

BIBUS

BIBUS SINDBY



Fuji Dampers

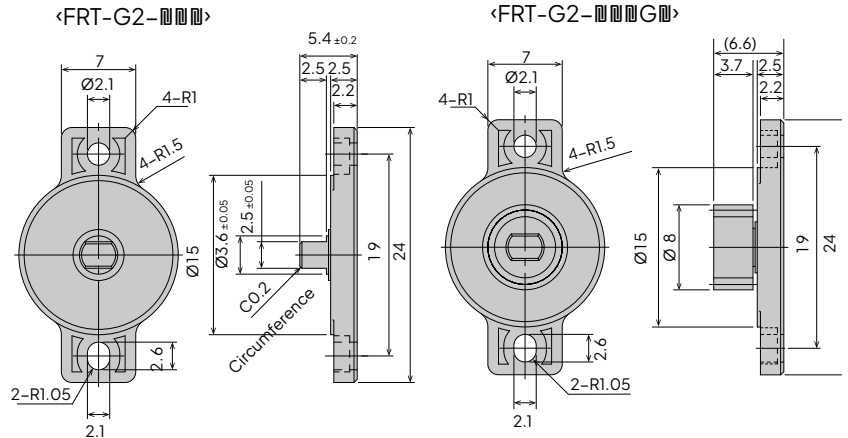
Rotary Damper

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

FRT-G2 Series

RoHS Compliant

• Products specification might be changed without notice.



Specifications

| Model | Rated torque |
|-----------------|---|
| FRT-G2-200 (G*) | (2±0.7)×10 ⁻³ N·m20±7 gf·cm |
| FRT-G2-300 (G*) | (3±0.8)×10 ⁻³ N·m30±8 gf·cm |
| FRT-G2-450 (G*) | (4.5±1)×10 ⁻³ N·m45±10 gf·cm |
| FRT-G2-600 (G*) | (6±1.2)×10 ⁻³ N·m60±12 gf·cm |
| FRT-G2-101(G*) | (10±2)×10 ⁻³ N·m100±20 gf·cm |

Note 1. Rated torque measured at a rotation speed of 20rpm at 23°C

Note 2. Models with gear bears G1, G2, or G3 at the end of their model numbers

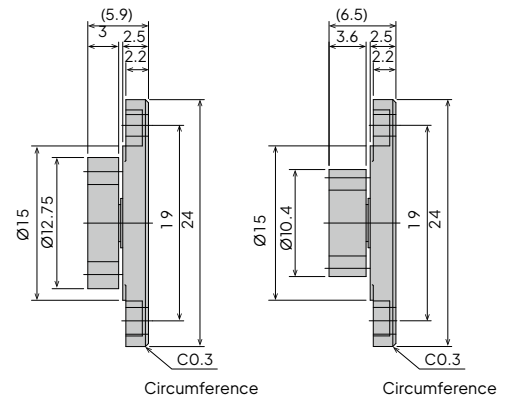
Note 3. Torque can be customized by changing the oil viscosity (see Customizable Torque Chart on page 178)

Note 4. The diagrams above are outline drawings of FRT-G2-****. Please refer to the diagrams at the right for G2 and G3.

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

Gear Specifications

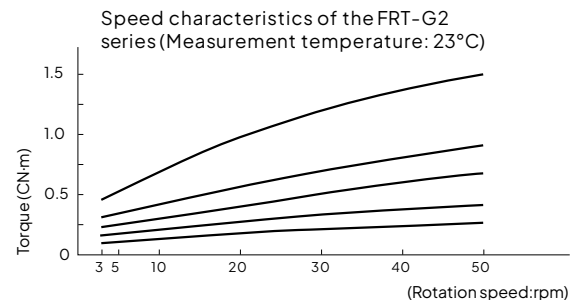
| | G1 | G2 | G3 |
|-----------------------|--------------------|---------------------------|--------------------|
| Type | Standard spur gear | Profile shifted spur gear | Standard spur gear |
| Tooth profile | Involute | | |
| Module | 0.5 | 1.0 | 0.8 |
| Pressure angle | 20° | | |
| Number of teeth | 14 | 10 | 11 |
| Pitch circle diameter | Ø7 | Ø10 | Ø8.8 |
| Addendum modification | - | +0.375 | - |



Damper Characteristics

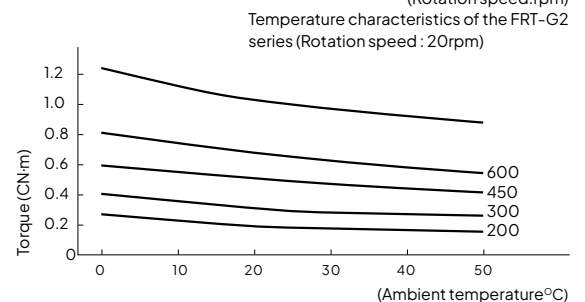
1. Speed characteristics

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



2. Temperature characteristics

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



MRF Damper

FMR-70S-403

Characteristics

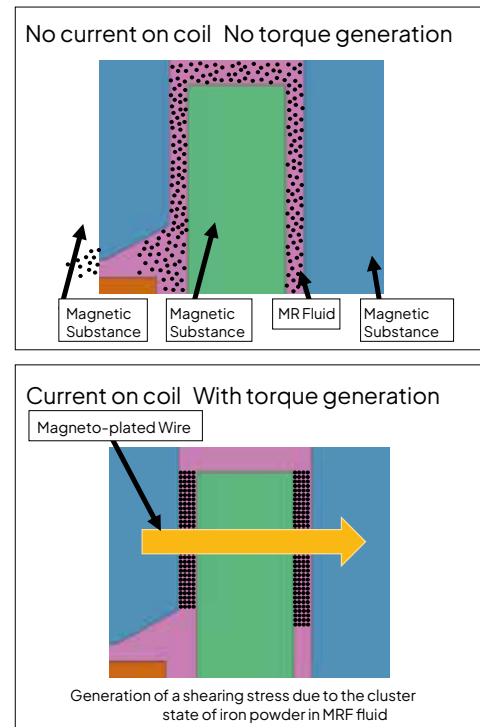
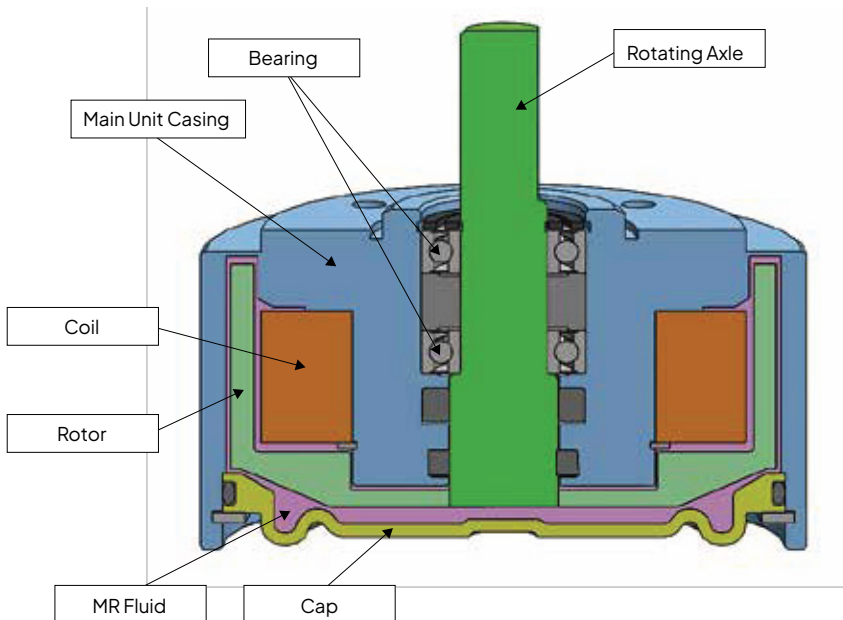


- Electrically controlled
- High response
- Flexible mounting ways
- Not required Pre-conditioning operation
- Smooth motion
- Long life
- Seamless torque change
- Less susceptibility of temperature affect
- Less susceptibility of the rotational speed affect

- Enabled electrically controlling the torque by using MR fluid (magnetic viscous fluid)
- Excellent electrical response makes realize a high response
- No restriction on the mounting direction
- Using MR fluid on friction part, it realized less humid effect and no requirement of pre-conditioning
- Small differences between the static friction and dynamic friction allows a smooth actuation
- Our original sealing structure realizes a long life cycle
- Available a seamless torque control steplessly
- Comparing to a standard rotary damper, small effect by temperature
- Comparing to a standard rotary damper, small effect by the rotating speed

Basic Structure and Action

The basic structure of MRF damper is shown below.



Behavior

The rotating shaft is supported with the bearings for providing the freedom of rotation in the main unit casing. A coil is implemented in the main unit casing, and a rotor having the shape of a cup is mounted on the rotating shaft. There is a gap between the internal surface of the main unit casing and the external surface of the rotor. The MR fluid is filled in this gap. When a current is supplied to the coil, a magnetic field line runs through the gap between the main unit casing and rotor, and a magnetic force flows in the MR fluid. When a magnetic force flows in the MR fluid, the iron powder is linked like a chain and the friction force of iron powder generates a force to restrict the rotation between the main unit casing and rotor.

What is the MR Fluid?

The MR (magneto-rheological) Fluid is a functional fluid that can be instantly reversibly changed between free liquid and semi-solid state by varying the applied magnetic field. The MR Fluid is featured with the wide shearing stress variation range based on the yield point determined by the semi-solid fluid due to the formation of chain type clusters of iron powder particles induced by the application of magnetic field in the dispersed micron size magnetic iron powders in the carrier fluid differently from general magnetic fluid.

Main Applications

The applications for robots, welfare devices, logistics, amusements, operation levers, switchgears and the torque controls for vibration control devices are expected.

Precautions for Use

Be sure to carefully read the owner's manual delivered with the product before using.



MR Fluid



MR Fluid A magnet in the proximity

Products specification might be changed without notice.

Specifications

| Type | Rated Torque N*m | Coil (23°C) | | | | Allowable slipping efficiency W |
|-------------|--------------------------------|------------------|-----------------------|--------------|---|------------------------------------|
| | | Voltage V | Current A | Resistance Ω | Capacity W | |
| FMR-70S-403 | 4 | DC24 | 0.13 | 192 | 3.12 | 10 ¹ |
| | Maximum Operating Speed rpm | Mounting Posture | Direction of Rotation | Mass kg | Moment of Inertia kg x cm ² | |
| | 50 | No restriction | Both directions | 0.83 | 1.16 | |

Temperature Range for Use: 0° to 40° The heat is generated from coil and the slipping friction during operation. The surface temperature of the product during operation shall not exceed 70°C.
 * For a continuous slipping application, the friction heat I be taken into consideration. The operation shall be within the allowable slipping efficiency range.

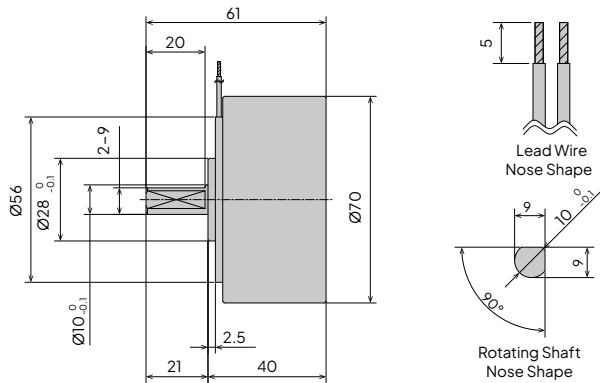
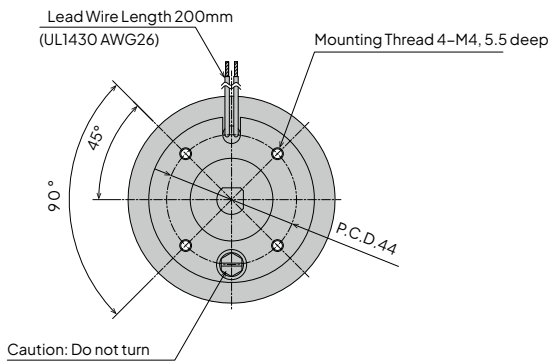
Calculation

Allowable slipping efficiency = $2 \times \pi / 60 \times n \times T_c \times n$:

Rotating Speed (rpm)

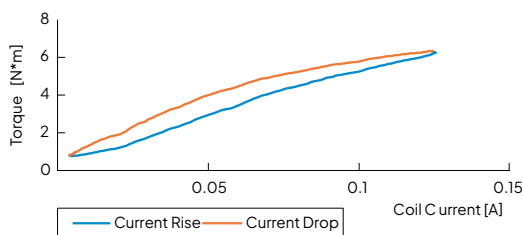
Tc : Slipping Torque (N-m)

| | Material | Surface Treatment |
|------------------|------------------|---------------------------------|
| Main Unit Casing | Metal (SUM) | Non-Electrolytic Nickel Plating |
| Rotating Shaft | Metal (SUM) | Nitriding |
| Cap | Polyacetal (POM) | - |

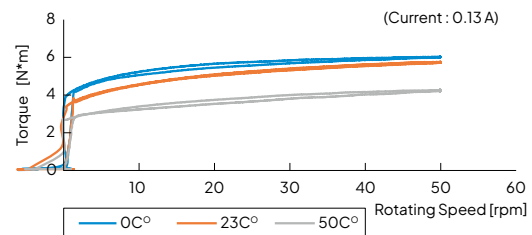


Test Data

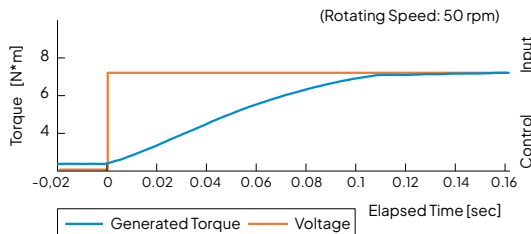
Coil Current - Torque Properties



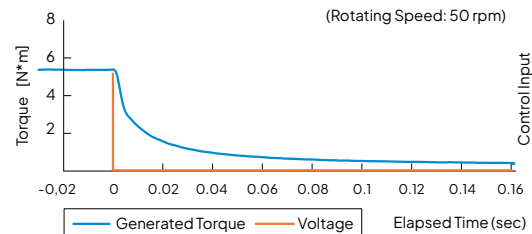
Temperature Properties (Torque and Rotating Speed)



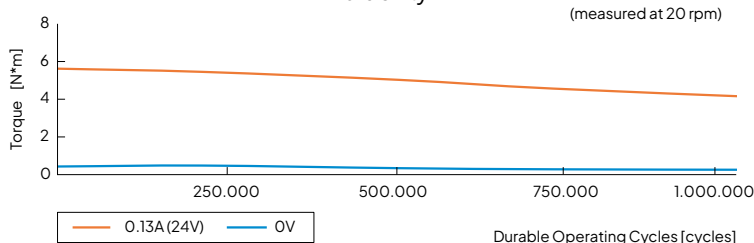
Response - Voltage Rise



Response Performance - Voltage Drop



Durability



Durability Test Conditions

Damper Mounting Posture: Shaft Upwards
 Rotating Speed: 50 rpm
 Durability Operation: Continuous Single Directional Rotation
 Current: 0.065 A (12 V)

Read these instructions before use

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

Warning Definition of Warning

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

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

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

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

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

Implementation of Safety Measures for the Purposes Below.

Implement the safety measures if used under the following conditions and environment, and consult our company for a judgment on the feasibility check beforehand. Also please take countermeasures against waterproofing, humid proofing as well as the designing of fail-safe, redundant and etc. for the purpose to keep the reliability of safety of the device as user's responsible task.

1. The use in the environment other than those standard specifications clearly indicated in the catalog or owner's manual, outdoors, or place exposed to the direct sunlight.

2. Nuclear related devices, devices directly or indirectly related to the running of rail or ship, devices related to aviation or space, military devices, medical devices, devices contacting the potions and foods, combustion equipment, amusement devices that are related to the influence on human and properties, emergency shut off circuit, press machinery, the use for the devices or purposes to which especially the safety is required because of the expected serious influence on the human and properties.

- Environment and the next safety exhibit can not be secured, please do not use the following devices that are required extremely high reliability and safety.

1. environment in which there is a possibility of ignition or explosion, or in water or a very high humid.
2. device in relate to the nuclear power, aviation, space, military, life supporting medical equipment, combustion etc.

When you touch the MRF dampers, confirm the power supply of the coil and the peripheral devices are switched of and the temperature of MRF damper is cooled down.

There is a risk of Electric shock, burns or fire if to mount or dis-mount the MRF damper during the operation of peripheral device or powering the MRF damper.

Ensure the connection of coil lean of MRF damper.

There is a risk of operation failure, electrical shock or leak if the connection of the leads is incomplete electrically or mechanically.

Do not throw into a fire

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

Warning Definition of "Caution"

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

Do not operate without sufficient mounting strength

- Operating with insufficient mounting strength may damage the main machine and cause injuries.
- Ensure sufficient mounting strength of load torque x safety factor

Do not pull or hang the MRF damper by the leads.

- There is a risk of injury by the fall of MRF damper. Also there is a risk that the leads shall cut and results operational failure or electrical shock or short-circuit.
- Hold the MRF damper when mounting or dis-mounting.
- After the installation, make sure to fix the leads not to contact with MRF damper or with peripheral devices.

Do not rotate the screw on top of MRF damper

Screw on top of MRF damper is the sealing for oil filling. Do not rotate it otherwise it may cause oil leakage or quality deterioration.

Usage environment

- This product cannot be used in a vacuum or under high pressure as well as in the circumstance where is impact. It may cause damage to the MRF damper or Peripheral equipment
- Do not use in an environment where chips, cutting oil, water, etc. can come in contact with the linear damper. This will result in a malfunction due to an oil leak caused by damage.
- Do not leave or use under the circumstance where is a high humid.

Do not discard oil more than is necessary

- Discarding the oil contained in MRF dampers more than is necessary will pollute the environment.
- Dispose the oil according to laws concerning waste management and cleaning.

Radial/Thrust load to the shaft

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

Do not repair, disassemble or modify the MRF damper

- MRF damper is not corresponded with repairing. In the even of failure and deterioration of performance, please replace it with a new one.
- It is contained the excitation coil and oil in inside of MRF damper. For safety reason, do not repair, disassemble or modify by yourself.
- If the remodeling to MRF damper (additional machining, painting, welding, hardening, etc.) has been carried out, we do not guarantee the MRF damper as well as peripheral equipment.
- Any damage or loss won't be indemnified if the customer performed the repairing, disassembly and modification of MRF damper.

Replacing time of MRF damper

Product reliable cycles are depended on the using circumstances and conditions; therefore, we cannot determine the life cycle however if there is phenomena such like below please consider that it is the time to replace to the new one.

1. When the necessary torque is no longer performed even though given rated current.
 2. When the torque started to be appeared without giving eclectic current.
 3. When various torque started to be appeared under a same circumstance.
 4. When abnormal noise, vibration or oil leakage are started to be appeared.
- In particular, high reliability and safeties is required, regardless the phenomenon such like above, we strongly recommend to replace to the new one periodically.

Over-tightening of mounting screws

- Over-tightening the mounting screws when installing a MRF damper may cause damage to the main unit.
- Based on the types and sizes of the screws used, please apply an appropriate tightening torque to tighten the screws.
- Use a proper sized screw as the screwing hall of MRF damper is M4 x 5.5 depth. As for tighten torque, make sure under 550N.cm.

Dispose

In case to dispose the MRF damper, follow the local rules and dispose as industrial waste.

Soft Absorber

FPD-1012 Series



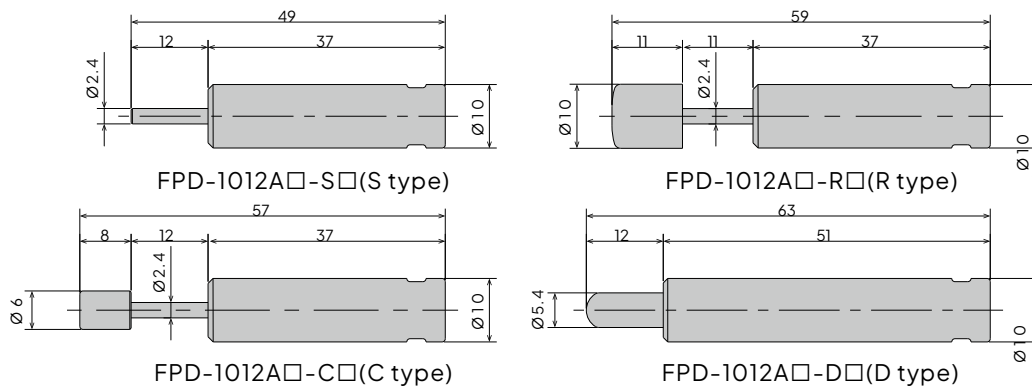
Model Description

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | P | D | - | 1 | 0 | 1 | 2 | A | 1 | - | S | W |
| 1 | | | | 2 | | 3 | | 4 | | | 5 | 6 |

1. Base model
2. External diameter
3. Stroke
4. Symbols indicating characteristics
 - A1. Low-load specifications
 - A3. Medium-load specifications
 - A5. High-load specifications
5. Symbols indicating form
 - S type (Standard)
 - C type (Cap)
 - R type (Elastomer cap)
 - D type (Eccentric angle cap)

* Please refer to the external dimensions.
6. Color symbols W= White B= Black

External Dimensions



Specifications

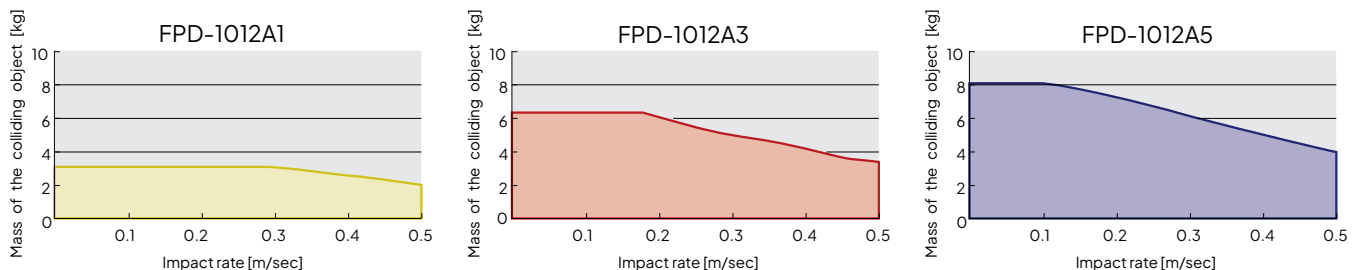
| MODEL | Load [kg] | Max absorption energy J (kgf·m) | Speed rang m/s | Cylinder cap color |
|------------|-----------|---------------------------------|----------------|--------------------|
| FPD-1012A1 | 1 | 0.05 (0.05) | 0.5 or lower | Black |
| FPD-1012A3 | 3 | 0.08 (0.08) | 0.5 or lower | White |
| FPD-1012A5 | 5 | 1.0 (1.08) | 0.5 or lower | Blue |

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

Common Specifications

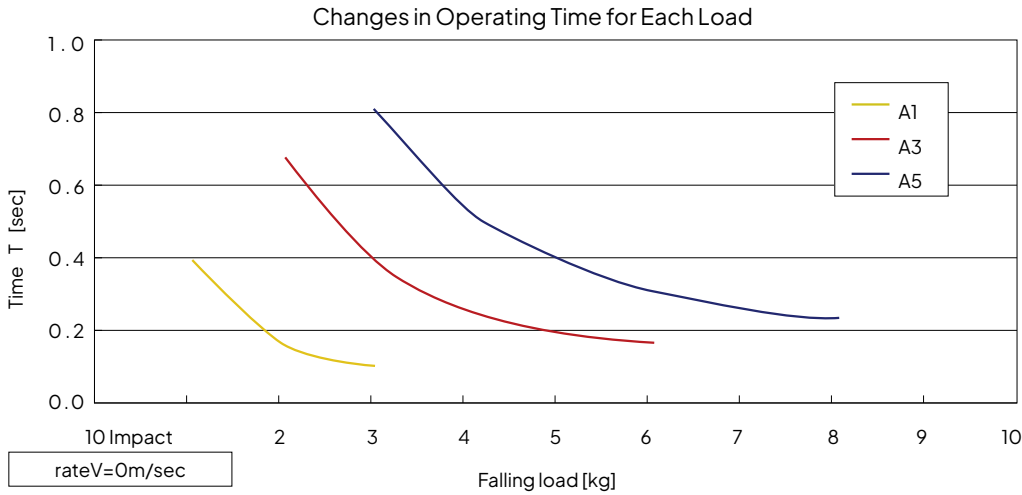
| | | | | | |
|------------------------------------|--------|----------------|--------------------------|---|--|
| Stroke (S/C/D type) | mm | 12 | Mass | g | S type= 4.5 C type=5.0 R type= 5.7D type=6.0 |
| Stroke (R type) | mm | 11 | Main unit material | | Resin |
| Recovering power of the piston rod | N(kgf) | 3(0.3) or less | Operating temperature °C | | 5~4 |

Impact rate and mass of the colliding object in freefall



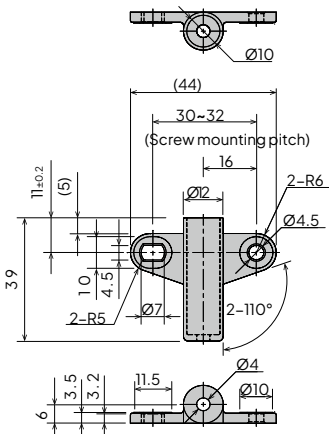
Products specification might be changed without notice.

Characteristics Graph



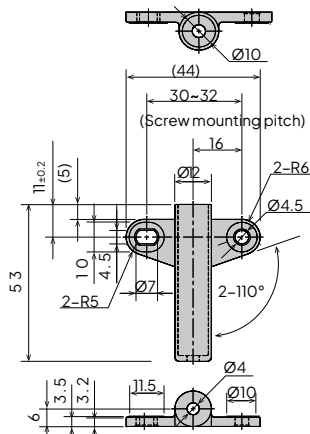
Optional Parts

OP-200-01B/W S/C/Rtype



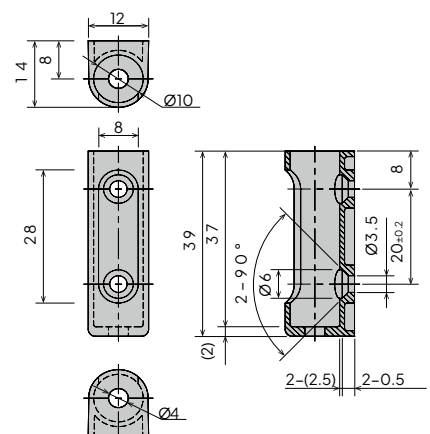
Screw: M4 (Truss screw)
Recommended tightening torque : 0.5N·m

OP-200-02B/W Dtype



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

OP-200-03B/W S/C/R/Dtype

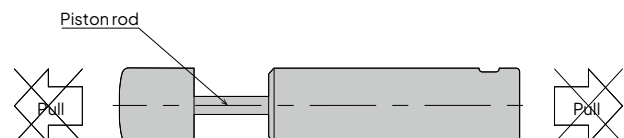


Screw: M3 (Flat head screw)
Recommended tightening torque : 0.3N·m

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

Precautions for Use

- Do not use this product without carefully reading the attached owner's manual.
- Use with an external stopper.
- Ensure that sufficient mounting strength is secured for this product.
- 2 or more of this product can be used in parallel.
- Do not use this product in a vacuum or a location where it may come in contact with oil.
- Ensure that an eccentric load is not applied to the soft absorber.
S/C/R type Allowable eccentric angle: $\pm 2.5^\circ$ or less
D type Allowable eccentric angle: $\pm 6^\circ$ or less
- Do not pull the piston rod of the soft absorber.
(This will cause air to get inside the soft absorber, causing ineffective stroke, abnormal sounds, and other damage to the soft absorber.)
- The difference between the speed of stroke and return of piston rod might influence the durability of the damper. So, please confirm sufficient performance on actual machine before use.



Soft Absorber

FPR-1040 Series

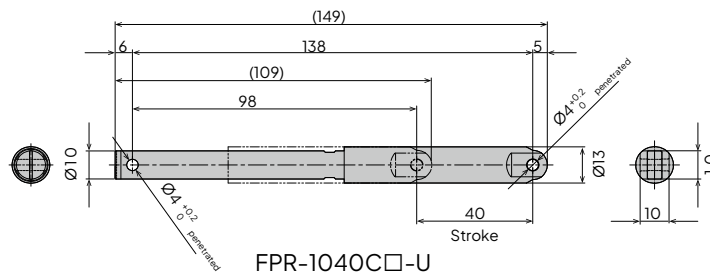
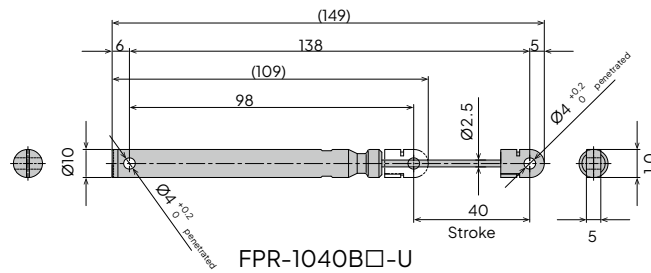


Model Description

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| F | P | D | - | 1 | 0 | 4 | 0 | B | 1 | - | U |
| 1 | | | | 2 | | 3 | | 4 | 5 | | 6 |

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

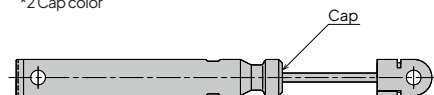
External Dimensions



Specification

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

*2 Cap color



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

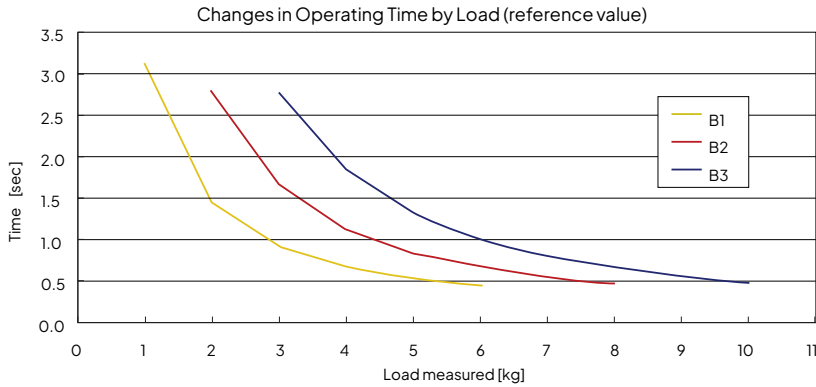
● □ will be filled in with either B or C

Common Specification

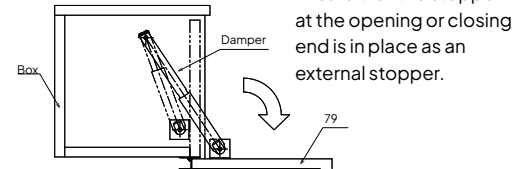
| | |
|----------------------------|------------------------------------|
| Stroke [mm] | Load [kg] |
| External diameter [mm] | 1 |
| Mass [g] (reference value) | FPR-1040B-U=11.6, FPR-1040C-U=14.2 |
| Main unit material | Resin |
| Operating temperature [°C] | 5~40 |

Products specification might be changed without notice.

Graph of Operating Time by Load



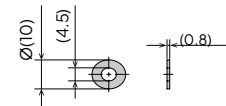
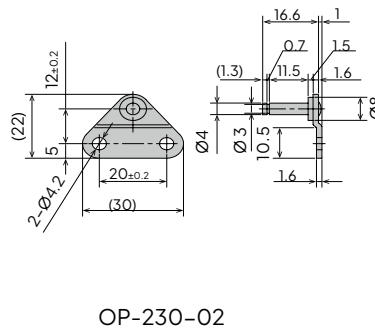
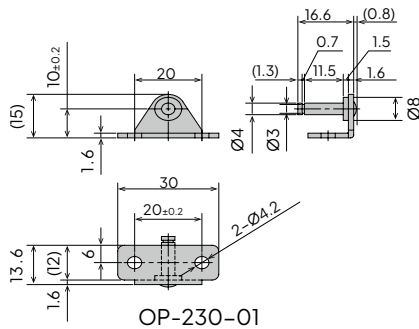
[Examples of Specifications Used]



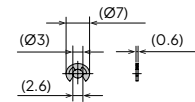
Optional Parts

Model
OP-230-01

Model
OP-230-02



Supplied accessory:
plain washer

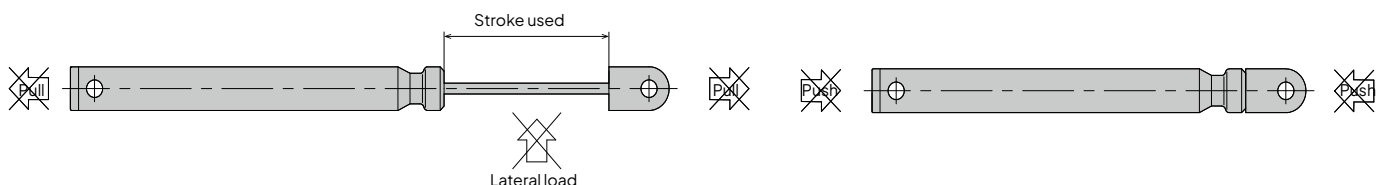


Supplied accessory:
E-shaped retaining ring (nominal 3 equivalent)

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

Precautions for Use

- The soft absorber generates the drag in the drawing direction (This will cause the damage or failure of the soft absorber.)
- Unusable to generate the resistance in the pushing direction.
- Use with an external stopper.
- Ensure that sufficient mounting strength is secured for this product.
- 2 or more of this product can be used in parallel
- Do not use this product in a vacuum or a location where it may come in contact with oil.
- Ensure that an eccentric load is not applied to the soft absorber.
- Do not pull the soft absorber beyond the stroke used.
- Do not press the soft absorber in beyond the stroke used. (This will cause the damage or failure of the soft absorber.)
- When the gap between the pressing time and the returning time of the piston rod is large, the durability may be affected. Confirm its performance in an actual machine before use.
- For the products with cover, do not pull the cover part. When you need to pull the product, insert a rod into the Ø4 through hole and pull the product by holding the rod.



Soft Absorber

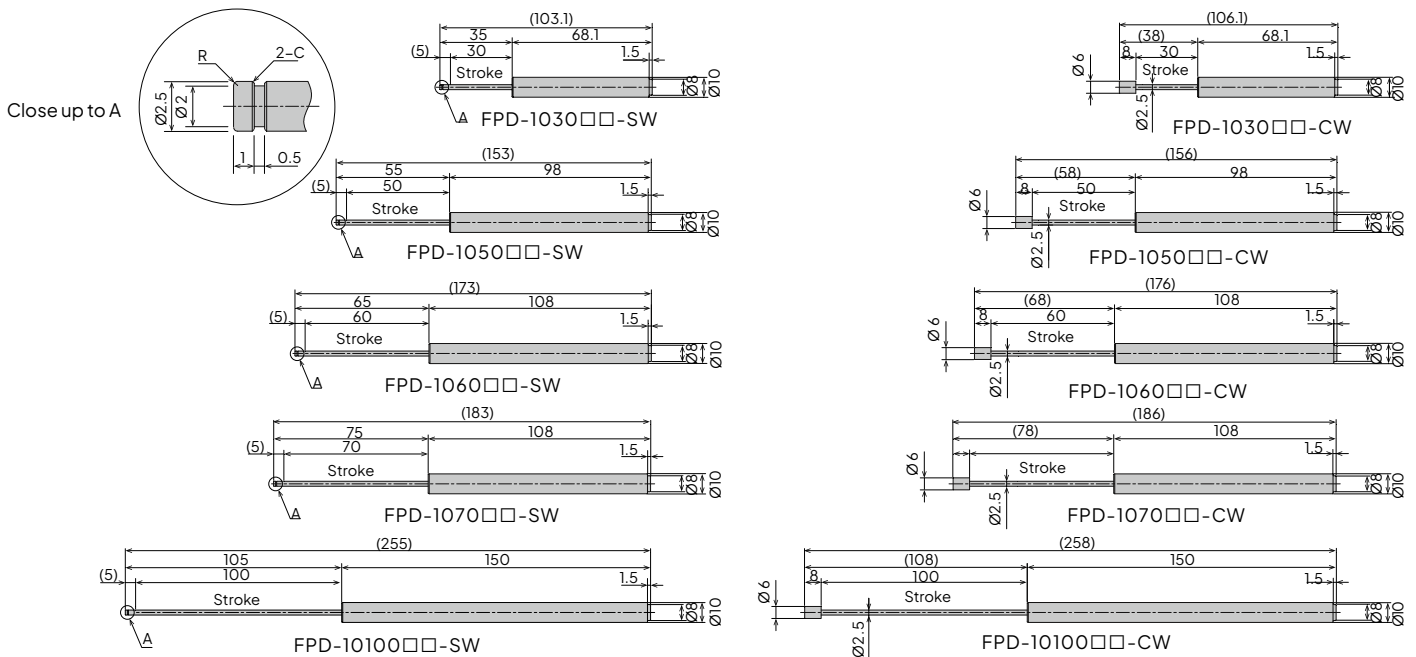
FPD-1030/1050/1060/1070/10100 Series



| Model Description | | | | | | | | | |
|-------------------|---|---|---|----|----|---|---|---|----|
| F | P | D | - | 10 | 30 | B | 1 | - | SW |
| 1 | | | | 2 | 3 | 4 | 5 | | 6 |

1. Series name
2. External diameter
3. Stroke
4. Self-return presence
 - B. With returning spring
 - C. Without returning spring
5. Symbols indicating characteristics
 - 1 Low load (low thrust) specifications
 - 2 Medium load (medium thrust) specifications
 - 3 High load (high thrust) specifications
6. Symbols indicating shape
 - sw Without cap
 - cw With cap

External Dimensions



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

Specifications

| | |
|---------------------------|--|
| Stroke[mm] | FPD-1030=30, FPD-1050=50, FPD-1060=60, FPD-1070=70, FPD-10100=100 |
| External diameter[mm] | Ø10 |
| Mass[g] | FPD-1030-SW=8, FPD-1030-CW=8.5, FPD-1050-SW=12, FPD-1050-CW=12.5, FPD-1060-SW=13.5, FPD-1060-CW=14, FPD-1070-SW=13.5, FPD-1070-CW=14, FPD-10100-SW=18.5, FPD-10100-CW=19 |
| Main unit material | Resin |
| Operating temperature[C°] | 5~4 |

Products specification might be changed without notice.

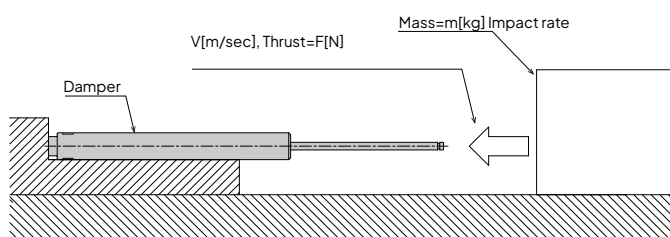
Motion performance

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

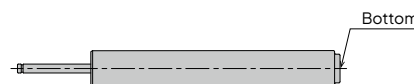
The above performance was measured using Fuji Latex's instruments.

So, please select dampers accordingly, and confirm operation on actual machines before selecting final models.

[Measurement conditions]

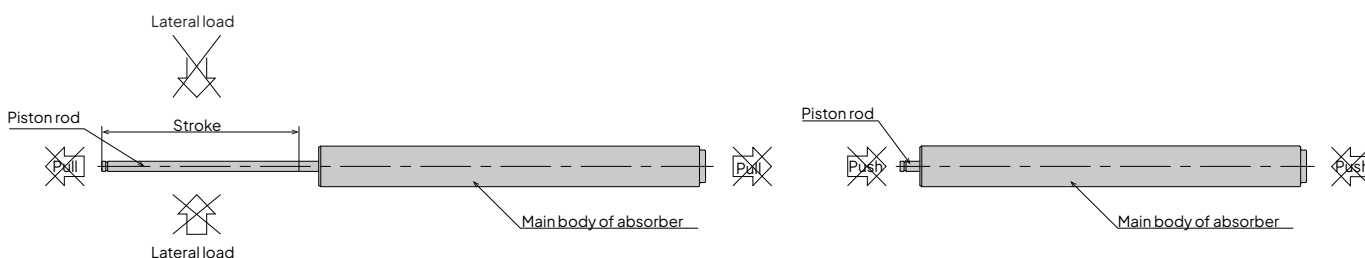


* Bottom color



Precautions in Use

- Do not use this product without carefully reading the attached owner's manual.
- Use with an external stopper.
- Ensure that sufficient mounting strength is secured for this product.
- 2 or more of this product can be used in parallel.
- Do not use this product in a vacuum or a location where it may come in contact with oil.
- Ensure that an eccentric load (lateral load) is not applied to the soft absorber.
- Do not pull the piston rod of the soft absorber more than stroke. (This will cause air to get inside the soft absorber, causing ineffective stroke, abnormal sounds, and other damage to the soft absorber.)
- Do not push the piston rod of the soft absorber more than stroke. (This will cause recovery failure and other damage to the soft absorber.)





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