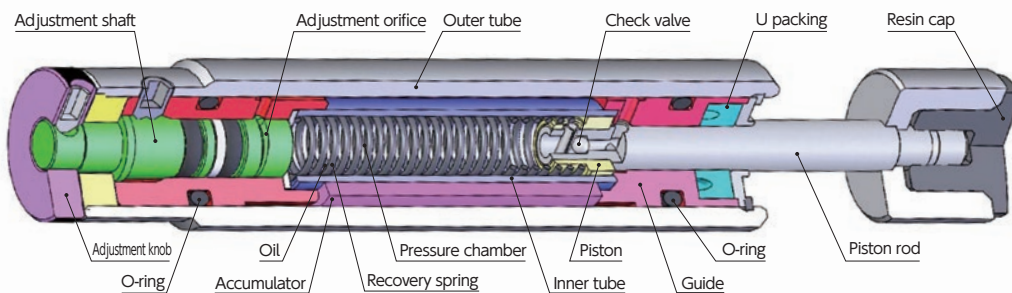
Soft absorbers are divided into two major categories based on how the orifice area changes, and they are further divided into four groups according to their absorption characteristics. Each of the absorption characteristics is described below.

Constant orifice	Single-orifice type		There are three structures in a single-orifice type: a dashpot structure that utilizes the space between the piston and cylinder tube; a single tube structure in which orifices are provided in the piston; and a double tube type single orifice structure (adjustable). Their resistance characteristics are shown in the graph to the right. When the piston moves within the cylinder tube, the product of the pressure generated in the inner tube and the piston area becomes the resistance. Throughout the entire stroke, the orifice area is constant. The resistance spikes immediately after the impact, and as the stroke advances, the speed decreases and the resistance decreases with it.	
Stroke-dependent orifice	Multiple-orifice type		It has a double structure comprising an outer tube and an inner tube. Similar to the single-orifice type, the resistance is the product of the pressure generated inside the inner tube when the piston is stroking and the piston area. The orifice area at the moment of impact is larger compared to the single type, and because it gradually decreases as the stroke advances, it can suppress the overall resistance. Theoretically, the resistance during a stroke can be maintained constant. Depending on the orifice design, the resistance characteristics can be modified according to the impact conditions.	
	Multiple varying orifice type		Although it has the same structure as the multiple-orifice type, resistance characteristics that are suitable for the intended use can be obtained rather than a constant damping force. FWM series is designed to absorb the kinetic energy in the first half of the stroke and to perform speed control during the last half of the stroke. Because of this, ideal energy absorption with respect to the air-cylinder thrust can be obtained.	
	Groove-orifice type		Through a single tube system, the orifice groove provided on the inside wall of the tube changes as the stroke advances. Similar to the multiple type, it has a large orifice area at the beginning of the stroke. As the stroke advances, the orifice area becomes smaller, suppressing the resistance. In addition, because the orifice area can be changed on a continuous basis, the resistance fluctuates less compared to the multiple type. Because of this, optimal energy absorption can be realized.	

Structures of Soft Absorbers (1)

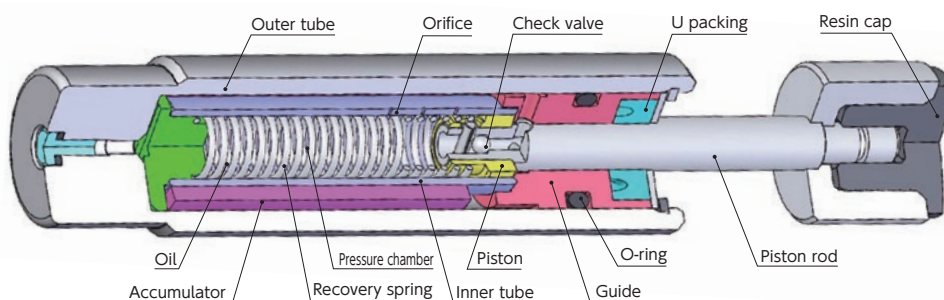
Soft absorbers have two types of structure: an adjustable type in which the absorption characteristics can be adjusted, and a fixed type, which is non-adjustable. Each structure is shown below.

Adjustable Type



By rotating the adjustment knob (adjustment shaft) located towards the rear of the main body, the amount of oil flowing out of the pressure chamber can be adjusted, which in turn adjusts the absorption characteristics. For the multiple types, the adjustment can only be made with the final orifice; therefore, the range of adjustment is limited. The adjustment range is wider in the single types. Because the orifice area changes in an analog manner, fine-tuning of the absorption characteristics is possible.

Fixed Type

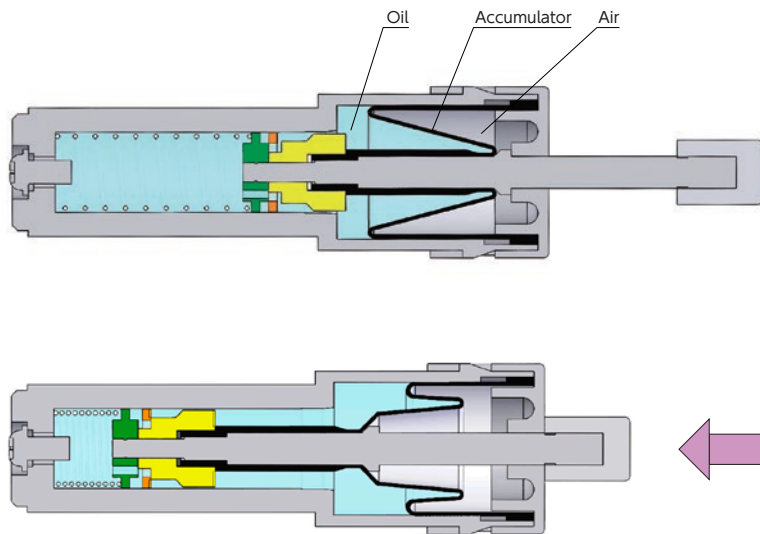


Because it has no adjustment mechanism, the overall length is shorter than the adjustable type. By customizing your orifice design, optimal absorption characteristics can be obtained. In addition, because the characteristics are fairly uniform, more than two of them can be used in parallel. For the fixed type FK series, high-speed, mid-speed, and low-speed types are generally available to accommodate various speeds.

Structures of Soft Absorbers (2)

Purpose of the Accumulator

Here, the purpose of the accumulator, which is shown on the previous page, shall be described. As shown below, when work collides with a soft absorber, the piston rod initiates a stroke, causing the oil to flow into the other side of the piston through the orifices. In short, the capacity of oil chamber B is reduced by the piston rod, and not all of the oil in oil chamber A is able to flow into the oil chamber B. In order to secure the capacity reduced by the piston rod, a self-foaming nitrile rubber is provided. The pressure of the oil compresses the rubber so that it absorbs the capacity that is equivalent to the piston rod. This is the role of an accumulator. Although silicone oil is used in a soft absorber, there are certain types of hydraulic oils that do not work well with certain types of accumulator. Using improper hydraulic oil causes the nitrile rubber to harden, reducing the durability of the soft absorber.



Soft Absorber's Cap: Securing Method and Materials

Diagrams illustrating how the caps are secured						
Applicable models	FA-1212 series FA-1010 series FA-1215 series FK-0404 series FK-0604 series	FA-0805 series FA-0806 series FA-1005 series FA-1008 series FWM-1008 series FK-1008 series FK-1417 series	FA/FWM-1210 FA/FWM-1410 FA/FWM-1612 FA/FWM-2016 FA/FWM-2530 FA/FWM-2725 FK-1210 FK-1412 FK-1612 FK-2016 FK-2530 FK-2725	FA/FWM-2540 FK-2540 FA/FWM-3035 FK-3035 FA/FWM-3650	FA/FWM-4250 FA/FWM-4280	FA/FK-3625A FA/FK-3650A FA/FK-4225B, 4250B, 4275B FA/FK-6450, 64100, 64150 FK-64200

Selection Procedure for Soft Absorbers

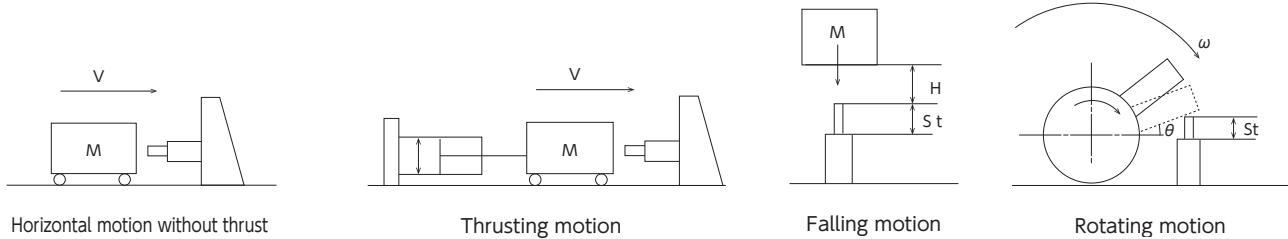
<Selection Procedure>

Item	Descriptions	
1	<p>Verification of the operating conditions</p> <p>↓</p> <p>↓</p> <p>↓</p> <p>↓</p>	<p>Verification of the types of motion: determine if it is a linear motion or a rotating motion, and whether thrust is present or not. Identify the specifications required for the selection.</p> <p>Verification of the colliding object's mass: Determine the maximum mass M (kg) of the colliding object.</p> <p>Verification of the impact rate: Determine the velocity V (m/s) just before it collides with the absorber. If the impact rate is not clear because the colliding object is cylindrical, the impact rate is determined by doubling the average velocity.</p>
2	<p>Calculation of the colliding object's kinetic energy</p> <p>↓</p>	<p>Based on the equation, calculate the kinetic energy, E_1 $E_1 = \frac{1}{2} \times M \times V^2$</p>
3	<p>Verification of thrust</p> <p>↓</p>	<p>Verify if thrust F is present, and if so, refer to the sample selection equation to determine the thrust. Based on these, select a tentative soft absorber.</p>
4	<p>Tentative determination of the absorber's stroke</p> <p>↓</p>	<p>Based on the tentatively selected soft absorber, the tentative stroke St is determined.</p>
5	<p>Calculation of thrusting energy</p> <p>↓</p>	<p>Determine Energy E_2 due to thrust. $E_2 = F \times St$</p>
6	<p>Calculation of the total energy E and selection of the soft absorber</p> <p>↓</p>	<p>Determine the total energy E. $E = E_1 + E_2$</p>
7	<p>Checking the maximum absorption energy per minute</p> <p>↓</p>	<p>Based on the operating cycle C (times/min) and the total energy, determine the amount of energy per minute and confirm that it is within the specifications. $E_3 \geq E \times C$</p>
8	<p>Checking the equivalent mass</p> <p>↓</p> <p>↓</p> <p>↓</p> <p>↓</p>	<p>When an impact is accompanied by thrust, always verify the equivalent mass, particularly for low-speed impacts (0.3m/s or slower).</p> <p>Me must be smaller than the catalogue specifications. $Me = \frac{2 \times E}{V^2}$</p> <p>$Me = M$ (mass of the colliding object) in horizontal impact without thrust.</p>
9	<p>Checking the operating temperature</p> <p>↓</p>	<p>Operating temperature must be within an acceptable range.</p>
10	<p>Other</p>	<p>Model selection can also be done on a computer using automatic selection software. Please contact our sales department for inquiries. You can also download information from our homepage. http://www.fujilatex.co.jp/</p>

Selection Method for Soft Absorbers

1. Verifying the Type of Motion

Impact conditions can be divided into following categories. When making a selection, it is necessary to calculate the energy for the relevant category and then consider the attachment method.



2. Energy Calculation

2-1. Linear motion

<Specifications to be verified>

- Mass of the colliding object : M(kg)
- Impact rate : V(m/s)
- Thrust : F(N) (air cylinder, thrust of the motor, friction, gravity, etc.)
- Number of soft absorber receivers : N
- Falling height : H(m) (Only if a falling motion is applicable. The soft absorber's stroke is not included.)
- Soft absorber stroke : St(m)

<Equations>

- Horizontal motion without thrust $E = \frac{1}{2} \times M \times V^2$
- Thrusting motion $E = \frac{1}{2} \times M \times V^2 + F \times St$
- Falling motion $E = M \times g \times (H + St)$ (g : Acceleration due to gravity=9.8m/s²)

2-2. Rotating motion

<Specifications to be verified>

- Mass of the colliding object : M(kg)
- Angular velocity of the impact : ω(rad/s)
- Torque : T(N·m)
- Moment of inertia : I(kg·m²)
- Stopping angle : θ(rad)

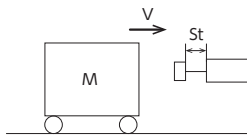
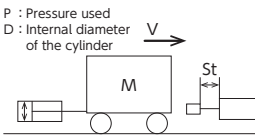
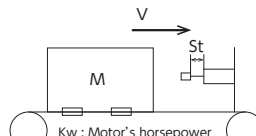
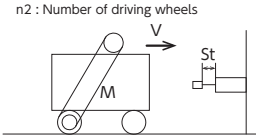
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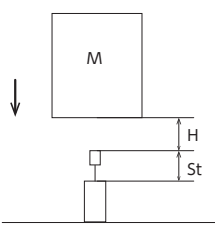
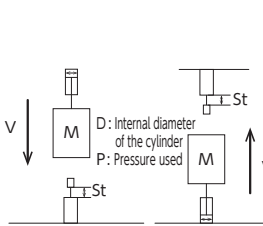
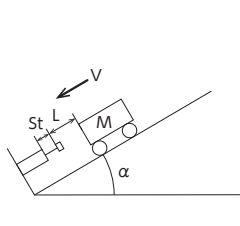
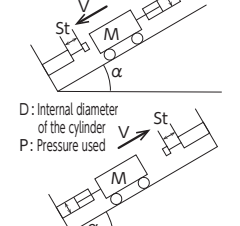
- Thrusting motion $E = \frac{1}{2} \times I \times \omega^2 + T \times \theta$

2-3. Other equations (the following equations indicate the minimum values; the actual values will be larger)

- Deceleration (G value) $G = \frac{0.051 \times V^2}{St}$ This indicates the degree of impact at the time of collision. (Smaller value means smaller impact)
- Braking force $F = \frac{E}{St}$ This indicates the resistance that is generated in the soft absorber at the moment of collision. This value is required for confirming the strength of attachment parts.
- Braking time $t = \frac{2 \times St}{V}$ This indicates the time it takes for the colliding object to come to a complete stop after colliding with a soft absorber.

Equations for the Selection of Soft Absorbers (1)

	Inertial impact (horizontal)	Cylindrical thrust (horizontal)	Motor-driven dolly (horizontal)	Friction-driven dolly (horizontal)
Impact (examples)		 P : Pressure used D : Internal diameter of the cylinder	 Kw : Motor's horsepower	 Kw : Motor's horsepower n1 : Total number of wheels n2 : Number of driving wheels
Mass of the colliding object (kg)	M	M	M	M
Impact rate (m/s)	V	V	V	V
Kinetic energy (J)	$E_1 = \frac{1}{2} M \cdot V^2$	$E_1 = \frac{1}{2} M \cdot V^2$	$E_1 = \frac{1}{2} M \cdot V^2$	$E_1 = \frac{1}{2} M \cdot V^2$
Thrust (N)	—————	$F = \frac{\pi D^2}{4} \times P \times 10^6$ ※1	$F = \frac{kw \times 2.5}{V} \times 10^3$ ※2	$\begin{cases} F = 0.25 \cdot M \cdot g \cdot \frac{n1}{n2} \\ F = \frac{kw \times 2.5}{V} \times 10^3 \end{cases}$ ※3
Thrusting energy (J)	—————	$E_2 = F \cdot St$	$E_2 = F \cdot St$	$E_2 = F \cdot St$
Total energy (J)	$E = \frac{E_1}{N}$ (N : Number of soft absorber receivers)	$E = \frac{E_1 + E_2}{N}$ (N : Number of soft absorber receivers)	$E = \frac{E_1 + E_2}{N}$ (N : Number of soft absorber receivers)	$E = \frac{E_1 + E_2}{N}$ (N : Number of soft absorber receivers)
Equivalent mass (kg)	$Me = \frac{M}{N}$	$Me = \frac{2 \cdot E}{V^2}$	$Me = \frac{2 \cdot E}{V^2}$	$Me = \frac{2 \cdot E}{V^2}$

	Free-fall (vertical)	Cylindrical thrust (up and down)	Free-fall (slope)	Cylindrical thrust (slope; up and down)
Collision Models		 D : Internal diameter of the cylinder P : Pressure used		 D : Internal diameter of the cylinder P : Pressure used
Collision Mass (kg)	M	M	M	M
Collision Speed (m/s)	$V = \sqrt{19.6H}$	V	$V = \sqrt{19.6L \cdot \sin \alpha}$	V
Kinetic Energy (J)	$E_1 = M \cdot g \cdot H$	$E_1 = \frac{1}{2} M \cdot V^2$	$E_1 = M \cdot g \cdot L \cdot \sin \alpha$	$E_1 = \frac{1}{2} M \cdot V^2$
Driving Force (N)	$F = M \cdot g$	$F = F_1 + M \cdot g$ (Descending) $F = F_1 - M \cdot g$ (Ascending) (F ₁ : Cylindrical thrust)	$F = M \cdot g \cdot \sin \alpha$	$F = F_1 + M \cdot g \cdot \sin \alpha$ (Descending) $F = F_1 - M \cdot g \cdot \sin \alpha$ (Ascending) (F ₁ : Cylindrical thrust)
Driving Force Energy (J)	$E_2 = F \cdot St$	$E_2 = F \cdot St$	$E_2 = F \cdot St$	$E_2 = F \cdot St$
Total Energy (J)	$E = \frac{E_1 + E_2}{N}$ (N : Number of soft absorber receivers)	$E = \frac{E_1 + E_2}{N}$ (N : Number of soft absorber receivers)	$E = \frac{E_1 + E_2}{N}$ (N : Number of soft absorber receivers)	$E = \frac{E_1 + E_2}{N}$ (N : Number of soft absorber receivers)
Equivalent Mass (kg)	$Me = \frac{2 \cdot E}{V^2}$	$Me = \frac{2 \cdot E}{V^2}$	$Me = \frac{2 \cdot E}{V^2}$	$Me = \frac{2 \cdot E}{V^2}$

Equations for the Selection of Soft Absorbers (2)

	Free-fall (rotating)	Cylindrical thrust (rotating)	Cylindrical thrust (horizontally rotating)
Collision Models			
Collision Mass (kg)	M	M	M
Collision Speed (m/s)	$V = \sqrt{\frac{2M \cdot g \cdot H}{I} \cdot R^2}$	$V = R \cdot \omega$	$V = R \cdot \omega$
Kinetic Energy (J)	$E_1 = M \cdot g \cdot H$	$E_1 = \frac{1}{2} I \cdot \omega^2$	$E_1 = \frac{1}{2} I \cdot \omega^2$
Driving Force (N)	$F = \frac{M \cdot g \cdot h}{R}$	$F = \left(\frac{\pi D^2}{4} \times P \times 10^6 + Mg \right) \times \frac{r}{R}$	$F = \frac{r_1}{R} \left(\frac{\pi D^2}{4} \right) \times P \times 10^6$
Driving Force Energy (J)	$E_2 = F \cdot St$	$E_2 = F \cdot St$	$E_2 = F \cdot St$
Total Energy (J)	$E = \frac{E_1 + E_2}{N}$ (N : Number of soft absorber receivers)	$E = \frac{E_1 + E_2}{N}$ (N : Number of soft absorber receivers)	$E = \frac{E_1 + E_2}{N}$ (N : Number of soft absorber receivers)
Equivalent Mass (kg)	$Me = \frac{2 \cdot E}{V^2}$	$Me = \frac{2 \cdot E}{V^2}$	$Me = \frac{2 \cdot E}{V^2}$

Explanation of the symbols

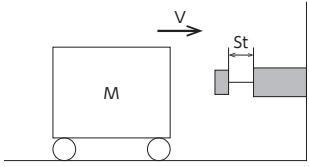
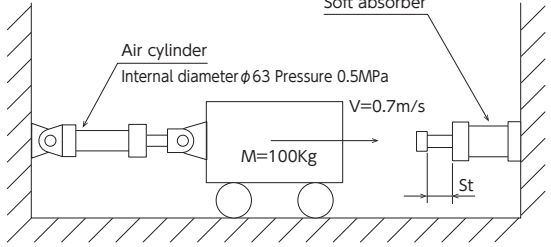
Symbol	Unit	Explanation	Symbol	Unit	Explanation
E	J	Total energy (per soft absorber)	α	rad	Sloping angle
E_1	J	Kinetic energy	θ	rad	Vibrational angle within the soft absorber stroke
E_2	J	Thrusting energy	R	m	Distance between the centre of rotation and absorber
P	MPa	Pressure used by the driving cylinder	r_1	m	Pitch circle radius of pinion gear
D	m	Internal diameter of the driving cylinder	r_2	m	Radius of turntable
M	kg	Mass of the colliding object	h	m	Distance between the centre of rotation and centre of gravity
V	m/s	Impact rate	$T\theta$	N·m	Driving torque
F	N	Thrust	ω	rad/s	Angular velocity
F_1	N	Air cylinder' s thrust	I	kg·m ²	Moment of inertia around the rotating shaft
St	m	Soft absorber stroke	N	Units	Number of soft absorber receivers
H	m	The distance an object falls until it hits the soft absorber	kw	kw	Motor capacity
L	m	Travelling distance on slope	n1		Total number of wheels
g	m/s ²	Acceleration due to gravity : 9.8m/s ²	n2		Number of driving wheels
G		Centre of gravity			

*1 Includes empty weight and external force of a cylinder, etc.

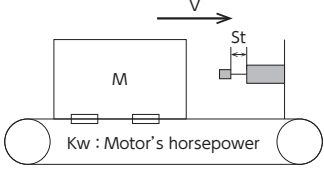
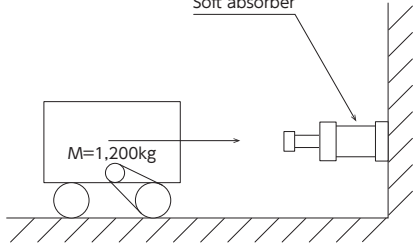
*2 Includes torque due to empty weight and torque due to motor, etc.

*3 Use whichever value is smaller.

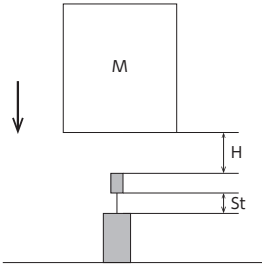
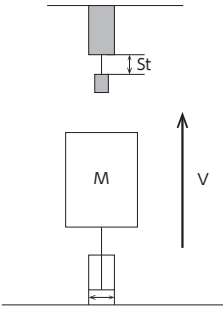
Sample Calculations for Selecting Soft Absorbers 1

	1. Inertial Impact (Horizontal)	2. Thrusting Motion due to Air Cylinder Thrust
Case Examples		
Specifications	<input type="checkbox"/> Mass of the colliding object M : 150kg <input type="checkbox"/> Impact rate V : 1.5 m/s <input type="checkbox"/> Operation frequency C : 1 time/min <input type="checkbox"/> Ambient temperature t : 0 ~ 25° C <input type="checkbox"/> Number of soft absorber receivers N : 1 unit	<input type="checkbox"/> Mass of the colliding object M : 100kg <input type="checkbox"/> Impact rate V : 0.7m/s <input type="checkbox"/> Operation frequency C : 1 time/min <input type="checkbox"/> Ambient temperature t : 0 ~ 25° C <input type="checkbox"/> Thrust F : Varies with the air cylinder D : Cylinder diameter--63mm P : Air pressure--0.5MPa <input type="checkbox"/> Number of soft absorber receivers N : 1 unit
Sample Calculations	<p>1. Calculating kinetic energy</p> $E_1 = \frac{1}{2} M \cdot V^2 = \frac{1}{2} \times 150 \times 1.5^2 = 169(\text{J})$ <p>2. Calculating total energy</p> $E = \frac{E_1}{N} = \frac{169}{1} = 169(\text{J})$ <p>According to Items 3 and 4 of the selection procedure on page 14, tentatively select FA-3625A3-C having the maximum absorption energy of 200(J) from the catalog.</p> <p>3. Feasibility check</p> <p>3-1. Using equivalent mass to check</p> $M_e = \frac{M}{N} = \frac{150}{1} = 150(\text{kg})$ <p>As the equivalent mass of FA-3625A3-C is 700(kg), it does not pose a problem. Based on these, FA-3625A3-C is selected</p>	<p>1. Calculating kinetic energy</p> $E_1 = \frac{1}{2} M \cdot V^2 = \frac{1}{2} \times 100 \times 0.7^2 = 24.5(\text{J})$ <p>2. Calculating thrusting energy</p> <p>Here, the soft absorber's stroke must be determined tentatively. In essence, because the absorber must have an absorption capacity larger than the calculated kinetic energy, tentatively select an absorber that has a capacity that is at least 24.5(J) higher than the catalogue specifications. Because the thrusting energy due to air cylinder must also be taken into consideration, tentatively select an absorber that has a capacity that is at least twice the kinetic energy. Here, FWM-2725FBD-* with a maximum absorption capacity of 79.4J is tentatively selected from the catalogue. Thrusting energy is determined as follows.</p> $F = \frac{\pi \cdot D^2}{4} \times P$ $= \frac{3.14 \times 0.063^2}{4} \times 0.5 \times 10^6$ $= 1,557(\text{N})$ $St = 25(\text{mm}) = 0.025(\text{m})$ $E_2 = F \times St = 1,557 \times 0.025$ $= 38.9(\text{J})$ <p>3. Determine the total energy.</p> $E = E_1 + E_2 = 24.5 + 38.9$ $= 63.4(\text{J})$ <p>4. Feasibility check</p> <p>4-1. Using absorption energy to check As the absorption energy of FWM-2725FBD-* is 79.4(J), it does not pose a problem.</p> <p>4-2. Using equivalent mass to check</p> $M_e = \frac{2E}{V^2} = \frac{2 \times 63.4}{0.7^2}$ $= 259(\text{kg})$ <p>As the equivalent mass of FWM-2725FBD-* is 450(kg), it does not pose a problem. Based on these, FWM-2725FBD-* is selected.</p>

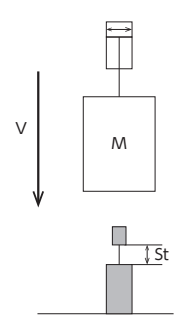
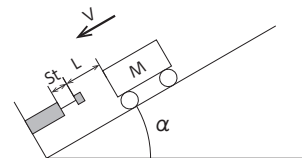
Sample Calculations for Selecting Soft Absorbers 2

	3. Motor's horsepower	4. Thrusting Energy due to Motor-Driven Dolly
Case Examples		
Specifications	<ul style="list-style-type: none"> <input type="checkbox"/> Mass of the colliding object M : 30kg <input type="checkbox"/> Impact rate V : 0.7m/s <input type="checkbox"/> Motor's horsepower kw : 1kw <input type="checkbox"/> Operation frequency C : 1 time/min <input type="checkbox"/> Ambient temperature t : 0~25° C <input type="checkbox"/> Number of soft absorber receivers N : 1 unit 	<ul style="list-style-type: none"> <input type="checkbox"/> Mass of the colliding object M : 1,200kg <input type="checkbox"/> Impact rate V : 0.5m/s <input type="checkbox"/> Operation frequency C : 1 time/min <input type="checkbox"/> Ambient temperature t : 0 ~ 25° C <input type="checkbox"/> Thrust F : Varies with the motor Motor output~3.7kw <input type="checkbox"/> Number of soft absorber receivers N : 1 unit
Sample Calculations	<p>1. Calculating kinetic energy</p> $E_1 = \frac{1}{2} M \cdot V^2 = \frac{1}{2} \times 30 \times 0.7^2 = 7.35 \text{ (J)}$ <p>2. Calculating thrust</p> $F = \frac{kw \cdot 2.5}{V} \times 10^3 = \frac{1 \times 2.5}{0.7} \times 10^3 = 3,571 \text{ (N)}$ <p>3. Calculating thrusting energy</p> <p>According to Items 3 and 4 of the selection procedure on page 14, tentatively select FA-3625A3-C having the maximum absorption energy of 200(J) from the catalog. The thrusting energy will be as follows.</p> $St = 25 \text{ (mm)} = 0.025 \text{ (m)}$ $E_2 = F \cdot St = 3,571 \times 0.025 = 89.3 \text{ (J)}$ <p>4. Calculating total energy</p> $E = \frac{E_1 + E_2}{N} = \frac{7.35 + 89.3}{1} = 96.6 \text{ (J)}$ <p>5. Feasibility check</p> <p>5-1. Using absorption energy to check As the absorption energy of FA-3625A3-C is 200(J), it does not pose a problem.</p> <p>5-2. Using equivalent mass to check</p> $Me = \frac{2 \cdot E}{V^2} = \frac{2 \times 96.6}{0.7^2} = 394 \text{ (kg)}$ <p>As the equivalent mass of FA-3625A3-C is 700(kg), it does not pose a problem. Based on these, FA-3625A3-C is selected.</p>	<p>1. Calculating kinetic energy</p> $E_1 = \frac{1}{2} M \cdot V^2 = \frac{1}{2} \times 1,200 \times 0.5^2 = 150 \text{ (J)}$ <p>2. Calculating thrusting energy</p> <p>Here, the thrust is first calculated. For a motor-driven dolly, the smaller calculated value based on the following two equations is used as thrust.</p> $(1) F = \frac{Kw \times 2.5}{V} \times 10^3 = \frac{3.7 \times 2.5}{0.5} \times 10^3 = 18,500 \text{ (N)}$ $(2) F = M \times g \times 0.25 \times \frac{n1}{n2} \quad (n1: \text{Number of driving wheels}, n2: \text{Total number of wheels})$ $= 1,200 \times 9.8 \times 0.25 \times \frac{1}{2}$ $= 1,470 \text{ (N)}$ <p>Therefore, 1,470N is used as thrust. At this point, a tentative absorber is selected. FA-3650A2-C is selected as the tentative soft absorber based on the kinetic energy. Thrusting energy is determined as follows:</p> $St = 50 \text{ (mm)} = 0.05 \text{ (m)}$ $E_2 = F \times St = 1,470 \times 0.05$ $= 73.5 \text{ (J)}$ <p>3. Determine the total energy.</p> $E = E_1 + E_2 = 150 + 73.5 = 223.5 \text{ (J)}$ <p>4. Feasibility check</p> <p>4-1. Using absorption energy to check As the absorption energy of FA-3650A2-C is 400 (J), it does not pose a problem.</p> <p>4-2. Using equivalent mass to check</p> $Me = \frac{2E}{V^2} = \frac{2 \times 223.5}{0.5^2}$ $= 1,788 \text{ (kg)}$ <p>As the equivalent mass of FA-3650A2-C is 2,700 (kg), it does not pose a problem. Based on these, FA-3650A2-C is selected.</p>

Sample Calculation for Selecting Soft Absorbers 3

	5. Free-Fall (vertical)	6. Cylindrical thrust (up)
Case Examples		
Specifications	<input type="checkbox"/> Mass of the colliding object M : 300kg <input type="checkbox"/> The distance of an object falls until it hits the shock absorber H : 0.15m/s <input type="checkbox"/> Operation frequency C : 1 time/min <input type="checkbox"/> Ambient temperature t : 0~25°C <input type="checkbox"/> Number of soft absorber receivers N : 2 units	<input type="checkbox"/> Mass of the colliding object M : 80kg <input type="checkbox"/> Impact rate V : 0.5m/s <input type="checkbox"/> Operation frequency C : 1 time/min <input type="checkbox"/> Ambient temperature t : 0~25°C <input type="checkbox"/> Thrust F : Air cylinder's thrust D : Internal diameter of the driving cylinder...80mm P : Pressure used by the driving Cylinder...0.5MPa <input type="checkbox"/> Number of soft absorber receivers N : 1 unit
Sample Calculations	<ol style="list-style-type: none"> Calculating impact rate $V = \sqrt{2 \cdot g \cdot H} = \sqrt{2 \times 9.8 \times 0.15} = 1.71 \text{ (m/s)}$ Calculating kinetic energy $E_1 = \frac{1}{2} \cdot M \cdot V^2 = \frac{1}{2} \times 300 \times 1.71^2 = 439 \text{ (J)}$ Calculating thrust 3-1. Using equivalent mass to check $F = M \cdot g = 300 \times 9.8 = 2,940 \text{ (N)}$ Calculating thrusting energy According to Items 3 and 4 of the selection procedure on page 14, tentatively select FK-4250BH-C having the maximum absorption energy of 520(J) from the catalog. * Since multiple absorbers are used, tentatively select the FK type (fixed type). The thrusting energy will be as follows. $St = 50 \text{ (mm)} = 0.05 \text{ (m)}$ $E_2 = F \cdot St = 2,940 \times 0.05 = 147 \text{ (J)}$ Calculating total energy $E = \frac{E_1 + E_2}{N} = \frac{439 + 147}{2} = 293 \text{ (J)}$ Feasibility check 6-1. Using absorption energy to check As the absorption energy of FK-4250BH-C is 520(J), it does not pose a problem. 6-2. Using equivalent mass to check $Me = \frac{2 \cdot E}{V^2} = \frac{2 \times 293}{1.71^2} = 200 \text{ (kg)}$ As the equivalent mass of FK-4250BH-C is 450(kg), it does not pose a problem. Based on these, two units of FK-4250BH-C are selected. 	<ol style="list-style-type: none"> Calculating kinetic energy $E_1 = \frac{1}{2} M \cdot V^2 = \frac{1}{2} \times 80 \times 0.5^2 = 10 \text{ (J)}$ Calculating thrust $F = \frac{\pi \cdot D^2}{4} \times P - M \cdot g$ $= \frac{\pi \times 80^2}{4} \times 0.5 - 80 \times 9.8 = 1,729 \text{ (N)}$ Calculating thrusting energy According to Items 3 and 4 of the selection procedure on page 14, tentatively select FWM-2725FBD-* having the maximum absorption energy of 79.3(J) from the catalog. The thrusting energy will be as follows. $St = 25 \text{ (mm)} = 0.025 \text{ (m)}$ $E_2 = F \cdot St = 1,729 \times 0.025 = 43.2 \text{ (J)}$ Calculating total energy $E_2 = \frac{E_1 + E_2}{N} = \frac{10 + 43.2}{1} = 53.2 \text{ (J)}$ Feasibility check 5-1. Using absorption energy to check As the absorption energy of FWM-2725FBD-* is 79.3(J), it does not pose a problem. 5-2. Using equivalent mass to check $Me = \frac{2 \cdot E}{V^2} = \frac{2 \times 53.2}{0.5^2} = 426 \text{ (kg)}$ As the equivalent mass of FWM-2725FBD-* is 450(kg), it does not pose a problem. Based on these, FWM-2725FBD-* is selected.

Sample Calculation for Selecting Soft Absorbers 4

	7. Cylindrical thrust (down)	8. Free-Fall (slope)
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Case Examples</p>		
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Specifications</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Mass of the colliding object M : 80kg <input type="checkbox"/> Impact rate V : 0.5m/s <input type="checkbox"/> Operation frequency C : 1 time/min <input type="checkbox"/> Ambient temperature t : 0~25°C <input type="checkbox"/> Thrust F : Air cylinder's thrust <li style="padding-left: 20px;">D : Internal diameter of the driving cylinder...80mm <li style="padding-left: 20px;">P : Pressure used by the driving Cylinder...0.5MPa <input type="checkbox"/> Number of the soft absorber receivers N : 1 unit 	<ul style="list-style-type: none"> <input type="checkbox"/> Mass of the colliding object M : 70kg <input type="checkbox"/> Travelling distance on slope L : 0.7m <input type="checkbox"/> Sloping angle α : 3° <input type="checkbox"/> Ambient temperature t : 0~25°C <input type="checkbox"/> Number of the soft absorber receivers N : 1 unit
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Sample Calculations</p>	<p>1. Calculating kinetic energy</p> $E_1 = \frac{1}{2} M \cdot V^2 = \frac{1}{2} \times 80 \times 0.5^2 = 10 \text{ (J)}$ <p>2. Calculating thrust</p> $F = \frac{\pi \cdot D^2}{4} \times P + M \cdot g$ $= \frac{\pi \times 80^2}{4} \times 0.5 + 80 \times 9.8 = 3,297 \text{ (N)}$ <p>3. Calculating thrusting energy</p> <p>According to Items 3 and 4 of the selection procedure on page 14, tentatively select FWM-3035TBD-* having the maximum absorption energy of 196(J) from the catalog.</p> <p>The thrusting energy will be as follows.</p> $St = 35 \text{ (mm)} = 0.035 \text{ (m)}$ $E_2 = F \cdot St = 3,297 \times 0.035 = 115 \text{ (J)}$ <p>4. Calculating total energy</p> $E = \frac{E_1 + E_2}{N} = \frac{10 + 115}{1} = 125 \text{ (J)}$ <p>5. Feasibility check</p> <p>5-1. Using absorption energy to check</p> <p>As the absorption energy of FWM-3035TBD - * is 196(J), it does not pose a problem.</p> <p>5-2. Using equivalent mass to check</p> $Me = \frac{2 \cdot E}{V^2} = \frac{2 \times 125}{0.5^2} = 1,000 \text{ (kg)}$ <p>As the equivalent mass of FWM-3035TBD - * is 1,300(kg), it does not pose a problem.</p> <p>Based on these, FWM-3035TBD - * is selected.</p>	<p>1. Calculating impact rate</p> $V = \sqrt{2 \cdot g \cdot L \cdot \sin \alpha}$ $= \sqrt{2 \times 9.8 \times 0.7 \times \sin 3^\circ} = 0.85 \text{ (m/s)}$ <p>2. Calculating kinetic energy</p> $E_1 = M \cdot g \cdot L \cdot \sin \alpha$ $= 70 \times 9.8 \times 0.7 \times \sin 3^\circ = 25.1 \text{ (J)}$ <p>3. Calculating thrusting energy</p> <p>According to Items 3 and 4 of the selection procedure on page 14, tentatively select FA-2016E3-* having the maximum absorption energy of 35.7(J) from the catalog.</p> <p>The thrusting energy will be as follows.</p> $St = 16 \text{ (mm)} = 0.016 \text{ (m)}$ $E_2 = M \cdot g \cdot \sin \alpha \cdot St$ $= 70 \times 9.8 \times \sin 3^\circ \times 0.016 = 0.57 \text{ (J)}$ <p>4. Calculating total energy</p> $E = \frac{E_1 + E_2}{N} = \frac{25.1 + 0.57}{1} = 25.7 \text{ (J)}$ <p>5. Feasibility check</p> <p>5-1. Using absorption energy to check</p> <p>As the absorption energy of FA-2016E3 - * is 35(J), it does not pose a problem.</p> <p>5-2. Using equivalent mass to check</p> $Me = \frac{2 \cdot E}{V^2} = \frac{2 \times 25.7}{0.85^2} = 71.1 \text{ (kg)}$ <p>As the equivalent mass of FA-2016E3 - * is 120(kg), it does not pose a problem.</p> <p>Based on these, FA-2016E3 - * is selected.</p>

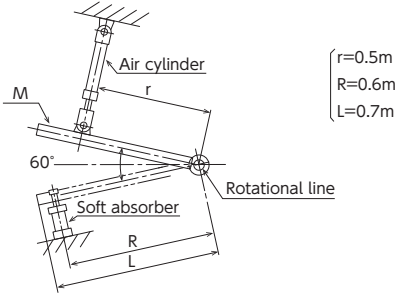
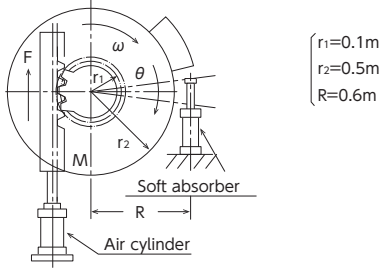
Sample Calculation for Selecting Soft Absorbers 5

	9. Cylindrical thrust (slope ; up)	10. Cylindrical thrust (slope ; down)
事例		
仕様	<input type="checkbox"/> Mass of the colliding object M : 70kg <input type="checkbox"/> Impact rate V : 0.5m/s <input type="checkbox"/> Thrust F : Air cylinder's thrust D : Internal diameter of the driving cylinder...80mm P : Pressure used by the driving Cylinder...0.4MPa <input type="checkbox"/> Sloping angle α : 30° <input type="checkbox"/> Ambient temperature t : 0~25°C <input type="checkbox"/> Number of the soft absorber receivers N : 1 unit	<input type="checkbox"/> Mass of the colliding object M : 70kg <input type="checkbox"/> Impact rate V : 1m/s <input type="checkbox"/> Thrust F : Air cylinder's thrust D : Internal diameter of the driving cylinder...80mm P : Pressure used by the driving Cylinder...0.4MPa <input type="checkbox"/> Sloping angle α : 30° <input type="checkbox"/> Ambient temperature t : 0~25°C <input type="checkbox"/> Number of the soft absorber receivers N : 1 unit
計算例	<p>1. Calculating kinetic energy</p> $E_1 = \frac{1}{2} \cdot M \cdot V^2 = \frac{1}{2} \times 70 \times 0.4^2 = 5.6 \text{ (J)}$ <p>2. Calculating thrust</p> $F = \frac{\pi \cdot D^2}{4} \cdot P - M \cdot g \cdot \sin \alpha$ $= \frac{\pi \times 80^2}{4} \times 0.4 - 70 \times 9.8 \times \sin 30^\circ$ $= 1,667 \text{ (N)}$ <p>3. Calculating thrusting energy According to Items 3 and 4 of the selection procedure on page 14, tentatively select FA-2725FB-* having the maximum absorption energy of 79.3(J) from the catalog. The thrusting energy will be as follows. St = 25 (mm) = 0.025 (m) $E_2 = F \cdot St = 1,667 \times 0.025 = 41.7 \text{ (J)}$</p> <p>4. Calculating total energy</p> $E = \frac{E_1 + E_2}{N} = \frac{5.6 + 41.7}{1} = 47.3 \text{ (J)}$ <p>5. Feasibility check 5-1. Using absorption energy to check As the absorption energy of FA-2725FB- * is 79.3(J), it does not pose a problem. 5-2. Using equivalent mass to check $M_e = \frac{2 \cdot E}{V^2} = \frac{2 \times 47.3}{0.4^2} = 591 \text{ (kg)}$ As the equivalent mass of FA-2725FB- * is 650 (kg), it does not pose a problem. Based on these, FA-2725FB- * is selected.</p>	<p>1. Calculating kinetic energy</p> $E_1 = \frac{1}{2} \cdot M \cdot V^2 = \frac{1}{2} \times 70 \times 1^2 = 35 \text{ (J)}$ <p>2. Calculating thrust</p> $F = \frac{\pi \cdot D^2}{4} \cdot P + M \cdot g \cdot \sin \alpha$ $= \frac{\pi \times 80^2}{4} \times 0.4 + 70 \times 9.8 \times \sin 30^\circ$ $= 2,354 \text{ (N)}$ <p>3. Calculating thrusting energy According to Items 3 and 4 of the selection procedure on page 14, tentatively select FK-3035M-* having the maximum absorption energy of 196(J) from the catalog. The thrusting energy will be as follows. St = 35 (mm) = 0.035 (m) $E_2 = F \cdot St = 2,354 \times 0.035 = 82.4 \text{ (J)}$</p> <p>4. Calculating total energy</p> $E = \frac{E_1 + E_2}{N} = \frac{35 + 82.4}{1} = 117.4 \text{ (J)}$ <p>5. Feasibility check 5-1. Using absorption energy to check As the absorption energy of FK-3035M- * is 196 (J), it does not pose a problem. 5-2. Using equivalent mass to check $M_e = \frac{2 \cdot E}{V^2} = \frac{2 \times 117.4}{1^2} = 234.8 \text{ (kg)}$ As the equivalent mass of FK-3035M- * is 390 (kg), it does not pose a problem. Based on these, FK-3035M- * is selected.</p>

Sample Calculation for Selecting Soft Absorbers 6

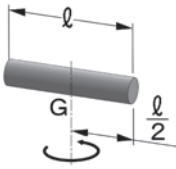
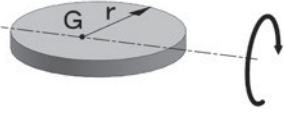
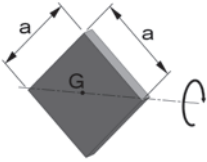

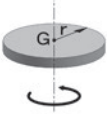
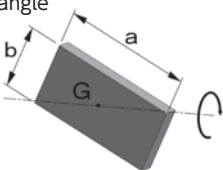
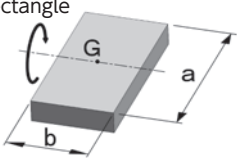
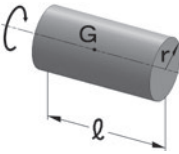
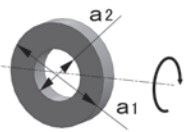
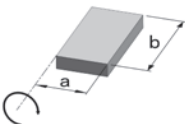
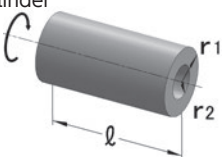
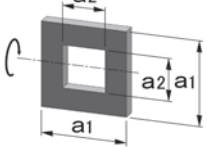
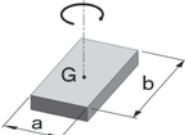

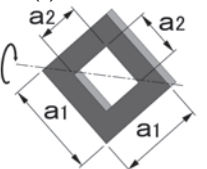
11. Free-Fall (rotating)																	
事例																	
仕様	<table border="0"> <tr> <td><input type="checkbox"/> Mass of the colliding object</td> <td>M : 15kg</td> </tr> <tr> <td><input type="checkbox"/> Overall length of a colliding object</td> <td>a : 0.12m</td> </tr> <tr> <td><input type="checkbox"/> Distance between the center of rotation and center of gravity</td> <td>h : 0.06m</td> </tr> <tr> <td><input type="checkbox"/> Distance between the center of rotation and absorber</td> <td>R : 0.1m</td> </tr> <tr> <td><input type="checkbox"/> Angle of fall of a colliding object</td> <td>α : 60°</td> </tr> <tr> <td><input type="checkbox"/> Number of the soft absorber receivers</td> <td>N : 1 unit</td> </tr> <tr> <td><input type="checkbox"/> Operation frequency</td> <td>C : 1 time/min</td> </tr> <tr> <td><input type="checkbox"/> Ambient temperature</td> <td>t : 0~25°C</td> </tr> </table>	<input type="checkbox"/> Mass of the colliding object	M : 15kg	<input type="checkbox"/> Overall length of a colliding object	a : 0.12m	<input type="checkbox"/> Distance between the center of rotation and center of gravity	h : 0.06m	<input type="checkbox"/> Distance between the center of rotation and absorber	R : 0.1m	<input type="checkbox"/> Angle of fall of a colliding object	α : 60°	<input type="checkbox"/> Number of the soft absorber receivers	N : 1 unit	<input type="checkbox"/> Operation frequency	C : 1 time/min	<input type="checkbox"/> Ambient temperature	t : 0~25°C
<input type="checkbox"/> Mass of the colliding object	M : 15kg																
<input type="checkbox"/> Overall length of a colliding object	a : 0.12m																
<input type="checkbox"/> Distance between the center of rotation and center of gravity	h : 0.06m																
<input type="checkbox"/> Distance between the center of rotation and absorber	R : 0.1m																
<input type="checkbox"/> Angle of fall of a colliding object	α : 60°																
<input type="checkbox"/> Number of the soft absorber receivers	N : 1 unit																
<input type="checkbox"/> Operation frequency	C : 1 time/min																
<input type="checkbox"/> Ambient temperature	t : 0~25°C																
計算例	<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p>1. Calculating kinetic energy Obtain the distance that an object falls from the angle of fall. $H = h \cdot \sin \alpha = 0.06 \times \sin 60^\circ = 0.051 \text{ (m)}$ $E_1 = M \cdot g \cdot H = 15 \times 9.8 \times 0.051 = 7.5 \text{ (J)}$</p> <p>2. Calculating thrust $F = \frac{h}{R} \cdot M \cdot g = \frac{0.06}{0.1} \times 15 \times 9.8 = 88.2 \text{ (N)}$</p> <p>3. Calculating thrusting energy According to Items 3 and 4 of the selection procedure on page 14, tentatively select FA-1612X3-* having the maximum absorption energy of 14.7(J) from the catalog. The thrusting energy will be as follows. St = 12 (mm) = 0.012 (m) $E_2 = F \cdot St = 88.2 \times 0.012 = 1.06 \text{ (J)}$</p> <p>4. Calculating total energy $E = \frac{E_1 + E_2}{N} = \frac{7.5 + 1.06}{1} = 8.56 \text{ (J)}$</p> </div> <div style="width: 48%;"> <p>5. Feasibility check</p> <p>5-1. Confirmation based on the absorbed energy There is no problem because the maximum absorption energy of FA-1612X3-* is 14.7(J).</p> <p>5-2. Confirmation based on the equivalent mass Obtain the impact rate from the moment of inertia. For the equation for obtaining the moment of inertia, refer to the Quick Reference for Moment of Inertia on page 32. $I = M \cdot \frac{a^2}{3} = 15 \times \frac{0.12^2}{3} = 0.072 \text{ (kg} \cdot \text{m}^2)$ $V = \sqrt{\frac{2 \cdot M \cdot g \cdot H}{I} \cdot R^2}$ $= \sqrt{\frac{2 \times 15 \times 9.8 \times 0.051}{0.072} \cdot 0.1^2} = 1.44 \text{ (m/s)}$ $Me = \frac{2 \cdot E_3}{V^2} = \frac{2 \times 8.56}{1.44^2} = 8.26 \text{ (kg)}$ As the equivalent mass of FA-1612X3-* is 35(kg), it does not pose a problem. Based on these, FA-1612X3-* is selected.</p> <p>5-3. Confirmation based on the eccentric angle $\theta = \tan^{-1} \left(\frac{St}{R} \right) = \tan^{-1} \left(\frac{0.012}{0.1} \right) = 6.8^\circ$ Since the eccentric angle of FA-1612X3-* is $\pm 2.5^\circ$, the eccentric angle adaptor needs to be used. In view of the foregoing, FA-1612X3-S and the eccentric angle adaptor OP-1010XB are selected.</p> </div> </div>																

Sample Calculation for Selecting Soft Absorbers 7

	12. Up-and-Down Motion due to Air Cylinder Thrust	13. Rotating Motion due to Air Cylinder Thrust
Case Examples		
Specifications	<input type="checkbox"/> Mass of the colliding object M : 260kg <input type="checkbox"/> Air Cylinder rate v : 0.5m/s <input type="checkbox"/> Operation frequency C : 1 time/min <input type="checkbox"/> Ambient temperature t : 0 ~ 25° C <input type="checkbox"/> Thrust F : Varies with the air cylinder D : Cylinder diameter...50mm P : Air pressure...0.5MPa <input type="checkbox"/> Number of soft absorber receivers N : 1 unit	<input type="checkbox"/> Mass of the colliding object M : 200kg <input type="checkbox"/> Air Cylinder rate v : 0.5m/s <input type="checkbox"/> Operation frequency C : 1 time/min <input type="checkbox"/> Ambient temperature t : 0 ~ 25° C <input type="checkbox"/> Thrust F : Varies with the air cylinder D : Cylinder diameter...80mm P : Air pressure...0.5MPa <input type="checkbox"/> Number of soft absorber receivers N : 1 unit
Sample Calculations	<p>1. Calculating kinetic energy</p> $E_1 = \frac{1}{2} I \omega^2 = \frac{1}{2} \times M \times \frac{L^2}{3} \times \left(\frac{v}{r}\right)^2$ $= \frac{1}{2} \times 260 \times \frac{0.7^2}{3} \times \left(\frac{0.5}{0.5}\right)^2 = 21.2(\text{J})$ <p>Impact rate $V = v \times \left(\frac{R}{r}\right) = 0.5 \times \frac{0.6}{0.5} = 0.6(\text{m/s})$</p> <p>2. Calculating thrusting energy</p> $E_2 = T\theta = \left(\frac{\pi \cdot D^2}{4} \times P \times 10^6 \times r + Mg \times \frac{L}{2}\right) \times \frac{St}{R}$ $= \left(\frac{3.14 \times 0.05^2}{4} \times 0.5 \times 10^6 \times 0.5 + 260 \times 9.8 \times \frac{0.7}{2}\right) \times \frac{St}{0.6}$ <p>As in previous examples, the soft absorber's stroke is tentatively determined. Here, FWM 3035TBD-*with a maximum absorption capacity of 196(J) is tentatively selected from the catalogue. Thrusting energy is determined as follows.</p> $E_2 = \left(\frac{3.14 \times 0.05^2}{4} \times 0.5 \times 10^6 \times 0.5 + 260 \times 9.8 \times \frac{0.7}{2}\right) \times \frac{0.035}{0.6} = 80.6(\text{J})$ <p>3. Determine the total energy. $E = E_1 + E_2 = 21.2 + 80.6 = 101.8(\text{J})$</p> <p>4. Feasibility check</p> <p>4-1. Using absorption energy to check As the absorption energy of FWM-3035TBD-*is 196(J), it does not pose a problem.</p> <p>4-2. Using equivalent mass to check</p> $Me = \frac{2E}{V^2} = \frac{2 \times 101.8}{0.6^2} = 565.6(\text{kg})$ <p>As the equivalent mass of FWM-3035TBD-* is 1300(kg), it does not pose a problem. Based on these, FWM-3035TBD-*is selected.</p>	<p>1. Calculating kinetic energy</p> $E_1 = \frac{1}{2} I \omega^2 = \frac{1}{2} \times M \times \frac{r_2^2}{2} \times \left(\frac{v}{r_1}\right)^2$ $= \frac{1}{2} \times 200 \times \frac{0.5^2}{2} \times \left(\frac{0.5}{0.1}\right)^2 = 312.5(\text{J})$ <p>Impact rate $V = v \times \left(\frac{R}{r_1}\right) = 0.5 \times \left(\frac{0.6}{0.1}\right) = 3(\text{m/s})$</p> <p>2. Calculating thrusting energy</p> $E_2 = T\theta = F \times r \times \frac{St}{R}$ $= \frac{3.14 \times 0.08^2}{4} \times 0.5 \times 10^6 \times 0.1 \times \frac{St}{0.6}$ <p>At this point, the soft absorber's stroke must be determined tentatively. FA-4250B3-C with a maximum absorption capacity of 520(J) is tentatively selected from the catalogue. Thrusting energy is determined as follows.</p> $E_2 = \frac{3.14 \times 0.08^2}{4} \times 0.5 \times 10^6 \times 0.1 \times \frac{0.05}{0.6} = 20.9(\text{J})$ <p>3. Determine the total energy. $E = E_1 + E_2 = 312.5 + 20.9 = 333.4(\text{J})$</p> <p>4. Feasibility check</p> <p>4-1. Using absorption energy to check As the absorption energy of FA-4250B3-C is 520 (J), it does not pose a problem.</p> <p>4-2. Using equivalent mass to check</p> $Me = \frac{2E}{V^2} = \frac{2 \times 333.4}{3^2} = 74(\text{kg})$ <p>As the equivalent mass of FA-4250B3-C is 6,500 (kg), it does not pose a problem. Based on these, FA-4250B3-C is selected</p>

Calculation Reference for Selecting Soft Absorbers 1

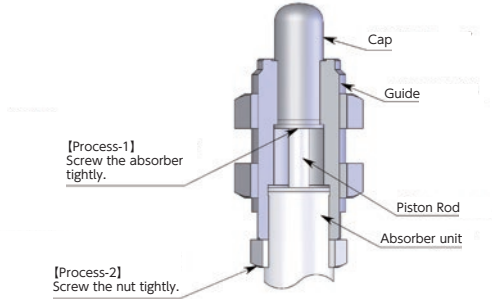
Quick Reference for Moment of Inertia

Shape	Slim rod 	Thin disc 	Thin square 
Rotating shaft	It is perpendicular to the rod and passes through the centre of gravity	It is parallel to the plain and passes through the centre of gravity	The axis passes through the centre of gravity and the opposing corner
Moment of inertia	$M \cdot \frac{l^2}{12}$	$M \cdot \frac{r^2}{4}$	$M \cdot \frac{a^2}{12}$
Shape	Slim rod 	Thin disc 	Thin rectangle 
Rotating shaft	It is perpendicular to the rod at one of the ends	It is perpendicular to the plain and passes through the centre of gravity	It is an axis that is parallel to the plain and passes through the centre of gravity
Moment of inertia	$M \cdot \frac{l^2}{3}$	$M \cdot \frac{r^2}{2}$	$M \cdot \frac{b^2 a^2}{6(b^2 + a^2)}$
Shape	Thin rectangle 	Cylinder 	Thin donut shape 
Rotating shaft	It is parallel to side b and passes through the centre of gravity	It is a central axis that passes through the centre of gravity	It is an axis that is parallel to the plain and passes through the central axis
Moment of inertia	$M \cdot \frac{a^2}{12}$	$M \cdot \frac{r^2}{2}$	$M \cdot \frac{(a_1^2 + a_2^2)}{16}$
Shape	Thin rectangle 	Hollow cylinder 	Square frame (i) 
Rotating shaft	It is parallel to side b and is on one side	It is a central axis that passes through the mutual center	It is an axis that is parallel to the plain and passes through the central axis
Moment of inertia	$M \cdot \frac{a^2}{3}$	$M \cdot \frac{r_1^2 + r_2^2}{2}$	$M \cdot \frac{(a_1^2 + a_2^2)}{12}$
Shape	Rectangle 	Sphere (filled) 	Square frame (ii) 
Rotating shaft	It is perpendicular to the plain and passes through the centre of gravity	It is an axis that passes through the centre of gravity	It is parallel to the plain and passes through the opposing corner
Moment of inertia	$M \cdot \frac{a^2 + b^2}{12}$	$M \cdot \frac{2r^2}{5}$	$M \cdot \frac{(a_1^2 + a_2^2)}{12}$

Unit : kg · m²

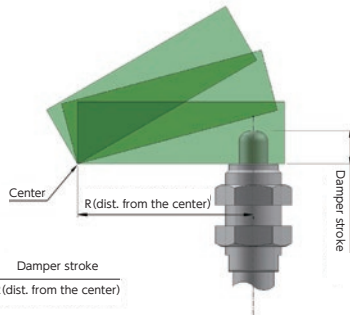
Calculation Reference for Selecting Soft Absorbers 2

How to mount the eccentric angle adopter



1. For a small eccentric angle

Easy placing absorber for a relatively small eccentric angle



$$\text{Polarizational angle} = \tan^{-1} \frac{\text{Damper stroke}}{R(\text{dist. from the center})}$$

Example of calculation

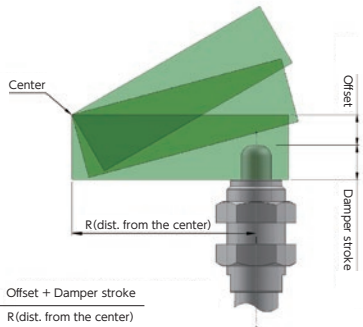
$$R=100\text{mm}$$

$$\text{Damper stroke}=16\text{mm}$$

$$\theta = \tan^{-1} \frac{16}{100} = 9^\circ$$

2. For a large eccentric angle

Easy placing absorber but the case that eccentric angle is large



$$\text{Polarizational angle} = \tan^{-1} \frac{\text{Offset} + \text{Damper stroke}}{R(\text{dist. from the center})}$$

Example of calculation

$$R=100\text{mm}$$

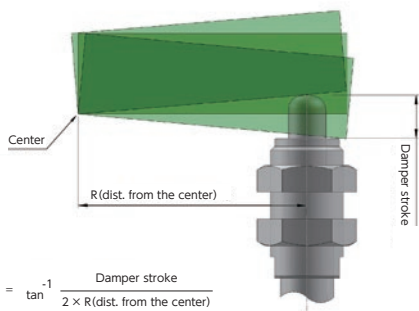
$$\text{Damper stroke}=16\text{mm}$$

$$\text{Offset}=15\text{mm}$$

$$\theta = \tan^{-1} \frac{16 + 15}{100} = 17^\circ$$

3. For the smallest eccentric angle

Collision object does not stop perpendicular to the absorber at the end of stroke but the case that the eccentric angle is the smallest



$$\text{Polarizational angle} = \tan^{-1} \frac{\text{Damper stroke}}{2 \times R(\text{dist. from the center})}$$

Example of calculation

$$R=100\text{mm}$$

$$\text{Damper stroke}=16\text{mm}$$

$$\theta = \tan^{-1} \frac{16}{2 \times 100} = 4.5^\circ$$

As above, depending on the mounting way, eccentric angle shall be differed even if the R(distance from the center) and damper stroke is same. Please confirm the maximum usable eccentric angle and use the eccentric angle adaptor within the allowance.

Cautions for Using Soft Absorbers 1

1. Parallel Use of Small Absorbers

1-1. Fixed soft absorbers

Fixed soft absorbers can be used in parallel, as they perform in a similar manner.

1-2. Adjustable soft absorbers

Parallel use of adjustable soft absorbers is not recommended, as some cannot be adjusted to perform equally. However, please contact our sales department when the following conditions apply.

1. The colliding work is guided and there is no risk of eccentric load.
2. When N is the number of receiving units and A is the required absorption energy capacity, A/N (absorption energy capacity per one unit) is sufficiently lower than the absorption capacity of the soft absorber to be used.

2.2. Operating Environment of Soft Absorbers

2-1. Do not use in an environment where oil mist, cutting oil, etc. may come in contact with a soft absorber. This is because oil can penetrate through the piston rod, disabling the stroke. When using under such circumstances, the soft absorber must be liquid-proofed.

1. Using absorbers with coolant specifications

There are models with triple packing.

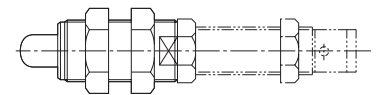
(This does not protect against all damages.)

2. Covering the piston rod with eccentric angle adaptors, etc.

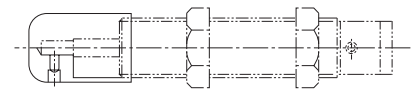
Although it will protect against direct oil contact, oil may still penetrate through a gap between the eccentric angle adaptor and the cap. (This does not protect against all damages.)

3. Using absorbers with liquid-proof cap specifications

Although it is effective when the rod is facing upward, it cannot be used when the rod is facing sideways or downward. It may also not be effective against oil mist.



(Eccentric angle adaptor)



(Liquid-proof cap)

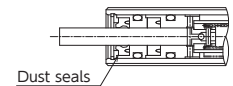
2-2. Using soft absorbers in a vacuum

Soft absorbers cannot be used in a vacuum. The absorber itself must be used outside the vacuum environment.

2-3. Using soft absorbers in dusty environments

Please use absorbers with dust seals.

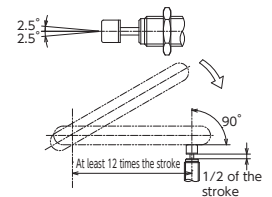
(However, depending on the environment, they may not be fully effective for ensuring durability.)



Dust seals

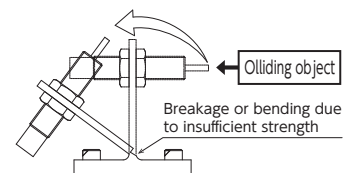
3. Protecting soft absorbers from eccentric load

Ensure that the angle of impact with respect to the soft absorber is 2.5° or less. A rod guide that acts as an eccentric load adaptor is required for an eccentric load with an angle of impact of over 2.5° . In principle, an adaptor that undergoes a rotating motion must be set in a location where the distance from the rotational centre of work is at least 12 times the stroke length, as well as where the collision occurs at a right angle at $1/2$ of the stroke length. In the event that it is perpendicular at the stroke end, please secure a distance that is at least 24 times the stroke length from the work's rotational centre.



4. Mounting strength of soft absorbers

The impact absorption of a soft absorber requires sufficient mounting strength. A good guideline is to secure a mounting strength that is 2 to 3 times larger than the max. drag based on the absorber specifications.

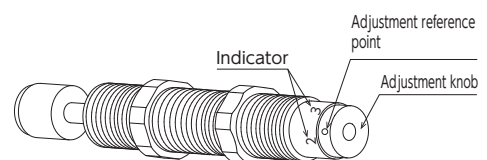


5. Adjusting soft absorbers

An adjustable soft absorber shall be adjusted to a proper position before use by rotating a knob for adjustment of shaft on the bottom of the unit.

●Types with Adjusting Scale 1-3 Weaker Torque 1←2→3 Stronger Torque

Set the adjusting scale approximately to the midpoint of "1-2" first, if the Torque is felt strong turn in the direction of "1" of scale, (Some of the models are not equipped with a locking screw)



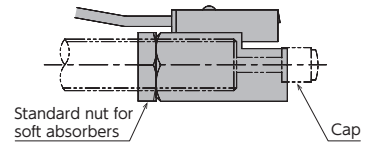
Cautions for Using Soft Absorbers 2

●Types with Adjusting Scale 1-7 Torque Weak 1←2←3←4→5→6→7 Torque Strong

Set the adjusting shaft to approximately "2" first. If the Torque is felt strong, turn in the direction of "1", and if the Torque is felt weak turn in the direction of "7" and fix with a locking screw before use.(The red range stands for the range in which the use is prohibited)

6. Cautions for attaching a holder with a switch

1. Set the holder's position so that the switch's tip and the edge of the metallic ring on the rod cap are at least 0.5mm apart. Otherwise, it will not work properly.
2. When attaching a holder with a switch to an adaptor, please be extremely careful not to screw it into the adaptor more than is necessary. This may cause the adaptor to press against the switch's sensor, damaging the switch. (When attaching, please ensure that the absorber's edge is not protruding out of the holder's edge.)



7. Cautions for Using the Switch

1. Do not use when it is in a transient state after the power is turned on (approx. 10ms).
2. Keep the cables as short as possible when using in places with a lot of noise. Also, please take all precautions, such as avoiding the parallel wiring of electric lines and power lines, as well as wiring within the same conduit.
3. Ensure that the switch does not come into direct contact with thinner-type chemicals.
4. Because it does not have a short-protection circuit, wiring must be done correctly.
5. Copper wire is used in the cable. Pay attention to the use in a copper free environment.

Model GXL-8F specifications Manufactured by SUNX

Item	Summary	Specification
Detection distance	Standard detected object 15×15×1 (Iron)	2.1mm
Power voltage		12~24VDC±10%
Consumption current		15mA or lower
Behaviour form		NO type
Output form		NPN open collector
Output capacity (with 24VDC power voltage)		100mA or lower
Protection feature		Comes with a surge absorption circuit
Residual Voltage	Inflowing Current	100 mA ± 2 V
Input/Output circuit diagram		Operation indicator light Red LED (lights up when the output is ON)
Response frequency		500Hz
Ambient operating temperature		-25~70°C
Ambient storage temperature		-40~85°C
Ambient operating humidity		35~85%RH
Ambient storage humidity		35~95%RH
Lead wire length		約1m
Mass	Including cable	約15g

8. Equivalent Mass of Soft Absorbers

During the soft absorber selection process, sometimes the absorption energy alone is considered without confirming the equivalent mass, or the maximum mass of the colliding object is confused with the equivalent mass. In order to make the most appropriate selection, the equivalent mass conditions must be satisfied. But why is satisfying the equivalent mass conditions so vital to securing optimal impact absorption? Selecting the best soft absorber means selecting the soft absorber that can generate the optimal drag. What are the factors that determine the optimal drag? Let us review the principles of soft absorbers.

F=PXA (P: Generated internal pressure of the absorber, A: Pressure-receiving piston area)

Based on the above equation, it is clear that if an appropriate P (Pressure) can be generated, the appropriate drag F can be obtained. One of the factors that determines the pressure P is the orifice area. An overview of the relationship between the orifice area, equivalent mass, and internal pressure is shown below.

Considering the relationship between impact rate and orifice area, using an absorber with a small orifice area to receive an impact from a high-speed collision results in an excessive increase in the internal pressure, causing a jolt. On the other hand, using an absorber with a large orifice area to receive a low-speed impact does not generate enough internal pressure, which in turn prevents

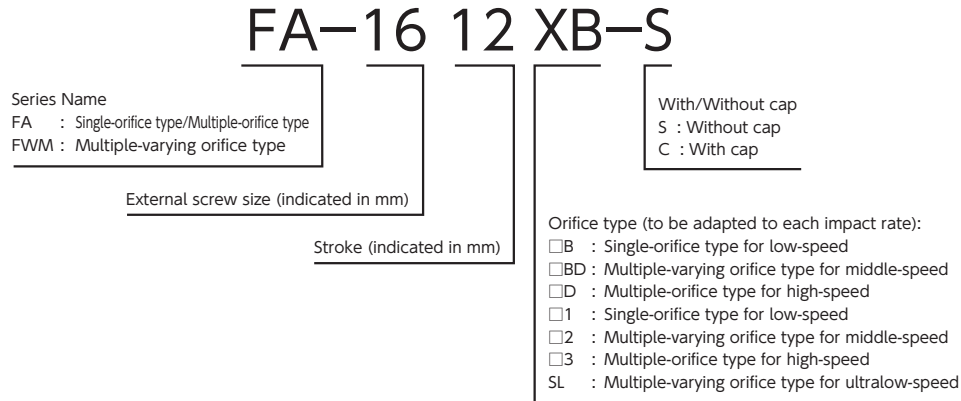
Orifice area	Equivalent mass Me	Generated internal pressure P	
Large	Small	Small	
Small	Large	Large	

the necessary drag from being generated. An adjustable absorber can adjust the size of the orifice area, allowing the absorber to generate the appropriate hardness, in another words, the drag, according to the impact rate. Consequently, maximum equivalent mass can be defined as the smallest possible orifice area in an adjustable absorber based on the relationship between equivalent mass and impact rate. In other words, it is the adjustable state in which the slowest impact rate under the operating conditions can be handled. Therefore, if the energy calculation and equivalent mass calculation based on the operating conditions result in a value that exceeds the maximum equivalent mass, the orifice area of the absorber cannot be set to the ideal size. In other words, it will not be able to decelerate the impact rate properly. The maximum absorption energy capacity of a soft absorber is a crucial factor in preventing the absorber from being damaged, and confirming the equivalent mass is therefore vital to the rate control for impact absorption. Therefore, both conditions must be satisfied for the absorber to function properly.

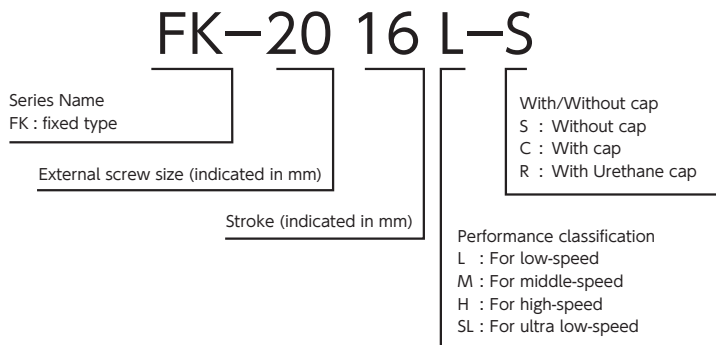
Key to Model Number

Key to Model Number

Soft Absorber (FA Series)



Soft Absorber (FK Series)



Soft Absorber

FPD-0715/0725/0745/0750/0755/0760 Series



Model Description

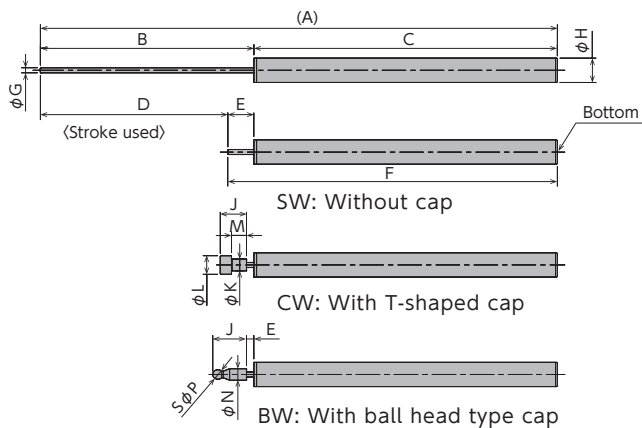
F P D - 0 7 4 5 A 1 - S W

① ② ③ ④ ⑤ ⑥

- ① Series name
- ② External diameter stroke
- ③ Stroke
- ④ With/Without self-returning
A : With Returning Spring
B : Without Returning Spring
- ⑤ Characteristics Number
1 : Low-load (low thrust) specifications
2 : Medium-load (medium thrust) specifications
3 : High-load (high thrust) specifications
- ⑥ Symbols indicating form SW: Without cap
CW : With T-shaped cap
BW : With ball head type cap

External Dimensions

FPD-0715/0745/0750/0755/0760 External Dimensions



FPD-0725 External Dimensions

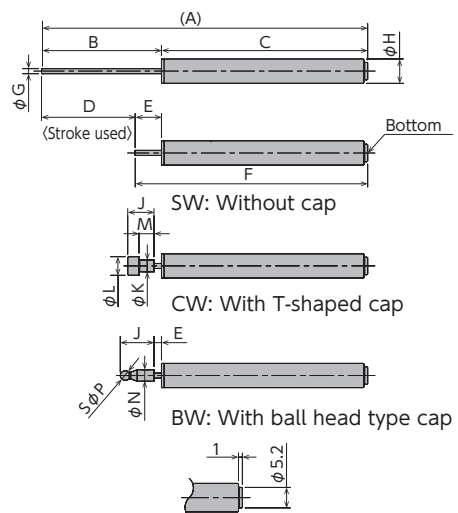


Fig. 1 Bottom Shape of FPD-0725 Series

*FPD-0715A Series are provided with Returning Spring Type only
*The shape of the bottom of FPD-0725 series diers from FPD-07□□ series. (Ref. Fig. 1)

Dimensions

MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Mass(g)			
FPD-0715A□-SW	66	22	44	15	7	51	1.5	7.2	-	-	-	-	-	-	2.7			
FPD-0715A□-CW	68	24			2	53			7	62	-	3.5	5.5	4	-	-	-	2.9
FPD-0725A□-SW	87	32	55	25	7	62			-	-	-	-	-	-	-	-	3.4	
FPD-0725A□-CW	89	34			2	64			7	62	7	3.5	5.5	4	-	-	-	3.6
FPD-0725B□-SW	87	32			7	62			7	62	-	-	-	-	-	-	-	3.2
FPD-0725B□-CW	89	34			2	64			7	62	7	3.5	5.5	4	-	-	-	3.4
FPD-0725B□-BW	91	36	9	-	-	66			9	-	-	-	3.4	2.8	3.3	3.3		
FPD-0745A□-SW	138	57	81	45	12	93			-	-	-	-	-	-	-	-	4.9	
FPD-0745A□-CW	140	59			7	95			7	95	7	3.5	5.5	4	-	-	-	5.1
FPD-0750B□-SW	138	57	81	50	7	88			-	-	-	-	-	-	-	-	4.7	
FPD-0750B□-CW	140	59			2	90			7	88	7	3.5	5.5	4	-	-	-	4.9
FPD-0750B□-BW	142	61			9	-			-	92	9	-	-	-	3.4	2.8	4.8	4.8
FPD-0755A□-SW	159	67	92	55	12	104	-	-	-	-	-	-	-	-	5.6			
FPD-0755A□-CW	161	69			7	106	7	106	7	3.5	5.5	4	-	-	-	5.8		
FPD-0760B□-SW	159	67		92	60	7	99	-	-	-	-	-	-	-	-	5.3		
FPD-0760B□-CW	161	69				2	101	7	99	7	3.5	5.5	4	-	-	-	5.5	
FPD-0760B□-BW	163	71	9	-	-	103	9	-	-	-	3.4	2.8	5.4	5.4				

*The characteristics number 1, 2, or 3 is inserted in the □.

●Products specification might be changed without notice.

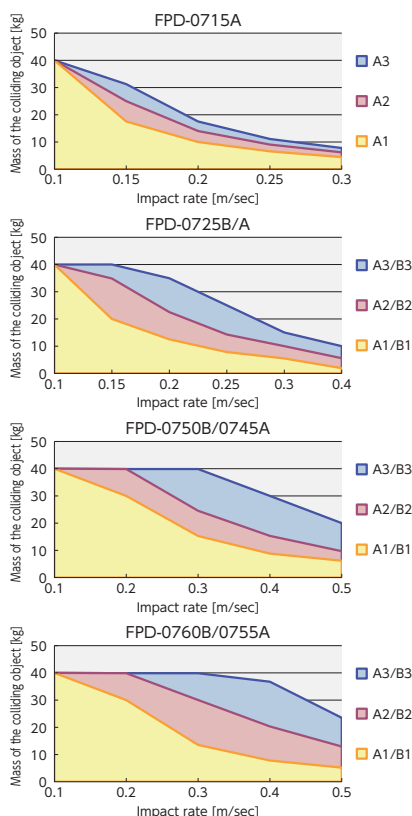
Specifications

MODEL	Max absorption every J (kgf·m)	Speed range m/s	Cylinder cap color
FPD-0715A1-□	0.2(0.02)	Under 0.3	Black
FPD-0715A2-□	0.28(0.028)	Under 0.3	White
FPD-0715A3-□	0.3(0.03)	Under 0.3	Blue
FPD-0725A1-□	0.25(0.025)	Under 0.4	Black
FPD-0725A2-□	0.45(0.045)	Under 0.4	White
FPD-0725A3-□	0.8(0.08)	Under 0.4	Blue
FPD-0725B1-□	0.25(0.025)	Under 0.4	Black
FPD-0725B2-□	0.45(0.045)	Under 0.4	White
FPD-0725B3-□	0.8(0.08)	Under 0.4	Blue
FPD-0745A1-□	0.7(0.07)	Under 0.5	Black
FPD-0745A2-□	1.25(0.125)	Under 0.5	White
FPD-0745A3-□	2.5(0.25)	Under 0.5	Blue
FPD-0750B1-□	0.7(0.07)	Under 0.5	Black
FPD-0750B2-□	1.25(0.125)	Under 0.5	White
FPD-0750B3-□	2.5(0.25)	Under 0.5	Blue
FPD-0755A1-□	0.75(0.075)	Under 0.5	Black
FPD-0755A2-□	1.6(0.16)	Under 0.5	White
FPD-0755A3-□	2.9(0.29)	Under 0.5	Blue
FPD-0760B1-□	0.75(0.075)	Under 0.5	Black
FPD-0760B2-□	1.6(0.16)	Under 0.5	White
FPD-0760B3-□	2.9(0.29)	Under 0.5	Blue

Common Specifications

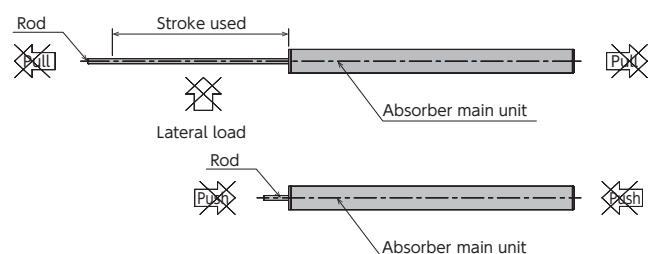
Recovering power of piston rod N (kgf)	With returning spring : ≤5 (0.5), Without returning spring : ≤1.5 (0.15)
Main unit material	Resin
Range of operating temperature, degree s C	5~40°C

Absorbable energy range under a horizontal inertial collision condition



Precautions for Use

- * Use with an external stopper.
- * Ensure that sufficient mounting strength is secured for this product.
- * 2 or more of this product can be used in parallel.
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber.
- * Do not press the piston rod of soft absorber in beyond the stroke used.
(This will cause the incomplete return of the piston rod and other failures.)
- * Do not pull the soft absorber beyond the stroke used.
(This will cause the damage or failure of the soft absorber.)
- * When the gap between the pressing time and the returning time of the piston rod is large, the durability may be affected. Confirm its performance in an actual machine before use.
- * * A falling impact will cause a deformation, damage, etc. Please handle with special care.



*The absorbable energy ranges above represent the properties under a condition where no thrusting force exists.

Soft Absorber

FPD-0805 Series



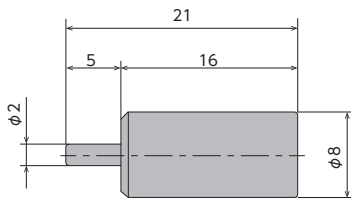
Model Description

F P D - 0 8 0 5 A 5 - S W

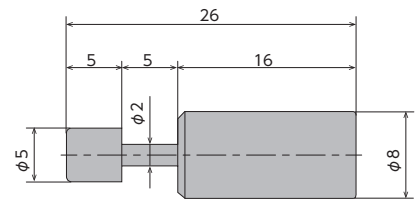
① ② ③ ④ ⑤ ⑥

- ① Series name
- ② External diameter
- ③ Stroke
- ④ Characteristics number
A1: Low-load specifications
A2: High-load specifications
- ⑤ Symbols indicating form
S : S type (Standard)
C : C type (Cap)
* Please refer to the external dimensions.
- ⑥ Symbols indicating color W : White

External Dimensions



FPD-0805A□-SW (S type)



FPD-0805A□-CW (C type)

Specifications

MODEL	Max absorption energy J (kgf·m)	Impact speed range m/s	Push Speed rang mm/s	Max load thrust N(kgf)	Cylinder cap color
FPD-0805A1	0.2	0.5 or lower	-	-	Black
FPD-0805A2	0.3	0.5 or lower	-	-	White
FPD-0805A5	-	-	50 or lower	80(8)	Blue
FPD-0805A7	-	-	20 or lower	100(10)	Brown

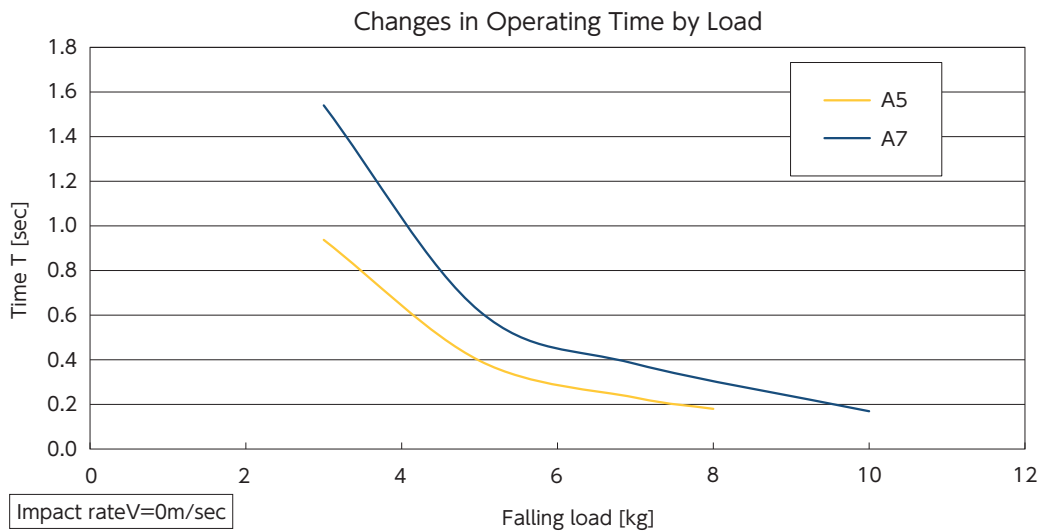
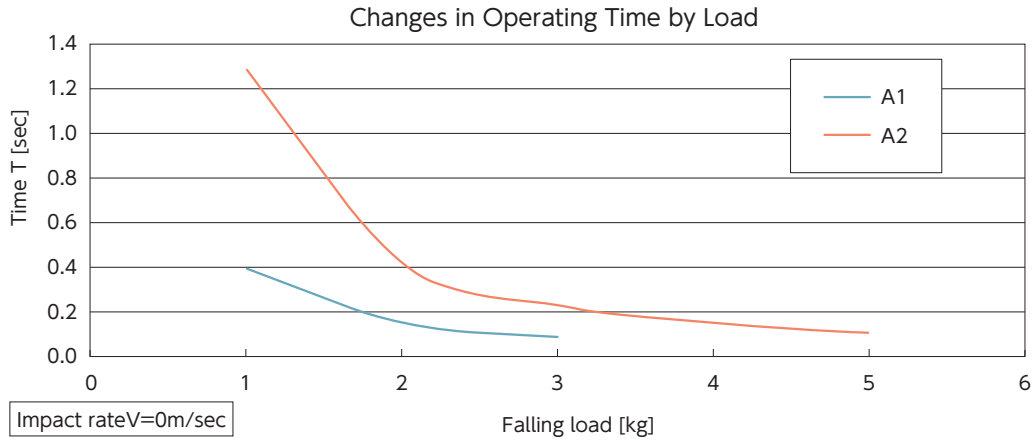
* For the motion-time of each load, please see the next page.

Common Specifications

Stroke (S/C type)	mm	5	Main Unit Material	Resin
Recovering power of piston rod	N(kgf)	6(0.6) or lower	Range of operating temperature, degrees °C	5~40
Mass	g	S type =1.3, C type =1.5		

●Products specification might be changed without notice.

Graph of Operating Time by Load



Precautions for Use

- * Use with an external stopper.
- * Ensure that sufficient mounting strength is secured for this product.
- * 2 or more of this product can be used in parallel.
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber.
 Allowable eccentric angle: within $\pm 2.5^\circ$
- * Do not pull the soft absorber beyond the stroke used.
 (This will cause the damage or failure of the soft absorber.)
- * Do not press the piston rod of soft absorber in beyond the stroke used.
 (This will cause the incomplete return of the piston rod, and other failures.)
- * When the gap between the pressing time and the returning time of the piston rod is large, the durability may be affected. Confirm its performance in an actual machine before use.



Soft Absorber

FPD-1006/1008 Series



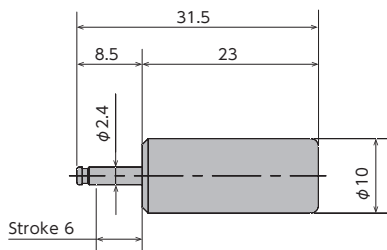
Model Description

F P D - 1 0 0 6 A 8 - S W

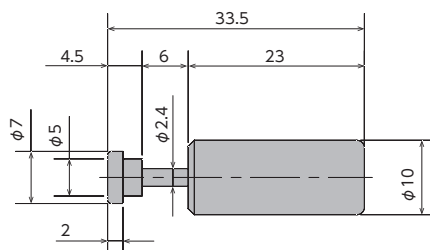
① ② ③ ④⑤ ⑥ ⑦

- ① Series name
- ② External diameter
- ③ Stroke
- ④ With/Without self-returning
A : With returning spring
B : Without returning spring
- ⑤ Characteristics number
3, 5 : High-load specifications
8, 12, 15 : Low-load specifications
- ⑥ Symbols indicating form
S : S type (Standard)
C : C type (Cap)
*Please refer to the external dimensions.
- ⑦ Symbols indicating color W : White

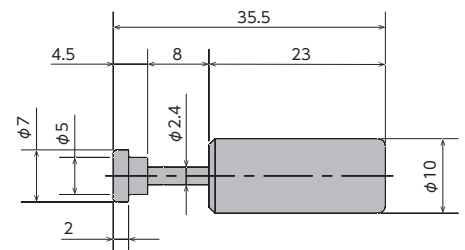
External Dimensions



FPD-1006A□-SW(S type)



FPD-1006A□-CW(C type)



FPD-1008B□-CW(C type)

* FPD-1006 Series are supplied only in types implementing a return spring, and FPD-1008 Series are supplied only in C-Type without a return spring.

Specifications

MODEL	Max absorption energy J(kgf·m)	Impact speed range m/s	Push Speed rang mm/s	Max load thrust N(kgf)	Cylinder cap color
FPD-1006A3	0.3	Under 0.5	-	-	Black
FPD-1006A5	0.4	Under 0.5	-	-	White
FPD-1006A8	-	-	Under 40	120(12)	Blue
FPD-1006A12	-	-	Under 30	160(16)	Brown
FPD-1006A15	-	-	Under 20	200(20)	Gray
FPD-1008B3	0.4	Under 0.5	-	-	Black
FPD-1008B5	0.5	Under 0.5	-	-	White
FPD-1008B8	-	-	Under 40	120(12)	Blue
FPD-1008B12	-	-	Under 30	160(16)	Brown
FPD-1008B15	-	-	Under 20	200(20)	Gray

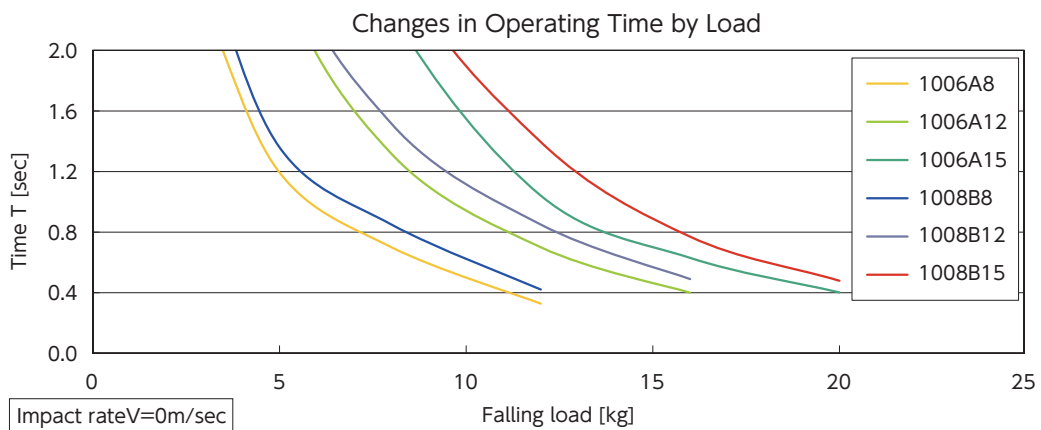
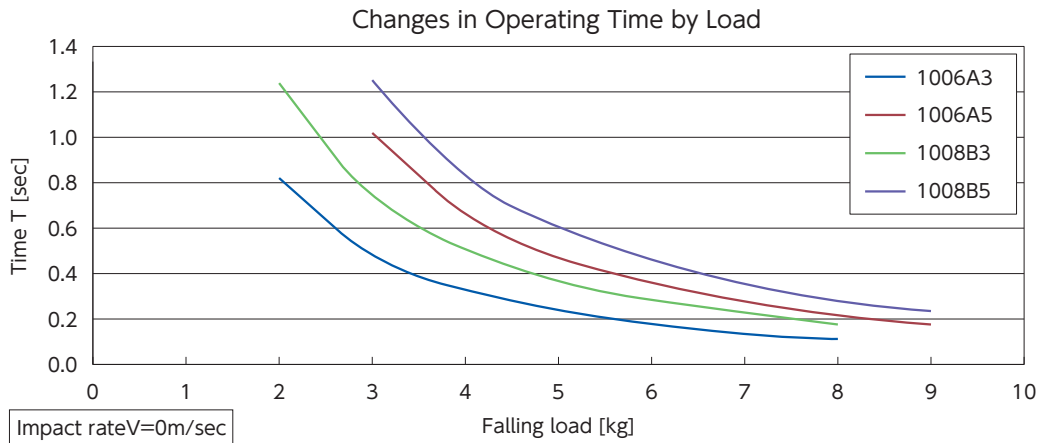
* For the motion-time of each load, please see the next page.

Common Specifications

Stroke	FPD-1006 6mm	Mass	FPD-1006 S type 2.9g
	FPD-1008 8mm		FPD-1006 C type 3.1g
Recovering power of piston rod N(kgf)	FPD-1006 Under 5(0.5)	Main unit material	FPD-1008 C type 3.0g
	FPD-1008 Under 1(0.1)		Resin
Range of operating temperature, degrees °C			5~40

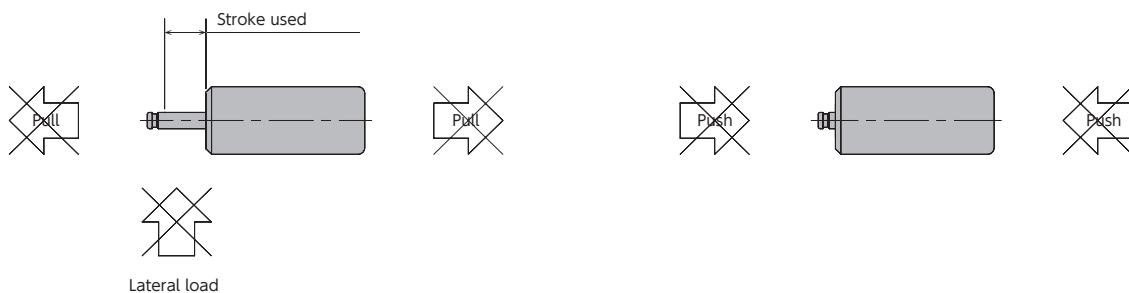
●Products specification might be changed without notice.

Graph of Operating Time by Load



Precautions for Use

- * Use with an external stopper.
- * Ensure that sufficient mounting strength is secured for this product.
- * 2 or more of this product can be used in parallel.
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber.
 Allowable eccentric angle: within $\pm 2.5^\circ$
- * Do not pull the soft absorber beyond the stroke used.
 (This will cause the damage or failure of the soft absorber.)
- * Do not press the piston rod of soft absorber in beyond the stroke used.
 (This will cause the incomplete return of piston rod, and other failures.)
- * When the gap between the pressing time and the returning time of the piston rod is large, the durability may be affected.
 Confirm its performance in an actual machine before use.



Soft Absorber

FPD-1012 Series



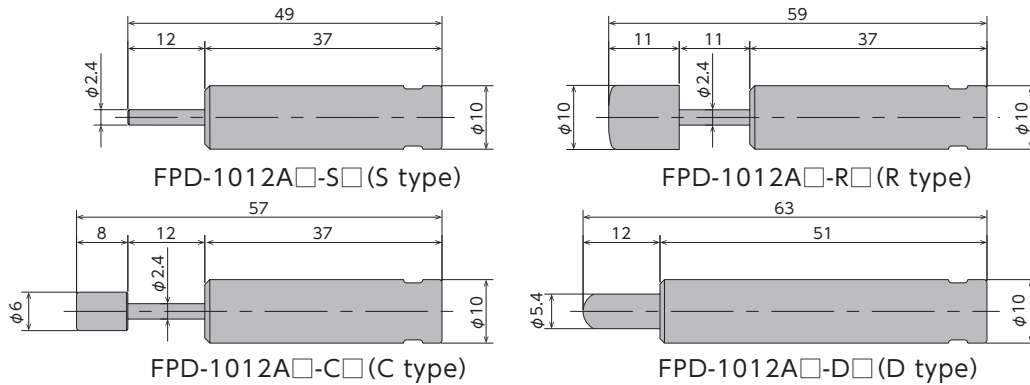
Model Description

FPD - 1012 A1 - SW

① ② ③ ④ ⑤ ⑥

- ① Base model
- ② External diameter
- ③ Stroke
- ④ Symbols indicating characteristics
 - A1 : Low-load specifications
 - A3 : Medium-load specifications
 - A5 : High-load specifications
- ⑤ Symbols indicating form
 - S : S type (Standard)
 - C : C type (Cap)
 - R : R type (Elastomer cap)
 - D : D type (Eccentric angle cap)
 - * Please refer to the external dimensions.
- ⑥ Color symbols W : White B : Black

External Dimensions



Specifications

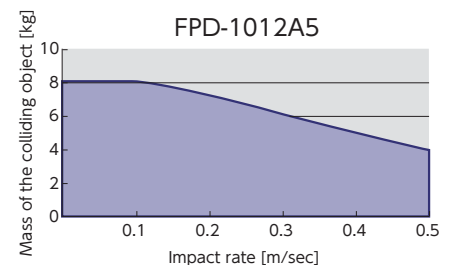
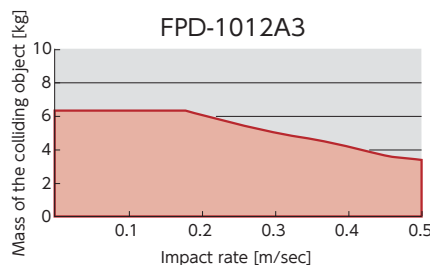
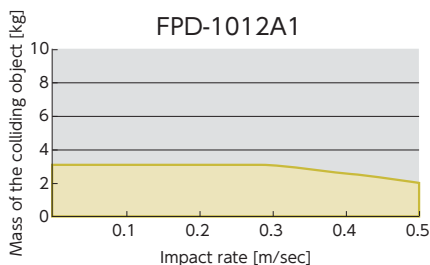
MODEL	load [kg]	Max absorption energy J (kgf·m)	Speed rang m/s	Cylinder cap color
FPD-1012A1	1	0.5 (0.05)	0.5 or lower	Black
FPD-1012A3	3	0.8 (0.08)	0.5 or lower	White
FPD-1012A5	5	1.0 (0.10)	0.5 or lower	Blue

* For the motion-time of each load, please see the next page.

Common Specifications

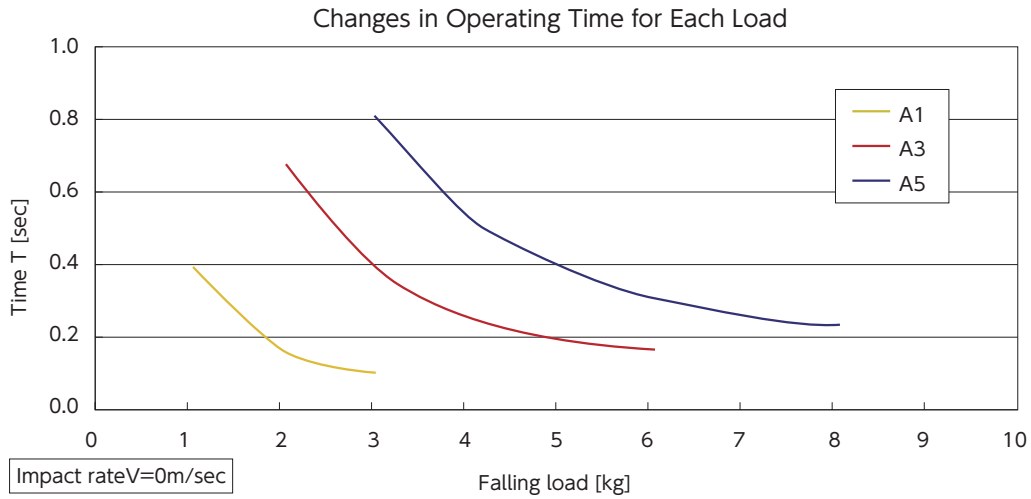
Stroke (S/C/D type)	mm	12	Mass	g	S type= 4.5, C type= 5.0, R type=5.7, D type =6.0
Stroke (R type)	mm	11	Main unit material	Resin	
Recovering power of the piston rod	N (kgf)	3 (0.3) or less	Operating temperature	℃ 5~40	

Impact rate and mass of the colliding object in freefall



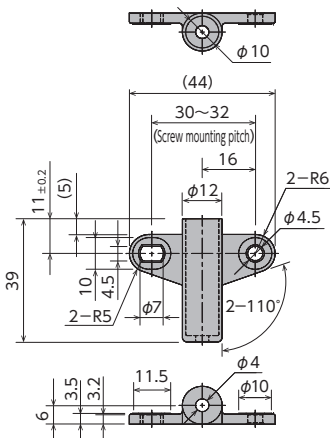
●Products specification might be changed without notice.

Characteristics Graph



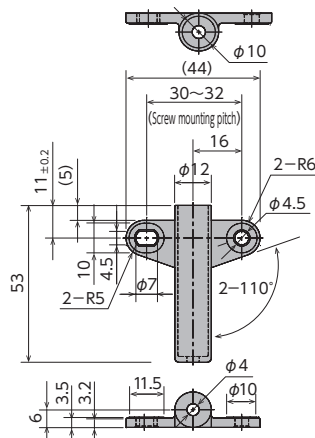
Optional Parts

OP-200-01B/W S/C/R type



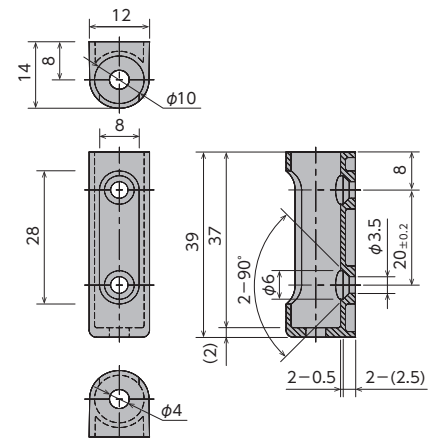
Screw: M4 (Truss screw)
 Recommended tightening torque : 0.5N·m

OP-200-02B/W D type



Screw: M4 (Truss screw)
 Recommended tightening torque : 0.5N·m

OP-200-03B/W S/C/R/D type

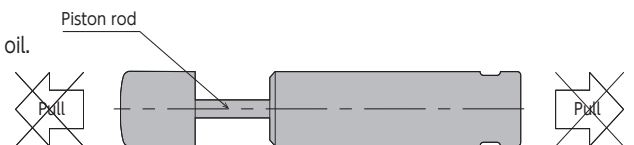


Screw: M3 (Flat head screw)
 Recommended tightening torque : 0.3N·m

- *These adaptors are dedicated for FPD-1012A series
- *They make it easy to install absorbers.
- *There are 2 colors: white and black.
- *Material : Polyacetal (POM)

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Use with an external stopper.
- * Ensure that sufficient mounting strength is secured for this product.
- * 2 or more of this product can be used in parallel.
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber.
 - S/C/R type ... Allowable eccentric angle: $\pm 2.5^\circ$ or less
 - D type Allowable eccentric angle: $\pm 6^\circ$ or less
- * Do not pull the piston rod of the soft absorber.



(This will cause air to get inside the soft absorber, causing ineffective stroke, abnormal sounds, and other damage to the soft absorber.)
 * The difference between the speed of stroke and return of piston rod might influence the durability of the damper. So, please confirm sufficient performance on actual machine before use.

Soft Absorber

FPD-1016 Series



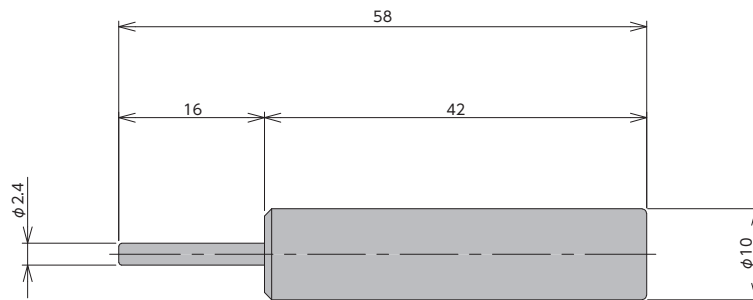
Model Description

F P D - 1 0 1 6 A 3 0 - S W

① ② ③ ④ ⑤ ⑥

- ① Series name
- ② External diameter
- ③ Stroke
- ④ Symbols indicating characteristic
A30: Low-load specification
A40: High-load specification
- ⑤ Symbols indicating form
S: S type (Standard)
*Please refer to the external dimensions
- ⑥ Symbols indicating color W : White

External Dimensions



FPD-1016A□-SW

Specifications

MODEL	Push speed range mm/s	Max load thrust N (kgf)	Cylinder cap color
FPD-1016A30-SW	15 or lower	300(30)	black
FPD-1016A40-SW		400(40)	white

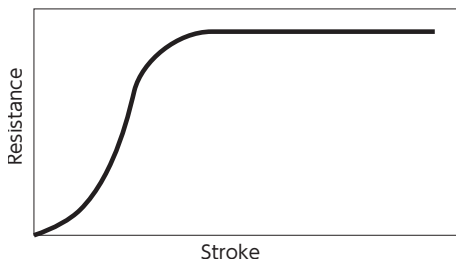
* For the motion-time of each load, please see the next page.

Common Specifications

Stroke	mm	16	Mass	g	5.2
			Main unit material		Resin
Recovering power of piston rod	N(kgf)	10 (1.0) or lower	Range of operating temperature	°C	5~40

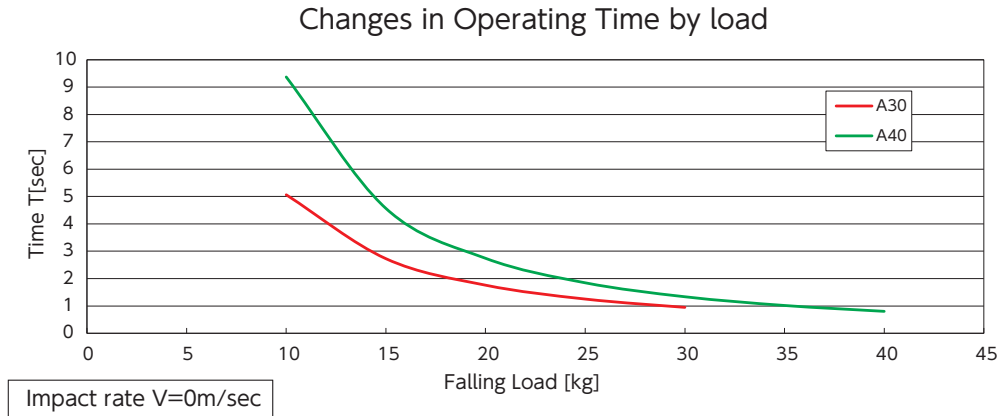
Waveform of Resistance

Waveform of Resistance: When pressing constant speed (F.Y.R.)

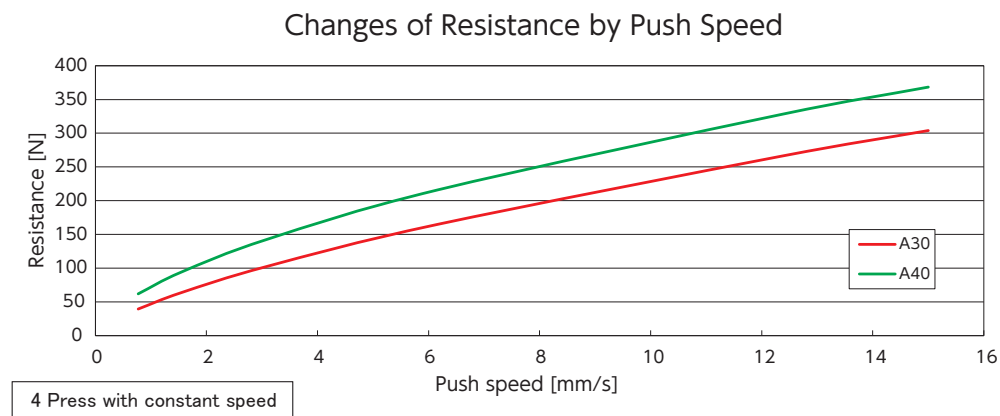


●Products specification might be changed without notice.

Graph of Operating Time by Load

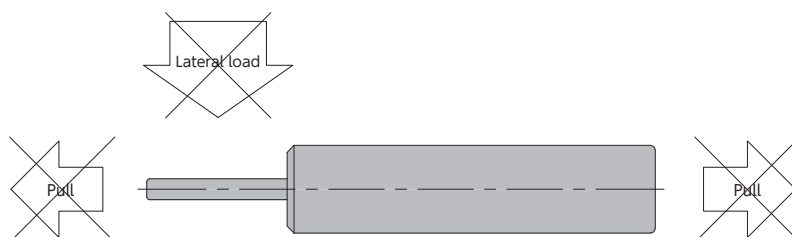


Graph of Resistance by Push Speed



Precautions for Use

- * Use with an external stopper.
- * Ensure that sufficient mounting strength is secured for this product.
- * 2 or more of this product can be used in parallel.
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber.
 Allowable eccentric angle: within $\pm 2.5^\circ$
- * Do not pull the soft absorber beyond the stroke used.
 (This will cause the damage or failure of the soft absorber.)
- * Do not press the piston rod of soft absorber in beyond the stroke used.
 (This will cause the incomplete return of piston rod, and other failures.)
- * When the gap between the pressing time and the returning time of the piston rod is large, the durability may be affected. Confirm its performance in an actual machine before use.



Soft Absorber

FPD-1018 Series



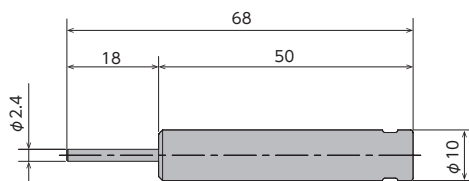
Model Description

F P D - 1 0 1 8 A 1 5 - S W

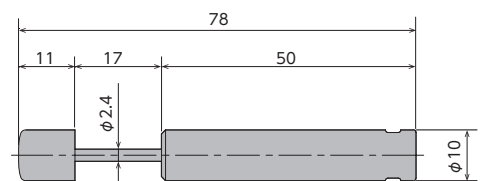
① ② ③ ④ ⑤ ⑥

- ① Series name
- ② External diameter
- ③ Stroke
- ④ Symbols indicating characteristics
A15 : Low-load specifications
A20 : High-load specifications
- ⑤ Symbols indicating form
S : S type (Standard)
C : C type (Cap)
R : R type (Elastomer cap)
* Please refer to the external dimensions.
- ⑥ Symbols indicating color W : White

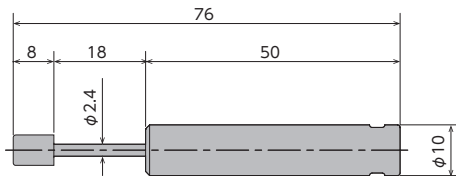
External Dimensions



FPD-1018A□-SW (S type)



FPD-1018A□-RW (R type)



FPD-1018A□-CW (C type)

Specifications

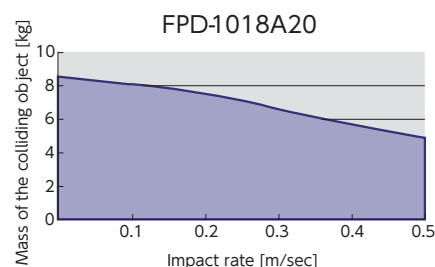
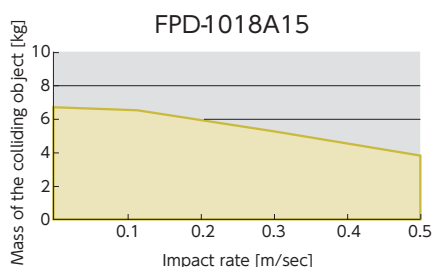
MODEL	Max absorption energy J (kgf·m)	Impact speed range m/s	Cylinder cap color
FPD-1018A15	1.2 (0.12)	0.5 or lower	Brown
FPD-1018A20	1.5 (0.15)	0.5 or lower	Gray

* For the motion-time of each load, please see the next page.

Common Specifications

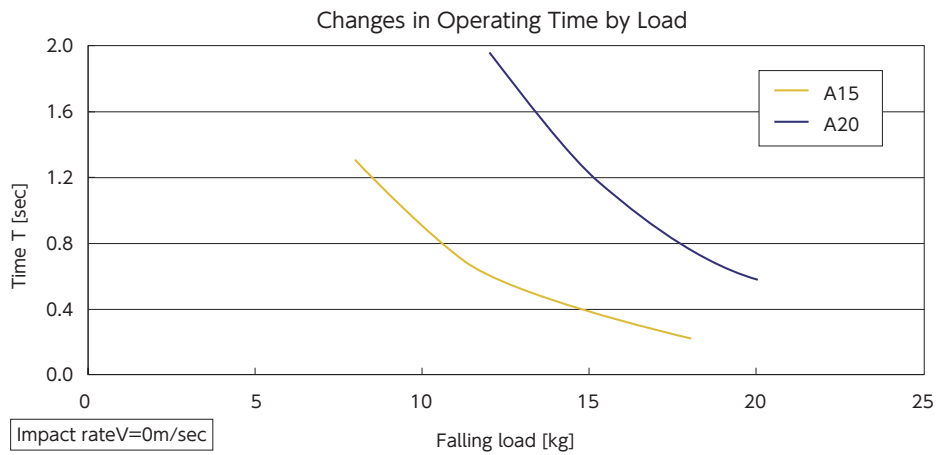
Stroke (S/C type)	mm	18	Mass	g	S type = 6.1, C type = 6.6, R type = 7.3
Stroke (R type)	mm	17	Main unit material		Resin
Recovering power of piston rod	N (kgf)	6 (0.6) or lower	Range of operating temperature, degrees	°C	5~40

Graph of Impact Rate/Mass of Colliding Object Under the Condition of Free Fall



●Products specification might be changed without notice.

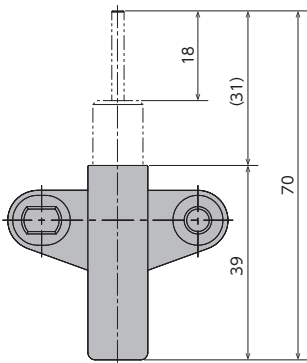
Graph of Operating Time by Load



Optional Parts

OP-200-01B/W

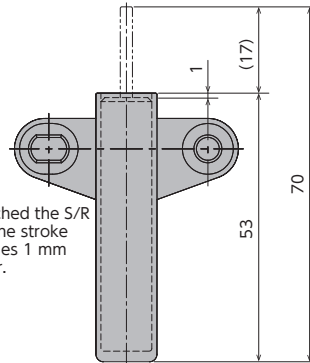
MODEL
OP-200-01B
OP-200-01W



Screw used: M4 (truss screw)
Recommended tightening torque: 0.5 N·m

OP-200-02B/W

MODEL
OP-200-02B
OP-200-02W

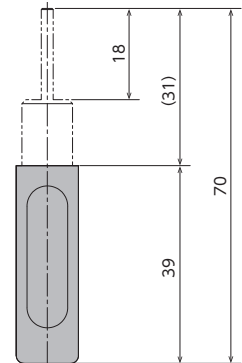


* Attached the S/R type, the stroke becomes 1 mm shorter.

Screw used: M4 (truss screw)
Recommended tightening torque: 0.5 N·m

OP-200-03B/W

MODEL
OP-200-03B
OP-200-03W

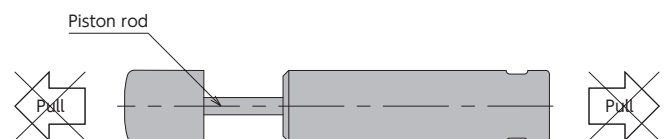


Screw used: M3 (countersunk screw)
Recommended tightening torque: 0.3 N·m

- The diagram indicates the mounting dimensions of the adaptor for the FPD-1012 series used in combination with the FPD-1018S type.
- For the details of the adaptor specifications, please see the pages of the FPD-1012 series.

Precautions for Use

- * Use with an external stopper.
- * Ensure that sufficient mounting strength is secured for this product.
- * 2 or more of this product can be used in parallel.
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber.
 - S/C/R type ••• Allowable eccentric angle: $\pm 2.5^\circ$ or less
- * Do not pull the piston rod of the soft absorber.



- (This will cause air to get inside the soft absorber, causing ineffective stroke, abnormal sounds, and other damage to the soft absorber.)
- ※When the gap between the pressing time and the returning time of the piston rod is large, the durability may be affected. Confirm its performance in an actual machine before use.

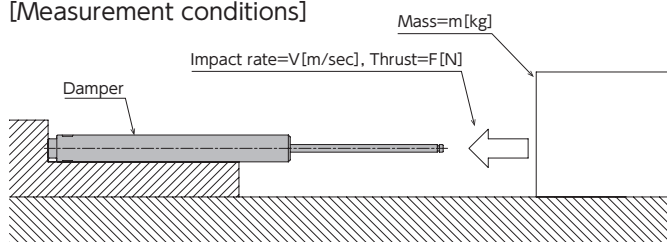
●Products specification might be changed without notice.

Motion performance

Model	Load [kg]	Thrust [N]	Impact rate [m/sec]	Motion time [sec]	Recovering power of the piston rod [N]	※Bottom color
FPD-1030A1-□W	10	6	0.3	0.2~1.5	5 or less	Black
FPD-1030A2-□W	10	8	0.3	0.2~1.5	5 or less	White
FPD-1030A3-□W	10	13	0.3	0.3~1.6	5 or less	Grey
FPD-1030B1-□W	10	5	0.3	0.2~1.2	1.5 or less	Black
FPD-1030B2-□W	10	8	0.3	0.2~1.2	1.5 or less	White
FPD-1030B3-□W	10	13	0.3	0.3~1.3	1.5 or less	Grey
FPD-1050A1-□W	10	8	0.5	0.3~2.0	6 or less	Black
FPD-1050A2-□W	10	10	0.5	0.4~2.2	6 or less	White
FPD-1050A3-□W	10	15	0.5	0.5~2.5	6 or less	Grey
FPD-1050B1-□W	10	5	0.5	0.3~2.0	1.5 or less	Black
FPD-1050B2-□W	15	8	0.5	0.4~2.2	1.5 or less	White
FPD-1050B3-□W	15	13	0.5	0.5~2.5	1.5 or less	Grey
FPD-1060A1-□W	10	8	0.5	0.3~2.0	6 or less	Black
FPD-1060A2-□W	10	10	0.5	0.4~2.2	6 or less	White
FPD-1060A3-□W	10	15	0.5	0.5~2.5	6 or less	Grey
FPD-1070B1-□W	10	5	0.5	0.3~2.0	1.5 or less	Black
FPD-1070B2-□W	15	8	0.5	0.4~2.2	1.5 or less	White
FPD-1070B3-□W	15	13	0.5	0.5~2.5	1.5 or less	Grey
FPD-10100B1-□W	10	5	0.5	0.8~3.0	1.5 or less	Black
FPD-10100B2-□W	15	8	0.5	0.8~3.2	1.5 or less	White
FPD-10100B3-□W	15	15	0.5	1.5~5.5	1.5 or less	Grey
FPD-10150B1-□W	20	15	0.5	0.8~3.5	4.0 or less	Black
FPD-10150B2-□W	20	20	0.5	0.8~3.5	4.0 or less	White
FPD-10150B3-□W	20	25	0.5	0.8~3.5	4.0 or less	Grey

The above performance was measured using Fuji Latex' s instruments. So, please select dampers accordingly, and confirm operation on actual machines before selecting final models.

[Measurement conditions]

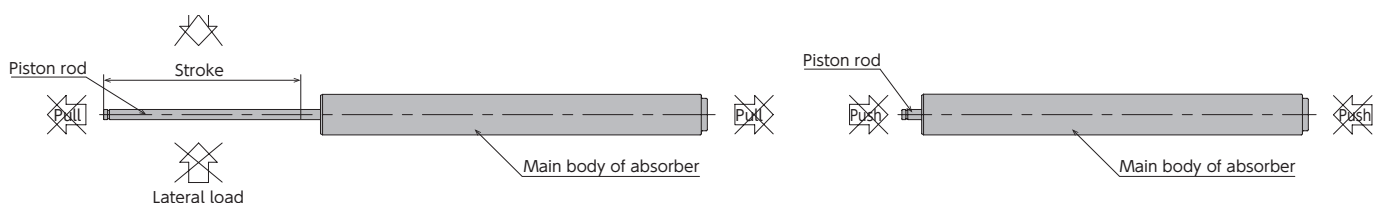


* Bottom color



Precautions in Use

- * Do not use this product without carefully reading the attached owner' s manual.
- * Use with an external stopper.
- * Ensure that sufficient mounting strength is secured for this product.
- * 2 or more of this product can be used in parallel.
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load (lateral load) is not applied to the soft absorber.
- * Do not pull the piston rod of the soft absorber more than stroke.
(This will cause air to get inside the soft absorber, causing ineffective stroke, abnormal sounds, and other damage to the soft absorber.)
- * Do not push the piston rod of the soft absorber more than stroke.
(This will cause recovery failure and other damage to the soft absorber.)
- * Although the main body of the FPD-10150B series may be slightly warped, there is no problem in terms of quality. However, it should be used after sufficiently confirming that there is no problem with respect to installation.



Soft Absorber

FPR-1040 Series



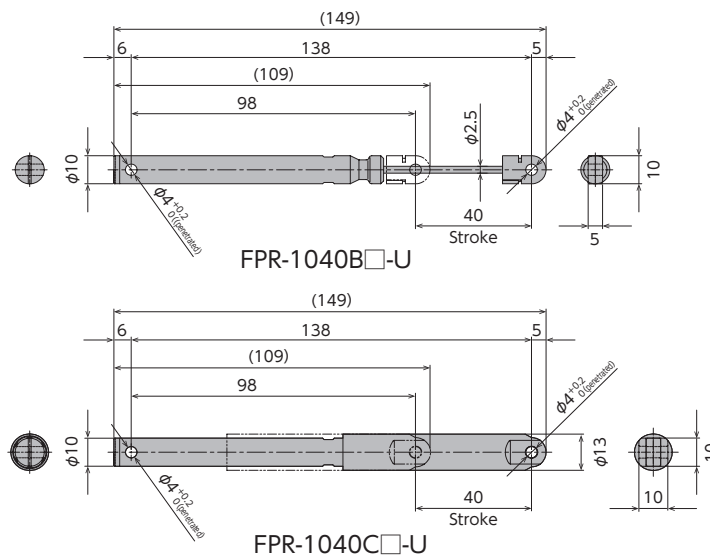
Model Description

F P R - 1 0 4 0 B 1 - U

① ② ③ ④ ⑤ ⑥

- ① Series name
- ② External diameter
- ③ Stroke
- ④ With/Without cover B : Without cover
 C : With cover
- ⑤ Symbols indicating characteristics
 - 1 : Low-load (low thrust) specifications
 - 2 : Medium-load (medium thrust) specifications
 - 3 : High-load (high thrust) specifications
- ⑥ Symbols indicating form U : With crevice

External Dimensions



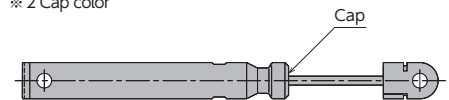
Specification

Model	Measuring speed [m/sec]	Resistance [N] ^{※1}	CAP COLOR ^{※2}
FPR-1040□1-U	0.04	30	Black
FPR-1040□2-U	0.04	45	White
FPR-1040□3-U	0.04	60	Gray

※ 1 The resistance generated is a reference value according to our measurement conditions.

● □ will be filled in with either B or C

※ 2 Cap color

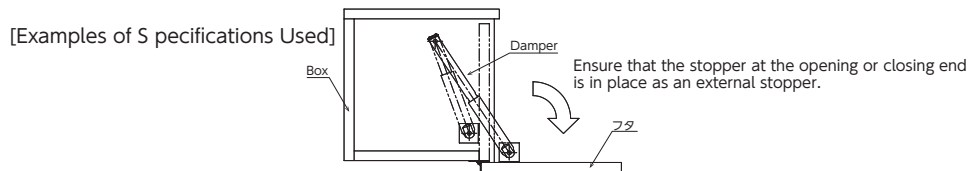
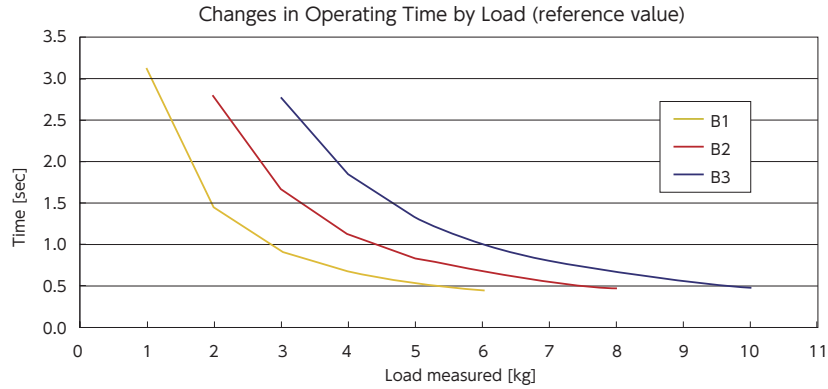


Common Specification

Stroke[mm]	40
External diameter[mm]	φ10
Mass[g] (reference value)	FPR-1040B-U=11.6, FPR-1040C-U=14.2
Main unit material	Resin
Operating temperature[°C]	5~40

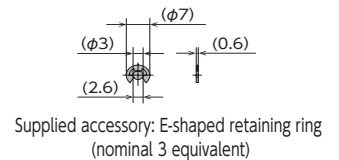
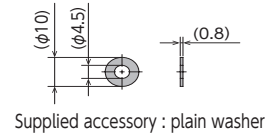
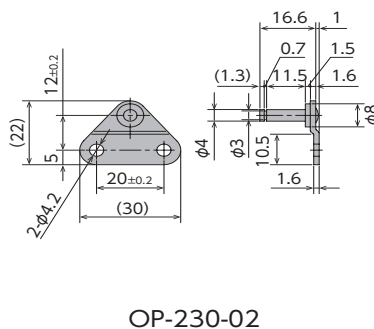
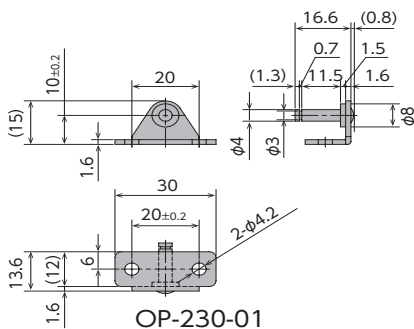
●Products specification might be changed without notice.

Graph of Operating Time by Load



Optional Parts

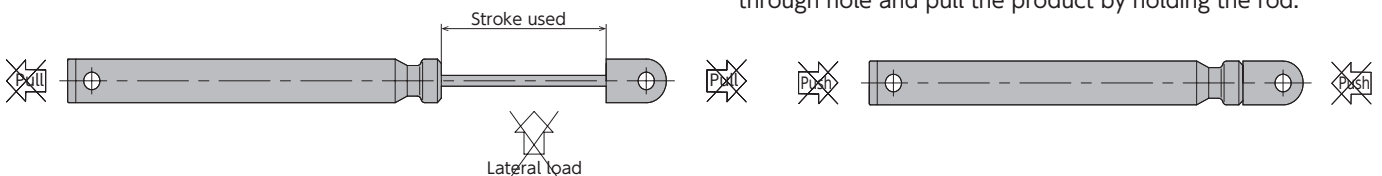
Model
OP-230-01
Model
OP-230-02



- Exclusive mounting fixture for FPR
- Facilitates the absorber mounting.
- A plain washer and E-shaped retaining ring are supplied to OP-230-01 and OP-230-02 each.
- Material: Metal

Precautions for Use

- * The soft absorber generates the drag in the drawing direction.
- * Unusable to generate the resistance in the pushing direction.
- * Use with an external stopper.
- * Ensure that sufficient mounting strength is secured for this product.
- * 2 or more of this product can be used in parallel.
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber.
- * Do not pull the soft absorber beyond the stroke used. (This will cause the damage or failure of the soft absorber.)
- * Do not press the soft absorber in beyond the stroke used. (This will cause the damage or failure of the soft absorber.)
- * When the gap between the pressing time and the returning time of the piston rod is large, the durability may be affected. Confirm its performance in an actual machine before use.
- * For the products with cover, do not pull the cover part. When you need to pull the product, insert a rod into the $\phi 4$ through hole and pull the product by holding the rod.



Soft Absorber

U Packing Seal

Fixed Type Adjustable type Self-adjusting

FPA-1475 Series

RoHS Compliant

●Products specification might be changed without notice.



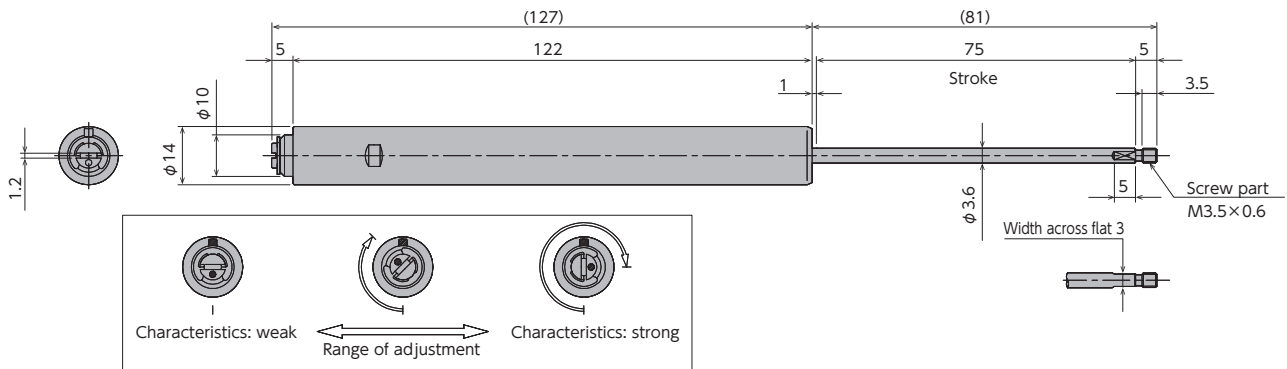
Model Description

F P A - 1 4 7 5 B 1 - S W

① ② ③ ④ ⑤ ⑥

- ① Series name
- ② External diameter
- ③ Stroke
- ④ For self-returning B : Without self-returning
With/Without spring
- ⑤ Symbols indicating characteristics
- ⑥ Symbols indicating form SW : Without cap

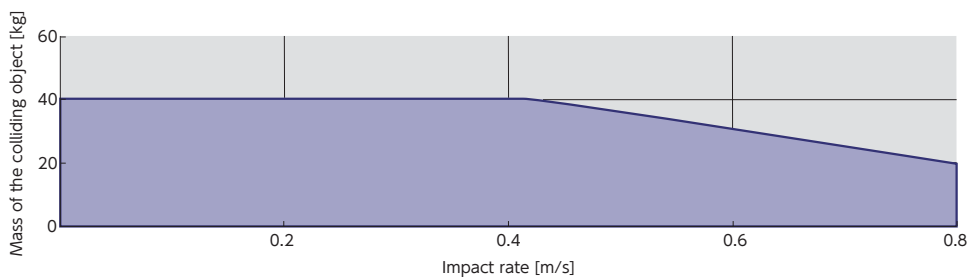
外形図



Specifications

Model	Stroke [mm]	Mass [g]	Main unit material	Range of impact rate [m/s]	range of operating temperature [°C]	Range of storage temperature [°C]
FPA-1475B1-SW	75	38	Resin	0.8 or lower	5~40	-10~50

Graph of Impact Rate/Mass of Colliding Object with the Condition of Horizontal Impact and No Thrust



Precautions for Use

- * The series do not have the self-returning function. The piston rod needs to be pulled out by external forces.
- * Use the product with the external stopper within the stroke range.
- * Ensure that sufficient mounting strength is secured for this product.
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load (lateral load) is not applied to the soft absorber.
- * When the gap between the pressing time and the returning time of the piston rod is large, the durability may be affected. Confirm its performance in an actual machine before use.

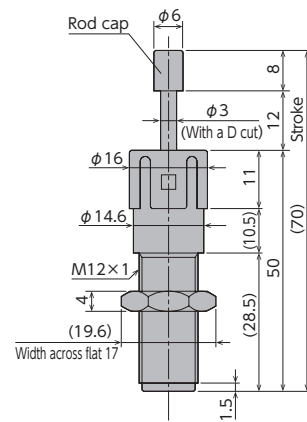
Soft Absorber

Bellofram Seal Type Dashpot Structure
Fixed Type Adjustable type Self-adjusting

FA-1212C Series

RoHS Compliant

●Products specification might be changed without notice.



Specifications

Model	Max. absorption energy J(kgf·m)	Speed range m/s	Max. equivalent mass kg(kgf)	Max. drag N(kgf)	Absorption energy per minute J/min(kgf·m/min)	Max. cycle rate cycle/min	Rod cap colour
FA-1212C1-C	0.29(0.03)	0.1~1.0	1.5(1.5)	245(25)	14.7(1.5)	45	White
FA-1212C2-C	0.49(0.05)		3(3)	294(30)			Black
FA-1212C3-C	1.0(0.10)		5(5)				Yellow
FA-1212C4-C		0.1~0.7	7.5(7.5)	5	Green		
FA-1212C5-C		0.1~0.5	10(10)	Red			

Common Specifications

Stroke	mm	12
Recovering power of the piston rod	N(kgf)	2.45(0.25)or less
Operating temperature	°C	-10~50
Mass	g	15
Main unit material		Resin

Precautions for Use

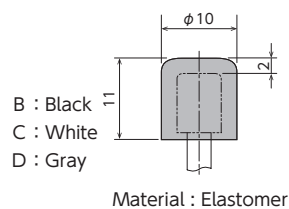
- * Do not use this product without carefully reading the attached owner's manual.
- * Use with an external stopper.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * 2 or more of this product can be used in parallel.
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber. (Allowable eccentric angle: within $\pm 2.5^\circ$)
- * Do not over-tighten the main unit and nuts. Please use the tightening torque (1.5N·m) listed in the owner's manual. If anchoring the absorber against the $\phi 14.6$ unit, please use a tightening torque of 1.0N·m.

Optional Parts

Muting cap OP-090-M12B/C/D

Model
OP-090-M12B
OP-090-M12C
OP-090-M12D

- A muting cap reduces the collision noise.
- To use, place it over a rod cap in the FA-1212C series.
- Stroke length is 11mm.



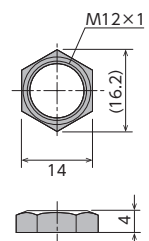
B : Black
C : White
D : Gray

Material : Elastomer

Small hexagon nut M12B

Model
M12B

- It is ideal for tight spaces, as it is smaller than the conventional hexagon nuts.

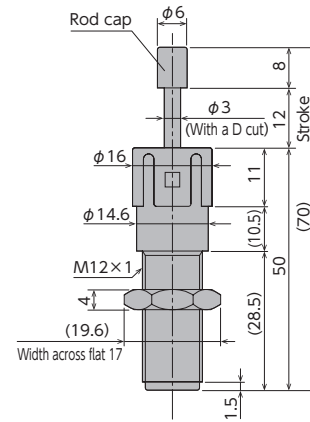


Standard nuts are sold separately as well.

Applicable Models	Model
FA-1212C	FA-1212C nut

Soft Absorber

FA-1212L Series



Operating Performance

Model	Load (kg)	Thrust (N)	Impact rate (m/s)	Motion-time (sec)	Recovering power of the piston rod (N)	Rod cap color
FA-1212L1-C	3	30	0.7 or lower	0.3~2.0	9以下	White
FA-1212L3-C			0.5 or lower	2.3~4.0		Yellow
FA-1212L5-C			0.3 or lower	4.3~6.0		Red

The performance above is based on the measuring machine of our company. Refer to the above to select the damper, confirm its performance in an actual machine, and finally select the model.

Specifications

Stroke	mm	12
Max. absorption energy	J(kgf·m)	1.5(0.15)
Max. thrust :FA-1212L1	N(kgf)	49(5)
:FA-1212L3	N(kgf)	78(8)
:FA-1212L5	N(kgf)	117(12)
Max. drag	N(kgf)	490(50)
Range of operating temperature	°C	-10~50
Mass	g	15
Main unit material		Resin

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Use with an external stopper.
- * Ensure that sufficient mounting strength is secured for this product.
(As a guideline, it should be 2 to 3 times the maximum drag listed in the catalog.)
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * 2 or more of this product can be used in parallel.
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber. (Allowable eccentric angle: within $\pm 2.5^\circ$)
- * Do not over-tighten the main unit and nuts. Please use the tightening torque (1.5N·m) listed in the owner's manual.
However, to fix the nut while pressing it against the $\phi 14.6$ part, use the tightening torque of 1 N·m.

●Products specification might be changed without notice.

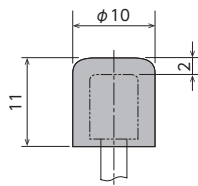
Optional Parts

Muting cap OP-090-M12B/C/D

Model
OP-090-M12B
OP-090-M12C
OP-090-M12D

- A muting cap reduces the collision noise.
- To use, place it over a rod cap in the FA-1212L series.
- Stroke length is 11mm.

B : Black
C : White
D : Gray

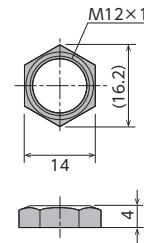


Material: Elastomer

Small hexagon nut M12B

Model
M12B

- It is ideal for tight spaces, as it is smaller than the conventional hexagon nuts.



The standard nut is also sold separately.

Applicable Models	Model
FA-1212L	Nut for FA-1212C

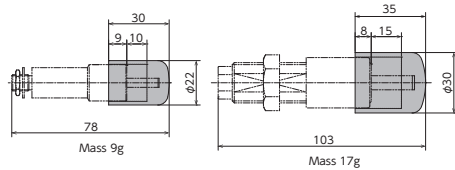
●Products specification might be changed without notice.

Optional Parts

Liquid-proof cap -060

Model
FA-1010D□-C-060
FA-1215B□-C-060

- A drip-proof cap is fitted on the main unit when shipped from the factory.
- Ideal for use in environments where oil splatter poses a problem.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.



FA-1010D□-C-060*1

FA-1215B□-C-060*2

- *1 □ will be filled in with a type indication code 2, 3 or 4
- *2 □ will be filled in with a type indication code 1 or 2.

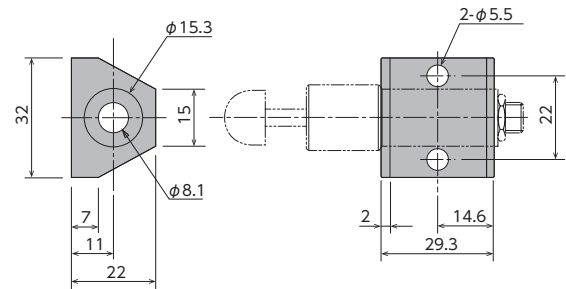
*Standard nuts are sold separately as well.

Applicable Models	Model
FA-1010D	FA-1010D M08 nut
FA-1215B	M20 nut

Bracket OP-1012A

Model
OP-1012A

- This is a mounting fixture for FA-1010D.



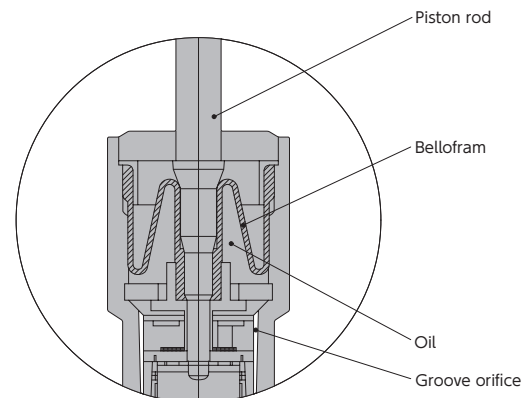
Mass 25g

Bellofram Seal Type

Unlike the conventional U packing type, it uses a Bellofram seal, as shown below. Because it does not generate sliding resistance between the piston rod and the packing, the spring power required to recover the piston rod can be reduced. The Bellofram also acts as an accumulator based on its ability to change shape. In principle, as long as the Bello is not damaged, oil will never leak.

Groove-orifice type

The cross-sectional area of the orifice in the groove-orifice type changes continuously as the piston strokes, thereby enabling smooth energy absorption.

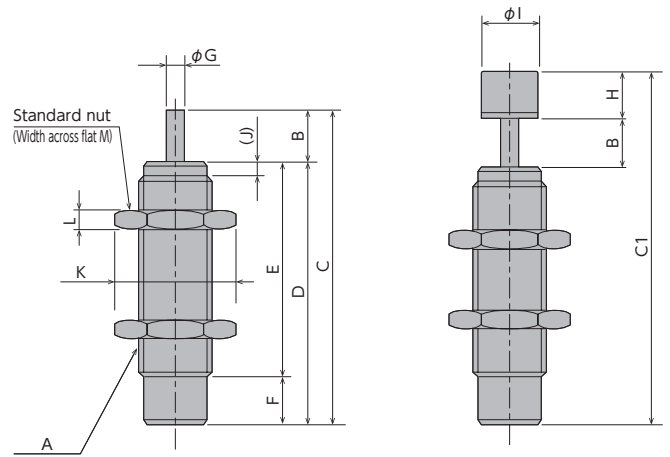


Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Use with an external stopper.
- * Ensure that sufficient mounting strength is secured for this product.
(As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * 2 or more of this product can be used in parallel.
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber.
(Allowable eccentric angle: within $\pm 2.5^\circ$)

Soft Absorber

FA-0805/FA-1005/FA-1008/FA-1210 Series



Dimensions

Model	A	B	C	C1	D	E	F	ϕG	H	ϕI	J	K	L	M
FA-0805SB*-S/C	M8×0.75 (M8×1)	5	32	37	27	22	5	2	5	6	1.5	12.7	2	11
FA-1005PMB*-S/C	M10×1	5	32	39	27	22	5	3	7	6	1.5	15	3	13
FA-1008PB*-S/C	M10×1	8	46	53	38	33	5	3	7	6	1.5	15	3	13
FA-1210KB*-S/C	M12×1	10	60	68	50	45	5	3.5	8	8	1.5	16.2	4	14

Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Max. drag N (kgf)	Absorption energy per minute J/min (kgf·m/min)	Recovering power of the piston rod N (kgf)	Mass g
FA-0805SB1-S ▲	5	0.39(0.04)	3(3)	490(50)	17.6(1.8)	4.9 or lower (0.5)	8.6
FA-0805SB1-C ▲							8.8
FA-0805SB2-S ▲							8.6
FA-0805SB2-C ▲							8.8
FA-1005PMB1-S	5	0.68(0.07)	5(5)	735(75)	41.1(4.2)	5.88 or lower (0.6)	13.2
FA-1005PMB1-C							14.2
FA-1005PMB2-S							13.2
FA-1005PMB2-C							14.2
FA-1008PB1-S	8	0.98(0.1)	7(7)	735(75)	58.8(6.0)	5.88 or lower (0.6)	17.2
FA-1008PB1-C							18.2
FA-1008PB2-S							17.2
FA-1008PB2-C							18.2
FA-1210KB1-S	10	1.96(0.2)	15(15)	1470(150)	98(10)	9.8 or lower (1.0)	30.6
FA-1210KB1-C							32.6
FA-1210KB2-S		2.45(0.25)	30(30)				30.6
FA-1210KB2-C							32.6

▲ The thread pitch P1.0 is supplied as well.

Common Specifications

Range of impact rate	m/s	0.3~1.0
Max. cycle rate	cycle/min	60(45 for the FA-0805 series)
Operating temperature	°C	-5~70

Note) MB X 1.0 is also available as the main body's screw pitch specifications for the FA-0805 series. Please order using the model number FA-0805SB □-S-P1.0 or FA-0805SB □-C-P1.0. However, please note that there are no optional parts for it.

Note) To place an order without a cap, put -S, and to place an order with a cap, put -C.

Note) Cap colour: **1 is white and **2 is black.

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper (Stopper nut OP-020**) is also used.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber. (Allowable eccentric angle: within $\pm 2.5^\circ$)

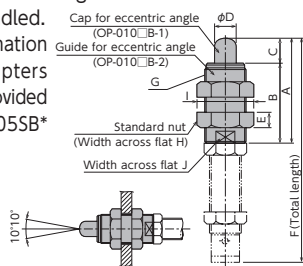
● Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010SB, PMB, PB, KB

Model
OP-010SB
OP-010PMB
OP-010PB
OP-010KB

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber.
- The maximum operating eccentric angle with an eccentric angle adaptor is ±10°.
- The caps and the guides for inclined use are not unbundled.
- The inclination angle adaptors are not provided for FA-0805SB* -SP1.0.



Note) Material of cap for eccentric angle: POM

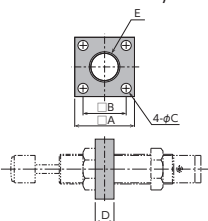
Model	A	B	C	φD	E	F
OP-010SB	28	23	5	6	4	44.5
OP-010PMB	28	23	5	8	6	44.5
OP-010PB	38	30	8	8	6	62.8
OP-010KB	48	38	10	10	5	81.8

Model	G	H	I	J	Mass g
OP-010SB	M12×1	14	16.2	10	13
OP-010PMB	M16×1.5	19	21.9	13	29
OP-010PB	M16×1.5	19	21.9	13	35
OP-010KB	M18×1.5	21	24.3	14	48

Square flange OP-040SB, PB, KB

Model
OP-040SB
OP-040PB
OP-040KB

- Once the attachment site is determined, use the main unit's nut to securely fasten in place.

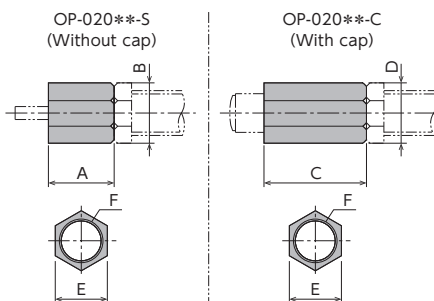


Model	A	B	C	D	E	Mass g
OP-040SB	25	18	3.2	4	M8×0.75	17
M10×1					16	
M12×1					15	

Stopper nut OP-020SB, PB, KB

Model
OP-020SB-S
OP-020SB-C
OP-020PB-S
OP-020PB-C
OP-020KB-S
OP-020KB-C

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.



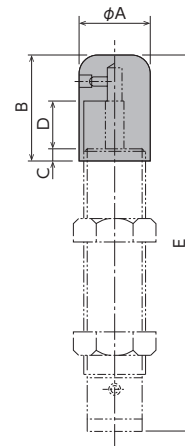
Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Model	A	B	C	D	E	F	Mass g
OP-020SB-*	10	12.7	15	12.7	11	M8×0.75	S 5
						C 7	
OP-020PB-*	10	15	16	15	13	M10×1	S 6
						C 9	
OP-020KB-*	12	16.2	16	16.2	14	M12×1	S 6
						C 8	

Liquid-proof cap -060

Model
FA-1005PMB□-C-060
FA-1008PB□-C-060
FA-1210KB□-C-060

- A drip-proof cap is fitted on the unit on delivery.
- Liquid-proof caps are not sold separately.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.

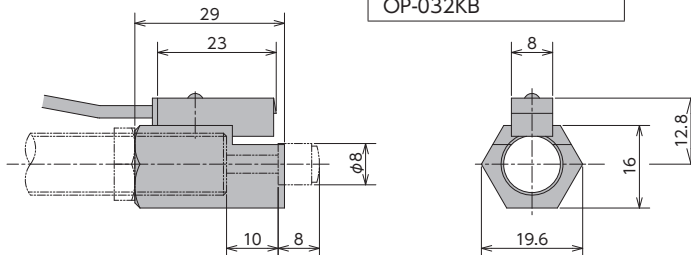


Model	φA	B	C	D	E	Mass g
FA-1005PMB□-C-060	13	15	3	5	39	9
FA-1008PB□-C-060	13	18	3	8	53	10
FA-1210KB□-C-060	17	28	9.5	10	68.5	25

- Model indication 1 or 2 is inserted in □.

Holder with switch OP-030KB-2

Model
OP-032KB



Mass 38g

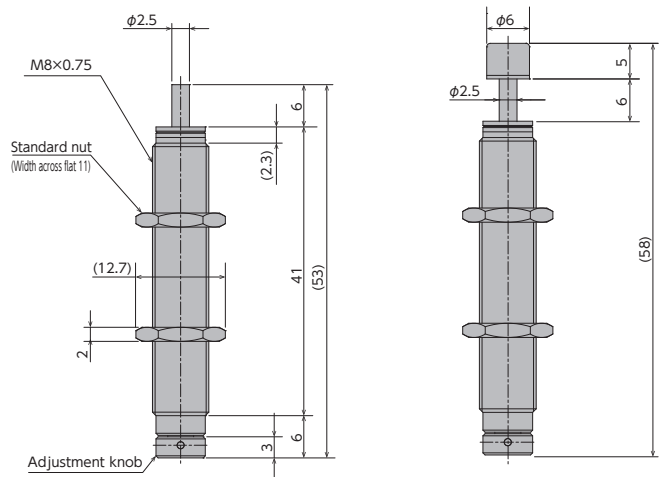
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

Standard nuts are sold separately as well.

Applicable Models	Model
FA-0805SB	M08 nut
FA-0805SB P1.0	M08-P1 nut
FA-1005PMB	M10 nut
FA-1008PB	M10 nut
FA-1210KB	M12 nut

Soft Absorber

FA-0806 Series



Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Orifice type
FA-0806-S	6	1.4 (0.14)	15 (15)	0.3~2	Single-orifice type
FA-0806-C					
FA-0806-S-P1.0					
FA-0806-C-P1.0					

Note: There are no optional parts for M8 x 1.0.

Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N (kgf)	670 (68.3)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	45	Mass :S type	g	13.8
Max. absorption energy per minute	J/min (kgf·m/min)	36.7 (3.74)	:C type	g	14.1
Recovering power of the piston rod	N (kgf)	9 or lower (0.92)			

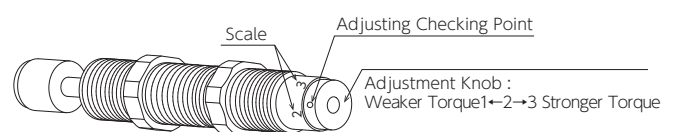
Absorption characteristics

Orifice type	Single-orifice type
Model number	FA-0806 Series
Application	For low to medium speed
Absorption characteristics	

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * We recommend that you use it with an external stopper (Stopper nut OP-020SB).
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber. (Allowable eccentric angle: within $\pm 2.5^\circ$)

Adjustment Method



- * To adjust, turn the adjustment knob.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * It does not have a lock screw for locking the adjusted setting.

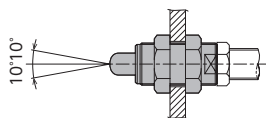
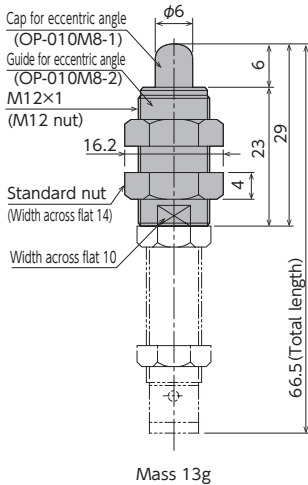
● Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010M8

Model
OP-010M8

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with FA-0806-S.
- The maximum operating eccentric angle with an eccentric angle adaptor is ±10°.
- The maximum inclination angle using an inclination angle adapter is ±10°
- The caps and the guides for inclined use are not unbundled.

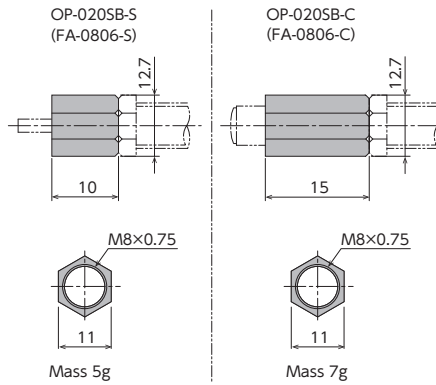


Note) Material of cap for eccentric angle: POM

Stopper nut OP-020SB

Model
OP-020SB-S
OP-020SB-C

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.

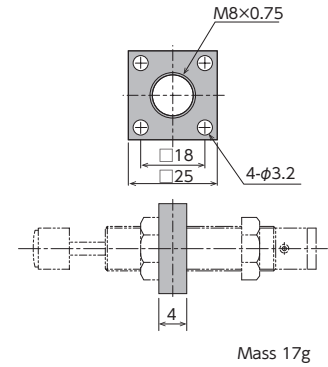


Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Square flange OP-040SB

Model
OP-040SB

- Once the attachment site is determined, use the main unit's nut to securely fasten in place.

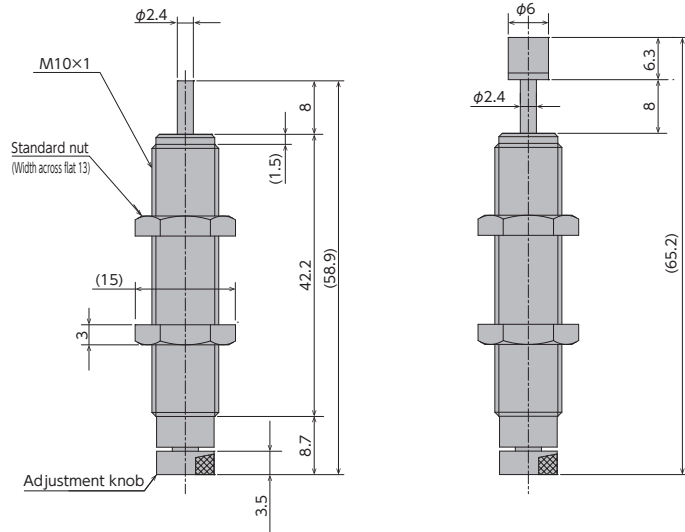


Standard nuts are sold separately as well.

Applicable Models	Model
FA-0806-S/C	M08 nut
FA-0806-S/C-P1.0	M08-P1.0 nut

Soft Absorber

FA-1008VB/FA-1008VD/FWM-1008VBD Series



Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Orifice type			
FA-1008VB-S	8	1.47 (0.15)	10 (10)	0.3~1	Single-orifice type			
FA-1008VB-C								
FA-1008VD-S		1.76 (0.18)	2.5 (2.5)	0.7~3	Multiple-orifice type			
FA-1008VD-C								
FWM-1008VBD-S						10 (10)	0.3~2	Multiple-varying orifice type
FWM-1008VBD-C								

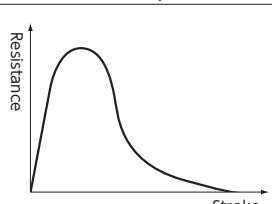
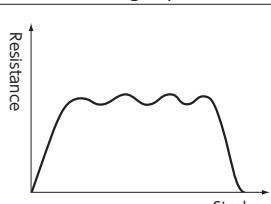
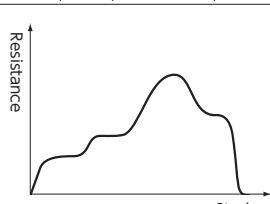
Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N (kgf)	637 (65)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	60	Mass : S type	g	26.5
Max. absorption energy per minute	J/min (kgf·m/min)	58.8 (6)	: C type	g	27
Recovering power of the piston rod	N (kgf)	5.88 (0.6) or lower			

Selection Guideline

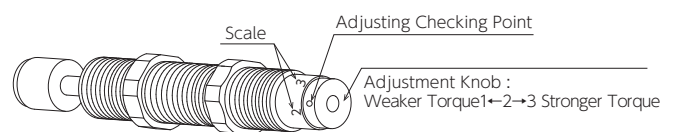
The FA-1008 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

Orifice type	Single-orifice type	Multiple-orifice type	Multiple-varying orifice type
Model number	FA-1008VB series	FA-1008VD series	FWM-1008VBD series
Application	For low-speed	For high-speed	For medium speed, in particular with a pneumatic cylinder
Absorption characteristics			

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper (Stopper nut OP-020PB) is also used.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within $\pm 2.5^\circ$)

Adjustment Method



- * To adjust, turn the adjustment knob.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * It does not have a lock screw for locking the adjusted setting.

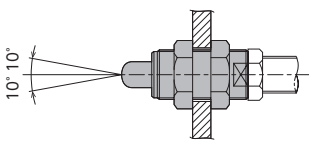
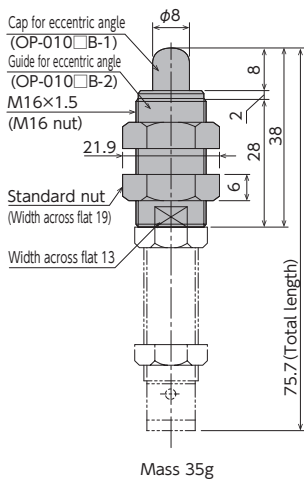
● Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010PB

Model
OP-010PB

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber.
- The maximum operating eccentric angle with an eccentric angle adaptor is ±10°.
- The caps and the guides for inclined use are not unbundled.

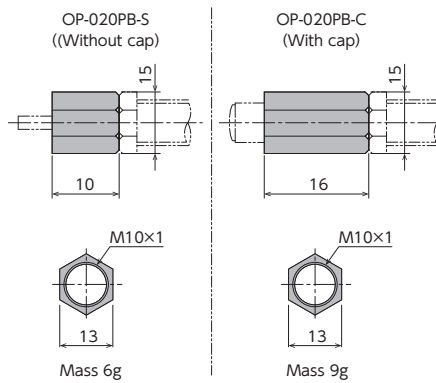


Note) Material of cap for eccentric angle: POM

Stopper nut OP-020PB-□

Model
OP-020PB-S
OP-020PB-C

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.

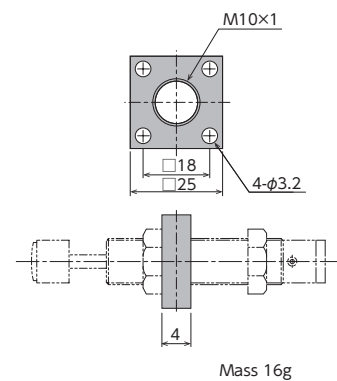


Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Square flange OP-040PB

Model
OP-040PB

- Once the attachment site is determined, use the main unit's nut to securely fasten in place.

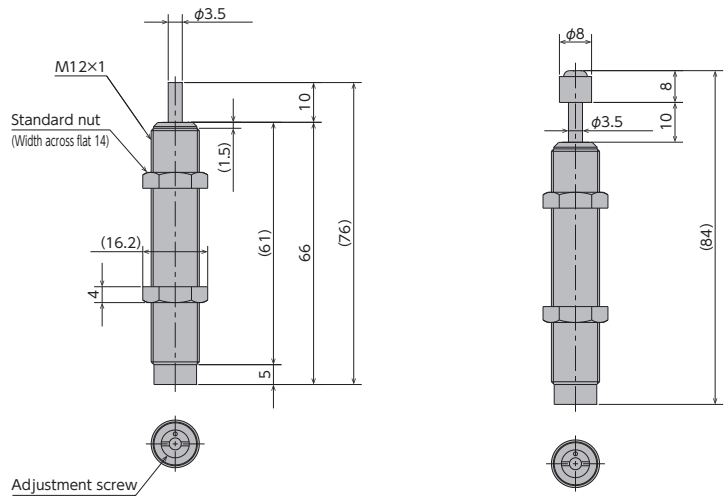


Standard nuts are sold separately as well.

Applicable Models	Model
FA-1008VB	M10 nut
FA-1008VD	
FWM-1008VBD	

Soft Absorber

FA-1210MB/FA-1210MD/FWM-1210MBD Series



Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Orifice type			
FA-1210MB-S	10	2.94 (0.3)	30 (30)	0.3~1	Single-orifice type			
FA-1210MB-C								
FA-1210MD-S		4.9 (0.5)	4 (4)	0.7~3	Multiple-orifice type			
FA-1210MD-C								
FWM-1210MBD-S						30 (30)	0.3~2	Multiple-varying orifice type
FWM-1210MBD-C								

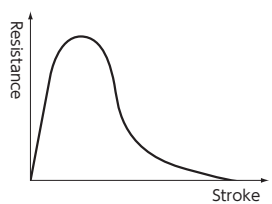
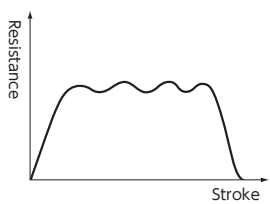
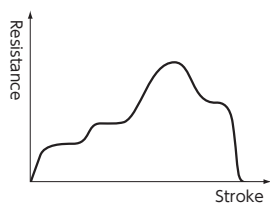
Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N (kgf)	1,470 (150)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	60	Mass : S type	g	44
Max. absorption energy per minute	J/min (kgf·m/min)	98 (10)	: C type	g	47
Recovering power of the piston rod	N (kgf)	9.8 (1.0) or lower			

Selection Guideline

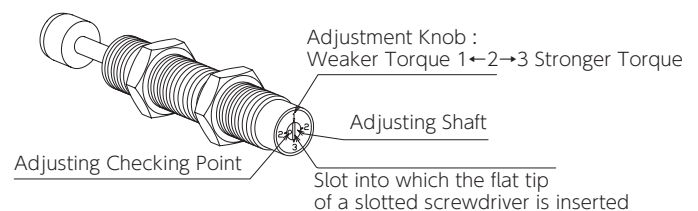
The FA-1210 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

Orifice type	Single-orifice type	Multiple-orifice type	Multiple-varying orifice type
Model number	FA-1210MB series	FA-1210MD series	FWM-1210MBD series
Application	For low-speed	For high-speed	For medium speed, in particular with a pneumatic cylinder
Absorption characteristics			

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper (Stopper nut OP-020KB) is also used.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within $\pm 2.5^\circ$)

Adjustment Method



- * To adjust, turn the adjustment knob with a slotted screw driver.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * It does not have a lock screw for locking the adjusted setting.

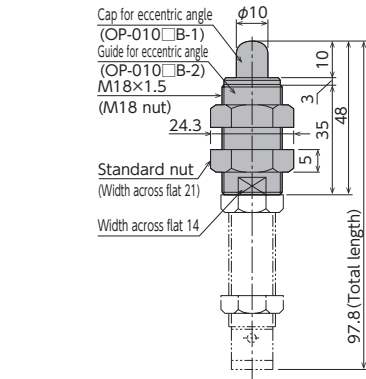
● Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010PB

Model
OP-010KB

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber.
- The maximum operating eccentric angle with an eccentric angle adaptor is ±10°.
- The caps and the guides for inclined use are not unbundled.



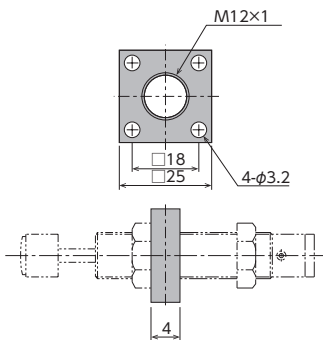
Mass 48g

Note) Material of cap for eccentric angle: POM

Square flange OP-040KB

Model
OP-040KB

- Once the attachment site is determined, use the main unit's nut to securely fasten in place.

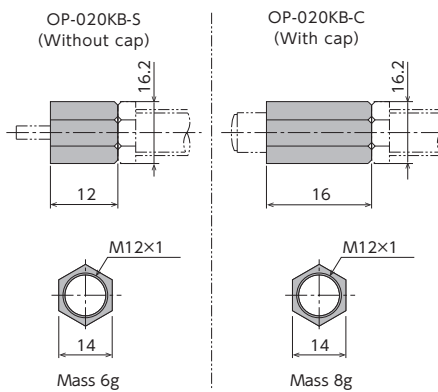


Mass 15g

Stopper nut OP-020KB-□

Model
OP-020KB-S
OP-020KB-C

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.

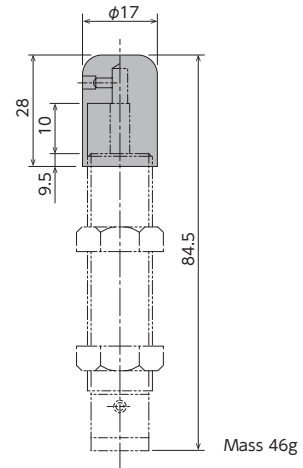


Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Liquid-proof cap F□□-1210M□□-C-060

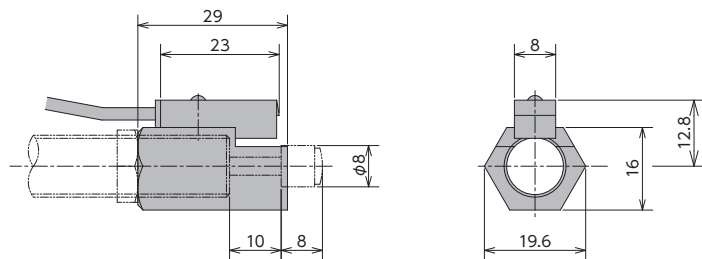
Model
FA-1210MB-C-060
FA-1210MD-C-060
FWM-1210MBD-C-060

- Ideal for use in environments where oil splatter poses a problem.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-1210M□□-C-060
 - Model indication A or WM is inserted in □ of F□□.
 - Model indication B, D or BD is inserted in □ of M□□.



Holder with a switch OP-030KB-2 (With a stopper function)

Model
OP-032KB



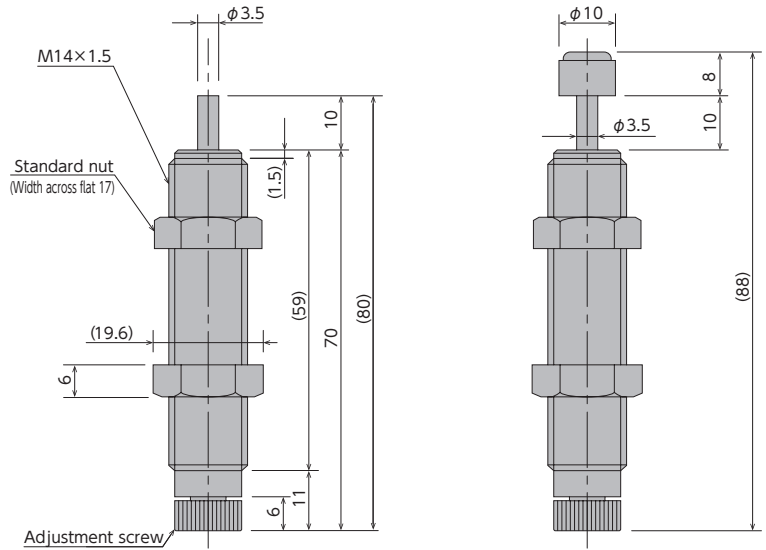
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

Standard nuts are sold separately as well.

Applicable Models	Model
FA-1210MB	M12 nut
FA-1210MD	
FWM-1210MBD	

Soft Absorber

FA-1410RB/FA-1410RD/FWM-1410RBD Series



Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Orifice type			
FA-1410RB-S	10	3.92(0.4)	30(30)	0.3~1	Single-orifice type			
FA-1410RB-C								
FA-1410RD-S		5.88(0.6)	4.5(4.5)	0.7~3	Multiple-orifice type			
FA-1410RD-C								
FWM-1410RBD-S						35(35)	0.3~2	Multiple-varying orifice type
FWM-1410RBD-C								

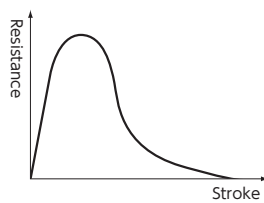
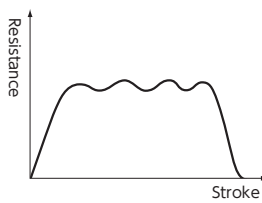
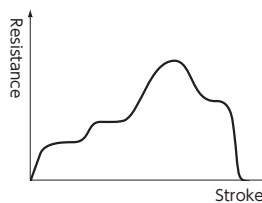
Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N(kgf)	1,813(185)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	60	Mass : S type	g	68
Max. absorption energy per minute	J/min (kgf·m/min)	147(15)	: C type	g	73
Recovering power of the piston rod	N(kgf)	9.8(1.0) or lower			

Selection Guideline

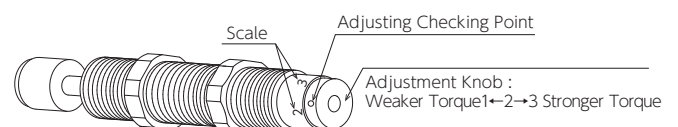
The FA-1410 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

Orifice type	Single-orifice type	Multiple-orifice type	Multiple-varying orifice type
Model number	FA-1410RB series	FA-1410RD series	FWM-1410RBD series
Application	For low-speed	For high-speed	For medium speed, in particular with a pneumatic cylinder
Absorbance Properties			

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper (Stopper nut OP-020RB) is also used.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within $\pm 2.5^\circ$)

Adjustment Method



- * To adjust, turn the adjustment knob located at the bottom of the main unit.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * Once the adjustment is complete, secure with a lock screw using a hex wrench.

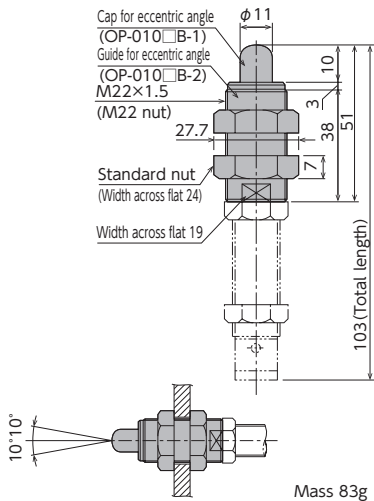
● Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010RB

Model
OP-010RB

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber.
- The maximum operating eccentric angle with an eccentric angle adaptor is ±10°.
- The caps and the guides for inclined use are not unbundled.

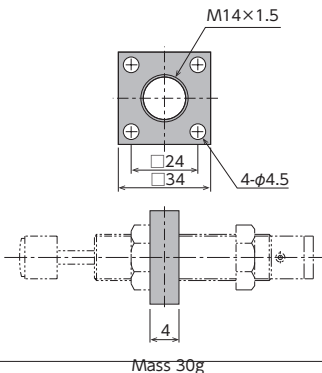


Note) Material of cap for eccentric angle: POM

Square flange OP-040RB

Model
OP-040RB

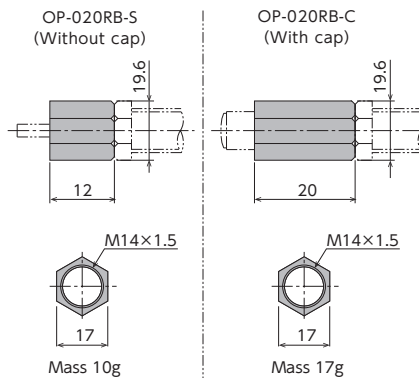
- Once the attachment site is determined, use the main unit's nut to securely fasten in place.



Stopper nut OP-020RB-□

Model
OP-020RB-S
OP-020RB-C

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.

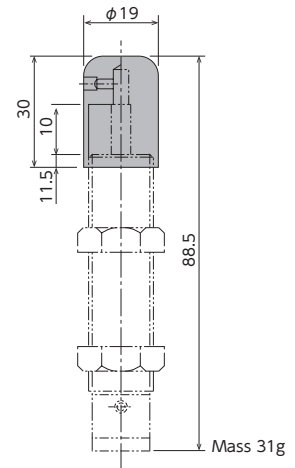


Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Liquid-proof cap F□□-1410R □□-C-060

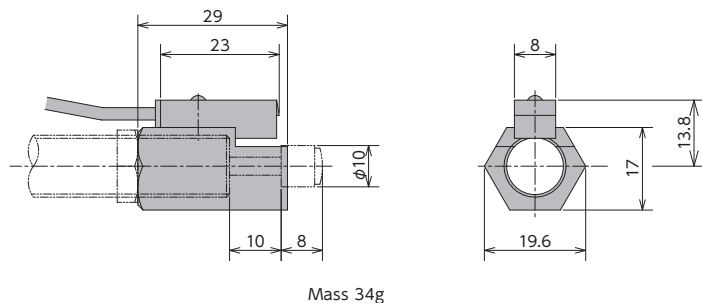
Model
FA-1410RB-C-060
FA-1410RD-C-060
FWM-1410RBD-C-060

- Ideal for use in environments where oil splatter poses a problem.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-1410M□□-C-060
 - Model indication A or WM is inserted in □ of F□□.
 - Model indication B, D or BD is inserted in □ of M□□.



Holder with a switch OP-030RB-2 (With a stopper function)

Model
OP-032RB



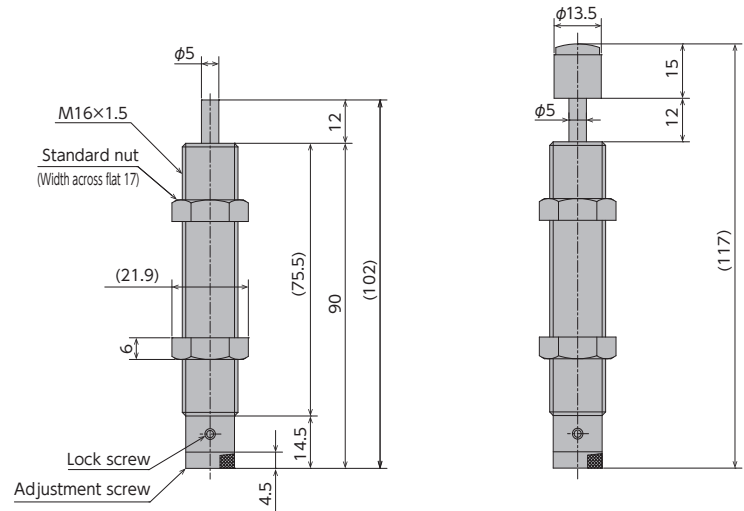
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

Standard nuts are sold separately as well.

Applicable Models	Model
FA-1410RB	M14 nut
FA-1410RD	
FWM-1410RBD	

Soft Absorber

FA-1612XB/FA-1612XD/FWM-1612XBD Series



Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Orifice type
FA-1612XB-S	12	9.8(1.0)	50(50)	0.3~1	Single-orifice type
FA-1612XB-C					
FA-1612XD-S			10(10)	0.7~3	Multiple-orifice type
FA-1612XD-C					
FWM-1612XBD-S			50(50)	0.3~2	Multiple-varying orifice type
FWM-1612XBD-C					

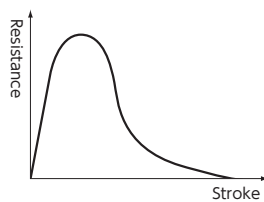
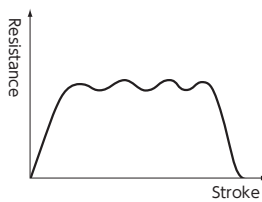
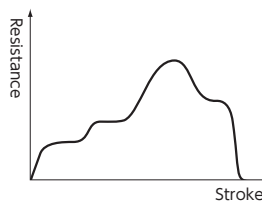
Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N(kgf)	2,646(270)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	60	Mass : S type	g	108
Max. absorption energy per minute	J/min(kgf·m/min)	235(24)	: C type	g	117
Recovering power of the piston rod	N(kgf)	14.7(1.5) or lower			

Selection Guideline

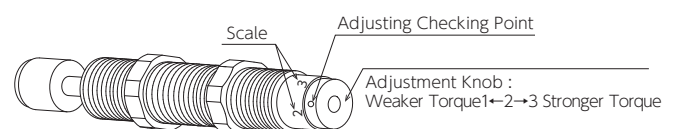
The FA-1612 series series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

Orifice type	Single-orifice type	Multiple-orifice type	Multiple-varying orifice type
Model number	FA-1612XB series	FA-1612XD series	FWM-1612XBD series
Application	For low-speed	For high-speed	For medium speed, in particular with a pneumatic cylinder
Absorption characteristics			

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper (Stopper nut OP-020HB) is also used.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within $\pm 2.5^\circ$)

Adjustment Method



- * To adjust, turn the adjustment knob located at the bottom of the main unit.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * Once the adjustment is complete, secure with a lock screw using a hex wrench.

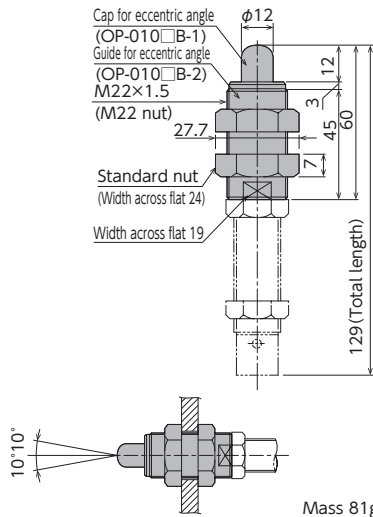
● Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010XB

Model
OP-010XB

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber.
- The maximum operating eccentric angle with an eccentric angle adaptor is ±10°.
- The caps and the guides for inclined use are not unbundled.

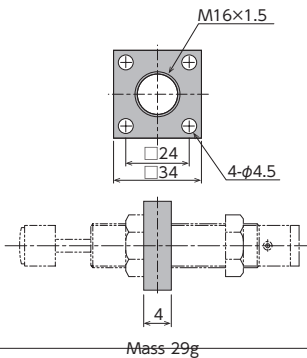


Note) Material of cap for eccentric angle: POM

Square flange OP-040XB

Model
OP-040XB

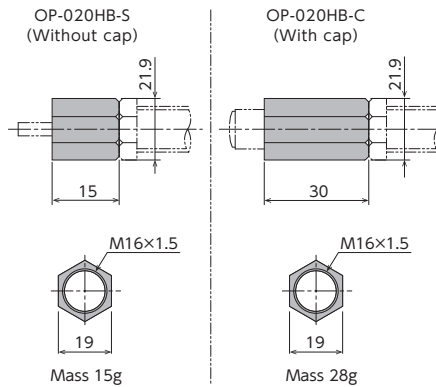
- Once the attachment site is determined, use the main unit's nut to securely fasten in place.



Stopper nut OP-020HB

Model
OP-020HB-S
OP-020HB-C

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.

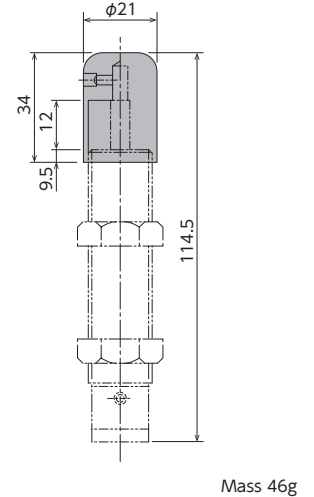


Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Liquid-proof cap F□□-1612X□□-C-060

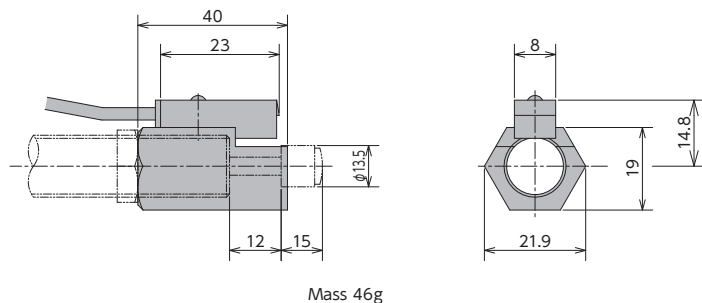
Model
FA-1612XB-C-060
FA-1612XD-C-060
FWM-1612XBD-C-060

- A drip-proof cap is fitted on the unit on delivery.
- Liquid-proof caps are not sold separately.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-16120M□□-C-060
 - Model indication A or WM is inserted in □ of F□□.
 - Model indication B, D or BD is inserted in □ of M□□.



Holder with a switch OP-030HB-□

Model
OP-032HB



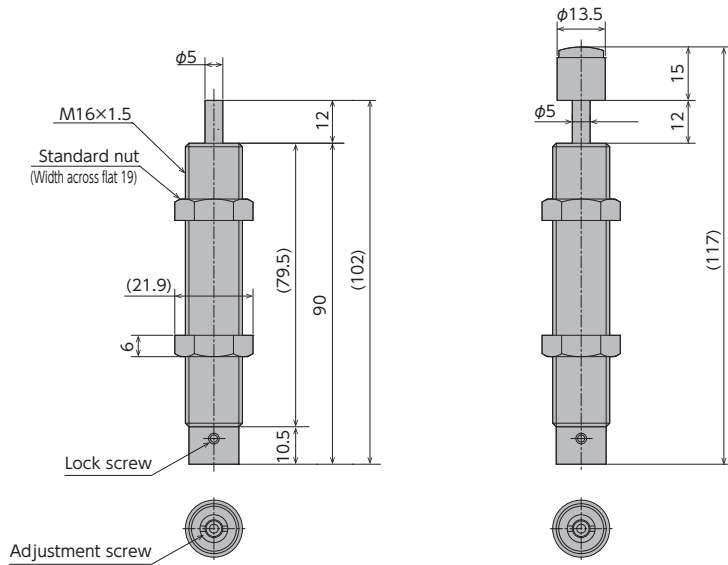
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

Standard nuts are sold separately as well.

Applicable Models	Model
FA-1612XB	M16 nut
FA-1612XD	
FWM-1612XBD	

Soft Absorber

FA-1612X Series



Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Orifice type
FA-1612X1-S	12	14.7	200 (200)	0.3~1	Single-orifice type
FA-1612X1-C					
FA-1612X2-S					
FA-1612X2-C			120 (120)	0.3~2	Multiple-varying orifice type
FA-1612X3-S					
FA-1612X3-C			35 (35)	0.7~3	Multiple-orifice type

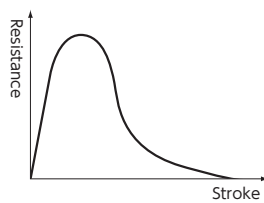
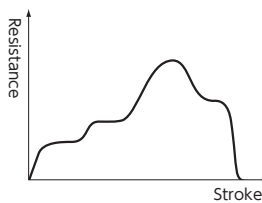
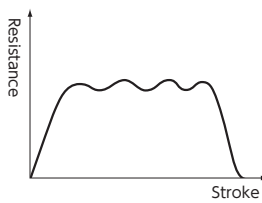
Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N (kgf)	3,528 (360)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	60	Mass : S type	g	98
Max. absorption energy per minute	J/min (kgf·m/min)	235 (24)	: C type	g	107
Recovering power of the piston rod	N (kgf)	19.6 (2.0) or lower			

Selection Guideline

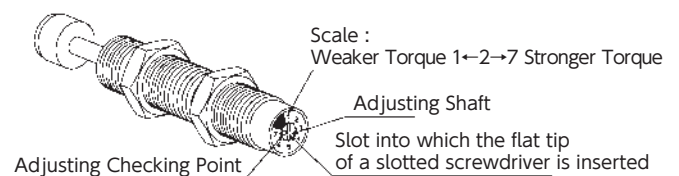
The FA-1612-FWM series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

Orifice type	Single-orifice type	Multiple-varying orifice type	Multiple-orifice type
Model number	FA-1612X1 series	FA-1612X2 series	FA-1612X3 series
Application	For low-speed	For medium speed, in particular with a pneumatic cylinder	For high-speed
Absorption characteristics			

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper (Stopper nut OP-020HB) is also used.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within $\pm 2.5^\circ$)

Adjustment Method



- * To adjust, turn the adjustment knob with a slotted screw driver.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * It does not have a lock screw for locking the adjusted setting.

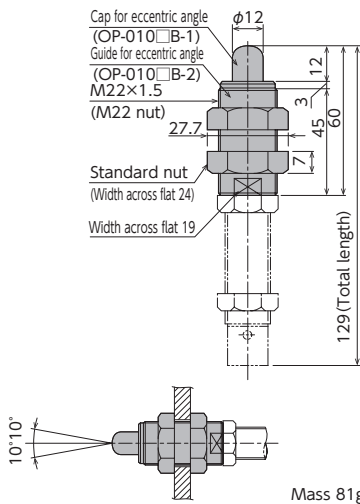
● Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010XB

Model
OP-010XB

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber.
- The maximum operating eccentric angle with an eccentric angle adaptor is ±10°.
- The caps and the guides for inclined use are not unbundled.

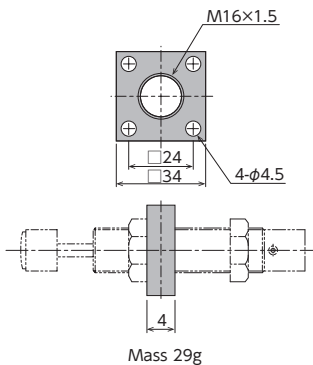


Note) Material of cap for eccentric angle: POM

Square flange OP-040XB

Model
OP-040XB

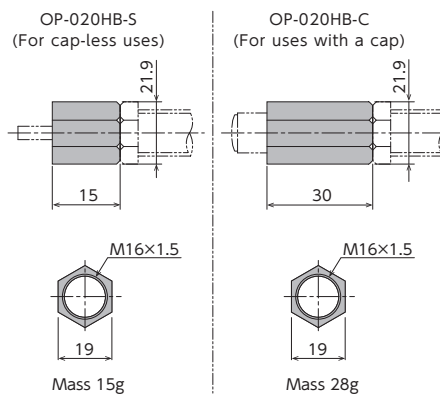
- Once the attachment site is determined, use the main unit's nut to securely fasten in place.



Stopper nut OP-020HB

Model
OP-020HB-S
OP-020HB-C

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.

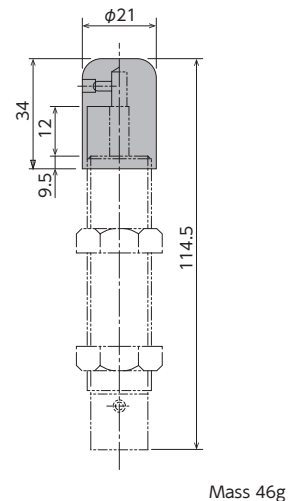


Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Liquid-proof cap FA-1612X□-C-060

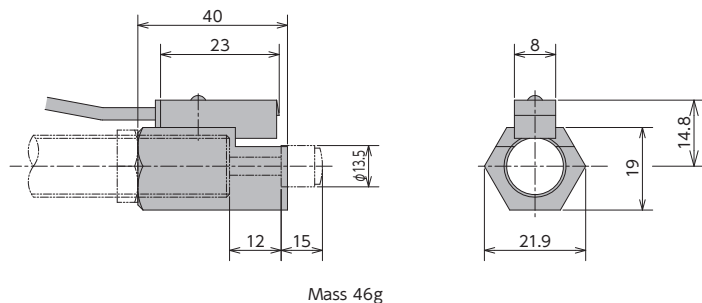
Model
FA-1612X□-C-060

- A drip-proof cap is fitted on the unit on delivery.
- Liquid-proof caps are not sold separately.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-16120M□□-C-060
 - The model number 1, 2, or 3 is inserted in the □ of X□.



Holder with a switch OP-032HB (With a stopper function)

Model
OP-032HB



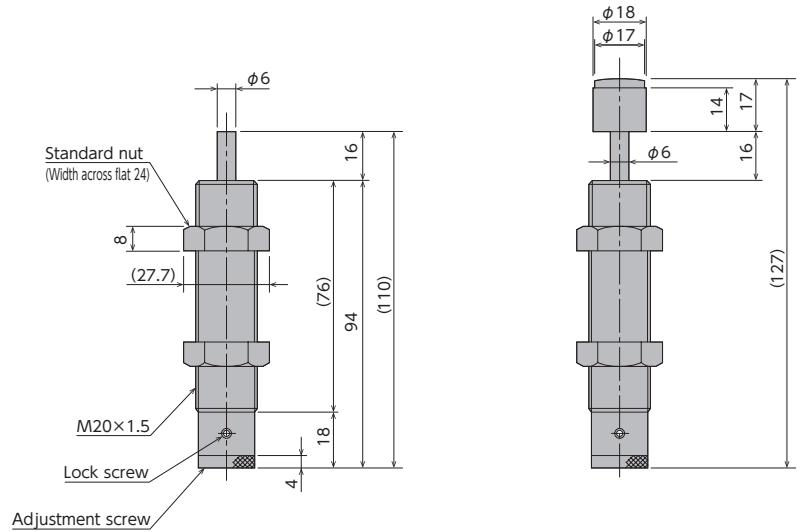
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

Standard nuts are sold separately as well.

Applicable Models	Model
FA-1612X	M16 nut

Soft Absorber

FA-2016EB/FA-2016ED/FWM-2016EBD Series



Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Orifice type
FA-2016EB-S	16	29.4 (3.0)	300 (300)	0.3~1	Single-orifice type
FA-2016EB-C					
FA-2016ED-S			120 (120)	0.7~3	Multiple-orifice type
FA-2016ED-C					
FWM-2016EBD-S			200 (200)	0.3~2	Multiple-varying orifice type
FWM-2016EBD-C					

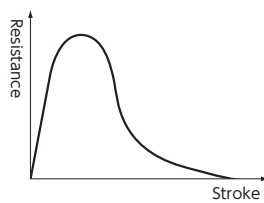
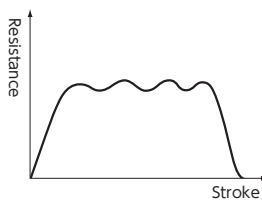
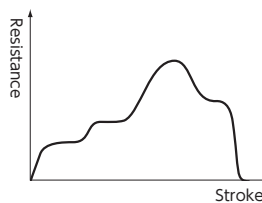
Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N (kgf)	3,528 (360)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	60	Mass : S type	g	180
Max. absorption energy per minute	J/min (kgf·m/min)	343 (35)	: C type	g	202
Recovering power of the piston rod	N (kgf)	18.1 (1.84) or lower			

Selection Guideline

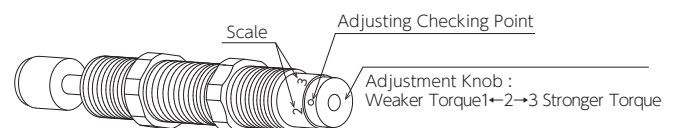
The FA-2016 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

Orifice type	Single-orifice type	Multiple-orifice type	Multiple-varying orifice type
Model number	FA-2016EB series	FA-2016ED series	FWM-2016EBD series
Application	For low-speed	For high-speed	For medium speed, in particular with a pneumatic cylinder
Absorption characteristics			

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper (Stopper nut OP-020EB) is also used.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within $\pm 2.5^\circ$)

Adjustment Method



- * To adjust, turn the adjustment knob located at the bottom of the main unit.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * Once the adjustment is complete, secure with a lock screw using a hex wrench.

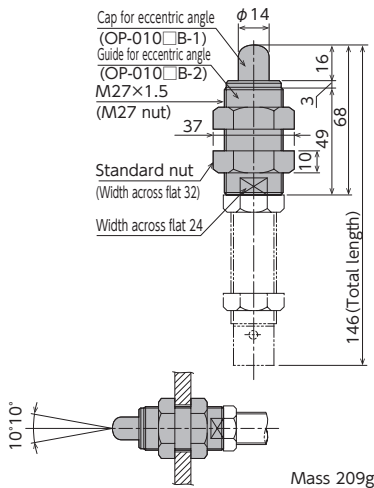
● Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010EB

Model
OP-010EB

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber.
- The maximum operating eccentric angle with an eccentric angle adaptor is ±10°.
- The caps and the guides for inclined use are not unbundled.

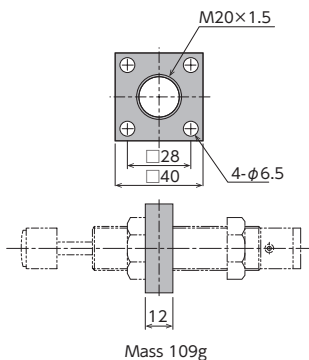


Note) Material of cap for eccentric angle: Metal

Square flange OP-040EB

Model
OP-040EB

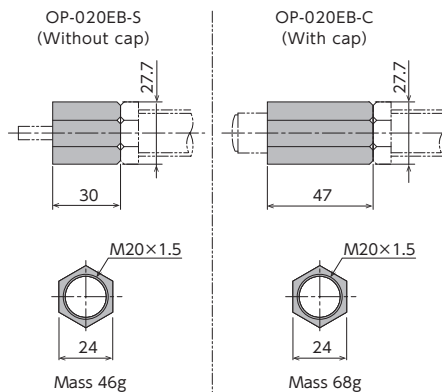
- Once the attachment site is determined, use the main unit's nut to securely fasten in place.



Stopper nut OP-020EB-□

Model
OP-020EB-S
OP-020EB-C

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.

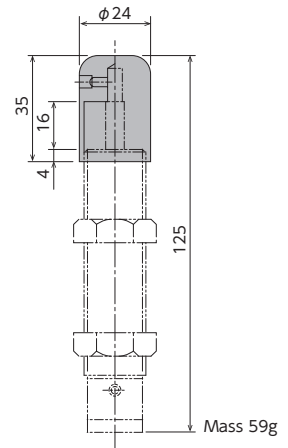


Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Liquid-proof cap FA-2016E□-C-060

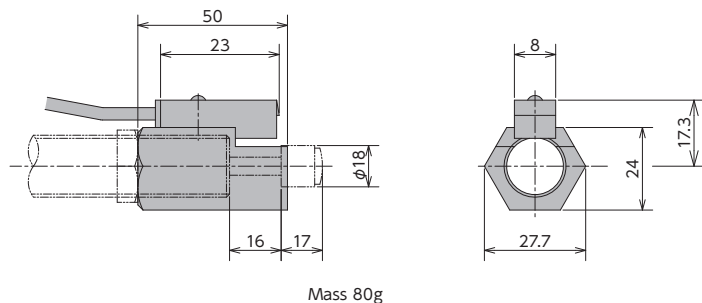
Model
FA-2016EB-C-060
FA-2016ED-C-060
FWM-2016EBD-C-060

- A drip-proof cap is fitted on the unit on delivery.
- Liquid-proof caps are not sold separately.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-16120M□□-C-060
 - Model indication A or WM is inserted in □ of F□□.
 - Model indication B, D or BD is inserted in □ of M□□.



Holder with a switch OP-030EB-□

Model
OP-032EB



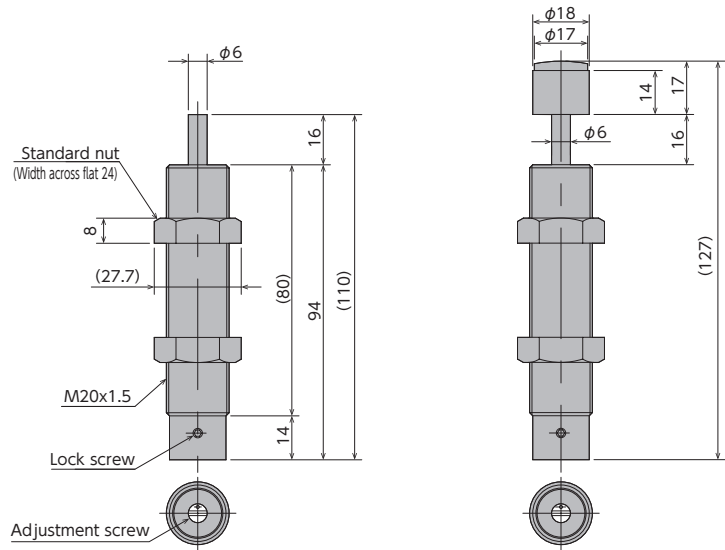
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

Standard nuts are sold separately as well.

Applicable Models	Model
FA-2016EB	M20 nut
FA-2016ED	
FWM-2016EBD	

Soft Absorber

FA-2016E Series



Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Orifice type
FA-2016E1-S	16	35 (3.57)	300 (300)	0.3~1	Single-orifice type
FA-2016E1-C					
FA-2016E2-S					
FA-2016E2-C			200 (200)	0.3~2	Multiple-varying orifice type
FA-2016E3-S					
FA-2016E3-C			120 (120)	0.7~3	Multiple-orifice type

Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N (kgf)	6,370 (650)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	60	Mass : S type	g	185
Max. absorption energy per minute	J/min (kgf·m/min)	343 (35)	: C type	g	207
Recovering power of the piston rod	N (kgf)	18.1 (1.84) or lower			

Selection Guideline

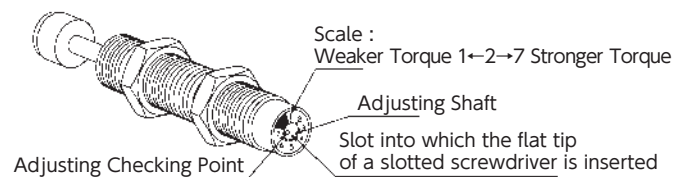
The FA-2016 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

Orifice type	Single-orifice type	Multiple-varying orifice type	Multiple-orifice type
Model number	FA-2016E1 series	FA-2016E2 series	FA-2016E3 series
Application	For low-speed	For medium speed, in particular with a pneumatic cylinder	For high-speed
Absorption characteristics			

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper (Stopper nut OP-020EB) is also used.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within $\pm 2.5^\circ$)

Adjustment Method



- * To adjust, turn the adjustment knob with a slotted screw driver.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * It does not have a lock screw for locking the adjusted setting.

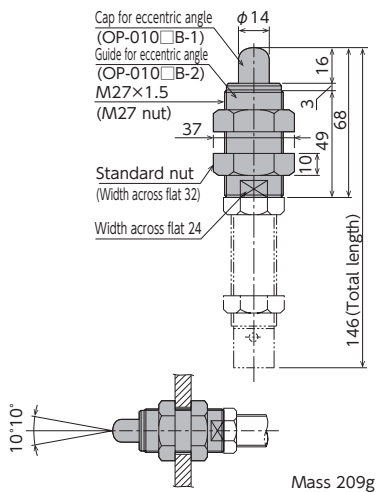
● Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010EB

Model
OP-010EB

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber.
- The maximum operating eccentric angle with an eccentric angle adaptor is ±10°.
- The caps and the guides for inclined use are not unbundled.

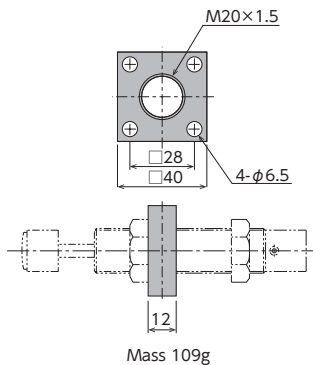


Note) Material of cap for eccentric angle: Metal

Square flange OP-040EB

Model
OP-040EB

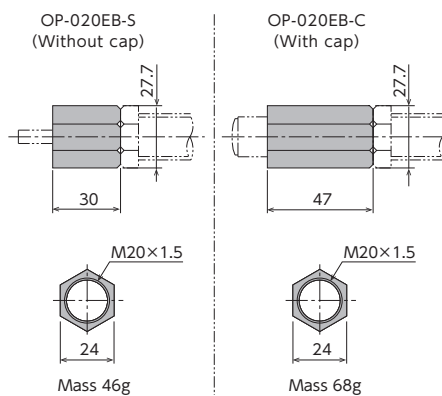
- Once the attachment site is determined, use the main unit's nut to securely fasten in place.



Stopper nut OP-020EB-□

Model
OP-020EB-S
OP-020EB-C

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.

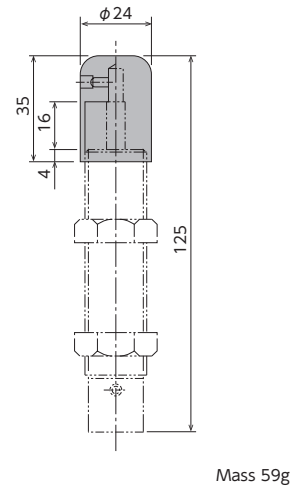


Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Liquid-proof cap FA-2016E□-C-060

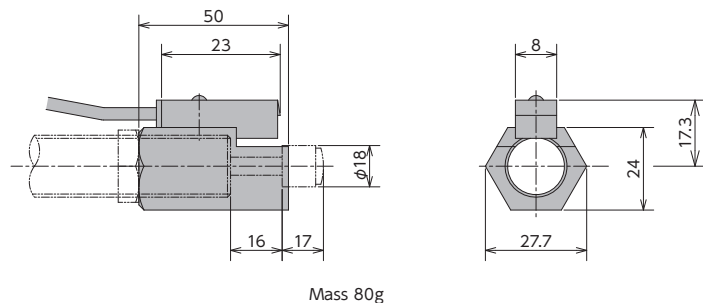
Model
FA-2016E□-C-060

- A drip-proof cap is fitted on the unit on delivery.
- Liquid-proof caps are not sold separately.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-16120M□□-C-060
 - The model number 1, 2, or 3 is inserted in the □ of X□.



Holder with a switch OP-030EB-□

Model
OP-032EB



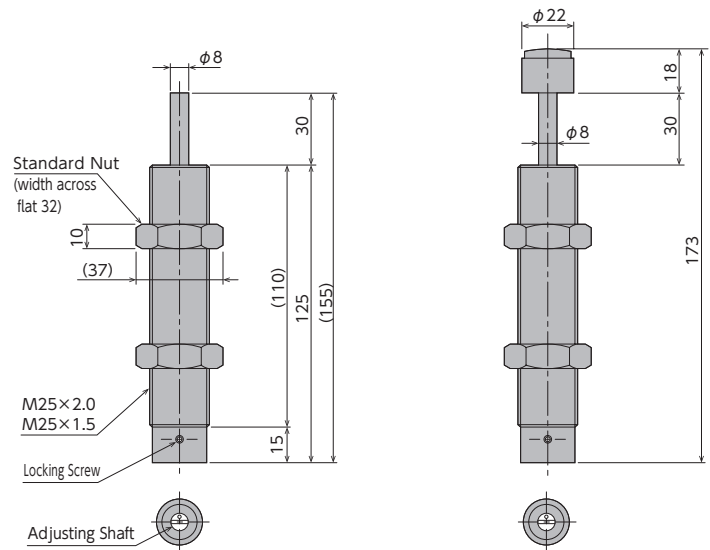
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

Standard nuts are sold separately as well.

Applicable Models	Model
FA-2016E	M20 nut

Soft Absorber

FA-2530GB/FA-2530GD/FWM-2530GBD Series



Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Orifice type
FA-2530GB-S ▲	30	49(5.0)	400(400)	0.3~1	Single-orifice type
FA-2530GB-C ▲					
FA-2530GD-S ▲			150(150)	0.7~3	Multiple-orifice type
FA-2530GD-C ▲					
FWM-2530GBD-S ▲			300(300)	0.3~2	Multiple-varying orifice type
FWM-2530GBD-C ▲					

▲ Thread pitch P2.0 is supplied as well.

Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

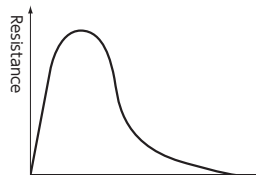
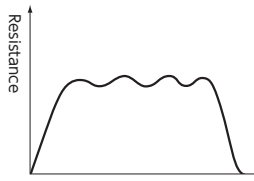
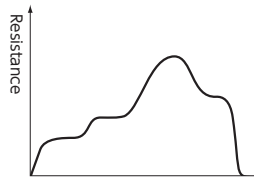
Note: M25 x 2.0 is included in main unit thread pitch specification for FA-2530. A designation shall include the model symbols such as FA-2530GB- * -P2.0, FA-2530GD- * -P2.0, FWM-2530GBD- * -P2.0, etc. for ordering. Note: "*" will be filled in with "-S" or "-C"

Common Specifications

Max. drag	N(kgf)	3,920(400)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	60	Mass : S type	g	406
Max. absorption energy per minute	J/min (kgf·m/min)	490(50)	: C type	g	436
Recovering power of the piston rod	N(kgf)	33.2(3.38) or lower			

Selection Guideline

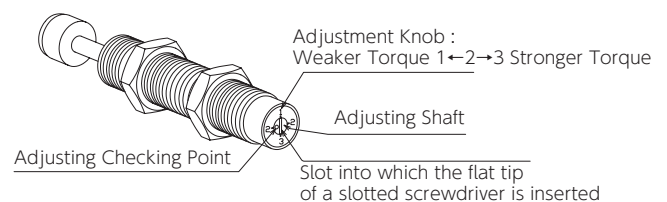
The FA-2530 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

Orifice type	Single-orifice type	Multiple-orifice type	Multiple-varying orifice type
Model number	FA-2530GB series	FA-2530GD series	FWM-2530GBD series
Application	For low-speed	For high-speed	For medium speed, in particular with a pneumatic cylinder
Absorption characteristics			

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper (Stopper nut OP-020GB) is also used.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within $\pm 2.5^\circ$)

Adjustment Method



- * To adjust, turn the adjustment knob with a slotted screw driver.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * It does not have a lock screw for locking the adjusted setting.

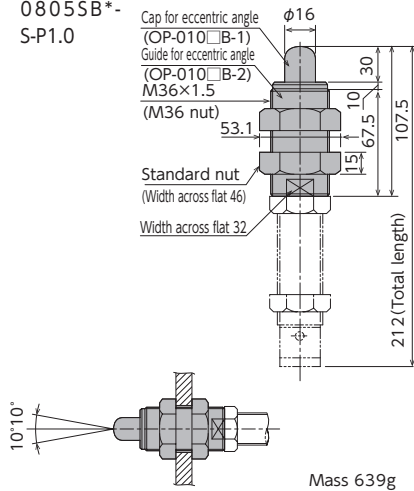
● Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010GB

Model
OP-010GB

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber.
- The maximum operating eccentric angle with an eccentric angle adaptor is ±10°.
- The caps and the guides for inclined use are not unbundled.
- The inclined adapter is not available for FA-0805SB*-S-P1.0

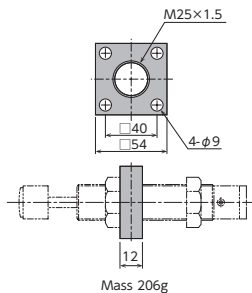


Note) Material of cap for eccentric angle: Metal

Square flange OP-040GB

Model
OP-040GB

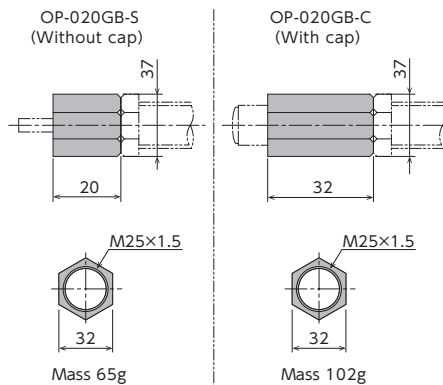
- Once the attachment site is determined, use the main unit's nut to securely fasten in place.



Stopper nut OP-020GB-□

Model
OP-020GB-S
OP-020GB-C

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.

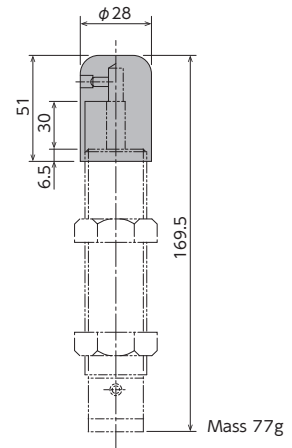


Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.
M25 X 2.0 is also available as a screw pitch specification.
Model number is either OP-020GB-S or C-P2.0

Liquid-proof cap F□□-2530G□□-C-060

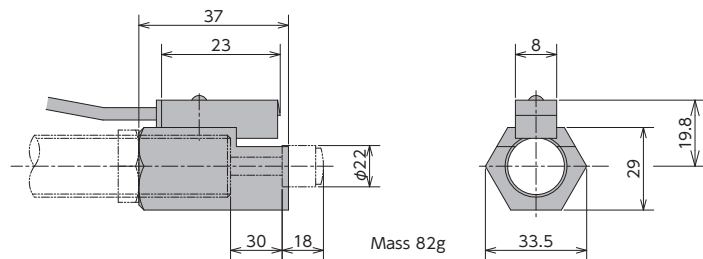
Model
FA-2530GB-C-060
FA-2530GD-C-060
FWM-2530GBD-C-060

- A drip-proof cap is fitted on the unit on delivery.
- Liquid-proof caps are not sold separately.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-2530G□□-C-060
 - Model indication A or WM is inserted in □ of F□□.
 - Model indication B, D or BD is inserted in □ of M□□.



Holder with a switch OP-030GB-□

Model
OP-032GB



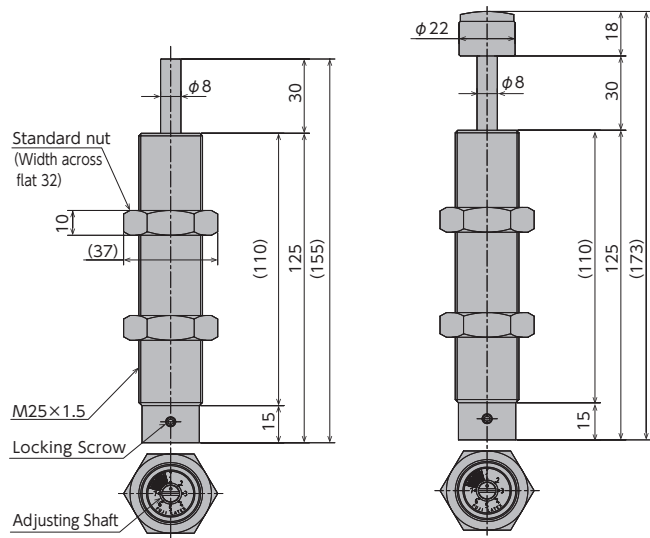
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

Standard nuts are sold separately as well.

Applicable Models	Model
FA-2530GB	M25 nut
FA-2530GD	
FWM-2530GBD	
FA-2530GB P2.0	M25-P2 nut
FA-2530GD P2.0	
FWM-2530GBD P2.0	

Soft Absorber

FA-2530G/FA-2530SL Series



Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Orifice type
FA-2530G1-S	30	49 (5.0)	400 (400)	0.3~1	Single-orifice type
FA-2530G1-C					Multiple-varying orifice type
FA-2530G2-S		58.8 (6.0)	300 (300)	0.3~2	Multiple-varying orifice type
FA-2530G2-C					Multiple-orifice type
FA-2530G3-S		49 (5.0)	4,150 (4,150)	0.05~0.5	Multiple-varying orifice type
FA-2530G3-C					Multiple-varying orifice type
FA-2530SL-S					Multiple-varying orifice type
FA-2530SL-C					Multiple-varying orifice type

Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N (kgf)	6,370 (650)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	60	Mass : S type	g	388
Max. absorption energy per minute	J/min (kgf·m/min)	490 (50)	: C type	g	418
Recovering power of the piston rod	N (kgf)	30.8 (3.14) or lower			

Note) M25 X 2.0 is also available as the main unit's screw pitch specifications for the FA-2530 series. Please your order using the model number FA-2530G*-SP2.0 or FA-2530G*-CP2.0, pitch specifications for the FA-2530 series. Please your order using the model number FA-2530G*-SP2.0 or FA-2530G*-CP2.0.

Selection Guideline

The FA-2530 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

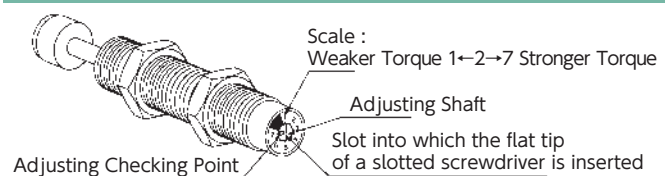
Orifice type	Single-orifice type	Multiple-varying orifice type	Multiple-orifice type
Model number	FA-2530G1 series	FA-2530G2, SL series	FA-2530G3 series
Application	For low-speed	For medium speed, in particular with a pneumatic cylinder	For high-speed
Absorption characteristics			

* The super low speed models are applicable for a lower collision speed range than low speed models.

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper (Stopper nut OP-020GB) is also used.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within ±2.5°)

Adjustment Method



- * To adjust, turn the adjustment knob with a slotted screw driver.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * It does not have a lock screw for locking the adjusted setting.

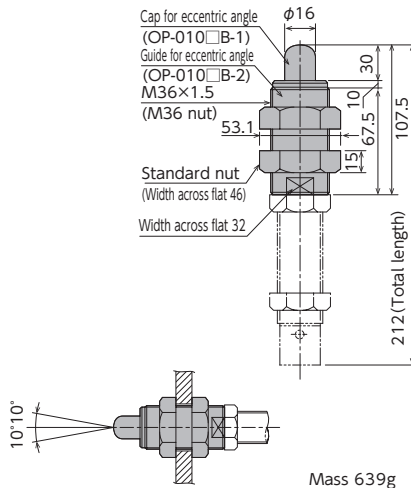
●Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010GB

Model
OP-010GB

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber.
- The maximum operating eccentric angle with an eccentric angle adaptor is ±10°.
- The caps and the guides for inclined use are not unbundled.

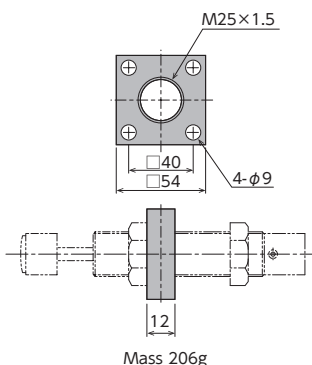


Note) Material of cap for eccentric angle: Metal

Square flange OP-040GB

Model
OP-040GB

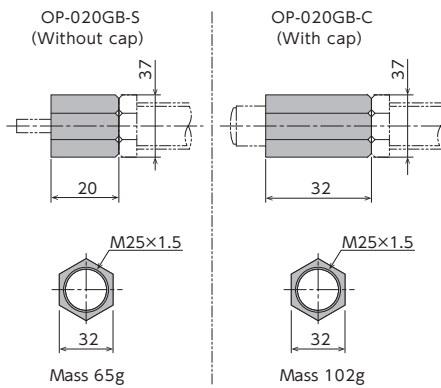
- Once the attachment site is determined, use the main unit's nut to securely fasten in place.



Stopper nut OP-020GB-□

Model
OP-020GB-S
OP-020GB-C

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.

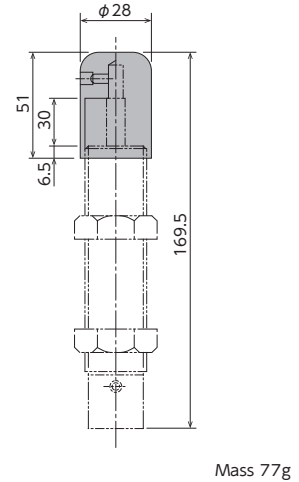


Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Liquid-proof cap F□-2530G□-C-060

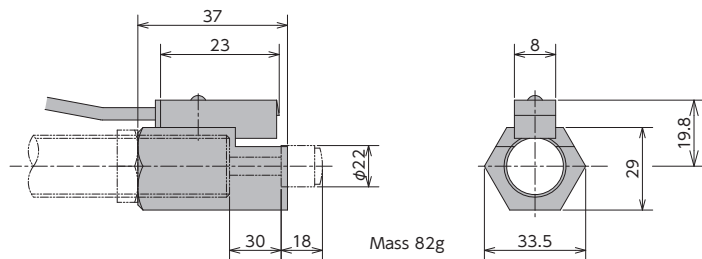
Model
FA-2530G1-C-060
FA-2530G2-C-060
FA-2530G3-C-060
FA-2530SL-C-060

- A drip-proof cap is fitted on the unit on delivery.
- Liquid-proof caps are not sold separately.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- FA-2530G□-C-060
 - The model number 1, 2, or 3 is inserted in the □ of X□.



Holder with a switch OP-030GB-□

Model
OP-032GB



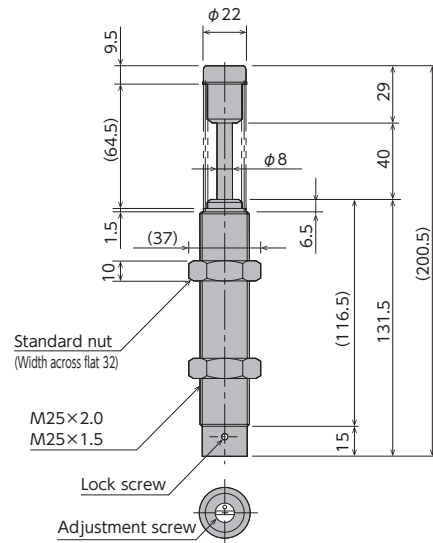
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

Standard nuts are sold separately as well.

Applicable Models	Model
FA-2530G	M25 nut
FA-2530SL	

Soft Absorber

FA-2540LB/FA-2540LD/FWM-2540LBD Series



Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Orifice type
FA-2540LB-C ▲	40	63.7 (6.5)	500 (500)	0.3~1	Single-orifice type
FA-2540LD-C ▲			200 (200)	0.7~3	Multiple-orifice type
FWM-2540LBD-C ▲			350 (350)	0.3~2	Multiple-varying orifice type

▲ Thread pitch P2.0 is supplied as well.

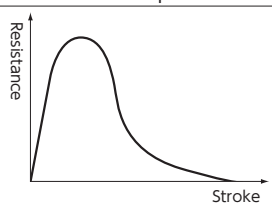
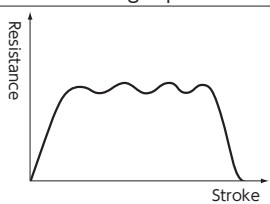
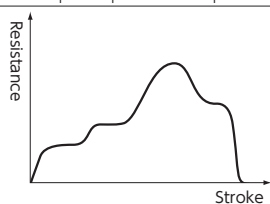
Common Specifications

Max. drag	N (kgf)	3,920 (400)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	60	Mass : C type	g	475.1
Max. absorption energy per minute	J/min (kgf·m/min)	637 (65)			
Recovering power of the piston rod	N (kgf)	71.4 (7.29) or lower			

Note) M25 X 2.0 is also available as the main unit's screw pitch specifications for the FA-2540 series. Please order using the model number FA-2540L*-C-P.2.0. However, please note that there are no optional parts for it.

Selection Guideline

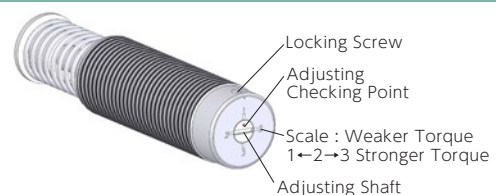
The FA-FWM-2540 series series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

Orifice type	Single-orifice type	Multiple-orifice type	Multiple-varying orifice type
Model number	FA-2540LB series	FA-2540LD series	FWM-2540LBD series
Application	For low-speed	For high-speed	For medium speed, in particular with a pneumatic cylinder
Absorption characteristics			

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper (Stopper nut OP-020LB) is also used.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within $\pm 2.5^\circ$)

Adjustment Method



- * To adjust, turn the adjustment knob with a slotted screw driver.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * It does not have a lock screw for locking the adjusted setting.

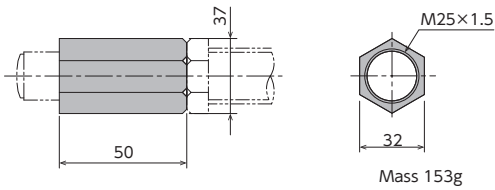
●Products specification might be changed without notice.

Optional Parts

Stopper nut OP-020LB

Model
OP-020LB

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.

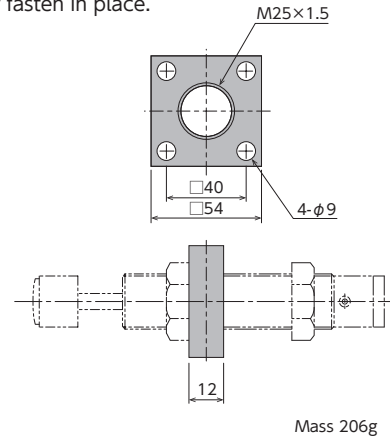


Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Square flange OP-040GB

Model
OP-040GB

- Once the attachment site is determined, use the main unit's nut to securely fasten in place.

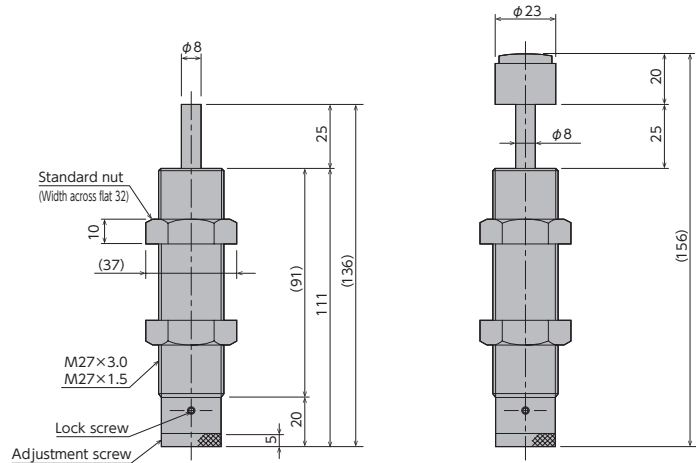


Standard nuts are sold separately as well.

Applicable Models	Model
FA-2540LB	M25 nut
FA-2540LD	
FWM-2540LBD	
FA-2540LB P2.0	M25-P2 nut
FA-2540LD P2.0	
FWM-2540LBD P2.0	

Soft Absorber

FA-2725FB/FA-2725FD/FWM-2725FBD/FA-2725SL Series



Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Orifice type
FA-2725FB-S ▲	25	79.3 (8.1)	650 (650)	0.3~1	Single-orifice type
FA-2725FB-C ▲					Multiple-orifice type
FA-2725FD-S ▲			300 (300)	0.7~3	Multiple-orifice type
FA-2725FD-C ▲					Multiple-orifice type
FWM-2725FBD-S ▲			450 (450)	0.3~2	Multiple-varying orifice type
FWM-2725FBD-C ▲					Multiple-varying orifice type
FA-2725SL-S ▲			5,000 (5,000)	0.05~0.5	Multiple-varying orifice type
FA-2725SL-C ▲					Multiple-varying orifice type

▲ Thread pitch P3.0 is supplied as well.

Common Specifications

Max. drag	N (kgf)	6,370 (650)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	60	Mass : S type	g	411
Max. absorption energy per minute	J/min (kgf·m/min)	539 (55)	: C type	g	460
Recovering power of the piston rod	N (kgf)	27.3 (2.78) or lower			

Note) M27X3.0 is also available as the main unit's screw pitch specification for the FA-2725 series. Please order using the model number FA-2725F*-S-P3.0 or FA-2725F*-C-P3.0.

Note: "*" will be filled in with "S" or "C"

Note: The maximum operation cycle of FA-2725SL is 30 (cycle/min). Note: The piston rod returning force of FA-2725SL is lower than 40.6N (4.14 kgf).

Selection Guideline

The FA-FWM-2725 series series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

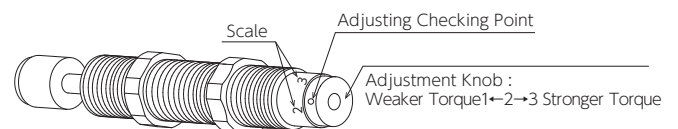
Orifice type	Single-orifice type	Multiple-orifice type	Multiple-varying orifice type
Model number	FA-2725FB series	FA-2725FD series	FWM-2725FBD, FA-2725SL series
Application	For low-speed	For high-speed	For medium speed, in particular with a pneumatic cylinder
Absorption characteristics			

* The super low speed models are applicable to a collision speed range lower than that of low speed models.

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper (Stopper nut OP-020FB) is also used.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within $\pm 2.5^\circ$)

Adjustment Method



To adjust, turn the adjustment knob located at the bottom of the main unit.

- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * Once the adjustment is complete, secure with a lock screw using a hex wrench.

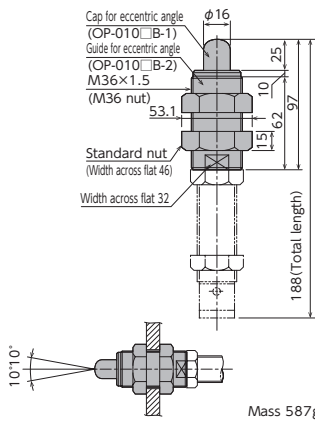
● Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010FB

Model
OP-010FB

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber.
- The maximum operating eccentric angle with an eccentric angle adaptor is ±10°.
- The caps and the guides for inclined use are not unbundled.

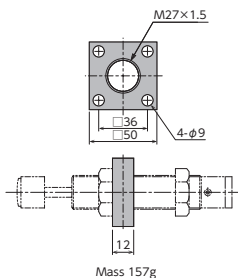


Note) Material of cap for eccentric angle: Metal

Square flange OP-040FB

Model
OP-040FB

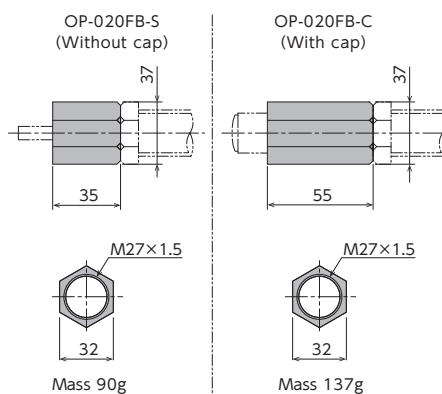
- Once the attachment site is determined, use the main unit's nut to securely fasten in place.



Stopper nut OP-020FB-□

Model
OP-020FB-S
OP-020FB-C

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.

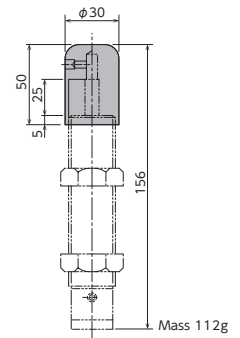


Note) When attaching, make sure that the side without a bearing chamfer is the impact surface. M27 X 3.0 is also available as a screw pitch specification. Model number is either OP-020FB-S or C-P3.0

Liquid-proof cap F□□-2725F□□-C-060

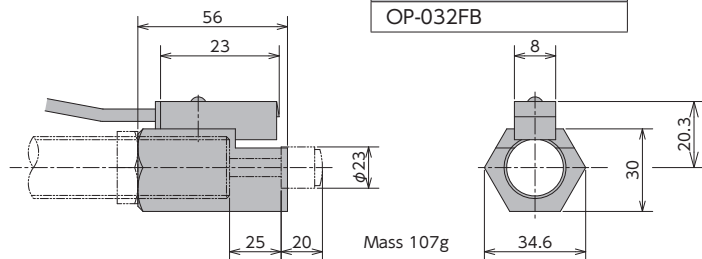
Model
FA-2725FB-C-060
FA-2725FD-C-060
FWM-2725FBD-C-060
FA-2725SL-C-060

- A drip-proof cap is fitted on the unit on delivery.
- Liquid-proof caps are not sold separately.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-2725F□□-C-060
 - Model indication A or WM is inserted in □ of F□□.
 - Model indication B, D or BD is inserted in □ of M□□.



Holder with a switch OP-030FB-□

Model
OP-032FB



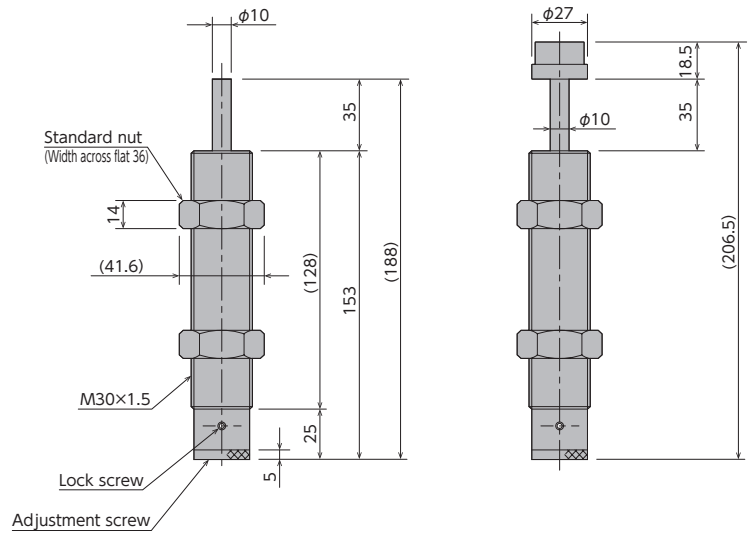
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

Standard nuts are sold separately as well.

Applicable Models	Model
FA-2725FB	M27 nut
FA-2725FD	
FWM-2725FBD	
FA-2725SL	
FA-2725FB P3.0	M27-P3 nut
FA-2725FD P3.0	
FWM-2725FBD P3.0	
FA-2725SL P3.0	

Soft Absorber

FA-3035TD/FWM-3035TBD/FA-3035SL Series



Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Orifice type
FA-3035TD-S	35	196 (20)	700 (700)	0.7~3	Multiple-orifice type
FA-3035TD-C					
FWM-3035TBD-S					
FWM-3035TBD-C			1,300 (1,300)	0.3~2	Multiple-varying orifice type
FA-3035SL-S					
FA-3035SL-C					

Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N (kgf)	16,660 (1,700)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	30	Mass : S type	g	710
Max. absorption energy per minute	J/min (kgf·m/min)	1,176 (120)	: C type	g	760
Recovering power of the piston rod	N (kgf)	60 (6.1) or lower			

Note: The maximum operation cycle of FA-3035SL is 15 (cycle/min).

Selection Guideline

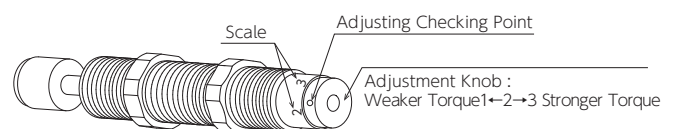
FA-3035 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

Orifice type	Multiple-orifice type	Multiple-varying orifice type
Model number	FA-3035TD series	FWM-3035TBD, FA-3035SL series
Application	For high-speed	For medium speed, in particular with a pneumatic cylinder
Absorption characteristics		

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper (Stopper nut OP-020TB) is also used.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within $\pm 2.5^\circ$)

Adjustment Method



To adjust, turn the adjustment knob located at the bottom of the main unit.

- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * Once the adjustment is complete, secure with a lock screw using a hex wrench.

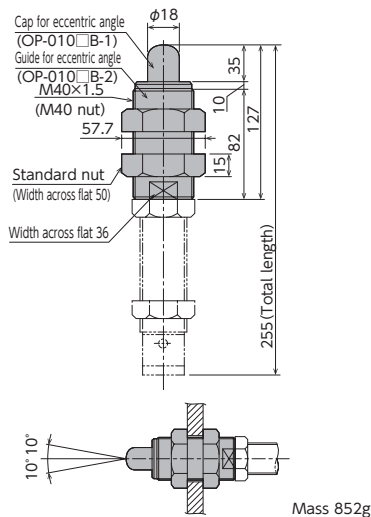
● Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010TB

Model
OP-010TB

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber.
- The maximum operating eccentric angle with an eccentric angle adaptor is ±10°.
- The caps and the guides for inclined use are not unbundled.

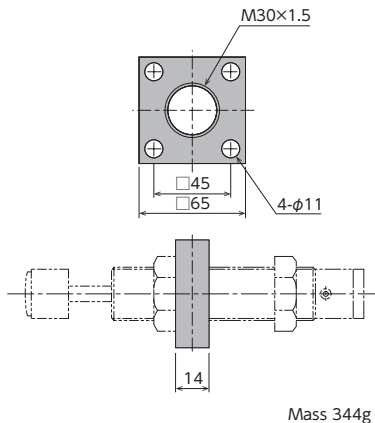


Note) Material of cap for eccentric angle: Metal

Square flange OP-040TB

Model
OP-040TB

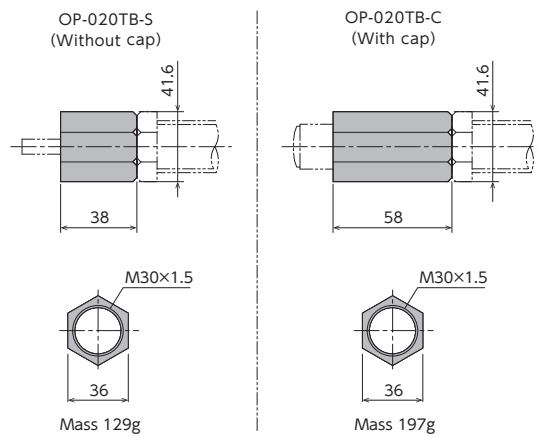
- Once the attachment site is determined, use the main unit's nut to securely fasten in place.



Stopper nut OP-020TB-□

Model
OP-020TB-S
OP-020TB-C

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.

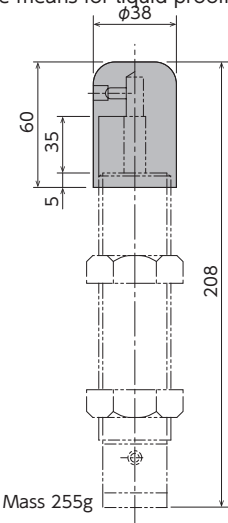


Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Liquid-proof cap F□□-3035T□□-C-060

Model
FA-3035TD-C-060
FWM-3035TBD-C-060

- Supplied in assembly
- Ideal for use in environments where oil splatter poses a problem.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-3035T□□-C-060
- Model indication A or WM is inserted in □ of F□□.
- Model indication D or BD is inserted in □ of T□□.



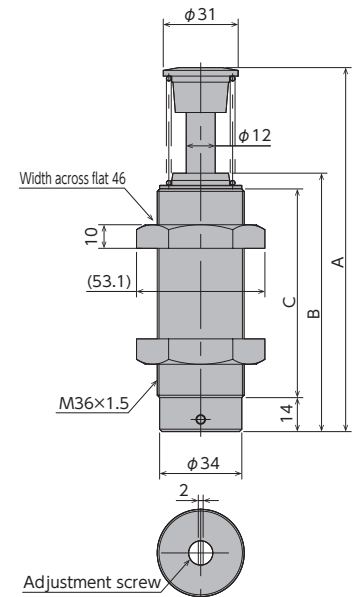
Note) Liquid-proof caps are not sold separately

Standard nuts are sold separately as well.

Applicable Models	Model
FA-3035TD	M30 nut
FWM-3035TBD	
FA-3035SL	

Soft Absorber

FA-3625A/FA-3650A/FA-3625SL/FA-3650SL Series



Dimensions

Model	A	B	C
FA-3625A1/A3/SL-C	150	106.5	86
FA-3650A2/A3/SL-C	217	148.5	128

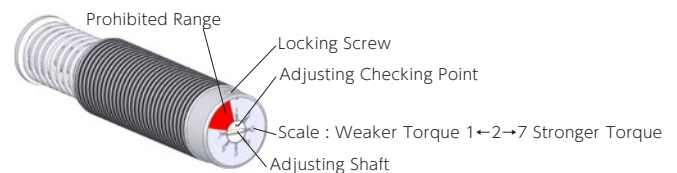
Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Max. drag N (kgf)	Max. cycle rate cycle/min	Absorption energy per minute J/min (kgf·m/min)	recovering power of the piston rod N (kgf)	Operating temperature °C	Mass g	
FA-3625A1-C	25	200 (20.4)	2,000 (2,000)	0.3~1.0	25,000 (2,551)	30	1,500 (153)	100 (10.2) or lower	-5~70	780	
FA-3625A3-C			700 (700)	0.7~3.0		15					
FA-3625SL-C			62,500 (62,500)	0.05~0.5		30					
FA-3650A2-C	50	400 (40.8)	2,700 (2,700)	0.3~2.0		15	2,352 (240)	120 (12.2) or lower			980
FA-3650A3-C			1,400 (1,400)	0.7~3.0							
FA-3650SL-C			124,800 (124,800)	0.05~0.5							

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper (Stopper nut OP-020M36) is also used.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within $\pm 2.5^\circ$)

Adjustment Method



- * To adjust, turn the adjustment knob with a slotted screw driver.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * It does not have a lock screw for locking the adjusted setting.

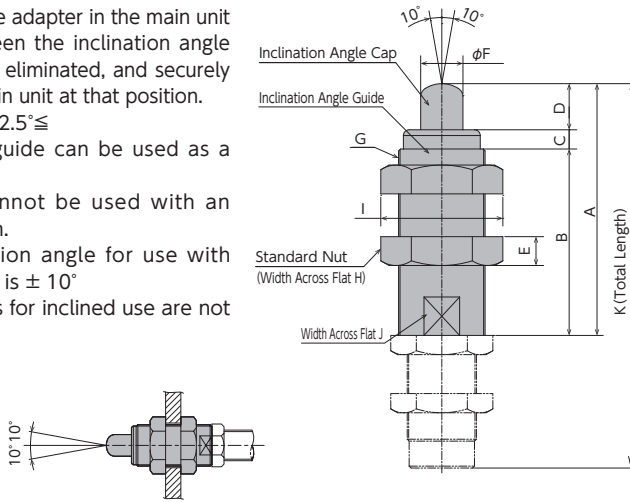
● Products specification might be changed without notice.

Optional Parts

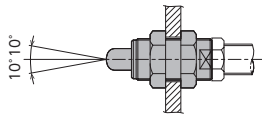
Inclination angle Adapter OP-010-M3625/M3650

Model
OP-010-M3625
OP-010-M3650

- Screw an inclination angle adapter in the main unit until the backlash between the inclination angle cap and the piston rod is eliminated, and securely tighten the nut for the main unit at that position.
- For an inclination angle $2.5^\circ \leq$
- The inclination angle guide can be used as a stopper as well
- The soft absorber cannot be used with an optional urethane cap on.
- The maximum inclination angle for use with inclination angle adapter is $\pm 10^\circ$
- The caps and the guides for inclined use are not unbundled.



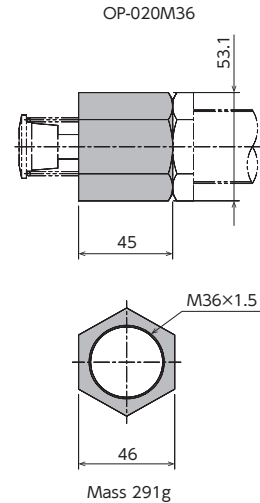
Model	A	B	C	D	ϕF	E	K	G	H	I	J	Mass g
OP-010-M3625	131	107	10	24	22	15	200	M45×1.5	55	63.5	41	880
OP-010-M3650	201	152	10	29			312					1,270



Stopper nut OP-020M36

Model
OP-020M36

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.

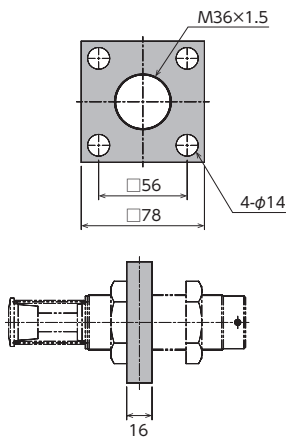


Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Square flange OP-040UB

Model
OP-040UB

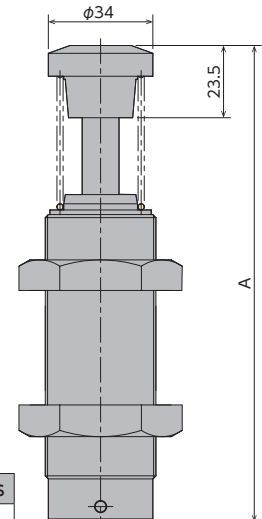
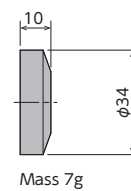
- Once the attachment site is determined, use the main unit's nut to securely fasten in place.



Urethane cap OP-090M36B

Model
OP-090M36B

OP-090M36B



Model	A Dimensions
FA-3625A1/A3/SL-C	155
FA-3650A2/A3/SL-C	222

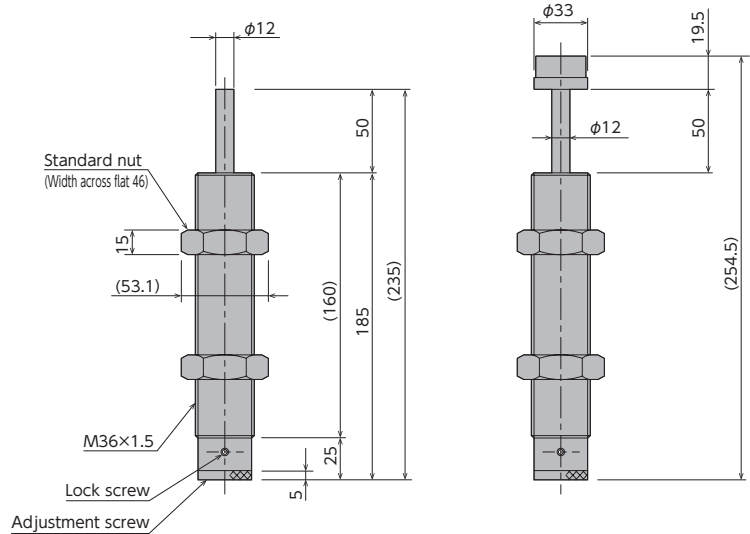
Dimensions with urethane cap attached

Standard nuts are sold separately as well.

Applicable Models	Model
FA-3625A	M36A nut
FA-3625SL	
FA-3650A	
FA-3650SL	

Soft Absorber

FA-3650UD/FWM-3650UBD Series



Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Orifice type
FA-3650UD-S	50	392 (40)	1,400 (1,400)	0.7~3	Single-orifice type
FA-3650UD-C					
FWM-3650UBD-S			2,700 (2,700)	0.3~2	Multiple-varying orifice type
FWM-3650UBD-C					

Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N (kgf)	23,520 (2,400)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	30	Mass : S type	g	1,330
Max. absorption energy per minute	J/min (kgf·m/min)	2,352 (240)	: C type	g	1,410
Recovering power of the piston rod	N (kgf)	68.6 (7.0) or lower			

Selection Guideline

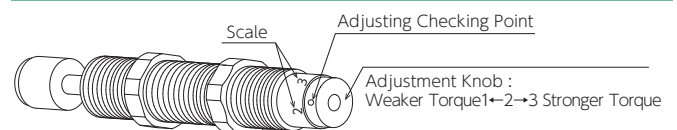
FA-3650 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

Orifice type	Multiple-orifice type	Multiple-varying orifice type
Model number	FA-3650UD series	FWM-3650UBD series
Application	For high-speed	For medium speed, in particular with a pneumatic cylinder
Absorption characteristics		

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper (Stopper nut OP-020UB) is also used.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within $\pm 2.5^\circ$)

Adjustment Method



To adjust, turn the adjustment knob located at the bottom of the main unit.

- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * Once the adjustment is complete, secure with a lock screw using a hex wrench.

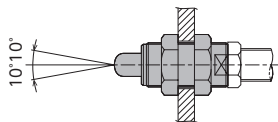
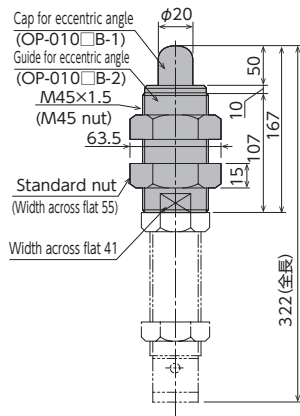
● Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010UB

Model
OP-010UB

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber.
- The maximum operating eccentric angle with an eccentric angle adaptor is ±10°.
- The caps and the guides for inclined use are not unbundled.



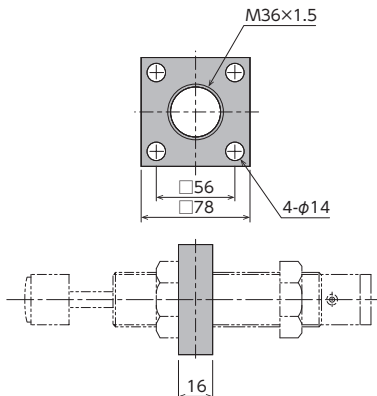
Note) Material of cap for eccentric angle: Metal

Mass 1,273g

Square flange OP-040UB

Model
OP-040UB

- Once the attachment site is determined, use the main unit's nut to securely fasten in place.

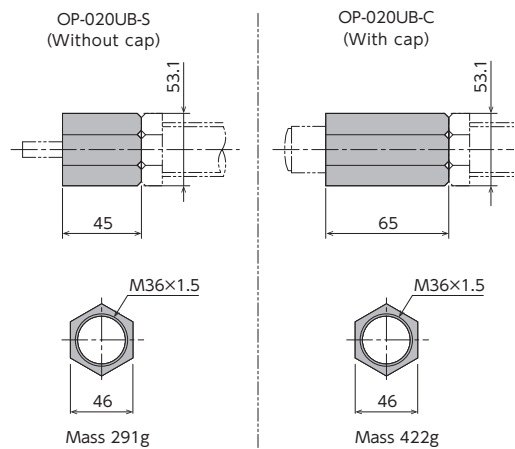


Mass 566g

Stopper nut OP-020UB-□

Model
OP-020UB-S
OP-020UB-C

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.



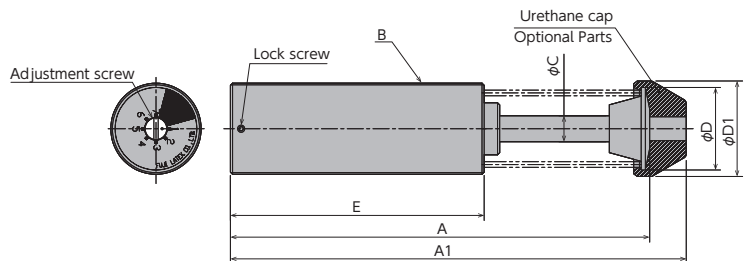
Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Standard nuts are sold separately as well.

Applicable Models	Model
FA-3650UD	M36 nut
FWM-3650UBD	

Soft Absorber

FA-4225B/FA-4250B/FA-4225SL/FA-4250SL/FA-4275B Series



*The absorber's main unit does not come with nuts.

Dimensions

Model	A	A1	B	C	D	D1	E
FA-4225B3/SL-C	144	162	M42×1.5	12	38	44	92
FA-4250B3/SL-C	195	213					118
FA-4275B3-C	246	264					143

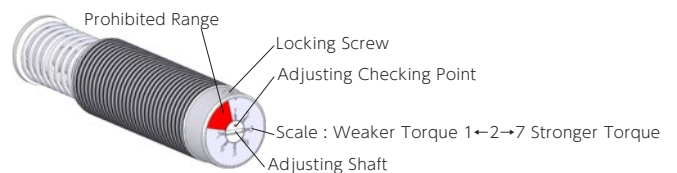
Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Max. drag N (kgf)	Max. cycle rate cycle/min	Absorption energy per minute J/min (kgf·m/min)	recovering power of the piston rod N (kgf)	Operating temperature °C	Mass g	
FA-4225B3-C	25	260 (26.5)	3,400 (3,400)	0.3~3.0	31,590 (3,223)	20	1,858 (190)	120 (12.2)	-5~70	795	
FA-4225SL-C			81,400 (81,400)	0.05~0.5		10					
FA-4250B3-C	50	520 (53.1)	6,500 (6,500)	0.3~3.0		10	2,372 (242)				
FA-4250SL-C			162,700 (162,700)	0.05~0.5		5					
FA-4275B3-C	75	780 (79.6)	9,700 (9,700)	0.3~3.0		6	3,345 (341)				1,240

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper (Stopper nut OP-020M42) is also used.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within $\pm 2.5^\circ$)
- * The urethane caps are consumables. Please replace them when necessary.

Adjustment Method



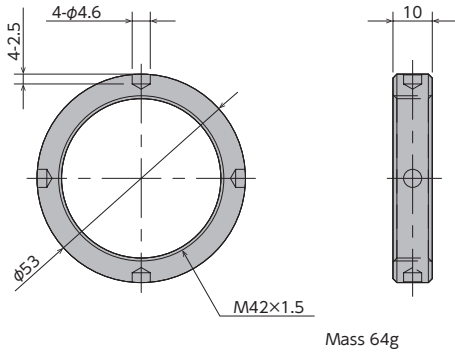
- * To adjust, turn the adjustment knob located at the bottom of the main unit.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * Once the adjustment is complete, secure with a lock screw using the attached hex wrench.

● Products specification might be changed without notice.

Optional Parts

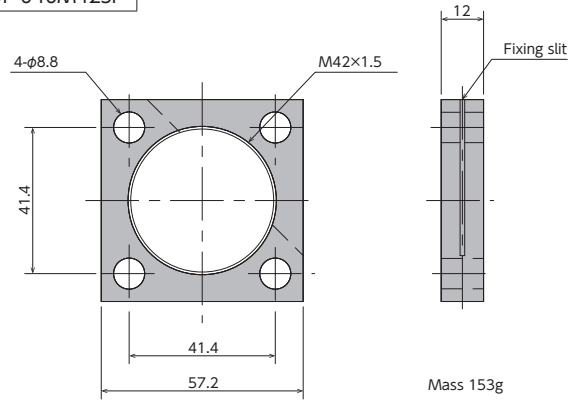
Nut OP-M42

Model
OP-M42



Square flange OP-040 M42SF

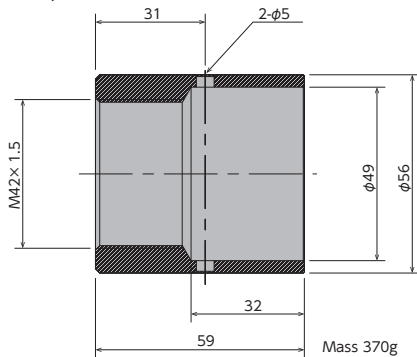
Model
OP-040M42SF



Stopper nut OP-020 M42

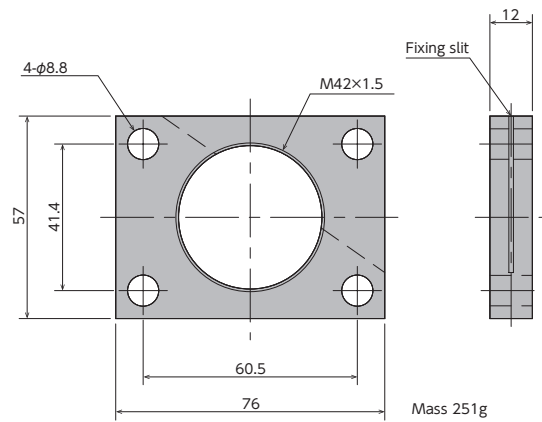
Model
OP-020M42

● Once the attachment site is determined, use the main unit's nut to securely fasten in place.



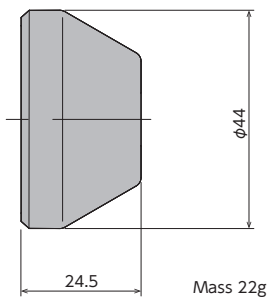
Rectangle flange OP-040 M42RF

Model
OP-040M42RF



Urethane cap OP-090 M42A

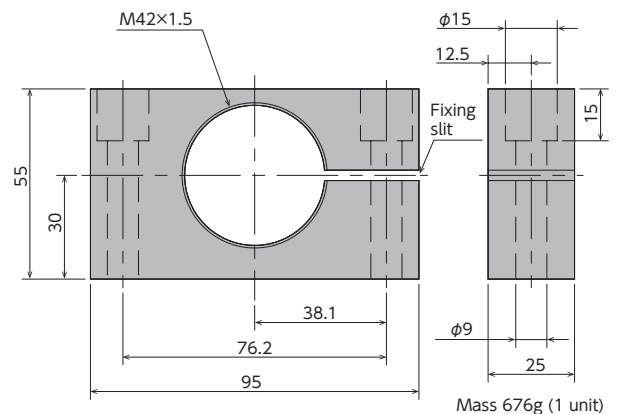
Model
OP-090M42A



Side mount OP-M42SM

Model
OP-M42SM

* Side mount is sold as a set of two.
* Recommended bolt: M8 X 50 hexagon socket head bolt



Soft Absorber

Fixed Type Adjustable type Self-adjusting

FA-4225B/FA-4225SL/FA-4250B/FA-4250SL Series

RoHS Compliant

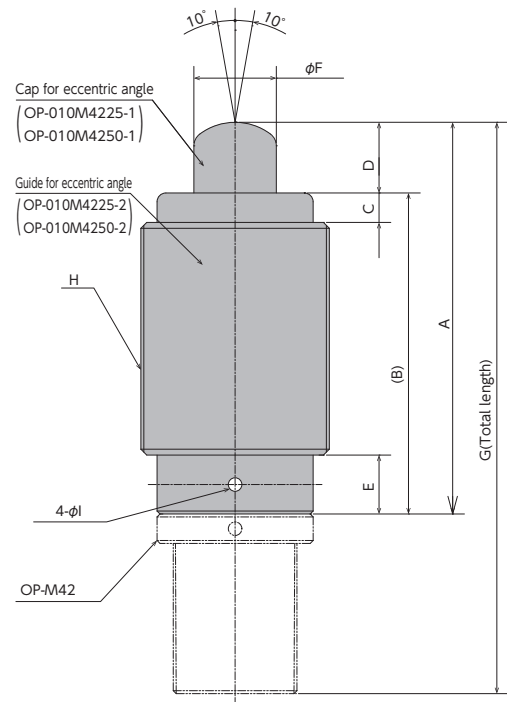
● Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010M4225/M4250

Model
OP-010M4225
OP-010M4250

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber.
- The maximum operating eccentric angle with an eccentric angle adaptor is $\pm 10^\circ$.
- Nut for unit is not inclusive.
- Not usable for FA-4250YD-C, FWM-4250YBD-C.
- The caps and the guides for inclined use are not unbundled.

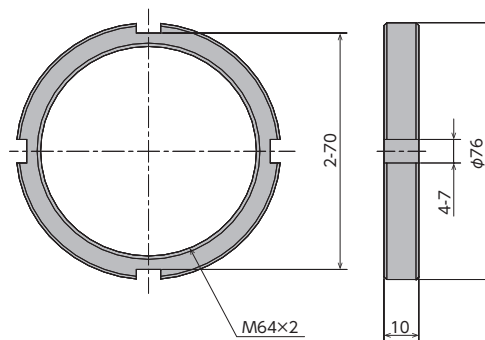


Model	A	B	C	D	E	ϕF	G	H	ϕI	Weight g
OP-010M4225	133	109	10	24	20	28	194	M64×2	4.6	1,600
OP-010M4250	203	154		49			290			2,500

Nut OP-M64

Model
OP-M64

- Usable as the nut for eccentric angle adaptor



Mass 100g

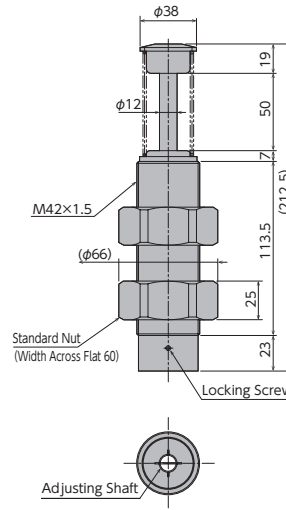
Soft Absorber

Fixed Type **Adjustable type** Self-adjusting

FA-4250YD/FWM-4250YBD Series

RoHS Compliant

●Products specification might be changed without notice.



Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Orifice type
FA-4250YD-C	50	441 (45)	390 (390)	0.7~3	Multiple-orifice type
FWM-4250YBD-C			3,500 (3,500)	0.3~2	Multiple-varying orifice type

Common Specifications

Max. drag	N (kgf)	27,030 (2,758)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	10	Mass : C type	g	1,940
Max. absorption energy per minute	J/min (kgf·m/min)	2,744 (280)			
Recovering power of the piston rod	N (kgf)	83.3 (8.5) or lower			

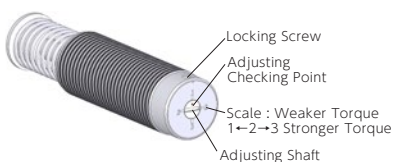
Selection Guideline FA-4250 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

Orifice type	Multiple-orifice type	Multiple-varying orifice type
Model number	FA-4250YD series	FWM-4250YBD series
Application	For high-speed	For medium speed, in particular with a pneumatic cylinder
Absorption characteristics		

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * We recommend that you use it with an external stopper.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber. (Allowable eccentric angle: $\pm 2.5^\circ$)

Adjustment Method

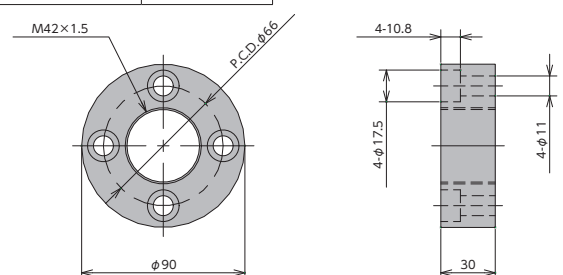


- * To adjust, turn the adjustment knob with a slotted screw driver.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * It does not have a lock screw for locking the adjusted setting.

Optional Parts

Square flange OP-040YB

Applicable Models	Model
FA-4250YD	OP-040YB
FWM-4250YBD	

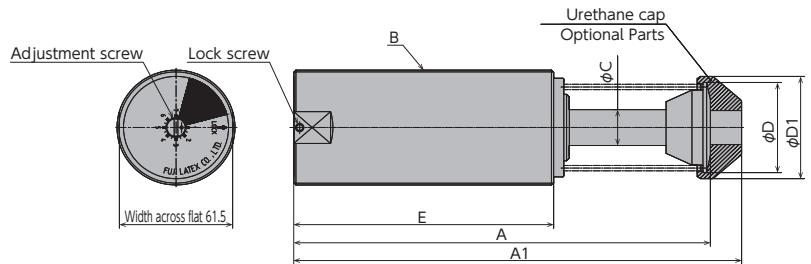


Standard nuts are sold separately as well.

Applicable Models	Model
FA-4250YD	M42 nut
FWM-4250YBD	

Soft Absorber

FA-6450/FA64100/FA64150 Series



* The absorber's main unit does not come with nuts.

Dimensions

Model	A	A1	B	C	D	D1	E
FA-6450□-C	226	243	M64×2	20	50.2	57	141
FA-64100□-C	328	345			60		191
FA-64150□-C	456	473					241

* A1 and D1 are dimensions with the optional urethane cap attached. (Urethane cap type: OP-090M64A)

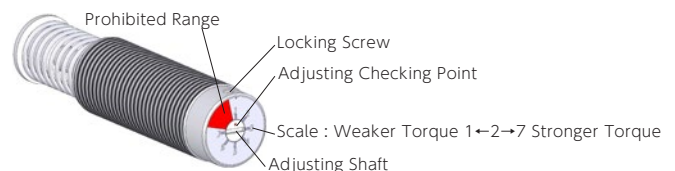
Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Max. drag N (kgf)	Max. cycle rate cycle/min	Absorption energy per minute J/min (kgf·m/min)	recovering power of the piston rod N (kgf)	Operating temperature °C	Mass g	Allowable eccentric angle
FA-6450Z-C	50	2,300 (234.7)	10,000~110,000(10,000~110,000)	0.02~0.3	90,000 (9,184)	3	164,608 (16,797)	150 (15.3)	-5~70	2.5	±2.5
FA-6450L-C			1,000~11,000(1,000~11,000)	0.3~1.0		15					
FA-6450H-C			200~1,800(200~1,800)	0.3~3.6		15					
FA-64100L-C	100	4,550 (464.3)	2,000~38,000(2,000~38,000)	0.3~1.0		10	214,118 (21,849)	180 (18.4)			
FA-64100H-C			250~2,500(250~2,500)	0.3~3.6		10					
FA-64150L-C	150	6,800 (693.9)	4,000~52,000(4,000~52,000)	0.3~1.0		8	275,556 (28,118)	370 (37.8)			
FA-64150H-C			300~5,500(300~5,500)	0.3~3.6	8	4.2			±1.0		

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * We recommend that you use it with an external stopper(Stopper nut OP-020M64).
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber.
- * The urethane caps are consumables. Please replace them when necessary. (Allowable eccentric angle: within ±2.5°)

Adjustment Method



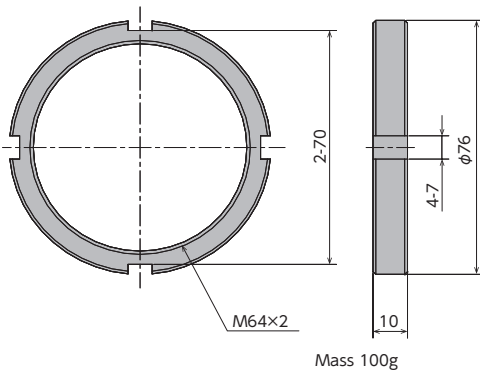
- * To adjust, turn the adjustment knob located at the bottom of the main unit.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * Once the adjustment is complete, secure with a lock screw using a hex wrench.

● Products specification might be changed without notice.

Optional Parts

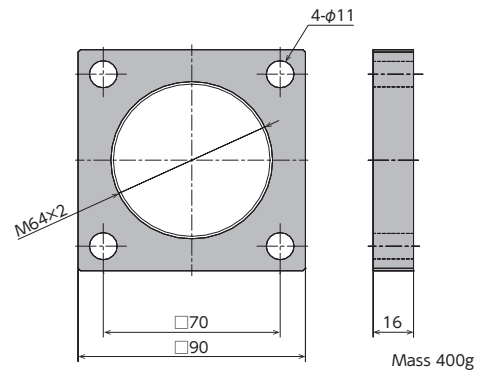
Nut OP-M64

Model
OP-M64



Square flange OP-040 M64SF

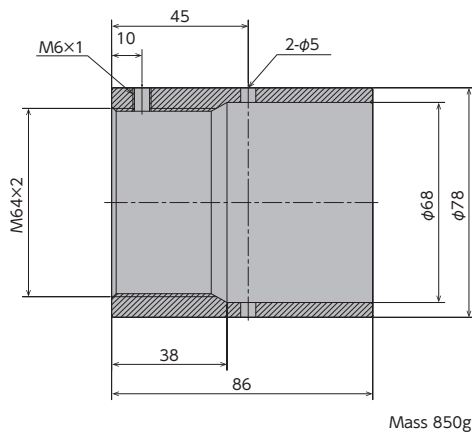
Model
OP-040M64SF



Stopper nut S OP-020 M64S

Model
OP-020M64S

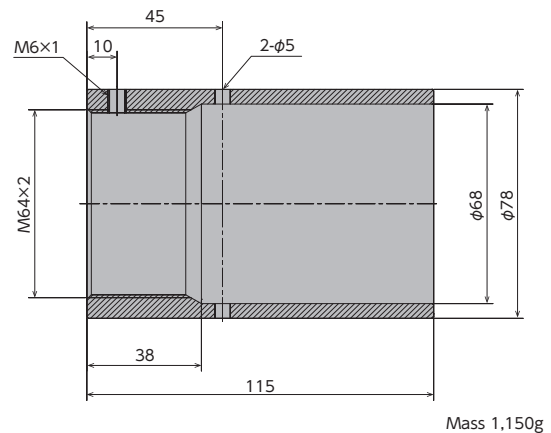
- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.



Stopper nut L OP-020 M64L * Exclusive for FA (FK) -64150

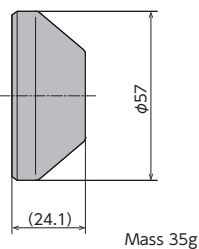
Model
OP-020M64L

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.



Urethane cap OP-090 M64A

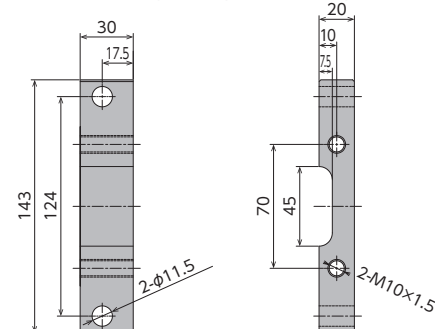
Model
OP-090M64A



Foot mount OP-M64FM

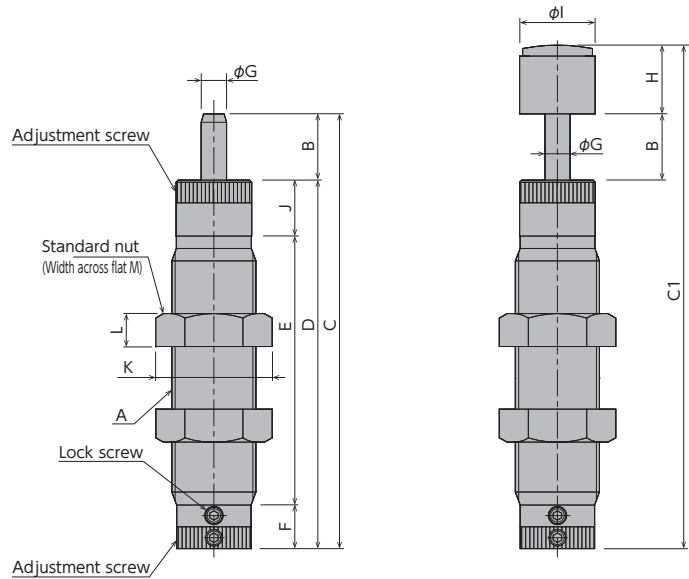
Model
OP-M64FM

- 1 set consists of 2 mounts.
- 4 hexagon socket head cap screws of M10×1.5 are contained in the set.
- The mount is common to the FA series and the FK series.
- 2 nuts OP-M64 (sold separately) will be required.



Soft Absorber

FA-2016EA/FA-2725FA Series



Dimensions

Model	A	B	C	C1	D	E	F	ϕG	H	ϕI	J	K	L	M
FA-2016EA-S/C	M20×1.5	16	105	122	89	65	10.5	6	17	18	13.5	27.7	8	24
FA-2725FA-S/C	M27×1.5	25	136	156	111	86.5	10.5	8	20	23	14	37	10	32

Note) To place an order without a cap, put -S at the end of the model number; to place an order with a cap, put -C at the end of the model number; and to place an order for a crevice type, put -U at the end of the model number.

Specifications

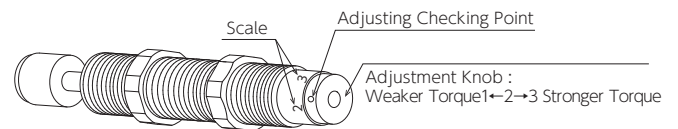
Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Max. drag N (kgf)	Max. cycle rate cycle/min	Absorption energy per minute J/min (kgf·m/min)	recovering power of the piston rod N (kgf)	Operating temperature °C	Mass g	Allowable eccentric angle
FA-2016EA-S	16	25.4 (2.6)	200 (200)	0.15~3.0	3,610	60	343 (35)	35.2 (3.59) or lower	-5~70	173	±2.5
191											
FA-2725FA-S	25	79.3 (8.1)	500 (500)	0.15~3.0	7,200	60	539 (55)	44.2 (4.51) or lower	-5~70	402	±2.5
446											

※ FA-2725FA-□シリーズは偏角度アダプター、防滴キャップはご使用できません。

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * We recommend that you use it with an external stopper (Stopper nut OP-020EB).
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber.
- * The urethane caps are consumables. Please replace them when necessary.

Adjustment Method



- * To adjust, turn the adjustment knob located at the bottom of the main unit.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * Once the adjustment is complete, secure with a lock screw using a hex wrench.

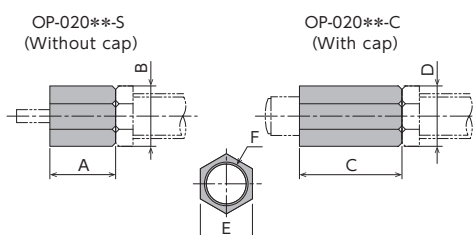
● Products specification might be changed without notice.

Optional Parts

Stopper nut OP-020EB, OP-020FB

Model
OP-020EB-S
OP-020EB-C
OP-020FB-S
OP-020FB-C

- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.



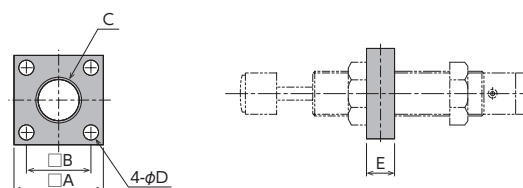
Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Model	A	B	C	D	E	F	Mass g
OP-020EB-*	30	27.7	47	27.7	24	M20X1.5	S 46
							C 68
OP-020FB-*	35	37	55	37	32	M27X1.5	S 90
							C 137

Square flange OP-040EB, OP-040FB

Model
OP-040EB
OP-040FB

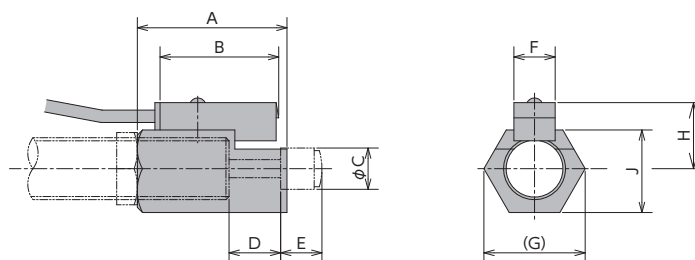
- Once the attachment site is determined, use the main unit's nut to securely fasten in place.



Model	A	B	C	φD	E	Mass g
OP-040EB	40	28	M20×1.5	6.5	12	109
OP-040FB	50	36	M27×1.5	9	12	157

Holder with a switch OP-032** (With stopper function)

Model
OP-032EB
OP-032FB



Model	A	B	C	D	E	F	G	H	J	Mass g
OP-032EB	50	21	18	16	17	8	28	18	24	80
OP-032FB	56	21	23	25	20	8	34.6	21	30	107

- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

Standard nuts are sold separately as well.

Applicable Models	Model
FA-2016EA	M20 nut
FA-2725FA	M27 nut

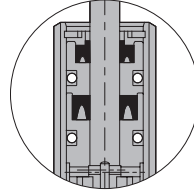
Soft Absorber

FA-S Series (Dust Seal Specifications)

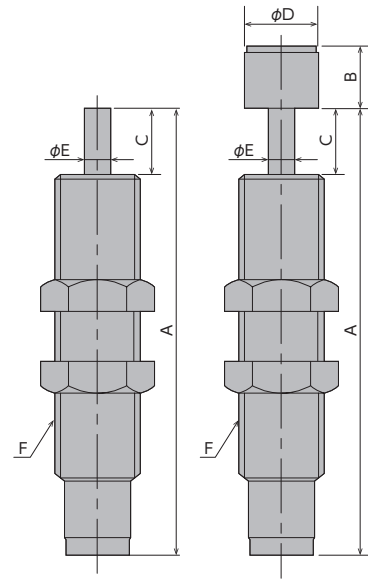
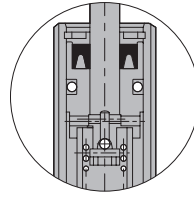
●Products specification might be changed without notice.



Dust seal specifications



Standard product



Dimensions

Model	A	B	C	D	E	F	Mass g	Specification Page
FA-S1210M□-S	76	8	10	8	3.5	M12×1	41	50
FA-S1210M□-C						44	50	
FA-S1410R□-S	80	8	10	10	3.5	M14×1.5	63	52
FA-S1410R□-C						68	52	
FA-S1612X□-S	102	15	12	13.5	5	M16×1.5	105	54
FA-S1612X□-C						114	54	
FA-S2016E□-S	120	17	16	18	6	M20×1.5	196	58
FA-S2016E□-C						218	58	
FA-S2530G□-S	155	18	30	22	8	M25×1.5	396	62
FA-S2530G□-C						427	62	
FA-S2540L□-C	171.5	29	40	22.5	8	M27×1.5	475	66
FA-S2725F□-S	136	20	25	24	8	M27×1.5	402	68
FA-S2725F□-C						451	68	
FA-S3035TD-S	188	18.5	35	27	10	M30×1.5	708	70
FA-S3035TD-C						755	70	
FA-S3650UD-S	235	19.5	50	33	12	M36×1.5	1330	74
FA-S3650UD-C						1410	74	

Note) B or D is inserted in the □. Insert B for a single-orifice type, and insert D for a multiple-orifice type.

Specifications

* The specification is identical with the standard models for each type

Precautions for Use

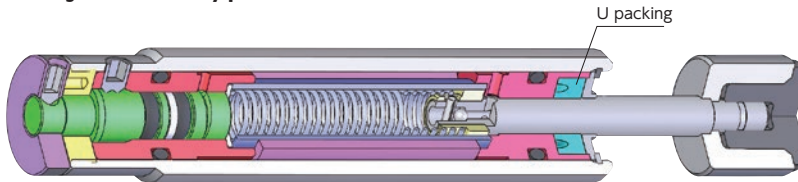
- * Do not use this product in places where it may come in contact with oil as it does not have a liquid-proof structure.
- * Please contact our sales department when the use of optional parts is planned.

- * Although the dimensions are identical to those of the FA series standard products (adjustable), the FA-S2016 series has a longer overall length (dimension A).

●Products specification might be changed without notice.

Overview

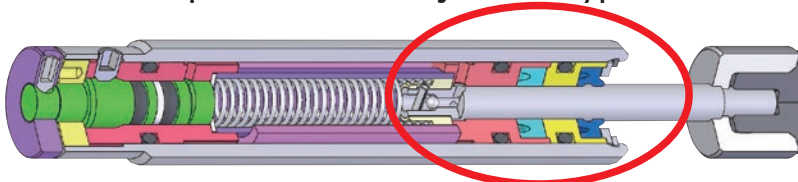
Adjustable type



In the case of a normal absorber, dust that has adhered to it may intrude the inside with each stroke. This can damage the seal and may lead to a defect such as oil leakage.



Dust seal specifications (adjustable type)



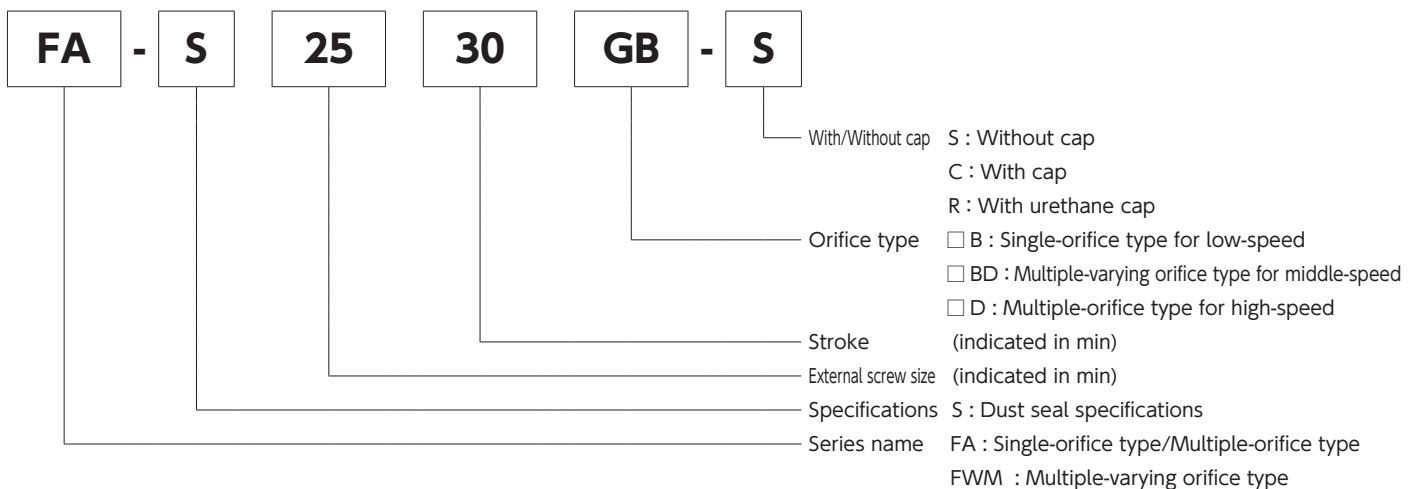
In the case of a product with dust-seal specifications, since double internal U-packings are used, thus having a structure that prevents the dust that has adhered from entering the inside.

Our original double packing structure

Specifications

*The specifications is identical with the standard models for each model (refer to the relevant page in the specifications listed in the dimensions table on the previous page).

Key to Model Number



Precautions for use

- * Since the absorber is not designed to have a drip-proof structure, avoid its use in an environment where oils are splashed.
- * If you use the optional parts, please contact our sales department.

- * Although the dimensions are the same as those of the FA series (adjustable type) with the standard specifications, only the FA-S2016/FWM-2016 series have a greater overall length (dimension A).

Soft Absorber

Multiple-varying orifice

Fixed Type

Adjustable type

Self-adjusting

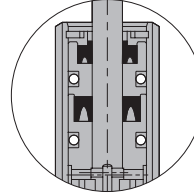
FWM-S Series (Dust Seal Specifications)

RoHS Compliant

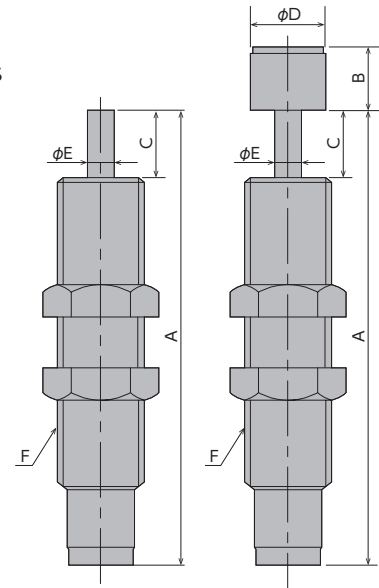
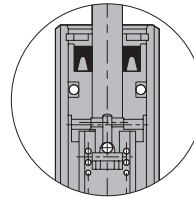
● Products specification might be changed without notice.



Dust seal specifications



Standard product



Dimensions

Model	A	B	C	D	E	F	Mass g	Specification Page
FWM-S1210MBD-S	76	8	10	8	3.5	M12×1	41	50
FWM-S1210MBD-C							44	50
FWM-S1410RBD-S	80	8	10	10	5	M14×1.5	63	52
FWM-S1410RBD-C							68	52
FWM-S1612XBD-S	102	15	12	13.5	5	M16×1.5	105	54
FWM-S1612XBD-C							114	54
FWM-S2016EBD-S	120	17	16	18	6	M20×1.5	196	58
FWM-S2016EBD-C							218	58
FWM-S2530GBD-S	155	18	30	22	8	M25×1.5	396	62
FWM-S2530GBD-C							427	62
FWM-S2540LBD-C	171.5	29	40	22.5			475	66
FWM-S2725FBD-S	136	20	25	24	10	M27×1.5	402	68
FWM-S2725FBD-C							451	68
FWM-S3035TBD-S	188	18.5	35	27	10	M30×1.5	708	70
FWM-S3035TBD-C							755	70
FWM-S3650UBD-S	235	19.5	50	33	12	M36×1.5	1330	74
FWM-S3650UBD-C							1410	74

Specifications

* The specification is identical with the standard models for each type

Precautions for Use

- * Do not use this product in places where it may come in contact with oil as it does not have a liquid-proof structure.
- * Please contact our sales department when the use of optional parts is planned.

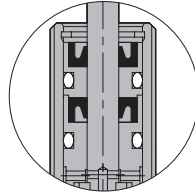
- * Although the dimensions are identical to those of the FA series standard products (adjustable), the FWM-S2016 series has a longer overall length (dimension A).

Soft Absorber

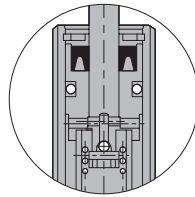
FA-F/FWM-F Series



Anti-coolant specifications

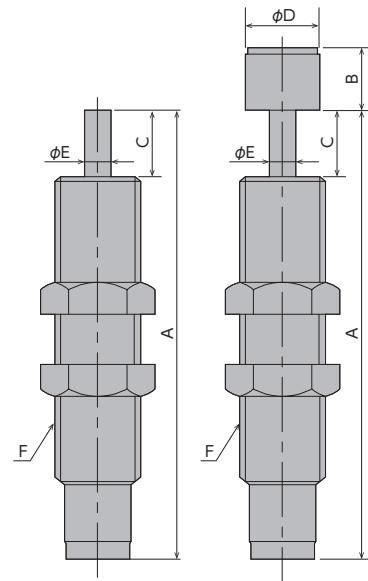


Standard product



No cap (-S)

With a cap (-C)



Dimensions

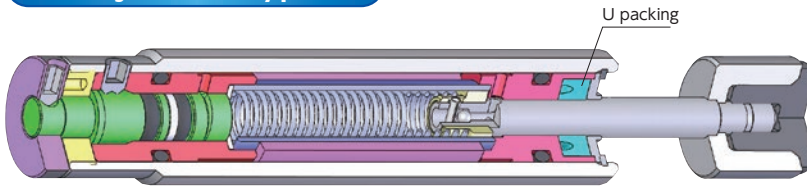
Model	A	B	C	D	E	F	Weight g	Specification Page
FA-F0806-S	59	—	6	—	2.5	M8×0.75	14	58
FA-F0806-C		5		6				
FA-F1008V□-S	73.2	—	8	—	2.4	M10×1	31	60
FA-F1008V□-C		6.3		6			32	
FWM-F1008VBD-S		—		—			31	
FWM-F1008VBD-C		6.3		6			32	
FA-F1210M□-S	82.6	—	10	—	3.5	M12×1	48	62
FA-F1210M□-C		8		8			51	
FWM-F1210MBD-S		—		—			48	
FWM-F1210MBD-C		8		8			51	
FA-F1410RB-S	98.2	—	10	—	4	M14×1.5	84	64
FA-F1410RB-C		10		10			87	
FA-F1410RD-S		—		—			84	
FA-F1410RD-C		10		10			87	
FWM-F1410RBD-S		—		—			84	
FWM-F1410RBD-C		10		10			87	
FA-F1612XB-S	107.7	—	12	—	5	M16×1.5	111	66
FA-F1612XB-C		15		13.5			120	
FA-F1612XD-S		—		—			111	
FA-F1612XD-C		15		13.5			120	
FWM-F1612XBD-S		—		—			111	
FWM-F1612XBD-C		15		13.5			120	
FA-F2016E□-S	120	—	16	—	6	M20×1.5	195	70
FA-F2016E□-C		17		18			218	
FWM-F2016EBD-S		—		—			195	
FWM-F2016EBD-C		17		18			218	
FA-F2530G□-S	168	—	30	—	8	M25×1.5	441	74
FA-F2530G□-C		18		22			471	
FWM-F2530GBD-S		—		—			441	
FWM-F2530GBD-C		18		22			471	
FA-F2725F□-S	148.2	—	25	—	8	M27×1.5	455	80
FA-F2725F□-C		20		23			504	
FWM-F2725FBD-S		—		—			455	
FWM-F2725FBD-C		20		23			504	

Note) B or D is inserted in the □. Insert B for a single-orifice type, and insert D for a multiple-orifice type.

●Products specification might be changed without notice.

Overview

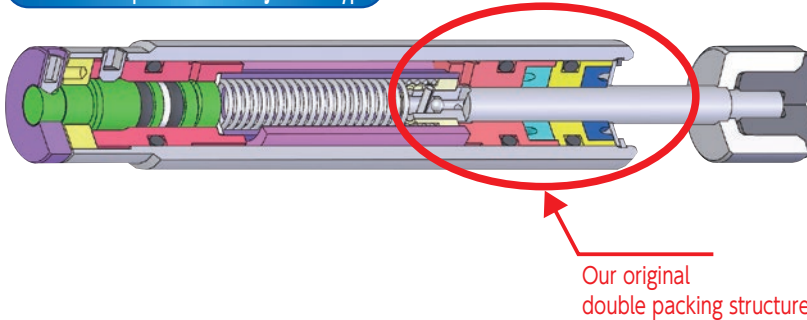
Adjustable type



In a normal absorber, adhering liquid is pushed inside with each stroke. This can block the accumulator and the flow of oil, ultimately preventing the rod from inserting or causing other trouble.



Anti-coolant specifications (adjustable type)



In the anti-coolant specifications, two internal U-packings are used (double packing structure) to form a wiper seal structure that prevents the adhering liquid from being pushed inside.

Specifications

* The specifications is identical with the standard models for each model (refer to the relevant page in the specifications listed in the dimensions table on the previous page).

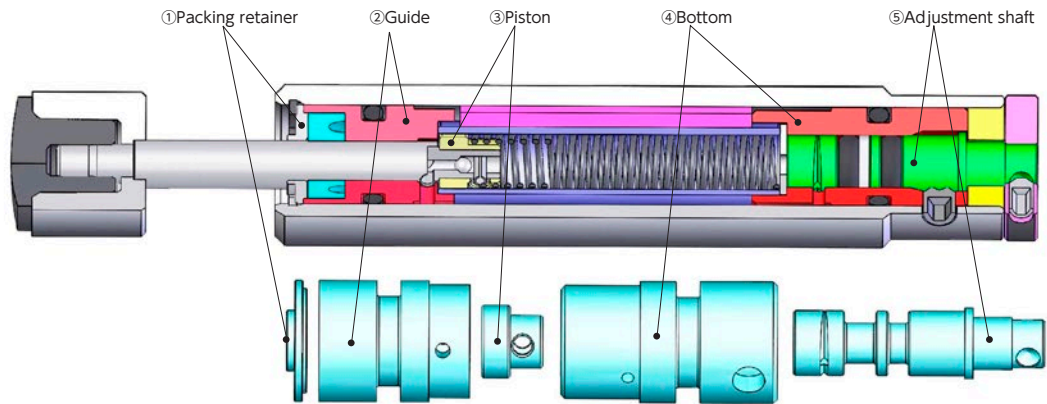
Precautions for Use

- * This product may not offer sufficient durability, depending on the liquid you use or its quantity. It is recommended to perform tests for adequacy in advance.
- * When the piston rod is not pressed all the way down to the stroke end during operation, stop use and exchange the product for the product life. If the product is used

- continuously, damage of the product may be caused.
- * This product has a unique packing structure. Because of this, using this product in places where the piston rod remains dry may cause the inside oil to leak early on in its product life.
- * If you use the optional parts, please contact our sales department.

Soft Absorber

FA/FWM-B Series



In many production lines of lithium ion batteries, use of the copper-containing materials is unacceptable, so Fuji Latex has developed the product that can be used under such condition.

Product Features

- The product is not made from copper-containing materials at all and can be used in an environment where copper ion is unacceptable.
- Models of M8 to M27 in external diameter with the FA/FWM adjusting function are available.
- It is very easy to replace the product because the external diameter of the product is the same as that of the standard specifications.

About Model

Please add "B" to the model of the standard specifications.

Example: FWM-B1008VBD-S (Model of the standard specification: FWM-1008VBD-S)

[List of materials of main parts changed * When FA-2016 is changed to FA-B2016] (): surface treatment

	Standard product FA-2016		Copper-free absorber FA-B2016
① Packing retainer	Brass(*1)	➔	Free-cutting steel (electroless nickel plating)
② Guide	Phosphor bronze(*1)		Free-cutting steel (blackening)
③ Piston	Brass(*1)		Cast iron (*1)
④ Bottom	Brass(*1)		Free-cutting steel (blackening)
⑤ Adjustment shaft	Brass(*1)		Free-cutting steel (electroless nickel plating)

*1 Without surface treatment

Dimensions and Specifications

* The dimensions and specifications are similar to those of the standard products of the FA/FWM series.

Precautions for Use

* If you use the optional part, please contact our sales department.

●Products specification might be changed without notice.

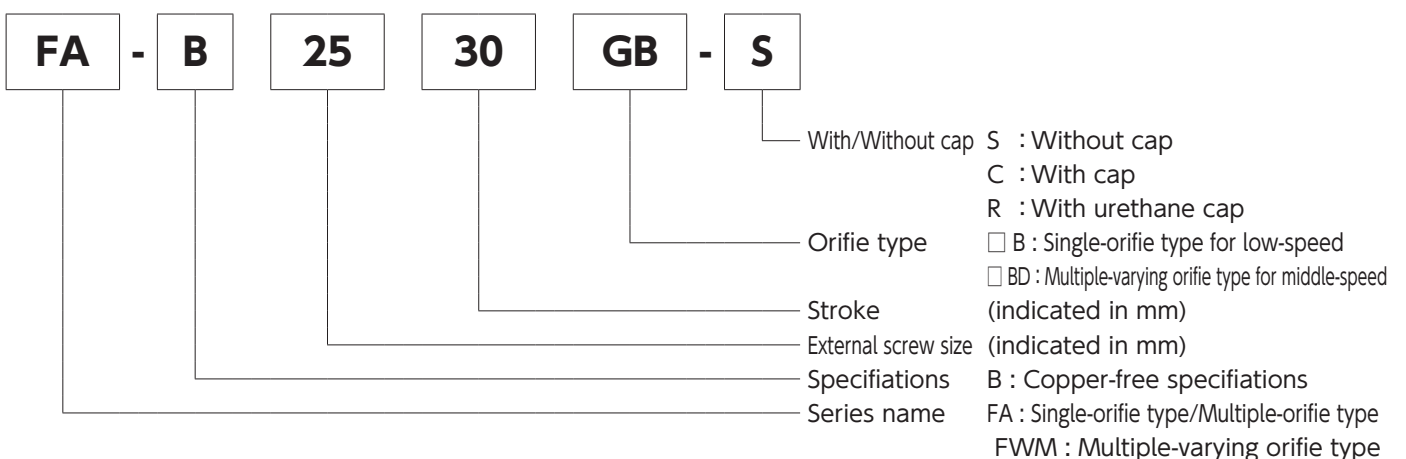
Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Orifice type	Specification Page
FA-B0806-□	6	1.4	15	0.3~2	Single-orifice type	54
FA-B1008VB-□	8	1.47	10	0.3~1	Single-orifice type	56
FA-B1008VD-□		1.76	2.5	0.7~3	Multiple-orifice type	
FWM-B1008VBD-□			10	0.3~2	Multiple-varying orifice type	
FA-B1210MB-□	10	2.94	30	0.3~1	Single-orifice type	58
FA-B1210MD-□		4.9	4	0.7~3	Multiple-orifice type	
FWM-B1210MBD-□			30	0.3~2	Multiple-varying orifice type	
FA-B1410RB-□	10	3.92	30	0.3~1	Single-orifice type	60
FA-B1410RD-□		5.88	4.5	0.7~3	Multiple-orifice type	
FWM-B1410RBD-□			35	0.3~2	Multiple-varying orifice type	
FA-B1612XB-□	12	9.8	50	0.3~1	Single-orifice type	62
FA-B1612XD-□			10	0.7~3	Multiple-orifice type	
FWM-B1612XBD-□			50	0.3~2	Multiple-varying orifice type	
FA-B2016EB-□	16	29.4	300	0.3~1	Single-orifice type	66
FA-B2016ED-□			120	0.7~3	Multiple-orifice type	
FWM-B2016EBD-□			200	0.3~2	Multiple-varying orifice type	
FA-B2530GB-□	30	49	400	0.3~1	Single-orifice type	70
FA-B2530GD-□			150	0.7~3	Multiple-orifice type	
FWM-B2530GBD-□			300	0.3~2	Multiple-varying orifice type	
FA-B2540LB-C	40	63.7	500	0.3~1	Single-orifice type	74
FA-B2540LD-C			200	0.7~3	Multiple-orifice type	
FWM-B2540LBD-C			350	0.3~2	Multiple-varying orifice type	
FA-B2725FB-□	25	79.3	650	0.3~1	Single-orifice type	76
FA-B2725FD-□			300	0.7~3	Multiple-orifice type	
FWM-B2725FBD-□			450	0.3~2	Multiple-varying orifice type	

Note 1) S (without tip cap) or C (with tip cap) is inserted in* .

Note 2) For the specifications and external dimensions, please see the pages of detailed specifications.

Key to Model Number



Soft Absorber

FK Series (M4~M16)



Characteristics

- With a fixed, specially-designed orifice structure, an optimal impact absorption can be achieved, even under variable operating conditions. (FK-0404 and FK-0604 series have a groove orifice structure.)
- We have three available types to accommodate various speeds.
For low-speed: L, for medium-speed: M, for highspeed: H
- Urethane cap specification is also available.
- 2 or more of this product can be used in parallel.
- This product can also be custom-designed for optimal impact absorption.

Specifications

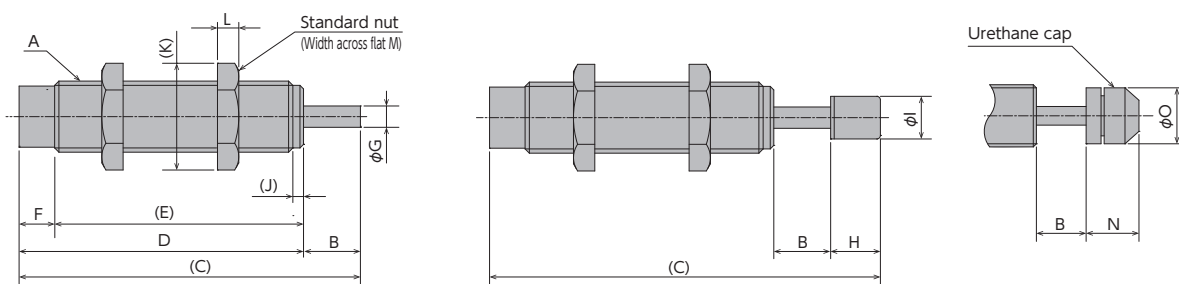
Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Max. drag N (kgf)	Max. cycle rate cycle/min	Max. absorption energy per minute J/min (kgf·m/min)	Recovering power of the piston rod N (kgf)	Operating temperature °C	Mass g (Type g)	Urethane Cap Specification (Type-R)
FK-0404L-□	4	0.1 (0.01)	1 (1)	0.3~1	214 (21.8)	45	4.5 (0.46)	2.5 (0.25) or lower	-5~70	2.4 (2.5)	×
FK-0404H-□		0.3 (0.03)	3 (3)				13.5 (1.38)				
FK-0604L-□	4	0.1 (0.01)	1 (1)	0.3~1	363 (37)	45	4.5 (0.46)	3 (0.3) or lower	-5~70	4.1 (4.2)	×
FK-0604H-□		0.5 (0.05)	3 (3)				22.5 (2.29)				
FK-1008L-□	8	2.94 (0.3)	20 (20)	0.3~1	1,078 (110)	60	58.8 (6.0)	4.9 (0.5) or lower	-5~70	20 (21)	○
FK-1008M-□			6 (6)	0.3~2							
FK-1008H-□			2.5 (2.5)	0.3~3							
FK-1210L-□	10	6.86 (0.7)	50 (50)	0.3~1	1,960 (200)	60	98 (10)	9.8 (1.0) or lower	-5~70	36 (37)	○
FK-1210M-□			14 (14)	0.3~2							
FK-1210H-□			6 (6)	0.3~3							
FK-1412L-□	12	9.8 (1.0)	75 (75)	0.3~1	2,156 (220)	60	176 (18)	8.9 (0.9) or lower	-5~70	55 (57)	○
FK-1412M-□			20 (20)	0.3~2							
FK-1412H-□			8 (8)	0.3~3							
FK-1417L-□	17	14.7 (1.5)	110 (110)	0.3~1	2,646 (270)	60	235 (24)	8.9 (0.9) or lower	-5~70	76 (77)	○
FK-1417M-□			30 (30)	0.3~2							
FK-1417H-□			13 (13)	0.3~3							
FK-1612L-□	12	14.7 (1.5)	110 (110)	0.3~1	2,940 (300)	60	235 (24)	9.8 (1.0) or lower	-5~70	76 (82)	○
FK-1612M-□			30 (30)	0.3~2							
FK-1612H-□			13 (13)	0.3~3							

Note) Insert S in the □ to order without a cap, and insert C in the □ to order with a cap (R if ordering urethane cap).

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Urethane caps are consumable goods that need to be replaced with new ones if necessary.
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber. (Allowable eccentric angle: $\pm 2.5^\circ$)
- * Ensure that an external stopper (OP-020**) is also used. (The FK-0404 and FK-0604 series can be used without a stopper.)

●Products specification might be changed without notice.

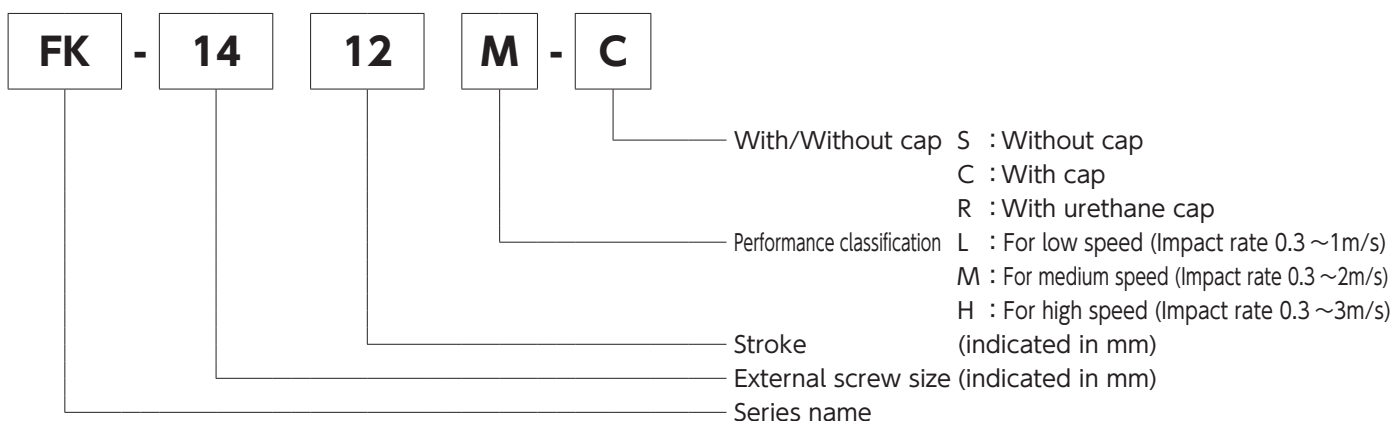


Dimensions

Model	A	B	C	D	E	F	ϕG	H	ϕI	J	K	L	M	N	ϕO
FK-0404□-S	M4×0.5	4	28.6	24.6	20.1	4.5	1.2	—	—	—	8.1	2	7	—	—
FK-0404□-C			32.6					4	3					—	—
FK-0604□-S	M6×0.75	4	29	25	20.5	4.5	1.8	—	—	—	9.2	2	8	—	—
FK-0604□-C			33					4	4.6					—	—
FK-1008□-S	M10×1.0	8	48	40	34.5	5.5	3	—	—	1.5	15	3	13	—	—
FK-1008□-C			55					7	6					7.3	8
FK-1210□-S	M12×1.0	10	63	53	47.5	5.5	3.5	—	—	—	16.2	4	14	—	—
FK-1210□-C			71					8	8					8.8	10
FK-1412□-S	M14×1.5	12	70	58	52.5	5.5	3.5	—	—	—	19.6	6	17	—	—
FK-1412□-C			78					8	10					8.8	10
FK-1417□-S	M14×1.5	17	97	80	74.5	5.5	4	—	—	1.5	19.6	6	17	—	—
FK-1417□-C			107					10	10					11	12
FK-1612□-S	M16×1.5	12	75	63	57.5	5.5	5	—	—	—	21.9	6	19	—	—
FK-1612□-C			90					15	13.5					13.1	14

Note) Urethane cap specification is not available for FK-0404 and FK0604.

Key to Model Number



Please refer to pages 112-115 for optional parts.

Soft Absorber

FK Series (M20~M25)



Characteristics

- With a fixed, specially-designed orifice structure, an optimal impact absorption can be achieved, even under variable operating conditions.
- The main unit can also be used as a stopper. (No external stopper required)
- We have three available types to accommodate various speeds.
For low-speed: L, for medium-speed: M, for highspeed:H
- Urethane cap specification is also available.
- 2 or more of this product can be used in parallel.
- This product can also be custom-designed for optimal impact absorption.

Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Max. drag N (kgf)	Max. cycle rate cycle/min	Max. absorption energy per minute J/min (kgf·m/min)	recovering power of the piston rod N (kgf)	Operating temperature °C	Mass Stype g (Ctype g)	Urethane Cap Specification (Type-R)
FK-2016L-□	16	29.4 (3.0)	230 (230)	0.3~1	3,528 (360)	60	343 (35)	18.1 (1.85) or lower	-5~70	147 (168)	○
FK-2016M-□			60 (60)	0.3~2							
FK-2016H-□			25 (25)	0.3~3							
FK-2022L-□	22	44.1 (4.5)	73 (73)	0.3~1	3,920 (400)	60	392 (40)	39.2 (4) or lower	-5~70	163 (178)	○
FK-2022M-□			30 (30)	0.3~2							
FK-2022H-□			15 (15)	0.3~3							
FK-2050L-R	50	98 (10)	30 (30)	0.3~2	4,900 (500)	30	490 (50)	39.2 (4) or lower	-5~70	294 (294)	○
FK-2050M-R			15 (15)	0.3~3							
FK-2050H-R			8 (8)	0.3~3							
FK-2530L-□	30	88.2 (9.0)	390 (390)	0.3~1	6,370 (650)	60	490 (50)	29.4 (3.0) or lower	-5~70	361 (391)	○
FK-2530M-□			175 (175)	0.3~2							
FK-2530H-□			75 (75)	0.3~3							
FK-2540L-□	40	117 (12)	480 (480)	0.3~1	6,370 (650)	60	490 (50)	71.5 (7.3) or lower	-5~70	437 (437)	○
FK-2540M-□			235 (235)	0.3~2							
FK-2540H-□			30 (30)	0.3~3							
FK-2550L-R	50	147 (15)	100 (100)	0.3~1.5	6,370 (650)	30	637 (65)	39.2 (4) or lower	-5~70	516 (516)	○
FK-2550M-R			50 (50)	0.3~2							
FK-2550H-R			30 (30)	0.3~3							

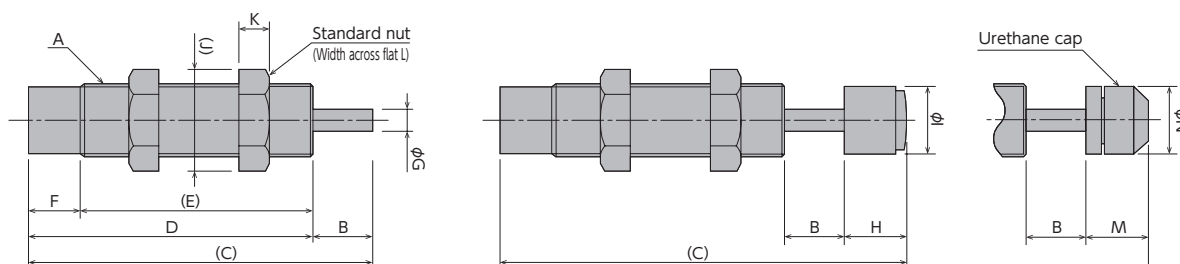
Note) Insert S in the □ to order without a cap, and insert C in the □ to order with a cap (R if ordering urethane cap). (-S is not available for FK-2540.)

Note) Urethane cap is the only available specification for FK-2022, 2050, and 2550 with a cap.

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber. (Allowable eccentric angle: $\pm 2.5^\circ$) Allowable eccentric angle in FK-2050 and 2550: $\pm 1.0^\circ$
- * Urethane caps are consumable goods that need to be replaced with new ones if necessary

●Products specification might be changed without notice.

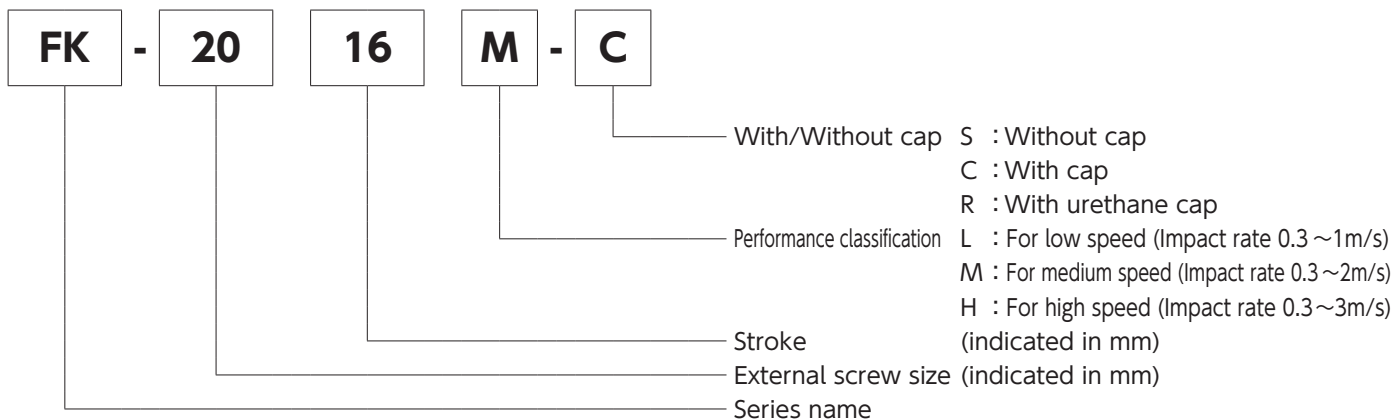


Dimensions

Model	A	B	C	D	E	F	ϕG	H	ϕI	J	K	L	M	ϕN
FK-2016□-S	M20×1.5	16	93	77	63	14	6	-	-	27.7	8	24	-	-
FK-2016□-C			110					17	18				17	18
FK-2022□-S	M20×1.5	22	112	90	76	14	6	-	-	27.7	8	24	-	-
FK-2022□-R			126.5					-	-				14.5	18
FK-2050□-R	M20×1.5	50	223.5	156.5	142.5	14	6	-	-	27.7	8	24	17	18
FK-2530□-S	M25×1.5	30	140	110	95	15	8	-	-	37	10	32	-	-
FK-2530□-C			158					18	22				18	22
FK-2540□-C	M25×1.5	40	185.5	124.5	109.5	15	8	21	22	37	10	32	26	22
FK-2550□-R	M25×2.0	50	228	160	145	15	8	-	-	37	10	32	18	22

Note) Urethane cap is the only available specification for FK-2022, 2050, and 2550 with a cap.

Key to Model Number



Please refer to pages 112-115 for optional parts.

Soft Absorber

FK Series (M27~M36)



Characteristics

- With a fixed, specially-designed orifice structure, an optimal impact absorption can be achieved, even under variable operating conditions.
- The main unit can also be used as a stopper. (No external stopper required, except for FK-3625A□)
- We have three available types to accommodate various speeds. For low-speed: L, for medium-speed: M, for high-speed: H
- Urethane cap specification is also available.
- 2 or more of this product can be used in parallel.
- This product can also be custom-designed for optimal impact absorption.

Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Max. cycle rate cycle/min	Max. absorption energy per minute J/min (kgf·m/min)	Max. drag N (kgf)	recovering power of the piston rod N (kgf)	Operating temperature °C	Mass Stype g (Ctype g)	Urethane Cap Specification (Type-R)
FK-2725L-□	25	79 (8.1)	420 (420)	0.3~1	60	539 (55)	6,370 (650)	27.3 (2.78) or lower	-5~70	341 (385)	×
FK-2725M-□			105 (105)	0.3~2							
FK-2725H-□			47 (47)	0.3~3							
FK-3035L-□	35	196 (20)	1,560 (1,560)	0.3~1	30	1,176 (120)	14,700 (1,500)	47.1 (4.8) or lower	-5~70	628 (681)	○
FK-3035M-□			390 (390)	0.3~2							
FK-3035H-□			173 (173)	0.3~3							
FK-3625AL-C	25	150 (15.3)	2,000	0.3~1	30	1,500 (153)	25,000 (2,551)	100 (10.2) or lower	-5~70	— (900)	○
FK-3625AM-C			800	0.3~2							
FK-3625AH-C			150	0.3~3							
FK-3650AL-C	50	400	3,400	0.3~1	30	2,352 (240)	25,000 (2,551)	120 (12.2) or lower	-5~70	— (980)	○
FK-3650AM-C			1,400	0.3~2							
FK-3650AH-C			300	0.3~3							
FK-3650L-□	50	392 (40)	3,137 (3,137)	0.3~1	30	2,352 (240)	21,110 (2,154)	68.6 (7.0) or lower	-5~70	1,177 (1,259)	○
FK-3650M-□			784 (784)	0.3~2							
FK-3650H-□			306 (306)	0.3~3							

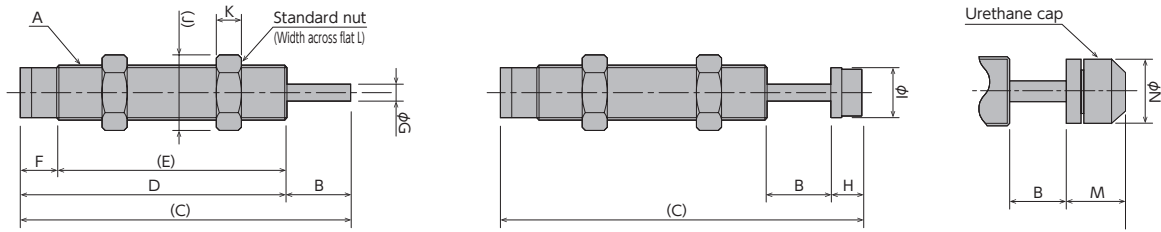
Note) Insert S in the □ to order without a cap, and insert C in the □ to order with a cap (R if ordering urethane cap). (-S is not available for FK-3625 □.)

Note : An additional urethane cap (OP-090M36B) can be mounted on FK-3625A□-C, FK-3650A□-C

Precautions for Use

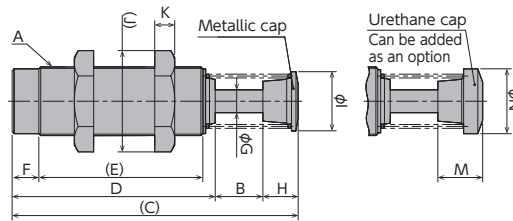
- * Do not use this product without carefully reading the attached owner's manual.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber. (Allowable eccentric angle: $\pm 2.5^\circ$)
- * We recommend that you use it with an external stopper (OP-020**).
- * Urethane caps are consumable goods that need to be replaced with new ones if necessary.

●Products specification might be changed without notice.



FK-3625A□

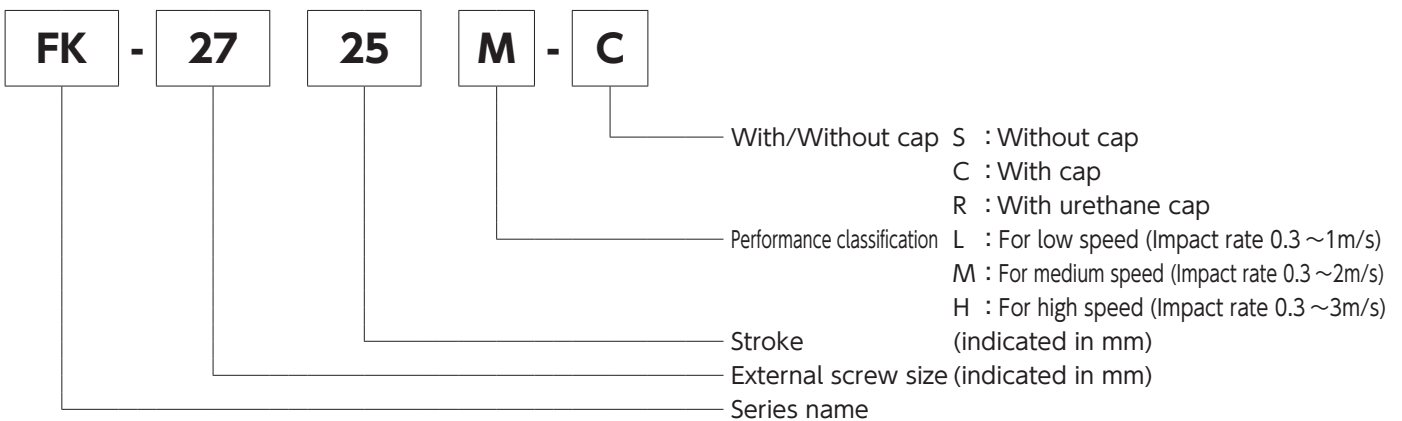
FK-3650A□



Dimensions

Model	A	B	C	D	E	F	φG	H	φI	J	K	L	M	φN
FK-2725□-S	M27×1.5	25	117.5	92.5	77.5	15	8	—	—	37	10	32	—	—
FK-2725□-C			137.5					20	23				—	—
FK-3035□-S	M30×1.5	35	171.5	136.5	116.5	20	10	—	—	41.6	14	36	—	—
FK-3035□-C			190					18.5	27				25	27
FK-3625A□-C	M36×1.5	25	150	106.5	86	14	12	18.5	31	53.1	10	46	23.5	34
FK-3650A□-C	M36×1.5	50	217	148.5	128	14	12	18.5	31	53.1	10	46	23.5	34
FK-3650□-S	M36×1.5	50	218.5	168.5	148.5	20	12	—	—	53.1	15	46	—	—
FK-3650□-C			238					19.5	33				24.3	33

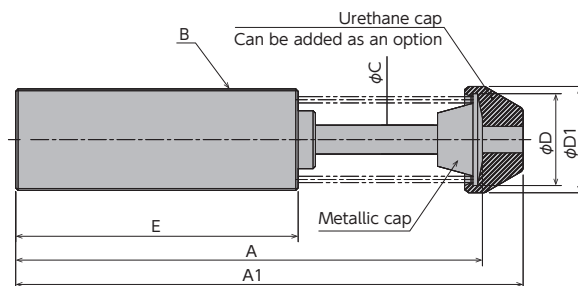
Key to Model Number



Please refer to pages 112-115 for optional parts.

Soft Absorber

FK-4225B/FK-4250B/FK-4275B Series



* The absorber's main unit does not come with nuts.

Dimensions

Model	A	A1	B	C	D	D1	E
FK-4225B□-C	144	162	M42×1.5	12	38	44	92
FK-4250B□-C	195	213					118
FK-4275B□-C	246	264					143

* A1 and D1 are the dimensions with a mounted urethane cap (optional). (Urethane Cap Type: OP-090M42A)

Specifications

Model	Stroke mm	Max. absorption energy J(kgf·m)	Max. equivalent mass kg(kgf)	Range of impact rate m/s	Max. drag N(kgf)	Max. cycle rate cycle/min	Max. absorption energy per minute J/min(kgf·m/min)	recovering power of the piston rod N(kgf)	Operating temperature °C	Mass g	Allowable eccentric angle
FK-4225BL-C	25	260(26.5)	14,000	0.1~0.5	31,590 (3,223)	16	1,858(190)	120(12.2)	-5~70	795	±2.5
FK-4225BM-C			1,350	0.3~1.5		20					
FK-4225BH-C			200	0.3~3.6		8					
FK-4250BL-C	50	520(53.1)	23,000	0.1~0.5		10	2,372(242)				
FK-4250BM-C			2,800	0.3~1.5		5					
FK-4250BH-C			450	0.3~3.6		6					
FK-4275BL-C	75	780(79.6)	30,000	0.1~0.5		5	3,345(341)				
FK-4275BM-C			3,400	0.3~1.5		6					
FK-4275BH-C			670	0.3~3.6							

Precautions for Use

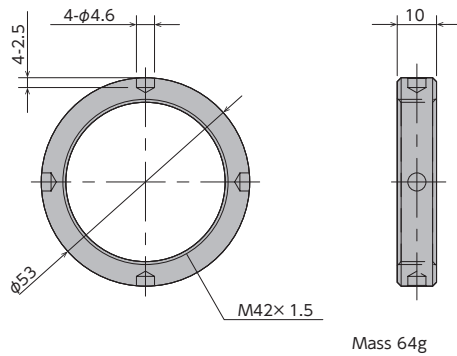
- * Do not use this product without carefully reading the attached owner's manual.
- * We recommend that you use it with an external stopper (Stopper nut OP-020M42).
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber. (Allowable eccentric angle: ±2.5°)
- * Ensure that an eccentric load is not applied to the soft absorber.
- * Urethane caps are consumable goods that need to be replaced with new ones if necessary.

●Products specification might be changed without notice.

Optional Parts

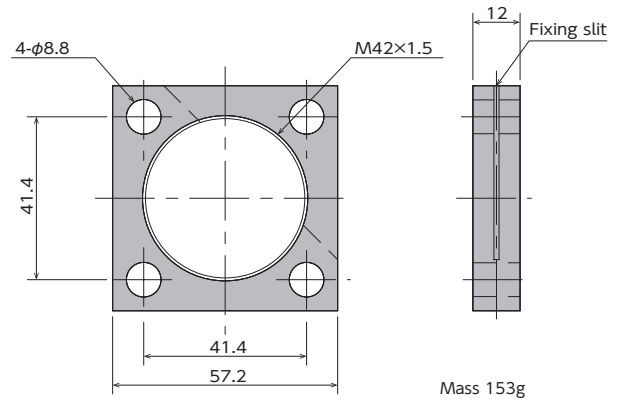
Nut OP-M42

Model
OP-M42



Square flange OP-040 M42SF

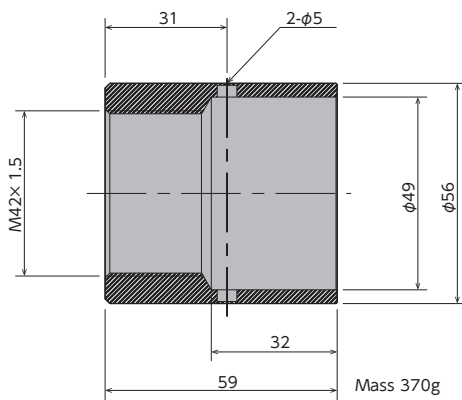
Model
OP-040M42SF



Stopper nut OP-020 M42

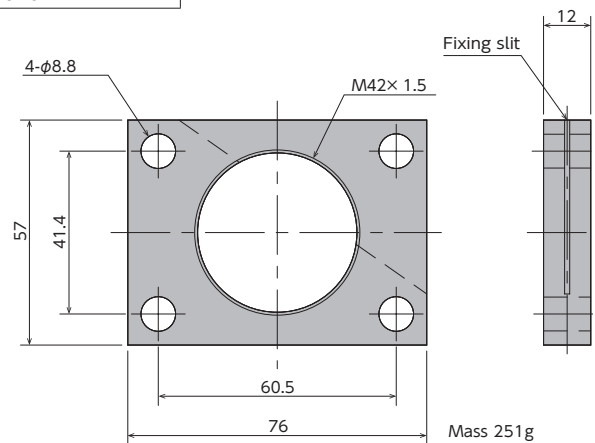
Model
OP-020M42

● Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.



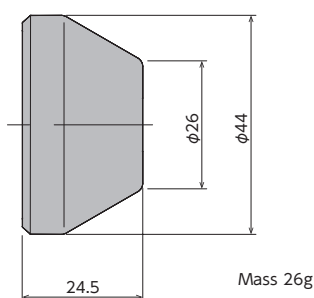
Rectangle flange OP-040 M42RF

Model
OP-040M42RF



Urethane cap OP-090 M42A

Model
OP-090M42A

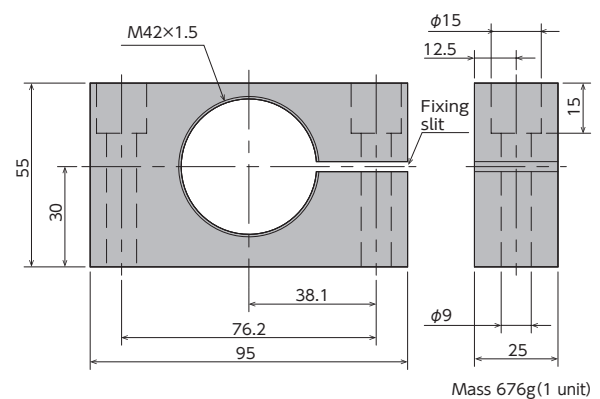


Side mount OP-M42SM

Model
OP-M42SM

*Side mount is sold as a set of two.

*Recommended bolt: M8 X 50 hexagon socket head bolt



Soft Absorber

Fixed Type Adjustable type Self-adjusting

FK-4225B/FK-4250B Series

RoHS Compliant

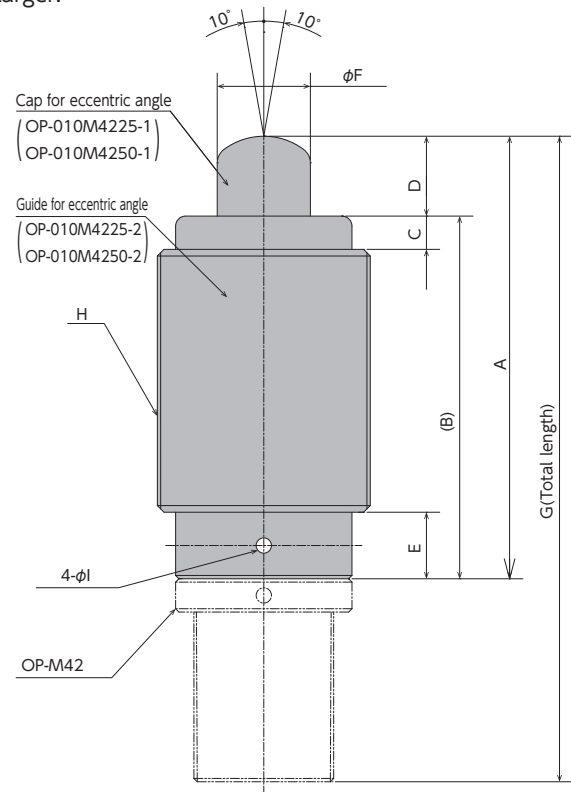
● Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010M4225/M4250

Model
OP-010M4225
OP-010M4250

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber
- The maximum operating eccentric angle with an eccentric angle adaptor is $\pm 10^\circ$.
- Nut for unit is not inclusive.
- Not usable for FA-4250YD-C, FWM-4250YBD-C.

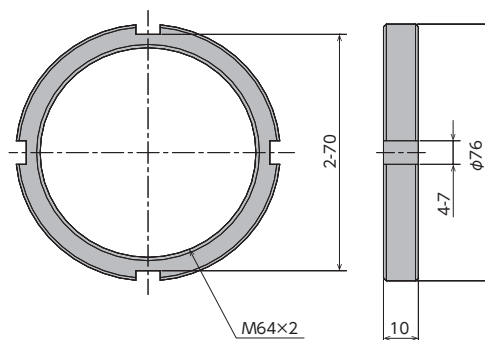


Model	A	B	C	D	E	ϕF	G	H	ϕI	Weight g
OP-010M4225	133	109	10	24	20	28	194	M64×2	4.6	1,600
OP-010M4250	203	154		49						290

Nut OP-M64

Model
OP-M64

- Usable as the nut for eccentric angle adaptor



Weight 100g

Soft Absorber

Fixed Type Adjustable type Self-adjusting

FK-6450/64100/64150/※64200 Series

RoHS Compliant

●Products specification might be changed without notice.



Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Max. drag N (kgf)	Max. cycle rate cycle/min	Max. absorption energy per minute J/min (kgf·m/min)	recovering power of the piston rod N (kgf)	Operating temperature °C	Mass kg	Allowable eccentric angle °
FK-6450L-C	50	2,000 (204.7)	2,800~36,000(2,800~36,000)	0.1~0.5	90,000 (9,184)	10	164,608 (16,797)	150(15.3)	-5~70	2.5	±2.5
FK-6450M-C			390~4,000(390~4,000)	0.3~1.5		15					
FK-6450H-C			130~500(130~500)	0.3~3.6		15					
FK-64100L-C	100	4,000 (408.2)	4,000~40,000(4,000~40,000)	0.1~0.6		8	214,118 (21,849)	180(18.4)		3.2	
FK-64100M-C			1,000~7,000(1,000~7,000)	0.3~1.5		10					
FK-64100H-C			250~1,300(250~1,300)	0.3~3.6		10					
FK-64150L-C	150	6,000 (612.2)	9,000~56,000(9,000~56,000)	0.1~0.6		6	275,556 (28,118)	370(37.8)		4.2	
FK-64150M-C			1,200~11,000(1,200~11,000)	0.3~1.5		8					
FK-64150H-C			350~2,200(350~2,200)	0.3~3.6		8					
FK-64200-C-□□□ Note 1	200	8,000(816.3)	—	—	—	—	400(40.8)	5.5	±1.0		

Note 1) □ for FK-64200-C-□□□ will be filled in with a branch number. (made to order product)

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * We recommend that you use it with an external stopper (Stopper nut OP-020M64□).
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalog.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber.
- * The urethane caps are consumables. Please replace them when necessary.
- * FK-64200-C-□□□ is only for emergency stop; it is not designed for normal use. (Customized orders)

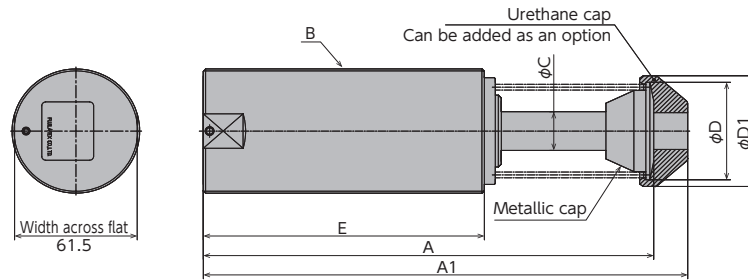
Soft Absorber

Fixed Type Adjustable type Self-adjusting

FK Series (M64)

RoHS Compliant

● Products specification might be changed without notice.



* The absorber's main unit does not come with nuts.

Dimensions

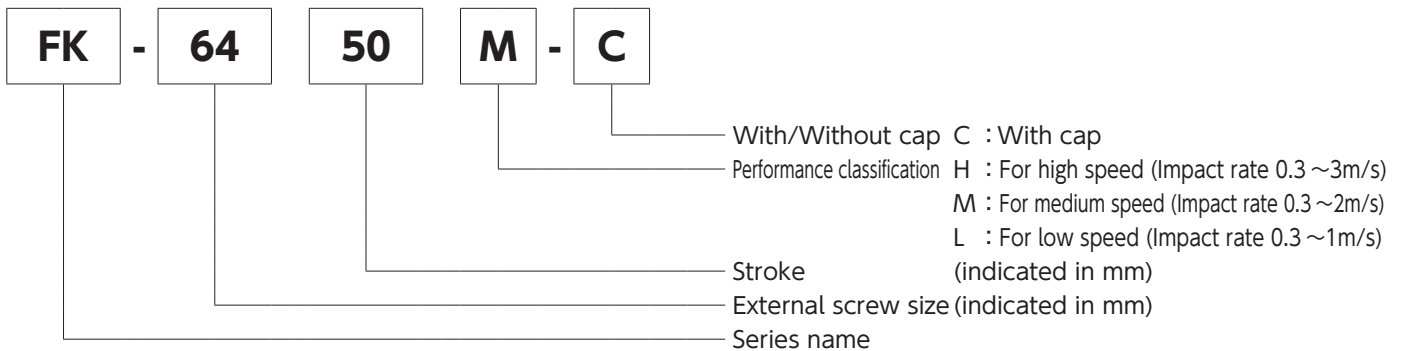
Model	A	A1	B	ϕC	ϕD	$\phi D1$	E
FK-6450□-C	226	243	M64×2	20	50.2	57	141
FK-64100□-C	328	345					191
FK-64150□-C	456	473			60		241
※FK-64200-C-□□□	556	573			291		

* A1 and D1 are dimensions with the optional urethane cap attached. (Urethane cap type: OP-090M64A)

* The optional parts are common with those of the adjustable type. Please refer to page 81.

* FK-64200-C-□□□ are made to order.

Key to Model Number



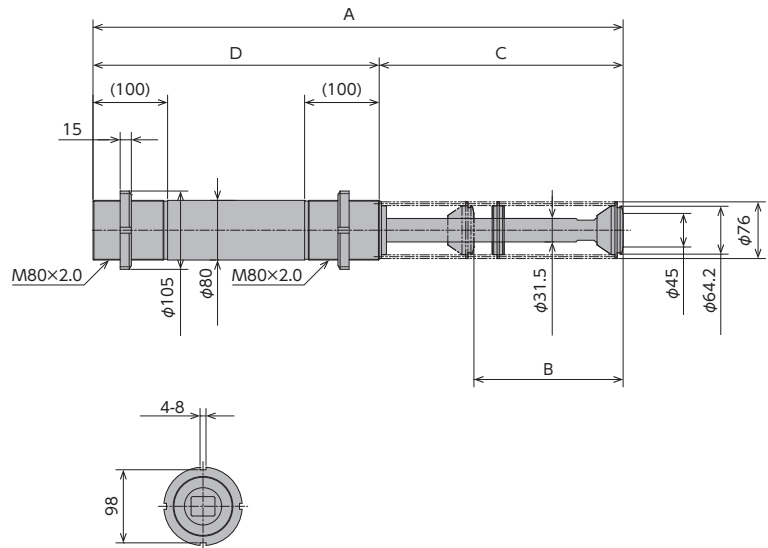
Soft Absorber

Customized orders For emergency stop
Fixed Type Adjustable type Self-adjusting

FK-80200-C-□□□/FK-80300-C-□□□/FK-80400-C-□□□

RoHS Compliant

●Products specification might be changed without notice.



Dimensions

Model	A	B	C	D
FK-80200-C-□□□	710.7	200	327	383.7
FK-80300-C-□□□	910.7	300	427	483.7
FK-80400-C-□□□	1,162.7	400	547	615.7

Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Range of impact rate m/s	Max. drag N (kgf)	Max. absorption energy per minute J/min	Max. cycle rate cycle/min	recovering power of the piston rod N (kgf)	Operating temperature °C	Mass kg
FK-80200-C-□□□	200	19,000 (1,938.8)	0.1~5.5	149,226 (15,227.1)	11,680	1	400 (40.8)	-5~70	11
FK-80300-C-□□□	300	28,900 (2,949)			17,770		510 (52)		14
FK-80400-C-□□□	400	38,800 (3,959.2)			23,852		510 (52)		18

* □ will be filled in with a branch number of a custom model

Soft Absorber

FK Series

RoHS Compliant

● Products specification might be changed without notice.

Optional Parts Compatibility Chart

Model	Eccentric angle adaptor	Stopper nut		Holder with a switch	Flange	Liquid-proof cap	Urethane cap	Nut
		Without cap	With cap					
FK-1008□-*	OP-010PB	OP-020PB-S	OP-020PB-C	—	OP-040PB	FK-1008□-C-060	OP-090M10A	—
FK-1210□-*	OP-010KB	OP-020KB-S	OP-020KB-C	OP-032KB	OP-040KB	FK-1210□-C-060	OP-090M12A	—
FK-1412□-*	OP-010RD	OP-020RB-S	OP-020RB-C	OP-032RB	OP-040RB	FK-1412□-C-060	OP-090M14A	—
FK-1417□-*	—	OP-020RB-S	OP-020RB-C	—	OP-040RB	—	OP-090M14B	—
FK-1612□-*	OP-010XB	OP-020HB-S	OP-020HB-C	OP-032HB	OP-040XB	FK-1612□-C-060	OP-090M16A	—
FK-2016□-*	OP-010EB	OP-020EB-S	OP-020EB-C	OP-032EB	OP-040EB	FK-2016□-C-060	OP-090M20A	—
FK-2022□-*	—	OP-020EB-S	OP-020EB-C	—	OP-040EB	—	OP-090M20A	—
FK-2050□-R	—	OP-020EB-S	OP-020EB-C	—	OP-040EB	—	OP-090M20A	—
FK-2530□-*	OP-010GB	OP-020GB-S	OP-020GB-C	OP-032GB	OP-040GB	FK-2530□-C-060	OP-090M25A	—
FK-2540□-*	—	OP-020LB	OP-020LB	—	OP-040GB	—	OP-090M25A	—
FK-2550□-R	—	—	—	—	—	—	OP-090M25A	—
FK-2725□-*	OP-010FB	OP-020FB-S	OP-020FB-C	OP-032FB	OP-040FB	FK-2725□-C-060	—	—
FK-3035□-*	OP-010TB	OP-020TB-S	OP-020TB-C	—	OP-040TB	FK-3035□-C-060	OP-090M30A	—
FK-3625A□-C	OP-010M3625	—	OP-020M36	—	OP-040UB	—	OP-090M36B	—
FK-3650A□-C	OP-010M3650	—	OP-020M36	—	OP-040UB	—	OP-090M36B	—
FK-3650□-*	OP-010UB	OP-020UB-S	OP-020UB-C	—	OP-040UB	—	OP-090M36A	—
FK-4225B□-C	OP-010M4225	—	OP-020M42	—	Square flange OP-040M42SF Rectangle flange OP-040M42RF	—	OP-090M42A	OP-M42
FK-4250B□-C	OP-010M4250	—	OP-020M42	—		—	OP-090M42A	OP-M42
FK-4275B□-C	—	—	OP-020M42	—	—	—	OP-090M42A	OP-M42
FK-6450□-C	—	—	OP-020M64S	—	Square flange OP-040M64SF	—	OP-090M64A	OP-M64
FK-64100□-C	—	—	OP-020M64S	—		—	OP-090M64A	OP-M64
FK-64150□-C	—	—	OP-020M64L	—		—	OP-090M64A	OP-M64

*Standard nuts are sold separately as well.

Applicable Models	Model
FK-0404	M04 nut
FK-0604	M06 nut
FK-1008	M10 nut
FK-1210	M12 nut
FK-1412	M14 nut
FK-1417	M14 nut
FK-1612	M16 nut
FK-2016	M20 nut
FK-2022	M20 nut
FK-2050	M20 nut
FK-2530	M25 nut
FK-2540	M25 nut
FK-2550 P2.0	M25-P2 nut
FK-2725	M27 nut
FK-3035	M30 nut
FK-3625A	M36A nut
FK-3650A	M36A nut
FK-3650	M36 nut

Soft Absorber

FK Series

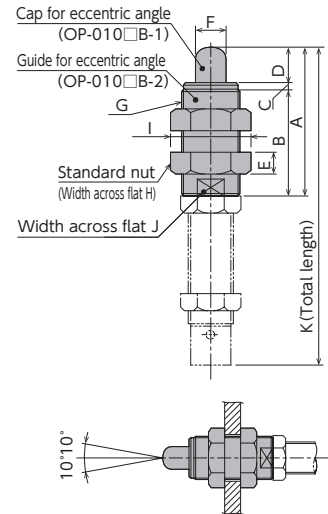
RoHS Compliant

● Products specification might be changed without notice.

Optional Parts

Eccentric angle adaptor OP-010

Model	A	B	C	D	E	F	G	H	I	J	K	Mass g
OP-010PB	38	28	2	8	6	8	M16×1.5	19	21.9	13	65	35
OP-010KB	48	35	3	10	5	10	M18×1.5	21	24.3	14	85	48
OP-010RD	53	38	3	12	7	11	M22×1.5	24	27.7	19	95	84
OP-010XB	60	45	3	12	7	12	M22×1.5	24	27.7	19	102	81
OP-010EB	68	49	3	16	10	14	M27×1.5	32	37	24	129	209
OP-010GB	107.5	67.5	10	30	15	16	M36×1.5	46	53.1	32	197.5	639
OP-010FB	97	62	10	25	15	16	M36×1.5	46	53.1	32	170	587
OP-010TB	127	82	10	35	15	18	M40×1.5	50	57.7	36	239	852
OP-010UB	167	107	10	50	15	20	M45×1.5	55	63.5	41	306	1,273
OP-010M3625	131	97	10	24	15	22	M45×1.5	55	63.5	41	200	880
OP-010M3650	201	142	10	49	15	22	M45×1.5	55	63.5	41	312	1,270
OP-010M4225	133	99	10	24	—	28	M64×2	—	—	—	194	1,600
OP-010M4250	203	144	10	49	—	28	M64×2	—	—	—	290	2,500



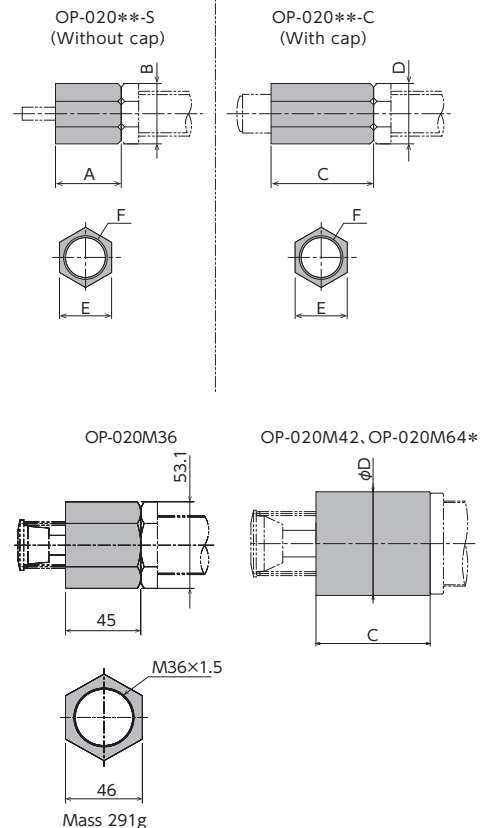
When attaching the eccentric angle adaptor, screw it into the main unit until the cap for eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.

* If the eccentric angle adaptor is secured without establishing a tight fit, a sufficient stroke cannot be obtained. Furthermore, if the eccentric angle adaptor is further screwed in, after it has formed a tight connection, and then secured in place, the cap for eccentric angle cannot be pushed all the way to the stroke end.

- The inclined adapter is not available for models with soft absorber cap (-C) and urethane cap (-R)
- The cap for eccentric angle and the guide for eccentric angle are not sold as single parts.
- The eccentric angle adaptors for M42 (OP-010M4225, OP-010M4250) are not provided with nuts. OP-M64 should be purchased separately.

Stopper nut OP-020

Model	Standard		With cap		Common dimensions		Mass g	
	OP-020□-S		OP-020□-C					
	A	B	C	D	E	F		
OP-020PB-S-C	10	15	16	15	13	M10×1	S	6
							C	9
OP-020KB-S-C	12	16.2	16	16.2	14	M12×1	S	6
							C	8
OP-020RB-S-C	12	19.6	20	19.6	17	M14×1.5	S	10
							C	17
OP-020HB-S-C	15	21.9	30	21.9	19	M16×1.5	S	15
							C	28
OP-020EB-S-C	30	27.7	47	27.7	24	M20×1.5	S	46
							C	68
OP-020GB-S-C	20	37	32	37	32	M25×1.5	S	65
							C	102
OP-020LB	—	—	50	37	32	M25×1.5	153	
OP-020FB-S-C	35	37	55	37	32	M27×1.5	S	90
							C	137
OP-020TB-S-C	38	41.6	58	41.6	36	M30×1.5	S	129
							C	197
OP-020UB-S-C	45	53.1	65	53.1	46	M36×1.5	S	291
							C	422
OP-020M36	—	—	45	53.1	46	M36×1.5	291	
OP-020M42	—	—	59	φ56	—	M42×1.5	370	
OP-020M64S	—	—	86	φ78	—	M64×2	850	
OP-020M64L	—	—	115	φ78	—	M64×2	1,150	



- Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.

Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Soft Absorber

FK Series

RoHS Compliant

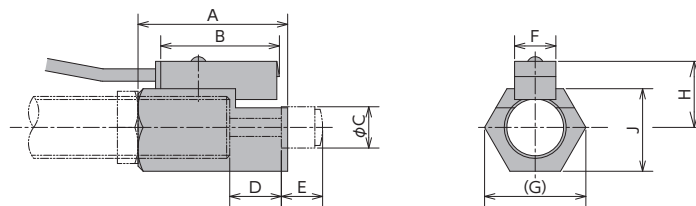
●Products specification might be changed without notice.

Optional Parts

Holder with a switch OP-032

Model	A	B	φC	D	E	F	(G)	H	J	Mass g
OP-032KB	29	23	8	10	8	8	19.6	12.8	16	38
OP-032RB	29	23	10	12	8	8	19.6	13.8	17	34
OP-032HB	40	23	13.5	12	15	8	21.9	14.8	19	46
OP-032EB	50	23	18	16	17	8	27.7	17.3	24	80
OP-032GB	37	23	22	30	18	8	33.5	19.8	29	82
OP-032FB	56	23	23	25	20	8	34.6	20.3	30	107

- Position the holder in such a way that the tip of the switch and one of the ends of the metal ring for the rod cap are separated more than 0.5 mm. Cause of malfunction.
- Please refer to below for the specification of switches and precautions for use.



Model GXL-8F specifications Manufactured by SUNX

Item	Summary	Specification
Detection distance	Standard detected object 15X15X1 (Iron)	2.1mm
Power voltage		12~24VDC±10%
Consumption current		15mA or lower
	Behaviour form	NO type
	Output form	NPN open collector
	Output capacity (with 24VDC power voltage)	100mA or lower
	Protection feature	Comes with a surge absorption circuit
	Residual voltage At 100mA inflowing current	2V or lower
	<p>λ Input/Output circuit diagram</p> <p>Operation indicator light Red LED (lights up when the output is ON)</p>	
Response frequency		500Hz
Ambient operating temperature		-25~70°C
Ambient storage temperature		-40~85°C
Ambient operating humidity		35~85%RH
Ambient storage humidity		35~95%RH
Lead wire length		Approximately 1m
Mass	Including cable	Approximately 15g

1) Do not use when it is in a transient state after the power is turned on (approx.10ms).

2) Keep the cables as short as possible when using in places with a lot of noise.

Also, please take all precautions, such as avoiding the parallel wiring of electric lines and power lines, as well as wiring within the same conduit.

3) Ensure that the switch does not come in direct contact with thinner-type chemicals.

4) Because it does not have a short-circuit protection circuit, wiring must be done correctly.

5) Since copper wires are used in the cable, exercise caution when using the cable in an environment where copper ions are unacceptable.

Soft Absorber

FK Series

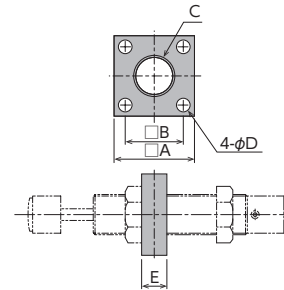
RoHS Compliant

● Products specification might be changed without notice.

Optional Parts

Flange OP-040

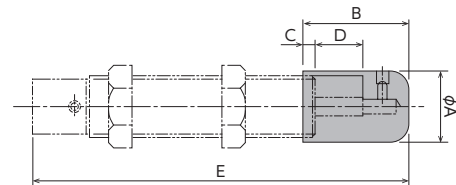
Model	A	B	C	D	E	Mass g
OP-040PB	25	18	M10×1	3.2	4	16
OP-040KB	25	18	M12×1	3.2	4	15
OP-040RB	34	24	M14×1.5	4.5	4	30
OP-040XB	34	24	M16×1.5	4.5	4	29
OP-040EB	40	28	M20×1.5	6.5	12	109
OP-040GB	54	40	M25×1.5	9	12	206
OP-040FB	50	36	M27×1.5	9	12	157
OP-040TB	65	45	M30×1.5	11	14	344
OP-040UB	78	56	M36×1.5	14	16	566



● This is a mounting fixture for soft absorbers.

Liquid-proof cap -060

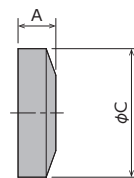
Model	A	B	C	D	E	Mass g
FK-1008□-C-060	13	18	3	8	55	10
FK-1210□-C-060	17	28	9.5	10	71.5	25
FK-1412□-C-060	19	30	9	12	78.5	31
FK-1612□-C-060	21	34	9.5	12	87.5	46
FK-2016□-C-060	24	35	4	16	108	59
FK-2530□-C-060	28	51	6.5	30	154.5	77
FK-2725□-C-060	30	50	5	25	137.5	112
FK-3035□-C-060	38	60	5	35	191.5	255



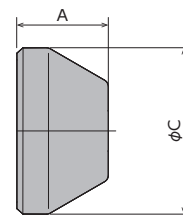
- The main unit is supplied in assembly
 - □ will be filled in with either of L, M, or H indicated in the catalog.
 - Ideal for use in environments where oil splatter poses a problem.
 - Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- Note) Liquid-proof caps are not sold separately.

Urethane cap OP-090

Model	A	C	Mass g
OP-090M36B	10	34	7
OP-090M42A	24.5	44	22
OP-090M64A	(24.1)	57	35



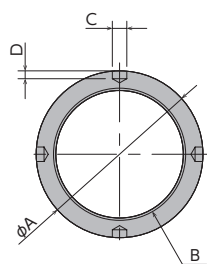
OP-090M36B



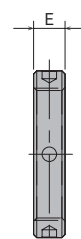
OP-090M42A
OP-090M64A

Nut

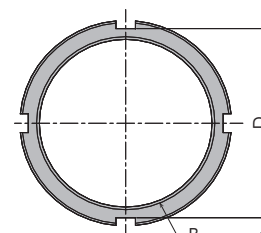
Model	A	B	C	D	E	Mass g
OP-M42	53	M42×1.5	4-φ4.6	4-2.5	10	64
OP-M64	76	M64×2.0	4-7	2-70	10	100



OP-M42

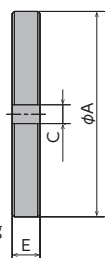


Mass 64g



OP-M64

Mass 100g



Soft Absorber

Multiple-orifice type

Fixed Type

Adjustable type

Self-adjusting

FL Series (M12~M16)

RoHS Compliant

● Products specification might be changed without notice.

Characteristics

- With an adjustable multiple-orifice structure, an optimal impact absorption can be achieved by making adjustments, even under variable operating conditions.
- This product is a long-stroke type that is suitable for high-speed (3m/s) collisions.

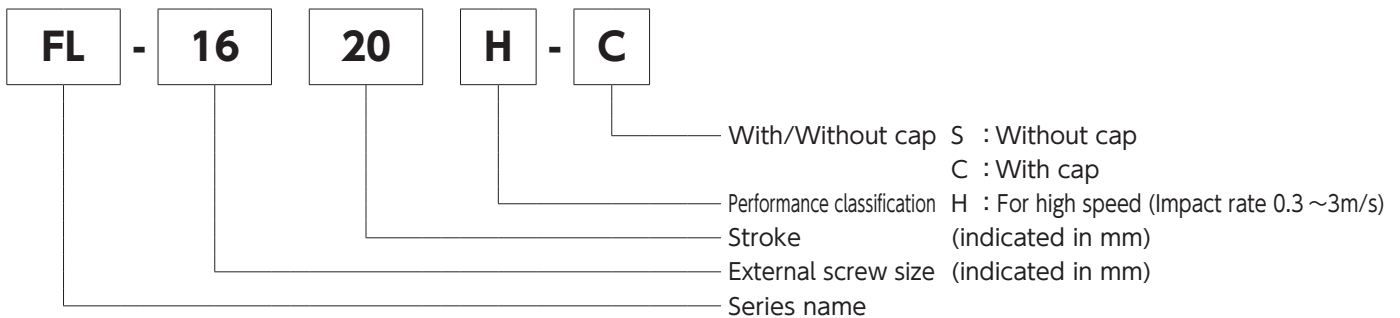


Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Max. drag N (kgf)	Max. cycle rate cycle/min	Max. absorption energy per minute J/min (kgf·m/min)	Recovering power of the piston rod N (kgf)	Operating temperature °C	Mass g	
										S type	C type
FL-1214H-□	14	5.4 (0.55)	30 (30)	0.3~3	1,156 (118)	60	98 (10)	12.7 (1.3) or lower	-5~70	46	49
FL-1417H-□	17	14.7 (1.5)	50 (50)	0.3~3	2,646 (270)	60	176 (18)	15.7 (1.6) or lower	-5~70	80	85
FL-1620H-□	20	17.6 (1.8)	60 (60)	0.3~3	2,646 (270)	60	235 (24)	19.6 (2.0) or lower	-5~70	124	136

Note) Insert S in the □ to order without a cap, and insert C in the □ to order with a cap (R if ordering urethane cap).

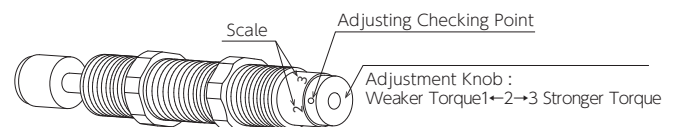
Key to Model Number



Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * We recommend that you use it with an external stopper (Stopper nut OP-020**).
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber. (Allowable eccentric angle: $\pm 2.5^\circ$)

Adjustment Method



- * To adjust, turn the adjustment knob located at the bottom of the main unit.
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
- * Once the adjustment is complete, secure with a lock screw using the attached hex wrench.

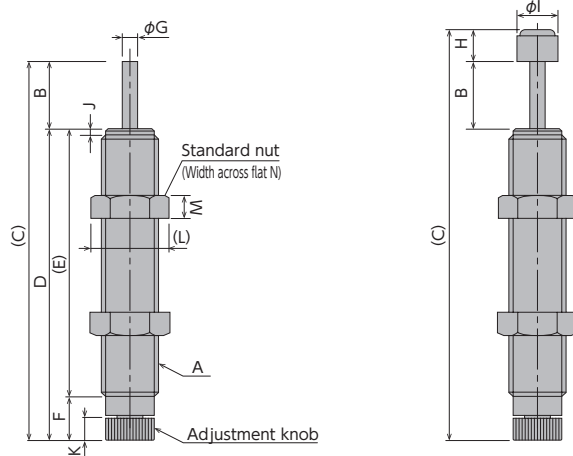
Soft Absorber

Fixed Type Adjustable type Self-adjusting

FL Series

RoHS Compliant

● Products specification might be changed without notice.



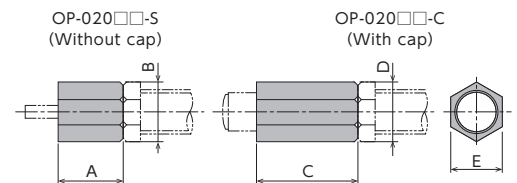
Dimensions

Model	A	B	C	D	E	F	ϕG	H	ϕI	J	K	L	M	N
FL-1214H-S	M12×1.0	14	84	70	59.5	10.5	3.5	—	—	1.5	5	16.2	4	14
FL-1214H-C			92					8	8					
FL-1417H-S	M14×1.5	17	105	88	77.8	10.2	4	—	—	1.5	5	19.6	6	17
FL-1417H-C			115					10	10					
FL-1620H-S	M16×1.5	20	128	108	93.5	14.5	5	—	—	—	4.4	21.9	6	19
FL-1620H-C			143					15	13.5					

Optional Parts

Stopper nut OP-020 □□ - □

Model	Without cap OP-020□□-S		With cap P-020□□-C		E	Applicable model	Mass g	
	A	B	C	D			S	C
OP-020KB-S-C	12	16.2	16	16.2	14	FL-1214H	S	6
							C	8
OP-020RB-S-C	12	19.6	20	19.6	17	FL-1417H	S	10
							C	17
OP-020HB-S-C	15	21.9	30	21.9	19	FL-1620H	S	15
							C	28

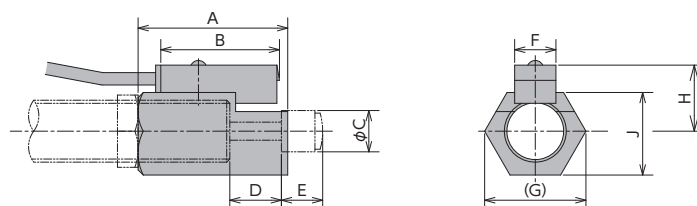


● Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.
Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Holder with a switch OP-032 □□

Model	A	B	ϕC	D	E	F	(G)	H	J	Applicable model	Mass g
OP-032KB	29	23	8	14	8	8	19.6	12.8	16	FL-1214H-C	38
OP-032HB	40	23	13.5	20	15	8	21.9	14.8	19	FL-1620H-C	46

Note) For switch specifications and precautions for use, please refer to page 23.
Note) A holder with a switch cannot be used with the FL-1417 series.



Standard nuts are sold separately as well.

Applicable model	Model
FL-1214H	M12 nut
FL-1417H	M14 nut
FL-1620H	M16 nut

Soft Absorber

Double Direction Type Multiple-orifice type
Fixed Type Adjustable type Self-adjusting

FW Series (M12~M25)

RoHS Compliant

● Products specification might be changed without notice.

Characteristics

- This product is a double-rod type that can absorb impact from both directions.
- Because of its multiple-orifice structure, a smooth impact absorption is possible.
- Idea for small spaces.

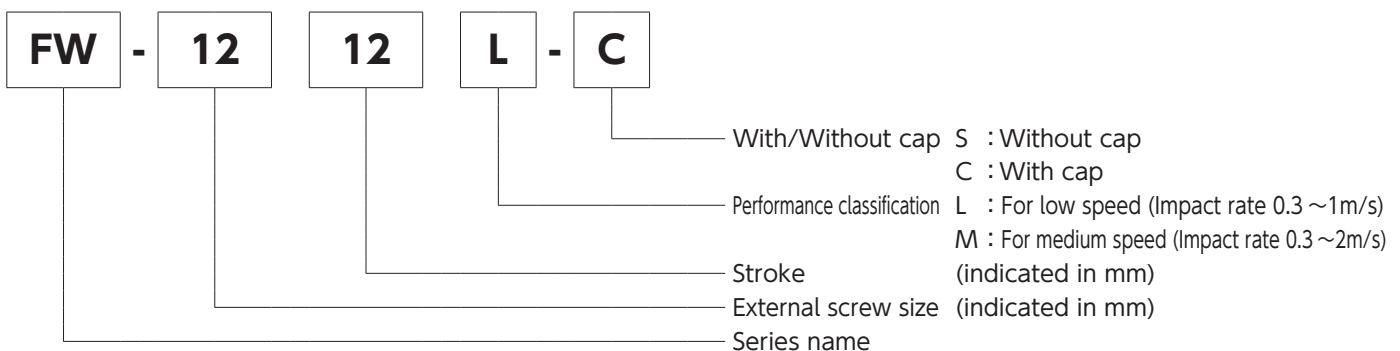


Specifications

Model	Stroke mm mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Max. drag N (kgf)	Max. cycle rate cycle/min	Max. absorption energy per minute J/min (kgf·m/min)	Recovering power of the piston rod N (kgf)	Operating temperature °C	Mass g	
										S type	C type
FW-1212L-C	12	4.9 (0.5)	39 (39)	0.3~1	1,078 (110)	60	41 (4.2)	7.8 (0.8) or lower	-5~70	-	64
FW-1616M-□	16	13.7 (1.4)	30 (30)	0.3~2	2,646 (270)	60	235 (24)	17.6 (1.8)) or lower	-5~70	130	142
FW-2025M-□	25	39.2 (4.0)	87 (87)	0.3~2	4,900 (500)	60	343 (35)	24.5 (2.5)) or lower	-5~70	234	271
FW-2530M-□	30	62.7 (6.4)	140 (140)	0.3~2	6,370 (650)	60	490 (50)	29.4 (3.0)) or lower	-5~70	460	527

Note) Insert S in the □ to order without a cap, and insert C in the □ to order with a cap (R if ordering urethane cap)..

Key to Model Number



Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * It cannot absorb impact from both directions at the same time.
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber. (Allowable eccentric angle: $\pm 2.5^\circ$)
- * Ensure that an external stopper is also used.

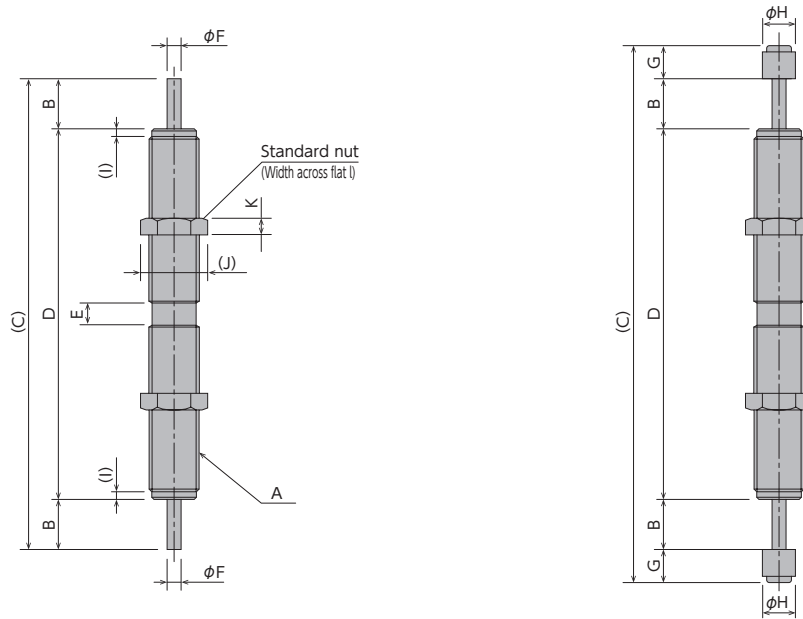
Soft Absorber

Double Direction Type | Multiple-orifice type
Fixed Type | Adjustable type | Self-adjusting

FW Series (M12~M25)

RoHS Compliant

● Products specification might be changed without notice.



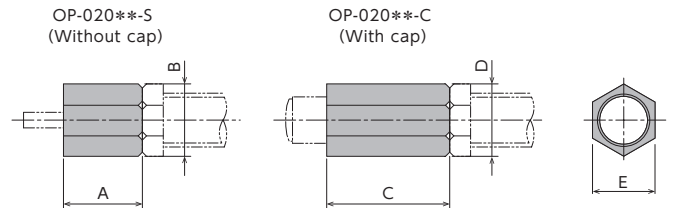
Dimensions

Model	A	B	C	D	E	φF	G	φH	I	J	K	L
FW-1212L-C	M12×1.0	12	130	90	5	3.5	8	8	2	16.2	4	14
FW-1616M-S	M16×1.5	16	134	102	-	5	-	-	6	21.9	6	19
FW-1616M-C			164				13.5	6				
FW-2025M-S	M20×1.5	25	170	120	-	6	-	-	6	27.7	8	24
FW-2025M-C			204				17	18	6			
FW-2530M-S	M25×1.5	30	205	145	-	8	-	-	6	37	10	32
FW-2530M-C			241				18	22	6			

Optional Parts

Stopper nut OP-020 ** - □

Model	A	B	C	Applicable model	Mass g
OP-020KB-C	16	16.2	14	FW-1212L-C	8
OP-020HB-S	15	21.9	19	FW-1616M-S	15
OP-020HB-C	30	21.9	19	FW-1616M-C	28
OP-020EB-S	30	27.7	24	FW-2025M-S	46
OP-020EB-C	47	27.7	24	FW-2025M-C	68
OP-020GB-S	20	37	32	FW-2530M-S	65
OP-020GB-C	32	37	32	FW-2530M-C	102



● Adjust so that it stops 1mm before the stroke end, and fasten with the main unit's nut until secured.
Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Standard nuts are sold separately as well.

Applicable model	Model
FW-1212L	M12 nut
FW-1616M	M16 nut
FW-2025M	M20 nut
FW-2530M	M25 nut

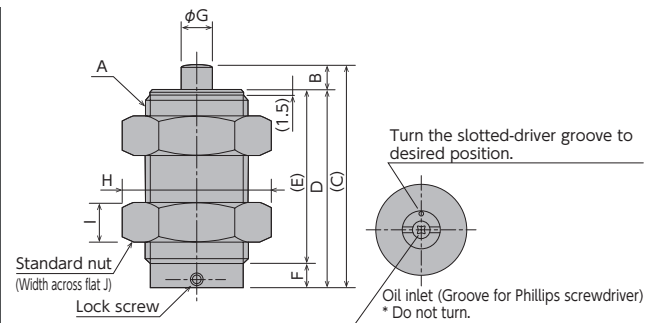
Soft Absorber

Short Stroke Type Single-Orifice
Fixed Type Adjustable type Self-adjusting

FS Series

RoHS Compliant

● Products specification might be changed without notice.



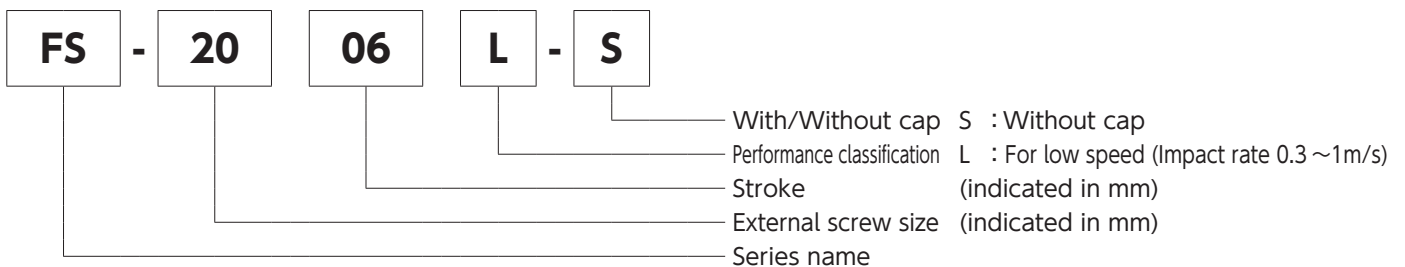
Dimensions

Model	A	B	C	D	E	F	ϕG	H	I	J
FS-1406L-S	M14×1.5	6	55	49	41	8	4	19.6	6	17
FS-1606L-S	M16×1.5	6	55	49	41	8	5	21.9	6	19
FS-2006L-S	M20×1.5	6	55	49	43	6	6	27.7	8	24
FS-2506L-S	M25×1.5	6	55	49	43	6	8	37	10	32
FS-2706L-S	M27×1.5	6	55	49	43	6	8	37	10	32

Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Max. drag N (kgf)	Max. cycle rate cycle/min	Max. absorption energy per minute J/min (kgf·m/min)	Recovering power of the piston rod N (kgf)	Operating temperature °C	Mass g
FS-1406L-S	6	3.5(0.36)	80(80)	0.3~1	2,000(204)	45	100 (10.2)	20(2) or lower	-5~70	49
FS-1606L-S	6	4.8(0.49)	120(120)	0.3~1	2,700(276)	45	130 (13.3)	20(2) or lower	-5~70	63
FS-2006L-S	6	7.8(0.8)	60(60)	0.3~1	3,920(400)	60	200 (20.4)	16.7(1.7) or lower	-5~70	114
FS-2506L-S	6	11.7(1.2)	90(90)	0.3~1	5,880(600)	60	300 (30.6)	19.6(2.0) or lower	-5~70	210
FS-2706L-S	6	15.6(1.6)	120(120)	0.3~1	7,840(800)	60	350 (35.7)	22.6(2.3) or lower	-5~70	221

Key to Model Number



Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that an external stopper is also used.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber. (Allowable eccentric angle: $\pm 2.5^\circ$)
- * Do not turn the oil inlet screw located at the bottom of the main unit.

Characteristics

- * To adjust, turn the adjustment knob with a slotted screw driver
- * Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.

Standard nuts are sold separately as well.

Applicable model	Model
FS-1406L	M14 nut
FS-1606L	M16 nut
FS-2006L	M20 nut
FS-2506L	M25 nut
FS-2706L	M27 nut

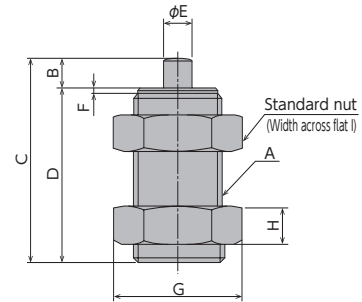
Soft Absorber

Short Stroke Type | Multiple-orifice type
Fixed Type | Adjustable type | Self-adjusting

FV Series

RoHS Compliant

●Products specification might be changed without notice.



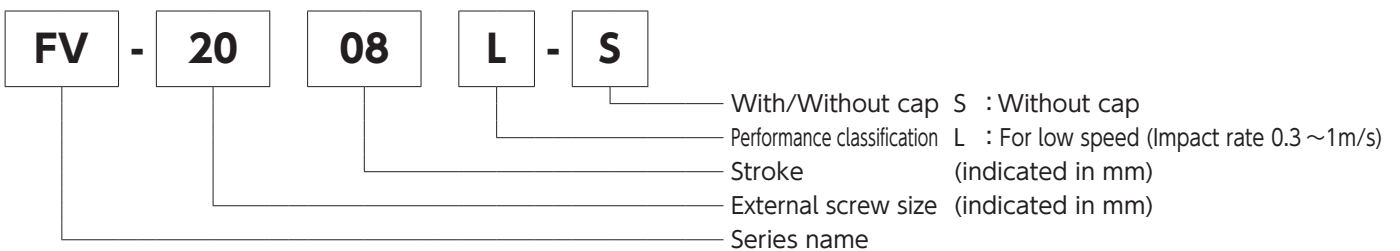
Dimensions

Model	A	B	C	D	φE	F	G	H	I
FV-1406L-S	M14×1.5	6	46	40	4	2	19.6	6	17
FV-1606L-S	M16×1.5	6	46	40	5	2	21.9	6	19
FV-2008L-S	M20×1.5	8	55	47	6	1.5	27.7	8	24
FV-2508L-S	M25×1.5	8	55	47	8	1.5	37	10	32
FV-2708L-S	M27×1.5	8	55	47	8	1.5	37	10	32

Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Max. drag N (kgf)	Max. cycle rate cycle/min	Max. absorption energy per minute J/min (kgf·m/min)	Recovering power of the piston rod N (kgf)	Operating temperature °C	Mass g
FV-1406L-S	6	4.5 (0.46)	80 (80)	0.3~1	2,000 (204)	45	100 (10.2)	15 (1.5) 以下	-5~70	42
FV-1606L-S	6	5.5 (0.56)	120 (120)	0.3~1	2,700 (276)	45	130 (13.3)	20 (2) 以下	-5~70	53
FV-2008L-S	8	8.8 (0.9)	70 (70)	0.3~1	3,430 (350)	60	200 (20.4)	14.7 (1.5) 以下	-5~70	108
FV-2508L-S	8	13.7 (1.4)	110 (110)	0.3~1	5,390 (550)	60	300 (30.6)	21.6 (2.2) 以下	-5~70	199
FV-2708L-S	8	19.6 (2.0)	150 (150)	0.3~1	7,350 (750)	60	350 (35.7)	23.5 (2.4) 以下	-5~70	206.7

Key to Model Number



Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Do not turn the oil inlet screw located at the bottom of the main unit.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Ensure that an eccentric load is not applied to the soft absorber. (Allowable eccentric angle: ±2.5°)
- * Ensure that an external stopper is also used.

Standard nuts are sold separately as well.

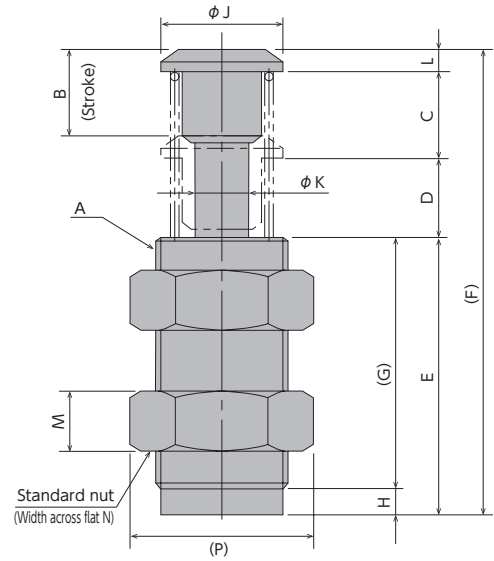
Applicable model	Model
FV-1406L	M14 nut
FV-1606L	M16 nut
FV-2008L	M20 nut
FV-2508L	M25 nut
FV-2708L	M27 nut

Soft Absorber

Emergency Absorber Variable-Groove Orifice
Fixed Type Adjustable type Self-adjusting

FED Series

● Products specification might be changed without notice.



Dimensions

Model	A	B	C	D	E	F	G	H	J	K	L	M	N	P
FED-2010M-C	M20×1.5	10	11	14	37.5	62.5	30.5	7	16	8	3	8	24	27.7
FED-3020M-C	M30×1.5	20	25	18	64	107	58	6	28	12	5	14	36	41.6

Specifications

Model	Stroke mm	Max. absorption energy J (kgf·m)	Max. equivalent mass kg (kgf)	Range of impact rate m/s	Max. drag N (kgf)	Recovering power of the piston rod N (kgf)	Operating temperature °C	Mass g
FED-2010M-C	10	19.6 (2.0)	30 (30)	0.5~2	6,860 (700)	41.2 (4.2) or lower	-5~70	79
FED-3020M-C	20	98 (10)	140 (140)		11,760 (1,200)	68.6 (7.0) or lower		350

* This product is an affordable compact soft absorber for emergencies.

* Light weight - made of aluminum.

* As an emergency absorber, it will last for approximately 100 uses.

Precautions for Use

- * Do not use this product without carefully reading the attached owner's manual.
- * Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- * Never apply eccentric load to the piston rod. In particular, when using in a rotating motion, the distance between the rotational centre of the impacted part and the mounted soft

absorber should be at least 12 times the stroke length. The soft absorber should also be mounted so that it is perpendicular halfway through the stroke.

- * Do not over-tighten the standard nut. (Tightening torque: 14.7H·m)
- * Do not use this product in a vacuum or a location where it may come in contact with oil.
- * Please use with an external stopper

Standard nuts are sold separately as well.

Applicable model	Model
FED-2010M	M20 nut Black
FED-3020M	M30 nut Black

Soft Absorber

FES Series



Type Descriptions

F E S - 1 2 1 5

① ② ③

- ① Series name
- ② Mounting screw size (metric coarse screw thread)
- ③ Max. stroke

Product Description

The emergency stopper, available for only one-time use, is designed to urgently stop in runaway of the devices with an linear motor or servomotor. Absorbs the energy using the plastic deformation of metal. Differs from the general hydraulic pressure shock absorber, impervious to an oil leak. Designed more compact than a hydraulic pressure shock absorber with the similar absorption capacity. Also, a rebound, frequently seen in a rubber stopper, does not occur and the excellent absorption characteristics cause no damage to the device.

Specifications

Model	Max. absorption energy J (kgf·m)	Maximum stroke mm	Range of impact rate m/s	Max. drag N (kgf)	Range of operating temperature °C	Mass g
FES-0607	7(0.7)	7	3以下	2,500(255)	-25~60	9
FES-1215	45(4.6)	15		6,500(663)		50
FES-1220	80(8.2)	20		8,500(867)		70
FES-1625	160(16.3)	25		9,500(969)		100
FES-2030	450(45.9)	30		27,000(2,755)		300
FES-2440	1,000(102)	40		45,000(4,592)		650
FES-3050	1,800(183.7)	50		60,000(6,122)		1,200

Dimensions

Model	A	B	C	D	E	F	G	H	J	K
FES-0607	28	21	—	7	M6×1	—	4	10	10.6	10.6
FES-1215	62	47	3	12	M12×1.75	15	14	14	14.6	15.4
FES-1220	74	59	3	12	M12×1.75	18	17	15	15.7	16.7
FES-1625	89	70	3	16	M16×2	19	17	15	16.5	17.5
FES-2030	109	84	5	20	M20×2.5	30	27	26	27.8	28.8
FES-2440	138	107	6	25	M24×3	40	36	33	36.7	37.7
FES-3050	172	134	8	30	M30×3.5	50	46	41	45	46

