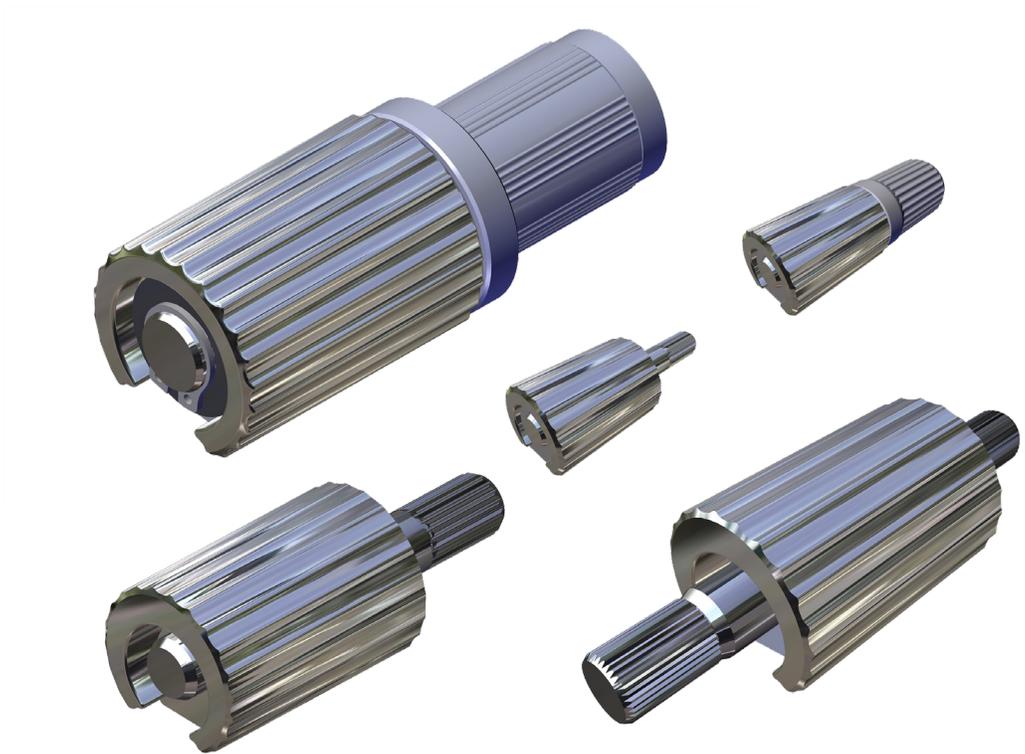




TI-300 Series Torque Insert Application and Installation Guide



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Reell torque inserts are hinge position control devices that are concealed within an application and support a cosmetically attractive design.

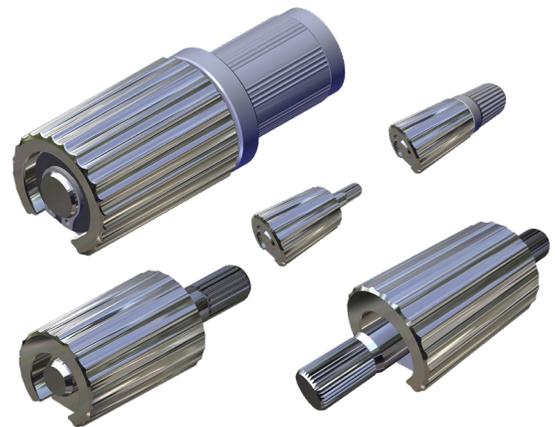
Friction from within the torque insert controls the infinite positioning of two pieces linked together and is capable of 360° of rotation. Without the visible appearance of a hinge, applications can be designed with great style and seem somewhat magical as to how components are infinitely positioned for the best user experience.

TI-300 Series Torque Inserts serve as advanced positioning and pivoting technology solutions uniquely developed to outmaneuver conventional hinges.

They enable reliable, precise, and controlled positioning of equipment and components for a wide range of hinging applications in consumer electronics, automotive, aircraft interior, medical technology, and many other commercial and industrial markets.

Advantages of TI-300 Series Torque Inserts

- Quick and easy press-fit installation
- Cost efficient requiring no mounting accessories
- Installs into a round hole using any forming press
- Easily concealed
- Stable performance up to 50K life
- Compatible with hot or cold environments (-20° to 80° C)
- Symmetrical and One Way torque available (Forward or Reverse torque)



ReellTorq® Technology

Reell's patented clip technology provides a long-life, cost-effective solution for applications requiring constant frictional torque from 0.50 to 10.00 Nm. Constant torque is generated by the controlled interference fit between clips and shaft.

Precision clips and shaft components, a proprietary lubricant, and a proprietary manufacturing process form the basis for Reell's technology for providing consistent torque over life. Torque increments are achieved through the addition of clips and allow custom torque specifications with standard components.

Standard torque tolerance over life is +/- 20%. Clip technology allows a close and predictable relationship between static and dynamic torque and specification of higher torques without compromising torque tolerance or life.

LIFE

Standard life for ReellTorq® clip products is specified up to 50K cycles. Cycle rates of up to 10/min are possible within these specifications.

COST

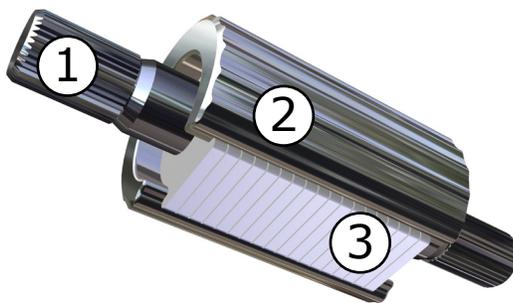
ReellTorq® clip technology offers excellent performance at an attractive cost through standard components such as clips and shafts, automated assembly of clips and shafts, and available standard hinge designs.

ENVIRONMENT

ReellTorq® clip technology may be applied in hot or cold environments from -20° to 80° C.

PATENTED TECHNOLOGY

Patents can be found at pat.reell.com, product code CP10.

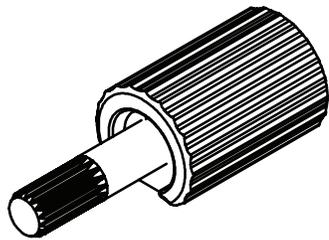


- 1. Shaft**
- 2. Housing**
- 3. Clips**

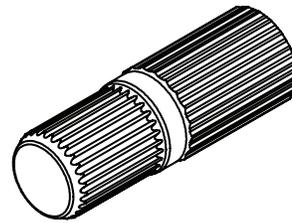
Figure 1: Torque Insert Features

Overview & Features

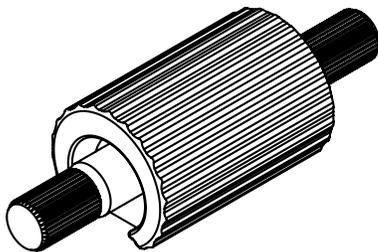
Reell TI-300 Series Torque Inserts feature a powdered metal package designed to be press-fit into round holes for quick and easy installation. The TI-300 Series is available in three package sizes with several shaft end options as displayed below.



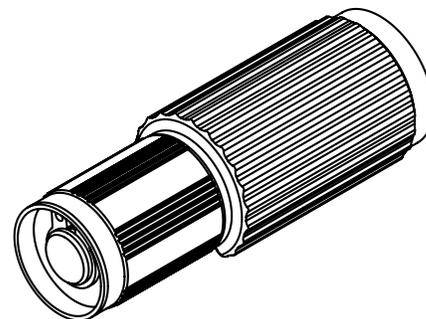
Knurled Shaft



Knurled Adapter



Dual Ended Knurled Shaft



**One Way
(Forward or Reverse)**

All TI-300 Series Torque Inserts feature Reell's patented ReellTorq® technology, which ensures consistent smooth long-life position control without adjustment. Torque values are available from 0.50 to 10.00 Nm.

Models

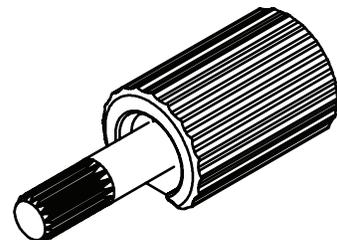
The TI-300 Series uses the following model naming convention:

TI-[Part]-[Torque]-[Shaft End]

Part	320
	340
	360
Torque (Nm)	TI-320: 0.50, 0.75, 1.00, 1.25, 1.50
	TI-340: 2.00, 3.00, 4.00, 5.00
	TI-360: 6.00, 8.00, 10.00
Shaft End	01 - Knurled Shaft
	02 - Knurled Adapter
	03 - One Way Forward
	04 - One Way Reverse
	05 - Dual Ended Knurled Shaft

Example: TI-320-0.50-01

Specifies a TI-320 torque insert with a knurled shaft end which has 0.50 Nm of torque.

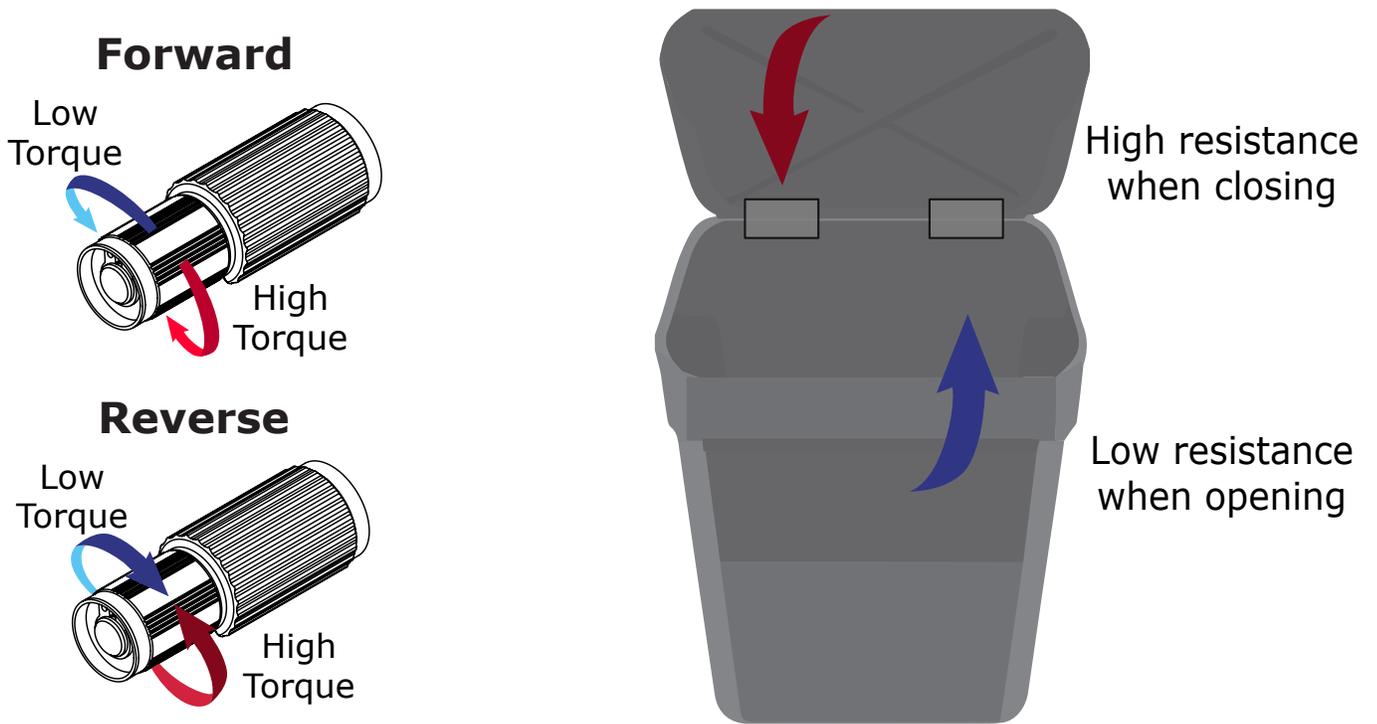


Application Designs

Torque inserts give smooth torque control of hinged mechanisms in office equipment, medical devices, automotive interiors, computer peripherals, flat-panel monitors, access panels, industrial enclosures, equipment guards, and many more applications.

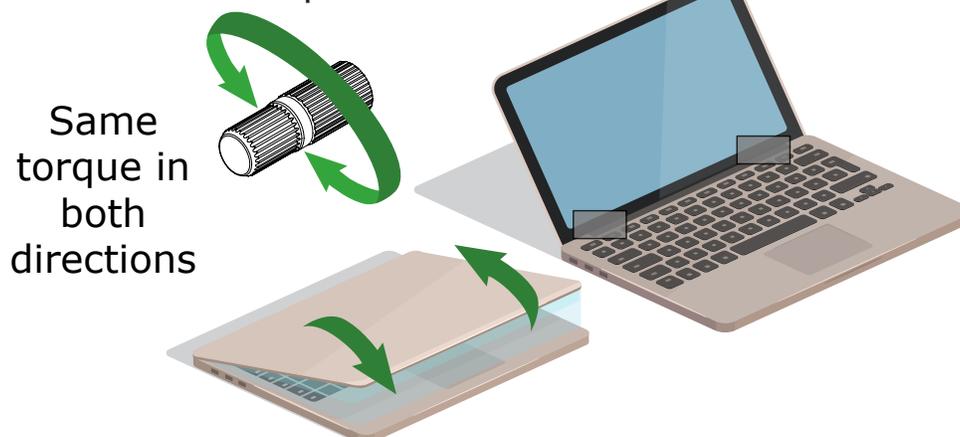
One Way Application

One way torque inserts in a lid allow for low resistance when lifting and high resistance when closing.



Symmetric Application

Symmetric torque inserts enable the rotation of a laptop screen in both directions with the same torque.

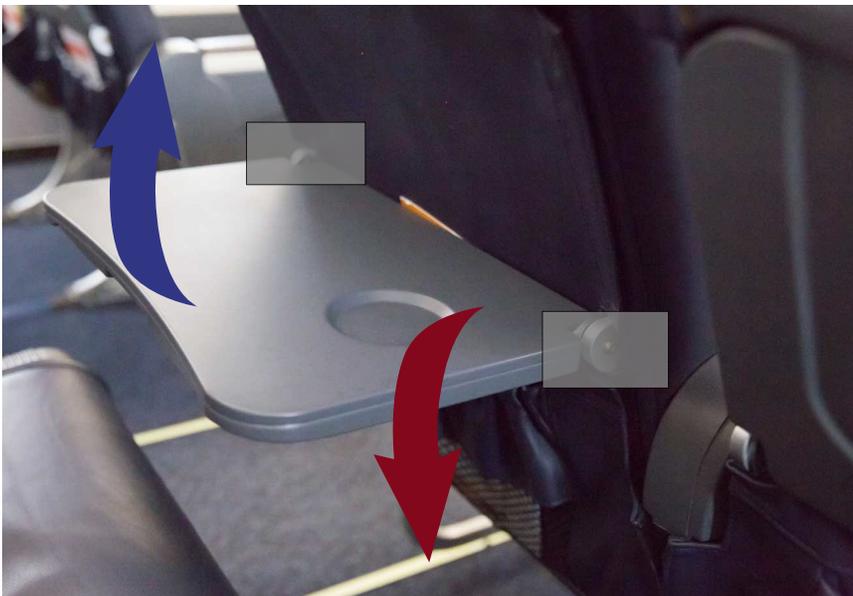
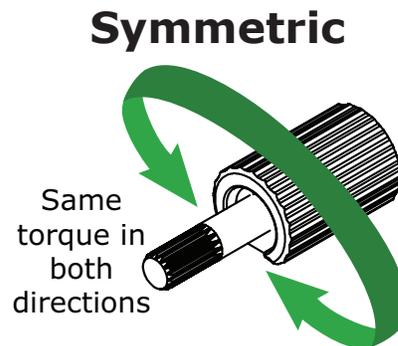
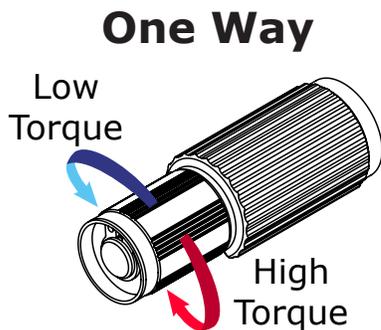


Combination (Asymmetric) Application

A combination of One Way and Symmetric torque inserts in an airplane tray:

- Provides easy lifting in an upward direction and solid holding power in a downward direction
- Allows for low torque in upward direction preventing it from ratcheting upwards
- Prevents free-fall when rotating past vertical

NOTE: Consider system stiffness to prevent racking or a twisting effect in your application



Low resistance
when folding up

High resistance
when folding down

Application Considerations

Torque inserts provide an advanced positioning and pivoting solution uniquely developed to outmaneuver conventional hinges. They enable reliable, precise, and controlled positioning of equipment and components for a wide range of hinging applications while eliminating any need for mounting hardware.

Successful press-in installation depends on the following:

Material

TI-300 Series Torque Inserts are designed to be press-fit into a variety of materials. The following materials have been tested.

- Metals (Knurled Shaft, One Way, Dual Ended Knurled Shaft)
 - ◇ Die Cast Zinc
 - ◇ Die Cast Aluminum
 - ◇ Mild Steel
 - ◇ Wrought Aluminum
- Plastics (Knurled Adapter)
 - ◇ Delrin (Polyoxymethylene)
- Avoid using in brittle plastics, softwoods, and hardened metals

If using a material not included on this list, please perform proper testing to ensure your specific application needs. For complete information on material specifications, please refer to the appropriate TI-300 Series Torque Insert Sales Drawing at www.reell.com.

Material Thickness

Side and End wall thickness varies based on insert model and material used. Please see the appropriate TI-300 Series Torque Insert Sales Drawing for specific details.

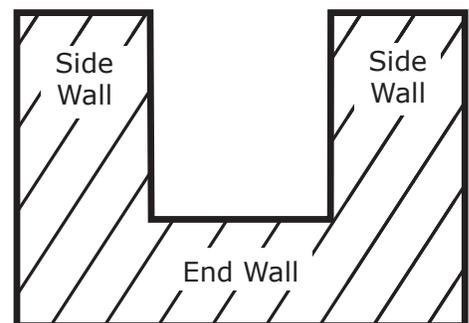


Figure 2: Minimum Material Thickness

Installation Hole

Mounting holes may be drilled, punched, or cast.

- Measure the hole diameter where the torque insert will be installed. The diameter must be within Reell specifications.
 - ◇ If the hole is too large, the torque insert will not properly grip the material
 - ◇ If the hole is too small, installation may be difficult and unsafe
 - ◇ If draft is present, measure the hole diameter at the midpoint of the depth of the hole
 - ◇ 2° maximum draft

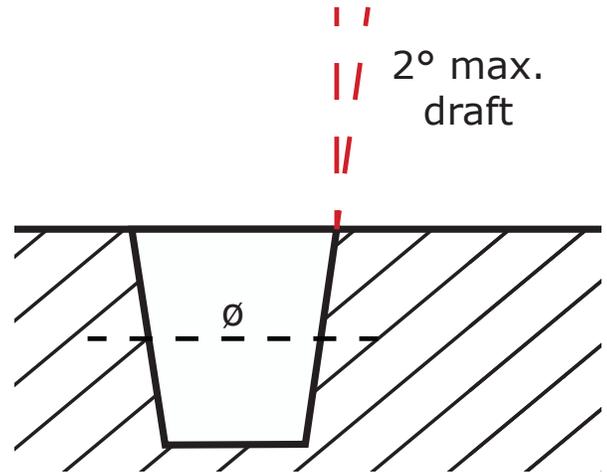


Figure 3: Hole Draft and Diameter

For more information, refer to the Sales Drawings at www.reell.com.

Environmental Factors

TI-300 Series Torque Inserts are intended for enclosed environments. Considerations must be taken to isolate torque inserts from environmental elements such as moisture, salt, cleaner and solvents. Torque is specified at room temperature and will vary as temperature moves from 20° C. Contact Reell if your application is intended to operate in extreme temperatures.

- Operating temperature: -20° C to 80° C

Lubrication Compatibility

TI-300 Series Torque Inserts are made with mineral oil-based lubricants. To ensure proper function, check compatibility of Reell lubricants when inserting torque insert into materials such as plastics. Inserts are maintenance free and do not require additional lubrication over life of use.

O-Ring Seal

In applications where the torque insert may be exposed to environmental elements, an O-Ring can be used to seal the torque insert. See Figure 4.

Painting and Plating Considerations

TI-300 Series Torque Inserts can be installed before or after any plating or painting is done to the product. If your application includes painting or plating, consider the following:

- When installing a torque insert after plating or painting has been applied to the installation site, do not include the coating thickness when taking measurements
- Do not submerge torque inserts in painting or plating bath
- Limit torque inserts to as little chemical exposure as possible
- If powder coating after install, do not expose torque insert to temperatures exceeding 80° C

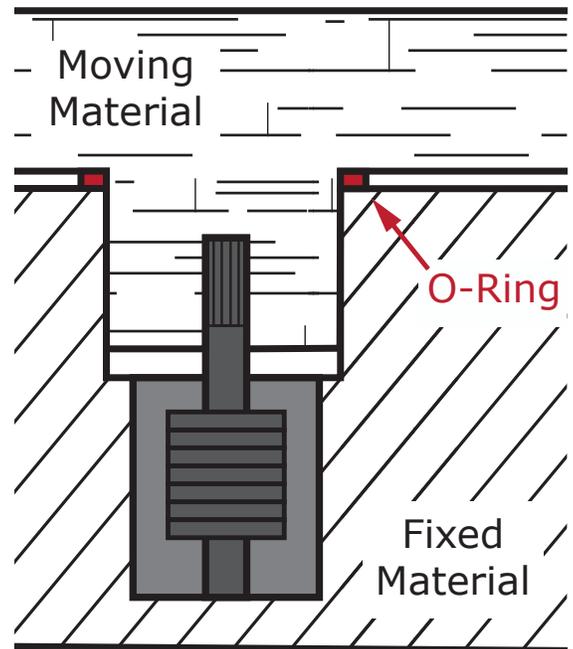


Figure 4: O-Ring Seal

Axial Force Direction

TI-300 Series Torque Inserts are not designed to support axial force between the shaft and clips. Considerations must be taken to ensure that the application supports the insert so that it does not pull apart.

Proper Axial Force Direction

Materials will contact each other if load is applied as shown in Figure 5.

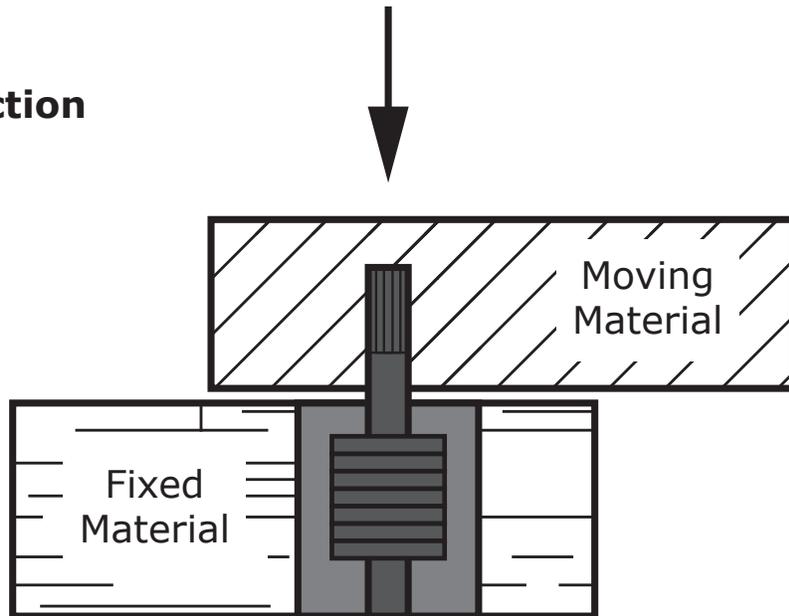


Figure 5: Proper Axial Force Direction

Improper Axial Force Direction

Materials will separate when load is applied as shown in Figure 6.

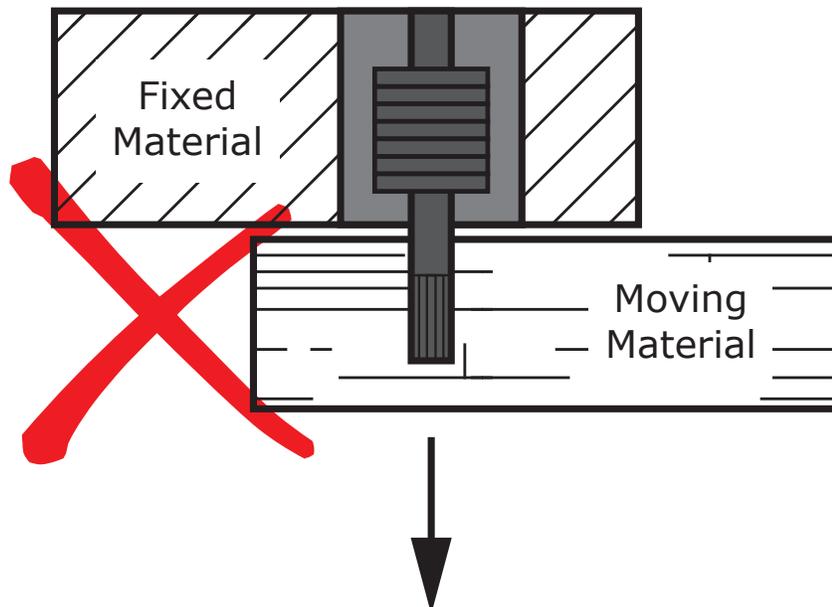


Figure 6: Improper Axial Force Direction

Specifications

	TI-320	TI-340	TI-360
Torque	0.50-1.50 Nm	2.00-5.00 Nm	6.00 - 10.00 Nm
Torque Type	Symmetric or One Way		
Life	50,000 cycles	25,000 cycles	25,000 cycles
Finish	Non-cosmetic plain		
Ambient Temperature	-20° to 80° C		
Environmental Rating	Designed for enclosed environments		
Springback	< 1°		
Free Play	Minimal		
Housing	Plated powdered metal		
Shaft	Hardened Steel		
Clips	Hardened Steel		
Lubricant	Mineral Oil Based		

Weight

Part weight varies based on the model. Below are approximate weights.

Model	Weight
TI-320 Knurled Shaft	6.50 g
TI-320 Knurled Adapter	11.85 g
TI-320 One Way	18.40 g
TI-320 Dual Ended Knurled Shaft	7.00 g
TI-340 Knurled Shaft	38.25 g
TI-340 Knurled Adapter	59.28 g
TI-340 One Way	54.83 g
TI-340 Dual Ended Knurled Shaft	39.65 g
TI-360 Knurled Shaft	61.20 g
TI-360 Knurled Adapter	92.60 g
TI-360 One Way	91.70 g
TI-360 Dual Ended Knurled Shaft	67.50 g

Radial Load Ratings

Abuse/Overload (Rare/Infrequent Events)

Product	Configuration	Moment at Knurl (Nm)	Force at Knurl (N)
TI-320	Knurled Shaft	3.5	550 N @ 6.5 mm
	Knurled Adapter		
	One Way		
	Dual Ended Knurled Shaft		
TI-340	Knurled Shaft	14.5	1700 N @ 8.5 mm
	Knurled Adapter		
	One Way		
	Dual Ended Knurled Shaft		
TI-360	Knurled Shaft	26.5	2500 N @ 10.5 mm
	Knurled Adapter		
	One Way		
	Dual Ended Knurled Shaft		

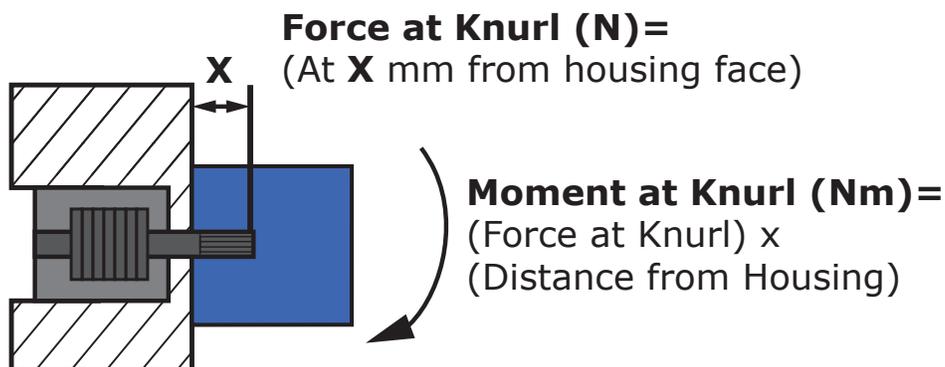


Figure 7: Radial Loads

Cyclical/Constant Load (Load on Every Cycle)

Product	Configuration	Moment at Knurl (Nm)	Force at Knurl (N)
TI-320	Knurled Shaft	0.4	55 N @ 6.5 mm
	Knurled Adapter		
	One Way		
	Dual Ended Knurled Shaft		
TI-340	Knurled Shaft	1.5	170 N @ 8.5 mm
	Knurled Adapter		
	One Way		
	Dual Ended Knurled Shaft		
TI-360	Knurled Shaft	2.7	250 N @ 10.5 mm
	Knurled Adapter		
	One Way		
	Dual Ended Knurled Shaft		

Dimensions

For complete information on dimensions, refer to the Sales Drawings located on the TI-300 Series Torque Inserts page at www.reell.com.

High Radial Load (Shear Force) or Abuse Load Applications

- Torque inserts were designed to provide torque only
- Customer material should account for axial and radial loads
- For force-moment ratings see Radial Load Ratings tables on page 15 & 16.

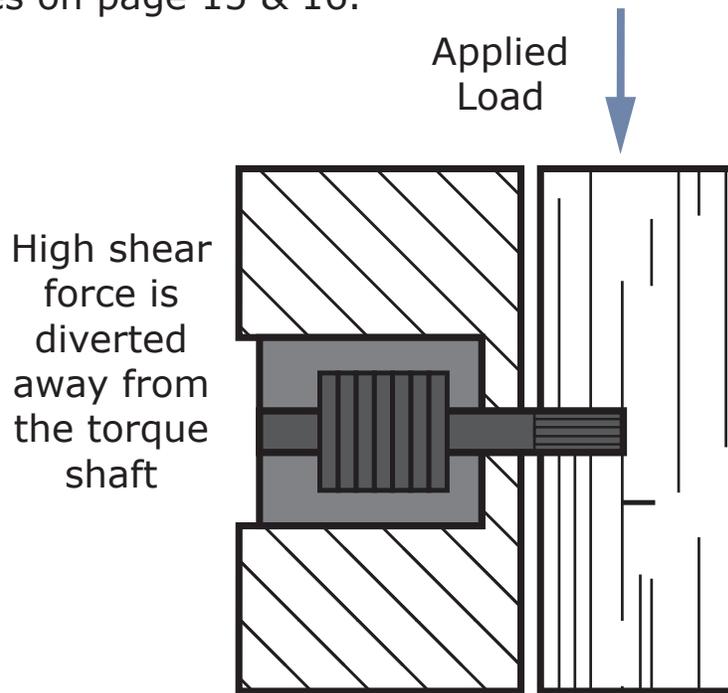


Figure 8: Proper Load

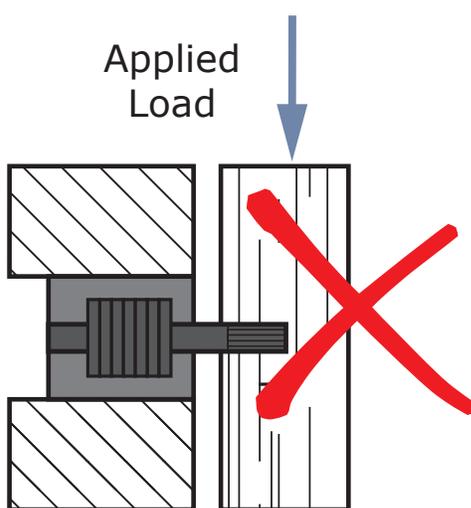


Figure 9: Improper Load

High shear force concentrated on the torque shaft at gap location

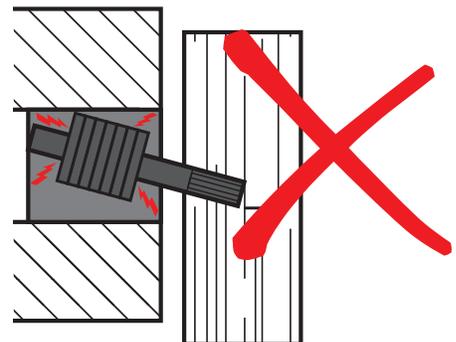
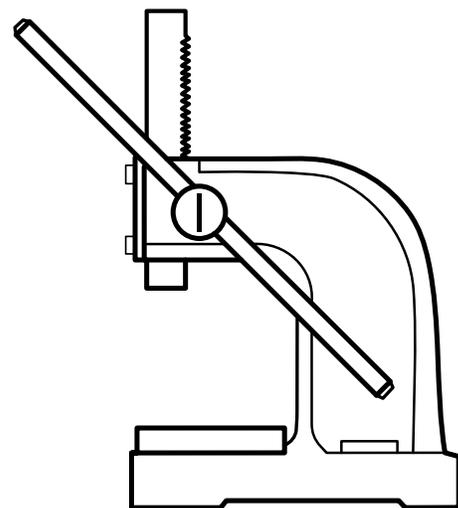


Figure 10: Improper Load Result

Installation Considerations

Installation Tools

- Forming press
 - ◇ Use any forming press to install the insert
 - ◇ Mechanical lever press (e.g., Arbor press)
 - ◇ Pneumatic press for high volume
- Ram or punch
 - ◇ Used to align and apply press force to the insert
 - ◇ **Important:** The ram or punch used must have a diameter larger than the housing to ensure that both the torque housing and shaft are in contact
- Base or clamp
 - ◇ Use to align and support mating materials for the press force
- A shim or tool stop can be used to ensure proper spacing during installation



Example: Arbor Press

Installation Force

Proper installation requires an even distribution of adequate force.

- Reell does not recommend using a hammer. An impact force does not provide an even distribution of force.
- Installation force varies from application to application, depending on hole size and mounting material.
 - ◇ A smaller hole size means more interference and more press force
 - ◇ A stiffer material means more press force
- Reell recommends the following press capacities:
 - ◇ For TI-320 models use a 1-ton press
 - ◇ For TI-340 models use a 2-ton press
 - ◇ For TI-360 models use a 3-ton press

Part Alignment

Part alignment is important for good press-fit assembly.

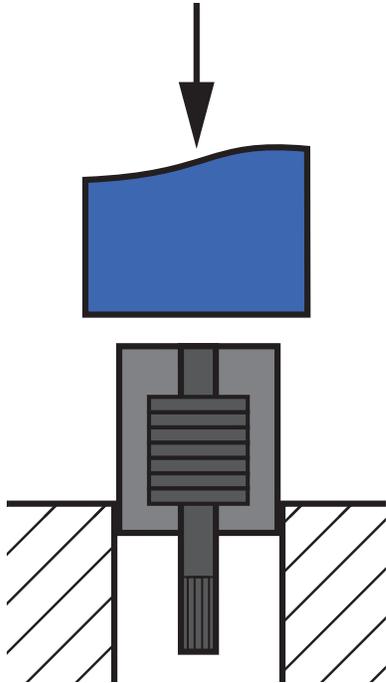


Figure 11: Proper Part Alignment

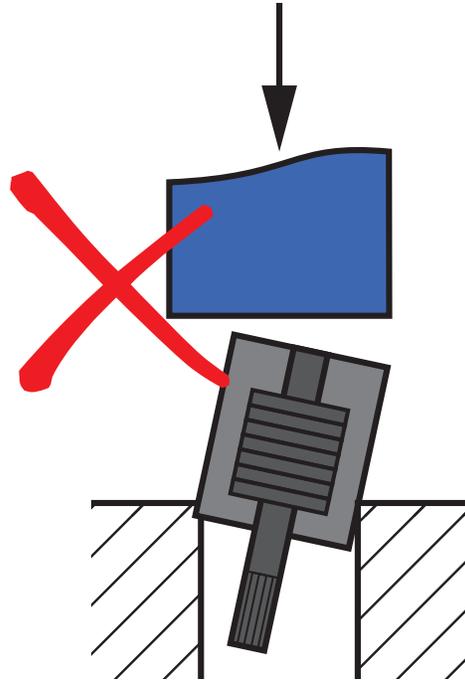


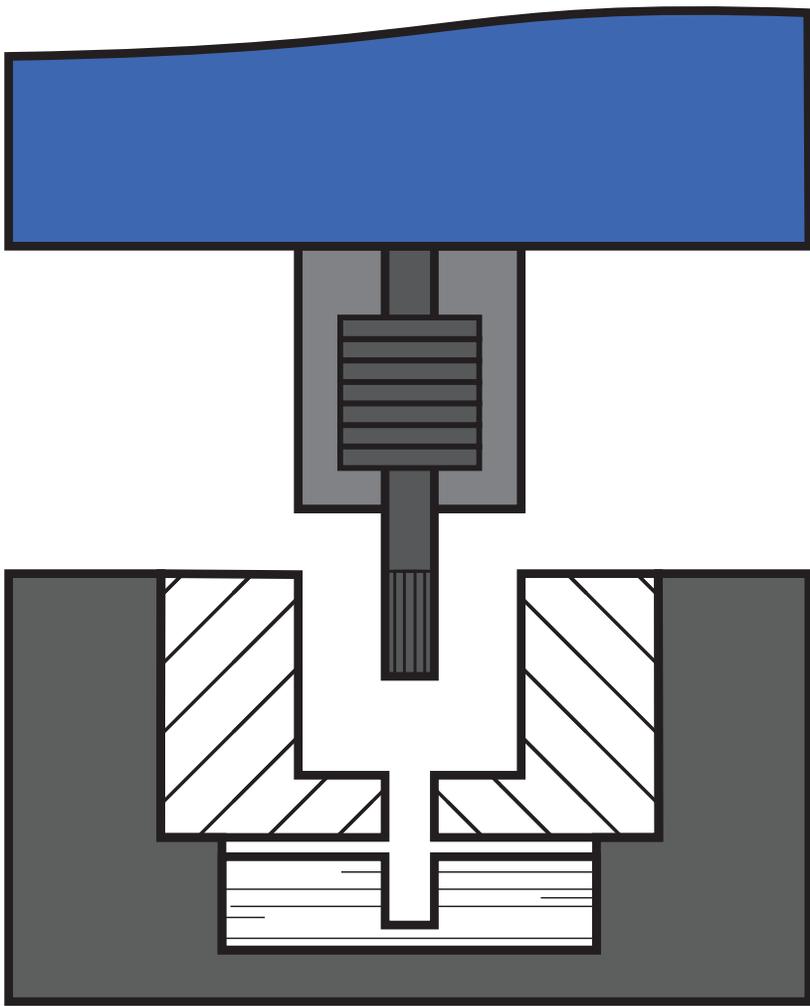
Figure 12: Improper Part Alignment

Material Containment

During proper installation of the torque insert, a very small amount of material will be shaved from the customer's mating material as the knurls need to bite into the mating material tightly to avoid free play in the system. Extra care should be taken if the presence of this material will affect the performance of the application.

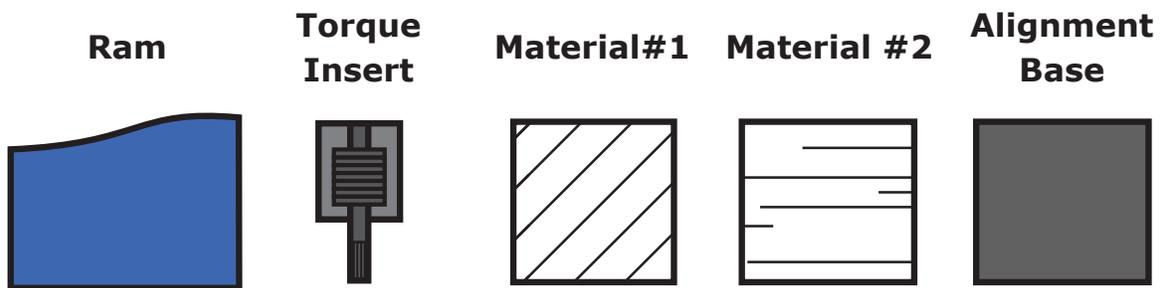
Material Support

Some applications require additional support surrounding the installation site of the torque insert to ensure proper installation. See Figure 13.



The alignment base (grey) shown here supports both materials independently while controlling the gap.

Figure 13: Proper Material Support Example



Installation

Installation order can affect product concealment or contain sheared material as a result of the installation press. The examples shown below highlight effective ways to conceal torque inserts within an application. Assembly order may need to change if concealment is paramount.

One-Step Installation

One-step installation is quick and easy by press fitting the torque insert into a round hole without the use of any mounting hardware. An arbor or pneumatic press ram contacts the entire area of the large housing end of the torque insert. With both the housing and shaft pressed simultaneously, the torque is inserted into both materials in one stroke.

To hide the torque insert completely, recess into material #1 and add a cap to conceal.

WARNING: Do not push on the shaft alone. Pushing on the shaft alone may result in damage to the torque insert. See Figure 15.

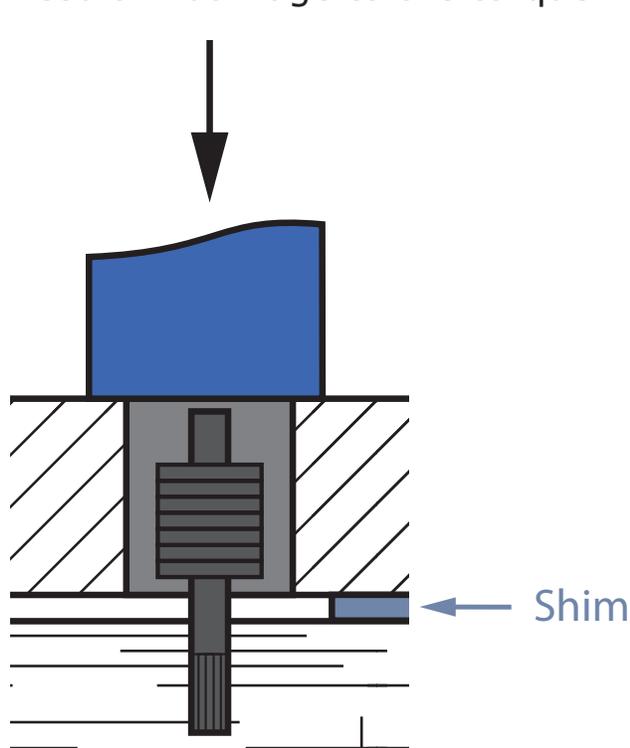


Figure 14: Proper One Step Application Installation

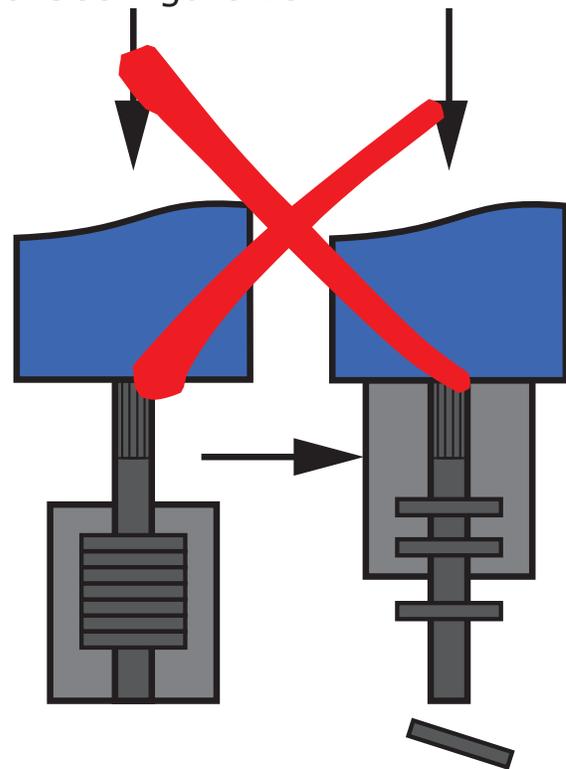


Figure 15: Improper One Step Application Installation

Two-Step Installation

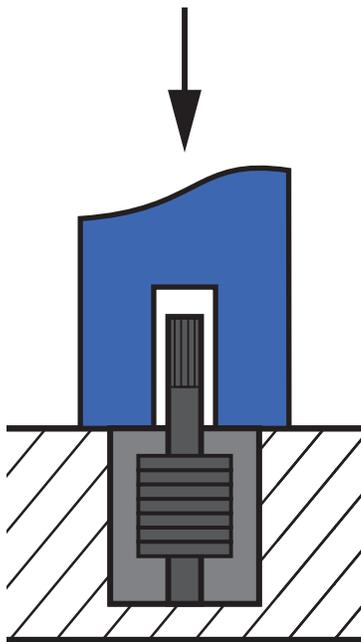
When utilizing a two-step installation, the torque insert is completely concealed.

If your application requires the torque insert housing to be installed into a material first, the press ram must contact housing while avoiding contact with the shaft. Do not press on shaft alone as this may shift the clips and shaft outside of the housing.

NOTE: If a gap is needed between materials, use a shim or external ram stop.

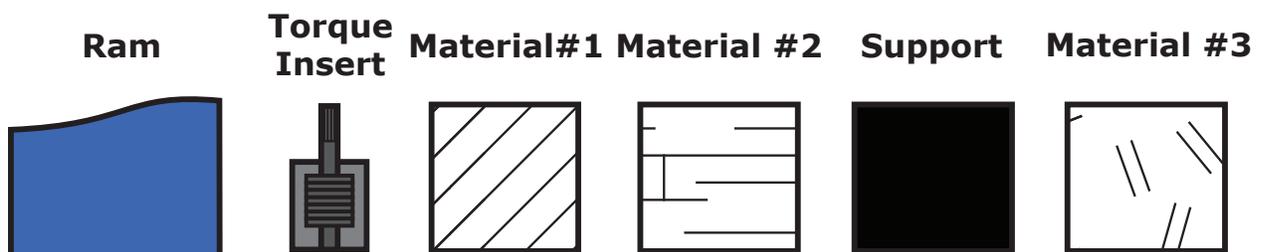
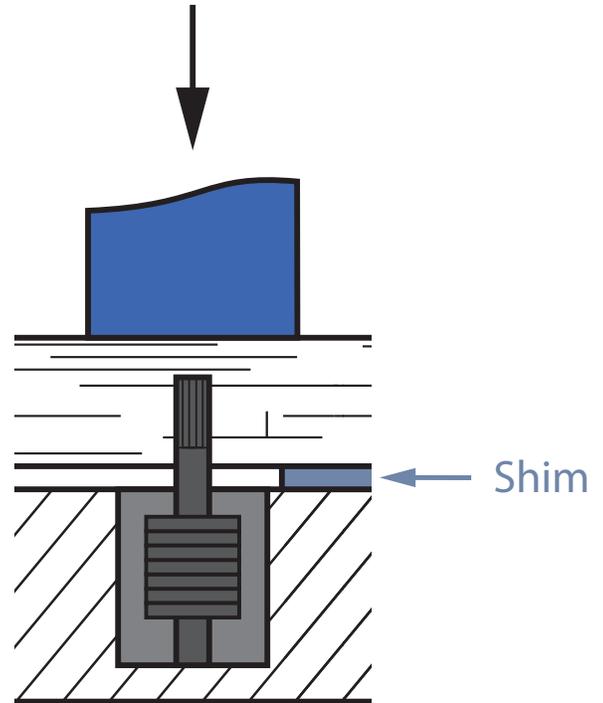
Step 1

Press the housing into the first material



Step 2

Press the second material onto the shaft using a shim to ensure spacing if necessary

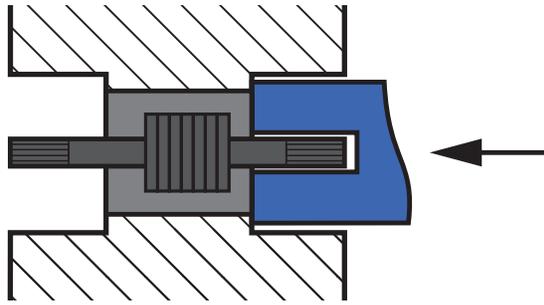


More Than Two Step Installation

Dual Ended models may require more than two inserts/presses. See the following three-step example installation for a Dual Ended Knurled Shaft torque insert.

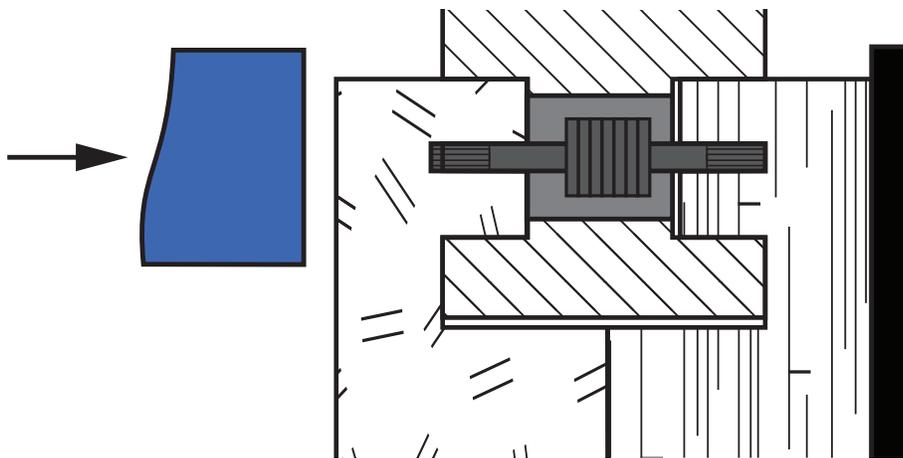
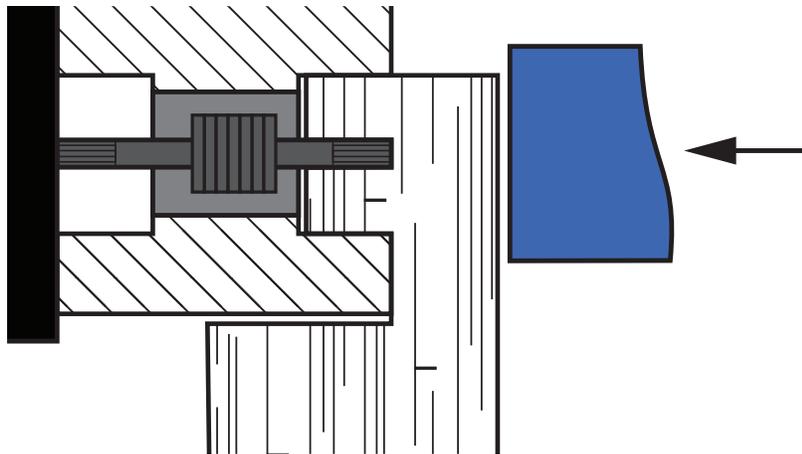
Step 1

Press the housing into the first material



Step 2

While supporting the opposite side of the shaft, press the second material onto one end of the shaft



Step 3

While supporting the second material, press the third material onto the other end of shaft

Reell provides high-quality, innovative solutions to transmit torque, control angular position and protect delicate components from excessive force. Combining the world's most precisely controlled torque technology with the industry's most experienced engineering team provides a perfect product fit in customer applications.

When Reell was established in 1970, the founders wanted to build a company that viewed success as more than return on investment. They wanted to provide exceptional products and services to customers while creating a work environment that fostered a balanced life for its co-workers. They named the company "Reell" (ray-EL'); a German word meaning honest, trustworthy and good, to reflect these values.

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Product Support

Not sure if a Reell motion control product will work for your application? Let a Reell engineer help you define your application needs.

Contact Reell customer support for consultation:

- Technical information
- Product specifications
- Sales drawings and datasheet documents
- Pricing, quotations, and lead-time
- Ordering
- Delivery
- RMA

Additional Resources

The following resources can be found on the Reell website:

[Hinge Selection Guide](#)

An interactive tool to explore Reell's Hinge and Torque Insert catalog and find products suited to your application.

[Torque Calculator](#)

A tool to compute the amount of torque needed to securely position a component.

[Torque Units Converter](#)

Warranty and Patent Information

Visit Reell.com for full Warranty and Patent information.