ACE
World leader in deceleration technology

Rotary Dampers
For Smooth Motion and that Touch of Quality

- Bi-Directional Dampers
- Bi/Uni-Directional Dampers
- Uni-Directional Dampers
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 counter-clockwise 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.

<table>
<thead>
<tr>
<th>Maximum Cycle Rates</th>
<th>Nominal Torque Rating</th>
<th>Operating Temperature</th>
<th>Storage Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Cycles per minute</td>
<td>Measured at 20 rpm &amp; 73˚F</td>
<td>32˚ to 122˚F (0˚ to 50˚C)</td>
<td>-4˚ to 140˚F (-20˚ to 60˚C)</td>
</tr>
</tbody>
</table>

Conversions

<table>
<thead>
<tr>
<th>Physical Quantity</th>
<th>Divide By To Obtain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque gf cm</td>
<td>72 to in oz</td>
</tr>
<tr>
<td>Torque gf cm</td>
<td>1.162 to in lb</td>
</tr>
<tr>
<td>Torque kgf cm</td>
<td>1.152 to in lb</td>
</tr>
<tr>
<td>Length mm</td>
<td>25.4 to in</td>
</tr>
<tr>
<td>Length cm</td>
<td>2.54 to in</td>
</tr>
<tr>
<td>Angular Velocity</td>
<td>6 to rpm</td>
</tr>
<tr>
<td>Angular Velocity</td>
<td>57.30 to rad/s</td>
</tr>
<tr>
<td>Angular Velocity</td>
<td>9.55 to rad/s</td>
</tr>
</tbody>
</table>

Temperature

\[ T_F = 32 + \left(\frac{9}{5}\right) T_C \]
\[ T_C = \left(\frac{5}{9}\right) (T_F - 32) \]

Where:

\[ T_F = \text{Temperature °Fahrenheit} \]
\[ T_C = \text{Temperature °Celsius} \]

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.
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

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

\[ T = \frac{L}{2} \times W \times \cos \theta \]

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.
E2 Series

Bi-Directional Damper

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

**Gear Specification - mm**

<table>
<thead>
<tr>
<th>Type</th>
<th>Standard spur gear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tooth profile</td>
<td>Involute (full)</td>
</tr>
<tr>
<td>Module</td>
<td>0.6</td>
</tr>
<tr>
<td>Pressure angle</td>
<td>20 degrees</td>
</tr>
<tr>
<td>Number of teeth</td>
<td>10</td>
</tr>
<tr>
<td>Pitch circle diameter</td>
<td>6.0</td>
</tr>
</tbody>
</table>

**Control Type**

- **RT** = Two Way
- **E2**
- **Blank** = Two Way

**Torque Code in oz / (gf cm)**

- 100 = 0.14 (10)
- 200 = 0.28 (20)
- 300 = 0.42 (30)
- 400 = 0.56 (40)

**Ordering Information**

- RT E2 100 G1
- G1 = With Gear
- Blank = Without Gear

**Dimensions in mm**

<table>
<thead>
<tr>
<th>Diameter</th>
<th>+/-0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø2.5</td>
<td></td>
</tr>
<tr>
<td>Ø10</td>
<td></td>
</tr>
<tr>
<td>Ø2.1</td>
<td></td>
</tr>
</tbody>
</table>

**Relationship Between Torque and Temperature**

- 20 rpm

**Relationship Between Torque and rpm’s**

- 73ºF (23ºC)
Applications include: audio cassette door on a tape deck and automobile ashtrays.

<table>
<thead>
<tr>
<th>Gear</th>
<th>Specification - mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Standard spur gear</td>
</tr>
<tr>
<td>Tooth profile</td>
<td>Involute (full)</td>
</tr>
<tr>
<td>Module</td>
<td>0.5</td>
</tr>
<tr>
<td>Pressure angle</td>
<td>20 degrees</td>
</tr>
<tr>
<td>Number of teeth</td>
<td>14</td>
</tr>
<tr>
<td>Pitch circle diameter</td>
<td>7.0</td>
</tr>
</tbody>
</table>

**Control Type**

- **RT** = Two Way
- **G2**
- **Blank** = Two Way
- **200**
- **G1**

**Torque Code**

<table>
<thead>
<tr>
<th>Code</th>
<th>in oz / (gf cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>0.28 (20)</td>
</tr>
<tr>
<td>300</td>
<td>0.42 (30)</td>
</tr>
<tr>
<td>450</td>
<td>0.63 (45)</td>
</tr>
<tr>
<td>600</td>
<td>0.83 (60)</td>
</tr>
<tr>
<td>101</td>
<td>1.39 (100)</td>
</tr>
</tbody>
</table>

**Gear**

- **G1** = With Gear
- **Blank** = Without Gear
## 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.

![Temperature Characteristics Diagram](image)

## 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.

![Speed Characteristics Diagram](image)

## Ordering Information

**Control Type**  
RT = Two Way  
**Series**  
L1  
**Directions**  
Blank = Two Way  
**Torque Code**  
in oz / (gf cm)  
202 = 27.77 (2000 ± 400)  
302 = 41.66 (3000 ± 600)
Bi-Directional Damper

DT-47A & 57A Series

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

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

Control Type  Series  Directions  Torque Code

DT = Two Way  47A  Blank = Two Way  DT-47A-203

blank = Two Way  57A  DT-57A-503

Torque Code
Nm (kgf cm)

203 = 2 ± 0.3 (20 ± 3)
503 = 4.7 ± 0.5 (47 ± 5)
**Specifications**

- **Max. rotation speed:** 50 rpm
- **Max. cycle rate:** 12 cycles/min
- **Operating temperature:** -10° to 50° C
- **Weight:**
  - 63A: 92 g, 70A: 112 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

**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.

**Speed Characteristics**

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

**Ordering Information**

- **Control Type**: DT = Two Way
- **Series**: 63A/B, 70A/B
- **Directions**: Blank = Two Way, DT- 63A/B-703, DT- 70A/B-903
- **Torque Code**
  - 703 = 6.7 ± 0.7 (67 ± 7.0)
  - 903 = 8.7 ± 0.8 (87 ± 8.0)
Applications include: briefcases, display lids, furniture doors, or any small panel that would benefit from being locked against rotation.

**Operation of A1/B1 Bi-Directional Locking Series**

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 Series**

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.
# HD-B1/B2 Series-Friction Rotary Damper

**Bi-Directional Damper (Fixed)**

## Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. rotation speed:</td>
<td>15 rpm</td>
</tr>
<tr>
<td>Max. cycle rate:</td>
<td>5 cycles/min</td>
</tr>
<tr>
<td>Operating temperature:</td>
<td>0-60˚ C</td>
</tr>
<tr>
<td>HD-B1/B2-133:</td>
<td>50 g</td>
</tr>
<tr>
<td>HD-B1/B2-133-1:</td>
<td>40 g</td>
</tr>
<tr>
<td>Body case material:</td>
<td>Aluminum die-casting</td>
</tr>
<tr>
<td>Shaft collar material:</td>
<td>Urethane rubber</td>
</tr>
<tr>
<td>Shaft material:</td>
<td>Steel (SCP440)</td>
</tr>
</tbody>
</table>

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

## 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

<table>
<thead>
<tr>
<th>Model</th>
<th>Series</th>
<th>Torque Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD</td>
<td>B1</td>
<td>133</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Torque Code</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nm (kgfcm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>133 = 1.35 ± 0.34 (13.5 ± 3.4)</td>
</tr>
</tbody>
</table>

Dimensions in mm

One half only can be used as a damper

Air-Oil Systems, Inc. www.airoil.com
Please use the following formula to determine the torque.

\[
(Torque) = \frac{M \times 9.8 \times 0.5 \times L \times \cos \theta}{0.65 \times \alpha \times N} \quad (Nm)
\]

**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.

<table>
<thead>
<tr>
<th>Gear Specification - mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Tooth profile</td>
</tr>
<tr>
<td>Module</td>
</tr>
<tr>
<td>Pressure angle</td>
</tr>
<tr>
<td>Number of teeth</td>
</tr>
<tr>
<td>Pitch circle diameter</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control Type</th>
<th>Series</th>
<th>Directions</th>
<th>Torque Code</th>
<th>Gear</th>
</tr>
</thead>
<tbody>
<tr>
<td>RN</td>
<td>C2</td>
<td>R</td>
<td>201</td>
<td>G1</td>
</tr>
<tr>
<td>RT</td>
<td></td>
<td>L</td>
<td></td>
<td>Blank</td>
</tr>
</tbody>
</table>

Dimensions in mm

Relationship Between Torque and Temperature

Relationship Between Torque and rpm's

73ºF (23ºC)
Bi/Uni-Directional Damper

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

<table>
<thead>
<tr>
<th>Gear</th>
<th>Specification - mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Modified spur gear</td>
</tr>
<tr>
<td>Tooth profile</td>
<td>Involute (full)</td>
</tr>
<tr>
<td>Module</td>
<td>1.0</td>
</tr>
<tr>
<td>Pressure angle</td>
<td>20 degrees</td>
</tr>
<tr>
<td>Number of teeth</td>
<td>12</td>
</tr>
<tr>
<td>Pitch circle diameter</td>
<td>12.0</td>
</tr>
</tbody>
</table>

Ordering Information

Control Type
- RN = One Way
- RT = Two Way

Series
- D2

Directions
- R = Clockwise
- L = Counterclockwise
- Blank = Two Way

Torque Code in oz / (gf cm)
- 501 = 6.94 (500)
- 102 = 13.89 (1000)
- 152 = 20.83 (1500)

Gear
- G1 = With Gear
- Blank = Without Gear

Dimensions in mm

Relationship Between Torque and Temperature
- 20 rpm

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

<table>
<thead>
<tr>
<th>Torque Code</th>
<th>lb/(kgf cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.01</td>
<td>0.0001</td>
</tr>
<tr>
<td>-0.03</td>
<td>0.0003</td>
</tr>
<tr>
<td>5.2</td>
<td>0.052</td>
</tr>
<tr>
<td>6.5</td>
<td>0.065</td>
</tr>
<tr>
<td>7.5</td>
<td>0.075</td>
</tr>
<tr>
<td>8.5</td>
<td>0.085</td>
</tr>
<tr>
<td>9.5</td>
<td>0.095</td>
</tr>
<tr>
<td>10.5</td>
<td>0.105</td>
</tr>
<tr>
<td>11.5</td>
<td>0.115</td>
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<tr>
<td>12.5</td>
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<tr>
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<td>0.175</td>
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<td>19.5</td>
<td>0.195</td>
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<td>0.205</td>
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<td>21.5</td>
<td>0.215</td>
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<td>0.225</td>
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<td>23.5</td>
<td>0.235</td>
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<td>0.295</td>
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<td>0.305</td>
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<td>0.315</td>
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<tr>
<td>34.5</td>
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<td>39.5</td>
<td>0.395</td>
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<td>40.5</td>
<td>0.405</td>
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<tr>
<td>41.5</td>
<td>0.415</td>
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<tr>
<td>42.5</td>
<td>0.425</td>
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<tr>
<td>43.5</td>
<td>0.435</td>
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<tr>
<td>44.5</td>
<td>0.445</td>
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<td>45.5</td>
<td>0.455</td>
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<tr>
<td>46.5</td>
<td>0.465</td>
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<tr>
<td>47.5</td>
<td>0.475</td>
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<tr>
<td>48.5</td>
<td>0.485</td>
</tr>
<tr>
<td>49.5</td>
<td>0.495</td>
</tr>
<tr>
<td>50.5</td>
<td>0.505</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>in lb/(kgf cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
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<tr>
<td>10</td>
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<tr>
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<td>0</td>
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<table>
<thead>
<tr>
<th>RPM</th>
<th>in lb/(kgf cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
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<tr>
<td>15</td>
<td>6</td>
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<tr>
<td>20</td>
<td>8</td>
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<tr>
<td>25</td>
<td>10</td>
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<td>30</td>
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<td>40</td>
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</tr>
<tr>
<td>45</td>
<td>18</td>
</tr>
<tr>
<td>50</td>
<td>20</td>
</tr>
</tbody>
</table>

**Ordering Information**

- Control Type: RN = One Way, RT = Two Way
- Series: F2
- Directions: R = Clockwise, L = Counterclockwise, Blank = Two Way
- Torque Code: 203 = 17.36 (20)

![Dimensions in mm](image)
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 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

Control Type | Series | Directions | Torque Code
--- | --- | --- | ---
RN = One Way | K2 | R = Clockwise | RN-K2-R103
RT = Two Way | | LN = Counterclockwise | RN-K2-L103
| | | RN-K2-L502
| | Blank = Two Way | RT-K2-103
| | | RT-K2-502

Torque Code
- Nm: RN-K2-R103 = 0.98 ± 0.2 Nm
- kgf cm: L103 = 10 ± 2 kgf cm
- Ncm: 103 = 10 ± 2 Ncm
- 502 = 50 ± 10 Ncm
FYT & FYN-H1(2) Series

Bi/Uni-Directional Damper (Adjustable)

Specifications

- Max. rotation angle: 105º
- 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

1. 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.

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

Example:

M = 5 kg
L = 0.4 m
T = 5 x 0.4 x 9.8/2 = 9.8 Nm
FYN-H1 *104 can be used.

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

Ordering Information

Control Type
- FYN = One Way
- FYT = Two Way

Series
- H1
- H2

Directions
- R = Clockwise
- L = Counterclockwise
- Blank = Two Way

Torque Code
- Nm (kgf cm)
- 104 = 10 (1000)
- Reverse Torque
- *104 = 0.5 (5)

*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 ± 52.5° from center. Exceeding the maximum action angle will result in damage to the damper. A stopper should be used.

Please refer to the drawings to the right.

**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° 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.
Bi/Uni-Directional Damper (Fixed)

### 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:
   
   \[ T = \frac{5 \times 0.4 \times 9.8}{2} = 9.8 \text{ Nm} \]
   
   FYN-D1 *104 can be used.

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

### Ordering Information

<table>
<thead>
<tr>
<th>Control Type</th>
<th>Series</th>
<th>Directions</th>
<th>Torque Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>FYN = One Way</td>
<td>D1</td>
<td>R = Clockwise</td>
<td>104 = 10 (1000)</td>
</tr>
<tr>
<td>FYT = Two Way</td>
<td>D2</td>
<td>L = Counterclockwise</td>
<td>Reverse Torque</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blank = Two Way</td>
<td>*104 = 0.5 (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FYT=D1(2)</td>
<td>*FYN models only</td>
</tr>
</tbody>
</table>

Air-Oil Systems, Inc. www.airoil.com
**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.

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.
Bi/Uni-Directional Damper (Adjustable)

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

Torque is determined at 23° C ± 2°C

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 x 0.4 x 9.8/2 = 39.2 Nm
FYN-LA3 can be used.

Damping number adjustment screw:
+ torque increases
- torque decreases

Ordering Information

Control Type
FYN = One Way
FYT = Two Way

Series
LA3

Directions
R = Clockwise
L = Counterclockwise
Blank = Two Way

Torque Code
Nm (kgf cm)
40 (400)

Damping Rate
10-60 Nm/rad/sec
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 = \( FL^2t \)  
   \[ F = \text{lever force (N)} \]  
   \[ L = \text{distance between center of damper axes to lever effect-point (m)} \]  
   \[ d = \text{lever removing distance (m)} \]  
   \[ t = \text{lever removing time} \]

2. Steady rotation = \( T/\omega \)  
   \[ T = \text{torque is on shaft (Nm)} \]  
   \[ \omega = \text{angle speed (rad/sec)} \]

3. Deceleration of mass moving in a straight line = \( MVL^2/d \)  
   \[ M = \text{quality (kg)} \]  
   \[ V = \text{speed (m/s)} \]  
   \[ L = \text{distance between center of damper axes to lever effect-point (m)} \]  
   \[ d = \text{lever removing distance (m)} \]

4. Critical damping of vibrating mass = \( MfL^2/0.08 \)  
   \[ M = \text{quality (kg)} \]  
   \[ f = \text{vibrancy frequency (Hz)} \]  
   \[ L = \text{distance between center of damper axes to lever effect-point (m)} \]
Uni-Directional Damper

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.

Ordering Information

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.

FYN-M1 Series

Air-Oil Systems, Inc. www.airoil.com
**Uni-Directional Damper**

### FYN-K1 Series

**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

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

**Control Type**
- FYN = One Way

**Series**
- K1

**Directions**
- R = Clockwise
- L = Counterclockwise

**Torque Code**
- 403 = 4 Nm (kgf cm)
Uni-Directional Damper

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:
\[ T = \frac{1.5 \times 0.4 \times 9.8}{2} \]
\[ = 2.9 \text{ Nm} \]
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

Control Type
FYN = One Way

Series
N1

Directions
R = Clockwise
L = Counterclockwise

Torque Code
Nm (kgf cm)
103 = 1 (10)
203 = 2 (20)
303 = 3 (30)

Dimensions in mm

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.

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.
Uni-Directional Damper

Specifications

- Max. rotation angle: 115˚
- Operating temperature: -5˚ to 50˚ C
- Height: 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 kg
L = 0.3 m
T = 1 x 0.3 x 9.8/2 = 1.47 Nm
Select damper: FYN-P1-153

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

Control Type
FYN = One Way
Series
P1
Directions
R = Clockwise
L = Counterclockwise
Torque Code
Nm (kgf cm)
103 = 1 (10)
153 = 1.5 (15)
183 = 1.8 (18)
Uni-Directional Damper

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 25˚ 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.

Ordering Information

<table>
<thead>
<tr>
<th>Control Type</th>
<th>Series</th>
<th>Directions</th>
<th>Torque Code Nm (kgf cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN = One Way</td>
<td>47A</td>
<td>R</td>
<td>2 ± 0.3 (20 ± 3)</td>
</tr>
<tr>
<td>DN-47A-R203</td>
<td>63A</td>
<td>L</td>
<td>8.5 ± 0.8 (85 ± 8)</td>
</tr>
</tbody>
</table>

Dimensions in mm
Uni-Directional Damper

DN-57A & 70A Series

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.

Ordering Information

Control Type
DN = One Way

Series
57A
70A

Directions
R = Clockwise
DN-57A-R553
DN-70A-R114
L = Counterclockwise
DN-57A-L553
DN-70A-L114

Torque Code
Nm (kgf cm)
553 = 5.5 ± 0.6 (55 ± 6)
114 = 11 ± 1.1 (110 ± 11)
Uni-Directional Damper

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.

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

Ordering Information

Control Type  Series  Directions  Torque Code

FYN = One Way  S1  R  104

Torque Code
Nm (kgf cm)

0 1 0 2 0 3 0 4 0

ambient temperature

FYN-S1 Temperature Characteristics

0 1 2 3 4 5 6

0 10 20 30 40 50 °C

Air-Oil Systems, Inc. www.airoil.com
**Uni-Directional Damper**

**FYN-D3 Series**

---

**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.

---

**Ordering Information**

<table>
<thead>
<tr>
<th>Control Type</th>
<th>Series</th>
<th>Directions</th>
<th>Torque Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>FYN = One Way</td>
<td>D3</td>
<td>R 104</td>
<td>Nm (kgf cm)</td>
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<tr>
<td>FYN-D3-R104</td>
<td>503</td>
<td>104</td>
<td>10 (100)</td>
</tr>
<tr>
<td>FYN-D3-R503</td>
<td>503</td>
<td>104</td>
<td>5 (50)</td>
</tr>
<tr>
<td>FYN-D3-R703</td>
<td>703</td>
<td>104</td>
<td>7 (70)</td>
</tr>
<tr>
<td>FYN-D3-L104</td>
<td>503</td>
<td>104</td>
<td>2 (20)</td>
</tr>
<tr>
<td>FYN-D3-L503</td>
<td>503</td>
<td>104</td>
<td>1 (10)</td>
</tr>
<tr>
<td>FYN-D3-L703</td>
<td>703</td>
<td>104</td>
<td>1 (10)</td>
</tr>
</tbody>
</table>

---

Use the following formula to determine the torque.

Example:

\[ T = \frac{5 \times 0.4 \times 9.8}{2} = 9.8 \text{ Nm} \]

FYN-D3-104 can be used. When the damper is mounted using the shaft, ensure as tight a fit as possible.

---

Air-Oil Systems, Inc. www.airoil.com
**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

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.
Uni-Directional Damper (Fixed)

Specifications

Max. rotation speed: 120°
Operating temperature: -10° to 50° C
Weight: 410 g
Body material: ZDC (zinc die-cast) + painting
Hinge material: SUS304 (stainless steel)

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

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)

Ordering Information

<table>
<thead>
<tr>
<th>Model</th>
<th>Mounting Styles</th>
<th>Torque Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD-A1</td>
<td>1</td>
<td>104</td>
</tr>
</tbody>
</table>

Torque Code Nm (kgf cm)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>104</td>
<td>under 1 (100)</td>
</tr>
<tr>
<td>503</td>
<td>under 0.6 (6)</td>
</tr>
</tbody>
</table>

HD-A1 1 104
Uni-Directional Damper

**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.

**RX-A1 Series**

**Control Type**
- RX = One Way
- A1 = Series

**Directions**
- R = Clockwise
- L = Counterclockwise

**Dimensions in mm**

- Ø 16
- Ø 22
- Ø 12.5
- Shaft GFK (GRP)
- 7.5
- 21.5
- 5
- 3.5
- 24
- 5
- 4.2
- 32
- 6.7
- 5

**Torque Code**

- **Nm (kgf cm):**
  - 203 = 2 ± 0.5
  - (20 ± 5)

**Ordering Information**

RX A1 R 203

Air-Oil Systems, Inc. www.airoil.com
Spring Hinged Damper (Fixed)

**Specifications**

- **Spring torque:**
  - $8.82^\circ \pm 1.76\text{Nm}$
  - ($\theta = 0^\circ$ damper closed spring torque)
  - $5.39 \pm 1.08\text{Nm}$
  - ($\theta = 75^\circ$ damper open spring torque)

- **Action angle:**
  - $75 \pm 5^\circ$ (action angle of hinge)
  - $25 \pm 5^\circ$ (action angle of damper)

- **Operating temp:**
  - $0^\circ$ to $50^\circ$ C

- **Weight:**
  - $1 \pm 0.2$ kg

Applications include: photocopy and test machine covers

---

**DSH-B1 action illustration.** This is a combined spring/damper hinge. (The damper is hidden inside the spring)

- $\theta_3$: Spring engaged—automatically returns to $90^\circ$ position.
- $\theta_2$: Spring engaged—free stop action—stops in desired position from $75^\circ$ to $25^\circ$
- $\theta_1$: Damper engaged—automatic controlled closing from $25^\circ$ to $0$

**Dimensions in mm**

---

**Ordering Information**

<table>
<thead>
<tr>
<th>Model</th>
<th>Series</th>
<th>Torque Code Nm (kgf cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSH</td>
<td>B1</td>
<td>134 (130) max</td>
</tr>
</tbody>
</table>
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