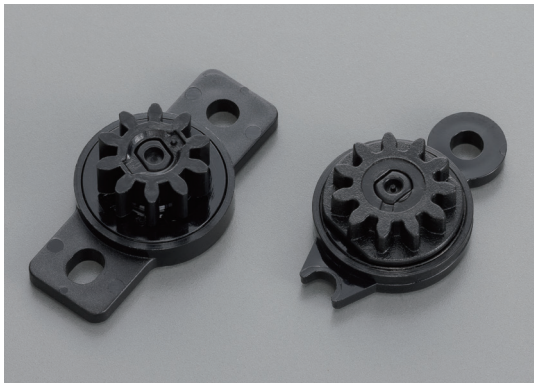
Rotary Damper

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

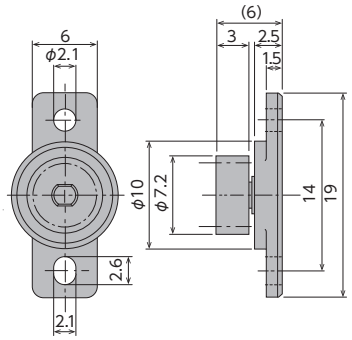
FRT-E2/E9 Series

RoHS Compliant

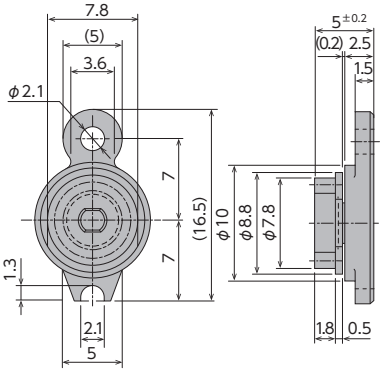
●Products specification might be changed without notice.



〈FRT-E2-※※※G1〉



〈FRT-E9-※※※G2〉



Specifications

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

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

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

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

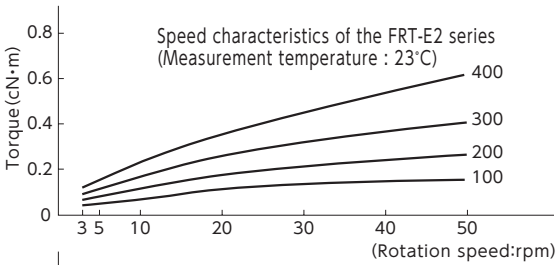
Gear Specifications

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

Damper Characteristics

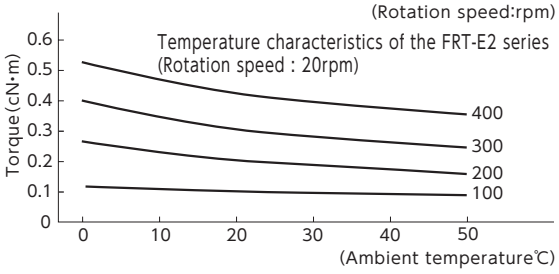
1. Speed characteristics

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



2. Temperature characteristics

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



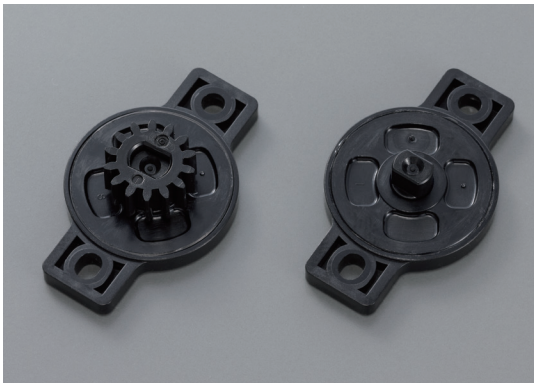
Rotary Damper

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

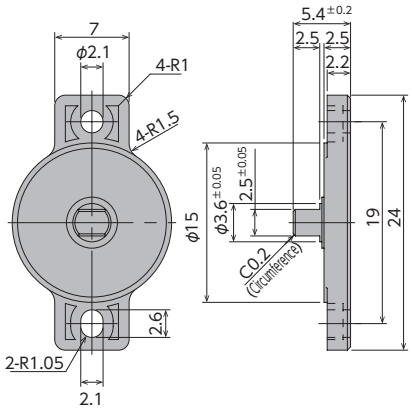
FRT-G2 Series

RoHS Compliant

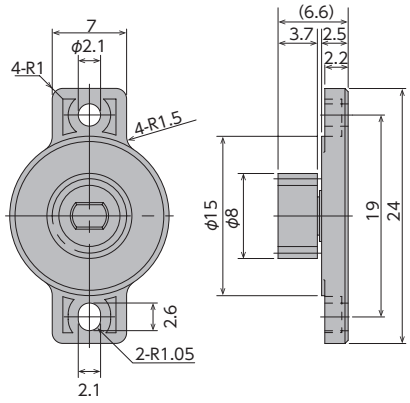
●Products specification might be changed without notice.



〈FRT-G2-※※※〉



〈FRT-G2-※※※G※〉



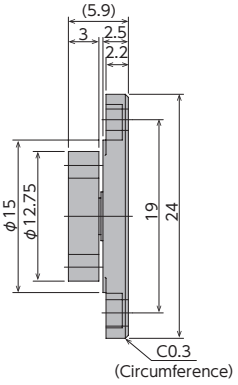
Specifications

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

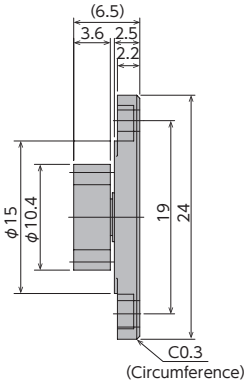
Note 1) Rated torque measured at a rotation speed of 20rpm at 23℃
Note 2) Models with gear bears G1, G2, or G3 at the end of their model numbers
Note 3) Torque can be customized by changing the oil viscosity (see Customizable Torque Chart on page 178)
Note 4) The diagrams above are outline drawings of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

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

〈FRT-G2-※※※G2〉



〈FRT-G2-※※※G3〉



Gear Specifications

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

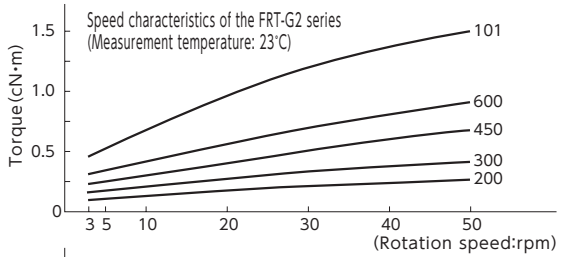
Damper Characteristics

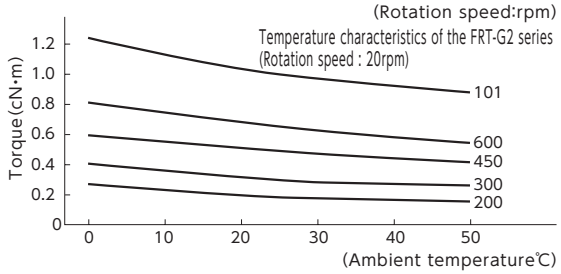
1. Speed characteristics

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

2. Temperature characteristics

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





Rotary Damper

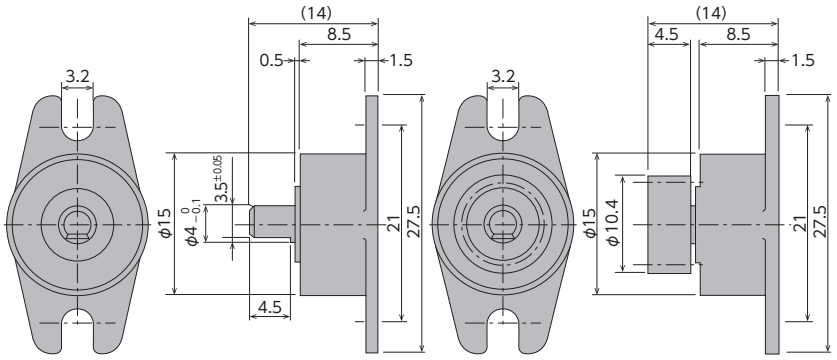
Bi-Directional Uni-Directional
Fixed Type Adjustable type Self-adjusting

FRT/FRN-C2 Series

RoHS Compliant

●Products specification might be changed without notice.





Specifications

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

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

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

Gear Specifications

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

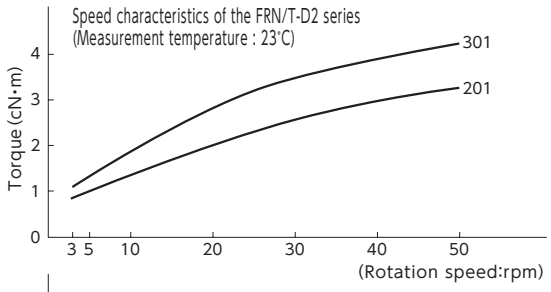
Damper Characteristics

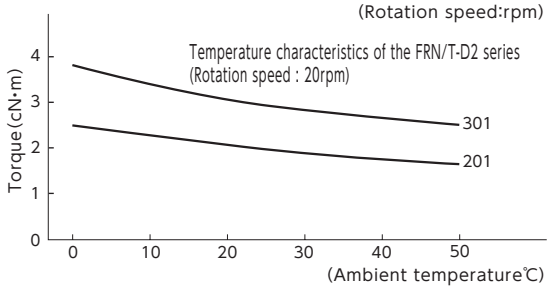
1. Speed characteristics

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

2. Temperature characteristics

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





Rotary Damper

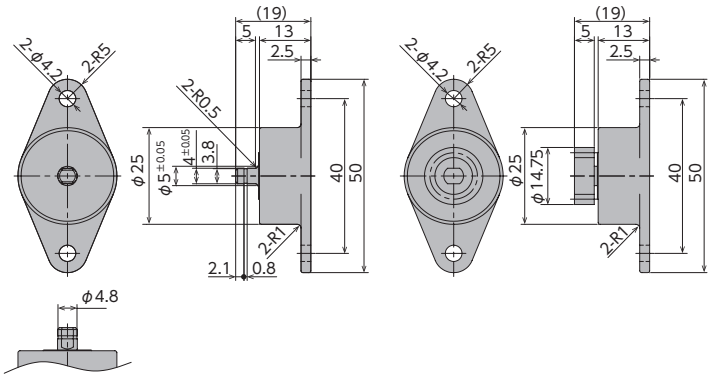
Bi-Directional | Uni-Directional
Fixed Type | Adjustable type | Self-adjusting

FRT/FRN-D3 Series

RoHS Compliant

●Products specification might be changed without notice.





Specifications

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

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

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

Gear Specifications

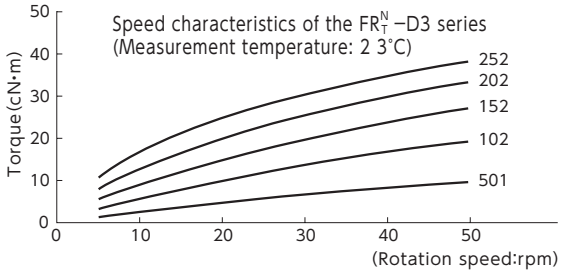
Type	Profile shifted spur gear
Tooth profile	Involute
Module	1.0
Pressure angle	20°
Number of teeth	12
Pitch circle diameter	φ12
Rack shift coefficient	+0.375

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

Damper Characteristics

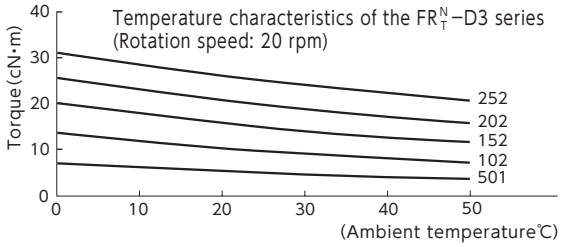
1. Speed characteristics

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



2. Temperature characteristics

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



Rotary Damper

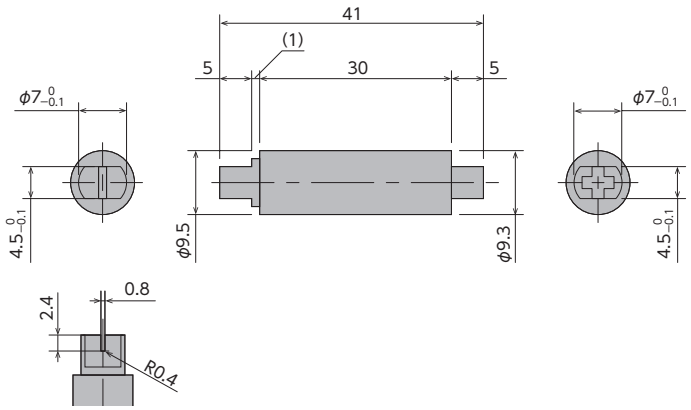
Bi-Directional | Uni-Directional
Fixed Type | Adjustable type | Self-adjusting

FRT-S1 Series

RoHS Compliant

●Products specification might be changed without notice.





Specifications

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

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

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

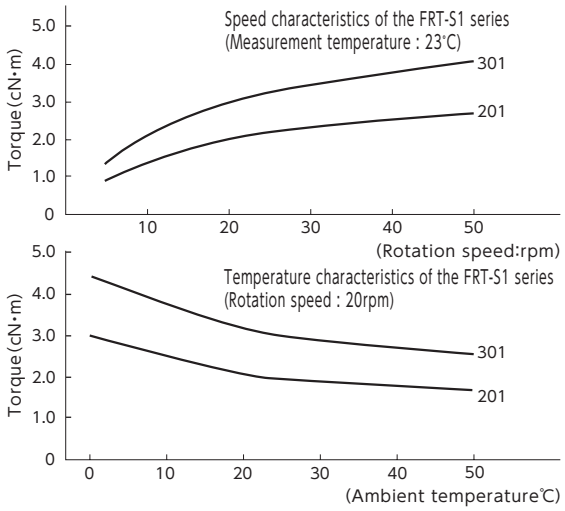
Damper Characteristics

1. Speed characteristics

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

2. Temperature characteristics

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



Rotary Damper

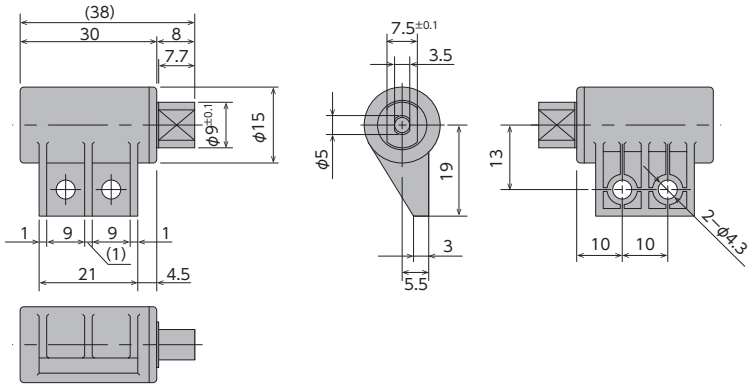
Bi-Directional | Uni-Directional
Fixed Type | Adjustable type | Self-adjusting

FRT-N1 Series

RoHS Compliant

●Products specification might be changed without notice.





Specifications

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

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

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

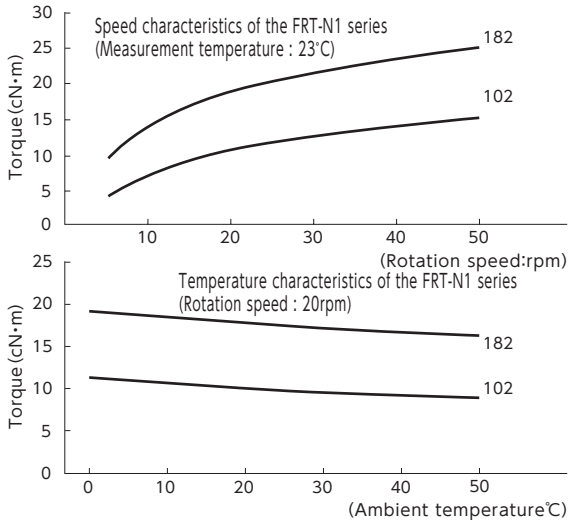
Damper Characteristics

1. Speed characteristics

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

2. Temperature characteristics

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



Rotary Damper

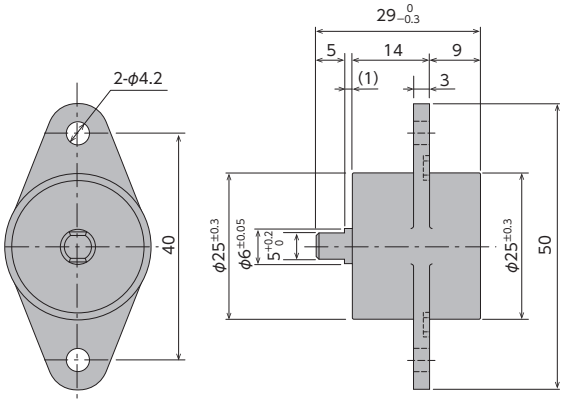
Bi-Directional | Uni-Directional
Fixed Type | Adjustable type | Self-adjusting

FRT-L1 Series

RoHS Compliant

●Products specification might be changed without notice.





Specifications

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

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

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

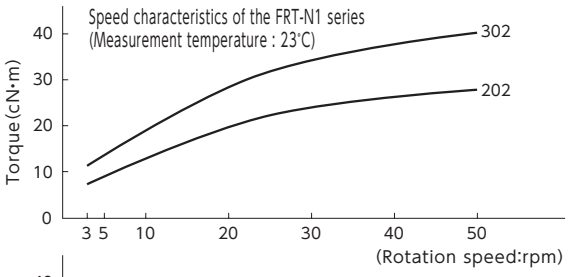
Damper Characteristics

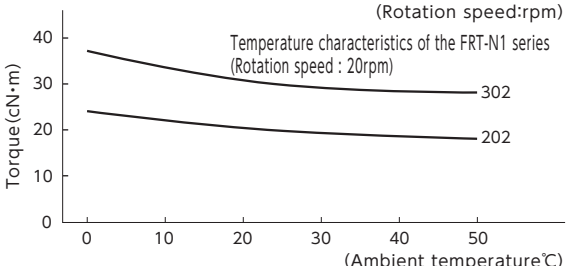
1. Speed characteristics

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

2. Temperature characteristics

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





Rotary Damper

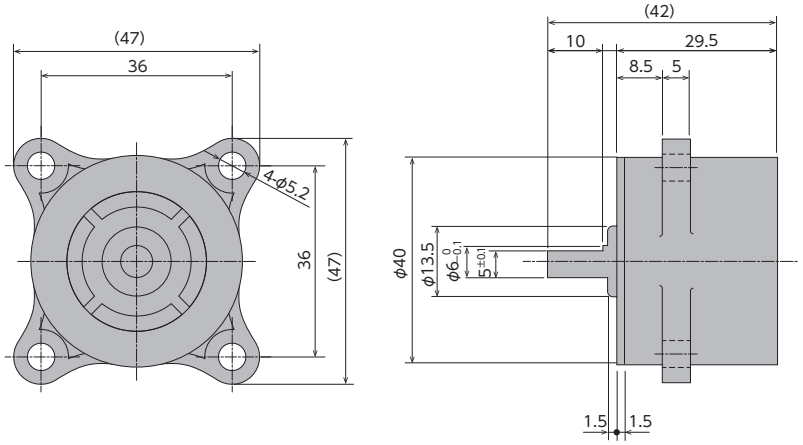
Bi-Directional | Uni-Directional
Fixed Type | Adjustable type | Self-adjusting

FRT/FRN-K2 Series

RoHS Compliant

●Products specification might be changed without notice.





Specifications

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

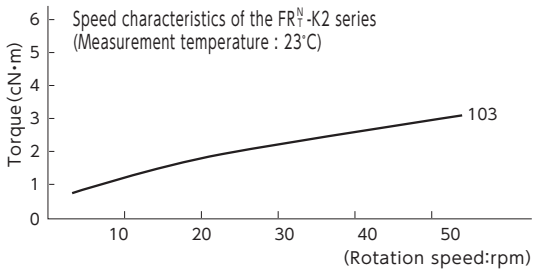
Note 1) Rated torque measured at a rotation speed of 20rpm at 23˚C
Note 2) Torque can be customized by changing the oil viscosity
(see Cutomizable Torque Chart on page 178)
Note 3) Dampers with gear can also be custom ordered.
● An FRT type damper generates torque in both directions and an FRN type generates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

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

Damper Characteristics

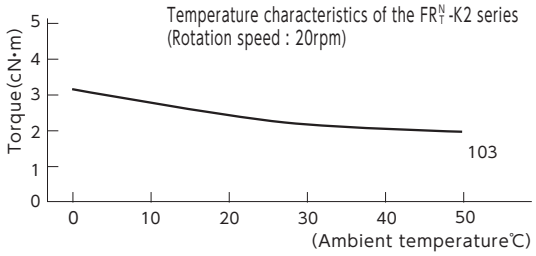
1. Speed characteristics

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



2. Temperature characteristics

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



Rotary Damper

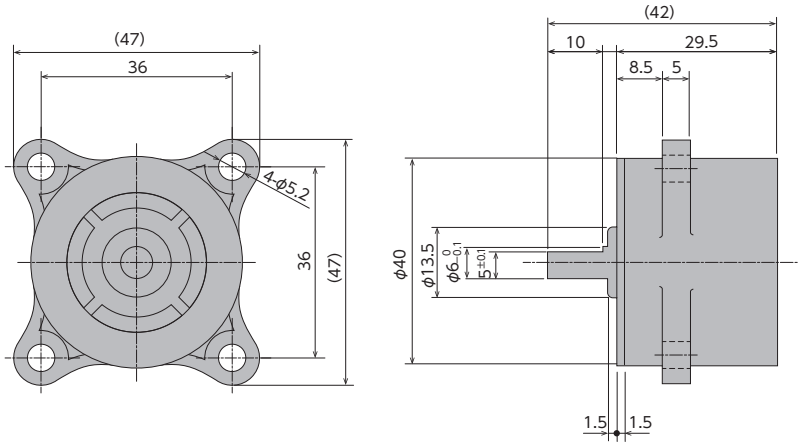
Bi-Directional Uni-Directional
Fixed Type Adjustable type Self-adjusting

FRT/FRN-F2 Series

RoHS Compliant

●Products specification might be changed without notice.





Specifications

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

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

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

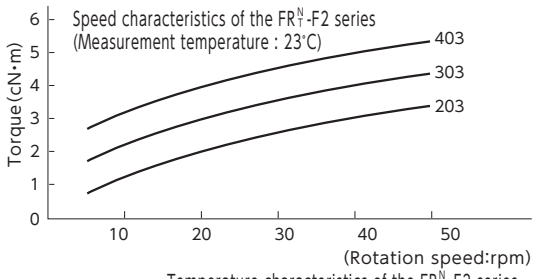
Damper Characteristics

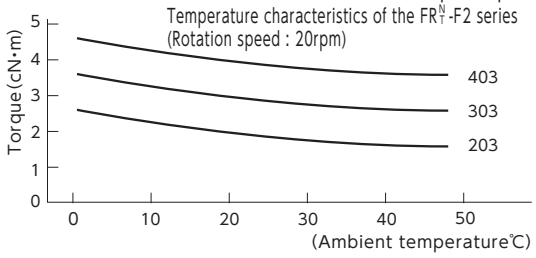
1. Speed characteristics

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

2. Temperature characteristics

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





MEMO

Rotary Damper

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



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

Specifications

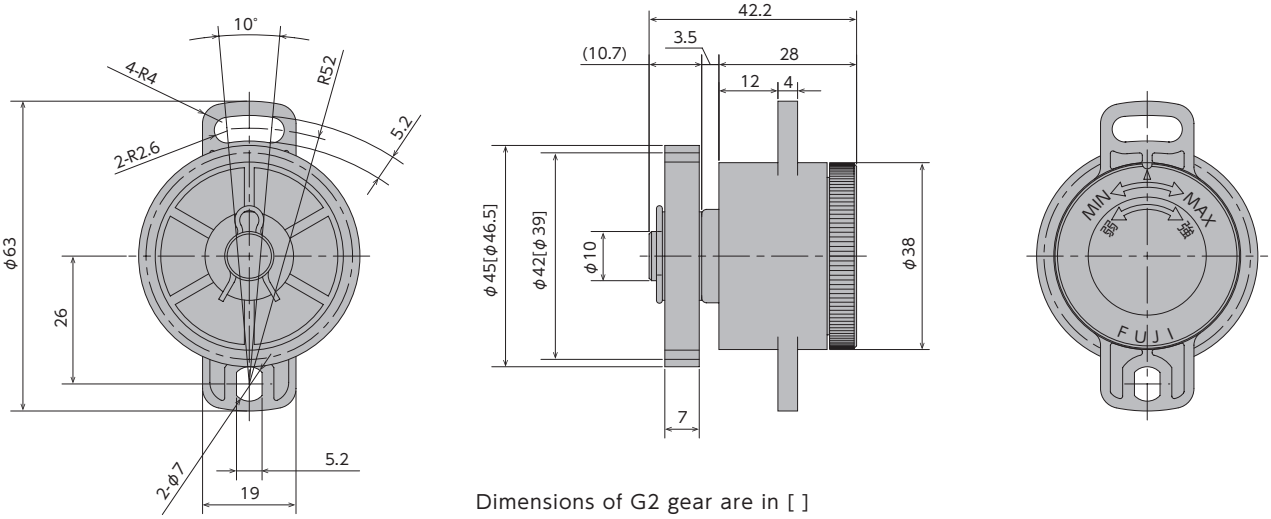
Model	Rated torque	Damping direction
FRN-P2-R501G*	0.05±0.01 N·m (0.5±0.1 kgf·cm)	Clockwise direction
FRN-P2-L501G*		Counter-clockwise direction
FRN-P2-R102G*	0.10±0.02 N·m (1.0±0.2 kgf·cm)	Clockwise direction
FRN-P2-L102G*		Counter-clockwise direction
FRN-P2-R202G*	0.20±0.04 N·m (2.0±0.4 kgf·cm)	Clockwise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

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

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

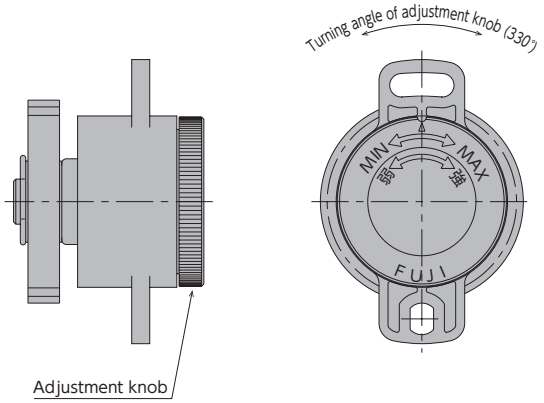
Gear Specifications

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

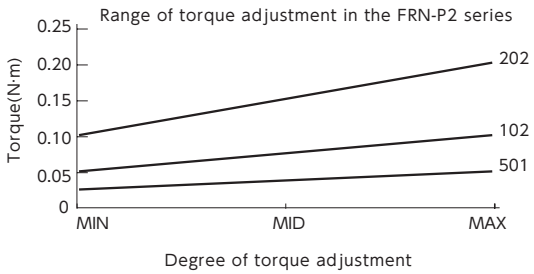


Dimensions of G2 gear are in [ ]

How to Adjust Torque



Range of Torque Adjustment

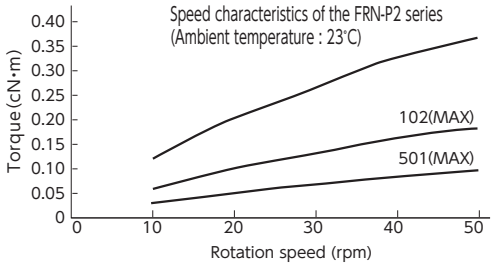


Turn the adjustment knob clockwise to increase damper torque and counterclockwise to decrease it.

Characteristics

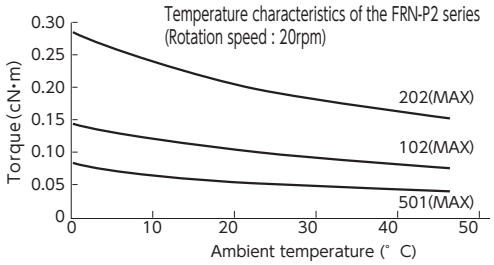
1. Speed characteristics

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

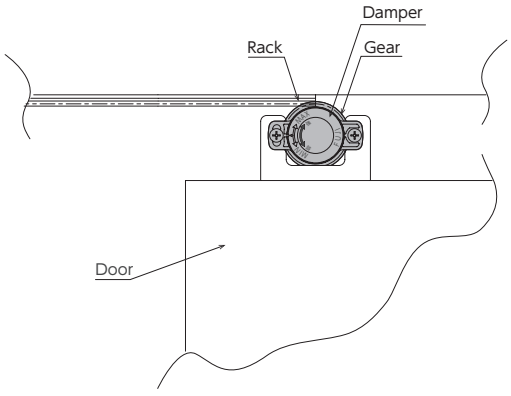


2. Temperature characteristics

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



Example of Using a Damper



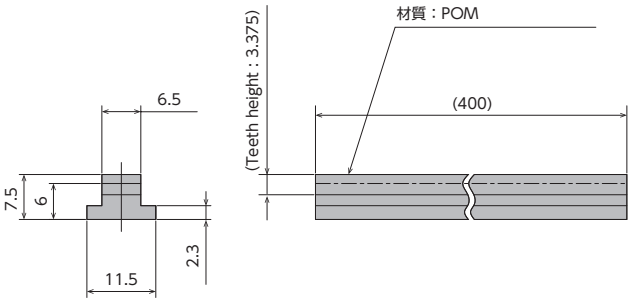
Application of the FRN-P2 Series

Option Rack

G1 Rack : ROP-020P2-1

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

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



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

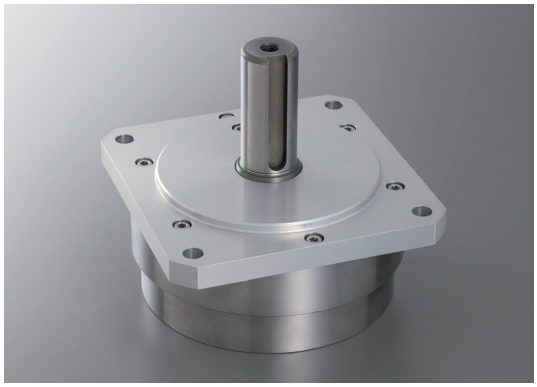
Rotary Damper

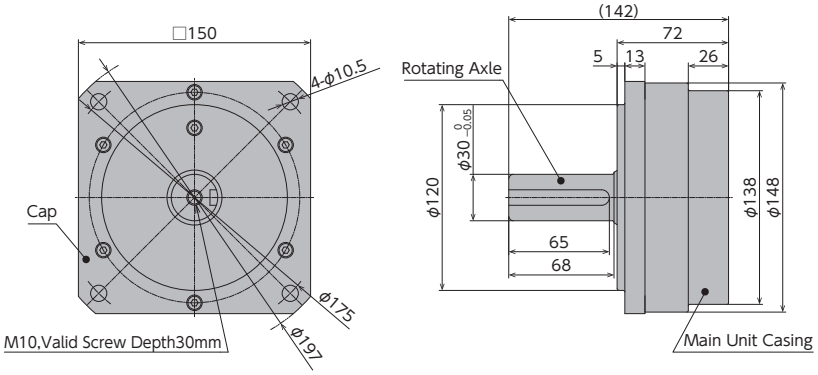
Customized orders | Bi-Directional | Uni-Directional
Fixed Type | Adjustable type | Self-adjusting

FRT-W1

RoHS Compliant

●Products specification might be changed without notice.





Specifications

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

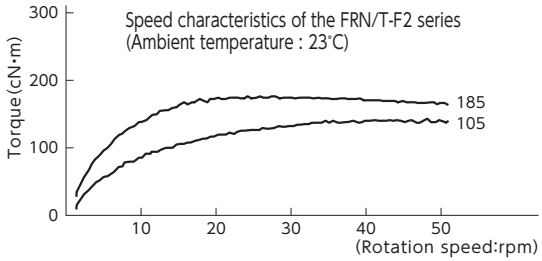
Note 1) Rated torque measured at a rotation speed of 20rpm at 23℃

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

Damper Characteristics

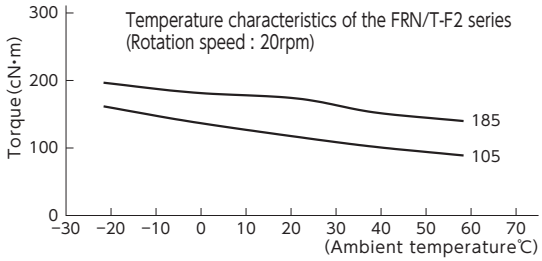
1. Speed characteristics

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



2. Temperature characteristics

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



MEMO

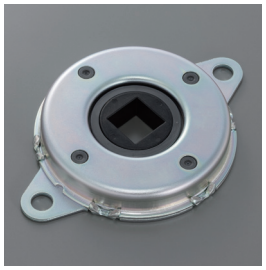
Disk Damper

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

FDT-47A/FDN-47A Series

RoHS Compliant

●Products specification might be changed without notice.

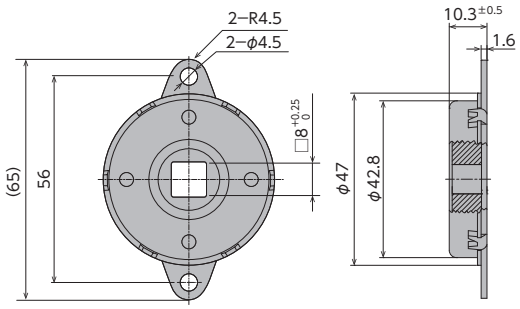



* Max. rotation speed 50rpm
* Max. cycle rate 12cycle /min
* Operating temperature −10～50℃
* Weight FDT- 47A : 50g
  FDN- 47A : 55g
* Main body material Iron (SPFC)
* Rotating (shaft) material Nylon (with glass)
* Oil typel Silicone oil

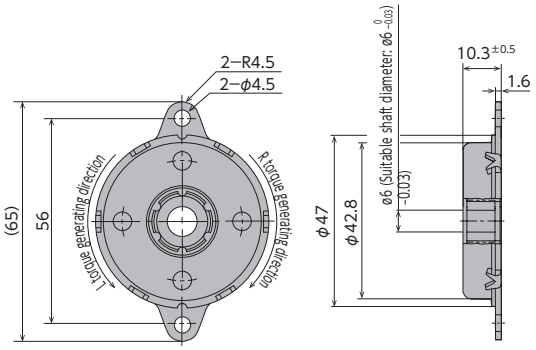
Specifications

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

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



<FDT-47A-※※※>



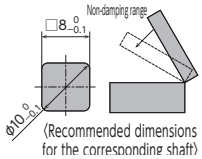
<FDN-47A-R／L※※※>

How to Use the Damper

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

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

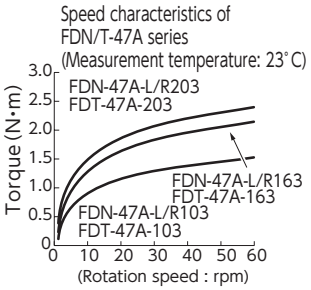
4. To insert a shaft into FDN-47A, insert the shaft while spinning it in the idling direction of the one-way clutch. (Do not force the shaft in from the regular direction. This may damage the oneway clutch.)
5. When using FDT-47A, please ensure that a shaft with specified angular dimensions is inserted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



Damper Characteristics

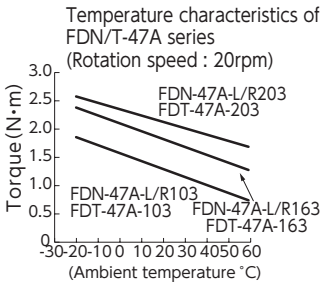
1. Speed characteristics

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



2. Temperature characteristics

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



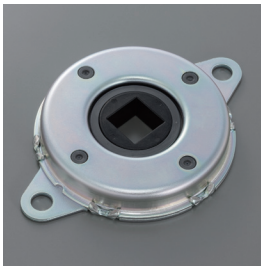
Disk Damper

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

FDT-57A/FDN-57A Series

RoHS Compliant

●Products specification might be changed without notice.



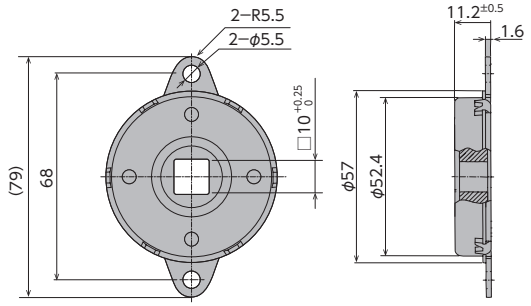


- ∗ Max. rotation speed 50rpm
- ∗ Max. cycle rate 12cycle /min
- ∗ Operating temperature −10～50℃
- ∗ Weight FDT-57A : 75g
  FDN-57A : 94g
- ∗ Main body material Iron (SPFC)
- ∗ Rotating (shaft) material Nylon (with glass)
- ∗ Oil typel Silicone oil

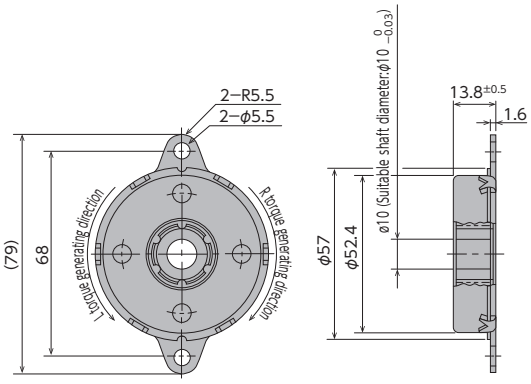
Specifications

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

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



<FDT-57A-※※※>



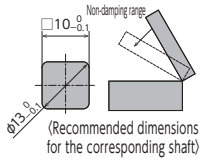
<FDN-57A-R／L※※※>

How to Use the Damper

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

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

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

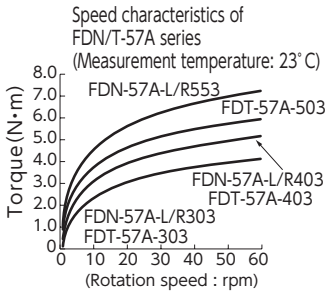


(Recommended dimensions for the corresponding shaft)

Damper Characteristics

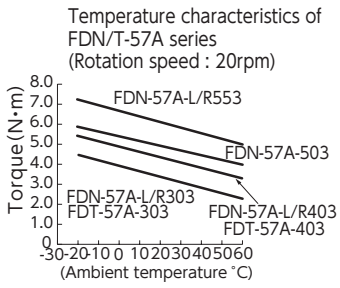
①1. Speed characteristics

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



2. Temperature characteristics

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



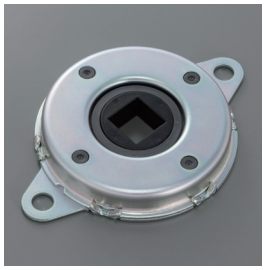
Disk Damper

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

FDT-63A/FDN-63A Series

RoHS Compliant

●Products specification might be changed without notice.

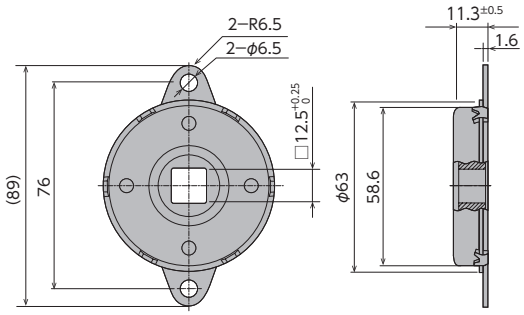



* Max. rotation speed 50rpm
* Max. cycle rate 12cycle /min
* Operating temperature −10～50℃
* Weight FDT-63A : 92g
  FDN-63A : 115g
* Main body material Iron (SPFC)
* Rotating (shaft) material Nylon (with glass)
* Oil typel Silicone oil

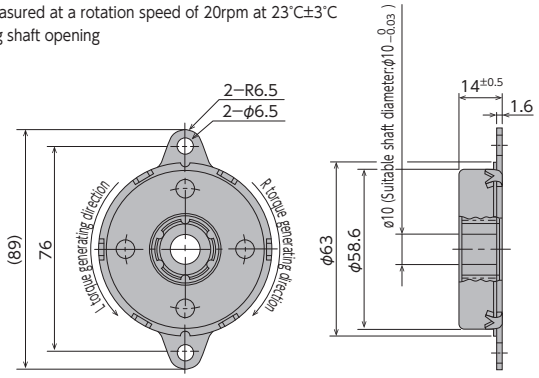
Specifications

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

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



<FDT-63A-※※※>



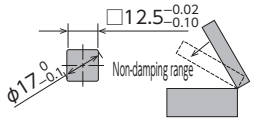
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How to Use the Damper

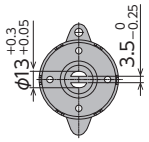
1. Dampers may generate torque in both directions, clockwise, or counter-clockwise.
2. Please make sure that a shaft attached to a damper has a bearing, as the damper itself is not fitted with one.
3. Please refer to the recommended dimensions below when creating a shaft for FDN-63A. Not using the recommended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

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

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



〈Recommended dimensions for the corresponding shaft〉

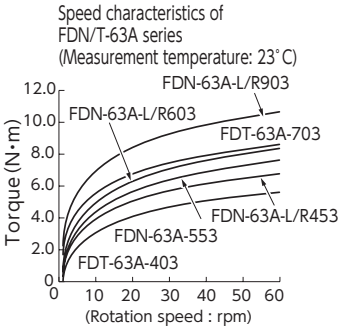


〈FDT-63B-703〉

Damper Characteristics

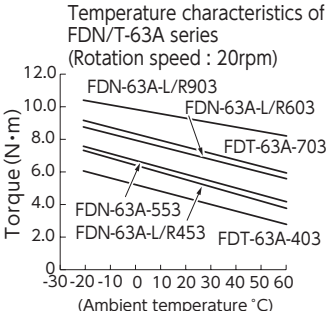
1. Speed characteristics

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



2. Temperature characteristics

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



Disk Damper

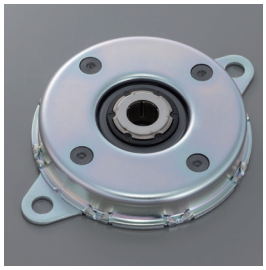
Fixed Type | Bi-Directional | Uni-Directional | Adjustable type | Self-adjusting

FDT-70A/FDN-70A Series

RoHS Compliant

●Products specification might be changed without notice.



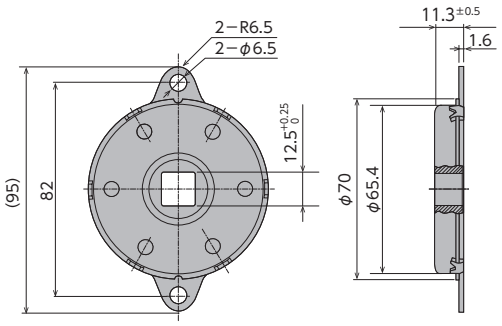


- ∗ Max. rotation speed 50rpm
- ∗ Max. cycle rate 12cycle /min
- ∗ Operating temperature −10～50℃
- ∗ Weight FDT-70A : 112g
  FDN-70A : 136g
- ∗ Main body material Iron (SPFC)
- ∗ Rotating (shaft) material Nylon (with glass)
- ∗ Oil typel Silicone oil

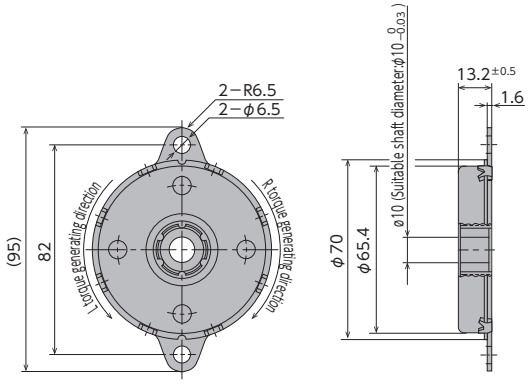
Specifications

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

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



<FDT-70A-903>



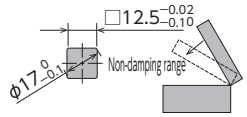
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How to Use the Damper

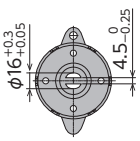
1. Dampers may generate torque in both directions, clockwise, or counter-clockwise.
2. Please make sure that a shaft attached to a damper has a bearing, as the damper itself is not fitted with one.
3. Please refer to the recommended dimensions below when creating a shaft for FDN-70A. Not using the recommended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

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

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



〈Recommended dimensions for the corresponding shaft〉

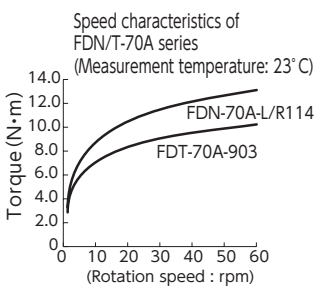


〈FDT-70B-903〉

Damper Characteristics

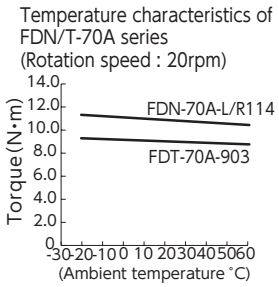
1. Speed characteristics

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



2. Temperature characteristics

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



Vane Damper

FYN-M1 Series

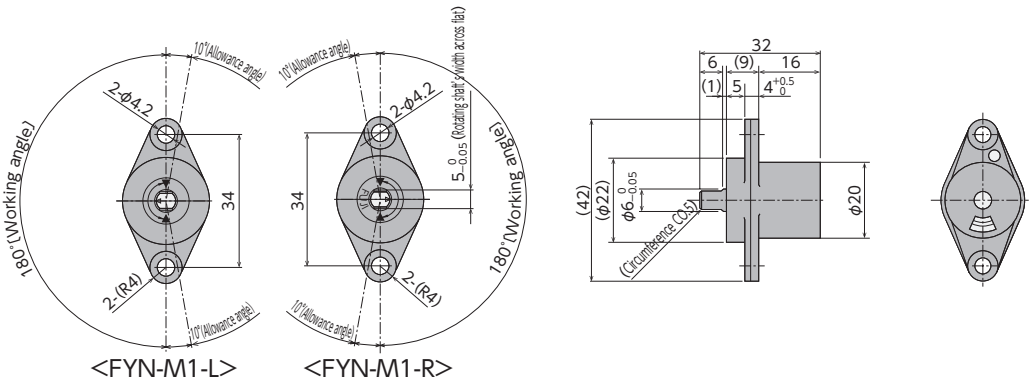


Specifications

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

Note) Measured at 23°C±2°C

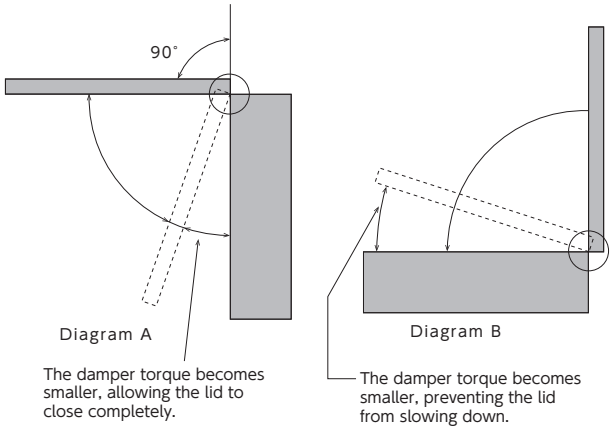
- ∗ Max. angle 180°
- ∗ Max. cycle rate 6cycle /min
- ∗ Operating temperature −5～50℃
- ∗ Weight 17±2g
- ∗ Main body Polybutylene terephthalate (PBT)
- ∗ Cap material Polybutylene terephthalate (PBT)
- ∗ Rotating shaft material Zinc die-cast (ZDC)
- ∗ Oil type Silicone oil
- ∗ Cap colour R: Black L: Gray



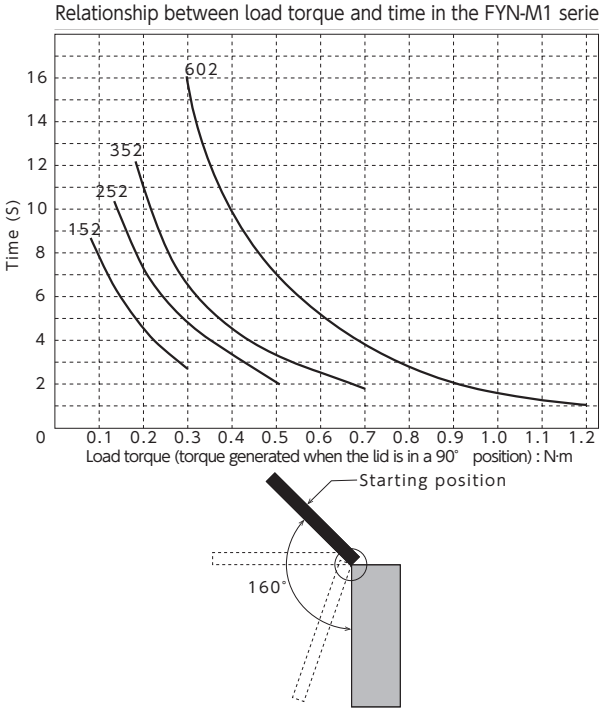
<FYN-M1-L> <FYN-M1-R>

How to Use the Damper

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

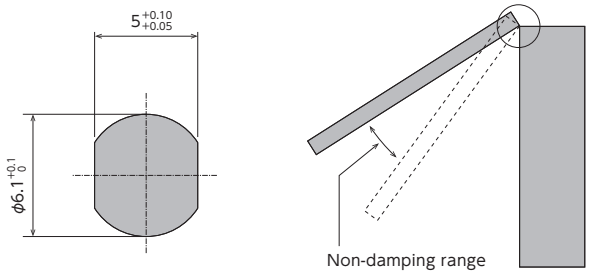


2. Below is a graph showing the relationship between the load torque and the time when a lid is closed from a 160° angle, as shown in the diagram.



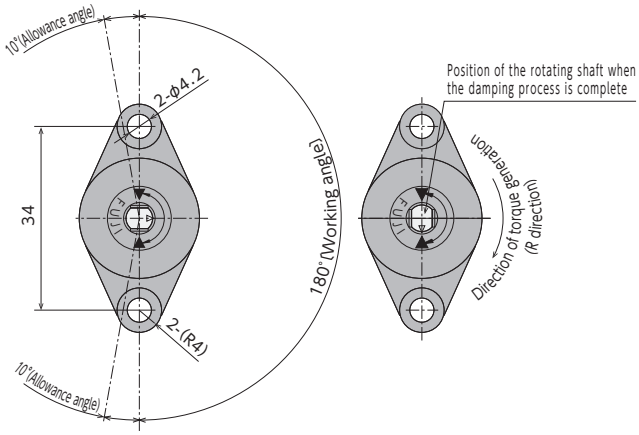
●Products specification might be changed without notice.

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



<Recommended dimensions for a rotating shaft opening>

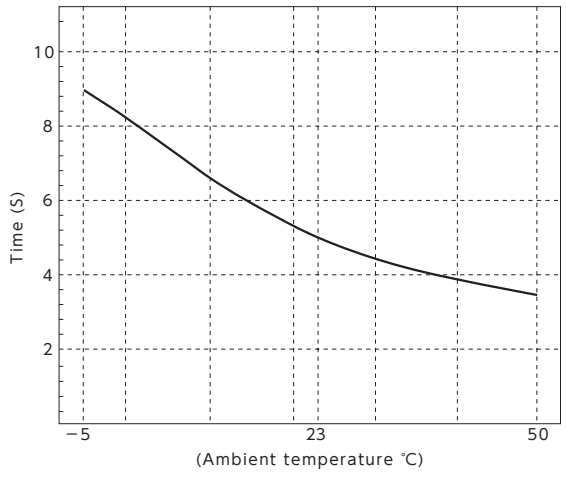
5. The standard for a damper's working angle is 180° with respect to the main body's attachment flange. Rotating the damper beyond this angle will cause damage to the damper. Please make sure that an external stopper is in place.



<FYN-M1-R>

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

Temperature characteristics of the FYN-M1 Series



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

Vane Damper

FYN-P1 Series

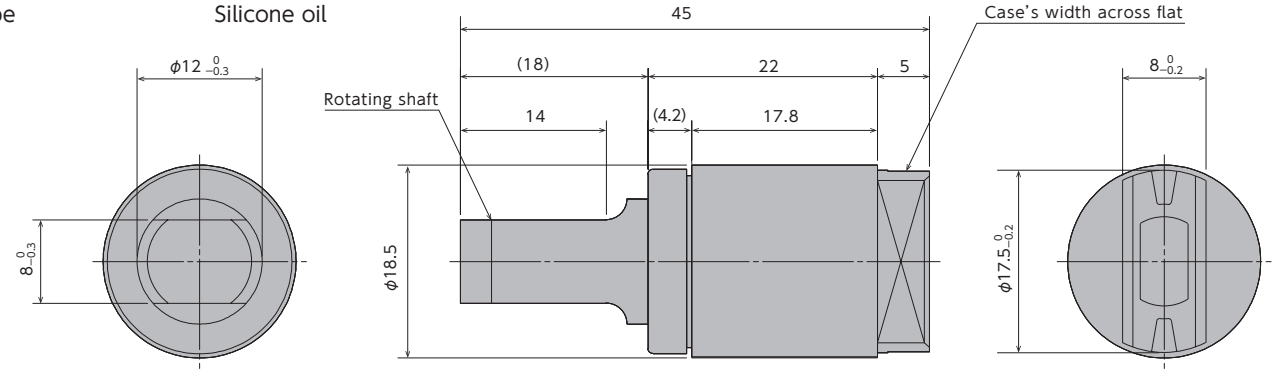


Specifications

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

Note) Measured at 23°C±2°C

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



How to Use the Damper

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

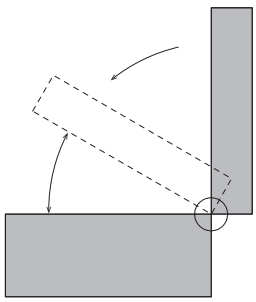


Diagram A

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

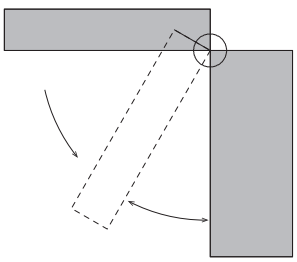
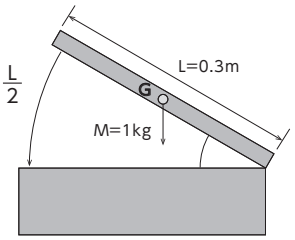


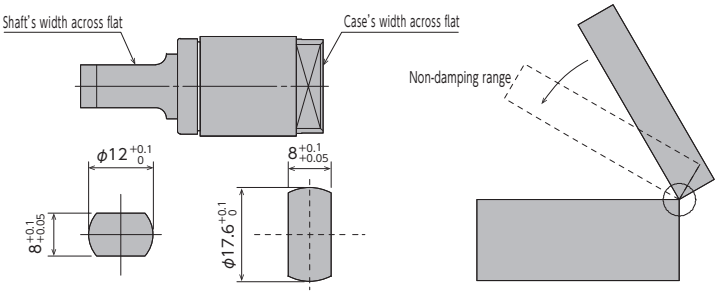
Diagram B

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

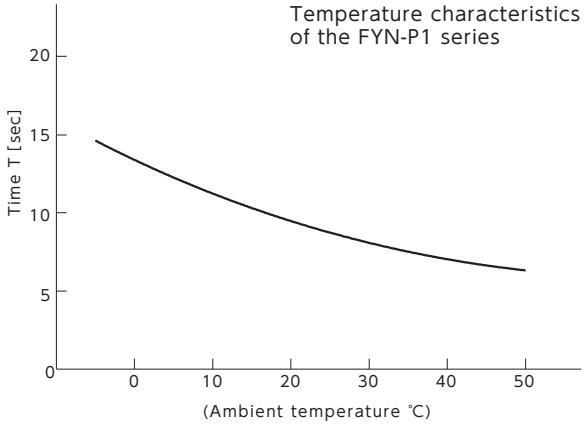
2. When using a damper on a lid, such as the one shown in the diagram, use the following selection calculation to determine the damper torque.
Example)
Lid mass M: 1kg
Lid dimensions L: 0.3m
Gravity Center Position : Assumed as $\frac{L}{2}$
Load torque : T=1×9.8×0.3÷2
=1.47N·m
Based on the above calculation,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



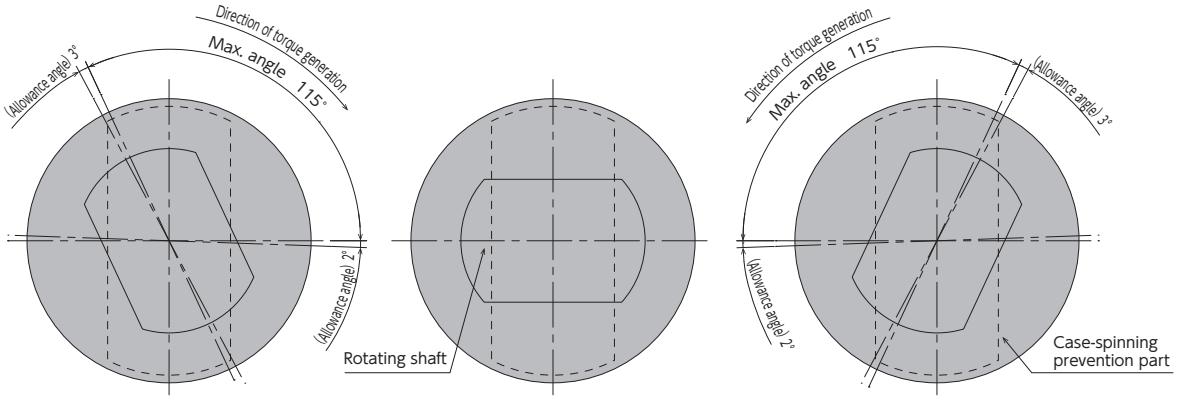
3. When connecting the rotating shaft to other parts, please ensure a tight fit between them. Without a tight fit, the lid will not slow down properly when closing. The corresponding dimensions for fixing the rotating shaft and the main body are as follows.



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



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



Rotation Start Position
FYN-P1-R

Rotation End Position
* Rotational position of rotating axle at shipping

Rotation Start Position
FYN-P1-L

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

Vane Damper

FYN-N2 Series

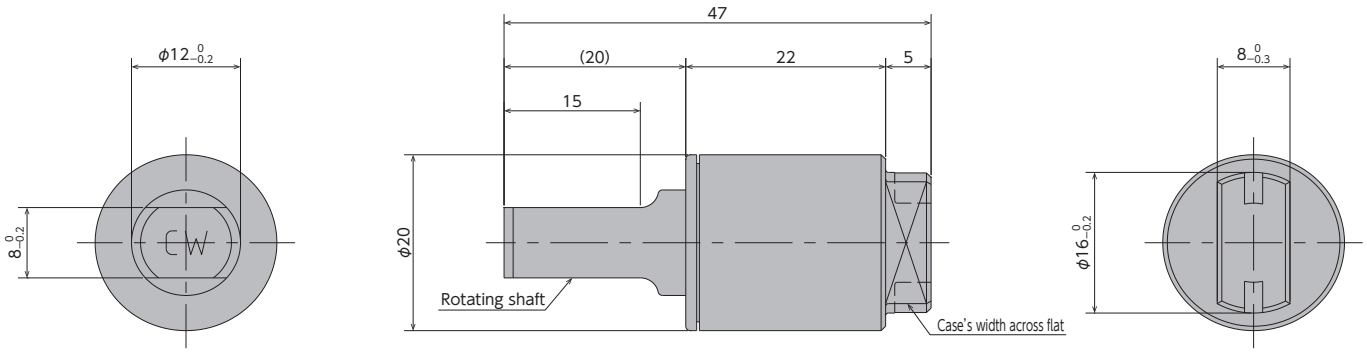


Specifications

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

Note) Measured at 23°C±2°C

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



How to Use the Damper

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

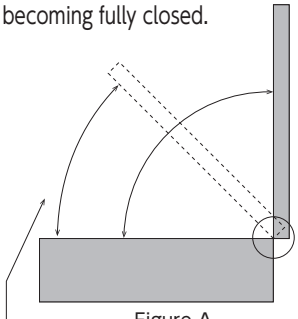


Figure A

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

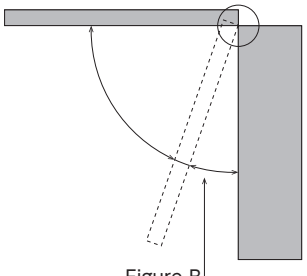
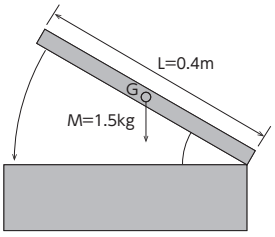


Figure B

Stronger damper torque prevents the lid from being fully closed.

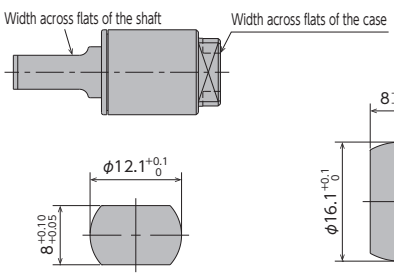
2. When using a damper with a lid shown in the diagram, determine the damper torque based on the following selection calculation.

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

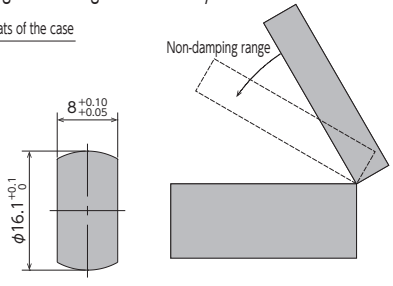


Based on the above calculation, select FYN-N2-*303.

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



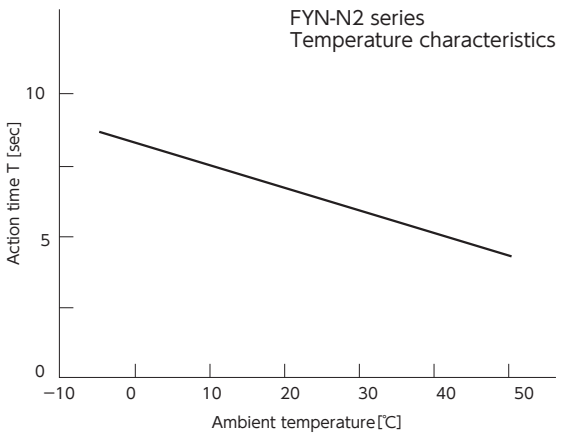
〈Recommended dimensions for mounting the rotating shaft〉



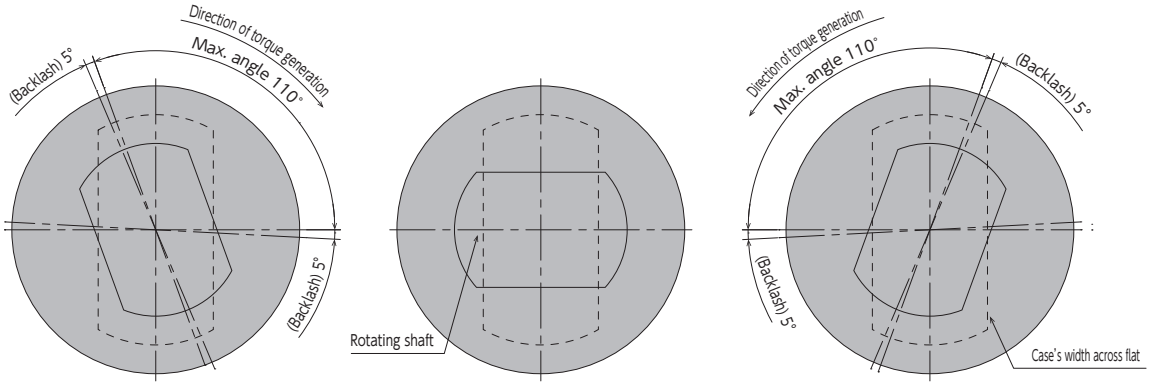
〈Recommended dimensions for mounting the body case〉

Products specification might be changed without notice.

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



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



Rotation starting point
FYN-N2-R

Rotation end point
*Rotating shaft angle for shipment

Rotation starting point
FYN-N2-L

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

Vane Damper

FYN-B1 Series

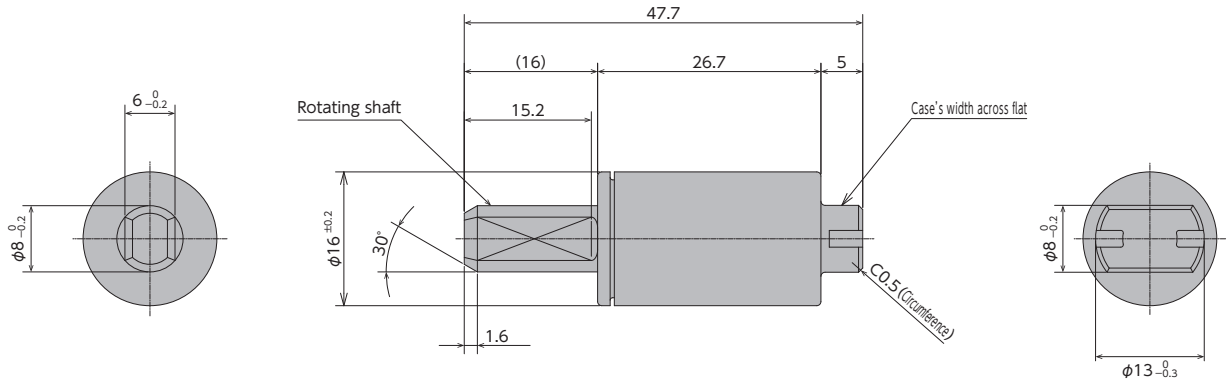


Specifications

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

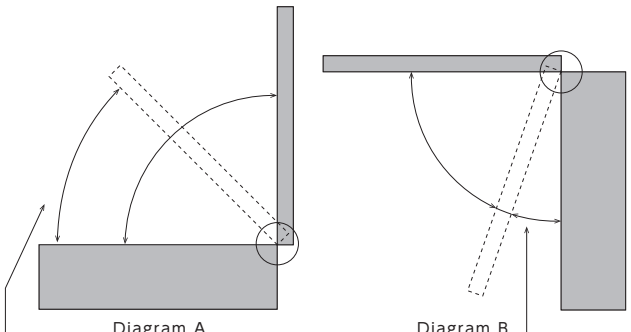
Note) Measured at 23°C±2°C

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



How to Use the Damper

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

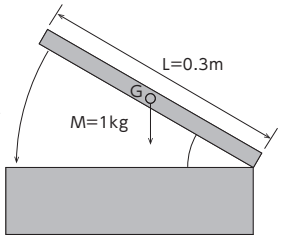


he damper torque becomes larger, preventing the lid from slowing down.

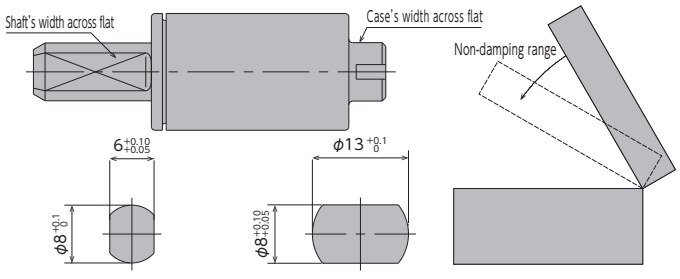
The damper torque becomes larger, preventing the lid from closing completely.

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

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



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

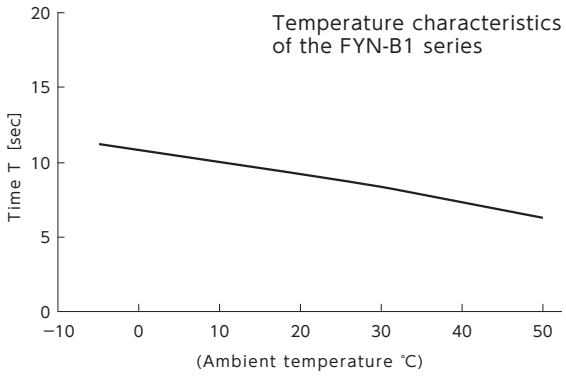


<Recommended dimensions for mounting a rotating shaft>

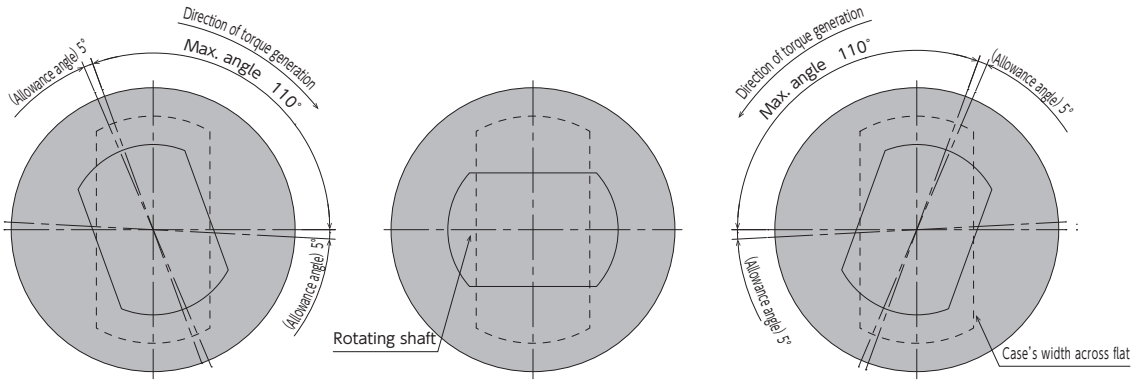
<Recommended dimensions for mounting the main body>

●Products specification might be changed without notice.

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



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



Rotation Start Position
FYN-B1-R

Rotation End Position
* Rotational position of rotating axle at shipping

Rotation Start Position
FYN-B1-L

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

Vane Damper

FYN-U1 Series

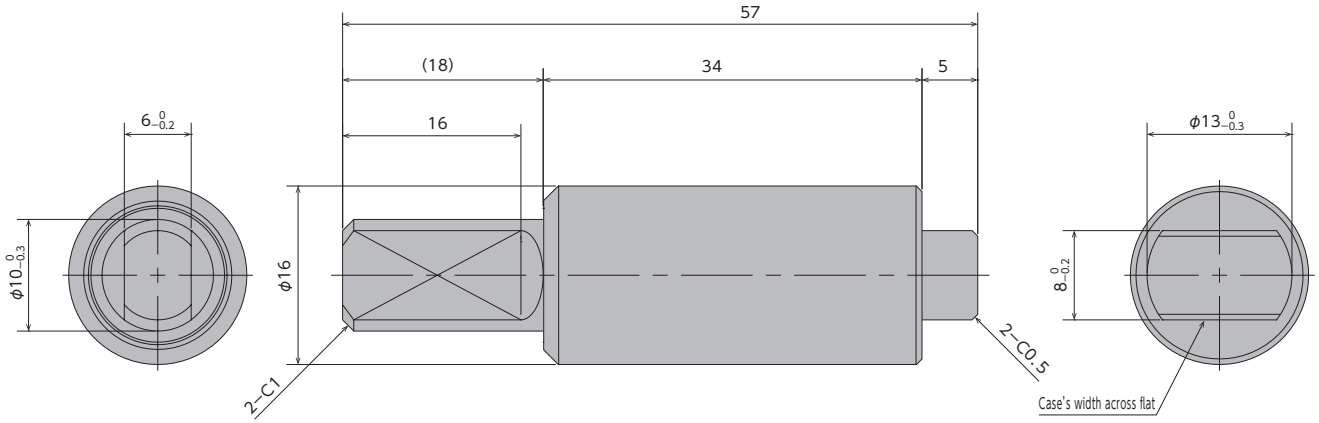


- Max. angle 115°
- Operating temperature −5～50℃
- Weight 40±4g
- Main body, rotating shaft materials Zinc die-cast (ZDC)
- Cap material Polyphenylene Sulphide (PPS)
- Oil type Silicone oil

Specifications

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

Note) Measured at 23°C±2°C



How to Use the Damper

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

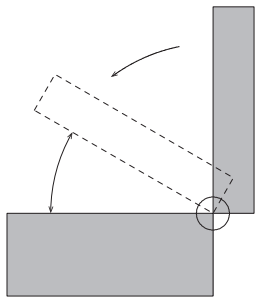


Diagram A

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

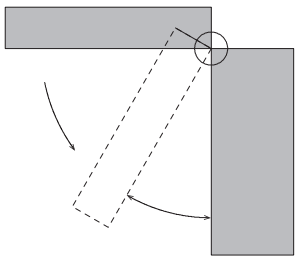
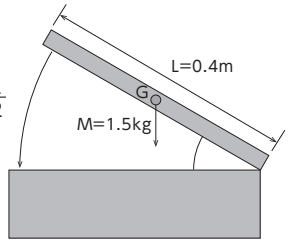


Diagram B

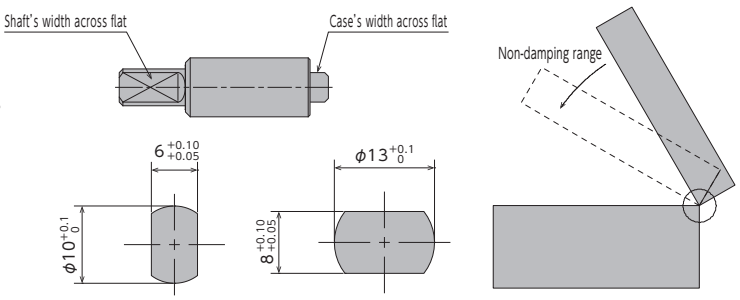
The damper torque becomes larger, preventing the lid from closing completely.

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

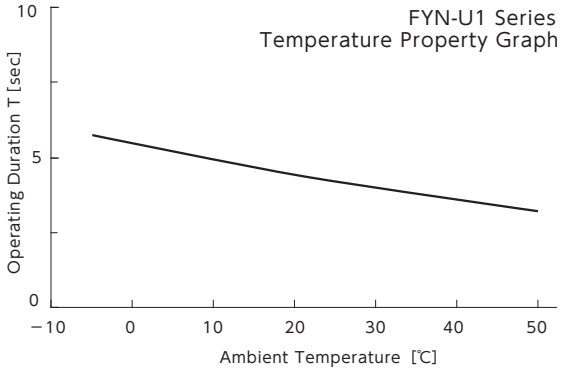
Example)
Lid mass M : 1.5kg
Lid dimensions L : 0.4m
Gravity Center Position : Assumed as $\frac{L}{2}$
Load torque : T = 1.5×9.8×0.4÷2
= 2.94N·m
Based on the above calculation,
FYN-U1-*303 is selected.



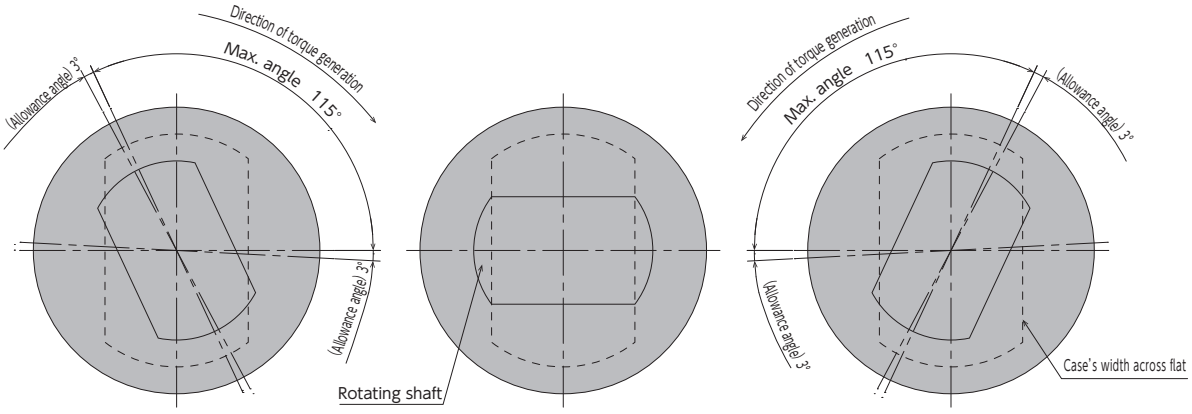
3. When connecting the rotating shaft to other parts, please ensure a tight fit between them. Without a tight fit, the lid will not slow down properly when closing. The corresponding dimensions for fixing the rotating shaft and the main body are as follows.



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



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



Rotation Start Position
FYN-U1-R

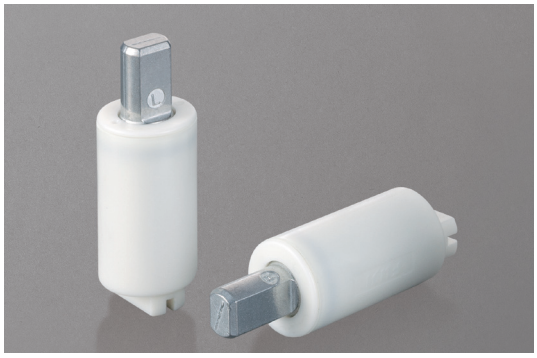
Rotation End Position
* Rotational position of rotating axle at shipping

Rotation Start Position
FYN-U1-L

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

Vane Damper

FYN-C1 Series

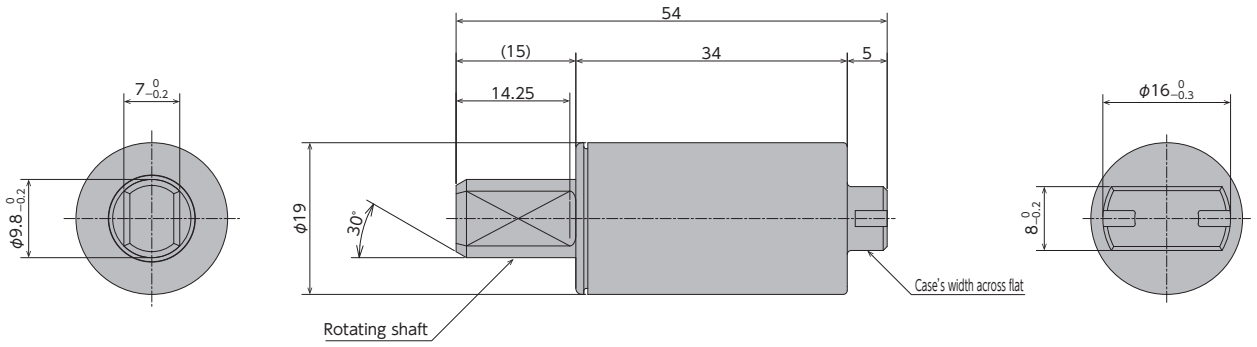


Specifications

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

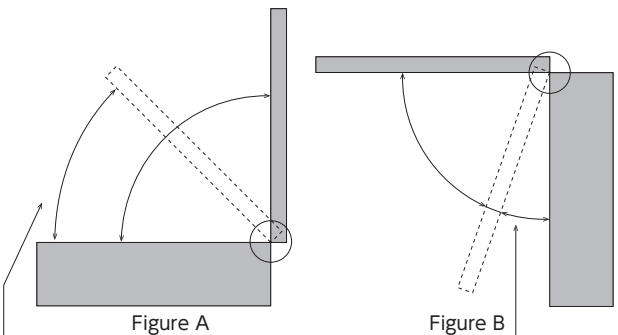
Note) Measured at 23°C±2°C

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



How to Use the Damper

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

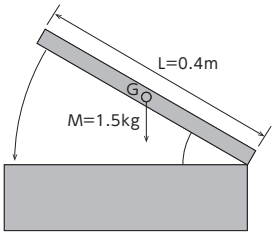


Stronger damper torque allows the lid to close gently until it is fully closed.

Stronger damper torque prevents the lid from being fully closed.

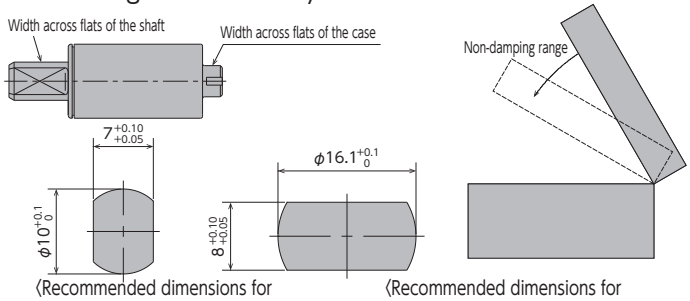
2. When using a damper with a lid shown in the diagram, determine the damper torque based on the following selection calculation.

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



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

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

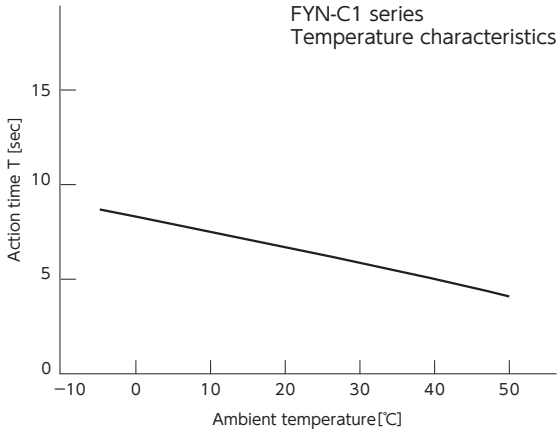


〈Recommended dimensions for mounting the rotating shaft〉

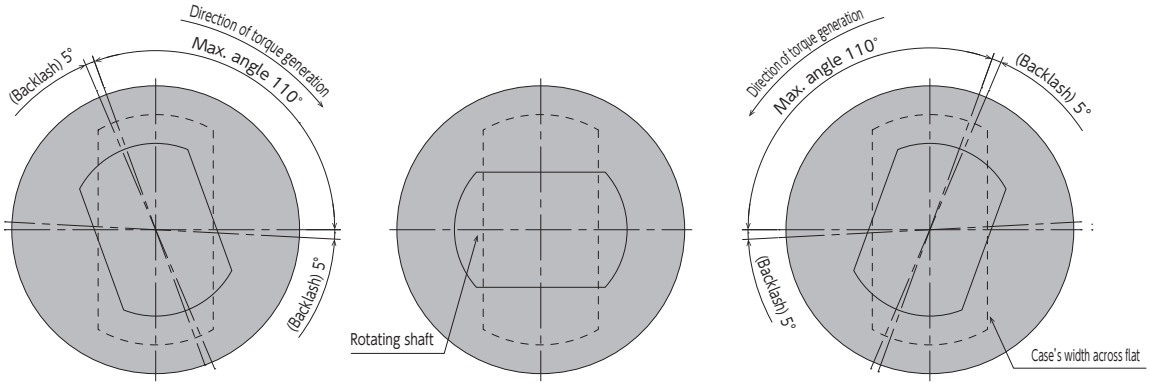
〈Recommended dimensions for mounting the body case〉

●Products specification might be changed without notice.

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



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



Rotation starting point
FYN-C1-R

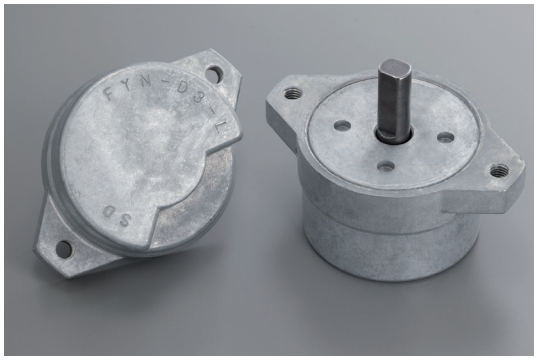
Rotation end point
*Rotating shaft angle for shipment

Rotation starting point
FYN-C1-L

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

Vane Damper

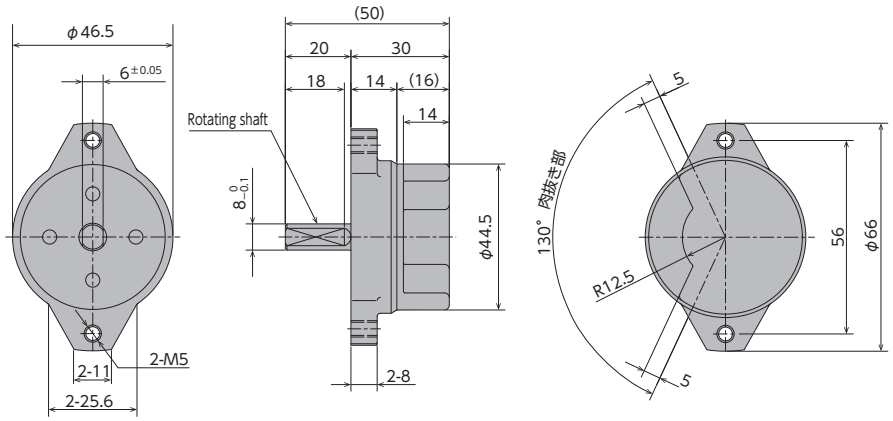
FYN-D3 Series



Specifications

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

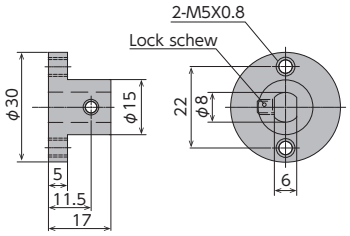
* Max. angle 180°
* Operating temperature −5～50℃
* Weight 215±10g
* Body and cap material Zinc die-cast (ZDC)
* Rotating shaft materia S25C
* Oil type Silicone oil



Optional Parts

Rotating shaft flange ROP-010H1

Applicable model	Model
FYN-D3	ROP-010H1



Rotating shaft flange
ROP−010H1

How to Use the Damper

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

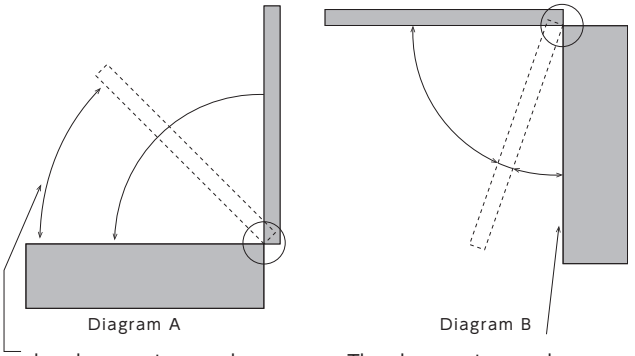


Diagram A

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

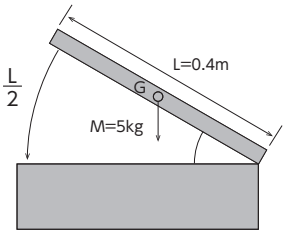
Diagram B

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

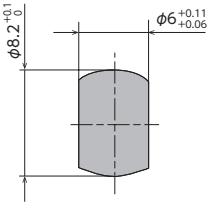
The angle in which the damper torque becomes large can be customized by modifying the inside orifice.

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

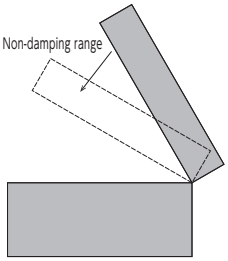
Example)
Lid mass M : 5kg
Lid dimensions L: 0.4m
Gravity Center Position : Assumed as $\frac{L}{2}$
Load torque : T = 5×9.8×0.4÷2
= 9.8N·m
Based on the above calculation,
FYN-D3-*104 is selected.



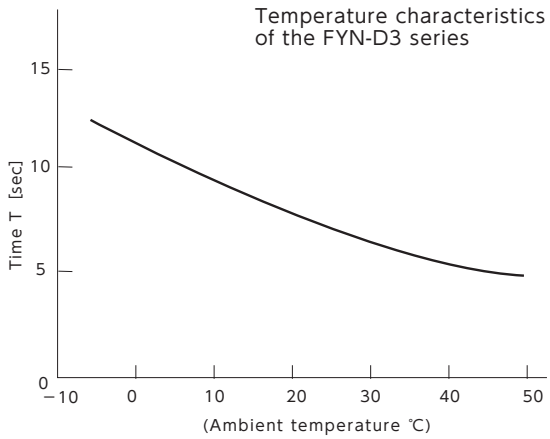
3. When connecting the rotating shaft to other parts, please ensure a tight fit between them. Without a tight fit, the lid will not slow down properly when closing. The corresponding dimensions for fixing the rotating shaft and the main body are as follows.



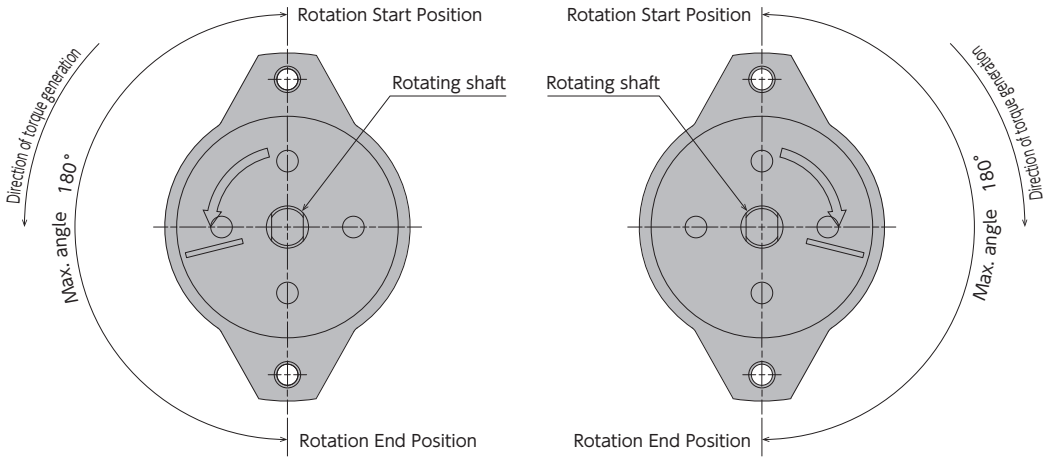
<Recommended dimensions for mounting a rotating shaft>



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



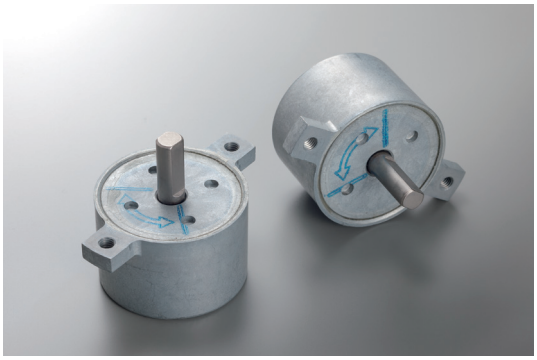
5. The damper's working angle is 110°, as shown below. Rotating the damper beyond this angle will cause damage to the damper. Please ensure that an external stopper is in place. The working angle is based on the width across flat for fixing, located towards the rear end of the main body. The position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



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

Vane Damper

FYT/FYN-D1(D2) Series

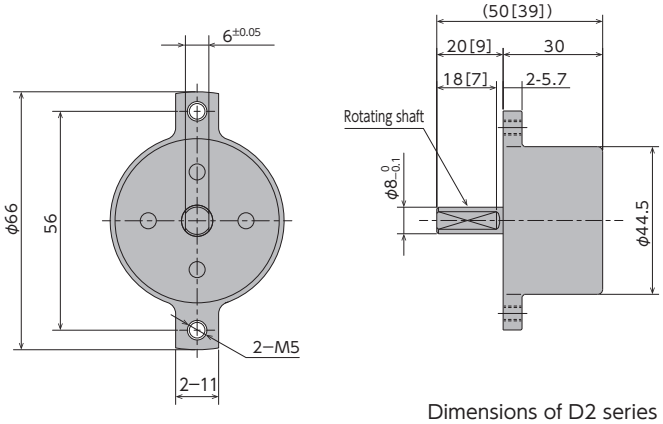


Specifications

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

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

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

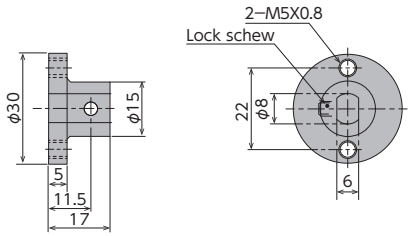


Dimensions of D2 series are in [ ]

Optional Parts

Rotating shaft flange ROP-010H1

Model
ROP-010H1



Rotating shaft flange
ROP-010H1

How to Use the Damper

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

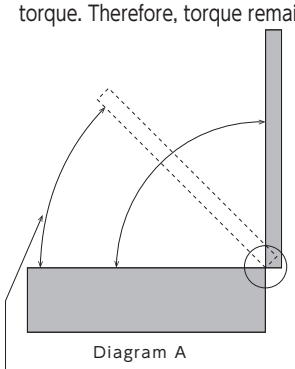


Diagram A

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

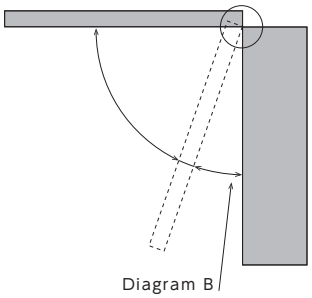
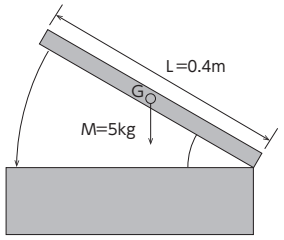


Diagram B

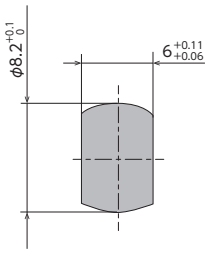
The damper torque becomes larger, preventing the lid from closing completely.

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

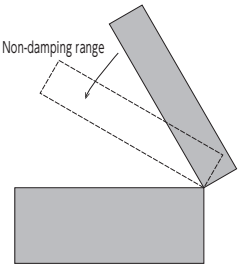
2. When using a damper on a lid, such as the one shown in the diagram, use the following selection calculation to determine the damper torque.
Example)
Lid mass M : 5kg
Lid dimensions L : 0.4m
Gravity Center Position : Assumed as $\frac{L}{2}$
Load torque : T = 5×9.8×0.4÷2
= 9.8N·m
Based on the above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



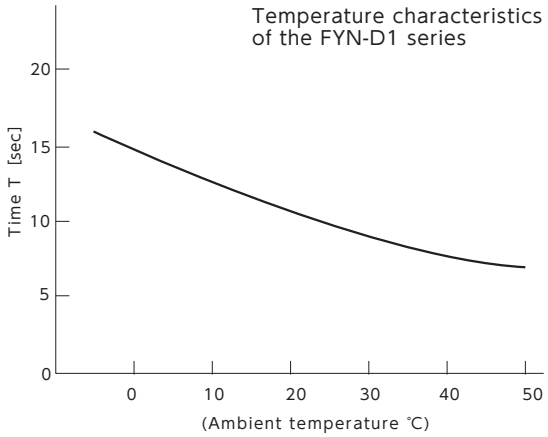
3. When connecting the rotating shaft to other parts, please ensure a tight fit between them. Without a tight fit, the lid will not slow down properly when closing. The corresponding dimensions for fixing the rotating shaft and the main body are as follows.



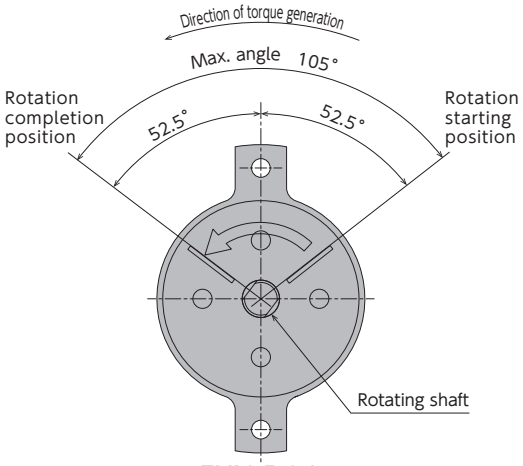
<Recommended dimensions for mounting a rotating shaft>



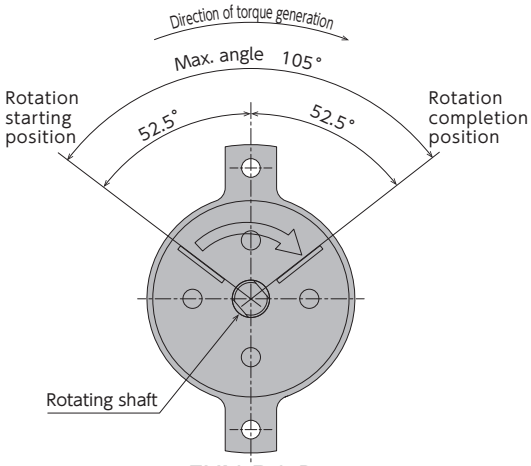
4. Damper characteristics vary according to the ambient temperature. In general, the damper characteristics become weaker as the temperature increases, and become stronger as the temperature decreases. This is because the viscosity of the oil inside the damper varies according to the temperature. When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



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



FYN-D1-L
FYN-D2-L



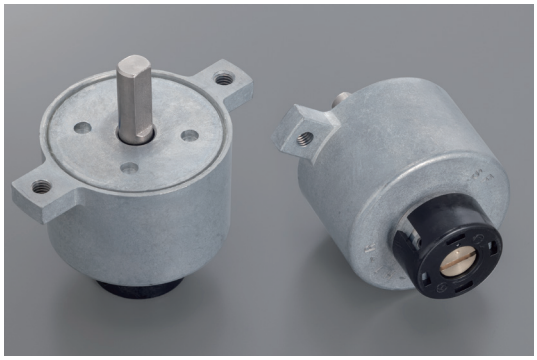
FYN-D1-R
FYN-D2-R

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

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

Vane Damper

FYT/FYN-H1(H2) Series

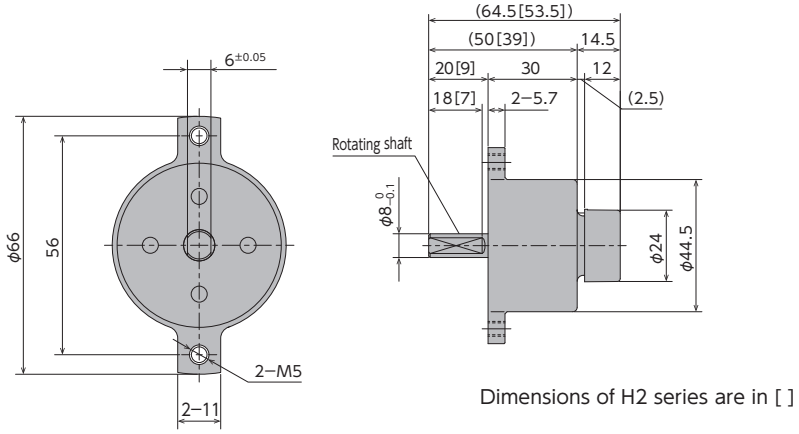


Specifications

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

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

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

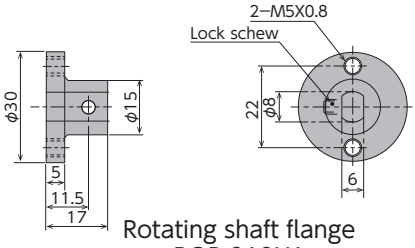


Dimensions of H2 series are in [ ]

Optional Parts

Rotating shaft flange ROP-010H1

Model
ROP-010H1



Rotating shaft flange
ROP-010H1

How to Use the Damper

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

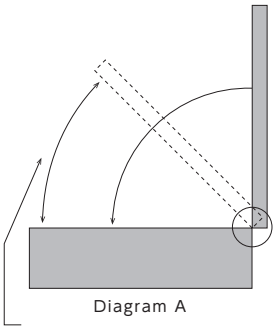


Diagram A

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

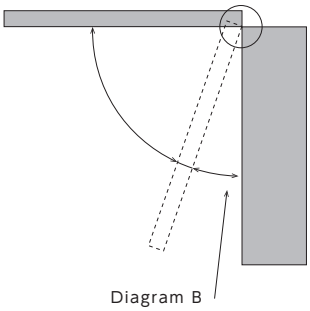
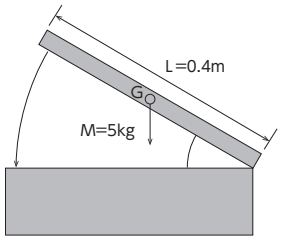


Diagram B

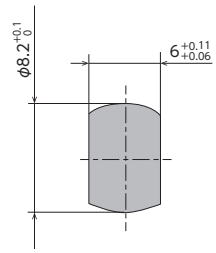
The damper torque becomes larger, preventing the lid from closing completely.

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

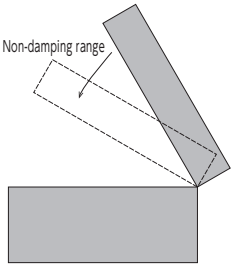
2. When using a damper on a lid, such as the one shown in the diagram, use the following selection calculation to determine the damper torque.
Example)
Lid mass M : 5kg
Lid dimensions L : 0.4m
Gravity Center Position : Assumed as $\frac{L}{2}$
Load torque : T = 5×9.8×0.4÷2
= 9.8N·m
Based on the above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



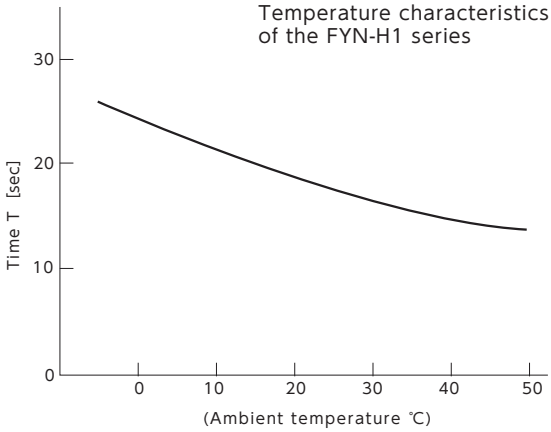
3. When connecting the rotating shaft to other parts, please ensure a tight fit between them. Without a tight fit, the lid will not slow down properly when closing. The corresponding dimensions for fixing the rotating shaft and the main body are as follows.



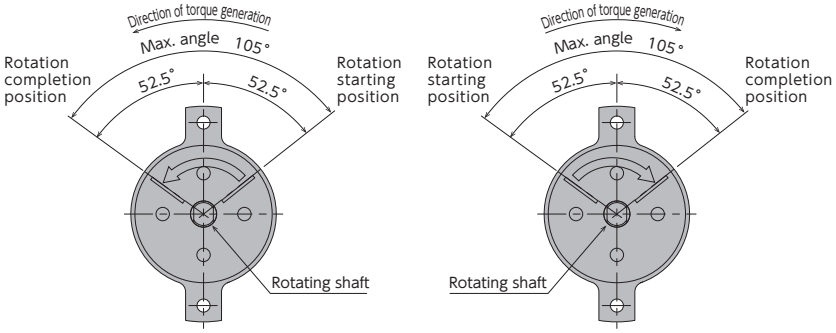
<Recommended dimensions for mounting a rotating shaft>



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

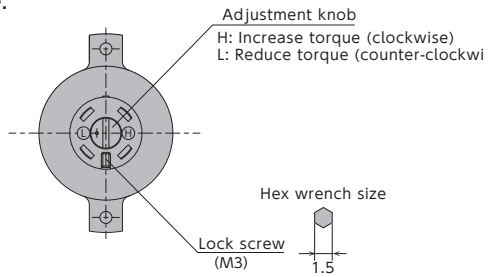


5. The damper's working angle is 110°, as shown below. Rotating the damper beyond this angle will cause damage to the damper. Please ensure that an external stopper is in place. The working angle is based on the width across flat for fixing, located towards the rear end of the main body. The position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



6. How to adjust the damper

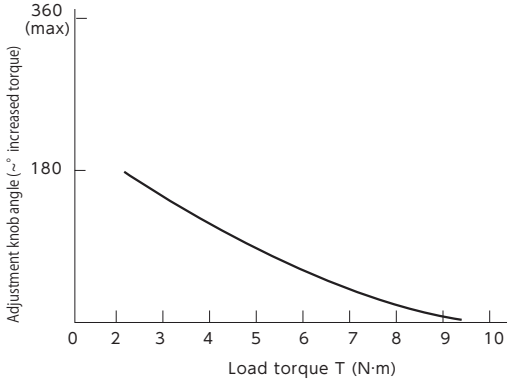
1) In the FYT-H1 (H2) and FYN-H1 (H2) series, the amount of generated torque can be adjusted with the adjustment knob located towards the rear of the main body. Insert a screwdriver in the minus groove to turn.
2) Turn the adjustment knob in the H direction to increase torque.
3) Turn the adjustment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



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

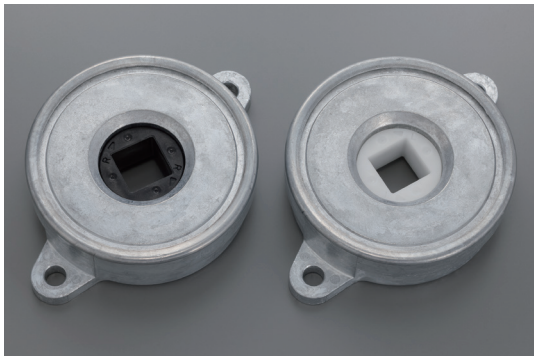
<Range of torque adjustment>

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



Vane Damper

FYN-S1 Series

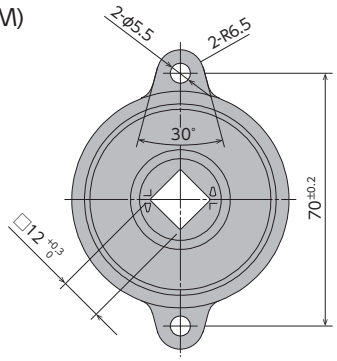


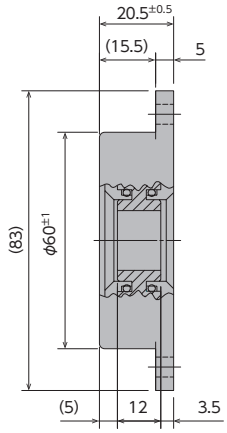
Specifications

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

Note) Measured at 23° C ± 2° C

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

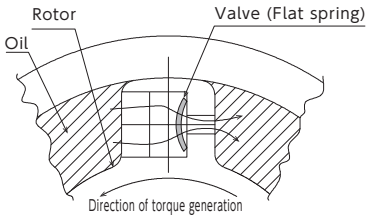




How to Use the Damper

1. Operating characteristics of self-adjusting oil pressure dampers

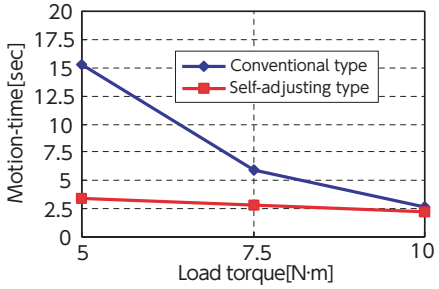
In a conventional vane damper, the damping strength (damping constant) does not change regardless of the load torque used. Because of this, its working speed is slower when the load torque is small, and faster when the load torque is large. However, because the self-adjusting FYN-S1 series is designed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



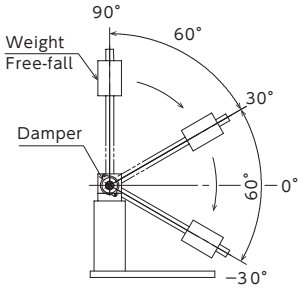
[Operating principles of the self-adjusting type]

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

[Motion time graph]



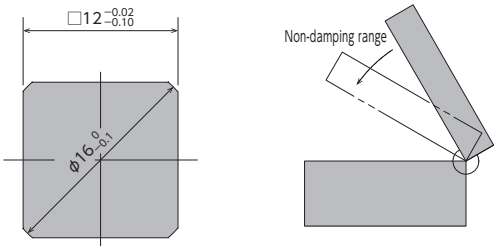
[Measurement conditions for th e motion-time graph]



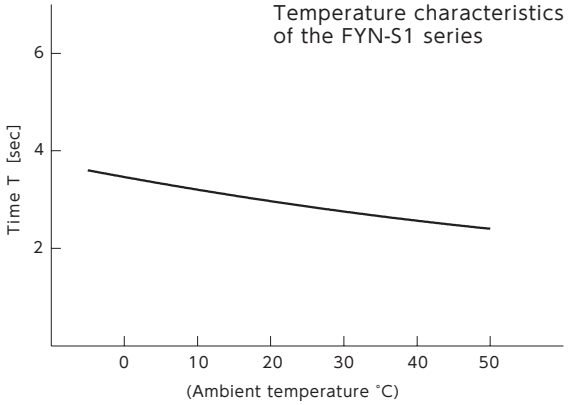
- Load torque T 5˜10N·m
- Measured angle 30° ～ -30°
- Measurement temperature 23° C±2° C

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

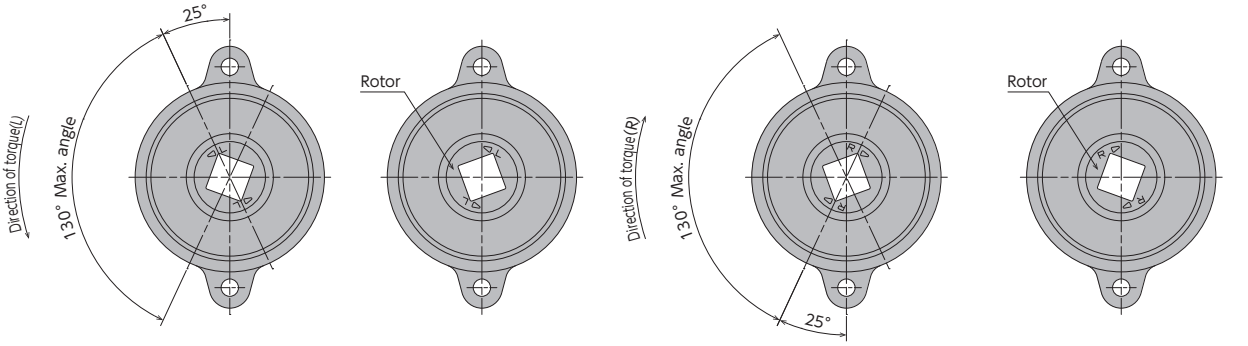
2. When using the damper, please ensure that a shaft with specified angular dimensions is inserted in the damper's shaft opening. Also, please ensure a tight fit between the shaft and the damper shaft's opening. Without a tight fit, the non-damping range becomes larger in a closing motion, etc., and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



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



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

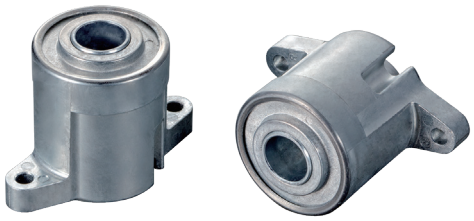


5. Because the FYN-S1 series is a self-adjusting type, the torque cannot be adjusted manually. However, by altering the viscosity of the oil, its damper characteristics can be modified. (Please contact us, as this is a custom order.)

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

Vane Damper

FYN-X2 Series

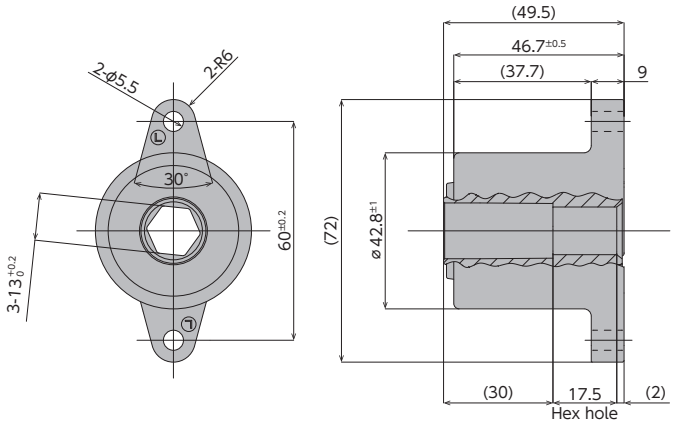


- ∗Max. angle 106°
- ∗Operating temperature −5～50℃
- ∗Weight 287±10g
- ∗Body material Zinc die-cast (ZDC)
- ∗Cap material Zinc die-cast (ZDC)
- ∗Rotor material Zinc die-cast (ZDC)
- ∗Oil type Silicone oil

Specifications

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

Note) Measured at 23°C±2°C



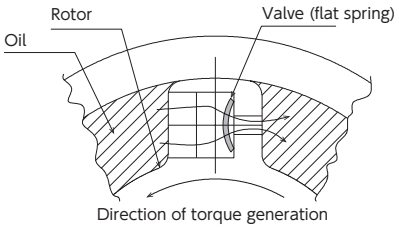
How to Use the Damper

1.Operating characteristics of self-adjusting oscillating dampers

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

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

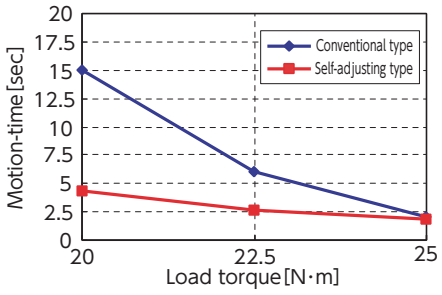
The acceptable range of torque is 10 to 15N•m or 20 to 25N•m. Please select your damper by referring to the motion-time graph below.

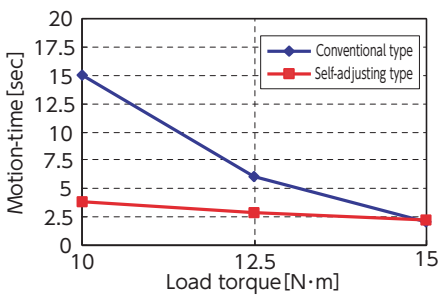


【Operating principles of the self-adjusting type】

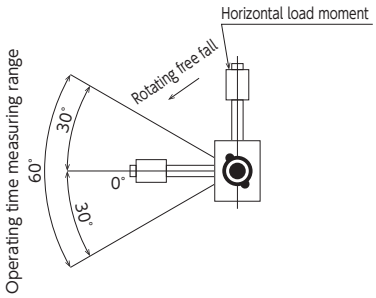
As shown in the diagram to the left, by changing the shape of the valve (flat spring), the amount of oil flow is altered, adjusting the damper's generated torque. (PAT.P)

【Motion time graph】



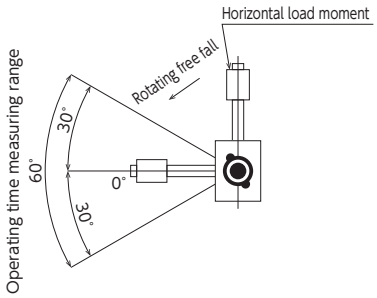


【Measurement conditions for the motion-time graph】



FYN-X2 25N·m specification

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

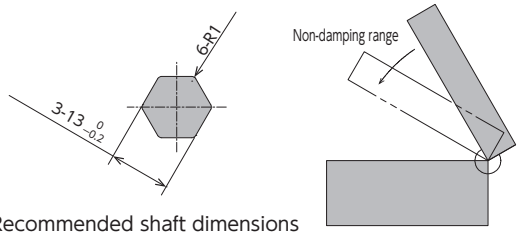


FYN-X2 15N·m specification

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

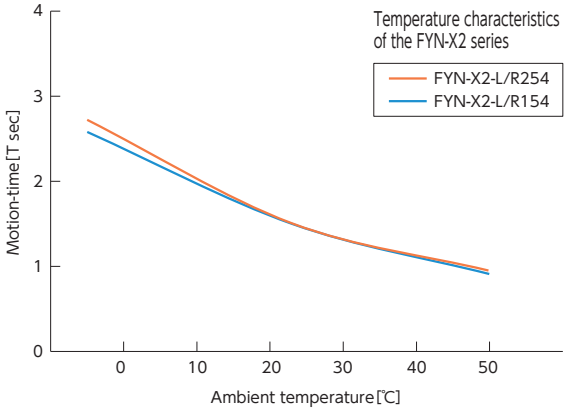
As the level of self-adjustment may vary depending on the range of the working angle of the actual work, please verify under actual working conditions before you select your damper.

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

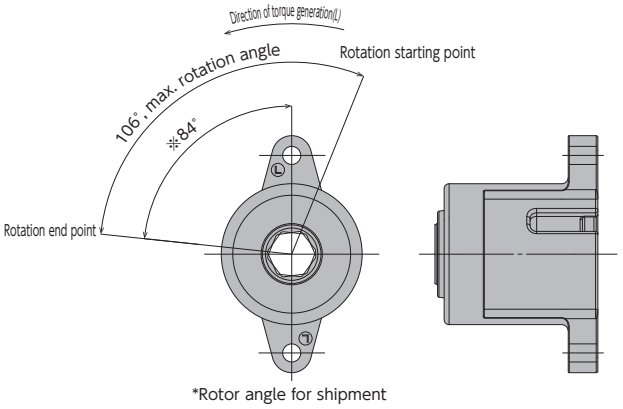


Recommended shaft dimensions

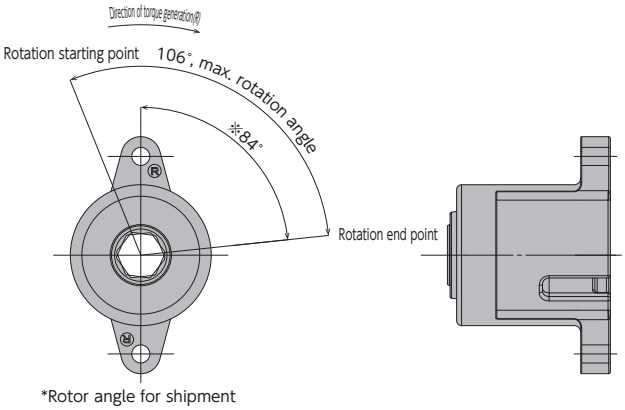
3.Damper characteristics vary according to the ambient temperature. In general, the damper characteristics become weaker as the temperature increases, and become stronger as the temperature decreases.
This is because the viscosity of the oil inside the damper varies according to the temperature. When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



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



FYN-X2-L154
FYN-X2-L254



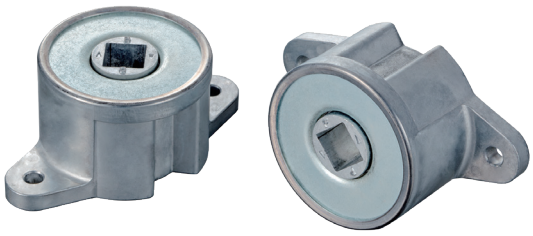
FYN-X2-R154
FYN-X2-R254

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

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

Vane Damper

FYN-Z2 Series

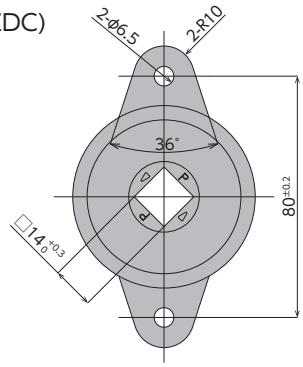


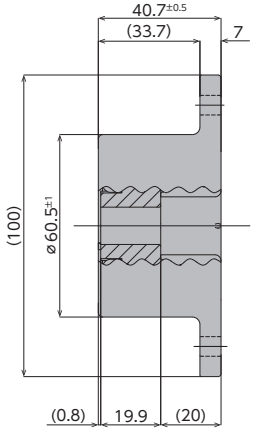
Specifications

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

Note) Measured at 23°C±2°C

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





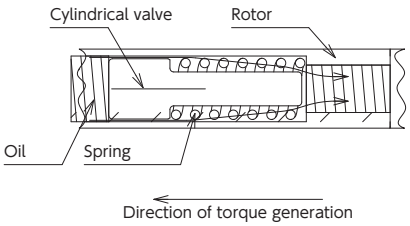
How to Use the Damper

1. Operating characteristics of self-adjusting oscillating dampers

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

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

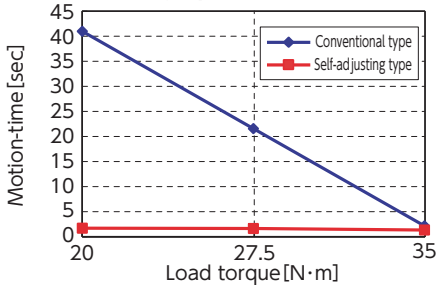
The acceptable range of torque is 20 to 35 N•m. Please select your damper by referring to the motion-time graph below.



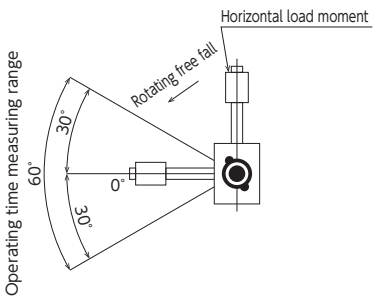
[Operating principles of the self-adjusting type]

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

[Motion time graph]



[Measurement conditions for the motion-ime graph]

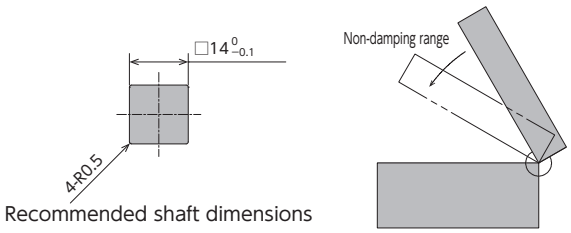


- Measuring temperature : Room temperature (23±3℃)
- Load torque : 20～35N·m
- Measuring angle: +30°～−30°

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

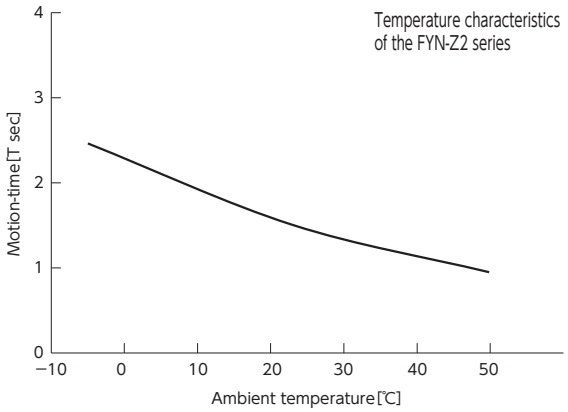
●Products specification might be changed without notice.

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

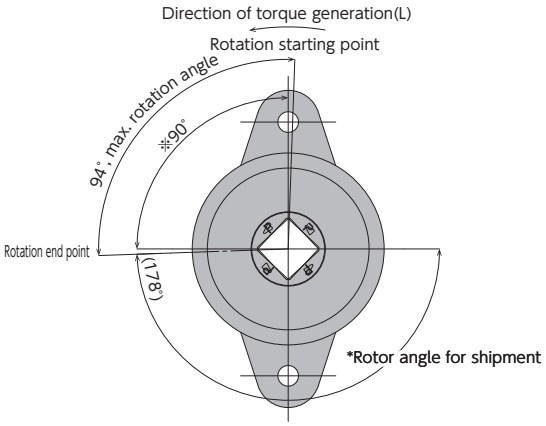


Recommended shaft dimensions

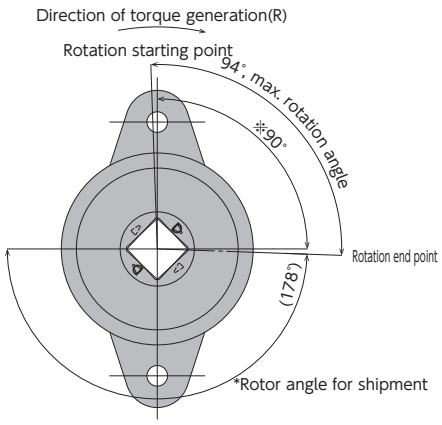
3.Damper characteristics vary according to the ambient temperature. In general, the damper characteristics become weaker as the temperature increases, and become stronger as the temperature decreases.
This is because the viscosity of the oil inside the damper varies according to the temperature. When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



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



FYN-Z2-L354



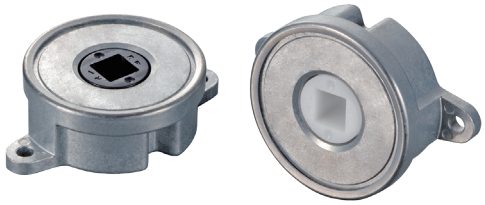
FYN-Z2-R354

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

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

Vane Damper

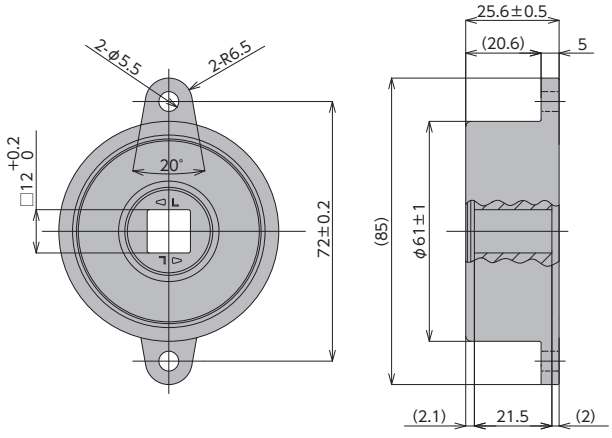
FYN-A2 Series



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

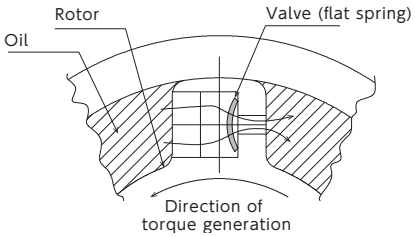
Specifications

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

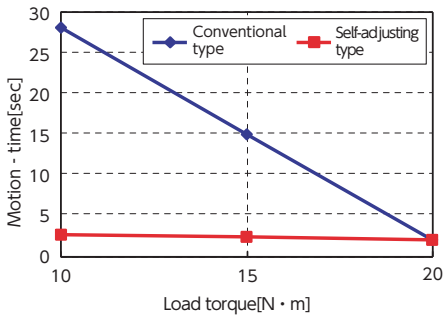


How to Use the Damper

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



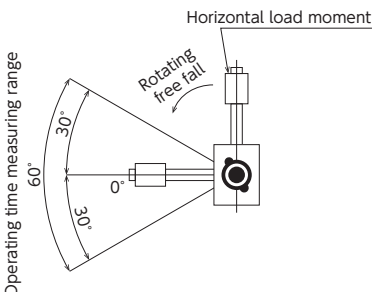
【Motion time graph】



【Operating principles of the self-adjusting type】

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

【Measurement conditions for the motion-time graph】



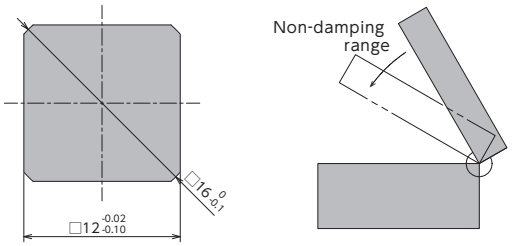
- Measuring temperature : Room temperature(23±3°C)
- Load torque : 10~20N·m
- Measuring angle : +30°~−30°

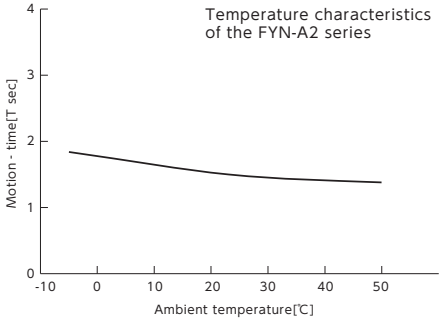
As the level of self-adjustment may vary depending on the range of the working angle of the actual work, please verify under actual working conditions before you select your damper.

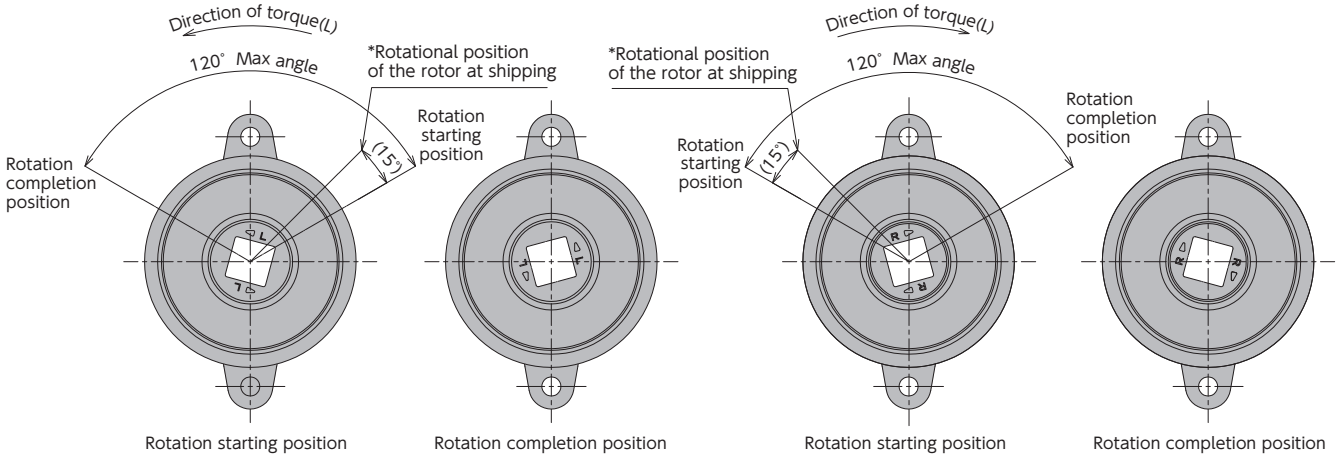
2. When using the damper, please ensure that a shaft with specified angular dimensions is inserted in the damper's shaft opening. Also, please ensure a tight fit between the shaft and the damper shaft's opening. Without a tight fit, the play becomes larger in a closing motion, etc., and the lid may not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

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

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



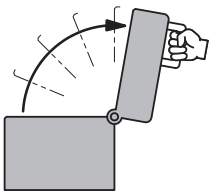




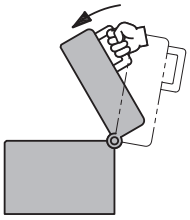
5. Because the FYN-A2 series is a self-adjusting type, the torque cannot be adjusted manually. However, by altering the viscosity of the oil, its damper characteristics can be modified. (Please contact us, as this is a custom order.)6. The direction in which torque is generated varies according to the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

Precautions for Use

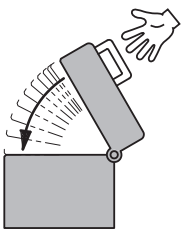
* When using the vane damper, ensure that after having fully opened the lid, move the lid to a point where free fall starts, and then release the hand from the lid. If the lid is slightly opened and in this state the hand is released, the lid may not be able to sufficiently slow down and the lid may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



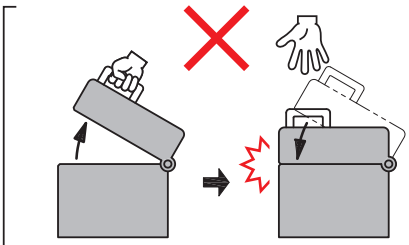
(1) Open the lid fully.



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



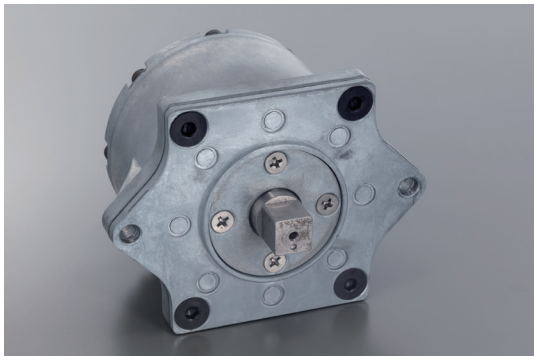
(3) Release the hand (the lid slows down).



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

Vane Damper

FYT/FYN-LA3 Series

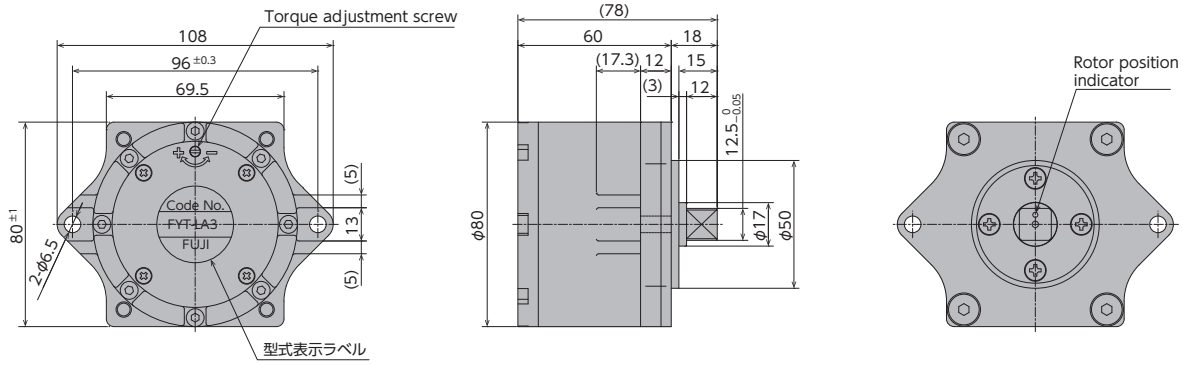


* Max. angle 210°
* Operating temperature 0～50℃
* Weight 1. 75k g
* Body and cap material Zinc die-cast (ZDC)
* Rotating shaft material Alloy steel
* Oil type Silicone oil

Specifications

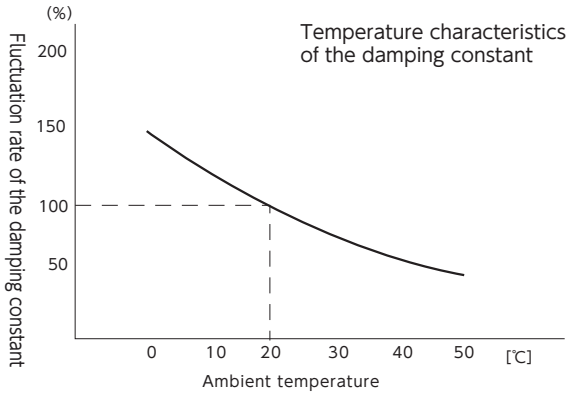
Model	Max. torque	Damping constant	Damping direction
FYT-LA3	40N·m (400kgf·cm)	10～60N·m/(rad/sec)	Both directions
FYN-LA3-R			Clockwise
FYN-LA3-L			Counter-clockwise

Note) Measured at 23°C±2°C



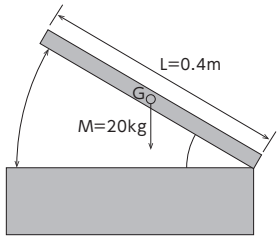
How to Use the Damper

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

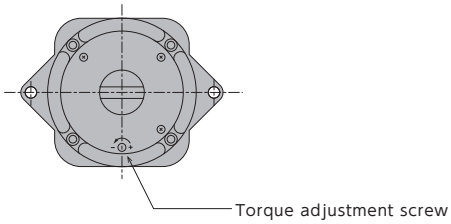


2. When using a damper on a lid, such as the one shown in the diagram, use the following selection calculation to determine the damper torque.

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



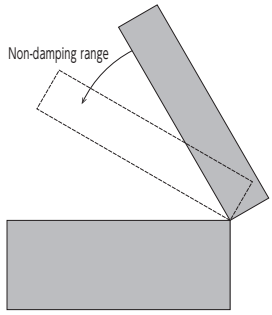
3. FYT, FYN-LA3 series are torque-adjustable types. Turn the damping adjustment screw located on the back of the main body by inserting a slotted screwdriver.
The damping constant increases when turned to the + direction (right).
The damping constant decreases when turned to the - direction (left).

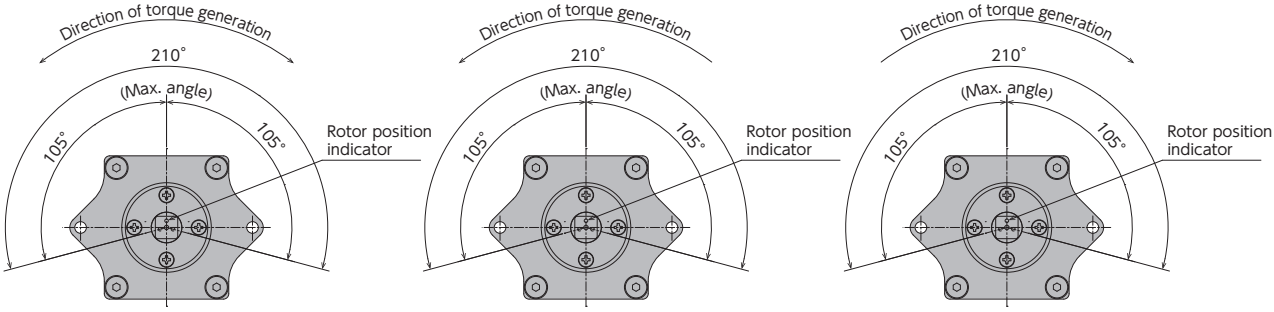


●Products specification might be changed without notice.

Instruction for Damper Attachment

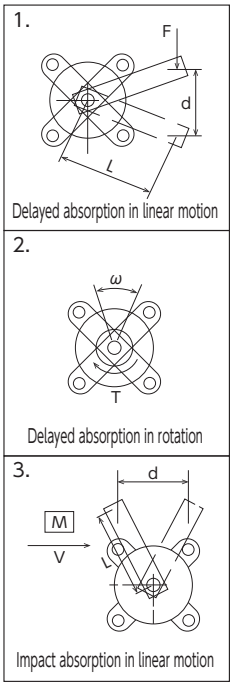
1. When attaching a rotating shaft to its corresponding part, ensure that they are firmly attached together by making the gap between them as small as possible. A large gap may affect the damper's non-damping range, preventing the lid from slowing down properly.
2. The damper's working angle is ±105°,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





FYT-LA3 FYN-LA3-L FYN-LA3-R

How to Calculate the Damping Constant for Vane Dampers



1. Delayed absorption in linear motion

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

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

2. Delayed absorption in rotation

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

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

3. Impact absorption in linear motion

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

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

Hinge Damper

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

FHD-A1 Series

RoHS Compliant

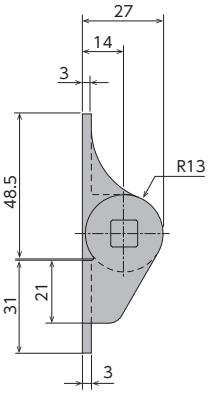
●Products specification might be changed without notice.

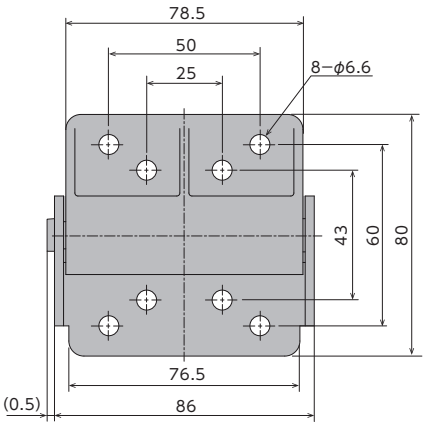


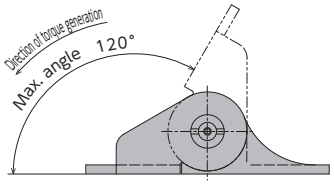
Specifications

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

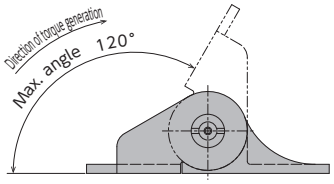
- ＊Max. angle 120°
- ＊Operating temperature −5～50℃
- ＊Weight 410g
- ＊Main body material Zinc die-cast (ZDC) + silver coating
- ＊Hinge material SUS304
- ＊Oil type Silicone oil







<FHD-A1-1-***>

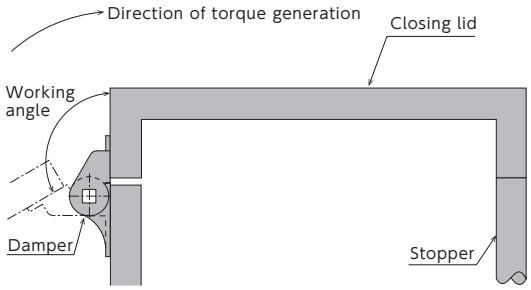


<FHD-A1-2-***>

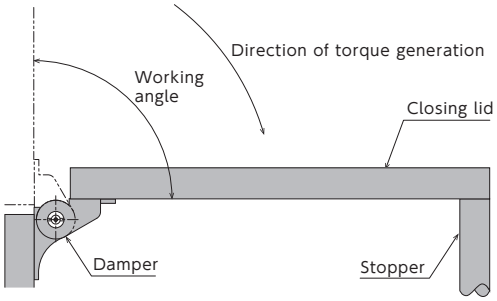
How to Use the Damper

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

○Attached externally(FHD-A1-1***)



○Attached internally(FHD-A1-2***)

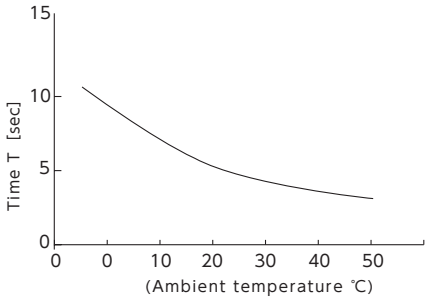


2. This damper is only for horizontal application. Please do not use this damper for vertical application.

Damper Characteristics

1. Temperature characteristics

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



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

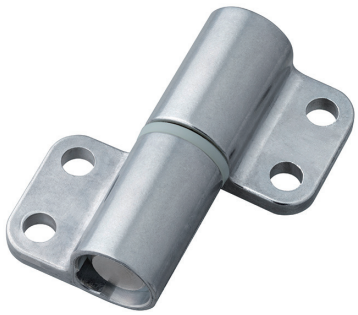
Friction Type Hinge Damper

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

FHD-B1/B2 Series

RoHS Compliant

●Products specification might be changed without notice.

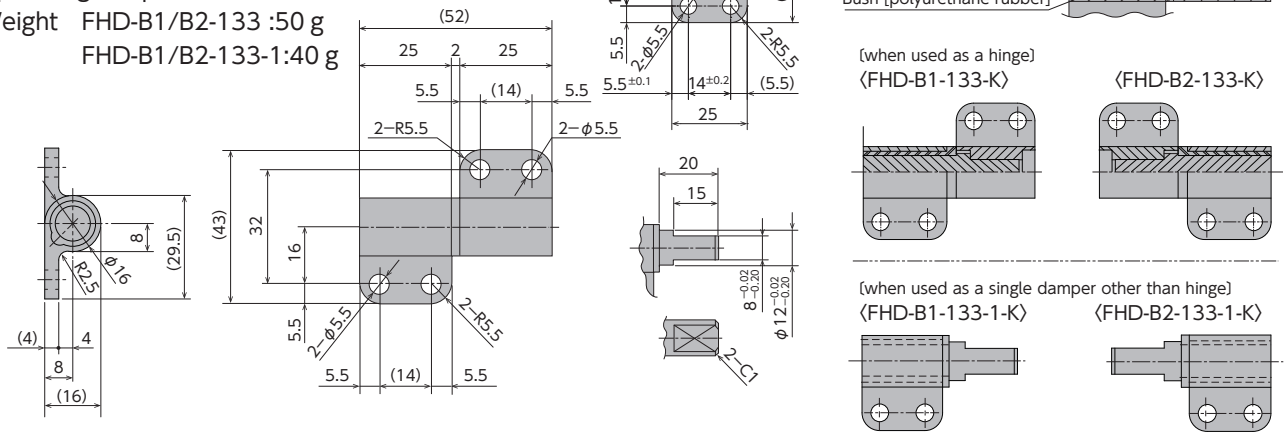


Specifications

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

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

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



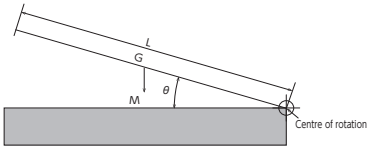
How to Use the Damper

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

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

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

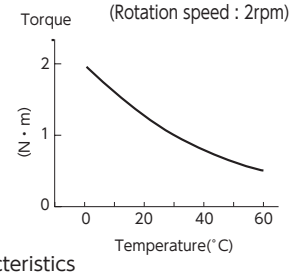
M : Mass of the retaining part
L : Distance between the tip of retaining part and the centre of rotation
θ : Retention angle from the retaining part's horizontal position
α : Temperature coefficient of the max. temperature
N : Number of dampers used



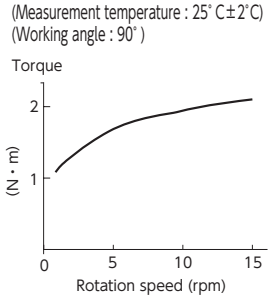
7. This damper is only for horizontal application. Please do not use this damper for vertical application.

Damper Characteristics

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



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



Friction Damper

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

FFD-25FS/FW/SS/SW Series

RoHS Compliant

●Products specification might be changed without notice.



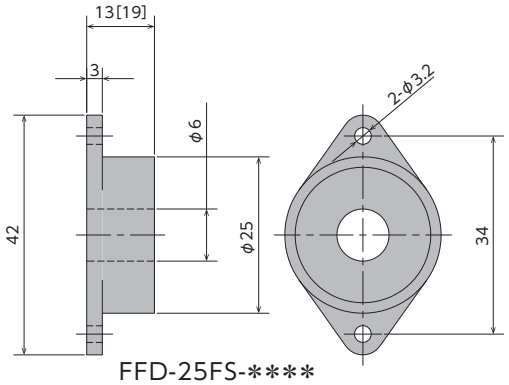
Specifications

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

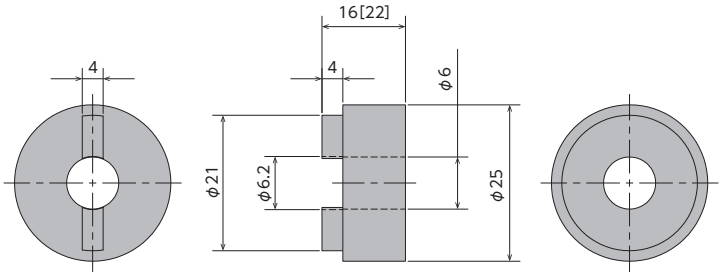
Model	Max. torque	Max. reverse torque
FFD-25SS-R102	0.1±0.01 {N·m} (1±0.1 kgf·cm)	Clockwise
FFD-25SS-L102		Counter-clockwise
FFD-25SS-R502	0.5±0.05 {N·m} (5±0.5 kgf·cm)	Clockwise
FFD-25SS-L502		Counter-clockwise
FFD-25SS-R103	1±0.1 {N·m} (10±1 kgf·cm)	Clockwise
FFD-25SS-L103		Counter-clockwise
FFD-25SW-R103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

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

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



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

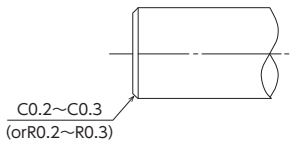


FFD-25SS-∗∗∗∗
(Dimension of FFD-25SW-∗∗∗∗ are in [ ])

How to Use the Damper

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

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

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

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

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

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

Friction Damper

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

FFD-28FS/FW/SS/SW Series

RoHS Compliant

●Products specification might be changed without notice.



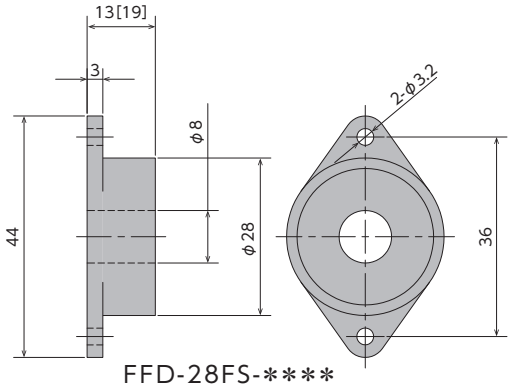
Specifications

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

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

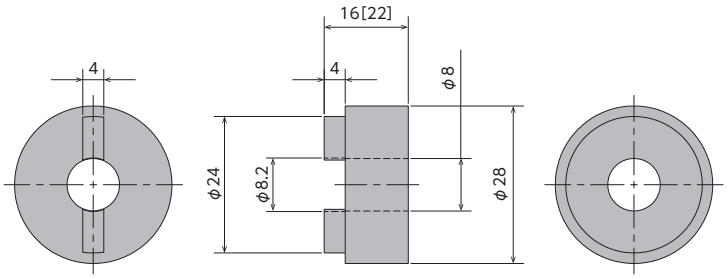
*) Rated torque is measured at a rotation speed of 20rpm at 20~25°C

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



FFD-28FS-∗∗∗∗

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



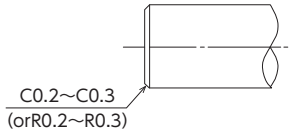
FFD-28SS-∗∗∗∗

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

How to Use the Damper

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

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

Shaft's external dimensions	8 $-\phi_{0.03}$
Surface hardness	HRC55 or higher
Quenching depth	0.5mm or higher
Surface roughness	1.0Z or lower
Chamfer end (Damper insertion side)	

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

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

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

Friction Damper

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

FFD-30FS/FW/SS/SW Series

RoHS Compliant

●Products specification might be changed without notice.



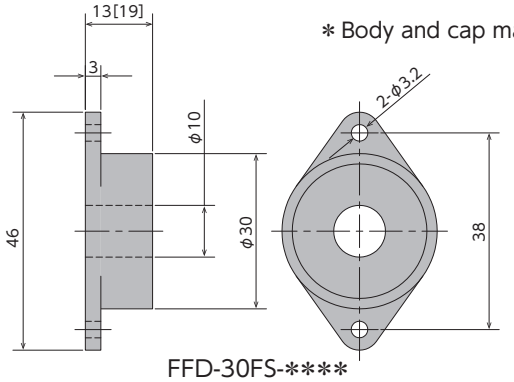
Specifications

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

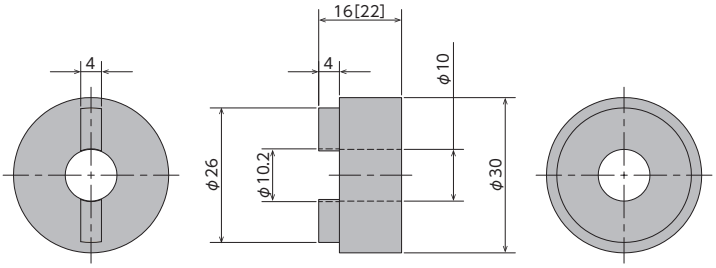
Model	Max. torque	Max. reverse torque
FFD-30SS-R102	0.1±0.01 (N·m) (1±0.1 kgf·cm)	Clockwise
FFD-30SS-L102		Counter-clockwise
FFD-30SS-R502	0.5±0.05 (N·m) (5±0.5 kgf·cm)	Clockwise
FFD-30SS-L502		Counter-clockwise
FFD-30SS-R103	1±0.1 (N·m) (10±1 kgf·cm)	Clockwise
FFD-30SS-L103		Counter-clockwise
FFD-30SS-R153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

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

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



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

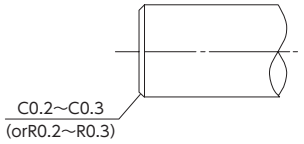


FFD-30SS-∗∗∗∗
(Dimension of FFD-30SW-∗∗∗∗ are in [ ])

How to Use the Damper

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

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

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

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

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

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

Read these instructions before use

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

⚠ Warning

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

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

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

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

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

Implementation of Safety Measures for the Purposes Below.

●Implement the safety measures if used under the following conditions and environment, and consult our company for a judgment on the feasibility check beforehand. Also please take countermeasures against waterproofing, humid proofing as well as the designing of fail-safe, redundant and etc. for the purpose to keep the reliability of safety of the device as user's responsible task.
1) The use in the environment other than those standard specifications clearly indicated in the catalog or owner's manual, outdoors, or place exposed to the direct sunlight.
2) Nuclear related devices, devices directly or indirectly related to the running of rail or ship, devices related to aviation or space, military devices, medical devices, devices contacting the potions and foods, combustion equipment, amusement devices that are related to the influence on human and properties, emergency shut off circuit, press machinery, the use for the devices or purposes to which especially the safety is required because of the expected serious influence on the human and properties.
●Environment and the next safety exhibit can not be secured, please do not use the following devices that are required extremely high reliability and safety.
1) environment in which there is a possibility of ignition or explosion, or in water or a very high humid.
2) device in relate to the nuclear power, aviation, space, military, life supporting medical equipment, combustion etc.

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

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

Ensure the connection of coil lean of MRF damper.

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

Do not throw into a fire

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

⚠ Caution

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

Do not operate without sufficient mounting strength

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

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

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

Do not rotate the screw on top of MRF damper

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

Usage environment

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

Do not discard oil more than is necessary

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

Radial/Thrust load to the shaft

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

Do not repair, disassemble or modify the MRF damper

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

Replacing time of MRF damper

●Product reliable cycles are depended on the using circumstances and conditions; therefore, we cannot determine the life cycle however if there is phenomena such like below please consider that it is the time to replace to the new one.
1. When the necessary torque is no longer performed even though given rated current.
2. When the torque started to be appeared without giving eclectic current.
3. When various torque started to be appeared under a same circumstance.
4. When abnormal noise, vibration or oil leakage are started to be appeared.

●In particular, high reliability and safeties is required, regardless the phenomenon such like above, we strongly recommend to replace to the new one periodically.

Over-tightening of mounting screws

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

Dispose

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

MRF Damper

FMR-70S-403

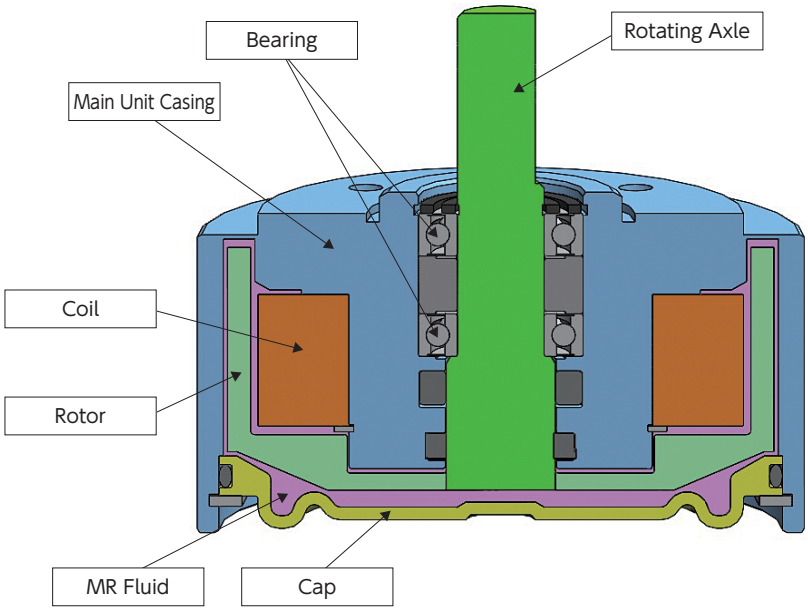


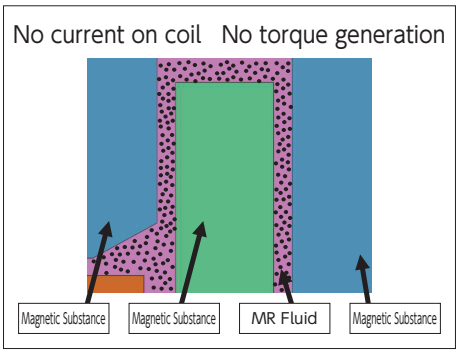
Characteristics

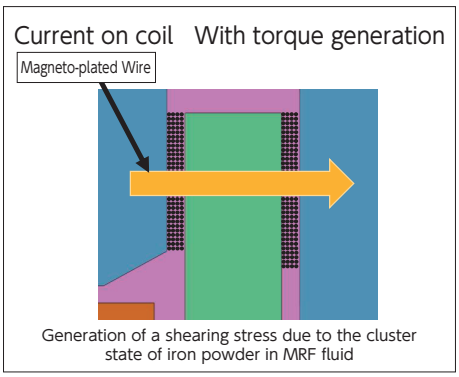
Electrically controlled	: Enabled electrically controlling the torque by using MR fluid (magnetic viscous fluid)
High response	: excellent electrical response makes realize a high response
Flexible mounting ways	: No restriction on the mounting direction
Not required Pre-conditioning operation	: Using MR fluid on friction part, it realized less humid effect and no requirement of pre-conditioning
Smooth motion	: Small differences between the static friction and dynamic friction allows a smooth actuation
Long life	: Our original sealing structure realizes a long life cycle
Seamless torque change	: Available a seamless torque control steplessly
Less susceptibility of temperature affect	: Comparing to a standard rotary damper, small effect by temperature
Less susceptibility of the rotational speed affect	: Comparing to a standard rotary damper, small effect by the rotating speed

Basic Structure and Action

The basic structure of MRF damper is shown below.







Generation of a shearing stress due to the cluster state of iron powder in MRF fluid

Behavior

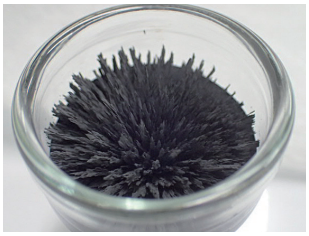
The rotating shaft is supported with the bearings for providing the freedom of rotation in the main unit casing.
A coil is implemented in the main unit casing, and a rotor having the shape of a cup is mounted on the rotating shaft.
There is a gap between the internal surface of the main unit casing and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

What is the MR Fluid?

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



MR Fluid



MR Fluid A magnet in the proximity

Main Applications

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

Precautions for Use

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

Specifications

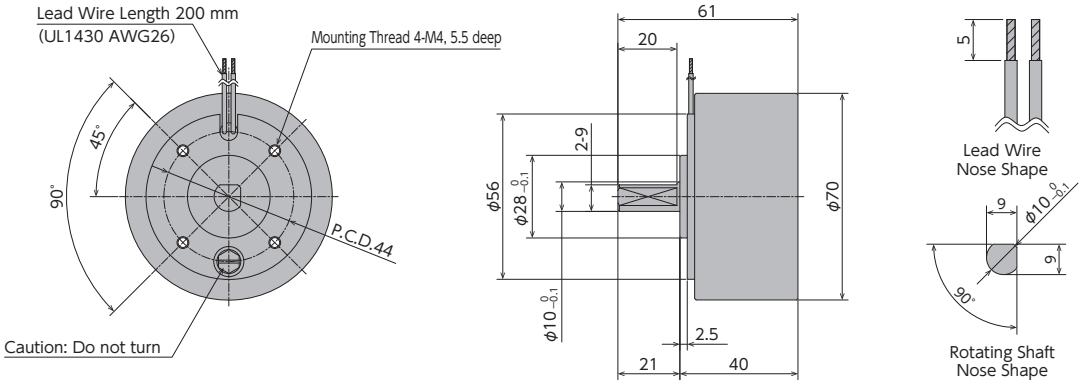
Type	Rated Torque N·m	Coil(23℃)				Allowable slipping efficiency W
		Voltage V	Current A	Resistance Ω	Capacity W	
FMR-70S-403	4	DC24	0.13	192	3.12	10※1
	Maximum Operating Speed rpm	Mounting Posture	Direction of Rotation	Mass kg	Moment of Inertia kg·cm²	
	50	No ristriction	Both directions	0.83	1.16	

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

Calculation

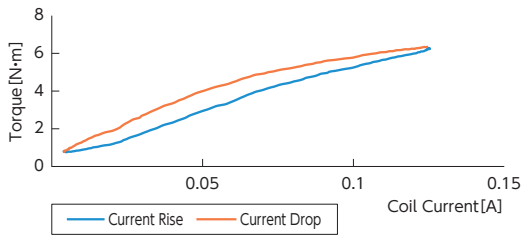
Allowable slipping efficiency = 2 x π / 60 x n x Tc
n : Rotating Speed (rpm)
Tc : Slipping Torque (N-m)

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

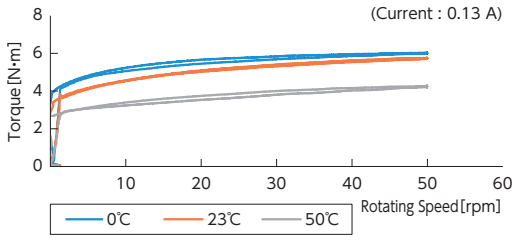


Test Data

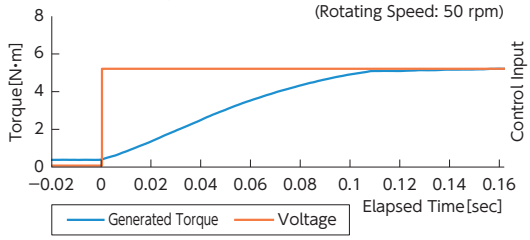
Coil Current - Torque Properties



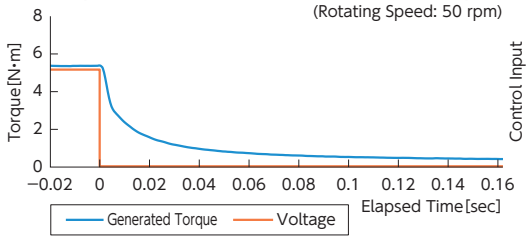
Temperature Properties (Torque and Rotating Speed)



Response - Voltage Rise

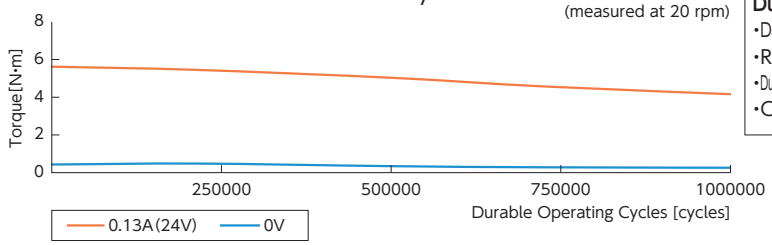


Response Performance - Voltage Drop



Durability

(measured at 20 rpm)



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