



Rotary Dampers....

For Smooth Motion And That Touch Of Quality



ACE Controls Inc.

World leader in deceleration technology

ISO 9001 Certified

11/01

ACE Rotary 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 consumers.

All rotary motion control models are available with damping in both directions of rotation (RT models). Alternatively, certain model sizes (C2, D2, F1) are available with the option of unidirectional damping, i.e. damping action only in a clockwise or counterclockwise rotation and free travel in the opposite rotation (RN models). 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 (A1/B1) bi-directional locking series of rotary dampers can be added to enhance the functionality of your new product design.

GENERAL SPECIFICATIONS ON ALL ROTARY DAMPERS

Maximum Cycle Rate	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)

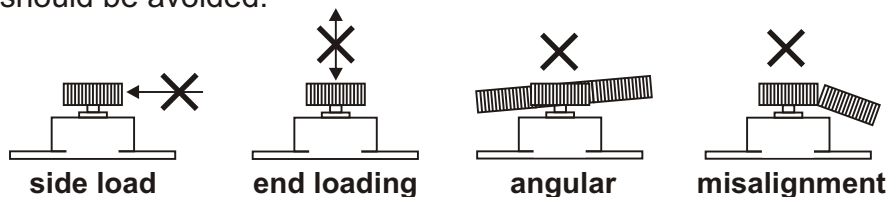
CONVERSIONS

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

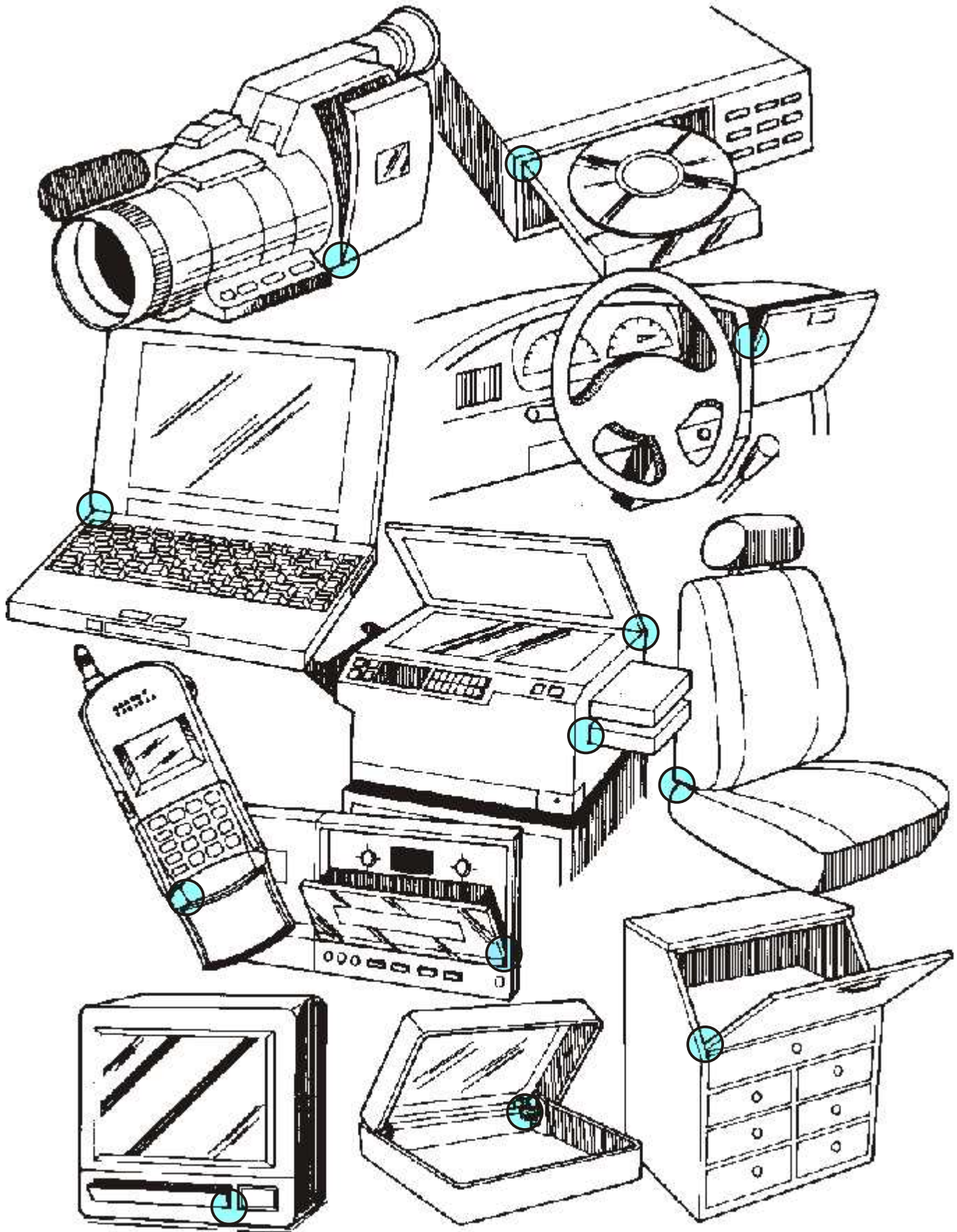
Temperature
$T_F = 32 + (9/5) T_C$
$T_C = (5/9) (T_F - 32)$
Where:
$T_F = \text{Temperature } ^\circ\text{Fahrenheit}$
$T_C = \text{Temperature } ^\circ\text{Celsius}$

MOUNTINGS TO AVOID

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



ACE Rotary Damper Applications

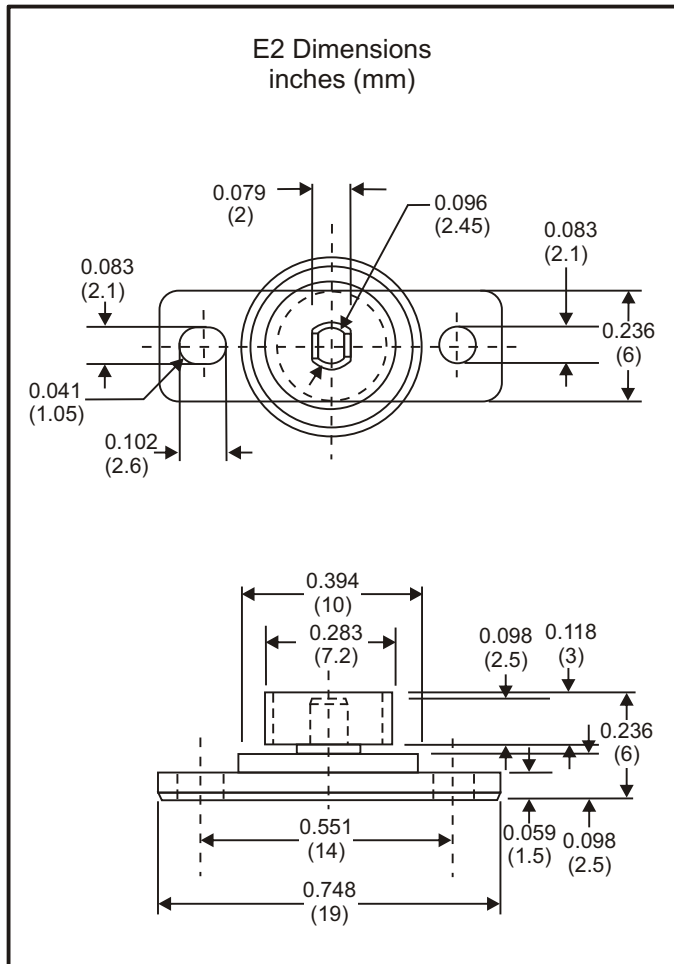


O Indicates rotary damper locations.

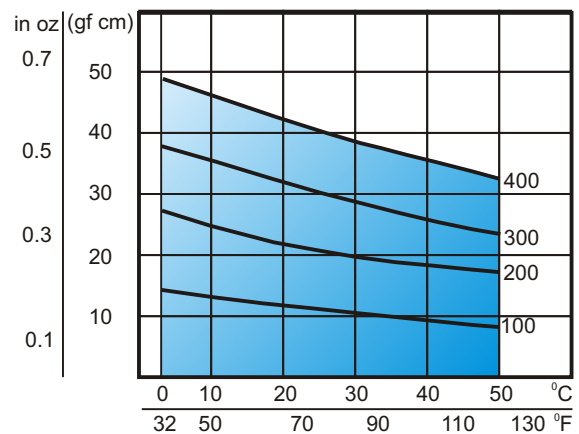


Applications include: computer disk drives, CD players and instrumentation equipment.

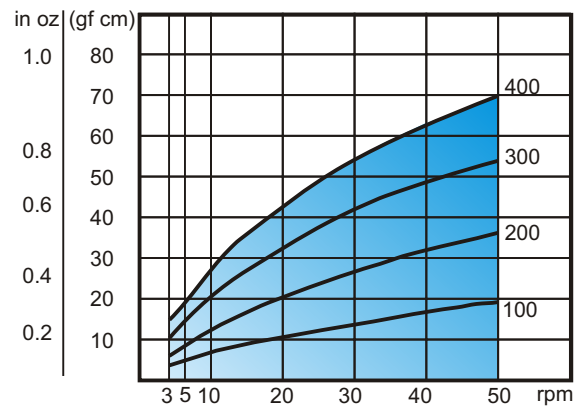
Gear	Specification inch/(mm)
Type	Standard Spur Gear
Tooth Profile	Involute (Full)
Module	0.024 (0.6)
Pressure Angle	20 Degrees
Number of Teeth	10
Pitch Circle Diameter	0.236 (6.0)



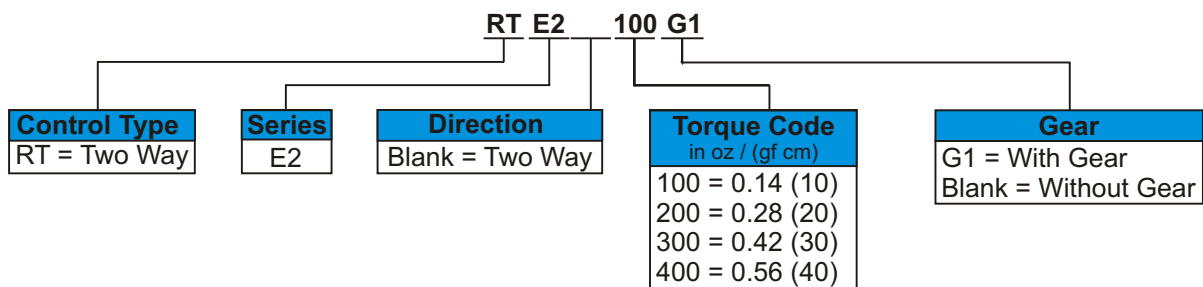
Relationship Between Torque and Temperature
20 rpm



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



ORDERING INFORMATION

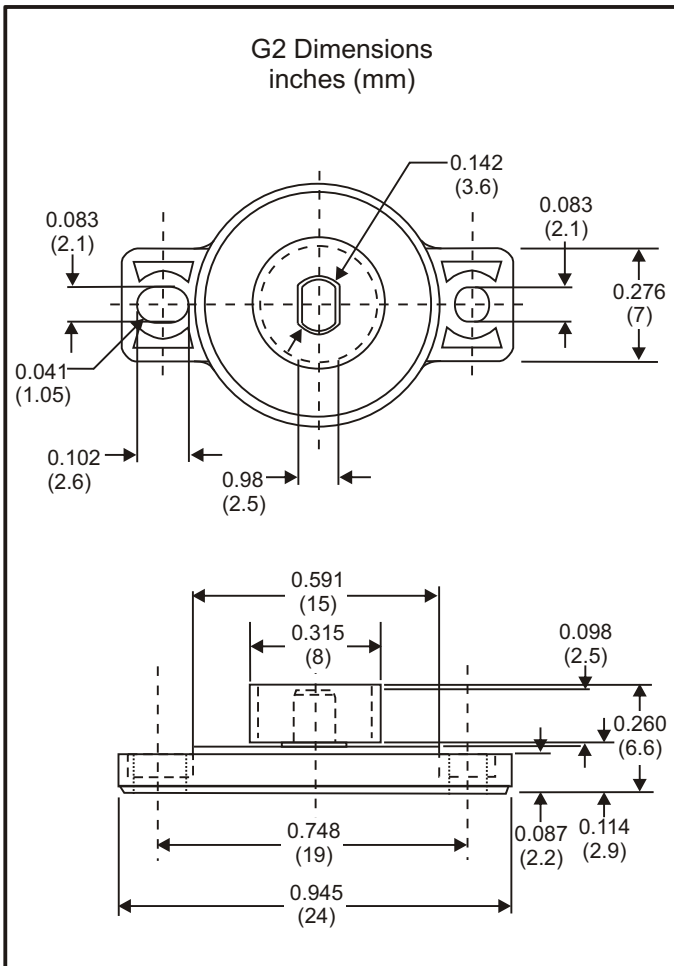


ACE G2 Series

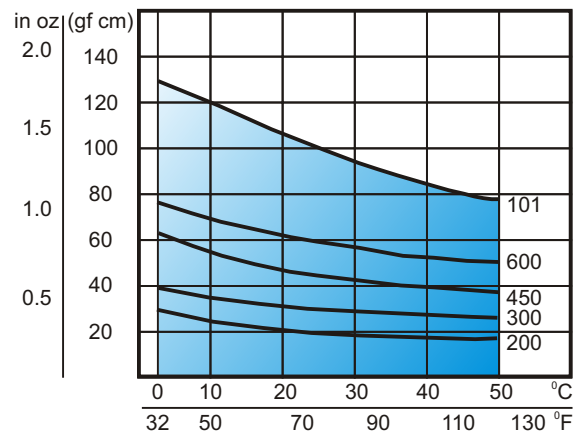


Applications include: audio cassette door on a tape deck and automobile ashtrays.

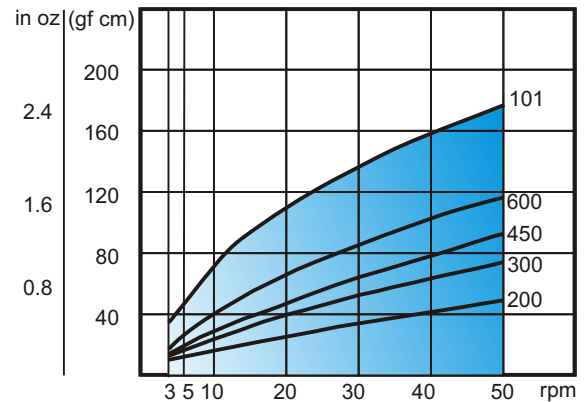
Gear	Specification inch/(mm)
Type	Standard Spur Gear
Tooth Profile	Involute (Full)
Module	0.020 (.5)
Pressure Angle	20 Degrees
Number of Teeth	14
Pitch Circle Diameter	0.276 (7.0)



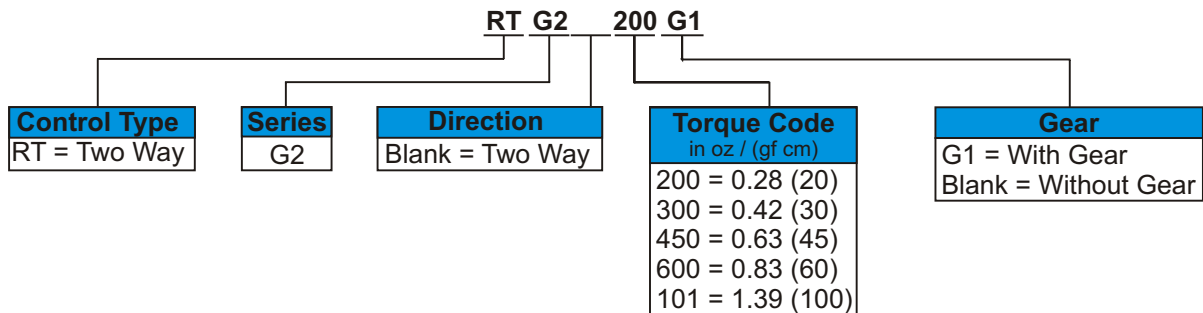
Relationship Between Torque and Temperature
20 rpm



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



ORDERING INFORMATION

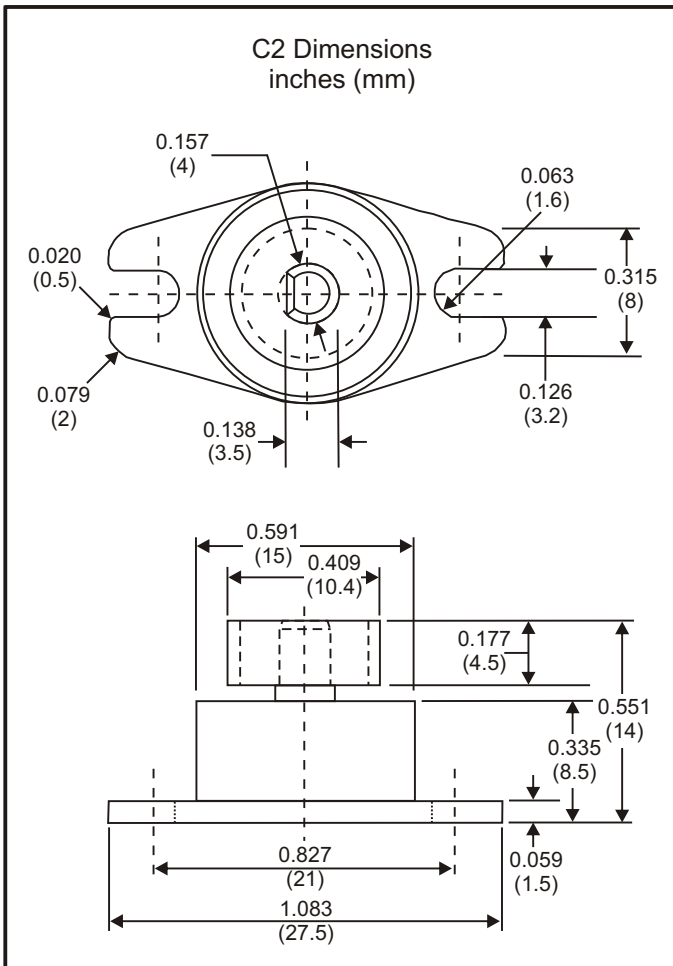


ACE C2 Series

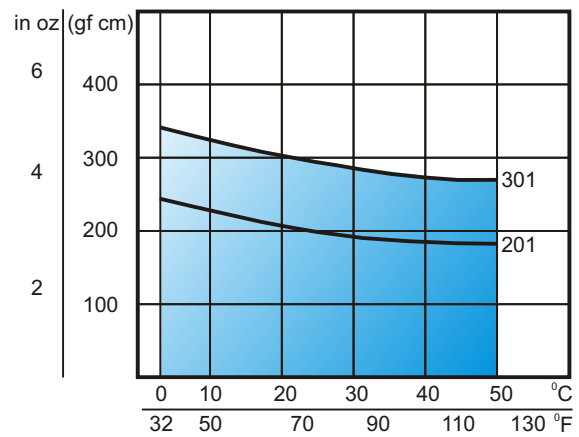


Applications include: VCR loading mechanisms, glove box doors and instrumentation equipment.

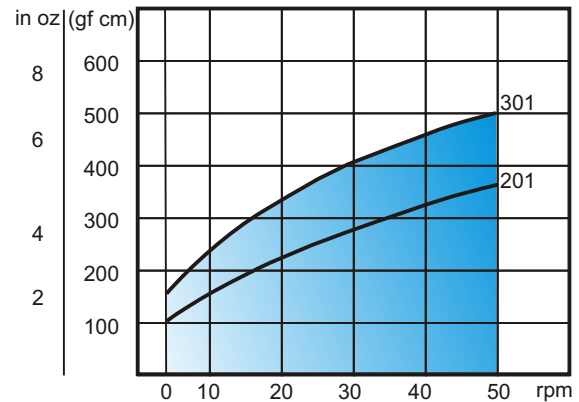
Gear	Specification inch/(mm)
Type	Standard Spur Gear
Tooth Profile	Involute (Full)
Module	0.031 (0.8)
Pressure Angle	20 Degrees
Number of Teeth	11
Pitch Circle Diameter	0.346 (8.8)



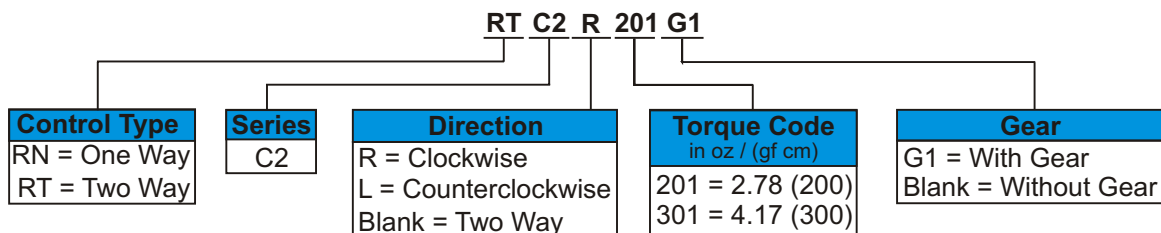
Relationship Between Torque and Temperature
20 rpm



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



ORDERING INFORMATION

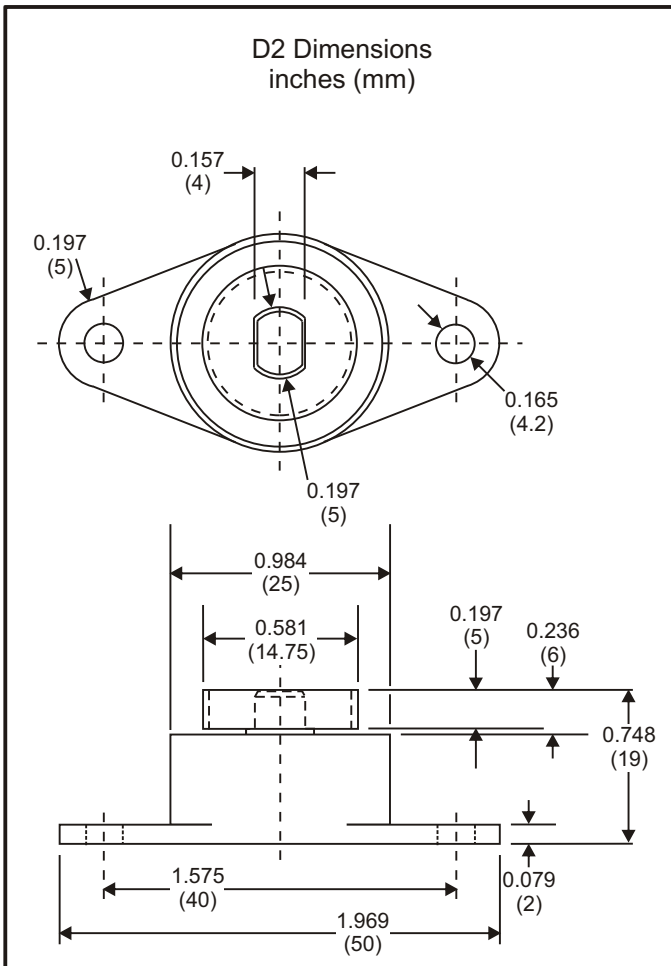


ACE D2 Series

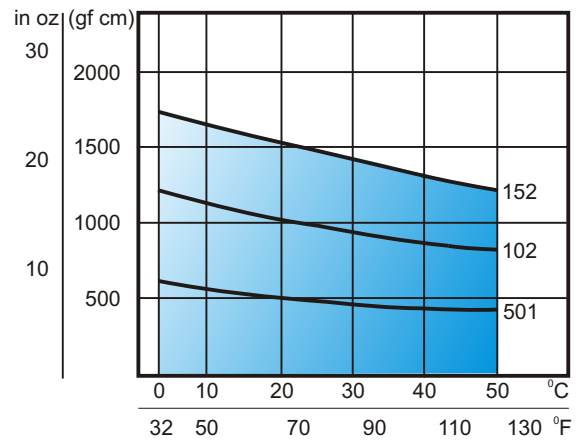


Applications include: window shades, sliding closet doors, printer covers and paper trays for copy machines.

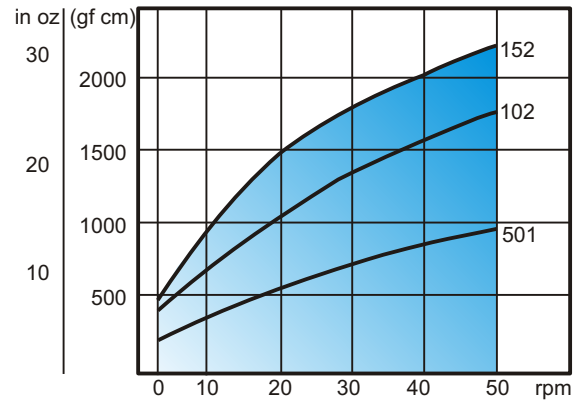
Gear	Specification inch/(mm)
Type	Modified Spur Gear
Tooth Profile	Involute (Full)
Module	0.039 (1.0)
Pressure Angle	20 Degrees
Number of Teeth	12
Pitch Circle Diameter	0.472 (12.0)



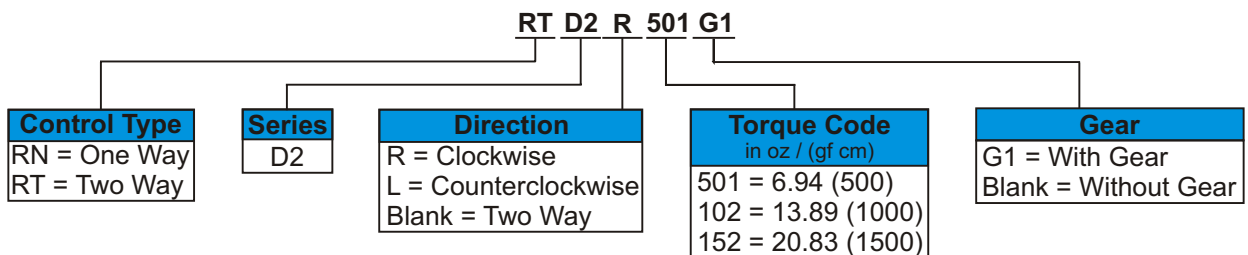
Relationship Between Torque and Temperature
20 rpm



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



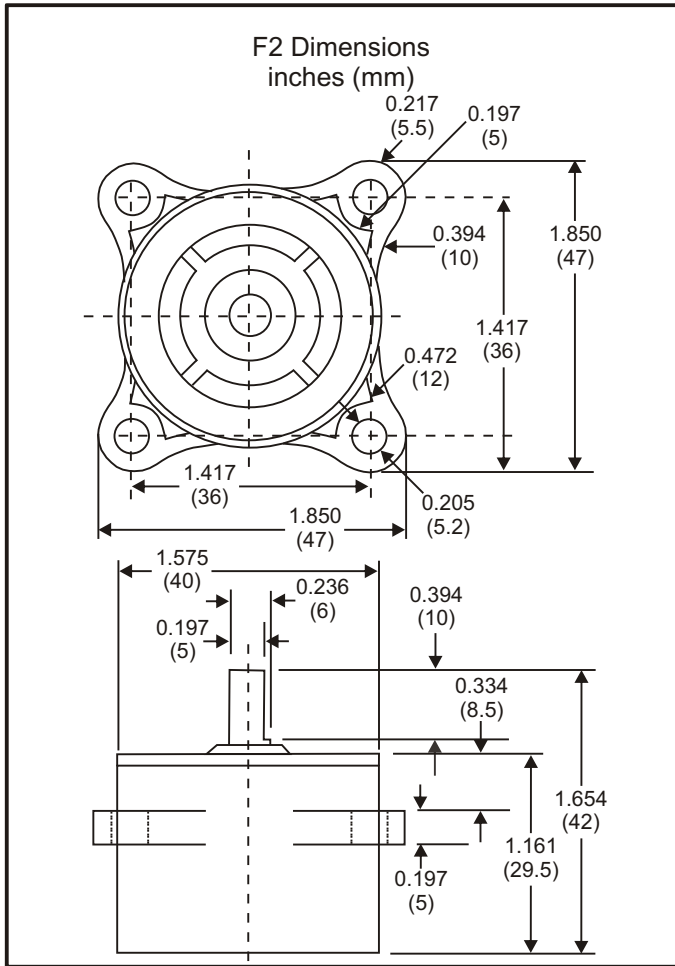
ORDERING INFORMATION



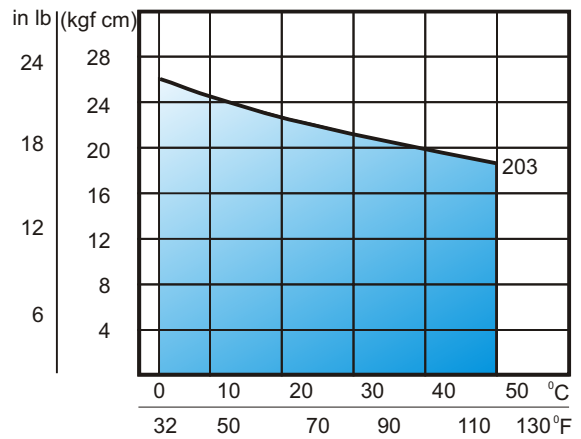
ACE F2 Series



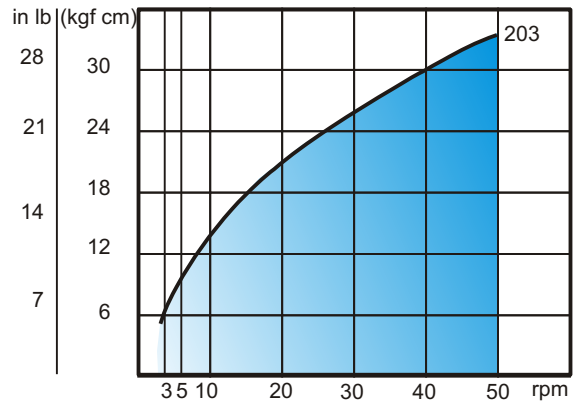
Applications include: copy machine lids, dining room table folding extensions.



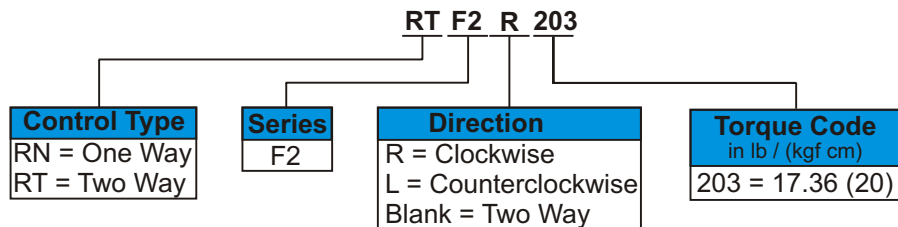
Relationship Between Torque and Temperature
20 rpm



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



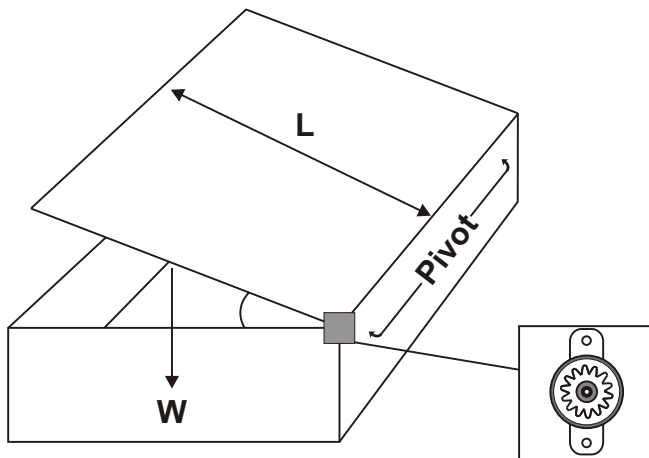
ORDERING INFORMATION



SELECTION PROCEDURE E2, G2, C2, D2, & F2 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 (pages 3 thru 7), 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 1-800-521-3320 to discuss a custom model for your application.

TORQUE CALCULATION EXAMPLE



- = Length from pivot to the end of the lid
- = Angle between the lid and horizontal
- = Free weight of the lid

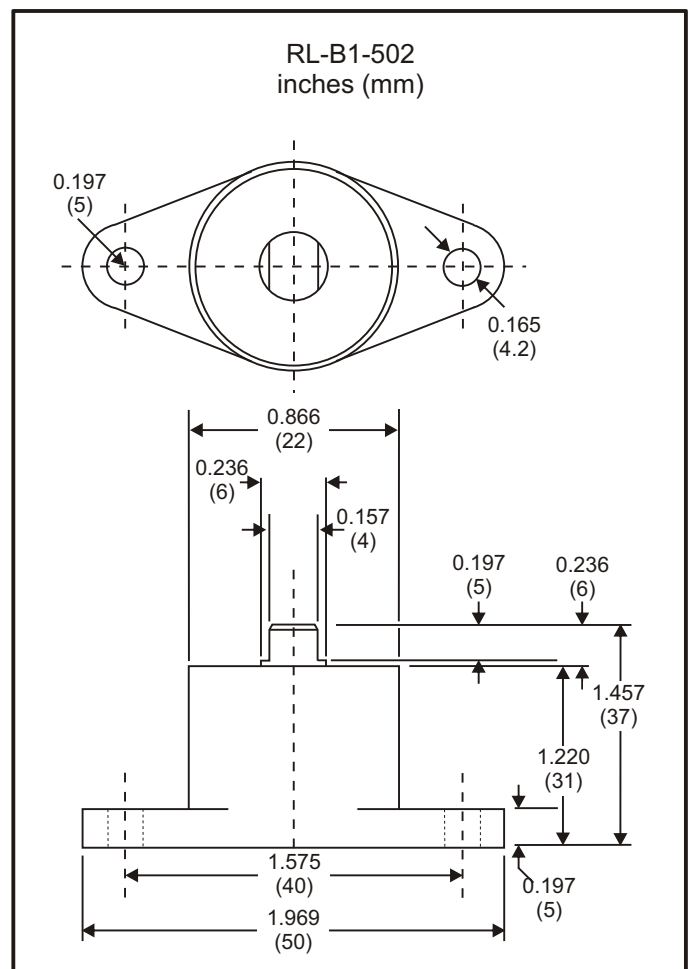
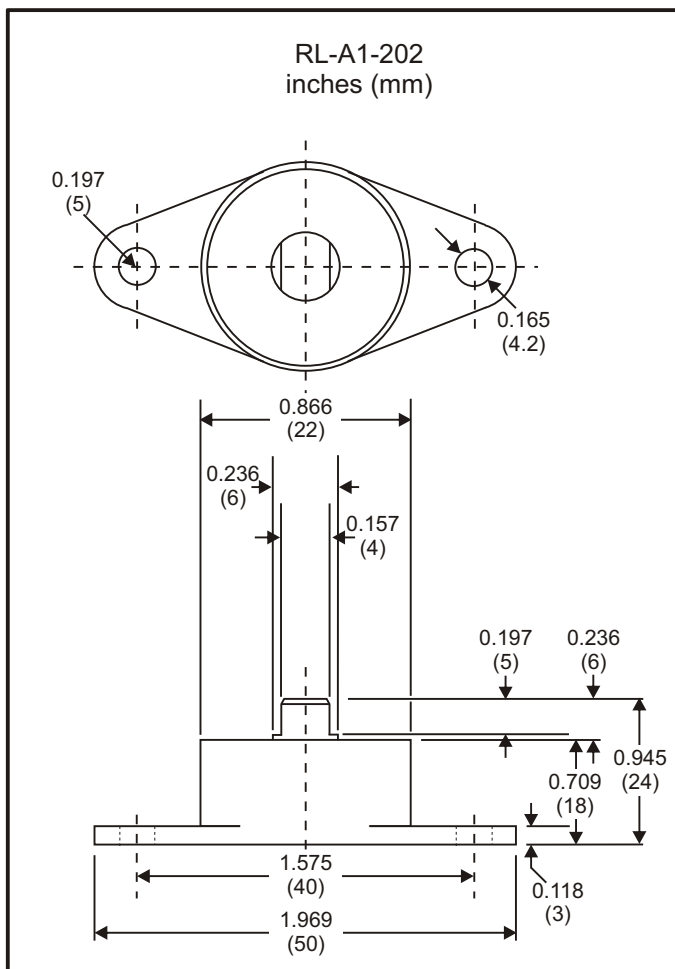
To calculate the torque about the pivot point for the lid pictured above use the following formula:

Where:

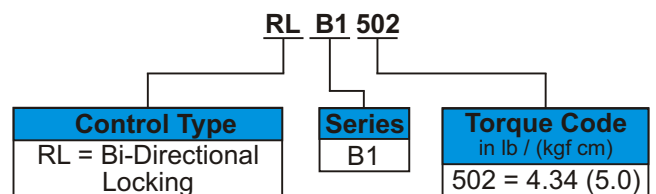
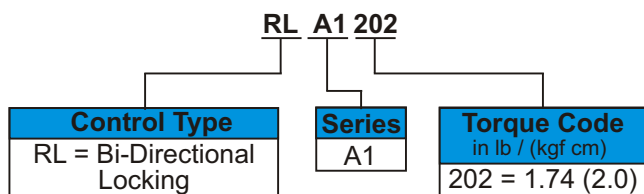
- = Torque
- = $1/2$ the length of the lid from the pivot to the end (center of gravity)
- = Free weight of the lid (actual weight of lid)
- = Angle between the lid and horizontal

ACE A1 and B1 Locking Series

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



ORDERING INFORMATION



OPERATION OF A1/B1 BI-DIRECTIONAL LOCKING SERIES

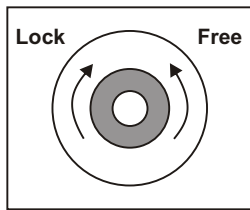


Figure 1

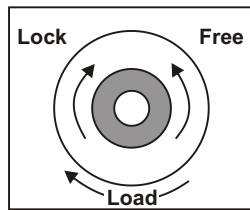


Figure 2

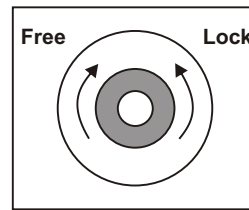


Figure 3

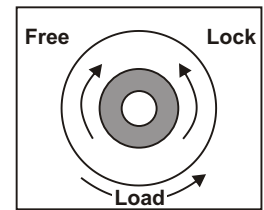


Figure 4

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.

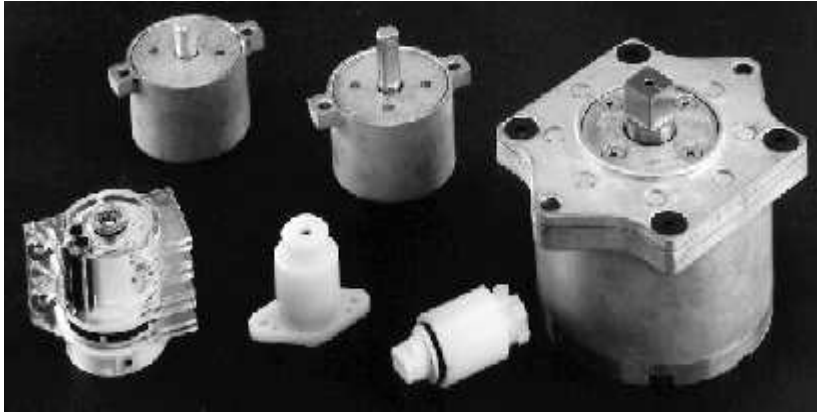
In Figure 4 a load exceeding the rated torque of the locking mechanism is applied in the counterclockwise direction and the lock function is cancelled. The damper has returned to its original state in Figure 1.

SELECTION PROCEDURE A1/BI SERIES

- 1.) Determine the torque about the pivot point for your application.
- 2.) From the catalog page 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 1-800-521-3320 to discuss a custom model for your application.

ACE Controls is focused on continuous improvement. We therefore reserve the right to change models, dimensions or specifications without notice or obligation.

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Selected Custom Rotary Dampers

ACE Controls, Inc. offers a unique line of custom rotary dampers for applications that require damping above and beyond the functional ranges of our standard product line. These durable dampers are designed to control one way or two way rotary motion.

Typical applications would include damping for furniture lids and leaves, automotive seats, as well as industrial safety covers and machine guards.

The units pictured above are intended to depict a range of custom dampers that have been produced to meet unique customer requirements. Custom tooling charges were incurred by customers in order to produce each of the dampers shown.



Toilet Seat With Rotary Dampers

Automatic lowering of the seat and cover of the toilet seat pictured above is a direct result of the incorporation of rotary dampers. This contemporary design controls the lowering velocity, resulting in improved safety characteristics and suppressed contact noises.

Additional ACE Products



INDUSTRIAL & SAFETY SHOCK ABSORBERS

Decelerate loads, prevent impact damage, dampen noise and increase cycle speeds with ACE industrial shock absorbers. For emergency applications relating to automated storage and retrieval systems, overhead cranes, conveyors, turntables, dockside equipment and bridges, ACE offers a rugged and dependable safety line of stacker crane shocks, as well as crane and heavy industrial shock absorbers. ACE's shocks provide true linear deceleration and solve shock-related problems more efficiently and effectively than any other device, at a fraction of the cost. In addition, ACE offers a dependable line of velocity and feed controllers.



GAS SPRINGS & HYDRAULIC DAMPERS

ACE Controls offers a durable line of gas springs and hydraulic dampers. ACE gas springs provide controlled motion for lids, panels, machine guards, etc. ACE hydraulic dampers are self-contained sealed units that are available with stroke lengths up to 31.50 inches (800 mm).

APPLICATIONS ASSISTANCE - If you require more information, call the Applications Hotline at 1-800-521-3320. In addition, ACE offices and distributors are located in over 100 cities worldwide to help provide applications solutions. For a distributor near your location, visit the ACE web site at www.acecontrols.com.