SOFT ABSORBER &
ROTARY DAMPER

FUJI LATEX CO.,LTD.

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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.

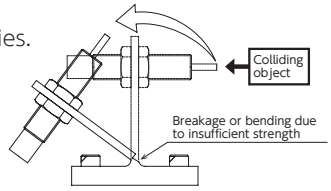
⚠ Caution

Defifinition 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 orcontact 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 ψ14.6, 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 thecap 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 ± 2.5° 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 ± 1°
●A collision shall be aligned to the centerline of the piston rod. If the inclination angle exceeds ± 2.5°, please use with an inclination angle adapter.Adaptable up to ± 10°

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 ℃ - +70 ℃.
※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℃- +80℃.
※Models FA-1212, 1010 and 1215 shall be in -20℃ - +50℃, Series FPD and FPR in -10℃ - +60℃.
●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 occurrs. 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.

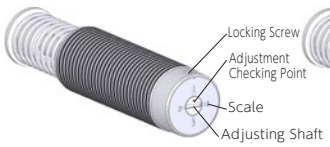
●Any remodeling on the product (additional working, coating, welding, hardening, etc.) will void all warranties by our company.

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.

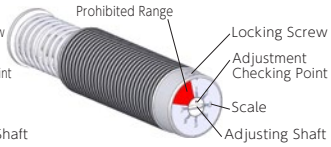
Note : Please be sure to protect the soft absorber using an external stopper or a stopper nut for adjusting.When the adjustment is complete, please be sure to tighten the locking screw. The use without locking will rotate the adjusting shaft and a variation of property occurs. There are some models that 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.

Models with Adjusting Scale 1-3



●Set the adjusting shaft to an "intermediate position of 1-2" firstand 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.

Models with Adjusting Scale 1-7



●Set the adjusting shaft to approximately "2" firstand 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.

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.

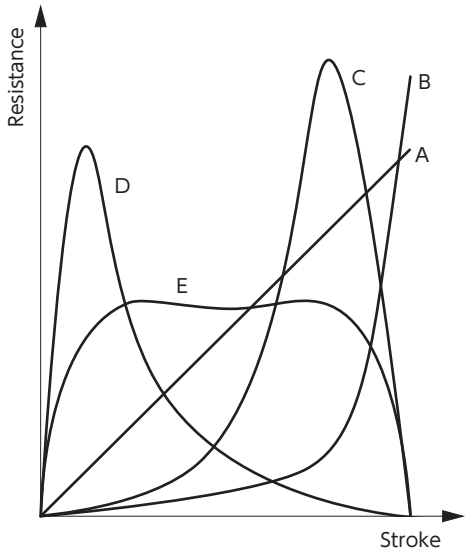
Fuji Latex Co., Ltd. assumes no responsibility for any secondary disasters caused by a soft absorber. Please enforce a preventive measure against any secondary disasters.

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.

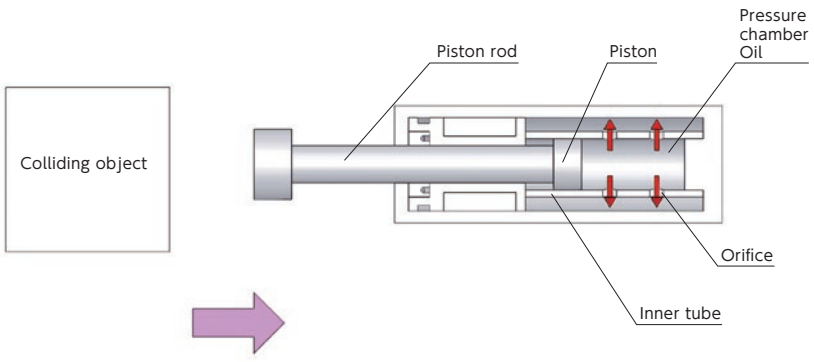
Rubber	The rubber's elastic deformation captures the impact energy, and this energy is then accumulated in the rubber. As a result, the accumulated energy works as a repulsive force, and there is a high risk of a rebound being tenerated. Therefore, it is not an efficient impact absorber. On the other 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

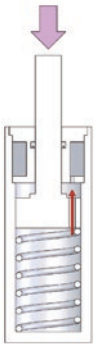
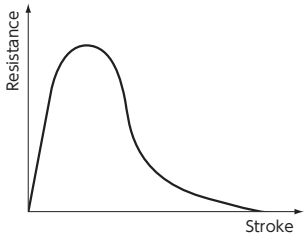
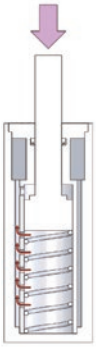
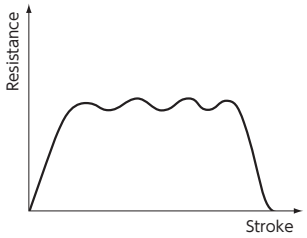
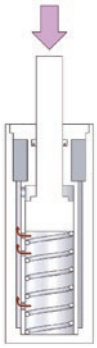
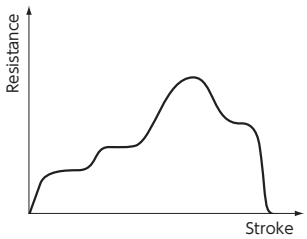
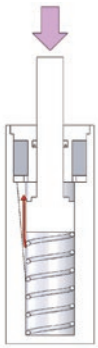
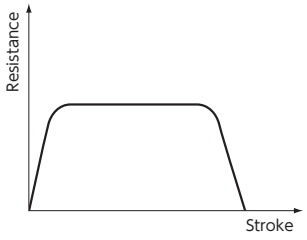
<Principles of Energy Absorption>

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 pressureapplied 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

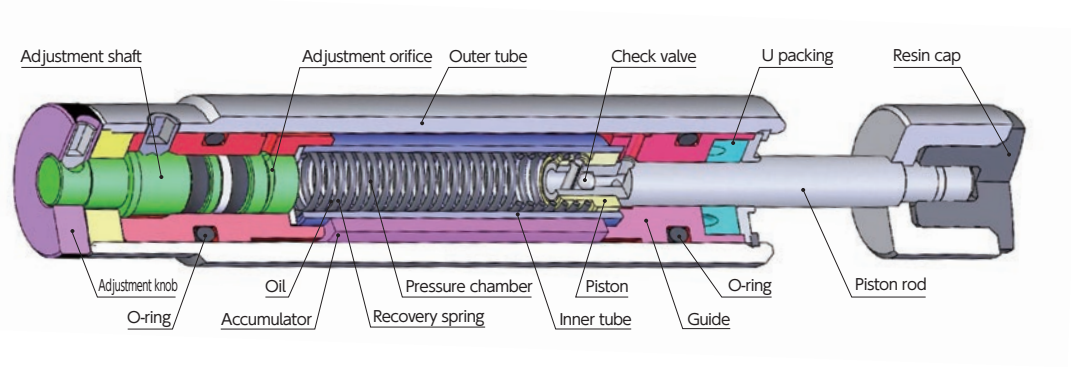
Soft absorbers are divided into two major categories based on how the orifice area changes, and they are further divided into four groups according to their absorption characteristics. Each of the absorption characteristics is described below.

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 resistancedecreases 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. Similarl 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)

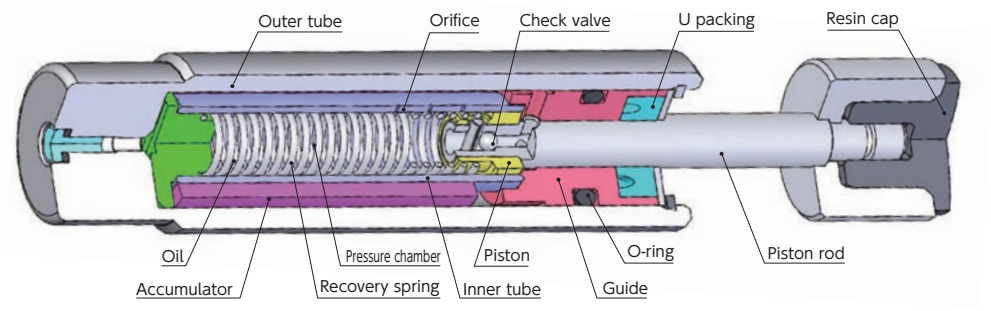
Soft absorbers have two types of structure: an adjustable type in which the absorption characteristics can be adjusted, and a fixed type, which is non-adjustable. Each structure is shown below.

Adjustable Type



By rotating the adjustment knob (adjustment shaft) located towards the rear of the main body, the amount of oil flowing outt hoef 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 nsigle types. Because the orifice area changes in an analog manner, fine-tuning of the absorption characteristics is possible.

Fixed Type

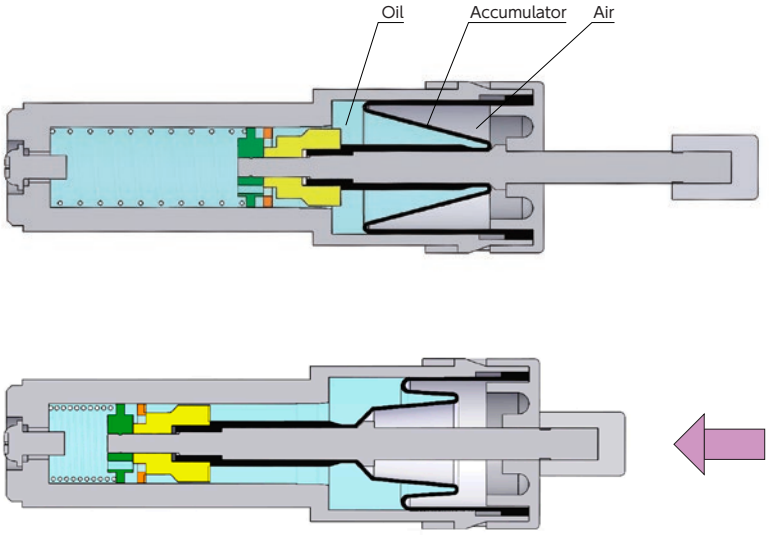


Because it has no adjustment mechanism, the overall length is shorter than the adjustable type. By customizing your orifice design, optimal absorption characteristics can be obtained. In addition, because the characteristics are fairly uniform, more than two of them can be used in parallel. For the fixed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

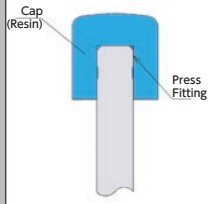
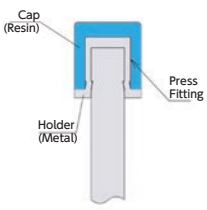
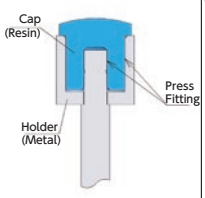
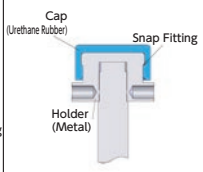
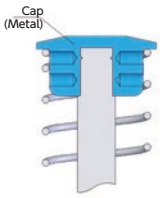
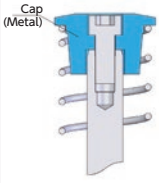
Structures of Soft Absorbers (2)

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

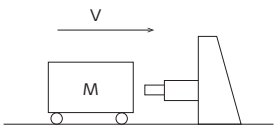
<Selection Procedure>

Item	Descriptions
1 Verification of the operating conditions	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. Verification of the colliding object's mass: Determine the maximum mass M (kg) of the colliding object. 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.
2 Calculation of the colliding object's kinetic energy	Based on the equation, calculate the kinetic energy, E1 $E_1 = \frac{1}{2} \times M \times V^2$
3 Verification of thrust	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.
4 Tentative determination of the absorber's stroke	Based on the tentatively selected soft absorber, the tentative stroke St is determined.
5 Calculation of thrusting energy	Determine Energy E2 due to thrust. $E_2 = F \times St$
6 Calculation of the total energy E and selection of the soft absorbe	Determine the total energy E. $E = E_1 + E_2$
7 Checking the maximum absorption energy per minute	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. $E_3 \geqq E \times C$
8 Checking the equivalent mass	When an impact is accompanied by thrust, always verify the equivalent mass, particularly for low-speed impacts (0.3m/s or slower). Me must be smaller than the catalogue specifications. $Me = \frac{2 \times E}{V^2}$ Me = M (mass of the colliding object) in horizontal impact without thrust.
9 Checking the operating temperature	Operating temperature must be within an acceptable range.
10 Other	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/

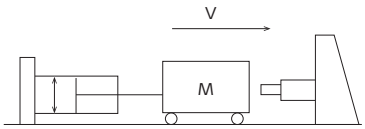
Selection Method for Soft Absorbers

1.Verifying the Type of Motion

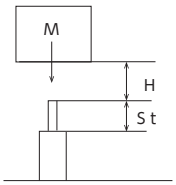
Impact conditions can be divided into following categories. When making a selection, it is necessary to calculate the energy for the relevant category and then consider the attachment method.



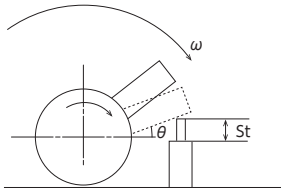
Horizontal motion without thrust



Thrusting motion



Falling motion



Rotating motion

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/s^2)

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·m^2)
- ☐ Stopping angle : θ(rad)

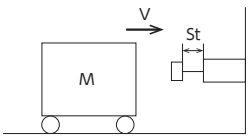
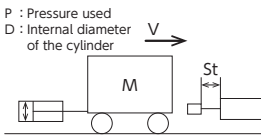
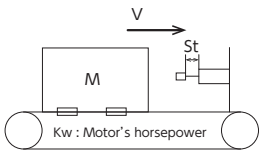
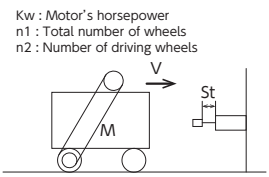
<Equations>

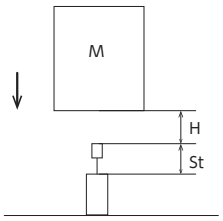
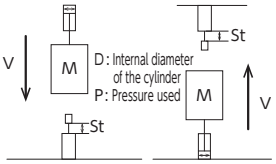
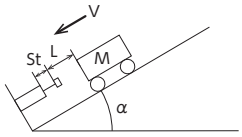
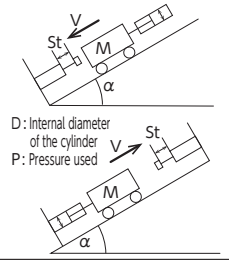
Thrusting motion $E=\frac{1}{2}\times I\times\omega^2+T\times\theta$

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

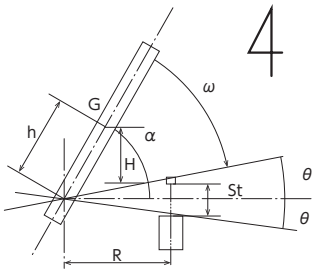
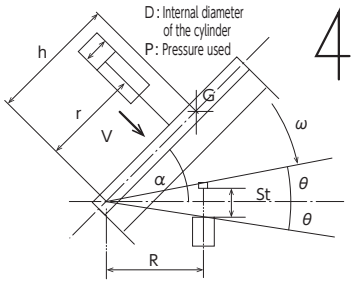
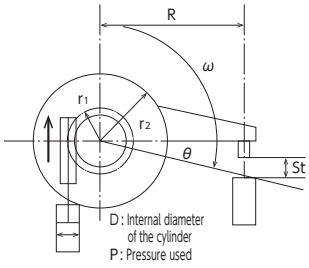
- ☐ Deceleration (G value) $G=\frac{0.051\times V^2}{St}$ — This indicates the degree of impact at the time of collision. (Smaller value means smaller impact)
- ☐ Braking force $F=\frac{E}{St}$ — This indicates the resistance that is generated in the soft absorber at the moment of collision. This value 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)				
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				
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

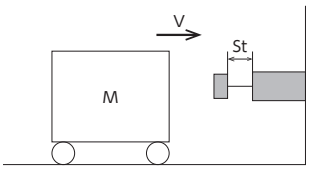
Symbol	Unit	Explanation	Symbol	Unit	Explanation
E	J	Total energy (per soft absorber)	α	rad	Sloping angle
E_1	J	Kinetic energy	θ	rad	Vibrational angle within the soft absorber stroke
E_2	J	Thrusting energy	R	m	Distance between the centre of rotation and absorber
P	MPa	Pressure used by the driving cylinder	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	Tθ	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.

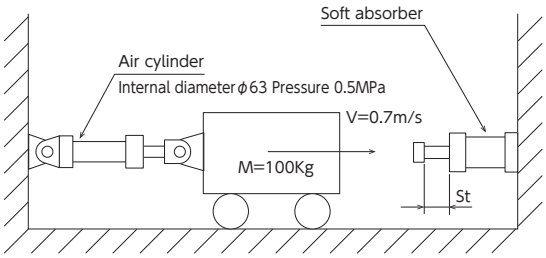
Sample Calculations for Selecting Soft Absorbers 1

Case Examples

1. Inertial Impact (Horizontal)



2. Thrusting Motion due to Air Cylinder Thrust



Specifications

1. Inertial Impact (Horizontal)

- ☐ Mass of the colliding object — M : 150kg
- ☐ Impact rate — V : 1.5 m/s
- ☐ Operation frequency — C : 1 time/min
- ☐ Ambient temperature — t : 0 ~ 25° C
- ☐ Number of soft absorber receivers — N : 1 unit

2. Thrusting Motion due to Air Cylinder Thrust

- ☐ Mass of the colliding object — M : 100kg
- ☐ Impact rate — V : 0.7m/s
- ☐ Operation frequency — C : 1 time/min
- ☐ Ambient temperature — t : 0 ~ 25° C
- ☐ Thrust — F : Varies with the air cylinder
  D : Cylinder diameter···63mm
  P : Air pressure··0.5MPa
- ☐ Number of soft absorber receivers — N : 1 unit

Sample Calculations

1. Inertial Impact (Horizontal)

1. Calculating kinetic energy

$$E_1 = \frac{1}{2} M \cdot V^2 = \frac{1}{2} \times 150 \times 1.5^2 = 169\,(J)$$

2. Calculating total energy

$$E = \frac{E_1}{N} = \frac{169}{1} = 169\,(J)$$

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.

3.Feasibility check

3-1. Using equivalent mass to check

$$Me = \frac{M}{N} = \frac{150}{1} = 150\,(kg)$$

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

2. Thrusting Motion due to Air Cylinder Thrust

1. Calculating kinetic energy

$$E_1 = \frac{1}{2} M \cdot V^2 = \frac{1}{2} \times 100 \times 0.7^2 = 24.5\,(J)$$

2. Calculating thrusting energy

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.

$$F = \frac{\pi \cdot D^2}{4} \times P$$
$$= \frac{3.14 \times 0.063^2}{4} \times 0.5 \times 10^6$$
$$= 1{,}557\,(N)$$

$St = 25\ (mm) = 0.025\,(m)$

$$E_2 = F \times St = 1{,}557 \times 0.025$$
$$= 38.9\,(J)$$

3. Determine the total energy.

$$E = E_1 + E_2 = 24.5 + 38.9$$
$$= 63.4\,(J)$$

4. Feasibility check

4-1. Using absorption energy to check
As the absorption energy of FWM-2725FBD-* is 79.4(J), it does not pose a problem.

4-2. Using equivalent mass to check

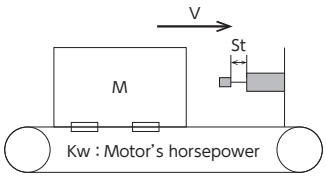
$$Me = \frac{2E}{V^2} = \frac{2 \times 63.4}{0.7^2}$$
$$= 259\,(kg)$$

As the equivalent mass of FWM-2725FBD-* is 450(kg), it does not pose a problem.
Based on these, FWM-2725FBD-* is selected.

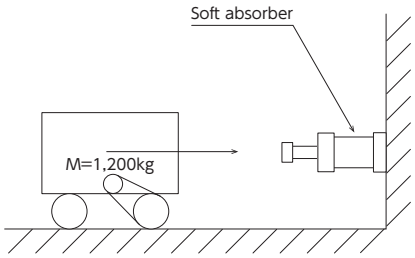
Sample Calculations for Selecting Soft Absorbers 2

Case Examples

3. Motor's horsepower



4. Thrusting Energy due to Motor-Driven Dolly



Specifications

3. Motor's horsepower

☐Mass of the colliding object	M : 30kg
☐Impact rate	V : 0.7m/s
☐Motor's horsepower	kw : 1kw
☐Operation frequency	C : 1 time/min
☐Ambient temperature	t : 0～25° C
☐Number of soft absorber receivers	N : 1 unit

4. Thrusting Energy due to Motor-Driven Dolly

☐ Mass of the colliding object	M : 1,200kg
☐ Impact rate	V : 0.5m/s
☐ Operation frequency	C : 1 time/min
☐ Ambient temperature	t : 0 ～ 25° C
☐ Thrust	F : Varies with the motor Motor output···3.7kw
☐ Number of soft absorber receivers	N : 1 unit

Sample Calculations

3. Motor's horsepower

1. Calculating kinetic energy

$$E_1 = \frac{1}{2} M \cdot V^2 = \frac{1}{2} \times 30 \times 0.7^2 = 7.35\,(J)$$

2. Calculating thrust

$$F = \frac{kw \cdot 2.5}{V} \times 10^3 = \frac{1 \times 2.5}{0.7} \times 10^3 = 3{,}571\,(N)$$

3. Calculating thrusting energy

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.

$St = 25\,(mm) = 0.025\,(m)$

$E_2 = F \cdot St = 3{,}571 \times 0.025 = 89.3\,(J)$

4. Calculating total energy

$$E = \frac{E_1 + E_2}{N} = \frac{7.35 + 89.3}{1} = 96.6\,(J)$$

5. Feasibility check

5-1. Using absorption energy to check

As the absorption energy of FA-3625A3-C is 200(J), it does not pose a problem.

5-2. Using equivalent mass to check

$$Me = \frac{2 \cdot E}{V^2} = \frac{2 \times 96.6}{0.7^2} = 394\,(kg)$$

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.

4. Thrusting Energy due to Motor-Driven Dolly

1. Calculating kinetic energy

$$E_1 = \frac{1}{2} M \cdot V^2 = \frac{1}{2} \times 1{,}200 \times 0.5^2 = 150\,(J)$$

2. Calculating thrusting energy

Here, the trust is first calculated. For a motor-driven dolly, the smaller calculated value based on the following two equations is used as thrust.

(1) $$F = \frac{Kw \times 2.5}{V} \times 10^3 = \frac{3.7 \times 2.5}{0.5} \times 10^3 = 18{,}500\,(N)$$

(2) $$F = M \times g \times 0.25 \times \frac{n1}{n2}$$ (n1: Number of driving wheels, n2: Total number of wheels)

$$= 1{,}200 \times 9.8 \times 0.25 \times \frac{1}{2}$$

$$= 1{,}470\,(N)$$

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:

$St = 50\,(mm) = 0.05\,(m)$

$E_2 = F \times St = 1{,}470 \times 0.05$

$= 73.5\,(J)$

3. Determine the total energy.

$E = E_1 + E_2 = 150 + 73.5 = 223.5\,(J)$

4. Feasibility check

4-1. Using absorption energy to check

As the absorption energy of FA-3650A2-C is 400 (J), it does not pose a problem.

4-2. Using equivalent mass to check

$$Me = \frac{2E}{V^2} = \frac{2 \times 223.5}{0.5^2}$$

$$= 1{,}788\,(kg)$$

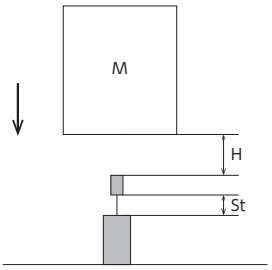
As the equivalent mass of FA-3650A2-C is 2,700 (kg), it does not pose a problem.

Based on these, FA-3650A2-C is selected.

Sample Calculation for Selecting Soft Absorbers 3

5. Free-Fall (vertical)

Case Examples



Specifications

□Mass of the colliding object M : 300kg
□The distance of an object falls until it hits the shock absorber H : 0.15m/s
□Operation frequency C : 1 time/min
□Ambient temperature t : 0～25°C
□Number of soft absorber receivers N : 2 units

Sample Calculations

1. Calculating impact rate

$V=\sqrt{2 \cdot g \cdot H}=\sqrt{2 \times 9.8 \times 0.15}=1.71\,(m/s)$

2. Calculating kinetic energy

$E_1=\frac{1}{2} \cdot M \cdot V^2=\frac{1}{2} \times 300 \times 1.71^2=439\,(J)$

3. Calculating thrust

3-1. Using equivalent mass to check

$F = M \cdot g = 300 \times 9.8 = 2{,}940\,(N)$

4. 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.

$St = 50\,(mm) = 0.05\,(m)$

$E_2 = F \cdot St = 2{,}940 \times 0.05 = 147\,(J)$

3. Calculating total energy

$E=\frac{E_1+E_2}{N}=\frac{439+147}{2}=293\,(J)$

6. 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.

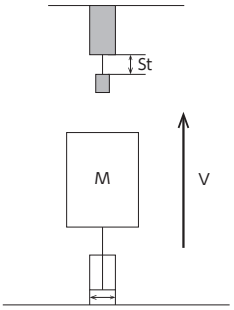
6-2. Using equivalent mass to check

$Me=\frac{2 \cdot E}{V^2}=\frac{2 \times 293}{1.71^2}=200\,(kg)$

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.

6. Cylindrical thrust (up)

Case Examples



Specifications

□Mass of the colliding object M : 80kg
□Impact rate V : 0.5m/s
□Operation frequency C : 1 time/min
□Ambient temperature t : 0～25°C
□Thrust F : Air cylinder's thrust
D : Internal diameter of the driving cylinder…80mm
P : Pressure used by the driving Cylinder…0.5MPa
□Number of soft absorber receivers N : 1 unit

Sample Calculations

1. Calculating kinetic energy

$E_1=\frac{1}{2} M \cdot V^2=\frac{1}{2} \times 80 \times 0.5^2=10\,(J)$

2. Calculating thrust

$F=\frac{\pi \cdot D^2}{4} \times P - M \cdot g$

$=\frac{\pi \times 80^2}{4} \times 0.5 - 80 \times 9.8 = 1{,}729\,(N)$

3. 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.

$St = 25\,(mm) = 0.025\,(m)$

$E_2 = F \cdot St = 1{,}729 \times 0.025 = 43.2\,(J)$

4. Calculating total energy

$E_2=\frac{E_1+E_2}{N}=\frac{10+43.2}{1}=53.2\,(J)$

5. Feasibility check

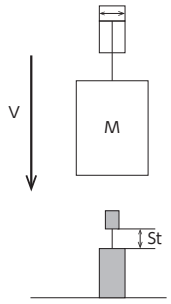
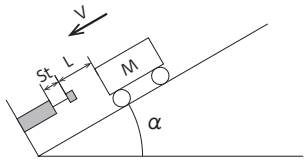
5-1. Using absorption energy to check
As the absorption energy of FWM-2725FBD - * is 79.3(J), it does not pose a problem.

5-2. Using equivalent mass to check

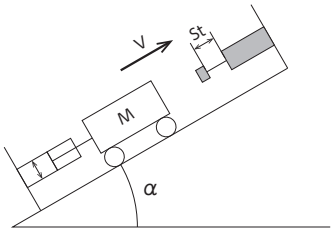
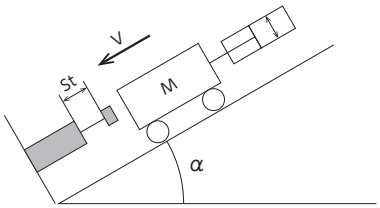
$Me=\frac{2 \cdot E}{V^2}=\frac{2 \times 53.2}{0.5^2}=426\,(kg)$

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)
Case Examples		
Specifications	☐ Mass of the colliding object M : 80kg ☐ Impact rate V : 0.5m/s ☐ Operation frequency C : 1 time/min ☐ Ambient temperature t : 0～25°C ☐ Thrust F : Air cylinder's thrust D : Internal diameter of the driving cylinder…80mm P : Pressure used by the driving Cylinder…0.5MPa ☐ Number of the soft absorber receivers N : 1 unit	☐ Mass of the colliding object M : 70kg ☐ Travelling distance on slope L : 0.7m ☐ Sloping angle α : 3° ☐ Ambient temperature t : 0～25°C ☐ Number of the soft absorber receivers N : 1 unit
Sample Calculations	**1. Calculating kinetic energy** $E_1 = \frac{1}{2} M \cdot V^2 = \frac{1}{2} \times 80 \times 0.5^2 = 10\,(J)$ **2. Calculating thrust** $F = \frac{\pi \cdot D^2}{4} \times P + M \cdot g$ $= \frac{\pi \times 80^2}{4} \times 0.5 + 80 \times 9.8 = 3{,}297\,(N)$ **3. Calculating thrusting energy** 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. The thrusting energy will be as follows. St = 35 (mm) = 0.035 (m) $E_2 = F \cdot St = 3{,}297 \times 0.035 = 115\,(J)$ **4. Calculating total energy** $E = \frac{E_1 + E_2}{N} = \frac{10 + 115}{1} = 125\,(J)$ **5. Feasibility check** 5-1. Using absorption energy to check As the absorption energy of FWM-3035TBD - * is 196(J), it does not pose a problem. 5-2. Using equivalent mass to check $Me = \frac{2 \cdot E}{V^2} = \frac{2 \times 125}{0.5^2} = 1{,}000\,(kg)$ As the equivalent mass of FWM-3035TBD - * is 1,300(kg), it does not pose a problem. Based on these, FWM-3035TBD - * is selected.	**1. Calculating impact rate** $V = \sqrt{2 \cdot g \cdot L \cdot \sin\alpha}$ $= \sqrt{2 \times 9.8 \times 0.7 \times \sin 3^\circ} = 0.85\,(m/s)$ **2. Calculating kinetic energy** $E_1 = M \cdot g \cdot L \cdot \sin\alpha$ $= 70 \times 9.8 \times 0.7 \times \sin 3^\circ = 25.1\,(J)$ **3. Calculating thrusting energy** 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. The thrusting energy will be as follows. St = 16 (mm) = 0.016 (m) $E_2 = M \cdot g \cdot \sin\alpha \cdot St$ $= 70 \times 9.8 \times \sin 3^\circ \times 0.016 = 0.57\,(J)$ **4. Calculating total energy** $E = \frac{E_1 + E_2}{N} = \frac{25.1 + 0.57}{1} = 25.7\,(J)$ **5. Feasibility check** 5-1. Using absorption energy to check As the absorption energy of FA-2016E3 - * is 35(J), it does not pose a problem. 5-2. Using equivalent mass to check $Me = \frac{2 \cdot E}{V^2} = \frac{2 \times 25.7}{0.85^2} = 71.1\,(kg)$ As the equivalent mass of FA-2016E3 - * is 120(kg), it does not pose a problem. Based on these, FA-2016E3 - * is selected.

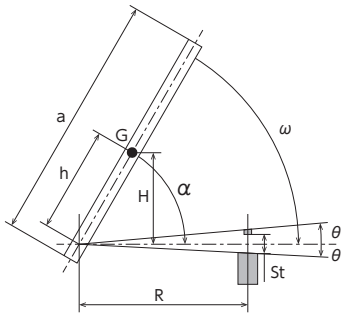
Sample Calculation for Selecting Soft Absorbers 5

	9. Cylindrical thrust (slope ; up)	10. Cylindrical thrust (slope ; down)
事例		
仕様	☐ Mass of the colliding object M : 70kg ☐ Impact rate V : 0.5m/s ☐ Thrust F : Air cylinder's thrust D : Internal diameter of the driving cylinder…80mm P : Pressure used by the driving Cylinder…0.4MPa ☐ Sloping angle α : 30° ☐ Ambient temperature t : 0～25°C ☐ Number of the soft absorber receivers N : 1unit	☐ Mass of the colliding object M: 70kg ☐ Impact rate V : 1m/s ☐ Thrust F : Air cylinder's thrust D : Internal diameter of the driving cylinder…80mm P : Pressure used by the driving Cylinder…0.4MPa ☐ Sloping angle α : 30° ☐ Ambient temperature t : 0～25°C ☐ Number of the soft absorber receivers N: 1 unit
計算例	**1. Calculating kinetic energy** $E_1 = \frac{1}{2} \cdot M \cdot V^2 = \frac{1}{2} \times 70 \times 0.4^2 = 5.6\,(J)$ **2. Calculating thrust** $F = \frac{\pi \cdot D^2}{4} \cdot P - M \cdot g \cdot \sin\alpha$ $= \frac{\pi \times 80^2}{4} \times 0.4 - 70 \times 9.8 \times \sin 30^\circ$ $= 1{,}667\,(N)$ **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) $E_2 = F \cdot St = 1{,}667 \times 0.025 = 41.7\,(J)$ **4. Calculating total energy** $E = \frac{E_1 + E_2}{N} = \frac{5.6 + 41.7}{1} = 47.3\,(J)$ **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 $Me = \frac{2 \cdot E}{V^2} = \frac{2 \times 47.3}{0.4^2} = 591\,(kg)$ As the equivalent mass of FA-2725FB - ∗ is 650 (kg), it does not pose a problem. Based on these, FA-2725FB- ∗ is selected.	**1. Calculating kinetic energy** $E_1 = \frac{1}{2} \cdot M \cdot V^2 = \frac{1}{2} \times 70 \times 1^2 = 35\,(J)$ **2. Calculating thrust** $F = \frac{\pi \cdot D^2}{4} \cdot P + M \cdot g \cdot \sin\alpha$ $= \frac{\pi \times 80^2}{4} \times 0.4 + 70 \times 9.8 \times \sin 30^\circ$ $= 2{,}354\,(N)$ **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) $E_2 = F \cdot St = 2{,}354 \times 0.035 = 82.4\,(J)$ **4. Calculating total energy** $E = \frac{E_1 + E_2}{N} = \frac{35 + 82.4}{1} = 117.4\,(J)$ **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 $Me = \frac{2 \cdot E}{V^2} = \frac{2 \times 117.4}{1^2} = 234.8\,(kg)$ As the equivalent mass of FK-3035M - ∗ is 390 (kg), it does not pose a problem. Based on these, FK-3035M- ∗ is selected

Sample Calculation for Selecting Soft Absorbers 6

11. Free-Fall (rotating)

事例



仕様

☐ Mass of the colliding object	M : 15kg
☐ Overall length of a colliding object	a : 0.12m
☐ Distance between the center of rotation and center of gravity	h : 0.06m
☐ Distance between the center of rotation and absorber	R : 0.1m
☐ Angle of fall of a colliding object	α : 60°
☐ Number of the soft absorber receivers	N : 1 unit
☐ Operation frequency	C : 1 time/min
☐ Ambient temperature	t : 0～25°C

計算例

1. Calculating kinetic energy

Obtain the distance that an object falls from the angle of fall.

$H = h \cdot \sin\alpha = 0.06 \times \sin 60^\circ = 0.051\,(m)$

$E_1 = M \cdot g \cdot H = 15 \times 9.8 \times 0.051 = 7.5\,(J)$

2. Calculating thrust

$$F = \frac{h}{R} \cdot M \cdot g = \frac{0.06}{0.1} \times 15 \times 9.8 = 88.2\,(N)$$

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.

$St = 12\,(mm) = 0.012\,(m)$

$E_2 = F \cdot St = 88.2 \times 0.012 = 1.06\,(J)$

4. Calculating total energy

$$E = \frac{E_1 + E_2}{N} = \frac{7.5 + 1.06}{1} = 8.56\,(J)$$

5. Feasibility check

5-1. Confirmation based on the absorbed energy

There is no problem because the maximum absorption energy of FA-1612X3-* is 14.7(J).

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.

$$I = M \cdot \frac{a^2}{3} = 15 \times \frac{0.12^2}{3} = 0.072\,(kg \cdot m^2)$$

$$V = \sqrt{\frac{2 \cdot M \cdot g \cdot H}{I} \cdot R^2} = \sqrt{\frac{2 \times 15 \times 9.8 \times 0.051}{0.072} \cdot 0.1^2} = 1.44\,(m/s)$$

$$Me = \frac{2 \cdot E_3}{V^2} = \frac{2 \times 8.56}{1.44^2} = 8.26\,(kg)$$

As the equivalent mass of FA-1612X3 - * is 35(kg), it does not pose a problem. Based on these, FA-1612X3- * is selected.

5-3. Confirmation based on the eccentric angle

$$\theta = \tan^{-1}\left(\frac{St}{R}\right) = \tan^{-1}\left(\frac{0.012}{0.1}\right) = 6.8\,(^\circ)$$

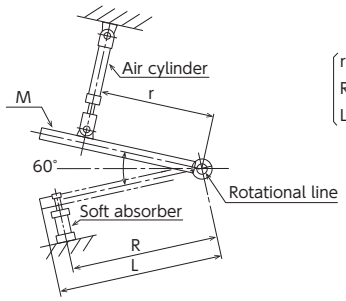
Since the eccentric angle of FA-1612X3-* is ± 2.5(°), the eccentric angle adaptor needs to be used.

In view of the foregoing, FA-1612X3-S and the eccentric angle adaptor OP-1010XB are selected.

Sample Calculation for Selecting Soft Absorbers 7

12. Up-and-Down Motion due to Air Cylinder Thrust

Case Examples



Specifications

☐ Mass of the colliding object	M :	260kg
☐ Air Cylinder rate	v :	0.5m/s
☐ Operation frequency	C :	1 time/min
☐ Ambient temperature	t :	0 ~ 25° C
☐ Thrust	F :	Varies with the air cylinder
	D :	Cylinder diameter···50mm
	P :	Air pressure···0.5MPa
☐ Number of soft absorber receivers	N :	1 unit

Sample Calculations

1. Calculating kinetic energy

$$E_1 = \frac{1}{2} I\omega^2 = \frac{1}{2} \times M \times \frac{L^2}{3} \times \left(\frac{v}{r}\right)^2$$

$$= \frac{1}{2} \times 260 \times \frac{0.7^2}{3} \times \left(\frac{0.5}{0.5}\right)^2 = 21.2(J)$$

Impact rate $V = v \times \left(\frac{R}{r}\right) = 0.5 \times \frac{0.6}{0.5} = 0.6(m/s)$

2. Calculating thrusting energy

$$E_2 = T\theta = \left(\frac{\pi \cdot D^2}{4} \times P \times 10^6 \times r + Mg \times \frac{L}{2}\right) \times \frac{St}{R}$$

$$= \left(\frac{3.14 \times 0.05^2}{4} \times 0.5 \times 10^6 \times 0.5 + 260 \times 9.8 \times \frac{0.7}{2}\right) \times \frac{St}{0.6}$$

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.

$$E_2 = \left(\frac{3.14 \times 0.05^2}{4} \times 0.5 \times 10^6 \times 0.5 + 260 \times 9.8 \times \frac{0.7}{2}\right) \times \frac{0.035}{0.6} = 80.6(J)$$

3. Determine the total energy.

$E = E_1 + E_2 = 21.2 + 80.6 = 101.8\,(J)$

4. Feasibility check

4-1. Using absorption energy to check

As the absorption energy of FWM-3035TBD-*is 196(J), it does not pose a problem.

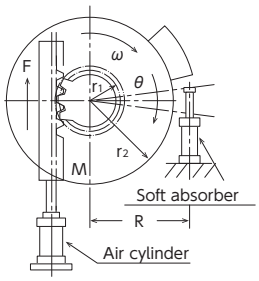
4-2. Using equivalent mass to check

$$Me = \frac{2E}{V^2} = \frac{2 \times 101.8}{0.6^2} = 565.6\,(kg)$$

As the equivalent mass of FWM-3035TBD-* is 1300(kg), itdoes not pose a problem. Based on these, FWM-3035TBD-*is selected.

13. Rotating Motion due to Air Cylinder Thrust

Case Examples



Specifications

☐ Mass of the colliding object	M :	200kg
☐ Air Cylinder rate	v :	0.5m/s
☐ Operation frequency	C :	1 time/min
☐ Ambient temperature	t :	0 ~ 25° C
☐ Thrust	F :	Varies with the air cylinder
	D :	Cylinder diameter···80mm
	P :	Air pressure···0.5MPa
☐ Number of soft absorber receivers	N :	1 unit

Sample Calculations

1. Calculating kinetic energy

$$E_1 = \frac{1}{2} I\omega^2 = \frac{1}{2} \times M \times \frac{r2^2}{2} \times \left(\frac{v}{r_1}\right)^2$$

$$= \frac{1}{2} \times 200 \times \frac{0.5^2}{2} \times \left(\frac{0.5}{0.1}\right)^2 = 312.5(J)$$

Impact rate $V = v \times \left(\frac{R}{r_1}\right) = 0.5 \times \left(\frac{0.6}{0.1}\right) = 3(m/s)$

2. Calculating thrusting energy

$$E_2 = T\theta = F \times r \times \frac{St}{R}$$

$$= \frac{3.14 \times 0.08^2}{4} \times 0.5 \times 10^6 \times 0.1 \times \frac{St}{0.6}$$

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.

$$E_2 = \frac{3.14 \times 0.08^2}{4} \times 0.5 \times 10^6 \times 0.1 \times \frac{0.05}{0.6} = 20.9(J)$$

3. Determine the total energy.

$E = E_1 + E_2 = 312.5 + 20.9 = 333.4\,(J)$

4. Feasibility check

4-1. Using absorption energy to check

As the absorption energy of FA-4250B3-C is 520 (J), it does not pose a problem.

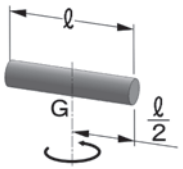
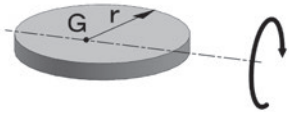
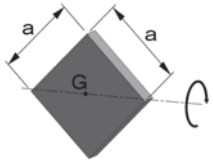
4-2. Using equivalent mass to check

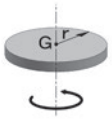
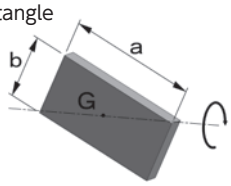
$$Me = \frac{2E}{V^2} = \frac{2 \times 333.4}{3^2} = 74\,(kg)$$

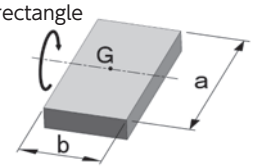
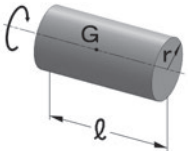
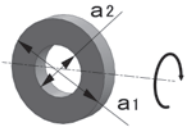
As the equivalent mass of FA-4250B3-C is 6,500 (kg), it does not pose a problem. Based on these, FA-4250B3-C is selected

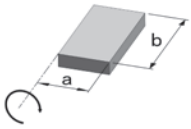
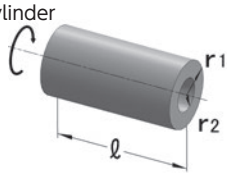
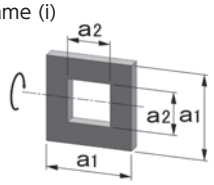
Calculation Reference for Selecting Soft Absorbers 1

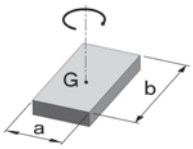
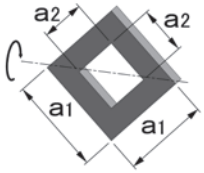
Quick Reference for Moment of Inertia

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	$M \cdot \frac{\ell^2}{12}$	$M \cdot \frac{r^2}{4}$	$M \cdot \frac{a^2}{12}$

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	$M \cdot \frac{\ell^2}{3}$	$M \cdot \frac{r^2}{2}$	$M \cdot \frac{b^2a^2}{6(b^2+a^2)}$

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	$M \cdot \frac{a^2}{12}$	$M \cdot \frac{r^2}{2}$	$M \cdot \frac{(a_1^2+a_2^2)}{16}$

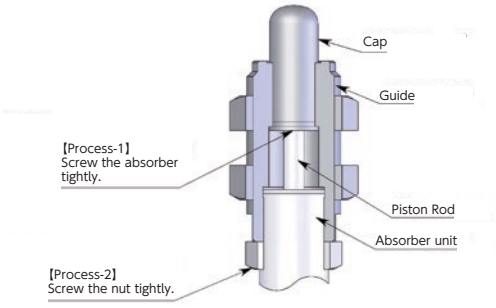
Shape	Thin rectangle 	Hollow cylinder 	Square frame (i) 
Rotating shaft	It is parallel to side b and is on one side	It is a central axis that passes through the mutual center	It is an axis that is parallel to the plain and passes through the central axis
Moment of inertia	$M \cdot \frac{a^2}{3}$	$M \cdot \frac{r_1^2+r_2^2}{2}$	$M \cdot \frac{(a_1^2+a_2^2)}{12}$

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	$M \cdot \frac{a^2+b^2}{12}$	$M \cdot \frac{2r^2}{5}$	$M \cdot \frac{(a_1^2+a_2^2)}{12}$

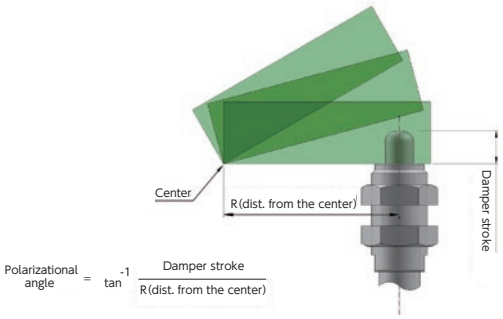
Unit : kg·m²

Calculation Reference for Selecting Soft Absorbers 2

How to mount the eccentric angle adopter



1. For a small eccentric angle

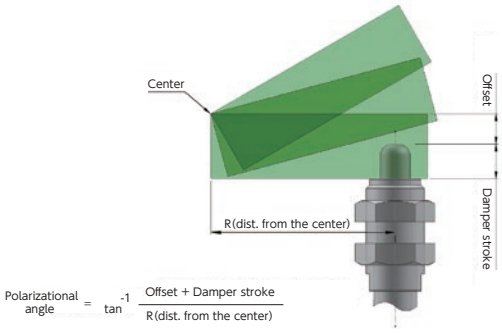


Easy placing absorber for a relatively small eccentric angle

Example of calculation
R=100mm
Damber stroke=16mm

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

2. For a large eccentric angle

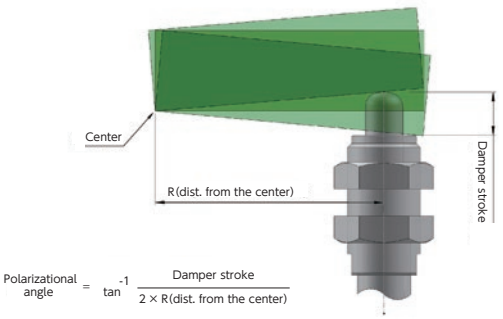


Easy placing absorber but the case that eccentric angle is large

Example of calculation
R=100mm
Damber stroke=16mm
Offset=15mm

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

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

Example of calculation
R=100mm
Damper stroke=16mm

$$\theta=\tan^{-1}\frac{16}{2\times100}=4.5^{\circ}$$

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

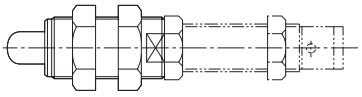
Parallel use of adjustable soft absorbers is not recommended, as some cannot be adjusted to perform equally.
However, please contact our sales department when the following conditions apply.

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

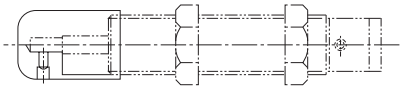
2-1. Do not use in an environment where oil mist, cutting oil, etc. may come in contact with a soft absorber. This is because oil can penetrate through the piston rod, disabling the stroke. When using under such circumstances, the soft absorber must be liquid-proofed.

1. Using absorbers with coolant specifications
   There are models with triple packing.
   (This does not protect against all damages.)



(Eccentric angle adaptor)

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.



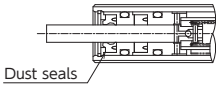
(Liquid-proof cap)

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.

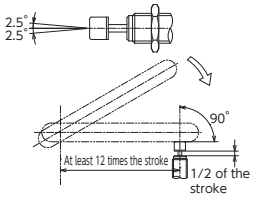
2-3. Using soft absorbers in dusty environments

Please use absorbers with dust seals.
(However, depending on the environment, they may not be fully effective for ensuring durability.)



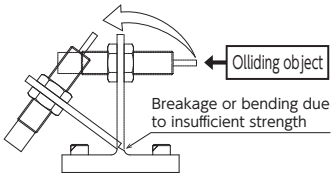
3. Protecting soft absorbers from eccentric load

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

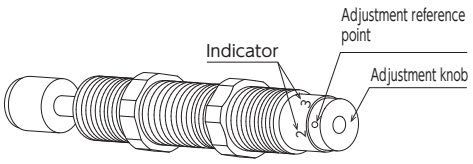
The impact absorption of a soft absorber requires sufficient mounting strength. A good guideline is to secure a mounting strength that is 2 to 3 times larger than the max. drag based on the absorber specifications.



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)

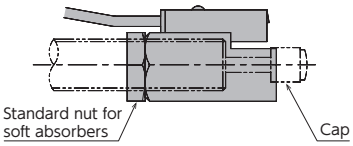


Cautions for Using Soft Absorbers 2

●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

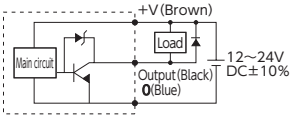
1. Set the holder's position so that the switch's tip and the edge of the metallic ringon the rod cap are at least 0.5mm apart. Otherwise, it will not work properly.
2. When attaching a holder with a switch to an adaptor, please be extremely careful not to screw it into the adaptor more than is necessary. 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

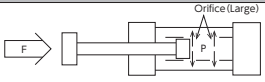
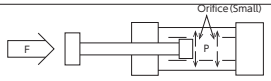
Item	Summary	Specification
Detection distance	Standard detected object 15×15×1 (Iron)	2.1mm
Power voltage		12～24VDC±10%
Consumption current		15mA or lower
	Behaviour form	NO type
	Output form	NPN open collector
	Output capacity (with 24VDC power voltage)	100mA or lower
	Protection feature	Comes with 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℃
Ambient storage temperature		-40～85℃
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=P×A (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 witha 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 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 masscalculation 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.

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

Key to Model Number

Key to Model Number

Soft Absorber (FA Series)

FA–16 12 XB–S

Series Name
FA : Single-orifice type/Multiple-orifice type
FWM : Multiple-varying orifice type

External screw size (indicated in mm)

Stroke (indicated in mm)

Orifice type (to be adapted to each impact rate):
□B : Single-orifice type for low-speed
□BD : Multiple-varying orifice type for middle-speed
□D : Multiple-orifice type for high-speed
□1 : Single-orifice type for low-speed
□2 : Multiple-varying orifice type for middle-speed
□3 : Multiple-orifice type for high-speed
SL : Multiple-varying orifice type for ultralow-speed

With/Without cap
S : Without cap
C : With cap

Soft Absorber (FK Series)

FK–20 16 L–S

Series Name
FK : fixed type

External screw size (indicated in mm)

Stroke (indicated in mm)

Performance classification
L : For low-speed
M : For middle-speed
H : For high-speed
SL : For ultra low-speed

With/Without cap
S : Without cap
C : With cap
R : With Urethane cap

Soft Absorber

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

Model Description

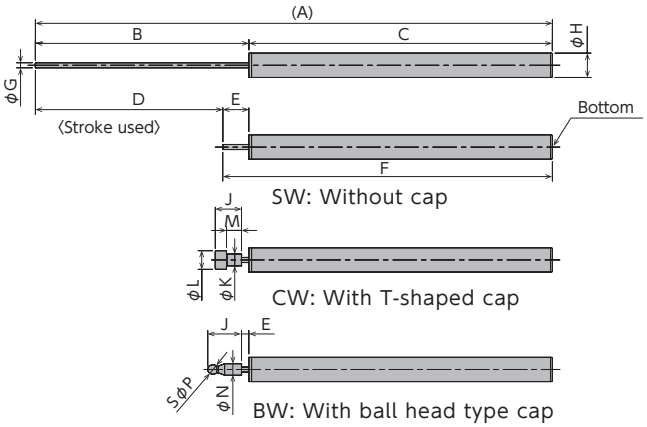
F P D – 0 7 4 5 A 1 – S W

① ② ③ ④ ⑤ ⑥

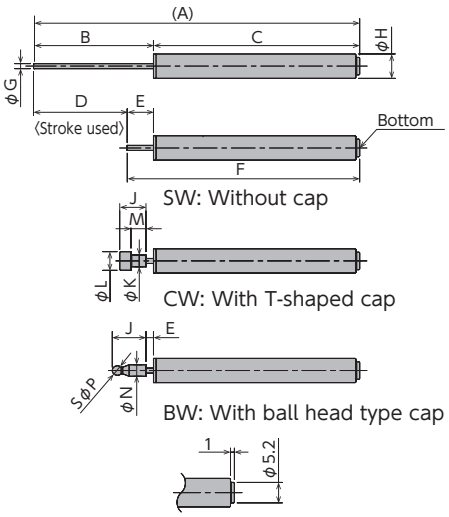
① Series name
② External diameter stroke
③ Stroke
④ With/Without self-returning
A : With Returning Spring
B : Without Returning Spring
⑤ Characteristics Number
1 : Low-load (low thrust) specications
2 : Medium-load (medium thrust) specications
3 : High-load (high thrust) specications
⑥ Symbols indicating 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



*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)

Fig. 1 Bottom Shape of FPD-0725 Series

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	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	3.5	5.5	4	-	-	3.6
FPD-0725B□-SW	87	32			7	62			-	-	-	-	-	-	3.2
FPD-0725B□-CW	89	34			2	64			7	3.5	5.5	4	-	-	3.4
FPD-0725B□-BW	91	36				66			9	-	-	-	3.4	2.8	3.3
FPD-0745A□-SW	138	57	81	45	12	93			-	-	-	-	-	-	4.9
FPD-0745A□-CW	140	59			7	95			7	3.5	5.5	4	-	-	5.1
FPD-0750B□-SW	138	57		50	7	88			-	-	-	-	-	-	4.7
FPD-0750B□-CW	140	59			2	90			7	3.5	5.5	4	-	-	4.9
FPD-0750B□-BW	142	61				92			9	-	-	-	3.4	2.8	4.8
FPD-0755A□-SW	159	67	92	55	12	104			-	-	-	-	-	-	5.6
FPD-0755A□-CW	161	69			7	106			7	3.5	5.5	4	-	-	5.8
FPD-0760B□-SW	159	67		60	7	99			-	-	-	-	-	-	5.3
FPD-0760B□-CW	161	69			2	101			7	3.5	5.5	4	-	-	5.5
FPD-0760B□-BW	163	71				103			9	-	-	-	3.4	2.8	5.4

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

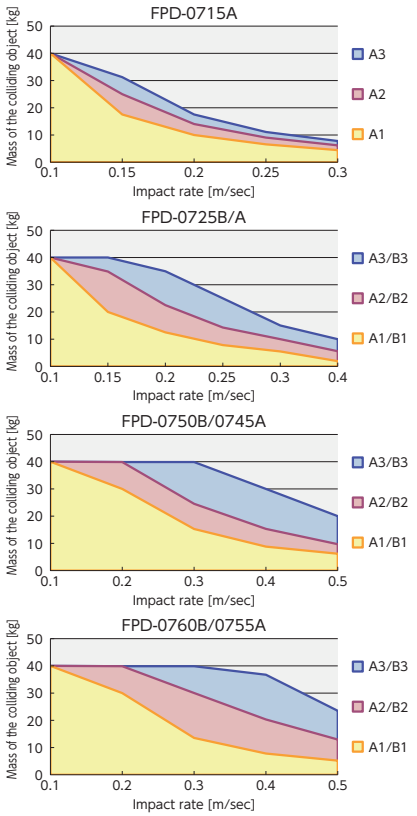
Specifications

MODEL	Max absorption evergy 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 m aterial	Resin
Range of operating te mperature, degree s C	5~40℃

Absorbable energy range under a horizontal inertial collision condition

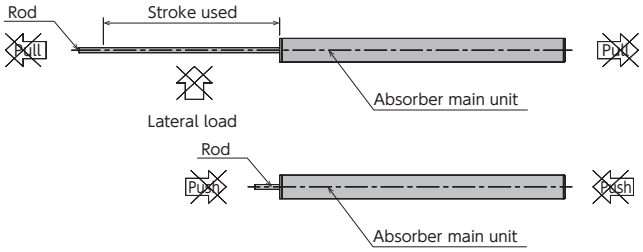


*The absorbable energy ranges above represent the properties under a condition where no thrusting force exists.

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.



Soft Absorber

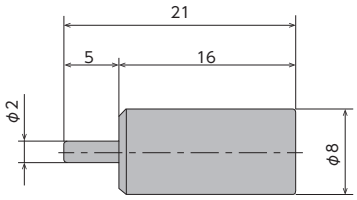
FPD-0805 Series

Model Description

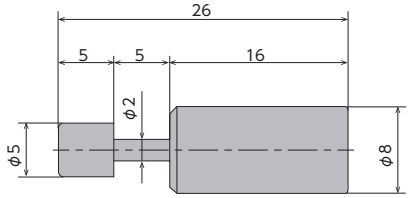
F P D	−	0 8	0 5	A 5	−	S	W
①		②	③	④		⑤	⑥

① Series name
② External diameter
③ Stroke
④ Characteristics number
A1: Low-load specications
A2: High-load specications
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)

Specications

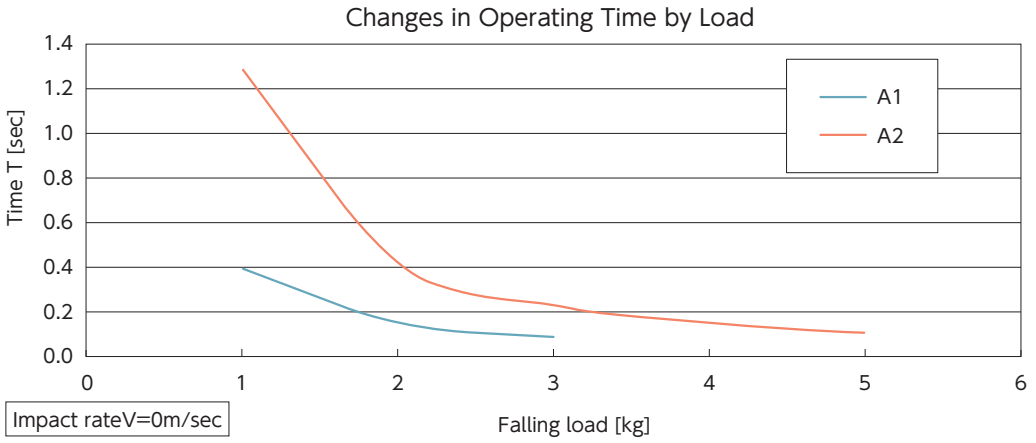
MODEL	Max absorption energy J(kgf•m)	Impact speed range m/s	Push Speed rang mm/s	Max load thrust N(kgf)	Cylinder cap color
FPD-0805A1	0.2	0.5 or lower	-	-	Black
FPD-0805A2	0.3	0.5 or lower	-	-	White
FPD-0805A5	-	-	50 or lower	80(8)	Blue
FPD-0805A7	-	-	20 or lower	100(10)	Brown

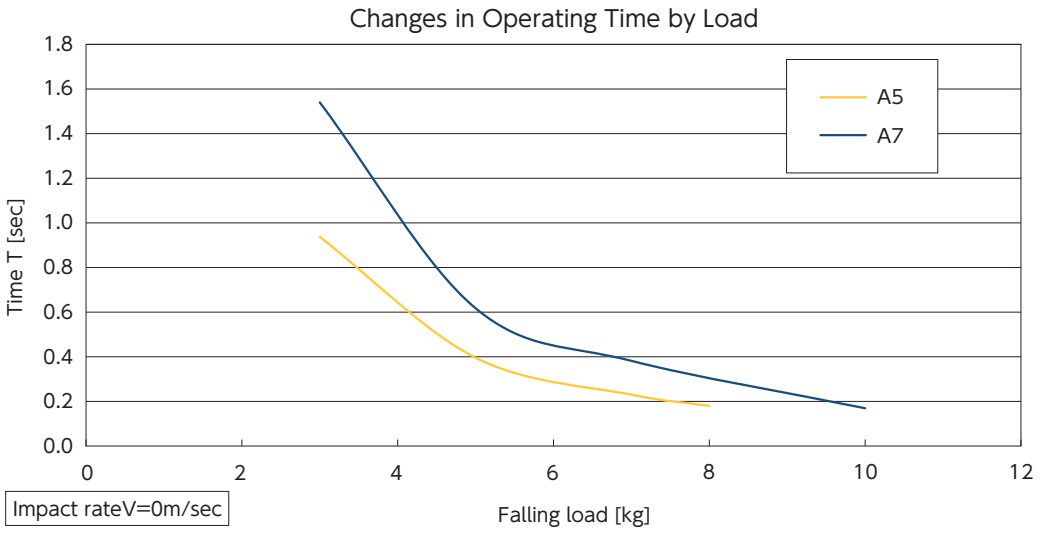
* For the motion-time of each load, please see the next page.

Common Specications

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 ℃	5~40
Mass	g	S type =1.3、C type =1.5		

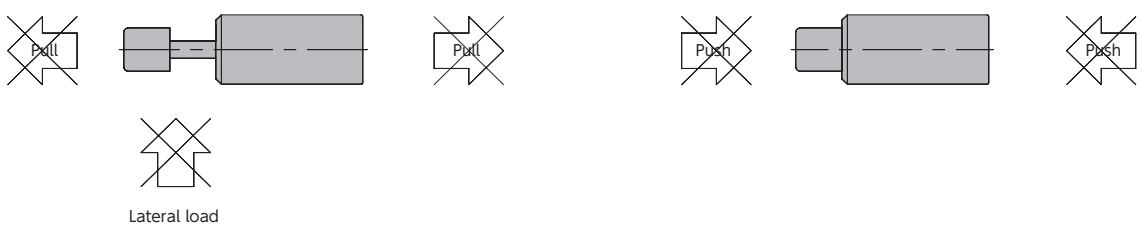
Graph of Operating Time by Load





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 ±2.5°
* 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

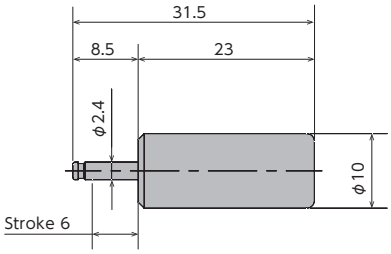
Model Description

FPD − 10 06 A8 − S W

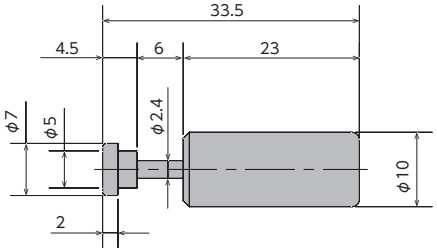
① ② ③ ④⑤ ⑥ ⑦

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 specications
8、12、15 : Low-load specications
⑥ Symbols indicating form
S : S type (Standard)
C : C type (Cap)
*Please refer to the external dimensions.
⑦ Symbols indicating color W : White

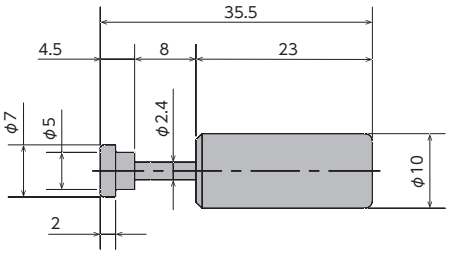
External Dimensions



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.

Specications

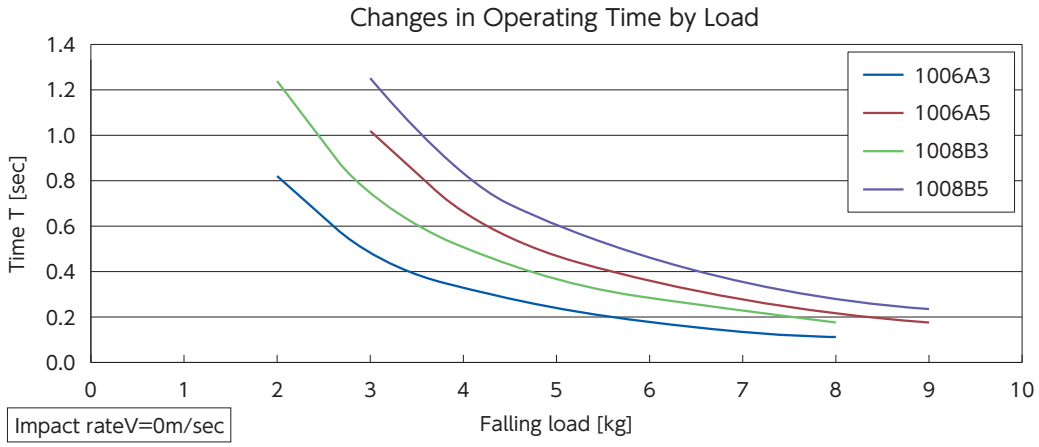
MODEL	Max absorption energy J(kgf•m)	Impact speed range m/s	Push Speed rang mm/s	Max load thrust N(kgf)	Cylinder cap color
FPD-1006A3	0.3	Under 0.5	-	-	Black
FPD-1006A5	0.4	Under 0.5	-	-	White
FPD-1006A8	-	-	Under 40	120(12)	Blue
FPD-1006A12	-	-	Under 30	160(16)	Brown
FPD-1006A15	-	-	Under 20	200(20)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

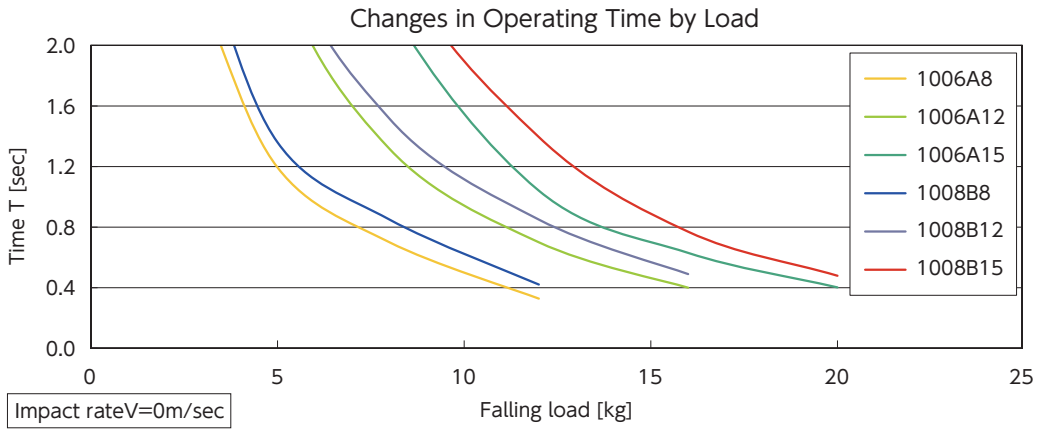
* For the motion-time of each load, please see the next page.

Common Specications

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)		FPD-1008 C type 3.0g
	FPD-1008 Under 1(0.1)	Main unit material	Resin
		Range of operating temperature, degrees ℃	5～40

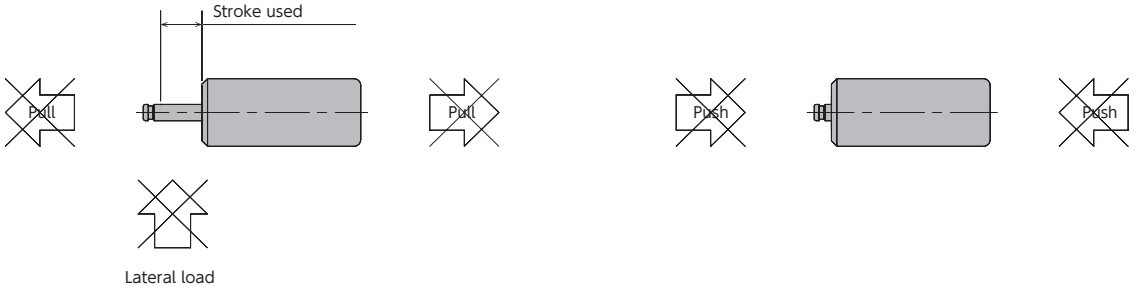
Graph of Operating Time by Load





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 ±2.5°
* 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

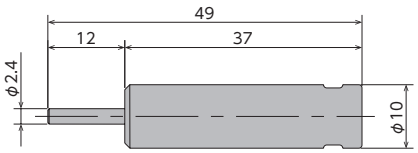
Model Description

FPD − 10 12 A1 − S W

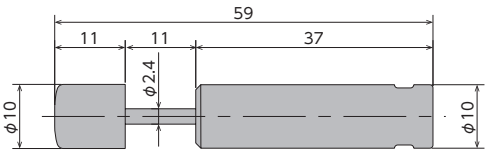
① ② ③ ④ ⑤ ⑥

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

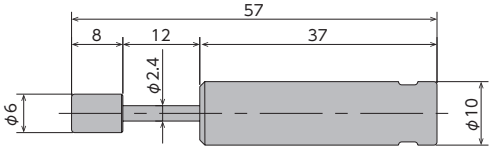
External Dimensions



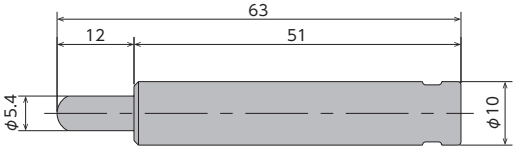
FPD-1012A□-S□(S type)



FPD-1012A□-R□(R type)



FPD-1012A□-C□(C type)



FPD-1012A□-D□(D type)

Specications

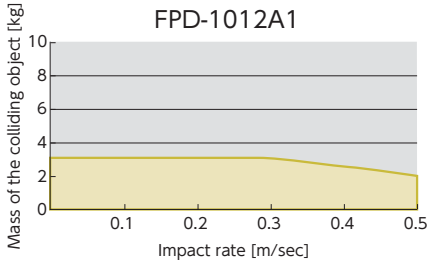
MODEL	load[kg]	Max absorption energy J(kgf•m)	Speed rang m/s	Cylinder cap color
FPD-1012A1	1	0.5(0.05)	0.5 or lower	Black
FPD-1012A3	3	0.8(0.08)	0.5 or lower	White
FPD-1012A5	5	1.0(0.10)	0.5 or lower	Blue

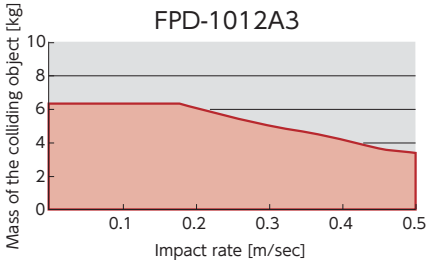
* For the motion-time of each load, please see the next page.

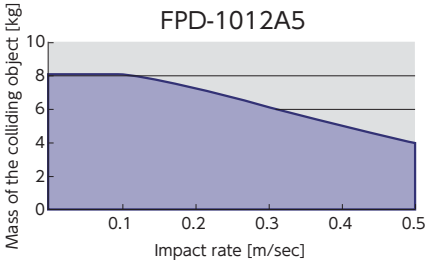
Common Specications

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

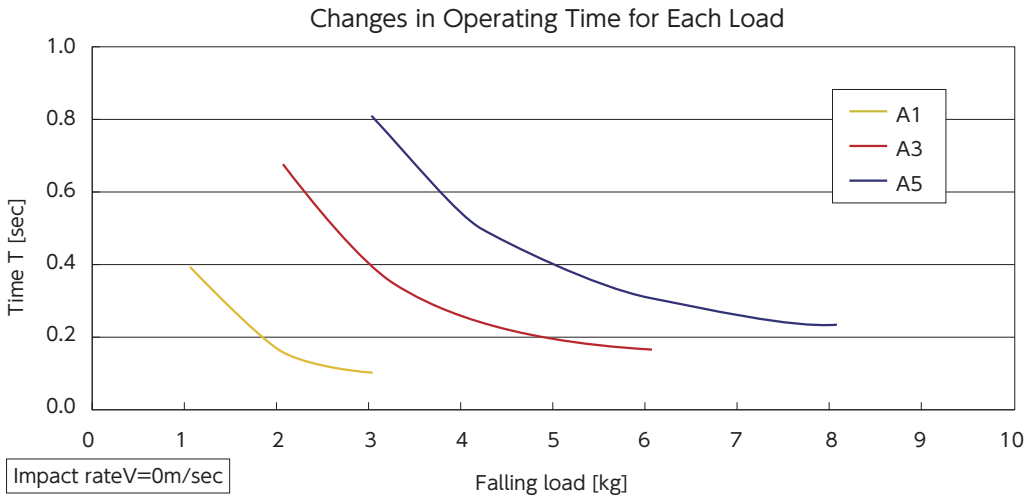
Impact rate and mass of the colliding object in freefall





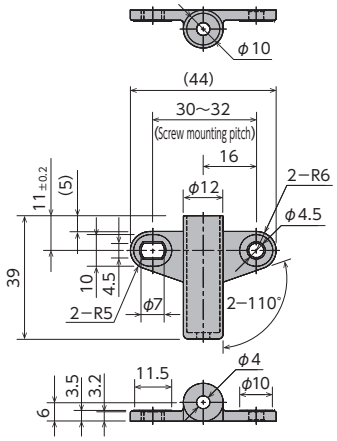


Characteristics Graph



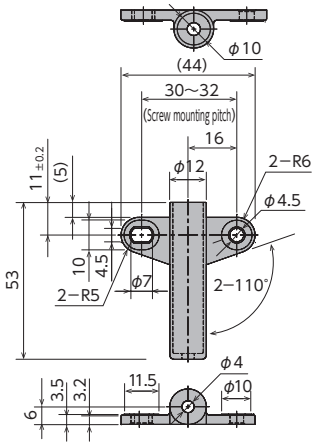
Optional Parts

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



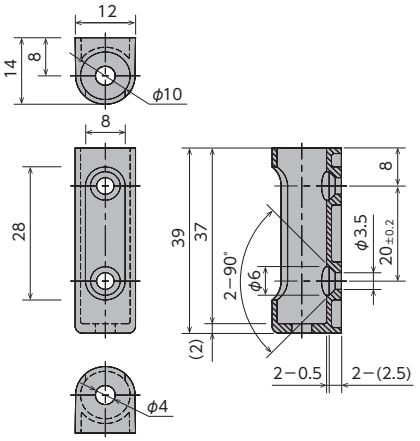
Screw: M4 (Truss screw)
Recommended tightening torque : 0.5N·m

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

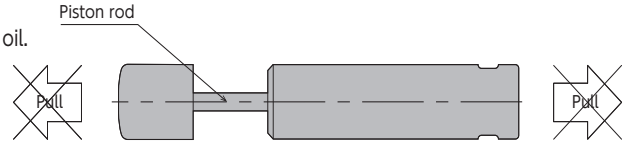


Screw: M3 (Flat head screw)
Recommended tightening torque : 0.3N·m

*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: ±2.5° or less
  ·D type ····· Allowable eccentric angle: ±6° 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

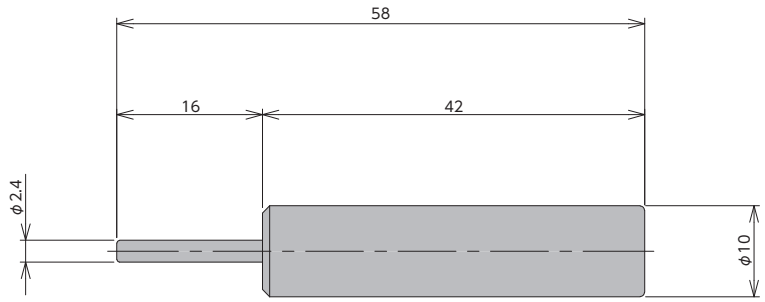
FPD-1016 Series

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

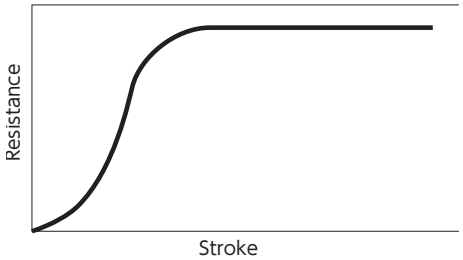
* For the motion-time of each load, please see the next page.

Common Specifications

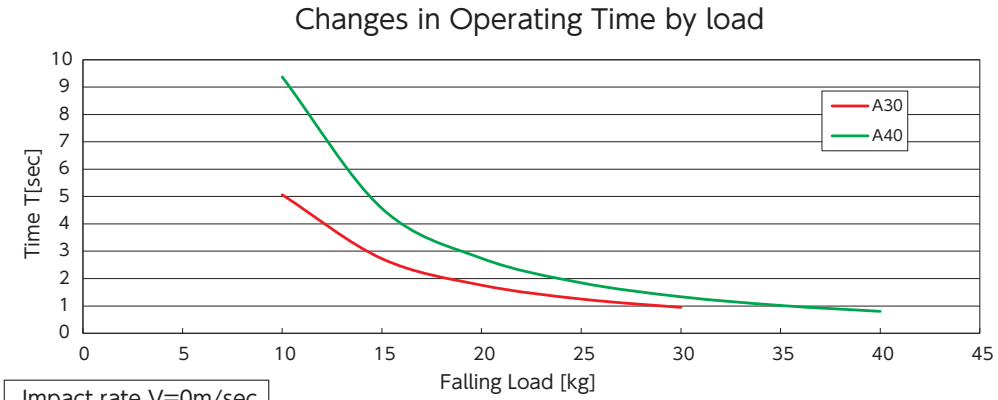
Stroke mm	16	Mass g	5.2
		Main unit material	Resin
Recovering power of piston rod N(kgf)	10 (1.0) or lower	Range of operating temperature ℃	5~40

Waveform of Resistance

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

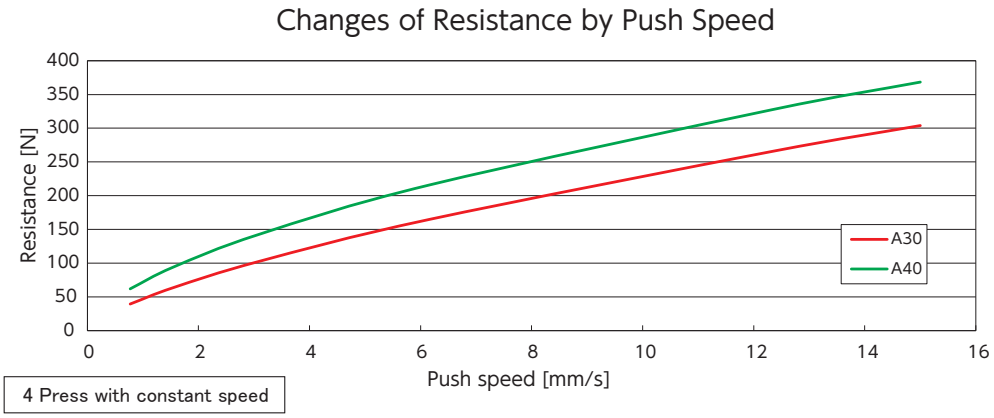


Graph of Operating Time by Load



Impact rate V=0m/sec

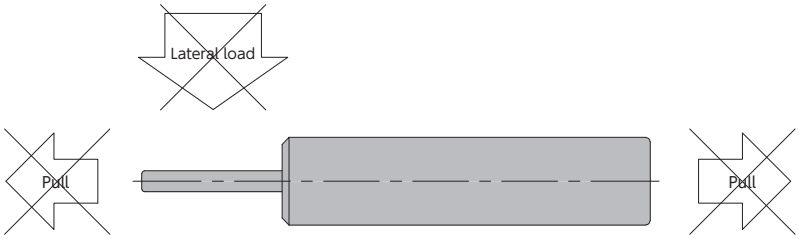
Graph of Resistance by Push Speed



4 Press with constant 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 ± 2.5°
* 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

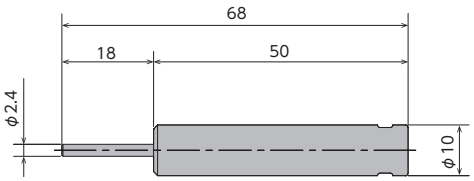
Model Description

F P D – 1 0 1 8 A 1 5 – S W

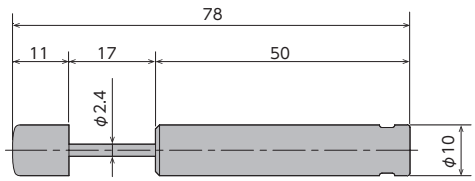
① ② ③ ④ ⑤ ⑥

① Series name
② External diameter
③ Stroke
④ Symbols indicat : ing 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

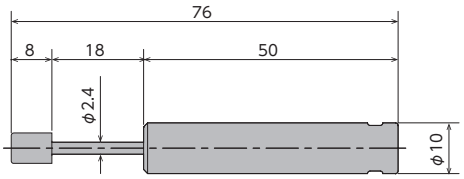
External Dimensions



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	Glay

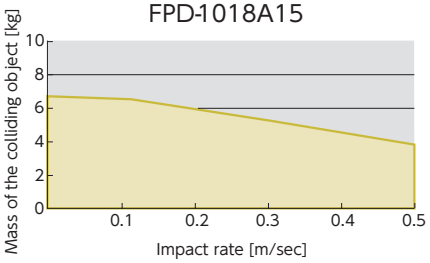
* For the motion-time of each load, please see the next page.

Common Specifications

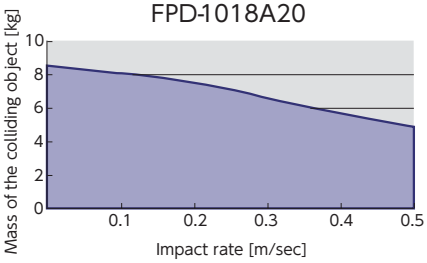
Stroke (S/C type)	mm	18	Mass	g	S type = 6.1、C type = 6.6、R type = 7.3
Stroke (R type)	mm	17	Main unit material		Resin
Recovering power of piston rod	N(kgf)	6(0.6) or lower	Range of operating temperature, degrees	℃	5～40

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

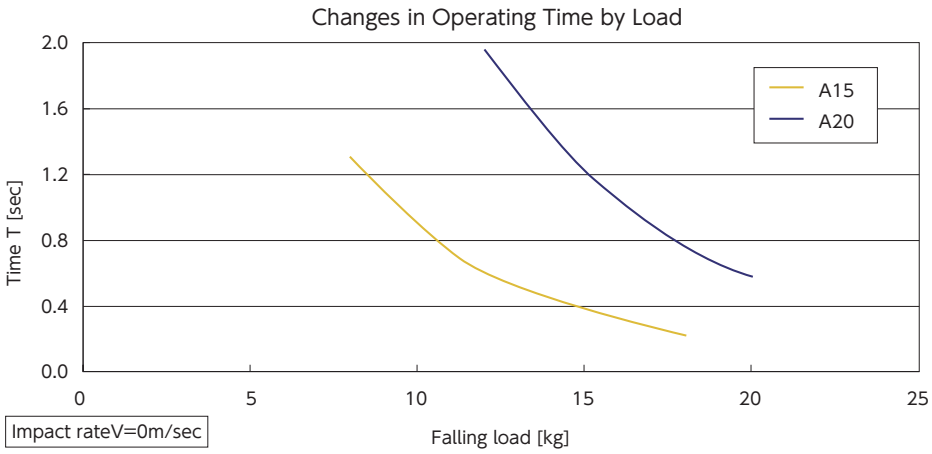
FPD-1018A15



FPD-1018A20



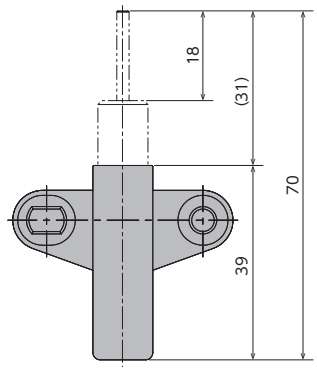
Graph of Operating Time by Load



Optional Parts

OP-200-01B/W

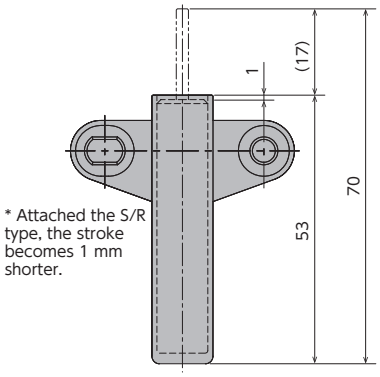
MODEL
OP-200-01B
OP-200-01W



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

OP-200-02B/W

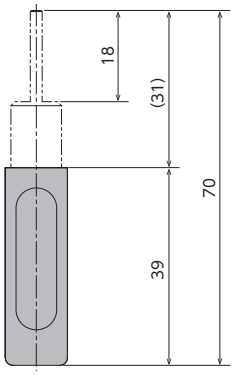
MODEL
OP-200-02B
OP-200-02W



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

OP-200-03B/W

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

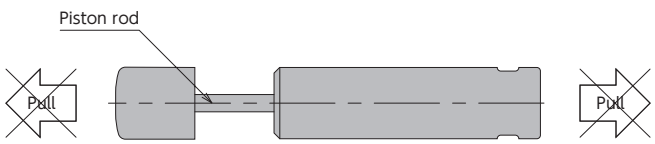


Screw used: M3 (countersunk screw)
Recommended tightening torque: 0.3 N·m

・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

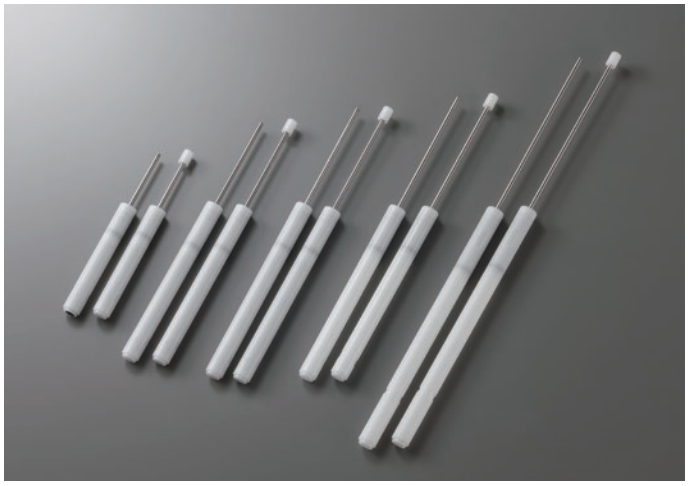
* Use with an external stopper.
* Ensure that sufficient mounting strength is secured for this product.
* 2 or more of this product can be used in parallel.
* Do not use this product in a vacuum or a location where it may come in contact with oil.
* Ensure that an eccentric load is not applied to the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

Soft Absorber

FPD-1030/1050/1060/1070/10100/10150 Series



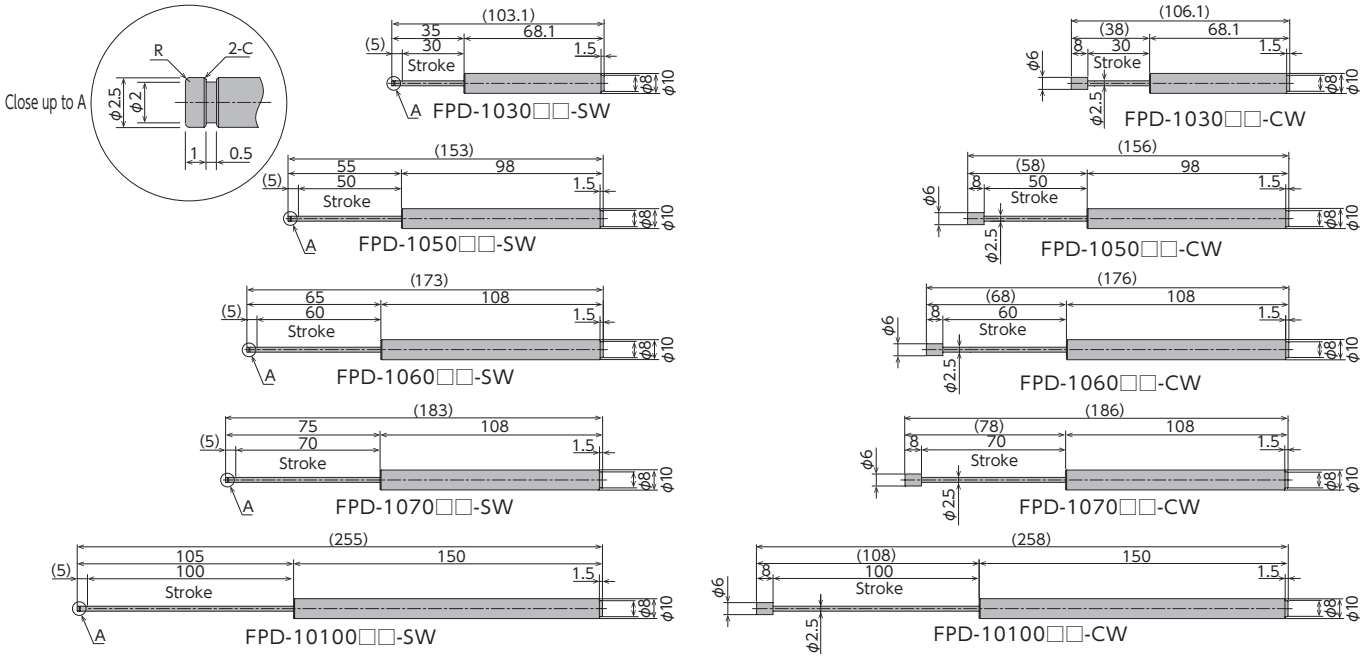
Model Description

F P D − 1 0 3 0 B 1 − S W

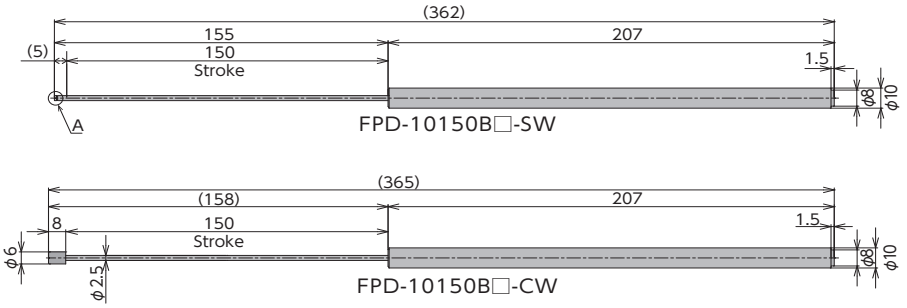
① ② ③ ④ ⑤ ⑥

① Series name
② External diameter
③ Stroke
④ Self-return presence A : With returning spring
B : Without returning spring
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 shape SW : Without cap
CW : With cap

External Dimensions



*The FPD-1070B series can be sold only without the spring.
*The FPD-1060A series can be sold only with the spring.
*E-type retaining ring (nominal 2) can be attached to top of S type (A in above drawing).



Specifications

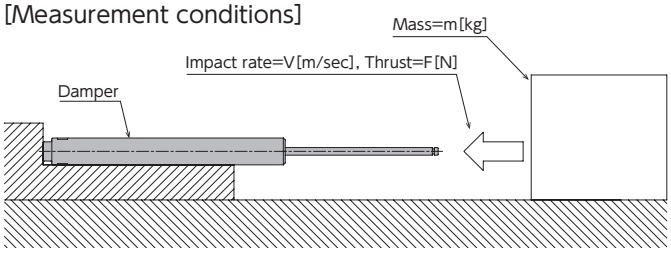
Stroke[mm]	FPD-1030=30,FPD-1050=50, FPD-1060=60, FPD-1070=70, FPD-10100=100, FPD-10150=150
External diameter[mm]	ϕ10
Mass[g]	FPD-1030-SW=8, FPD-1030-CW=8.5, FPD-1050-SW=12, FPD-1050-CW=12.5, FPD-1060-SW=13.5, FPD-1060-CW=14, FPD-1070-SW=13.5, FPD-1070-CW=14, FPD-10100-SW=18.5, FPD-10100-CW=19, FPD-10150-SW=26.1,FPD-10150-CW=26.4
Main unit material	Resin
Operating temperature[℃]	5～40

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]

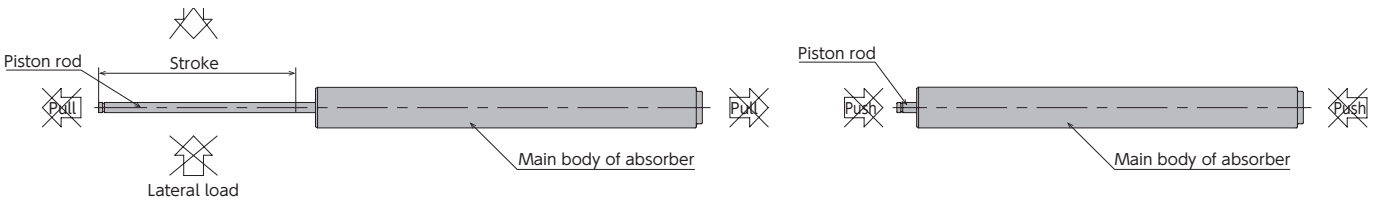


* Bottom color

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

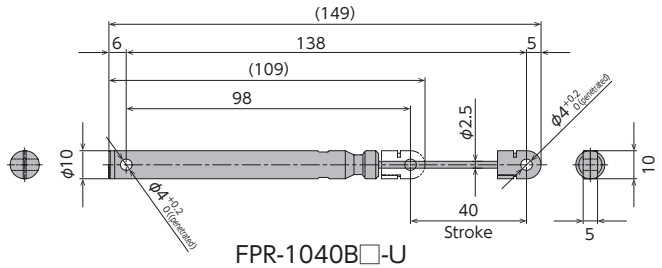
Model Description

F P R − 1 0 4 0 B 1 − U

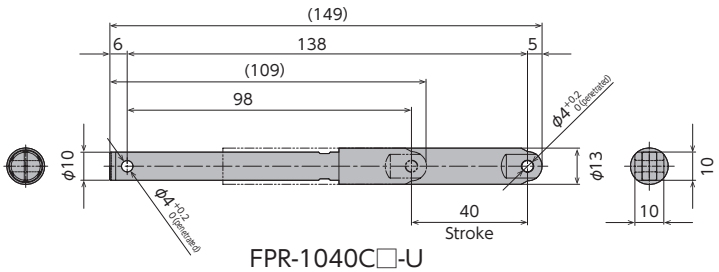
① ② ③ ④ ⑤ ⑥

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



FPR-1040B□-U



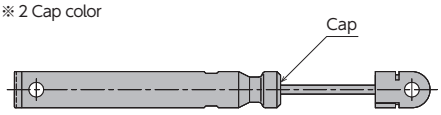
FPR-1040C□-U

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

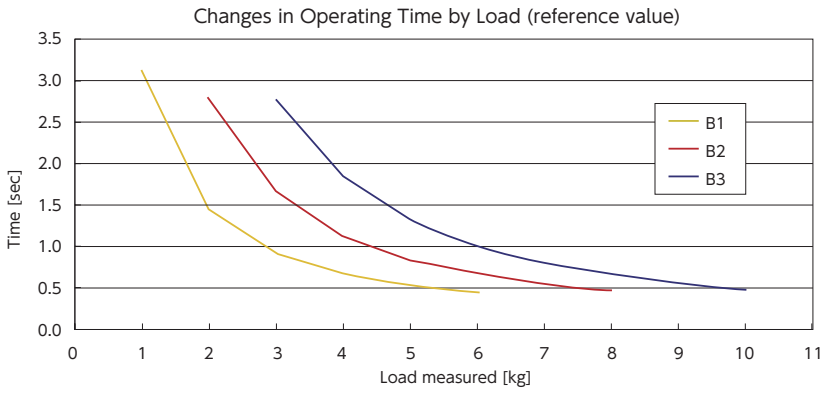
※ 2 Cap color



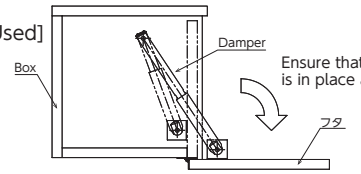
Common Specification

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[℃]	5~40

Graph of Operating Time by Load



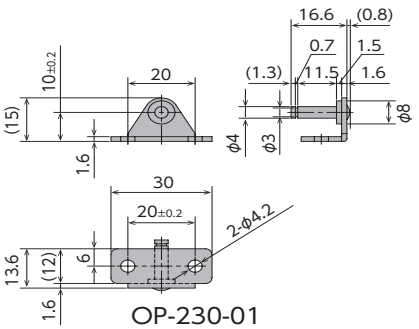
[Examples of S pecifications Used]

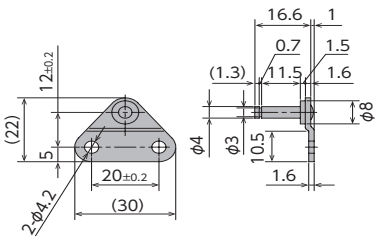


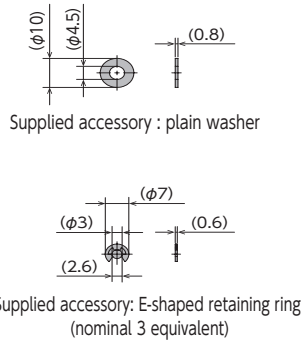
Optional Parts

Model
OP-230-01

Model
OP-230-02


OP-230-01

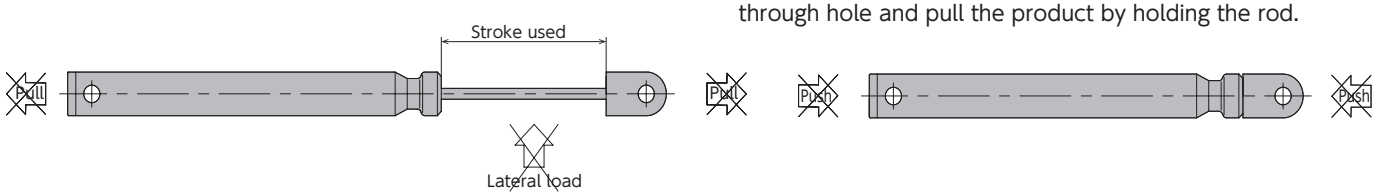

OP-230-02



・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 ϕ 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

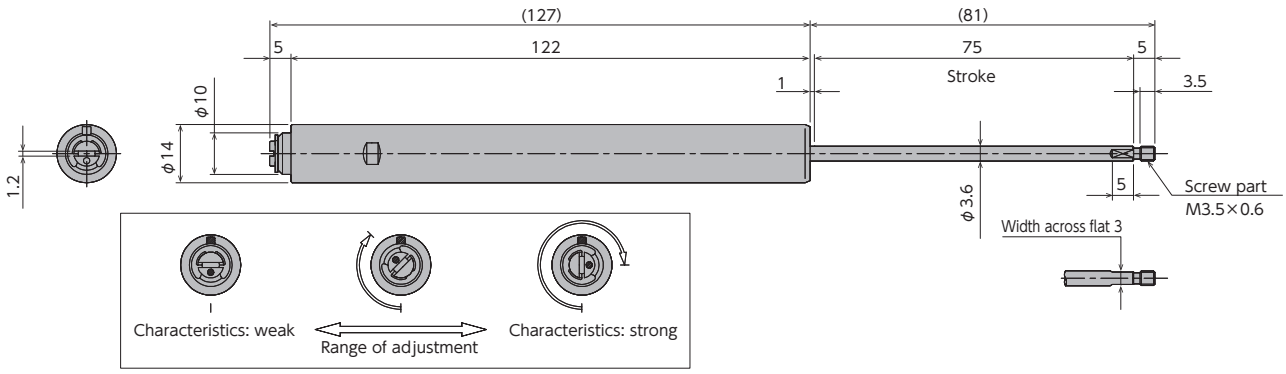
●Products specification might be changed without notice.

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

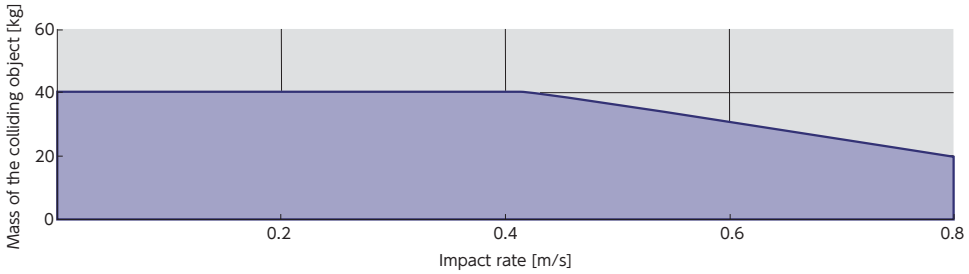
外形図



Specifications

Model	Stroke [mm]	Mass [g]	Main unit material	Range of impact rate [m/s]	range of operating temperature [℃]	Range of storage temperature [℃]
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.

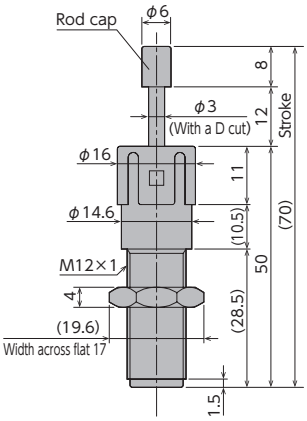
Soft Absorber

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)		5.0(0.5)	5	Yellow
FA-1212C4-C		0.1～0.7	7.5(7.5)				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	℃	−10～50
Mass	g	15
Main unit material		Resin

Precautions for Use

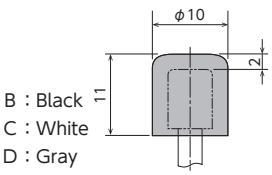
* Do not use this product without carefully reading the attached owner's manual.
* Use with an external stopper.
* Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
* Do not turn the oil inlet screw 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 ±2.5°)
* 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 ø14.6 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.

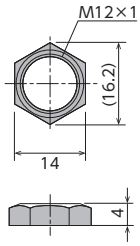


Material : Elastomer

Small hexagon nut M12B

Model
M12B

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

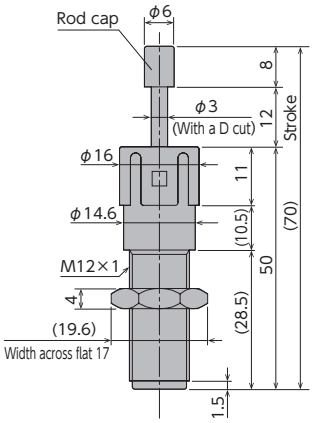


Standard nuts are sold separately as well.

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 en ergy	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 ope rating temperature	℃	−10～50
Ma ss	g	15
Main unit material		Resin

Precautions for Use

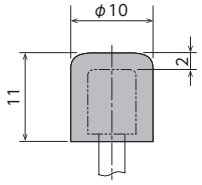
* Do not use this product without carefully reading the attached owner's manual.
* Use with an external stopper.
* Ensure that sufficient mounting strength is secured for this product.
  (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalog.)
* Do not turn the oil inlet screw 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 ±2.5˚)
* 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 ϕ14.6 part, use the tightening torque of 1 N･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-1212L series.
- Stroke length is 11mm.



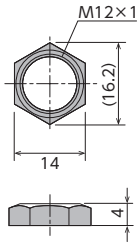
B : Black
C : White
D : Gray

Material: Elastomer

Small hexagon nut M12B

Model
M12B

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



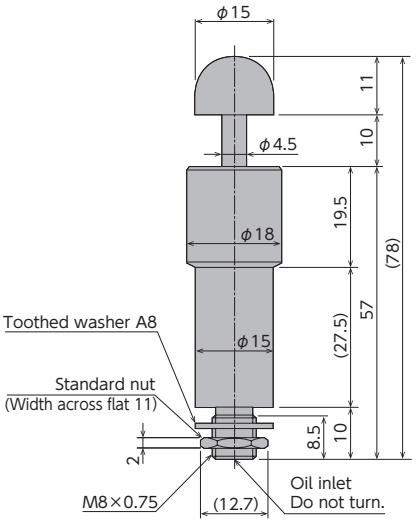
The standard nut is also sold separately.

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

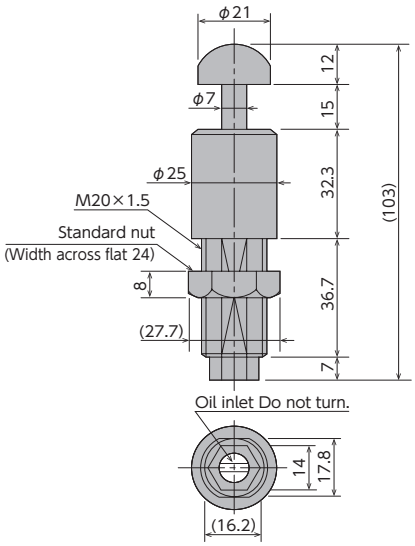
Soft Absorber

FA-1010D/FA-1215B Series

FA-1010D□-C
(Groove orifice)



FA-1215B□-C
(Groove orifice)



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-1010D2-C	10	0.98(0.1)	10(10)	980(100)	44.1(4.5)	5.88(0.6)or lower	41.5
FA-1010D3-C		2.05(0.21)	15(15)		78.4(8.0)		
FA-1010D4-C		3.23(0.33)	20(20)				
FA-1215B1-C	15	7.84(0.8)	30(30)	1470(150)	245(25)	11.8(1.2)or lower	116
FA-1215B2-C		11.7(1.2)	40(40)	1960(200)			

Common Specifications

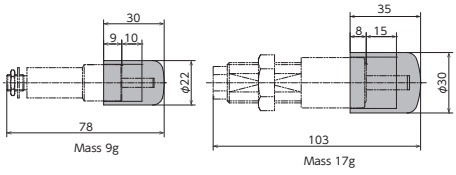
Operating speed range	m/s	0.1～1.0(0.1 to 0.5 for the FA-1215 series)
Max. cycle rate	cycle/min	45((30 for the FA-1215 series)
Operating temperature	℃	−10～50

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.

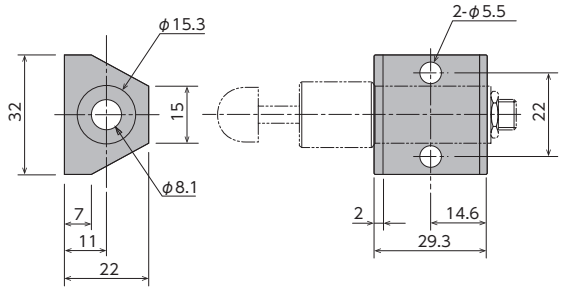
***Standard nuts are sold separately as well.**

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

Bracket OP-1012A

Model
OP-1012A

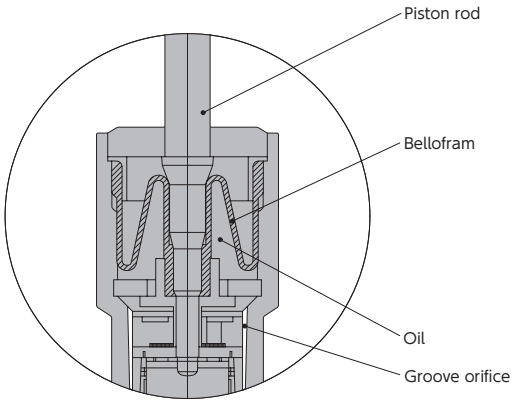
● This is a mounting fixture for FA-1010D.



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

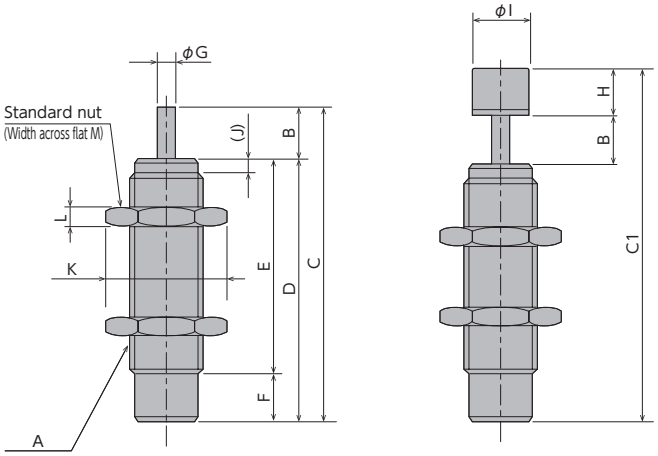
The cross-sectional area of the orifice in the groove-orifice type changes continuously as the piston strokes, thereby enabling smooth energy absorption.

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 ±2.5°)

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 ▲		0.68(0.07)	5(5)	588(60)	22.5(2.3)		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		0.98(0.1)	8(8)				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		1.47(0.15)	10(10)				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	℃	−5～70

Note) M8 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

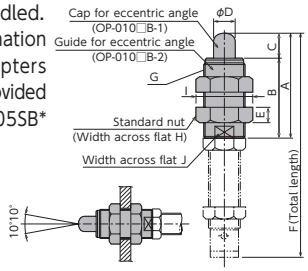
* Do not use this product without carefully reading the attached owner's manual.
* Ensure that an external stopper (Stopper nut OP-020**) is also used.
* Do not turn the oil inlet screw located at the bottom of the main unit.
* Ensure that sufficient mounting strength is secured for this product. (As 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 ±2.5°)

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 adapters are not provided for FA-0805SB* -SP1.0.



Note) Material of cap for eccentric angle: POM

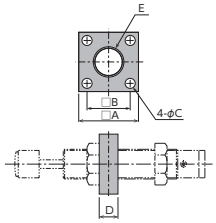
Model	A	B	C	ϕD	E	F
OP-010SB	28	23	5	6	4	44.5
OP-010PMB	28	23	5	8	6	44.5
OP-010PB	38	30	8	8	6	62.8
OP-010KB	48	38	10	10	5	81.8

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, uset he main unit's nut to securely fasten in place.

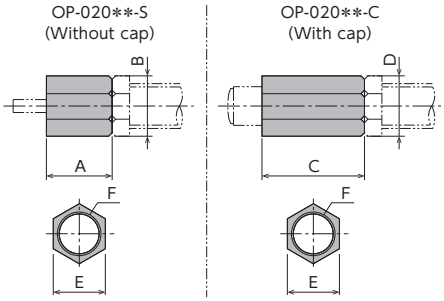


Model	A	B	C	D	E	Mass g
OP-040SB	25	18	3.2	4	M8×0.75	17
OP-040PB					M10×1	16
OP-040KB					M12×1	15

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.



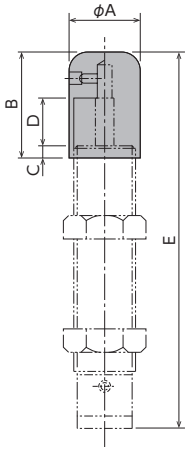
Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

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.

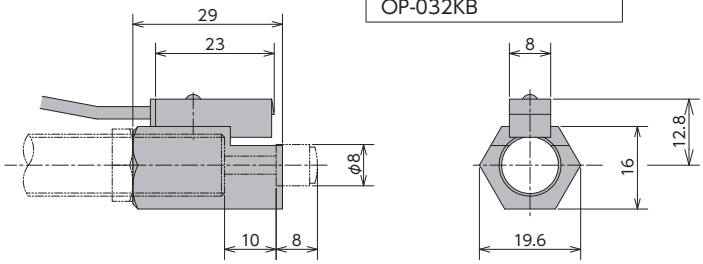


Model	ϕA	B	C	D	E	Mass g
FA-1005PMB□-C-060	13	15	3	5	39	9
FA-1008PB□-C-060	13	18	3	8	53	10
FA-1210KB□-C-060	17	28	9.5	10	68.5	25

●Model indication 1 or 2 is inserted in □.

Holder with switch OP-030KB-2

Model
OP-032KB



Mass 38g

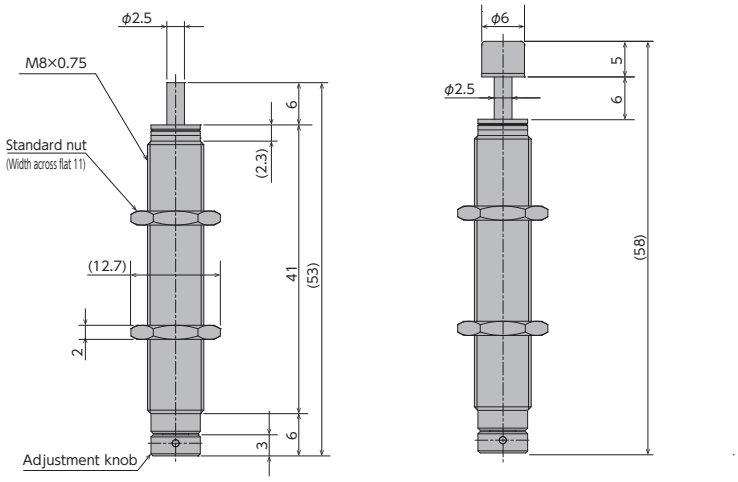
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

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					

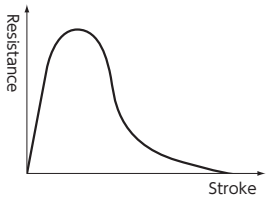
Note: There are no optional parts for M8 x 1.0.

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	℃	−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)			

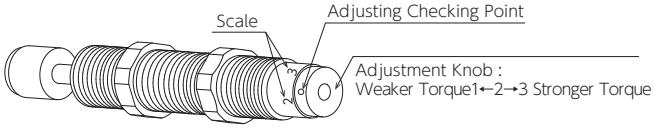
Absorption characteristics

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 ± 2.5°)

Adjustment Method



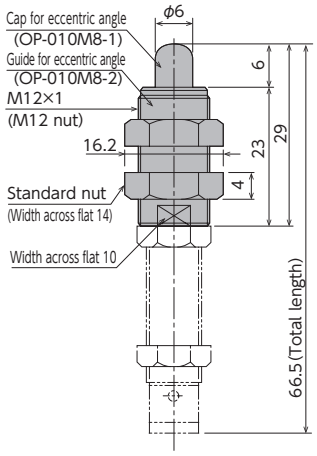
* To adjust, turn the adjustment knob.
* Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
* It does not have a lock screw for locking the adjusted setting.

Optional Parts

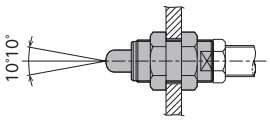
Eccentric angle adaptor OP-010M8

Model
OP-010MB

- 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.



Mass 13g

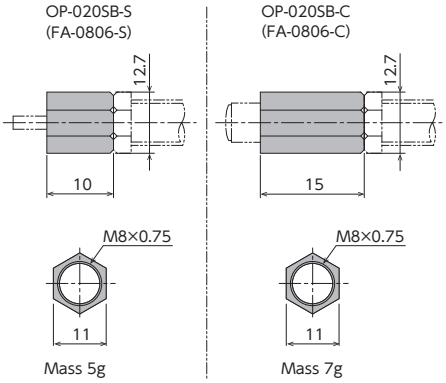


Note) Material of cap for eccentric angle: POM

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.



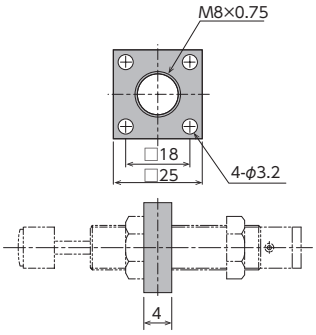
Mass 5g　　Mass 7g

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.



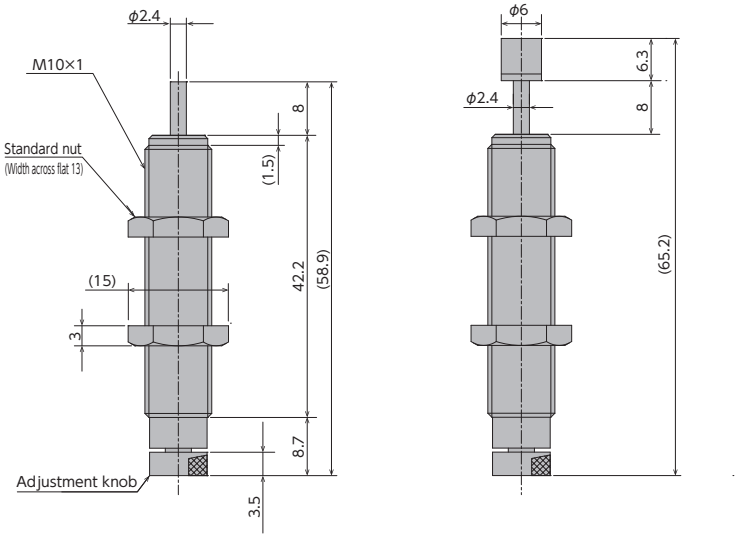
Mass 17g

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					

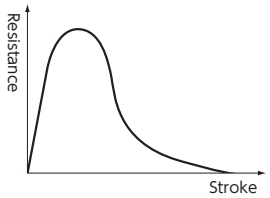
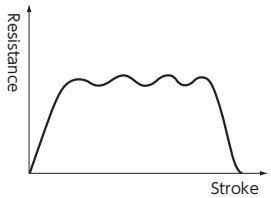
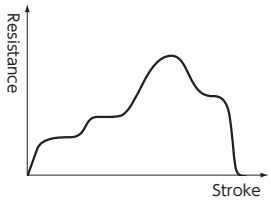
Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N(kgf)	637(65)	Operating temperature	℃	−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

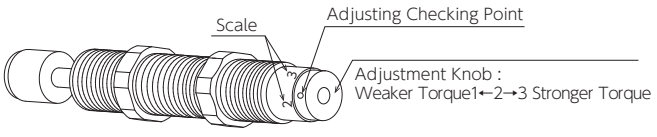
The FA-1008 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

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 ±2.5°)

Adjustment Method



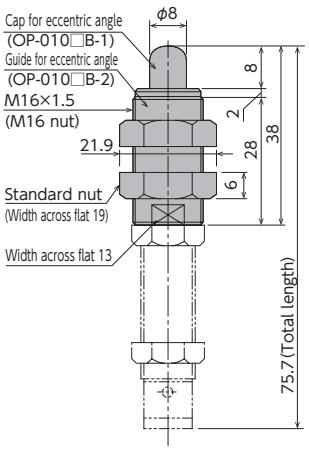
* To adjust, turn the adjustment knob.
* Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
* It does not have a lock screw for locking the adjusted setting.

Optional Parts

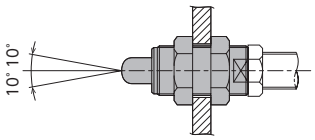
Eccentric angle adaptor OP-010PB

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.



Mass 35g

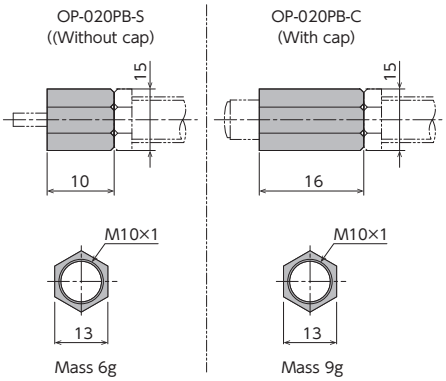


Note) Material of cap for eccentric angle: POM

Stopper nut OP-020PB-□

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

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



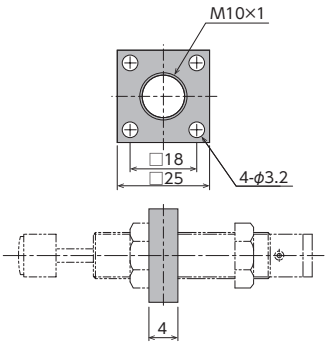
Mass 6g　　Mass 9g

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.



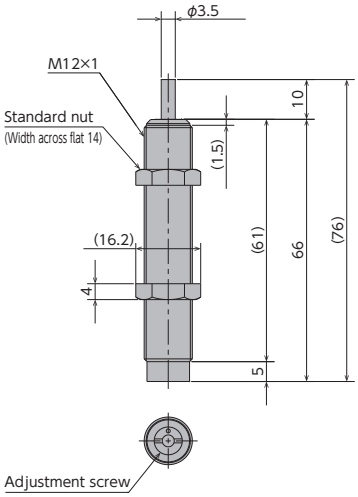
Mass 16g

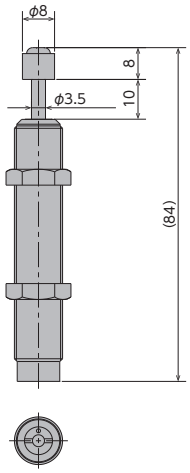
Standard nuts are sold separately as well.

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					

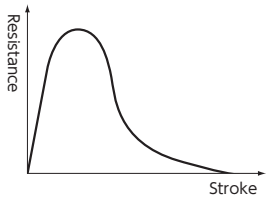
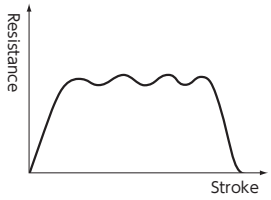
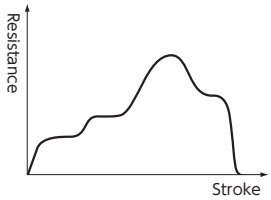
Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N(kgf)	1,470(150)	Operating temperature	℃	−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

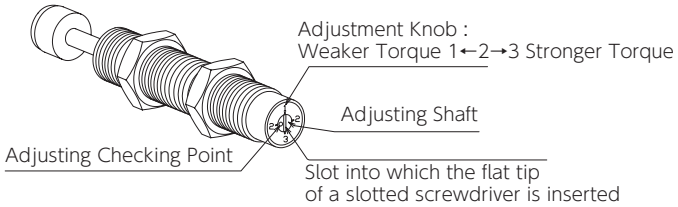
The FA-1210 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

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 ±2.5°)

Adjustment Method



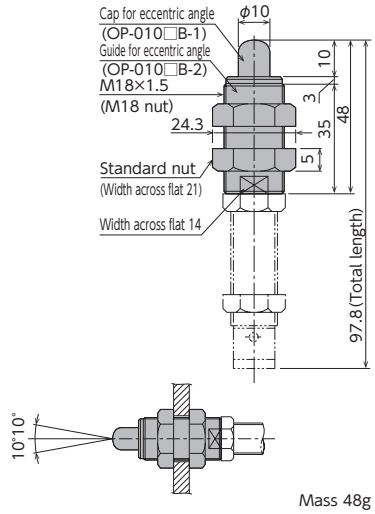
* To adjust, turn the adjustment knob with a slotted screw driver.
* Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
* It does not have a lock screw for locking the adjusted setting.

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.



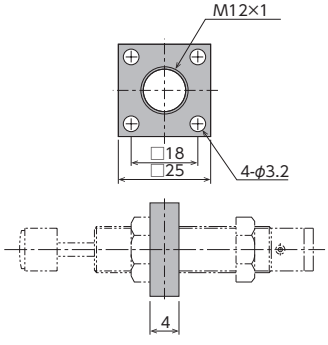
Mass 48g

Note) Material of cap for eccentric angle: POM

Square flange OP-040KB

Model
OP-040KB

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

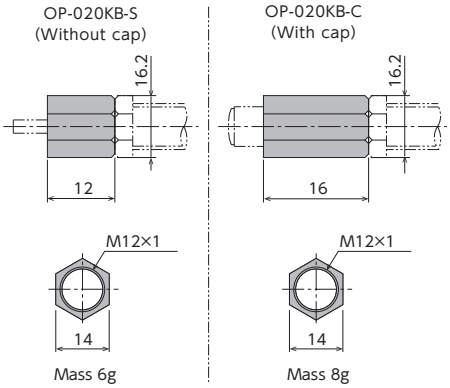


Mass 15g

Stopper nut OP-020KB- □

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

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

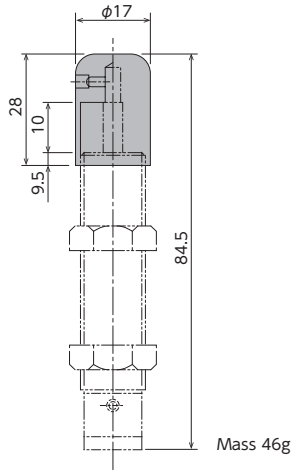


Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Liquid-proof cap F□□-1210M□□-C-060

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

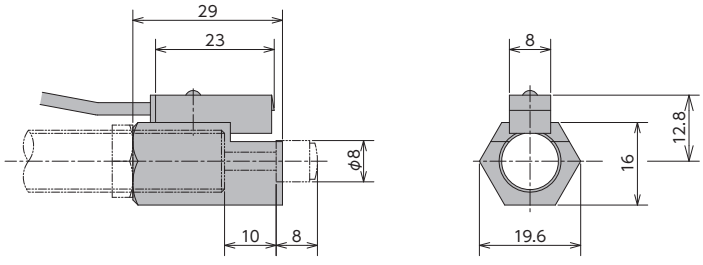
- Ideal for use in environments where oil splatter poses a problem.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-1210M□□-C-060
  - Model indication A or WM is inserted in □ of F□□.
  - Model indication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



Mass 46g

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

Model
OP-032KB



Mass 38g

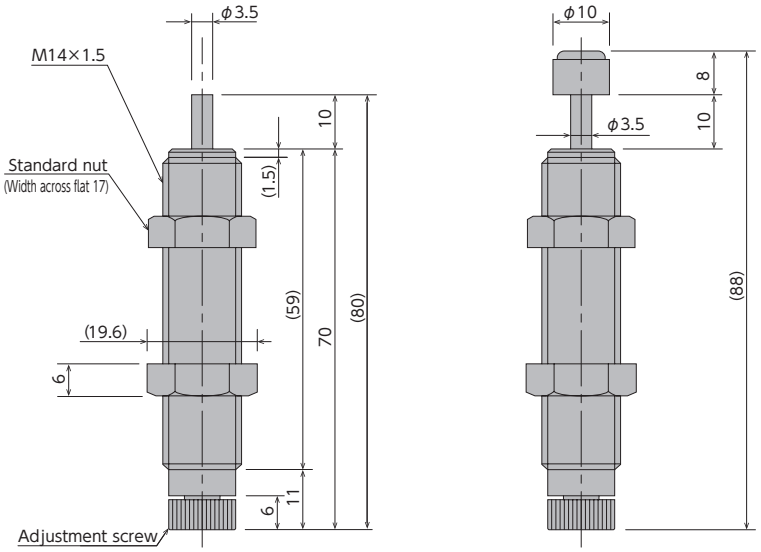
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

Standard nuts are sold separately as well.

Applicable Models	Model
FA-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					

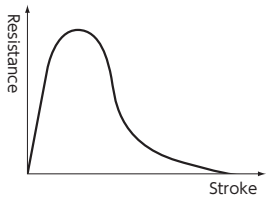
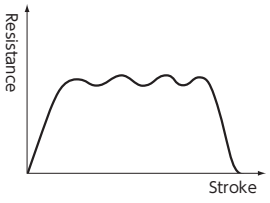
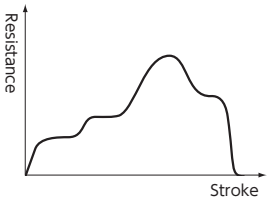
Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N(kgf)	1,813(185)	Operating temperature	℃	−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

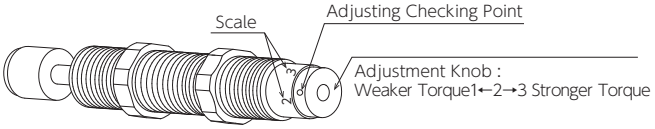
The FA-1410 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

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 ±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.

RoHS Compliant

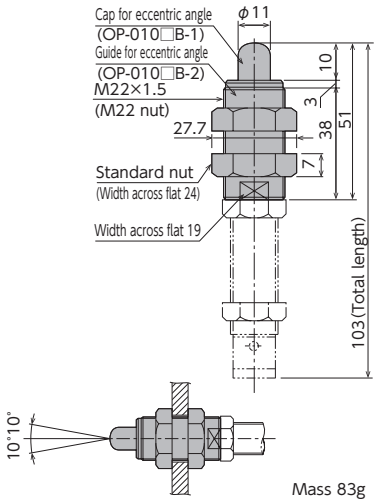
●Products specification might be changed without notice.

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.



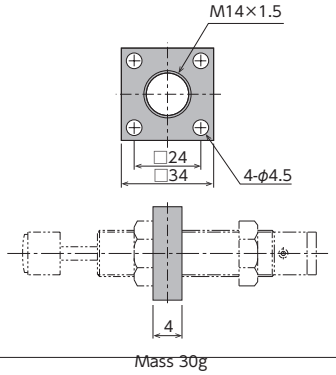
Mass 83g

Note) Material of cap for eccentric angle: POM

Square flange OP-040RB

Model
OP-040RB

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

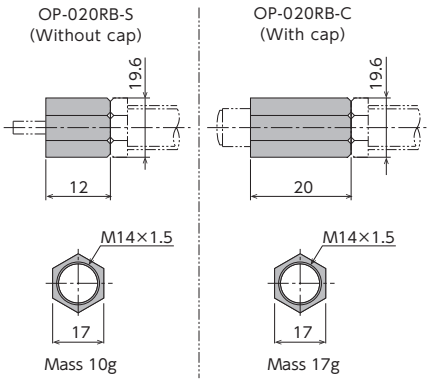


Mass 30g

Stopper nut OP-020RB- □

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

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



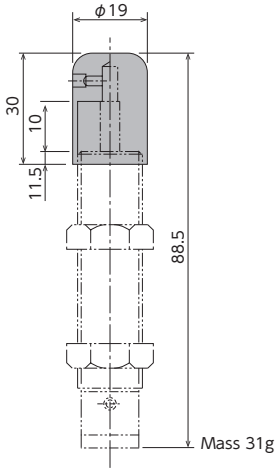
Mass 10g　Mass 17g

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

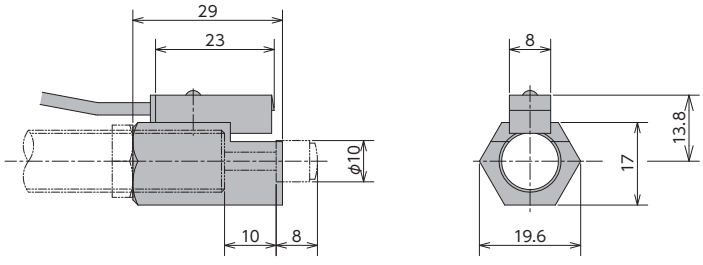
- Ideal for use in environments where oil splatter poses a problem.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-1410M□□-C-060
  - Model indication A or WM is inserted in □ of F□□.
  - Model indication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



Mass 31g

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

Model
OP-032RB



Mass 34g

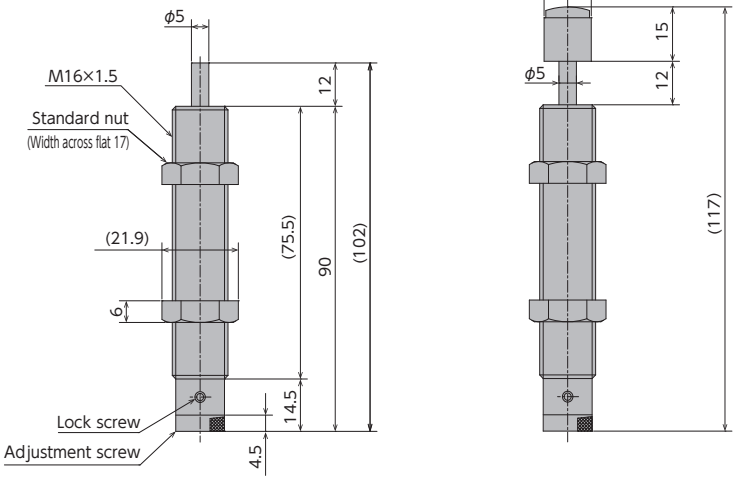
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

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					

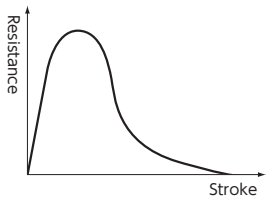
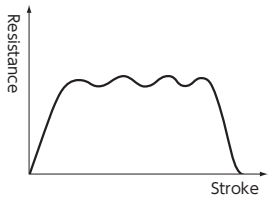
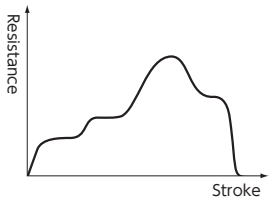
Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N(kgf)	2,646(270)	Operating temperature	℃	−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

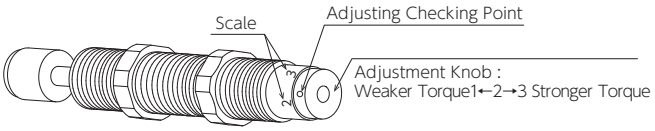
The FA-1612 series series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

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 ±2.5°)

Adjustment Method



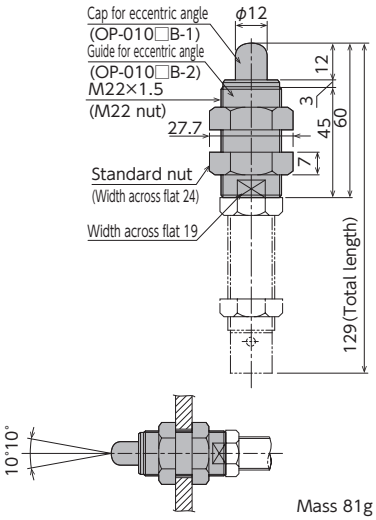
* To adjust, turn the adjustment knob located at the bottom of the main unit.
* Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
* Once the adjustment is complete, secure with a lock screw using a hex wrench.

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.



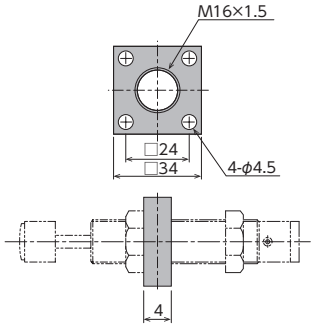
Mass 81g

Note) Material of cap for eccentric angle: POM

Square flange OP-040XB

Model
OP-040XB

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

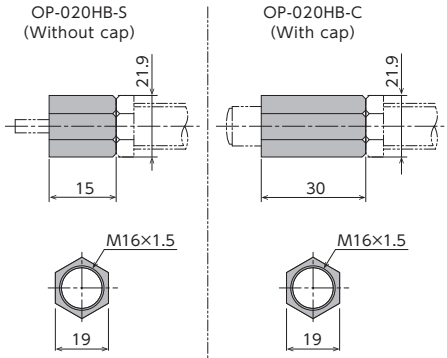


Mass 29g

Stopper nut OP-020HB

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

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



Mass 15g

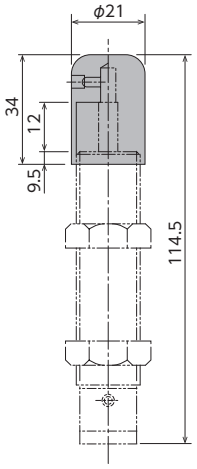
Mass 28g

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

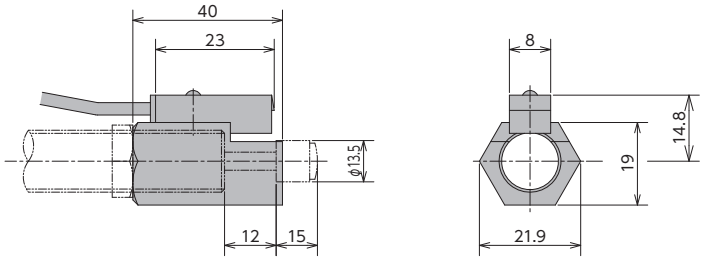
- A drip-proof cap is fitted on the unit on delivery.
- Liquid-proof caps are not sold separately.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-16120M□□-C-060
  - Model indication A or WM is inserted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



Mass 46g

Holder with a switch OP-030HB-□

Model
OP-032HB



Mass 46g

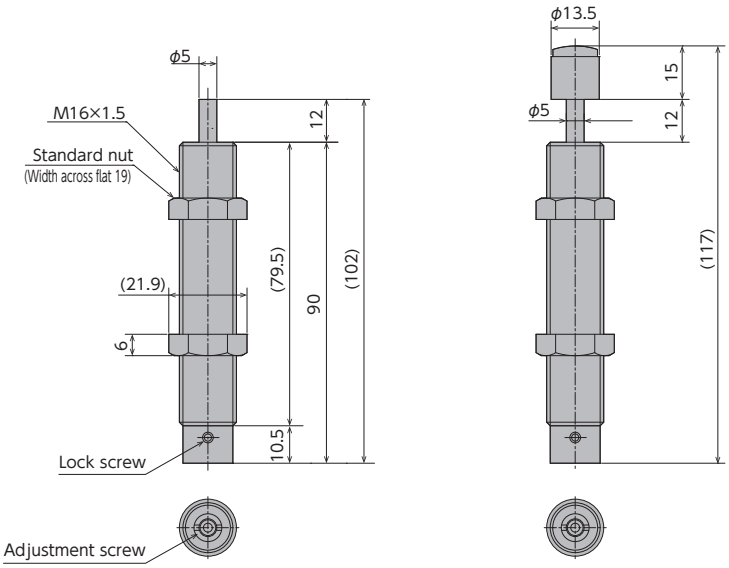
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

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			120(120)	0.3～2	Multiple-varying orifice type
FA-1612X2-C					
FA-1612X3-S			35(35)	0.7～3	Multiple-orifice type
FA-1612X3-C					

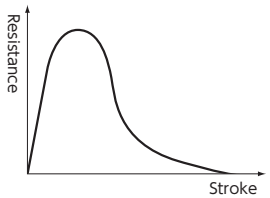
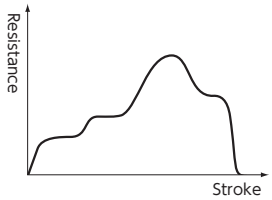
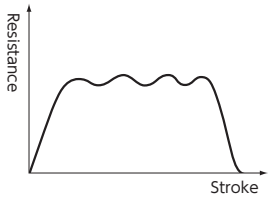
Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N(kgf)	3,528(360)	Operating temperature	℃	−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

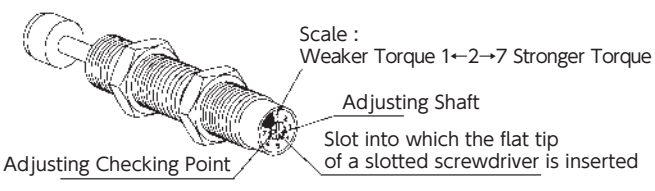
The FA-1612-FWM series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

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 ±2.5°)

Adjustment Method



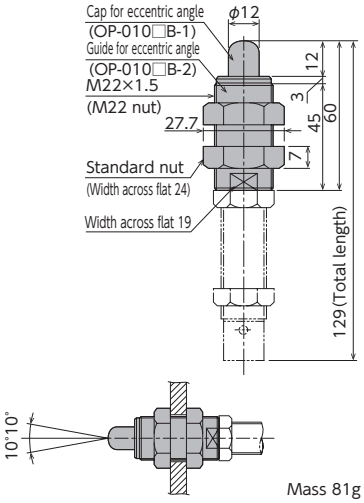
* To adjust, turn the adjustment knob with a slotted screw driver.
* Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
* It does not have a lock screw for locking the adjusted setting.

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.



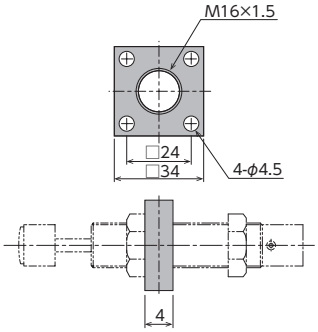
Mass 81g

Note) Material of cap for eccentric angle: POM

Square flange OP-040XB

Model
OP-040XB

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

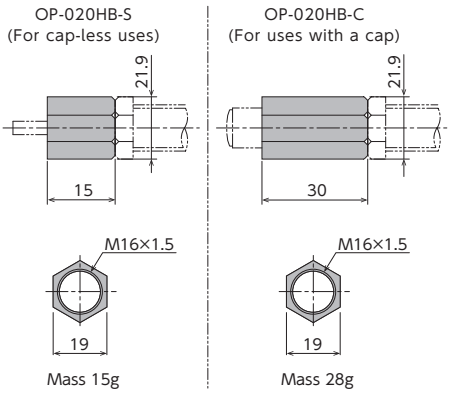


Mass 29g

Stopper nut OP-020HB

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

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



Mass 15g

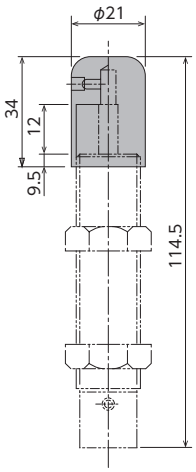
Mass 28g

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

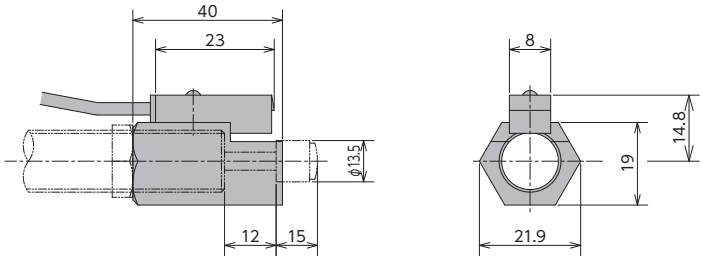
- A drip-proof cap is fitted on the unit on delivery.
- Liquid-proof caps are not sold separately.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-16120M□□-C-060
  - The model number 1, 2, or 3 is inserted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



Mass 46g

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

Model
OP-032HB



Mass 46g

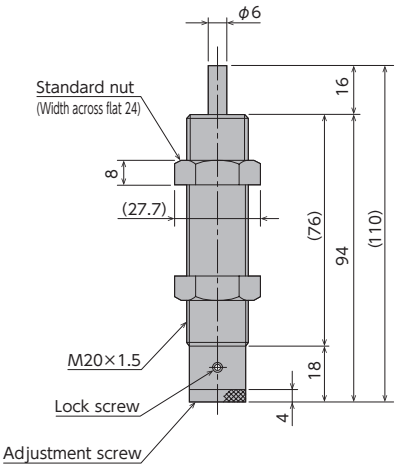
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

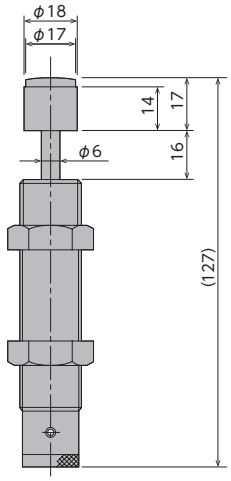
Standard nuts are sold separately as well.

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					

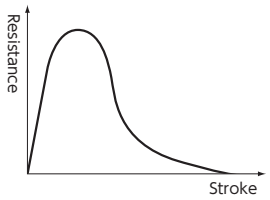
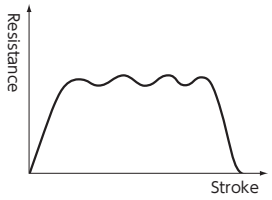
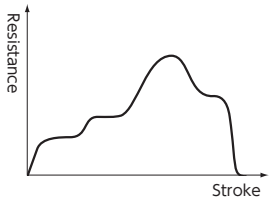
Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N(kgf)	3,528(360)	Operating temperature	℃	−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

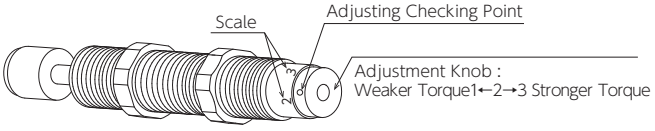
The FA-2016 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

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 ±2.5°)

Adjustment Method



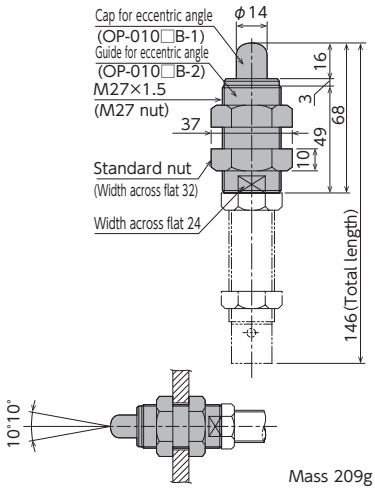
* To adjust, turn the adjustment knob located at the bottom of the main unit.
* Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
* Once the adjustment is complete, secure with a lock screw using a hex wrench.

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.



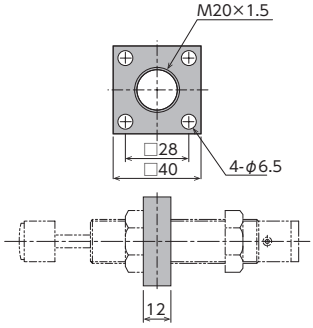
Mass 209g

Note) Material of cap for eccentric angle: Metal

Square flange OP-040EB

Model
OP-040EB

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

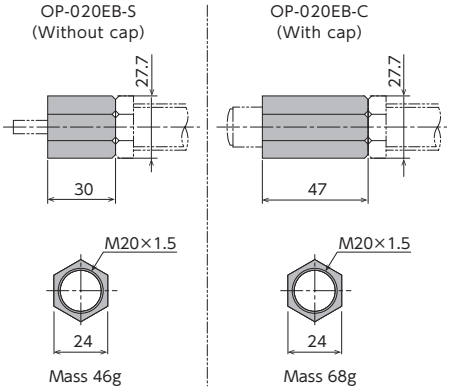


Mass 109g

Stopper nut OP-020EB-□

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

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



Mass 46g

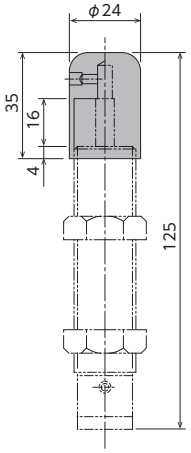
Mass 68g

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

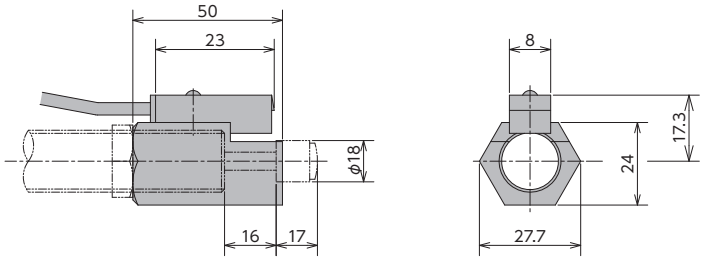
- A drip-proof cap is fitted on the unit on delivery.
- Liquid-proof caps are not sold separately.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-16120M□□-C-060
  - Model indication A or WM is inserted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



Mass 59g

Holder with a switch OP-030EB-□

Model
OP-032EB



Mass 80g

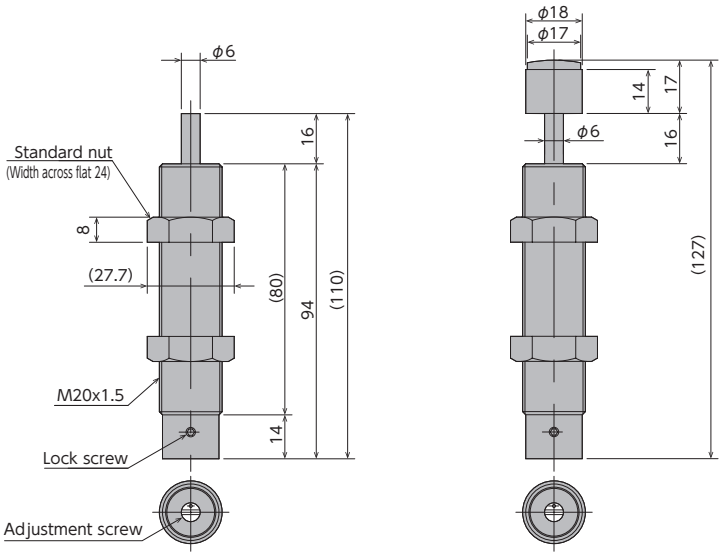
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

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			200(200)	0.3～2	Multiple-varying orifice type
FA-2016E2-C					
FA-2016E3-S			120(120)	0.7～3	Multiple-orifice type
FA-2016E3-C					

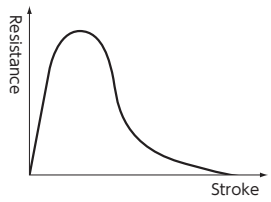
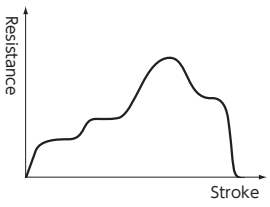
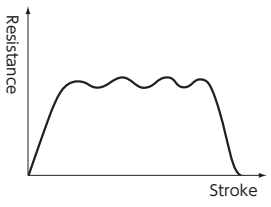
Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.

Common Specifications

Max. drag	N(kgf)	6,370(650)	Operating temperature	℃	−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

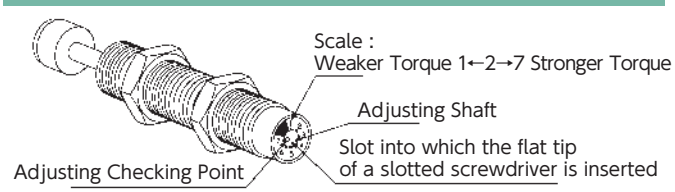
The FA-2016 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

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 ±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.

RoHS Compliant

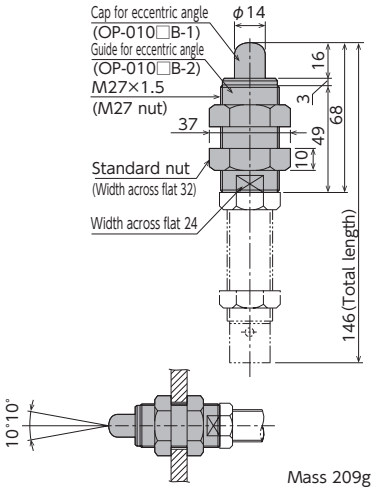
●Products specification might be changed without notice.

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.



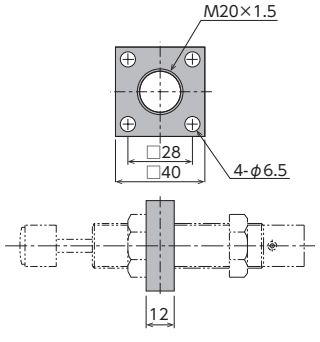
Mass 209g

Note) Material of cap for eccentric angle: Metal

Square flange OP-040EB

Model
OP-040EB

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

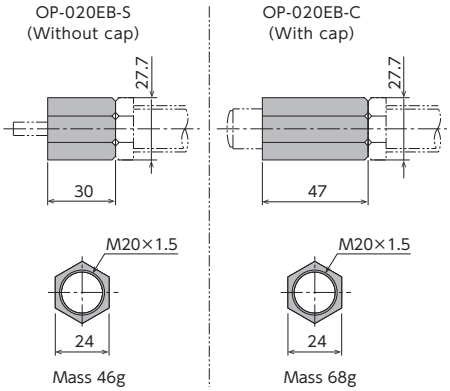


Mass 109g

Stopper nut OP-020EB-□

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

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



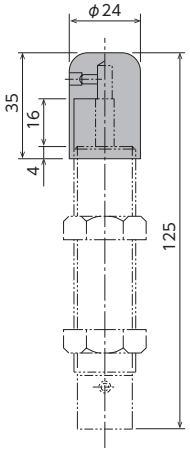
Mass 46g　Mass 68g

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

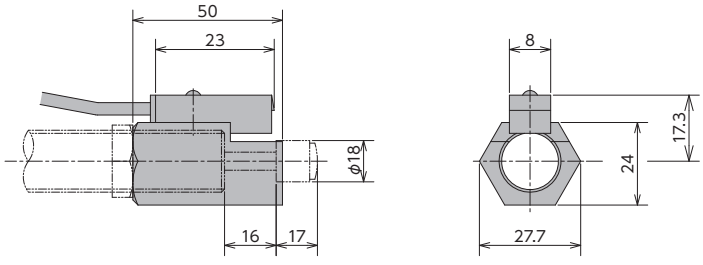
- A drip-proof cap is fitted on the unit on delivery.
- Liquid-proof caps are not sold separately.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-16120M□□-C-060
  - The model number 1, 2, or 3 is inserted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



Mass 59g

Holder with a switch OP-030EB-□

Model
OP-032EB



Mass 80g

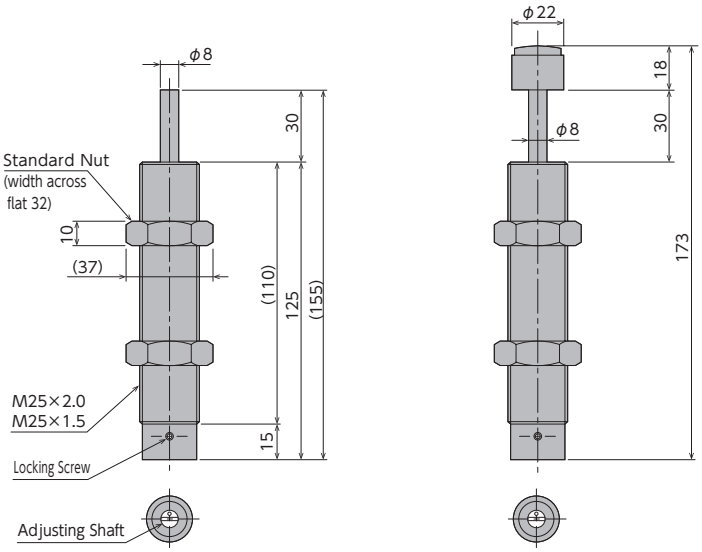
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

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 ▲					

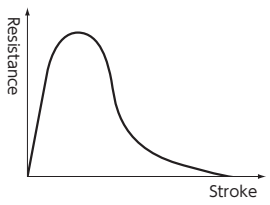
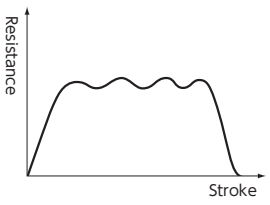
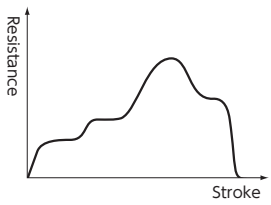
▲ Thread pitch P2.0 is supplied as well.
Note) To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number.
Note: M25 x 2.0 is included in main unit thread pitch specification for FA-2530. A designation shall include 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	℃	−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

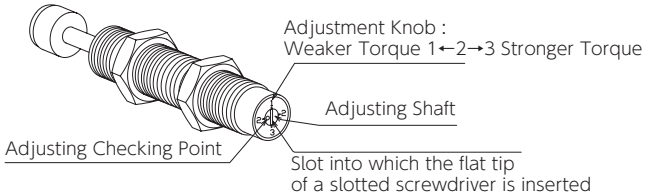
The FA-2530 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

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 ±2.5°)

Adjustment Method



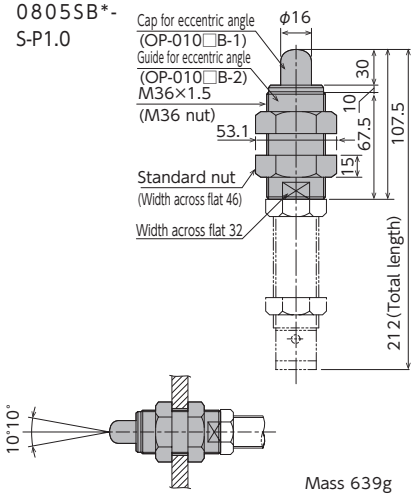
* To adjust, turn the adjustment knob with a slotted screw driver.
* Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
* It does not have a lock screw for locking the adjusted setting.

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



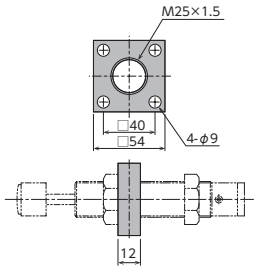
Mass 639g

Note) Material of cap for eccentric angle: Metal

Square flange OP-040GB

Model
OP-040GB

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

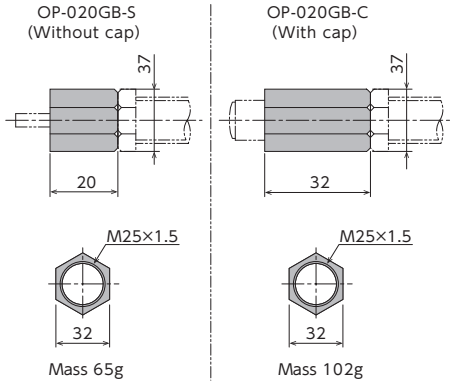


Mass 206g

Stopper nut OP-020GB-□

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

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



Mass 65g

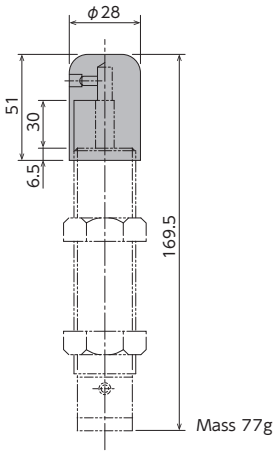
Mass 102g

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

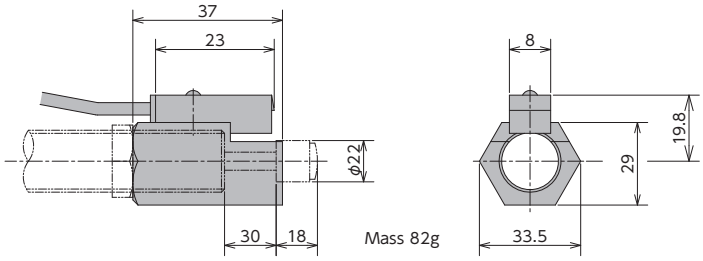
- A drip-proof cap is fitted on the unit on delivery.
- Liquid-proof caps are not sold separately.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-2530G□□-C-060
  - Model indication A or WM is inserted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



Mass 77g

Holder with a switch OP-030GB-□

Model
OP-032GB



Mass 82g

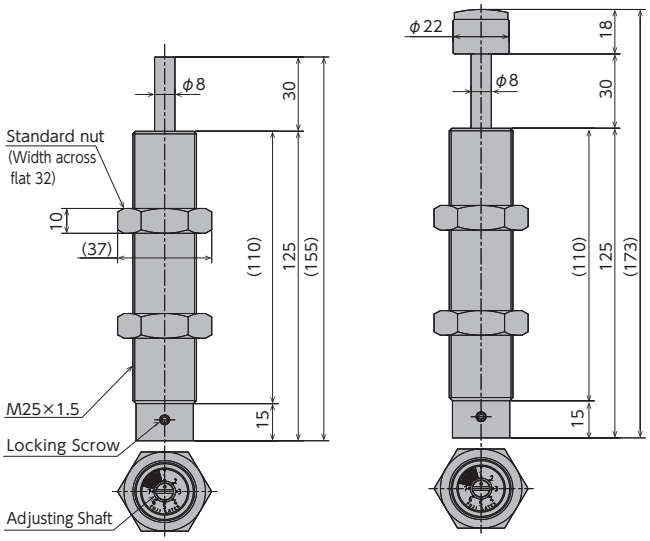
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

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					
FA-2530G2-S		58.8(6.0)	300(300)	0.3～2	Multiple-varying orifice type
FA-2530G2-C					
FA-2530G3-S			150(150)	0.7～3	Multiple-orifice type
FA-2530G3-C					
FA-2530SL-S		49(5.0)	4,150(4,150)	0.05～0.5	Multiple-varying orifice type
FA-2530SL-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.

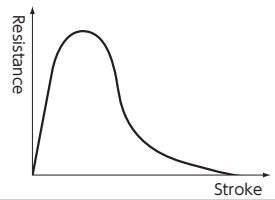
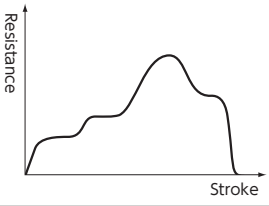
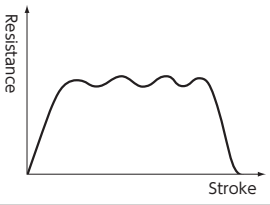
Common Specifications

Max. drag	N(kgf)	6,370(650)	Operating temperature	℃	−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*-S-P2.0 or FA-2530G*-C-P2.0.pitch specifications for the FA-2530 series. Please your order using the model number FA-2530G*-S-P2.0 or FA-2530G*-C-P2.0.

Selection Guideline

TThe 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.

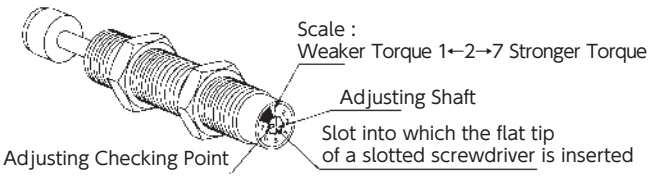
Orifice type	Single-orifice type	Multiple-varying orifice type	Multiple-orifice type
Model number	FA-2530G1 series	FA-2530G2, SL series	FA-2530G3 series
Application	For low-speed	For medium speed, in particular with a pneumatic cylinder	For high-speed
Absorption characteristics			

* 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



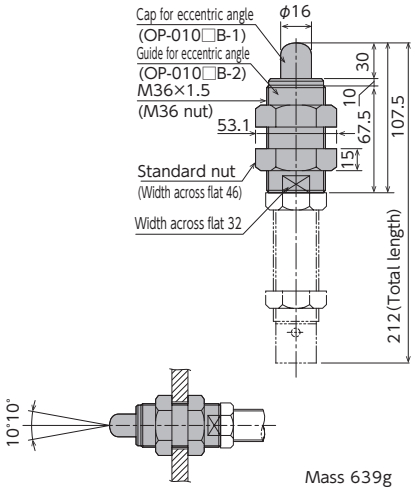
* To adjust, turn the adjustment knob with a slotted screw driver.
* Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
* It does not have a lock screw for locking the adjusted setting.

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.



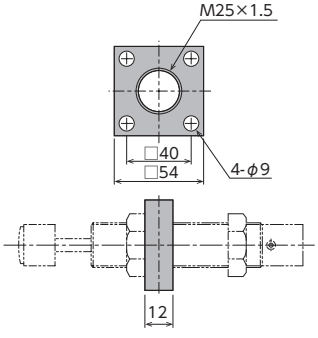
Mass 639g

Note) Material of cap for eccentric angle: Metal

Square flange OP-040GB

Model
OP-040GB

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

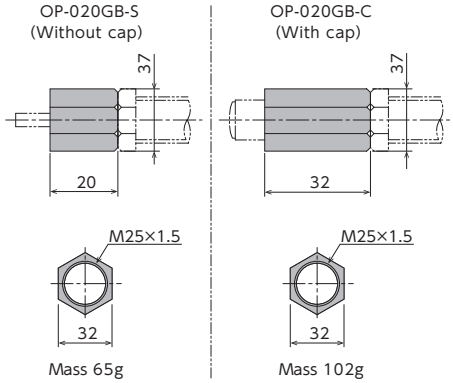


Mass 206g

Stopper nut OP-020GB-□

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

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



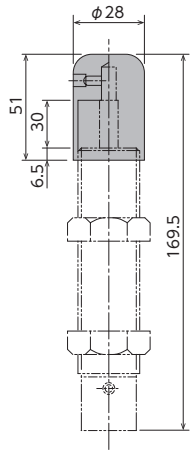
Mass 65g　Mass 102g

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

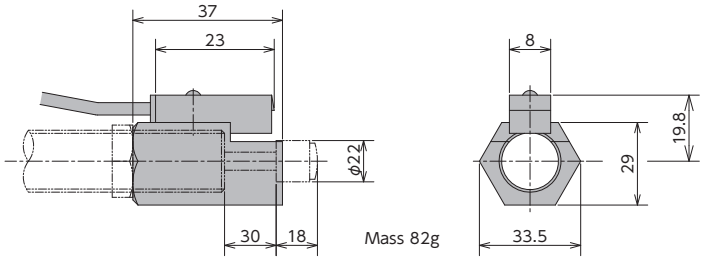
- A drip-proof cap is fitted on the unit on delivery.
- Liquid-proof caps are not sold separately.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- FA-2530G□-C-060
  - The model number 1, 2, or 3 is inserted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



Mass 77g

Holder with a switch OP-030GB-□

Model
OP-032GB



Mass 82g

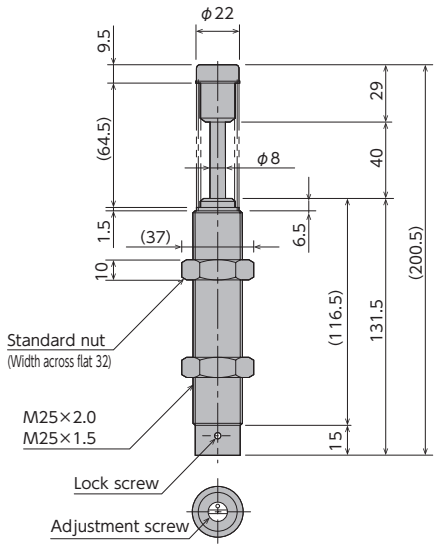
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

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.

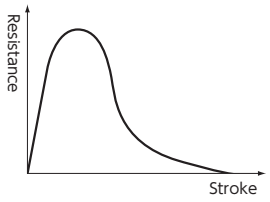
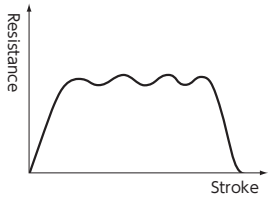
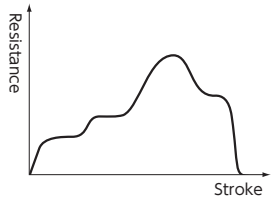
Common Specifications

Max. drag	N(kgf)	3,920(400)	Operating temperature	℃	−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

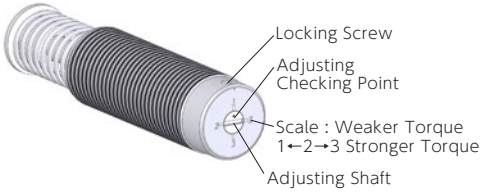
The FA-FWM-2540 series series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

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 ±2.5°)

Adjustment Method



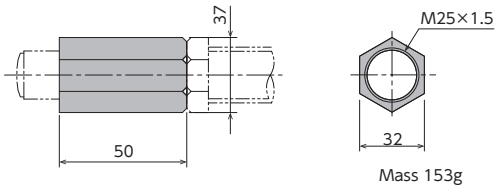
* To adjust, turn the adjustment knob with a slotted screw driver.
* Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
* It does not have a lock screw for locking the adjusted setting.

Optional Parts

Stopper nut OP-020LB

Model
OP-020LB

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



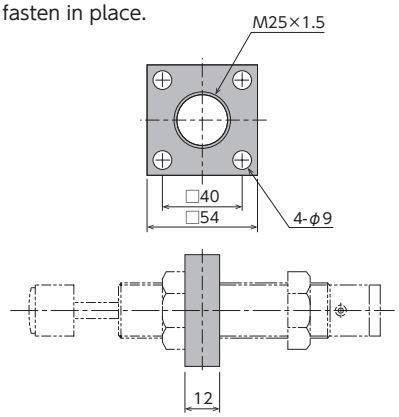
Mass 153g

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.



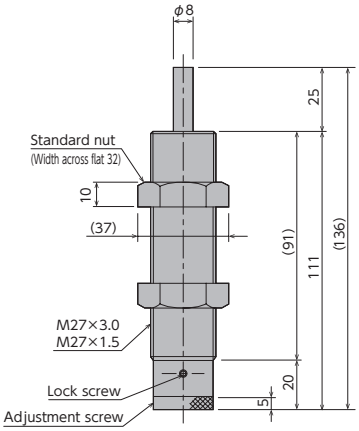
Mass 206g

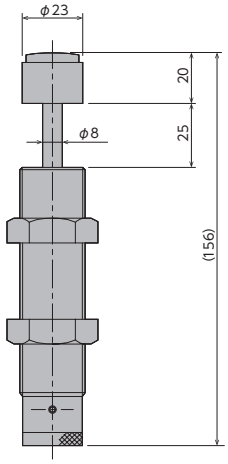
Standard nuts are sold separately as well.

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 ▲					
FA-2725FD-S ▲			300(300)	0.7～3	Multiple-orifice type
FA-2725FD-C ▲					
FWM-2725FBD-S ▲			450(450)	0.3～2	Multiple-varying orifice type
FWM-2725FBD-C ▲					
FA-2725SL-S ▲			5,000(5,000)	0.05～0.5	Multiple-varying orifice type
FA-2725SL-C ▲					

▲ Thread pitch P3.0 is supplied as well.

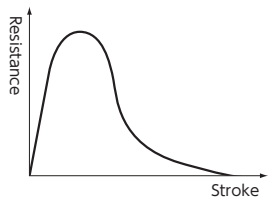
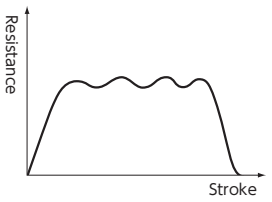
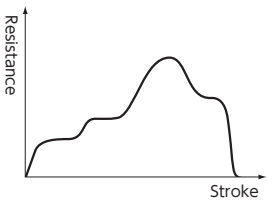
Common Specifications

Max. drag	N(kgf)	6,370(650)	Operating temperature	℃	−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.

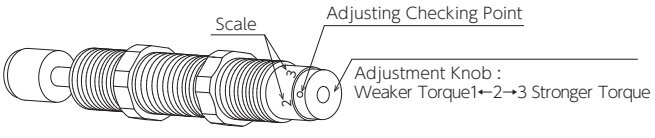
Orifice type	Single-orifice type	Multiple-orifice type	Multiple-varying orifice type
Model number	FA-2725FB series	FA-2725FD series	FWM-2725FBD, FA-2725SL series
Application	For low-speed	For high-speed	For medium speed, in particular with a pneumatic cylinder
Absorption characteristics			

* 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 ±2.5°)

Adjustment Method



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

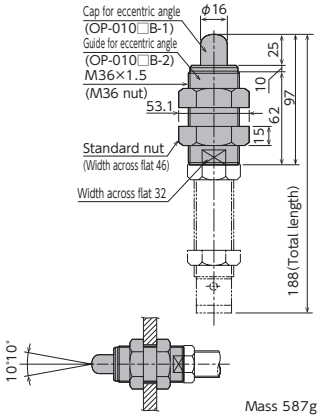
* Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
* Once the adjustment is complete, secure with a lock screw using a hex wrench.

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.

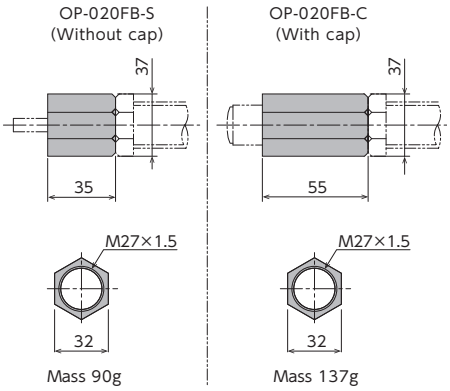


Note) Material of cap for eccentric angle: Metal

Stopper nut OP-020FB-□

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

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

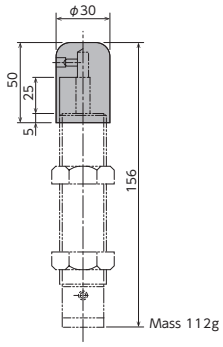


Note) When attaching, make sure that the side without a bearing chamfer is the impact surface. M27 X 3.0 is also available as a screw pitch specification. Model number is either OP-020FB-S or C-P3.0

Liquid-proof cap F□□-2725F□□-C-060

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

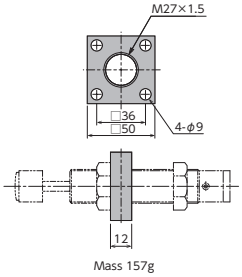
- A drip-proof cap is fitted on the unit on delivery.
- Liquid-proof caps are not sold separately.
- Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means for liquid proofing.
- F□□-2725F□□-C-060
  - Model indication A or WM is inserted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



Square flange OP-040FB

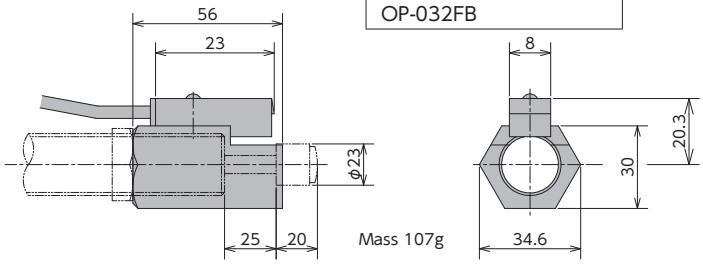
Model
OP-040FB

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



Holder with a switch OP-030FB-□

Model
OP-032FB



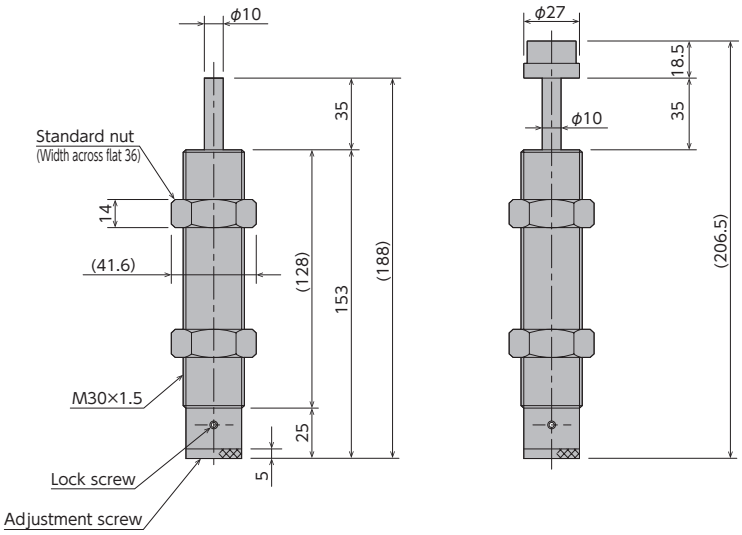
- Although a holder with a switch can be ordered on its own, we strongly recommend ordering one with the main unit. Please include the main unit's model number when placing an order.
- For switch specifications and precautions for use, please refer to page 23.

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			1,300(1,300)	0.3～2	Multiple-varying orifice type
FWM-3035TBD-C					
FA-3035SL-S			30,000(30,000)	0.05～0.5	Multiple-varying orifice type
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.

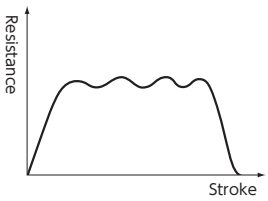
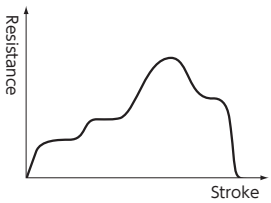
Common Specifications

Max. drag	N(kgf)	16,660(1,700)	Operating temperature	℃	−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

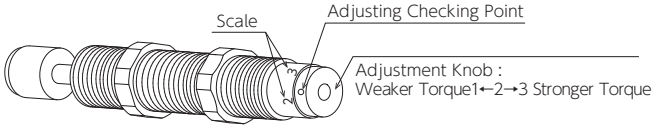
FA-3035 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

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 ±2.5°)

Adjustment Method



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

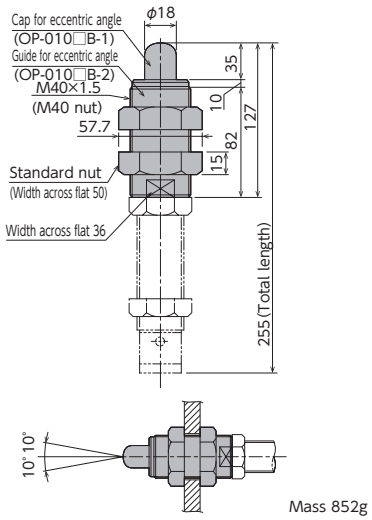
* Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
* Once the adjustment is complete, secure with a lock screw using a hex wrench.

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.



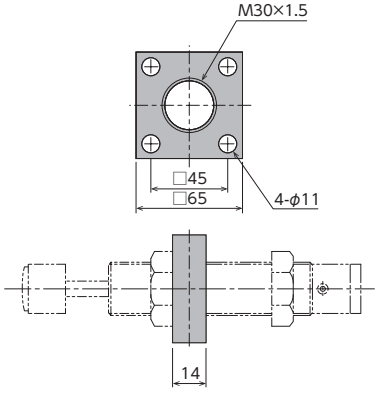
Mass 852g

Note) Material of cap for eccentric angle: Metal

Square flange OP-040TB

Model
OP-040TB

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

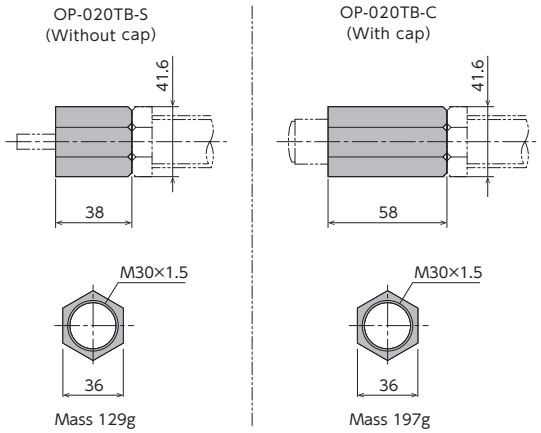


Mass 344g

Stopper nut OP-020TB-□

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

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



Mass 129g

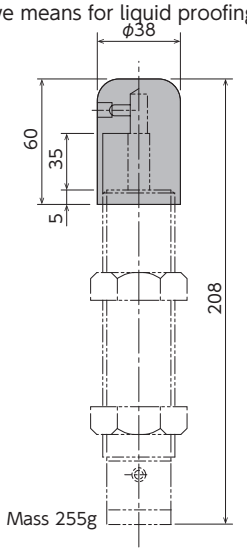
Mass 197g

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

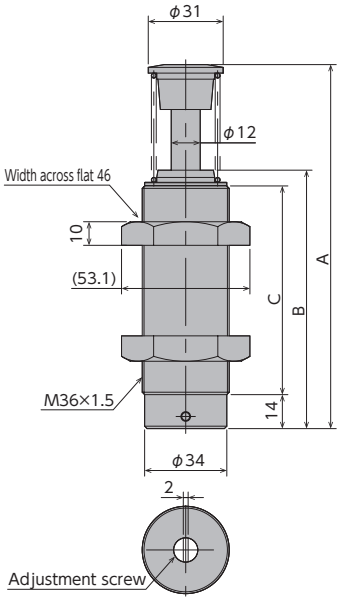
Mass 255g

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

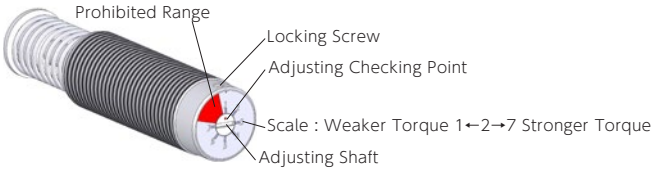
Specifications

Model	Stroke mm	Max. absorption energy J(kgf·m)	Max. equivalent mass kg(kgf)	Rarge of impact rate m/s	Max. drag N(kgf)	Max.cycle rate cycle/min	Absorption energy per minute J/min (kgf·m/min)	ecovering power of the piston rod N(kgf)	Operating temperature ℃	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						
FA-3625SL-C			62,500(62,500)	0.05～0.5		15				
FA-3650A2-C	50	400(40.8)	2,700(2,700)	0.3～2.0		30	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		15				

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 ±2.5°)

Adjustment Method



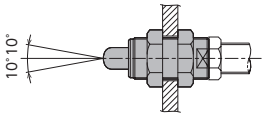
* To adjust, turn the adjustment knob with a slotted screw driver.
* Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
* It does not have a lock screw for locking the adjusted setting.

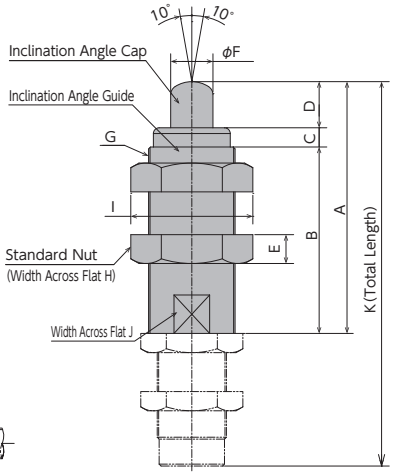
Optional Parts

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°≦
- 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 ± 10°
- The caps and the guides for inclined use are not unbundled.





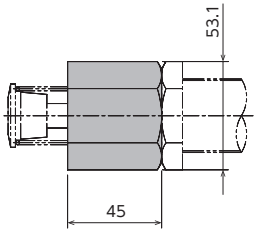
Model	A	B	C	D	ϕF	E	K	G	H	I	J	Mass g
OP-010-M3625	131	107	10	24	22	15	200	M45×1.5	55	63.5	41	880
OP-010-M3650	201	152	10	29			312					1,270

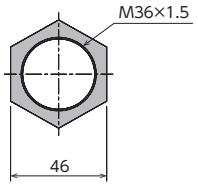
Stopper nut OP-020M36

Model
OP-020M36

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

OP-020M36





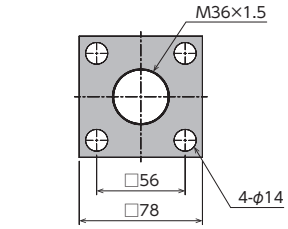
Mass 291g

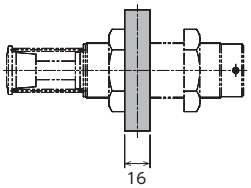
Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

Square flange OP-040UB

Model
OP-040UB

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



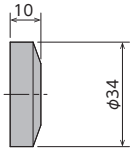


Mass 566g

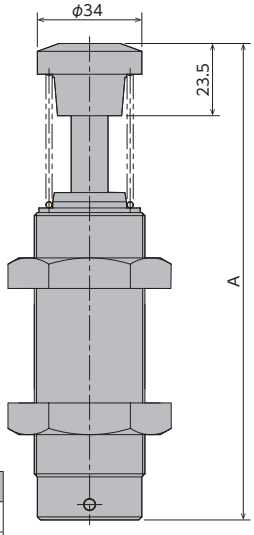
Urethane cap OP-090M36B

Model
OP-090M36B

OP-090M36B



Mass 7g



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

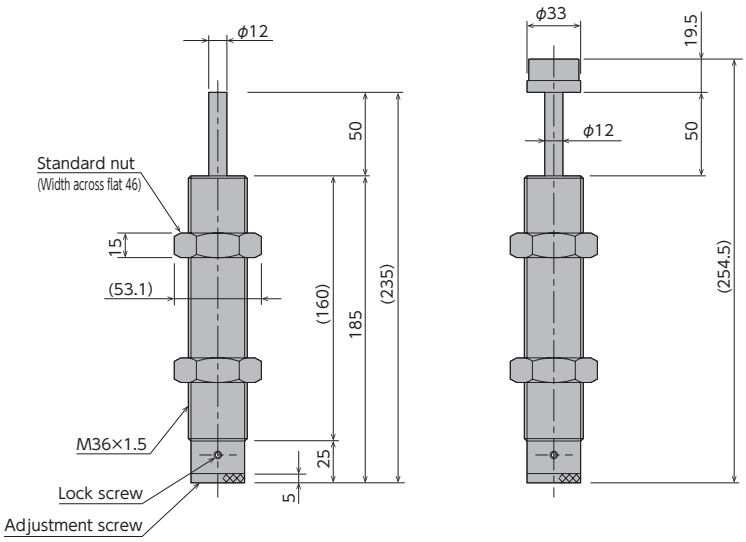
Dimensions with urethane cap attached

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					

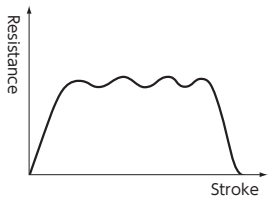
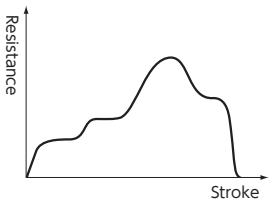
Note) To place an order without a cap, put –S at the end of the model number, and to place an order with a cap, put –C at the end of the model number.

Common Specifications

Max. drag	N(kgf)	23,520(2,400)	Operating temperature	℃	−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

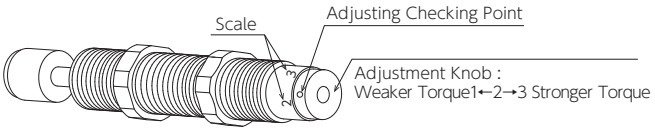
FA-3650 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

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 ±2.5°)

Adjustment Method



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

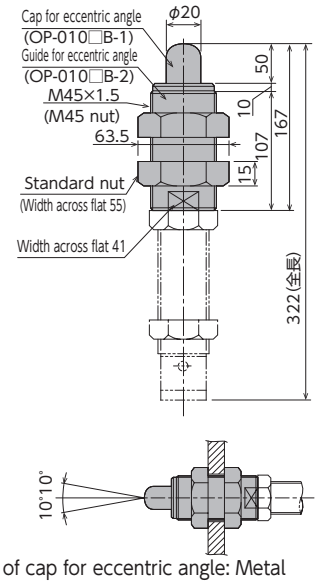
* Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
* Once the adjustment is complete, secure with a lock screw using a hex wrench.

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.



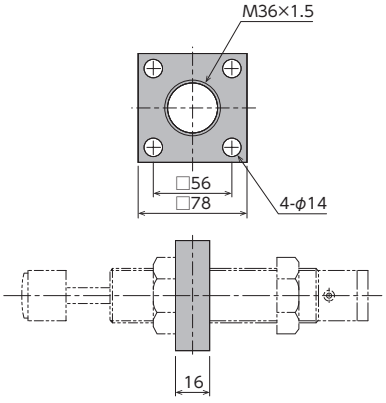
Mass 1,273g

Note) Material of cap for eccentric angle: Metal

Square flange OP-040UB

Model
OP-040UB

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

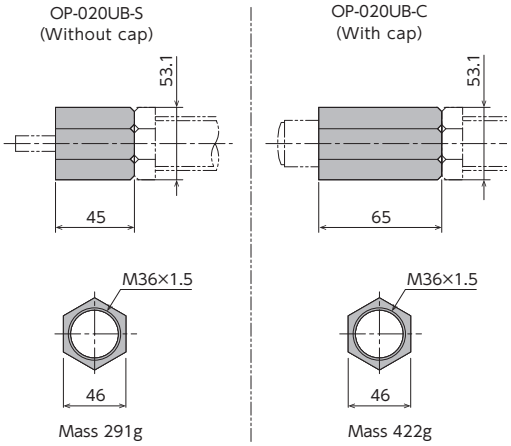


Mass 566g

Stopper nut OP-020UB- □

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

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



Mass 291g

Mass 422g

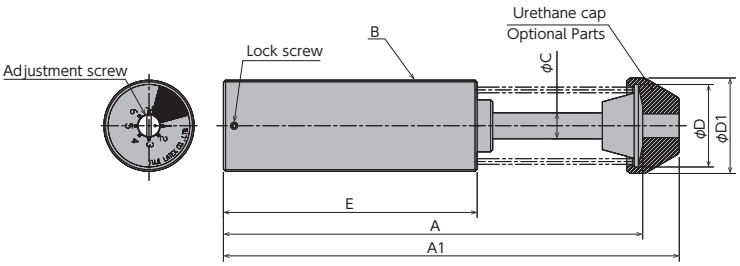
Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

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

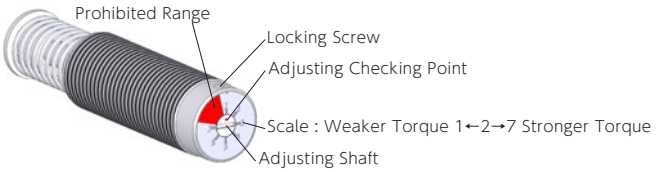
Specifications

Model	Stroke mm	Max. absorption energy J(kgf·m)	Max. equivalent mass kg(kgf)	Rarge of impact rate m/s	Max. drag N(kgf)	Max.cycle rate cycle/min	Absorption energy per minute J/min (kgf·m/min)	ecovering power of the piston rod N(kgf)	Operating temperature ℃	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)			1,020
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 ±2.5°)
* The urethane caps are consumables. Please replace them when necessary.

Adjustment Method

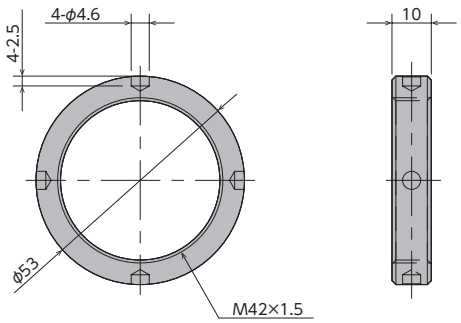


* To adjust, turn the adjustment knob located at the bottom of the main unit.
* Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
* Once the adjustment is complete, secure with a lock screw using the attached hex wrench.

Optional Parts

Nut OP-M42

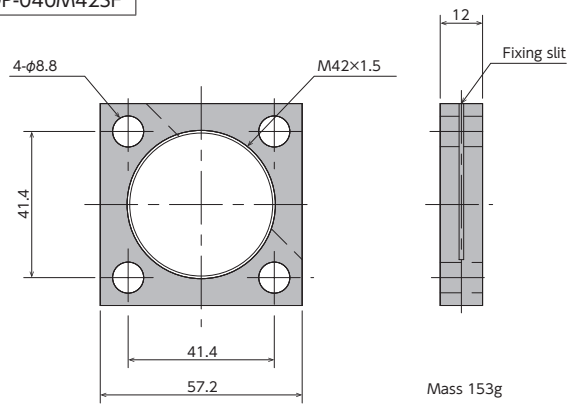
Model
OP-M42



Mass 64g

Square flange OP-040 M42SF

Model
OP-040M42SF

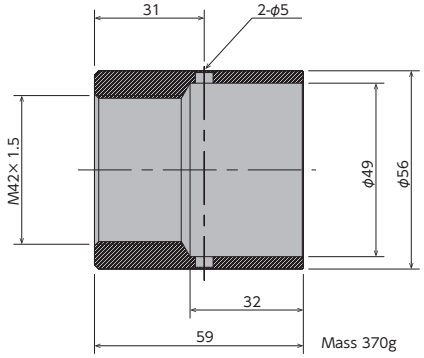


Mass 153g

Stopper nut OP-020 M42

Model
OP-020M42

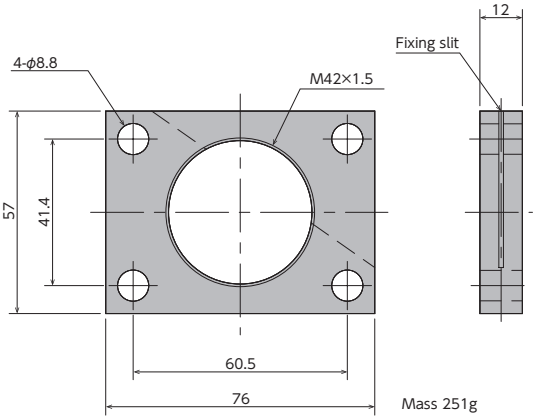
● Once the attachment site is determined, uset he main unit' s nut to securely fasten in place.



Mass 370g

Rectangle flange OP-040 M42RF

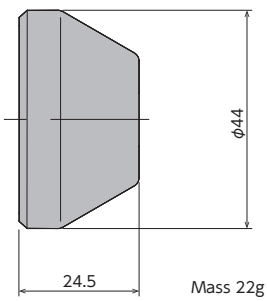
Model
OP-040M42RF



Mass 251g

Urethane cap OP-090 M42A

Model
OP-090M42A

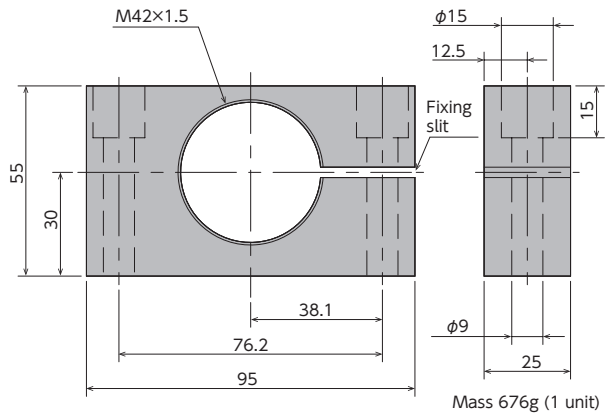


Mass 22g

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



Mass 676g (1 unit)

Soft Absorber

Fixed Type | Adjustable type | Self-adjusting

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

RoHS Compliant

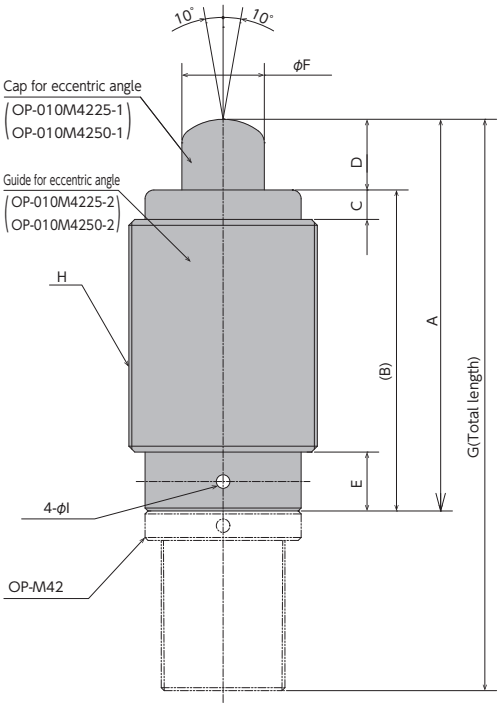
●Products specification might be changed without notice.

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 ±10˚.
- 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.

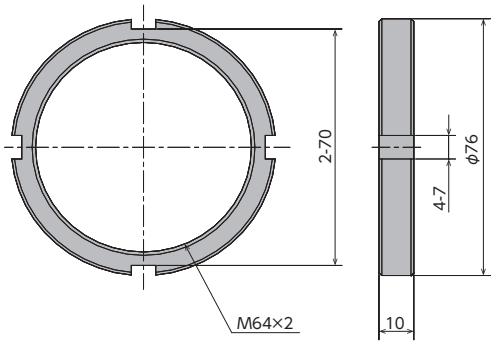


Model	A	B	C	D	E	ϕF	G	H	ϕI	Weight g
OP-010M4225	133	109	10	24	20	28	194	M64×2	4.6	1,600
OP-010M4250	203	154		49			290			2,500

Nut OP-M64

Model
OP-M64

- Usable as the nut for eccentric angle adaptor



Mass 100g

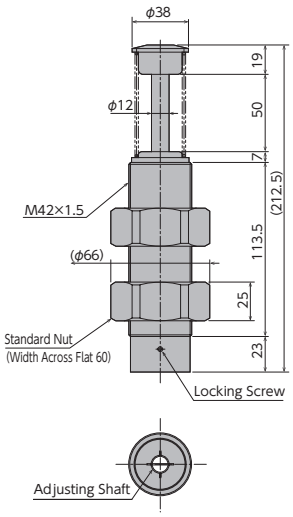
Soft Absorber

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	℃	−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

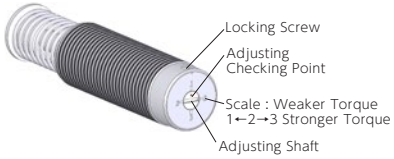
FA-4250 series has the following three patterns of absorption characteristics depending on the orifice type. Please use the following information as a guideline when making your selection.

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: ±2.5˚)

Adjustment Method

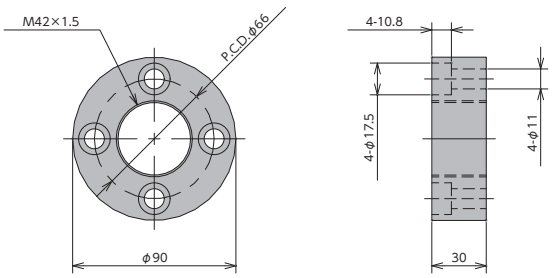


* To adjust, turn the adjustment knob with a slotted screw driver.
* Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
* It does not have a lock screw for locking the adjusted setting.

Optional Parts

Square flange OP-040YB

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

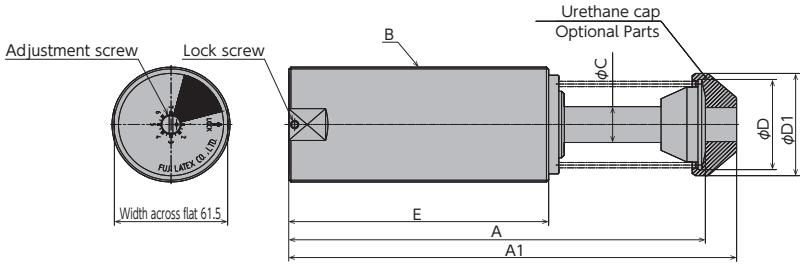


Standard nuts are sold separately as well.

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					191
FA-64150□-C	456	473			60		241

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

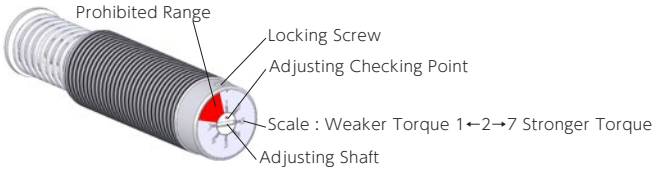
Specifications

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)	ecovering power of the piston rod N(kgf)	Operating temperature ℃	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)		3.2	±1.0
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)		4.2	
FA-64150H-C			300~5,500(300~5,500)	0.3~3.6		8					

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

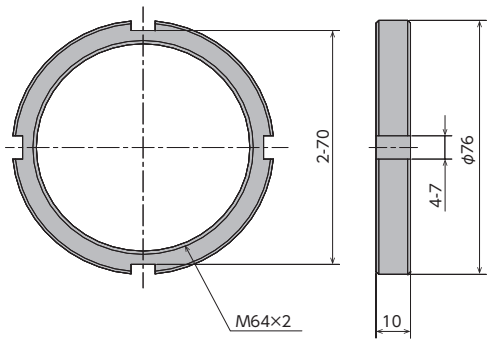


* To adjust, turn the adjustment knob located at the bottom of the main unit.
* Because the adjustment can be done in an analog manner, a value between two integers on the indicator can be set.
* Once the adjustment is complete, secure with a lock screw using a hex wrench.

Optional Parts

Nut OP-M64

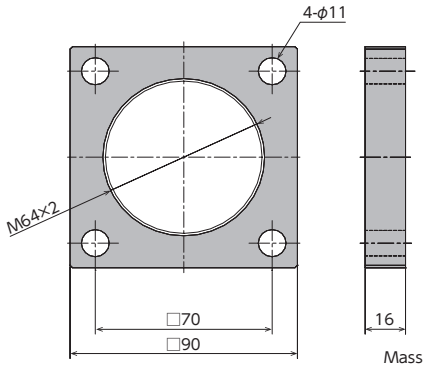
Model
OP-M64



Mass 100g

Square flange OP-040 M64SF

Model
OP-040M64SF

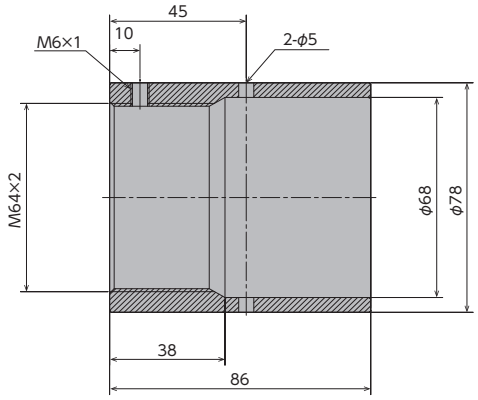


Mass 400g

Stopper nut S OP-020 M64S

Model
OP-020M64S

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

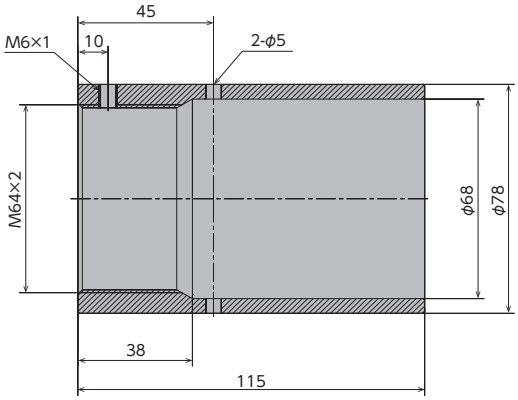


Mass 850g

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

Model
OP-020M64L

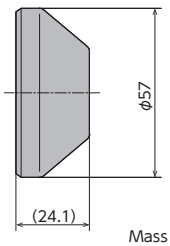
● Adjust so that it stops 1mm before thestroke end, and fasten with the main unit' s nut until secured.



Mass 1,150g

Urethane cap OP-090 M64A

Model
OP-090M64A

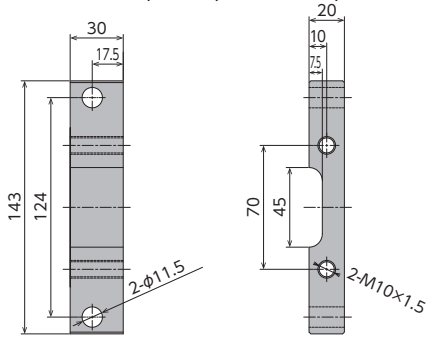


Mass 35g

Foot mount OP-M64FM

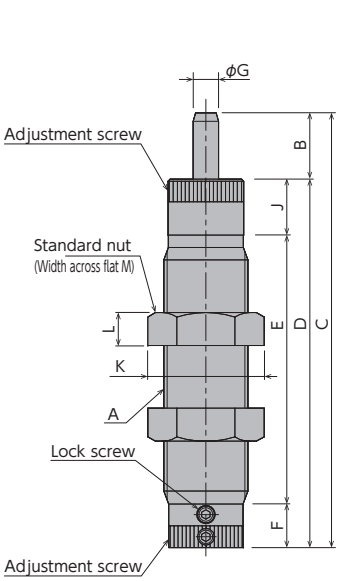
Model
OP-M64FM

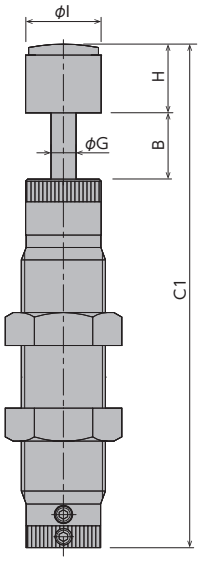
- 1 set consists of 2 mounts.
- 4 hexagon socket head cap screws of M10×1.5 are contained in the set.
- The mount is common to the FA series and the FK series.
- 2 nuts OP-M64 (sold separately) will be required.



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

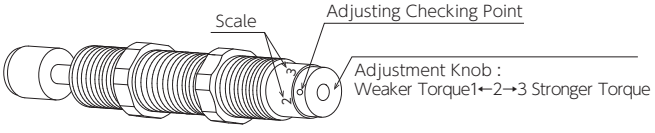
Model	Stroke mm	Max. absorption energy J(kgf·m)	Max. equivalent mass kg(kgf)	Rarge of impact rate m/s	Max. drag N(kgf)	Max.cycle rate cycle/min	Absorption energy per minute J/min (kgf·m/min)	ecovering power of the piston rod N(kgf)	Operating temperature ℃	Mass g	Allowable eccentric angle °
FA-2016EA-S	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
FA-2016EA-C										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		402	±2.5
FA-2725FA-C										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.

RoHS Compliant

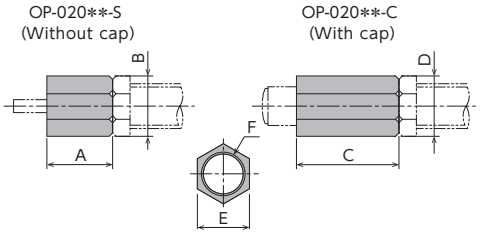
●Products specification might be changed without notice.

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 thestroke end, and fasten with the main unit' s nut until secured.



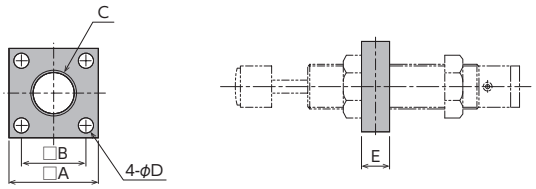
Note) When attaching, make sure that theside without a bearing chamfer is the impact surface.

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

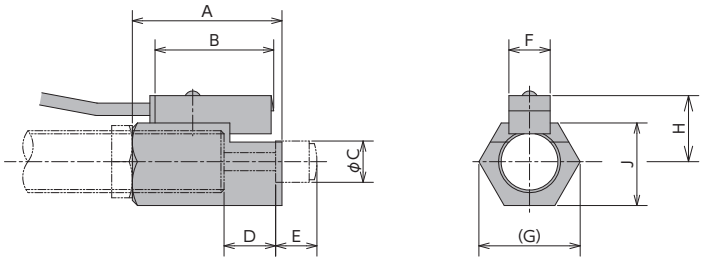
● Once the attachment site is determined, uset he main unit' s nut to securely fasten in place.



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.

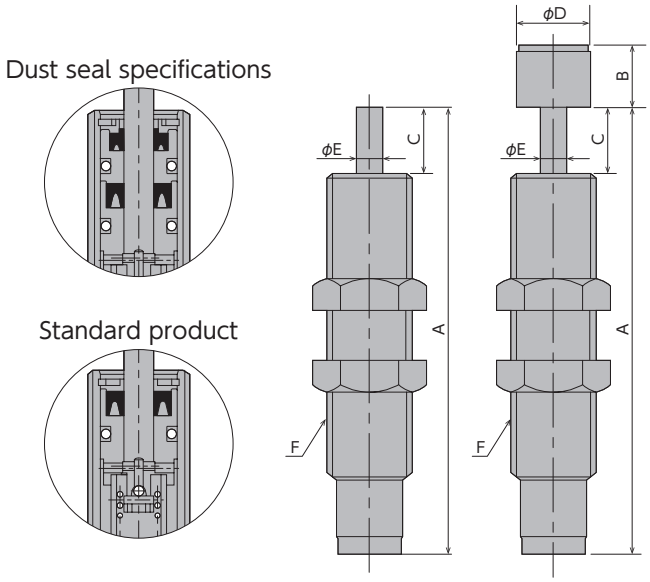
Standard nuts are sold separately as well.

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.



Dimensions

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

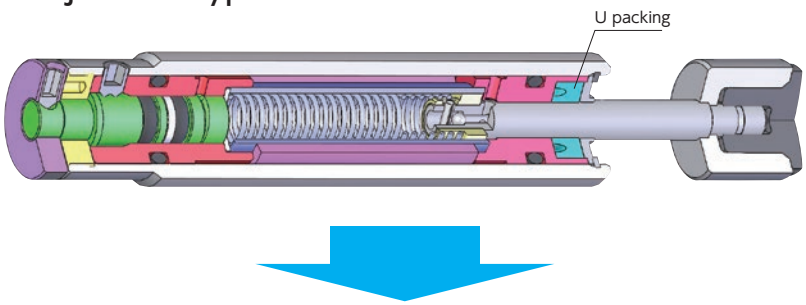
Precautions for Use

* 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.

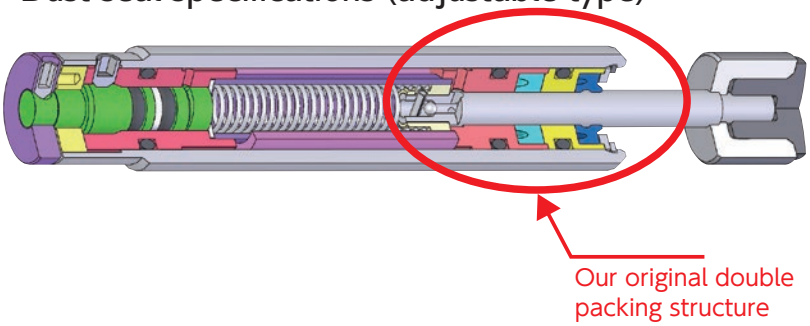
Overview

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.

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

FA - S 25 30 GB - S

With/Without cap	S : Without cap C : With cap R : With urethane cap
Orifice type	☐ B : Single-orifice type for low-speed ☐ BD : Multiple-varying orifice type for middle-speed ☐ D : Multiple-orifice type for high-speed
Stroke	(indicated in min)
External screw size	(indicated in min)
Specifications	S : Dust seal specifications
Series name	FA : Single-orifice type/Multiple-orifice type FWM : Multiple-varying orifice type

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

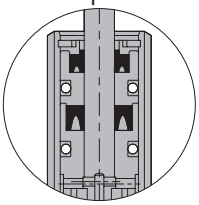
Multiple-varying orifice
Fixed Type | Adjustable type | Self-adjusting

FWM-S Series (Dust Seal Specifications)

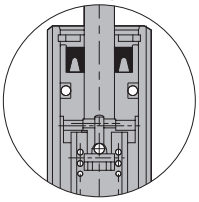
RoHS Compliant

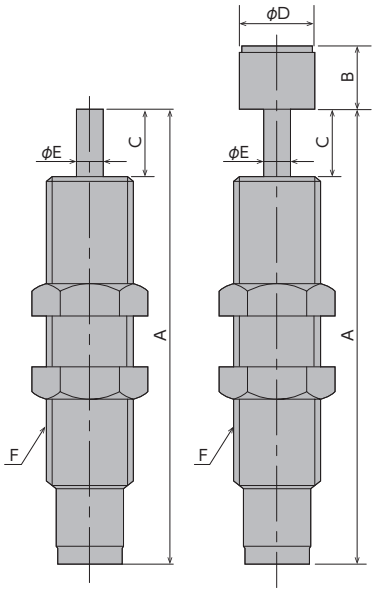
●Products specification might be changed without notice.

Dust seal specifications



Standard product





Dimensions

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

Specifications

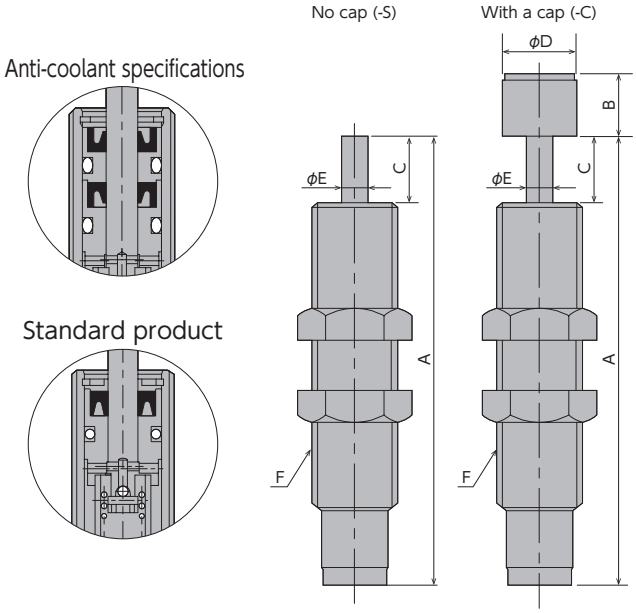
* The specification is identical with the standard models for each type

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



Dimensions

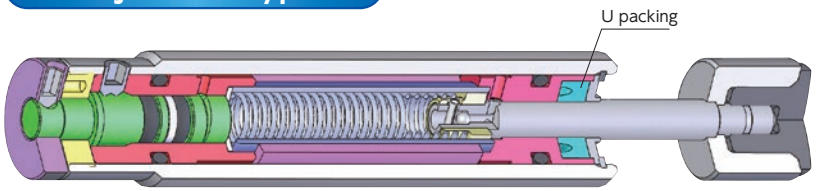
Model	A	B	C	D	E	F	Weight g	Specification Page
FA-F0806-S	59	–	6	–	2.5	M8×0.75	14	58
FA-F0806-C		5		6				
FA-F1008V□-S	73.2	–	8	–	2.4	M10×1	31	60
FA-F1008V□-C		6.3		6			32	
FWM-F1008VBD-S		–		–			31	
FWM-F1008VBD-C		6.3		6			32	
FA-F1210M□-S	82.6	–	10	–	3.5	M12×1	48	62
FA-F1210M□-C		8		8			51	
FWM-F1210MBD-S		–		–			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.

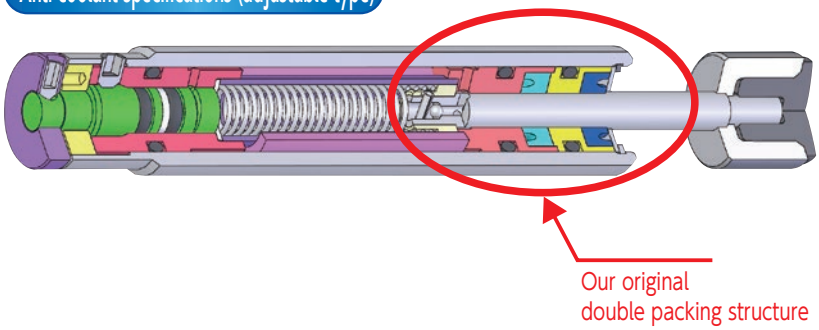
Overview

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

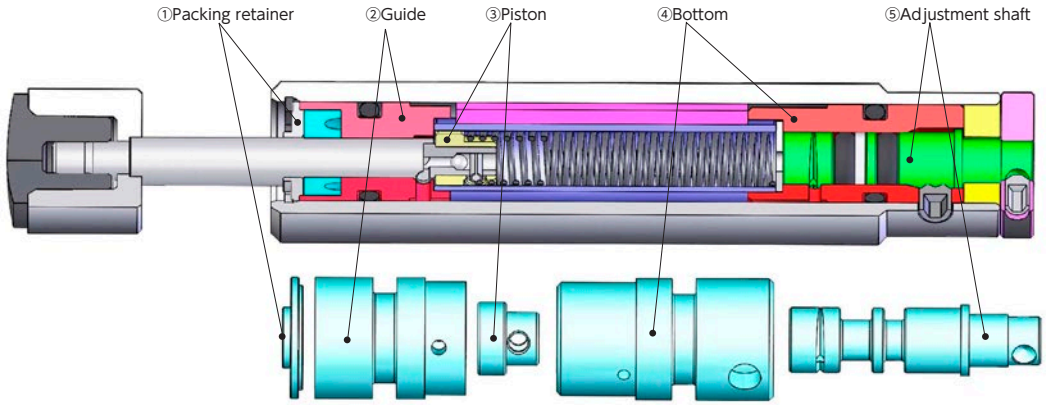
* The specifications is identical with the standard models for each model (refer to the relevant page in the specifications listed in the dimensions table on the previous page).

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 c opper-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.

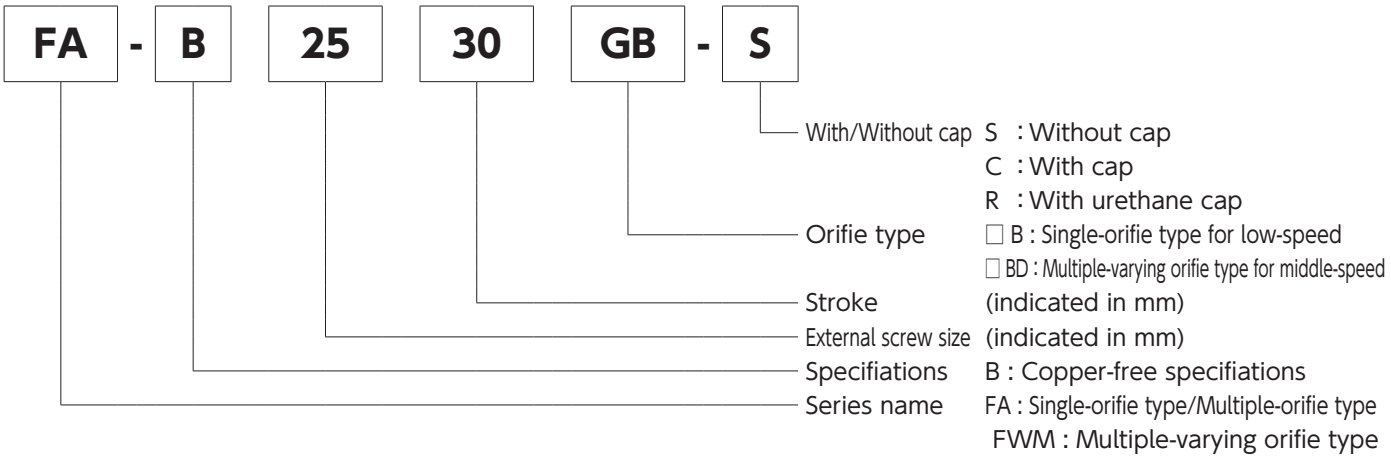
●Products specification might be changed without notice.

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 grooveorifice 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)	Rarge of impact rate m/s	Max. drag N(kgf)	Max.cycle rate cycle/min	Max. absorption energy per minute J/min (kgf·m/min)	ecovering power of the piston rod N(kgf)	Operating temperature ℃	Mass Stype g (Ctype 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							

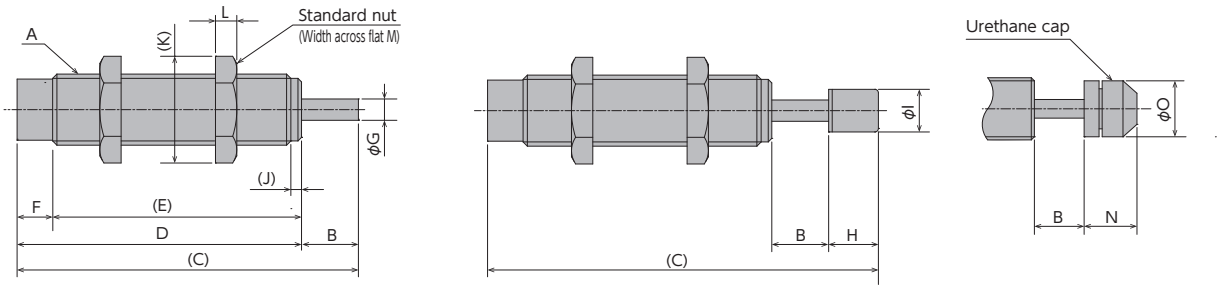
Note) Insert S in the □ to order without a cap, and insert C in the □ to order with a cap (R if ordering urethane cap).

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: ±2.5°)
* Ensure that an external stopper (OP-020**) is also used.
  (The FK-0404 and FK-0604 series can be used without a stopper.)

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	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

FK - 14 12 M - C

- With/Without cap: S : Without cap; C : With cap; R : With urethane cap
- Performance classification: L : For low speed (Impact rate 0.3～1m/s); M : For medium speed (Impact rate 0.3～2m/s); H : For high speed (Impact rate 0.3～3m/s)
- Stroke (indicated in mm)
- External screw size (indicated in mm)
- Series name

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)	Rarge of impact rate m/s	Max. drag N (kgf)	Max.cycle rate cycle/min	Max. absorption energy per minute J/min (kgf·m/min)	ecovering power of the piston rod N (kgf)	Operating temperature ℃	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							

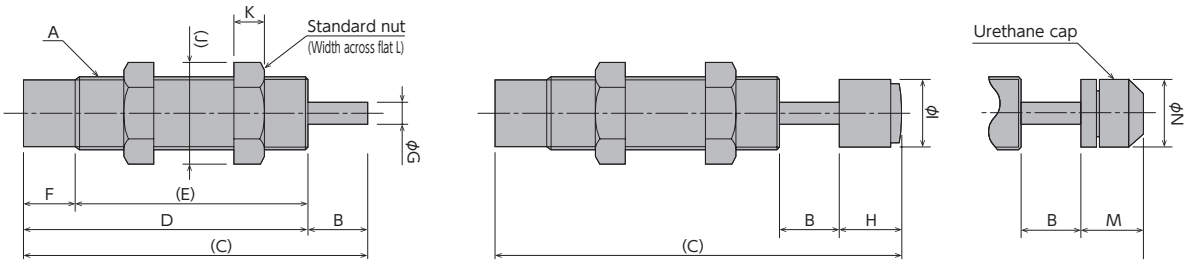
Note) Insert S in the □ to order without a cap, and insert C in the □ to order with a cap (R if ordering urethane cap). (-S is not available for FK-2540.)
Note) Urethane cap is the only available specification for FK-2022, 2050, and 2550 with a cap.

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: ±2.5°) Allowable eccentric angle in FK-2050 and 2550: ±1.0°
* Urethane caps are consumable goods that need to be replaced with new ones if necessary

RoHS Compliant

●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

FK - 20 16 M - C

- With/Without cap: S : Without cap; C : With cap; R : With urethane cap
- Performance classification: L : For low speed (Impact rate 0.3～1m/s); M : For medium speed (Impact rate 0.3～2m/s); H : For high speed (Impact rate 0.3～3m/s)
- Stroke (indicated in mm)
- External screw size (indicated in mm)
- Series name

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. (Noexternal 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)	Rarge of impact rate m/s	Max. drag N(kgf)	Max. cycle rate cycle/min	Max. absorption energy per minute J/min (kgf·m/min)	ecovering power of the piston rod N(kgf)	Operating temperature ℃	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		200(20.4)	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							

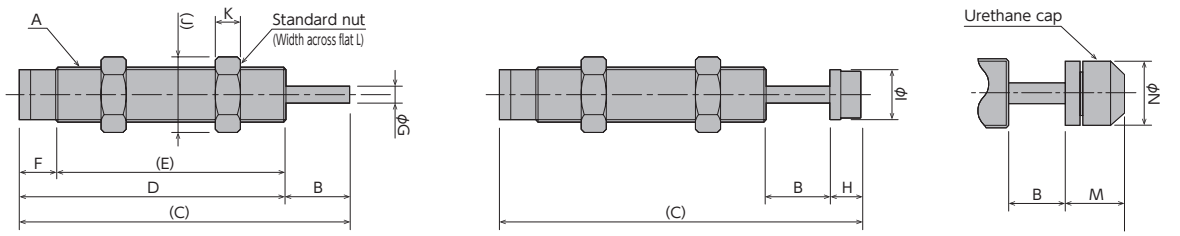
Note) Insert S in the □ to order without a cap, and insert C in the □ to order with a cap (R if ordering urethane cap). (-S is not available for FK-3625 □.)
Note : An additional urethane cap (OP-090M36B) can be mounted on FK-3625A□-C, FK-3650A□-C

Precautions for Use

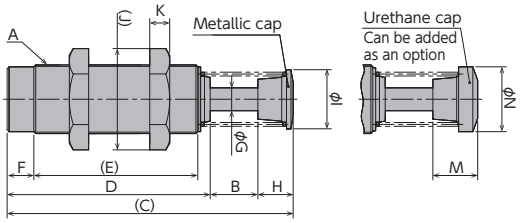
* Do not use this product without carefully reading the attached owner’ s manual.
* Do not turn the oil inlet screw located at the bottom of the main unit.
* Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the 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: ±2.5°)
* 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.

RoHS Compliant

●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

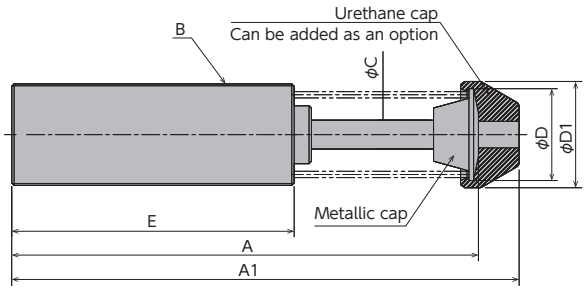
FK - 27 25 M - C

- With/Without cap: S : Without cap; C : With cap; R : With urethane cap
- Performance classification: L : For low speed (Impact rate 0.3～1m/s); M : For medium speed (Impact rate 0.3～2m/s); H : For high speed (Impact rate 0.3～3m/s)
- Stroke (indicated in mm)
- External screw size (indicated in mm)
- Series name

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)	Rarge of impact rate m/s	Max. drag N(kgf)	Max.cycle rate cycle/min	Max. absorption energy per minute J/min (kgf·m/min)	ecovering power of the piston rod N(kgf)	Operating temperature ℃	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							
FK-4250BL-C	50	520(53.1)	23,000	0.1～0.5		8	2,372(242)			1,020	
FK-4250BM-C			2,800	0.3～1.5		10					
FK-4250BH-C			450	0.3～3.6							
FK-4275BL-C	75	780(79.6)	30,000	0.1～0.5		5	3,345(341)			1,240	
FK-4275BM-C			3,400	0.3～1.5		6					
FK-4275BH-C			670	0.3～3.6							

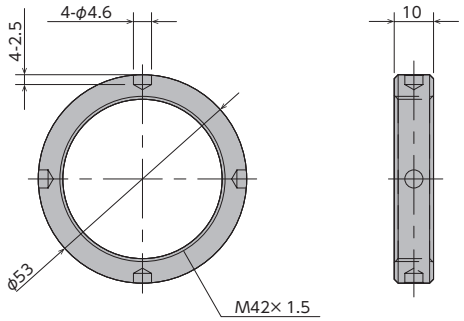
Precautions for Use

* 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.

Optional Parts

Nut OP-M42

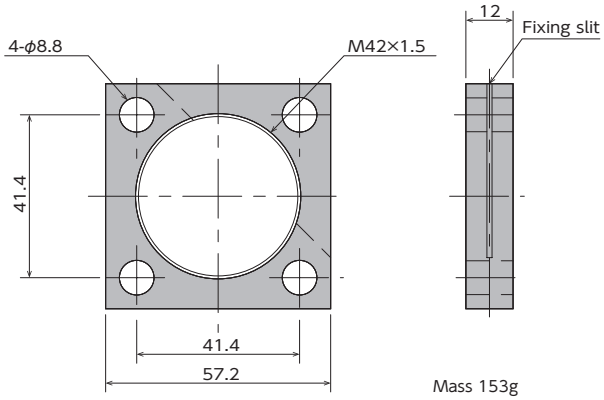
Model
OP-M42



Mass 64g

Square flange OP-040 M42SF

Model
OP-040M42SF

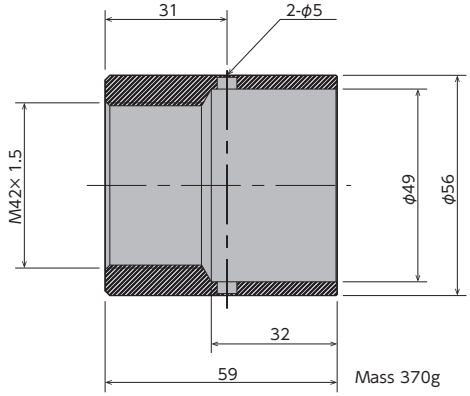


Mass 153g

Stopper nut OP-020 M42

Model
OP-020M42

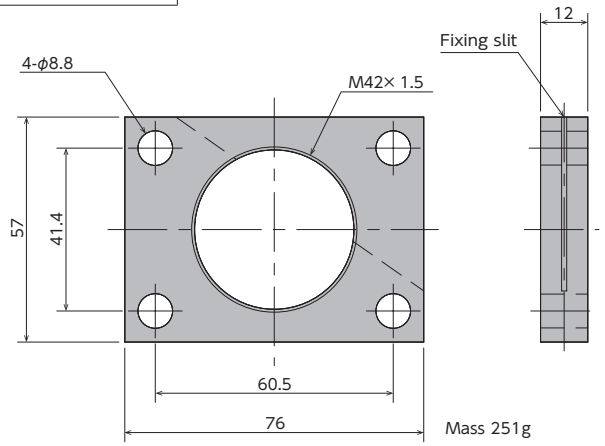
● Adjust so that it stops 1mm before thestroke end, and fasten with the main unit' s nut until secured.



Mass 370g

Rectangle flange OP-040 M42RF

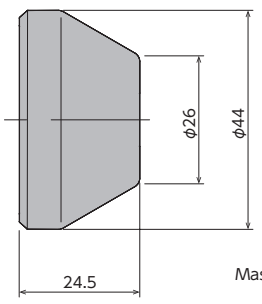
Model
OP-040M42RF



Mass 251g

Urethane cap OP-090 M42A

Model
OP-090M42A

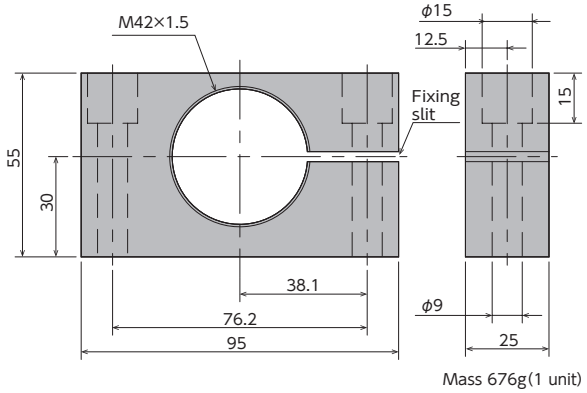


Mass 26g

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



Mass 676g(1 unit)

Soft Absorber

Fixed Type | Adjustable type | Self-adjusting

FK-4225B/FK-4250B Series

RoHS Compliant

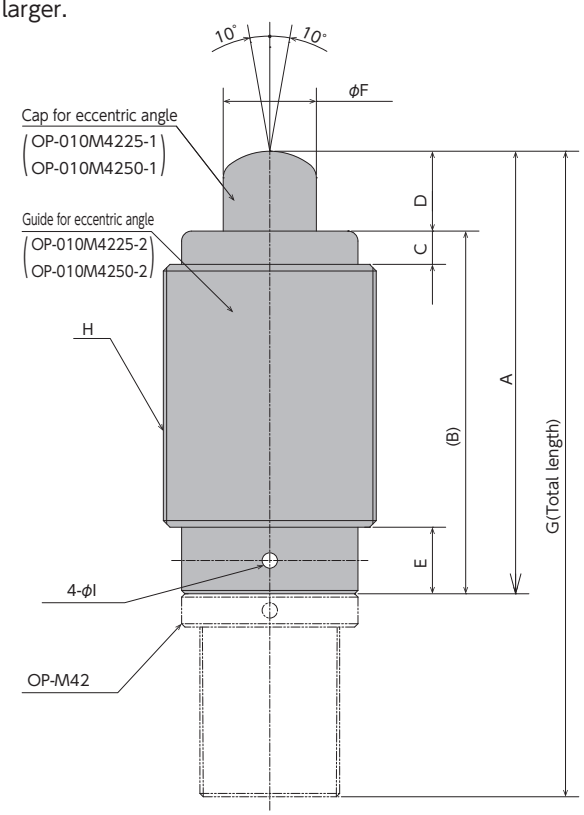
●Products specification might be changed without notice.

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 ± 10˚.
- Nut for unit is not inclusive.
- Not usable for FA-4250YD-C, FWM-4250YBD-C.

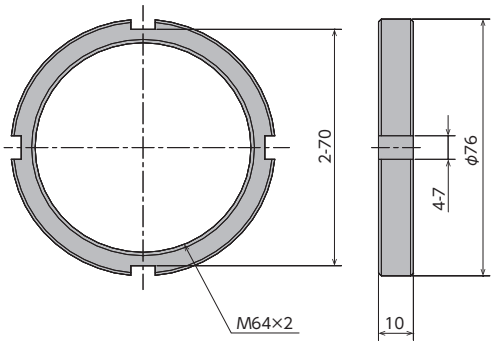


Model	A	B	C	D	E	ϕF	G	H	ϕI	Weight g
OP-010M4225	133	109	10	24	20	28	194	M64×2	4.6	1,600
OP-010M4250	203	154		49			290			2,500

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)	Rarge of impact rate m/s	Max.drag N(kgf)	Max. cycle rate cycle/min	Max. absorption energy per minute J/min (kgf·m/min)	ecovering power of the piston rod N(kgf)	Operating temperature ℃	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	±1.0
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	

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)

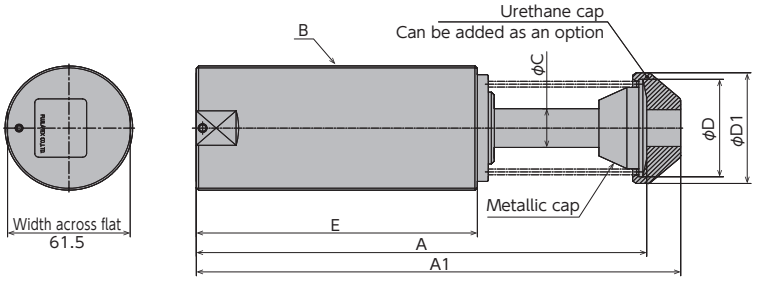
Soft Absorber

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	ϕD1	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

FK - 64 50 M - C

- With/Without cap: C : With cap
- Performance classification: H : For high speed (Impact rate 0.3～3m/s)
  M : For medium speed (Impact rate 0.3～2m/s)
  L : For low speed (Impact rate 0.3～1m/s)
- Stroke (indicated in mm)
- External screw size (indicated in mm)
- Series name

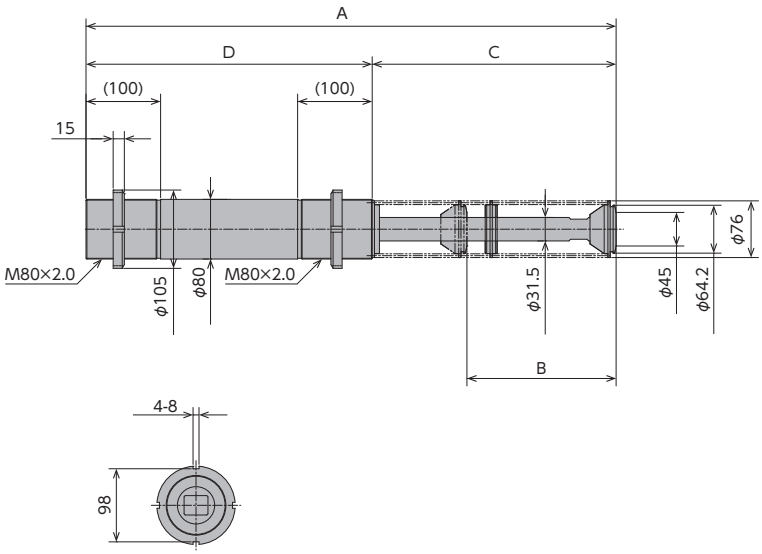
Soft Absorber

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)	Rarge of impact rate m/s	Max. drag N(kgf)	Max. absorption energy per minute J/min	Max. cycle rate cycle/min	ecovering power of the piston rod N(kgf)	Operating temperature ℃	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

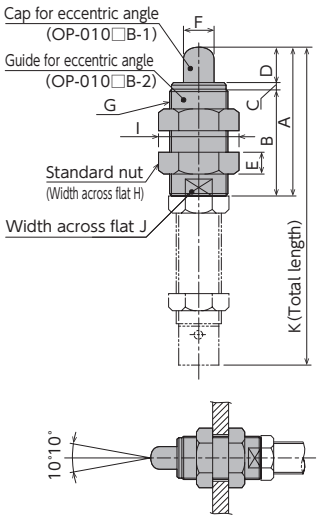
RoHS Compliant

●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



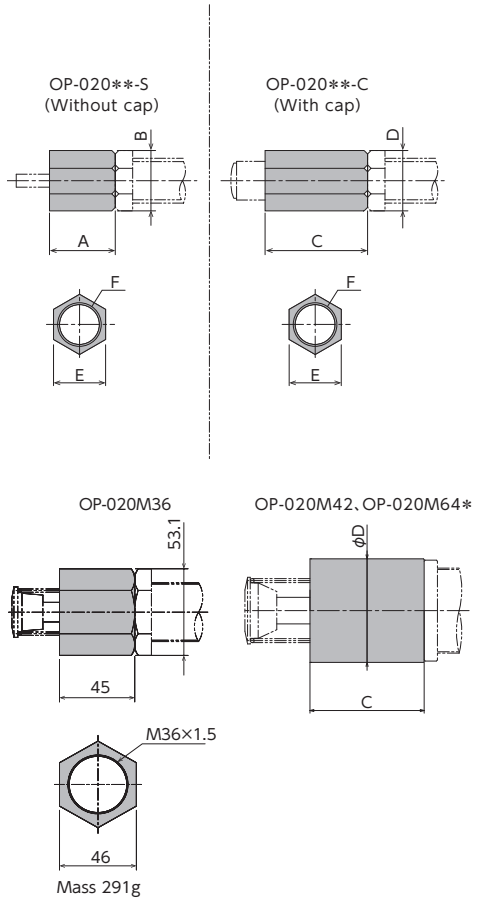
When attaching the eccentric angle adaptor, screw it into the main unit until the cap for eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.

* 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 OP-020□-S		With cap OP-020□-C		Common dimensions		Mass g	
	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

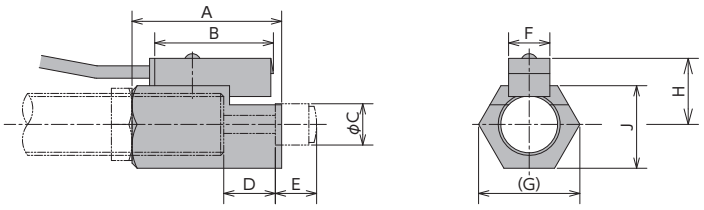
●Products specification might be changed without notice.

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
	入Input/Output circuit diagram +V (Brown) Load Main circuit 12～24V DC±10% Output (Black) 0 (Blue) Operation indicator light Red LED (lights up when the output is ON)	
Response frequency		500Hz
Ambient operating temperature		−25～70℃
Ambient storage temperature		−40～85℃
Ambient operating humidity		35～85%RH
Ambient storage humidity		35～95%RH
Lead wire length		Approximately 1m
Mass	Including cable	Approximately15g

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 ofelectric 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

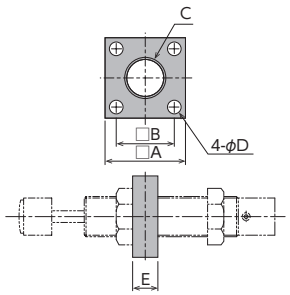
RoHS Compliant

●Products specification might be changed without notice.

Optional Parts

Flange OP-040

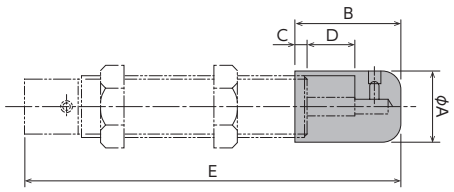
Model	A	B	C	D	E	Mass g
OP-040PB	25	18	M10×1	3.2	4	16
OP-040KB	25	18	M12×1	3.2	4	15
OP-040RB	34	24	M14×1.5	4.5	4	30
OP-040XB	34	24	M16×1.5	4.5	4	29
OP-040EB	40	28	M20×1.5	6.5	12	109
OP-040GB	54	40	M25×1.5	9	12	206
OP-040FB	50	36	M27×1.5	9	12	157
OP-040TB	65	45	M30×1.5	11	14	344
OP-040UB	78	56	M36×1.5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



● This is a mounting fixture for soft absorbers.

Liquid-proof cap -060

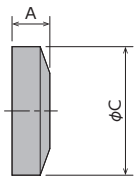
Model	A	B	C	D	E	Mass g
FK-1008□-C-060	13	18	3	8	55	10
FK-1210□-C-060	17	28	9.5	10	71.5	25
FK-1412□-C-060	19	30	9	12	78.5	31
FK-1612□-C-060	21	34	9.5	12	87.5	46
FK-2016□-C-060	24	35	4	16	108	59
FK-2530□-C-060	28	51	6.5	30	154.5	77
FK-2725□-C-060	30	50	5	25	137.5	112
FK-3035□-C-060	38	60	5	35	191.5	255



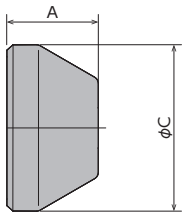
● The main unit is supplied in assembly
● □ will be filled in with either one of L, M, or H indicated in the catalog.
● Ideal for use in environments where oil splatter poses a problem.
● Ensure that the cap is facing upward. If the cap is facing sideways or downward, it cannot provide an effective means 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



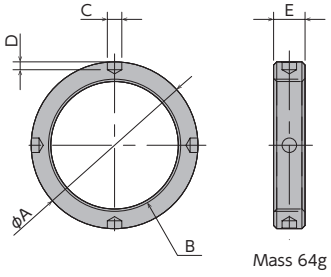
OP-090M36B



OP-090M42A
OP-090M64A

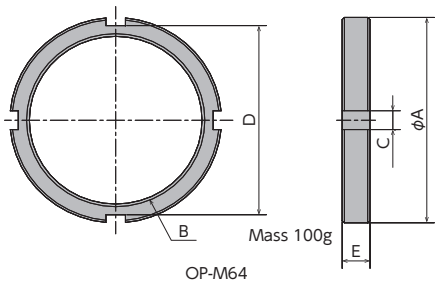
Nut

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



Mass 64g

OP-M42



Mass 100g

OP-M64

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)	Rarge 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 ℃	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

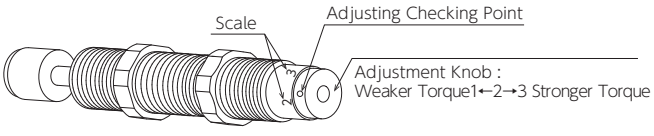
FL - 16 20 H - C

- With/Without cap S : Without cap / C : With cap
- Performance classification H : For high speed (Impact rate 0.3～3m/s)
- Stroke (indicated in mm)
- External screw size (indicated in mm)
- Series name

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: ±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 the attached hex wrench.

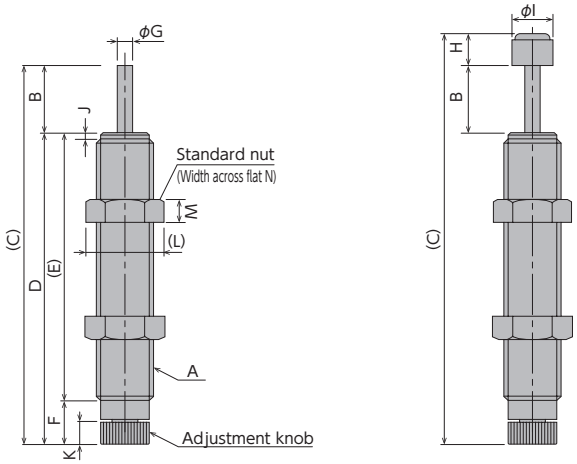
Soft Absorber

Fixed Type | Adjustable type | Self-adjusting

FL Series

RoHS Compliant

●Products specification might be changed without notice.



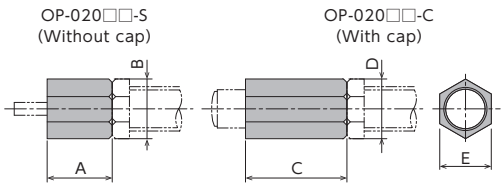
Dimensions

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				
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

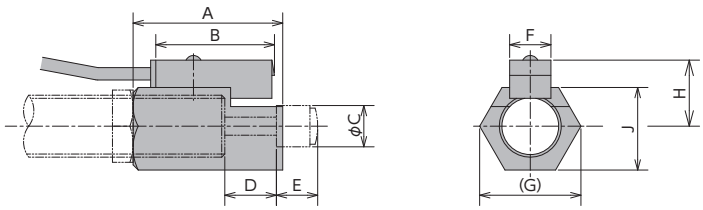


● Adjust so that it stops 1mm before thestroke end, and fasten with the main unit's nut until secured.
Note) When attaching, make sure that the side without a bearing chamfer is the impact surface.

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 ℃	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

FW - 12 12 L - C

- With/Without cap: S : Without cap; C : With cap
- Performance classification: L : For low speed (Impact rate 0.3～1m/s); M : For medium speed (Impact rate 0.3～2m/s)
- Stroke (indicated in mm)
- External screw size (indicated in mm)
- Series name

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: ±2.5°C)
* Ensure that an external stopper is also used.

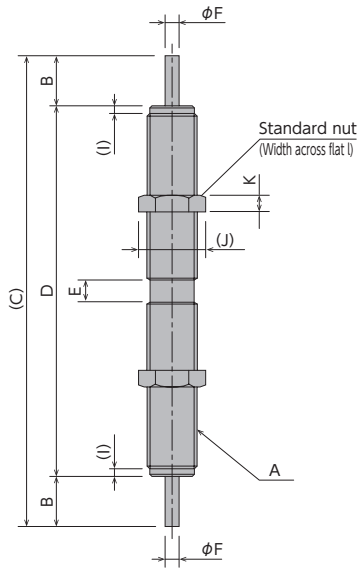
Soft Absorber

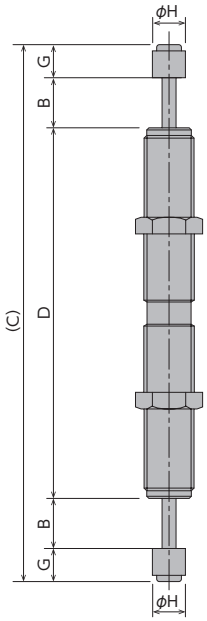
Double Direction Type | Multiple-orifice type
Fixed Type | Adjustable type | Self-adjusting

FW Series (M12～M25)

RoHS Compliant

●Products specification might be changed without notice.





Dimensions

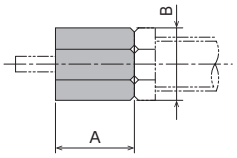
Model	A	B	C	D	E	ϕF	G	ϕH	I	J	K	L
FW-1212L-C	M12×1.0	12	130	90	5	3.5	8	8	2	16.2	4	14
FW-1616M-S	M16×1.5	16	134	102	–	5	–	–	6	21.9	6	19
FW-1616M-C			164				15	13.5	6			
FW-2025M-S	M20×1.5	25	170	120	–	6	–	–	6	27.7	8	24
FW-2025M-C			204				17	18	6			
FW-2530M-S	M25×1.5	30	205	145	–	8	–	–	6	37	10	32
FW-2530M-C			241				18	22	6			

Optional Parts

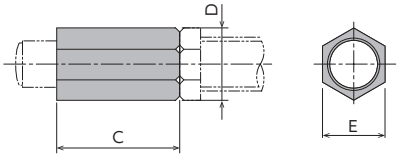
Stopper nut OP-020 ** - □

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

OP-020**-S
(Without cap)



OP-020**-C
(With cap)



● Adjust so that it stops 1mm before thestroke 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

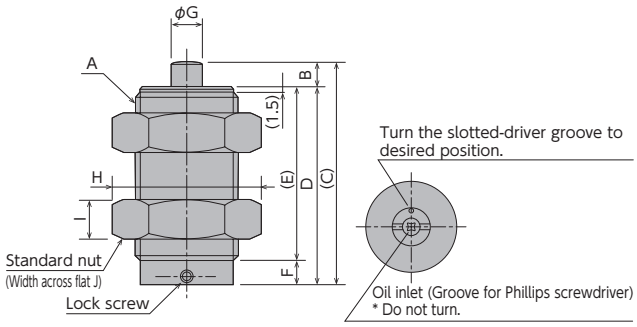
Soft Absorber

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 ℃	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

FS - 20 06 L - S

- With/Without cap — S : Without cap
- Performance classification — L : For low speed (Impact rate 0.3 ~1m/s)
- Stroke — (indicated in mm)
- External screw size — (indicated in mm)
- Series name

Precautions for Use

* Do not use this product without carefully reading the attached own' se rmanual.
* 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: ±2.5°)
* 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

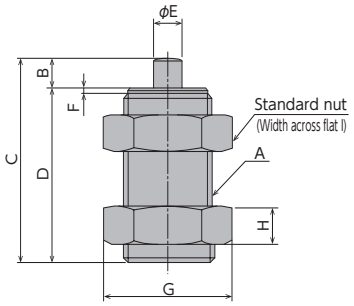
Soft Absorber

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 ℃	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

FV - 20 08 L - S

- With/Without cap S : Without cap
- Performance classification L : For low speed (Impact rate 0.3～1m/s)
- Stroke (indicated in mm)
- External screw size (indicated in mm)
- Series name

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.

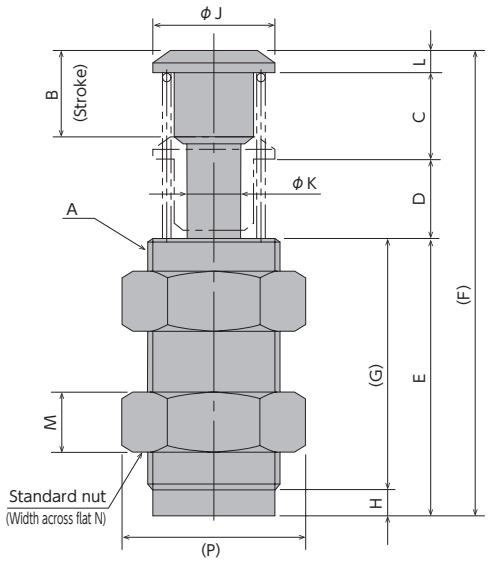
Applicable model	Model
FV-1406L	M14 nut
FV-1606L	M16 nut
FV-2008L	M20 nut
FV-2508L	M25 nut
FV-2708L	M27 nut

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 ℃	Mass g 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

Multiple-Orifice (M12 is Single-Orifice)
Fixed Type Adjustable type Self-adjusting

FSB Series (M12、M14、M16)

RoHS Compliant

●Products specification might be changed without notice.

Characteristics

- High functionality stopper bolt (with an implemented absorber)
- Easy to mount external geometry

Material	Main unit	SUM
	Cap	Polyacetal
Surface treatment	Main unit	Nitriding treatment

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 ℃	Mass g
FSB-1205-C	5	0.68 (0.07)	5 (5)	0.3～1.0	588 (60)	45	65 (6.63)	4.9 or lower (0.5)	−5～70	40
FSB-1407-C	7	2.5 (0.25)	20 (20)		1,078 (110)	60	120 (12.2)	4.9 or lower (0.5)		70
FSB-1609-C	9	6 (0.61)	50 (50)		1,960 (200)	60	200 (20.4)	9.8 or lower (1.0)		115

Key to Model Number

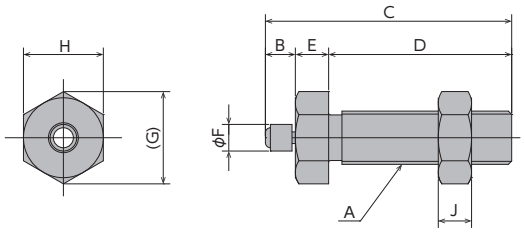
FSB - **16** **09** - **C**

- C : With cap — With/Without cap
- (indicated in mm) — Stroke
- (indicated in mm) — External screw size
- Series name

Dimensions

Model	A	B	C	D	E	F	G	H	J
FSB-1205-C	M12×1.75	5	43	30	8	6	21.9	19	7
FSB-1407-C	M14×2	7	56	40	9	6	25.4	22	8
FSB-1609-C	M16×2	9	74	55	10	8	27.7	24	10

● The thread pitch is different from other absorbers.



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.)
* 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°)
* Do not over-tighten the main unit and nuts. Please use the tightening torque as listed in the owner's manual.
* Due to the structure of this product, using the absorber (piston rod side) in an upright position in a dusty environment causes the dust to collect on the absorber, which may affect the durability.

Standard nuts are sold separately as well.

Applicable model	Model
FSB-1205	FSB-1205 nut
FSB-1407	FSB-1407 nut
FSB-1609	FSB-1609 nut

Soft Absorber

FES Series

Type Descriptions

F E S − 12 15

① ② ③

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

Product Description

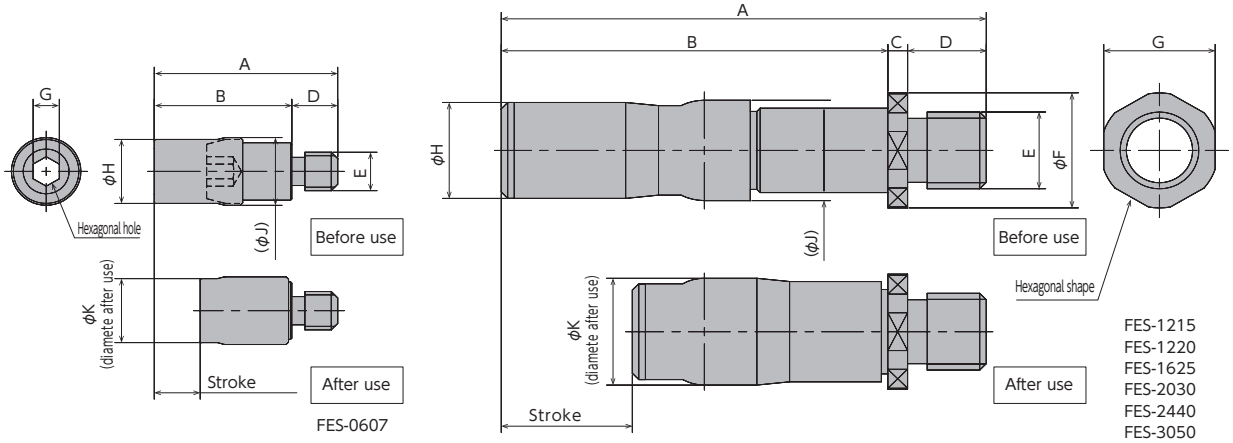
The emergency stopper, available for only one-time use, is designed to urgently stop in runway of the devices with an linear motor or servomotor.
Absorbs the energy using the plastic deformation of metal. Differs from the general hydraulic pressure shock absorber, impervious to an oil leak.
Designed 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 ℃	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



Selection Method

1. Based on the equations for the selection, please calculate the kinetic energy (E1) of the application to be used and tentatively select the model with grater maximum absorption energy than the calculated energy value.

* According to the expected number of units to be used (n), multiply the maximum absorption energy by n.

↓

2. Calculate the stroke of the tentatively selected model (St) based on the stroke equations and the table of coefficient for each model, and calculate the thrusting energy (E2) using the equations for the selection.

↓

3. Confirm that the total energy (E) and stroke (St) calculated above meet the specifications of the tentatively selected model. When the specifications are met, the selection is complete. If not, please calculate again with another model with greater maximum absorption energy.

Equations for the Selection

With thrust (horizontal)

$$E_1=\frac{1}{2}MV^2 \qquad E_2=F\times St$$

$$St=\frac{1}{2}MV^2\times\frac{1}{((\text{max. drag}\times n\times\text{coefficient})-F}$$

$$E=E_1+E_2$$

Without thrust (horizontal)

$$E_1=\frac{1}{2}MV^2$$

$$E=E_1$$

You can calculate the approximate stroke using the equations below (no need to use the equation of E2 = F × St).

$$St=\frac{1}{2}MV^2\times\frac{1}{\text{max. drag}\times n\times\text{coefficient}}$$

For free fall

$$E_1=M\cdot g\cdot H \qquad E_2=M\cdot g\cdot St$$

$$St=\frac{1}{2}MV^2\times\frac{1}{(\text{max. drag}\times n\times\text{coefficient})-(M\times g)}$$

$$E=E_1+E_2$$

Equations to calculate a stroke

Equations to calculate St (stroke) of E2=F×St

$$St=\frac{1}{2}MV^2\times\frac{1}{\text{max. drag}\times n\times\text{coefficient}-F}$$

(max. drag: Thrust; n: Number of FES)

Table of coefficient for each model

Model	Stroke mm	Max. absorption energy J	Max. drag N	Coefficient
FES−0607	7	7	2,500	0.5
FES−1215	15	45	6,500	0.7
FES−1220	20	80	8,500	0.7
FES−1625	25	160	9,500	0.7
FES−2030	30	450	27,000	0.6
FES−2440	40	1,000	45,000	0.7
FES−3050	50	1,800	60,000	0.7

Product Characteristics

* Excellent absorption characteristic
* Compact with large absorption capacity
* Usable without an external stopper
* Maintenance-free
* Little changes in the characteristics with operating temperature

How to Mount

Tightening torque when attaching N·m (kg·f m)	
FES-0607	9(0.9)
FES-1215	61.4(6.26)
FES-1220	66.5(6.78)
FES-1625	107(10.9)
FES-2030	315(32.1)
FES-2440	564(57.6)
FES-3050	1,125(114.7)

* Attach the product with tightening torque above using the hexagonal part of the main unit.
* Using another part to attach the product causes insufficient tightening or damage.
* When using in a place where vibration easily causes loosening, take measures so that loosening does not occur.

FES-0607		
Material	SUS	
Surface treatment	Main unit	Bright quenching

FES-1215、1220、1625、2030、2440、3050		
Material	Carbon steel	
Surface treatment	Cap	Galvanized
	Main unit	Nitriding treatment

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 catalog.)
* 2 or more of this product can be used in parallel.
* Ensure that an eccentric load is not applied to the product.
* You can use the product only once. Not available repeatedly.

2

Rotary Damper

A rotary type damper utilizing oil viscosity resistance or hydraulic resistance
Provides a soft opening/closing action of doors and lids and creates a touch of quality
for furniture, automotive interiors, and equipment.

Read these instructions before use

This owner's manual contains various safety cautions regarding the proper handling of this product, and preventing danger to the operator as well as damage to the plant and the machine. Please read this manual thoroughly 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.

A person who designs the equipment or determines the specification shall determine the compatibility of a rotary damper.

● A person who designs the equipment or determines the specification shall determine the compatibility of a rotary damper with the equipment as necessary after carrying out a performance verification and a life test because there are a variety of conditions for applications.

Please do not use outside the specification range of a rotary damper.

● Any use outside the specification range will cause a malfunction or damage to product.

Enforcement of safety measures for applications as follows

● Please enforce a safety measure when using in the conditions and environments listed below, and consult our company beforehand for determining the adequacy of use.

1) The use in such places as an environment outside the specification not clarified in the catalogs or owner's manuals, outdoors or direct sunlight
2) The use for those devices and applications such as nuclear power equipment, the devices directly or indirectly related with the services of railroad, boats and ships and the running of vehicles, aerospace devices, military devices, medical devices, devices contacting with beverages and foods, combustion equipment, amusement devices influencing human or property, emergency shut down circuit, press devices, etc., a serious influence on humans or property is anticipated and special safety is requested.

Do not throw into an open flame

● Throwing into an open flame poses a risk of injury by explosion or ignition of encapsulated oil.

⚠ Caution

Definifinition 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 load torque x safety factor

Do not operate without an external stopper

●Use within the damper's range of operating angle. Do not use the damper itself as a stopper by setting the rotational limit position of the rotating shaft as the resting position of the rotating object. Using the damper itself as a stopper may damage the damper and consequently damage the main machine, and it may also result in injuries.

●Set the external stopper to the operating angle before use.

Do not use when the maximum operating torque is exceeded

●Using this product beyond the maximum operating torque may cause an oil leak, reduced durability, and damage to the shaft This may damage the damper and consequently damage the main machine, and it may also result in injuries. Do not exceed the maximum operating torque when using this product.

Do not operate outside the operating temperature range

●Using this product outside the operating temperature range may cause an oil leak and torque problems. Use this product within the operating temperature range.

Usage enviornment

●This product cannot be used in a vaccum or under high pressure, as this will cause damage to the main machine.

●Do not use in an environment where chips, cutting oil, water, etc. can come in contact with the linear damper. This will result in a malfunction due to an oil leak caused by damage.

Do not discard oil more than is necesssary

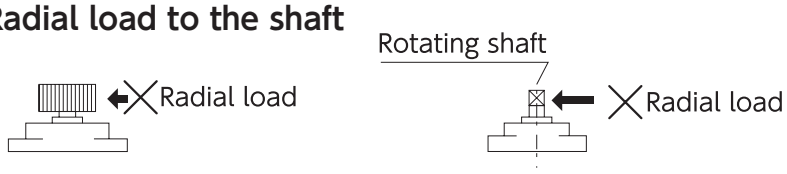
●Discarding the oil contained in dampers more than is necessary will pollute the environment.

●Dispose the oil according to laws concerning waste management and cleaning.

Remodeling of the product is prohibited

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

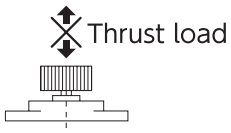
Radial load to the shaft



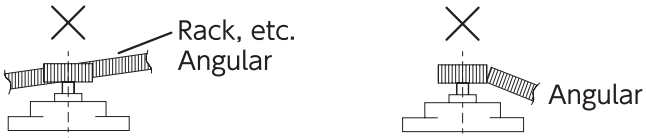
●Applying load to the rotating shaft (gear) in a radial direction may cause an oil leak, torque problems, and damage to the shaft (or to the gear if the gear is used).

Thrust load to the shaft

●Applying load to the rotating shaft (gear) in a thrust direction may cause an oil leak, torque problems, and damage to the main unit (or to the gear, or cause the gear to become disengaged, if the gear is used).



★ When assembling, attach the damper's gear to the opposing arm (gear) as parallel as possible.



Using the product above its maximum rotations

●Using this product above its maximum rotations may cause an oil leak, torque problems, and damage to the rotating shaft.
★ Please refer to the catalogue for the product's maximum rotations.
(*If you are going to exceed the maximum rotations when using this product, please contact our sales department.)

Using the product outside its operating temperature range

●Using this product outside the operating temperature range may cause an oil leak and torque problems.
★ Please refer to the catalogue for the product's operating temperature range.
(*If you are going to use this product outside its operating temperature range, please contact our sales department.)

Using the product above its maximum cycles

●Using this product above its maximum cycles may cause torque down and an oil leak.
★ Please refer to the catalogue for the product's maximum cycles.
(*If you are going to exceed the maximum rotations when using this product, please contact our sales department.)

Over-tightening of mounting screws

●Over-tightening the mounting screws when installing a rotary damper may cause damage to the main unit.
★ Based on the types and sizes of the screws used, please apply an appropriate tightening torque to tighten the screws.

Disposal

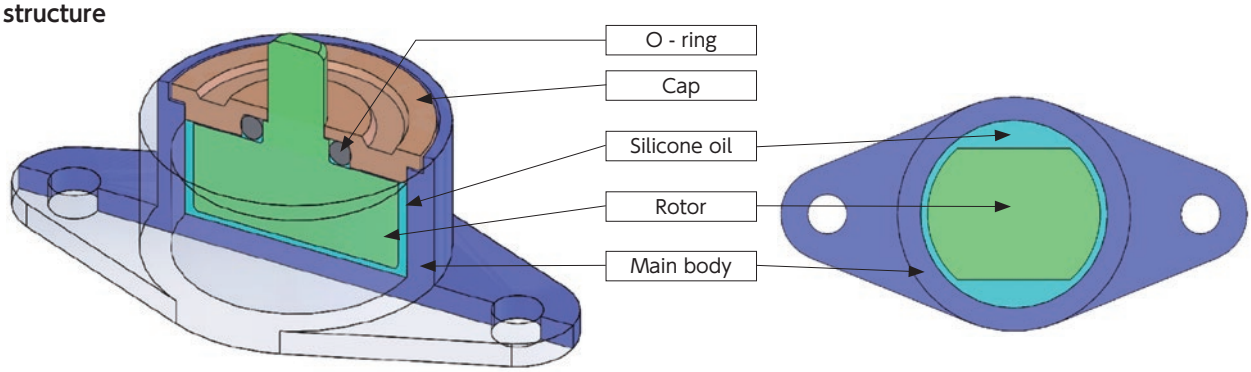
● When a rotary damper is no more necessary, please take a proper disposal procedure in accordance with the local ordinance, rules, etc. as an industrial waste.

Fuji Latex is not responsible for any secondary accidents caused by a rotary damper. The user should implement preventative measures against such secondary accidents.

Basic Structure and Principle

1. Rotary Damper

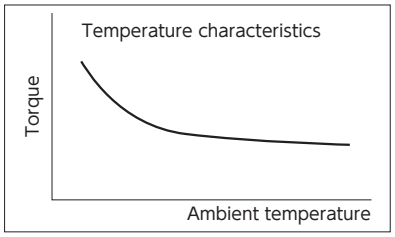
Basic structure



This is a rotary damper that utilizes the braking force generated by the oil's viscosity resistence. The braking force generated by oil viscosity, clearance between the rotor and the main body, and the oil's contact area varies based on the structure shown above.

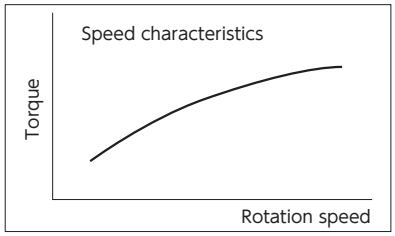
1−1) Temperature characteristics

The torque of a rotary damper varies according to the ambient temperature. This is because the viscosity of the oil inside the damper changes according to the temperature.



1−2) Speed characteristics

The braking torque of a rotary damper varies according to the cycle rate. In general, the torque increases when the cycle rate increases, and the torque decreases when the cycle rate decreases. The rated torque listed in the catalogue is the torque generated when the cycle rate is 20rpm.

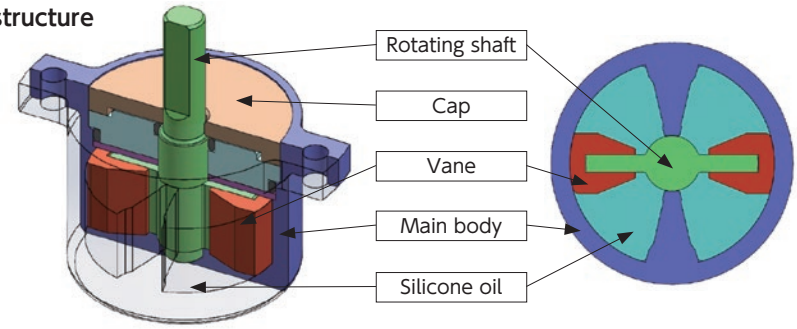


1-3) Direction of Torque Generation

The torque is generated in both directions in principle, but one-way rotary dampers are available for some of the models with an implemented one-way clutch

2. Vane Damper

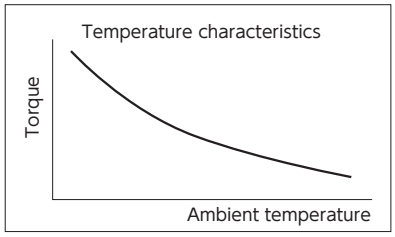
Basic structure

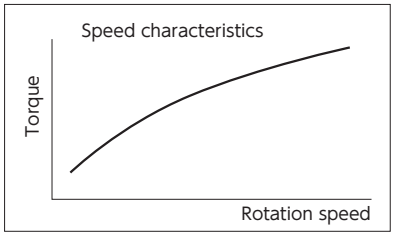


This is a rotating-type damper that utilizes the oil pressure. The braking force generated by oil viscosity, clearance between the rotor and the main body, and the vane's pressure-receiving area varies based on the structure shown above.

Basic characteristics

Similar to the rotary damper, the torque varies according to the ambient temperature. Its basic structure is a dashpot structure (single orifice). The internal pressure of a damper increases as the ratation speed increases, which consequently increases the torque.





Selection / Key to Model Number

Selection of Rotary Damper and Vane Damper

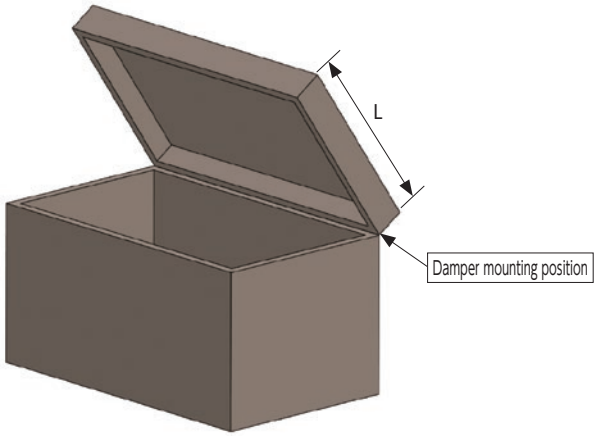
1) If the rotating shaft and the damper's axis are directly connected, the approximate torque can be calculated based on the following equation if the lid size and the weight are known.

Torque $T = M \times 9.8 \times \frac{L}{2}$ (N·m)

M : Weight of the lid (kg)

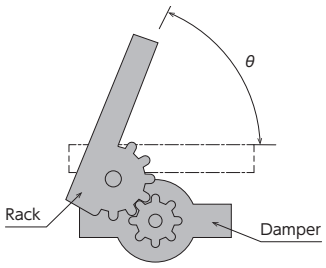
L : Dimensions of the lid (m)

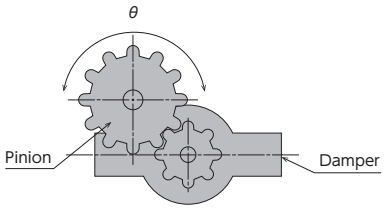
($\frac{L}{2}$ is assumed as the lid gravity center position)



Using the above equation, determine the maximum torque generaged immediately prior to the closing of the lid. Use a prototype to confirm its performance in an actual machine, and determine the torque required. Fine adjustment of the torque can be done by varying the viscosity of the oil inside the damper.

2) If the damper's rotating shaft and the lid's rotating shaft are connected by a lever or a gear, the results of the aforementioned torque calculation will vary according to the lever ratio or gear ratio.





There is no exact method for determining whether a damper is suitable for the application or not. In the event that closing time is chosen as a factor, an apparent damper effect can be observed if it takes 2 seconds or longer for the lid to fully close after it is allowed to free-fall from a 60° angle. However, it is ultimately up to the user as to whether the damper is suitable for the application or not.

Key to Model Number

<Rotary damper, Disc damper

FRN–F2–R 203 G □

- Series name: FRT : Bi-directional rotary damper / FRN : Uni-directional rotary damper / FDT : Bi-directional disc damper / FDN : Uni-directional disc damper
- Model name
- Damping direction: R : Torque is generated in a clockwise direction / L : Torque is generated in a counter-clockwise direction
- Torque: The last digit indicates the power, and the torque is expressed as below. 203=20×10³ =20,000gf·cm =2N·m(20Kgf·cm)
- With or without gear: G : With gear, Blank : without gear
- Gear specification

Vane Damper

FYN–H1–R 104

- Series name: FYT : Bi-directional vane damper / FYN : Uni-directional vane damper
- Model name
- Damping direction: R : Torque is generated in a clockwise direction / L : Torque is generated in a counter-clockwise direction
- Torque: The last digit indicates the power, and the torque is expressed as below. 104=10×10⁴ =100,000gf·cm =10N·m(100kgf·cm)

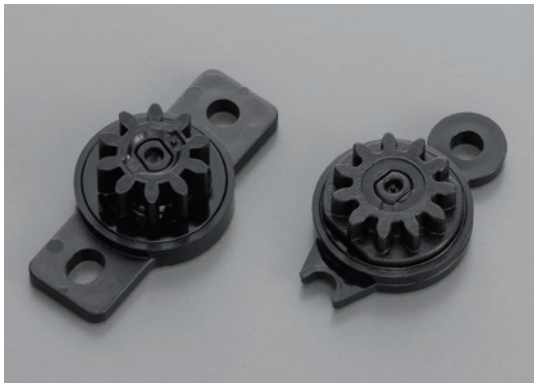
Rotary Damper

Bi-Directional | Uni-Directional
Fixed Type | Adjustable type | Self-adjusting

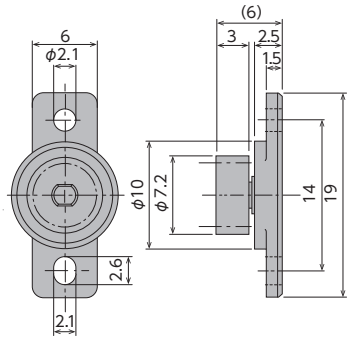
FRT-E2/E9 Series

RoHS Compliant

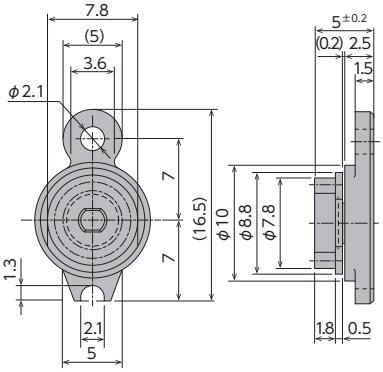
●Products specification might be changed without notice.



〈FRT-E2-※※※G1〉



〈FRT-E9-※※※G2〉



Specifications

Model	Rated torque
FRT-E2-100G1	(1±0.5)×10^{-3}N·m
FRT-E9-100G2	10±5 gf·cm
FRT-E2-200G1	(2±0.7)×10^{-3}N·m
FRT-E9-200G2	20±7 gf·cm
FRT-E2-300G1	(3±0.8)×10^{-3}N·m
FRT-E9-300G2	30±8 gf·cm
FRT-E2-400G1	(4±1)×10^{-3}N·m
FRT-E9-400G2	40±10 gf·cm

Note 1) Rated torque measured at a rotation speed of 20rpm at 23˚C
Note 2) Gear model number has G1 and G2 at the end

- ∗ Max. rotation speed 50rpm
- ∗ Max. cycle rate 10cycle/min
- ∗ Operating temperature 0～50℃
- ∗ Weight FRT-E2 : with gear : 0.41g
  FRT-E9 : with gear : 0.38g
- ∗ Body and cap material Polycarbonate (PC)
- ∗ Rotating shaft material Polyacetal (POM)
- ∗ Gear material Polyacetal (POM)
- ∗ Oil type Silicone oil

Note 3) Torque can be customized by changing the oil viscosity (see Customizable Torque Chart on page 178)
Note 4) Model E9 is a customized product with a one-sided mounting

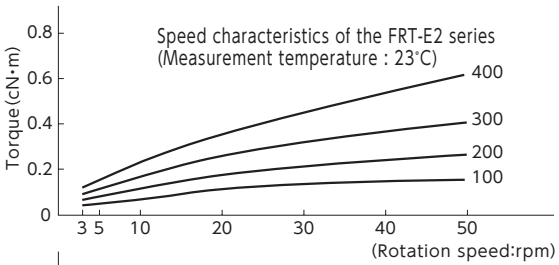
Gear Specifications

Model	G1 (for E2)	G2 (for E9)
Type	Standard spur gear	Standard spur gear
Tooth profile	Involute	
Module	0.6	
Pressure angle	20˚	
Number of teeth	10	11
Pitch circle diameter	φ6	φ6.6

Damper Characteristics

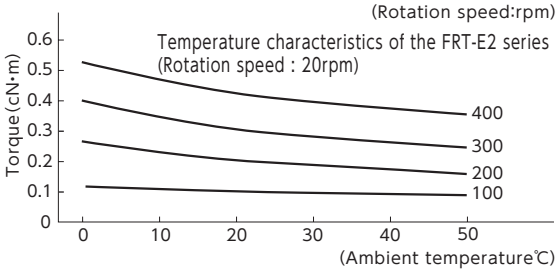
1. Speed characteristics

A rotary damper's torque varies according to the rotation speed. In general, as shown in the graph to the right, the torque increases as the rotation speed increases, and the torque decreases as the rotation speed decreases. In addition, please note that the starting torque slightly differs from the rated torque.



2. Temperature characteristics

A rotary damper's torque varies according to the ambient temperature. In addition, as shown in the graph to the right, the torque decreases as the ambient temperature increases, and the torque increases as the ambient temperature decreases. This is because the viscosity of the silicone oil inside the damper varies according to the temperature. When the temperature returns to normal, the torque will return to normal as well.



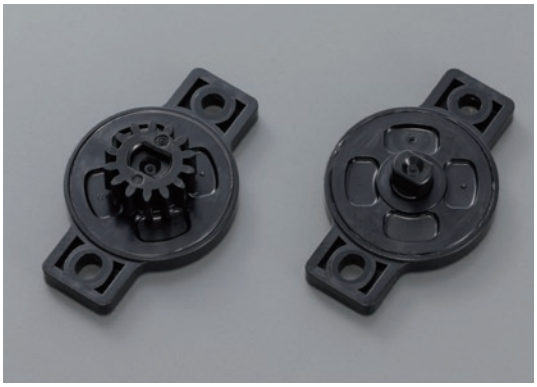
Rotary Damper

Bi-Directional | Uni-Directional
Fixed Type | Adjustable type | Self-adjusting

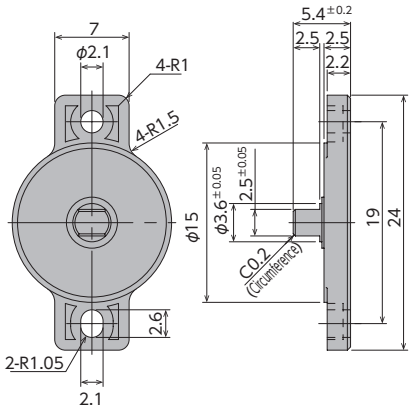
FRT-G2 Series

RoHS Compliant

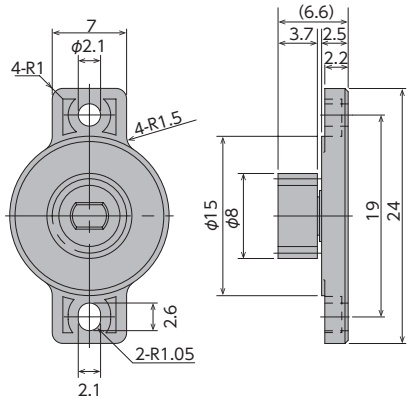
●Products specification might be changed without notice.



〈FRT-G2-※※※〉



〈FRT-G2-※※※G※〉



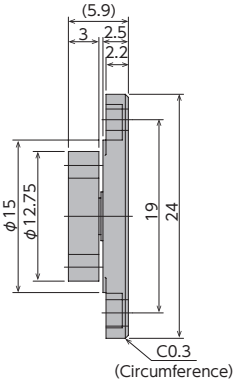
Specifications

Model	Rated torque
FRT-G2-200(G*)	(2±0.7)×10^{-3}N·m 20±7 gf·cm
FRT-G2-300(G*)	(3±0.8)×10^{-3}N·m 30±8 gf·cm
FRT-G2-450(G*)	(4.5±1)×10^{-3}N·m 45±10 gf·cm
FRT-G2-600(G*)	(6±1.2)×10^{-3}N·m 60±12 gf·cm
FRT-G2-101(G*)	(10±2)×10^{-3}N·m 100±20 gf·cm

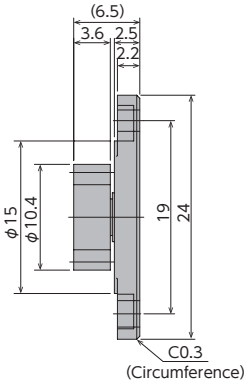
Note 1) Rated torque measured at a rotation speed of 20rpm at 23°C
Note 2) Models with gear bears G1, G2, or G3 at the end of their model numbers
Note 3) Torque can be customized by changing the oil viscosity (see Customizable Torque Chart on page 178)
Note 4) The diagrams above are outline drawings of FRT-G2-****. Please refer to the diagrams at the right for G2 and G3.

* Max. rotation speed 50rpm
* Max. cycle rate 10cycle/min
* Operating temperature 0～50℃
* Weight 0.6g(with gear : G1 : 0.8g G2 : 1.0g G3 : 0.9g)
* Body and cap material Polycarbonate (PC)
* Rotating shaft material Polyacetal (POM)
* Gear material Polyacetal (POM)
* Oil type Silicone oil

〈FRT-G2-※※※G2〉



〈FRT-G2-※※※G3〉



Gear Specifications

	G1	G2	G3
Type	Standard spur gear	Profile shifted spur gear	Standard spur gear
Tooth profile	Involute		
Module	0.5	1.0	0.8
Pressure angle	20°		
Number of teeth	14	10	11
Pitch circle diameter	φ7	φ10	φ8.8
Addendum modification	–	+0.375	–

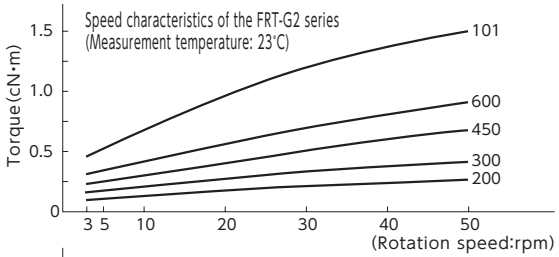
Damper Characteristics

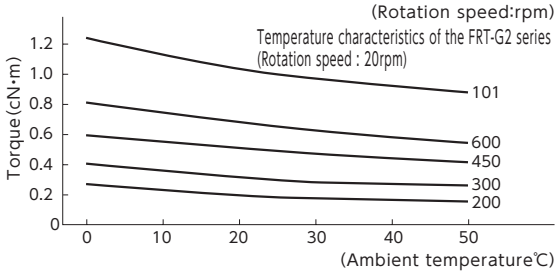
1. Speed characteristics

A rotary damper's torque varies according to the rotation speed. In general, as shown in the graph to the right, the torque increases as the rotation speed increases, and the torque decreases as the rotation speed decreases. In addition, please note that the starting torque slightly differs from the rated torque.

2. Temperature characteristics

A rotary damper's torque varies according to the ambient temperature. In addition, as shown in the graph to the right, the torque decreases as the ambient temperature increases, and the torque increases as the ambient temperature decreases. This is because the viscosity of the silicone oil inside the damper varies according to the temperature. When the temperature returns to normal, the torque will return to normal as well.





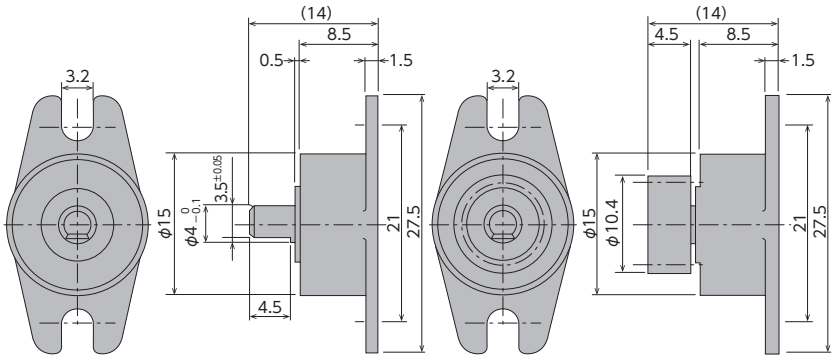
Rotary Damper

Bi-Directional Uni-Directional
Fixed Type Adjustable type Self-adjusting

FRT/FRN-C2 Series

RoHS Compliant

●Products specification might be changed without notice.



Specifications

Model	Rated torque	Damping direction
FRT-C2-201 (G1)	(20±6)×10^{-3}N·m 200±60 gf·cm	Both directions
FRT-C2-301 (G1)	(30±8)×10^{-3}N·m 300±80 gf·cm	Both directions
FRN-C2-R301 (G1)	(30±8)×10^{-3}N·m 300±80 gf·cm	Clockwise
FRN-C2-L301 (G1)		Counter-clockwise

Note 1) Rated torque measured at a rotation speed of 20rpm at 23°C
Note 2) Gear model number has G1 at the end
Note 3) Torque can be customized by changing the oil viscosity (see Customizable Torque Chart on page 178)
● There are dampers that generate torque in both directions and one-way torque in the CW direction or CCW direction when the rotating axle is viewed from the top.

∗ Max. rotation speed	50rpm
∗ Max. cycle rate	10cycle /min
∗ Operating temperature	0 ~50℃
∗ Weight	FRT-C2 : 2.1g (with gear : 2.4g)
	FRN-C2 : 3.2g (with gear : 3.5g)
∗ Body and cap material	Polycarbonate (PC)
∗ Rotating shaft material	Polyacetal (POM)
	metal (FRT: POM, FRN: SUS)
∗ Gear material	Polyacetal (POM)
∗ Oil type	Silicone oil

Gear Specifications

Type	Profile shifted spur gear
Tooth profile	Involute
Module	0.8
Pressure angle	20°
Number of teeth	11
Pitch circle diameter	φ8.8

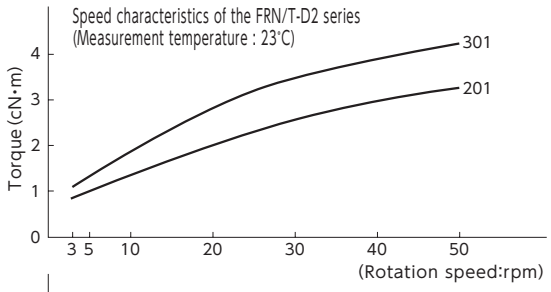
Damper Characteristics

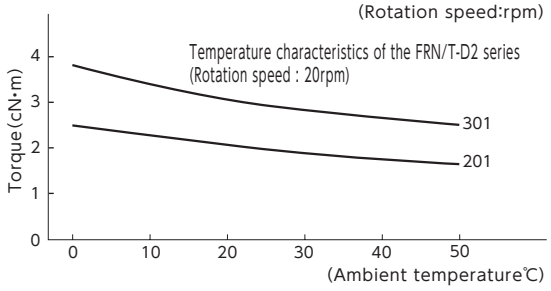
1. Speed characteristics

A rotary damper's torque varies according to the rotation speed. In general, as shown in the graph to the right, the torque increases as the rotation speed increases, and the torque decreases as the rotation speed decreases. In addition, please note that the starting torque slightly differs from the rated torque.

2. Temperature characteristics

A rotary damper's torque varies according to the ambient temperature. In addition, as shown in the graph to the right, the torque decreases as the ambient temperature increases, and the torque increases as the ambient temperature decreases. This is because the viscosity of the silicone oil inside the damper varies according to the temperature. When the temperature returns to normal, the torque will return to normal as well.





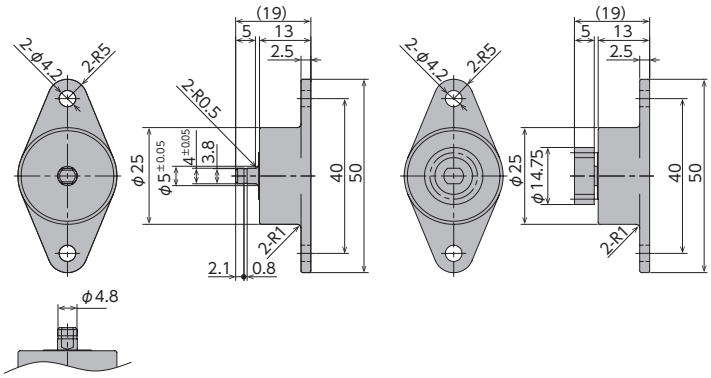
Rotary Damper

Bi-Directional | Uni-Directional
Fixed Type | Adjustable type | Self-adjusting

FRT/FRN-D3 Series

RoHS Compliant

●Products specification might be changed without notice.



Specifications

Model	Rated torque	Damping direction
FRT-D3-501(G1)	(50±10)×10⁻³N·m 500±100 gf·cm	Both directions
FRT-D3-102(G1)	(100±20)×10⁻³N·m 1,000±200 gf·cm	Both directions
FRT-D3-152(G1)	(150±30)×10⁻³N·m 1,500±300 gf·cm	Both directions
FRT-D3-202(G1)	(200±40)×10⁻³N·m 2,000±400 gf·cm	Both directions
FRT-D3-252(G1)	(250±50)×10⁻³N·m 2,500±500 gf·cm	Both directions
FRN-D3-R501(G1)	(50±10)×10⁻³N·m 500±100 gf·cm	Clockwise
FRN-D3-L501(G1)		Counter-clockwise
FRN-D3-R102(G1)	(100±20)×10⁻³N·m 1,000±200 gf·cm	Clockwise
FRN-D3-L102(G1)		Counter-clockwise
FRN-D3-R152(G1)	(150±30)×10⁻³N·m 1,500±300 gf·cm	Clockwise
FRN-D3-L152(G1)		Counter-clockwise
FRN-D3-R202(G1)	(200±40)×10⁻³N·m 2,000±400 gf·cm	Clockwise
FRN-D3-L202(G1)		Counter-clockwise
FRN-D3-R252(G1)	(250±50)×10⁻³N·m 2,500±500 gf·cm	Clockwise
FRN-D3-L252(G1)		Counter-clockwise

Note 1) Rated torque measured at a rotation speed of 20rpm at 23℃
Note 2) Gear model number has G1 at the end

* Max. rotation speed 50rpm
* Max. cycle rate 10cycle/min
* Operating temperature 0～50℃
* Weight FRT-D3 : 8.3g(with gear : 9g)
  FRN-D3 : 12.3g(with gear : 13g)
* Body and cap material * Oil type
* Rotating shaft material Polyacetal (POM)
  metal (FRN : SUS)
* Gear material Polyacetal (POM)
* Oil type Silicone oil
* Cap color FRT : Gray
  FRN(R) : Black
  FRN(L) : White

Gear Specifications

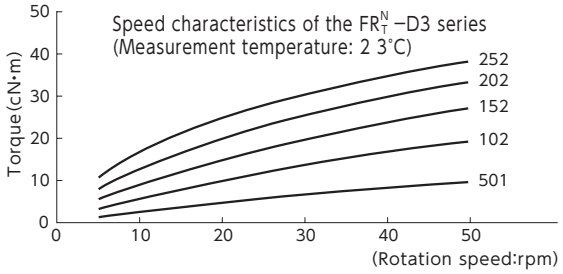
Type	Profile shifted spur gear
Tooth profile	Involute
Module	1.0
Pressure angle	20°
Number of teeth	12
Pitch circle diameter	φ12
Rack shift coefficient	+0.375

Note 3) Torque can be customized by changing the oil viscosity (see Customizable Torque Chart on page 178)
● There are dampers that generate torque in both directions and one-way torque in the CW direction or CCW direction when the rotating axle is viewed from the top.

Damper Characteristics

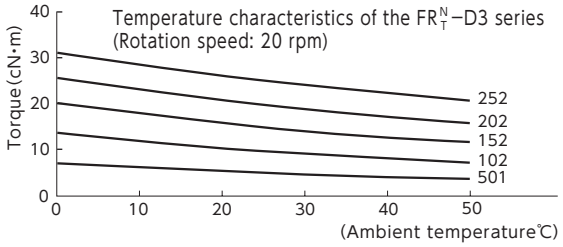
1. Speed characteristics

A rotary damper's torque varies according to the rotation speed. In general, as shown in the graph to the right, the torque increases as the rotation speed increases, and the torque decreases as the rotation speed decreases. In addition, please note that the starting torque slightly differs from the rated torque.



2. Temperature characteristics

A rotary damper's torque varies according to the ambient temperature. In addition, as shown in the graph to the right, the torque decreases as the ambient temperature increases, and the torque increases as the ambient temperature decreases. This is because the viscosity of the silicone oil inside the damper varies according to the temperature. When the temperature returns to normal, the torque will return to normal as well.



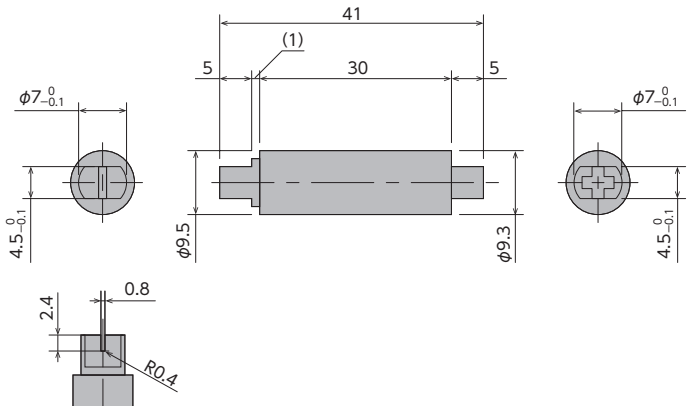
Rotary Damper

Bi-Directional | Uni-Directional
Fixed Type | Adjustable type | Self-adjusting

FRT-S1 Series

RoHS Compliant

●Products specification might be changed without notice.



Specifications

Model	Rated torque
FRT-S1-201	(20±6)×10^{-3}N·m 200±60 gf·cm
FRT-S1-301	(30±8)×10^{-3}N·m 300±80 gf·cm

Note 1) Rated torque measured at a rotational speed of 20 rpm at 23℃
Note 2) Torque can be customized by changing the oil viscosity.
(See Customizable Torque Chart on page 178.)

＊Max. rotational speed	50rpm
＊Max. cycle rate	10cycle /min
＊Operating temperature	0 ~50℃
＊Weight	3g
＊Main body material	Polyacetal(POM)
＊Rotating shaft material	Polyacetal(POM)
＊Oil type	Silicone oil

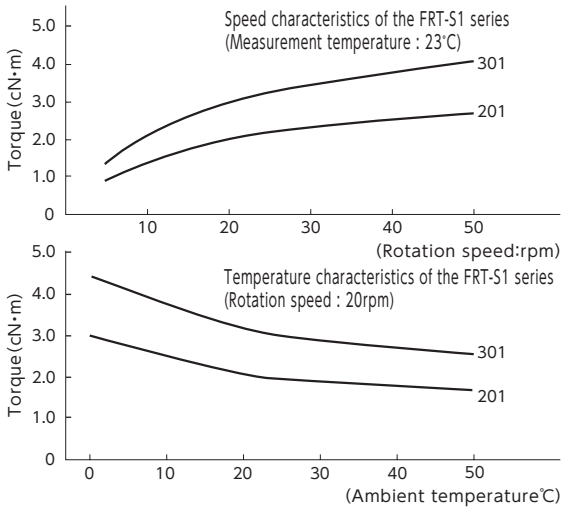
Damper Characteristics

1. Speed characteristics

A rotary damper's torque varies according to the rotation speed. In general, as shown in the graph to the right, the torque increases as the rotation speed increases, and the torque decreases as the rotation speed decreases. In addition, please note that the starting torque slightly differs from the rated torque.

2. Temperature characteristics

A rotary damper's torque varies according to the ambient temperature. In addition, as shown in the graph to the right, the torque decreases as the ambient temperature increases, and the torque increases as the ambient temperature decreases. This is because the viscosity of the silicone oil inside the damper varies according to the temperature. When the temperature returns to normal, the torque will return to normal as well.



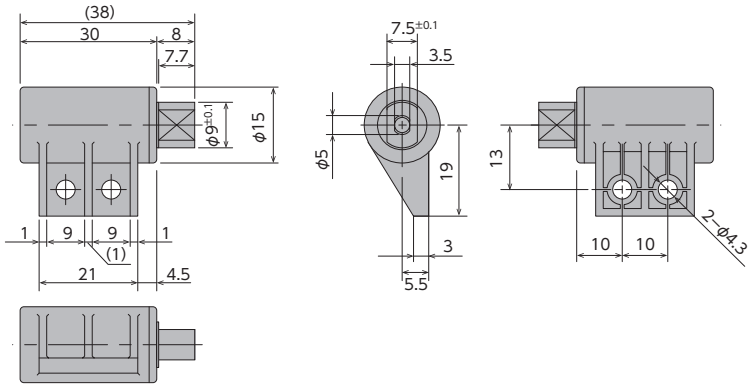
Rotary Damper

Bi-Directional | Uni-Directional
Fixed Type | Adjustable type | Self-adjusting

FRT-N1 Series

RoHS Compliant

●Products specification might be changed without notice.



Specifications

Model	Rated torque
FRT-N1-102	(100±20)×10^{-3}N·m 1,000±200 gf·cm
FRT-N1-182	(180±36)×10^{-3}N·m 1,800±360 gf·cm

Note 1) Rated torque measured at a rotational speed of 20 rpm at 23℃
Note 2) Torque can be customized by changing the oil viscosity.
(See Customizable Torque Chart on page 178.)

∗ Max. rotational speed	50rpm
∗ Max. cycle rate	10cycle /min
∗ Operating temperature	0 ~50℃
∗ Weight	8.2g
∗ Main body material	Polyacetal(POM)
∗ Cap material	Polyacetal(POM)
∗ Rotating shaft material	Polyacetal(POM)
∗ Oil type	Silicone oil

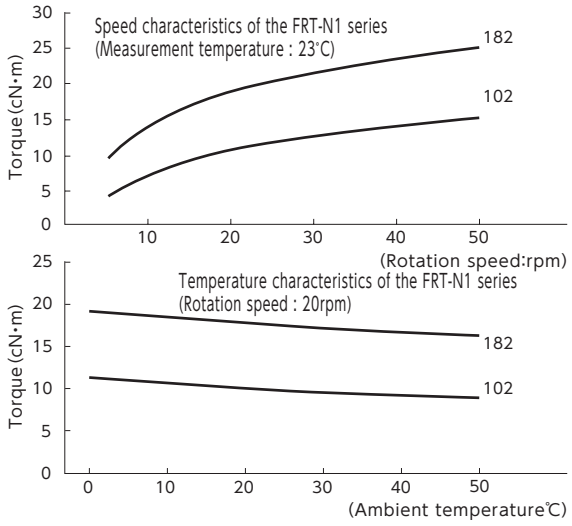
Damper Characteristics

1. Speed characteristics

A rotary damper's torque varies according to the rotation speed. In general, as shown in the graph to the right, the torque increases as the rotation speed increases, and the torque decreases as the rotation speed decreases. In addition, please note that the starting torque slightly differs from the rated torque.

2. Temperature characteristics

A rotary damper's torque varies according to the ambient temperature. In addition, as shown in the graph to the right, the torque decreases as the ambient temperature increases, and the torque increases as the ambient temperature decreases. This is because the viscosity of the silicone oil inside the damper varies according to the temperature. When the temperature returns to normal, the torque will return to normal as well.



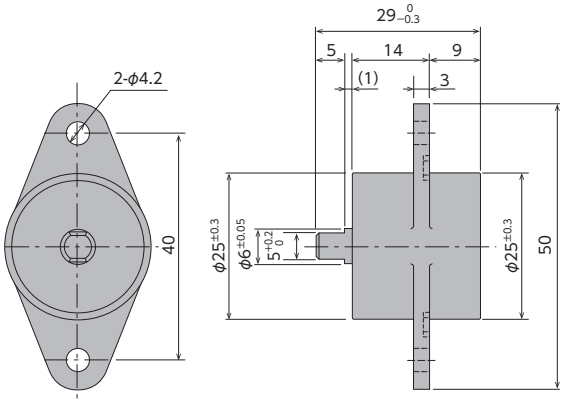
Rotary Damper

Bi-Directional | Uni-Directional
Fixed Type | Adjustable type | Self-adjusting

FRT-L1 Series

RoHS Compliant

●Products specification might be changed without notice.



Specifications

Model	Rated torque
FRT-L1-202	(200±40)×10⁻³N·m 2,000±400 gf·cm
FRT-L1-302	(300±60)×10⁻³N·m 3,000±600 gf·cm

Note 1) Rated torque measured at a rotational speed of 20 rpm at 23℃
Note 2) Torque can be customized by changing the oil viscosity.
(See Customizable Torque Chart on page 178.)

∗Max. rotational speed	50rpm
∗Max. cycle rate	10cycle/min
∗Operating temperature	0～50℃
∗Weight	14.1g
∗Main body material	Polycarbonate(PC)
∗Rotating shaft material	Polyacetal(POM)
∗Oil type	Silicone oil

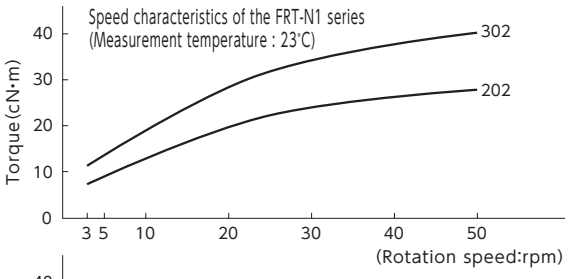
Damper Characteristics

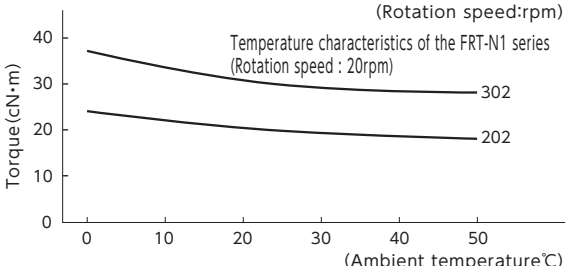
1. Speed characteristics

A rotary damper's torque varies according to the rotation speed. In general, as shown in the graph to the right, the torque increases as the rotation speed increases, and the torque decreases as the rotation speed decreases. In addition, please note that the starting torque slightly differs from the rated torque.

2. Temperature characteristics

A rotary damper's torque varies according to the ambient temperature. In addition, as shown in the graph to the right, the torque decreases as the ambient temperature increases, and the torque increases as the ambient temperature decreases. This is because the viscosity of the silicone oil inside the damper varies according to the temperature. When the temperature returns to normal, the torque will return to normal as well.





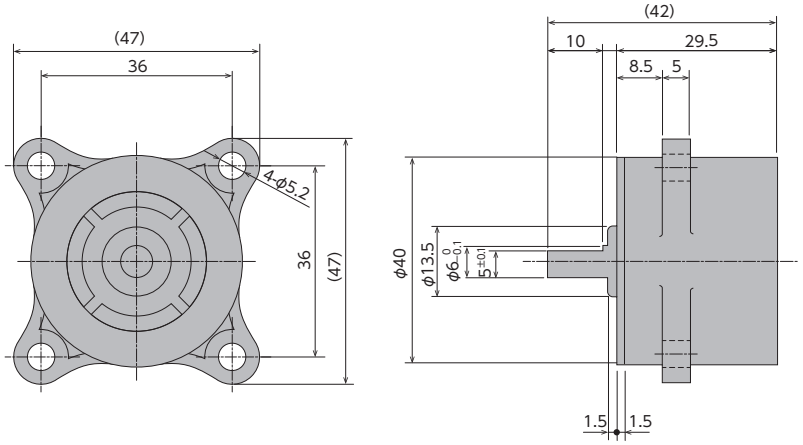
Rotary Damper

Bi-Directional | Uni-Directional
Fixed Type | Adjustable type | Self-adjusting

FRT/FRN-K2 Series

RoHS Compliant

●Products specification might be changed without notice.



Specifications

Model	Rated torque	Damping direction
FRT-K2-103	1±0.2 N·m (10±2 kgf·cm)	Both directions
FRN-K2-R103	1±0.2 N·m (10±2 kgf·cm)	Clockwise
FRN-K2-L103		Counter-clockwise

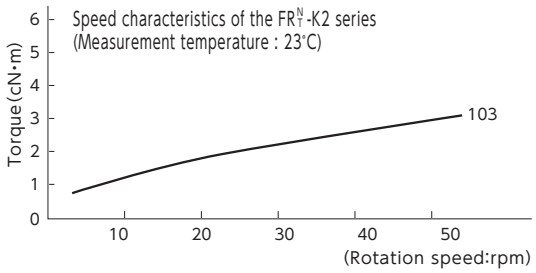
Note 1) Rated torque measured at a rotation speed of 20rpm at 23˚C
Note 2) Torque can be customized by changing the oil viscosity
(see Cutomizable Torque Chart on page 178)
Note 3) Dampers with gear can also be custom ordered.
● An FRT type damper generates torque in both directions and an FRN type generates one-way torque in the CW direction (R) or CCW direction (L) when the rotating axle is viewed from the top.

∗ Max. rotational speed	50rpm
∗ Max. cycle rate	10cycle /min
∗ Operating temperature	0 ~50℃
∗ Weight	FRT-K2 : 78.3g
	FRN-K2 : 56.6g
∗ Main body material	Polycarbonate + glass fiber
∗ Rotating shaft material	Metal (SUS)
∗ Oil type	Silicone oil

Damper Characteristics

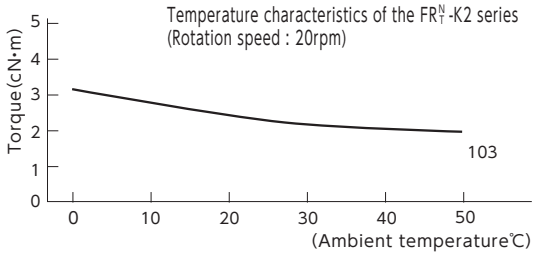
1. Speed characteristics

A rotary damper's torque varies according to the rotation speed. In general, as shown in the graph to the right, the torque increases as the rotation speed increases, and the torque decreases as the rotation speed decreases. In addition, please note that the starting torque slightly differs from the rated torque.



2. Temperature characteristics

A rotary damper's torque varies according to the ambient temperature. In addition, as shown in the graph to the right, the torque decreases as the ambient temperature increases, and the torque increases as the ambient temperature decreases. This is because the viscosity of the silicone oil inside the damper varies according to the temperature. When the temperature returns to normal, the torque will return to normal as well.



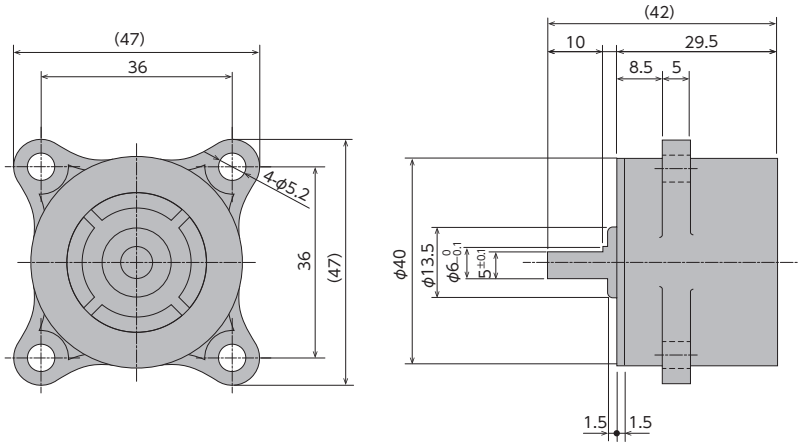
Rotary Damper

Bi-Directional Uni-Directional
Fixed Type Adjustable type Self-adjusting

FRT/FRN-F2 Series

RoHS Compliant

●Products specification might be changed without notice.



Specifications

Model	Rated torque	Damping direction
FRT-F2-203	2±0.4 N·m (20±4 kgf·cm)	Both directions
FRT-F2-303	3±0.8 N·m (30±8 kgf·cm)	Both directions
FRT-F2-403	4±1 N·m (40±10 kgf·cm)	Both directions
FRN-F2-R203	2±0.4 N·m (20±4 kgf·cm)	Clockwise
FRN-F2-L203		Counter-clockwise

Note 1) Rated torque measured at a rotation speed of 20rpm at 23°C
Note 2) Torque can be customized by changing the oil viscosity
(see Cutomizable Torque Chart on page 178)
Note 3) Dampers with gear can also be custom ordered.
● An FRT type damper generates torque in both directions and an FRN type generates one-way torque in the CW direction (R) or CCW direction (L) when the rotating axle is viewed from the top.

∗ Max. rotational speed	50rpm
∗ Max. cycle rate	10cycle /min
∗ Operating temperature	0 ~50℃
∗ Weight	FRT-K2 : 115.6g
	FRN-K2 : 93.2g
∗ Main body material	Polycarbonate + glass fiber
∗ Rotating shaft material	Metal (SUS)
∗ Oil type	Silicone oil

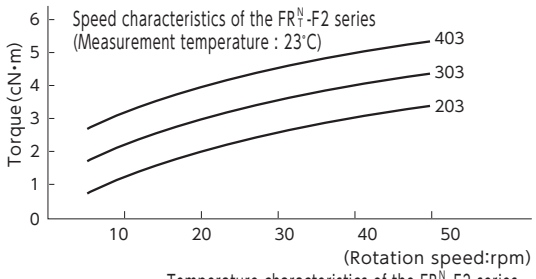
Damper Characteristics

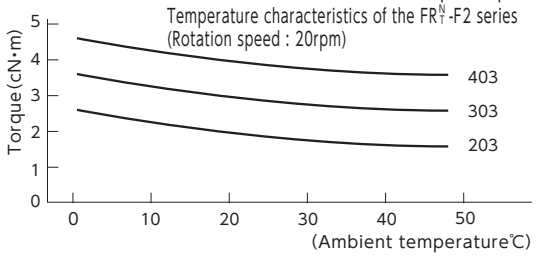
1. Speed characteristics

A rotary damper's torque varies according to the rotation speed. In general, as shown in the graph to the right, the torque increases as the rotation speed increases, and the torque decreases as the rotation speed decreases. In addition, please note that the starting torque slightly differs from the rated torque.

2. Temperature characteristics

A rotary damper's torque varies according to the ambient temperature. In addition, as shown in the graph to the right, the torque decreases as the ambient temperature increases, and the torque increases as the ambient temperature decreases. This is because the viscosity of the silicone oil inside the damper varies according to the temperature. When the temperature returns to normal, the torque will return to normal as well.





Rotary Damper

FRN-P2 Series(Adjustable Types: Variable Torque Models)

- Max. rotation speed 50rpm
- Max. cycle rate 10cycle/min
- Operating temperature 0～50℃
- Weight 64g
- Body and cap material PBT
- Rotating shaft material SUS
- Gear, adjustment knob POM
- Oil type Silicone oil

Specifications

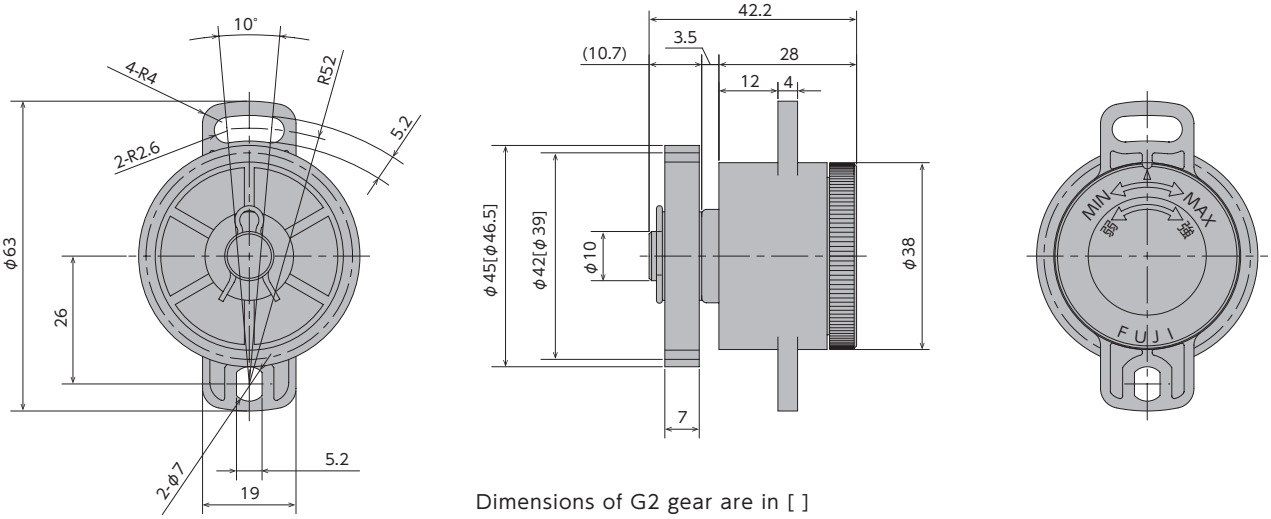
Model	Rated torque	Damping direction
FRN-P2-R501G*	0.05±0.01 N·m (0.5±0.1 kgf·cm)	Clockwise direction
FRN-P2-L501G*		Counter-clockwise direction
FRN-P2-R102G*	0.10±0.02 N·m (1.0±0.2 kgf·cm)	Clockwise direction
FRN-P2-L102G*		Counter-clockwise direction
FRN-P2-R202G*	0.20±0.04 N·m (2.0±0.4 kgf·cm)	Clockwise direction
FRN-P2-L202G*		Counter-clockwise direction

Note 1) Rated torque is measured at a rotation speed of 20rpm at 23℃ (adjustment knob set at MAX)

● There are dampers that generate torque in the CW direction or CCW direction when the rotating axle is viewed from the top.

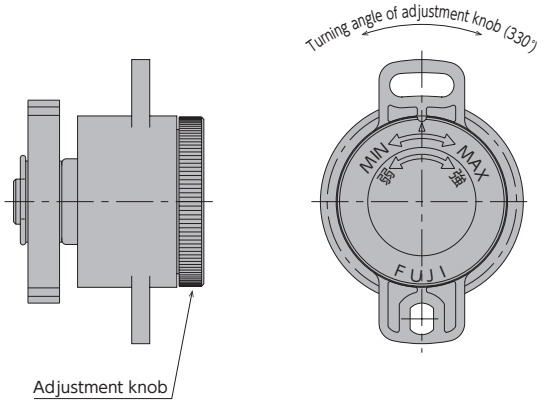
Gear Specifications

Model	G1	*G2
Type	Standard spur gear	Shifted spur gear
Tooth profile	Involute	
Module	1.5	3.0
Pressure angle	20°	
Number of teeth	28	13
Pitch circle diameter	ϕ42	ϕ39
Addendum modification coefficient	–	+0.25

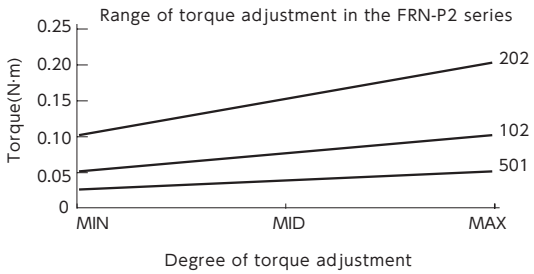


Dimensions of G2 gear are in [ ]

How to Adjust Torque



Range of Torque Adjustment



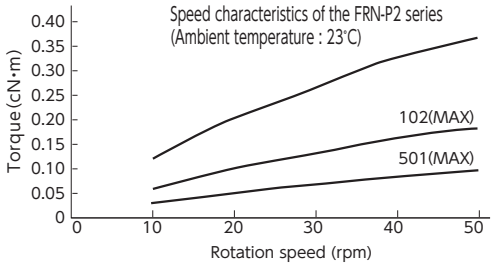
Turn the adjustment knob clockwise to increase damper torque and counterclockwise to decrease it.

●Products specification might be changed without notice.

Characteristics

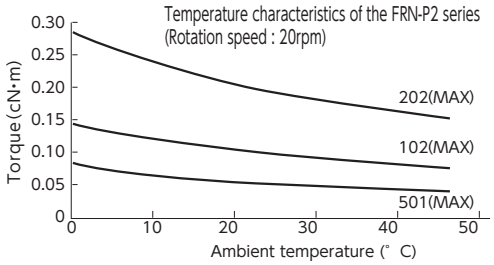
1. Speed characteristics

A rotary damper's torque varies according to the rotation speed. In general, as shown in the graph to the right, the torque increases as the rotation speed increases, and the torque decreases as the rotation speed decreases. In addition, please note that the starting torque slightly differs from the rated torque.

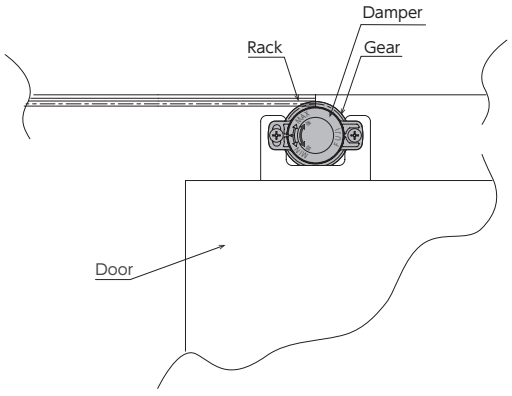


2. Temperature characteristics

A rotary damper's torque varies according to the ambient temperature. In addition, as shown in the graph to the right, the torque decreases as the ambient temperature increases, and the torque increases as the ambient temperature decreases. This is because the viscosity of the silicone oil inside the damper varies according to the temperature. When the temperature returns to normal, the torque will return to normal as well.



Example of Using a Damper



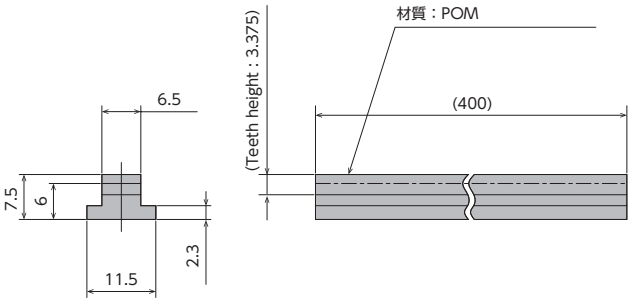
Application of the FRN-P2 Series

Option Rack

G1 Rack : ROP-020P2-1

Applicable Models	Model
FRN-P2	ROP-020P2-1

Rack specifications : m=1.5
Pressure angle 20° (full depth tooth)
Z=85



There is no provision for option racks complying with the gear specification G2 (shifted spur gear) of FRN-P2

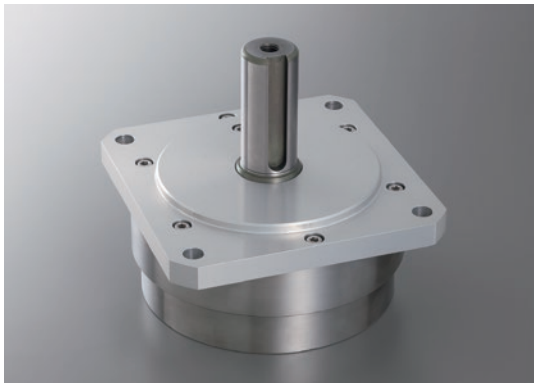
Rotary Damper

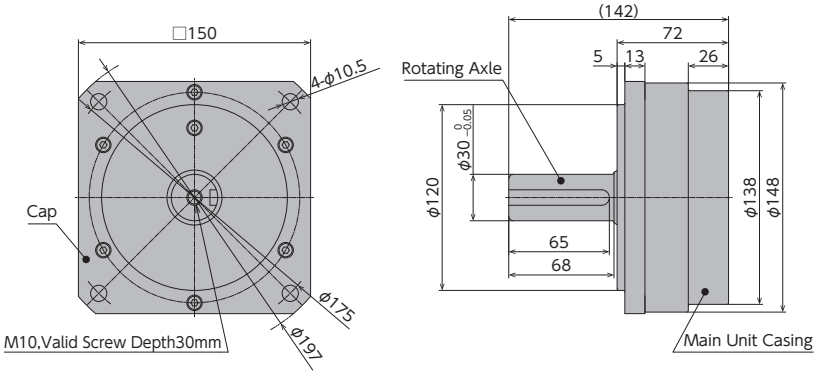
Customized orders | Bi-Directional | Uni-Directional
Fixed Type | Adjustable type | Self-adjusting

FRT-W1

RoHS Compliant

●Products specification might be changed without notice.





Specifications

Model	Rated torque	Damping direction
FRT-W1-105	100±20N·m	Both directions
FRT-W1-185	180±40N·m	Both directions

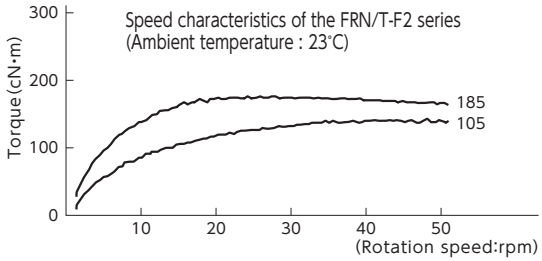
Note 1) Rated torque measured at a rotation speed of 20rpm at 23℃

∗ Max. rotation speed	50rpm
∗ Max. cycle rate	1.5cycle /min
∗ Operating temperature	−20 ~60℃
∗ Weight	6g
∗ Main body material	SUS304
∗ Cap material	A2017
∗ Rotating (shaft) material	SUS420
∗ Oil typel	Silicone oil

Damper Characteristics

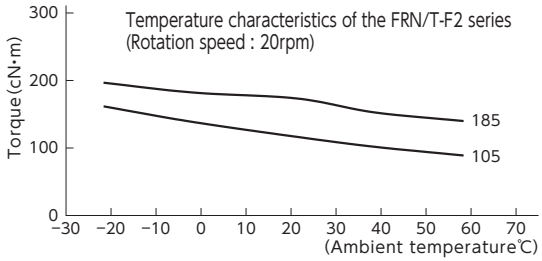
1. Speed characteristics

A rotary damper's torque varies according to the rotation speed. In general, as shown in the graph to the right, the torque increases as the rotation speed increases, and the torque decreases as the rotation speed decreases. In addition, please note that the starting torque slightly differs from the rated torque.



2. Temperature characteristics

A rotary damper's torque varies according to the ambient temperature. In addition, as shown in the graph to the right, the torque decreases as the ambient temperature increases, and the torque increases as the ambient temperature decreases. This is because the viscosity of the silicone oil inside the damper varies according to the temperature. When the temperature returns to normal, the torque will return to normal as well.



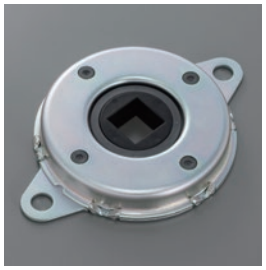
Disk Damper

Bi-Directional Uni-Directional
Fixed Type Adjustable type Self-adjusting

FDT-47A/FDN-47A Series

RoHS Compliant

●Products specification might be changed without notice.

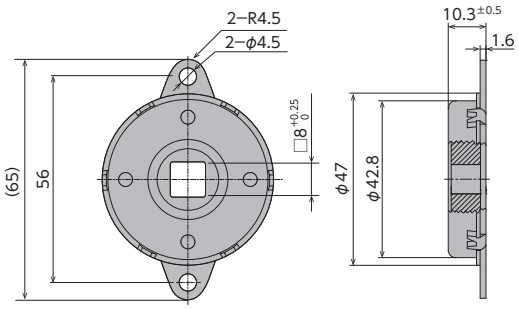



* Max. rotation speed 50rpm
* Max. cycle rate 12cycle /min
* Operating temperature −10～50℃
* Weight FDT- 47A : 50g
  FDN- 47A : 55g
* Main body material Iron (SPFC)
* Rotating (shaft) material Nylon (with glass)
* Oil typel Silicone oil

Specifications

Model	Rated torque	Damping direction
FDT-47A-502	0.5±0.15 N·m(5±1.5 kgf·cm)	Both directions
FDT-47A-103	1±0.2 N·m(10±2 kgf·cm)	Both directions
FDT-47A-163	1.6±0.3 N·m(16±3 kgf·cm)	Both directions
FDT-47A-203	2±0.3 N·m(20±3 kgf·cm)	Both directions
FDN-47A-R502	0.5±0.15 N·m (5±1.5 kgf·cm)	Clockwise direction
FDN-47A-L502		Counter-clockwise direction
FDN-47A-R103	1±0.2 N·m (10±2 kgf·cm)	Clockwise direction
FDN-47A-L103		Counter-clockwise direction
FDN-47A-R163	1.6±0.3 N·m (16±3 kgf·cm)	Clockwise direction
FDN-47A-L163		Counter-clockwise direction
FDN-47A-R203	2±0.3 N·m (20±3 kgf·cm)	Clockwise direction
FDN-47A-L203		Counter-clockwise direction

Note) Rated torque is measured at a rotation speed of 20rpm at 23°C±3°C



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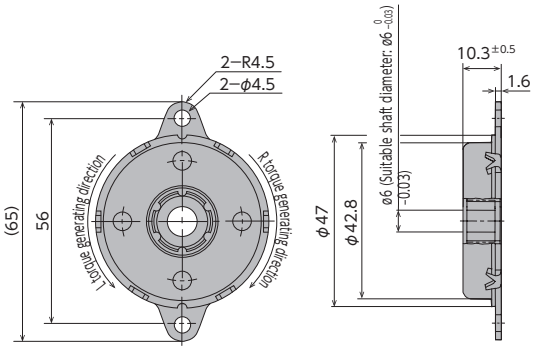


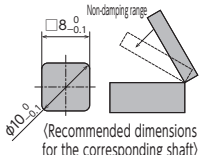
<FDN-47A-R／L※※※>

How to Use the Damper

1. Dampers may generate torque in both directions, clockwise, or counter-clockwise.
2. Please make sure that a shaft attached to a damper has a bearing, as the damper itself is not fitted with one.
3. Please refer to the recommended dimensions below when creating a shaft for FDN-47A. Not using the recommended shaft dimensions may cause the shaft to slip out.

Shaft's external dimensions	ϕ 6 0 -0.03
Surface hardness	HRC55 or higher
Quenching depth	0.5mm or higher
Surface roughness	1.0Z or lower
Chamfer end (Damper insertion side)	C0.2～C0.3 (orR0.2～R0.3)

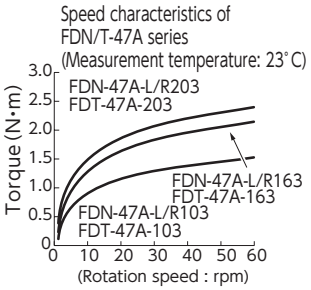
4. To insert a shaft into FDN-47A, insert the shaft while spinning it in the idling direction of the one-way clutch. (Do not force the shaft in from the regular direction. This may damage the oneway clutch.)
5. When using FDT-47A, please ensure that a shaft with specified angular dimensions is inserted in the damper's shaft opening. A wobbling shaft and damper shaft may not allow the lid to slow down properly when closing. Please see the diagrams to the right for the recommended shaft dimensions for a damper.
6. Please contact us when a continuous rotation is planned.



Damper Characteristics

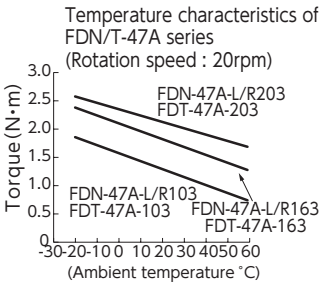
1. Speed characteristics

A disk damper's torque varies according to the rotation speed. In general, as shown in the graph to the right, the torque increases as the rotation speed increases, and the torque decreases as the rotation speed decreases. Torque at 20rpm is shown in this catalogue. In a closing lid, the rotation speed is slow when the lid begins to close, resulting in the generation of torque that is smaller than the rated torque.



2. Temperature characteristics

Damper torque (rated torque in this catalogue) varies according to the ambient temperature. As the temperature increases, the torque decreases, and as the temperature decreases, the torque increases. This is because the viscosity of the silicone oil inside the damper varies according to the temperature. The graph to the right illustrates the temperature characteristics



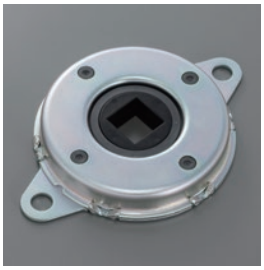
Disk Damper

Fixed Type | Bi-Directional | Uni-Directional | Adjustable type | Self-adjusting

FDT-57A/FDN-57A Series

RoHS Compliant

●Products specification might be changed without notice.

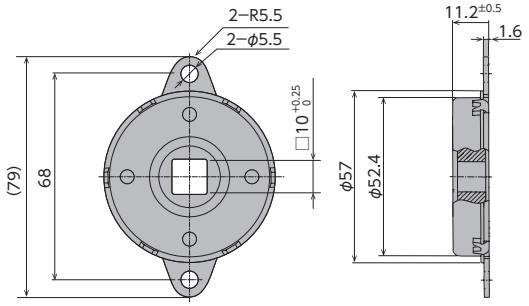


- ∗ Max. rotation speed 50rpm
- ∗ Max. cycle rate 12cycle /min
- ∗ Operating temperature −10～50℃
- ∗ Weight FDT-57A : 75g
  FDN-57A : 94g
- ∗ Main body material Iron (SPFC)
- ∗ Rotating (shaft) material Nylon (with glass)
- ∗ Oil typel Silicone oil

Specifications

Model	Rated torque	Damping direction
FDT-57A-303	3±0.4 N·m (30±4 kgf·cm)	Both directions
FDT-57A-403	4±0.5 N·m (40±5 kgf·cm)	Both directions
FDT-57A-503	4.7±0.5 N·m (47±5 kgf·cm)	Both directions
FDN-57A-R303	3±0.4 N·m (30±4 kgf·cm)	Clockwise direction
FDN-57A-L303		Counter-clockwise direction
FDN-57A-R403	4±0.5 N·m (40±5 kgf·cm)	Clockwise direction
FDN-57A-L403		Counter-clockwise direction
FDN-57A-R553	5.5±0.6 N·m (55±6 kgf·cm)	Clockwise direction
FDN-57A-L553		Counter-clockwise direction

Note) Rated torque is measured at a rotation speed of 20rpm at 23°C±3°C



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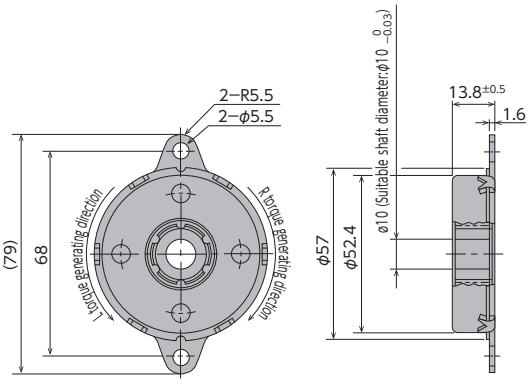


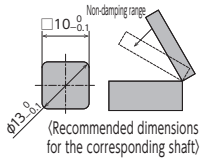
<FDN-57A-R／L※※※>

How to Use the Damper

1. Dampers may generate torque in both directions, clockwise, or counter-clockwise.
2. Please make sure that a shaft attached to a damper has a bearing, as the damper itself is not fitted with one.
3. Please refer to the recommended dimensions below when creating a shaft for FDN-57A. Not using the recommended shaft dimensions may cause the shaft to slip out.

Shaft's external dimensions	ϕ 10 −0 −0.03
Surface hardness	HRC55 or higher
Quenching depth	0.5mm or higher
Surface roughness	1.0Z or lower
Chamfer end (Damper insertion side)	C0.2～C0.3 (orR0.2～R0.3)

4. To insert a shaft into FDN-57A, insert the shaft while spinning it in the idling direction of the one-way clutch. (Do not force the shaft in from the regular direction. This may damage the oneway clutch.)
5. When using FDT-57A, please ensure that a shaft with specified angular dimensions is inserted in the damper's shaft opening. A wobbling shaft and damper shaft may not allow the lid to slow down properly when closing. Please see the diagrams to the right for the recommended shaft dimensions for a damper.
6. Please contact us when a continuous rotation is planned.

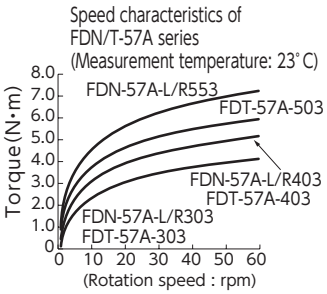


(Recommended dimensions for the corresponding shaft)

Damper Characteristics

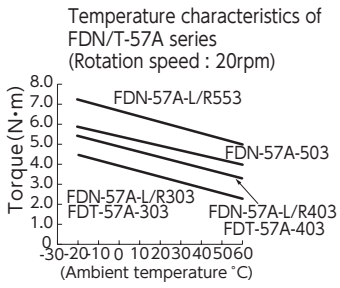
①1. Speed characteristics

A disk damper's torque varies according to the rotation speed. In general, as shown in the graph to the right, the torque increases as the rotation speed increases, and the torque decreases as the rotation speed decreases. Torque at 20rpm is shown in this catalogue. In a closing lid, the rotation speed is slow when the lid begins to close, resulting in the generation of torque that is smaller than the rated torque.



2. Temperature characteristics

Damper torque (rated torque in this catalogue) varies according to the ambient temperature. As the temperature increases, the torque decreases, and as the temperature decreases, the torque increases. This is because the viscosity of the silicone oil inside the damper varies according to the temperature. The graph to the right illustrates the temperature characteristics



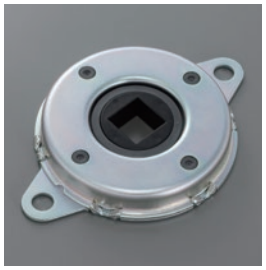
Disk Damper

Bi-Directional | Uni-Directional
Fixed Type | Adjustable type | Self-adjusting

FDT-63A/FDN-63A Series

RoHS Compliant

●Products specification might be changed without notice.

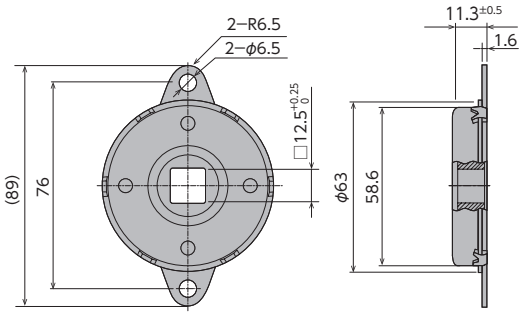



* Max. rotation speed 50rpm
* Max. cycle rate 12cycle /min
* Operating temperature −10～50℃
* Weight FDT-63A : 92g
  FDN-63A : 115g
* Main body material Iron (SPFC)
* Rotating (shaft) material Nylon (with glass)
* Oil typel Silicone oil

Specifications

Model	Rated torque	Damping direction
FDT-63A-403	4±0.5 N·m (40±5 kgf·cm)	Both directions
FDT-63A-533	5.3±0.6 N·m (53±6 kgf·cm)	Both directions
FDT-63A-703 FDT-63B-703	6.7±0.7 N·m (67±7 kgf·cm)	Both directions
FDN-63A-R453	4.5±0.5 N·m (45±5 kgf·cm)	Clockwise direction
FDN-63A-L453		Counter-clockwise direction
FDN-63A-R603	6±0.6 N·m (60±6 kgf·cm)	Clockwise direction
FDN-63A-L603		Counter-clockwise direction
FDN-63A-R903	8.5±0.8 N·m (85±8 kgf·cm)	Clockwise direction
FDN-63A-L903		Counter-clockwise direction

Note) Rated torque is measured at a rotation speed of 20rpm at 23°C±3°C
63B has a slotted rotating shaft opening



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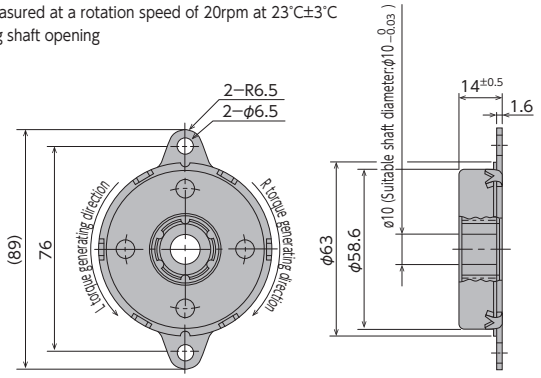


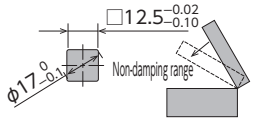
<FDN-63A-R／L※※※>

How to Use the Damper

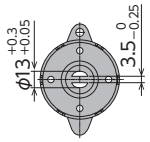
1. Dampers may generate torque in both directions, clockwise, or counter-clockwise.
2. Please make sure that a shaft attached to a damper has a bearing, as the damper itself is not fitted with one.
3. Please refer to the recommended dimensions below when creating a shaft for FDN-63A. Not using the recommended shaft dimensions may cause the shaft to slip out.
4. To insert a shaft into FDN-63A, insert the shaft while spinning it in the idling direction of the one-way clutch. (Do not force the shaft in from the regular direction. This may damage the one-way clutch.)

Shaft's external dimensions	ϕ 10 $^{0}_{-0.03}$
Surface hardness	HRC55 or higher
Quenching depth	0.5mm or higher
Surface roughness	1.0Z or lower
Chamfer end (Damper insertion side)	C0.2~C0.3 (orR0.2~R0.3)

5. When using FDT-63A, please ensure that a shaft with specified angular dimensions is inserted in the damper's shaft opening. A wobbling shaft and damper shaft may not allow the lid to slow down properly when closing. Please see the diagrams to the right for the recommended shaft dimensions for a damper.
6. A damper shaft connecting to a part with slotted groove is also available. The slotted groove type is excellent for usage with spiral springs
7. Please contact us when a continuous rotation is planned.



〈Recommended dimensions for the corresponding shaft〉

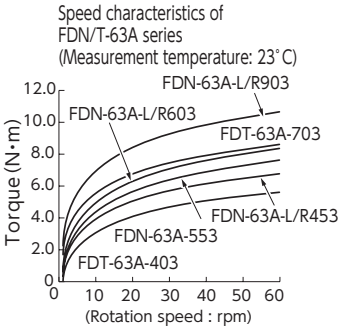


〈FDT-63B-703〉

Damper Characteristics

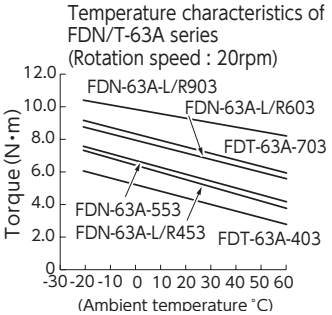
1. Speed characteristics

A disk damper's torque varies according to the rotation speed. In general, as shown in the graph to the right, the torque increases as the rotation speed increases, and the torque decreases as the rotation speed decreases. Torque at 20rpm is shown in this catalogue. In a closing lid, the rotation speed is slow when the lid begins to close, resulting in the generation of torque that is smaller than the rated torque.



2. Temperature characteristics

Damper torque (rated torque in this catalogue) varies according to the ambient temperature. As the temperature increases, the torque decreases, and as the temperature decreases, the torque increases. This is because the viscosity of the silicone oil inside the damper varies according to the temperature. The graph to the right illustrates the temperature characteristics



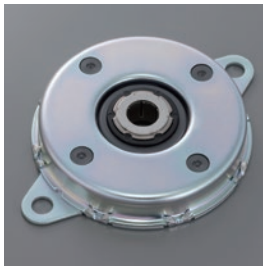
Disk Damper

Fixed Type | Bi-Directional | Uni-Directional | Adjustable type | Self-adjusting

FDT-70A/FDN-70A Series

RoHS Compliant

●Products specification might be changed without notice.

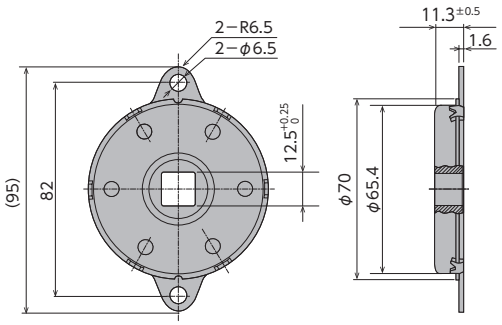


- ∗ Max. rotation speed 50rpm
- ∗ Max. cycle rate 12cycle /min
- ∗ Operating temperature −10～50℃
- ∗ Weight FDT-70A : 112g
  FDN-70A : 136g
- ∗ Main body material Iron (SPFC)
- ∗ Rotating (shaft) material Nylon (with glass)
- ∗ Oil typel Silicone oil

Specifications

Model	Rated torque	Damping direction
FDT-70A-903	8.7±0.8 N·m (87±8 kgf·cm)	Both directions
FDT-70B-903		
FDN-70A-R114	11±1.1 N·m (110±11 kgf·cm)	Clockwise direction
FDN-70A-L114		Counter-clockwise direction

Note) Rated torque is measured at a rotation speed of 20rpm at 23°C±3°C
70B has a slotted rotating shaft opening



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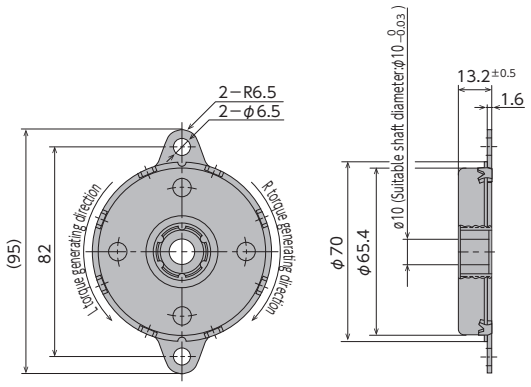


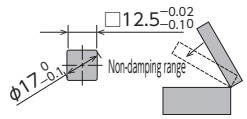
<FDN-70A-R／L114>

How to Use the Damper

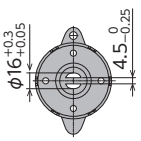
1. Dampers may generate torque in both directions, clockwise, or counter-clockwise.
2. Please make sure that a shaft attached to a damper has a bearing, as the damper itself is not fitted with one.
3. Please refer to the recommended dimensions below when creating a shaft for FDN-70A. Not using the recommended shaft dimensions may cause the shaft to slip out.
4. To insert a shaft into FDN-70A, insert the shaft while spinning it in the idling direction of the one-way clutch. (Do not force the shaft in from the regular direction. This may damage the one-way clutch.)

Shaft's external dimensions	φ10 0 −0.03
Surface hardness	HRC55 or higher
Quenching depth	0.5mm or higher
Surface roughness	1.0Z or lower
Chamfer end (Damper insertion side)	C0.2～C0.3 (orR0.2～R0.3)

5. When using FDT-70A, please ensure that a shaft with specified angular dimensions is inserted in the damper's shaft opening. A wobbling shaft and damper shaft may not allow the lid to slow down properly when closing. Please see the diagrams to the right for the recommended shaft dimensions for a damper.
6. A damper shaft connecting to a part with slotted groove is also available. The slotted groove type is excellent for usage with spiral springs
7. Please contact us when a continuous rotation is planned.



〈Recommended dimensions for the corresponding shaft〉

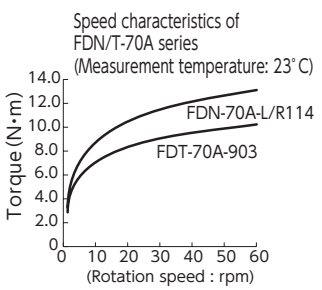


〈FDT-70B-903〉

Damper Characteristics

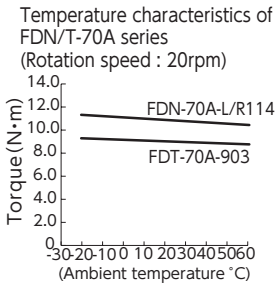
1. Speed characteristics

A disk damper's torque varies according to the rotation speed. In general, as shown in the graph to the right, the torque increases as the rotation speed increases, and the torque decreases as the rotation speed decreases. Torque at 20rpm is shown in this catalogue. In a closing lid, the rotation speed is slow when the lid begins to close, resulting in the generation of torque that is smaller than the rated torque.



2. Temperature characteristics

Damper torque (rated torque in this catalogue) varies according to the ambient temperature. As the temperature increases, the torque decreases, and as the temperature decreases, the torque increases. This is because the viscosity of the silicone oil inside the damper varies according to the temperature. The graph to the right illustrates the temperature characteristics



Vane Damper

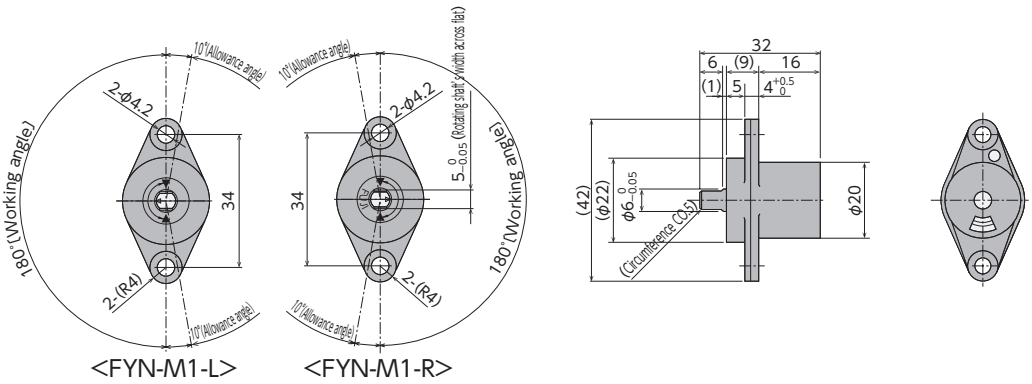
FYN-M1 Series

Specifications

Model	Max. torque	Reverse torque	Damping direction
FYN-M1-R152	0.15 N·m (1.5 kgf·cm)	0.1 N·m or lower (1kgf·cm or lower)	Clockwise
FYN-M1-L152			Counter-clockwise
FYN-M1-R252	0.25 N·m (2.5 kgf·cm)	0.2 N·m or lower (2 kgf·cm or lower)	Clockwise
FYN-M1-L252			Counter-clockwise
FYN-M1-R352	0.35 N·m (3.5 kgf·cm)	0.2 N·m or lower (2 kgf·cm or lower)	Clockwise
FYN-M1-L352			Counter-clockwise
FYN-M1-R602	0.60 N·m (6.0kgf·cm)	0.4 N·m or lower (4 kgf·cm or lower)	Clockwise
FYN-M1-L602			Counter-clockwise

Note) Measured at 23°C±2°C

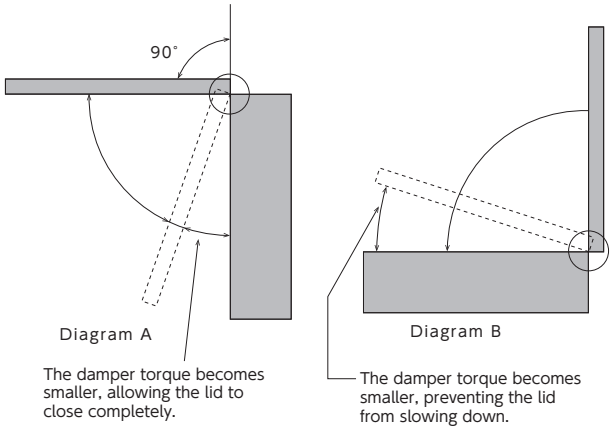
- ∗ Max. angle 180°
- ∗ Max. cycle rate 6cycle /min
- ∗ Operating temperature −5～50℃
- ∗ Weight 17±2g
- ∗ Main body Polybutylene terephthalate (PBT)
- ∗ Cap material Polybutylene terephthalate (PBT)
- ∗ Rotating shaft material Zinc die-cast (ZDC)
- ∗ Oil type Silicone oil
- ∗ Cap colour R: Black L: Gray



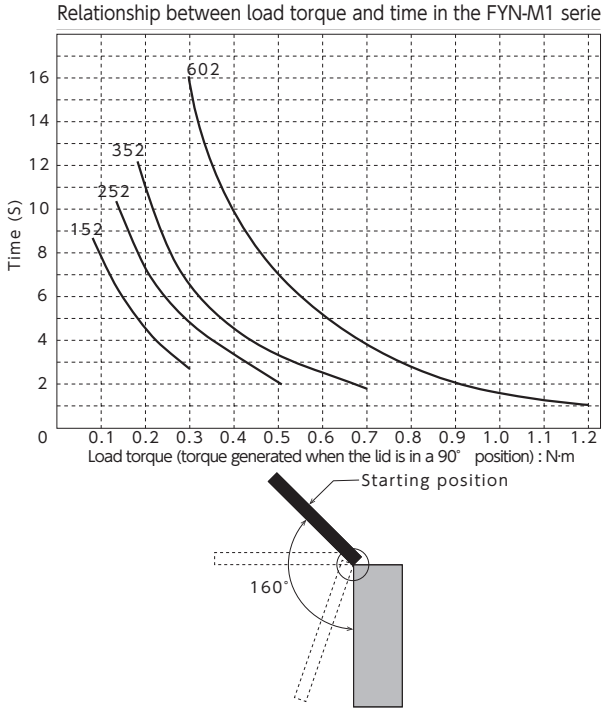
<FYN-M1-L> <FYN-M1-R>

How to Use the Damper

1. The FYN-M1 Series is designed to generate a large torque up to 90° in a closing lid, as shown in Diagram A, and the lid is able to close completely. However, when the lid is closed from a vertical position, as shown in Diagram B, the lid cannot be slowed down, as the torque becomes small just before the lid is completely closed.

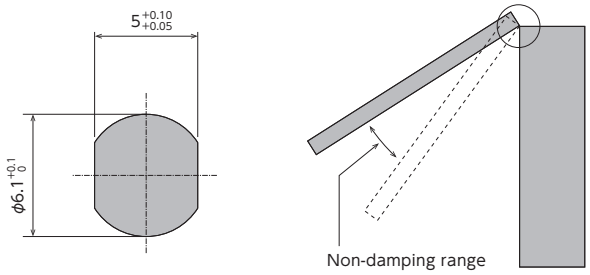


2. Below is a graph showing the relationship between the load torque and the time when a lid is closed from a 160° angle, as shown in the diagram.



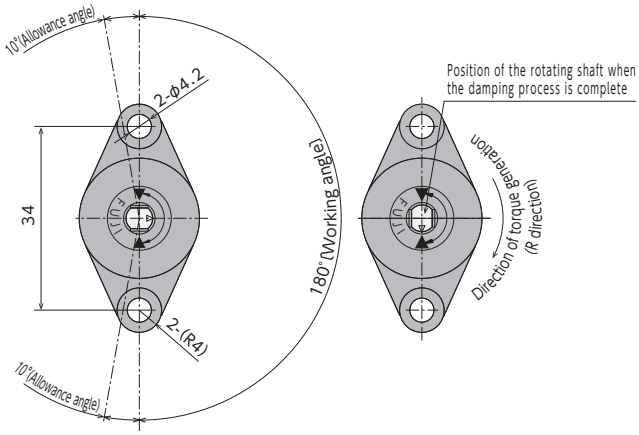
●Products specification might be changed without notice.

3. When connecting the rotating shaft to other parts, please ensure a tight fit between them. Without a tight fit, the lid will not slow down properly when closing.



<Recommended dimensions for a rotating shaft opening>

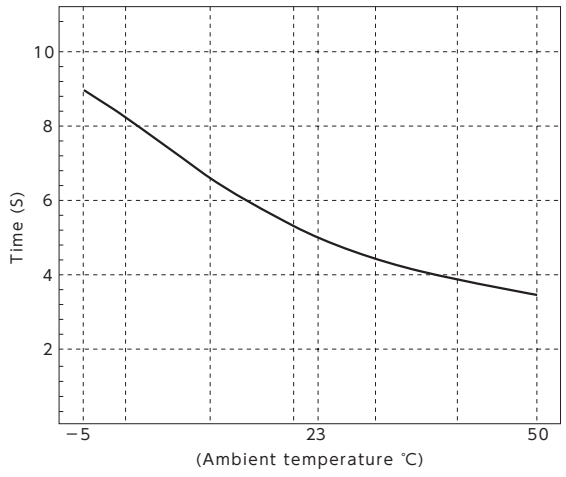
5. The standard for a damper's working angle is 180° with respect to the main body's attachment flange. Rotating the damper beyond this angle will cause damage to the damper. Please make sure that an external stopper is in place.



<FYN-M1-R>

4. The time it takes for a lid with a damper to close variesaccording to the ambient temperature. As the temperature increases, it takes less time, and as the temperature decreases, it will take longer for the lid to close. This is because the viscosity of the oil inside the damper changes according to the temperature. When the temperature returns to normal, the required time will return to normal as well. The temperature characteristics are shown in the graph below.

Temperature characteristics of the FYN-M1 Series



6. The direction in which torque is generated varies according to the model. Please select the appropriate model for your purpose.

Vane Damper

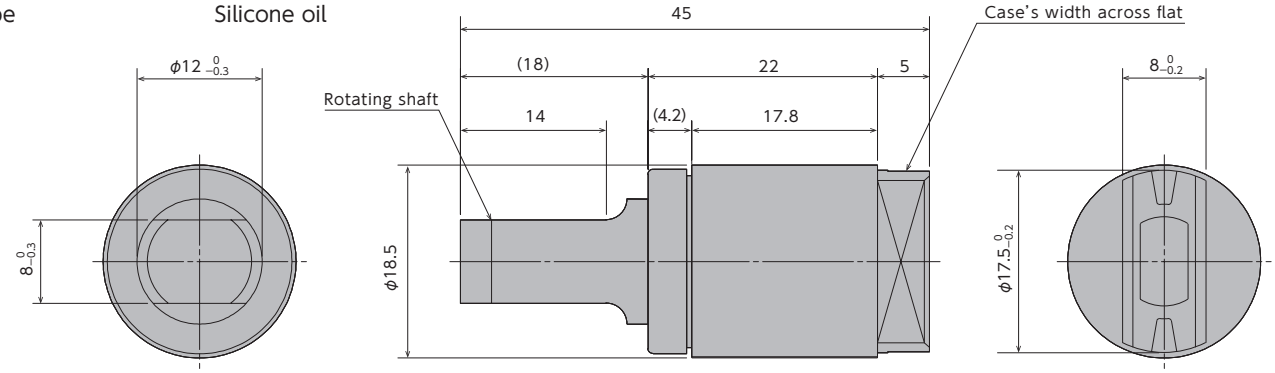
FYN-P1 Series

Specifications

Model	Max. torque	Reverse torque	Damping direction
FYN-P1-R103	1 N·m (10 kgf·cm)	0.3 N·m or lower (3 kgf·cm or lower)	Clockwise
FYN-P1-L103			Counter-clockwise
FYN-P1-R153	1.5 N·m (15 kgf·cm)	0.5 N·m or lower (5 kgf·cm or lower)	Clockwise
FYN-P1-L153			Counter-clockwise
FYN-P1-R183	1.8 N·m (18 kgf·cm)	0.8 N·m or lower (8 kgf·cm or lower)	Clockwise
FYN-P1-L183			Counter-clockwise

Note) Measured at 23°C±2°C

* Max. angle 115°
* Operating temperature −5～50℃
* Weight 10. 5±1g
* Body and cap material Polybutylene terephthalate (PBT)
* Rotating shaft material Polybutylene terephthalate (PBT)
* Oil type Silicone oil



How to Use the Damper

1. FYN-P1 is designed to generate a large torque just before a lid closing from a vertical position, as shown in Diagram A, comes to a full closure. When a lid is closed from a horizontal position, as shown in Diagram B, a strong torque is generated just before the lid is fully closed, causing the lid to not close properly.

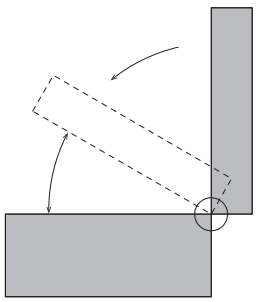


Diagram A

The damper torque becomes larger, preventing the lid from slowing down.

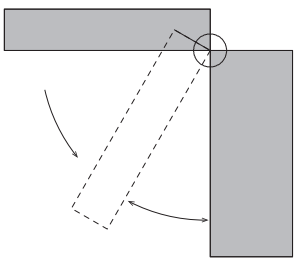
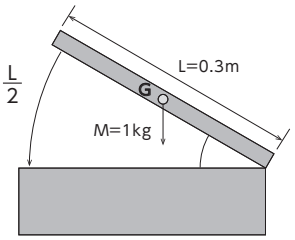


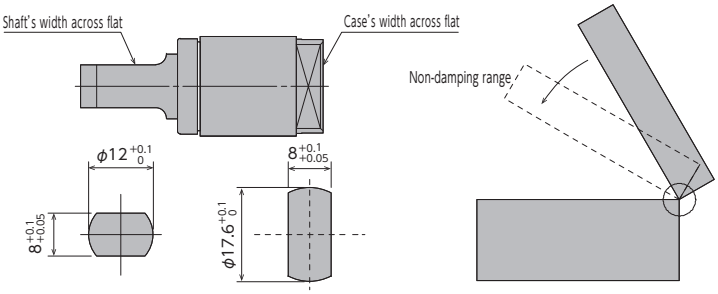
Diagram B

The damper torque becomes larger, preventing the lid from closing completely.

2. When using a damper on a lid, such as the one shown in the diagram, use the following selection calculation to determine the damper torque.
Example)
Lid mass M: 1kg
Lid dimensions L: 0.3m
Gravity Center Position : Assumed as $\frac{L}{2}$
Load torque : T=1×9.8×0.3÷2
=1.47N·m
Based on the above calculation,
FYN-P1-*153 is selected.



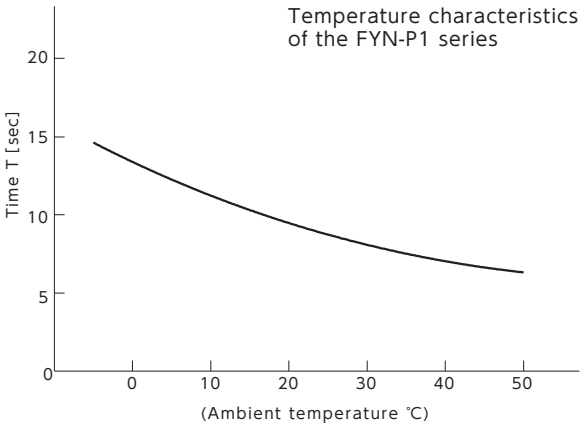
3. When connecting the rotating shaft to other parts, please ensure a tight fit between them. Without a tight fit, the lid will not slow down properly when closing. The corresponding dimensions for fixing the rotating shaft and the main body are as follows.



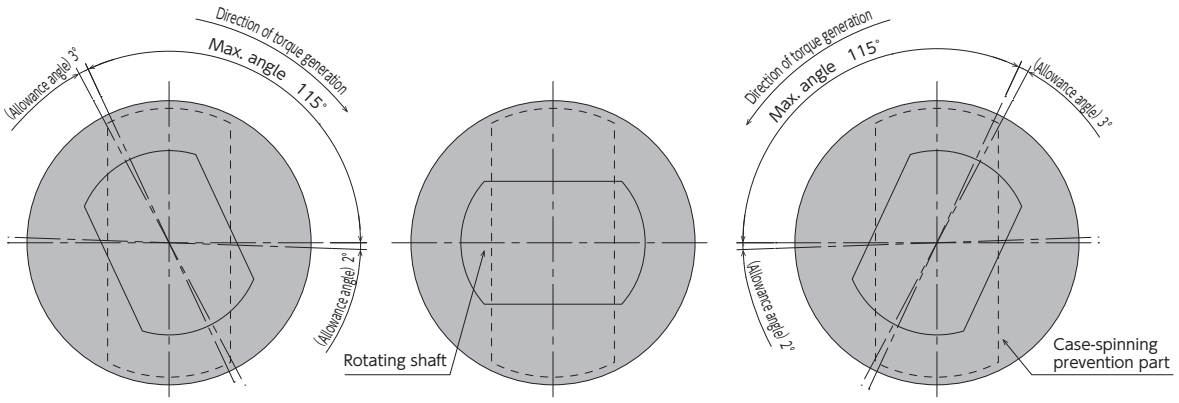
●Products specification might be changed without notice.

4. Damper characteristics vary according to the ambient temperature. In general, the damper characteristics become weaker as the temperature increases, and become stronger as the temperature decreases. This is because the viscosity of the oil inside the damper varies according to the temperature. When the temperature returns to normal, the damper characteristics will return to normal as well. The time it takes for the lid to close is shown in the graph to the right.

Temperature characteristics of the FYN-P1 series



5. The damper's working angle is 115°, as shown below. Rotating the damper beyond this angle will cause damage to the damper. Please ensure that an external stopper is in place. The working angle is based on the width across flat for fixing, located towards the rear end of the main body. The position where the rotation is complete is at 90° with respect to the width across flat.



Rotation Start Position
FYN-P1-R

Rotation End Position
* Rotational position of rotating axle at shipping

Rotation Start Position
FYN-P1-L

6. The direction in which torque is generated varies according to the model. Please select the appropriate model for your purpose.

Vane Damper

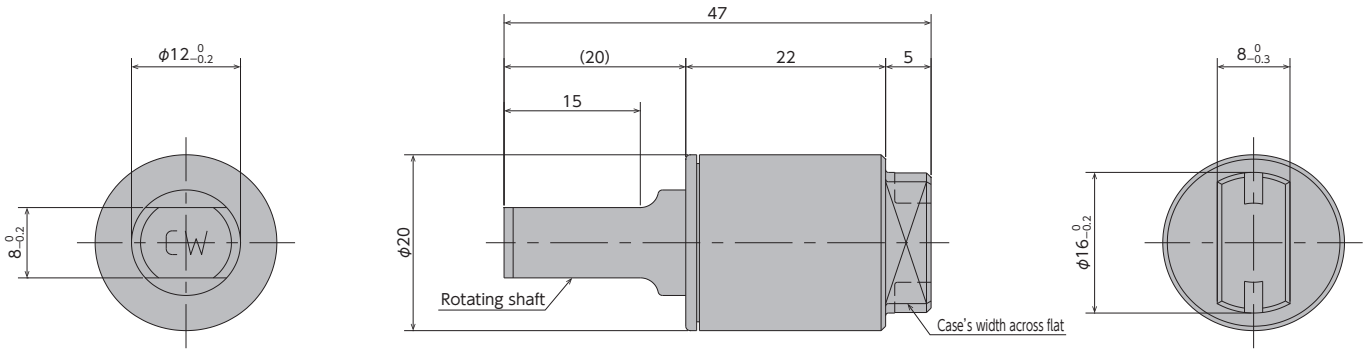
FYN-N2 Series

Specifications

Model	Max. torque	Reverse torque	Directions
FYN-N2-R103	1 N·m (10kgf·cm)	0.2 N·m or lower (2 kgf·cm or lower)	Clockwise (CW)
FYN-N2-L103			Counterclockwise (CCW)
FYN-N2-R203	2 N·m (20 kgf·cm)	0.4 N·m or lower (4 kgf·cm or lower)	Clockwise (CW)
FYN-N2-L203			Counterclockwise (CCW)
FYN-N2-R303	3 N·m (30 kgf·cm)	0.8 N·m or lower (8 kgf·cm or lower)	Clockwise (CW)
FYN-N2-L303			Counterclockwise (CCW)

Note) Measured at 23°C±2°C

* Max. angle 110°
* Operating temperature −5∼50℃
* Weight 13 ±1g
* Body and cap material Polybutylene terephthalate (PBT)
* Rotating shaft material Polyamide (PA)
* Oil type Silicone oil



How to Use the Damper

1. FYN-N2 series has been designed so that when a lid is closing from a vertical position, as shown in Figure A, high torque is generated just before it closes completely. For a lid that closes from a horizontal position, as shown in Figure B, the strong torque generated just prior to a complete closure may prevent the lid from becoming fully closed.

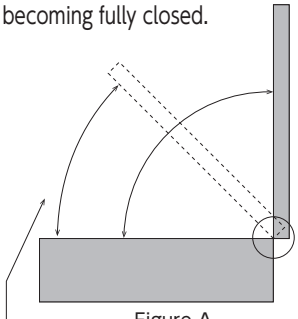


Figure A

Stronger damper torque allows the lid to close gently until it is fully closed.

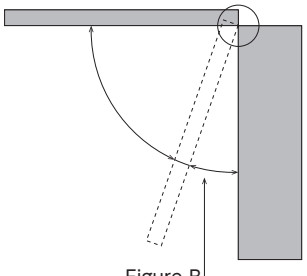
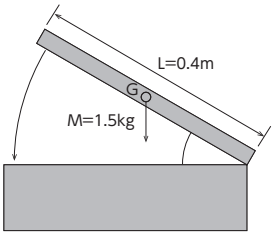


Figure B

Stronger damper torque prevents the lid from being fully closed.

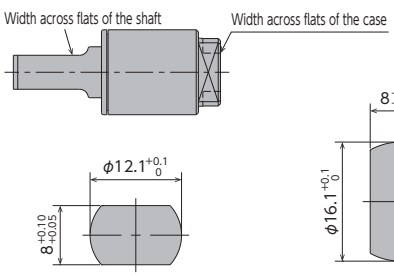
2. When using a damper with a lid shown in the diagram, determine the damper torque based on the following selection calculation.

Example)
Lid weight M: 1.5 kg
Lid dimension L: 0.4 m
Gravity Center Position G: Assumed as $\frac{L}{2}$
Load torque: T = 1.5 × 9.8 × 0.4 ÷ 2
=2.94N·m

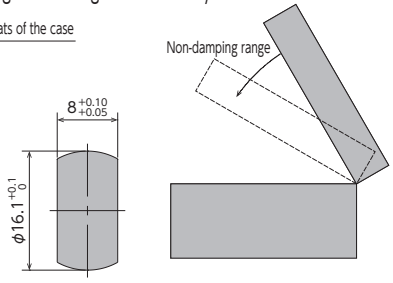


Based on the above calculation, select FYN-N2-*303.

3. When connecting parts that are joined to the rotating shaft, ensure a snug fit. The lid will not decelerate as designed when closing if these parts are not connected properly. The dimensional tolerance for fixing the rotating shaft and body case is shown below.



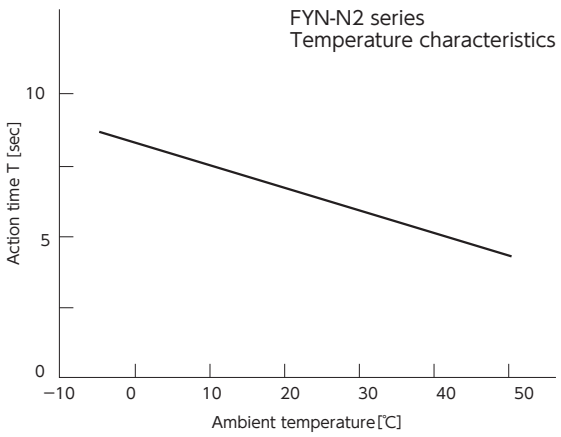
〈Recommended dimensions for mounting the rotating shaft〉



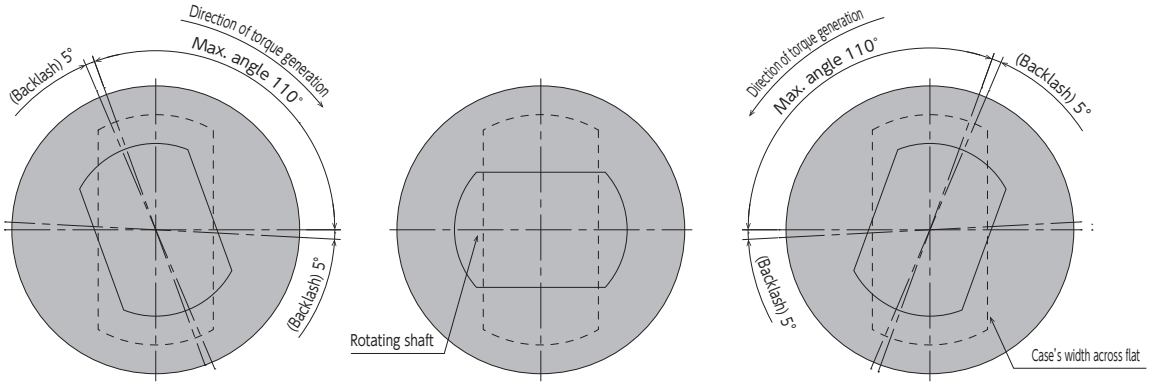
〈Recommended dimensions for mounting the body case〉

Products specification might be changed without notice.

4. Damper characteristics vary according to the ambient temperature. In general, damper characteristics weaken as the temperature goes up, and become stronger as the temperature goes down.
This occurs because the viscosity of oil inside the damper is affected by the temperature change. Once the temperature returns to normal, so will the damper characteristics. Please refer to the right diagram for change in the action time for a free-closing lid.



5. The damper action angle is 110° as shown below. Rotating it beyond this angle will cause the damper to break. Ensure that an external stopper is in place. The action angle is based on the width across flats of the case on the back of the body. The rotation end point is at 90° on the basis of the width across flats of the case. (Refer to the figure below.)



Rotation starting point
FYN-N2-R

Rotation end point
*Rotating shaft angle for shipment

Rotation starting point
FYN-N2-L

6. There are dampers that generate torque in either the clockwise or counterclockwise direction when the rotating shaft is seen from the above. Select a model according to use.

Vane Damper

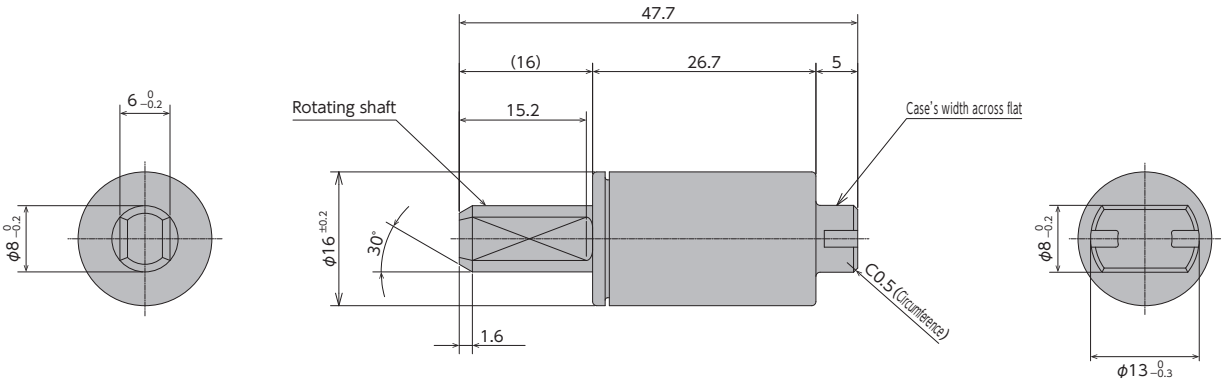
FYN-B1 Series

Specifications

Model	Max. torque	Reverse torque	Damping direction
FYN-B1-R502	0.5N·m (5kgf·cm)	0.3N·m or lower (3kgf·cm) or lower	Clockwise
FYN-B1-L502			Counter-clockwise
FYN-B1-R103	1N·m (10kgf·cm)	0.4N·m or lower (4kgf·cm) or lower	Clockwise
FYN-B1-L103			Counter-clockwise
FYN-B1-R153	1.5N·m (15kgf·cm)	0.5N·m or lower (5kgf·cm) or lower	Clockwise
FYN-B1-L153			Counter-clockwise

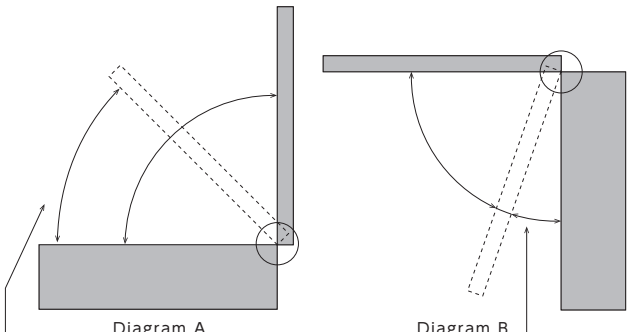
Note) Measured at 23°C±2°C

∗Max. angle 110°
∗Operating temperature −5～50℃
∗Weight 9±1g
∗Body and cap material Polybutylene terephthalate (PBT)
∗Rotating shaft material Polyphenylene Sulphide (PPS)
∗Oil type Silicone oil
∗R type has Black shaft / L type has white shaft



How to Use the Damper

1. FYN-B1 is designed to generate a large torque just before a lid closing from a vertical position, as shown in Diagram A, comes to a full closure. When a lid is closed from a horizontal position, as shown in Diagram B, a strong torque is generated just before the lid is fully closed, causing the lid to not close properly.

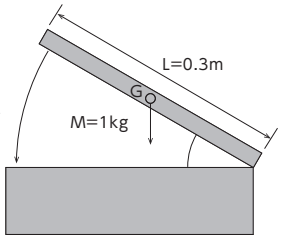


he damper torque becomes larger, preventing the lid from slowing down.

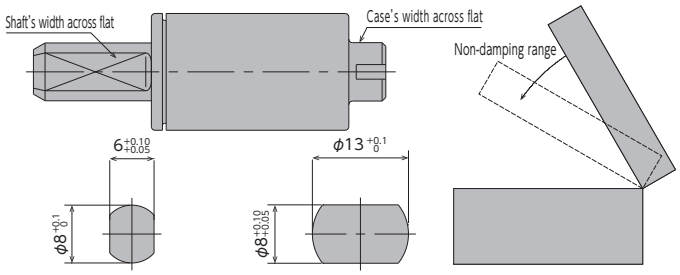
The damper torque becomes larger, preventing the lid from closing completely.

2. When using a damper on a lid, such as the one shown in the diagram, use the following selection calculation to determine the damper torque.

Example)
Lid mass M : 1kg
Lid dimensions L: 0.3m
Gravity Center Position : Assumed as $\frac{L}{2}$
Load torque : T =1.5×0.4×9.8÷2
= 2.94N·m
Based on the above calculation,
FYN-B1-*153 is selected.



3. When connecting the rotating shaft to other parts, please ensure a tight fit between them. Without a tight fit, the lid will not slow down properly when closing. The corresponding dimensions for fixing the rotating shaft and the main body are as follows.

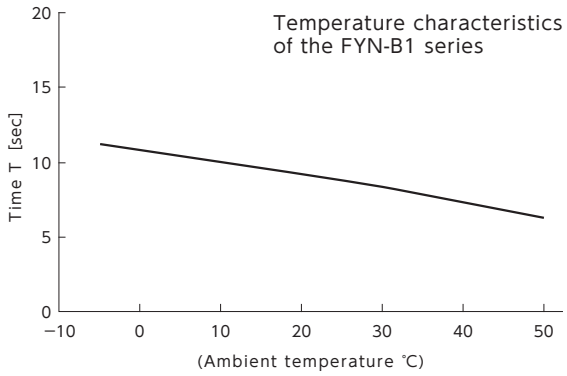


<Recommended dimensions for mounting a rotating shaft>

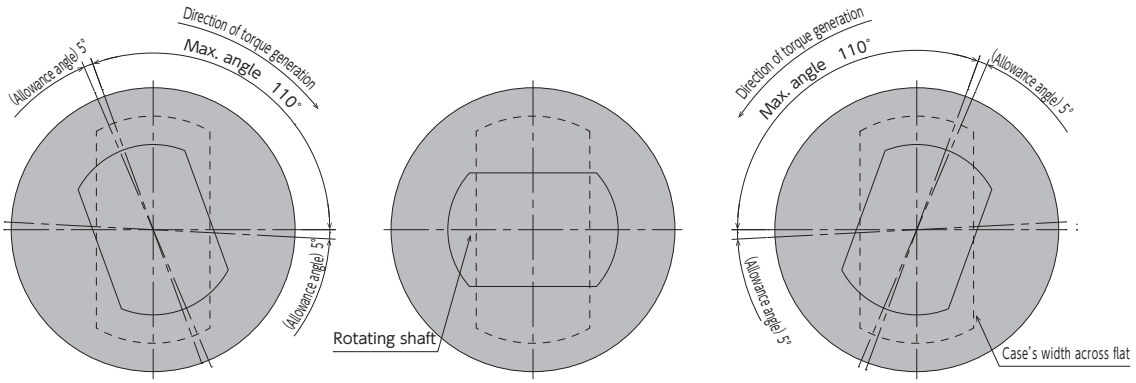
<Recommended dimensions for mounting the main body>

●Products specification might be changed without notice.

4. Damper characteristics vary according to the ambient temperature. In general, the damper characteristics become weaker as the temperature increases, and become stronger as the temperature decreases. This is because the viscosity of the oil inside the damper varies according to the temperature. When the temperature returns to normal, the damper characteristics will return to normal as well. The changes in the time it takes for the lid to close are shown in the graph to the right.



5. The damper's working angle is 110˚, as shown below. Rotating the damper beyond this angle will cause damage to the damper. Please ensure that an external stopper is in place. The working angle is based on the width across flat for fixing, located towards the rear end of the main body. The position where the rotation is complete is at 90˚ with respect to the width across flat.



Rotation Start Position
FYN-B1-R

Rotation End Position
* Rotational position of rotating axle at shipping

Rotation Start Position
FYN-B1-L

6. The direction in which torque is generated varies according to the model. Please select the appropriate model for your purpose.

Vane Damper

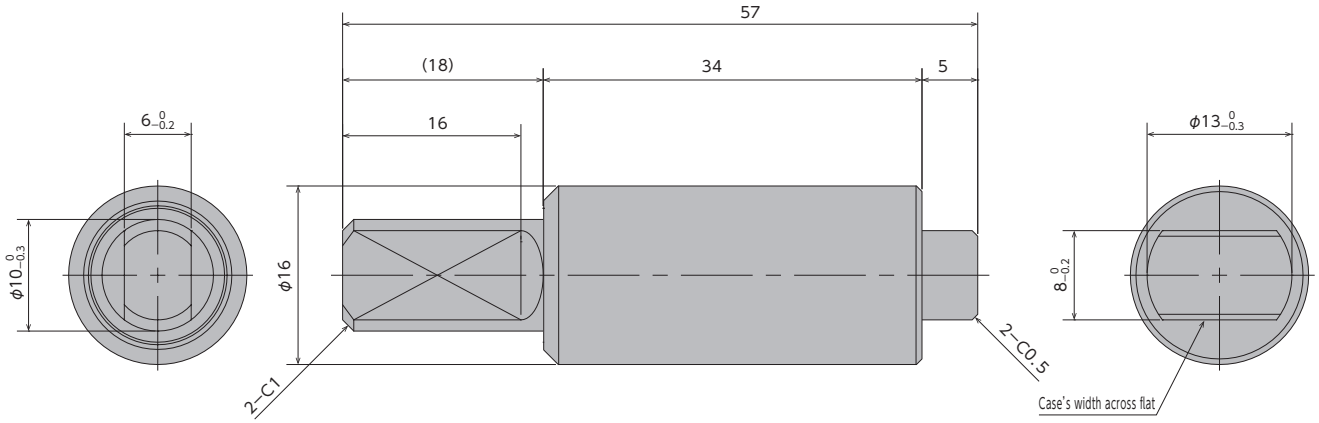
FYN-U1 Series

Specifications

Model	Max. torque	Reverse torque	Damping direction
FYN-U1-R103	1 N·m (10 kgf·cm)	0.5 N·m or lower (5 kgf·cm or lower)	Clockwise
FYN-U1-L103			Counter-clockwise
FYN-U1-R203	2 N·m (20 kgf·cm)	0.7 N·m or lower (7 kgf·cm or lower)	Clockwise
FYN-U1-L203			Counter-clockwise
FYN-U1-R303	3 N·m (30 kgf·cm)	0.9 N·m以下 (9 kgf·cm or lower)	Clockwise
FYN-U1-L303			Counter-clockwise

Note) Measured at 23°C±2°C

* Max. angle 115°
* Operating temperature −5～50℃
* Weight 40±4g
* Main body, rotating shaft materials Zinc die-cast (ZDC)
* Cap material Polyphenylene Sulphide (PPS)
* Oil type Silicone oil



How to Use the Damper

1. FYN-U1 is designed to generate a large torque just before a lid closing from a vertical position, as shown in Diagram A, comes to a full closure. When a lid is closed from a horizontal position, as shown in Diagram B, a strong torque is generated just before the lid is fully closed, causing the lid to not close properly.

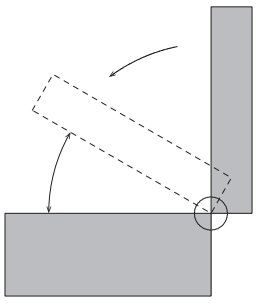


Diagram A

he damper torque becomes larger, preventing the lid from slowing down.

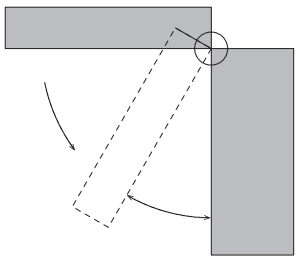
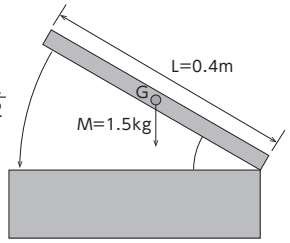


Diagram B

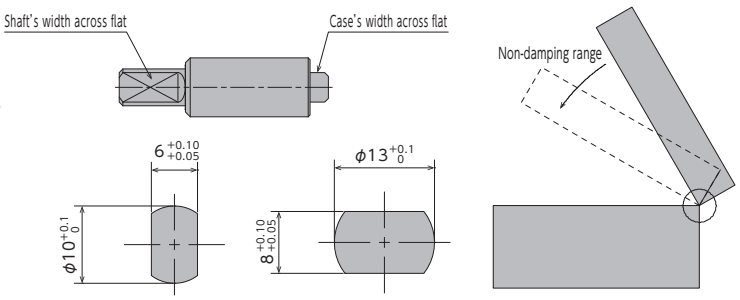
The damper torque becomes larger, preventing the lid from closing completely.

2. When using a damper on a lid, such as the one shown in the diagram, use the following selection calculation to determine the damper torque.

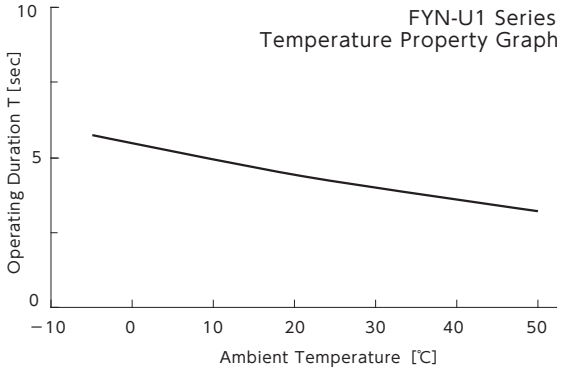
Example)
Lid mass M : 1.5kg
Lid dimensions L : 0.4m
Gravity Center Position : Assumed as $\frac{L}{2}$
Load torque : T = 1.5×9.8×0.4÷2
= 2.94N·m
Based on the above calculation,
FYN-U1-*303 is selected.



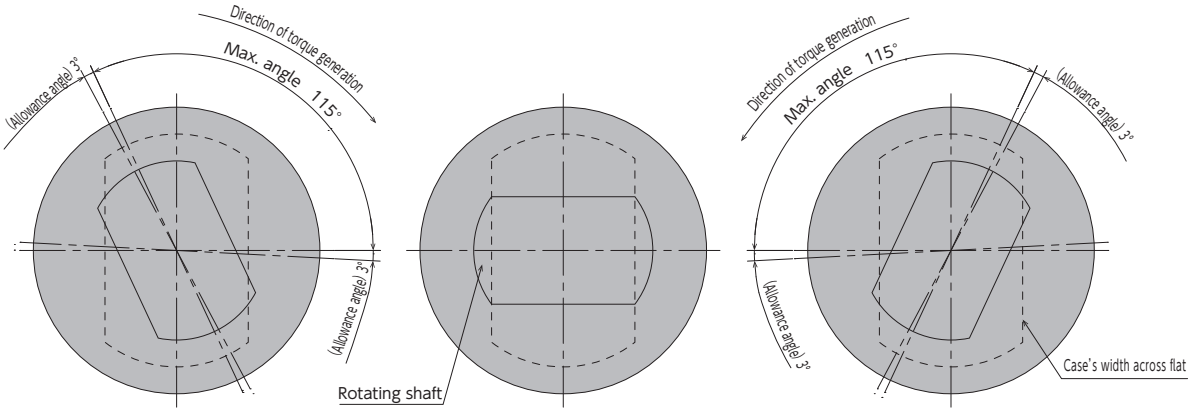
3. When connecting the rotating shaft to other parts, please ensure a tight fit between them. Without a tight fit, the lid will not slow down properly when closing. The corresponding dimensions for fixing the rotating shaft and the main body are as follows.



4. Damper characteristics vary according to the ambient temperature. In general, the damper characteristics become weaker as the temperature increases, and become stronger as the temperature decreases. This is because the viscosity of the oil inside the damper varies according to the temperature. When the temperature returns to normal, the damper characteristics will return to normal as well. The changes in the time it takes for the lid to close are shown in the graph to the right.



5. The damper's working angle is 110°, as shown below. Rotating the damper beyond this angle will cause damage to the damper. Please ensure that an external stopper is in place. The working angle is based on the width across flat for fixing, located towards the rear end of the main body. The position where the rotation is complete is at 90° with respect to the width across flat.



Rotation Start Position
FYN-U1-R

Rotation End Position
* Rotational position of rotating axle at shipping

Rotation Start Position
FYN-U1-L

6. The direction in which torque is generated varies according to the model. Please select the appropriate model for your purpose.

Vane Damper

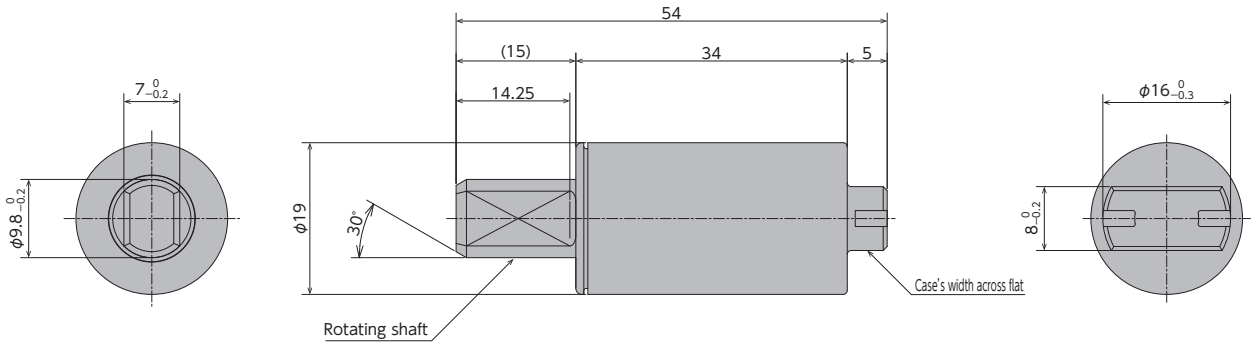
FYN-C1 Series

Specifications

Model	Max. torque	Reverse torque	Directions
FYN-C1-R203	2N·m (20kgf·cm)	0.3 N·m or lower (3 kgf·cm or lower)	Clockwise (CW)
FYN-C1-L203			Counterclockwise (CCW)
FYN-C1-R253	2.5N·m (25kgf·cm)	0.5 N·m or lower (5 kgf·cm or lower)	Clockwise (CW)
FYN-C1-L253			Counterclockwise (CCW)
FYN-C1-R303	3N·m (30kgf·cm)	0.7 N·m or lower (7 kgf·cm or lower)	Clockwise (CW)
FYN-C1-L303			Counterclockwise (CCW)
FYN-C1-R353	3.5N·m (35kgf·cm)	0.9 N·m or lower (9 kgf·cm or lower)	Clockwise (CW)
FYN-C1-L353			Counterclockwise (CCW)
FYN-C1-R403	4N·m (40kgf·cm)	1.1 N·m or lower (11 kgf·cm or lower)	Clockwise (CW)
FYN-C1-L403			Counterclockwise (CCW)

Note) Measured at 23°C±2°C

* Max. angle 110°
* Operating temperature −5～50℃
* Weight 30±2g
* Body and cap material Polybutylene terephthalate (PBT)
* Rotating shaft material Zinc die-cast (ZDC)
* Oil type Silicone oil



How to Use the Damper

1. The FYN-C1 series has been designed so that when a lid is closing from a vertical position, as shown in Figure A, high torque is generated just before it closes completely.
For a lid that closes from a horizontal position, as shown in Figure B, the strong torque generated just prior to a complete closure may prevent the lid from becoming fully closed.

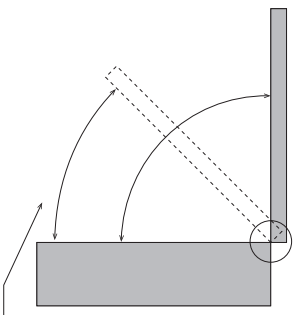


Figure A

Stronger damper torque allows the lid to close gently until it is fully closed.

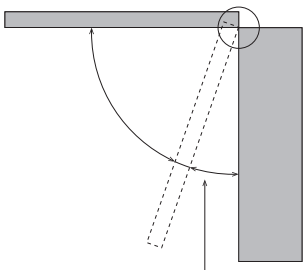
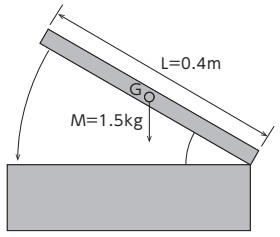


Figure B

Stronger damper torque prevents the lid from being fully closed.

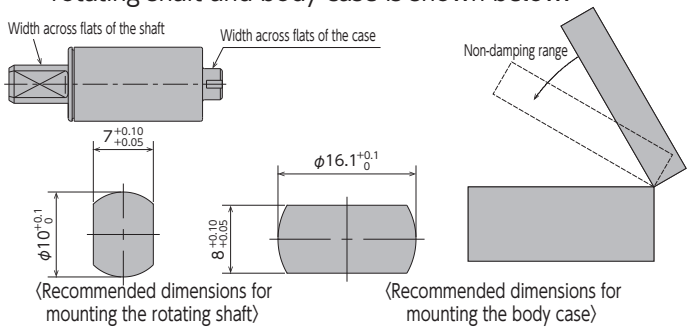
2. When using a damper with a lid shown in the diagram, determine the damper torque based on the following selection calculation.

Example)
Lid weight M : 2kg
Lid dimension L : 0.4m
Gravity Center Position G: Assumed as $\frac{L}{2}$
Load torque : T=2×9.8×0.4÷2
=3.92N·m



Based on the above calculation, select FYN-C1-*403.

3. When connecting parts that are joined to the rotating shaft, ensure a snug fit. The lid will not decelerate as designed when closing if these parts are not connected properly. The dimensional tolerance for fixing the rotating shaft and body case is shown below.

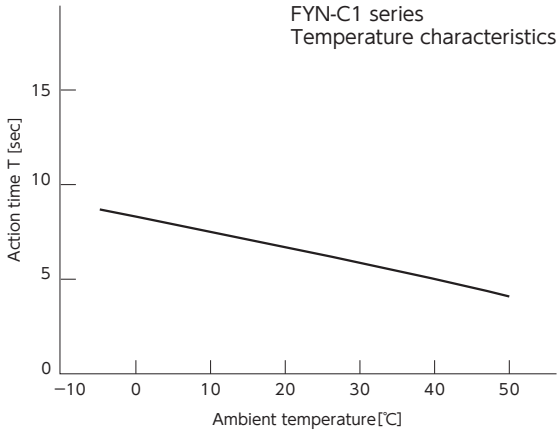


〈Recommended dimensions for mounting the rotating shaft〉

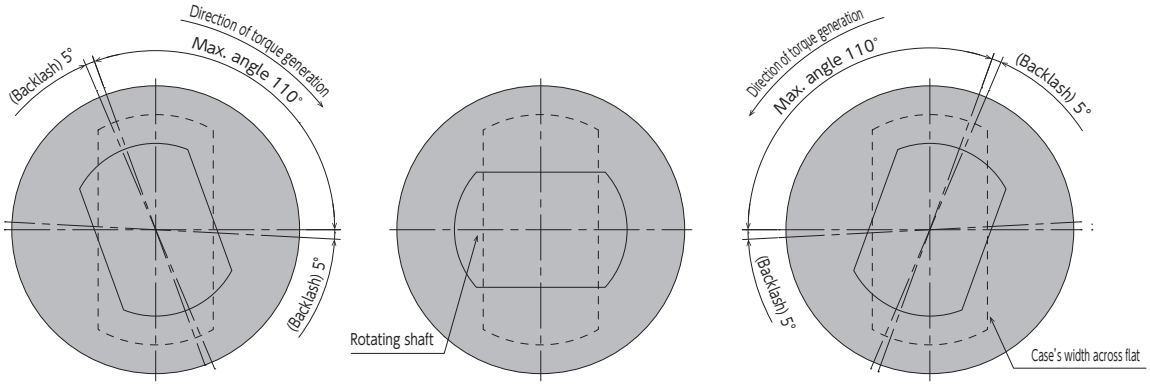
〈Recommended dimensions for mounting the body case〉

●Products specification might be changed without notice.

4.Damper characteristics vary according to the ambient temperature. In general, damper characteristics weaken as the temperature goes up, and become stronger as the temperature goes down.
This occurs because the viscosity of oil inside the damper is affected by the temperature change. Once the temperature returns to normal, so will the damper characteristics. Please refer to the right diagram for change in the action time for a free-closing lid.



5.The damper action angle is 110° as shown below. Rotating it beyond this angle will cause the damper to break. Ensure that an external stopper is in place. The action angle is based on the width across flats of the case on the back of the body. The rotation end point is at 90° on the basis of the width across flats of the case. (Refer to the figure below.)



Rotation starting point
FYN-C1-R

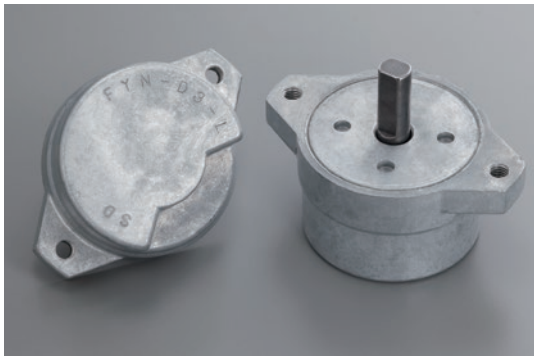
Rotation end point
*Rotating shaft angle for shipment

Rotation starting point
FYN-C1-L

6.There are dampers that generate torque in either the clockwise or counterclockwise direction when the rotating shaft is seen from the above. Select a model according to use.

Vane Damper

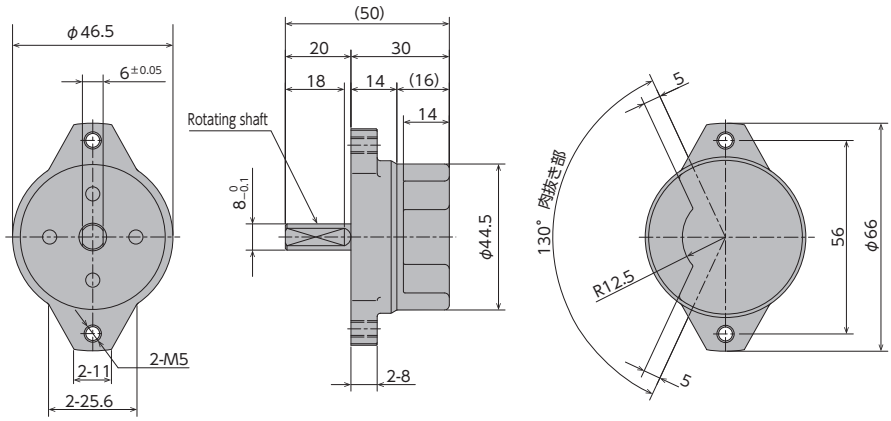
FYN-D3 Series



Specifications

Model	Max. torque	Reverse torque	Damping direction
FYN-D3-R503	5 N·m (50 kgf·cm)	1 N·m or lower (10 kgf·cm or lower)	Clockwise
FYN-D3-L503			Counter-clockwise
FYN-D3-R703	7 N·m (70 kgf·cm)	1 N·m or lower (10 kgf·cm or lower)	Clockwise
FYN-D3-L703			Counter-clockwise
FYN-D3-R104	10 N·m (100 kgf·cm)	2 N·m or lower (20 kgf·cm or lower)	Clockwise
FYN-D3-L104			Counter-clockwise

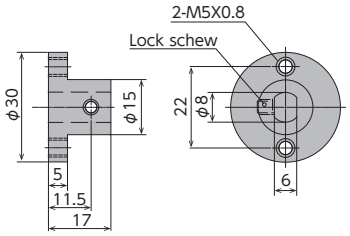
* Max. angle 180°
* Operating temperature −5～50℃
* Weight 215±10g
* Body and cap material Zinc die-cast (ZDC)
* Rotating shaft materia S25C
* Oil type Silicone oil



Optional Parts

Rotating shaft flange ROP-010H1

Applicable model	Model
FYN-D3	ROP-010H1



Rotating shaft flange
ROP−010H1

How to Use the Damper

1. FYN-D3 is designed to generate a large torque just before a lid closing from a vertical position, as shown in Diagram A, comes to a full closure. When a lid is closed from a horizontal position, as shown in Diagram B, a strong torque is generated just before the lid is fully closed, causing the lid to not close properly.

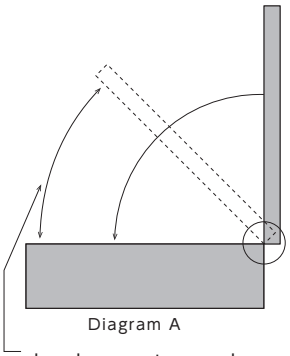


Diagram A

he damper torque becomes larger, preventing the lid from slowing down.

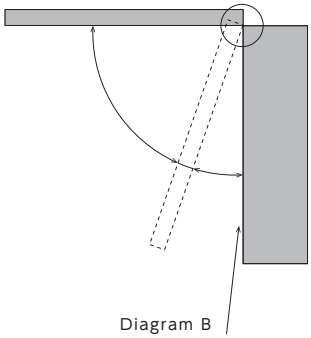


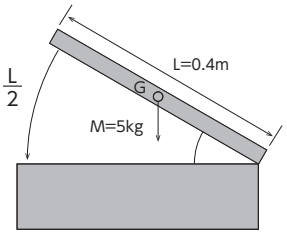
Diagram B

The damper torque becomes larger, preventing the lid from closing completely.

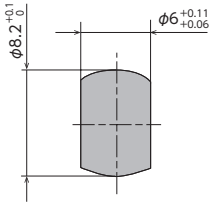
The angle in which the damper torque becomes large can be customized by modifying the inside orifice.

2. When using a damper on a lid, such as the one shown in the diagram, use the following selection calculation to determine the damper torque.

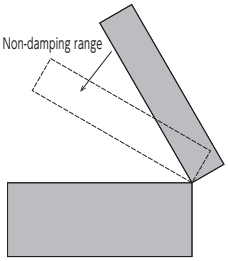
Example)
Lid mass M : 5kg
Lid dimensions L: 0.4m
Gravity Center Position : Assumed as $\frac{L}{2}$
Load torque : T = 5×9.8×0.4÷2
= 9.8N·m
Based on the above calculation,
FYN-D3-*104 is selected.



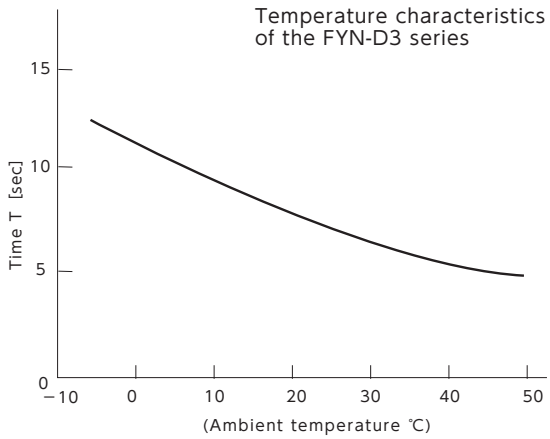
3. When connecting the rotating shaft to other parts, please ensure a tight fit between them. Without a tight fit, the lid will not slow down properly when closing. The corresponding dimensions for fixing the rotating shaft and the main body are as follows.



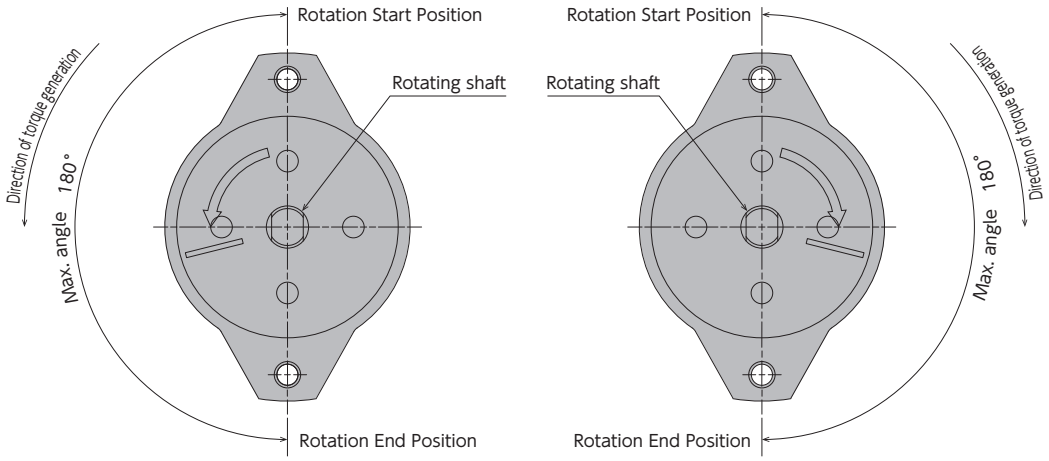
<Recommended dimensions for mounting a rotating shaft>



4. Damper characteristics vary according to the ambient temperature. In general, the damper characteristics become weaker as the temperature increases, and become stronger as the temperature decreases. This is because the viscosity of the oil inside the damper varies according to the temperature. When the temperature returns to normal, the damper characteristics will return to normal as well. The changes in the time it takes for the lid to close are shown in the graph to the right.



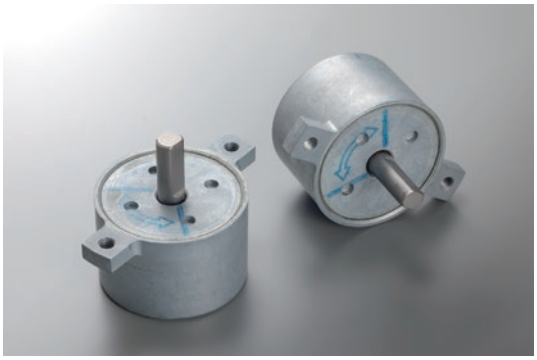
5. The damper's working angle is 110°, as shown below. Rotating the damper beyond this angle will cause damage to the damper. Please ensure that an external stopper is in place. The working angle is based on the width across flat for fixing, located towards the rear end of the main body. The position where the rotation is complete is at 90° with respect to the width across flat.



6. The direction in which torque is generated varies according to the model. Please select the appropriate model for your purpose.

Vane Damper

FYT/FYN-D1(D2) Series

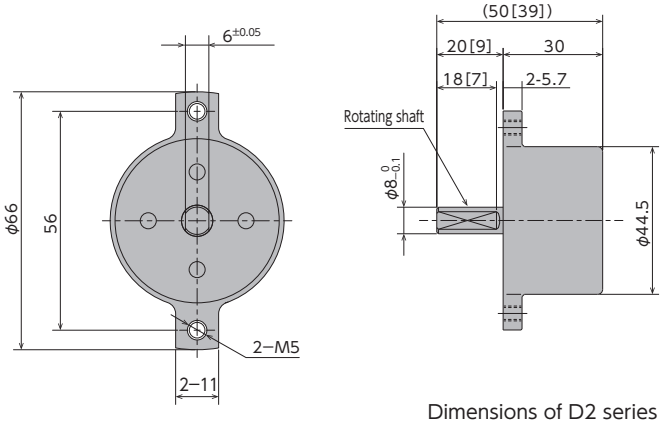


Specifications

Model	Max. torque	Reverse torque	Damping direction
FYT-D1(2)-104	10 N·m (100 kgf·cm)	—	Both directions
FYN-D1(2)-R104	10 N·m (100 kgf·cm)	0.5 N·m or lower (5 kgf·cm or lower)	Clockwise
FYN-D1(2)-L104			Counter-clockwise

Note) Measured at 23˚C±2˚C
The FYT/N-D2 series has a shorter shaft length.

* Max. angle 105˚
* Operating temperature −5∼50℃
* Weight D1 : 215±10g, D2 : 210±10g
* Body and cap material Zinc die-cast (ZDC)
* Rotating shaft material S25C
* Oil type Silicone oil

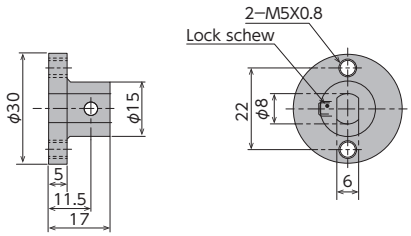


Dimensions of D2 series are in [ ]

Optional Parts

Rotating shaft flange ROP-010H1

Model
ROP-010H1



Rotating shaft flange
ROP-010H1

How to Use the Damper

1. The uni-directional FYN-D1 is designed to generate a large torque just before a lid closing from a vertical position, as shown in Diagram A, comes to a full closure. When a lid is closed from a horizontal position, as shown in Diagram B, a strong torque is generated just before the lid is fully closed, causing the lid to not close properly. Torque is generated in both clockwise and counterclockwise directions in the FTY-D1 series. Unlike the FYN-D1 series, it does not have a fixed orifice for adjusting torque. Therefore, torque remains constant at any angle.

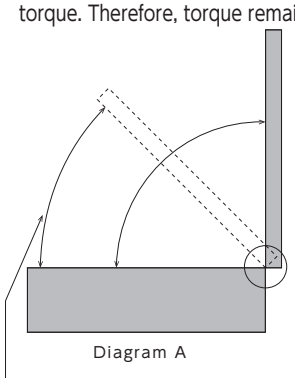


Diagram A

he damper torque becomes larger, preventing the lid from slowing down.

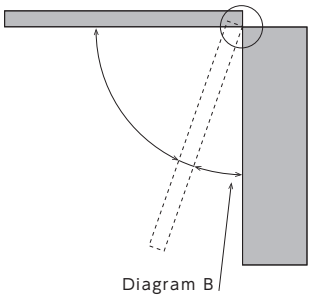
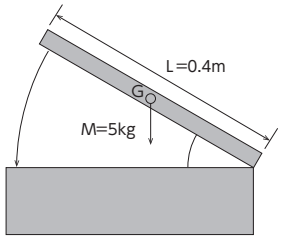


Diagram B

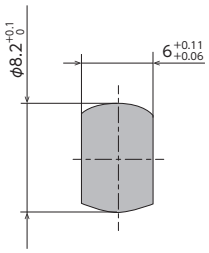
The damper torque becomes larger, preventing the lid from closing completely.

The angle in which the damper torque becomes large can be customized by modifying the inside orifice.

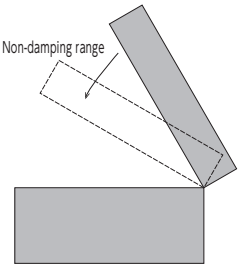
2. When using a damper on a lid, such as the one shown in the diagram, use the following selection calculation to determine the damper torque.
Example)
Lid mass M : 5kg
Lid dimensions L : 0.4m
Gravity Center Position : Assumed as $\frac{L}{2}$
Load torque : T = 5×9.8×0.4÷2
= 9.8N·m
Based on the above calculation,
FYN-D1-*104 is selected.



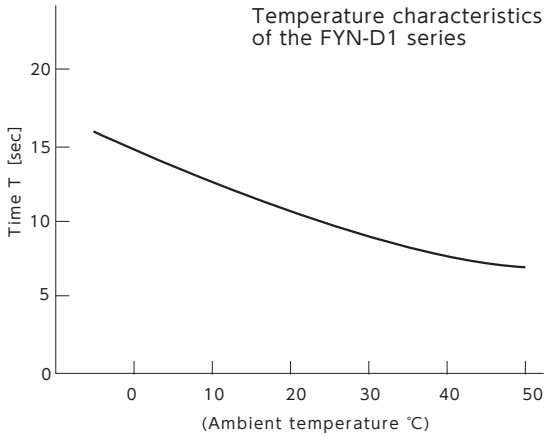
3. When connecting the rotating shaft to other parts, please ensure a tight fit between them. Without a tight fit, the lid will not slow down properly when closing. The corresponding dimensions for fixing the rotating shaft and the main body are as follows.



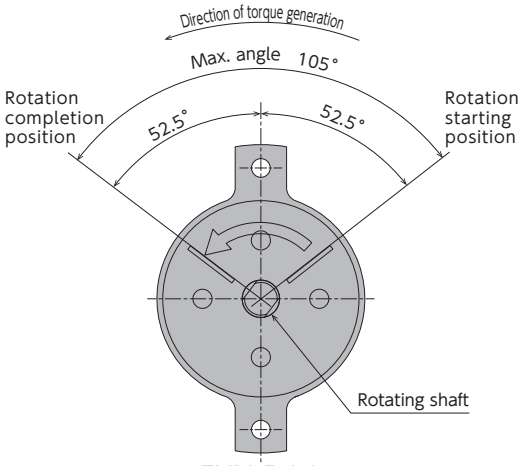
<Recommended dimensions for mounting a rotating shaft>



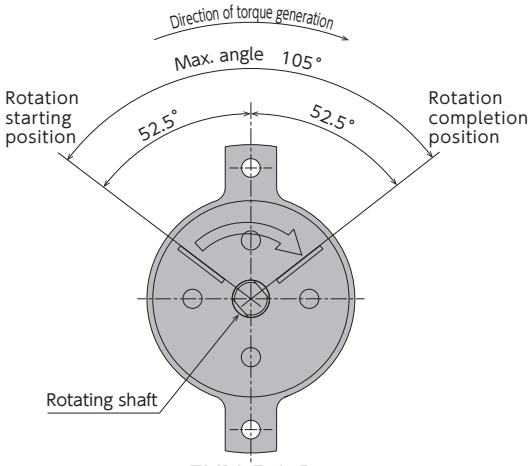
4. Damper characteristics vary according to the ambient temperature. In general, the damper characteristics become weaker as the temperature increases, and become stronger as the temperature decreases. This is because the viscosity of the oil inside the damper varies according to the temperature. When the temperature returns to normal, the damper characteristics will return to normal as well. The changes in the time it takes for the lid to close are shown in the graph to the right.



5. The damper's working angle is 110°, as shown below. Rotating the damper beyond this angle will cause damage to the damper. Please ensure that an external stopper is in place. The working angle is based on the width across flat for fixing, located towards the rear end of the main body. The position where the rotation is complete is at 90° with respect to the width across flat.



FYN-D1-L
FYN-D2-L



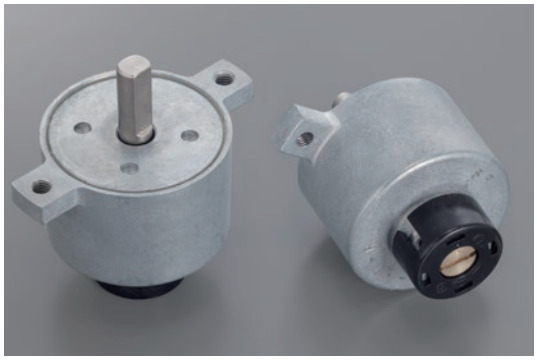
FYN-D1-R
FYN-D2-R

6. The FYN-D1 series is a fixed type; its torque is non-adjustable. However, a customized order for a torque between the range of 2 ~20N·m is possible by changing the oil viscosity.

7. The direction in which torque is generated varies according to the model. Please select the appropriate model for your purpose.

Vane Damper

FYT/FYN-H1(H2) Series

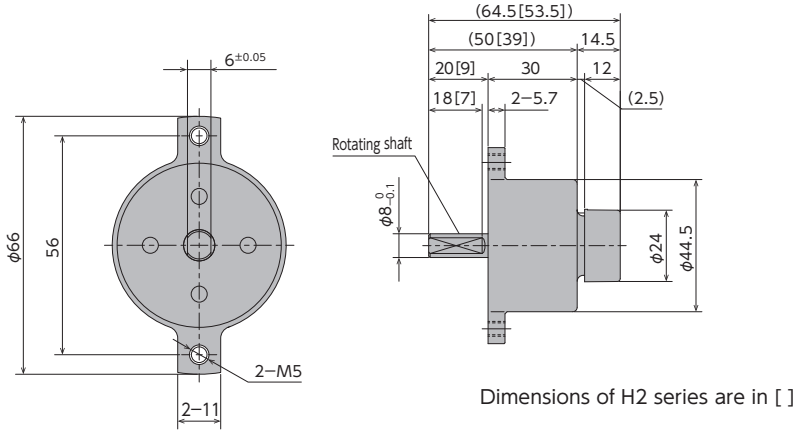


Specifications

Model	Max. torque	Reverse torque	Damping direction
FYT-H1(2)-104	10 N·m (100 kgf·cm)	—	Both directions
FYN-H1(2)-R104	10 N·m (100 kgf·cm)	0.5 N·m or lower (5 kgf·cm or lower)	Clockwise
FYN-H1(2)-L104			Counter-clockwise

Note) Measured at 23˚C ± 2˚C
The FYT/N-H2 series has shorter shaft length.

* Max. angle 105˚
* Operating temperature −5~50℃
* Weight H1 : 240±10g, H 2 : 235±10g
* Body and cap material Zinc die-cast (ZDC)
* Rotating shaft material S25C
* Oil type Silicone oil

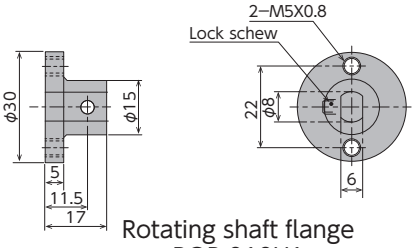


Dimensions of H2 series are in [ ]

Optional Parts

Rotating shaft flange ROP-010H1

Model
ROP-010H1



Rotating shaft flange
ROP-010H1

How to Use the Damper

1. The uni-directional FYN-H1 is designed to generate a large torque just before a lid closing from a vertical position, as shown in Diagram A, comes to a full closure. When a lid is closed from a horizontal position, as shown in Diagram B, a strong torque is generated just before the lid is fully closed, causing the lid to not close properly. Torque is generated in both clockwise and counterclockwise directions in the FTY-H1 series. Unlike the FYN-H1 series, it does not have a fixed orifice for adjusting torque. Therefore, torque remains constant at any angle.

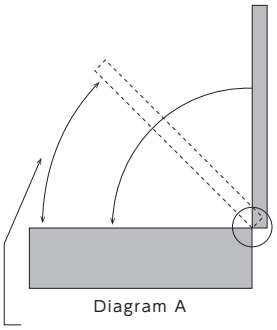


Diagram A

he damper torque becomes larger, preventing the lid from slowing down.

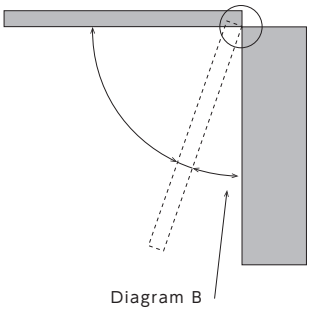
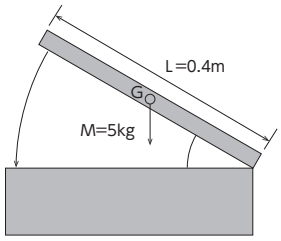


Diagram B

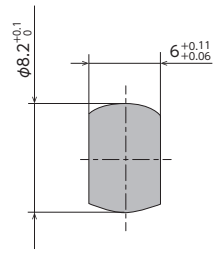
The damper torque becomes larger, preventing the lid from closing completely.

The angle in which the damper torque becomes large can be customized by modifying the inside orifice.

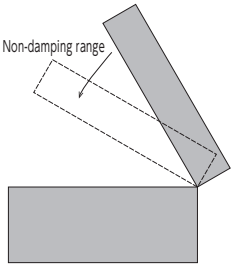
2. When using a damper on a lid, such as the one shown in the diagram, use the following selection calculation to determine the damper torque.
Example)
Lid mass M : 5kg
Lid dimensions L : 0.4m
Gravity Center Position : Assumed as $\frac{L}{2}$
Load torque : T = 5×9.8×0.4÷2
= 9.8N·m
Based on the above calculation,
FYN-H1-*104 is selected.



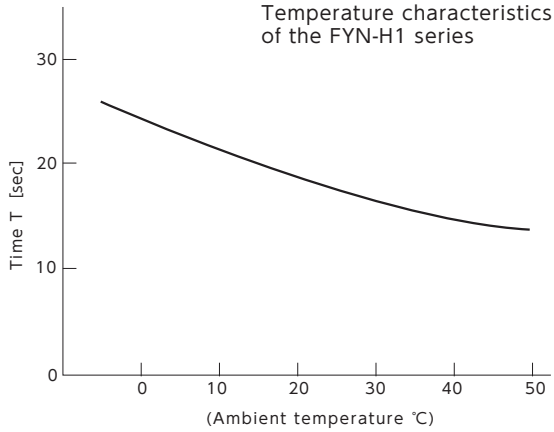
3. When connecting the rotating shaft to other parts, please ensure a tight fit between them. Without a tight fit, the lid will not slow down properly when closing. The corresponding dimensions for fixing the rotating shaft and the main body are as follows.



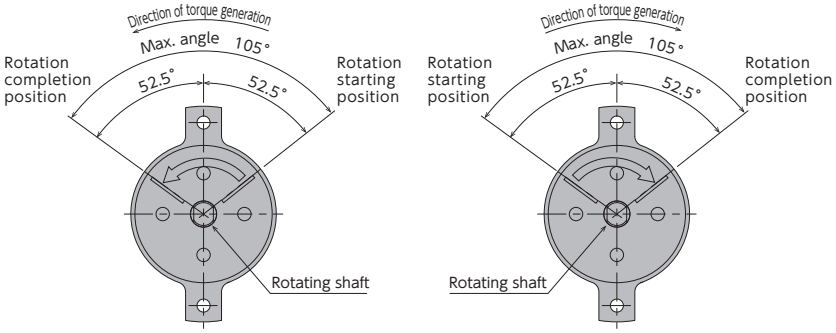
<Recommended dimensions for mounting a rotating shaft>



4. Damper characteristics vary according to the ambient temperature. In general, the damper characteristics become weaker as the temperature increases, and become stronger as the temperature decreases. This is because the viscosity of the oil inside the damper varies according to the temperature. When the temperature returns to normal, the damper characteristics will return to normal as well. The changes in the time it takes for the lid to close are shown in the graph to the right.

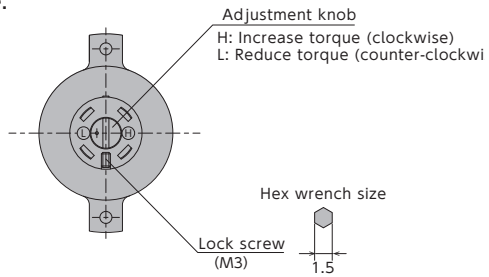


5. The damper's working angle is 110°, as shown below. Rotating the damper beyond this angle will cause damage to the damper. Please ensure that an external stopper is in place. The working angle is based on the width across flat for fixing, located towards the rear end of the main body. The position where the rotation is complete is at 90° with respect to the width across flat.



6. How to adjust the damper

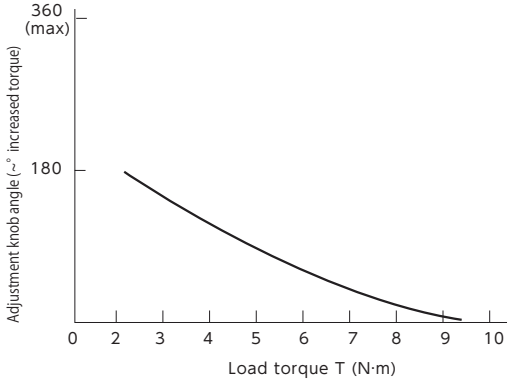
1) In the FYT-H1 (H2) and FYN-H1 (H2) series, the amount of generated torque can be adjusted with the adjustment knob located towards the rear of the main body. Insert a screwdriver in the minus groove to turn.
2) Turn the adjustment knob in the H direction to increase torque.
3) Turn the adjustment knob in the L direction to reduce torque.
4) Do not turn the adjustment knob more than 360°. Turning the knob more than 360° causes the adjustment shaft to slip out, resulting in oil leakage.
5) Once the adjustment is complete, secure with a lock screw. Using the damper without securing it may result in fluctuating torque.



7. The direction in which torque is generated varies according to the model. Please select the appropriate model for your purpose.

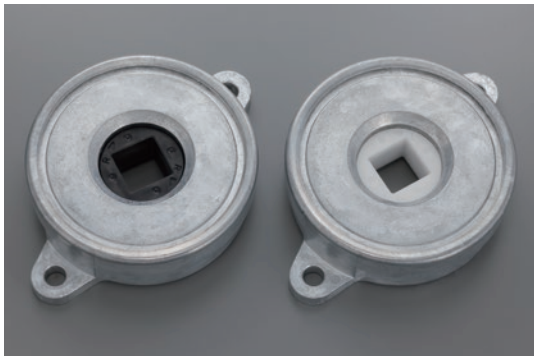
<Range of torque adjustment>

Please refer to the graph below for the relationship between torque and the adjustment knob.



Vane Damper

FYN-S1 Series

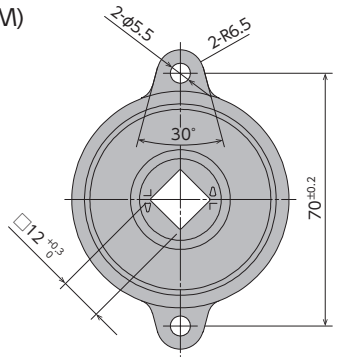


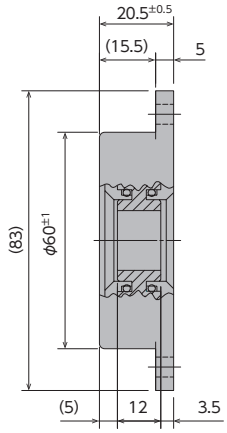
Specifications

Model	Max. torque	Reverse torque	Damping direction
FYN-S1-R104	10 N·m (100 kgf·cm)	1.5 N·m or lower (15 kgf·cm or lower)	Clockwise
FYN-S1-L104			Counter-clockwise

Note) Measured at 23° C ± 2° C

- Max. angle 130°
- Operating temperature −5～50℃
- Weight 220±10g
- Main body material Zinc die-cast (ZDC)
- Cap material Zinc die-cast (ZDC)
- Rotor material Polyacetal (POM)
- Oil type Silicone oil

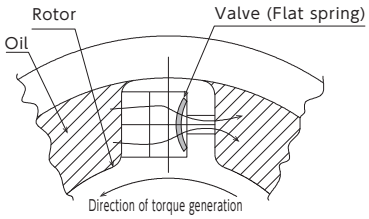




How to Use the Damper

1. Operating characteristics of self-adjusting oil pressure dampers

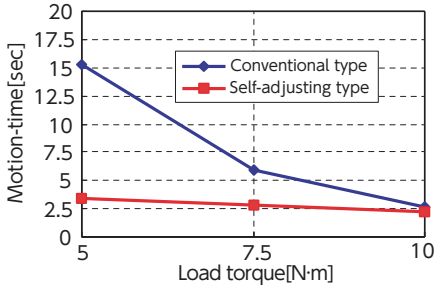
In a conventional vane damper, the damping strength (damping constant) does not change regardless of the load torque used. Because of this, its working speed is slower when the load torque is small, and faster when the load torque is large. However, because the self-adjusting FYN-S1 series is designed to self-adjust the damping force (damping constant) according to the applied load, the working speed fluctuates less compared to conventional dampers when the applied load is altered. The acceptable range or torque is 5 ～10N·m. Please select your damper by referring to the motion-time graph below.



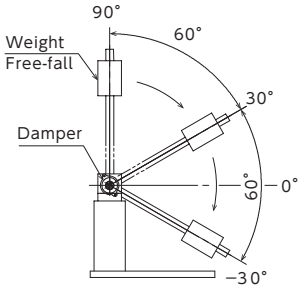
[Operating principles of the self-adjusting type]

As shown in the diagram to the left, by changing the shape of the valve (flat spring), the amount of oil flow is altered, adjusting the damper's generated torque. (PAT.P)

[Motion time graph]



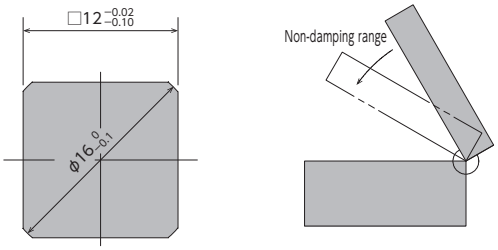
[Measurement conditions for th e motion-time graph]



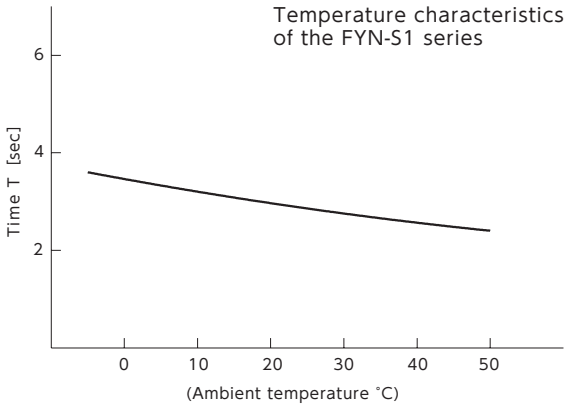
- Load torque T 5˜10N·m
- Measured angle 30° ～ -30°
- Measurement temperature 23° C±2° C

As the level of self-adjustment may vary depending on the range of the working angle of the actual work, please verify under actual working conditions before you select your damper.

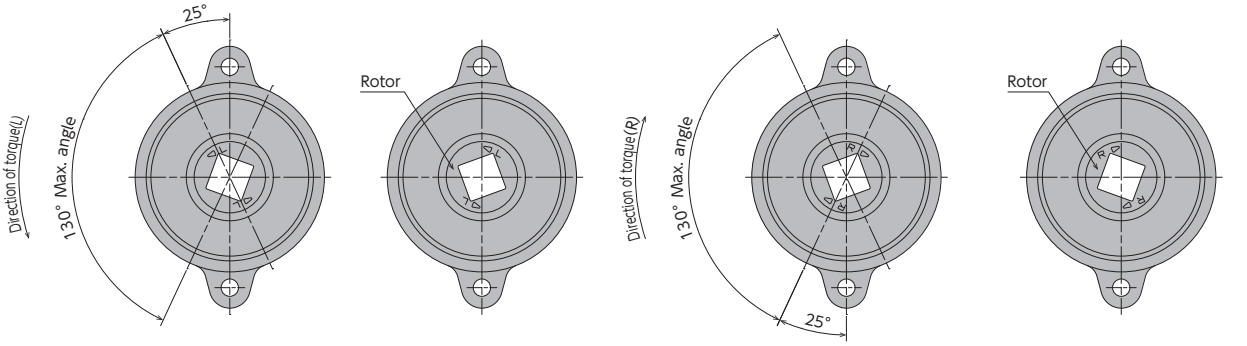
2. When using the damper, please ensure that a shaft with specified angular dimensions is inserted in the damper's shaft opening. Also, please ensure a tight fit between the shaft and the damper shaft's opening. Without a tight fit, the non-damping range becomes larger in a closing motion, etc., and it may not slow down properly. Please see the diagrams to the right for the recommended shaft dimensions for a damper.



3. Damper characteristics vary according to the ambient temperature. In general, the damper characteristics become weaker as the temperature increases, and become stronger as the temperature decreases. This is because the viscosity of the oil inside the damper varies according to the temperature. When the temperature returns to normal, the damper characteristics will return to normal as well. The time it takes for the lid to close is shown in the graph to the right.



4. The damper's working angle is 130°, as shown below. Rotating the damper beyond this angle will cause damage to the damper. Please ensure that an external stopper is in place.

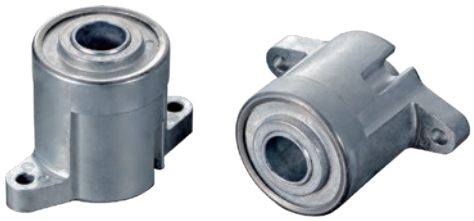


5. Because the FYN-S1 series is a self-adjusting type, the torque cannot be adjusted manually. However, by altering the viscosity of the oil, its damper characteristics can be modified. (Please contact us, as this is a custom order.)

6. The direction in which torque is generated varies according to the model. Please select the appropriate model for your purpose.

Vane Damper

FYN-X2 Series

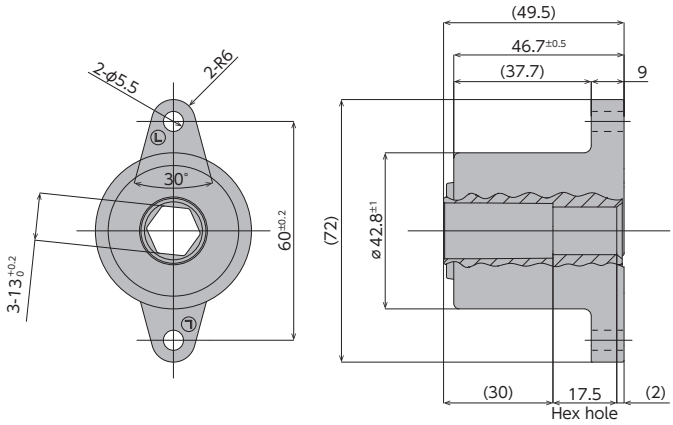


Specifications

Model	Max. torque	Reverse torque	Directions
FYN-X2-R154	15N·m (150kgf·cm)	2 N·m or lower (20kgf·cm以下)	Clockwise
FYN-X2-L154			Counterclockwise
FYN-X2-R254	25N·m (250kgf·cm)	3 N·m or lower (30 kgf·cm or lower)	Clockwise
FYN-X2-L254			Counterclockwise

Note) Measured at 23°C±2°C

∗Max. angle 106°
∗Operating temperature −5～50℃
∗Weight 287±10g
∗Body material Zinc die-cast (ZDC)
∗Cap material Zinc die-cast (ZDC)
∗Rotor material Zinc die-cast (ZDC)
∗Oil type Silicone oil



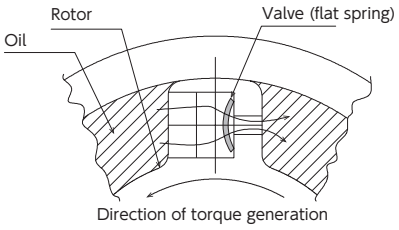
How to Use the Damper

1.Operating characteristics of self-adjusting oscillating dampers

In a conventional oscillating damper, the damping strength (damping constant) does not change regardless of the load torque used. Therefore, the operating speed is slower when the load torque is small, and faster when the load torque is large.

However, since the self-adjusting FYN-X2 series is designed to self-adjust the damping strength (damping constant) according to the applied load, its motion-time fluctuates less than that of conventional dampers when the load changes.

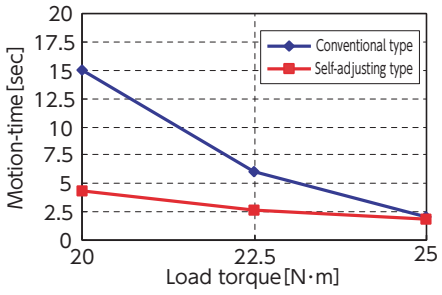
The acceptable range of torque is 10 to 15N•m or 20 to 25N•m. Please select your damper by referring to the motion-time graph below.

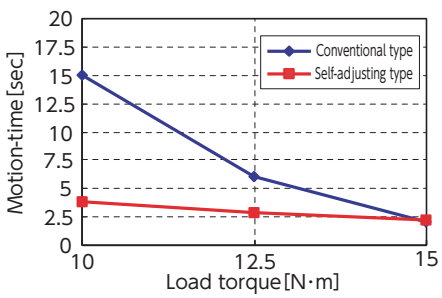


【Operating principles of the self-adjusting type】

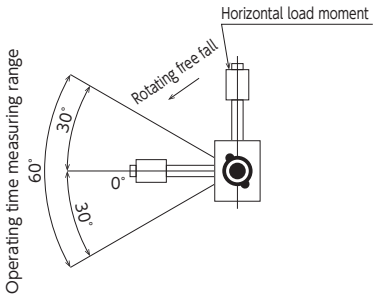
As shown in the diagram to the left, by changing the shape of the valve (flat spring), the amount of oil flow is altered, adjusting the damper's generated torque. (PAT.P)

【Motion time graph】

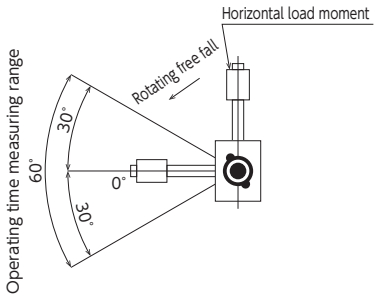




【Measurement conditions for the motion-time graph】



FYN-X2 25N·m specification
- Measuring temperature : Room temperature (23±3℃)
- Load torque : 20～25N·m
- Measuring angle : +30°～−30°

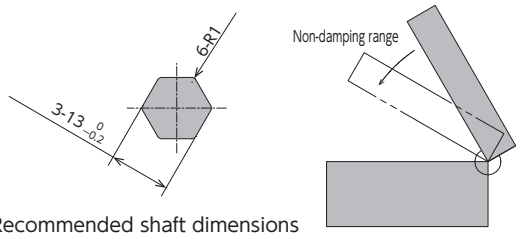


FYN-X2 15N·m specification
- Measuring temperature : Room temperature (23±3℃)
- Load torque : 10～15N·m
- Measuring angle : +30°～−30°

As the level of self-adjustment may vary depending on the range of the working angle of the actual work, please verify under actual working conditions before you select your damper.

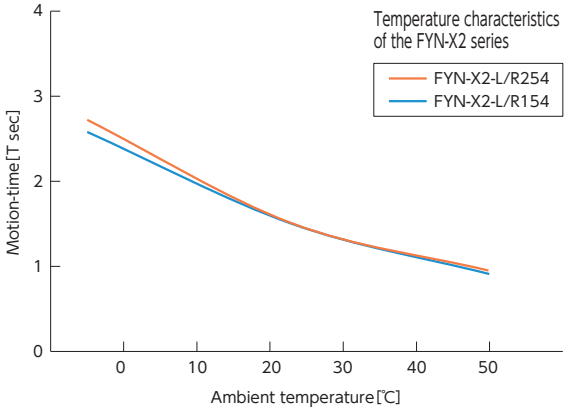
●Products specification might be changed without notice.

2.When using the damper, please ensure that a shaft with specified angular dimensions is inserted in the damper's shaft opening. Also, please ensure a tight fit between the shaft and the damper shaft's opening. Without a tight fit, the play becomes larger in a closing motion, etc., and the lid may not slow down properly. Please see the diagrams to the right for the recommended shaft dimensions for a damper.

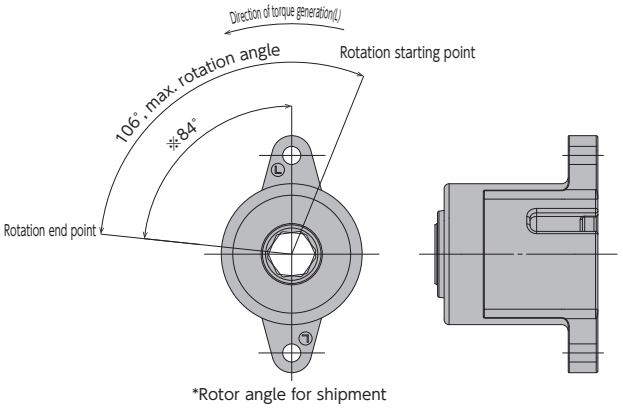


Recommended shaft dimensions

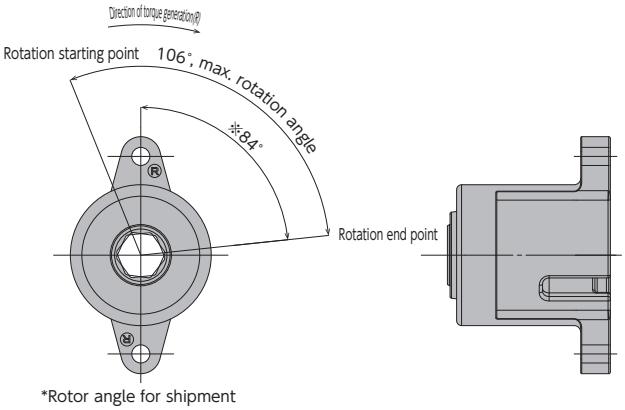
3.Damper characteristics vary according to the ambient temperature. In general, the damper characteristics become weaker as the temperature increases, and become stronger as the temperature decreases.
This is because the viscosity of the oil inside the damper varies according to the temperature. When the temperature returns to normal, the damper characteristics will return to normal as well. The time it takes for the lid to close is shown in the graph to the right.



4.The damper's working angle is 106° as shown below. Rotating the damper beyond this angle will cause the damage to the damper. Please ensure that an external stopper is in place.



FYN-X2-L154
FYN-X2-L254



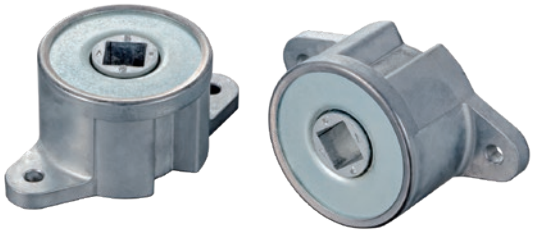
FYN-X2-R154
FYN-X2-R254

5. Because the FYN-X2 series is a self-adjusting type, the torque cannot be adjusted manually. However, by altering the viscosity of the oil, its damper characteristics can be modified.
* Please contact us, as this is a custom order,

6.The direction in which torque is generated varies according to the model. Please select the appropriate model for your purpose.

Vane Damper

FYN-Z2 Series

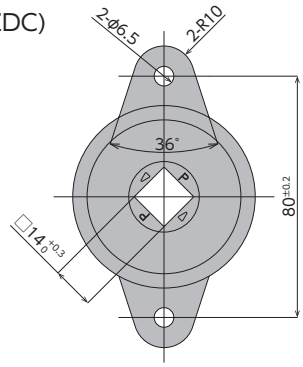


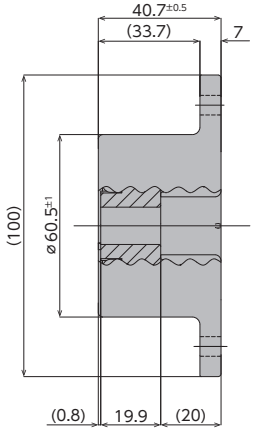
Specifications

Model	Max. torque	Reverse torque	Directions
FYN-Z2-R354	35N·m (350kgf·cm)	3 N·m or lower (30 kgf·cm or lower)	Clockwise
FYN-Z2-L354			Counterclockwise

Note) Measured at 23°C±2°C

∗Max. angle 94°
∗Operating temperature −5～50℃
∗Weight 506±10g
∗Body material Zinc die-cast (ZDC)
∗Cap material Iron (SPFC)
∗Rotor material Zinc die-cast (ZDC)
∗Oil type Silicone oil





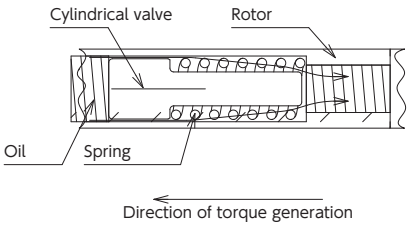
How to Use the Damper

1. Operating characteristics of self-adjusting oscillating dampers

In a conventional oscillating damper, the damping strength (damping constant) does not change regardless of the load torque used. Therefore, the operating speed is slower when the load torque is small, and faster when the load torque is large.

However, since the self-adjusting FYN-X2 series is designed to self-adjust the damping strength (damping constant) according to the applied load, its motion-time fluctuates less than that of conventional dampers when the load changes.

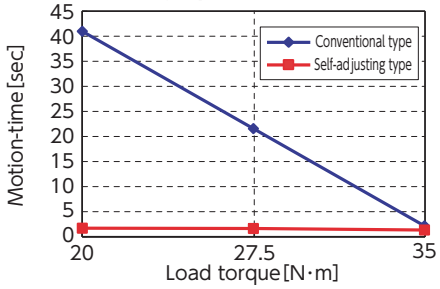
The acceptable range of torque is 20 to 35 N•m. Please select your damper by referring to the motion-time graph below.



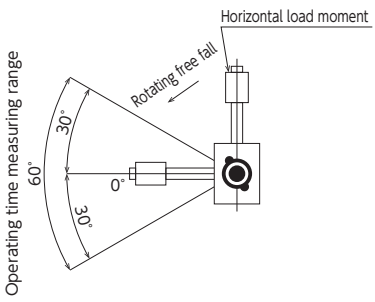
[Operating principles of the self-adjusting type]

As shown in the diagram to the left, the spring compressed by the movement of the cylindrical valve alters the amount of oil flow so as to adjust the generated torque of the damper. (Patent pending)

[Motion time graph]



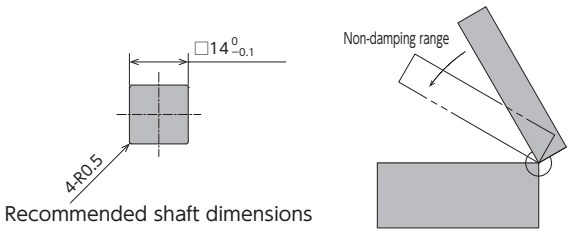
[Measurement conditions for the motion-ime graph]



- Measuring temperature : Room temperature (23±3℃)
- Load torque : 20～35N·m
- Measuring angle: +30°～−30°

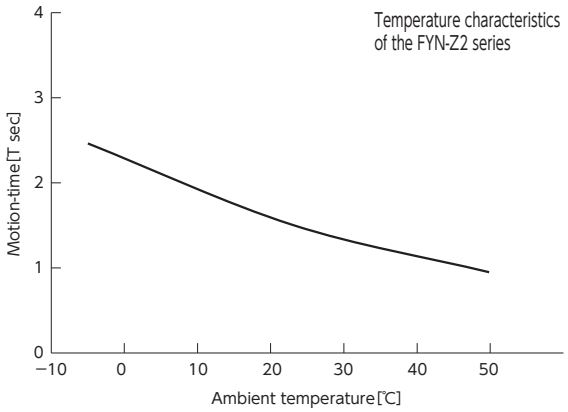
As the level of self-adjustment may vary depending on the range of the working angle of the actual work, please verify under actual working conditions before you select your damper.

2.When using the damper, please ensure that a shaft with specified angular dimensions is inserted in the damper's shaft opening. Also, please ensure a tight fit between the shaft and the damper shaft's opening. Without a tight fit, the play becomes larger in a closing motion, etc., and the lid may not slow down properly. Please see the diagrams to the right for the recommended shaft dimensions for a damper.

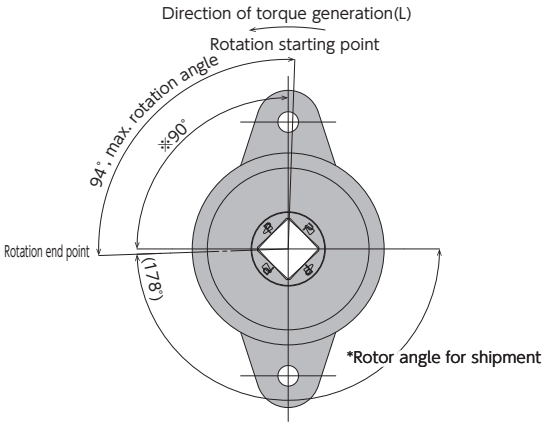


Recommended shaft dimensions

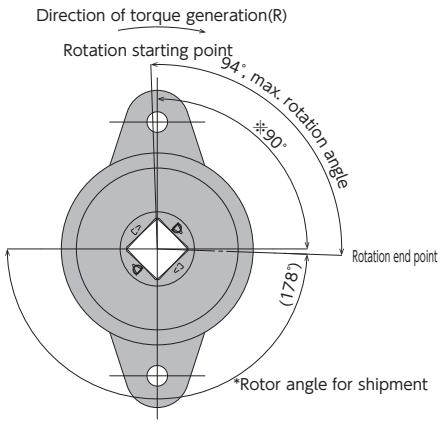
3.Damper characteristics vary according to the ambient temperature. In general, the damper characteristics become weaker as the temperature increases, and become stronger as the temperature decreases.
This is because the viscosity of the oil inside the damper varies according to the temperature. When the temperature returns to normal, the damper characteristics will return to normal as well. The time it takes for the lid to close is shown in the graph to the right.



4.The damper's working angle is 94° as shown below. Rotating the damper beyond this angle will cause the damage to the damper. Please ensure that an external stopper is in place.



FYN-Z2-L354



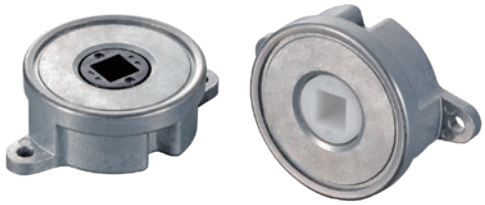
FYN-Z2-R354

5. Because the FYN-Z2 series is a self-adjusting type, the torque cannot be adjusted manually. However, by altering the viscosity of the oil, its damper characteristics can be modified.
* Please contact us, as this is a custom order,

6.The direction in which torque is generated varies according to the model. Please select the appropriate model for your purpose.

Vane Damper

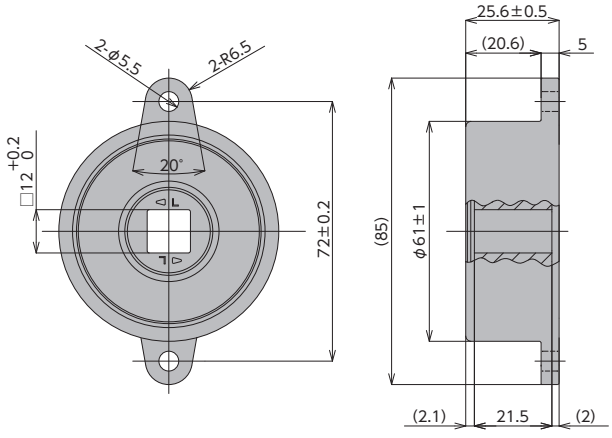
FYN-A2 Series



- Max. angles 120°
- Operating temperature -5 ~50° C
- Weight 222 ± 11g
- Body material Zinc die - cast (ZDC)
- Cap material Zinc die - cast (ZDC)
- Rotor material Zinc die - cast (ZDC)
- Oil type Silicone oil
- Rotary color L: Black R: White

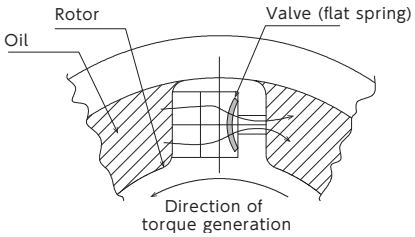
Specifications

Model	Max. torque	Reverse torque	Directions
FYN-A2-R204	20N·m (200kgf·cm)	2N·m or lower (20kgf·cm lower)	Clockwise
FYN-A2-L204			Counterclockwise

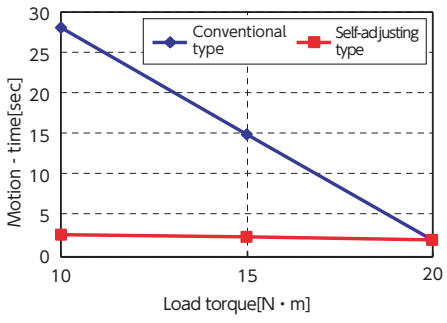


How to Use the Damper

1. Operating characteristics of self-adjusting oscillating dampers
in a conventional oscillating damper, the damping strength (damping constant) does not change regardless of the load torque used.
Therefore, the operating speed is slower when the load torque is small, and faster when the load torque is large.
However, since the self-adjusting FYN-A2 series is designed to self-adjustable the damping strength (damping constant) according to the applied load, its motion-time fluctuates less than that of conventional dampers when the load changes.
The acceptable range of torque is 10 to 15N·m or 20 to 25N·m. Please select your damper by referring to the motion graph below.



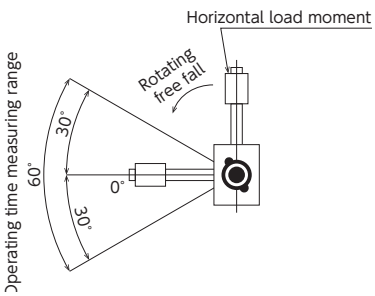
【Motion time graph】



【Operating principles of the self-adjusting type】

As shown in the diagram to the left, by changing the shape of the valve (flat spring), the amount of oil flow is altered, adjusting the damper's generated torque. (PAT.P)

【Measurement conditions for the motion-time graph】



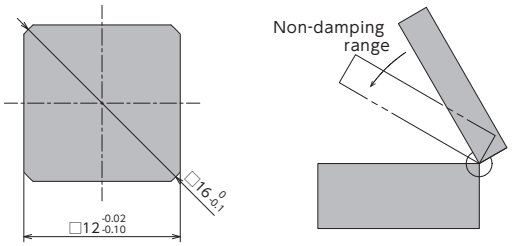
- Measuring temperature : Room temperature(23±3°C)
- Load torque : 10~20N·m
- Measuring angle : +30°~−30°

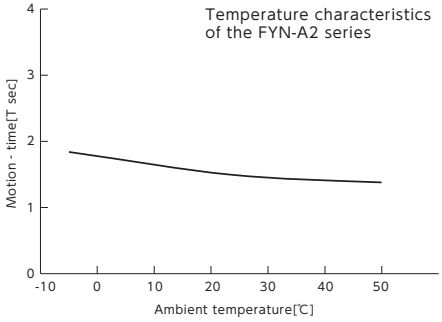
As the level of self-adjustment may vary depending on the range of the working angle of the actual work, please verify under actual working conditions before you select your damper.

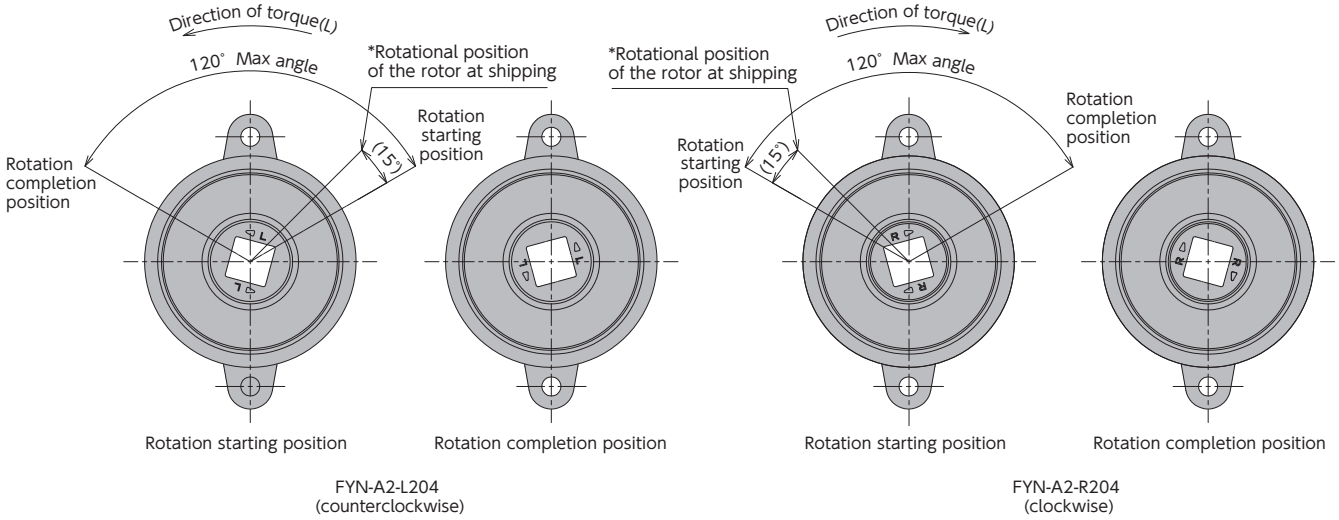
2. When using the damper, please ensure that a shaft with specified angular dimensions is inserted in the damper's shaft opening. Also, please ensure a tight fit between the shaft and the damper shaft's opening. Without a tight fit, the play becomes larger in a closing motion, etc., and the lid may not slow down properly. Please see the diagrams to the right for the recommended shaft dimensions for a damper.

3. Damper characteristics vary according to the ambient temperature. In general, the damper characteristics become weaker as the temperature decreases.This is because the viscosity of the temperature. When the temperature returns to normal, The damper characteristics will return to normal as well. The time it takes for the lid to close is shown in the graph to the right.

4. The damper's working angle is 120˚as shown below. Rotating the damper beyond this angle will cause the damage to the damper. Please ensure that an external stopper is in place.





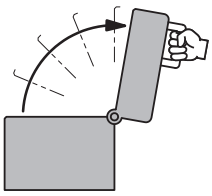


5. Because the FYN-A2 series is a self-adjusting type, the torque cannot be adjusted manually. However, by altering the viscosity of the oil, its damper characteristics can be modified. (Please contact us, as this is a custom order.)6. The direction in which torque is generated varies according to the model. Please select the appropriate model for your purpose.

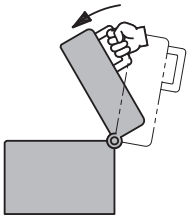
6. The direction in which torque is generated varies according to the model. Please select the appropriate model for your purpose.

Precautions for Use

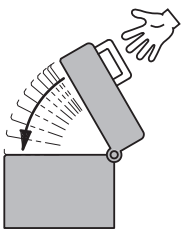
* When using the vane damper, ensure that after having fully opened the lid, move the lid to a point where free fall starts, and then release the hand from the lid. If the lid is slightly opened and in this state the hand is released, the lid may not be able to sufficiently slow down and the lid may be closed with force, which could result in an injury such as getting the hand caught by the lid.



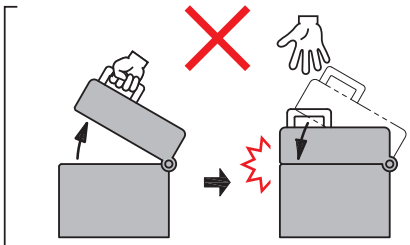
(1) Open the lid fully.



(2) Move the lid to a point where free fall starts.



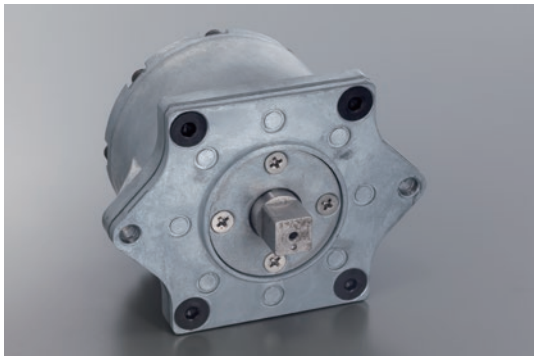
(3) Release the hand (the lid slows down).



(4) If the lid is released without fully opening it, it does not slow down.

Vane Damper

FYT/FYN-LA3 Series

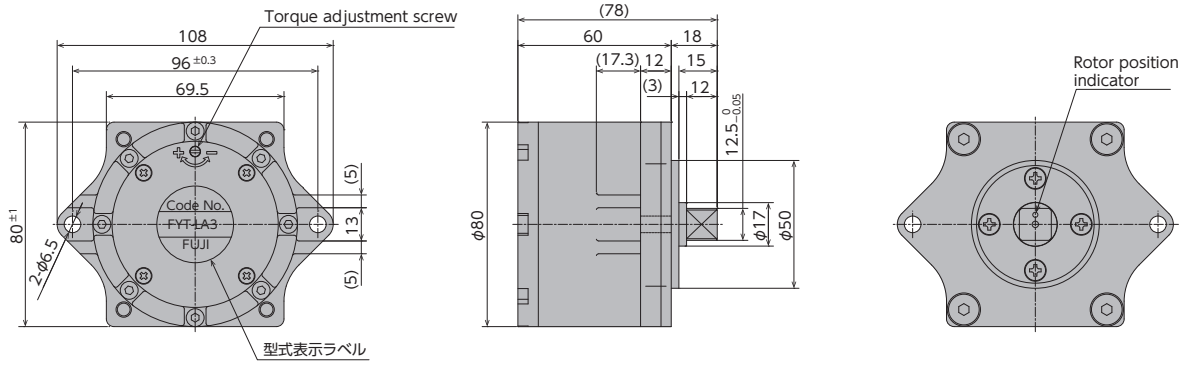


* Max. angle 210°
* Operating temperature 0～50℃
* Weight 1. 75k g
* Body and cap material Zinc die-cast (ZDC)
* Rotating shaft material Alloy steel
* Oil type Silicone oil

Specifications

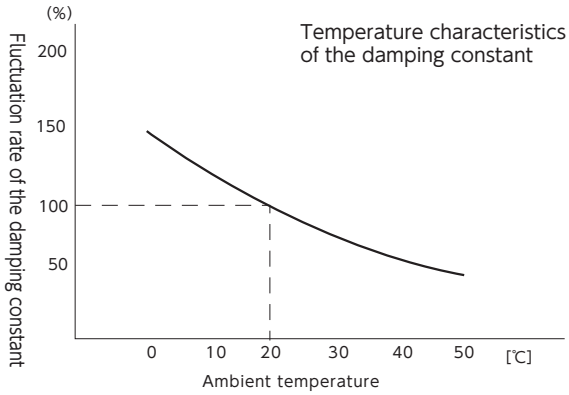
Model	Max. torque	Damping constant	Damping direction
FYT-LA3	40N·m (400kgf·cm)	10～60N·m/(rad/sec)	Both directions
FYN-LA3-R			Clockwise
FYN-LA3-L			Counter-clockwise

Note) Measured at 23°C±2°C



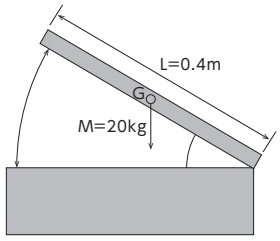
How to Use the Damper

1. Damper characteristics vary according to the ambient temperature. In general, the damping constant decreases as the temperature increases, and the damping constant increases as the temperature decreases. This is because the viscosity of the oil inside the damper changes according to the temperature. When the temperature returns to normal, the damping constant will return to normal as well.

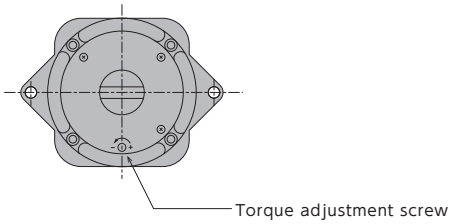


2. When using a damper on a lid, such as the one shown in the diagram, use the following selection calculation to determine the damper torque.

Example)
Lid mass M : 20kg
Lid dimensions L : 0.4m
Gravity Center Position : Assumed as $\frac{L}{2}$
Load torque : T = 20×0.4×9.8÷2
= 39.2N·m

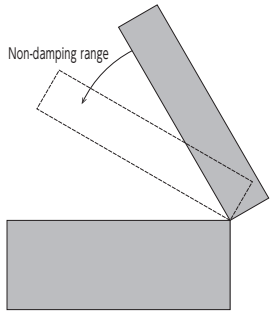


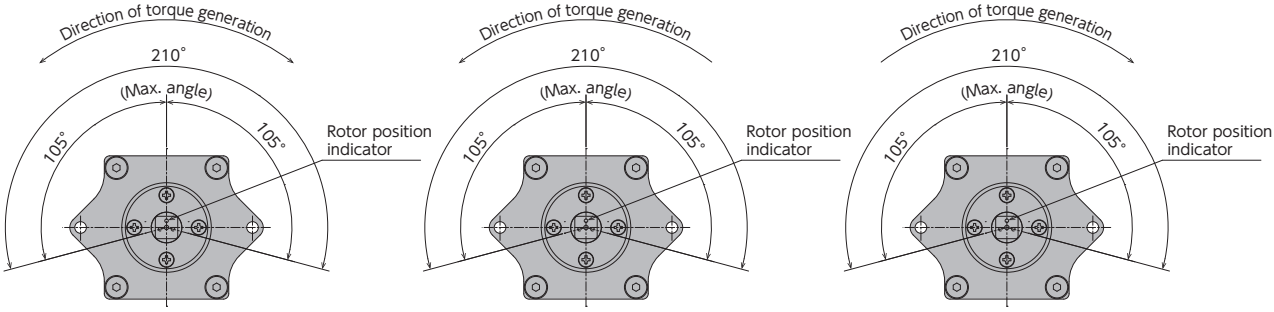
3. FYT, FYN-LA3 series are torque-adjustable types. Turn the damping adjustment screw located on the back of the main body by inserting a slotted screwdriver.
The damping constant increases when turned to the + direction (right).
The damping constant decreases when turned to the - direction (left).



Instruction for Damper Attachment

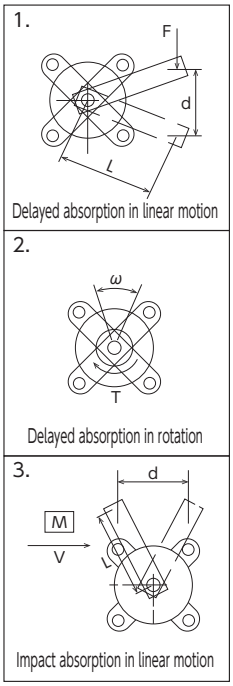
1. When attaching a rotating shaft to its corresponding part, ensure that they are firmly attached together by making the gap between them as small as possible. A large gap may affect the damper's non-damping range, preventing the lid from slowing down properly.
2. The damper's working angle is ±105°, as shown on the right (second diagram). Please determine where to attach it according to your needs.
3. The direction in which torque is generated varies according to the model. Please select the appropriate model for your purpose.
4. Do not use the damper as a stopper. An external stopper must be attached at the stopping position.
5. In FYN-LA3-L and FYN-LA3-R, the angular velocity in the reverse direction (opposite to the direction of torque generation) should be 1 rad/sec or less.





FYT-LA3　　FYN-LA3-L　　FYN-LA3-R

How to Calculate the Damping Constant for Vane Dampers



1. Delayed absorption in linear motion

Formula (N·m/(rad/sec)) $= \frac{FL^2t}{d}$

F = Force or mass applied to the lever tip (N)
L = Distance between the centre of the damper shaft and the lever's point of application (m)
d = Distance travelled by lever (m)
t = Travelling time of the lever (sec)

2. Delayed absorption in rotation

Formula (N·m/(rad/sec)) $= \frac{T}{\omega}$

T = Torque applied to shaft (N·m)
ω = Angular velocity(rad/sec)

3. Impact absorption in linear motion

Formula (N·m/(rad/sec)) $= \frac{MVL^2}{d}$

M = Mass(kg)
V = Velocity(m/sec)
L = Distance between the centre of the damper shaft and the lever's point of application (m)
d = Distance travelled by lever (m)

Hinge Damper

Bi-Directional Uni-Directional
Fixed Type Adjustable type Self-adjusting

FHD-A1 Series

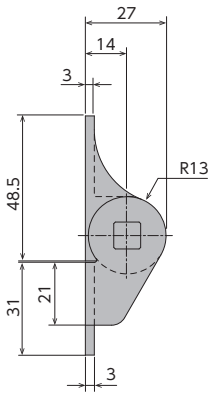
RoHS Compliant

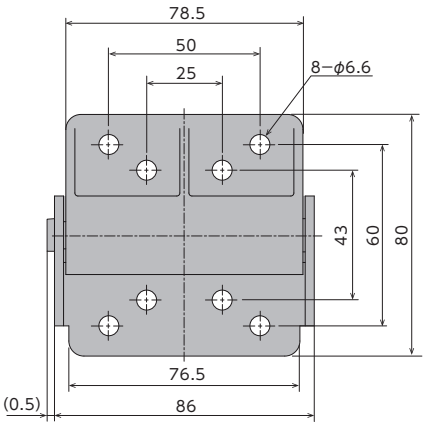
●Products specification might be changed without notice.

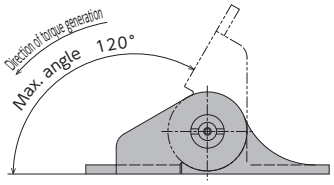
Specifications

Model	Max. torque	Max. reverse torque
FHD-A1-1-503	5N·m (50 kgf·cm)	0.6N·m or lower (6kgf·cm or lower)
FHD-A1-2-503		
FHD-A1-1-104	10N·m (100 kgf·cm)	1N·m or lower (10kgf·cm or lower)
FHD-A1-2-104		

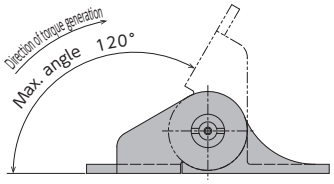
- ＊Max. angle 120°
- ＊Operating temperature −5～50℃
- ＊Weight 410g
- ＊Main body material Zinc die-cast (ZDC) + silver coating
- ＊Hinge material SUS304
- ＊Oil type Silicone oil







<FHD-A1-1-***>

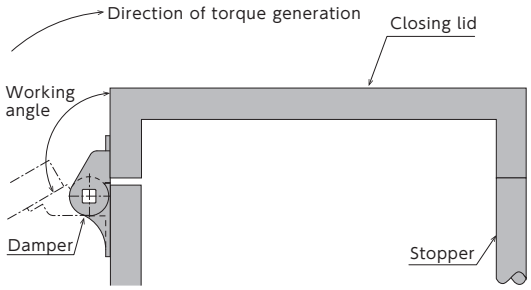


<FHD-A1-2-***>

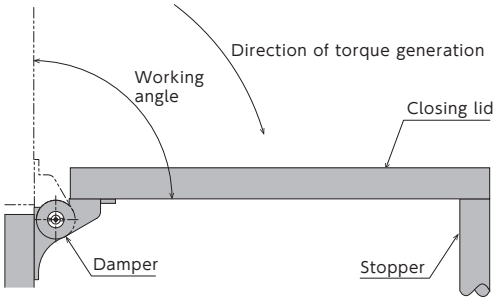
How to Use the Damper

1. There are two ways to attach the damper, as shown below.

○Attached externally(FHD-A1-1***)



○Attached internally(FHD-A1-2***)

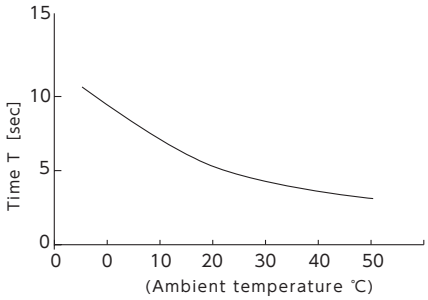


2. This damper is only for horizontal application. Please do not use this damper for vertical application.

Damper Characteristics

1. Temperature characteristics

Damper characteristics vary according to the ambient temperature. In general, the damper characteristics become weaker as the temperature increases, and become stronger as the temperature decreases. This is because the viscosity of the oil inside the damper varies according to the temperature. When the temperature returns to normal, the damper characteristics will return to normal as well.



2. The working angle of the hinge is 120° .
Operating the hinge beyond this angle will cause damage to the hinge. Please ensure that an external stopper is in place.

Friction Type Hinge Damper

Fixed Type | Bi-Directional | Uni-Directional | Adjustable type | Self-adjusting

FHD-B1/B2 Series

RoHS Compliant

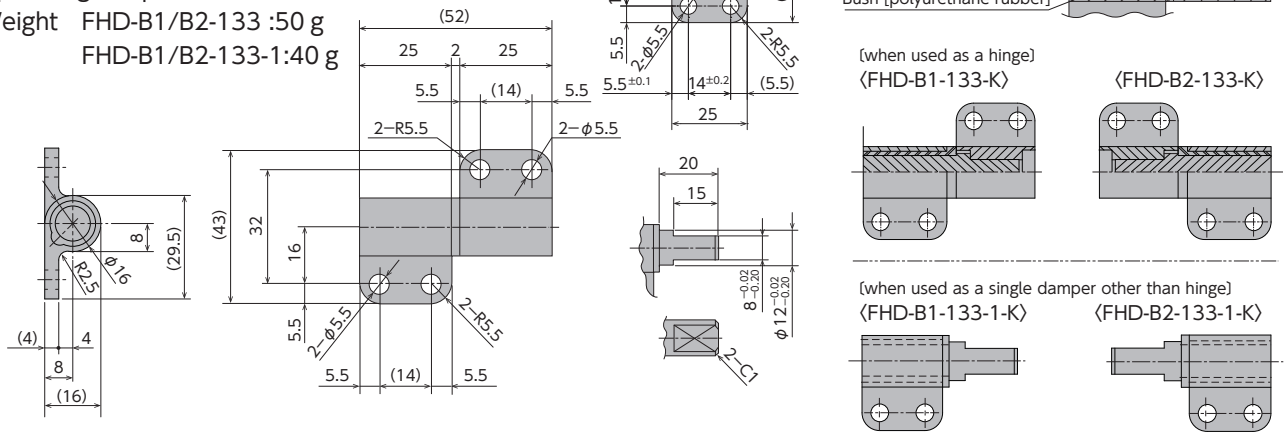
●Products specification might be changed without notice.

Specifications

Model	Max. torque
FHD-B1-133-K	1.35±0.34 N·m (13.5±3.4 kgf·cm)
FHD-B2-133-K	
FHD-B1-133-1-K	1.35±0.34 N·m (13.5±3.4 kgf·cm)
FHD-B2-133-1-K	
FHD-B1-133-2-K	
FHD-B2-133-2-K	

Note) Damper torque was measured at 25°C±2C° at 2rpm

∗ Max. rotation speed 15rpm
∗ Max. cycle rate 5cycle / min
∗ Operating temperature 0℃~60℃
∗ Weight FHD-B1/B2-133 :50 g
FHD-B1/B2-133-1:40 g



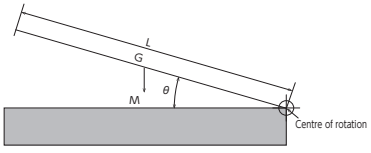
How to Use the Damper

1. The damper generates torque in both clockwise and counter-clockwise directions.
2. A friction-type hinge damper can be used as a bearing.
3. Friction-type hinge dampers have a long product life and do not require lubrication.
4. Torque down will result if the damper part gets wet with water or oil.
5. It cannot be used for continuous rotation. Please use it in a vane motion.
6. Depending on the operating conditions, it can be used as a free-stop hinge. Please calculate the retention torque based on the following equation.

$$\text{Retention torque } o = \frac{M \times 9.8 \times \frac{L}{2} \times \cos\theta}{0.65 \times \alpha \times N} \text{ (N·m)}$$

Retention temperature	α
Room temperature (25±5℃)	1.0
MAX40℃	0.75
MAX60℃	0.50

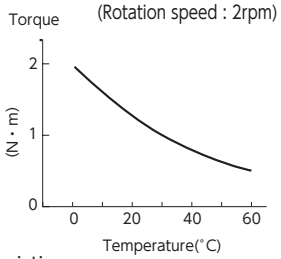
M : Mass of the retaining part
L : Distance between the tip of retaining part and the centre of rotation
θ : Retention angle from the retaining part's horizontal position
α : Temperature coefficient of the max. temperature
N : Number of dampers used



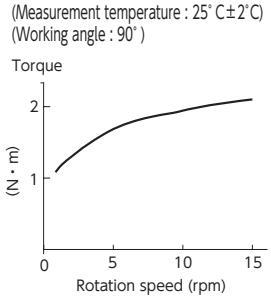
7. This damper is only for horizontal application. Please do not use this damper for vertical application.

Damper Characteristics

1. Temperature characteristics
Damper characteristics vary according to the ambient temperature. In general, the damper characteristics become weaker as the temperature increases, and become stronger as the temperature decreases. This is because the temperature of the shaft bush inside the damper varies according to the temperature. When the temperature returns to normal, the damper characteristics will return to normal as well.



2. Speed characteristics
The speed characteristics of a friction-type hinge damper are shown in the graph below. The damper torque is determined based on the speed characteristics at 2rpm.



Friction Damper

Fixed Type | Bi-Directional | Uni-Directional | Adjustable type | Self-adjusting

FFD-25FS/FW/SS/SW Series

RoHS Compliant

●Products specification might be changed without notice.

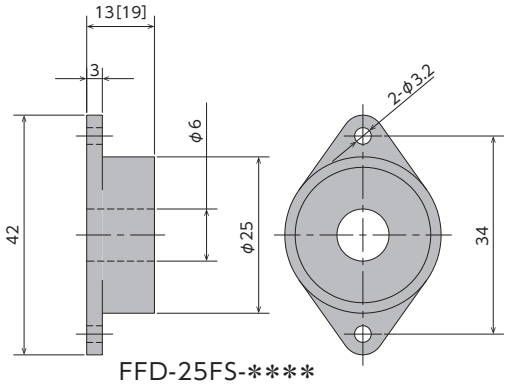
Specifications

Model	Max. torque	Max. reverse torque
FFD-25FS-R102	0.1±0.01 (N·m) (1±0.1 kgf·cm)	Clockwise
FFD-25FS-L102		Counter-clockwise
FFD-25FS-R502	0.5±0.05 (N·m) (5±0.5 kgf·cm)	Clockwise
FFD-25FS-L502		Counter-clockwise
FFD-25FS-R103	1±0.1 (N·m) (10±1 kgf·cm)	Clockwise
FFD-25FS-L103		Counter-clockwise
FFD-25FW-R103	1±0.1 (N·m) (10±1 kgf·cm)	Clockwise
FFD-25FW-L103		Counter-clockwise
FFD-25FW-R153	1.5±0.15 (N·m) (15±1.5 kgf·cm)	Clockwise
FFD-25FW-L153		Counter-clockwise
FFD-25FW-R203	2±0.2 (N·m) (20±2 kgf·cm)	Clockwise
FFD-25FW-L203		Counter-clockwise

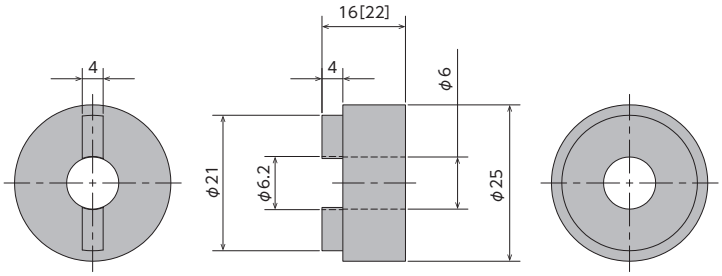
Model	Max. torque	Max. reverse torque
FFD-25SS-R102	0.1±0.01 (N·m) (1±0.1 kgf·cm)	Clockwise
FFD-25SS-L102		Counter-clockwise
FFD-25SS-R502	0.5±0.05 (N·m) (5±0.5 kgf·cm)	Clockwise
FFD-25SS-L502		Counter-clockwise
FFD-25SS-R103	1±0.1 (N·m) (10±1 kgf·cm)	Clockwise
FFD-25SS-L103		Counter-clockwise
FFD-25SW-R103	1±0.1 (N·m) (10±1 kgf·cm)	Clockwise
FFD-25SW-L103		Counter-clockwise
FFD-25SW-R153	1.5±0.15 (N·m) (15±1.5 kgf·cm)	Clockwise
FFD-25SW-L153		Counter-clockwise
FFD-25SW-R203	2±0.2 (N·m) (20±2 kgf·cm)	Clockwise
FFD-25SW-L203		Counter-clockwise

*) Rated torque is measured at a rotation speed of 20rpm at 20~25℃

∗Max. rotation speed	30rpm	∗Cap colour	R:Black L:White
∗Max. cycle rate	13cycle/min	∗Weight	FFD-25FS 13±2g
∗Operating temperature	−10~60℃ (90%RH)		FFD-25FW 24±2g
			FFD-25SS 12±2g
∗Body and cap material	POM		FFD-25SW 23±2g



FFD-25FS-∗∗∗∗
(Dimension of FFD-25FW-∗∗∗∗ are in [ ])

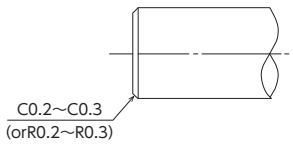


FFD-25SS-∗∗∗∗
(Dimension of FFD-25SW-∗∗∗∗ are in [ ])

How to Use the Damper

1. The damper generates torque in both the clockwise and counter-clockwise directions. (A one-way clutch is built in inside the damper.)

2. Please make sure that the shaft attached to a damper has a bearing, as the damper itself is not fitted with one.

Shaft's external dimensions	6 $^{0}_{-0.03}$
Surface hardness	HRC55 or higher
Quenching depth	0.5mm or higher
Surface roughness	1.0Z or lower
Chamfer end (Damper insertion side)	

3. It can be used as a free-stop for a load that is smaller than the rated torque.

4. Please refer to the recommended dimensions below when creating a shaft for attachment to the damper. Using a shaft outside of the recommended dimensions may cause the shaft to slip out.

5. To insert a shaft into the damper, insert the shaft while spinning it in the opposite direction of the damper's direction of torque generation. (Do not force the shaft in from a regular direction. This may damage the built-in oneway clutch.)

Friction Damper

Fixed Type | Bi-Directional | Uni-Directional | Adjustable type | Self-adjusting

FFD-28FS/FW/SS/SW Series

RoHS Compliant

●Products specification might be changed without notice.

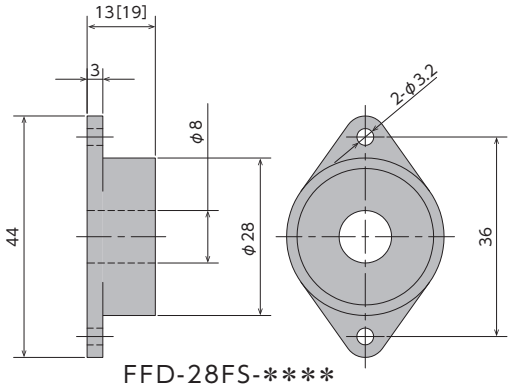
Specifications

Model	Max. torque	Max. reverse torque
FFD-28FS-R102	0.1±0.01 {N·m} (1±0.1 kgf·cm)	Clockwise
FFD-28FS-L102		Counter-clockwise
FFD-28FS-R502	0.5±0.05 {N·m} (5±0.5 kgf·cm)	Clockwise
FFD-28FS-L502		Counter-clockwise
FFD-28FS-R103	1±0.1 {N·m} (10±1 kgf·cm)	Clockwise
FFD-28FS-L103		Counter-clockwise
FFD-28FW-R103	1±0.1 {N·m} (10±1 kgf·cm)	Clockwise
FFD-28FW-L103		Counter-clockwise
FFD-28FW-R153	1.5±0.15 {N·m} (15±1.5 kgf·cm)	Clockwise
FFD-28FW-L153		Counter-clockwise
FFD-28FW-R203	2±0.2 {N·m} (20±2 kgf·cm)	Clockwise
FFD-28FW-L203		Counter-clockwise

Model	Max. torque	Max. reverse torque
FFD-28SS-R102	0.1±0.01 {N·m} (1±0.1 kgf·cm)	Clockwise
FFD-28SS-L102		Counter-clockwise
FFD-28SS-R502	0.5±0.05 {N·m} (5±0.5 kgf·cm)	Clockwise
FFD-28SS-L502		Counter-clockwise
FFD-28SS-R103	1±0.1 {N·m} (10±1 kgf·cm)	Clockwise
FFD-28SS-L103		Counter-clockwise
FFD-28SW-R103	1±0.1 {N·m} (10±1 kgf·cm)	Clockwise
FFD-28SW-L103		Counter-clockwise
FFD-28SW-R153	1.5±0.15 {N·m} (15±1.5 kgf·cm)	Clockwise
FFD-28SW-L153		Counter-clockwise
FFD-28SW-R203	2±0.2 {N·m} (20±2 kgf·cm)	Clockwise
FFD-28SW-L203		Counter-clockwise

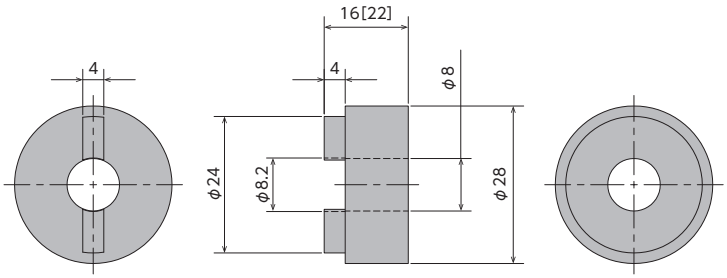
*) Rated torque is measured at a rotation speed of 20rpm at 20~25°C

∗ Max. rotation speed	30rpm	∗Cap colour	R:Black L:White
∗ Max. cycle rate	13cycle/min	∗ Weight	FFD-28FS 14 ± 2g
∗ Operating temperature	– 10 ~60℃ (90%RH)		FFD-28FW 27 ± 2g
			FFD-28SS 14 ± 2g
∗Body and cap material	POM		FFD-28SW 25 ± 2g



FFD-28FS-∗∗∗∗

(Dimension of FFD-28FW-∗∗∗∗ are in [ ])



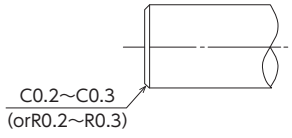
FFD-28SS-∗∗∗∗

(Dimension of FFD-28SW-∗∗∗∗ are in [ ])

How to Use the Damper

1. The damper generates torque in both the clockwise and counter-clockwise directions. (A one-way clutch is built in inside the damper.)

2. Please make sure that the shaft attached to a damper has a bearing, as the damper itself is not fitted with one.

Shaft's external dimensions	8 $-\phi_{.03}$
Surface hardness	HRC55 or higher
Quenching depth	0.5mm or higher
Surface roughness	1.0Z or lower
Chamfer end (Damper insertion side)	 C0.2~C0.3 (orR0.2~R0.3)

3. It can be used as a free-stop for a load that is smaller than the rated torque.

4. Please refer to the recommended dimensions below when creating a shaft for attachment to the damper. Using a shaft outside of the recommended dimensions may cause the shaft to slip out.

5. To insert a shaft into the damper, insert the shaft while spinning it in the opposite direction of the damper's direction of torque generation. (Do not force the shaft in from a regular direction. This may damage the built-in oneway clutch.)

Friction Damper

Fixed Type | Bi-Directional | Uni-Directional | Adjustable type | Self-adjusting

FFD-30FS/FW/SS/SW Series

RoHS Compliant

●Products specification might be changed without notice.

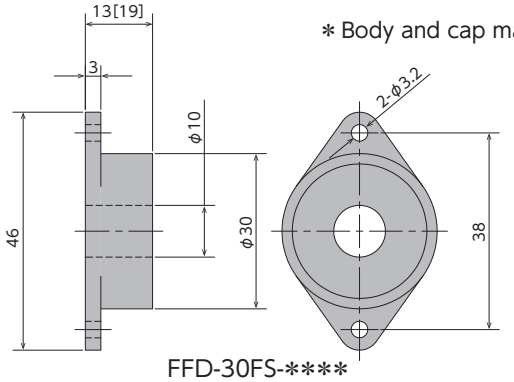
Specifications

Model	Max. torque	Max. reverse torque
FFD-30FS-R102	0.1±0.01 (N·m) (1±0.1 kgf·cm)	Clockwise
FFD-30FS-L102		Counter-clockwise
FFD-30FS-R502	0.5±0.05 (N·m) (5±0.5 kgf·cm)	Clockwise
FFD-30FS-L502		Counter-clockwise
FFD-30FS-R103	1±0.1 (N·m) (10±1 kgf·cm)	Clockwise
FFD-30FS-L103		Counter-clockwise
FFD-30FS-R153	1.5±0.15 (N·m) (15±1.5 kgf·cm)	Clockwise
FFD-30FS-L153		Counter-clockwise
FFD-30FW-R153	1.5±0.15 (N·m) (15±1.5 kgf·cm)	Clockwise
FFD-30FW-L153		Counter-clockwise
FFD-30FW-R203	2±0.2 (N·m) (20±2 kgf·cm)	Clockwise
FFD-30FW-L203		Counter-clockwise
FFD-30FW-R253	2.5±0.25 (N·m) (25±2 .5kgf·cm)	Clockwise
FFD-30FW-L253		Counter-clockwise
FFD-30FW-R303	3±0.3 (N·m) (30±3 kgf·cm)	Clockwise
FFD-30FW-L303		Counter-clockwise

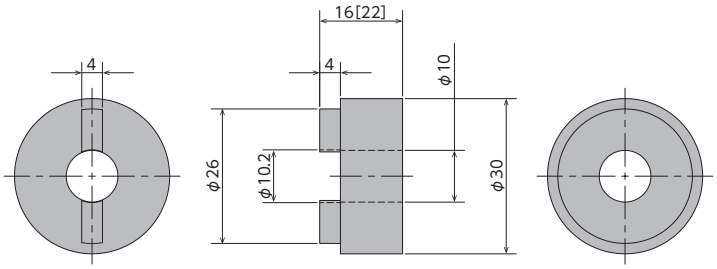
Model	Max. torque	Max. reverse torque
FFD-30SS-R102	0.1±0.01 (N·m) (1±0.1 kgf·cm)	Clockwise
FFD-30SS-L102		Counter-clockwise
FFD-30SS-R502	0.5±0.05 (N·m) (5±0.5 kgf·cm)	Clockwise
FFD-30SS-L502		Counter-clockwise
FFD-30SS-R103	1±0.1 (N·m) (10±1 kgf·cm)	Clockwise
FFD-30SS-L103		Counter-clockwise
FFD-30SS-R153	1.5±0.15 (N·m) (15±1.5 kgf·cm)	Clockwise
FFD-30SS-L153		Counter-clockwise
FFD-30SW-R153	1.5±0.15 (N·m) (15±1.5 kgf·cm)	Clockwise
FFD-30SW-L153		Counter-clockwise
FFD-30SW-R203	2±0.2 (N·m) (20±2 kgf·cm)	Clockwise
FFD-30SW-L203		Counter-clockwise
FFD-30SW-R253	2.5±0.25 (N·m) (25±2 .5kgf·cm)	Clockwise
FFD-30SW-L253		Counter-clockwise
FFD-30SW-R303	3±0.3 (N·m) (30±3 kgf·cm)	Clockwise
FFD-30SW-L303		Counter-clockwise

*) Rated torque is measured at a rotation speed of 20rpm at 20~25℃

＊Max. rotation speed	30rpm	＊Cap colour	R:Black L:White
＊Max. cycle rate	13cycle/min	＊Weight	FFD-30FS 17 ± 2g
＊Operating temperature	− 10 ~60℃ (90%RH)		FFD-30FW 31 ± 2g
			FFD-30SS 16 ± 2g
＊Body and cap material	POM		FFD-30SW 30 ± 2g



FFD-30FS-＊＊＊＊
(Dimension of FFD-30FW-＊＊＊＊ are in [ ])

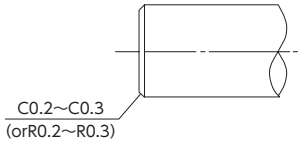


FFD-30SS-＊＊＊＊
(Dimension of FFD-30SW-＊＊＊＊ are in [ ])

How to Use the Damper

1. The damper generates torque in both the clockwise and counter-clockwise directions. (A one-way clutch is built in inside the damper.)

2. Please make sure that the shaft attached to a damper has a bearing, as the damper itself is not fitted with one.

Shaft's external dimensions	$\phi 10_{-0.03}^{0}$
Surface hardness	HRC55 or higher
Quenching depth	0.5mm or higher
Surface roughness	1.0Z or lower
Chamfer end (Damper insertion side)	 C0.2~C0.3 (orR0.2~R0.3)

3. It can be used as a free-stop for a load that is smaller than the rated torque.

4. Please refer to the recommended dimensions below when creating a shaft for attachment to the damper. Using a shaft outside of the recommended dimensions may cause the shaft to slip out.

5. To insert a shaft into the damper, insert the shaft while spinning it in the opposite direction of the damper's direction of torque generation. (Do not force the shaft in from a regular direction. This may damage the built-in oneway clutch.)

Read these instructions before use

This owner's manual contains various safety cautions regarding the proper handling of this product, and preventing danger to the operator as well as damage to the plant and the machine. Please read this manual thoroughly 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.

The decision on the suitability of MRF damper shall be made by an engineer of the equipment or a person who determine the specification.

●Because of the wide variety of conditions of use, the decision on the suitability of MRF damper shall be made by an engineer of the equipment or a person who determine the specification, after the performance verification and life test as necessity.

Do not use the MRF damper outside the range of specification.

●Do not use outside the range of specification for such like operating temperature range, rated voltage and current of the coil, the rated torque, the allowable slip rate, maximum rotational speed.
●There is a risk to receive injury or to make damage for MRF damper and/or peripheral devices.
●There is a risk of Electric shock, burns or fire.
●Due to oil leakage or deterioration of parts, there is a possibility that the durability of the product is significantly decreased.
●Refer to the product page of MRF damper for details.
●When used, it generates heat by energization and or the slip friction of the coil. If the temperature of MRF damper surface is high, adjust the condition and make its surface under 70 ℃ and prevent the generation of heat.

Implementation of Safety Measures for the Purposes Below.

●Implement the safety measures if used under the following conditions and environment, and consult our company for a judgment on the feasibility check beforehand. Also please take countermeasures against waterproofing, humid proofing as well as the designing of fail-safe, redundant and etc. for the purpose to keep the reliability of safety of the device as user's responsible task.
1) The use in the environment other than those standard specifications clearly indicated in the catalog or owner's manual, outdoors, or place exposed to the direct sunlight.
2) Nuclear related devices, devices directly or indirectly related to the running of rail or ship, devices related to aviation or space, military devices, medical devices, devices contacting the potions and foods, combustion equipment, amusement devices that are related to the influence on human and properties, emergency shut off circuit, press machinery, the use for the devices or purposes to which especially the safety is required because of the expected serious influence on the human and properties.
●Environment and the next safety exhibit can not be secured, please do not use the following devices that are required extremely high reliability and safety.
1) environment in which there is a possibility of ignition or explosion, or in water or a very high humid.
2) device in relate to the nuclear power, aviation, space, military, life supporting medical equipment, combustion etc.

When you touch the MRF dampers, confirm the power supply of the coil and the peripheral devices are switched off and the temperature of MRF damper is cooled down.

●There is a risk of Electric shock, burns or fire if to mount or dis-mount the MRF damper during the operation of peripheral device or powering the MRF damper.

Ensure the connection of coil lean of MRF damper.

●There is a risk of operation failure, electrical shock or leak if the connection of the leads is incomplete electrically or mechanically.

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

Definifinition 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 load torque x safety factor

Do not pull or hang the MRF damper by the leads.

●There is a risk of injury by the fall of MRF damper. Also there is a risk that the leads shall cut and results operational failure or electrical shock or short-circuit.
●Hold the MRF damper when mounting or dis-mounting.
●After the installation, make sure to fix the leads not to contact with MRF damper or with peripheral devices.

Do not rotate the screw on top of MRF damper

●Screw on top of MRF damper is the sealing for oil filling. Do not rotate it otherwise it may cause oil leakage or quality deterioration.

Usage environment

●This product cannot be used in a vacuum or under high pressure as well as in the circumstance where is impact. It may cause damage to the MRF damper or Peripheral equipment
●Do not use in an environment where chips, cutting oil, water, etc. can come in contact with the linear damper. This will result in a malfunction due to an oil leak caused by damage.
●Do not leave or use under the circumstance where is a high humid.

Do not discard oil more than is necessary

●Discarding the oil contained in MRF dampers more than is necessary will pollute the environment.
●Dispose the oil according to laws concerning waste management and cleaning.

Radial/Thrust load to the shaft

●Applying load to the rotating shaft (gear) in a radial/thrust direction may cause an oil leak, torque problems, and damage to the main unit (or to the gear, or cause the gear to become disengaged, if the gear is used).

Do not repair, disassemble or modify the MRF damper

●MRF damper is not corresponded with repairing. In the even of failure and deterioration of performance, please replace it with a new one.
●It is contained the excitation coil and oil in inside of MRF damper. For safety reason, do not repair, disassemble or modify by yourself.
●If the remodeling to MRF damper (additional machining, painting, welding, hardening, etc.) has been carried out, we do not guarantee the MRF damper as well as peripheral equipment.
●Any damage or loss won't be indemnified if the customer performed the repairing, disassembly and modification of MRF damper.

Replacing time of MRF damper

●Product reliable cycles are depended on the using circumstances and conditions; therefore, we cannot determine the life cycle however if there is phenomena such like below please consider that it is the time to replace to the new one.
1. When the necessary torque is no longer performed even though given rated current.
2. When the torque started to be appeared without giving eclectic current.
3. When various torque started to be appeared under a same circumstance.
4. When abnormal noise, vibration or oil leakage are started to be appeared.

●In particular, high reliability and safeties is required, regardless the phenomenon such like above, we strongly recommend to replace to the new one periodically.

Over-tightening of mounting screws

●Over-tightening the mounting screws when installing a MRF damper may cause damage to the main unit.
Based on the types and sizes of the screws used, please apply an appropriate tightening torque to tighten the screws.
●Use a proper sized screw as the screwing hall of MRF damper is M4 x 5.5 depth. As for tighten torque, make sure under 550N.cm.

Dispose

●In case to dispose the MRF damper, follow the local rules and dispose as industrial waste.

MRF Damper

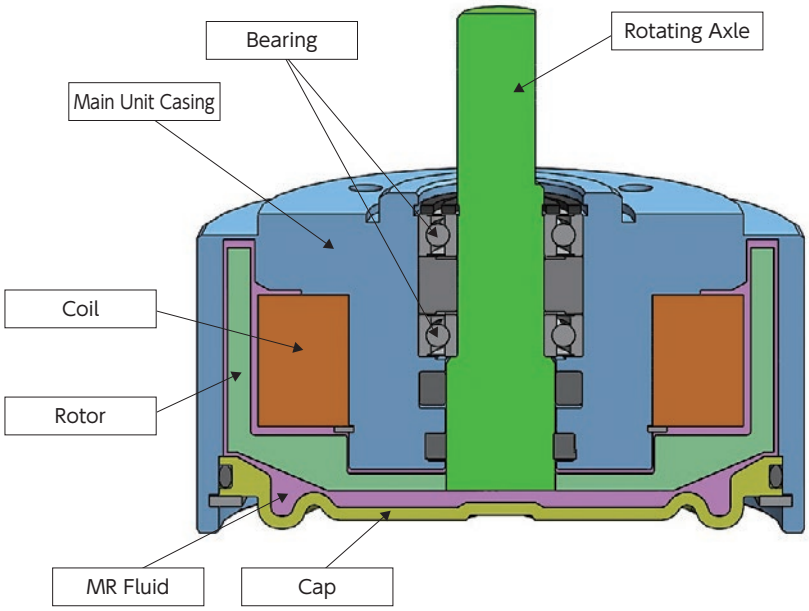
FMR-70S-403

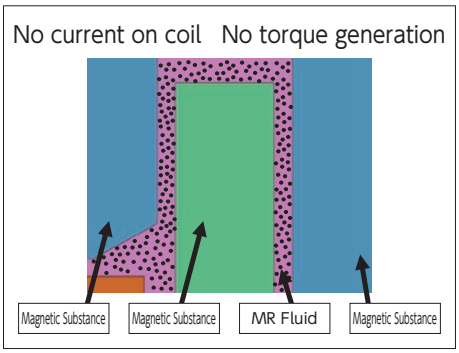
Characteristics

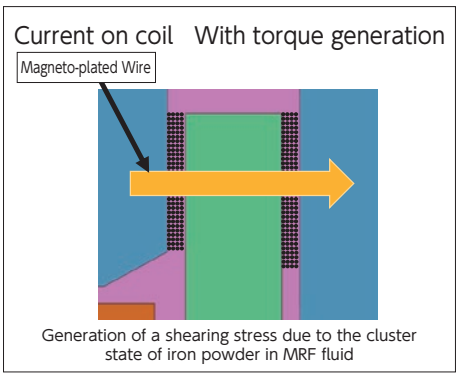
Electrically controlled	: Enabled electrically controlling the torque by using MR fluid (magnetic viscous fluid)
High response	: excellent electrical response makes realize a high response
Flexible mounting ways	: No restriction on the mounting direction
Not required Pre-conditioning operation	: Using MR fluid on friction part, it realized less humid effect and no requirement of pre-conditioning
Smooth motion	: Small differences between the static friction and dynamic friction allows a smooth actuation
Long life	: Our original sealing structure realizes a long life cycle
Seamless torque change	: Available a seamless torque control steplessly
Less susceptibility of temperature affect	: Comparing to a standard rotary damper, small effect by temperature
Less susceptibility of the rotational speed affect	: Comparing to a standard rotary damper, small effect by the rotating speed

Basic Structure and Action

The basic structure of MRF damper is shown below.







Generation of a shearing stress due to the cluster state of iron powder in MRF fluid

Behavior

The rotating shaft is supported with the bearings for providing the freedom of rotation in the main unit casing.
A coil is implemented in the main unit casing, and a rotor having the shape of a cup is mounted on the rotating shaft.
There is a gap between the internal surface of the main unit casing and the external surface of the rotor. The MR fluid is filled in this gap.
When a current is supplied to the coil, a magnetic field line runs through the gap between the main unit casing and rotor, and a magnetic force flows in the MR fluid.
When a magnetic force flows in the MR fluid, the iron power is linked like a chain and the friction force of iron powder generates a force to restrict the rotation between the main unit casing and rotor.

What is the MR Fluid?

The MR (magneto-rheological) Fluid is a functional fluid that can be instantly reversibly changed between free liquid and semi-solid state by varying the applied magnetic field.The MR Fluid is featured with the wide shearing stress variation range based on the yield point determined by the semi-solid fluid due to the formation of chain type clusters of iron powder particles induced by the application of magnetic field in the dispersed micron size magnetic iron powders in the carrier fluid differently from general magnetic fluid.

MR Fluid

MR Fluid A magnet in the proximity

Main Applications

The applications for robots, welfare devices, logistics, amusements, operation levers, switchgears and the torque controls for vibration control devices are expected.

Precautions for Use

Be sure to carefully read the owner's manual delivered with the product before using.

Specifications

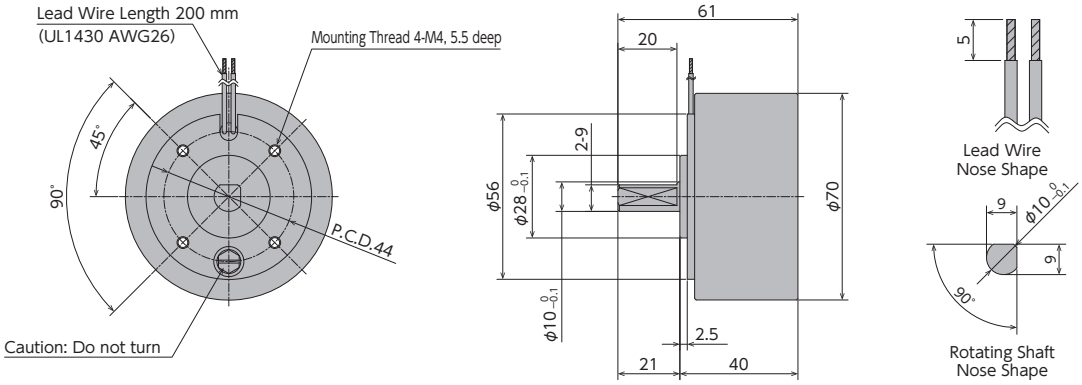
Type	Rated Torque N·m	Coil(23℃)				Allowable slipping efficiency W
		Voltage V	Current A	Resistance Ω	Capacity W	
FMR-70S-403	4	DC24	0.13	192	3.12	10※1
	Maximum Operating Speed rpm	Mounting Posture	Direction of Rotation	Mass kg	Moment of Inertia kg·cm²	
	50	No ristriction	Both directions	0.83	1.16	

Temperature Range for Use: 0℃ to 40℃ The heat is generated from coil and the slipping friction during operation. The surface temperature of the product during operation shall not exceed 70℃.
* For a continuous slipping application, the friction heat shall be taken into consideration. The operation shall be within the allowable slipping efficiency range.

Calculation

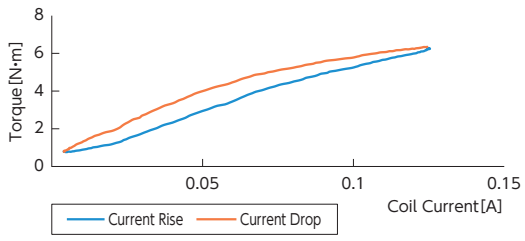
Allowable slipping efficiency = 2 x π / 60 x n x Tc
n : Rotating Speed (rpm)
Tc : Slipping Torque (N-m)

	Material	Surface Treatment
Main Unit Casing	Metal (SUM)	Non-Electrolytic Nickel Plating
Rotating Shaft	Metal (SUM)	Nitriding
Cap	Polyacetal (POM)	–

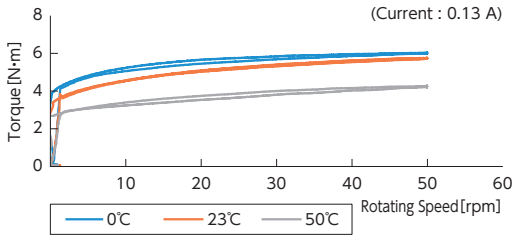


Test Data

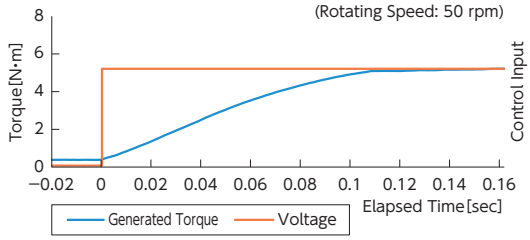
Coil Current - Torque Properties



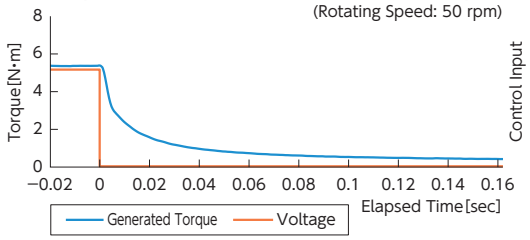
Temperature Properties (Torque and Rotating Speed)



Response - Voltage Rise

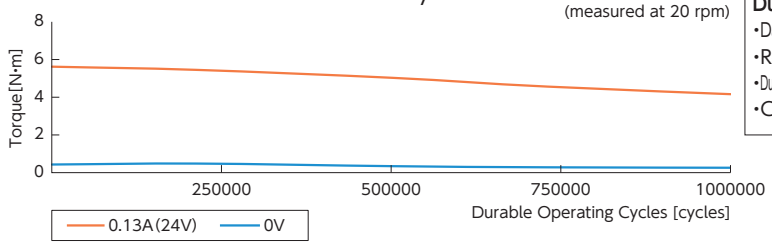


Response Performance - Voltage Drop



Durability

(measured at 20 rpm)



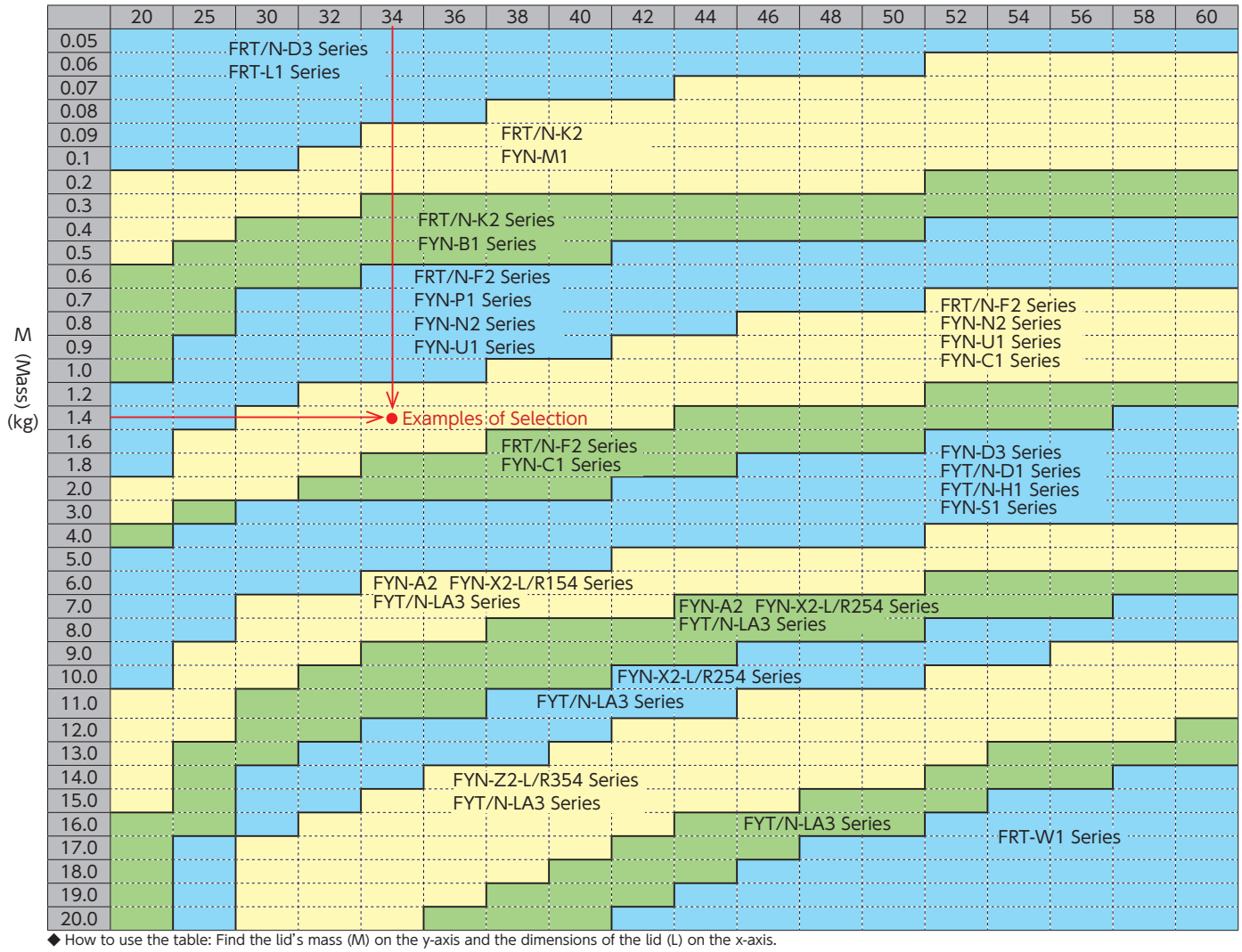
Durability Test Conditions
- Damper Mounting Posture: Shaft Upwards
- Rotating Speed: 50 rpm
- Durability Operation : Continuous Single Directional Rotation
- Current: 0.065 A (12 V)

Reference Table for the Selection of a Rotary Damper/Vane Damper/Customizable Torque Chart for Rotary Dampers

Reference Table for the Selection of a Rotary Damper/Vane Damper

※Lid's mass M·····1.4kg Dimensions of the lid L·····36cm Selected model : FYN–N1

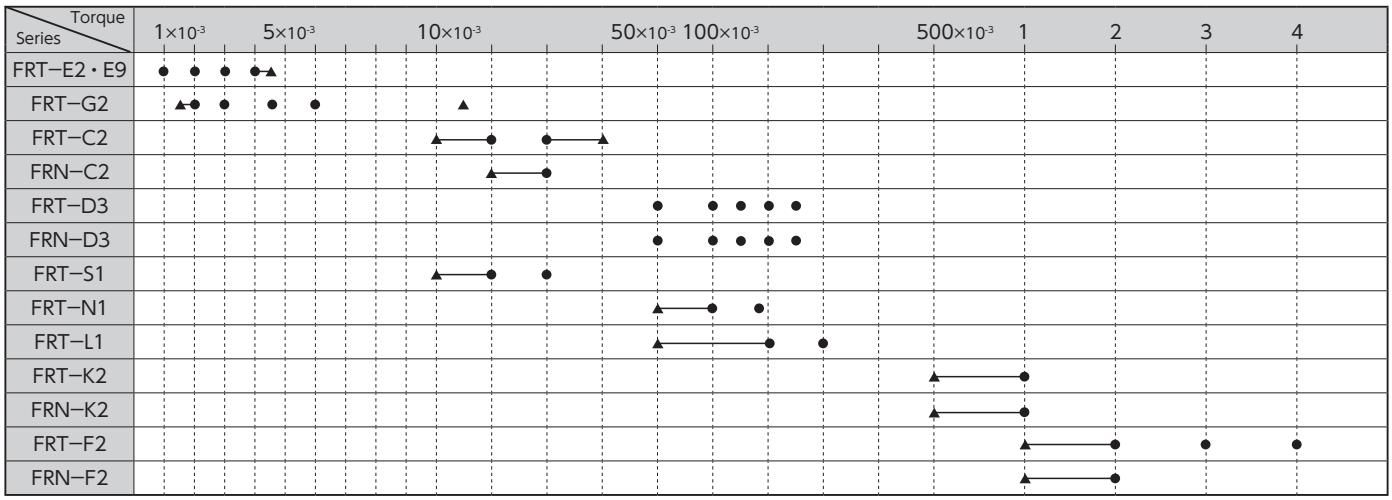
L (Dimensions of the lid) (cm)



◆ How to use the table: Find the lid's mass (M) on the y-axis and the dimensions of the lid (L) on the x-axis.
◆ This table should be used as a general guideline. The model selected based on this table is only a suggestion.

Customizable Torque Chart for Rotary Dampers

(Unit : N・m)



Note)" ● " indicates standard torque "▲" stands for a made to order torque range. Be sure to confirm before selecting.

5

Helical Isolators

A unique vibration absorber that absorbs vibration and shock utilizing the deflection and friction of a stainless wire.
A vibration absorber that provides an effective vibration measure for transporting special vehicles, on board electronic devices on ships, arts, precision instrument.

Read these instructions before use

This owner's manual contains various safety precautions regarding the proper handling of this product, and preventing danger to the operator, as well as damage to the plant and the machine. Please read this manual thoroughly 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.

The decision on the suitability of helical vibration absorber shall be made by an engineer of the equipment or a person who determine the specification.

- Because of the wide variety of conditions of use, the decision on the suitability of helical vibration absorber shall be made by an engineer of the equipment or a person who determine the specification, after the performance verification and life test as necessity.

Do not use the helical vibration absorber outside the range of specification.

- The use outside the range of specification will cause the failure or breakage of the product.

Implementation of Safety Measures for the Purposes Below.

- Implement the safety measures if used under the following conditions and environment, and consult our company for a judgment on the fe asibility check beforehand.

1. The use in the environment other than those standard specifications clearly indicated in the catalog or owner's manual, outdoors, or place exposed to the direct sunlight.
2. Nuclear related devices, devices directly or indirectly related to the running of rail or ship, devices related to aviation or space, military devices, medical devices, devices contacting the potions and foods, combustion equipment, amusement devices that are related to the influence on human and properties, emergency shut off circuit, press machinery, the use for the devices or purposes to which especially the safety is required because of the expected serious influence on the human and properties.

When installing a heavy object, follow these instructions:

- The installation process is extremely dangerous, as it may result in accidents causing injury or death as well as damage to the object being installed.

1. Install by lifting up the object with a hoist, etc.
   - Ensure that the object is well balanced and stable.
   - Make sure that the hoisting wire rope does not become undone or severed
2. Install by jacking up the object.

- As the helical vibration absorber will flex due to the installed object's weight, please accordingly select an appropriate jack. Please contact our company for further information on the product's flex.

⚠ Caution

Definifition 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.

Never disassemble the helical vibration absorber.

- You may not be able to reassemble it, or the mounting dimensions and characteristics may be altered.

Do not use the helical vibration absorber in the pulling direction.

- Compared to a compression direction, the spring is so rigid in a pulling direction that the selection graph in this catalog cannot be applied (please see Installation Method).

Do not use in a CR (Clean Room).

- Minute friction dust may contaminate the room.

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

Helical Vibration Absorber

FH•FHM Series

Structure and Principle

The stainless steel wire rope is bound on the retainer for mounting, and the wire rope is wound in a helical manner. This structure provides the significant deformation of wire rope in three axial directions to work as a spring. In addition, the element wires will rub each other during deformation to cause a phenomenon called hysteresis, which shows the different reaction forces at extension and shrinkage of helical vibration absorber due to this friction. This hysteresis phenomenon works as a damper.

Common Applications

Absorption of vibration and impact in electronic devices, computer hardware, and precision instruments such as optical equipment, machines, carrier devices, automobiles, ships, aircrafts, and containers.

Characteristics

1. Hybrid function of spring and damper:
It is a compact and simple device that functions as a spring and a damper.
2. A variety of installation options:
Because it can absorb vibration and impact in all three dimensions, it can be installed in four different ways, as shown below.
Installation is easy and simple.
3. Wide range of use:
From a small load to a large load, helical isolators can be used in a wide range of conditions, as they are extremely resistant to corrosion and chemicals, and they can operate under a wide range of temperatures (-50 ~ +190°C).
FH Series are provided with All Stainless Steel Specification
4. Maintenance-free:
No maintenance is required.
5. Delivery:
FH Series achieved the short delivery based on the domestic production.

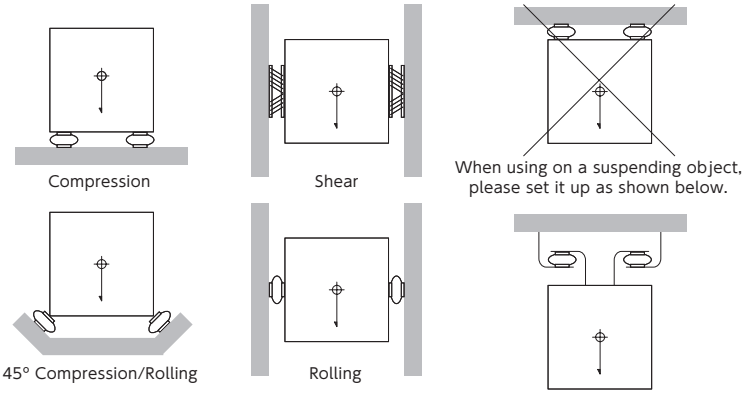
Material

Name	FH series	FHM series
Retainer	Stainless steel (SUS304)	Aluminum alloy (A6061-T6 with iridite coating)
Press fitting nut	Stainless steel (martensite passivation treated)	FHM08375~FHM08625: Stainless steel (SUS304 embedded nut) FHM08875: Directly threaded on the retainer
Wire rope	Stainless steel (SUS304)	
Tube	Stainless steel (SUS304)	———
Retaining bolt	———	FHM08375~FHM08875: Carbon Steel with chrome (III) chromate

Note: Stainless steel and aluminum alloy are used, but it does not guarantee the rust prevention.

Installation Method

Helical vibration absorber cannot be used in the pulling direction. (Use for suspension)
The position of the mounting hole of the retainer may be misaligned due to the deflection of wire during the installation of the helical vibration absorber.
Please contact our sales department with any questions regarding the mounding method.
Contact information: Fuji Latex Co., Ltd. Precision Device Business Division Phone: +81-282-30-1856 Fax: +81-282-30-1857



Type Indication Method

FH **10** **016** – **4** – **A**

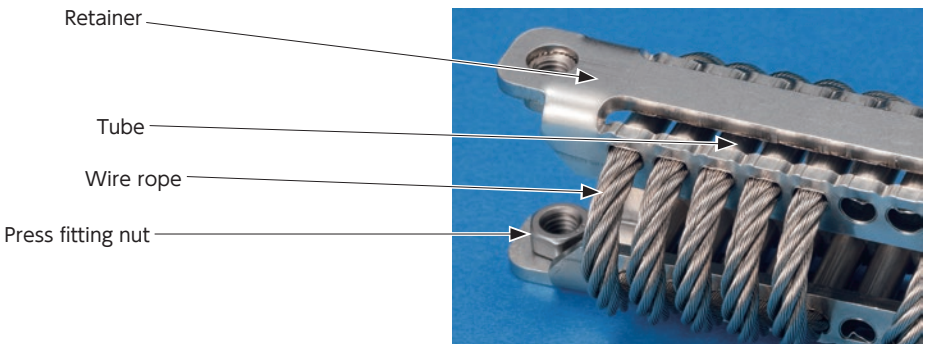
- Please see Shape of Mounting Parts of each model.
- Performance classification
- Wire rope diameter (□□□ × 0.1 ≒ wire diameter in mm)
- Number of wire rope coils
- Helical vibration absorber FH series Stainless steel used for the whole/Domestic product

FHM **08** **375** – **3** – **A**

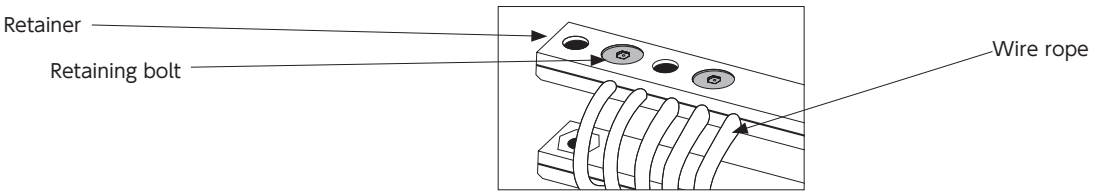
- Please see Shape of Mounting Parts (on page 208).
- Performance classification
- Wire rope diameter (□□□ × 0.0254 ≒ wire diameter in mm)
- Number of wire rope coils
- Helical vibration absorber FHM series

Name of parts and their materials

FH series

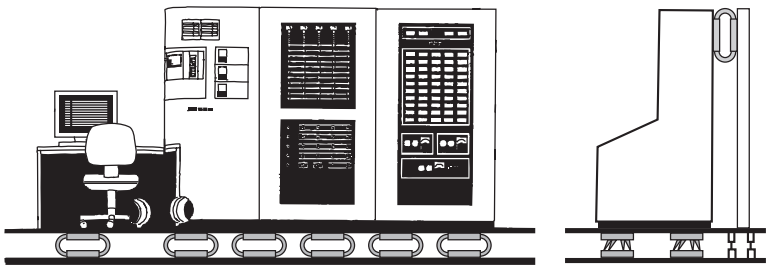


FHM series



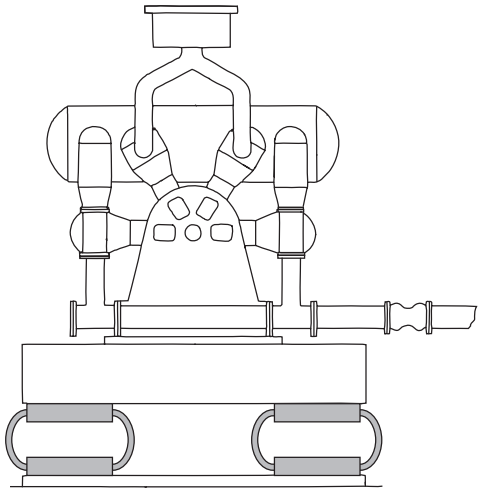
Applications

FH•FHM Series



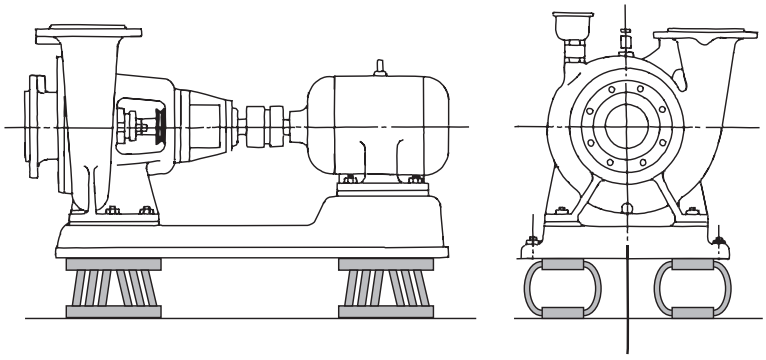
Control panel

Vibration Absorption Wagons

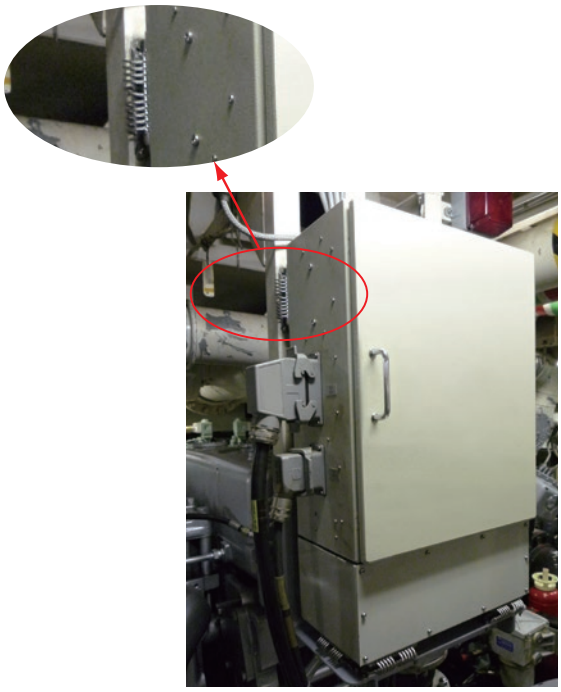


Compressor

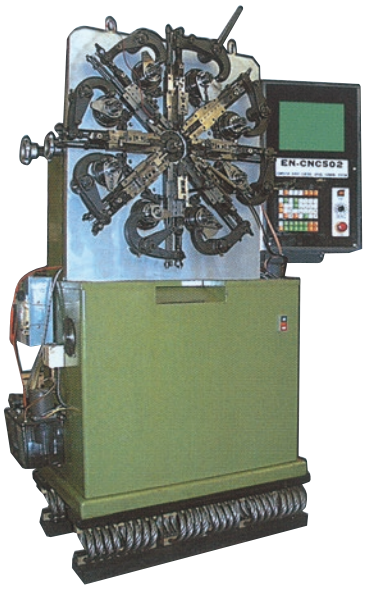
Vibration Absorption Wagons



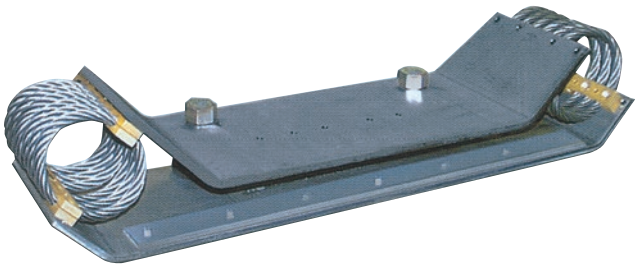
Turbo Blowers



Marine Control Panels



Coil spring machine



Example of 45° compression/rolling installation

This example uses the vibration absorber as a stabilizer. For thin or high gravity center equipment, the combined use with vibration or impact absorber will effectively reduce the swaying motion.

power generator

Various control panels
This example uses a standard vibration absorber for absorbing vibration or impact.

Selection Method

FH•FHM Series

(Please refer to the next page for example selections.)

Verification of common specifications and calculation thereof

M : Mass of the installing object = kg

n : Number of vibration absorber = pce

(The number of vibration or impact absorbers, in which the number of anti-swaying stabilizers is not included.
For the examples of anti-swaying stabilizer, please see page 205.)

m : Supporting mass per anti-vibration device = $\frac{M}{n}$ = kg

The external dimensions of installed object : H (height)× W (width)× D (depth) = × × mm

Centre of gravity of the installed object :

(If the installing object sways sideways due to a high centre of gravity, etc, use a stabilizer that is the same model as the one selected below, or a model in the next performance classification number.)

Selection of Installation Method: Select from the figures in page 202.

Temperature Range for Use (can be used in the range of -50 ~+190℃) : ~ ℃

If you need to use a helical isolator under other operating conditions, please consult our company's sales department.

Selection for Vibration Absorption

f : Machine's vibration frequency = Hz

N : Rotations per minute of motors and engines = rpm

$f = \frac{N}{60}$ = Hz

fn : Natural Frequency of Helical Vibration Absorber = $\frac{f}{3}$ = Hz

The intersection of calculated m and fn indicates the smallest model in the vibration selection graph. If an intersection cannot be found in the graph, select a model directly under the intersection. Next, select the shape of the mounting to finish the selection.
(The reason for selecting the model listed directly below the intersection is to improve the anti-vibration effect during regular operation by using a more flexible model.)

Caution : Operating a machine at its natural frequency is dangerous, as it increases vibration. Please make sure that natural frequency is passed as quickly as possible.

Selection for Impact Absorption

Ga : Allowable G value = G

V : Max. speed = m/s

1) Free fall $V = \sqrt{19.6 \times h}$ = m/s

h : Height of free fall = m

2) Halfsine acceleration input $V = \frac{19.6 \times Gmax \times t}{\pi}$ = m/s

Gmax : Max. G value = G

t : Action time of halfsine acceleration input $(\frac{\text{Half Sin Period T}}{2})$ = s

X : Flex = $\frac{1000 \times V^2}{9.8 \times Ga}$ = mm

Ensure that flex X is smaller than the listed maximum flex for each model.

Fmax : Impact load per one vibration absorber = N = m×9.8× Ga (+m× g)

* (+ m x g) is only for uses in the direction of compression

The intersection of calculated Fmax and X indicates the smallest model in the impact selection graph. If an intersection cannot be found in the graph, select a model directly under the intersection Next, select the shape of the mounting to finish the selection.
(The reason for selecting the model listed directly below the intersection is to reduce the impact load by using a more flexible model.)

Example of a Vibration Absorption Selection

1. Specifications:

M : Mass of installed object =180kg, n: Number of anti-vibration devices (Stabilizer is not required because of good stability due to the low center of gravity) =4

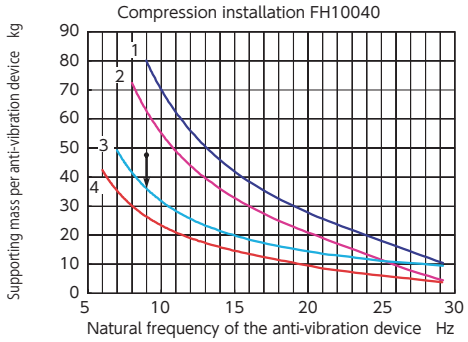
m : Supporting mass per anti-vibration device =45kg, Installation Method: compression, Ambient temperature: -5 ~40℃

f : Vibration frequency of machinery =27Hz

2. Selection:

m : Supporting mass per = 45kg、fn : Natural frequency of anti-vibration device $= \frac{f}{3} = 9Hz$

Selected FH10040-3 using m, fn and the vibration selection graph. Next, the model description will be FH10040-3-D because the shape of mounting parts is D. Such a model description can be used for ordering.



Example of Impact Absorption Selection

1. Specifications:

Total Mass=60kg, n: Number of anti-vibration devices (Stabilizer is regarded not required because of good stability due to the low center of gravity).

=4, m : Supporting mass per anti-vibration device = 15kg, Installation Method: compression, Ambient temperature: 0 ~60℃ As halfsine input, Ga : Allowable G value = 5G, Gmax : Max. G value = 15G

t : Action time of halfsine acceleration input = 0.01 s

2. Selection:

m : Supporting mass per anti-vibration device = 15 kg

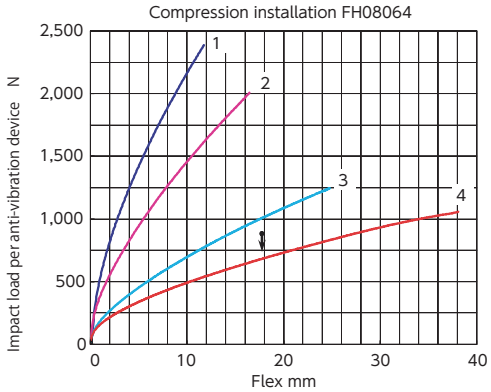
As it is input as halfsine, the maximum speed is as follows, based on the equation in 2) on page 210.

$$V : \text{Max. speed} = \frac{19.6 \times Gmax \times t}{\pi} = \frac{19.6 \times 15 \times 0.01}{\pi} = 0.9358 m/s$$

$$X : \text{Flex} = \frac{1{,}000 \times V^2}{9.8 \times Ga} = \frac{1{,}000 \times 0.9358^2}{9.8 \times 5} = 17.87mm$$

Fmax : Impact load per anti-vibration device = 9.8 × m × Ga = 9.8 × 15 × 5 = 880N

Selected FH08064-4 using Fmax, X and Impact selection graph. Next, the model description will be FH08064-4-A because the shape of mounting parts is A. Such a model description can be used for ordering.



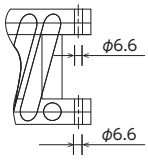
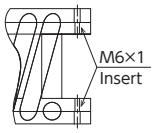
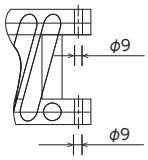
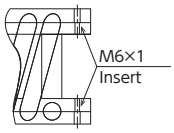
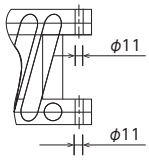
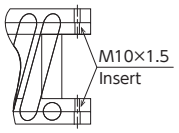
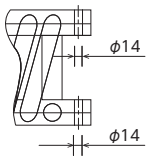
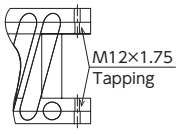
Helical Vibration Absorber

FHM Series

Shape of Mounting Parts

〈Geometry of the mountings for aluminum retainer〉

For this series, there are two types of standard shapes of mounting parts: D (drill end) and A (screw).

Shape of mounting parts / Symbol / Shape	Standard shape of mounting parts	
	D	A
FHM08375		
FHM08500		
FHM08625		
FHM08875		

Helical Vibration Absorber

FH10016

RoHS Compliant

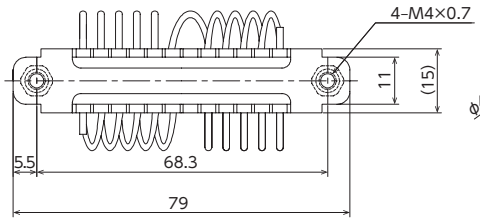
●Products specification might be changed without notice.

Specifications

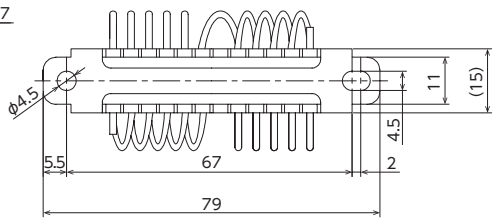
Model	H mm	OD mm	Mass g	Max. flex mm		
				Compression	Shear and rolling	45° Compression /Rolling
FH10016-1-□	23.3	33.5	51	6.3	10.2	9.5
FH10016-2-□	27.1	37.4	52	10.1	15.2	14.3
FH10016-3-□	29.3	39.8	53	12.3	17.8	17.4
FH10016-4-□	34.0	45.4	55	16.6	22.9	23.5

□ will be filled in with the mounting type either A or D.

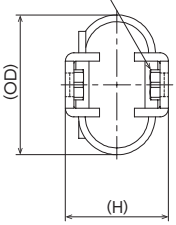
A type (screw of mountin g part)



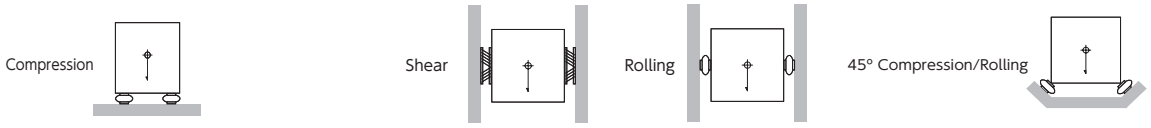
D type (drill end of mountin g part)



Press fitting nut
(Only for A typ e)

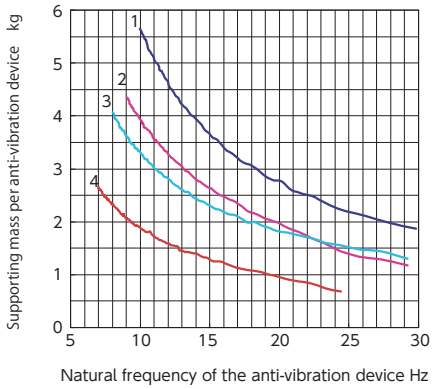


Installation Method

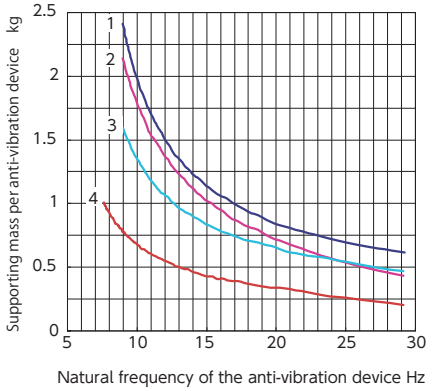


Vibration Selection Graph

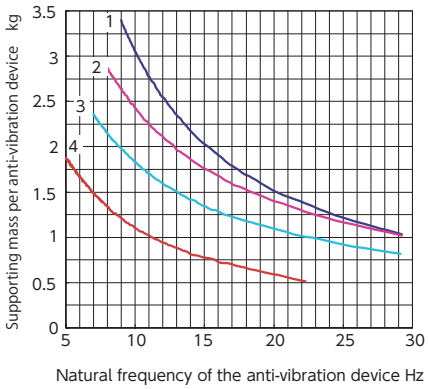
Compression installation



Shear and rolling installation

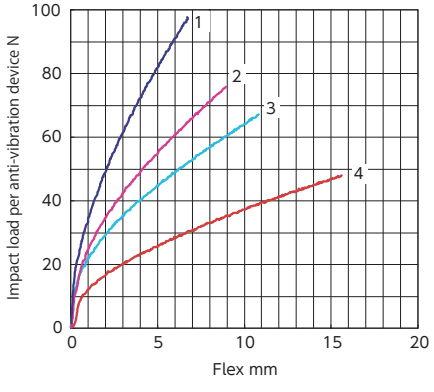


45° Compression/Rolling installation

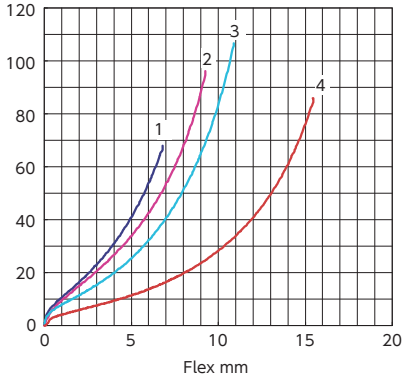


Impact Selection Graph

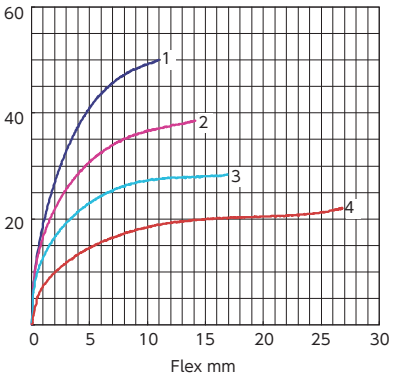
Compression installation



Shear and rolling installation



45° Compression/Rolling installation



Helical Vibration Absorber

FH10024

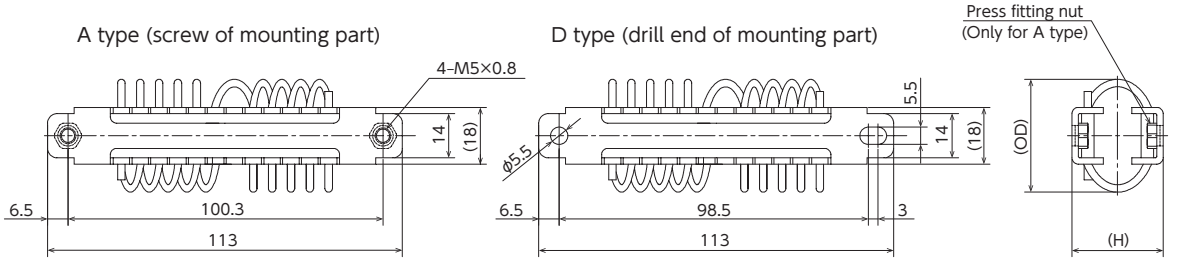
RoHS Compliant

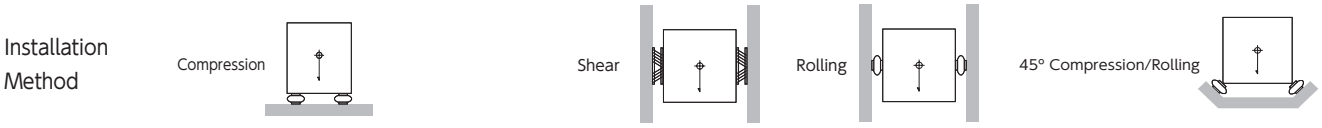
●Products specification might be changed without notice.

Specifications

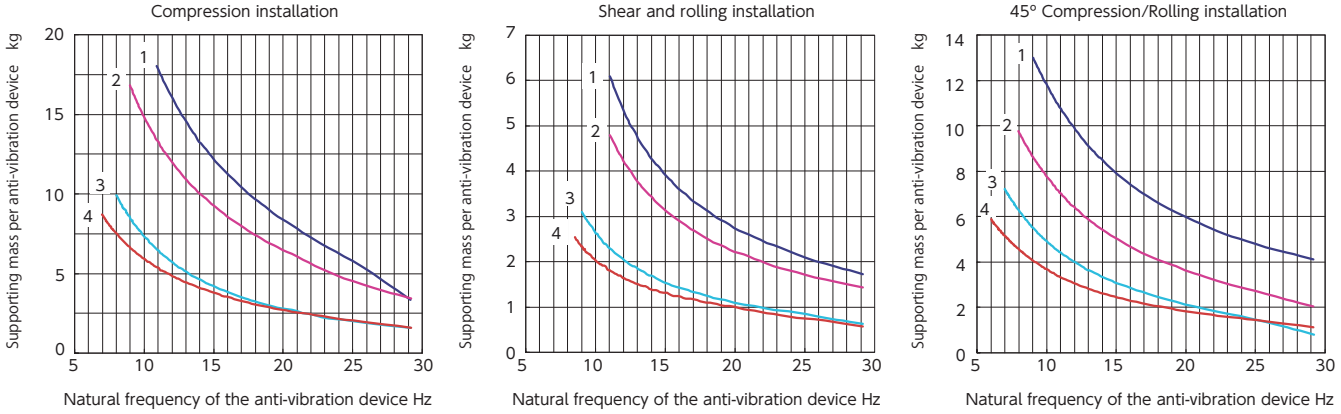
Model	H mm	OD mm	Mass g	Max. flex mm		
				Compression	Shear and rolling	45° Compression /Rolling
FH10024-1-□	28.8	37.8	102	7.4	10.2	10.5
FH10024-2-□	30.0	41.5	105	8.9	12.7	12.6
FH10024-3-□	35.2	46.1	108	13.9	15.2	19.7
FH10024-4-□	39.7	51.7	112	18.3	20.3	25.9

□ will be filled in with the mounting type either A or D.

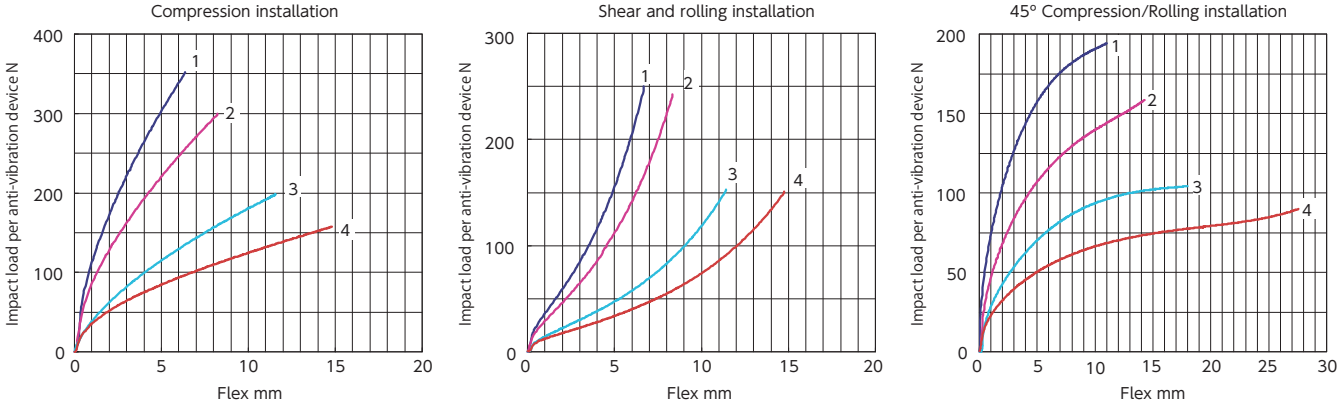




Vibration Selection Graph



Impact Selection Graph



Helical Vibration Absorber

FH10032

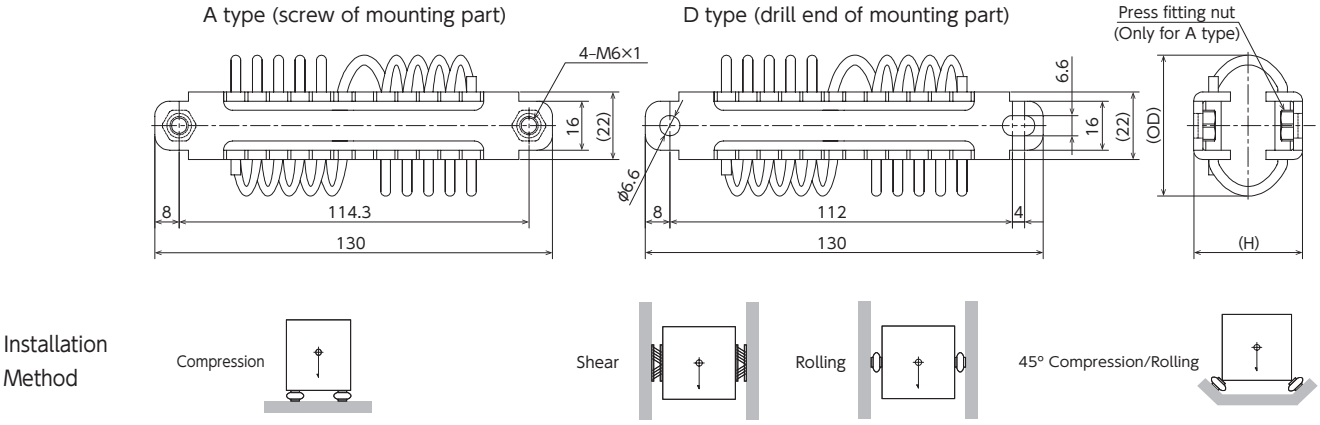
RoHS Compliant

●Products specification might be changed without notice.

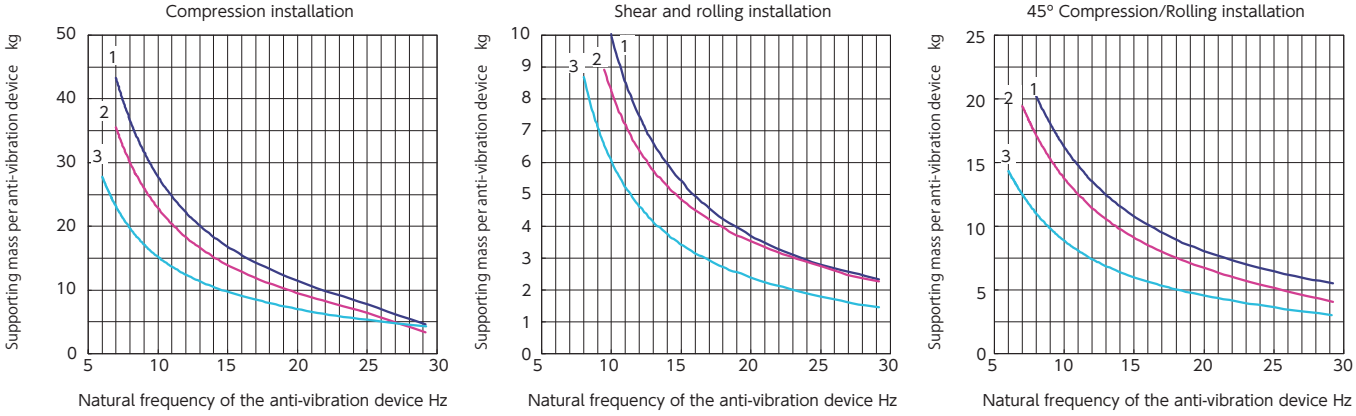
Specifications

Model	H mm	OD mm	Mass g	Max. flex mm		
				Compression	Shear and rolling	45° Compression /Rolling
FH10032-1-□	34.3	48.3	193	9.6	12.7	13.6
FH10032-2-□	35.9	51.8	200	10.7	15.2	15.1
FH10032-3-□	40.8	56.3	203	15.8	20.3	22.3

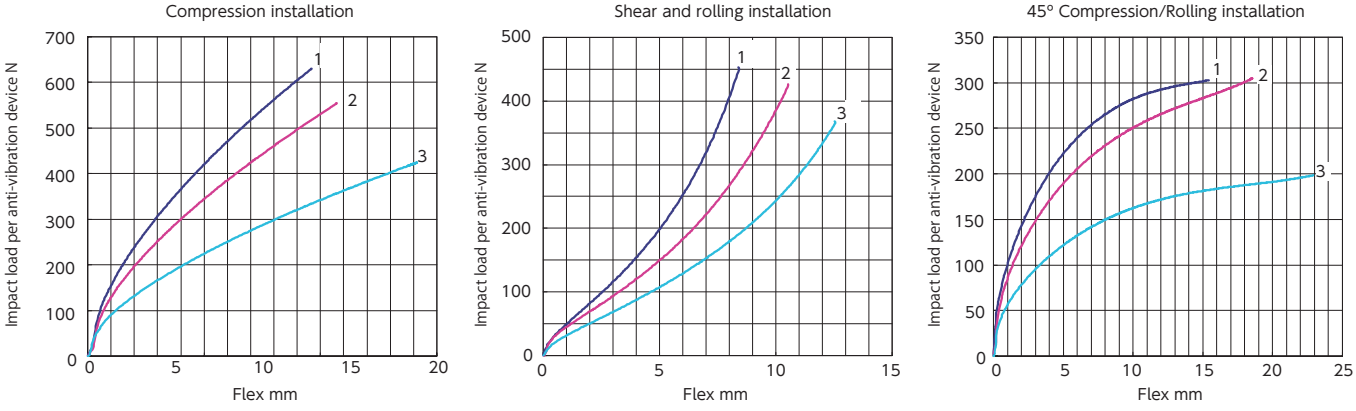
□ will be filled in with the mounting type either A or D.



Vibration Selection Graph



Impact Selection Graph



Helical Vibration Absorber

FH10040

RoHS Compliant

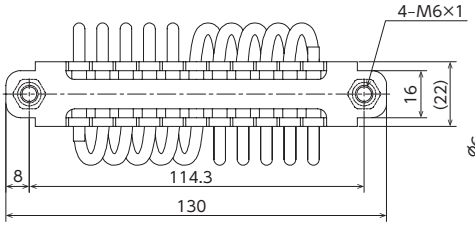
●Products specification might be changed without notice.

Specifications

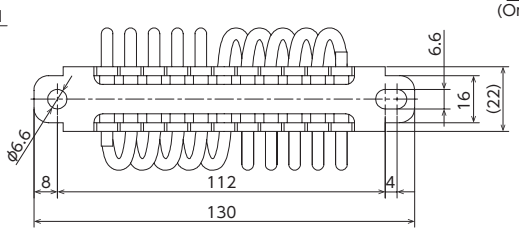
Model	H mm	OD mm	Mass g	Max. flex mm		
				Compression	Shear and rolling	45° Compression /Rolling
FH10040-1-□	33.5	50.6	223	8.2	12.7	11.6
FH10040-2-□	35.6	52.2	232	10.4	15.2	14.7
FH10040-3-□	40.9	58.4	235	15.4	20.3	21.8
FH10040-4-□	45.7	64.6	249	20.2	27.9	28.6

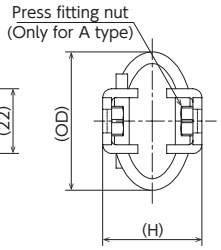
□ will be filled in with the mounting type either A or D.

A type (screw of mounting part)

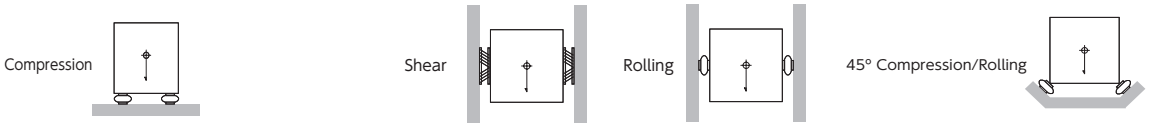


D type (drill end of mounting part)



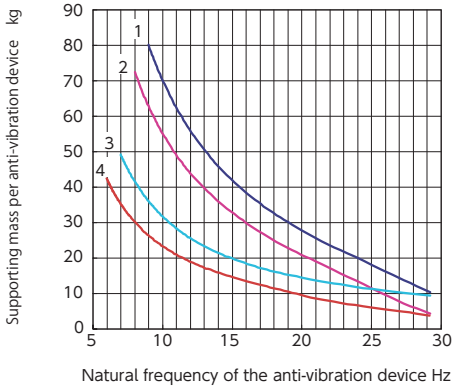


Installation Method

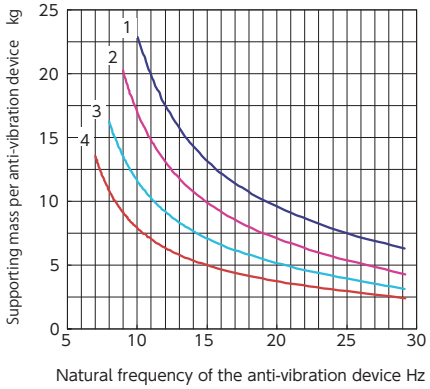


Vibration Selection Graph

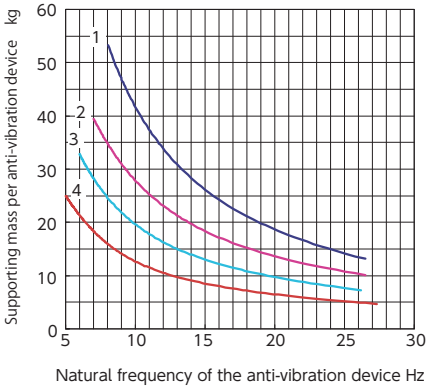
Compression installation



Shear and rolling installation

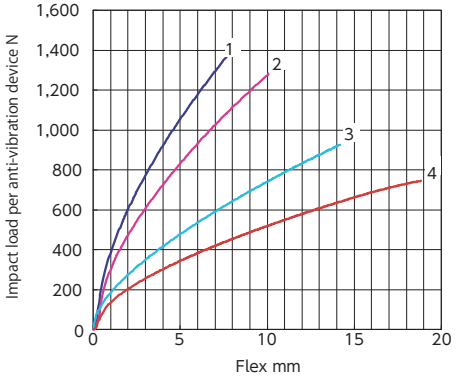


45° Compression/Rolling installation

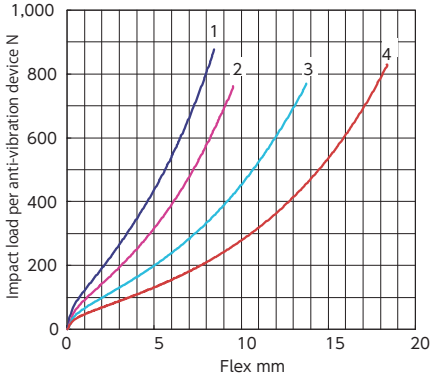


Impact Selection Graph

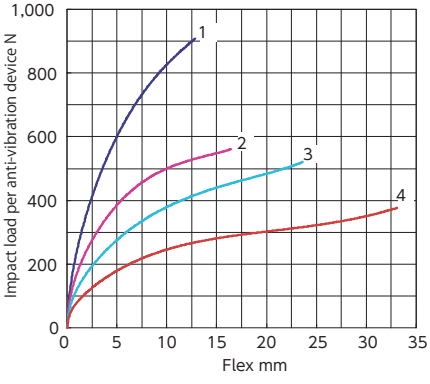
Compression installation



Shear and rolling installation



45° Compression/Rolling installation



Helical Vibration Absorber

FH10048

RoHS Compliant

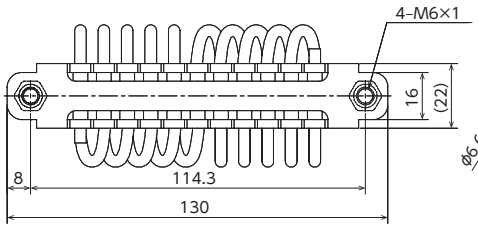
●Products specification might be changed without notice.

Specifications

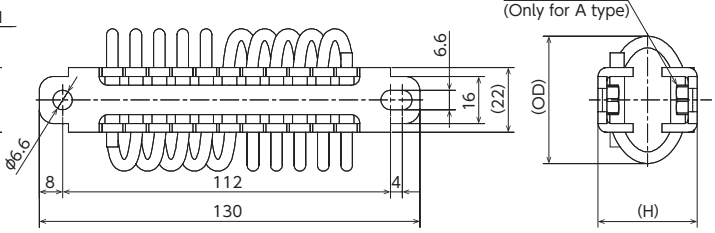
Model	H mm	OD mm	Mass g	Max. flex mm		
				Compression	Shear and rolling	45° Compression /Rolling
FH10048-1-□	33.5	46.1	256	6.2	10.2	8.8
FH10048-2-□	37.8	51.4	280	10.9	12.7	15.4
FH10048-3-□	42.0	57.4	286	15.0	12.7	21.2

□ will be filled in with the mounting type either A or D.

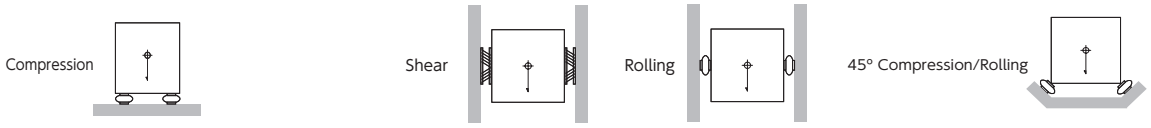
A type (screw of mounting part)



D type (drill end of mounting part)

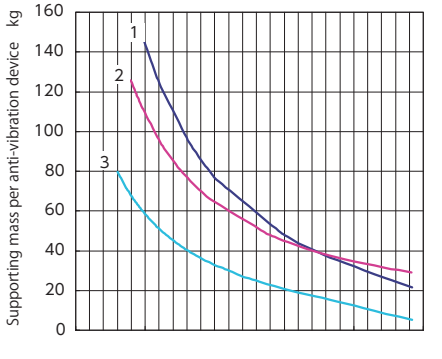


Installation Method

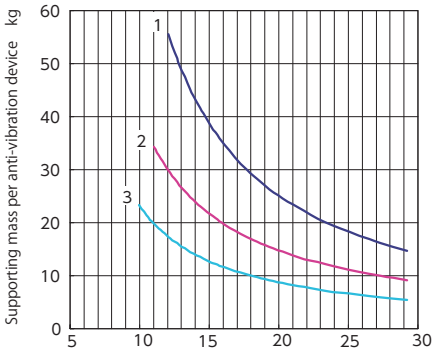


Vibration Selection Graph

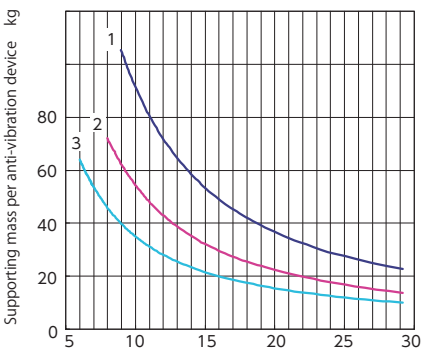
Compression installation



Shear and rolling installation

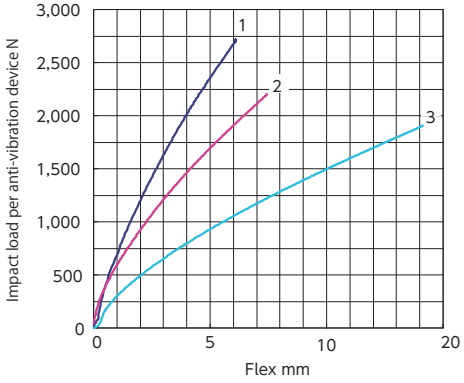


45° Compression/Rolling installation

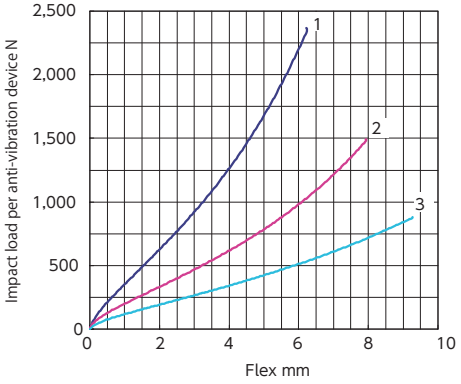


Impact Selection Graph

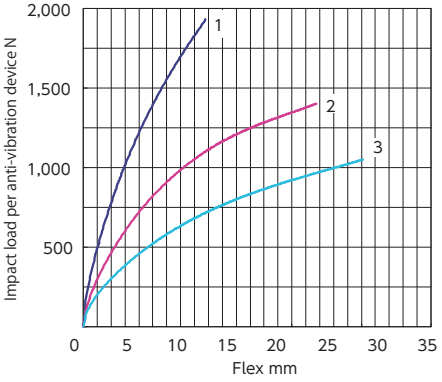
Compression installation



Shear and rolling installation



45° Compression/Rolling installation



Helical Vibration Absorber

FH08064

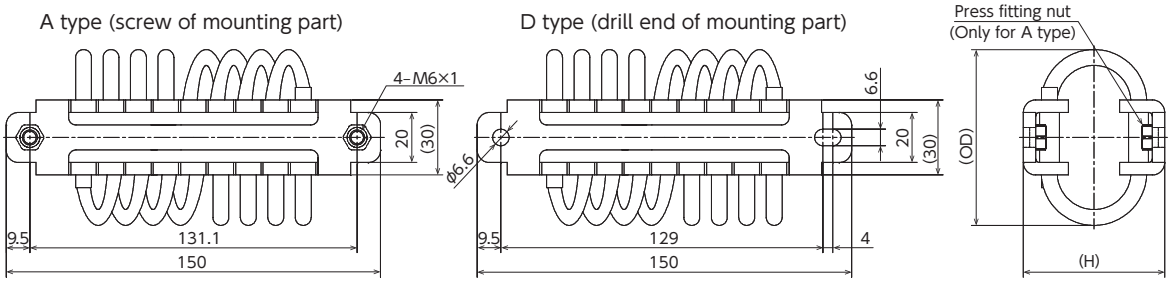
RoHS Compliant

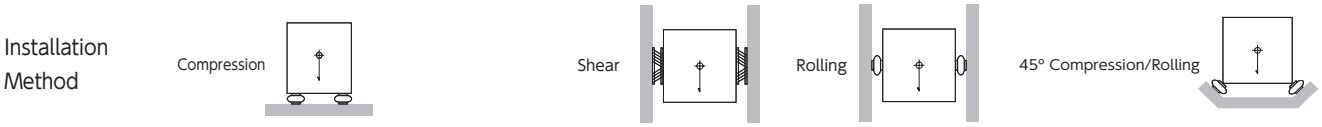
●Products specification might be changed without notice.

Specifications

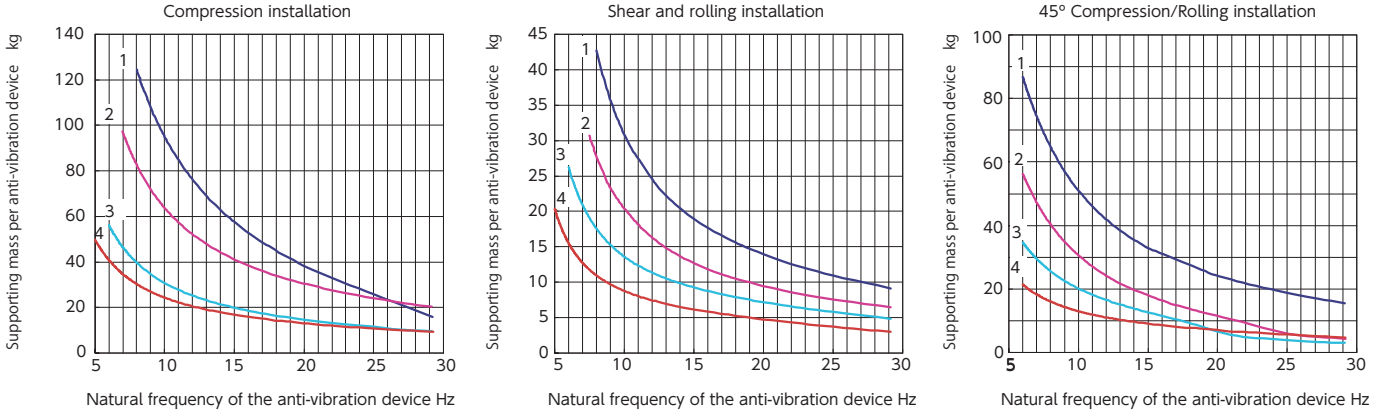
Model	H mm	OD mm	Mass g	Max. flex mm		
				Compression	Shear and rolling	45° Compression /Rolling
FH08064-1-□	54.1	75.0	566	16.4	20.3	23.2
FH08064-2-□	60.8	82.0	595	22.9	25.4	32.4
FH08064-3-□	70.8	98.0	679	32.4	40.6	45.8
FH08064-4-□	79.7	112.6	698	42.9	48.3	60.7

□ will be filled in with the mounting type either A or D.

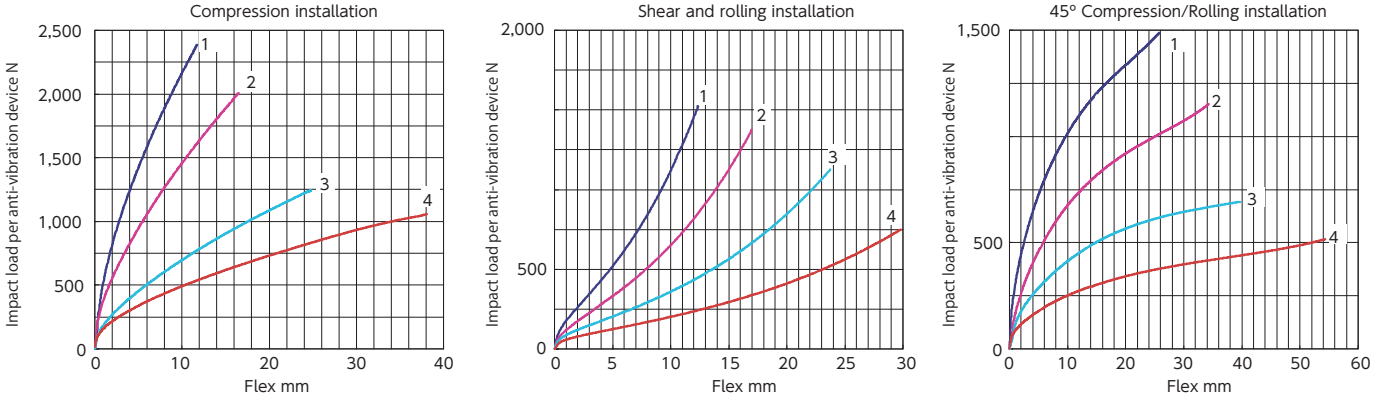




Vibration Selection Graph



Impact Selection Graph



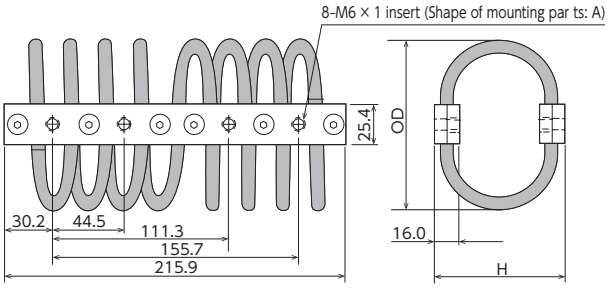
Helical Vibration Absorber

Customized orders

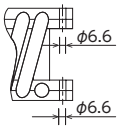
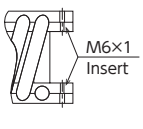
FHM08375

●Products specification might be changed without notice.

Dimensions



Model	H mm	OD mm	Mass g
FHM08375-1	71.1	84.1	1.043
FHM08375-3	76.2	104.9	1.179
FHM08375-7	108.0	139.7	1.406

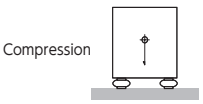
Standard shape of mounting parts	
D	A
	

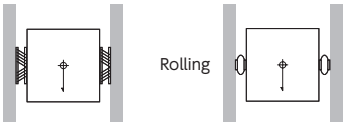
Please refer to page 208 if you require other shapes M6 × 1 for your mounting parts.

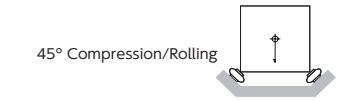
Model	Max. flex mm		
	Compression	Shear and rolling	45° Compression /Rolling
FHM08375-1-□	25.4	25.4	38.1
FHM08375-3-□	33.0	38.1	58.4
FHM08375-7-□	55.9	55.9	114.3

□ will be filled in with the mounting type either A or D.

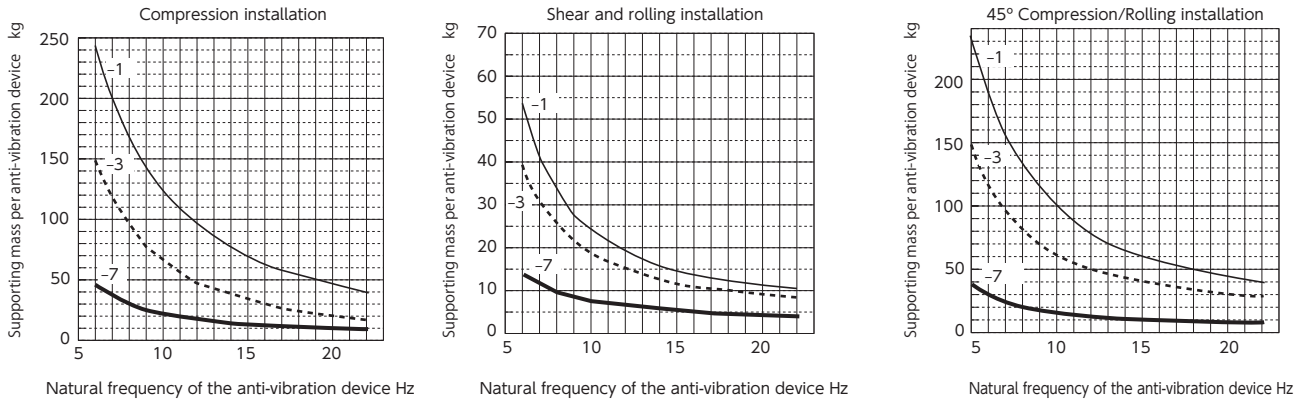
Installation Method



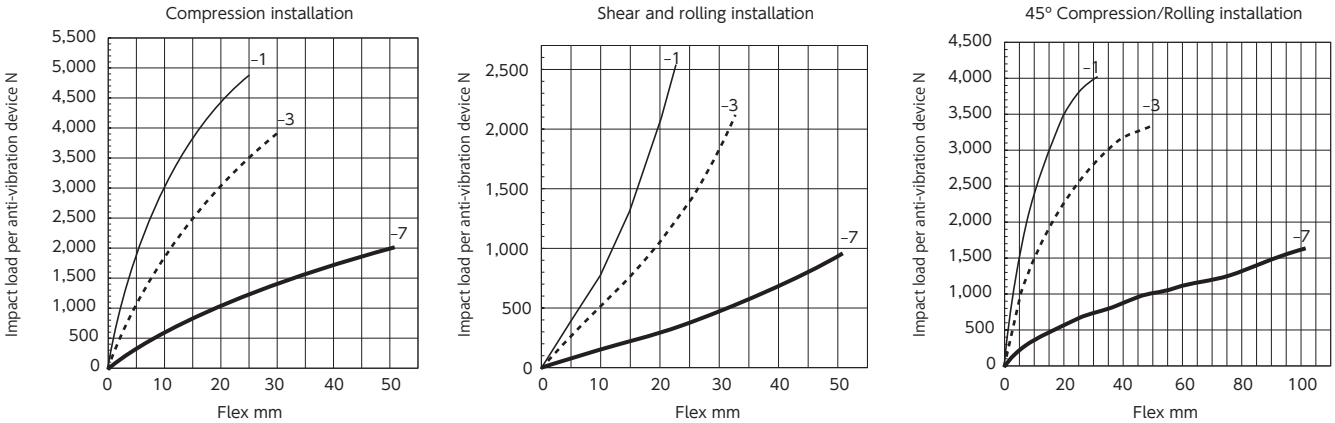




Vibration Selection Graph



Impact Selection Graph



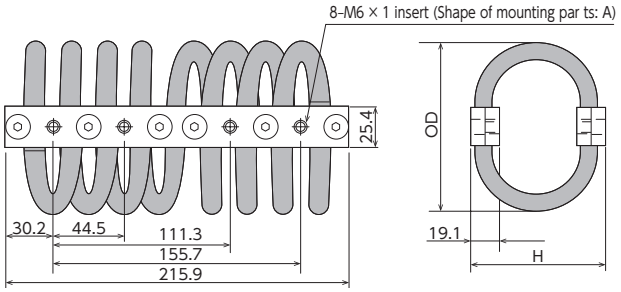
Helical Vibration Absorber

Customized orders

FHM08500

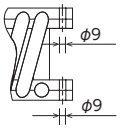
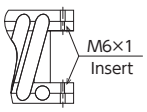
●Products specification might be changed without notice.

Dimensions



Model	H mm	OD mm	Mass kg
FHM08500-2	88.9	104.9	1.769
FHM08500-3	95.3	120.7	1.950
FHM08500-5	124.5	143.5	2.358

Standard Shape of Mounting Parts and Maximum Flex

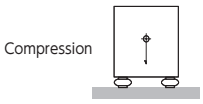
Standard shape of mounting parts	
D	A
	

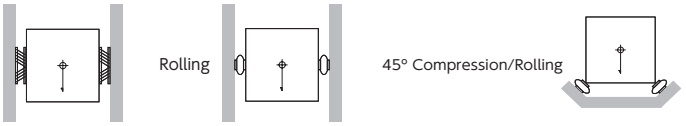
Please refer to page 208 if you require other shapes M6 × 1 for your mounting parts.

Model	Max. flex mm		
	Compression	Shear and rolling	45° Compression /Rolling
FHM08500-2-□	40.6	33.0	68.6
FHM08500-3-□	43.2	38.1	81.3
FHM08500-5-□	71.1	58.4	101.6

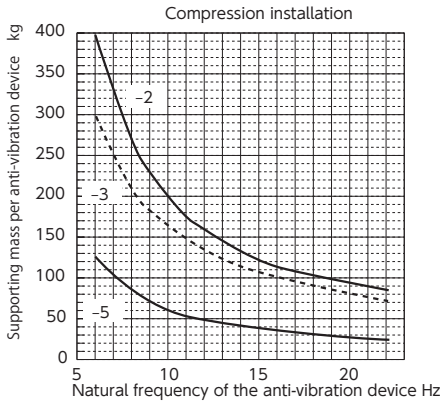
□ will be filled in with the mounting type either A or D.

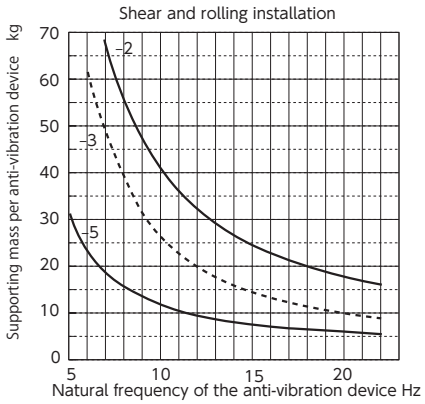
Installation Method

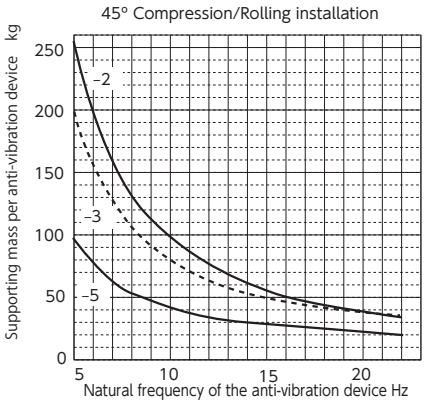




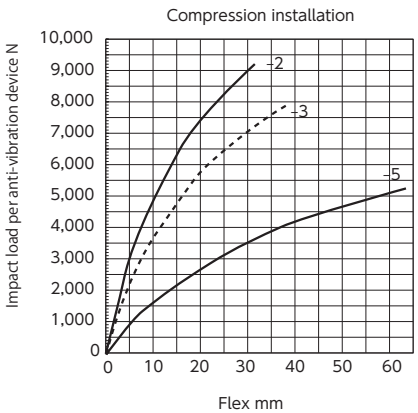
Vibration Selection Graph

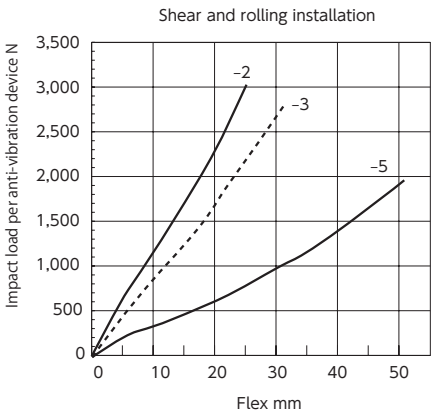


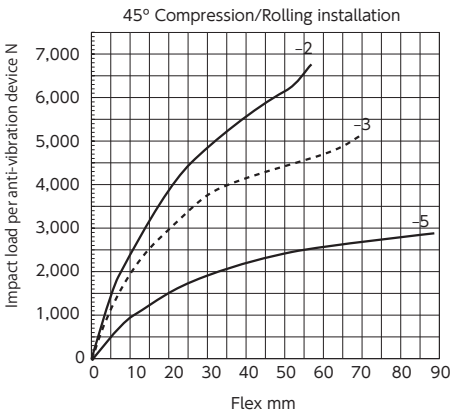




Impact Selection Graph







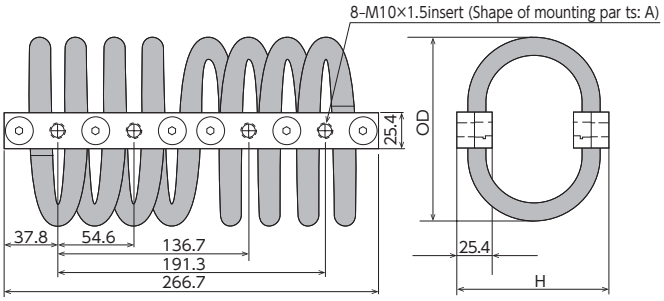
Helical Vibration Absorber

Customized orders

FHM08625

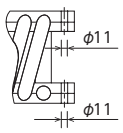
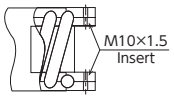
●Products specification might be changed without notice.

Dimensions



Model	H mm	OD mm	Mass kg
FHM08625-1	88.9	101.6	2.875
FHM08625-3	109.2	134.6	3.592
FHM08625-5	127.0	165.1	4.236

Standard Shape of Mounting Parts and Maximum Flex

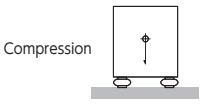
Standard shape of mounting parts	
D	A
	

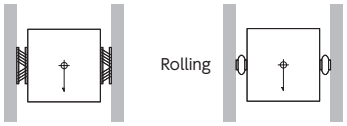
Please refer to page 208 if you require other shapes M6 × 1 for your mounting parts.

Model	Max. flex mm		
	Compression	Shear and rolling	45° Compression /Rolling
FHM08625-1-□	30.5	30.5	45.7
FHM08625-3-□	45.7	45.7	71.1
FHM08625-5-□	63.5	63.5	91.4

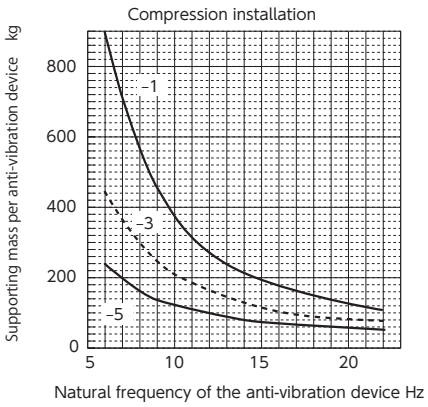
□ will be filled in with the mounting type either A or D.

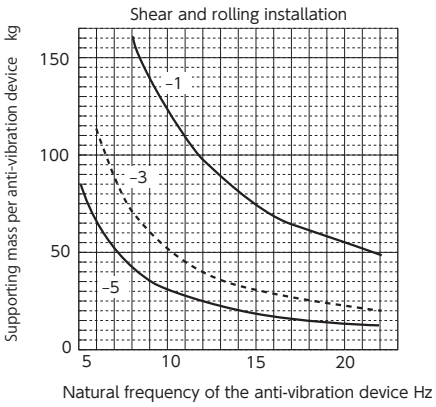
Installation Method

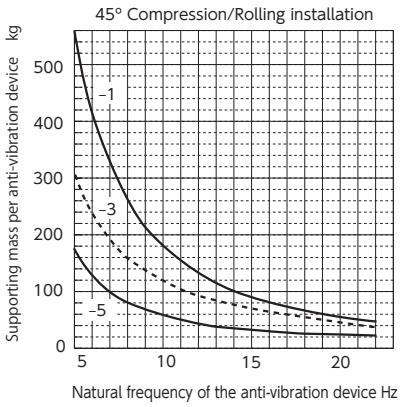




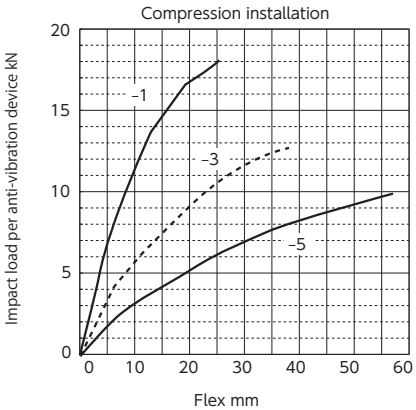
Vibration Selection Graph

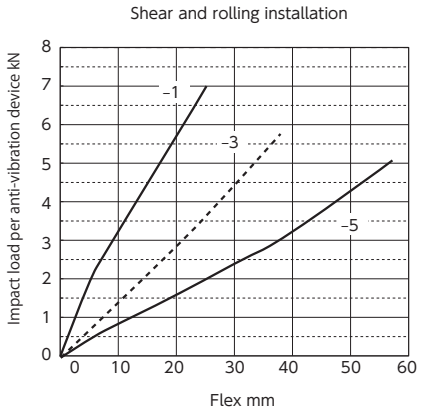


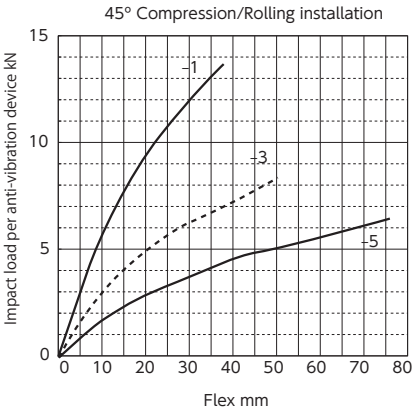




Impact Selection Graph







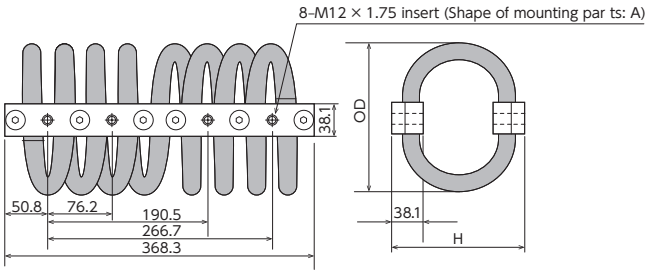
Helical Vibration Absorber

Customized orders

FHM08875

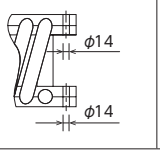
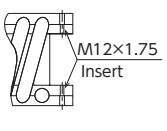
●Products specification might be changed without notice.

Dimensions



Model	H mm	OD mm	Mass kg
FHM08875-1	133.4	139.7	8.164
FHM08875-3	158.8	177.8	9.525
FHM08875-4	190.5	209.6	10.886

Standard Shape of Mounting Parts and Maximum Flex

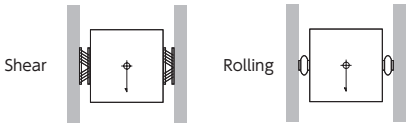
Standard shape of mounting parts	
D	A
	

Please refer to page 208 if you require other shapes.

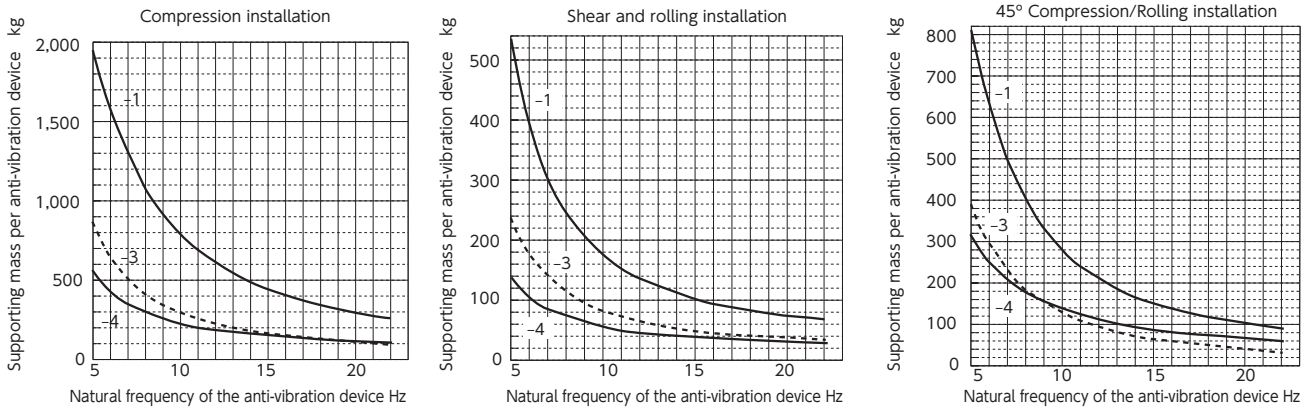
Model	Max. flex mm		
	Compression	Shear and rolling	45° Compression / Rolling
FHM08875-1-□	50.8	53.3	63.5
FHM08875-3-□	76.2	73.7	96.5
FHM08875-4-□	91.4	83.8	119.4

□ will be filled in with the mounting type either A or D.

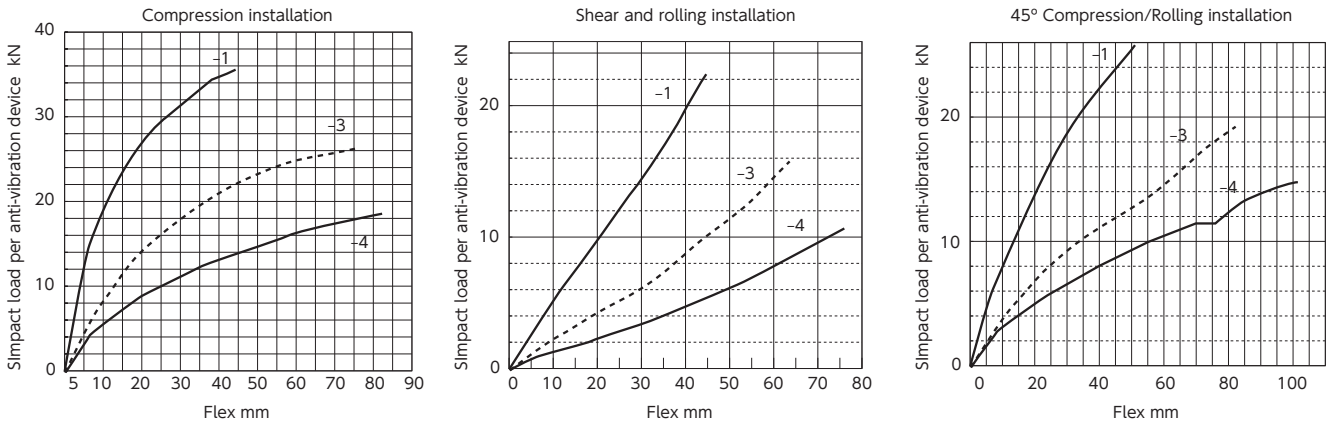
Installation Method



Vibration Selection Graph



Impact Selection Graph



6

Model Selection Form

Rotary Damper/Vane Damper Model Selection Form

1. Fill in an application of a rotary/vane damper (for what/how?)

2. Please draw a simple diagram of the mechanism/device in which you intend to install the soft absorber and the shape of the mounting parts.
[Machine/Device] [Shape of Mounting Parts]

3. Fill in the operating conditions for a rotary damper/vane damper
(The items that require no special designation are not required to be filled in.)
Conditions for Use

For Rotational Motion

Body Dimensions	D	mm
	W	mm
	H (thickness)	mm
Position of gravity center of the body		
Angle for use		degrees
Operating Duration		sec

For linear motion

Body Moving Distance	mm
Body Moving Duration	sec
Driving Force	N

Body Mass	kg
Direction for Use	Horizontal Rotation Vertical Rotation Vertical Movement Horizontal Movement
Cycle of use cycle	cycle/min
Temperature for use	°C
Environment for use	Indoors Outdoors

4. Fill in the required quantity (planned quantity for mass production)

Your company's name	TEL
Division/Department	FAX
Representative's name	Adress

Contact information : FUJI LATEX CO., LTD. International Department. TEL +81-03-3259-2530 FAX +81-03-3293-6070

Soft Absorber Model Selection Form

For Linear Movement

1. Please tell us your intended purpose for using a soft absorber. (What you intend to use it on and how?).

2. Please draw a simple diagram of the mechanism/device in which you intend to install the soft absorber and the shape of the mounting parts.
[Machine/Device] [Shape of Mounting Parts]

3. Please specify what kind of function and shape you would like to see in the soft absorber.
(You may skip this part if you do not have any particular preference)

Shape

Total length		mm or less
Stroke		mm
External diameter	Screw type	M × ((pitch)
	Non-screw type	ϕ or less
Cap		Required · Not required

Function

Max. drag	or less
Deceleration	or less
Recovering power	or less
Braking time	
Adjustment Method	Fixed · Adjustable

4. Please enter your impact conditions and usage environment.

Impact conditions

Impact rate	m/s
Mass of the colliding object	Kg
External thrust	N
Operating cycle	times/minutes
Eccentric angle	degrees
Number of supports for soft absorber	pcs

Operating direction

Horizontal	Friction coefficient μ=	∗1
Perpendicular	Facing upward · Facing downward	
Slope	From the horizontal surface	∗2

*1 Please enter if using a conveyer, etc.
*2 Positive value for downward direction

Using a cylinder

Drive source	Pneumatic pressure · Hydraulic pressure
Internal diameter of the cylinder	ϕ
Pressure used	MPa
Number of units	units

Usage environment

Ambient temperature	℃
Contact with liquid	No · Yes
Contact with dust	No · Yes
Measures against copper ions	None · Exterior only · Full

5. Please enter the number of units (expected number of mass-produced units) you require._____ units (Monthly · Single order)

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Division/Department	FAX
Representative's name	Adress

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Soft Absorber Model Selection Form

For Rotational Movement

1. Please tell us your intended purpose for using a soft absorber. (What you intend to use it on and how?).

2. Please draw a simple diagram of the mechanism/device in which you intend to install the soft absorber and the shape of the mounting parts.
[Machine/Device] [Shape of Mounting Parts]

3. Please specify what kind of function and shape you would like to see in the soft absorber.
(You may skip this part if you do not have any particular preference)

Shape

Total length		mm or less
Stroke		mm
External diameter	Screw type	M × ((pitch)
	Non-screw type	ϕ or less
Cap		Required · Not required

Function

Max. drag	or less
Deceleration	or less
Recovering power	or less
Braking time	
Adjustment Method	Fixed · Adjustable

4. Please enter your impact conditions and usage environment.

Impact conditions

Colliding Speed	m/s
Colliding Mass	Kg
External Driving Force	N
Angular Velocity (fill in either one of these)	rad/s
	degrees in seconds
Moment of Inertia	
Driving Source Torque	
Driving Source Type	
Cycle of Use	cycle/min
Inclination Angle	degrees
Number of supports for soft absorber	pcs

Operating direction

Direction of Rotation	Horizontal / Vertical / Inclined (°)	
Position of Gravity Center	from rotating axle	mm
Stopping Position	from horizontal surface	° ∗1
Mounting Position	from rotating axle	mm

∗1 Downward is positive.

Usage environment

Ambient Temperature	℃
Adhesion of liquid, etc.	Present / Absent
Adhesion of power dust, etc.	Present / Absent
Countermeasures against copper ion	Present / Perfect

* Please fill in only as far as you know in reference to the examples of selection calculation

5. Please fill in the required quantity (planned number for mass production) pcs (per month/only this time)

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Division/Department	FAX
Representative's name	Adress

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Helical Vibration Absorber Selection Form

1. Please specifically describe the applications for the helical vibration absorber

2. Please describe the schematic diagram of machine/equipment used
(H x W x D, position of gravity center, direction of gravity, planned position for installation, etc.)

3. Conditions for Use

Installation Method (Please circle on either one)			Compression Shearing and roll 45° compression / roll		
Mass of installed body	M				kg
Quantity of used vibration absorber (excluding stabilizer)	n				pcs
Quantity of use as a stabilizer	n				pcs
Temperature for use			℃ ～ ℃		
Other environmental conditions					
Absorption of Vibration			Absorption of Shock		
Machine vibration frequency f		Hz	Free falling height h		m
Machine rotational speed N		rpm	Allowable G value Ga		G
			* Maximum G value Gmax G		G
			* Applied duration of half sin acceleration input t		S
Please fill in the required quantity (planned quantity for mass production)			pcs (per month/only this time)		

Note The symbol "*" stands for a case where the half sin acceleration is input

4. Requested Items

Absorption of Vibration		Absorption of Shock	
Allowable Deflection	mm	Allowable Deflection	mm

Your company's name	TEL
Division/Department	FAX
Representative's name	Adress

Contact information : FUJI LATEX CO., LTD. International Department. TEL +81-03-3259-2530 FAX +81-03-3293-6070