Read these instructions before use

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

⚠ Warning

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

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

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

Do not use the soft absorber out of specification range.

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

Implementation of safety measures under the following use

●If you would like to use soft absorber under the circumstance such like below, please consult us before using.

1)To use soft absorber under the circumstance which is not mentioned on this catalog or under direct sunlight and/or outdoor.

2)To use soft absorber for the equipment related to nuclear power, the equipment involved directly or indirectly in the operation and running of the vehicle of the rail and ship, equipment related to aviation and space, equipment related to the military, the equipment involved in the medical, equipment exposed to the beverage and food, combustion equipment, entertainment equipment related influence on people and property in the equipment, emergency stop circuits, press equipment, other, is expected to exert a major impact on people, property, or the use of the equipment and applications which require special safety measures to be adopted.

Do not throw into a fire

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

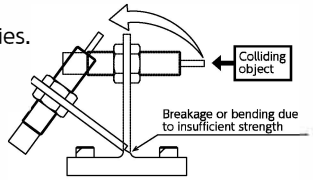
⚠ Caution

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

Do not operate without sufficient mounting strength

・Operating with insufficient mounting strength may damage the main machine and cause injuries.

・Ensure sufficient mounting strength of maximum drag x safety factor
(Regarding maximum drag, please refer to the catalogue orcontact our sales department.)



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

・Without an external stopper, the main machine may become damaged due to bottoming

・Ensure that an external stopper is set in the prescribed location for each type before operating the product.

Do not attach using incorrect tightening torque

・Using an incorrect tightening torque when attaching may cause operational failure and damage to the main machine.

・When tightening an attachment screw for a soft absorber, please use the tightening torque as listed below.

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

※1 FA-1212 series tightening torque : 1.5N·m(In case to fix directly at ψ14.6, tightening torque shall be 1N·m)
※2 FED-2010M-C tightening torque : 15N·m
※3 FED-3020M-C tightening torque : 30N·m

Please adjust the torque for the adjustable soft absorber.

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

Oil

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

Model selection

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

●Along with the number of times of use, reduction of internal oil, due to wear of parts, energy absorption capacity will decrease. Concerning it, we recommend selecting a size which is margin 20 to 40% or more with respect to the maximum absorption energy.

●Parallel use of adjustable soft absorber, please refrain it because it is difficult to tune the torques of all the absorber. For the parallel use, please choose the fixed type.

●Please limit the number of use of FED series, please limit up to 100 times.

Scattering pieces due to cap damage

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

Pay attention to a loose retaining ring

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

Product Main Unit

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

Eccentric load and eccentric angle

●A collision of a load with inclination angle larger than ± 2.5° will cause the degradation of performance due to defective return of bent piston rod or local friction of sliding contacts, and the mother machine will be damaged.
* Types FK-2050, FK-2550, FA/FK-64100, FA/FK-64150 and FA-64200 shall be used within the inclination angle range of ± 1°
●A collision shall be aligned to the centerline of the piston rod. If the inclination angle exceeds ± 2.5°, please use with an inclination angle adapter.Adaptable up to ± 10°

Operating temperature

●Please use within the temperature range for use. Any use outside the range will lead to a shortened lifetime. Please use in an ambient temperature of - 5 ℃ - +70 ℃.
※Some of the models have a different temperature range; please check the table of specifications for a specific model. Storage shall be in an ambient temperature -10℃- +80℃.
※Models FA-1212, 1010 and 1215 shall be in -20℃ - +50℃, Series FPD and FPR in -10℃ - +60℃.
●Please use in the atmospheric environment. The use in vacuum or high pressure will cause oil leakage or damage.
●Use in a place where ozone is generated will cause the shortened lifetime.
●Please do not use in such an environment where cut chips, cutting oil, water, etc. contacts the piston rod. Malfunctioning or damage to mother machine will be caused by oil leakage due to packing damage.
※The coolant proof specification may be applicable under some of the environments where cutting oil contacts. (Refer to a catalog for details)

Daily Inspection and Maintenance

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

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

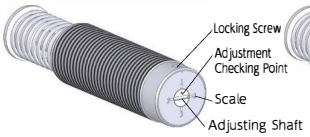
●Any remodeling on the product (additional working, coating, welding, hardening, etc.) will void all warranties by our company.

How to Adjust an Adjustable Soft Absorber

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

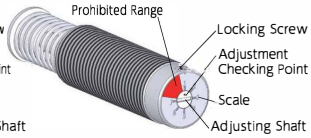
Note : Please be sure to protect the soft absorber using an external stopper or a stopper nut for adjusting.When the adjustment is complete, please be sure to tighten the locking screw. The use without locking will rotate the adjusting shaft and a variation of property occurs. There are some models that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

Models with Adjusting Scale 1-3



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

Models with Adjusting Scale 1-7



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

Disposal

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

Selection of a Soft Absorber

●Please refer to an item "Compact Soft Absorbers" in the catalog for selection of a soft absorber
●「A "soft absorber selection software" is prepared as well. Please contact our sales department.
※The selection can be made in our website as well. URL: http://www.fujilatex.co.jp
List of Optional Parts
A lineup of optional parts are provided as below. Please use in reference to the catalog.
- Inclined Angular Adapter, Stopper Nut, Urethane Cap, Nut, Drip-Proof Cap, Switched Holder, Flange, Side Mount
Note : Not all the optional parts are prepared for all models. Please understand this and use the optional parts prepared for only a specific model.

Takachiho America Inc. assumes no responsibility for any secondary disasters caused by a soft absorber. Please enforce a preventive measure against any secondary disasters.

Cautions for Using Soft Absorbers 1

1. Parallel Use of Small Absorbers

1–1. Fixed soft absorbers

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

1–2. Adjustable soft absorbers

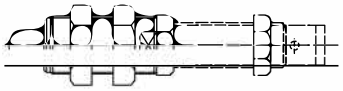
Parallel use of adjustable soft absorbers is not recommended, as some cannot be adjusted to perform equally.
However, please contact our sales department when the following conditions apply.

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

2. 2. Operating Environment of Soft Absorbers

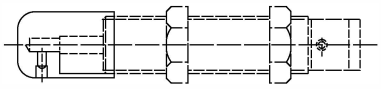
2–1. Do not use in an environment where oil mist, cutting oil, etc. may come in contact with a soft absorber. This is because oil can penetrate through the piston rod, disabling the stroke. When using under such circumstances, the soft absorber must be liquid-proofed.

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



(Eccentric angle adaptor)

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



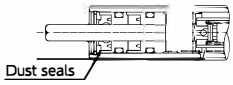
(Liquid-proof cap)

2–2. Using soft absorbers in a vacuum

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

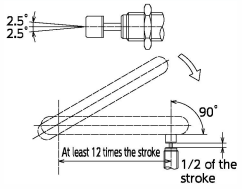
2–3. Using soft absorbers in dusty environments

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



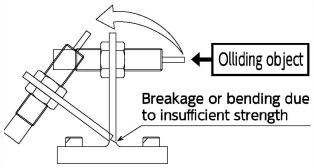
3. Protecting soft absorbers from eccentric load

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



4. Mounting strength of soft absorbers

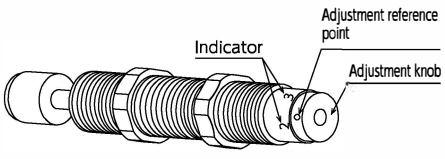
The impact absorption of a soft absorber requires sufficient mounting strength. A good guideline is to secure a mounting strength that is 2 to 3 times larger than the max. drag based on the absorber specifications.



5. Adjusting soft absorbers

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

●Types with Adjusting Scale 1–3 Weaker Torque 1←2→3 Stronger Torque
Set the adjusting scale approximately to the midpoint of "1–2" first, if the Torque is felt strong turn in the direction of "1" of scale, (Some of the models are not equipped with a locking screw)



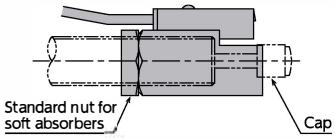
Cautions for Using Soft Absorbers 2

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

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

6. Cautions for attaching a holder with a switch

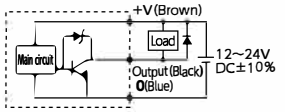
1. Set the holder's position so that the switch's tip and the edge of the metallic ringon the rod cap are at least 0.5mm apart. Otherwise, it will not work properly.
2. When attaching a holder with a switch to an adaptor, please be extremely careful not to screw it into the adaptor more than is necessary.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



7. Cautions for Using the Switch

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

Model GXL-8F specifications Manufactured by SUNX

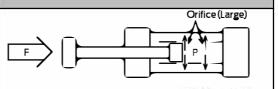
Item	Summary	Specification
Detection distance	Standard detected object 15×15×1 (Iron)	2.1mm
Power voltage		12~24VDC±10%
Consumption current		15mA or lower
	Behaviour form	NO type
	Output form	NPN open collector
	Output capacity (with 24VDC power voltage)	100mA or lower
	Protection feature	Comes with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

8. Equivalent Mass of Soft Absorbers

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

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

Based on the above equation, it is clear that if an appropriate P (Pressure) can be generated, the appropriate drag F can be obtained. One of the factors that determines the pressure P is the orifice area. An overview of the relationship between the orifice area, equivalent mass, and internal pressure is shown below. Considering the relationship between impact rate and orifice area, using an absorber witha small orifice area to receive an impact from a high-speed collision results in an excessive increase in the internal pressure, causing a jolt. On the other hand, using an absorber with a large orifice area to receive a low-speed impact does not generate enough internal pressure, which in turn prevents the necessary drag from being generated. An adjustable absorber can adjust the size of the orifice area, allowing the absorber to generate the appropriate hardness, in another words, the drag, according to the impact rate. Consequently, maximum equivalent mass can be defined as the smallest possible orifice area in an adjustable absorber based on the relationship between equivalent mass and impact rate. In other words, it is the adjustable state in which the slowest impact rate under the operating conditions can be handled. Therefore, if the energy calculation and equivalent masscalculation based on the operating conditions result in a value that exceeds the maximum equivalent mass, the orifice area of the absorber cannot be set to the ideal size. In other words, it will not be able to decelerate the impact rate properly. The maximum absorption energy capacity of a soft absorber is a crucial factor in preventing the absorber from being damaged, and confirming the equivalent mass is therefore vital to the rate control for impact absorption. Therefore, both conditions must be satisfied for the absorber to function properly.

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