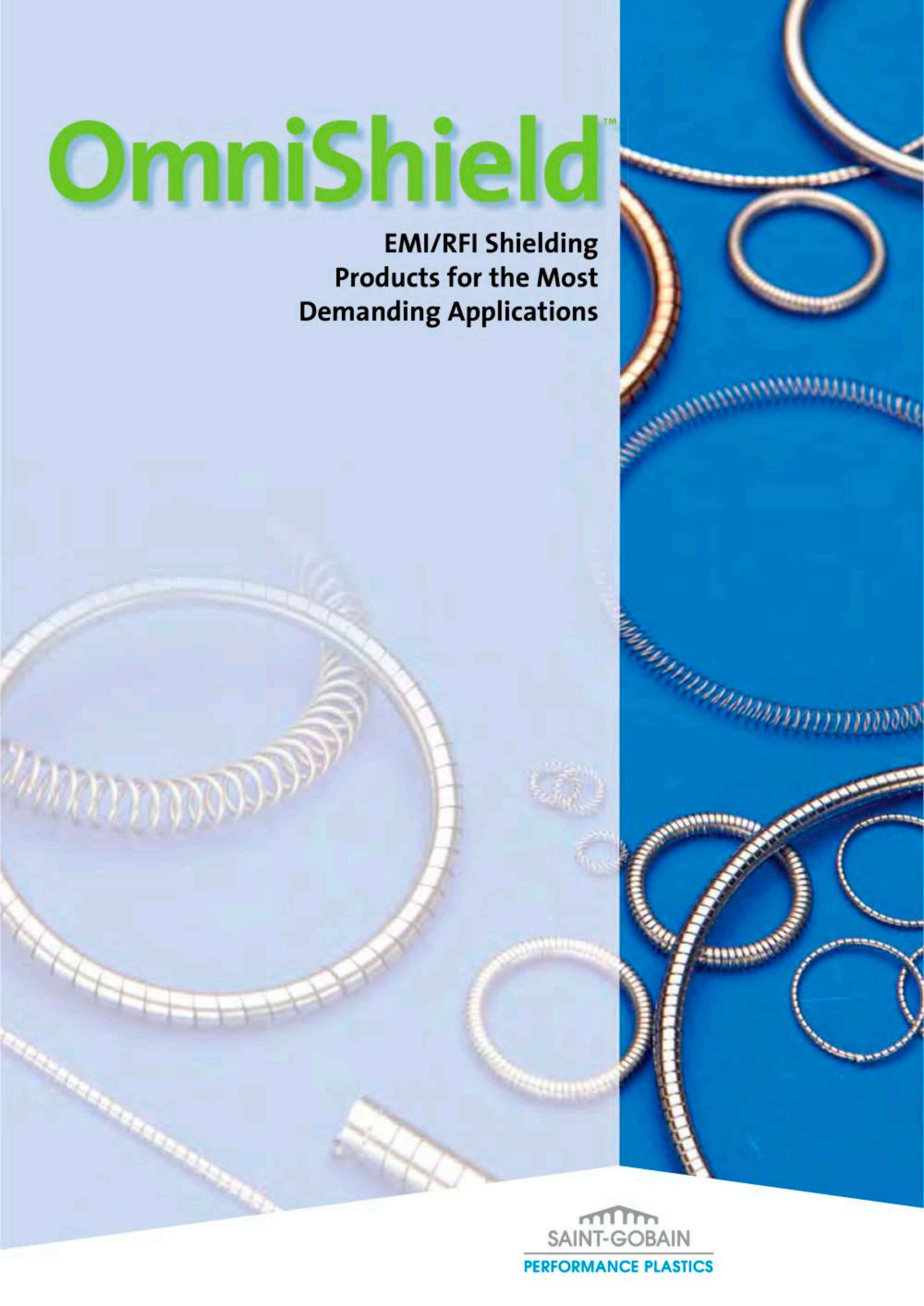


# OmniShield™

**EMI/RFI Shielding  
Products for the Most  
Demanding Applications**





## OmniShield™

The OmniShield™ product line is composed of four high-performance spring types capable of handling extreme service conditions while exhibiting excellent EMI/RFI shielding. Saint-Gobain has been making these cross-section compression springs for aerospace applications since 1958 and is the world leader in spring technology and performance.

All parts are manufactured to order, as customer satisfaction is of the utmost importance to Saint-Gobain. Custom attributes such as size, shape, material and coatings are as simple as an e-mail or phone call away. RoHS and DFARS metals are available upon request.

Saint-Gobain has a rich tradition of excellence that dates back over 300 years. Today it is one of the world's top 100 industrial corporations and a leader in the development and production of engineered materials. Established in France in 1665 as a glass maker, Saint-Gobain continues through arduous research to develop new and innovative materials.

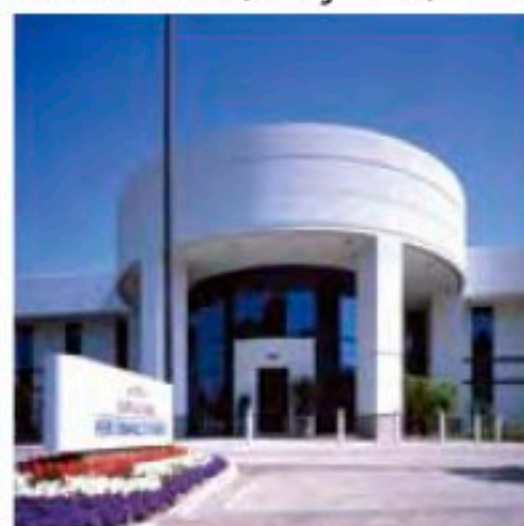
Saint-Gobain is a global leader in each of its businesses – flat glass, packaging, insulation, building materials, abrasives, reinforcements, ceramics and plastics – including EMI/RFI shielding components.

## A Worldwide Leader in High-Performance



- ▲ Seals sales and marketing offices
- Seals manufacturing and R&D facilities
- ▲ Other Saint-Gobain Performance Plastics locations

*Garden Grove, California, USA*



*Vinhedo, Sao Paulo, Brazil*



*Kolo, Poland*





# Springs Technology



## Experience You Can Rely On

With a rich history of innovation, Saint-Gobain Performance Plastics is dedicated to providing the most technologically advanced products on the market today. Every order is custom-designed so that each customer has access to the market-leading engineering, research and customer service expertise of Saint-Gobain. OmniShield™ is manufactured throughout the world with sites located in the Americas, Europe and Asia.

Our worldwide manufacturing sites in North America and Europe house state of the art spring processing and test equipment as well as the worldwide Springs and Seals Research & Development Center. These facilities also houses an experienced design engineering and customer service staff available for the needs of every customer.

Fifty years of experience in manufacturing, plus our spirit of continuous improvement utilizing 5S, Kaizen and Six Sigma, results in superior process control, high product quality and consistent performance. As a result of our dedication to excellence, our worldwide facilities are ISO 9001 certified.

**ISO 9001  
Certified**  
Worldwide  
Facilities

**EN9100  
Certified**  
Kontich,  
Belgium  
Facility

*Kontich, Belgium*



*Minhang, Shanghai, China*



*Suwa, Japan*



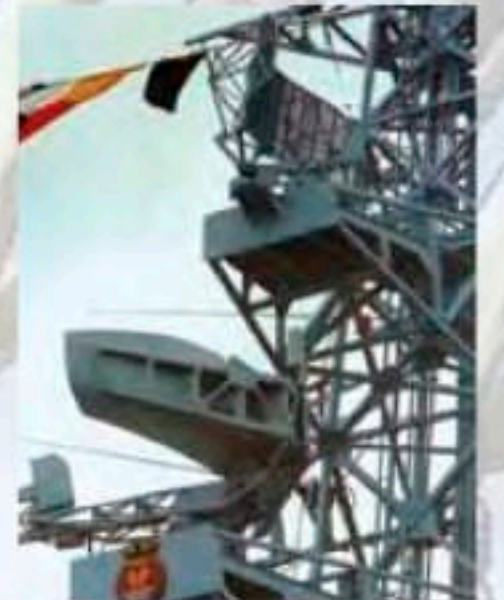


# OmniShield™ in the Marketplace

Saint-Gobain Performance Plastics' springs are used in an extensive array of demanding industrial applications spanning the global marketplace, including:

- › Aerospace
- › Military
- › Construction equipment
- › High-performance racing
- › Medical instrumentation
- › Liquid chromatography
- › Semiconductor manufacturing
- › Petroleum/chemical processing
- › Pumps, valves, compressors

In addition to standard catalog parts, Saint-Gobain manufactures springs to order. Design engineers can benefit from the ability to design custom sizes, shapes, materials and coatings. RoHS and DFARS materials are available upon request.





**OmniShield™**

OmniShield™ EMI/RFI Shielding ..... 6

Typical Shielding/Electrical Connector Test Data ..... 7

How to Order OmniShield™ Springs..... 8

Application Data Form ..... 10

OmniShield™ Performance and Material Selection..... 11

OmniShield™ 22-Series ..... 12

OmniShield™ 73-Series ..... 13

OmniShield™ 09-Series ..... 14

OmniShield™ 23-Series ..... 15

**Technical Data**

Warranty ..... 16

Terms and Conditions ..... 17

Other Products..... 19

**Table of Contents**



# OmniShield™ EMI/RFI Shielding

## Introduction to OmniShield™

The OmniShield™ product line was developed to optimize the EMI/RFI properties of high-performance electronic components used under extreme service conditions. The wide selection of available springs and materials enables us to meet the requirements of a wide range of applications. Our expert engineers will recommend the optimal solution based on the unique product attributes of each spring type. The four basic spring types are customizable and can be optimized for:

- EMI/RFI attenuation and shielding
- Current corrosion resistance
- Electrical DC resistance
- Spring load
- Deflection
- Mounting

Saint-Gobain has been making high-performance springs for the aerospace and military industries for over 50 years. We offer a wide variety of EMI/RFI

shielding springs in order to accommodate applications ranging from the most basic to the most challenging. Whether your application involves inert, dry or corrosive environments; extreme temperatures, high current or low signals; DC or microwave, motionless or wiping contact; bare metal or plated; or catalog or custom, Saint-Gobain can exceed your needs.

OmniShield™ products are designed to fit in all standard hardware glands such as MIL-G-5514, AS4716, industrial, metric

and JIS, as well as custom gland sizes. OmniShield™ products are available from 1mm up to 10m in diameter.

- Shielding quality:  
107dB to 164dB at 200MHz and  
96dB to 159dB at 1000MHz
- Load: Three standard load ranges  
from 0,35 N/mm to 11,73 N/mm
- Over 15 materials available
- 5 plating options available

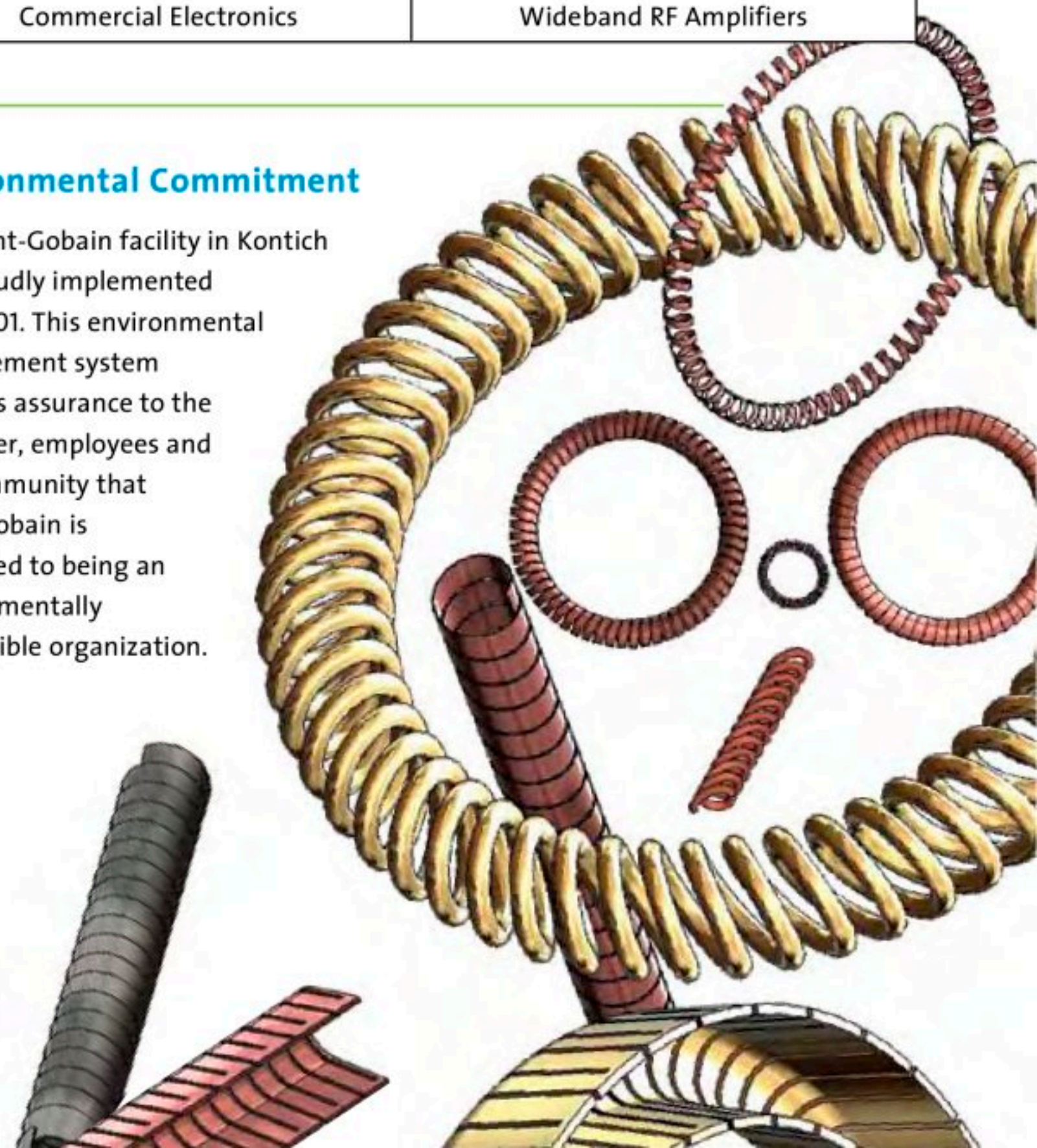
OmniShield™ EMI/RFI Shielding Applications	
Avionics	Consumer Electronics
Radar Systems	Handheld Communication Devices
Microwave Systems	Military
Shielding Cabinetry	Medical Devices
Semiconductor Processing Equipment	Automotive Electronic Controls
Commercial Electronics	Wideband RF Amplifiers

## Quality Assurance

The Saint-Gobain springs quality system is EN9100 and aerospace standard accredited at our European manufacturing facility in Kontich, Belgium. Due to the more exacting requirements of our customers in the aerospace industry, we have chosen EN9100, which exceeds all requirements (including the ISO 9001 standard). We apply these standards to all OmniShield™ components, resulting in a product of the highest quality. The Quality Team in Kontich represents the customers' interest in all areas of contract administration, documentation control and manufacturing functions.

## Environmental Commitment

The Saint-Gobain facility in Kontich has proudly implemented ISO 14001. This environmental management system provides assurance to the customer, employees and the community that Saint-Gobain is dedicated to being an environmentally responsible organization.





# Typical Shielding Test Data

## Shielding Quality Defined

Electromagnetic leakage through seams and gasketed joints in shielded enclosures occurs primarily as a result of currents travelling across a seam. Electromagnetic leakage through the seam is proportional to the transfer voltage developed across the seam. In shielding theory the seam is analyzed in terms of transfer impedance.

$$Z_T = V/J_s$$

$Z_T$  = Transfer impedance of the seam ( $\Omega$ -m)

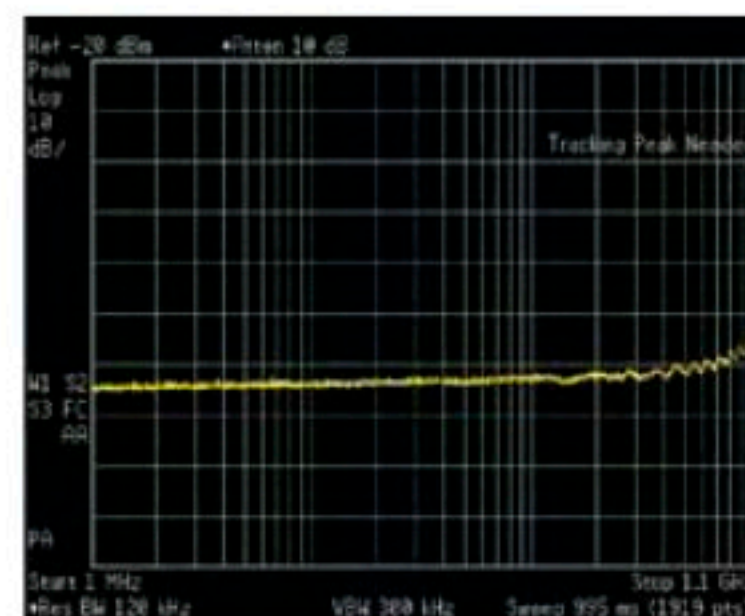
$V$  = Transfer voltage (voltage across seam)

$J_s$  = Density of current which crosses the seam (A/m)

The theoretical shielding effectiveness of a gasket is known as shielding quality (SQ). The shielding quality is calculated as:

$$SQ = 373/Z_T$$

$$SQ \text{ (dB)} = 20 \log 377 - Z_T \text{ (dB)}$$



## Test Method

OmniShield™ components are tested for shielding quality according to the SAE ARP1705 test method, "Coaxial Test Procedure to Measure the RF Shielding Characteristics of EMI Gasket Materials." The test method was developed to establish a reliable and repeatable

procedure for measuring RF shielding characteristics of EMI gasket materials. The test is administered within the frequency range of 1.0kHz to 1.0GHz. The test fixture pictured was assembled according to SAE ARP1705.

## OmniShield™ Test Data

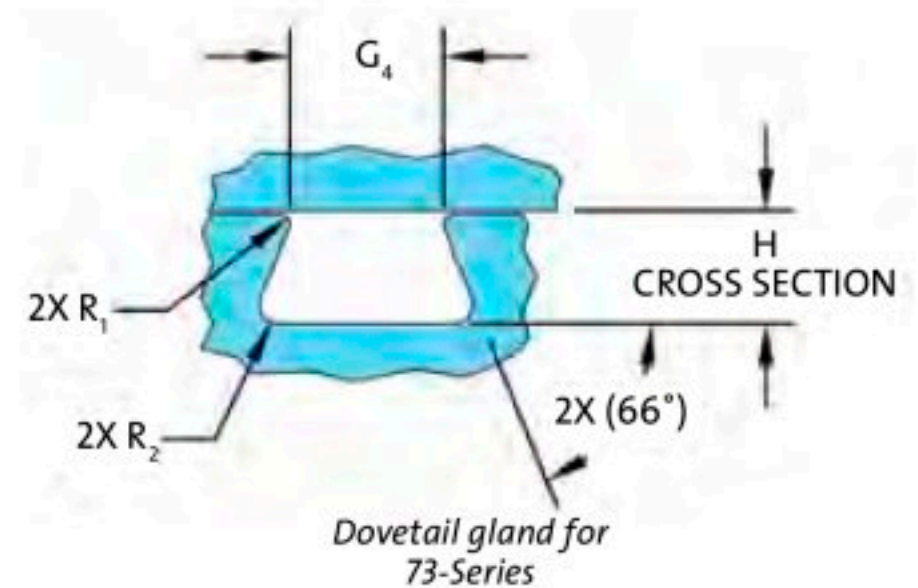
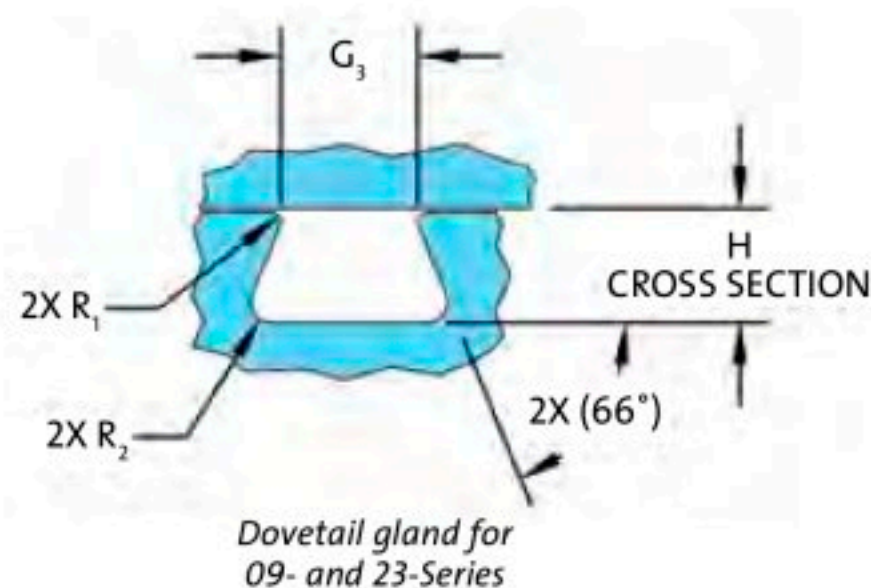
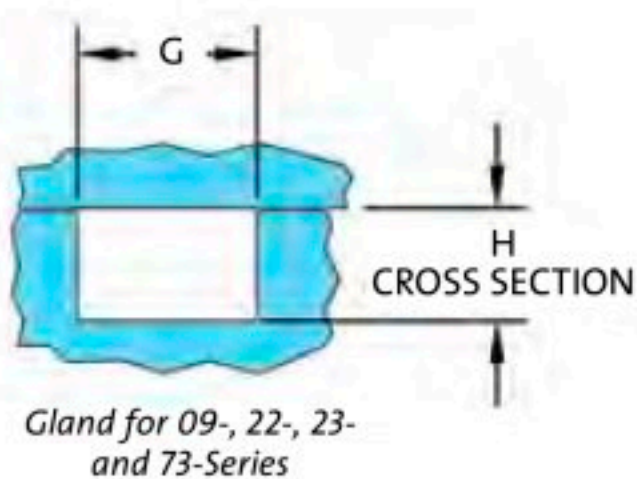
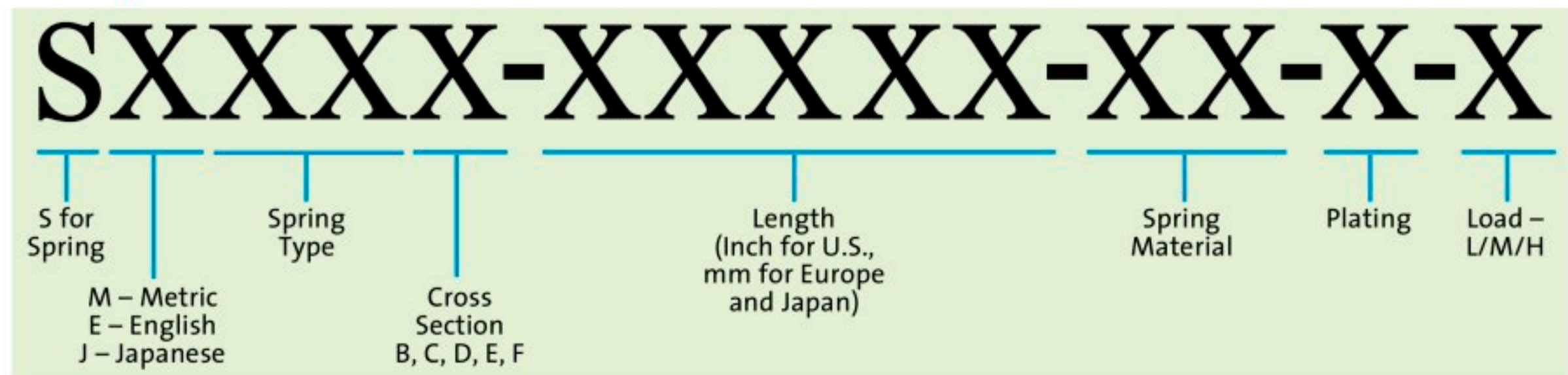
The shielding quality of the OmniShield™ product line is expressed in decibels (dB) attenuation. The table at right is an example of how the data is recorded while testing, and effectively shows that electromagnetic leakage increases as the frequency moves from 1,0MHz to 1,0GHz. The data in this table is representative of the expected shielding quality of OmniShield™ components. The material and plating options shown in the table are just a small sample of what's available. Please contact our expert technical staff so that we can provide you with the solution that best matches your needs.

	Spring Design and Material	Plating	Resistance (mΩ/mm)	Force (N/mm)			Shielding Quality (dB Attenuation)	
				Low	Med.	High	200MHz	1000MHz
22-Series	304 Stainless Steel	None	1,067	0,67	1,17	2,73	119	109
	304 Stainless Steel	Sn	0,038	0,67	1,17	2,73	136	128
	Beryllium Copper	None	0,013	0,46	0,79	1,82	143	135
	Beryllium Copper	Ag	0,004	0,46	0,79	1,82	154	143
73-Series	302 Stainless Steel	None	0,451	0,60	1,49	4,26	123	114
	302 Stainless Steel	Sn	0,016	0,60	1,49	4,26	158	150
	Beryllium Copper	None	0,005	0,37	0,91	2,47	155	147
	Beryllium Copper	Ag	0,002	0,37	0,91	2,47	164	157
09-Series	301 Stainless Steel	None	0,504	0,93	2,85	11,38	109	99
	301 Stainless Steel	Sn	0,025	0,93	2,85	11,38	152	135
	Beryllium Copper	None	0,009	1,28	4,24	5,60	146	135
	Beryllium Copper	Ag	0,003	1,28	4,24	5,60	155	143
	Hastelloy™	None	0,535	0,89	2,75	11,73	107	96
23-Series	17-7 Stainless Steel	None	0,516	0,35	1,05	4,20	112	103
	17-7 Stainless Steel	Ag	0,016	0,35	1,05	4,20	155	149
	Beryllium Copper	None	0,006	0,39	1,17	2,28	153	145
	Beryllium Copper	Sn	0,002	0,39	1,17	2,28	162	159



# How to Order OmniShield™ Springs

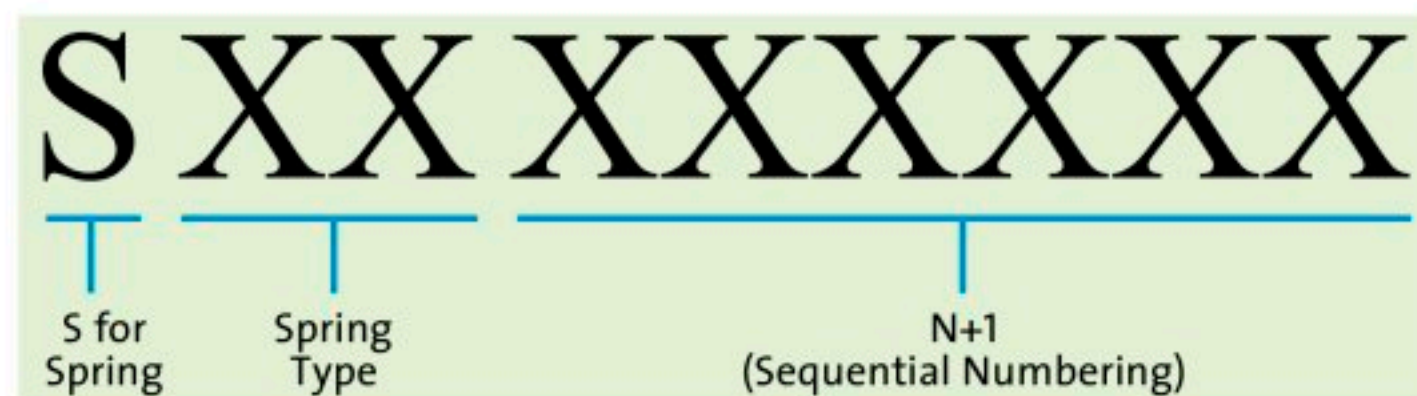
## Catalog Part Number



## Standard Groove Dimensions

Gland Size Numbering	H Cross Section ±0.05mm	G Rectangular Groove +0.13mm/ -0.00mm	G <sub>3</sub> Dovetail Groove +0.13mm/ -0.00mm	G <sub>4</sub> Dovetail Groove +0.13mm/ -0.00mm	(R <sub>1</sub> ) Dovetail Radius (mm)	(R <sub>2</sub> ) Dovetail Radius (mm)
S	0,79	1,40	0,81	1,02	0,08	0,08
A	1,45	2,39	1,70	2,13	0,13	0,25
B	2,29	3,58	2,62	3,07	0,25	0,38
C	3,10	4,78	3,28	3,99	0,25	0,76
D	4,75	7,14	5,18	6,22	0,38	0,76
E	6,07	9,53	6,93	N/A	0,38	1,52
F	3,96	7,24	4,72	5,97	0,25	0,76


## Custom Part Number





# How to Order OmniShield™ Springs

## Spring Types

OmniShield™ 22-Series	
	
	
OmniShield™ 73-Series	
	
	
OmniShield™ 09-Series	
	
	
OmniShield™ 23-Series	
	
	

## Spring Material Code

01 – 301 stainless steel half hard per AMS 5918  
 04 – 304 stainless steel half hard per AMS 5911  
 05 – Nickel/cobalt UNS R3003  
 06 – 316 stainless steel  
 08 – Hastelloy® C-276  
 09 – 302 stainless steel  
 11 – Beryllium copper #625

## Plating Options

X – No plating  
 G – Gold  
 T – Tin  
 N – Nickel  
 S – Silver

## Springs Load

U – Ultra low  
 L – Low  
 M – Medium  
 H – High

## OmniShield™ Ordering Process

Ordering OmniShield™ EMI/RFI components is designed to be a simple and easy process. Both catalog and custom parts can be ordered using the same process.

**STEP 1** Should you have any questions while getting started please contact us by e-mail at [infoproducts.kontich@saint-gobain.com](mailto:infoproducts.kontich@saint-gobain.com) or call +32 3 458 28 28.

**STEP 2** Fill out the Application Data Form (pg. 10) online at [www.omnishield@saint-gobain.com](http://www.omnishield@saint-gobain.com). The form can also be downloaded online and faxed to +32 3 458 26 69.

**STEP 3** You will be contacted upon receipt of your request. In some cases additional information will be required to ensure your needs are properly addressed. In the case of custom, non-catalog orders your request will be personally handled by a representative in your area.

Once your order is processed the service doesn't stop. The OmniShield™ team is dedicated to solving your most difficult application issues today and in the future. Saint-Gobain Performance Plastics strives to be your partner in success.



# Application Data Form

## Contact Information

NAME	TITLE	COMPANY	
ADDRESS			
CITY	STATE/PROVINCE	ZIP/POSTAL CODE	COUNTRY
PHONE	FAX	E-MAIL	

## Application Information

DEVICE/APPLICATION	<input type="checkbox"/> EMI/RFI SHIELDING	<input type="checkbox"/> CURRENT CARRYING CONTACT
ANNUAL USAGE	<input type="checkbox"/> HOLDING/LOCKING/LATCHING	<input type="checkbox"/> SEALING
<input type="checkbox"/> PROTOTYPE <input type="checkbox"/> PRODUCTION <input type="checkbox"/> EXISTING PRODUCT	<input type="checkbox"/> OTHER	
<input type="checkbox"/> OTHER		

## Function

## Application/Operating Conditions

APPLICATION TYPE	ENVIRONMENTAL CONDITIONS
STATIC	TEMPERATURE (C/F) <input type="checkbox"/> MAX <input type="checkbox"/> OP <input type="checkbox"/> MIN
LINEAR/RECIPROCATING	PRESSURE (MPa/psi) <input type="checkbox"/> MAX <input type="checkbox"/> OP <input type="checkbox"/> MIN
OSCILLATORY	MEDIA
OTHER	OTHER CONSIDERATIONS

## Mechanical Conditions

STROKE LENGTH (mm/In.)	<input type="checkbox"/> LINEAR <input type="checkbox"/> RECIPROCATING
STROKES PER MINUTE	
INSERTION FORCE (N/Lbs.)	
REMOVAL FORCE (N/Lbs.)	
COMPRESSION FORCE (N/Lbs.)	
RPM	<input type="checkbox"/> ROTARY <input type="checkbox"/> OSCILLATORY

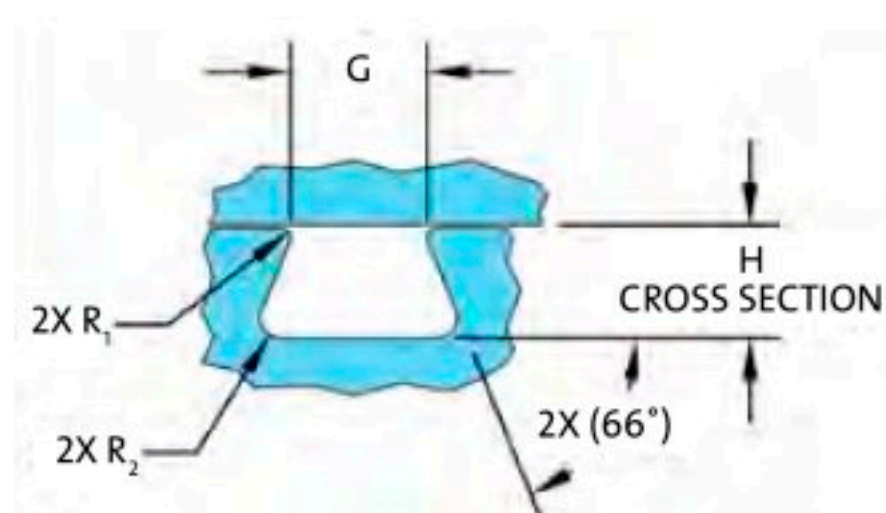
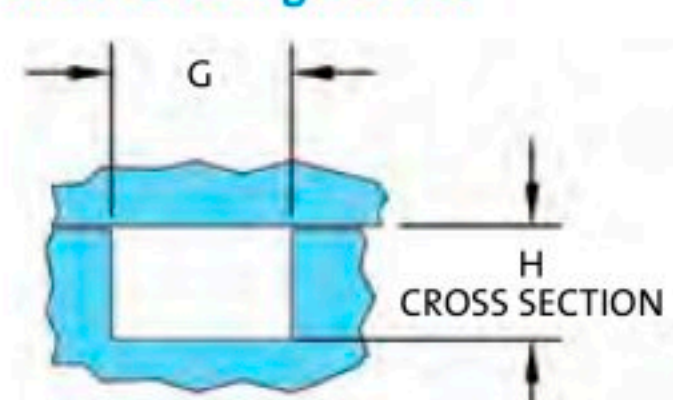
## Electrical Conditions

SHIELDING QUALITY (dB)
RESISTANCE ( $\Omega$ /m $\Omega$ / $\mu\Omega$ )
CONTINUOUS CURRENT <input type="checkbox"/> A <input type="checkbox"/> kA <input type="checkbox"/> mA <input type="checkbox"/> $\mu$ A
POWER/VOLTAGE <input type="checkbox"/> WATTS <input type="checkbox"/> VOLTS
FREQUENCY <input type="checkbox"/> DC <input type="checkbox"/> Hz <input type="checkbox"/> MHz
OTHER

## Housing Information

DIAMETER/LENGTH (mm/In.)	GROOVE MATERIAL
TOLERANCE	PLATING/COATING
GROOVE WIDTH (mm/In.)	HARDNESS (Rc)
GROOVE DEPTH (mm/In.)	SURFACE FINISH (S/Ra)
SMALLEST RADIUS (mm/In.)	OTHER

## Groove Configurations

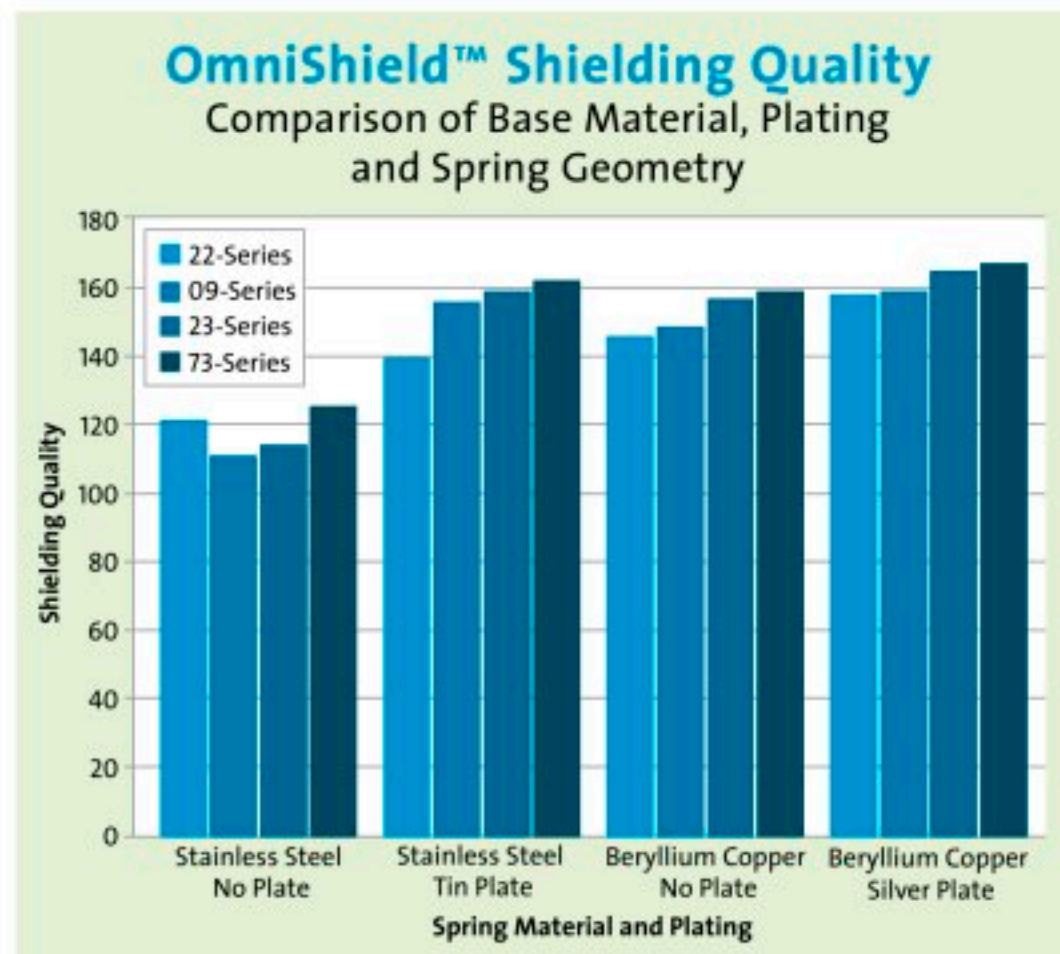




# OmniShield™ Performance and Material Selection

## Shielding Quality

OmniShield™ is available in a wide variety of base materials and platings in order to support applications from the most routine to the most challenging. EMI/RFI shielding in springs can be attributed to a number of variables, including base material, plating and spring geometry. The chart below displays how shielding quality is affected by these specific variables. For the most challenging applications a highly conductive material such as beryllium copper may require plating, even though the increase in shielding quality is modest. Conversely, a stainless steel spring sees a significant increase in shielding quality as a result of plating. In applications where appropriate, such a component would offer the most value. As base material and plating combinations are vast, our expert engineers are available to help guide you through the selection process.



Note: Results averaged across all cross sections. More base materials and plating options available.

## Corrosion Resistance

The EMI/RFI shielding performance of OmniShield™ is dependent upon how the base material or plating interacts with environmental conditions. The table at right displays the interaction of ten different spring materials with the mating surfaces of the hardware. A scale of one to five is used to advise on the level of compatibility between the spring component and the hardware. Careful selection of materials will contribute to a corrosion-free joint, ensuring a long operating life for both the OmniShield™ and the hardware. Saint-Gobain Performance Plastics engineers will guide you through the process of choosing the best spring material to match your hardware.

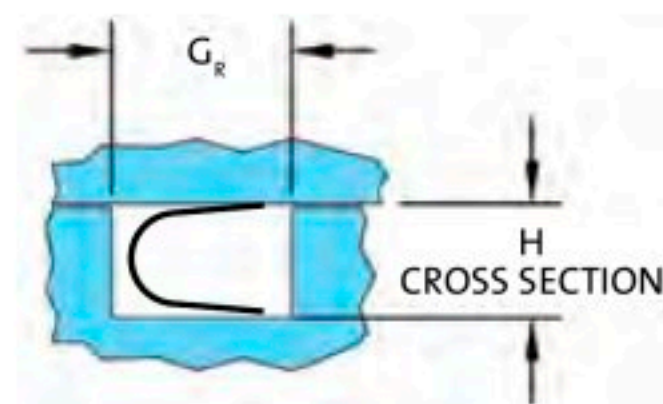
			Spring Outside Surface Metal										
			Stainless steel	Nickel cobalt UNS R3003	Hastelloy® C-276	Beryllium copper	Nickel #220	Copper chromium zirconium	Nickel plate	Tin plate	Gold plate	Silver plate	
Hardware Base Material	Aluminum 1000 Aluminum/manganese 3000 Aluminum/magnesium 5000	Hardware Contacting Surface	Bare clean metal	3	3	2	3	4	2	4	1	5	X
			Electroless nickel	1	1	1	4	1	1	1	4	2	4
			Bare cadmium plate	3	2	4	3	4	4	4	1	2	4
			Cadmium chromate w/wo color	1	2	3	3	4	4	3	1	2	4
			Chromium	1	2	1	4	4	1	1	1	1	1
			Mil-C-5541 chromate Class 1A or Class 3	3	2	3	3	4	4	3	1	2	3
	Aluminum/copper 2000 Aluminum/magnesium/silicon 7000	Bare clean metal	3	4	2	3	3	3	4	1	5	X	
		Electroless nickel	1	2	1	4	1	1	1	4	4	4	
		Bare cadmium plate	4	4	4	3	3	4	4	1	2	4	
		Cadmium chromate w/wo color	3	3	3	3	3	3	3	1	2	4	
		Chromium	1	3	1	4	1	1	1	1	1	1	
		Tin plate	1	4	4	3	4	1	3	1	1	1	
		Mil-C-5541 chromate Class 1A	4	3	3	3	3	4	3	1	3	3	
		Mil-C-5541 chromate Class 3	3	3	3	3	3	4	3	1	3	3	
	Carbon steels Alloy steels	Nickel electroplate	1	2	1	4	1	1	1	4	4	4	
		Electroless nickel	1	2	1	4	1	1	1	4	4	4	
		Tin	1	4	1	3	3	1	3	1	1	1	
		Lead or lead/tin (solder)	1	3	1	1	1	2	1	1	1	1	
		Bare cadmium plate	3	3	4	3	4	4	4	1	3	3	
		Galvanized zinc	1	4	4	3	5	3	5	1	3	5	
		Clear chromate	1	3	3	3	4	4	4	1	2	3	
		Colored chromate	1	3	3	3	4	4	4	1	3	3	
		Chromium (on copper)	1	4	1	3	1	1	1	1	1	1	
	Stainless steel 200/300/400	None	1	2	1	3	1	1	1	1	2	1	
		Passivated	1	1	1	3	1	1	1	1	1	1	
		Tin	1	4	2	3	1	1	1	1	1	1	
	Nickel, Inconel®, Stainless steel 15-5, 17-4, 17-7	None	2	1	1	3	1	1	1	1	4	1	
		Passivated	1	1	1	3	1	1	1	1	3	2	
		Tin	1	4	1	3	1	1	1	1	1	1	
	Copper alloys	None	1	2	1	3	3	3	3	4	3	2	
		Tin	1	4	1	2	1	1	1	1	1	1	
		Silver	1	4	4	3	4	4	4	1	1	1	
		Gold	1	3	4	3	4	4	4	1	1	1	
		RoHS solder	1	3	1	3	1	2	1	1	2	1	
		Chrome plate	4	2	1	3	1	1	1	1	1	1	
	Titanium alpha, alpha/beta and beta alloys	None (de-oxidized)	1	4	1	3	1	1	1	4	1	2	
		Nickel plate	1	2	1	3	1	1	1	4	3	4	
	Conductive coatings and adhesives	Aluminum filled	3	3	3	3	4	4	4	2	3	2	
		Silver filled	1	4	4	3	4	4	4	4	1	1	
		Zinc filled	X	X	4	3	4	4	4	1	2	X	
Carbon filled		1	2	2	2	3	2	3	3	1	1		

### Legend

- 1: Compatible
- 2: Compatible but should not be exposed to conductive solutions or corrosive atmosphere
- 3: Compatible but needs to be kept dry
- 4: Compatible but needs to be kept dry and room temperature
- 5: Compatible but needs to be protected from moisture, heat and atmospheric oxygen
- X: NOT RECOMMENDED



# OmniShield™ 22-Series



## 22-Series Spring

This finger type spring is ideal for smaller sized applications. Its novel design is best suited for multiple compression and release applications. Another benefit is that the spring is self-cleaning, from sliding action as it is compressed.

The standard materials available for 22-Series springs are:

- > 304 stainless steel
- > Beryllium copper
- > Nickel cobalt

22-Series springs are best installed in a rectangular groove by groove retention, bonding, spot welding, laser spot welding or soldering (if spring is copper alloy, tin or silver plate).

## 22-Series Standard Sized Cross Sections

Custom Sizes Available

Code	Height (±0.05mm)	G <sub>r</sub> (+0.13mm/ -0.00mm)	Spring Height (mm)	Spring Width (mm)
S	0,79	1,40	1,47	1,07
A	1,45	2,39	2,06	1,91
B	2,29	3,58	3,20	2,84
C	3,10	4,78	3,76	3,76
D	4,75	7,14	5,59	5,59
E	6,07	9,53	8,20	7,62
F	3,96	7,24	6,07	4,83

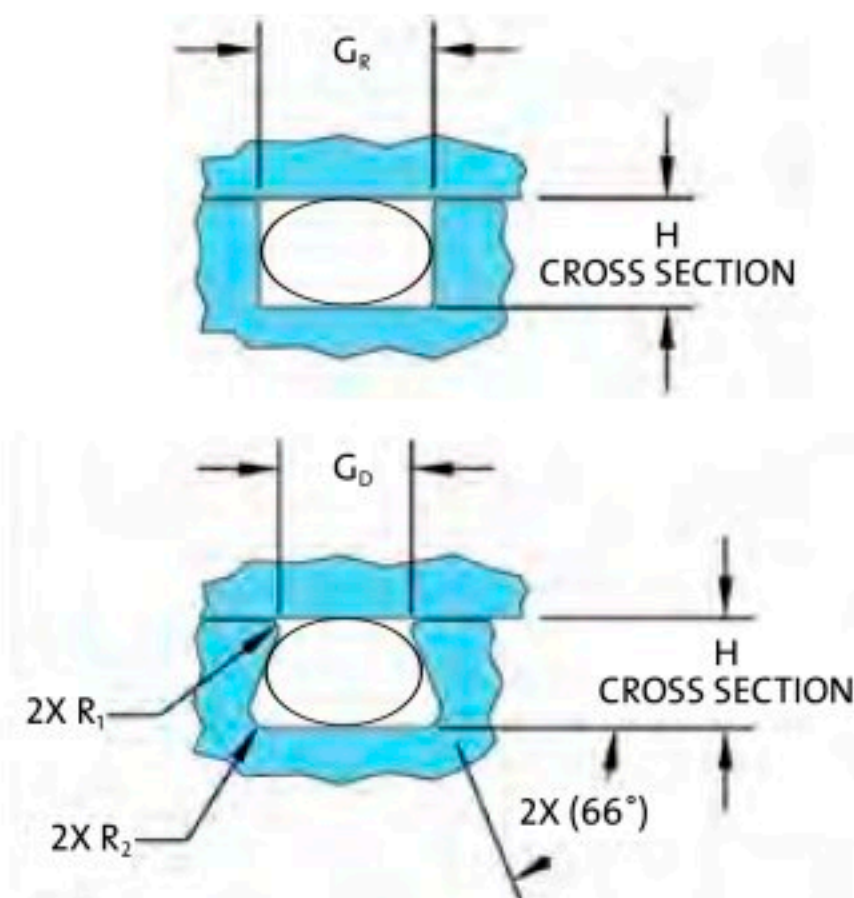
## 22-Series Properties

Spring Material	Force (N/mm)			Shielding Quality* (dB Attenuation)	
	Low	Med.	High	200 MHz	1000 MHz
304 Stainless Steel	0,70	1,23	2,63	119	109
Beryllium Copper	0,53	0,88	1,75	143	135
Nickel Cobalt	0,53	0,88	1,75	116	108

\*Shielding quality averaged across all cross sections in unplated, bare metal.



# OmniShield™ 73-Series



## 73-Series Spring

This wound canted-coil wire spring is the most versatile of the OmniShield™ product line. 73-Series springs are ideal for moderate loads where high spring deflection is necessary. With the cross-sectional deflection exceeding 30%, the spring develops a sliding action when compressed. Additionally, 73-Series springs are self-cleaning in repetitive contact applications and can endure millions of compressions without set or yield.

The standard materials available for 27-Series springs are:

- > 300 series stainless steels
- > Beryllium copper
- > Nickel cobalt

These springs can be compressed for installation into a blind radial groove and are best suited as a retro-fit into grooves with worn, warped or bent mating surfaces.

## 73-Series Standard Sized Cross Sections

Custom Sizes Available

Code	Height (±0.05mm)	G <sub>R</sub> (+0.13mm/ -0.00mm)	G <sub>D</sub> (+0.13mm/ -0.00mm)	Spring Height (mm)	Spring Width (mm)
S	0,79	1,40*	1,02	0,99	1,14
A	1,45	2,39	2,13	1,98	2,29
B	2,29	3,58	3,07	3,00	3,30
C	3,10	4,78	3,99	3,68	4,57
D	4,75	7,14	6,22	6,10	6,86
E	N/A	N/A	N/A	N/A	N/A
F	3,96	7,24	5,97	5,59	6,40

\*+0,08mm

## 73-Series Properties

Spring Material	Force (N/mm)			Shielding Quality* (dB Attenuation)	
	Low	Med.	High	200MHz	1000MHz
302 Stainless Steel	0,53	1,58	4,20	123	114
Beryllium Copper	0,35	0,88	2,45	155	147
Nickel Cobalt	0,53	1,58	4,20	118	108

\*Shielding quality averaged across all cross sections in unplated, bare metal.



# OmniShield™ 09-Series



## 09-Series Standard Sized Cross Sections

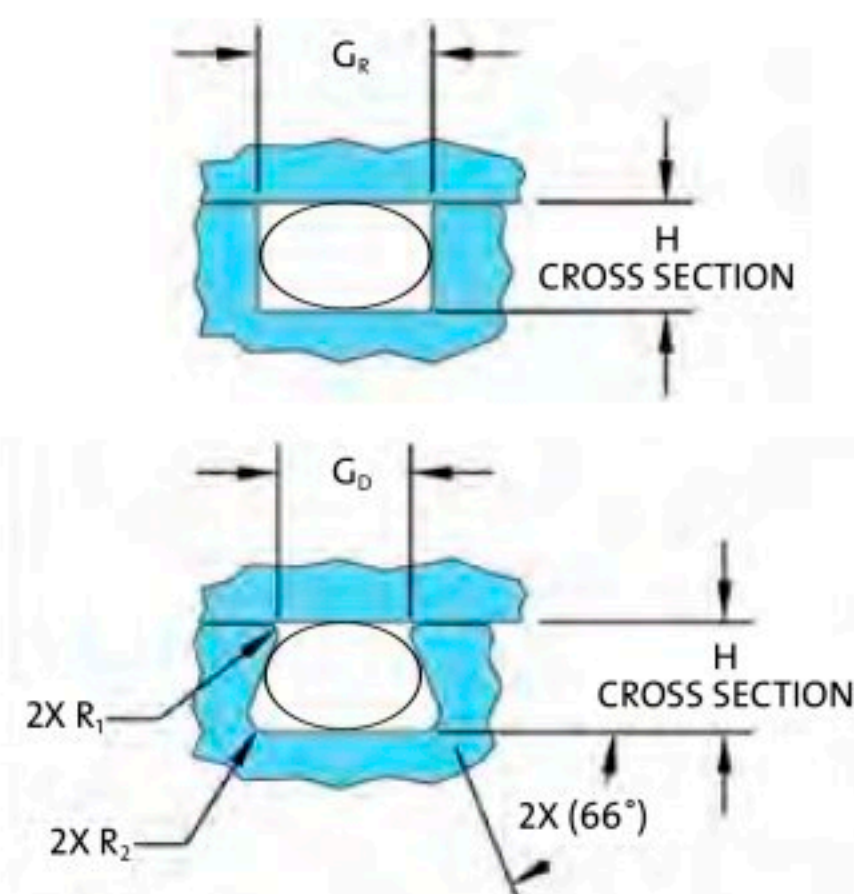
Custom Sizes Available

Code	Height (±0.05mm)	$G_R$ (+0.13mm/ -0.00mm)	$G_D$ (+0.13mm/ -0.00mm)	Spring Diameter (mm)
S	N/A	N/A	N/A	N/A
A	1,45	2,39	1,70	1,80
B	2,29	3,58	2,62	2,79
C	3,10	4,78	3,28	3,68
D	4,75	7,14	5,18	5,72
E	6,07	9,53	6,93	7,62
F	3,96	7,24	4,72	5,08

## 09-Series Properties

Spring Material	Force (N/mm)			Shielding Quality* (dB Attenuation)	
	Low	Med.	High	200MHz	1000MHz
301 Stainless Steel	0,88	2,80	11,38	109	99
Beryllium Copper	1,23	4,20	5,60	146	135
Hastelloy®	0,88	2,80	11,73	107	96

\*Shielding quality averaged across all cross sections in unplated, bare metal.



## 09-Series Spring

The most robust spring in the product line is an overlapping helical spring that can fit the requirements of the most demanding jobs. The unique design is ideal for extremely high load, larger radii applications that require minimal deformation. The 09-Series spring's gapless design allows for effective shielding quality and gasket-like performance.

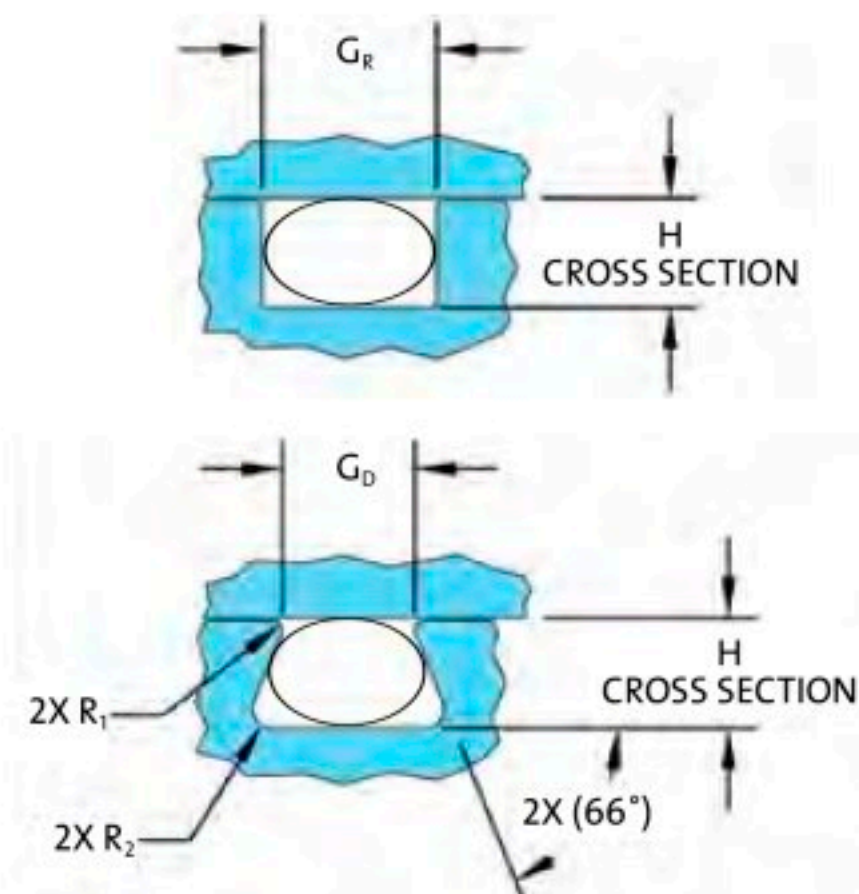
The standard materials available for 09-Series springs are:

- > 301 stainless steel
- > Beryllium copper
- > Hastelloy™ C-276

Countless additional design and material options are available as each spring will be designed per the customer's requirements.



# OmniShield™ 23-Series



## 23-Series Spring

This wound helical spring provides the most value of the entire OmniShield™ product line and is ideal for EMI/RFI shielding in a variety of different applications. The springs are very versatile and can be designed to accommodate loads from 0,2 N/mm to 17 N/mm. These non-sliding, non-wearing springs are best suited for operation on a clean, flat and soft metal.

The standard materials available for 23-Series springs are:

- > 304 stainless steel
- > 17-7 stainless steel
- > Beryllium copper

23-Series springs are best used in a nested groove for radial and face applications. Additionally, the springs can be compressed for installation into blind radial grooves.

## 23-Series Standard Sized Cross Sections

Custom Sizes Available

Code	Height (±0.05mm)	G <sub>R</sub> (+0.13mm/ -0.00mm)	G <sub>D</sub> (+0.13mm/ -0.00mm)	Spring Diameter (mm)
S	0,79	1,40	0,81	0,91
A	1,45	2,39	1,70	1,80
B	2,29	3,58	2,62	2,79
C	3,10	4,78	3,28	3,68
D	4,75	7,14	5,18	5,72
E	6,07	9,53	6,93	7,62
F	3,96	7,24	4,72	5,08

\*+0,08mm

## 23-Series Properties

Spring Material	Force (N/mm)			Shielding Quality* (dB Attenuation)	
	Low	Med.	High	200MHz	1000MHz
304 Stainless Steel	0,35	1,05	4,20	130	122
17-7 Stainless Steel	0,35	1,05	4,20	112	103
Beryllium Copper	0,35	1,23	2,28	153	145

\*Shielding quality averaged across all cross sections in unplated, bare metal.



# Warranty

WARNING: BEFORE USE OR INCORPORATION INTO A FINISHED GOOD, EACH PRODUCT MANUFACTURED OR SOLD BY SAINT-GOBAIN PERFORMANCE PLASTICS CORPORATION (EACH HEREINAFTER REFERRED TO AS A "PRODUCT") MUST BE TESTED AND EVALUATED BY THE END-USER UNDER ACTUAL SERVICE CONDITIONS WITH SUFFICIENT SAFETY FACTORS TO DETERMINE IF SUCH PRODUCT IS SUITABLE FOR THE INTENDED USE. THE END-USER, THROUGH ITS OWN ANALYSIS AND TESTING, IS SOLELY RESPONSIBLE FOR THE SUITABILITY OF THE PRODUCT FOR ITS INTENDED USE AND FOR COMPLIANCE OF THE PRODUCT WITH ALL APPLICABLE PERFORMANCE, SAFETY AND WARNING REQUIREMENTS. THE END-USER ASSUMES ALL RISK AND LIABILITY WHATSOEVER IN CONNECTION WITH THE USE OF THE PRODUCTS IN ANY FINISHED GOOD MANUFACTURED BY END-USER.

FAILURE OF A PRODUCT CAN CAUSE EQUIPMENT FAILURE, PROPERTY DAMAGE, PERSONAL INJURY, AND/OR DEATH. FINISHED GOODS INCORPORATING OR USING A PRODUCT MUST BE DESIGNED WITH SAFETY FEATURES TO PREVENT PROPERTY DAMAGE, PERSONAL INJURY, AND/OR DEATH THAT CAN RESULT IN THE EVENT OF A PARTIAL OR TOTAL FAILURE OF THE PRODUCTS.

Any statements, technical information, and recommendations in this publication are believed to be reliable, but the accuracy or completeness thereof is not guaranteed. The statements, technical information, and recommendations in this publication shall not be the basis of buyer's decision to purchase the Product and should not be relied upon to establish specification limits or as the basis of design. Saint-Gobain Performance Plastics Corporation makes no warranties, express or implied, and assumes no liability in connection with the use of the statements, technical information, and recommendations in this publication. Saint-Gobain Performance Plastics Corporation reserves the right to make any changes without notice to the Products and to the information and contents of this or any other publication, including, without limitation, materials, dimensional attributes, performance characteristics and other properties.

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Saint-Gobain Performance Plastics Corporation warrants that its products do not infringe on any patent, copyright, trade secret or other proprietary right of a third party except to the extent Customer provides the specific design of the products or any part thereof.

IF ANY PRODUCT IS RESOLD BY BUYER, A COPY OF THIS NOTICE MUST BE PROVIDED TO THE SUBSEQUENT PURCHASER/END-USER.



# Terms and Conditions

- 1. Acceptance Of Orders/Terms:** All orders are subject to acceptance by Saint-Gobain Performance Plastics Corporation ("SGPPL") at its Wayne, New Jersey headquarters. SGPPL reserves the right to reject any order. Possession of a price list does not constitute an offer to sell. Acceptance of any order by SGPPL is expressly conditioned on Customer's assent to the terms and conditions set forth herein ("Terms") and the waiver by Customer of any terms and conditions contained in any order form, confirmation, or any other communication of Customer, whether previously or hereafter delivered to SGPPL, which either add to, differ from, modify, conflict with or are otherwise inconsistent with any term or condition herein. SGPPL hereby gives notice of its objection to any additional or different terms or conditions in any such order form, confirmation or communication. Customer's failure to object in writing to these Terms prior to the earlier of Customer's acceptance of the products ordered or fifteen (15) days after delivery thereof to Customer will constitute agreement by Customer to these Terms.
- 2. Product Changes:** SGPPL reserves the right to discontinue the manufacture or sale of any product at any time or to alter, modify or redesign its products.
- 3. Price:** All prices are subject to change without notice. Should any governmental action or request prevent SGPPL from implementing any price or continuing any price already in effect, SGPPL may at its option cancel Customer's order or any part thereof.
- 4. Taxes/Duties:** All federal, state or local sales, use or other taxes, and all duties, import fees or other assessments imposed on materials sold hereunder, or on the manufacture, sale or delivery thereof, shall be for Customer's account.
- 5. Credit Approval:** Customer credit approval is required prior to any shipment. If SGPPL determines at any time that Customer's financial condition does not justify the extension of credit to Customer, then SGPPL may at its option require cash payments in advance or other satisfactory security prior to delivery.
- 6. Cancellation/Change Orders:** Orders for standard products may only be revised or canceled by Customer prior to the date of loading at the place of shipment, and only with SGPPL's prior consent. Orders for nonstandard or custom products may only be revised or canceled by Customer prior to the commencement of production, and only with SGPPL's prior consent. Any product which SGPPL has the capability of producing but does not inventory, or does not have the capability of producing, is considered a nonstandard or custom product.
- 7. Packaging/Shipping/Risk of Loss:** Unless otherwise agreed to by SGPPL in writing (i) SGPPL shall select the method of shipment, (ii) SGPPL shall ship materials FOB (SGPPL's point of shipment), and (iii) costs for special packaging and/or handling requested by Customer shall be the responsibility of Customer. In the event of any general freight increase or any governmental ruling or regulation that results in increased freight costs, such additional costs shall be for Customer's account. Title to, and the risk of loss, damage or shortage of, such materials shall pass to Customer upon delivery to the carrier regardless of notice to Customer. SGPPL assumes no responsibility for insuring shipments unless specifically agreed to in writing by SGPPL, in which case the cost of insurance shall be for Customer's account.
- 8. Delivery:** Quoted shipping and/or delivery dates are based on estimates at the time of quotation. SGPPL shall use reasonable commercial efforts to meet such shipping and/or delivery dates, but SGPPL shall not be liable for any direct or indirect costs or damages, including without limitation incidental or consequential damages, resulting from late deliveries. For orders with indefinite delivery dates, SGPPL shall have the right to manufacture or procure the materials covered thereby and hold such materials for Customer's account pending receipt of definite shipping instructions. Except as expressly provided otherwise herein, Customer agrees to purchase and pay for all material ordered.
- 9. Claims for Loss, Damage or Shortage:** Upon delivery, shipments must be inspected by Customer for damage, loss or shortage prior to acceptance from the carrier. If damage, loss or shortage exists with respect to any shipment and it is not concealed, Customer shall secure a notation of such damage, loss or shortage from the carrier on the freight bill or delivery receipt. If damage, loss or shortage is concealed, Customer must notify the carrier within 15 days, hold the merchandise for its inspection and secure a signed report from the carrier acknowledging the damage, loss or shortage. No claims for damage, loss or shortage will be allowed unless they are accompanied by an inspection report or signed delivery receipt noting such damage, loss or shortage signed by a representative of the carrier and forwarded to SGPPL within 30 days of the invoice date. Any claims for damage, loss or shortage should also be filed by Customer with the carrier in writing immediately upon receipt of the materials. In no event shall SGPPL be liable for damage or loss to a shipment caused by a carrier.
- 10. Payment:** All invoices, whether partial or in full, shall be due and payable in full by Customer net 30 days from the date of shipment unless otherwise agreed to in writing by SGPPL. All past due, unpaid balances will bear a service charge of the lesser of one and one-half percent (1½%) per month or the maximum interest rate permitted by applicable law. If Customer (i) becomes insolvent, files or has filed against it a petition in bankruptcy, makes any assignment for the benefit of creditors, or has a receiver or trustee appointed for it or its property, (ii) takes action to liquidate or otherwise cease doing business as a going concern, (iii) undergoes a change in ownership, (iv) fails to provide adequate assurance or security for credit extended, or (v) takes any other action that SGPPL determines in its sole discretion adversely impacts the conditions under which credit was extended, then all amounts outstanding from Customer hereunder shall at SGPPL's option become immediately due and payable. ALL PAYMENTS, WHETHER UNDER THE STANDARD PAYMENT TERMS OR OTHERWISE, SHALL BE CONSIDERED RECEIVED BY SGPPL AS FOLLOWS: (A) FOR PAYMENTS BY CHECK, WHEN THE CHECK IS RECEIVED AT SGPPL'S DESIGNATED PAYMENT LOCATION, AND (B) FOR PAYMENTS BY ELECTRONIC FUNDS TRANSFER, THE BUSINESS DAY IMMEDIATELY PRECEDING THE DAY ON WHICH THE FUNDS ARE IMMEDIATELY AVAILABLE TO SGPPL. Customer shall pay all undisputed invoices regardless of any dispute that may exist as to other delivered or undelivered goods. With respect to any disputed invoice, Customer shall pay all amounts not in dispute. Customer expressly waives the right to assert any offset or counterclaim with respect to amounts due under any invoice issued by SGPPL hereunder.



# Terms and Conditions

**11. Returned Materials:** Material may only be returned with the prior approval of SGPPL. Material returned without such approval will not be accepted and such approval may be conditioned upon Customer paying a restocking charge of up to 25% and freight costs of returned material (and out-freight if applicable). All returned materials must arrive at the point of return designated by SGPPL in salable condition, as determined by SGPPL's Quality Control Department, before any credit will be issued.

**12. Warranty/Limitation of Liability:** EXCEPT FOR PRODUCTS FOR WHICH SGPPL HAS ESTABLISHED A SPECIFIC WRITTEN WARRANTY, THE GOODS DELIVERED HEREUNDER ARE SOLD BY SGPPL WITHOUT ANY GUARANTY AND/OR WARRANTY, ORAL OR WRITTEN (WHETHER OR NOT SUCH GOODS REMAIN IN THE FORM IN WHICH THEY ARE ORIGINALLY DELIVERED TO CUSTOMER OR ARE FABRICATED BY CUSTOMER OR ANY OTHER PARTY TO PRODUCE A FINISHED PRODUCT). THE PRODUCT-SPECIFIC WRITTEN WARRANTIES REFERENCED ABOVE AND HEREBY INCORPORATED HEREIN ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, ORAL OR WRITTEN, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL SGPPL BE RESPONSIBLE FOR CONSEQUENTIAL, INCIDENTAL, INDIRECT OR SPECIAL DAMAGES OF ANY KIND, INCLUDING, WITHOUT LIMITATION, ANY EXPENSE FOR REMOVAL OR REINSTALLATION RESULTING FROM ANY DEFECT, INCLUDING ANY DIMENSIONAL DEFECT INVOLVING NONSTANDARD PRODUCTS. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, OR OF ANY EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO CUSTOMER. THE WARRANTY PROVIDED BY SGPPL GIVES CUSTOMER SPECIFIC LEGAL RIGHTS, AND CUSTOMER MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION. NO FIELD REPRESENTATIVE, DISTRIBUTOR OR DEALER OF SGPPL IS AUTHORIZED TO MAKE ANY CHANGE OR MODIFICATION TO THESE WARRANTIES.

**13. Remedies For Non-Warranty Claims:** THE SOLE AND EXCLUSIVE REMEDY OF CUSTOMER AND THE SOLE AND EXCLUSIVE OBLIGATION OF SGPPL IN CONNECTION WITH CLAIMS RELATING TO MANUFACTURING DEFECTS ARE SET FORTH IN SECTION 12. THE SOLE AND EXCLUSIVE REMEDY OF CUSTOMER AND THE SOLE AND EXCLUSIVE OBLIGATION OF SGPPL FOR ANY BREACH OF CONTRACT CLAIM THAT MATERIALS DELIVERED DO NOT OTHERWISE CONFORM TO THE ACCEPTED ORDER SHALL BE EITHER THE RETURN OF CONSIDERATION PAID BY CUSTOMER TO SGPPL RELATED TO THE BREACH, OR UPON SGPPL'S ELECTION, THE DELIVERY OF CONFORMING PRODUCTS TO CUSTOMER. WITH RESPECT TO SGPPL'S NONCOMPLIANCE WITH ANY OTHER OBLIGATION OF SGPPL HEREUNDER, THE SOLE AND EXCLUSIVE REMEDY OF CUSTOMER AND THE SOLE AND EXCLUSIVE OBLIGATION OF SGPPL WILL BE AS SGPPL IN ITS DISCRETION WILL DETERMINE AS FOLLOWS: (1) SGPPL MAY ELECT TO CURE SUCH NONCOMPLIANCE WITHIN A REASONABLE PERIOD OF TIME, OR (2) IF SGPPL FAILS TO CURE SUCH NONCOMPLIANCE, CUSTOMER MAY RECOVER AN EQUITABLE AMOUNT NOT TO EXCEED SUCH CHARGES AS WERE PREVIOUSLY PAID TO SGPPL BY CUSTOMER HEREUNDER. CUSTOMER WAIVES ALL OTHER REMEDIES, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, THE REMEDIES OF SPECIFIC PERFORMANCE AND REPLEVIN. ANY ACTION BROUGHT BY CUSTOMER IN CONNECTION WITH SGPPL'S PERFORMANCE HEREUNDER MUST BE COMMENCED WITHIN SIX (6) MONTHS AFTER SUCH CAUSE OF ACTION ACCRUES OR IT WILL BE DEEMED WAIVED. SGPPL'S LIABILITY TO CUSTOMER, REGARDLESS OF WHETHER SUCH LIABILITY ARISES IN CONTRACT, TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE OR STRICT LIABILITY) OR OTHERWISE, SHALL IN NO EVENT EXCEED AMOUNTS PAID BY CUSTOMER TO SGPPL FOR THE PRODUCTS INVOLVED, AND CUSTOMER RELEASES SGPPL FROM ALL CLAIMS AND LIABILITIES IN EXCESS OF THIS LIMITATION. IN NO EVENT SHALL SGPPL BE RESPONSIBLE FOR CONSEQUENTIAL, INCIDENTAL, INDIRECT OR SPECIAL DAMAGES OF ANY KIND.

**14. Excused Performance:** SGPPL shall not be liable for nor be deemed to be in default of these Terms on account of any failure to perform its obligations or attempt to cure any breach thereof if SGPPL has been delayed or prevented from doing so by any cause or condition beyond SGPPL's reasonable control. If SGPPL determines that its ability to supply the total demand for the products, or obtain any or a sufficient quantity of any material used directly or indirectly in the manufacture of the products, is hindered, limited or made impracticable, SGPPL may allocate its available supply of the products or such material (without obligation to require other supplies of any such products or material) among itself and its customers as SGPPL determines in its sole discretion without liability for any failure of performance which may result therefrom. Delivery suspended or not made by reason of this action shall be canceled without liability, but these Terms shall otherwise remain unaffected.

**15. Fair Labor Standards Act:** SGPPL hereby certifies that the materials sold hereunder that were produced in the United States were produced in compliance with all applicable requirements of Sections 6, 7 and 12 of the Fair Labor Standards Act, as amended, and of regulations and orders of the United States Department of Labor issued under Section 14 thereof.

**16. Change In Terms And Conditions Of Sale:** The terms and conditions contained herein constitute the entire agreement between SGPPL and Customer and supersede any and all prior representations, agreements or understandings, whether oral or written, relative to the materials delivered hereunder. No course of dealing or usage of trade shall be relevant to supplement or explain any of these terms or conditions. No modification of these terms and conditions shall be effective unless made in writing and executed by SGPPL.

**17. General:** This agreement shall not be assigned by Customer without the prior written consent of SGPPL, and any assignment made without such consent shall be null and void. This agreement shall inure to the benefit of and be binding upon the parties hereto and their respective successors and permitted assigns. This agreement shall be governed by and construed in accordance with the laws of the State of New Jersey, without giving effect to its conflicts of law provisions. The courts located in New Jersey shall have exclusive jurisdiction of all matters relating to or arising out of any sale of materials by SGPPL to Customer hereunder, and Customer hereby consents to the jurisdiction of such courts.



# Other Products



## OmniSeal® Seals

Saint-Gobain Performance Plastics' proprietary blends of engineered polymers can be coupled with many spring geometries to offer a superior seal that operates in a variety of different applications in a range of industries.



## OmniLip™ Seals

Saint-Gobain Performance Plastics designs and manufactures a complete line of rotary lip seals for high speed and/or high pressure rotary applications.



## OmniGasket®

Spring energized face seal retained in a metal gasket designed to customer specifications. Offers the advantages of a readymade seal groove (saving hardware design and machining cost), and easy changeout of the seals in the field.



## DynaLip® Seals

Provides similar performance to OmniLip™ seals but is more economical in smaller quantities. The soft surface on the OD will not damage the housing and is easily installed and removed. Designed for extreme temperatures.



## OmniShield™ Springs

Capable of handling extreme service conditions while exhibiting excellent EMI/RFI shielding properties. Available in four high-performance spring designs.



## OmniSpring™ Springs

Capable of handling extreme service conditions while exhibiting excellent latching, locking and contact properties. Available in four high-performance spring designs.

## Seals and Springs Manufacturing Worldwide

### Saint-Gobain Performance Plastics High-Performance Seals

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		INJECTION MOLDING	AGRICULTURAL PLASTICS	NORGLIDE® BEARINGS	NORSLIDE®	OMNIFLEX™	OMNILIP™	OMNISEAL®	OMNISHIELD™	OMNISPRING™	MELDIN®	RULON®	RAM EXTRUSION	MACHINED & MOLDED COMPONENTS
<b>EUROPE</b>														
* Saint-Gobain Performance Plastics Pampus GmbH Willich • Germany	Phone: (49) 2154 600 Fax: (49) 2154 60310		•	•								•		•
* Saint-Gobain Performance Plastics N.V. Kontich • Belgium	Phone: (32) 34 58 28 28 Fax: (32) 34 58 26 69				•		•	•	•	•	•	•		•
Saint-Gobain Performance Plastics Agrate Brianza (Mi) • Italy	Phone: (39) 03 96 50 070 Fax: (39) 03 96 52 736		•	•	•		•	•			•	•	•	
* Saint-Gobain Performance Plastics Kolo • Poland	Phone: (48) 063 2617 100 Fax: (48) 063 2720 401						•							
Saint-Gobain Performance Plastics Espana, S.A. Barcelona • Spain	Phone: (34) 93 682 8138 Fax: (34) 93 682 8143		•	•										
* Saint-Gobain Performance Plastics Espana, S.A. Logroño • Spain	Phone: (34) 94 14 86 035 Fax: (34) 94 14 37 095	•						•			•	•		•
<b>NORTH AMERICA</b>														
* Saint-Gobain Performance Plastics Corporation Wayne, New Jersey • USA	Phone: (1) 973-696-4700 Fax: (1) 973-696-4056		•	•										
* Saint-Gobain Performance Plastics Corporation Bristol, Rhode Island • USA	Phone: (1) 401-253-2000 Fax: (1) 401-253-1755	•						•			•	•		•
* Saint-Gobain Performance Plastics Corporation Garden Grove, California • USA	Phone: (1) 714-630-5818 Fax: (1) 714-688-2614				•	•	•		•	•			•	•
* Saint-Gobain Performance Plastics Corporation Saltillo • Mexico	Phone: (52) 844 866 1200 Fax: (52) 844 180 82 13	•									•	•	•	•
<b>SOUTH AMERICA</b>														
* Saint-Gobain Ceramics Industrias Ltda. Vinhedo-SP • Brazil	Phone: (55) 19 3876 8153 Fax: (55) 19 3876 8077	•	•	•	•		•	•			•	•		
<b>ASIA</b>														
* Saint-Gobain KK-Performance Plastics Tokyo • Japan	Phone: (81) 33 26 30 285 Fax: (81) 33 26 30 286		•	•	•		•	•			•	•	•	•
* Saint-Gobain Performance Plastics Korea Co., Ltd. Seoul • South Korea	Phone: (82) 25 08 82 00 Fax: (82) 25 54 15 50		•	•	•		•	•			•	•		•
* Saint-Gobain Performance Plastics Shanghai Co., Ltd. Shanghai • China	Phone: (86) 21 54 72 15 68 Fax: (86) 21 54 72 60 35	•	•	•	•		•	•	•	•	•	•	•	•
* Saint-Gobain Advanced Materials (Taiwan) Co., Ltd. Taipei • Taiwan	Phone: (886) 22 50 34 201 Fax: (886) 22 50 34 202		•	•	•		•	•			•	•		•
* Grindwell Norton Ltd. Bangalore • India	Phone: (91) 80 847 2900 Fax: (91) 80 847 2905		•	•	•		•	•			•	•		
Saint-Gobain Performance Plastics Johor • Malaysia	Phone: (60) 7 2686022 Fax: (60) 7 2686027		•	•	•		•	•						
* Saint-Gobain Advanced Materials (M) Sdn.Bhd Selangor Darul Ehsan • Malaysia	Phone: (60) 37 36 40 82/81 Fax: (60) 37 36 40 99		•	•	•		•	•			•	•		

\* Manufacturing Facilities

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