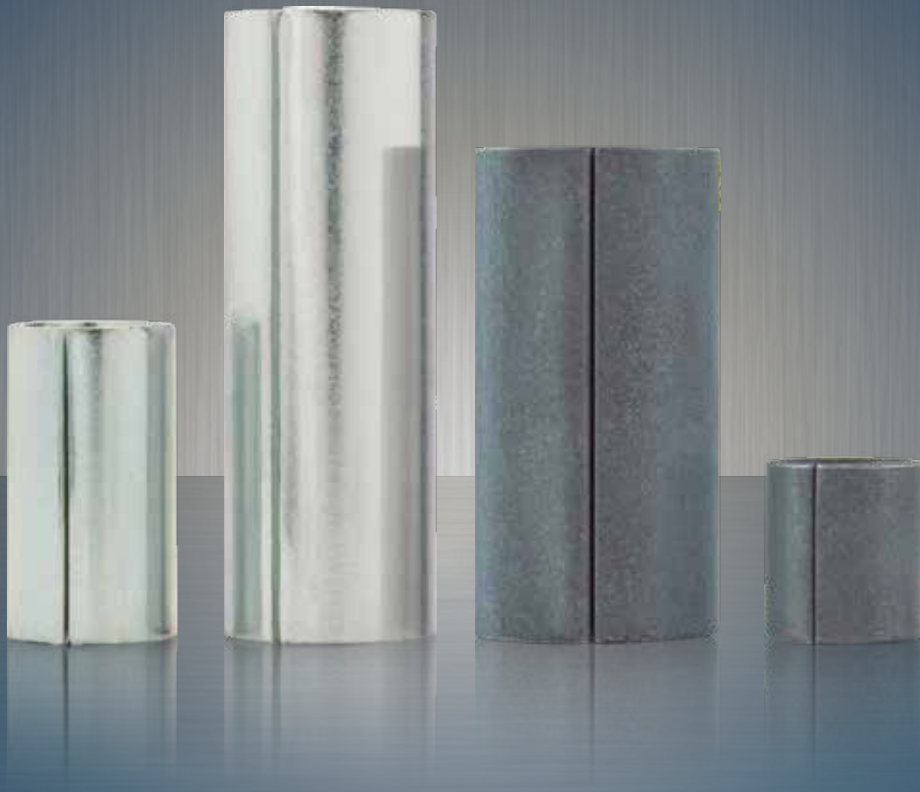
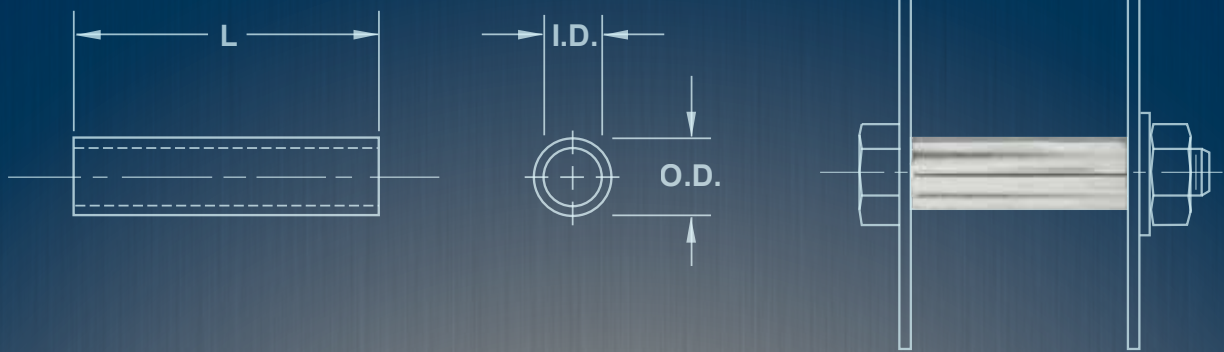


SPIROL[®]

SPACERS & ROLLED TUBULAR COMPONENTS



Proprietary production technology and value-engineered design reduces the cost of Tubular Products.

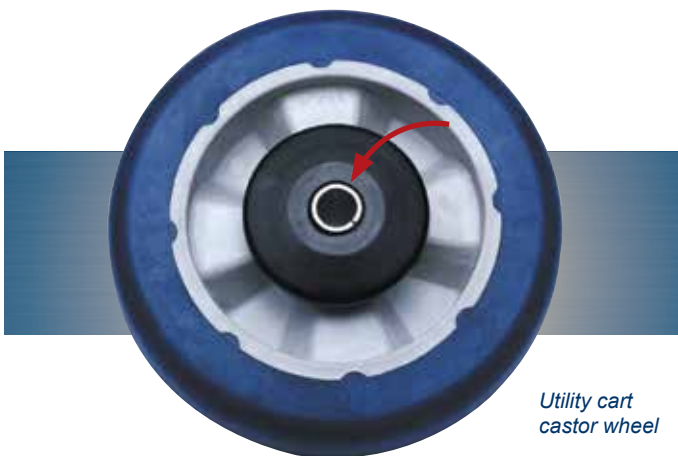
SPIROL® Spacers are formed into closed seam tubes from cold rolled strip. The component cost savings are achieved through:

- Use of SPIROL's proprietary, highly flexible and efficient production technology.
- SPIROL's roll formed Spacer design has tolerances that meet application requirements. This prevents unnecessarily close tolerances associated with manufacturing technologies required to produce more expensive alternative products such as cut tubing, machined bushings, etc.

Typical applications use the Spacer to separate two components in an assembly joined by a bolt, rivet or rod passed through the inside diameter of the Spacer. The inside diameter of the Spacer is designed for a clearance fit.

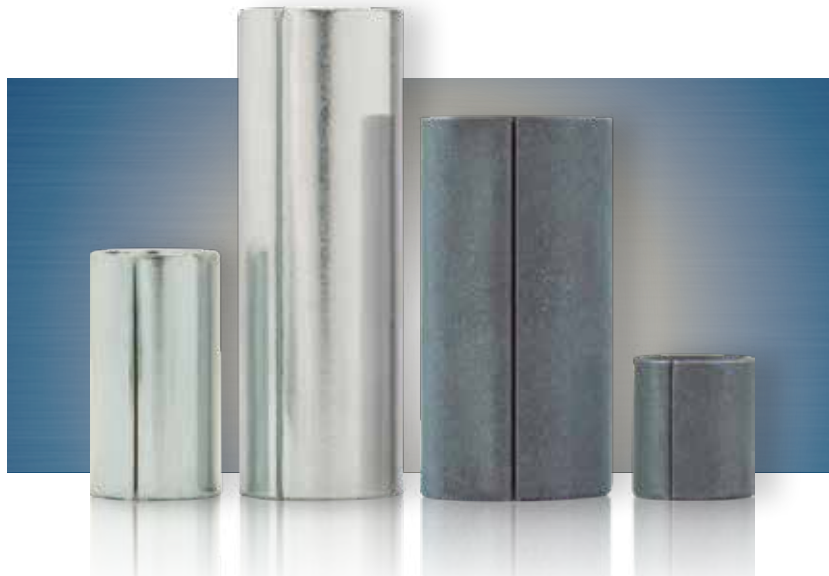


End link for front end stabiliser.



Utility cart castor wheel

Spacers and other tubular components are also used as stand-offs, bushings, tension sleeves, Compression Limiters, spring guides, axles and pins. They often replace cut-off tubing, ferrules, grommets, rivets and machined parts.



The standard range of **SPIROL** Spacers includes both metric and inch specifications in a variety of diameters and lengths. Most standard diameters are available in two wall thickness options, standard wall and heavy wall, to accommodate specific application strength and bearing requirements.

- **SP100** standard wall Spacers are typically used in static applications without excessive external forces acting on the joint.
- **SP150** heavy wall Spacers have greater compression strength and additional bearing surface. The additional bearing surface is often used to prevent witness marks or indenting when the Spacer is clamped between soft materials.

This provides an extensive range of sizes - which is broadened even further when metric sizes are converted to inch and vice versa. The benefits of using standard Spacers are as follows:

- Reduced cost and no tooling charges — particularly in low- or medium-volume applications.
- SPIROL stock allows for just-in-time delivery and reduced inventories.
- Standard Spacers can be ordered in bulk or small pack quantities to meet specific demand requirements.
- SPIROL's expansive standard size range meets most application requirements and eliminates the need for custom-designed parts.



SPECIALS

If your application requirements cannot be met by a standard SPIROL Spacer, our **Application Engineering** department will assist you in designing a tubular part that meets your needs and can provide you with samples for prototype and testing purposes.

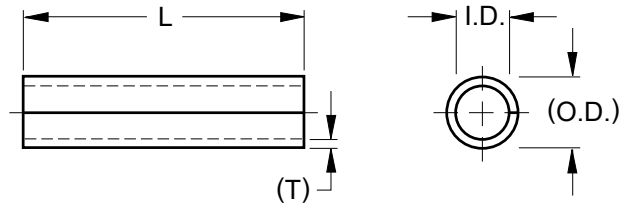
MATERIAL

F Low Carbon Steel

FINISHES

K - Plain/Oiled

H - ArmorGalv®



DIMENSIONAL DATA

NOMINAL SIZE ▶			3	4	5	6	8	10	12	14	16	20
SP100 STD WALL	I.D.	MIN.	3.15	4.15	5.2	6.2	8.2	10.2	12.25	14.25	16.25	20.4
		MAX.	3.3	4.3	5.4	6.4	8.5	10.5	12.7	14.8	16.8	21
	WALL THICKNESS REF.		0.5	0.7	0.7	0.9	1.1	1.2	1.6	1.6	1.8	2
	O.D. REF. ONLY		4.22	5.62	6.7	8.1	10.55	12.75	15.67	17.73	20.12	24.7

AVAILABLE LENGTHS

NOMINAL SIZE ▶			3	4	5	6	8	10	12	14	16	20
LENGTH	4		*	*								
	5											
	6		*	*	*	*						
	8		*	*	*	*	*					
	10		*	*	*	*	*	*				
	12		*	*	*	*	*	*	*			
	14		*	*	*	*	*	*	*	*		
	16			*	*	*	*	*	*	*	*	
	18											
	20			*	*	*	*	*	*	*	*	*
	22											
	25				*	*	*	*				
	28											
	30											
	35											
	40											
	45											
	50											
	55											
	60											
	65											
	70											
	75											
	80											
	85											
	90											
	95											
	100											

LENGTH TOLERANCES

NOMINAL SIZE	NOMINAL LENGTH	LENGTH TOLERANCE
3 - 6	$L \leq 40$	± 0.15
	$40 < L \leq 100$	± 0.25
8 - 12	$L \leq 50$	± 0.25
	$50 < L \leq 100$	± 0.40
14 - 20	$L \leq 100$	± 0.40

* Generally stocked size

- All dimensions apply prior to the application of any special supplemental finish
- Shorter, longer and intermediate lengths are available upon request
- Custom diameters will be evaluated upon request

INSPECTION METHODS

I.D. - Go and No Go Plug Gauges
Length - Callipers

Contact **SPIROL**
for columnar strength and bearing
surface requirements for your
specific application.



FLANGE HINGE

A traditional Spacer application used to eliminate flange collapse when the bolt is torqued during installation to achieve the desired friction fit.

To Order: SPCR Size x Length Material Finish Series
Example: SPCR 6 x 25 FK SP100

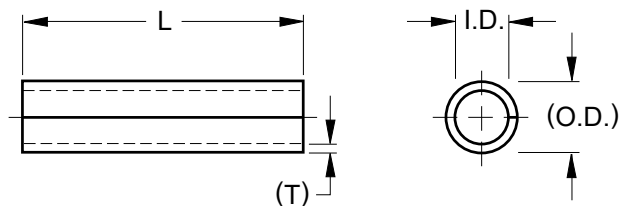
MATERIAL

F Low Carbon Steel

FINISHES

K - Plain/Oiled

H - ArmorGalv®



DIMENSIONAL DATA

NOMINAL SIZE ▶			3	4	5	6	8	10	12	14	16
SP150 HEAVY WALL	I.D.	MIN.	3.1	4.1	5.1	6.1	8.1	10.1	12.15	14.2	16.15
		MAX.	3.3	4.35	5.4	6.4	8.6	10.6	13	15.1	17.1
	WALL THICKNESS REF.		0.7	1.1	1.2	1.5	1.7	2	2.2	2.4	2.6
	O.D. REF. ONLY		4.6	6.42	7.65	9.25	11.75	14.35	16.97	19.5	21.82

AVAILABLE LENGTHS

NOMINAL SIZE ▶			3	4	5	6	8	10	12	14	16
LENGTH	4										
	5										
	6				*	*					
	8				*	*	*				
	10				*	*	*	*			
	12				*	*	*	*			
	14				*	*	*	*			
	16				*	*	*	*			
	18										
	20				*	*	*	*			
	22										
	25				*	*	*	*			
	28				*	*	*	*			
	30										
	35										
	40										
	45										
	50										
	55										
	60										
	65										
	70										
	75										
	80										
	85										
	90										
	95										
	100										

LENGTH TOLERANCES

NOMINAL SIZE	NOMINAL LENGTH	LENGTH TOLERANCE
3 - 6	$L \leq 40$	± 0.20
	$40 < L \leq 100$	± 0.30
8 - 12	$L \leq 50$	± 0.40
	$50 < L \leq 100$	± 0.50
14 - 16	$L \leq 100$	± 0.50

* Generally stocked size

- All dimensions apply prior to the application of any special supplemental finish
- Shorter, longer and intermediate lengths are available upon request
- Custom diameters will be evaluated upon request

INSPECTION METHODS

I.D. - Go and No Go Plug Gauges
Length - Callipers



AUTOMOTIVE CHASSIS FRAME BRACKET

Reinforces hollow rectangular frame. Spacer is welded to bracket that fits into frame.

To Order: SPCR Size x Length Material Finish Series
Example: SPCR 8 x 20 FH SP150

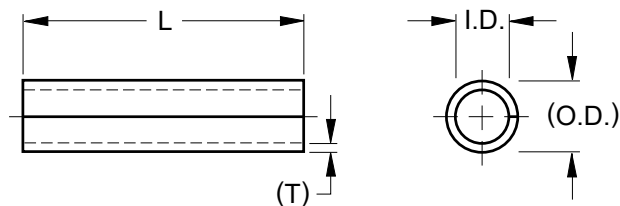
MATERIAL

F Low Carbon Steel

FINISHES

K - Plain/Oiled

H - ArmorGalv®



DIMENSIONAL DATA

NOMINAL SIZE ▶			#4	#6	#8	#10	.250 1/4	.312 5/16	.375 3/8	.437 7/16	.500 1/2	.625 5/8	.750 3/4
SP100 STD WALL	I.D.	MIN.	.118	.144	.172	.198	.260	.322	.385	.449	.512	.637	.767
		MAX.	.124	.150	.180	.206	.268	.332	.395	.464	.532	.657	.792
	WALL THICKNESS REF.		.021	.021	.027	.027	.036	.042	.048	.048	.062	.072	.078
	O.D. REF. ONLY		.163	.189	.230	.256	.336	.411	.486	.552	.646	.791	.935

AVAILABLE LENGTHS

NOMINAL SIZE			#4	#6	#8	#10	.250 1/4	.312 5/16	.375 3/8	.437 7/16	.500 1/2	.625 5/8	.750 3/4
LENGTH	.187	3/16											
	.250	1/4	*	*	*	*	*						
	.312	5/16	*	*	*	*	*	*					
	.375	3/8	*	*	*	*	*	*	*				
	.437	7/16	*	*	*	*	*	*	*				
	.500	1/2	*	*	*	*	*	*	*		*		
	.562	9/16											
	.625	5/8	*	*	*	*	*	*	*		*	*	
	.687	11/16											
	.750	3/4	*	*	*	*	*	*	*		*	*	
	.812	13/16											
	.875	7/8	*	*	*	*	*	*	*		*	*	
	.937	15/16											
	1.000	1	*	*	*	*	*	*	*		*	*	
	1.125	1-1/8	*	*	*	*	*	*	*		*	*	
	1.250	1-1/4	*	*	*	*	*	*	*		*	*	
	1.375	1-3/8											
	1.500	1-1/2	*	*	*	*	*	*	*		*	*	
	1.625	1-5/8											
	1.750	1-3/4				*	*	*	*		*	*	
	1.875	1-7/8											
	2.000	2											
	2.250	2-1/4											
	2.500	2-1/2											
	2.750	2-3/4											
	3.000	3											
	3.250	3-1/4											
	3.500	3-1/2											
	3.750	3-3/4											
	4.000	4											

LENGTH TOLERANCES

NOMINAL SIZE	NOMINAL LENGTH	LENGTH TOLERANCE
#4 - .250	L ≤ 1.500	±.005
	1.500 < L ≤ 4.000	±.010
.312 - .437	L ≤ 2.000	±.010
	2.000 < L ≤ 4.000	±.015
.500 - .875	L ≤ 4.000	±.015

* Generally stocked size

- All dimensions apply prior to the application of any special supplemental finish
- Shorter, longer and intermediate lengths are available upon request
- Custom diameters will be evaluated upon request

INSPECTION METHODS

I.D. - Go and No Go Plug Gauges
Length - Callipers

Contact **SPIROL**
for columnar strength and bearing
surface requirements for your
specific application.

RAIN GUTTER SPACER

Spacers reinforce rain gutters when being installed on structure.

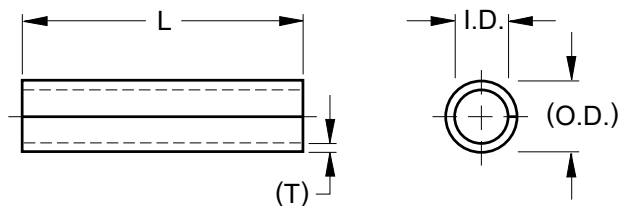
MATERIAL

F Low Carbon Steel

FINISHES

K - Plain/Oiled

H - ArmorGalv®



DIMENSIONAL DATA

NOMINAL SIZE ►			#4	#6	#8	#10	.250 1/4	.312 5/16	.375 3/8	.437 7/16	.500 1/2	.625 5/8	.750 3/4
SP150 HEAVY WALL	I.D.	MIN.	.116	.142	.168	.194	.254	.318	.381	.445	.508	.632	.758
		MAX.	.124	.152	.180	.206	.268	.338	.401	.475	.538	.672	.798
	WALL THICKNESS REF.		.027	.036	.042	.048	.058	.067	.078	.087	.094	.102	.110
	O.D. REF. ONLY		.174	.219	.258	.296	.377	.462	.547	.638	.711	.856	.998

AVAILABLE LENGTHS

NOMINAL SIZE ▶			#4	#6	#8	#10	.250 1/4	.312 5/16	.375 3/8	.437 7/16	.500 1/2	.625 5/8	.750 3/4
LENGTH	.187	3/16											
	.250	1/4											
	.312	5/16				*	*	*					
	.375	3/8				*	*	*	*				
	.437	7/16				*	*	*	*				
	.500	1/2				*	*	*	*		*		
	.562	9/16											
	.625	5/8				*	*	*	*		*	*	
	.687	11/16											
	.750	3/4				*	*	*	*		*	*	
	.812	13/16											
	.875	7/8				*	*	*	*		*	*	
	.937	15/16											
	1.000	1				*	*	*	*		*	*	
	1.125	1-1/8				*	*	*	*		*	*	
	1.250	1-1/4				*	*	*	*		*	*	
	1.375	1-3/8											
	1.500	1-1/2				*	*	*	*		*	*	
	1.625	1-5/8											
	1.750	1-3/4											
	1.875	1-7/8											
	2.000	2											
	2.250	2-1/4											
	2.500	2-1/2											
	2.750	2-3/4											
	3.000	3											
	3.250	3-1/4											
	3.500	3-1/2											
	3.750	3-3/4											
	4.000	4											

LENGTH TOLERANCES

NOMINAL SIZE	NOMINAL LENGTH	LENGTH TOLERANCE
#4 - .250	L ≤ 1.500	±.008
	1.500 < L ≤ 4.000	±.012
.312 - .437	L ≤ 2.000	±.015
	2.000 < L ≤ 4.000	±.020
.500 - .875	L ≤ 4.000	±.020

- * Generally stocked size
- * All dimensions apply prior to the application of any special supplemental finish
- * Shorter, longer and intermediate lengths are available upon request
- * Custom diameters will be evaluated upon request

INSPECTION METHODS

I.D. - Go and No Go Plug Gauges
Length - Callipers

To Order: SPCR Size x Length Material Finish Series
Example: SPCR .312 x 1.250 FH SP150



SCISSOR JACK

Eight Spacers (welded into place) are used as distance bushings and reinforcements in the pivot joints.

STANDARD MATERIAL

Low Carbon Steel (F)

Low carbon steel is the most economical material to manufacture roll formed Spacers from in the absence of any plating or coating. Additional coatings and finishes can be applied to low carbon steel to improve corrosion resistance.

STANDARD FINISHES

Plain, Oiled (K)

This finish is a thin coating of oil that provides corrosion resistance during storage and shipping.

ArmorGalv® (H)

ArmorGalv® is a zinc alloy thermal diffusion coating covered by ASTM A1059M-08(2013). SPIROL recommends ArmorGalv® for Spacers for many reasons; chief among them being uniform deposition of coating on all surfaces of the part. There are no insignificant surfaces and the entire inner diameter receives full coating and protection. ArmorGalv®, complimented by two sealers, offers a minimum of 1,000 hours corrosion resistance to red rust, and due to its slightly porous surface, it will retain paint and other coatings in the event that the complete assembly requires subsequent painting, powder coating, etc. Compared to some stainless steels, ArmorGalv® is an ideal coating for some of the most aggressive environments such as marine, automotive, agriculture, mining and industrial manufacturing.



ArmorGalv® Coated

SPECIAL MATERIALS

Austenitic (Nickel) Stainless Steel (D)

Austenitic stainless steel provides excellent corrosion protection against normal environmental conditions. It withstands fresh water and atmospheric marine conditions very well, and is suitable for many other industrial conditions including acidic environments.

Aluminium (A)

Aluminium is lightweight, lead free, and has sufficient columnar strength for many non-critical applications. Aluminium is 1/3 the weight of steel, and does not require any supplemental coatings or platings to provide the necessary corrosion protection in most environments.

SPECIAL FINISHES

Electroplated Zinc (T)

This finish consists of a minimum of 5µm (.0002") thick electrodeposited zinc with a clear trivalent passivation topcoat. Zinc plate is primarily used for cosmetic purposes as this finish yields a bright, silvery appearance on the outside surfaces of the Spacer. Zinc plating is also commonly used to prevent galvanic corrosion. The major drawback to electroplated zinc on Spacers is that coverage on the inner diameter is limited to one diameter's length of "throw" of the plating. If atmospheric corrosion protection is required throughout the entirety of the part, ArmorGalv® should be considered instead of zinc plate.



Electroplated Zinc

SPIROL is a licensee of ArmorGalv®, a registered trademark of Distek N.A LLC

STANDARD MATERIALS & FINISHES

TYPE	GRADE	FINISH
F - Low Carbon Steel	UNS G10060 / UNS G10080 / UNS G10100	K - Plain/Oiled
	DC04 (1.0338) / DC03 (1.0347) / DC01 (1.0330)	H - ArmorGalv®

SPECIALS – CUSTOMISED TO MEET YOUR SPECIFIC REQUIREMENTS

SPIROL specialises in replacing costly machined and cold-formed components with less expensive roll-formed product. SPIROL's proprietary manufacturing technology enables the cost-effective production of special tubular products that meet the performance requirements of the comparatively more expensive alternatives.

SPECIAL LENGTHS

Any length from 2.5mm to 150mm (.094" to 6") subject to some limitations relative to diameter and wall thickness.

SPECIAL INSIDE DIAMETERS

Any diameter between $\varnothing 2\text{mm}$ to $\varnothing 26\text{mm}$ ($\varnothing .078"$ to $\varnothing 1"$). Reduced tolerances are also available.

SPECIFIED OUTSIDE DIAMETERS

The outside diameter can be specified with minimum and maximum tolerances, but it is then suggested to specify the inside diameter with only a reference dimension or only a minimum dimension rather than a minimum/maximum tolerance to reduce cost.

BOTH DIAMETERS SPECIFIED

In situations that require both the inside and outside diameters to be specified with toleranced dimensions, a decision needs to be made as to which dimension should have the tighter tolerance so that the raw material tolerance can be properly allocated.

GAP

Spacers are usually butted with minimal or no gap. The gap can be specified from "no gap" to a toleranced or maximum specified gap.

SPECIAL WALL THICKNESS

The ideal wall thickness is 15% of the mean inside diameter. Spacers can be manufactured to order with a special wall thickness to meet specific application requirements - subject to review by SPIROL Engineering.

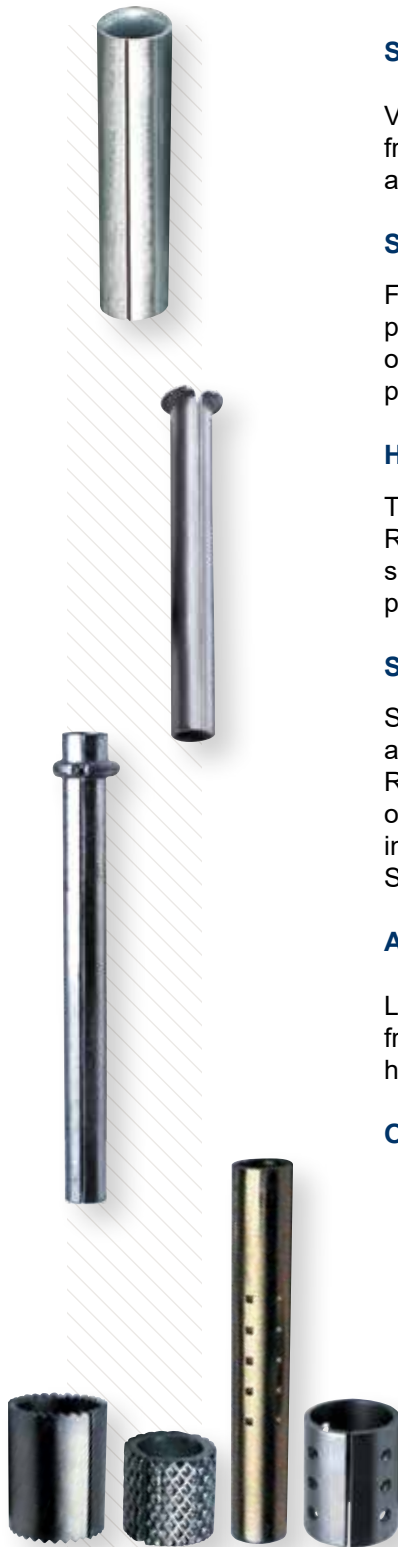
SPECIAL LENGTH TOLERANCES

Standard Spacers have a generous length tolerance to keep the cost down. Reduced tolerances can be provided to 0.05mm (.004"), and in some instances even these tolerances can be further reduced. Since tight tolerances increase costs, tolerances should be tailored to the needs of the application to eliminate unnecessary expense.

INCREASED COLUMNAR STRENGTH

Can be achieved through increased wall thickness, higher strength material, or by using materials that can be heat treated. Given that columnar strength is application dependant, SPIROL's Applications Engineering team should be consulted whenever the Spacer will be used in a critical load bearing path.





SPECIAL MATERIALS

Virtually any material available in cold rolled strip form can be used. Some of the more frequently specified materials are aluminium, stainless steel, brass, galvanised steel and high carbon steel.

SPECIAL FINISHES

Finishes are only limited by market availability. Finishes are specified for corrosion protection, colour coding, and appearance. Aluminium, stainless steel, galvanised steel, or brass should be considered in place of finishes, since these can result in a better product at a lower cost.

HEADED SPACERS/TUBULAR RIVETS

This economical method of manufacturing, combined with the Headed Spacer's/Tubular Rivet's hollow construction, reduces costs and permits lower prices. They have straighter shanks than conventional Rivets for faster, easier assembly. **SPIROL** Engineering can provide recommended heading tool dimensions for clinching the non-headed side of the part.

SHOULDER RIVETS

Shoulder Rivets are produced to meet specific customer requirements. The clinch allowance can be varied according to the thickness of the panel to which the Shoulder Rivet is to be attached. The inside diameter can be designed to allow for the passage of rivets, screws, or shafts. The wall thickness can be varied to achieve the desired inside/outside diameter relationship. These are often used to replace expensive long Semi-Tubular Rivets.

APPLICATION-SPECIFIC SPECIALS

Lightweight and durable **Conveyor Spacers** are used to separate the skate wheel rollers from each other and the conveyor walls. Corrosion-resistant **Garage Door Spacers** for hinges cost less than cut-off tubing and plated parts.

OTHER SPECIALS

- Stamped with identification numbers or letters, indentations and protrusions
- Holes and perforations
- Chevron or dovetail seams
- Outside diameter diamond knurls
- Serrated ends
- Inside diameter lead-ins or outside diameter chamfers
- Oval and C-shaped configurations



SPACER AND TUBULAR COMPONENTS APPLICATIONS

GARAGE DOOR HINGE

Corrosion-resistant, galvanised steel Spacers cost less than cut-off tubing and plated parts.



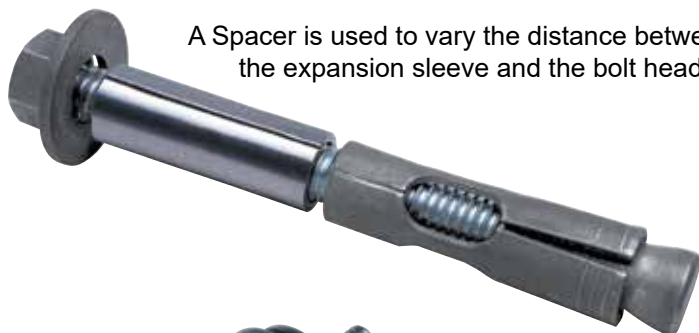
LEAF SPRING

Hardened Spacers are force fit into the inside diameters of rubber absorption grommets. They absorb bolt compression force and isolate bolt pressure from the rubber grommet.



EXPANSION BOLT

A Spacer is used to vary the distance between the expansion sleeve and the bolt head.



CASTOR WHEEL SOCKET (CASTOR NIB)

The rolled Spacer is welded to the leg. Socket stem with locking ring is press fit into the inside diameter of the Spacer.



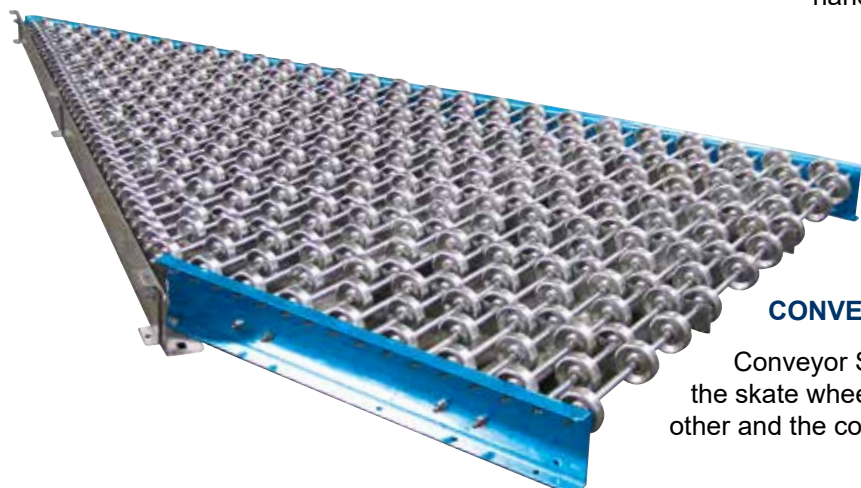
UTILITY CART WHEEL ASSEMBLY

Headed Spacer is clinched into place to replace a bolt or rivet.



WHEEL CHAIR

Spacers that replace cut-off tubing are used to separate the handrail from the rear wheel.



CONVEYOR SYSTEMS

Conveyor Spacers separate the skate wheel rollers from each other and the conveyor walls.



Coiled Spring Pins



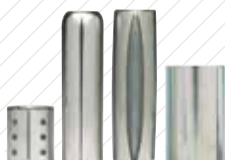
Slotted Spring Pins



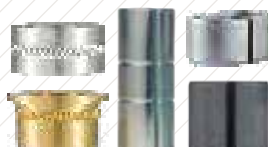
Solid Pins



**Alignment Dowels /
Bushings**



**Spacers & Rolled
Tubular Components**



**Compression
Limiters**



**Threaded Inserts
for Plastics**



Disc Springs



**Machined Aerospace
Components**



**Precision Shims,
Washers & Metal Gaskets**



Laminated Shims



**Parts Feeding
Technology**



**Pin Installation
Technology**



**Insert Installation
Technology**



**Compression Limiter
Installation Technology**

Please refer to www.SPIROL.co.uk for current specifications and standard product offerings.

SPIROL offers complimentary Application Engineering support! We will assist on new designs as well as help resolve issues, and recommend cost savings on existing designs. Let us help by visiting **Application Engineering Services** on SPIROL.co.uk.

Technical Centres

Europe SPIROL United Kingdom
Corby, Northants, England
+44 (0) 1536 444800
info-uk@spirol.com

SPIROL Ford
South Shields, Tyne & Wear, England
+44 (0) 1914 540141
contactus@ford-engineering.com

SPIROL France
Saint-Léonard
+33 (0) 3 26 36 31 42
info-fr@spirol.com

SPIROL Germany
Münich
+49 (0) 89 4 111 905 71
info-de@spirol.com

SPIROL Spain
Barcelona
+34 932 71 64 28
info-es@spirol.com

SPIROL Czech Republic
Tuchoměřice
+420 226 218 935
info-cz@spirol.com

SPIROL Poland
Warsaw
+48 510 039 345
info-pl@spirol.com

Americas SPIROL International Corporation
Connecticut, USA
+1 860 774 8571
info@spirol.com

SPIROL Shim Division
Ohio, USA
+1 330 920 3655
info@spirol.com

SPIROL Canada
Windsor, Ontario
+1 519 974 3334
info-ca@spirol.com

SPIROL Mexico
Apodaca, Nuevo León
+52 81 8385 4390
info-mx@spirol.com

SPIROL Brazil
Indaiatuba, São Paulo
+55 19 3936 2701
info-br@spirol.com

Asia Pacific SPIROL China
Shanghai
+86 (0) 21 5046-1451
info-cn@spirol.com

SPIROL Malaysia
Iskandar Puteri, Johor
+60 77 063 960
info-my@spirol.com

SPIROL Korea
Seoul, South Korea
+82 (0) 10 9429 1451
info-kr@spirol.com