## FUJI LATEX Product catalog

The Key of controlling the motion ROTARY DAMPERS SHOCK ABSORBERS HELICAL ISOLATORS

## Motion Control & Design



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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.

## <u> (</u>Warning

**Definition of** "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.

Olt 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.
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.

## **A** Caution

**Defifinition of** "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	<sub>≋1</sub> 7.8	9.8	14.7	<sub>*2</sub> 29.4	49	58.8	<sub>*3</sub> 78.4	98	392	420

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

%2 FED-2010M-C tightening torque : 15N·m%3 FED-3020M-C tightening torque : 30N·m

#### Please adjust the torque for the adjustable soft absorber.

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

#### Oil

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

#### **Model selection**

•Please select the model with acknowledging all the content of the latest catalog and technical document.

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



Colliding object

Breakage or bending due to insufficient strength

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### Scattering pieces due to cap damage

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

#### Pay attention to a loose retaining ring

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

#### Product Main Unit

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

#### Eccentric load and eccentric angle

- $\bullet$ A collision of a load with inclination angle larger than  $\pm 2.5^{\circ}$  will cause the degradation of performance due to defective return of bent piston rod or local friction of sliding contacts, and the mother machine will be damaged.
- \* Types FK-2050, FK-2550, FA/FK-64100, FA/FK-64150 and FA-64200 shall be used within the inclination angle range of ± 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°C- +80°C. \*Models FA-1212, 1010 and 1215 shall be in -20°C - +50°C, Series FPD and FPR in -10°C - +60°C.

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

#### Daily Inspection and Maintenance

- •Performance and functions of a product will be degraded with the lifetime. Please carry out daily inspection and confirm that the required functions are satisfied and prevent the occurrence of an accident.
- ●Please check for looseness of mounting nuts. Any use with loose parts will cause damage or an accident.
- Please pay attention to abnormal vibration noises and vibrations. When a shock noise or vibration abnormally increases, please replace the unit because it is an indication of the lifetime limit.
- A continued use will cause damage to a device on which this product is mounted.
- •Please check the oil leakage and returning of piston rod. If a large quantity of oil leakage or defective returning of piston rod is observed, please replace if a problem 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.

#### 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.



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

- 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)  $1 \leftarrow 2 \rightarrow 3$
- (Stronger Torque) •The adjusting shaft can be rotated in 360° and is locked at any position. \* and is locked at any position, but please do not use or lock in the prohibited range.

## **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.



## <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.	Besistance Besistance Besistance Stroke
	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.	Besistance Stroke
Stroke-dependent orifice	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.	Besistance Stroke
	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.	Stroke

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.

### 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	(Resin) Press Fitting	(Resin) Holder (Metal)	Cap (Resin) Holder/ (Metal)	Urehave Ridden Holder (Metal)	Meta	(Veta)
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 FW/M-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. $E_3 \ge E \times C$
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/

Impact conditions can be divided into following categories. When making a selection, it is necessary to calculate the energy for the

V

M

Thrusting motion

Μ

Falling motion

Н S t

ΊÂ

Rotating motion

\$ St

15

## : M(kg) : V(m/s) : F(N) (air cylinder, thrust of the motor, friction, gravity, etc.) □ Number of soft absorber receivers : N : H(m) (Only if a falling motion is applicable. The soft absorber's stroke is not included.) : St(m) $E = \frac{1}{2} \times M \times V^2$ $E = \frac{1}{2} \times M \times V^2 + F \times St$ $E = M \times g \times (H+St)$ (g : Acceleration due to gravity=9.8m/s<sup>2</sup>) Mass of the colliding object · M(ka) $E = \frac{1}{2} \times I \times \omega^2 + T \times \theta$ 2-3. Other equations (the following equations indicate the minimum values; the actual values will be larger) $G = 0.051 \times V^2$ This indicates the degree of impact at the time of collision. Deceleration (G value) St (Smaller value means smaller impact)

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.

This indicates the time it takes for the colliding object to come to a complete stop after colliding with a soft absorber.

Horizontal motion without thrust

V

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1. Verifying the Type of Motion

relevant category and then consider the attachment method.

## 2. Energy Calculation

#### 2-1. Linear motion

#### <Specifications to be verified>

□ Mass of the colliding object

□ Impact rate

- Thrust
- Falling height
- □ Soft absorber stroke

#### <Equations>

Horizontal motion without thrust

Thrusting motion

Falling motion

#### 2-2. Rotating motion

#### <Specifications to be verified>

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

 $F = \frac{E}{St}$ 

 $t = \frac{2 \times St}{1}$ 

#### <Equations>

Thrusting motion

Braking force

Braking time

## Equations for the Selection of Soft Absorbers (1)

	Inertial impact (horizontal)	Cylindrical thrust (horizontal)	Motor-driven dolly (horizontal)	Friction-driven dolly (horizontal)
Impact (examples)	M St	P : Pressure used D : Internal diameter of the cylinder	V St M Kw : Motor's horsepower	Kw : Motor's horsepower n1 : Total number of wheels n2 : Number of driving wheels
Mass of the colliding object (kg)	M	Μ	Μ	Μ
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)		$F = \frac{\pi D^2}{4} \times P \times 10^6$	$F = \frac{kw \times 2.5}{V} \times 10^{3}$	$ \begin{pmatrix} F=0.25 \cdot M \cdot g \cdot \frac{n1}{n2} \\ F=\frac{kw \times 2.5}{V} \times 10^{3} \end{pmatrix} $
Thrusting energy (J)		$E_2 = F \cdot St$	$E_2 = F \cdot St$	E₂=F∙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	↓ M H St	V M D: Internal diameter of the cylinder P: Pressure used M V FTSt	St. L M Hb a	D: Internal diameter of the cylinder P: Pressure used
Collision Mass (kg)	Μ	Μ	Μ	Μ
Collision Speed (m/s)	V <i>=</i> √19.6H	V	V=√19.6L·sinα	V
Kinetic Energy (J)	E₁=M·g·H	$E_1 = \frac{1}{2} \mathbf{M} \cdot \mathbf{V}^2$	E₁=M•g•L•sinα	$E_1 = \frac{1}{2} M \cdot V^2$
Driving Force (N)	F=M·g	$\begin{array}{l} F = F_1 + \mathbf{M} \cdot \mathbf{g} \text{ (Descending)} \\ F = F_1 - \mathbf{M} \cdot \mathbf{g} \text{ (Ascending)} \\ (F_1 : Cylindrical thrust) \end{array}$	F=M•g•sinα	$F=F_1+M\cdot g\cdot sin\alpha (Descending)$ $F=F_1-M\cdot g\cdot sin\alpha (Ascending)$ $(F_1: Cylindrical thrust)$
Driving Force Energy (J)	E <sub>2</sub> =F·St	E <sub>2</sub> =F·St	E <sub>2</sub> =F·St	E2=F·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	h H H R H	h r V R D: Internal diameter of the cylinder P: Pressure used $\omega$ $\omega$ $\omega$ $\theta$	R w r1 r2 e D: Internal diameter of the cylinder P: Pressure used	
Collision Mass (kg)	Μ	Μ	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)	E₁=M·g·H	$E_1 = \frac{1}{2} \cdot \omega^2$	$E_1 = \frac{1}{2} \mathbf{I} \cdot \boldsymbol{\omega}^2$	
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)	E2=F·St	$E_2 = F \cdot St$	E2=F·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 <sub>1</sub>	J	Kinetic energy	θ	rad	Vibrational angle within the soft absorber stroke
E <sub>2</sub>	J	Thrusting energy	R	m	Distance between the centre of rotation and absorber
Р	MPa	Pressure used by the driving cylinder	r <sub>1</sub>	m	Pitch circle radius of pinion gear
D	m	Internal diameter of the driving cylinder	r <sub>2</sub>	m	Radius of turntable
Μ	kg	Mass of the colliding object	h	m	Distance between the centre of rotation and centre of gravity
V	m/s	Impact rate	Тθ	N∙m	Driving torque
F	Ν	Thrust	ω	rad/s	Angular velocity
F <sub>1</sub>	Ν	Air cylinder's thrust	Ι	kg∙m²	Moment of inertia around the rotating shaft
St	m	Soft absorber stroke	Ν	Units	Number of soft absorber receivers
Н	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 <sup>2</sup>	Acceleration due to gravity : 9.8m/s <sup>2</sup>	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



## Sample Calculations for Selecting Soft Absorbers 2



4 Speed Controller

## Sample Calculation for Selecting Soft Absorbers 3

	5. Free-Fall (vertical)	6. Cylindrical thrust (up)
Case Examples		
Specifications	<ul> <li>☐Mass of the colliding object</li> <li>☐The distance of an object falls until it hits the shock absorber</li> <li>☐Operation frequency</li> <li>C: 1 time/min</li> <li>☐Ambient temperature</li> <li>t: 0~25°C</li> <li>☐Number of soft absorber receivers</li> <li>N: 2 units</li> </ul>	<ul> <li>Mass of the colliding object M : 80kg</li> <li>Impact rate V : 0.5m/s</li> <li>Operation frequency C : 1 time/min</li> <li>Ambient temperature t : 0~25°C</li> <li>Thrust F : Air cylinder's thrust D : Internal diameter of the driving cylinder…80mm P : Pressure used by the driving Cylinder…0.5MPa</li> <li>Number of soft absorber receivers N : 1 unit</li> </ul>
Sample Calculations	1. Calculating impact rate $V = \sqrt{2 \cdot g \cdot H} = \sqrt{2 \times 9.8 \times 0.15} = 1.71 \text{ (m/s)}$ 2. Calculating kinetic energy $E_1 = \frac{1}{2} \cdot M \cdot V^2 = \frac{1}{2} \times 300 \times 1.71^2 = 439 \text{ (J)}$ 3. Calculating thrust 3-1. Using equivalent mass to check $F = M \cdot g = 300 \times 9.8 = 2,940 \text{ (N)}$ 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) $E_2 = F \cdot St = 2,940 \times 0.05 = 147 \text{ (J)}$ 3. Calculating total energy $E = \frac{E_1 + E_2}{N} = \frac{439 + 147}{2} = 293 \text{ (J)}$ 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 $Me = \frac{2 \cdot E}{V^2} = \frac{2 \times 293}{1.71^2} = 200 \text{ (kg)}$ As the equivalent mass of FK-4250BH-C is 450(kg), it does not pose a problem. Based on these, two units of FK-4250BH-C are selected.	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 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

8. Free-Fall (slope)

7. Cylindrical thrust (down)

Case Examples

Specifications

Sample Calculations

Μ □ Mass of the colliding object M : 80kg  $\Box$  Mass of the colliding object M:70kg □ Travelling distance on slope V :0.5m/s L:0.7m Impact rate  $\Box$  Operation frequency C:1 time/min □ Sloping angle  $\alpha:3^{\circ}$ t :0~25℃ t :0~25°C Ambient temperature □ Ambient temperature F: Air cylinder's thrust □ Number of the soft absorber receivers N : 1 unit 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 1. Calculating kinetic energy 1. Calculating impact rate  $E_1 = \frac{1}{2} M \cdot V^2 = \frac{1}{2} \times 80 \times 0.5^2 = 10 (J)$  $V = \sqrt{2 \cdot g \cdot L \cdot \sin \alpha}$  $=\sqrt{2 \times 9.8 \times 0.7 \times \sin 3^{\circ}} = 0.85 (m/s)$ 2. Calculating thrust  $F = \frac{\pi \cdot D^2}{4} \times P + M \cdot g$ =  $\frac{\pi \times 80^2}{4} \times 0.5 + 80 \times 9.8 = 3,297 (N)$ 2. Calculating kinetic energy  $E_1 = M \cdot g \cdot L \cdot \sin \alpha$  $= 70 \times 9.8 \times 0.7 \times \sin^3 = 25.1$  (J) 3. Calculating thrusting energy 3. Calculating thrusting energy According to Items 3 and 4 of the selection procedure According to Items 3 and 4 of the selection procedure on page 14, tentatively select FA-2016E3-\* having the on page 14, tentatively select FWM-3035TBD-\* having maximum absorption energy of 35.7(J) from the catalog. the maximum absorption energy of 196(J) from the The thrusting energy will be as follows. catalog. St = 16 (mm) = 0.016 (m)The thrusting energy will be as follows.  $E_2 = M \cdot g \cdot \sin \alpha \cdot St$ St = 35 (mm) = 0.035 (m) $= 70 \times 9.8 \times sin3^{\circ} \times 0.016 = 0.57$  (J)  $E_2 = F \cdot St = 3,297 \times 0.035 = 115 (J)$ 4. Calculating total energy 4. Calculating total energy  $E = \frac{E_1 + E_2}{N} = \frac{25.1 + 0.57}{1} = 25.7 \text{ (J)}$  $E = \frac{E_1 + E_2}{N} = \frac{10 + 115}{1} = 125 \text{ (J)}$ Ν 5. Feasibility check 5. Feasibility check 5-1. Using absorption energy to check 5-1. Using absorption energy to check As the absorption energy of FA-2016E3 As the absorption energy of FWM-3035TBD - \* is 35(J), - \* is 196(J), it does not pose a problem. it does not pose a problem. 5-2. Using equivalent mass to check 5-2. Using equivalent mass to check  $Me = \frac{2 \cdot E}{V^2} = \frac{2 \times 25.7}{0.85^2} = 71.1 \, (kg)$  $Me = \frac{2 \cdot E}{V^2} = \frac{2 \times 125}{0.5^2} = 1,000 \, (kg)$ As the equivalent mass of FA-2016E3 As the equivalent mass of FWM-3035TBD - \* is 1,300(kg), - \* is 120(kg), it does not pose a problem. it does not pose a problem. Based on these, FA-2016E3 - \* is selected. Based on these, FWM-3035TBD - \* is selected.

## Sample Calculation for Selecting Soft Absorbers 5



#### α Ťθ

事例

	R	$\theta$
仕様	Mass of the colliding objectM : 15Overall length of a colliding objecta : 0.7Distance between the center of rotation and center of gravityh : 0.0Distance between the center of rotation and absorberR : 0.7Angle of fall of a colliding objectα : 60Number of the soft absorber receiversN : 15Operation frequencyC : 15Ambient temperaturet : 0-7	5kg 12m 06m 1m )° unit time/min ~25°C
計算例	1. Calculating kinetic energy Obtain the distance that an object falls from the angle of fall. $H = h \cdot \sin \alpha = 0.06 \times \sin 60^\circ = 0.051 \text{ (m)}$ $E_1 = M \cdot g \cdot H = 15 \times 9.8 \times 0.051 = 7.5 \text{ (J)}$ 2. Calculating thrust $F = \frac{h}{R} \cdot M \cdot g = \frac{0.06}{0.1} \times 15 \times 9.8 = 88.2 \text{ (N)}$ 3. Calculating thrusting energy According to Items 3 and 4 of the selection procedure on page 14, tentatively select FA-1612X3-* having the maximum absorption energy of 14.7 (J) from the catalog. The thrusting energy will be as follows. St = 12 (mm) = 0.012 (m) $E_2 = F \cdot St = 88.2 \times 0.012 = 1.06 \text{ (J)}$ 4. Calculating total energy $E = \frac{E_1 + E_2}{N} = \frac{7.5 + 1.06}{1} = 8.56 \text{ (J)}$	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. $I = M \cdot \frac{a^2}{3} = 15 \times \frac{0.12^2}{3} = 0.072 (\text{kg} \cdot \text{m}^2)$ $V = \sqrt{\frac{2 \cdot \text{M} \cdot \text{g} \cdot \text{H}}{I}} \cdot \text{R}^2$ $= \sqrt{\frac{2 \times 15 \times 9.8 \times 0.051}{0.072}} \cdot 0.1^2 = 1.44 (\text{m/s})$ $Me = \frac{2 \cdot \text{E}_3}{V^2} = \frac{2 \times 8.56}{1.44^2} = 8.26 (\text{kg})$ As the equivalent mass of FA-1612X3 -* is 35(kg), it does not pose a problem. Based on these, FA-1612X3-* is selected. 5-3. Confirmation based on the eccentric angle $\theta = \tan^{-1}\left(\frac{\text{St}}{R}\right) = \tan^{-1}\left(\frac{0.012}{0.1}\right) = 6.8 (^{\circ})$ Since the eccentric angle of FA-1612X3-* is ± 2.5(^{\circ}), the eccentric angle adaptor needs to be used. In view of the foregoing, FA-1612X3-S and the eccentric angle adaptor OP-1010XB are selected.

## Sample Calculation for Selecting Soft Absorbers 6

11. Free-Fall (rotating)

ω

## Sample Calculation for Selecting Soft Absorbers 7

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

Air cylinder

Soft absorber

′r=0.5m

R=0.6m L=0.7m

Rotational line

v : 0.5m/s

C: 1 time/min

t :  $0 \sim 25^{\circ} C$ 

D: Cylinder diameter

Case Examples □ Mass of the colliding object M: 260kg Specifications Air Cylinder rate □ Operation frequency □ Ambient temperature Thrust □ Number of soft absorber receivers N : 1 unit 1. Calculating kinetic energy  $E_1 = \frac{1}{2} |\omega^2 = \frac{1}{2} \times M \times \frac{L^2}{3} \times \left(\frac{v}{r}\right)^2$  $=\frac{1}{2} \times 260 \times \frac{0.7^2}{3} \times \left(\frac{0.5}{0.5}\right)^2 = 21.2$ (J) Impact rate  $V = v \times \left(\frac{R}{r}\right) = 0.5 \times \frac{0.6}{0.5} = 0.6 \text{ (m/s)}$ 2. Calculating thrusting energy  $E_2 = T\theta = \left(\frac{\pi \cdot D^2}{4} \times P \times 10^6 \times r + Mg \times \frac{L}{2}\right) \times \frac{St}{R}$  $= \left(\frac{3.14 \times 0.05^{2}}{4} \times 0.5 \times 10^{6} \times 0.5 + 260 \times 9.8 \times \frac{0.7}{2}\right)$  $\times \frac{\text{St}}{0.6}$ Sample Calculations 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.  $E_{2} = \left(\frac{3.14 \times 0.05^{2}}{4} \times 0.5 \times 10^{6} \times 0.5 + 260 \times 9.8 \times \frac{0.7}{2}\right)$  $\times \frac{0.035}{0.6} = 80.6 \text{ (J)}$ 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

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

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

1. Calculating kinetic energy  

$$E_{1} = \frac{1}{2} |\omega^{2} = \frac{1}{2} \times M \times \frac{r^{2}}{2} \times \left(\frac{v}{r_{1}}\right)^{2}$$

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

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

#### 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**

2

Unit : kg•m²

## 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

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

R(dist. from the center)

## 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

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

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

## 1. Parallel Use of Small Absorbers

#### 1-1. **Fixed soft absorbers**

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

#### 1-2. Adjustable soft absorbers

Parallel use of adjustable soft absorbers is not recommended, as some cannot be adjusted to perform equally.

- However, please contact our sales department when the following conditions apply.
- 1. The colliding work is guided and there is no risk of eccentric load.
- 2. When N is the number of receiving units and A is the required absorption energy capacity, A/N (absorption energy capacity per one unit) is sufficiently lower than the absorption capacity of the soft absorber to be used.

## 2.2. Operating Environment of Soft Absorbers

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

There are models with triple packing.

(This does not protect against all damages.)

- 2. Covering the piston rod with eccentric angle adaptors, etc. Although it will protect against direct oil contact, oil may still penetrate through a gap between the eccentric angle adaptor and the cap. (This does not protect against all damages.)
- 3. Using absorbers with liquid-proof cap specifications Although it is effective when the rod is facing upward, it cannot be used when the rod is facing sideways or downward. It may also not be effective against oil mist.
- 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.)

## 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  $1 \leftarrow 2 \rightarrow 3$  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)

















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## **Cautions for Using Soft Absorbers 2**

#### •Types with Adjusting Scale 1-7 Torque Weak $1 \leftarrow 2 \leftarrow 3 \leftarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7$ 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.)



Specification

2.1mm

12~24VDC±10%

15mA or lower

NO type

NPN open collector

100mA or lower

Comes with a surge absorption circuit

Operation

indicator light

Red LED (lights up when

the output is ON)

500Hz

-25~70°C

-40~85°C

35~85%RH

35~95%RH

約1m

約15g

Inflowing Current 100 mA ≤ 2 V

.12~24V DC±10%

Model GXL-8F specifications Manufactured by SUNX

Summary

Standard detected object 15×15×1 (Iron)

Output capacity (with 24VDC power voltage)

Input/Output circuit diagram

+V(Brown)

Load 🔺

Output(Black)

Behaviour form

Protection feature

Residual Voltage

Main circuit

Including cable

Output form

Item

Detection distance

Power voltage

Consumption current

Response frequency

Ambient operating temperature

Ambient storage temperature

Ambient stora humidity

ead wire length

Mass

bient operating humidity

## 7. Cautions for Using the Switch

- Do not use when it is in a transient state after the power is turned on (approx. 10ms).
   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.
- Because it does not have a short-protection circuit, wiring must be done correctly.
- Copper wire is used in the cable. Pay attention to the use in a copper free environment.

## 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

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.



## Key to Model Number



# Model Selection Form

## Soft Absorber

### FA-1212C Series

RoHS Compliant

#### Products specification might be changed without notice.

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





### **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)		1.5(1.5)	245(25)	147(1E)	45	White
FA-1212C2-C	0.49(0.05)	0.1~1.0	3(3)		14.7(1.5)	45	Black
FA-1212C3-C			5(5)	204(20)			Yellow
FA-1212C4-C	1.0(0.10)	0.1~0.7	7.5(7.5)	294(30)	5.0(0.5)	5	Green
FA-1212C5-C	-	0.1~0.5	10(10)				Red

### **Common Specifications**

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

### **Precautions for Use**

- \* Do not use this product without carefully reading the attached owner's manual.
- \* Use with an external stopper.
- \* Ensure that sufficient mounting strength is secured for this product. (As a guideline, it should be 2 to 3 times the maximum drag listed in the catalogue.)
- \* Do not turn the oil inlet screw located at the bottom of the main unit.
- \* 2 or more of this product can be used in parallel.

## **Optional Parts**



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

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

- \* Do not use this product in a vacuum or a location where it may come in contact with oil.
- \* Ensure that an eccentric load is not applied to the soft absorber. (Allowable eccentric angle: within  $\pm 2.5^{\circ}$ )
- \* Do not over-tighten the main unit and nuts. Please use the tightening torque (1.5N·m) listed in the owner's manual. If anchoring the absorber against the ø14.6 unit, please use a tightening torque of 1.0N·m.





## Soft Absorber

### FA-1212L Series





### **Operating Performance**

Model	Load Thrust (kg) (N)		Impact rate (m/s)	Motion-time (sec)	Recovering power of the piston rod (N)	Rod cap color	
FA-1212L1-C			0.7 or lower	0.3~2.0		White	
FA-1212L3-C	3	30	0.5 or lower	2.3~4.0	9以下	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	Ĉ	-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  $\phi$ 14.6 part, use the tightening torque of 1 N·m.



#### The standard nut is also sold separately.

Material: Elastomer

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

#### •Products specification might be changed without notice.

## Soft Absorber

## FA-1010D/FA-1215B Series

SOFT ABSO

1010D2

FA-1010D .-C

(Groove orifice)

OFT AB

FA-1215B -C

(Groove orifice)

15B

### 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		0.98(0.1)	10(10)		44.1 (4.5)		
FA-1010D3-C	10	2.05(0.21)	15(15)	980(100)	79 4 (9 0)	5.88(0.6) or lower	41.5
FA-1010D4-C		3.23(0.33)	20(20)		70.4(0.0)		
FA-1215B1-C	15	7.84(0.8)	30(30)	1470(150)	245(25)	11.9(1.2) or lower	116
FA-1215B2-C		11.7(1.2)	40 (40)	1960 (200)	245(25)	11.0(1.2)01 lower	110

## **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	°C	-10~50





**RoHS Compliant** 

Products specification might be changed without notice.

### **Optional Parts**

#### Liquid-proof cap -060

Model

FA-1010D\_-C-060

FA-1215B□-C-060

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



\*1  $\square$  will be filled in with a type indication code 2, 3 or 4 \*2  $\square$  will be filled in with a type indication code 1 or 2.

\*Standard nuts are sold separately as well.

o canada a nace	ale sola separately	
Applicable Models	Model	
FA-1010D	FA-1010D M08 nut	
FA-1215B	M20 nut	

## Bellofram Seal Type

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

### Groove-orifice type

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

### Precautions for Use

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

#### Bracket OP-1012A

Model
OP-1012A

This is a mounting fixture for FA-1010D.





## Soft Absorber

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







### Dimensions

Model	А	В	С	C1	D	E	F	φG	Н	φI	J	К	L	Μ
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 🔺		0.20(0.04)	2(2)	400 (E0)	17 ( (1 0)		8.6
FA-0805SB1-C 🔺	F	0.39(0.04)	3(3)	490(50)	17.0(1.0)	4.9 or lower	8.8
FA-0805SB2-S	Э	0 6 8 (0 07)	E (E)		22 E (2 2)	(0.5)	8.6
FA-0805SB2-C 🔺		0.00(0.07)	5(5)	500(00)	22.5(2.5)		8.8
FA-1005PMB1-S		0 6 8 (0 07)	E (E)				13.2
FA-1005PMB1-C	E	0.66(0.07)	5(5)	72E (7E)	41 1 (4 2)	5.88 or lower	14.2
FA-1005PMB2-S	5	0.09(0.1)	0(0)	/35(/5)	41.1(4.2)	(0.6)	13.2
FA-1005PMB2-C		0.96(0.1)	0(0)				14.2
FA-1008PB1-S		0.09(0.1)	7(7)				17.2
FA-1008PB1-C	o	0.96(0.1)	/(/)	72E (7E)		5.88 or lower	18.2
FA-1008PB2-S	0	1 47(0 15)	10(10)	/35(/5)	50.0(0.0)	(0.6)	17.2
FA-1008PB2-C		1.47 (0.15)	10(10)				18.2
FA-1210KB1-S		1.06(0.2)	15/15)				30.6
FA-1210KB1-C	10	1.90(0.2)	15(15)	1470(150)	00(10)	9.8 or lower	32.6
FA-1210KB2-S	10	2 45 (0.25)	20(20)		90(10)	(1.0)	30.6
FA-1210KB2-C		2.43(0.25)	30(30)				32.6

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

### **Common Specifications**

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

Note) MB X 1.0 is also available as the main body's screw pitch specifications for the FA-0805 series. Please order using the model number FA-0805SB \_-S-P1.0 or FA-0805SB \_-C-P1.0. However, please note that there are no optional parts for it. Note) To place an order without a cap, put –S, and to place an order with a cap, put –C. Note) Cap colour: \*\*1 is white and \*\*2 is black.

## Precautions for Use

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

**RoHS Compliant** 

Products specification might be changed without notice.

## **Optional Parts**

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

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

- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber.
- The maximum operating eccentric angle
- with an eccentric angle adaptor is ±10°.
  The caps and the guides for inclined use are
- not unbundled. Cap for eccentric angle PD (OP-010\_B-1) The inclination Guide for centric angle (OP-010\_B-2)



Standard nut

Note) Material of cap for eccentric angle: POM

Model	Α	В	С	φD	Е	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
	r		r	· · · · ·		
Model	0	G	Н	L	J	Mass g
Model OP-010SB	M12	3 2×1	H 14	I 16.2	J 10	Mass g 13
Model OP-010SB OP-010PMB	M12 M12	3 2×1 ×1.5	H 14 19	I 16.2 21.9	J 10 13	Mass g 13 29
Model OP-010SB OP-010PMB OP-010PB	M12 M16 M16	3 2×1 ×1.5 ×1.5	H 14 19 19	I 16.2 21.9 21.9	J 10 13 13	Mass g 13 29 35
Model OP-010SB OP-010PMB OP-010PB OP-010KB	M12 M16 M16 M18	3 2×1 ×1.5 ×1.5 ×1.5	H 14 19 19 21	I 16.2 21.9 21.9 24.3	J 10 13 13 14	Mass g 13 29 35 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	Α	В	С	D	E	Mass g
OP-040SB					M8×0.75	17
OP-040PB	25	18	3.2	4	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	Α	В	С	D	Е	F	Ma	ss g
	10	1177	10	107	11	110VO 7E	S	5
OF-02036-*	10	12./	15	12.7	11	10/0/1/2	С	7
	10	10	16	10	12	M10v1	S	6
OP-020PB-*	10	15	10	15	13	10/10/1	С	9
	12	16.2	16	16.2	1.4	M10v1	S	6
OF-020KB-*	12	10.2	10	10.2	14	1011271	С	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
- 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	В	С	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-1210KBC-060	17	28	9.5	10	68.5	25

•Model indication 1 or 2 is inserted in  $\Box$ .



12.8

### 29 23 CP-032KB 0P-032KB 10 - 8 10 - 8

Mass 38g

Holder with switch OP-030KB-2

- 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.
- \_\_\_\_\_

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

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#### 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					
FA-0806-C	6	1.4(0.1.4)	1 - (1 - )	0.2.2	Circular and Circular and
FA-0806-S-P1.0	0	1.4(0.14)	15(15)	0.3~2	single-onlice type
FA-0806-C-P1.0	-				

Note: There are no optional parts for M8  $\times$  1.0.

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

### **Common Specifications**

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

#### Absorption characteristics

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

### **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.)
- ${\boldsymbol{\ast}}\,$  Do not use this product in a vacuum or a location where it may come in contact with oil.
- \* Ensure that an eccentric load is not applied to the soft absorber. (Allowable eccentric angle: within  $\pm\,2.5^\circ$  )



- \* 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.

#### **RoHS Compliant**

Products specification might be changed without notice.

Model

OP-040SB

## **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  $\pm 10^{\circ}$ .
- The maximum inclination angle using
- an inclination angle adapter is  $\pm 10^{\circ}$ • The caps and the guides for inclined use are not unbundled.





Note) Material of cap for eccentric angle: POM

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



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







Mass 17g



Square flange OP-040SB

• Once the attachment site is determined,



### 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		1 47(0 15)	10(10)	0.3-1	Single-orifice type
FA-1008VB-C		1.47 (0.15)		0.5~1	
FA-1008VD-S	Q		2.5 (2.5)	0.7~3	Multiple-orifice type
FA-1008VD-C	0	1 76 (0 18)			
FWM-1008VBD-S		1.70(0.10)	10(10)	0.22	Multiple yearing orifice type
FWM-1008VBD-C			10(10)	0.5~2	wulliple-varying office type

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

### **Common Specifications**

Max. drag	N(kgf)	637(65)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	60	Mass : S type	g	26.5
Max. absorption energy per minute	J/min(kgf•m/min)	58.8(6)	: C type	g	27
Recovering power of the piston r	od 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	Resistance	Resistance	Resistance Stroke

#### Precautions for Use

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



- \* 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.

#### **RoHS Compliant**

Products specification might be changed without notice.

## **Optional Parts**

#### Eccentric angle adaptor OP-010PB

Model OP-010PB

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





Note) Material of cap for eccentric angle: POM

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

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





#### 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		204(02)	30(30)	0.3-1	Single-orifice type
FA-1210MB-C		2.94(0.3)	50(50)	0.5.01	
FA-1210MD-S	10		A ( A )	07.2	Multiple orifice type
FA-1210MD-C	10	4 Q (Q E)	4(4)	0.7**5	Multiple-office type
FWM-1210MBD-S		4.9(0.3)	20(20)	02-0	Multiple vaning orifice type
FWM-1210MBD-C			50(50)	0.5~2	wulliple-varying onlice type

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

#### **Common Specifications**

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

#### Precautions for Use

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



- \* 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  $\pm 10^{\circ}$ . The caps and the guides for inclined use



Mass 48g Note) Material of cap for eccentric angle: POM

#### Square flange OP-040KB

Square nange Or	-04
Model	
OP-040KB	
	Model OP-040KB

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





- OP-020KB-C
- Adjust so that it stops 1mm before thestroke end, and fasten with the main unit's nut until secured.



#### 

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  $\Box$  of F $\Box\Box$ .
- Model indication B, D or BD is inserted in  $\Box$  of  $M\Box\Box$ .



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



impact surface.



- 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	
FA-1210MD	M12 nut
FWM-1210MBD	

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







## **Specifications**

Ad	justment	screw,

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	2.02(0.4)	20(20)	0.2-1	Single orifice type
FA-1410RB-C		3.92(0.4)	50(50)	0.5~1	Single-onlice type
FA-1410RD-S			4 E (4 E)	07-2	Multiple orifice type
FA-1410RD-C		E 88(0.6)	4.5(4.5)	0.7~3	Multiple-onlice type
FWM-1410RBD-S		5.88(0.0)	25 (25)	0.22	Multiple verying orifice type
FWM-1410RBD-C			55(55)	0.5~2	wulliple-valying onlice type

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

### **Common Specifications**

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

#### Precautions for Use

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



- \* 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-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  $\pm 10^{\circ}$ . The caps and the guides for inclined use are not unbundled.



Note) Material of cap for eccentric angle: POM

Square flange O	P-040RB
Model	
OP-040RB	

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



Standard nuts are sold separately as well.



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



- 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  $\Box$  of F $\Box\Box$ .
- Model indication B, D or BD is inserted in  $\Box$  of  $M\Box\Box$ .



impact surface.



- 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.

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

#### 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	0.8/4.0)	50(50)	0.3~1	Single-orifice type
FA-1612XB-C					
FA-1612XD-S			10(10)	07.2	Multiple orifice type
FA-1612XD-C		9.8(1.0)	10(10)	0.7~3	Multiple-office type
FWM-1612XBD-S			EQ(EQ)	0.22	Multiple verying orifice type
FWM-1612XBD-C			50(50)	0.5~2	wulliple-varying office type

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

#### **Common Specifications**

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

#### **Precautions for Use**

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





- \* 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.



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.





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



#### 

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  $\Box$  of M $\Box$ .



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 witch specifications and processitions for use place refer to page 23.
- For switch specifications and precautions for use, please refer to page 23.

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

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

#### FA-1612X Series







## Specifications

Adjustment screw

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	12 147	200(200)	0.3~1	Single-orifice type
FA-1612X1-C					
FA-1612X2-S			120(120)	0.2-2	Multiple verying orifice type
FA-1612X2-C		14.7	120(120)	0.5~2	wulliple-varying onlice type
FA-1612X3-S			2E (2E)	0.72	Multiple orifice type
FA-1612X3-C			35(55)	0.7~3	multiple-office type

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

### **Common Specifications**

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

#### Precautions for Use

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



- \* 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-010XB

Model OP-010XB

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



Note) Material of cap for eccentric angle: POM

Square flange OP-040XB	
Model	
OP-040XB	
• Once the attachment site is determined	

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





 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.



- 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

#### 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	16 29.4(3.0)	300 (300)	0.3~1	Single-orifice type
FA-2016EB-C					
FA-2016ED-S			120(120)	07-2	Multiple orifice type
FA-2016ED-C			120(120)	0.7~3	Multiple-office type
FWM-2016EBD-S			200(200)	0.22	Multiple verying orifice type
FWM-2016EBD-C			200(200)	0.5~2	wulliple-varying office type

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

#### **Common Specifications**

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

#### Precautions for Use

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



- \* 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  $\pm 10^{\circ}$ . The caps and the guides for inclined use are not unbundled.



Note) Material of cap for eccentric angle: Metal

#### Square flange OP-040EB Model OP-040EB

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





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





#### 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  $\Box$  of F $\Box\Box$ .
- Model indication B, D or BD is inserted in  $\Box$  of  $M\Box\Box$ .





Holder with a switch OP-030EB-Mode OP-032EB 50 23 16 .17 27.7

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 FA-2016ED M20 nut FWM-2016EBD

#### 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)	02-0	Multiple varying orifice type
FA-2016E2-C			200(200)	0.5~2	wulliple-varying office type
FA-2016E3-S			120(120)	07.2	Multiple orifice type
FA-2016E3-C			120(120)	0.7~3	Multiple-onlice type

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

### **Common Specifications**

Max. drag	N(kgf)	6,370(650)	Operating temperature	°C	-5~70
Max. cycle rate	cycle/min	60	Mass : S type	g	185
Max. absorption energy per minute	J/min(kgf•m/min)	343 (35)	: C type	g	207
Recovering power of the piston re	od 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-2016E1 series FA-2016E2 series	
Application	For low-speed	For medium speed, in particular with a pneumatic cylinder	For high-speed
Absorption characteristics	Resistance	Resistance Stroke	Resistance Stroke

#### **Precautions for Use**

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



- $\ast$  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.



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.
<u>M20×1.5</u>
$\begin{array}{c} \oplus \\ \oplus \\ \hline \\$
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 59g

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

Holder with a switch OP-030EB-



- 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

#### 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 🔺		49(5.0)	400(400)	0.3~1	Single-orifice type
FA-2530GB-C 🔺					
FA-2530GD-S 🔺	20		150(150)	0.7~3	Multiple-orifice type
FA-2530GD-C 🔺	50				
FWM-2530GBD-S			200(200)	0.2. 2	Multiple yearing exifice type
FWM-2530GBD-C			500(500)	0.5~2	wiutupie-varying office type

▲ Thread pitch P2.0 is supplied as well. Note: To place an order without a cap, put -S at the end of the model number, and to place an order with a cap, put -C at the end of the model number. Note: M25 x 2.0 is included in main unit thread pitch specification for FA-2530. A designation shall include the model symbols such as FA-2530GB- \* -P2.0, FA-2530GD- \* -P2.0, FWM-2530GBD- \*-P2.0, etc. for ordering. Note: "\*" will be filled in with "-S" or "-C"

### **Common Specifications**

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

### Precautions for Use

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

## **Adjustment Method**



of a slotted screwdriver is inserted

- \* 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\*- Conference data



Note) Material of cap for eccentric angle: Metal

#### Square flange OP-040GB Model OP-040GB • Once the attachment site is determined, uset

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





OP-020GB-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.

- M25 X 2.0 is also available as a screw pitch specification.
  - Model number is either OP-020GB-S or C-P2.0

#### 

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  $\Box$  of M $\Box$ .



Holder with a switch OP-030GB-



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

#### 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		49(F 0)	400(400)	0.3-1	Single-orifice type
FA-2530G1-C		49(5.0)	400(400)	0.5	
FA-2530G2-S			300 (300)	0.3~2	Multiple-varying orifice type
FA-2530G2-C	30	F8 8 (6 0)			
FA-2530G3-S	50	36.8(6.0)	150(150)	07-2	Multiple orifice type
FA-2530G3-C			150(150)	0.7~3	Multiple-office type
FA-2530SL-S		40(5.0)	4 150 (4 150)	0.050.05	Multiple varying orifice type
FA-2530SL-C		49(5.0)	4,150(4,150)	0.05~0.5	wulliple-varying onlice type

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

#### **Common Specifications**

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

Note) M25 X 20 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\*-CP2.0 or FA-2530G\*-CP2.0.0rth specifications for the FA-2530 series. Please your order using the model number FA-2530G\*-CP2.0.0rth specifications for the FA-2530 series. Please your order using the model number FA-2530G\*-CP2.0.0rth specifications for the FA-2530 series. Please your order using the model number FA-2530G\*-CP2.0.0rth specifications for the FA-2530 series. Please your order using the model number FA-2530G\*-CP2.0.0rth specifications for the FA-2530 series. Please your order using the model number FA-2530G\*-CP2.0.0rth specifications for the FA-2530 series. Please your order using the model number FA-2530G\*-CP2.0.0rth specifications for the F

Selection Guideline The FA2530 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	Resistance	Resistance Stroke	Resistance

\* 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  $\pm 2.5^\circ)$

## Adjustment Method



Scale : Weaker Torque 1←2→7 Stronger Torque

Adjusting Shaft Slot into which the flat tip of a slotted screwdriver is inserted

- Adjusting Checking Point
- \* 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  $\pm 10^{\circ}$ . The caps and the guides for inclined use



Note) Material of cap for eccentric angle: Metal

Square flange OI	P-040GB
Model	
OP-040GB	

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



Standard nuts are sold separately as well



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



32 Mass 102g

32

Mass 65g

#### 

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  $\Box$  of X $\Box$ .



Mass 77g

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

#### Holder with a switch OP-030GB-[



- 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.

•	Applicable Models	Model		
	FA-2530G			
	FA-2530SL	MZ5 Hut		

#### 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			500 (500)	0.3~1	Single-orifice type
FA-2540LD-C	40	63.7(6.5)	200 (200)	0.7~3	Multiple-orifice type
FWM-2540LBD-C			350 (350)	0.3~2	Multiple-varying orifice type

▲ Thread pitch P2.0 is supplied as well.

## **Common Specifications**

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

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	( TUTO ET		<ul> <li>The FAF WWF2340 Series Series has the following three patients of absorption chalderistics depending on the onlice type. Flease use the following information as a guideline when making your selection</li> </ul>
	Juider		,

		-		
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	Resistance	Resistance	Resistance	

### **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.)
- st Do not use this product in a vacuum or a location where it may come in contact with oil.
- \* Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within  $\pm 2.5^{\circ}$ )



- $\ast$  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.

M25×1.5

4-φ9

Mass 206g

Square flange OP-040GB

Æ

<u>40</u> ]54

12

## **Optional Parts**



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

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

75

## 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 🔺	-	79.3(8.1)	650(650)	0.31	Single orifice type
FA-2725FB-C			050(050)	0.5~1	Single-onlice type
FA-2725FD-S			300 (300)	0.7~3	Multiple-orifice type
FA-2725FD-C	25				
FWM-2725FBD-S 🔺			450(450)	0.22	Multiple yang orifice type
FWM-2725FBD-C			450(450)	0.5~2	multiple-valying office type
FA-2725SL-S 🔺			E 000 (E 000)	0.05 - 0.5	Multiple vaning orifice type
FA-2725SL-C			5,000(5,000)	0.05~0.5	multiple-valying office type

 $\blacktriangle$  Thread pitch P3.0 is supplied as well.

## **Common Specifications**

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



\* 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.)
- st Do not use this product in a vacuum or a location where it may come in contact with oil.
- \* Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within  $\pm 2.5^\circ$ )



- 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  $\pm 10^{\circ}$ . The caps and the guides for inclined use are not unbundled.



Note) Material of cap for eccentric angle: Metal

#### Square flange OP-040FB Model

OP-040FB

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





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  $\Box$  of F $\Box\Box$ .
- Model indication B, D or BD is inserted in  $\Box$  of  $M\Box\Box$ .





Holder with a switch OP-030FB-[ Model OP-032FB 56 23 8



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	
	FA-2725FD	MOZ put
	FWM-2725FBD	IVIZ7 HUL
	FA-2725SL	
	FA-2725FB P3.0	
	FA-2725FD P3.0	MOZ DO put
	FWM-2725FBD P3.0	1V127-P3 Hut
	FA-2725SL P3.0	

#### 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		196(20)	700(700)	0.7~3	Multiple-orifice type
FA-3035TD-C			700(700)		
FWM-3035TBD-S	25		1,300(1,300)	0.3~2	Multiple-varying orifice type
FWM-3035TBD-C	22				
FA-3035SL-S			20,000(20,000)		Multiple yearing orifice type
FA-3035SL-C			50,000(50,000)	0.05~0.5	wulliple-varying onlice type

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

## **Common Specifications**

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



#### **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.)
- $\ensuremath{^{\ast}}$  Do not use this product in a vacuum or a location where it may come in contact with oil.
- \* Ensure that an eccentric load is not applied to the soft absorber (Allowable eccentric angle: within  $\pm 2.5^{\circ}$ )



- 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.



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.





#### Stopper nut OP-020TB-



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





OP-020TB-C

(With cap)

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

Mass 129g

#### 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

Note) Liquid-proof caps are not sold separately



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





### Dimensions

Model	А	В	С
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			2,000 (2,000)	0.3~1.0	-	30	1,500(153)	500(153) 100(10.2) or lower	5~70 -	
FA-3625A3-C	25	200(20.4)	700 (700)	0.7~3.0		30				780
FA-3625SL-C			62,500(62,500)	0.05~0.5	25,000	15				
FA-3650A2-C			2,700(2,700)	0.3~2.0	(2,551)	20		120 (12.2) or lower		
FA-3650A3-C	50	400(40.8)	1,400(1,400)	0.7~3.0		50	2,352(240)			980
FA-3650SL-C			124,800(124,800)	0.05~0.5	1	15				

## Precautions for Use

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



- \* 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**





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



Model

fasten in place.



Mass 566g



Standard nuts are sold separately as well.

Applicable Models	Model			
FA-3625A				
FA-3625SL	1126 A mut			
FA-3650A	MS6A NUL			
FA-3650SL	-			

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



Model

OP-090M36B

OP-040UB

• Once the attachment site is determined, uset he main unit's nut to securely

#### 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			1 400(1 400)	0.7~3	Single-orifice type
FA-3650UD-C	FO	202(40)	1,400(1,400)		
FWM-3650UBD-S	50	392(40)	2 700 (2 700)	0.2. 2	Multiple verying orifice type
FWM-3650UBD-C			2,700(2,700)	0.3~2	multiple-varying office type

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

## **Common Specifications**

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

### **Precautions for Use**

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



- 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-010UB

#### Model

- OP-010UB
- Screw the eccentric angle adaptor into the main unit until the cap for the eccentric angle and the piston rod form a tight connection. While maintaining this position, fasten the main unit's nut until secured.
- Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.
- The main unit can also be used as a stopper.
- Use it with a capless soft absorber.
- The maximum operating eccentric angle with an eccentric angle adaptor is ±10°.
- The caps and the guides for inclined use are not unbundled.



Note) Material of cap for eccentric angle: Metal

#### Square flange OP-040UB

Mass 1,273g

Model OP-040UB

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



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

Applicable Models	Model		
FA-3650UD	Mag nut		
FWM-3650UBD	MS6 Hut		

#### Stopper nut OP-020UB-



 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.

#### 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	В	С	D	D1	E
FA-4225B3/SL-C	144	162					92
FA-4250B3/SL-C	195	213	M42×1.5	12	38	44	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 E)	3,400(3,400) 0.3~3.0		20	1 959/100)			705			
FA-4225SL-C	25	200(20.5)	81,400(81,400)	0.05~0.5		10	1,050(190)			/95		
FA-4250B3-C	50	50	-C FO	E20/E2 1)	6,500(6,500)	0.3~3.0	31,590	10	2 2 2 2 ( 2 4 2 )	120(12.2)	-5~70	1.020
FA-4250SL-C		520(53.1)	162,700(162,700)	0.05~0.5	(3,223)	5	2,372(242)	-		1,020		
FA-4275B3-C	75	780(79.6)	9,700 (9,700)	0.3~3.0		6	3,345(341)			1,240		

## Precautions for Use

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



- \* 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**



#### Stopper nut OP-020 M42



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



#### Urethane cap OP-090 M42A





Rectangle flange OP-040 M42RF Model

41.4

57.2

(+





Fixed Type Adjustable type Self-adjusting

•Products specification might be changed without notice.

M42×1.5

Square flange OP-040 M42SF

Model

OP-040M42SF

Ŧ

4-φ8.8

41.4

**RoHS Compliant** 

Fixing slit

12

Mass 153g

15

• Use the eccentric angle adaptor when the eccentric angle is 2.5° or larger.

 $\bullet$  The maximum operating eccentric angle with an eccentric angle adaptor is  $\pm 10^{\circ}$ .

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

**RoHS** Compliant

Products specification might be changed without notice.

## **Optional Parts**

• The main unit can also be used as a stopper.

Not usable for FA-4250YD-C, FWM-4250YBD-C.

• The caps and the guides for inclined use are not unbundled.

• Use it with a capless soft absorber.

Nut for unit is not inclusive.

Model

Eccentric angle adaptor OP-010M4225/M4250



Model	А	В	С	D	E	φF	G	Н	φI	Weight g
OP-010M4225	133	109	10	24	20	20	20 194	146122	16	1,600
OP-010M4250	203	154		49		20	290	1///04^2	4.6	2,500

#### Nut OP-M64

Model OP-M64

Usable as the nut for eccentric angle adaptor



#### Fixed Type Adjustable type Self-adjusting

FA-4250YD/FWM-4250YBD Series

**RoHS Compliant** 





#### **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(4E)	390(390)	0.7~3	Multiple-orifice type
FWM-4250YBD-C		441(45)	3,500(3,500)	0.3~2	Multiple-varying orifice type

## **Common Specifications**

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

## **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

- Locking Screw Adjusting Checking Point Scale : Weaker Torque 1+2+3 Stronger Torque Adjusting Shaft
- \* 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

4-10.8

t-φ17.5



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

	ie sola separately	45
Applicable Models	Model	
FA-4250YD	MAD out	
FWM-4250YBD	1V14Z Mut	

#### FA-6450/FA64100/FA64150 Series







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

#### **Dimensions**

Model	A	A1	В	С	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)	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-6450Z-C		2,300	10,000~110,000(10,000~110,000)	0.02~0.3		3	164,608	150		2.5			
FA-6450L-C	50		1,000~11,000(1,000~11,000)	0.3~1.0		15					±2.5		
FA-6450H-C		(234.7)	200~1,800(200~1,800)	0.3~3.6		15	(10,7 57)	(13.3)					
FA-64100L-C	100	100	100	4,550	2,000~38,000(2,000~38,000)	0.3~1.0	90,000 (9 184)	10	214,118	180	-5~70	2.2	
FA-64100H-C		(464.3)	250~2,500(250~2,500)	0.3~3.6	(),104)	10	(21,849)	(18.4)		5.2	+10		
FA-64150L-C	150	6,800	4,000~52,000(4,000~52,000)	0.3~1.0		8	275,556	370		4.2	1.0		
FA-64150H-C	150	(693.9)	300~5,500(300~5,500)	0.3~3.6		8	(28,118)	(37.8)		4.2			

### 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  $\pm 2.5^{\circ}$ )



- \* 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**

Model

OP-020M64S



Stopper nut S OP-020 M64S



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



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





#### Foot mount 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.






#### FA-2016EA/FA-2725FA Series







#### **Dimensions**

Model	A	В	С	C1	D	E	F	φG	Н	φI	J	K	L	М
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	200(200)	01520	3 6 1 0	60	343(25)	35.2(3.59)		173	+25
FA-2016EA-C	10	(2.6)	200(200)	0.15~5.0	3,010	00	545(55)	or lower	F. 70	191	12.5
FA-2725FA-S	25	79.3	500(500)	0.152.0	7 200	60	E30(EE)	44.2(4.51)		402	+25
FA-2725FA-C	25	(8.1)	500(500)	0.15~~5.0	7,200	00	229(22)	or lower		446	12.5

※ 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.

# Fixed Type Adjustable type Self-adjusting RoHS Compliant

Multiple-orifice (2 Openings)

•Products specification might be changed without notice.

Square flange OP-040EB、OP-040FB

• Once the attachment site is determined, uset he main unit's nut to

Model

securely fasten in place.

OP-040EB OP-040FB

## **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	Α	В	С	D	E	F	Mass g	
	20	27.7	47	27.7	24	M20V1 5	S	46
OF-020EB-*	50	27.7	47	2/./	24	1012071.5	С	68
	25	27	EE	27	22	M07V1 E	S	90
OF-020FD-*	55	57	55	57	52	10127 \ 1.5	С	137

Model	A	В	С	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

4-øD

F

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

Model
OP-032EB
OP-032FB





Model	Α	В	С	D	E	F	G	Н	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

#### FA-S Series (Dust Seal Specifications)

•Products specification might be changed without notice.





#### Dimensions

Model	А	В	С	D	E	F	Mass g	Specification Page
FA-S1210MS	76					M1 2×1	41	50
FA-S1210MC	70	8	10	8	2 5	10(12×1	44	50
FA-S1410R -S	00			5.5		63	52	
FA-S1410R -C	00	8		10		10114~1.5	68	52
FA-S1612XS	102		10		F	M16×1.5	105	54
FA-S1612XC	102	15	ΙZ	13.5	5		114	54
FA-S2016ES	120		16		6		196	58
FA-S2016EC	120	17	10	18	6 /VI20×1.5	M20×1.5	218	58
FA-S2530GS	155		20			M25×1.5	396	62
FA-S2530GC	155	18	50	22			427	62
FA-S2540LC	171.5	29	40	22.5	8		475	66
FA-S2725FS	126		25				402	68
FA-S2725FC	130	20	25	24		10127 ~ 1.5	451	68
FA-S3035TD-S	100		25		10		708	70
FA-S3035TD-C	100	18.5	35	27	10	10150×1.5	755	70
FA-S3650UD-S	22E		FO		10	M36×1.5	1330	74
FA-S3650UD-C	235	19.5	50	33	١Z		1410	74

Note) B or D is inserted in the  $\Box$ . 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

- \* 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 U packing In the case of a normal absorber, dust that has adhered to it may intrude the inside with each stroke. This can damage the seal and may lead to a defect such as oil leakage. Dust seal specifications (adjustable type) In the case of a product with dust-seal specifications, since double internal U-packings are used, thus having a structure that prevents the dust that has adhered from entering the inside. Our original double packing structure

## **Specifications**

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

## Key to Model Number



- \* 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).

Fixed Type Adjustable type Self-adjusting

FWM-S Series (Dust Seal Specifications)

**RoHS Compliant** 

Products specification might be changed without notice.





#### Dimensions

Model	A	В	С	D	E	F	Mass g	Specification Page
FWM-S1210MBD-S	76					M12×1	41	50
FWM-S1210MBD-C	/0	8	10	8	2 5	10(12×1	44	50
FWM-S1410RBD-S	80		10		5.5	M14×1.5	63	52
FWM-S1410RBD-C	00	8		10			68	52
FWM-S1612XBD-S	100		10		E	M16×1 5	105	54
FWM-S1612XBD-C	102	15	ΙZ	13.5	5	10/10/1.5	114	54
FWM-S2016EBD-S	120		16		6		196	58
FWM-S2016EBD-C	120	17	10	18	6 ///20×1		218	58
FWM-S2530GBD-S	155		20			M25×1.5	396	62
FWM-S2530GBD-C	155	18	30	22			427	62
FWM-S2540LBD-C	171.5	29	40	22.5	8		475	66
FWM-S2725FBD-S	126		25				402	68
FWM-S2725FBD-C	150	20	25	24		10127 ~ 1.5	451	68
FWM-S3035TBD-S	199		25		10		708	70
FWM-S3035TBD-C	100	18.5	22	27	10	10150~1.5	755	70
FWM-S3650UBD-S	225		FO		10		1330	74
FWM-S3650UBD-C	255	19.5	50	33	١Z	10150/1.5	1410	74

## Specifications

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

- \* 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).

# MEMO

## FA-F/FWM-F Series







ΦE



## Dimensions

FA+0080-S FA+0080C-S FA+008VC-S FA+1008VC-S FA+1008VC-S FA+1008VC-S5 <th>Model</th> <th>A</th> <th>В</th> <th>С</th> <th>D</th> <th>Е</th> <th>F</th> <th>Weight g</th> <th>Specification Page</th>	Model	A	В	С	D	Е	F	Weight g	Specification Page	
FAF-0080C_C         55         5         6         6         2.3         MBX0/3         14         58           FAF-1008V[]-C         FAF-1008V[]-C         FAF-108V[]-C         FAF-1210M[]-S         FAF-1410RB-S         FAF-1410RB-S <td< td=""><td>FA-F0806-S</td><td>FO</td><td>-</td><td>6</td><td>-</td><td>2 5</td><td></td><td>1.4</td><td>EQ</td></td<>	FA-F0806-S	FO	-	6	-	2 5		1.4	EQ	
FA-F1008VCI-S FA-F1008VEDC73.2- 6.3 6.3- 6.3- 6.4 6.3- 6.4 6.4- 6.4- 6.4- 31- 32FWM-F1008VBDC6.3 <td< td=""><td>FA-F0806-C</td><td>59</td><td>5</td><td>0</td><td>6</td><td>2.5</td><td>1010~0.75</td><td>14</td><td>20</td></td<>	FA-F0806-C	59	5	0	6	2.5	1010~0.75	14	20	
FAF-1008VCI-C FWMF1008V8D-573.26.3 -86 -2.4M10x132 3130 3160FM-F1008V8D-5<	FA-F1008VS		_		-			31		
FWM-F1008VBDC         7.5.2         -         6         -         2.4         MIDA1         31         60           FWM-F1008VBDC         6.3         6         32         32         32         32           FAF1210MCC         8         6         32         32         32         32           FAF1210MCC         8         6         -         32         32         32           FMM-F1210MBDC         8         51         51         51         51           FAF1410RB-5         -         8         51         62         64           FAF1410RB-5         -         10         10         84         87           FAF1410RB-5         -         10         10         84         87           FAF1610RD-5         -         10         10         87         84           FWM-F1410RB-5         -         10         10         87         84           FAF1612RD-5         -         10         10         10         10         10         10         10         10         10         10         10         10         10         10         10         10         10         10         10         <	FA-F1008V□-C	72.2	6.3	0	6	2.4	M10×1	32	60	
FWM.F1008VBD-C FAF1210MC> FAF1210MC> FAF1210MC> FAF1210MC> FAF1210MC>C FAF1210MC>C FAF1210MC>C FAF1410RB-C FAF1410RB-C FAF1410RB-C FAF1410RB-C FAF1410RB-C FAF1410RB-C FAF1410RBD-C FAF1410RBD-C FAF1410RBD-C FAF1410RBD-C FAF1410RBD-C FAF1410RBD-C FAF1410RBD-C FAF1410RBD-C FAF1410RBD-C FAF1410RBD-C FAF1410RBD-C FAF1410RBD-C FAF1410RBD-C FAF1410RBD-C FAF1410RBD-C FAF1410RBD-C FAF1410RBD-C FAF1410RBD-C FAF1612XBD-C FAF16	FWM-F1008VBD-S	/3.2	_	0	-	2.4		31	00	
FAF1210MU-S FAF1210MU-C82.6485162FWMF1210MBD-S FAF1410RB-C88-85162FAF1410RB-C8888FAF1410RB-C98.28884FAF1410RD-C-108487FAF1410RD-C10848764FAF1612XB-S8487FAF1612XB-S108764FAF1612XB-S13.5-84FAF1612XD-S107.71513.5-13.5111FAF1612XD-S-1513.5-111120FAF2016EU-S-1513.5-111120FAF2016EU-S195218FAF2016EU-S195218FAF2016EU-S195218FAF2016EU-S-1821870FAF2016EU-S441471FAF2530GU-S441471FAF2530GU-S455FAF2725FU-S455504FAF2725FU-S455504FAF2725FU-S-	FWM-F1008VBD-C		6.3		6			32		
FAF1210MU-C FWMF1210MBDC82.68 -10 -3.5M12×151 4862FWMF1210MBDC FAF1410RBS FAF1410RBC5151FAF1410RBC FAF1410RDC84FAF1410RDC FAF1410RDC-10-87FAF1410RDC FAF1410RDC-101087FWMF1410RBC FAF1410RDC-101087FAF1612XBS FAF1612XDS-101087FAF1612XBC FAF1612XDC1513.5111120FAF1612XDS FAF1612XDC-13.5111120FAF1612XDS FAF1612XDC13.5111FAF1612XDS FAF1612XDC13.5111FAF1612XDC FAF2016ELS111FAF2016ELS FAF2016EDS118FAF2016EDS FWMF2016EBDS18FAF2016EDS FWMF2016EBDS441FAF2530GUSFAF2016EDS FWMF2530GBDS441FAF2530GUS441FAF2725FUS FMWF2725FBDS455FWMF2725FBDS FWMF2725FBDS455FWMF2725FBDS455FWMF2725FBDS455FWMF2725FBDS455	FA-F1210MS		_		-			48		
FWM-F1210MBD-S         52.5         -         10         -         5.5         M12X1         48         62           FWM-F1210MBD-C         8         8         51         51           FA-F1410RB-C         -         8         64         87         844           FA-F1410RB-C         -         10         -         84         87           FA-F1410RB-C         -         10         10         87         84           FMM-F1410RBD-C         -         -         84         87           FWM-F1410RBD-C         -         -         84         87           FWM-F1410RBD-C         -         -         84         87           FWM-F1410RBD-C         10         10         87         84           FA-F1612XBC         -         -         11         87         84           FA-F1612XBC-         107         15         13.5         111         120           FA-F1612XBC-C         -         15         -         13.5         110         120           FA-F2016EI_>C         -         -         -         -         120         70           FA-F2016EI_>C         -         -         -	FA-F1210MC	826	8	10	8	2 5	M1 2×1	51	62	
FWM-F1210MBD-C FA-F1410RB-S FA-F1410RB-C FA-F1410RD-S FA-F1410RD-C85110 FA-F1410RD-C FA-F1410RD-C8410 FA-F1410RD-C FWM-F1410RD-S-1084FWM-F1410RD-C FA-F1612XB-C FA-F1612XB-C FA-F1612XB-C FA-F1612XB-C FA-F1612XB-C FA-F1612XB-C10 FA-F1612XB-C FA-F1612XB-C FA-F1612XB-C FA-F1612XB-C FA-F1612XD-C107.7-13.5-107.7-13.51111FA-F1612XB-C FA-F1612XD-C1111FA-F1612XD-C FA-F1612XD-C13.5FA-F1612XD-C FA-F2016ED-CFA-F2016ED-C FM-F2016ED-C110FA-F2016ED-C FM-F2016ED-CFA-F2016ED-C FM-F2016ED-C118FA-F2016ED-C FM-F2530GC-C118FA-F2530GC-C FA-F2725FD-SFA-F2725FD-C FA-F2725FD-CFWM-F2725FBD-C FWM-F2725FBD-CFWM-F2725FBD-C FWM-F2725FBD-CFWM-F2725FBD-C FA-F2725FD-CFWM-F2725FBD-C FWM-F2725FBD-CFWM-F2725FBD-C FWM-F2725FBD-CFWM-F2725FBD-C FWM-F2725FBD-C <t< td=""><td>FWM-F1210MBD-S</td><td>02.0</td><td>_</td><td>10</td><td>-</td><td>3.5</td><td>10112×1</td><td>48</td><td>02</td></t<>	FWM-F1210MBD-S	02.0	_	10	-	3.5	10112×1	48	02	
FA-F1410RB-S FA-F1410RB-C84FA-F1410RB-C1084FA-F1410RD-C1084FMM-F1410RBD-C1084FWM-F1410RBD-C1084FWM-F1410RBD-C101087FA-F1612XB-C1187FA-F1612XD-C1110FA-F1612XD-C1513.5FA-F1612XD-C11.1120FA-F1612XD-C13.5111FA-F1612XD-C13.5111FA-F2016EC1513.5FA-F2016ES18FA-F2016ES1718FA-F2016EC1718FA-F2530GSFA-F2530GB-C168FA-F225FS18FA-F2725FS22FWM-F2725FBD-S22FWM-F2725FBD-S22FWM-F2725FBD-S23FWM-F2725FBD-S23FWM-F2725FBD-S23FWM-F2725FBD-SFWM-F2725FBD-SFWM-F2725FBD-SFWM-F2725FBD-SFWM-F2725FBD-SFWM-F2725FBD-SFWM-F2725FBD-SFWM-F2725FBD-SFWM-F2725FBD-SFWM-F2725FBD-SFWM-F2725FBD	FWM-F1210MBD-C		8		8			51		
FA-F1410RB-C FA-F1410RD-C98.210 - - 101010687 84FA-F1410RD-C-101084FWM-F1410RBD-C-101084FWM-F1410RBD-C-101084FA-F1612XB-C-101084FA-F1612XD-C15-13.5111FA-F1612XD-C-1513.5111FA-F1612XB-C-13.5-111FA-F1612XB-C-13.5-111FA-F1612XBD-C-13.5-111FWM-F1612XBD-C-13.5-111FWM-F1612XBD-C-113.5-120FA-F2016ED-S18-FWM-F2016EBD-C-1718218FWM-F2016EBD-C441FA-F2530GD-CFA-F2530GD-C441FA-F225FD-SFW-F2725FBD-C22-FW-F2725FBD-C23-FW-F2725FBD-C23-FW-F2725FBD-C455FW-F2725FBD-CFW-F2725FBD-CFW-F2725FBD-CFW-F2725FBD-CFW-F2725FBD-C </td <td>FA-F1410RB-S</td> <td></td> <td>-</td> <td></td> <td>-</td> <td></td> <td></td> <td>84</td> <td></td>	FA-F1410RB-S		-		-			84		
FA-F1410RD-S FA-F1410RD-C FWM-F1410RBD-C98.2 $-$ 1010 $-$ 108464FWM-F1410RBD-C FMM-F1410RBD-C10 $ 87$ 84FMM-F1410RBD-C FA-F1612XB-S1010 $7$ $87$ FA-F1612XB-S FA-F1612XD-S $-$ 11513.5 $111$ $120$ FA-F1612XD-C FMM-F1612XBD-S $ 115$ $13.5$ $111$ $120$ FMM-F1612XB-S FWM-F1612XBD-S $ 115$ $115$ $112$ $120$ FA-F2016ED-S FA-F2016ED-S $ 117$ $18$ $ 111$ FA-F2016ED-S FA-F2016ED-C $ 17$ $18$ $ 218$ FWM-F2016EBD-S FMM-F2016EBD-S $   441$ $-$ FA-F2530GC-C FA-F223GGD-C $   441$ $-$ FA-F2530GC-C $    441$ $-$ FMM-F2725FD-S FA-F2725FD-S $    441$ $-$ FWM-F2725FBD-S $      -$ FWM-F2725FBD-S $     -$ <	FA-F1410RB-C		10		10			87		
FA-F1410RD-C         96.2         10         10         10         10         10         87         84           FWM-F1410RBD-C         10         10         10         87         84           FWM-F1410RBD-C         10         10         10         87         84           FA-F1612XB-C         FA-F1612XD-C         11         10         7         87           FA-F1612XD-C         107.7         15         13.5         -         111         120           FA-F1612XD-C         15         13.5         -         111         120         111           FWM-F1612XD-C         15         13.5         -         111         120         66           FA-F2016ED-S         -         15         13.5         -         111         120           FA-F2016ED-S         -         17         16         -         18         195         195           FWM-F2016EBD-S         17         18         -         18         195         195           FWM-F2530GBD-S         168         -         22         -         441         74           FM-F2530GBD-S         18         -         22         -         441 <t< td=""><td>FA-F1410RD-S</td><td>000</td><td>_</td><td>10</td><td>-</td><td>4</td><td></td><td>84</td><td>6.4</td></t<>	FA-F1410RD-S	000	_	10	-	4		84	6.4	
FWM-F1410RBD-S         -         -         84           FWM-F1410RBD-C         10         10         87           FA-F1612XB-S         -         10         11         87           FA-F1612XB-C         -         15         13.5         111         120           FA-F1612XD-C         15         -         13.5         111         120           FA-F1612XD-C         15         -         13.5         120         111           FMM-F1612XBD-S         -         -         13.5         120         66           FWM-F1612XBD-C         15         13.5         120         111         66           FA-F2016ED-S         -         -         18         -         120         66           FWM-F2016EBD-C         17         16         -         18         195         218         70           FWM-F2016EBD-C         -         17         18         -         441         74           FA-F2530GBD-C         -         18         22         441         74         74           FWM-F230GBD-C         18         22         441         471         74         74           FA-F2725F_S_S         -	FA-F1410RD-C	90.2	10	10	10	4	10114~1.5	87	04	
FWM-F1410RBD-C101087FA-F1612XB-S111FA-F1612XB-C115112FA-F1612XD-C111FA-F1612XB-C111FM-F1612XBD-C111FM-F1612XBD-C111FM-F1612XBD-C1513.5FA-F2016E_S111120FA-F2016E_S111FA-F2016E_S18FA-F2016EB-C1718-218FMM-F2016EBD-C-18-441FA-F2530G_S441FA-F2530GBD-C1822-441FM-F2725F_S441FA-F2725F_S441FA-F2725F_S441FM-F2725FB-S455FWM-F2725FB-S455FWM-F2725FB-S2023-FWM-F2725FB-S455FWM-F2725FB-S455FWM-F2725FB-S455FWM-F2725FB-S455FWM-F2725FB-S504FWM-F2725FB-S504<	FWM-F1410RBD-S		-		-			84		
FA-F1612XB-S FA-F1612XB-C FA-F1612XD-C FA-F1612XD-C FA-F1612XD-C FA-F1612XD-C13.5-111107.71513.5-111120FA-F1612XD-C FM-F1612XBD-S13.5-111120FM-F1612XBD-C-1513.5-111120111FWM-F1612XBD-C-1513.5120111120FA-F2016ES FA-F2016EB-S18-195FWM-F2016EBD-C1718-18195-FA-F2530GS FWM-F2530GB-S441-FA-F2530GC FWM-F2530GBD-C-1822441-FA-F272SFS FA-F272SFS4455FM-F272SFBD-S148.2455FWM-F272SFBD-S148.220455FWM-F2725FBD-S-2023455FWM-F2725FBD-S8M27×1.5504FWM-F2725FBD-S8M27×1.5504FWM-F2725FBD-S8880FWM-F2725FBD-S860-8FWM-F2725FBD-S	FWM-F1410RBD-C		10		10			87		
FA-F1612XB-C FA-F1612XD-S FA-F1612XD-C         107.7         15 13.5 5 13.5         M16×1.5         120 111         66           FWM-F1612XBD-C FWM-F1612XBD-C          13.5          111         120           FWM-F1612XBD-C         15         13.5          111         120           FA-F2016E_I-S          13.5          120         111           FWM-F2016EBD-S           18          195            FWM-F2016EBD-C         117         18          195             FA-F2503G_I-S          18	FA-F1612XB-S		_		-			111		
FA-F1612XD-S FA-F1612XD-C107.7 $-$ 15 $-$ 15 $   -$	FA-F1612XB-C		15	12	13.5			120		
FA-F1612XD-C         107.7         15         12         13.5         5         M16×1.3         120         66           FWM-F1612XBD-S         -         -         111         111         111           FWM-F1612XBD-C         15         13.5         -         120         111           FM-F2016ES         -         15         13.5         -         120         120           FA-F2016EC         -         17         16         -         -         195         218           FWM-F2016EBD-C         -         17         18         -         195         218           FA-F2530GS         -         18         -         -         441         74           FA-F2530G_C-C         18         -         -         441         74           FWM-F2530GBD-S         18         -         -         441         74           FWM-F2530GBD-C         18         -         -         -         4455         74           FA-F2725FS         -         148.2         -         -         -         455         504           FWM-F2725FBD-S         20         23         23         8         M27×1.5         504 <td>FA-F1612XD-S</td> <td>1077</td> <td>_</td> <td>-</td> <td rowspan="3">5</td> <td rowspan="4">M16×1.5</td> <td>111</td> <td>66</td>	FA-F1612XD-S	1077	_		-	5	M16×1.5	111	66	
FWM-F1612XBD-S         -         -         -         111           FWM-F1612XBD-C         15         13.5         120         120           FA-F2016ES         -         17         18         195         218           FWM-F2016EBD-S         -         -         195         218         195           FWM-F2016EBD-C         17         18         -         195         218           FA-F2530GS         -         -         441         -         -           FA-F2530GC         18         -         -         441         -           FWM-F2530GBD-S         -         -         -         441         -           FWM-F2530GBD-C         18         -         -         -         455         -           FA-F2725FS         -         -         -         -         455         -         80           FWM-F2725FBD-S         -         20	FA-F1612XD-C	107.7	15		13.5			120	00	
FWM-F1612XBD-C         15         13.5         120         120           FA-F2016EC	FWM-F1612XBD-S		_		-			111		
FA-F2016EC            195         218         70           FWM-F2016EBD-S             18         195         218         70           FWM-F2016EBD-C          17         18          218         70           FA-F2530GS             441          441            FA-F2530GC              441 <td>FWM-F1612XBD-C</td> <td></td> <td>15</td> <td></td> <td>13.5</td> <td></td> <td>120</td> <td></td>	FWM-F1612XBD-C		15		13.5			120		
$ \begin{array}{c c c c c c c c c c } \hline FA-F2016 \hline \square & \hline 120 \\ \hline 120 \\ \hline FWM-F2016 \hline EBD-S \\ \hline FWM-F2016 \hline EBD-C \\ \hline FWM-F2016 \hline EBD-C \\ \hline 177 \\ \hline 18 \\ \hline 177 \\ \hline 18 \\ \hline 18 \\ \hline 70 \\ \hline 18 \\ \hline 18 \\ \hline 70 \\ \hline 195 \\ \hline 218 \\ \hline 441 \\ \hline 471 \\ \hline 441 \\ \hline 441 \\ \hline 441 \\ \hline 441 \\ \hline 74 \\ \hline 441 \\ \hline 74 \\ \hline \\ \hline 74 \\ \hline \\ \hline 74 \\ \hline \\ \hline \\ FWM-F2530 \hline GBD-C \\ \hline 18 \\ \hline 18 \\ \hline 22 \\ \hline 21 \\ \hline 21$	FA-F2016ES		-		-			195		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	FA-F2016EC	120	17	16	18	C		218	70	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	FWM-F2016EBD-S	120	_	10	-	0	10/20×1.5	195	70	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	FWM-F2016EBD-C		17		18			218		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	FA-F2530GS		-		-			441		
FWM-F2530GBD-S     166     -     30     -     6     M25×1.5     441       FWM-F2530GBD-C     18     22     471       FA-F2725F□-S     -     -     455       FA-F2725F□-C     148.2     -     23     8     M27×1.5     441       FWM-F2725FBD-S     148.2     -     -     455     80       FWM-F2725FBD-S     20     23     8     M27×1.5     504       FWM-F2725FBD-C     20     23     504     455	FA-F2530G□-C	16.0	18	20	22	0		471	74	
FWM-F2530GBD-C         18         22         471           FA-F2725F□-S         -         -         -         455           FA-F2725F□-C         148.2         -         23         8         M27×1.5         504           FWM-F2725FBD-S         -         20         23         504         80           FWM-F2725FBD-C         20         23         504         504	FWM-F2530GBD-S	168	_	30	_	8	IV\25×1.5	441	74	
FA-F2725F□-S         -         455           FA-F2725F□-C         20         23         8         455           FWM-F2725FBD-S         -         -         504         80           FWM-F2725FBD-C         20         23         504         80	FWM-F2530GBD-C	-	18		22			471		
FA-F2725F□-C         148.2         20         23         8         M27×1.5         504         80           FWM-F2725FBD-C         20         23         23         8         M27×1.5         504         80	FA-F2725FS		-		-			455		
FWM-F2725FBD-S     148.2     -     25     -     8     M2/×1.5     80       FWM-F2725FBD-C     20     23     504     504	FA-F2725FC	140.0	20	25	23	0		504	80	
FWM-F2725FBD-C 20 23 504	FWM-F2725FBD-S	148.2	_	25	_	23 8 - 8 23	M27×1.5	455	80	
	FWM-F2725FBD-C		20		23			504		

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

Fixed Type Adjustable type Self-adjusting

#### **RoHS Compliant**

•Products specification might be changed without notice.

#### Overview



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.

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.

#### **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	
① Packing retainer	Brass(*1)	
2 Guide	Phosphor bronze(*1)	
③ Piston	Brass(*1)	
④ Bottom	Brass(*1)	
⑤ Adjustment shaft	Brass(*1)	
*1 \//ithout curface treate	aont	

0	
Co	opper-free absorber FA-B2016
Free-cut	ting steel (electroless nickel plating)
F	ree-cutting steel (blackening)
	Cast iron (*1)
F	ree-cutting steel (blackening)
Free-cut	ting steel (electroless nickel plating)

Vithout 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.

**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	Specification Page
FA-B0806-	6	1.4	15	0.3~2	Single-orifice type	54
FA-B1008VB-		1.47	10	0.3~1	Single-orifice type	
FA-B1008VD-	8	1.70	2.5	0.7~3	Multiple-orifice type	56
FWM-B1008VBD-	1	1.76	10	0.3~2	Multiple-varying orifice type	
FA-B1210MB-		2.94	30	0.3~1	Single-orifice type	
FA-B1210MD-	10	4.0	4	0.7~3	Multiple-orifice type	58
FWM-B1210MBD-	1	4.9	30	0.3~2	Multiple-varying orifice type	
FA-B1410RB-		3.92	30	0.3~1	Single-orifice type	
FA-B1410RD-	10	E 00	4.5	0.7~3	Multiple-orifice type	60
FWM-B1410RBD-	1	5.00	35	0.3~2	Multiple-varying orifice type	
FA-B1612XB-			50	0.3~1	Single-orifice type	
FA-B1612XD-	12	9.8	10	0.7~3	Multiple-orifice type	62
FWM-B1612XBD-			50	0 0.3~2 Multiple-varying orifice t		
FA-B2016EB-			300	0.3~1	Single-orifice type	
FA-B2016ED-	16	29.4	120	0.7~3	Multiple-orifice type	66
FWM-B2016EBD-			200	0.3~2	Multiple-varying orifice type	
FA-B2530GB-			400	0.3~1	Single-orifice type	
FA-B2530GD-	30	49	150	0.7~3	Multiple-orifice type	70
FWM-B2530GBD-			300	0.3~2	Multiple-varying orifice type	
FA-B2540LB-C			500	0.3~1	Single-orifice type	
FA-B2540LD-C	40	63.7	200	0.7~3	Multiple-orifice type	74
FWM-B2540LBD-C			350	0.3~2	Multiple-varying orifice type	
FA-B2725FB-			650	0.3~1	Single-orifice type	
FA-B2725FD-	25	79.3	300	0.7~3	Multiple-orifice type	76
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



#### 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 °C	Mass Stype g (Ctype g )	Urethane Cap Specification (Type-R)
FK-0404L-	4	0.1 (0.01)	1(1)	0.30.1	214(21.8)	45	4.5(0.46)	2.5(0.25)	-570	24(25)	~
FK-0404H-	4	0.3(0.03)	3(3)	0.5.01	214(21.0)	45	13.5(1.38)	or lower	-3.970	2.4(2.3)	
FK-0604L-	4	0.1 (0.01)	1(1)	0.2-1	363	15	4.5(0.46)	3(0.3)	-E- 70	41(42)	~
FK-0604H-🗌	4	0.5(0.05)	3(3)	0.5~1	(37)	45	22.5(2.29)	or lower	-5~70	4.1(4.2)	
FK-1008L-			20(20)	0.3~1	1.070			4 Q (Q F)			
FK-1008M-	8	2.94(0.3)	6(6)	0.3~2	(110)	60	58.8(6.0)	4.9(0.5)	-5~70	20(21)	0
FK-1008H-	]		2.5(2.5)	0.3~3	(110)			OI LOWEI			
FK-1210L-			50(50)	0.3~1	1.000			0.0(1.0)			
FK-1210M-	10	6.86(0.7)	14(14)	0.3~2	(200)	60	98(10)	9.8(1.0)	-5~70	36(37)	0
FK-1210H-			6(6)	0.3~3	(200)			OI LOWEI			
FK-1412L-			75(75)	0.3~1	0.454			0.0(0.0)			
FK-1412M-	12	9.8(1.0)	20(20)	0.3~2	(220)	60	176(18)	8.9(0.9)	-5~70	55(57)	0
FK-1412H-	1		8(8)	0.3~3	(220)			OI LOWEI			
FK-1417L-			110(110)	0.3~1	0.646			0.0(0.0)			
FK-1417M-	17	14.7(1.5)	30(30)	0.3~2	2,646	60	235(24)	8.9(0.9)	-5~70	76(77)	0
FK-1417H-	1		13(13)	0.3~3	(270)			or lower			
FK-1612L-			110(110)	0.3~1	2.040			0.0(1.0)			
FK-1612M-	12	14.7(1.5)	30(30)	0.3~2	(200)	60	235(24)	9.8(1.0)	-5~70	76(82)	0
FK-1612H-	1		13(13)	0.3~3	(300)			or lower			

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

- \* 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	В	С	D	E	F	φG	Н	φI	J	К	L	Μ	N	φΟ
FK-0404□-S		4	28.6	24.6	20.1	4 5	1 0	—	-		0 1	2	7	-	-
FK-0404□-C	1014~0.5	4	32.6	24.0	20.1	4.5	1.2	4	3		0.1	Z		-	-
FK-0604S		4	29	25	20 E	4 5	1 0	—	—		0.2	2	0	-	_
FK-0604□-C	1010~0.75	4	33	25	20.5	4.5	1.0	4	4.6		9.2	Z	0	-	-
FK-1008□-S		0	48	40	24 E		S	—	-	1 5	15	2	10	-	-
FK-1008□-C	///////////////////////////////////////	0	55	40	54.5	5.5	2	7	6	1.5	15	2	15	7.3	8
FK-1210 -S	M12×10	10	63	ED	47 E		2 5	—	—		16.0	4	11	-	-
FK-1210□-C	10112~1.0	10	71	55	47.5	5.5	5.5	8	8		10.2	4	14	8.8	10
FK-1412□-S		10	70	EO	EDE		2 5	—	-		10.6	6	17	-	-
FK-1412□-C	////4/1.5	ΙZ	78	50	52.5	5.5	5.5	8	10		19.0	0	17	8.8	10
FK-1417□-S		17	97	00	74 5		4	—	—	1 5	10.6	6	17	-	-
FK-1417□-C	10114~1.5	17	107	00	74.5	5.5	4	10	10	1.5	19.0	0	17	11	12
FK-1612□-S		12	75	63	575	55	Б	_	-		21.0	6	10	_	-
FK-1612□-C	101071.5	١Z	90	05	57.5	5.5	C	15	13.5		21.9	0	19	13.1	14

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

## Key to Model Number



Please refer to pages 112-115 for optional parts.

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#### FK Series (M20~M25)



#### Characteristics

impact absorption.

- 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

	Spec	cificat	tions
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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-🗌			230(230)	0.3~1	3 5 7 8			18 1 (1 85) or		147	
FK-2016M-	16	29.4(3.0)	60(60)	0.3~2	(360)	60	343(35)	10.1(1.05)01	-5~70	(168)	0
FK-2016H-🗌			25(25)	0.3~3	(300)			tower		(100)	
FK-2022L-			73(73)	0.3~1	2 0 2 0			20.2(4)		160	
FK-2022M-	22	44.1 (4.5)	30(30)	0.3~2	3,920	60	392(40)	39.2(4)	-5~70	(178)	0
FK-2022H-🗌			15(15)	0.3~3	(400)			or tower		(170)	
FK-2050L-R			30(30)	0.3~2	4.000			20.2(4)		20.4	
FK-2050M-R	50	98(10)	15(15)	0.3~3	4,900	30	490 (50)	39.2(4)	-5~70	(204)	0
FK-2050H-R			8(8)	0.3~3	(300)			or tower		(294)	
FK-2530L-			390 (390)	0.3~1	6 270			20.4(2.0) ==		261	
FK-2530M-	30	88.2(9.0)	175(175)	0.3~2	6,370 (6E0)	60	490 (50)	29.4(3.0) or	-5~70	361	0
FK-2530H-			75(75)	0.3~3	(050)			lower		(391)	
FK-2540L-			480(480)	0.3~1	6.070			74 5 (7 2)		407	
FK-2540M-	40	117(12)	235(235)	0.3~2	6,370 (650)	60	490 (50)	/1.5(/.3)or	-5~70	437	0
FK-2540H-			30(30)	0.3~3	(050)			lower		(437)	
FK-2550L-R			100(100)	0.3~1.5	6.270			20.2(4)		F1C	
FK-2550M-R	50	147(15)	50(50)	0.3~2	6,370	30	0 637(65)	39.2(4) or lower	-5~70	516	0
FK-2550H-R			30(30)	0.3~3	(050)			or tower		(310)	

Note) Insert S in the  $\Box$  to order without a cap, and insert C in the  $\Box$  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.

- \* 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:  $\pm2.5^\circ$ ) Allowable eccentric angle in FK-2050 and 2550:  $\pm1.0^\circ$
- \* 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	В	С	D	E	F	φG	Н	φI	J	K	L	Μ	φN
FK-2016 -S		16	93	77	62	14	6	-		27.7	0	24	-	-
FK-2016□-C	10120~1.5	10	110	//	05	14	0	17	18	27.7	0	24	17	18
FK-2022 -S		22	112	00	76	14	6	-	-	27.7	0	24	-	_
FK-2022 - R	10120~1.5	22	126.5	90 70		14	0	-	-	27.7	0	24	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		20	140	110	05	1 5	0	-	-	27	10	22	-	-
FK-2530□-C	10125~1.5	50	158	110	95	15	0	18	22	5/	10	52	18	22
FK-2540□-C	M25×1.5	40	185.5	124.5	109.5	15	8	21	22	37	10	32	26	22
FK-2550 -R	M25×2.0	50	228	160	145	15	8	-	-	37	10	32	18	22

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

## Key to Model Number



Please refer to pages 112-115 for optional parts.

#### 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.

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-			420(420)	0.3~1		F 2 0		27.2 (2.70)				
FK-2725M-	25	79(8.1)	105(105)	0.3~2	60	(55)	6,370(650)	27.3(2.78)	-5~70	341 (385)	×	
FK-2725H-	]		47(47)	0.3~3		(55)		OI LOWEI				
FK-3035L-			1,560(1,560)	0.3~1		1 170		471(40)				
FK-3035M-	35	196(20)	390 (390)	0.3~2	0.3~2 30		14,700(1,500)	or lower	-5~70	628(681)	0	
FK-3035H-			173(173)	0.3~3		(120)		or tower				
FK-3625AL-C		150(15.3)	2,000	0.3~1		1 5 0 0		100(10.2)				
FK-3625AM-C	25	200(20.4)	800	0.3~2	30	(153)	25,000(2,551)	100(10.2)	-5~70	(900)	0	
FK-3625AH-C	1	200(20.4)	150	0.3~3		(155)		or tower		(900)		
FK-3650AL-C			3,400	0.3~1		2 252		120/12 2)				
FK-3650AM-C	50	400	1,400	0.3~2	30	(240)	25,000(2,551)	120(12.2)	-5~70	(080)	0	
FK-3650AH-C	]		300	0.3~3		(240)		OI LOWEI		(900)		
FK-3650L-			3,137(3,137)	0.3~1		2 252		(0((70)		1 1 7 7		
FK-3650M-	50	392(40)	784(784)	0.3~2 30	2 30 3	2,352	$\begin{vmatrix} 2,352\\(240)\end{vmatrix}$ 21	2 21,110(2,154)	68.6(7.0)	-5~70	(1 250)	0
FK-3650H-	]		306 (306)	0.3~3		(240)		or tower		(1,239)		

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

## **Precautions for Use**

Specifications

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

#### **RoHS Compliant**

#### Products specification might be changed without notice.



FK-3625A



#### Dimensions

Model	А	В	С	D	Е	F	φG	Н	φI	J	К	L	Μ	φN
FK-2725S		25	117.5	02.5	77 5	15	0	-	_	27	10	22	-	_
FK-2725C	IWI27×1.5	25	137.5	92.5	//.5	15	8	20	23	3/	10	32	—	-
FK-3035S		25	171.5	126 E	116 E	20	10	-	_	41.6	14	26	-	-
FK-3035□-C	1///30×1.5	35	190	130.5	110.5	20	10	18.5	27	41.0	14	30	25	27
FK-3625AC	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		FO	218.5	160 E	140 E	20	12	-	_	E2 1	1 5	16	—	-
FK-3650 -C	1.5	50	238	100.5	140.0	20	12	19.5	33	55.1	ID	40	24.3	33

#### Key to Model Number



Please refer to pages 112-115 for optional parts.

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







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

#### Dimensions

Model	A	A1	В	С	D	D1	E
FK-4225B□-C	144	162					92
FK-4250B□-C	195	213	M42×1.5	12	38	44	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 °C	Mass g	Allowable eccentric angle °
FK-4225BL-C			14,000	0.1~0.5		16					
FK-4225BM-C	25	260(26.5)	1,350	0.3~1.5		20	1,858(190)			795	
FK-4225BH-C			200	0.3~3.6		20		120(12.2)	-5~70		
FK-4250BL-C			23,000	0.1~0.5	21 500	8					
FK-4250BM-C	50	520(53.1)	2,800	0.3~1.5	(2,222)	10	2,372(242)			1,020	±2.5
FK-4250BH-C			450	0.3~3.6	(3,223)	10					
FK-4275BL-C			30,000	0.1~0.5	] [	5					
FK-4275BM-C	75	780(79.6)	3,400	0.3~1.5	] [	6	3,345(341)			1,240	
FK-4275BH-C			670	0.3~3.6		0					

- \* 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:  $\pm 2.5^\circ)$

- \* Ensure that an eccentric load is not applied to the soft absorber.
- \* Urethane caps are consumable goods that need to be replaced with new ones if necessary.

#### Products specification might be changed without notice.

#### **Optional Parts**





Square flange OP-040 M42SF

#### Stopper nut OP-020 M42



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



Urethane cap OP-090 M42A





Rectangle flange OP-040 M42RF



#### Side mount OP-M42SM



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



FK-4225B/FK-4250B Series

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	Α	В	С	D	E	φF	G	Н	φI	Weight g
OP-010M4225	133	109	10	24	20	20	194	M64×2	16	1,600
OP-010M4250	203	154	10	49	20	20	290	1004^2	4.0	2,500

#### Nut OP-M64

Model

OP-M64

Usable as the nut for eccentric angle adaptor



Weight 100g

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 °C	Mass kg	Allowable eccentric angle °
FK-6450L-C		2 000	2,800~36,000(2,800~36,000)	0.1~0.5		10	164609				
FK-6450M-C	50	(204 7)	390~4,000(390~4,000)	0.3~1.5		15	(16 797)	150(15.3)		2.5	±2.5
FK-6450H-C		(204.7)	130~500(130~500)	0.3~3.6		15	(10,7 57)				
FK-64100L-C		4 000	4,000~40,000(4,000~40,000)	0.1~0.6		8	214 110				
FK-64100M-C	100	4,000	1,000~7,000(1,000~7,000)	0.3~1.5	90,000	10	(218/9)	180(18.4)	-570	3.2	
FK-64100H-C		(400.2)	250~1,300(250~1,300)	0.3~3.6	(9,184)	10	(21,045)				
FK-64150L-C		C 000	9,000~56,000(9,000~56,000)	0.1~0.6		6					±1.0
FK-64150M-C	150	6,000	1,200~11,000(1,200~11,000)	0.3~1.5		8	2/5,556	370(37.8)		4.2	
FK-64150H-C		(012.2)	350~2,200 (350~2,200)	0.3~3.6		8	(20,110)				
FK-64200-C-	200	8,000(816.3)						400 (40.8)		5.5	

- \* 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 $\square$ ).
- \* 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-

**RoHS Compliant** 

Products specification might be changed without notice.



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

#### Dimensions

Model	А	A1	В	φC	φD	φD1	E
FK-6450□-C	226	243			50.2		141
FK-64100□-C	328	345	MGAYO	20	50.2	57	191
FK-64150□-C	456	473	1///04/2		60		241
*FK-64200-C-	556	573			60		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-

#### Key to Model Number



#### Customized orders For emergency stop

Fixed Type Adjustable type Self-adjusting

FK-80200-C-

#### **RoHS** Compliant

•Products specification might be changed without notice.





## Dimensions

Model	А	В	С	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 °C	Mass kg
FK-80200-C-	200	19,000 (1,938.8)			11,680		400 (40.8)		11
FK-80300-C-	300	28,900 (2,949)	0.1~5.5	149,226 (15,227.1)	17,770	1	510 (52)	-5~70	14
FK-80400-C-	400	38,800 (3,959.2)			23,852		510 (52)		18

\*  $\square$  will be filled in with a branch number of a custom model

#### **FK Series**

**RoHS Compliant** 

Products specification might be changed without notice.

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Madal	Eccentric angle	Stopp	er nut	Holder with a	Elango		Urothana can	Nut
Model	adaptor	Without cap	With cap	switch	Flange	сіцию-ргоог сар	Orethane cap	INUL
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-090M42A	OP-M42
FK-4250B□-C	OP-010M4250	—	OP-020M42	-	Rectangle flange	_	OP-090M42A	OP-M42
FK-4275BC	—	—	OP-020M42	-	OP-040M42RF	—	OP-090M42A	OP-M42
FK-6450□-C	_	_	OP-020M64S	_	Courses floorers	_	OP-090M64A	OP-M64
FK-64100□-C	_	_	OP-020M64S	_	OP-040M64SF	_	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

**FK Series** 

**RoHS Compliant** 

#### Products specification might be changed without notice.

## **Optional Parts**

						Ec	ccentric a	ngle	adapt	or O	P-010	)
Model	Α	В	С	D	E	F	G	Н	Ι	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

Cap for eccentric angle (OP-010 B-1) Guide for eccentric angle (OP-010 B-2) G Standard nut (Width across flat H Width across flat J length) K (Total

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 nu	t OF	P-020	
	Stand	lard	With	сар	Com	mon dimensions			
Model	OP-02	0 <u></u> -S	OP-02	20□-C	Com		M	ass g	
	А	В	С	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	
							С	17	
OP-020HB-S+C	15	21.9	30	21.9	19	M16×1.5	S	15	
		,		2			С	28	
OP-020EB-S+C	30	27.7	47	27.7	24	M20×1.5	S	46	
0. 02020 0							С	68	
OP-020GB-S+C	20	37	32	37	32	M25×1 5	S	65	
					52	1125-115	С	102	
OP-020LB	_	_	50	37	32	M25×1.5		153	
	25	27		27	22		S	90	
OP-020FB-S•C	35	3/	55	3/	32	IVI2/×1.5	С	137	
	20	41.0	F.0	41 C	26	M20×1 F	S	129	
OP-02018-S•C	38	41.6	58	41.6	36	IVI30×1.5	С	197	
OP-020LIB-S+C	45	53.1	65	53.1	46	M36×1.5	S	291	
01 02000 5 C		55.1		55.1		1130/(1.5	С	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 85		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.



OP-020M36 OP-020M42, OP-020M64\* m m 45 M36×1.5

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Mass 291g



#### **FK Series**

**RoHS Compliant** 

Products specification might be changed without notice.

#### **Optional Parts**

Holder with a switch OP-032										
Model	A	В	φC	D	E	F	(G)	Н	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 Man	ufactured by SUNX				
ltem	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				
	Alnput/Output circuit diagram	Operation indicator light Red LED 12~24V (lights up when the output is ON) DC±10%				
Response frequency		500Hz				
Ambient operating temperature		−25~70℃				
Ambient storage temperature		−40~85°C				
Ambient operating humidity		35~85%RH				
Ambient storage humidity		35~95%RH				
Lead wire length		Approximately 1m				
Mass	Including cable	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.

# 6 Model Selection Form

# Soft Absorber

**FK Series** 

RoHS Compliant

#### Products specification might be changed without notice.

## **Optional Parts**

						F	lange OP-040
Model	Α	В	С	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.

					Liq	uid-pro	of cap -0
Model	Α	В	С	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-3035C-060	38	60	5	35	191.5	255	





The main unit is supplied in assembly

lacksquare 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.

Α	С	Mass g
10	34	7
24.5	44	22
(24.1)	57	35
	A 10 24.5 (24.1)	A         C           10         34           24.5         44           (24.1)         57

#### Urethane cap OP-090



OP-090M36B



Nut Model А В С D Е Mass g OP-M42 53 M42×1.5 4-φ4.6 4-2.5 10 64 OP-M64 76 M64×2.0 4-7 2-70 10 100



OP-M42



Fixed Type Adjustable type Self-adjusting



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

Strok		Max. absorption	Max.	Rarge of	Max. drag	Max.cycle	Max. absorption energy per minute	Recovering power	Operating	Mass g	
Model	mm	<sup>energy</sup> J(kgf∙m	equivalent mass kg (kgf)	impact rate m/s	N(kgf)	rate cycle/min	J/min (kgf∙m/min)	of the piston rod N (kgf)	temperature ීC	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  $\Box$  to order without a cap, and insert C in the  $\Box$  to order with a cap (R if ordering urethane cap).

## Key to Model Number



## Precautions for Use

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

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#### **FL Series**





## Dimensions

Model	А	В	C	D	E	F	φG	Н	φI	J	К	L	Μ	N
FL-1214H-S	M12×1.0	14	84	70	EOE	FOF 10F		-	-	1 5	E	16.2	4	14
FL-1214H-C	10112~1.0	14	92	70	59.5	10.5	5.5	8	8	1.5	5	10.2	4	14
FL-1417H-S		17	105	00	77 0	10.2	4	-	-	1 5	F	10.6	6	17
FL-1417H-C	10114~1.5	17	115	00	//.0	10.2	4	10	10	1.5	5	19.0	0	17
FL-1620H-S	M16V1 E	20	128	109	02 E	145	F	-	-		4.4	21.0	6	10
FL-1620H-C	10/10/1.5	20	143	100	93.5	14.5	5	15	13.5		4.4	21.9	0	19

# **Optional Parts**

Stopper nut OP-020 
-

	Witho	ut cap	With	і сар		Applicable	Mass g	
Model	OP-02	0 <b></b> -S	P-020	□ <b>□</b> -C	E	model		
	Α	В	С	D		model		
	12	16.2	16	16.2	11		S	6
OF-020KB-3*C	12	10.2	10	10.2	14	FL-121411	С	8
	10	10.6	20	10.6	17		S	10
OF-020RD-3*C	12	19.0	20	19.0	17	FL-141711	С	17
	15	21.0	20	21.0	10		S	15
OF-02008-3*C	15	21.9	50	21.9	19	FL-1020H	С	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.

				H	older wi	th a swi	tch OP-(	032 🗆			
Model	A	В	φC	D	E	F	(G)	Н	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

**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

Strok		Max. absorption	Max. equivalent	Range of	Max. drag	Max.	Max. absorption energy	Recovering power of	Operating	Mass g	
Model	mm mm	energy J (kgf∙m)	mass kg (kgf)	impact rate m/s	/s N (kgf) cycle rate //s // cycle/min J/		per minute J/min (kgf•m/min)	the piston rod N (kgf)	temperature ℃	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  $\Box$  to order without a cap, and insert C in the  $\Box$  to order with a cap (R if ordering urethane cap).

## Key to Model Number



- \* 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.

FW Series (M12~M25)

#### **RoHS Compliant**







#### **Dimensions**

	-	-	-	-	_	. –	-			-		-
Model	A	В	C	D	E	φF	G	φH	I	J	К	L
FW-1212L-C	M12×1.0	12	130	90	5	3.5	8	8	2	16.2	4	14
FW-1616M-S		16	134	100	E	-	-	6	21.0	6	10	
FW-1616M-C	///10/1.5	10	164	102		5	15	13.5	6	21.9	0	19
FW-2025M-S	M20×1 F	25	170	120		6	-	-	6	277	0	24
FW-2025M-C	10120~1.5	25	204	120		0	17	18	6	27.7	0	24
FW-2530M-S		20	205	145		0	-	-	6	27	10	22
FW-2530M-C	10123~1.5	- 50	241	145		0	18	22	6	5/	10	52

## **Optional Parts**

	Stopper nut OP-020 ** - 🗌								
Model	Α	В	С	Applicable model	Mass g	OP-020**-S	OP-020**-C		
OP-020KB-C	16	16.2	14	FW-1212L-C	8	(Without cap)	(With cap)		
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	A	C		
OP-020GB-C	32	37	32	FW-2530M-C	102				

• 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



Short Stroke Type Single-Orifice

Products specification might be changed without notice.

Fixed Type Adjustable type Self-adjusting

**RoHS Compliant** 

**FS Series** 



#### **Dimensions**

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

# **Specifications**

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

# Key to Model Number



## **Precautions for Use**

- \* Do not use this product without carefully reading the attached 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:  $\pm 2.5^{\circ}$ )
- \* Do not turn the oil inlet screw located at the bottom of the main unit.

- With/Without cap S: Without cap
- Stroke

- External screw size (indicated in mm)
- Series name
- Performance classification L : For low speed (Impact rate  $0.3 \sim 1 \text{m/s}$ )
  - (indicated in mm)

  - 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

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**RoHS Compliant** 

#### Products specification might be changed without notice.





#### Dimensions

**FV** Series

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

#### Specifications

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

#### Key to Model Number



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:  $\pm 2.5^{\circ}$ )
- \* Ensure that an external stopper is also used.

 Standard nuts are sold separately as well.
 Applicable model
 Model

 FV-1406L
 M14 nut
 FV-1406L
 M16 nut

 FV-1606L
 M16 nut
 FV-1606L
 M16 nut

 FV-2008L
 M20 nut
 FV-2508L
 M25 nut

 FV-2708L
 M27 nut
 FV-2708L
 M27 nut

C

Ю ш

Т

£

# Soft Absorber

## FED Series

Products specification might be changed without notice.

φJ

(P)

B (Stroke)

А

≥

Standard nut

(Width across flat N)



## Dimensions

Model	A	В	С	D	E	F	G	Н	J	К	L	Μ	Ν	Р
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 $^{\circ}C$	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	- E 70	79
FED-3020M-C	20	98(10)	140(140)	0.5~2	11,760(1,200)	68.6(7.0) or lower	-5~70	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

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

FSB Series (M12, M14, M16)

Products specification might be changed without notice.

**RoHS Compliant** 



# Characteristics

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

Matorial	Main unit	SUM		
Malenal	Сар	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 °C	Mass g
FSB-1205-C	5	0.68(0.07)	5(5)		588 (60)	45	65 (6.63)	4.9 or lower(0.5)		40
FSB-1407-C	7	2.5 (0.25)	20(20)	0.3~1.0	1,078(110)	60	120 (12.2)	4.9 or lower(0.5)	-5~70	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



## Dimensions

Model	А	В	С	D	Е	F	G	Н	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:  $\pm 2.5^\circ$  )
- \* 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

#### **FES Series**



Type Descriptions				
FES	-	12	15	
1		2	3	

① Series name

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 $^{\circ}$ C	Mass g
FES-0607	7(0.7)	7		2,500(255)		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	3以下	9,500 (969)	-25~60	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	В	С	D	E	F	G	Н	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





#### **RoHS Compliant**

Products specification might be changed without notice.

#### **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)

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

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

$$E = E_{1} + E_{2}$$

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  $E2 = F \times St$ ).

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

For free fall

$$\begin{split} E_1 = \mathbf{M} \cdot \mathbf{g} \cdot \mathbf{H} & E_2 = \mathbf{M} \cdot \mathbf{g} \cdot \mathbf{St} \\ \text{St} = \frac{1}{2} \mathbf{M} \mathbf{V}^2 \times \frac{1}{(\text{max. drag} \times \text{n} \times \text{coefficient}) - (\mathbf{M} \times \mathbf{g})} \end{split}$$

 $E=E_1+E_2$ 

#### 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.

#### Equations to calculate a stroke

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

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

Number of FES Thrust

ient-F

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

FES-0607					
Material	SUS				
Surface treatment	Main unit	Bright quenching			
FES-1215、1220、1625、2030、2440、3050					

Material	Carbon steel		
Surface treatment	Сар	Galvanized	
	Main unit	Nitriding treatment	

- \* 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.

