

Smalley products brought to you by,



EXIM & MFR ENTERPRISE
Your partner in single source solutions

PARTNERS IN EXCELLENCE

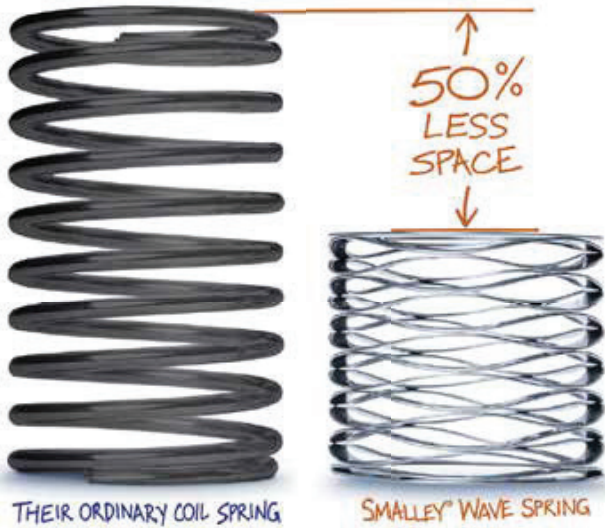
RETAINING RINGS AND WAVE SPRINGS

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 (5mm to 60mm) in carbon and stainless steel
- Standards from 16mm to 100mm
- Customs from 4mm to 3000mm

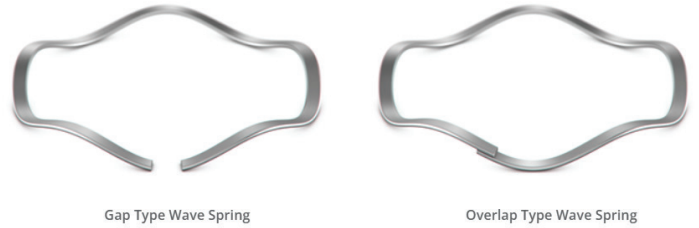
Nested Spiralwave® Wave Springs



Nested Spiralwave 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 4mm to 3000mm

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 (12mm to 600mm) 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.

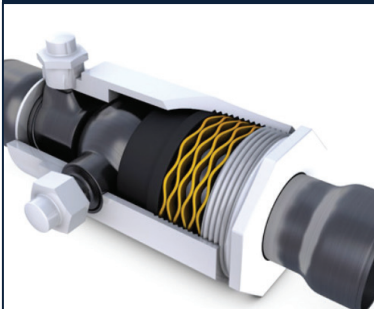
Custom Wave Springs



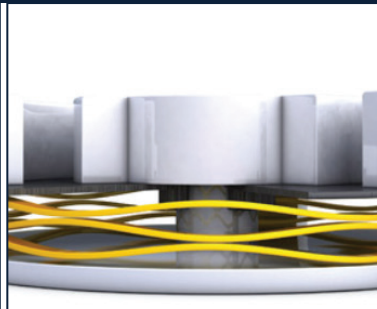
Edgewinding, our flexible manufacturing process, allows us to quickly and economically make design changes, all with No-Tooling-Costs™.

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

Wave Spring Applications



Flow Valve



Pressure Relief Valve



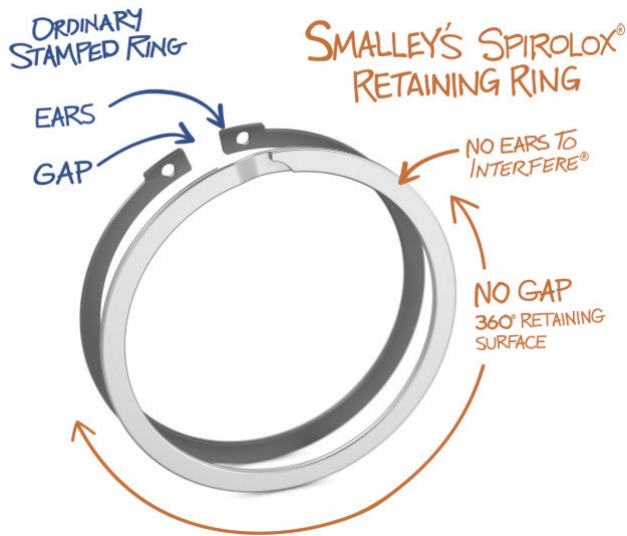
Axial Piston Pump



Vibration Isolator

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 (6mm to 400mm)
- No Gap – 360° retaining surface
- Easy to assemble and remove
- No gaps/lugs provide for functional and aesthetically pleasing ring
- Customs from 4mm to 3000mm

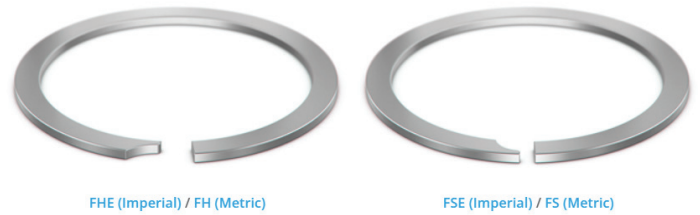
Wave Rings



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 edgewise, 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 13mm to 300mm
- 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.

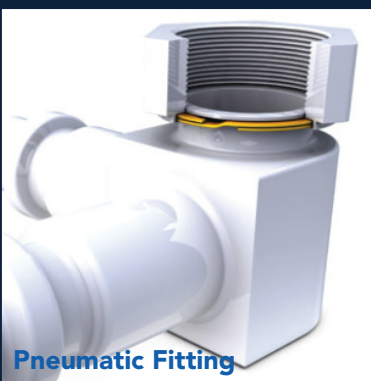
Custom Retaining Rings



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

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

Retaining Ring Applications



EMAIL TO APPROPRIATE CONTACT
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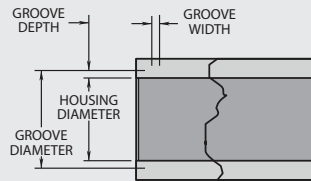
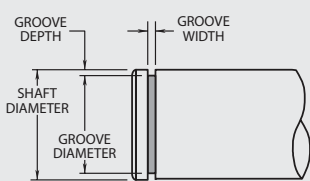
APPLICATION CHECKLIST

CUSTOM ORDERS... OUR SPECIALTY

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

PERMANENT GROOVE DEFORMATION

RING SHEAR



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)

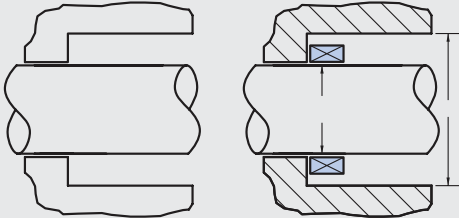
If thrust is a consideration specify:

Groove Material _____ Maximum Capacity : _____ N

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

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

Free Height _____ Approximately _____

Group B

Min - Max Load @ Work Height 1 () lb @ in () N @ mm

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

Free Height _____ Approximately _____

Group C

Free Height _____ (min) - _____ (max)

of Waves _____ Material Thickness _____

Radial Wall _____

FATIGUE:

Specify estimated cycle life

- () Static Application
() Under 10⁵ Cycle Life
() 10⁵ Cycle Life
() 10⁶ Cycle Life
() Over 10⁶ Cycle Life

MATERIAL

Consider the environment:
Temperature _____ °C
Corrosive Media _____

Carbon Steel ^{1,2} ()
302 Stainless Steel ² ()
316 Stainless Steel ² ()
17-7 ph/c Stainless Steel ^{1,2} ()
Inconel X-750 ()
A-286 ()
Other _____ ()

¹ STANDARD RETAINING RING MATERIAL
² STANDARD WAVE SPRING MATERIAL

FINISH

* Oil dipped ()
(Carbon Steel)
* Vapor degreased ()
and ultrasonic cleaned
(Stainless Steel)
Passivate ()
Black Oxide ()
Phosphate Coat ()
Vibratory Deburr ()
Other _____ ()

* STANDARD

QUANTITY

Prototype _____
Production _____

APPLICATION (DESCRIPTION)

vw _____

FOR MORE INFORMATION, PLEASE VISIT OUR WEBSITE • www.eximfr.com.sg •

EXIM has attained AS 9120, ISO 9001, ISO 13485, ISO 14001,
ISO 22301, ISO 26000, ISO 29001 & ISO 45001

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