SMALLEY®
THE ENGINEER'S CHOICE®

PRODUCT GUIDE

RETAINING RINGS AND WAVE SPRINGS

ABOUT US

SECURE YOUR SUCCESS®

Founded over 100 years ago, Smalley has evolved to become the world leader in the manufacturing and development of Retaining Rings, Spirolox® Retaining Rings, Constant Section Rings, and Wave Springs. Smalley has led the way in introducing state-of-the-art products and continues to lead the way in innovations for the future.

At Smalley we look at business differently. Quality, integrity, precision, and reliability are synonymous with our brand and our culture. At Smalley we have a passion for our customers and their businesses. We spend every waking hour committed to bringing ideal solutions to you.

Smalley's 300,000 sq. ft. facility located in Lake Zurich, IL, USA

We stock over 11,000 parts in over 400 sizes ranging from .188" to 16" (5 mm to 400 mm). We also offer custom parts ranging from .118" to 120" (3 mm to 3000 mm).

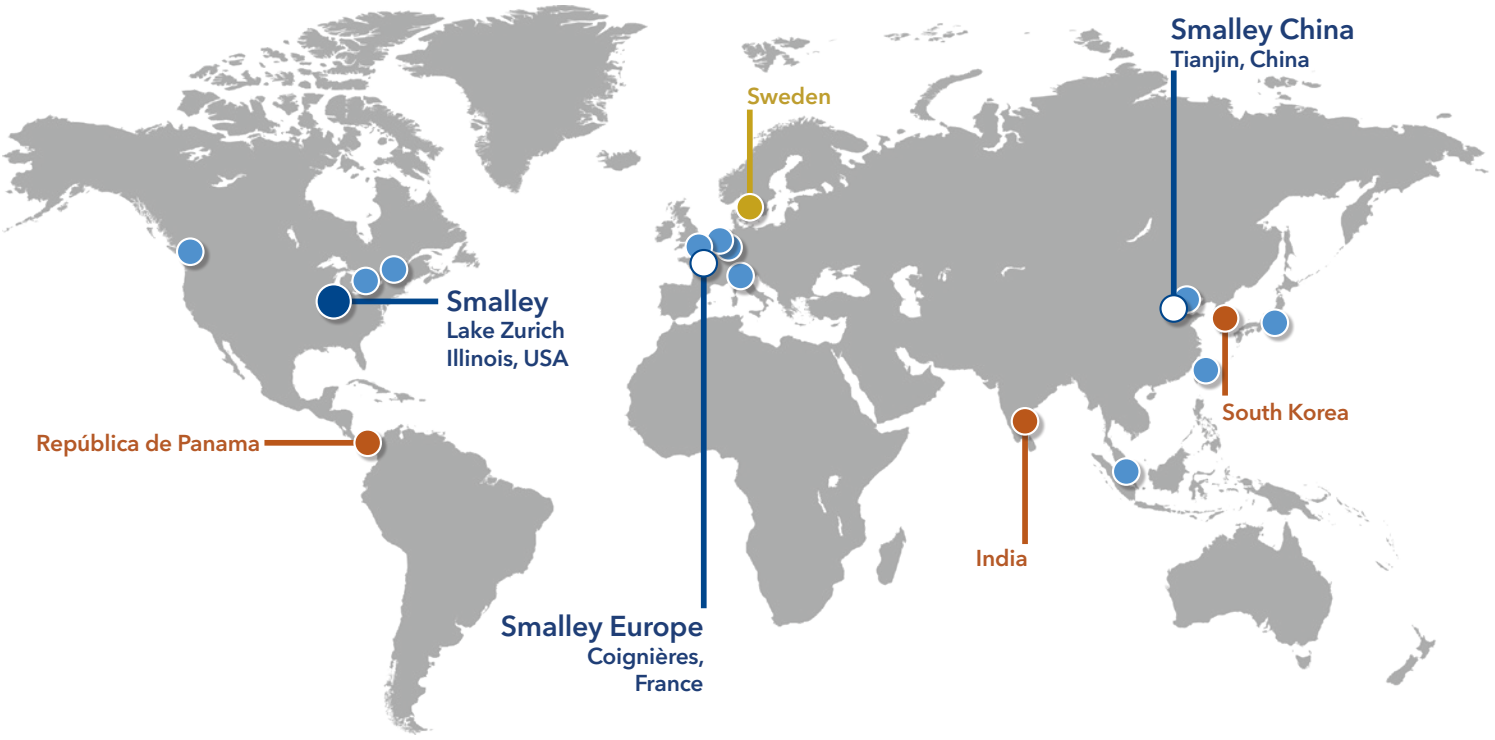
Whether you need something standard or custom, you will work directly with an engineer to ensure you get exactly what you require. We will provide you with the right part, in the right material, with No-Tooling-Charges™.

INDUSTRIES SERVED

Smalley's products can be found in applications across every major industry. Engineers in the world's most innovative companies choose to work with Smalley to give their products a performance edge. From small to large diameters, light to heavy duty parts, and various exotic materials, we carry solutions for all industries. Secure your success with Smalley!

LOCATIONS

Smalley's products are manufactured at our Headquarters in Lake Zurich, Illinois, just outside Chicago. Our global network of sales offices, engineers, and distribution partners allows us to provide your company with local, high quality customer service no matter where you are.



CORPORATE OFFICE & MANUFACTURING

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For more contact information, please visit smalley.com/our-offices

QUALITY

QUALITY DRIVEN

Smalley provides exceptional quality products and service to our customers. As a customer-focused organization, we prioritize your success. Our proactive approach continues to be one of the reasons why we excel in supporting your business. We strive for:

- Complete conformance to drawings, specifications, and contractual requirements
- Commitment to on-time delivery
- Exceeding customer expectations

CERTIFICATIONS AND COMPLIANCES

ISO 9001:2015
Quality Management System

ISO 14001:2015
Environmental Management System

ISO 13485:2016
Medical Device Quality Management System

IATF 16949:2016
Automotive Quality Management System

AS9100:2016
Aviation, Space, and Defense Quality Management System

RoHS, REACH, and DFARS compliant materials and certifications available.

QUALITY CONTROL

Smalley's Quality Engineering Department has the capability to test and inspect parts right on the manufacturing floor, preventing manufacturing delays. Smalley's Quality Engineers work closely with the Inspection personnel to ensure our raw materials and final products conform to customer requirements.

A TRUSTED SUPPLIER

Smalley's dedication to excellence has earned us the trust of manufacturers worldwide. In fact, our products have been used in over 25,000 applications! We have received multiple awards for our service and quality, including Supplier Excellence Awards from both GM and CAT.

Smalley has earned the esteemed honor of receiving the GM Supplier Quality Excellence Award consecutively for the past decade.

THE ENGINEER'S CHOICE®

When you work with Smalley, you will find an experienced partner committed to providing you with the exact part you need. We can guide you through the catalog to find a suitable standard part or help you with your custom design.

Our support goes further than just the design process; we will make sure our parts are working for you and your application from start to finish. If you need installation and removal help or have questions about a new design, our engineers are ready for the challenge.

Smalley is available by e-mail, phone, or live chat communication where you can speak to a real person who understands your product applications. Get assistance from our engineering and tech support team on product specifications and application use, order status, sample assistance, and more!

EDGEWINDING AND NO-TOOLING-CHARGES

Our vertically integrated manufacturing process begins by feeding raw round wire through our rolling mill to flat dimensions. Flat wire is then coiled on edge to form the ring or spring. Our products are edgewound instead of stamped, no custom tooling is required, saving time and costs.

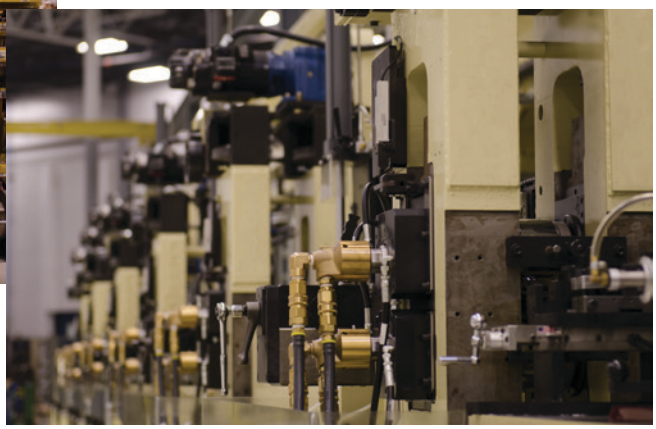
Features and Benefits

- Increased strength and stability compared to stamped products
- Ability to customize with little to no material waste
- Easily create and modify designs and prototypes
- Quick and economical testing and production procedures
- Large selection of alloys readily available

Smalley Edgewound

Stamped with waste material

Smalley raw material warehouse.



Smalley in-house rolling mill.

Crest-to-Crest Wave Spring

Crest-to-Crest Wave Spring with Shim Ends

Smalley Wave Spring

Coil Spring

Crest-to-Crest

Crest-to-Crest Wave Springs are flat-wire, multi-turn springs coiled in series. These springs are also available with Shim Ends, which provide a flat 360° mating surface to distribute forces more evenly in softer assembly materials.

Features and Benefits

- Reduce spring height by up to 50%, saving space and weight
- Same force and deflection as coil/helical compression springs
- Suitable for light-to-medium forces and medium travel
- Custom parts available in diameters from .118 to 120" (3 to 3000 mm) with No-Tooling-Charges

Crest-to-Crest available from stock in carbon and 17-7 PH stainless steel:

Stock Series	Units	Spring Type	Diameter
C	Imperial	Light-to-medium forces; medium travel	.188 – 2"
CM	Metric	Light-to-medium forces; medium travel	5 - 60 mm

Crest-to-Crest with Shim Ends available from stock in carbon and 17-7 PH stainless steel:

Stock Series	Units	Spring Type	Diameter
CS	Imperial	Light-to-medium forces; medium travel	.312 - 2"
CMS	Metric	Light-to-medium forces; medium travel	8 - 60 mm

Application: Push Button

For more information on Crest-to-Crest Wave Springs or how they can be customized, please visit: **smalley.com/crest-to-crest**
For Free Samples, please visit: **smalley.com/samples**

Nestawave

Nestawave

Smalley's Nestawave springs are nested wave springs in a Crest-to-Crest configuration. Coiled from a single, continuous piece of wire, they offer flexibility in spring rate design. By combining the deflection characteristics of a Crest-to-Crest Wave Spring with the force output of a Nested Spirawave® Spring, the Nestawave delivers high force and significant travel in a compact design. Ideal for replacing stacks of Belleville washers, Nestawave springs reduce the risk of improper installation and simplify assembly.

Features and Benefits

- High-force with significant travel
- Offers spring rate flexibility
- Produced from one continuous piece of wire for more consistent load properties
- Ideal for replacing stacks of Belleville washers
  - Eliminates chance of improper installation
  - Saves on labor of manually stacking
  - Reduces inventory needs—one part replaces many

Custom Ordering

The Nestawave is a custom part and is available to order in diameters ranging from .250" to 20" (6.5 mm to 510 mm). Nestawave springs are available with and without Shim Ends. Contact a Smalley engineer to order.

Nestawave Replaces Belleville Stack

For more information on Nestawave, please visit: **smalley.com/nestawave**
For Free Samples, please visit: **smalley.com/samples**

Gap-Type Wave Spring

Overlap-Type Wave Spring

Gap-Type and Overlap-Type Single-Turn

Single-turn wave springs are flat-wire springs with either a gap or an overlap at the ends.

Features and Benefits

- Ideal for providing a preload or tolerance take-up
- Gap-type is suitable for stacking and reduces height
- Overlap-type is suitable for small diameters and reduces tangling in packaging
- Provides more accurate load than a wave washer
- Suitable for light-to-medium forces and short deflections
- SSB Series is designed around standard metric bearing sizes
- Custom parts available from .118 to 120" (3 to 3000 mm) with No-Tooling-Charges

Overlap-Type available from stock in carbon and 17-7 PH stainless steel:

Stock Series	Units	Spring Type	Diameter
SSR	Imperial	Light-to-medium forces; short deflections	.500 - 1.625"
SSB	Metric	Light-to-medium forces; short deflections	9 - 95 mm

Gap-Type available from stock in carbon and 17-7 PH stainless steel:

Stock Series	Units	Spring Type	Diameter
SSR	Imperial	Light-to-medium forces; short deflections	1.750 - 16"
SSR-N	Imperial	Light-to-medium forces; narrow section, short deflection	3.250 - 7.750"
SSB	Metric	Light-to-medium forces; short deflections	100 - 580 mm

Application: Bearing Preload

For more information on single-turn wave springs or how they can be customized, please visit: **smalley.com/single-turn**
For Free Samples, please visit: **smalley.com/samples**

Nested Spirawave

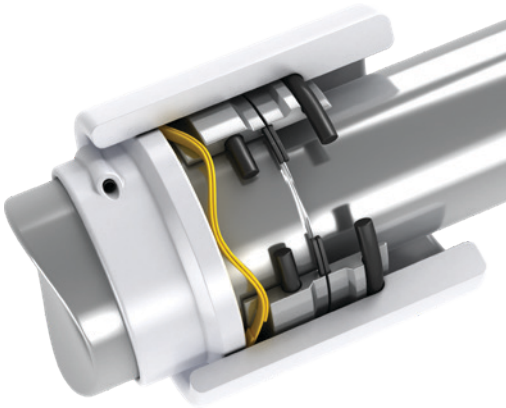
Nested Spirawave Wave Springs are flat-wire, multi-turn wave springs coiled in parallel.

Features and Benefits

- Two-turn and three-turn configurations available from stock
- Can replace stacks of single-turn wave springs
- Eliminates misalignment and loading inconsistencies, reducing cost and assembly time
- Suitable for medium-to-high forces and short deflections
- Custom parts available from .118 to 120" (3 to 3000 mm) with No-Tooling-Charges

Available from stock in carbon and 17-7 PH stainless steel:

Stock Series	Units	Spring Type	Diameter
NSSR	Imperial	Medium-to-high forces	.500 - 4"
NSSB	Metric	Medium-to-high forces; short deflections	16 - 100 mm



Application: Push Seal

For more information on Nested Spirawave Wave Springs or how they can be customized, please visit: **smalley.com/nested**
For Free Samples, please visit: **smalley.com/samples**

Wavo

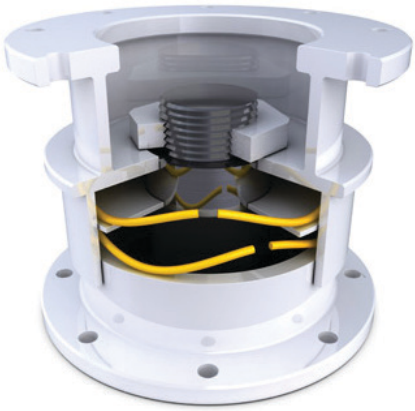
Wavo Springs are single-turn round wire springs.

Features and Benefits

- Suitable for high forces and used in very tight radial spaces
- Reduces or eliminates vibration in a bearing preload
- Compensates for thermal expansion
- Can be a replacement for Belleville disc washers
- Custom parts available from .118 to 120" (3 to 3000 mm) with No-Tooling-Charges

Available from stock in carbon and 17-7 PH stainless steel:

Stock Series	Units	Spring Type	Diameter
RW	Imperial	High forces; tight radial spaces; short deflection	.500 - 6"



Application: Vibration Isolator

For more information on Wavo Springs or how they can be customized, please visit: **smalley.com/wavo**
For Free Samples, please visit: **smalley.com/samples**

Linear

Linear Springs are wave-formed straight lengths of flat wire.

Features and Benefits

- Suitable for low-to-medium forces and deflections
- Ideal for applications requiring spring force in linear cavities
- Custom parts available with No-Tooling-Charges

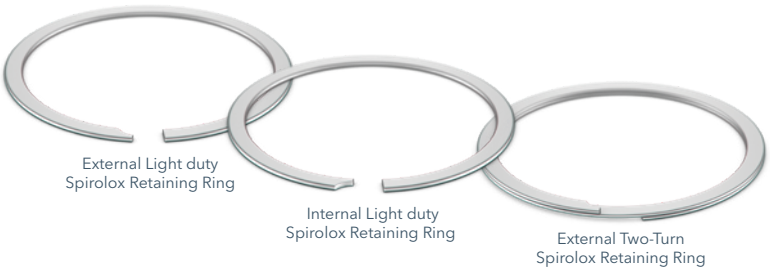
Available from stock in carbon and 17-7 PH stainless steel:

Stock Series	Units	Spring Type	Lengths
LS	Imperial	Low-to-medium forces/deflections	1.500 - 13.500"

Note:
Some applications use these as a Marcel Expander, good for radial positioning.

Application: Detent Preload

For more information on Linear Wave Springs or how they can be customized, please visit: **smalley.com/linear**
For Free Samples, please visit: **smalley.com/samples**

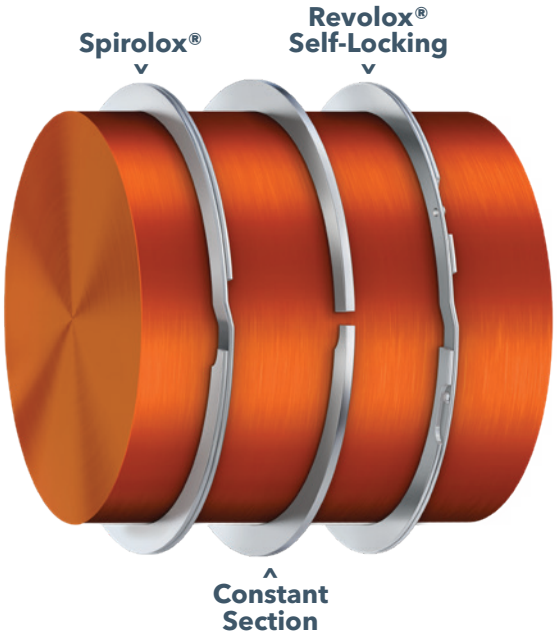


Spirolox

Spirolox Retaining Rings are coiled in single-turn, two-turn, three-turn configurations.

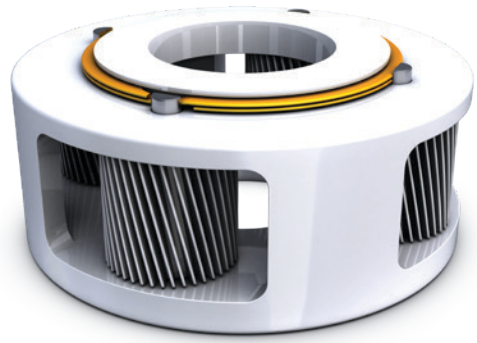
Features and Benefits

- No Ears to Interfere® with mating components
- No gap – 360° retaining surface for two-turned designs
- No lugs – uniform cross-section, improved aesthetic appearance
- No special tooling for installation or removal – simple and safe
- Coiled, not stamped – reduces scrap and costs
- Groove-interchangeable with stamped rings
- Custom parts available from .118 to 120" (3 to 3000 mm) with No-Tooling-Charges



Available from stock in carbon, 302 stainless steel and 316 stainless steel:

Stock Series	Units	Ring Type	Diameter
VH	Imperial	Single-Turn, Light duty, Internal	.250 – 10"
VHM	Metric	Single-Turn, Light duty, Internal	6 – 300 mm
VS	Imperial	Single-Turn, Light duty, External	.250 – 10"
VSM	Metric	Single-Turn, Light duty, External	6 – 300 mm
WH	Imperial	Two-Turn, Medium duty, Internal	.500 – 11"
WS	Imperial	Two-Turn, Medium duty, External	.500 – 11"
EH	Metric	Two-Turn, Aerospace, Internal	6 – 280 mm
ES	Metric	Two-Turn, Aerospace, External	6 – 280 mm
WHT	Imperial	Two/Three-Turn, Medium/heavy duty, Internal	.500 – 10.500"
WST	Imperial	Two/Three-Turn, Medium/heavy duty, External	.469 – 10"
WHM	Imperial	Two-Turn, Heavy duty, Internal	.250 – 15"
WSM	Imperial	Two-Turn, Heavy duty, External	.250 – 15"
DNH	Metric	Two-Turn, DIN interchange, Internal	13 – 400 mm
DNS	Metric	Two-Turn, DIN interchange, External	13 – 400 mm



Application: Gear Assembly

For more information on Spirolox or how they can be customized, please visit: **smalley.com/spirolox**
For Free Samples, please visit: **smalley.com/samples**

Two-Turn Revolox
Self-Locking Retaining Ring

The dome and slot mechanism helps prevent the ring from expanding.

Revolox

The Revolox self-locking retaining ring is excellent for enhancing performance in high-speed applications. It utilizes a dome-shaped protrusion that locks into a slot, preventing ring expansion during acceleration and high rotational speeds. The Revolox is an excellent choice for applications where performance and ease of installation are critical.

Features and Benefits

- Prevents ring expansion at high rotational speeds
- Sturdy design not easily damaged during installation
- Lightweight – lower rotating mass
- Ease of installation
- Automated installation capabilities – ideal for high production volumes

Custom Ordering

The Revolox is a custom part and is available to order in diameters ranging from 1.200" to 4" (30 mm to 100 mm). There is flexibility for smaller or larger sizes depending on the application, quantity, and specifications needed. Contact a Smalley engineer to order.

Application: Electric Motor

For more information on Revolox, please visit: **smalley.com/revolox**
For Free Samples, please visit: **smalley.com/samples**

Internal Constant Section Ring

External Constant Section Ring

Constant Section

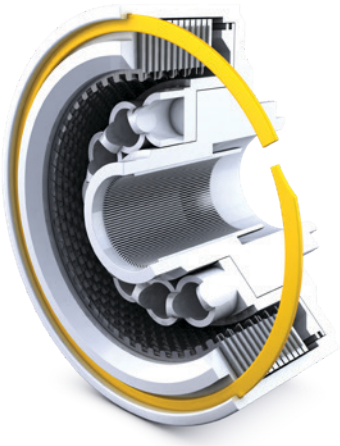
Constant Section Retaining Rings are single-turn, square edge rings with a gap between the two ends.

Features and Benefits

- Groove-interchangeable with Eaton-style Snap Rings
- Smalley's heaviest-duty rings; suitable for very high forces and impact loading
- Various end types available
- Custom parts available from .118 to 120" (3 to 3000 mm) with No-Tooling-Charges

Available from stock in carbon and 302 stainless steel:

Stock Series	Units	Ring Type	Diameter
FHE	Imperial	Heavy Duty, Internal	.500 - 11"
FSE	Imperial	Heavy Duty, External	.500 - 11"
FH	Metric	Heavy Duty, Internal	13 - 300 mm
FS	Metric	Heavy Duty, External	13 - 300 mm
XAH	Imperial	Eaton Interchange, Internal	.375 - 10"
XAS	Imperial	Eaton Interchange, External	.312 - 10"
XDH	Imperial	Eaton Interchange, Internal	1.125 - 8"
XDS	Imperial	Eaton Interchange, External	.500 - 8"



Application: Pneumatic Clutch

For more information on Constant Section or how they can be customized, please visit: **smalley.com/constant-section**
For Free Samples, please visit: **smalley.com/samples**

Internal WaveRing

External WaveRing

WaveRing

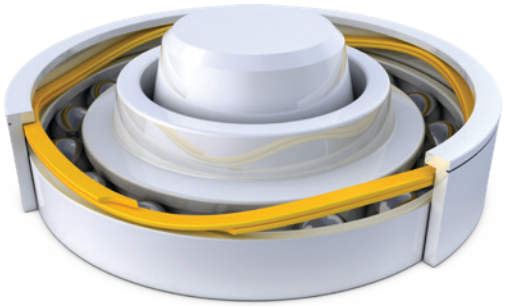
WaveRings are two-turn rings with an axial waveform.

Features and Benefits

- Similar function to a traditional retaining ring, but with spring force
- Applies pressure against groove wall and assembly simultaneously
- Custom parts available from .500 to 120" (12.7 to 3000 mm) with No-Tooling-Charges

Available from stock in carbon and 17-7 PH stainless steel:

Stock Series	Units	Ring Type	Diameter
WHW	Imperial	Internal	.750 - 5"
WSW	Imperial	External	.750 - 5"



Application: Bearing Preload and Retention

For more information on WaveRings or how they can be customized, please visit: **smalley.com/wavering**
For Free Samples, please visit: **smalley.com/samples**

External Hoopster

Internal Hoopster

Internal Hoopster
with Removal Provision

Hoopster

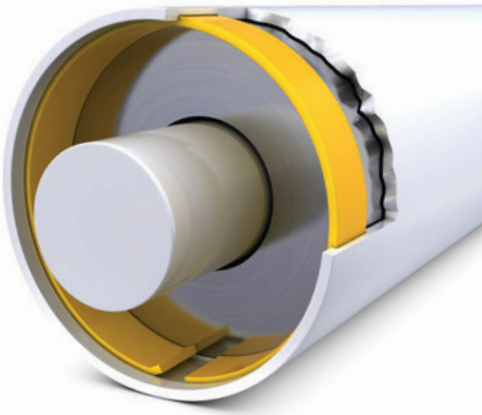
Hoopster Retaining Rings are single-turn, square edge rings that function in very shallow radial grooves.

Features and Benefits

- Minimal radial profile suitable for shallow groove depths
- Light-to-medium loads
- Available with or without removal provision
- Custom parts available from .250 to 120" (6.35 to 3000 mm) with No-Tooling-Charges

Available from stock in carbon and 302 stainless steel:

Stock Series	Units	Ring Type	Diameter
HH/HHU	Imperial	Internal	.375 - 3"
HHM/HHMU	Metric	Internal	10 - 76 mm
HS	Imperial	External	.375 - 3"
HSM	Metric	External	10 - 76 mm



Application: Thin Walled Cylinder

For more information on Hoopster Retaining Rings or how they can be customized, please visit: **smalley.com/hoopster**
For Free Samples, please visit: **smalley.com/samples**

Two-Turn, Two Ring Sets

Single-Turn. Three Ring Sets

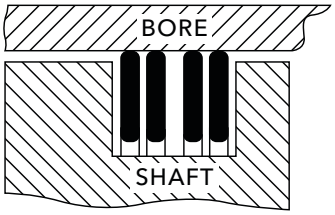
Laminar Seals

A Laminar Seal Ring set is a metallic labyrinth seal consisting of multiple rings in a groove. The arrangement and specific orientation of the rings are dictated by the application and the severity of the environment. Contact us to help you select the right part for your design.

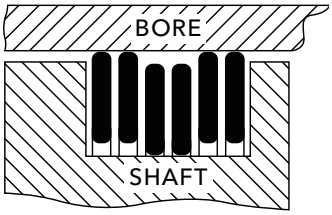
Features and Benefits

- Sets of two, three, or five rings
- Configurations (single-turn, two-turn) and materials used dependent on the severity of the environment
- Designed to protect assemblies from solid contaminants
- Stock sizes available from .625 to 50" (15 to 1300 mm) with No-Tooling-Charges

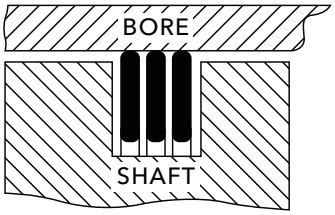
Two-Turn, Two Ring Sets
YHD Series / QHD Series



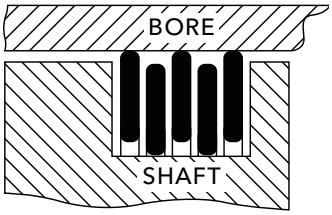
Two-Turn, Three Ring Sets
YHKD Series / QHKD Series



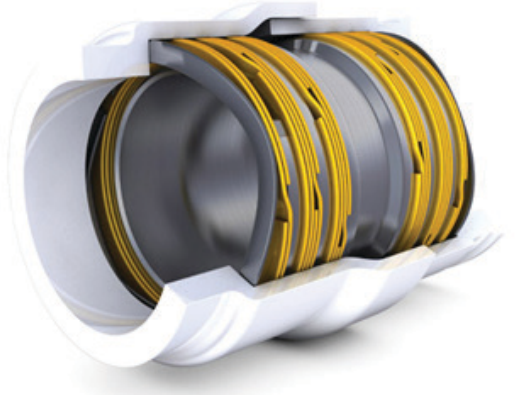
Single-Turn, Three Ring Sets
YH Series / QH Series



Single-Turn, Five Ring Sets
YHK Series / QHK Series



Housing designed shown. Shaft designs also available



Application: Connector

For more information on Laminar Seal Rings or how they can be customized, please visit: **smalley.com/laminar**
For Free Samples, please visit: **smalley.com/samples**

CUSTOM ENGINEERED PRODUCTS

Designing a custom part does not have to be complicated. Our vertically integrated edgewinding manufacturing process makes it an economical choice. Edgewinding allows us to produce your prototypes quickly, and any adjustments throughout the manufacturing process can be made without additional tooling costs. Your custom product can be in your hands in weeks instead of months.

Smalley offers a wide variety of configurations for both rings and springs. These are just a few examples of what we can customize and manufacture:

Retaining Rings

Can be modified by:

- Diameter
- Number of turns
- Rotational capacity
- Wire thickness
- Material
- Finishes, coatings, and platings
- Radial wall
- End configurations
- Packaging
- Quality assurance certifications

Wave Springs

Can be modified by:

- Diameter
- Spring force
- Work height
- Radial wall
- Wire thickness
- Material
- Finishes, coatings, and platings
- Shim end(s)
- Free height
- End configurations
- Packaging
- Quality assurance certifications

Examples of Custom Materials:

- Carbon Steel
- Stainless Steel
- A-286
- INCONEL®
- ELGILOY®
- Beryllium Copper
- MP35N®
- Hastelloy
- Monel

Popular custom configurations:


Self-Locking


Flat Wire Bent Ends


Balanced


Round Wire Bent Ends


Special Locking


Removal Handle


Crimp End


Multi-Turn Bent Ends


Marcel


Heavy Duty


Pitched Coil Spring

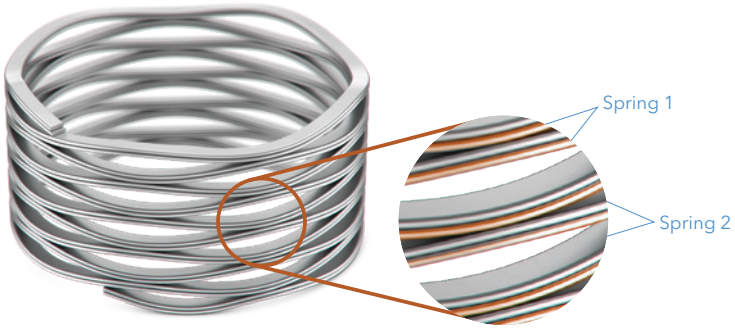

Interlaced

For more information please visit: **smalley.com/customs**
For Free Samples, please visit: **smalley.com/samples**

Interlaced

Interlaced springs are flat-wire, multi-turn wave springs wound together in series and parallel.

- Provides increased loading capacity and greater fatigue resistance
- Alternative to Crest-to-Crest when higher loads are needed
- Substitute to a Nested Spirawave when higher free height or deflection is needed
- Available as a custom wave spring



Nestawave

Smalley's Nestawave springs are nested wave springs in a Crest-to-Crest configuration. Coiled from a single, continuous piece of wire, they offer flexibility in spring rate design. By combining the deflection characteristics of a Crest-to-Crest Wave Spring with the force output of a Nested Spirawave Spring, the Nestawave delivers high force and significant travel in a compact design. Ideal for replacing stacks of Belleville washers, Nestawave springs reduce the risk of improper installation and simplify assembly.

- High-force with significant travel
- Offers spring rate flexibility
- Produced from one continuous piece of wire for more consistent load properties
- Ideal for replacing stacks of Belleville washers

Marcel

Marcel expanders are circular wave springs that provide radial force in an assembly.

- Suitable for tolerance take-up or to self-center an assembly
- Energizes seals when no other pressure is available
- Available as a custom wave spring

For more information please visit: **smalley.com/customs**
For Free Samples, please visit: **smalley.com/samples**

CUSTOM RETAINING RING CONFIGURATIONS

Spirolox Two-Turn
Balanced Retaining Ring

Balanced

Balanced Retaining Rings are retaining rings with slots cut opposite the gap end to centralize the rings' center of gravity.

- Slots made in radial wall balance the ring
- Suitable for reducing eccentric loading in applications where balance is critical
- Available as a custom option for retaining rings
- Balanced when rotating in an assembly, particularly for higher RPMs

Self-Locking

Smalley's Self-Locking Retaining Rings are multiple-turn rings that have self-locking mechanisms.

There are two types of self-locking rings. **Spirolox Tab and Slot** rings have a small tab on the inside, outside, or center of the radial wall, along with an aligned slot on the next turn for it to "lock" into place. **Revolox** rings have a dome-shaped protrusion and allow for more easy installation and removal.

- Suitable for applications with high rotational requirements or speeds exceeding standard spiral capacity
- Prevents interference with mating components

Spirolox Two-Turn Retaining
Ring – Locking on I.D.

Spirolox Two-Turn Retaining
Ring – Locking on O.D.

Spirolox Two-Turn Retaining
Ring – Locking on Centerline

Revolox Two-Turn Retaining
Ring – Locking on O.D.

For more information please visit: **smalley.com/customs**
For Free Samples, please visit: **smalley.com/samples**

OVERVIEW

When you're dealing with components in all shapes, sizes, and quantities, shipping and packaging logistics can get complicated. This guide breaks down Smalley's packaging options and explains when each is the best fit. That way, you get the parts you need hassle-free and right on time.

Standard packaging includes:

- Bulk in Poly Bag
- Paper Roll Pack

Smalley also offers these custom packaging options upon request:

- Cardboard or Plastic Tube
- Shrink Wrap
- Wire Loop
- Individual Bag
- VCI Bag or Paper
- Returnable Container
- Bulk in Box
- Palletized

TAILORED PACKAGING STARTS HERE

Smalley is committed to providing packaging solutions that support both efficiency and protection. Our standard configurations are based on predetermined quantity increments, but we understand that unique applications may require something different. If you have special packaging requirements, we're here to help explore tailored options. Contact us at **info@smalley.com** to discuss your needs.

WAVE SPRINGS
Application Checklist

SMALLEY WAVE SPRINGS

Email to: info@smalley.com
Or fill out online: smalley.com/spring-design-help

Name _____ Title _____ Date _____

Company _____

Address _____

City/State/Zip Code _____ Country _____

Phone _____ Fax _____

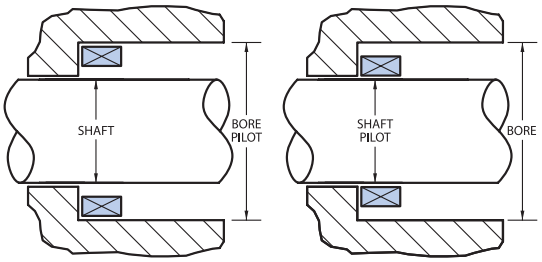
Email _____

DIMENSIONS IN: ( ) Imperial Units ( ) Metric Units

Operates in _____ bore diameter

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 _____ Approximate

Group B

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

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

Free Height _____ Approximate

Group C

Free Height _____ (min) — _____ (max)

# of Waves _____ Material Thickness _____

Radial Wall _____

MATERIAL

Consider the environment:
Temperature _____ °
( ) F ( ) C

Corrosive Media _____

Carbon Steel ( )
17-7 PH/CH900 Stainless ( )
302 Stainless Steel ( )
316 Stainless Steel ( )
Inconel X-750 ( )
Other _____ ( )

FINISH

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

SKETCH

FATIGUE: Specify estimated cycle life

( ) Static Application
( ) Under 10^5 Cycle Life
( ) 10^5 Cycle Life
( ) 10^6 Cycle Life
( ) Over 10^6 Cycle Life

QUANTITY:

Prototype _____
Production _____

APPLICATION: (Description)

Email to: info@smalley.com
Or fill out online: smalley.com/ring-design-help

SMALLEY RETAINING RINGS

Name _____ Title _____ Date _____

Company _____

Address _____

City/State/Zip Code _____ Country _____

Phone _____ Fax _____

Email _____

DIMENSIONS IN: ( ) Imperial Units ( ) Metric Units

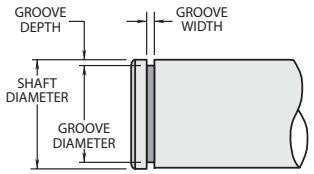
Housing Diameter _____

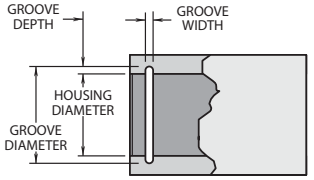
Shaft Diameter _____

Groove Diameter _____

Groove Width _____

RPM _____





Ring Radial Wall _____ Ring Thickness _____

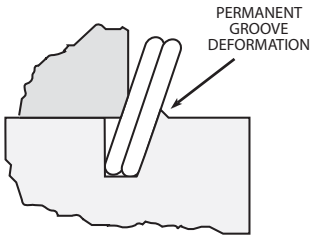
THRUST CAPACITY

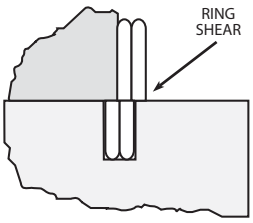
1) Groove Deformation

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 _____

Load Capacity _____ ( ) lb ( ) N

MATERIAL

Consider the environment:
Temperature _____ °
( ) F ( ) C
Corrosive Media _____

Carbon Steel	( )
17-7 PH/CH900 Stainless	( )
302 Stainless Steel	( )
316 Stainless Steel	( )
Inconel X-750	( )
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 Co.
555 Oakwood Road
Lake Zurich, IL 60047 USA

STANDARD OR CUSTOM

We'll provide you with the right part, in the right material, for your application with No-Tooling-Charges.

PRODUCTS READY TO SHIP

11,000 standard parts stocked in carbon and stainless steel.

CUSTOM ENGINEERED PRODUCTS

Diameters from .118 to 120" and 3 to 3000 mm.
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