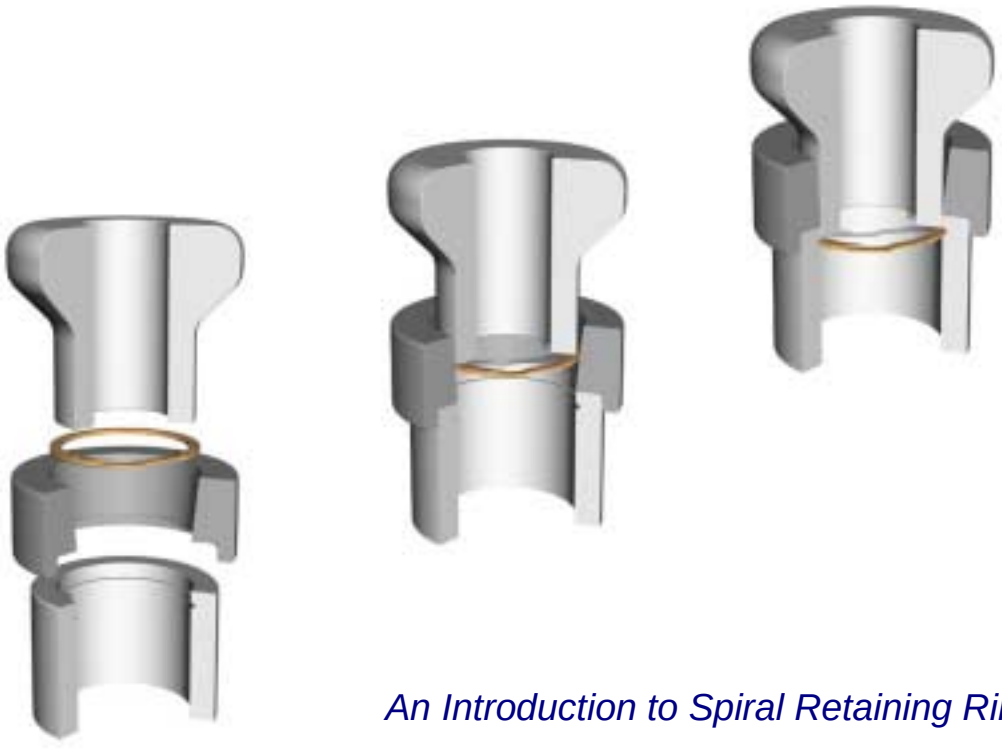
Smalley®
Steel Ring Company

Wind Your Way Through Easy Installation



An Introduction to Spiral Retaining Ring Installation and Removal

FACTS AND FIGURES OF SPIRAL RETAINING RINGS

Retaining Rings act as a removable shoulder on a shaft or in a bore. When installed in a groove, in an assembly, they retain components and are removable to allow field serviceability of a product.

In the universe of rings, Spiral Retaining Rings are one style of ring consisting of two or more turns of rectangular cross-section material, circle-coiled to most any diameter. Unlike die-stamped, tapered-section retaining rings, Smalley Spiral Rings are formed on edge using flat wire, providing a gapless and continuous ring surface having 360 degrees of retention. The process of circle-forming a uniform section retaining ring from pre-tempered wire is an economical and scrapless process, providing many advantages to users.

The laminated configuration of spiral rings offers many benefits in the design of a product. No-Tooling-Charges™ make special designs fast and easy to produce, designed to your exact specifications. For example, to affect thrust capacity, adjust the ring thickness by changing the number of turns or raw material size. Non-standard grooves can easily be accommodated by a simple diameter adjustment.

Smalley, for over 35 years has produced Spiral Retaining Rings to Military, Aerospace and Automotive standards. As the largest producer worldwide, Smalley has gained the technical expertise necessary to maintain its leadership position in the spiral ring industry.

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***Smalley engineers are always available to help you**

FEATURES AND ADVANTAGES OF SPIRAL RETAINING RINGS

Uniform Radial Section

-Provides a pleasant appearance on the assembled product

-Beneficial when radial clearance is limited

Design Flexibility

-Ring thickness can be changed to accommodate most any application by either varying material thickness and/or number of turns.

Simplify Assembly

-Wind into groove

-No special pliers/tools needed to install or remove

-Removal notch provided for easy removal using a screwdriver

No Gap-No Protruding Ears

-Coiled Like a Slinky in Multiple Turns

-Diameters From 9/32” to 84”

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MANUAL INSTALLATION

1.) Separate the ring coils and insert one end of the ring into the groove.

2.) Wind the ring by pressing down around the circumference until the entire ring is inserted into the groove.

-Ease and simplicity of installation are two main reasons to utilize a Spiral Retaining Ring in your assembly.

-Multiple ring layers offer greater axial flexibility of the ring, allowing it to be inserted by hand and wound into the groove.

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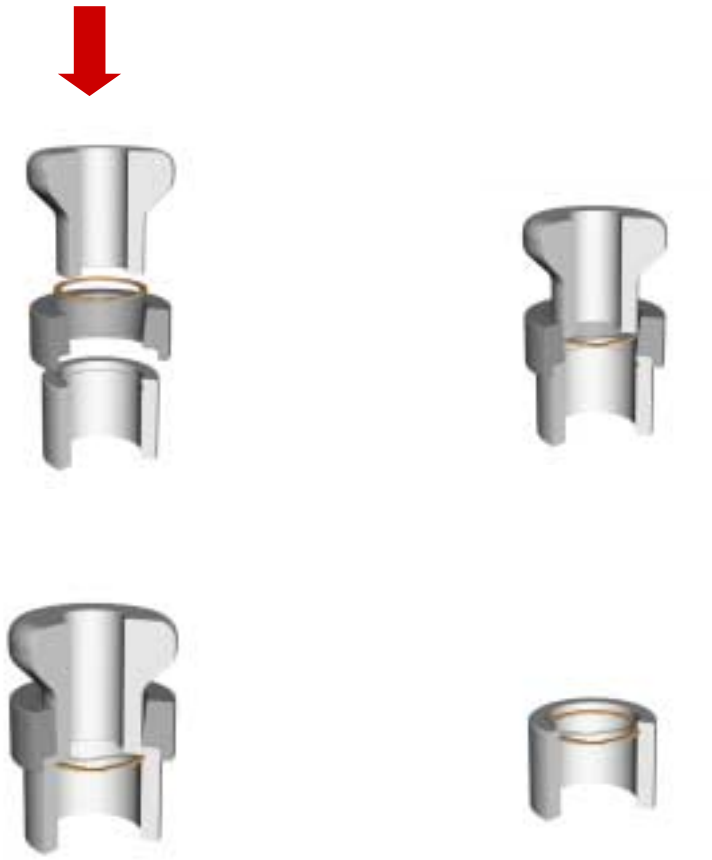
SEMI-AUTOMATED AND AUTOMATED INSTALLATION

Internal

1.) Internal retaining ring installation is accomplished with a plunger and a tapered bore sleeve.

2.) A tapered bore sleeve, which acts as a ring contracting guide, and a plunger pushes the retaining ring into position.

3.) Tooling for ring installation should have hardened working surfaces to minimize wear.



*Smalley can assist you with your automated assembly needs.

*Smalley engineers are available to help you

SEMI-AUTOMATED AND AUTOMATED INSTALLATION

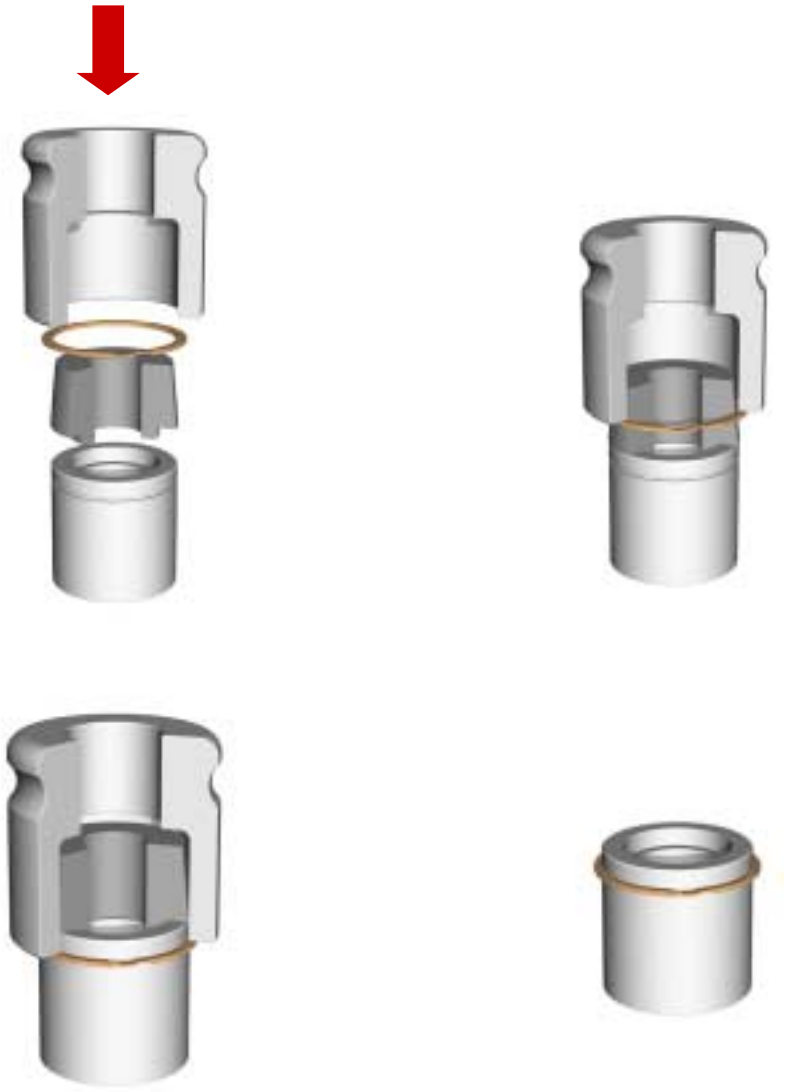
External

1.) External installation on a shaft can be accomplished with a plunger and a tapered plug.

2.) The plug, angled at approximately six degrees, is centered over the shaft end.

3.) A loose fitting plunger pushes the ring into position over the tapered plug.

4.) An arbor press or air cylinder can automate this assembly operation.



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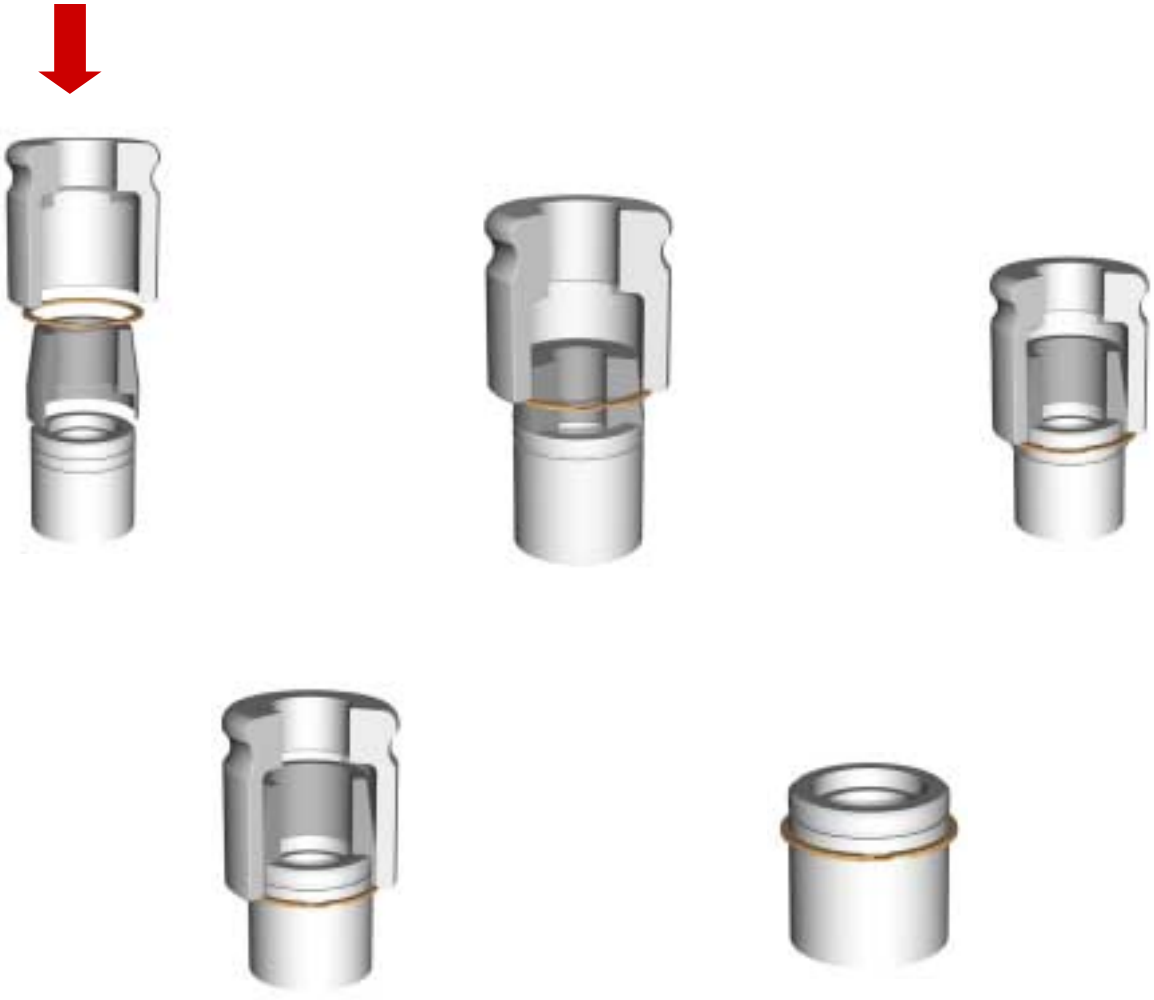
MULTIPLE GROOVE INSTALLATION

1.) An extended thin wall sleeve fits loosely over the shaft and creates a pilot for the plug

2.) The length of the Thin Wall section extends just past the first groove, allowing the ring to clear the first groove during installation.

3.) Consideration must be given to the thin wall thickness of the sleeve, as damage can easily occur to this area.



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SELF LOCKING INSTALLATION

1.) Install the self-locking ring in the same manner as standard retaining rings by winding the ring into the groove.

2.) Use a light hammer strike to engage the tab and slot to complete the installation. Caution must be taken not to flatten the locking tab during installation.

-Special designs are sometimes needed to combat problems. A self-locking ring incorporates the orientation of a tab within a slot on adjacent turns of the ring.

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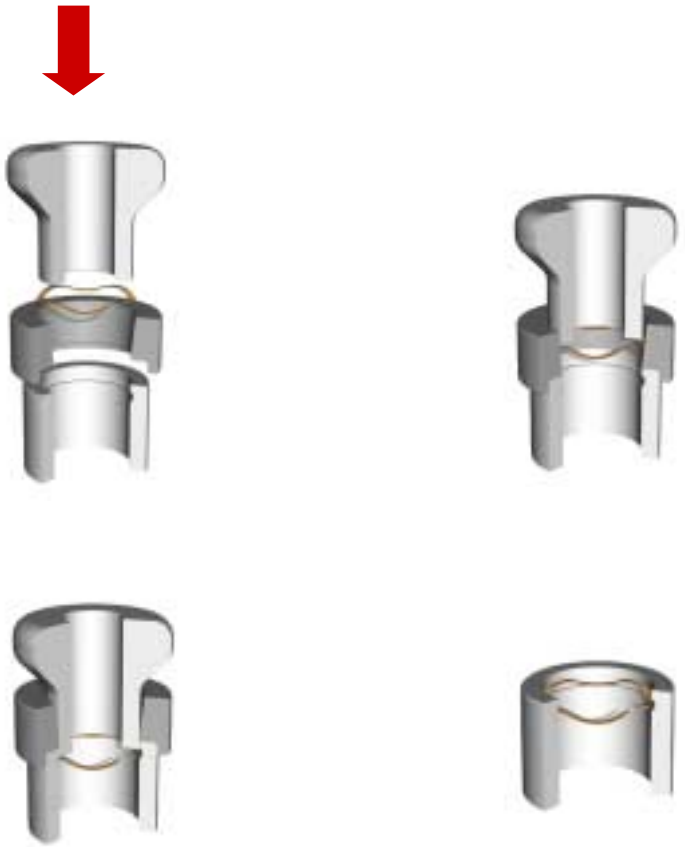
WAVERING INSTALLATION

1.) A WaveRing is installed using basically the same tooling as previously described for a conventional Smalley Ring with consideration for the wave form and the rings ability to snap radially while under axial pressure.

2.) The installation tooling can be designed to reduce the frictional effects of the plunger by providing a polished and/or partial contact plunger face.

3.) In addition, the WaveRing can be produced with additional cling by adjusting the diameter for greater installation force.



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REMOVAL USING A SCREWDRIVER

Smalley Retaining Rings are supplied standard with removal notches to enable easy extraction from a groove. The notch is provided to form a small gap between the ring end and the shaft or housing, permitting a blunt object to be inserted at the end of the ring to pry the free end out radially and up.

Use a Screwdriver or Dental Pick as a blunt object.

1.) Insert a screwdriver or dental pick into the removal notch.
2.) Use the tool to pry out the first end of the ring.
3.) Manually spiral the ring around until it is free from the groove.

Access Slot

1.) To facilitate removal, an access slot may be provided in the housing as illustrated.
2.) The slot exposes the ring's radial wall and the back edge of the ring sitting on the groove.
3.) To remove the ring, fit the tool behind the ring.
4.) Manually pull out radially and up to unwind the ring from the groove.

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REMOVAL TOOL FOR MULTIPLE TURN RETAINING RINGS

Smalley's Spiral Retaining Ring Removal Tool, part number RT-107, fits between the layers of a multiple turn retaining ring in order to access the removal notch. The removal tool eliminates slipping.

1.) Begin removal at the gap end of the ring

2.) Slip the slotted end of the tool, flat side down, horizontally toward the ring. (You can accomplish this by slightly rotating the tool)

3.) When the tool is secured over the ring end, pull it out radially and up. (Direction depends on whether the application is internal or external)

4.) Remove first end of ring and spiral the ring out of the groove.

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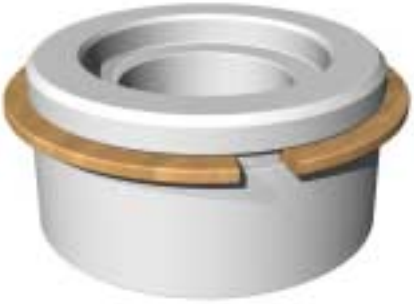
SPECIAL END CONFIGURATIONS

To facilitate easier removal, or to hamper removal, Smalley can design special end configurations.

Tamper Proof

Slotted

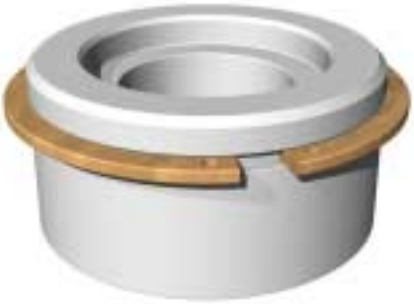


Pi-Cut

Angle Cut
(FS/FH series model)

Bent Ends

Scissor Cut



Holes

Rounded/Blended Ends
(via vibratory)

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Rotary Union Assembly

The uniform cross section of the spiral retaining ring allows the ring to be installed in the assembly without interfering with the mating components.

1.) Simplify design
2.) Cost is less in stainless than with a snap ring

ID/OD Lock

1.) The ring is initially installed in the housing groove.
2.) When the mating component in the assembly is added, the ring compresses into the groove.
3.) The groove is deep enough for the rings radial wall to fit into as the component slides into position.
4.) Finally, when the grooves meet, the ring snaps into the shaft groove (groove depth equals ½ the ring radial wall) while still in the housing groove.

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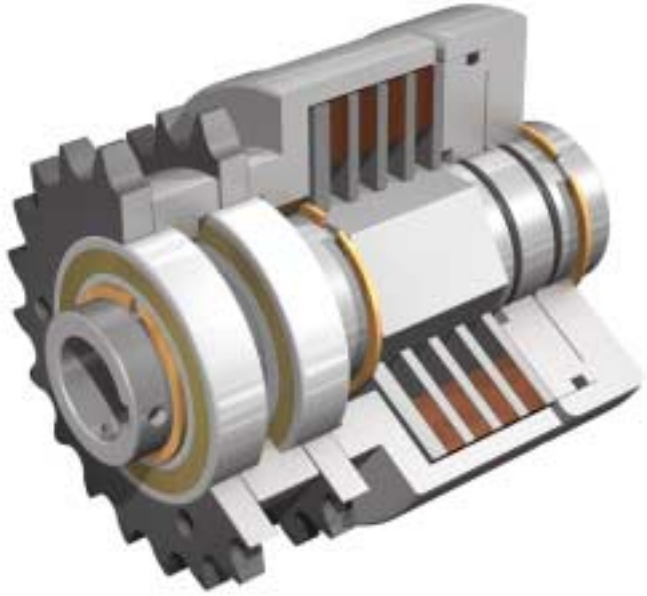
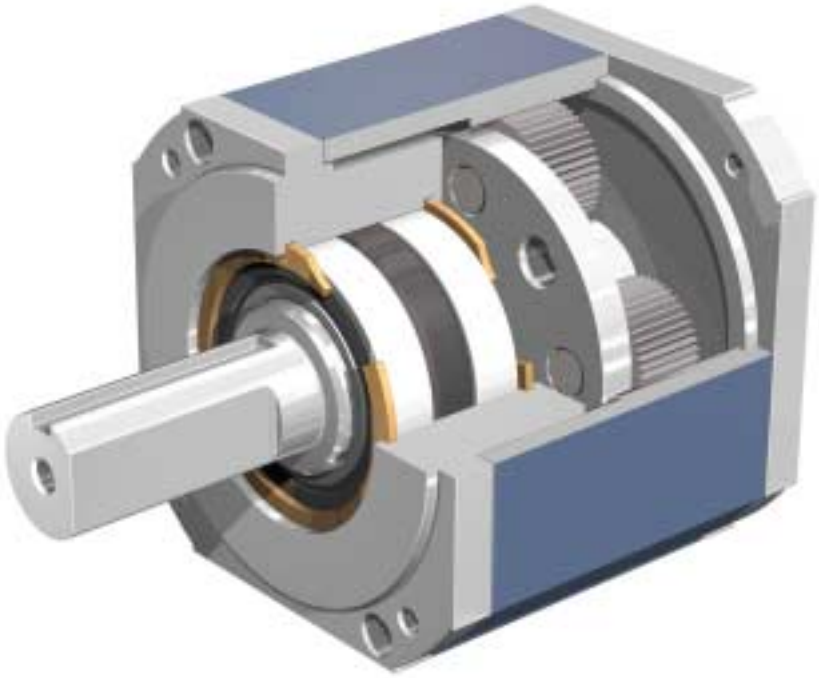
MISCELLANEOUS APPLICATIONS



Clutch Application

Three snap rings retain components in the clutch.

1.) No ears to interfere with other mating components
2.) Low cost assembly
3.) Capable of high RPM



Planetary Gearbox

Two snap rings secure bearings in gearbox.

1.) Tighter ring tolerance, due to edgewinding versus stamping, allows for precise fit.
2.) Lower field maintenance costs because the snap ring is easily removed for bearing replacement.

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MISCELLANEOUS APPLICATIONS

Actuator

Single turn snap ring keeps sleeve assembled to the body. Sleeve then locks the balls into postion.

1.) Removes costly shoulder
2.) Simple groove to machine
3.) Available in stainless steel
4.) Easy to install

Centrifugal Clutch

Snap ring retains entire assembly.

1.) Available in high temperature and corrosive resistant materials.
2.) Easy to install.

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APPLICATION CHECKLIST

Smalley Retaining Rings
FAX TO: (847) 719-5999

CUSTOM ORDERS...OUR SPECIALITY

Quick Delivery on Custom Orders • No-Tooling Cost™ • Precise Specifications
Engineering/Design Assistance

Name_____ Title _____Date_____

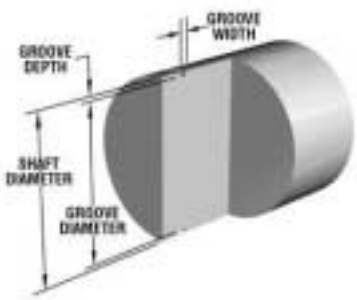
Company_____ Phone ( )_____

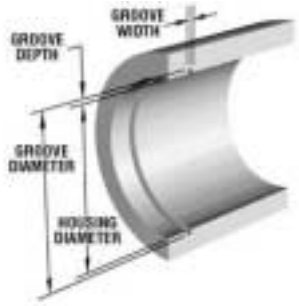
Address _____ Fax ( )_____

City _____State _____ Zip _____

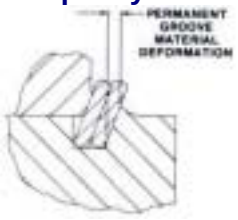
Dimensions in:
- ❑ Standard Units _____
- ❑ Metric _____

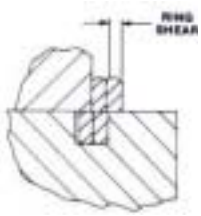
Housing Diameter _____
Shaft Diameter _____
Groove Diameter_____
Groove Width _____
RPM _____





Thrust Capacity





1. **Groove Deformation**
   Occurs when maximum capacity is limited by the groove material (groove material is soft)
2. **Ring Shear**
   Occurs when maximum capacity is limited by the snap ring (groove material is hardened)

If thrust is a consideration specify:

Groove Material _____
Maximum Capacity _____

Material

Consider the environment:
Temperature____°F
Corrosive Media

- ❑ **Carbon Steel**
- ❑ **302 Stainless**
- ❑ **316 Stainless**
- ❑ **Inconel X-750**
- ❑ **A-286**

- ❑ **Other**

_____
_____

Finish

- ❑ **Oil Dipped (Carbon Steel)**
- ❑ **Vapor Degreased and Ultrasonic cleaned (Stainless Steel)**
- ❑ **Passivate**
- ❑ **Black Oxide**
- ❑ **Phosphate Coat**
- ❑ **Vibratory Deburr**

- ❑ **Other**

_____
_____

Sketch

Quantity

Prototype _____
Production _____

Application Description

_____
_____
_____
_____

Smalley®
Steel Ring Company

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