

# ACE

®

*Innovation in Deceleration and Motion Control*

## **Rotary Dampers**

*For Smooth Motion and that Touch of Quality*



- *Bi-Directional Dampers*
- *Bi/Uni-Directional Dampers*
- *Uni-Directional Dampers*



Revised  
04/2017

ACE Controls Inc. offers a world class range of compact rotary dampers that enable products to function with a smooth mechanical motion, resulting in that touch of quality. Incorporation of ACE’s reliable dampers can protect delicate electronics and extend the life of your product by helping to prevent lid and access panel closure damage. In addition, superior noise suppression is obtained as a direct result of the smooth flowing motion provided by ACE’s dependable rotary dampers.

In today’s liability conscious world it pays to incorporate elements into your product design that reduce your chances of liability litigation. ACE’s rotary dampers can help make your product safer for today’s discerning, safety conscious consumer.

Rotary motion control models are available with damping in both directions of rotation. Alternatively, certain model sizes are available with the option of uni-directional damping, i.e. damping action only in a clockwise or counterclockwise rotation and free travel in the opposite rotation. This is achieved by means of an internal one way clutch on the output shaft.

If your application calls for locking in both directions of motion, the versatile ACE Controls bi-directional locking series of rotary dampers can be added to enhance the functionality of your new product design.

### General Specifications

Models may vary. See individual specifications or consult factory.

Maximum Cycle Rates	Nominal Torque Rating	Operating Temperature	Storage Temperature
10 Cycles per minute	Measured at 20 rpm & 73°F	32° to 122°F (0° to 50°C)	-4° to 140°F (-20° to 60°C)

### Conversions

Physical Quantity	Divide	By	To Obtain
Torque	gf cm	72	in oz
Torque	gf cm	1152	in lb
Torque	kgf cm	1.152	in lb
Length	mm	25.4	in
Length	cm	2.54	in
Angular Velocity	deg/s	6	rpm
Angular Velocity	deg/s	57.30	rad/s
Angular Velocity	rpm	9.55	rad/s

### Temperature

$$T_F = 32 + (9/5) T_C$$

$$T_C = (5/9) (T_F - 32)$$

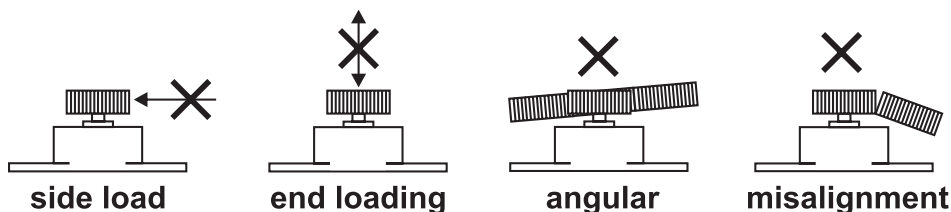
Where:

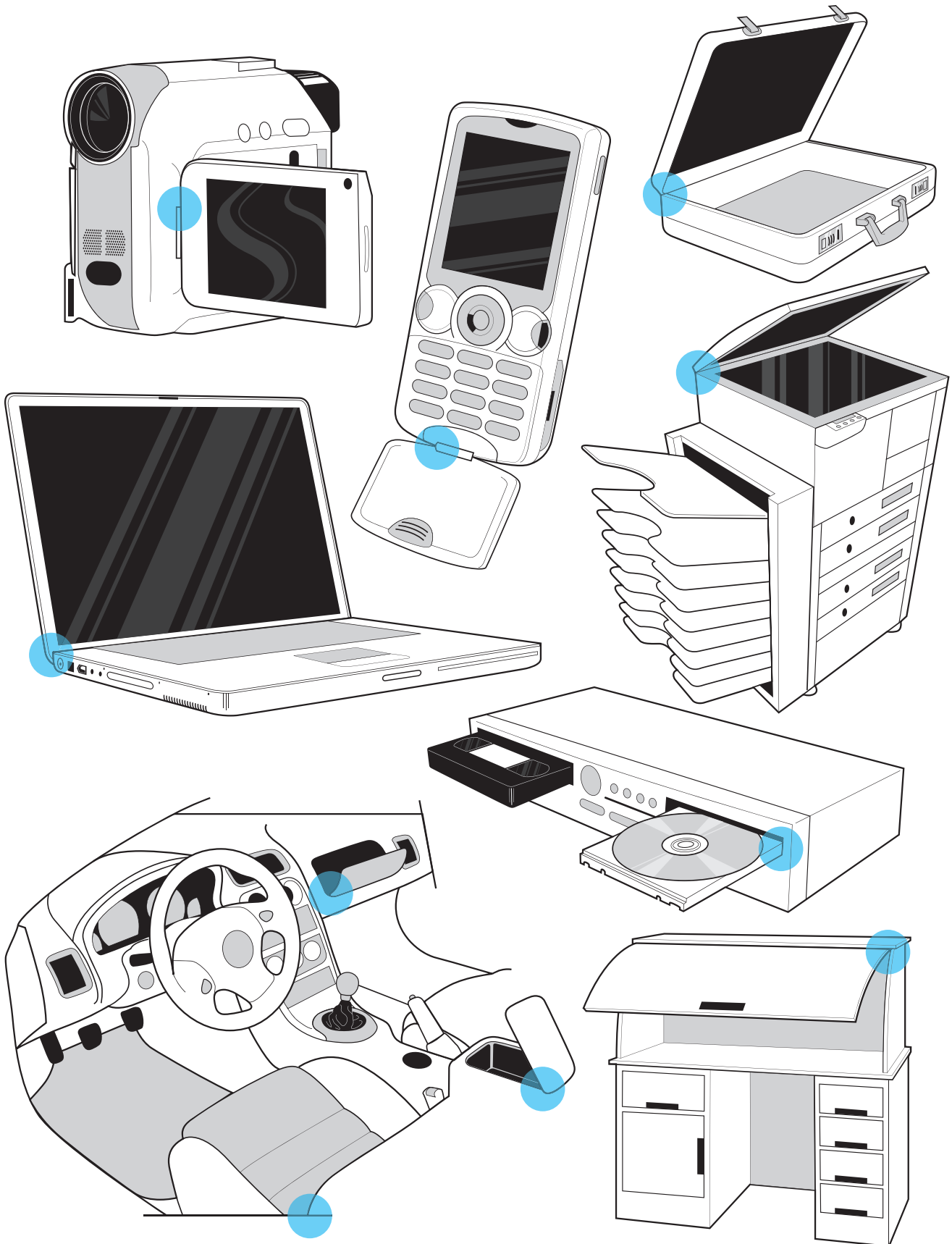
T<sub>F</sub> = Temperature °Fahrenheit

T<sub>C</sub> = Temperature °Celsius

### Mountings To Avoid

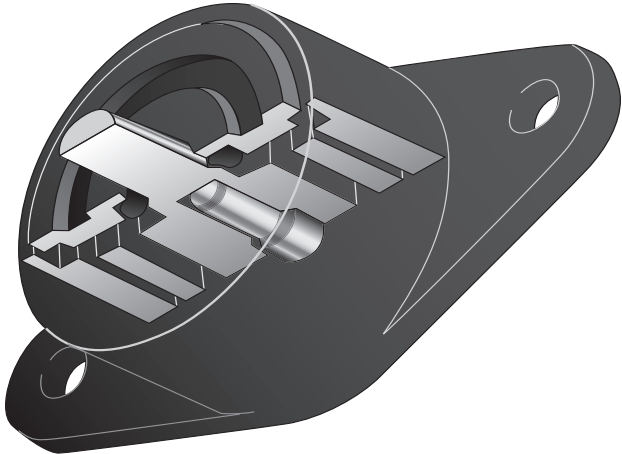
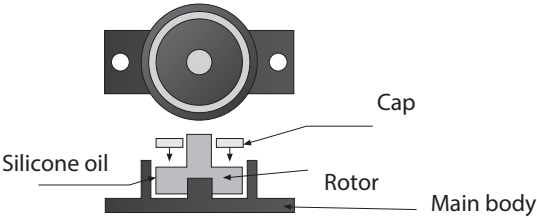
Rotary dampers are designed for controlling rotary and linear motion. Shown below are examples of mountings that should be avoided.





● Indicates rotary damper locations

### Rotary Damper-Basic Structure



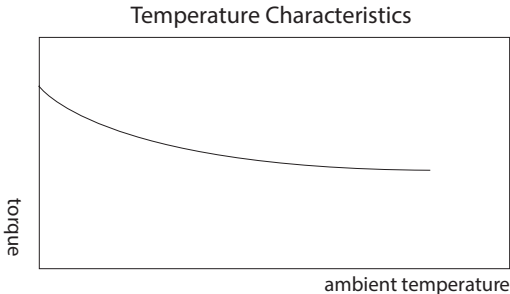
### Basic Principles

Rotary dampers utilize the principle of fluid resistance to dampen movement. Oil viscosity is utilized to provide the braking force of the damper.

The torque is determined by the viscosity of the oil; the gap between the rotor and the body and the surface area of the parts.

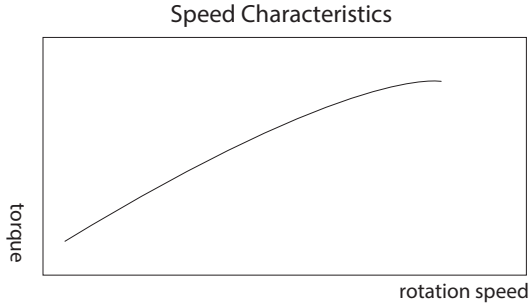
### Temperature Characteristics

The torque of the rotary damper varies according to the temperature. The higher the temperature, the lower the torque. The lower the temperature, the higher the torque.

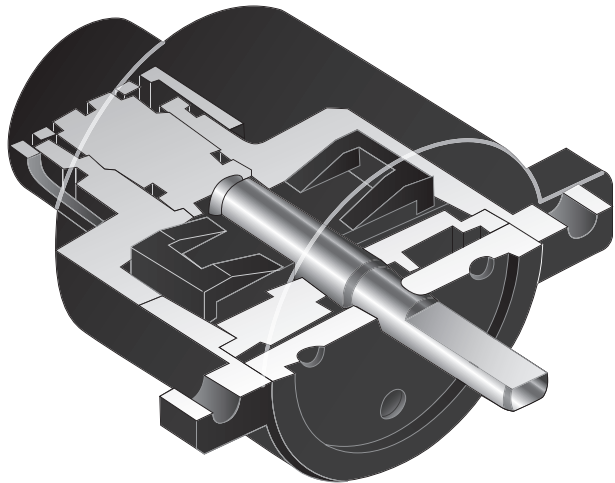
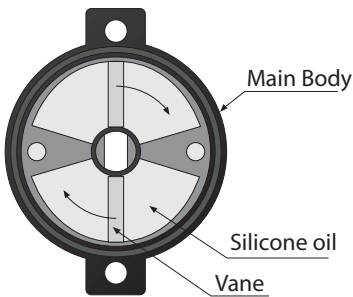


### Speed Characteristics

The torque of the rotary damper varies according to cycle rate. In general, if the cycle rate goes up, the torque increases. If the cycle rate goes down, the torque decreases.



### Vane Damper-Basic Structure



### Basic Principles

Oil viscosity is utilized to provide the braking force of the damper. The torque is determined by the viscosity of the oil, the gap between the moving parts and the surface area of the parts.

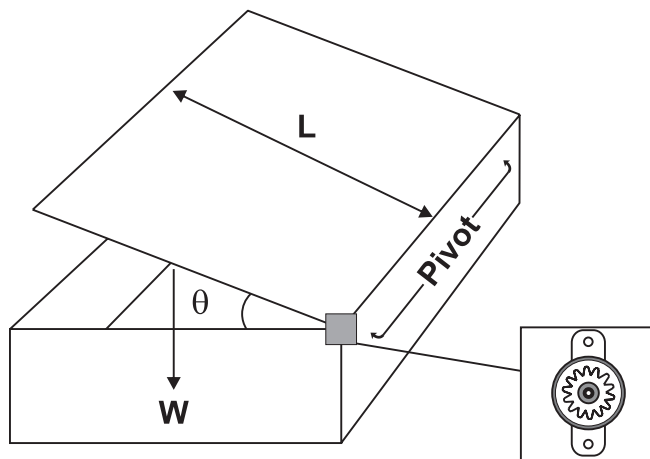
When the shaft rotates, the oil in the damper moves into the opposite chamber. The torque is determined by the oil pressure on the vane.

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## Selection Procedure C2, D2, E2, F2, & G2 Series

- 1). Determine the torque about the pivot point for your application. Also, determine a desired angular velocity for the pivoting object. (See example below.)
- 2). From the catalog pages in the Ordering Information section, choose a rotary damper that provides the closest torque to what was calculated in step 1.
- 3). On the catalog page of the model selected, look at the torque vs rpm graph to determine the rotation speed using the selected damper.
- 4). If the speed is too fast for your requirement, select the next higher torque damper. If the speed is too slow, select the next lower torque damper.
- 5). Develop a part number from the Ordering Information table on the catalog page of the damper selected.
- 6). If a satisfactory model cannot be found, contact ACE applications engineering at 800-521-3320 to discuss a custom model for your application.

### Torque Calculation Example



$L$  = Length from pivot to the end of the lid  
 $\theta$  = Angle between the lid and horizontal  
 $W$  = Free weight of the lid

To calculate the torque about the pivot point for the lid pictured above use the following formula:

$$T = (L/2) \times (W) \times (\text{Cos } \theta)$$

Where:

$T$  = Torque  
 $L/2$  = 1/2 the length of the lid from the pivot to the end (center of gravity)  
 $W$  = Free weight of the lid (actual weight of lid)  
 $\theta$  = Angle between the lid and horizontal

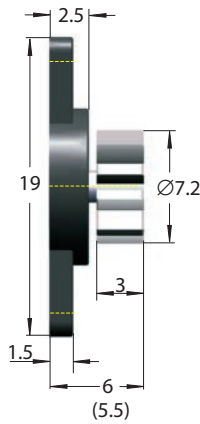
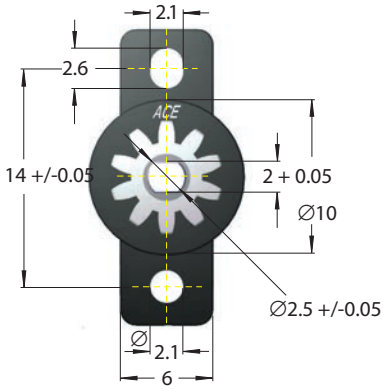
Note: as the lid closes,  $\theta$  decreases and the torque increases.



Applications include: computer disk drives, CD players and instrumentation equipment.

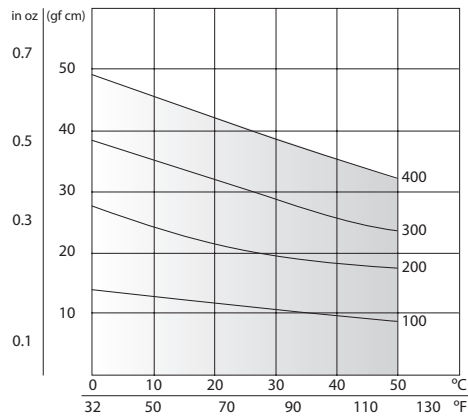
**Gear Specification - mm**

Type	Standard spur gear
Tooth profile	Involute (full)
Module	0.6
Pressure angle	20 degrees
Number of teeth	10
Pitch circle diameter	6.0

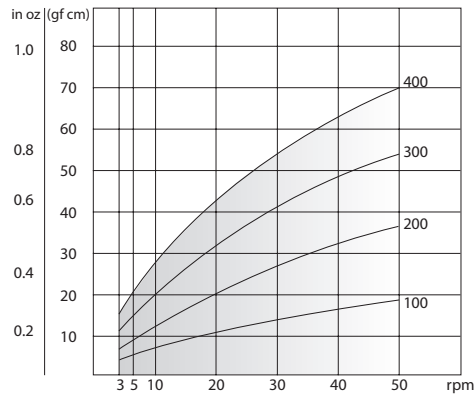


Dimensions in mm

Relationship Between Torque and Temperature  
20 rpm

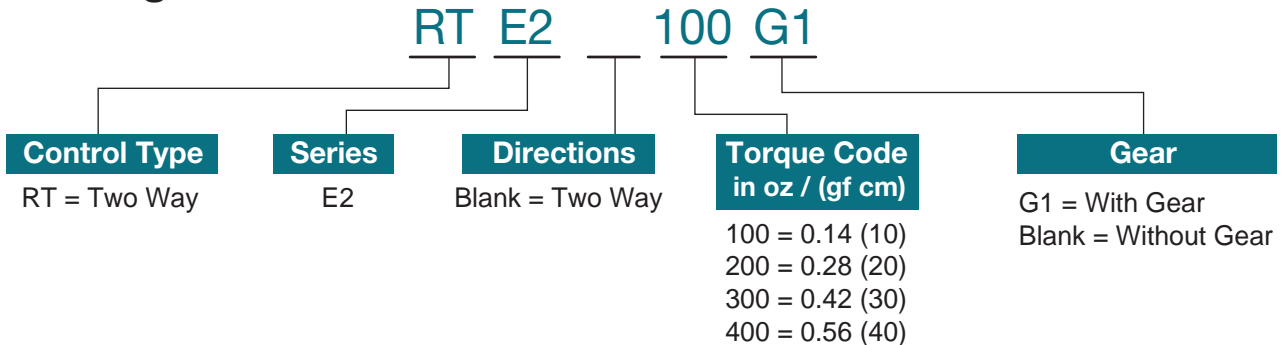


Relationship Between Torque and rpm's  
73°F (23°C)



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**Ordering Information**

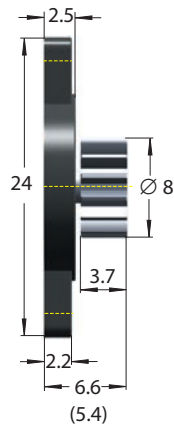
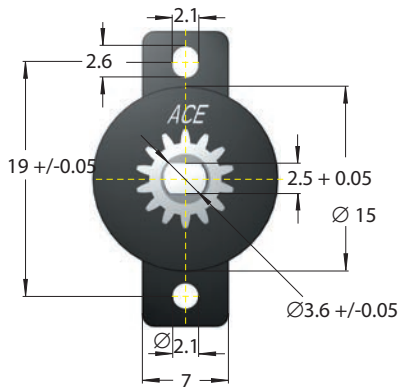


Applications include: audio cassette door on a tape deck and automobile ashtrays.

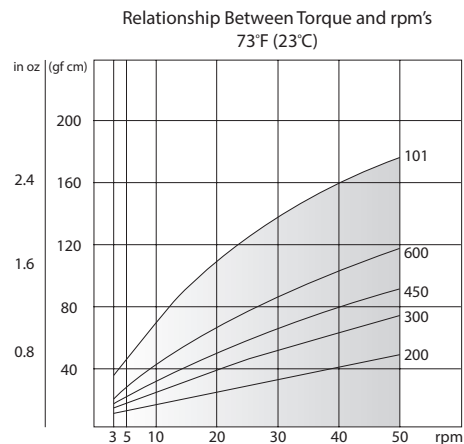
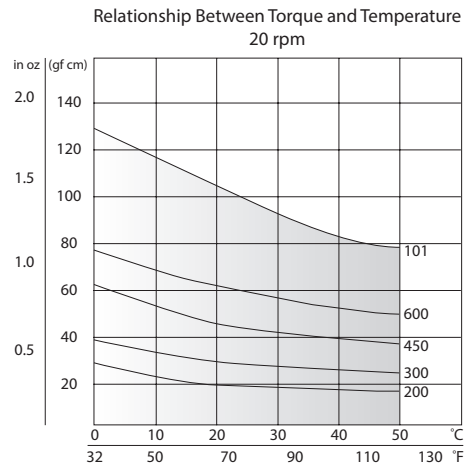


Gear	Specification - mm
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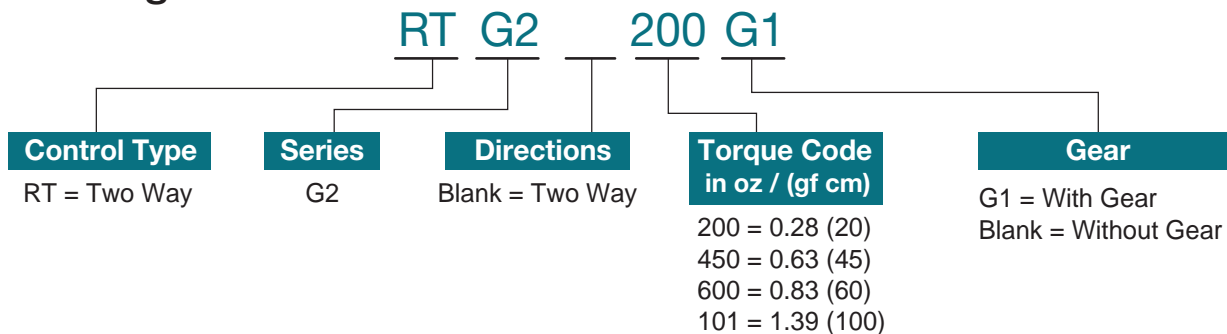
Type	Standard spur gear
Tooth profile	Involute (full)
Module	0.5
Pressure angle	20 degrees
Number of teeth	14
Pitch circle diameter	7.0

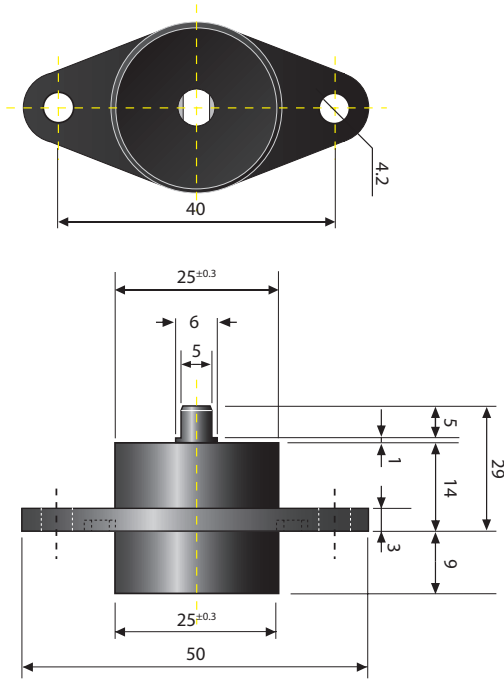


Dimensions in mm



## Ordering Information





Dimensions in mm

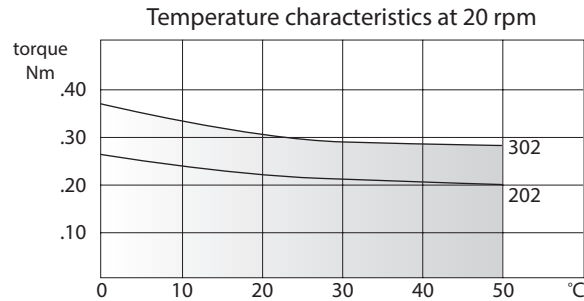
### Specifications

Max. rotation speed:	50 rpm
Max. cycle rate:	10 cycles/min
Operating temperature:	0° to 50° C
Weight:	14.1 g
Body and cap material:	PC (polycarbonate)
Rotating shaft material:	POM
Oil type:	Silicone

Standard torque is decided at 20 rpm and 23° C ± 2° C  
 Within limits different torques can be obtained by using a different viscosity oil.

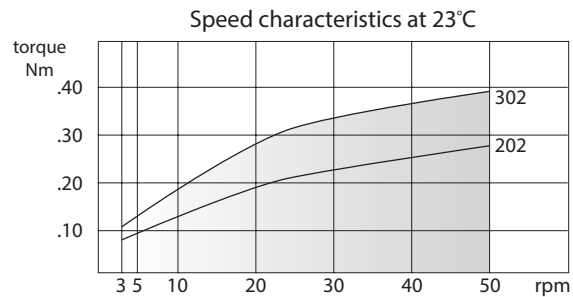
### Temperature Characteristics

Rotary damper torque varies according to the ambient temperature. Refer to the diagram below which shows the torque change under different temperatures. This occurs because the oil viscosity varies according to the temperature.

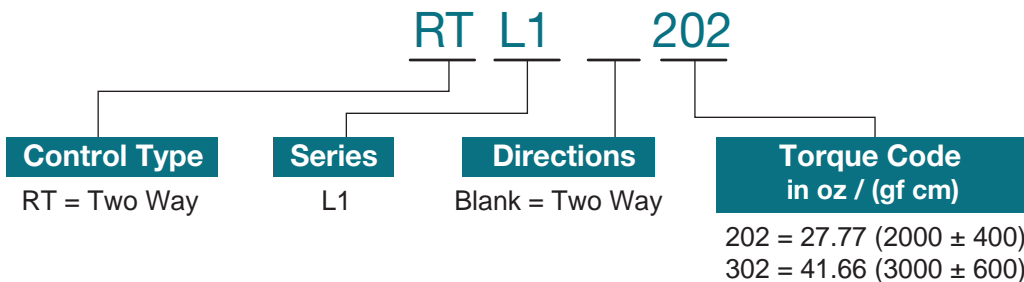


### Speed Characteristics

Rotary damper torque varies according to the rotation speed. Refer to the diagram below. The starting torque is different than the standard torque.



### Ordering Information



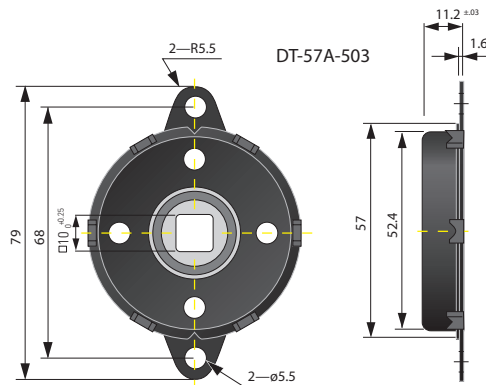
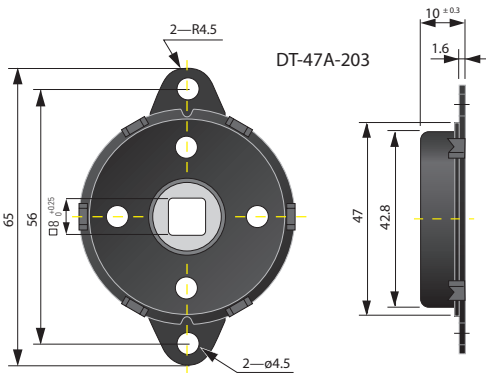




## Specifications

Max. rotation speed:	50 rpm
Max. cycle rate:	12 cycles/min
Operating temperature:	-10° to 50° C
Weight:	47A: 49g, 57A: 75g
Body and cap material:	Steel (SCP440)
Rotating shaft material:	NYLON (with glass)
Oil type:	Silicone

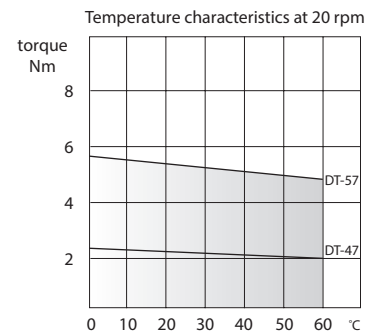
Standard torque is decided at 20 rpm and 23° C ± 2° C



Dimensions in mm

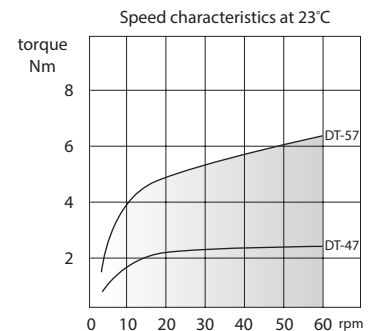
## Temperature Characteristics

Rotary damper torque varies according to the ambient temperature. Refer to the chart to the right which shows the torque change under different temperatures. This occurs because the oil viscosity varies according to the temperature.

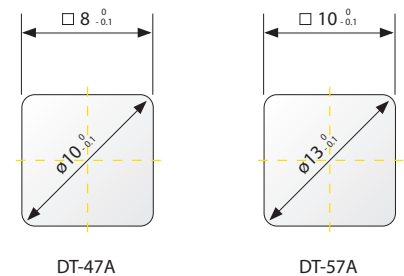


## Speed Characteristics

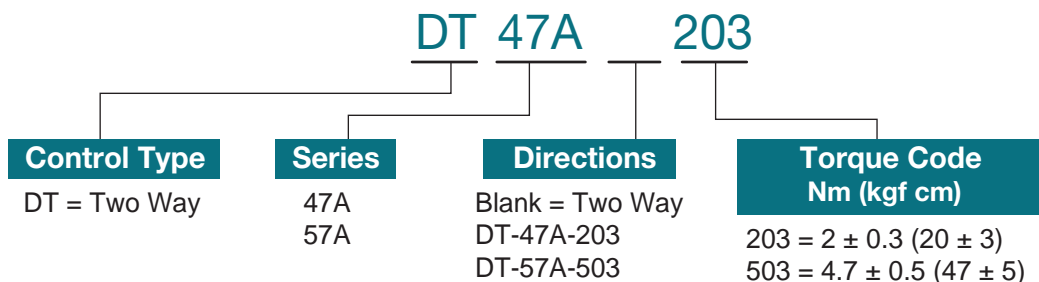
Rotary damper torque varies according to the rotation speed. Refer to the diagram to the right.



This damper is a two way torque damper. There is no support for the shaft in the damper structure. Support for the shaft must be provided. Please use the recommended shaft dimensions. When mounting the shaft, ensure as tight a fit as possible. Refer to the dimensions in the diagrams at the right.



## Ordering Information





**Specifications**

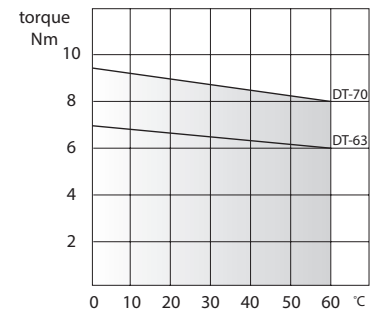
Max. rotation speed:	50 rpm
Max. cycle rate:	12 cycles/min
Operating temperature:	-10° to 50° C
Weight:	63A: 92, 70A: 112g
Body and cap material:	Steel (SCP440)
Rotating shaft material:	Nylon (with glass)
Oil type:	Silicone

Standard torque is decided at 20 rpm and 23° C ± 2° C

**Temperature Characteristics**

Rotary damper torque varies according to the ambient temperature. Refer to the chart at the right which shows the torque change under different temperatures. This occurs because the oil viscosity varies according to the temperature.

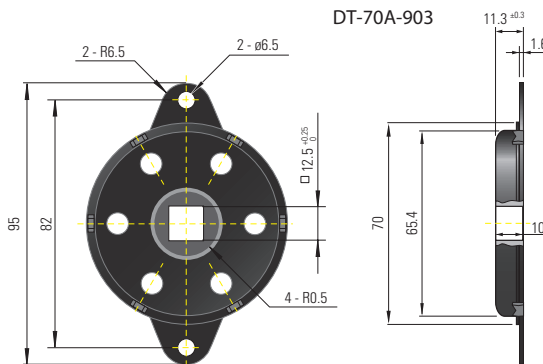
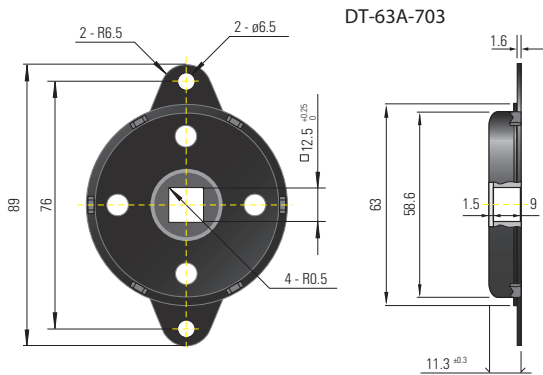
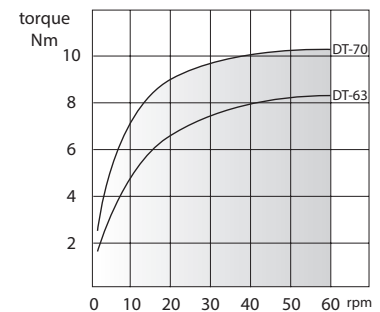
Temperature characteristics at 20 rpm



**Speed Characteristics**

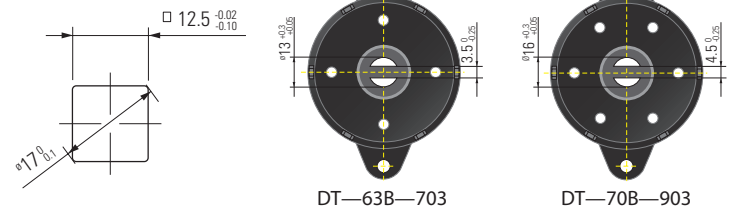
Rotary damper torque varies according to the rotation speed. Refer to the chart at the right.

Speed characteristics at 23° C

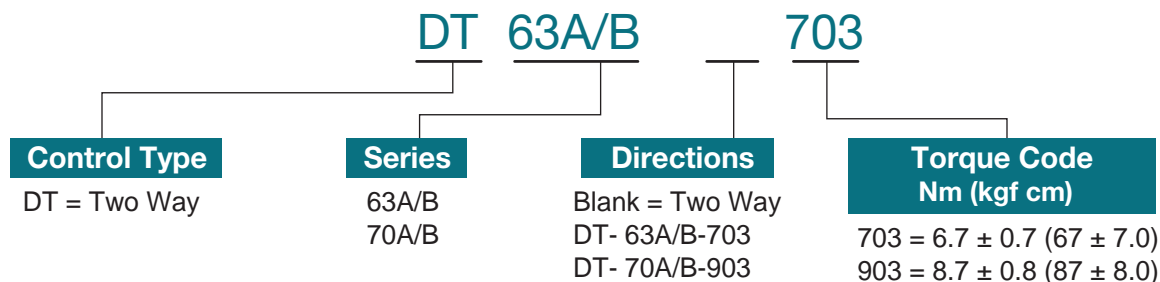


Dimensions in mm

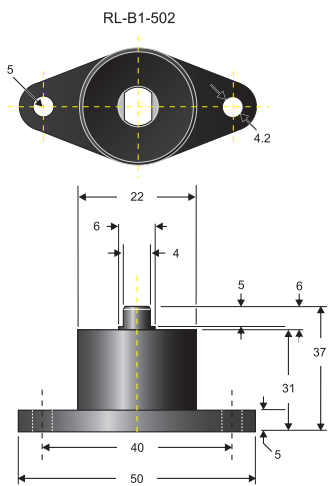
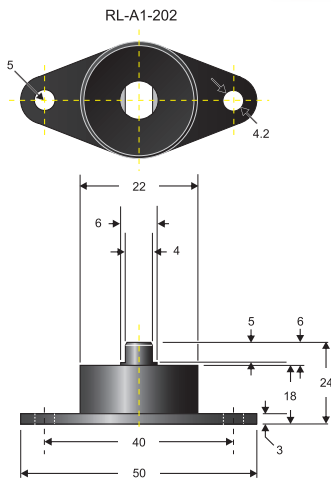
This damper is a two way torque damper. There is no support for the shaft in the damper structure. Support for the shaft must be provided. Please use the recommended shaft dimensions. When mounting the shaft, ensure as tight a fit as possible. Refer to the dimensions in the drawings to the right.



**Ordering Information**

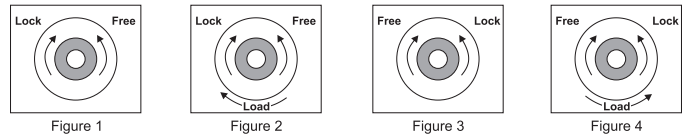


Applications include: briefcases, display lids, furniture doors, or any small panel that would benefit from being locked against rotation.



Dimensions in mm

## Operation of A1/B1 Bi-Directional Lock-



In Figure 1 free movement is available in the counterclockwise direction and the unit is locked against movement in the clockwise direction.

In Figure 2 a load exceeding the rated torque of the locking mechanism is applied in the clockwise direction and the lock function is cancelled.

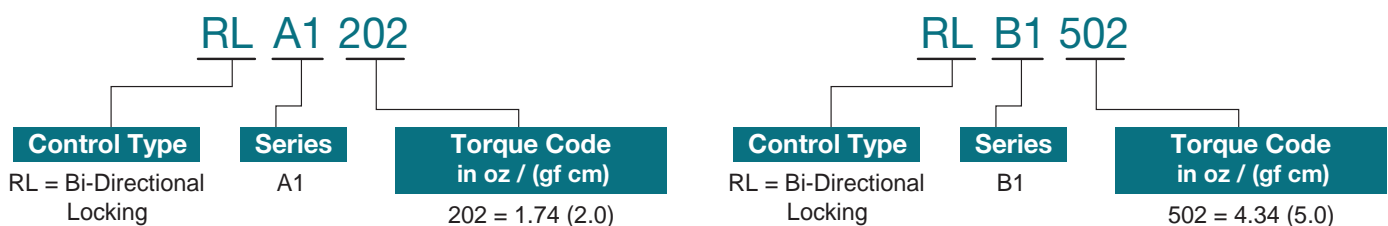
In Figure 3 free movement is now available in the clockwise direction but is locked against movement in the counterclockwise direction.

In Figure 4 a load exceeding the rated torque of the locking mechanism is applied in the counterclockwise direction and the lock function is cancelled. The damper has returned to its original state in Figure 1.

## Selection Procedure A1/B1

1. Determine the torque about the pivot point for your application.
2. In the Ordering Information section, select a model which has a higher torque rating than what was calculated in step 1, above.
3. The difference between the torque determined in step 1 and the torque rating of the model selected in step 2 is the external load that must be applied to cancel the locking function. If this difference is too small, select a model with a higher torque rating. If this difference is too large, select a model with a lower torque rating.
4. Develop a part number from the Ordering Information table on the specification page.
5. If a satisfactory model cannot be found contact ACE applications engineering at 800-521-3320 to discuss a custom model for your application.

## Ordering Information

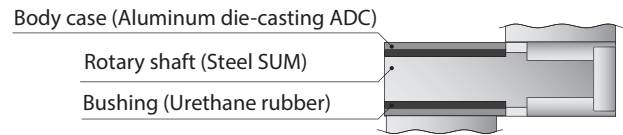




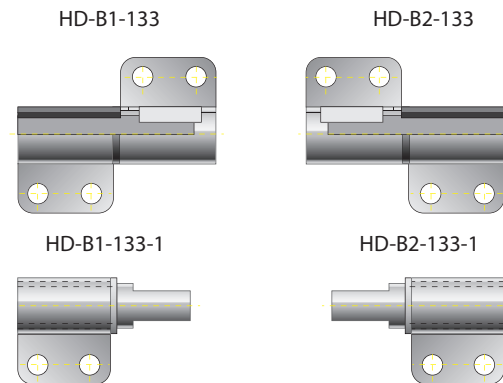
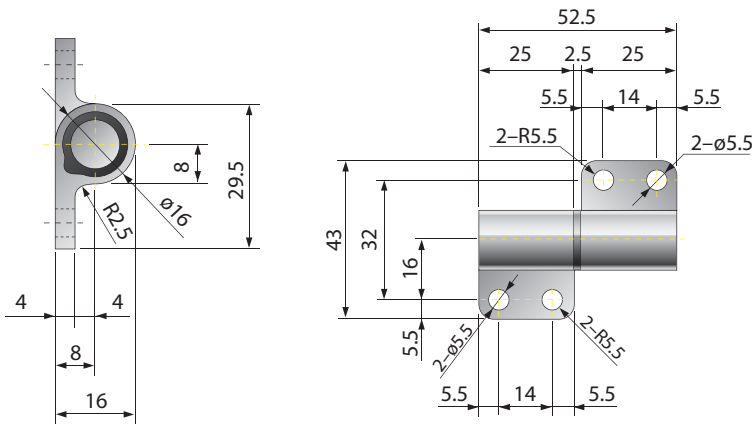
## Specifications

Max. rotation speed:	15 rpm
Max. cycle rate:	5 cycles/min
Operating temperature:	0-60° C
HD-B1/B2-133:	50 g
HD-B1/B2-133-1:	40 g
Body case material:	Aluminum die-casting
Shaft collar material:	Urethane rubber
Shaft material:	Steel (SCP440)

The torque is determined at 2 rpm and 25° C ± 2° C



Dimensions in mm

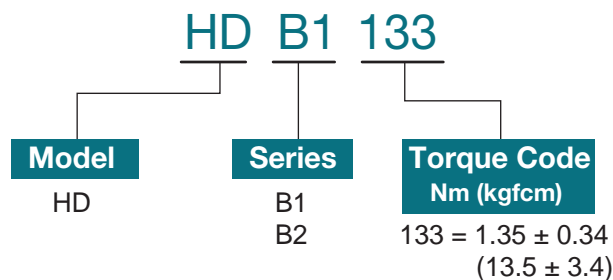


One half only can be used as a damper

## Damper Usage

1. This damper can be used in two directions.
2. Damper can be used even without shaft support.
3. Lubricants must not be used in or near the damper.
4. If damper is used in or near water or oil, the torque will be lost.
5. Damper cannot be used for more than one continuous 360° rotation.
6. Damper can be used as a free stop hinge.

## Ordering Information



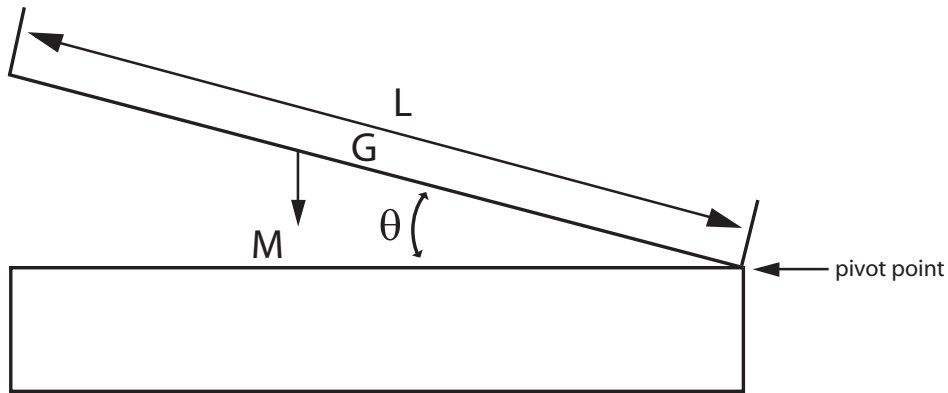
# Bi-Directional Damper (Fixed) HD-B1/B2 Series-Friction Rotary Damper

Please use the following formula to determine the torque.

- M: Material
- L: Length
- $\theta$ : Degrees
- a: Max temperature rate
- N: Damper number

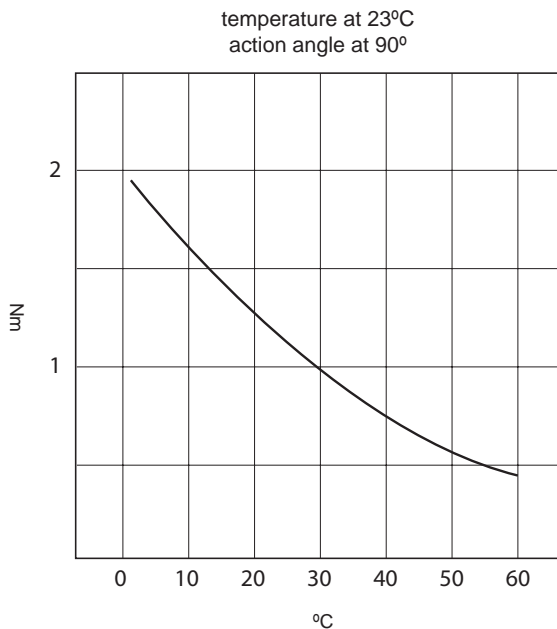
Max temperature rate	a
Room temperature (25 ± 5° C)	1
Max 40° C	0.75
Max 60° C	0.50

$$(\text{Torque}) = \frac{M \times 9.8 \times 0.5 \times L \times \cos \theta}{0.65 \times a \times N} \quad (\text{Nm})$$



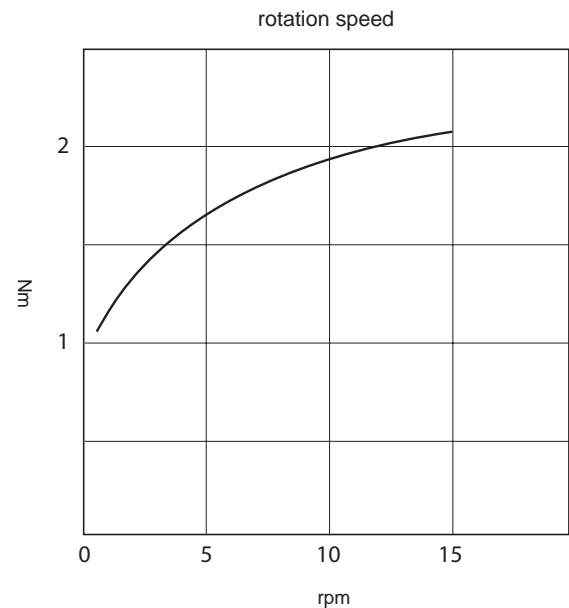
## Temperature Characteristics

Rotary damper torque varies according to ambient temperature. This occurs because the oil viscosity varies according to the temperature. Please refer to the chart below.



## Speed Characteristics

Rotary damper torque varies according to the rotation speed. Refer to the chart below.

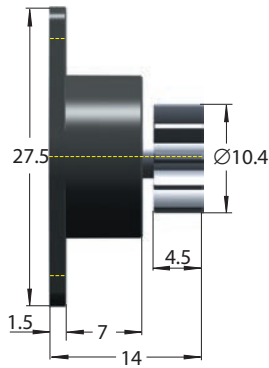
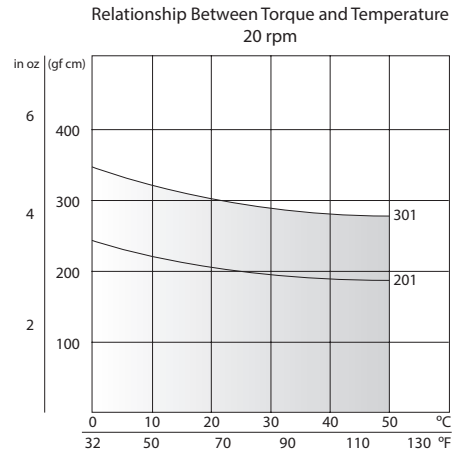
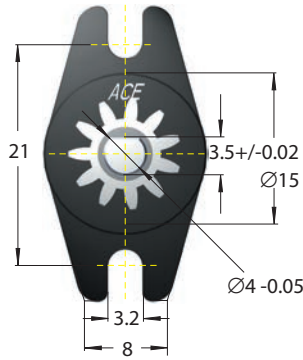


Applications include: VCR loading mechanisms, glove box doors and instrumentation equipment.

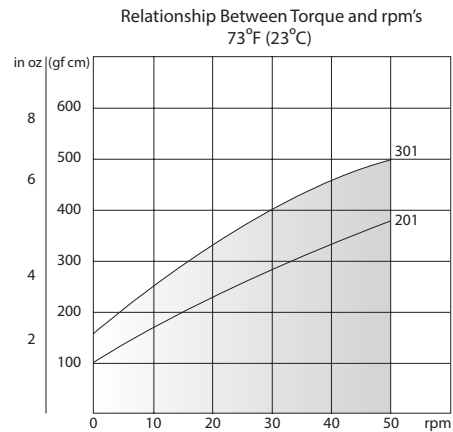


**Gear Specification - mm**

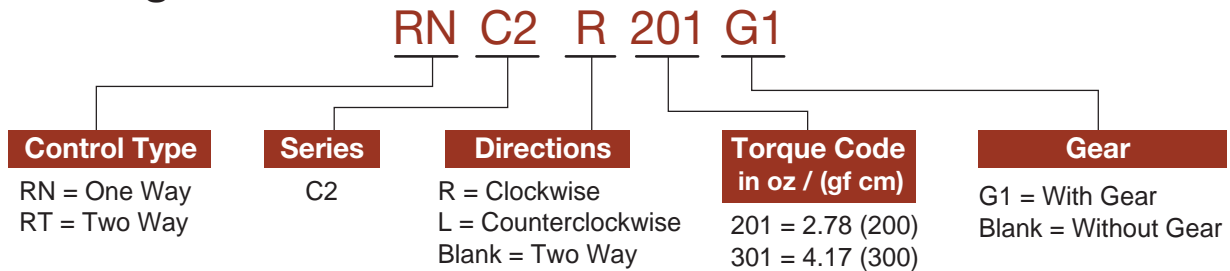
Type	Standard spur gear
Tooth profile	Involute (full)
Module	0.8
Pressure angle	20 degrees
Number of teeth	11
Pitch circle diameter	8.8



Dimensions in mm



**Ordering Information**

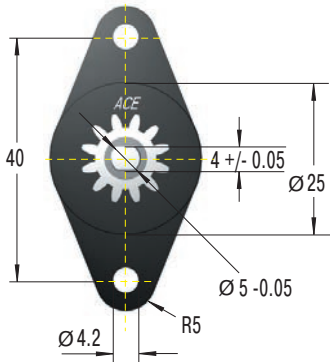


Applications include: window shades, sliding closet doors, printer covers and paper trays for copy machines.

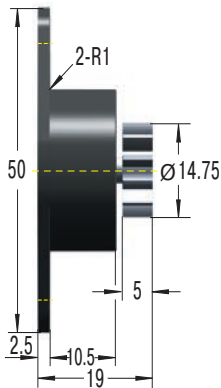
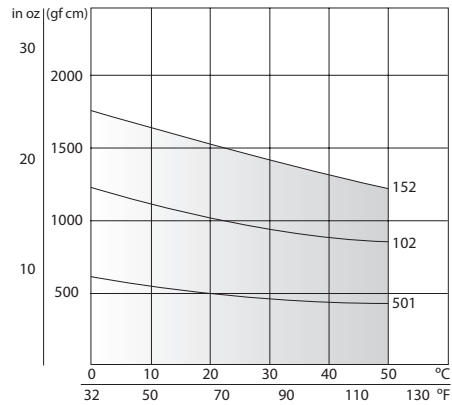


**Gear Specification - mm**

Type	Modified spur gear
Tooth profile	Involute (full)
Module	1.0
Pressure angle	20 degrees
Number of teeth	12
Pitch circle diameter	12.0

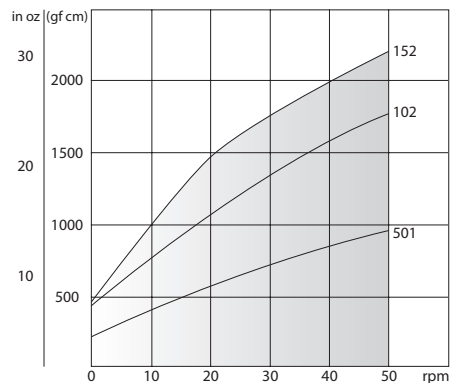


Relationship Between Torque and Temperature  
20 rpm

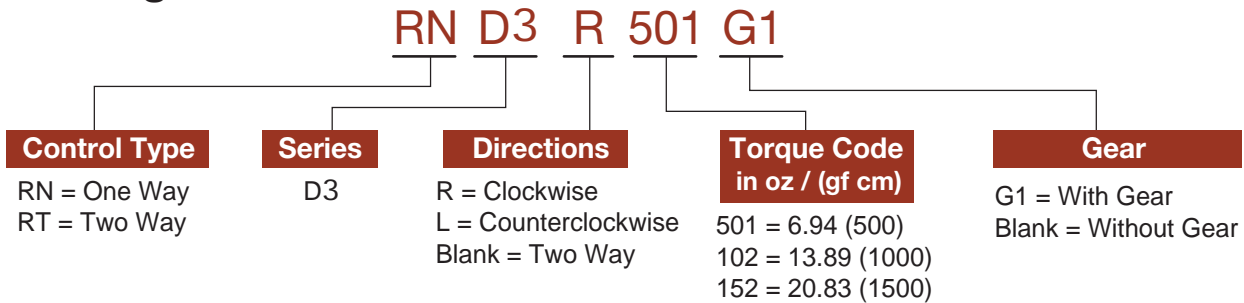


Dimensions in mm

Relationship Between Torque and rpm's  
73°F (23°C)



**Ordering Information**

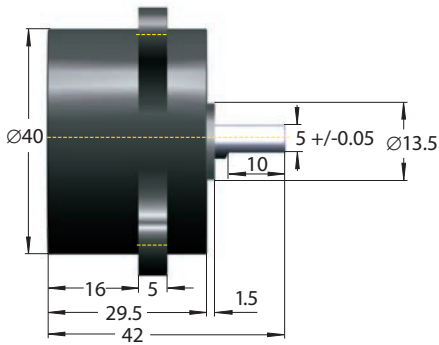
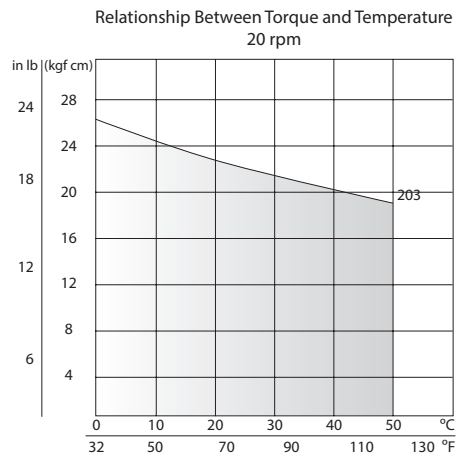
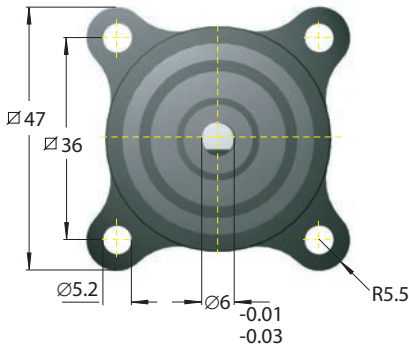




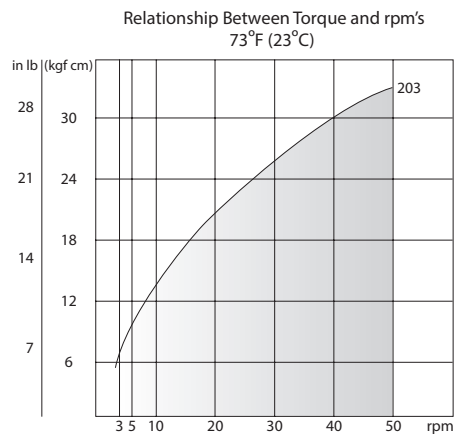
Applications include: copy machine lids, dining room table folding extensions and more.

**Specifications**

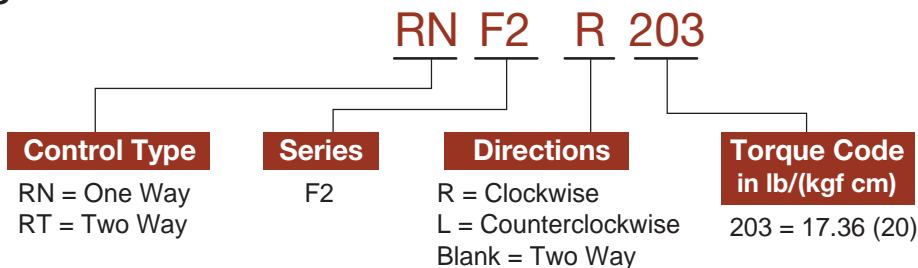
Max. rotation speed:	50 rpm
Max. cycle rate:	10 cycles/min
Operating temperature:	0° to 50° C
Weight:	RT-F2 115.6 g RN-F2 93.2 g
Body and cap material:	Polycarbonate + glass
Rotating shaft material:	SUS (stainless steel)
Oil Type:	Silicone



Dimensions in mm



**Ordering Information**







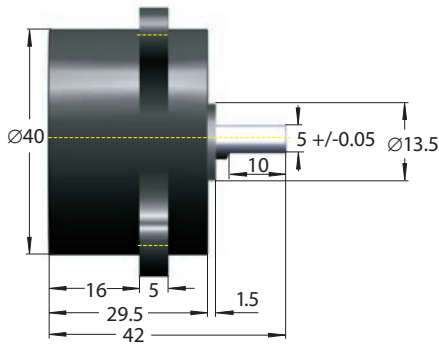
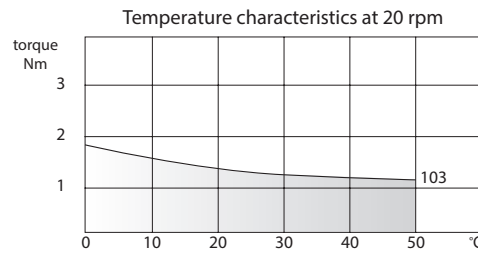
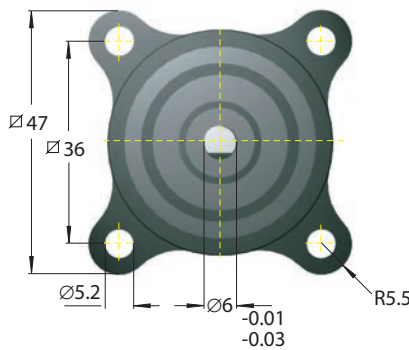
**Specifications**

Max. Rotation Speed:	50 rpm
Max. Cycle Rate:	10 cycles/min
Operating Temperature:	0° to 50° C
Weight:	RT-K2 78.3g RN-K2 56.6g
Body and cap material:	Polycarbonate + glass
Rotating shaft material:	SUS (stainless steel)
Oil Type:	Silicone

Standard torque is decided at 20 rpm and 23° C ± 2° C  
 Within limits different torques can be obtained by using a different viscosity oil.

**Temperature Characteristics**

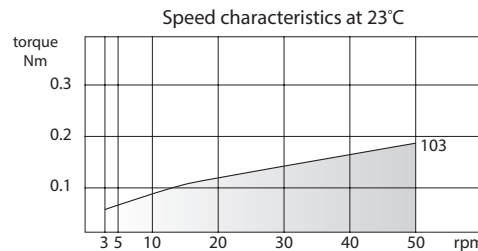
Rotary damper torque varies according to the ambient temperature. Refer to the diagram below which shows the torque change under different temperatures. This occurs because the oil viscosity



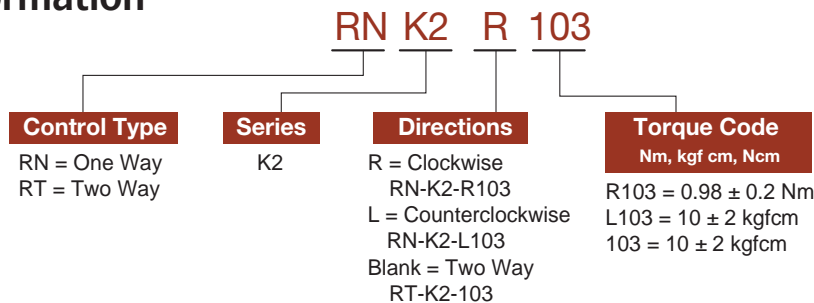
Dimensions in mm

**Speed Characteristics**

Rotary damper torque varies according to the rotation speed. Refer to the diagram below. The starting torque is different than the standard torque.



**Ordering Information**





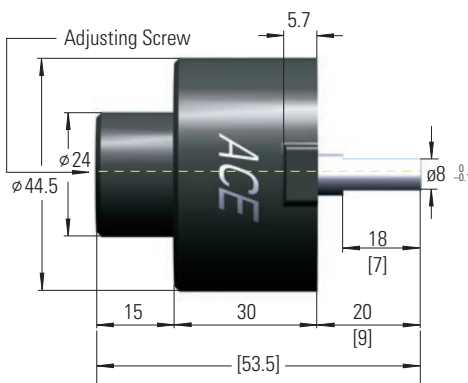
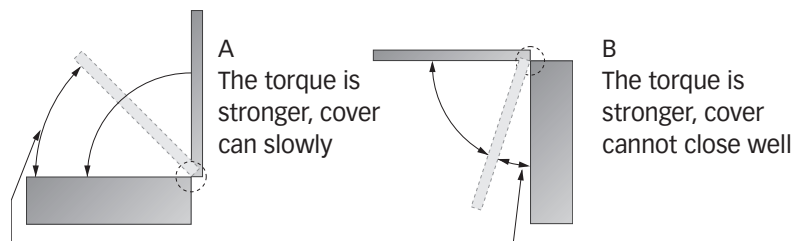
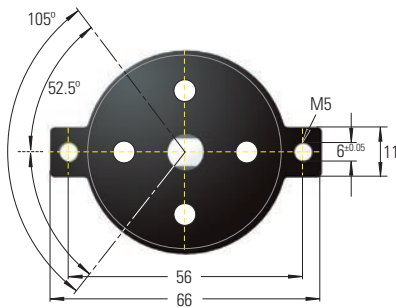
### Specifications

Max. rotation angle:	105°
Operating temperature:	-5° to 50° C
Weight:	H1:240 ± 10, H2:235 ± 10g
Body and cap material:	ZDC (zinc die-cast)
Rotating shaft material:	S25C (carbon steel)
Oil type:	Silicone

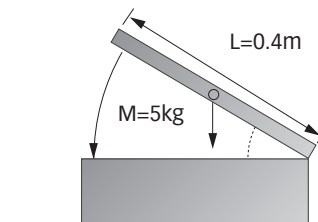
Torque is determined at 23° C ± 2° C

- The FYN-H1 action is designed for use in applications as shown in diagram A. The torque is highest when the cover is horizontal and lowest when the cover is vertical. If used in applications as shown in diagram B, the damper will not provide a satisfactory closing action.

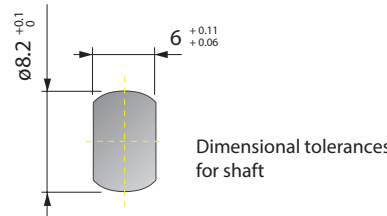
A damper with a higher torque can be made to special order.



Dimensions in mm  
H2 Dimensions in [ ]



- Please use the following formula to determine the torque.  
Example:  
M = 5 kg  
L = 0.4 m  
 $T = 5 \times 0.4 \times 9.8 / 2 = 9.8 \text{ Nm}$   
FYN-H1 \*104 can be used.



- When the damper is mounted using the shaft, ensure as tight a fit as possible.

### Ordering Information

**FYN H1 R 104**

<b>Control Type</b> FYN = One Way FYT = Two Way	<b>Series</b> H1 H2	<b>Directions</b> R = Clockwise FYN-H1(2) L = Counterclockwise FYN-H1(2) Blank = Two Way FYT=H1(2)	<b>Torque Code Nm (kgf cm)</b> 104 = 10 (100) Reverse Torque *104 = 0.5 (5)
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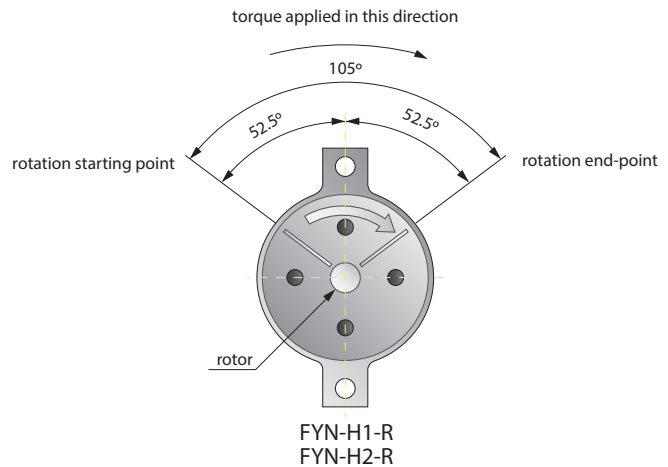
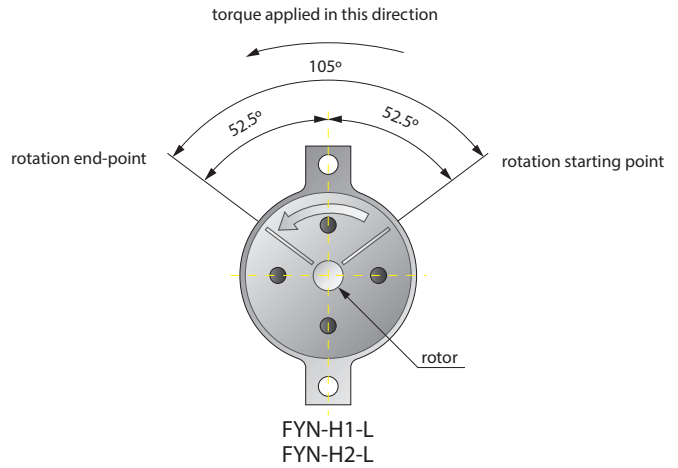
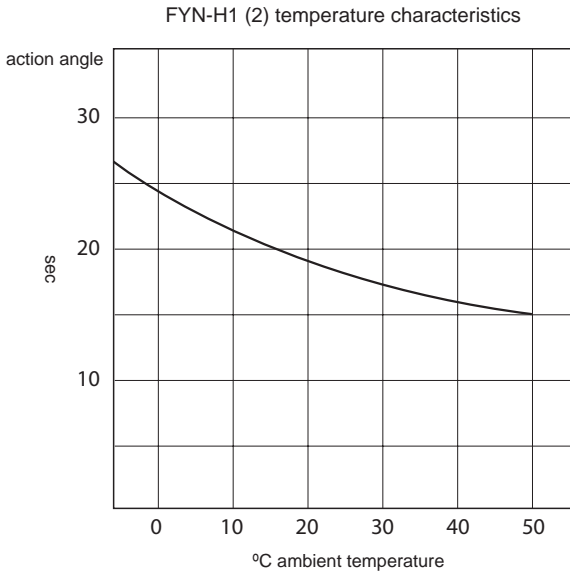
\*FYN models only



## Temperature Characteristics

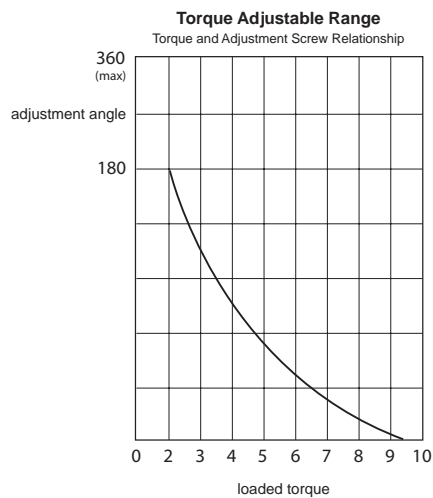
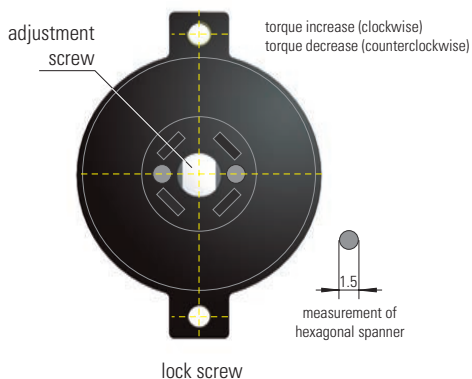
Rotary damper torque varies according to the ambient temperature. Refer to the chart below which shows the torque change under different temperatures. This occurs because the oil viscosity varies according to the temperature.

Damper action angle is  $\pm 52.5^\circ$  from center. Exceeding the maximum action angle will result in damage to the damper. A stopper should be used.



## Torque Adjustment Method

1. FYT-H1(H2) and FYN-H1(H2) torque is adjustable by turning the adjustment screw.
2. To increase torque turn screw in clockwise direction(H).
3. To reduce torque turn screw in counterclockwise direction(L).
4. Do not rotate the adjustment screw more than  $360^\circ$  as the damper may be damaged.
5. After adjusting please fix the adjustment screw, otherwise the torque may change during operation.



Damper torque direction differs according to the model, please choose an appropriate direction for your application.



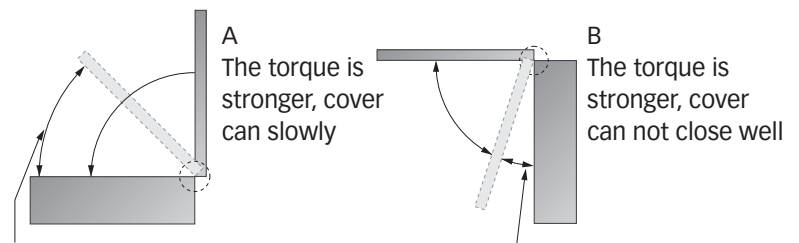
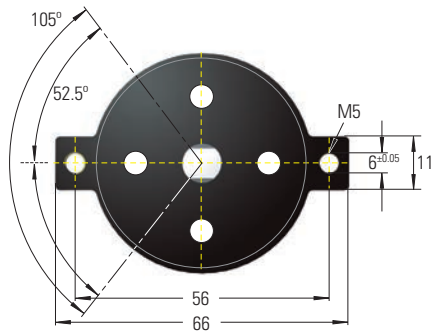
**Specifications**

Max. Rotation Angle:	105°
Operating Temperature:	-5° to 50° C
Weight:	D1:215 ± 10, D2:210 ± 10g
Body and cap material:	ZDC (zinc die-cast)
Rotating shaft material:	S25C (carbon steel)
Oil Type:	Silicone

Torque is determined at 23° C ± 2° C

1. The FYN-D1 action is designed for use in applications as shown in diagram A. The torque is highest when the cover is horizontal and lowest when the cover is vertical. If used in applications as shown in diagram B, the damper will not provide a satisfactory closing action.

A damper with a higher torque can be made to special order.



2. Please use the following formula to determine the torque.

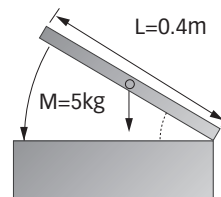
Example:

M = 5 kg

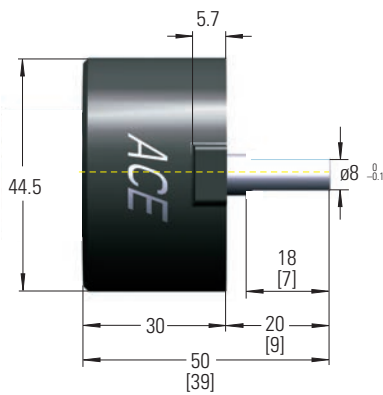
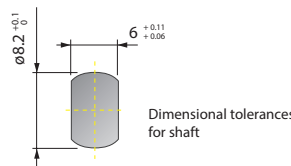
L = 0.4 m

$T = 5 \times 0.4 \times 9.8/2 = 9.8 \text{ Nm}$

FYN-D1 \*104 can be used.



3. When the damper is mounted using the shaft, ensure as tight a fit as possible.



Dimensions in mm  
D2 Dimensions in [ ]

**Ordering Information**

**FYN D1 R 104**

<p><b>Control Type</b></p> <p>FYN = One Way FYT = Two Way</p>	<p><b>Series</b></p> <p>D1 D2</p>	<p><b>Directions</b></p> <p>R = Clockwise FYN-D1(2) L = Counterclockwise FYN-D1(2) Blank = Two Way FYT=D1(2)</p>	<p><b>Torque Code Nm (kgf cm)</b></p> <p>104 = 10 (100) Reverse Torque *104 = 0.5 (5)  *FYN models only</p>
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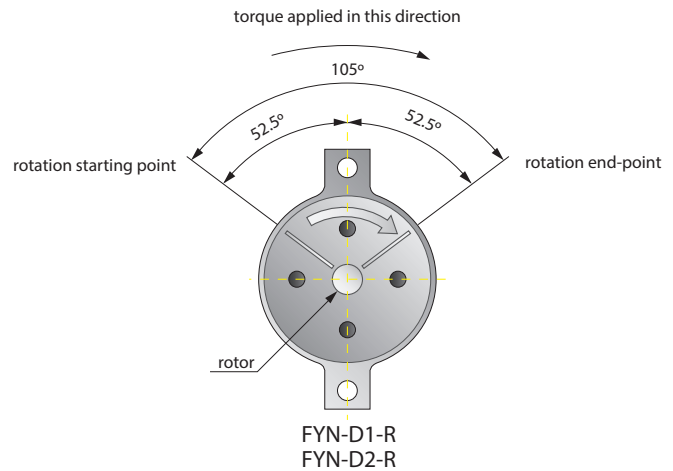
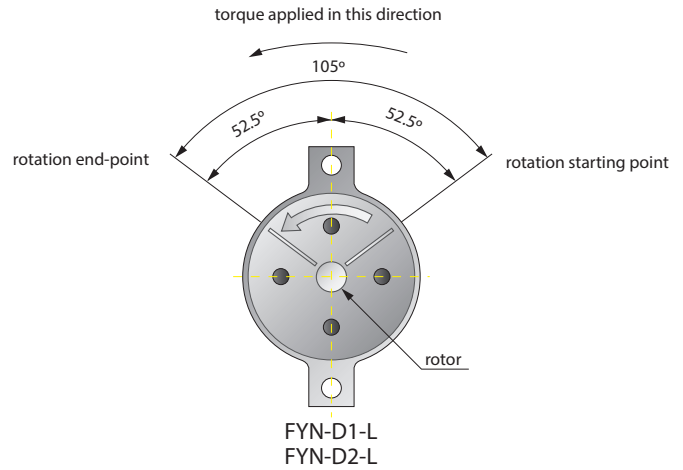
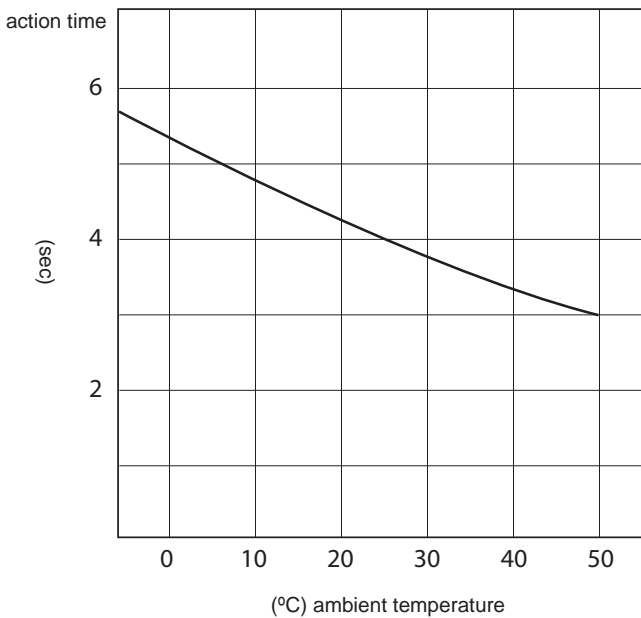


## Temperature Characteristics

Rotary damper torque varies according to the ambient temperature. Refer to the chart below which shows the torque change under different temperatures. This occurs because the oil viscosity varies according to the temperature.

Max damper action angle is 105°  
 Do not exceed 105° or damage will result.  
 Please use mechanical stop.  
 Please refer to the drawings to the right.

FYT/N-D1 (D2) temperature characteristics



FYN-D1 torque is nonadjustable, however dampers with torque ranging from 2 to 20 Nm can be supplied by using a different viscosity oil.

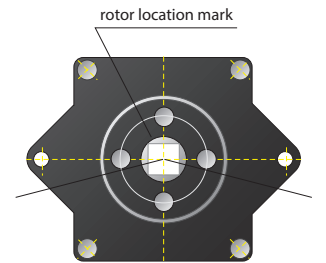
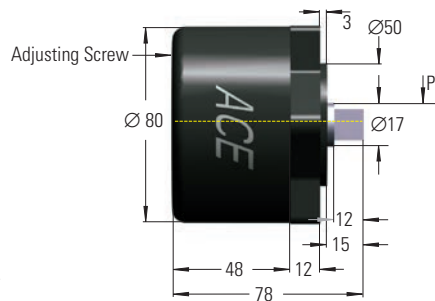
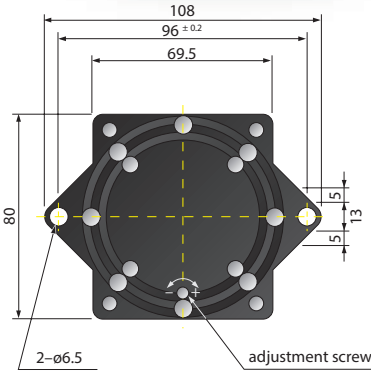
Damper torque direction differs according to the model, please choose an appropriate direction for your application.



**Specifications**

Max. rotation angle:	210°
Operating temperature:	-5° to 50° C
Weight:	1.75 kg
Body and cap material:	ZDC (zinc die-cast)
Rotating shaft material:	S25C (carbon steel)
Oil type:	Silicone
Damping Rate:	10-60 Nm/rad/sec

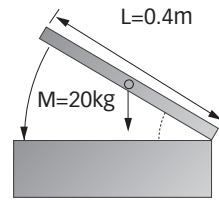
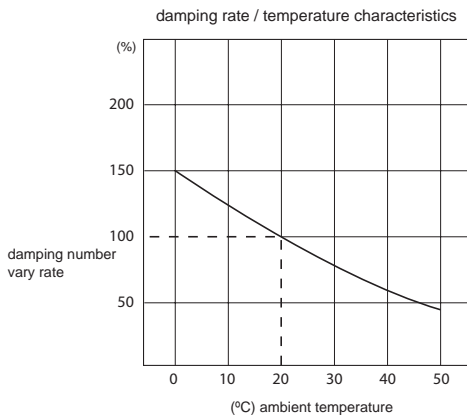
Torque is determined at 23° C ± 2° C



damper action angle is ± 105° from center mark

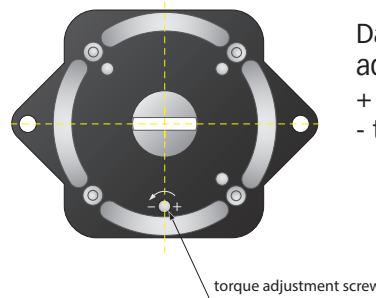
**Temperature Characteristics**

Rotary damper torque varies according to the ambient temperature. Refer to the chart below which shows the torque change under different temperatures. This occurs because the oil viscosity varies according to the temperature.



2. Use the following formula to determine the torque.

Example:  
 M = 20 kg  
 L = 0.4 m  
 $T = 20 \times 0.4 \times 9.8/2 = 39.2 \text{ Nm}$   
 FYN-LA3 can be used.



Damping number adjustment screw:  
 + torque increases  
 - torque decreases

**Ordering Information**

**FYN LA3 R 40**

**Control Type**

FYN = One Way  
 FYT = Two Way

**Series**

LA3

**Directions**

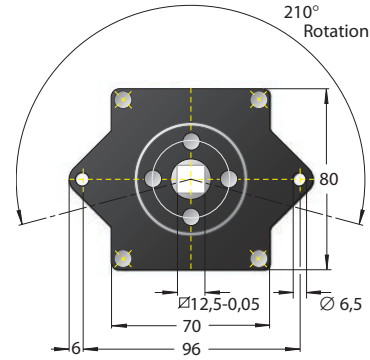
R = Clockwise  
 FYN-LA3R  
 L = Counterclockwise  
 FYN-LA3L  
 Blank = Two Way  
 FYT=LA3

**Torque Code Nm (kgf cm)**

40 (400)

**Important Damper Information**

1. When the damper is mounted using the shaft, ensure as tight a fit as possible.
2. Damper action angle is ± 105° from center.
3. Damper torque direction differs according to the model.
4. Max damper action angle is ± 105°. Do not exceed ± 105° or damage will result. Use mechanical stop.



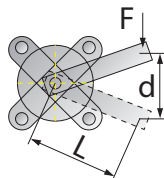
**Rotary Damper Damping Number Count Method**

1. Steady movement in a straight line  $F = \text{lever force (N)}$   

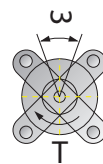
$$\text{line} = \frac{FL^2t}{d}$$
  - L = distance between center of damper axes to lever effect-point (m)
  - d = lever removing distance (m)
  - t = lever removing time
2. Steady rotation  $= \frac{T}{w}$   
  - T = torque is on shaft (Nm)
  - w = angle speed (rad/sec)
3. Deceleration of mass moving in a straight line  $M = \text{quality (kg)}$   

$$\text{a straight line} = \frac{MVL^2}{d}$$
  - V = speed (m/s)
  - L = distance between center of damper axes to lever effect-point (m)
  - d = lever removing distance (m)
4. Critical damping of vibrating mass  $= \frac{MfL^2}{0.08}$   
  - M = quality (kg)
  - f = vibrancy frequency (Hz)
  - L = distance between center of damper axes to lever effect-point (m)

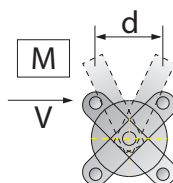
**Controls linear movement**



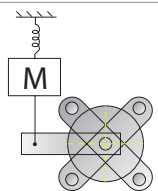
**Controls rotational motion**



**Impact absorption**



**Vibration absorption**





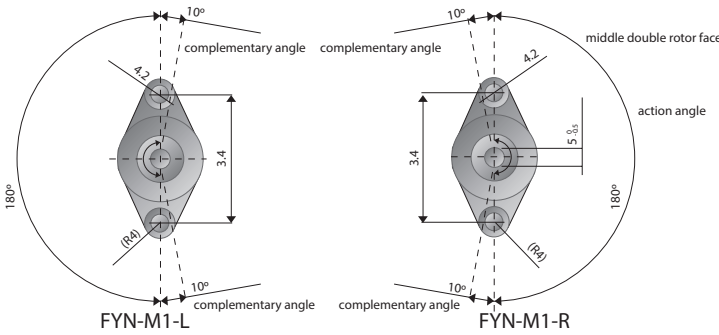
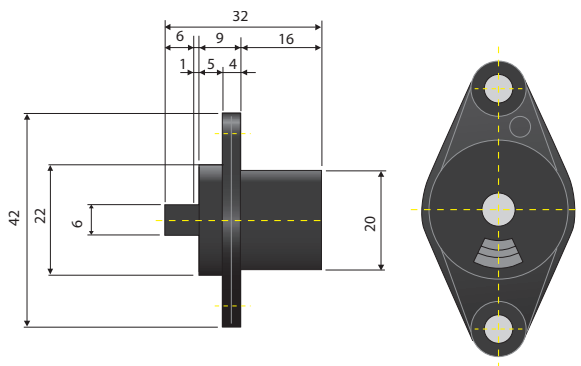
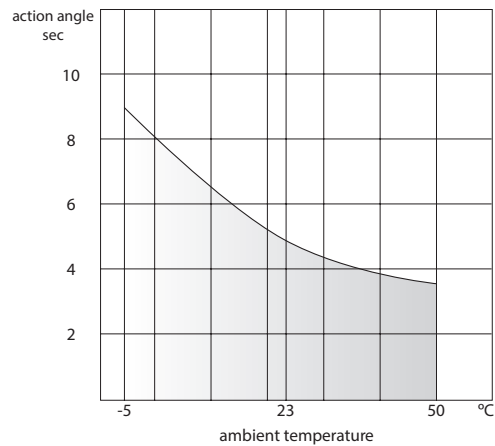
**Specifications**

Max. rotation angle:	180°
Max. cycle rate:	6 cycles/min
Operating temperature:	0° to 50° C
Weight:	17 ± 2 g
Body and cap material:	PBT
Rotating shaft material:	ZDC (zinc die-cast)
Oil type:	Silicone

**Temperature Characteristics**

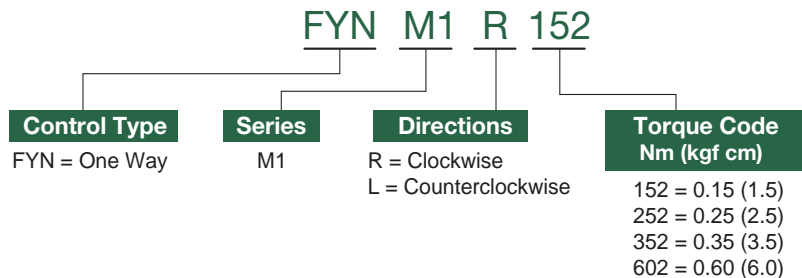
Rotary damper torque varies according to the ambient temperature. Refer to the chart below which shows the torque change under different temperatures. This occurs because the oil viscosity varies according to the temperature.

FYN-M1 Series Temperature Characteristics



Standard torque is decided at 20 rpm and 23° C ± 2° C  
 Within limits different torques can be obtained by using a different viscosity oil.

**Ordering Information**







## Specifications

Max. rotation angle:	108°
Operating temperature:	-5° to 50° C
Weight:	33 ± 3 g
Body and cap material:	PBT
Rotating shaft material:	PPS
Oil type:	Silicone

Use the following formula to determine the torque.

Example:

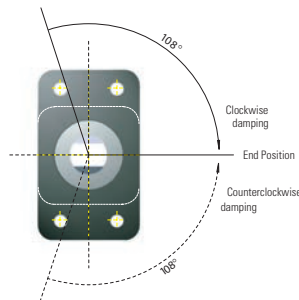
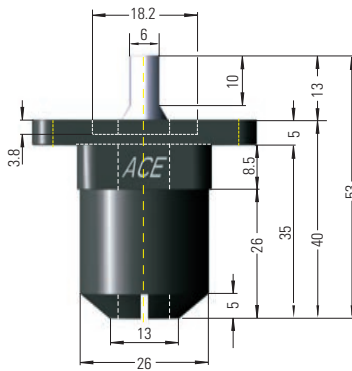
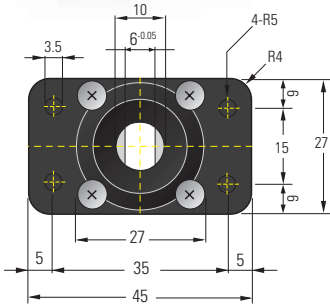
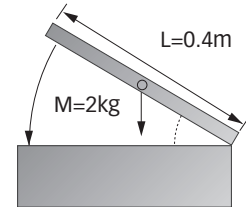
$$M = 2 \text{ kg}$$

$$L = 0.4 \text{ m}$$

$$T = 2 \times 0.4 \times 9.8/2$$

$$= 3.92 \text{ Nm}$$

Select damper: FYN-K1-403



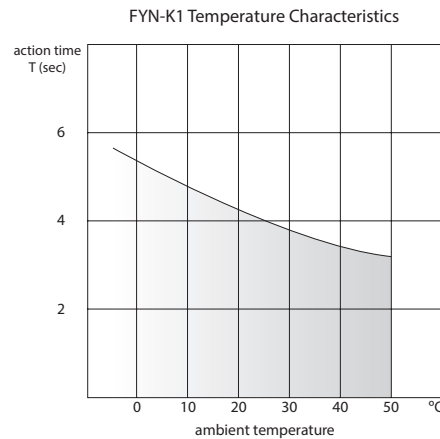
Dimensions in mm

Torque is determined at 23° C ± 2° C

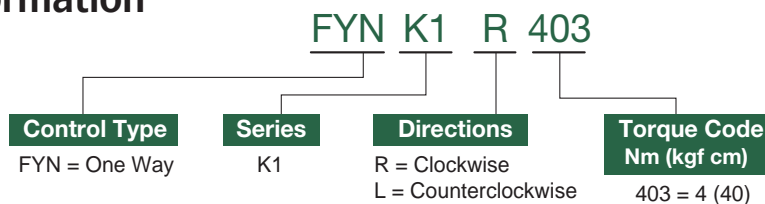
FYN-K1 torque is nonadjustable. However, dampers with torque ranging from 2 to 4 Nm can be supplied by using a different viscosity oil.

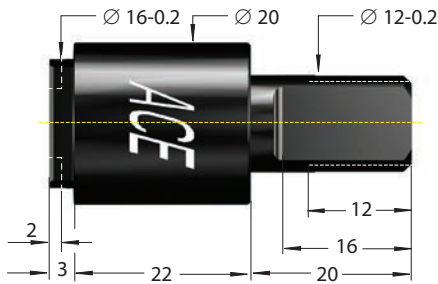
## Temperature Characteristics

Rotary damper torque varies according to the ambient temperature. Refer to the chart below which shows the torque change under different temperatures. This occurs because the oil viscosity varies according to the temperature.

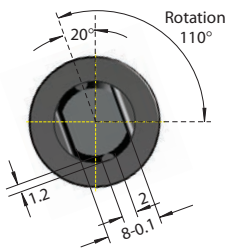
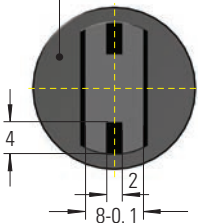


## Ordering Information



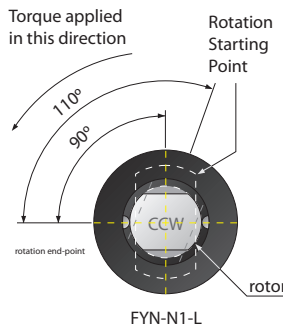


White end cap: counterclockwise damping  
Black end cap: clockwise damping



As shown in the diagram below, the maximum action angle is 110°. Do not exceed 110° or damage will result.

The rotating starting point is pre-set at the factory.



Dimensions in mm

**Specifications**

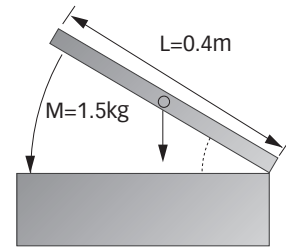
Max. rotation angle:	110°
Operating temperature:	-5° to 50° C
Weight:	12 ± 1 g
Body and cap material:	PBT
Rotating shaft material:	PPS
Oil type:	Silicone

Standard torque is decided at 20 rpm and 23° C ± 2° C  
Within limits different torques can be obtained by using a different viscosity oil.

Use the following formula to determine the torque.

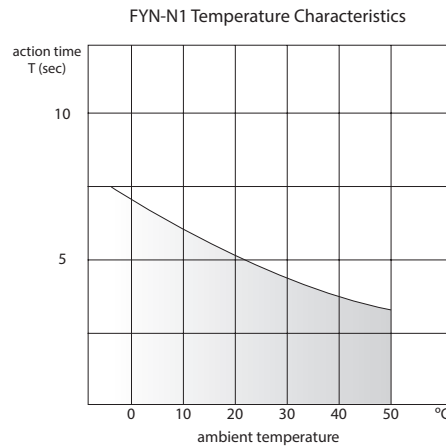
Example:  
 $M = 1.5 \text{ kg}$   
 $L = 0.4 \text{ m}$   
 $T = 1.5 \times 0.4 \times 9.8/2$   
 $= 2.9 \text{ Nm}$

Select damper: FYN-N1-303

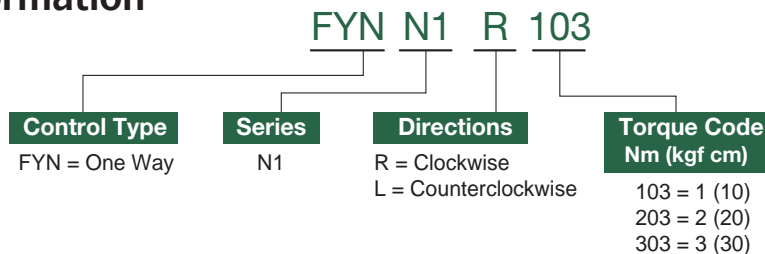


**Temperature Characteristics**

Rotary damper torque varies according to the ambient temperature. Refer to the chart below which shows the torque change under different temperatures. This occurs because the oil viscosity varies according to the temperature.



**Ordering Information**





## Specifications

Max. rotation angle:	115°
Operating temperature:	-5° to 50° C
Weight:	10.5 ± 1 g
Body and cap material:	PBT
Rotating shaft material:	PBT
Oil type:	Silicone

Torque is determined at 23° C ± 2° C  
Use the following formula to determine the torque.

Example:

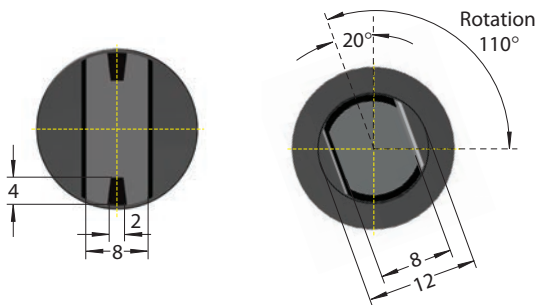
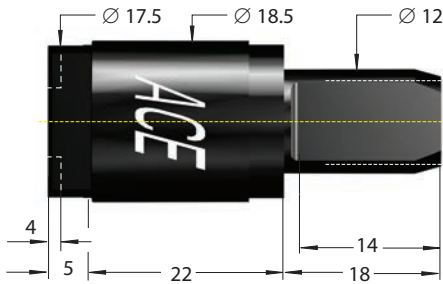
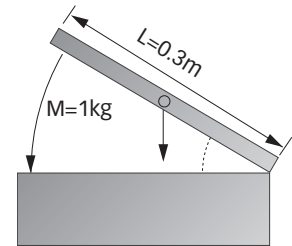
$$M = 1 \text{ kg}$$

$$L = 0.3 \text{ m}$$

$$T = 1 \times 0.3 \times 9.8/2$$

$$= 1.47 \text{ Nm}$$

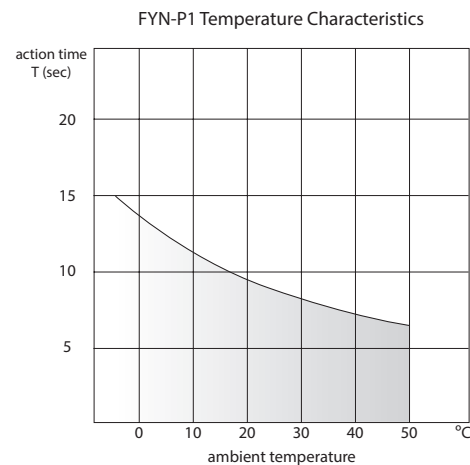
Select damper: FYN-P1-153



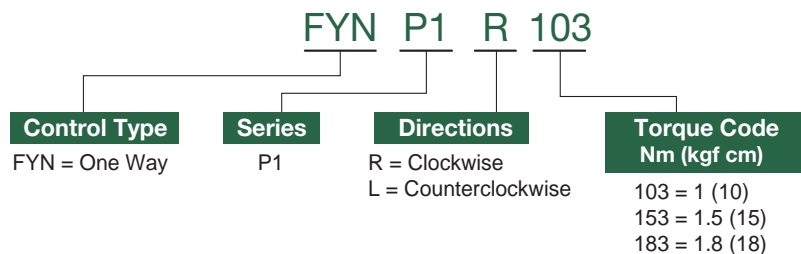
Dimensions in mm

## Temperature Characteristics

Rotary damper torque varies according to the ambient temperature. Refer to the chart below which shows the torque change under different temperatures. This occurs because the oil viscosity varies according to the temperature.



## Ordering Information





**Specifications**

Max. rotation speed:	50 rpm
Max. cycle rate:	12 cycles/min
Operating temperature:	-10° to 50° C
Weight max:	120 g
Body and cap material:	Steel (SCP440)
Rotating shaft material:	Nylon (with glass)
Oil type:	Silicone

Standard torque is decided at 20 rpm and 23° C ± 2° C  
 Within limits different torques can be obtained by using a different viscosity oil.

**Temperature Characteristics**

Rotary damper torque varies according to the ambient temperature. This occurs because the oil viscosity varies according to the temperature.

**Speed Characteristics**

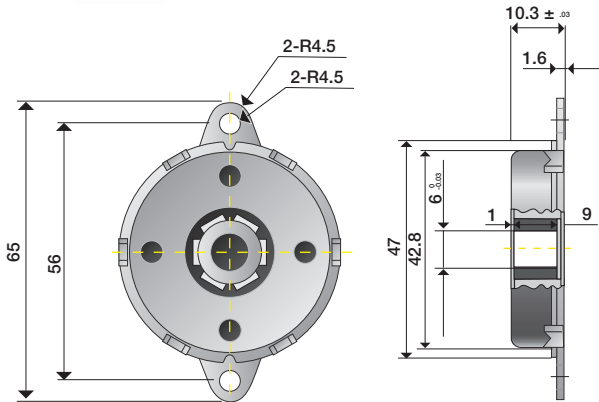
Rotary damper torque varies according to the rotation speed.

This is a one way damper which features a special axle insert which can be easily reversed by the user to provide damping in the opposite direction.

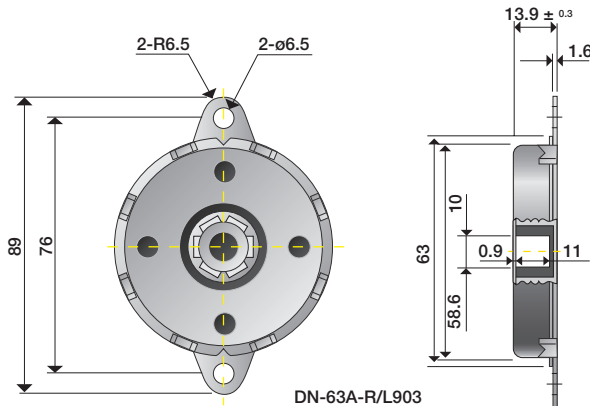
There is no support for the shaft in the damper structure. Support for the shaft must be provided.

**Mounting Shaft Tolerance**

shaft tolerance	6 <sup>+0</sup> <sub>-0.03</sub> (47A)	10 <sup>+0</sup> <sub>-0.03</sub> (63A)
surface hardness	over HRC 55	
quench thickness	over 0.5 mm	
surface roughness	under 1.0 Z	



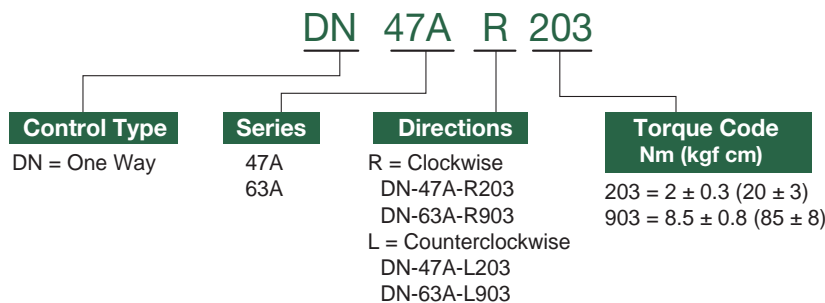
DN-47A-R/L203



DN-63A-R/L903

Dimensions in mm

**Ordering Information**





## Specifications

Max. rotation speed:	50 rpm
Max. cycle rate:	12 cycles/min
Operating temperature:	-10° to 50° C
Weight:	57A: 94g, 70A:120g
Body and cap material:	Steel (SCP440)
Rotating shaft material:	Nylon (with glass)
Oil type:	Silicone

Standard torque is decided at 20 rpm and 23° C ± 2° C  
 Within limits different torques can be obtained by using a different viscosity oil.

## Temperature Characteristics

Rotary damper torque varies according to the ambient temperature. This occurs because the oil viscosity varies according to the temperature.

## Speed Characteristics

Rotary damper torque varies according to the rotation speed.

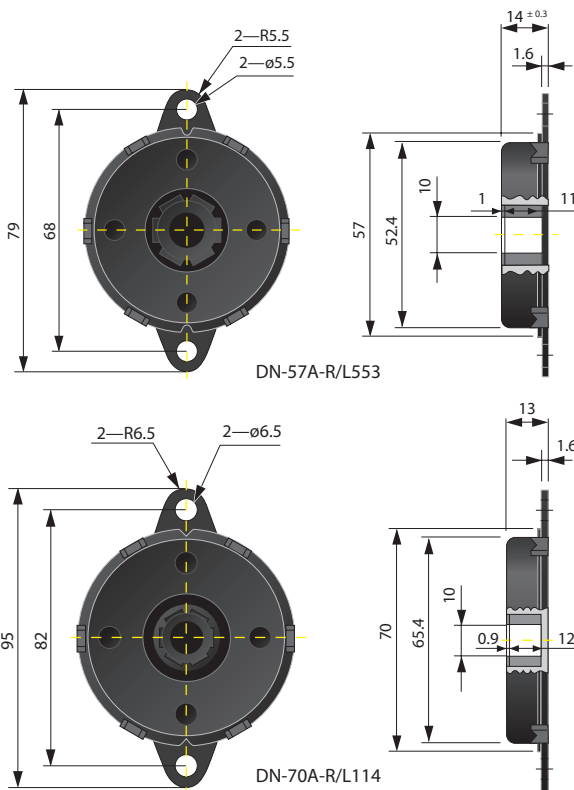
This is a one way damper which features a special axle insert which can be easily reversed by the user to provide damping in the opposite direction.

There is no support for the shaft in the damper structure. Support for the shaft must be provided.

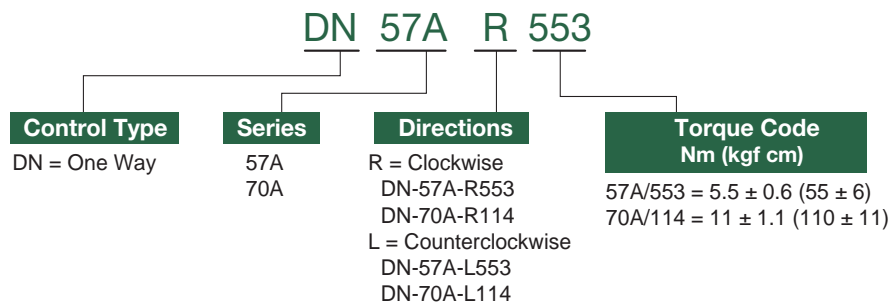
## Mounting Shaft Tolerance

shaft tolerance	10 <sup>+0</sup> <sub>-0.03</sub>
surface hardness	over HRC 55
quench thickness	over 0.5 mm
surface roughness	under 1.0 Z

Dimensions in mm



## Ordering Information





**Specifications**

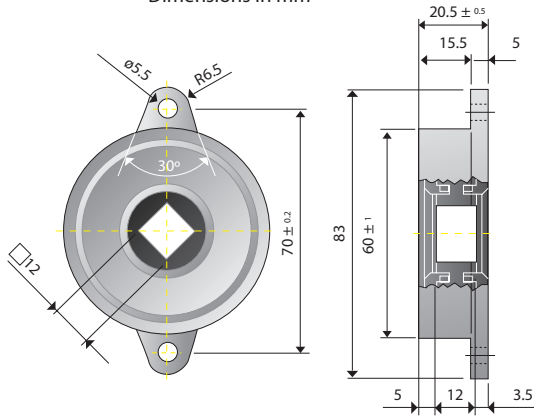
Max. rotation angle:	130°
Operating temperature:	-5° to 50° C
Weight:	220 ± 10 g
Body and cap material:	ZDC (zinc die-cast)
Rotating shaft material:	POM
Oil type:	Silicone

Torque is determined at 23° C ± 2° C  
 FYN-S1 Series dampers are self-compensating and can maintain the same action time as the load changes.

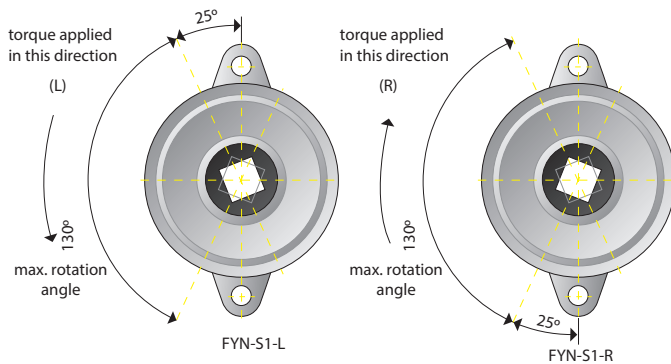
**Temperature Characteristics**

Rotary damper torque varies according to the ambient temperature. Refer to the chart below which shows the torque change under different temperatures. This occurs because the oil viscosity varies according to the temperature.

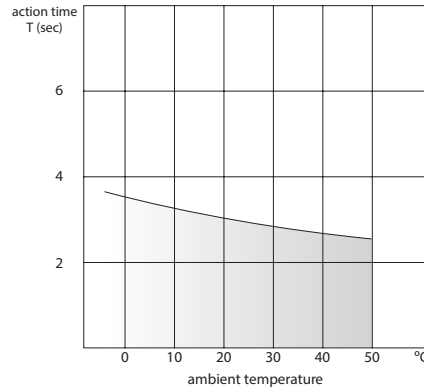
Dimensions in mm



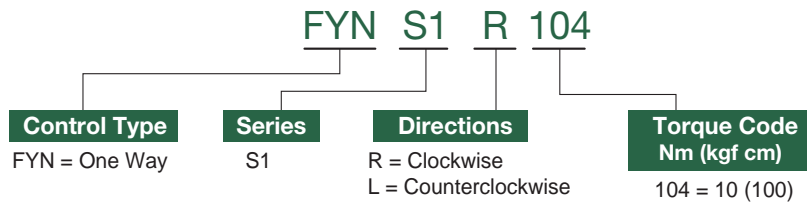
The maximum action angle of the damper is 130° as shown below. Do not exceed 130°. A mechanical stop is recommended.



FYN-S1 Temperature Characteristics



**Ordering Information**

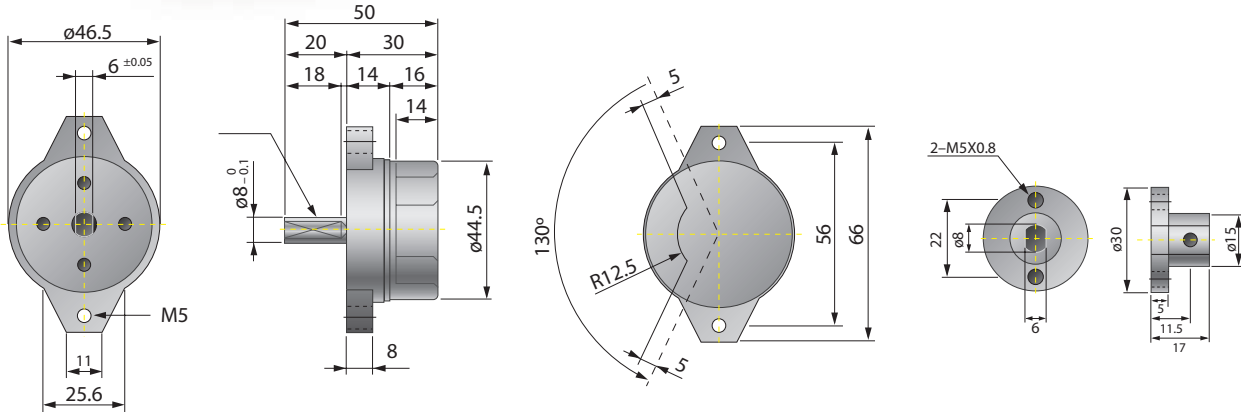




## Specifications

Max. rotation speed:	108°
Operating temperature:	-5° to 50° C
Weight:	215 ± 1 g
Body and cap material:	ZDC (zinc die-cast)
Shaft material:	S25C (carbon steel)
Oil type:	Silicone

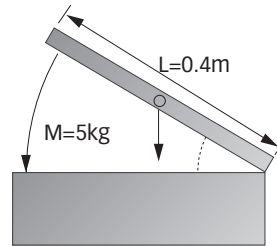
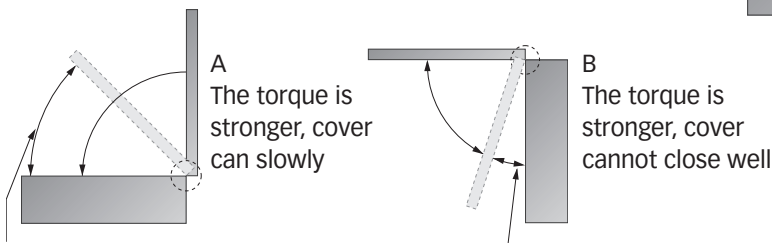
Torque is determined at 23° C ± 2° C



Dimensions in mm

The FYN-H1 action is designed for use in applications as shown in diagram A. The torque is highest when the cover is horizontal and lowest when the cover is vertical. If used in applications as shown in diagram B, the damper will not provide a satisfactory closing action.

A damper with a higher torque can be made to special order.



Use the following formula to determine the torque.

Example:

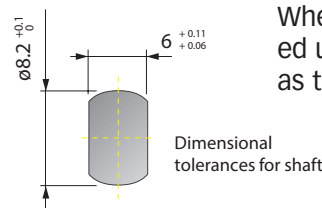
$M = 5 \text{ kg}$

$L = 0.4 \text{ m}$

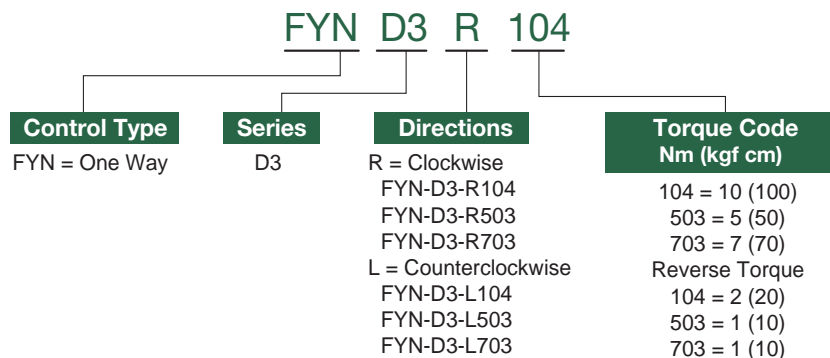
$T = 5 \times 0.4 \times 9.8/2 = 9.8 \text{ Nm}$

FYN-D3-104 can be used.

When the damper is mounted using the shaft, ensure as tight a fit as possible.



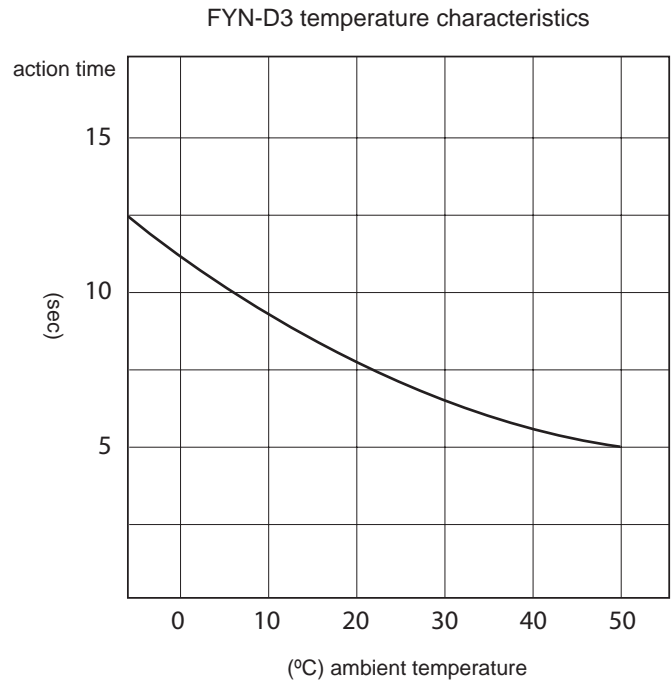
## Ordering Information



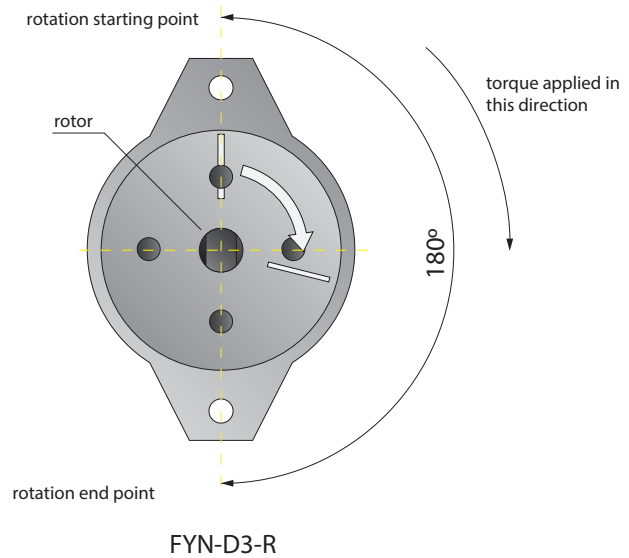
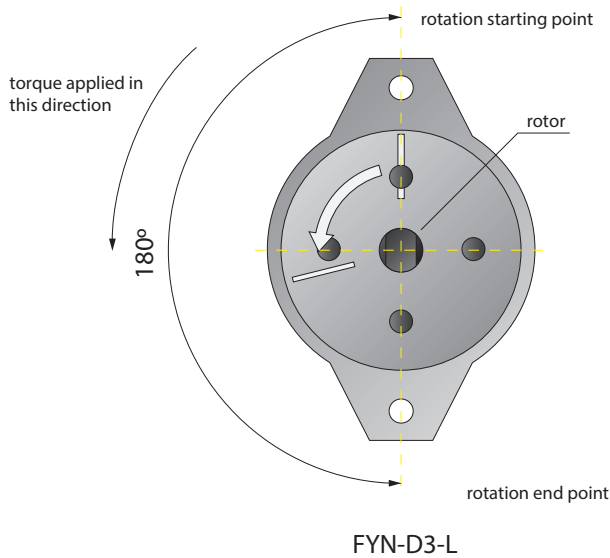
**Temperature Characteristics**

Rotary damper torque varies according to the ambient temperature. Refer to the chart to the right which shows the torque change under different temperatures. This occurs because the oil viscosity varies according to the temperature.

Max damper action angle is 180°  
 Do not exceed 180° or damage will result  
 Please use mechanical stop  
 Please refer to the following diagram



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- 6. FYN-D3 torque is non-adjustable, however dampers with torque ranging from 5 to 10 Nm can be supplied by using a different viscosity oil.
- 7. Damper torque direction differs according to the model, please choose an appropriate direction for your application.

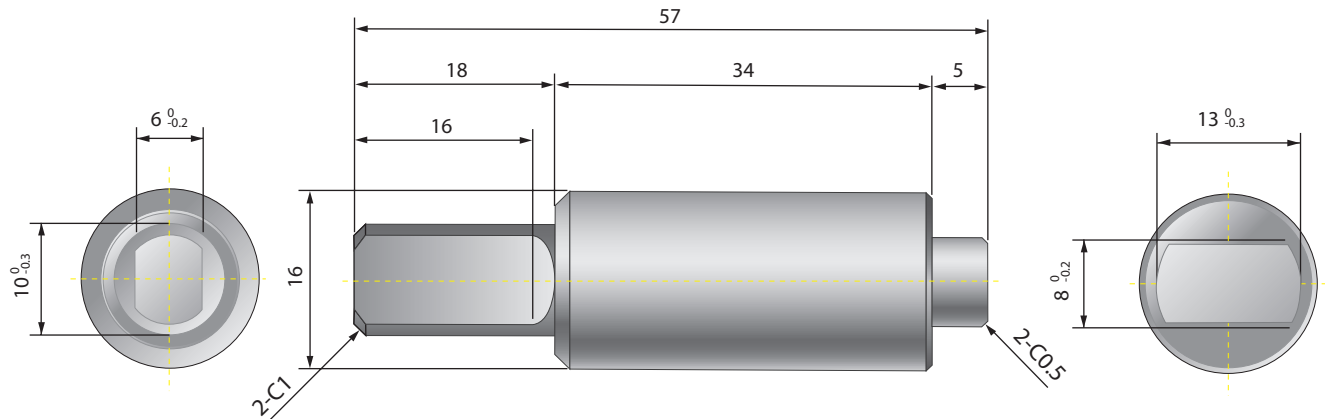


## Specifications



Max. rotation angle:	115°
Operating temperature:	-5° to 50° C
Weight:	40 ± 4 g
Main body & rotating shaft materials:	ZDC (zinc die-cast)
Cap Material:	(PPS) Polyphenylene sulphide
Oil type:	Silicone
Measured at 23° C ± 2° C	

Dimensions in mm



## Damper Utilization

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.

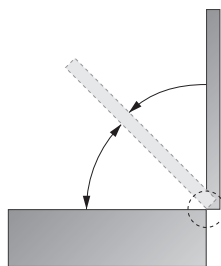


Diagram A

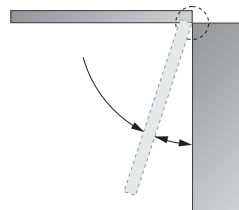
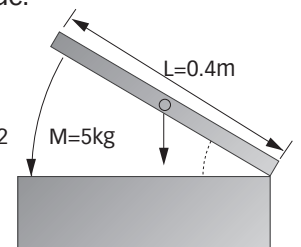


Diagram B

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

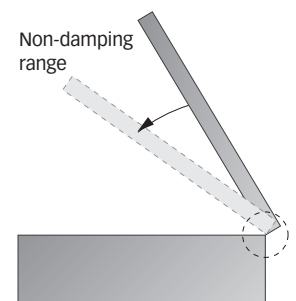
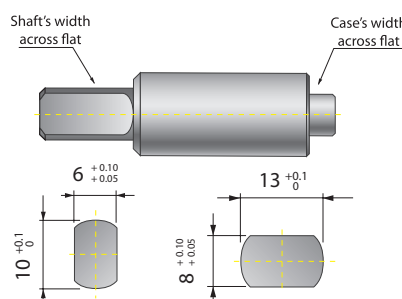
2. When using a damper on a lid, such as the one shown in the diagram, use the following selection calculation to determine the damper torque.

Example: Lid Mass  $M : 1.5 \text{ kg}$   
 Lid Dimensions  $L : 0.4 \text{ m}$   
 Load torque :  $T = 1.5 \times 0.4 \times 9.8 / 2$   
 $= 2.94 \text{ Nm}$



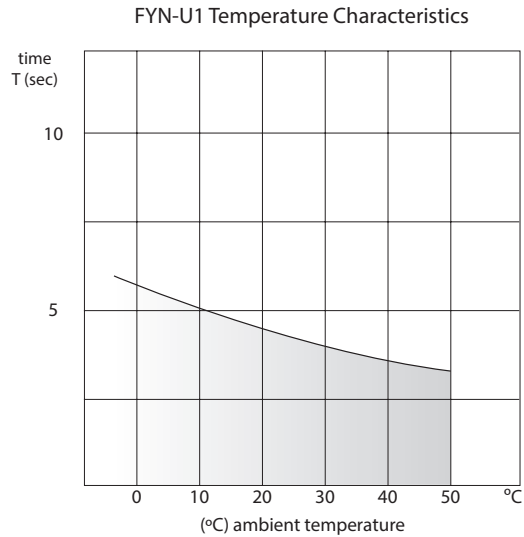
Based on the above calculation, FYN-U1-\*303 is selected

3. When connecting the rotating shaft to the 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.

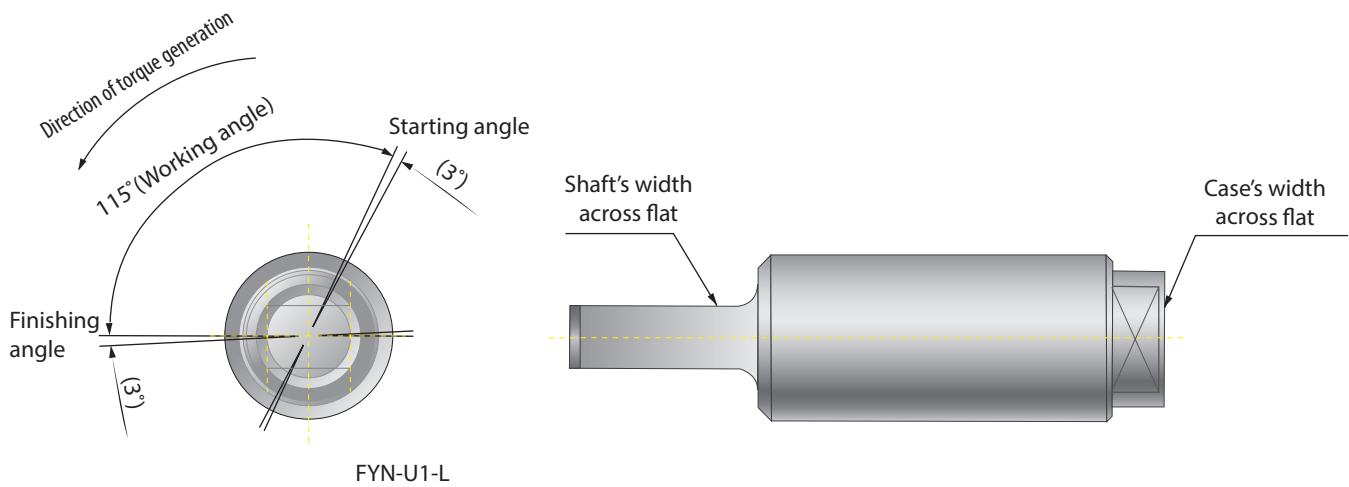


4. Damper characteristics vary according to the ambient temperature. In general, the damper characteristics become weaker as the temperature increases, and become stronger as the temperature decreases. This is because the viscosity of the oil inside the damper varies according to the temperature. When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



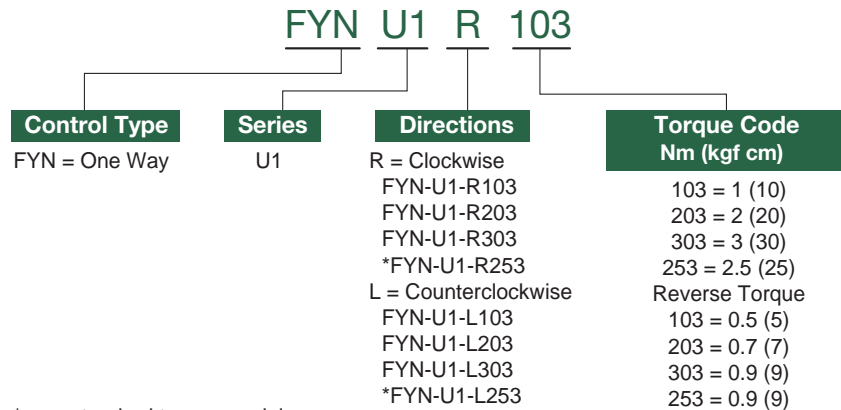
34



6. The FYN-U1 series is a fixed type; its torque is non-adjustable. However, a customized order for a torque between the range of 1 ~ 3Nm 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.

### Ordering Information



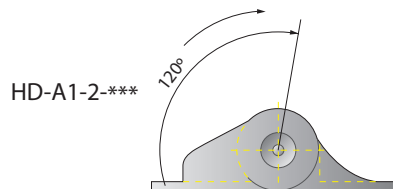
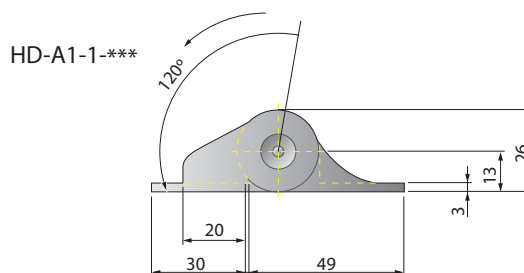
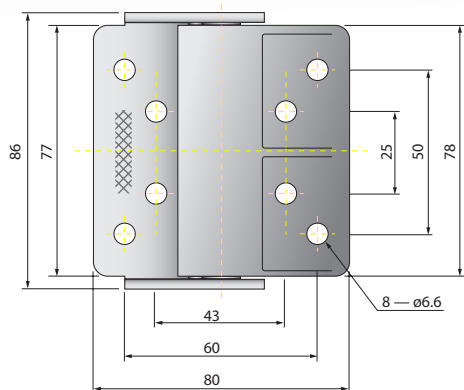
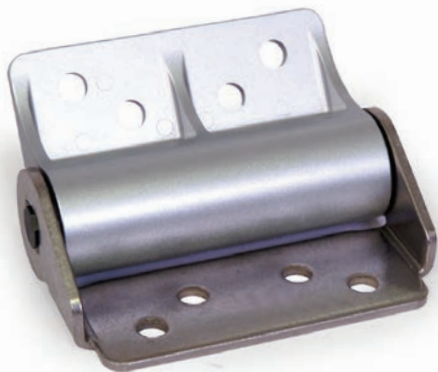
\* non-standard torque model



## Specifications

Max. rotation speed:	120°
Operating temperature:	-5° to 50° C
Weight:	410 g
Body material:	ZDC (zinc die-cast) + painting
Hinge material:	SUS304 (stainless steel)
Oil Type:	Silicone

Max. Action time:  $4 \pm 2.5$  sec.  
 (Torque: loaded torque 9.8 Nm, Fall angle 60° to 0°)



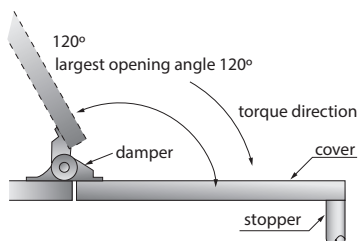
Dimensions in mm

### Temperature Characteristics

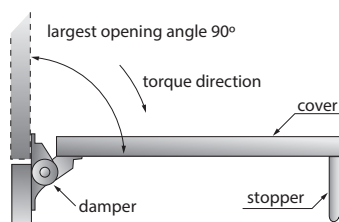
Rotary damper torque varies according to the ambient temperature. This occurs because the oil viscosity varies according to the temperature.

This damper is available in 2 mounting styles:

HD-A1-1-XXX (Fixing outside)

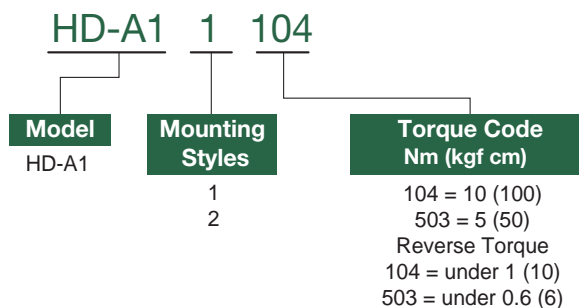


HD-A1-2-XXX (Fixing inside)



This damper is for horizontal applications only.  
 Do not use this damper for vertical applications

## Ordering Information

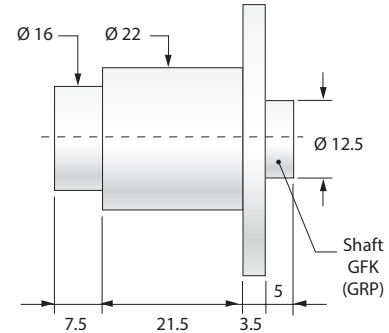
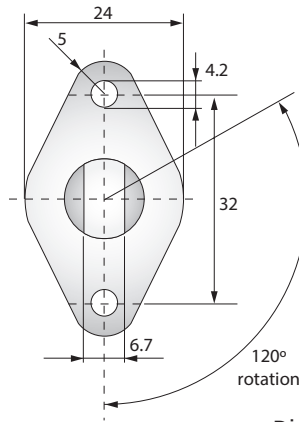




**Specifications**

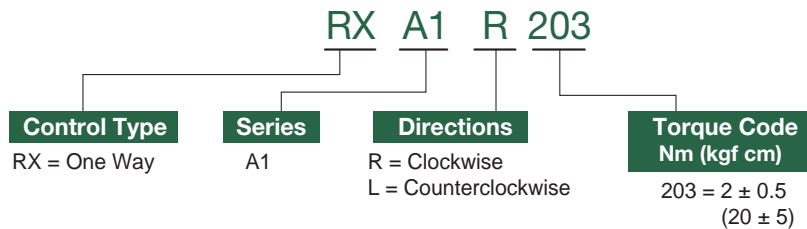
Material: Nylon  
 Operating temperature: 0° C to 50° C  
 Weight: 0.016 kg  
 Max rotation angle: 120°

Do not use damper as final end stop.  
 Fit external mechanical stops.



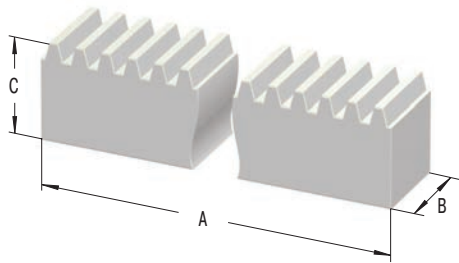
Dimensions in mm

**Ordering Information**



**Toothed Rack M 0.5, M 0.6, M 0.8, M 1.0**

The Toothed Rack mates with the gear wheels on rotary dampers C2, D2, G2 and E2. It serves to transmit a force that dampens linear motion.

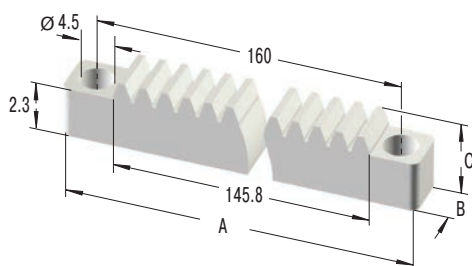


**Material:** Plastic  
 Metal racks available on request

**Damping direction:** right hand damping = damping action in clockwise direction when looking at the output shaft.

**Toothed Rack M 0.8 P**

Dimensions in mm



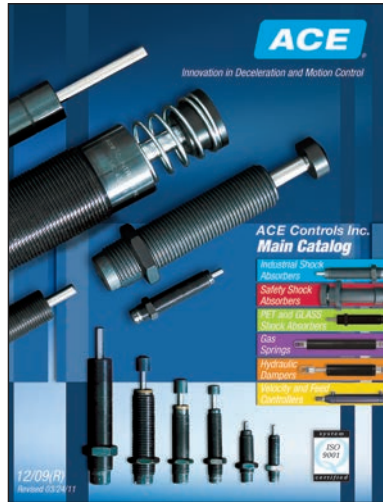
**Models available**

Toothed Rack	Part Numbers	A mm	B mm	C mm	Model
M 0.5	250-0102	250	4	6	rigid, milled
M 0.6	250-0137	250	4	6	rigid, milled
M 0.8	250-0136	250	6	8	rigid, milled
M 0.8 P	250-0138	170	8	4.1	flexible, milled
M 1.0	250-0139	250	10	10	rigid, milled
M 1.0	250-0140	500	10	10	rigid, milled

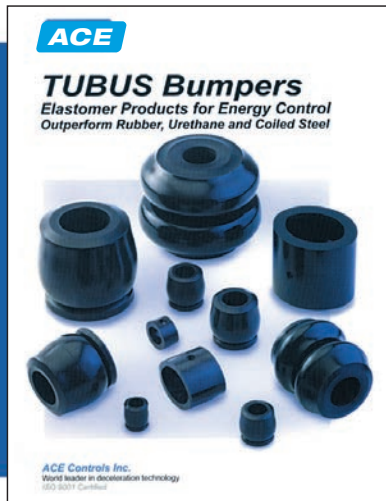
Metal racks available on request



## Additional ACE Controls Products



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Velocity Controllers



TUBUS Bumpers



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