

Smalley products brought to you by,



EXIM & MFR ENTERPRISE  
義信企業私人有限公司  
Your partner in single source solutions

# PARTNERS IN EXCELLENCE

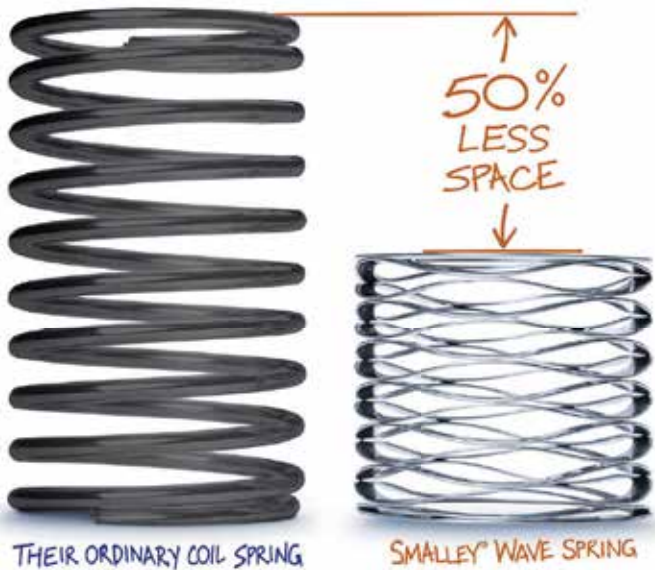
## RETAINING RINGS AND WAVE SPRINGS

Together, Smalley in partnership with EXIM have earned a reputation for unsurpassed selection, reliability, and performance alongside unequalled service and competitive pricing.

*Your Gateway To Endless Possibilities*

# Smalley Wave Springs

## Crest-to-Crest® Wave Springs



Smalley Wave Springs (Flat Wire Compression Springs) offer the unique advantage of space savings when used to replace coil springs. Because wave springs reduce spring operating height, the spring cavity is also reduced. With a smaller assembly size and less material used in the manufacturing process, a cost savings is realized.

- Reduce spring height by 50%
- Same force and deflection as ordinary coil/compression springs
- Fit in tight radial and axial spaces
- Metric and Imperial stock sizes (5 mm to 60 mm) in carbon and stainless steel
- Standards from 16 mm to 100 mm
- Customs from 4 mm to 3000 mm

## Nested Spirawave® Wave Springs



Nested Spirawave springs are flat wire wave springs with multiple turns, coiled in parallel to produce higher forces. These forces increase proportionally to the number of turns.

- Two to three times the force of a single-turn wave spring
- Replaces stacks of single-turn springs
- Sturdy and tangle-resistant design for automated handling
- Customs from 4 mm to 3000 mm

## Single-Turn Wave Springs



Conventional Gap and Overlap Type Wave Springs are used in a wide variety of applications. For short deflections and low-medium forces, they function with precision and dependability. Single-Turn Wave Springs are ideal for preloading bearings, tolerance take-up, and more.

- Metric and Imperial stock sizes (12 mm to 600 mm) in carbon and stainless steel
- SSB Series Bearing Preload Springs designed to match popular metric bearing sizes.

## Wavo® Springs



Wavo Springs are produced from round-section wire to provide higher loads while maintaining the accurate loading found in wave springs. As an alternative to Belleville Springs, the Wavo provides similar loads but with an accurate, predictable spring rate.

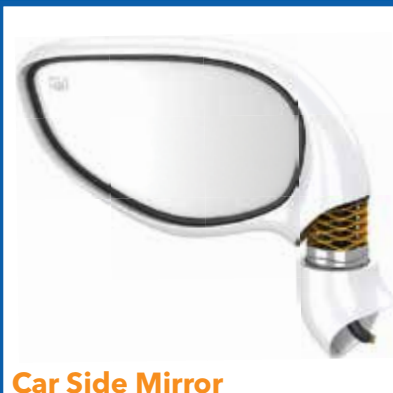
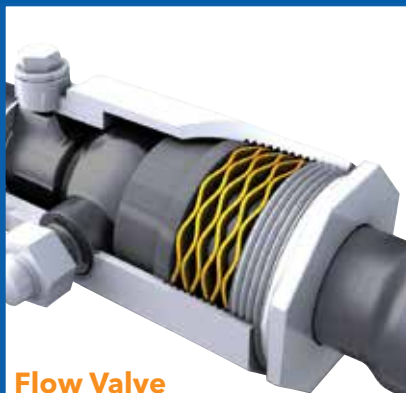
## Custom Wave Spring



Edgewinding, our flexible manufacturing process, allows us to quickly and economically make design changes, all with No-Tooling-Costs™.

- Diameters from 4 mm to 3000 mm
- Exotic alloys stocked for production (Inconel, Elgiloy, A286 and more)
- Short lead times
- Prototype to production volumes

# Wave Spring Applications



*It's not about being the best. It's about being better than you were yesterday.*

# Spirolox Retaining Rings

## Spirolox® Retaining Rings



Spirolox Retaining Rings, also known as Spiral Retaining Rings, are available exclusively from Smalley. Spirals have No Ears To Interfere® with mating components in your assembly. Our retaining rings are manufactured by coiling the ring from flat wire on edge. Because coiling produces a retaining ring with no scrap, the Smalley ring can be economically produced in carbon steel, stainless steel, coppers, and many other alloys.

- Stocked in 302 and 316 stainless steel (6 mm to 400 mm)
- No Gap - 360° retaining surface
- Easy to assemble and remove
- No gap/lugs provide for a functional and aesthetically pleasing ring
- Customs from 4 mm to 3000 mm

## WaveRings



The WaveRing is a spiral retaining ring with an axial wave form. It acts like a standard retaining ring with the additional feature of compressibility. It compensates for the overall length tolerance of stacked components, while still acting as a retaining ring. Once assembled, the WaveRing will reduce looseness and vibration in the assembly.

Designed to fit into a groove, the WaveRing applies pressure in two directions: against the groove wall and against the assembly components. Single, double, or multiple turns in the WaveRing are possible as well as a choice of materials, including our standard 17-7 PH stainless and carbon steel.

## Constant Section Rings



Constant Section Rings (Snap Rings) are often specified for heavy-duty or impact loading applications. Produced by edgewinding, with no special tooling charges, snap rings have been specified for many years in the automotive and heavy equipment industries as a standard choice of engineers

- Over 1,000 stock sizes with 12 different end configurations
- Metric and Imperial stock sizes 13 mm to 300 mm
- Available from stock in both carbon and 302 stainless steel

## Hoopster® Rings



Hoopster Retaining Rings offer an innovative way to retain mechanical components when radial space is a problem. Hoopsters have a minimal radial projection and a shallow groove depth. The low profile Hoopsters are ideal for applications with thin wall cylinders. The ring ends flex for simplified assembly and removal with no special tools required.

## Custom Retaining Rings



Edgewinding, our flexible manufacturing process, allows us to quickly and economically make design changes, all with No-Tooling-Costs™.

- Diameters from 4 mm to 3000 mm
- Exotic alloys stocked for production (Inconel, Elgiloy, A286 and more)
- Short lead times
- Prototype to production volumes

# Retaining Ring Applications

## Pneumatic Fitting



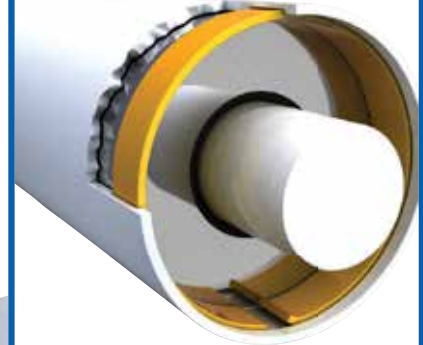
## ID/OD Retaining Ring Lock



## Hip Replacement



## Coilover



*A comfort zone is a beautiful place, but nothing ever grows there.*

# APPLICATION CHECKLIST

CUSTOM ORDERS...OUR SPECIALTY

FAX OR EMAIL TO APPROPRIATE CONTACT AT BOTTOM OF PAGE

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

Name \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_  
 Company \_\_\_\_\_ Phone \_\_\_\_\_ Email \_\_\_\_\_

**SPIROLOX RETAINING RINGS**

Housing Diameter \_\_\_\_\_ Groove Width \_\_\_\_\_  
 Shaft Diameter \_\_\_\_\_ RPM \_\_\_\_\_  
 Groove Diameter \_\_\_\_\_

**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 retaining ring (groove material is hardened)

If thrust is a consideration specify:  
 Groove Material \_\_\_\_\_ Maximum Capacity : \_\_\_\_\_N

**SMALLEY WAVE SPRINGS**

Operates in \_\_\_\_\_ bore diameter or  
 Inside diameter clears \_\_\_\_\_ shaft.

Specify which diameter the spring should pilot closest to:  
 Bore  Shaft

**LOAD DEFLECTION (Select One)**

**Group A**  
 \_\_\_\_\_ @ \_\_\_\_\_ ( ) lb @ in ( ) N @ mm  
Min - Max Load Work Height

Free Height \_\_\_\_\_ Approximately \_\_\_\_\_

**Group B**  
 \_\_\_\_\_ @ \_\_\_\_\_ ( ) lb @ in ( ) N @ mm  
Min - Max Load Work Height 1

\_\_\_\_\_ @ \_\_\_\_\_ ( ) lb @ in ( ) N @ mm  
Min - Max Load Work Height 2

Free Height \_\_\_\_\_ Approximately \_\_\_\_\_

**Group C**  
 Free Height \_\_\_\_\_ (min) - \_\_\_\_\_ (max)  
 # of Waves \_\_\_\_\_ Material Thickness \_\_\_\_\_  
 Radial Wall \_\_\_\_\_

**FATIGUE:**  
 Specify estimated cycle life

Static Application  
 Under 10<sup>5</sup> Cycle Life  
 10<sup>5</sup> Cycle Life  
 10<sup>6</sup> Cycle Life  
 Over 10<sup>6</sup> Cycle Life

|   |   |  |
|---|---|--|
| <p><b>MATERIAL</b></p> <p>Consider the environment:<br/>             Temperature _____ °C<br/>             Corrosive Media _____</p> <p>Carbon Steel <sup>1,2</sup> ( )<br/>             302 Stainless Steel<sup>2</sup> ( )<br/>             316 Stainless Steel<sup>2</sup> ( )<br/>             17-7 ph/c Stainless Steel<sup>1,2</sup> ( )<br/>             Inconel X-750 ( )<br/>             A-286 ( )<br/>             Other _____ ( )</p> <p><small><sup>1</sup> STANDARD RETAINING RING MATERIAL<br/> <sup>2</sup> STANDARD WAVE SPRING MATERIAL</small></p> | <p><b>FINISH</b></p> <p>* Oil dipped ( )<br/>             (Carbon Steel)</p> <p>* Vapor degreased ( )<br/>             and ultrasonic cleaned<br/>             (Stainless Steel)</p> <p>Passivate ( )<br/>             Black Oxide ( )<br/>             Phosphate Coat ( )<br/>             Vibratory Deburr ( )<br/>             Other _____ ( )</p> <p>* STANDARD</p> | <p><b>QUANTITY</b></p> <p>Prototype _____<br/>             Production _____</p> <p>APPLICATION (DESCRIPTION)</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> |
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**EXIM has attained AS 9120, ISO 9001, ISO 13485, ISO 14001, IATF 16949, ISO 22301, ISO 26000, ISO/IEC 27001, ISO/TS 29001, ISO 45001(OHSAS 18001) & ISO 50001**