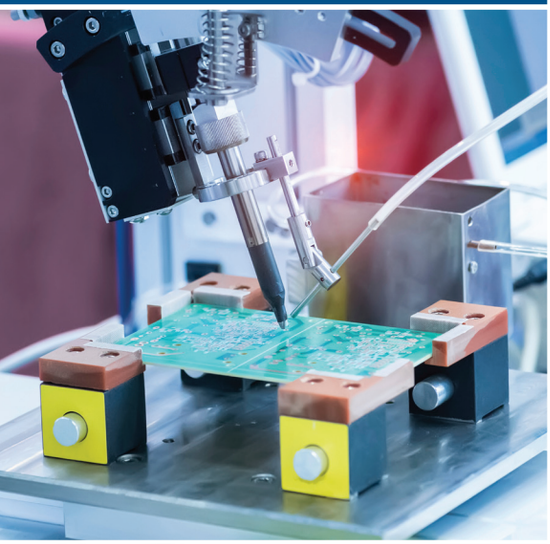
SYSTEMS™
PROTECTION

Energy, Industrial and Transport

Protection Products



Leading the Future Through Innovative Technologies

BentleyHarris®
Protection Products

About Systems Protection

Systems Protection (SP) is the world's foremost supplier of protective sleeving and shielding solutions for wires, hoses, and mechanical assemblies. Major industries served include automotive and aerospace, as well as the Energy, Industrial, and Transport (EIT) markets. With sales, manufacturing, and innovation centers located in the Americas, Europe and Asia, SP delivers the broadest, most innovative product portfolio to both original equipment and tier suppliers. SP is the proud manufacturer of Bentley-Harris® protection products.

1924	1998	2018	2024
BentleyHarris® Protection Products	FEDERAL MOGUL Systems Protection	TENNECO SYSTEMS PROTECTION	SYSTEMS™ PROTECTION

About Tenneco

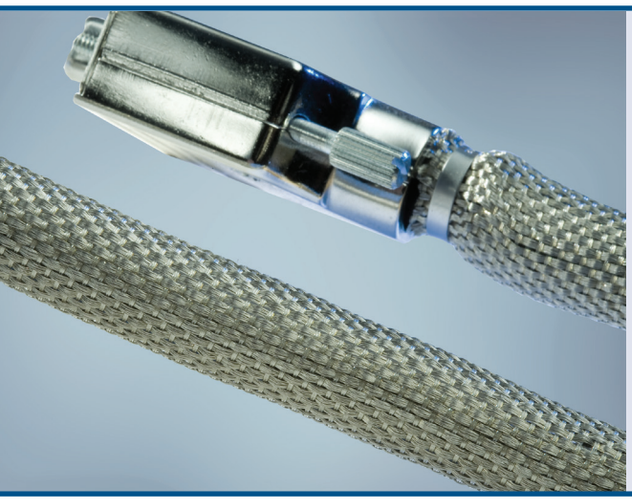
Formed from the combination of Tenneco Clean Air and Federal-Mogul Powertrain, the new Tenneco will bring together more than a century of innovation to serve the automotive, light, medium and heavy-duty commercial, marine, rail, aerospace, power generation and industrial markets worldwide. By building more efficient, more powerful and more sophisticated powertrain systems, Tenneco's engineered solutions improve fuel economy and power and electrified powertrains.

Certifications

Systems Protection is committed to providing the highest quality systems for our customers, employees, and environment and continues to follow the rigorous requirements needed to maintain several industry certifications.
We are proud to confirm the following certifications:

- ISO 9001, IATF 16949, AS/EN 9100: Quality Management Systems
- ISO14001: Environmental Management Systems
- ISO 45001: Occupational Health and Safety Management Systems

RoHS COMPLIANT
AS 9100 EN 9100
ISO
REACH COMPLIANT



Our Mission

As the market leader, our mission is to serve our customers and deliver value through continual improvement in our products and processes by focusing on:

- Innovative Product Solutions
- Superior Engineering and Technical Support
- Outstanding Customer Service
- Manufacturing Excellence
- Global Presence

Focus on Energy, Industrial & Transport

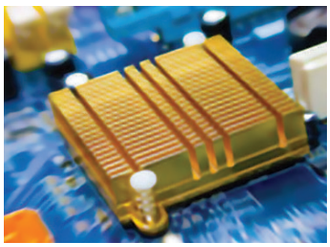
Systems Protection offers a comprehensive line of bundling and component protection solutions for the Energy, Industrial and Transport (EIT) Markets. Our wide range of products include sleeving and shielding to protect against abrasion, radiant and convective heat, and electromagnetic interference. We are focused on serving the diverse needs of our customers in a variety of EIT markets, including:

Railway

Our full line of products designed for the railway industry have been extensively tested to the various regional requirements of our railway customers, and can be used to protect wire harnesses and cable assemblies in several areas of a railway car including in cabin, in chassis, under carriage, and within electrical cabinets. Applications include high speed trains, monorails, rolling stock, and light rail.

Off-Road

With applications ranging from construction and agricultural equipment to ATVs and snowmobiles, Tenneco's Off-Road product line addresses a number of thermal and abrasion issues caused by the harsh environments these types of vehicles are exposed to. From dirt and moisture to salt spray and vibration caused by rough terrain, our Off-Road product line withstands the toughest conditions.



Electronics

SP's Electronics product line includes a number of UL Recognized Components, including the popular Expando® brand of sleeving. Used primarily for the mechanical and EMI protection of wire harnesses, these products cover a wide range of applications from consumer electronics to telecommunications equipment to power supplies.

Industrial

Utilizing products designed to meet the most challenging temperature environments, SP's Industrial product line includes the well-known FyreJacket® sleeving product as well as sleeves constructed from unique materials such as ceramic and silica fibers. This product line covers a diverse set of customer needs, with applications ranging from industrial steel mills to mining equipment to oil drilling.

Focused on reducing the effects of mechanical wear, impact damage, and thermal degradation, SP can help to extend component life and reduce service cost. Additionally, complementary product families target thermal insulation, reduction of electromagnetic interference, and noise attenuation, as well as bundling and routing control, to ensure that systems operate at optimum levels and deliver the ideal user experience.

ABRASION/ MECHANICAL

IMPACT RESISTANCE/ CRASH

THERMAL REFLECTIVE & CONTAINMENT

ELECTROMAGNETIC INTERFERENCE

NOISE / VIBRATION & HARSHNESS

ELECTRICAL INSULATION

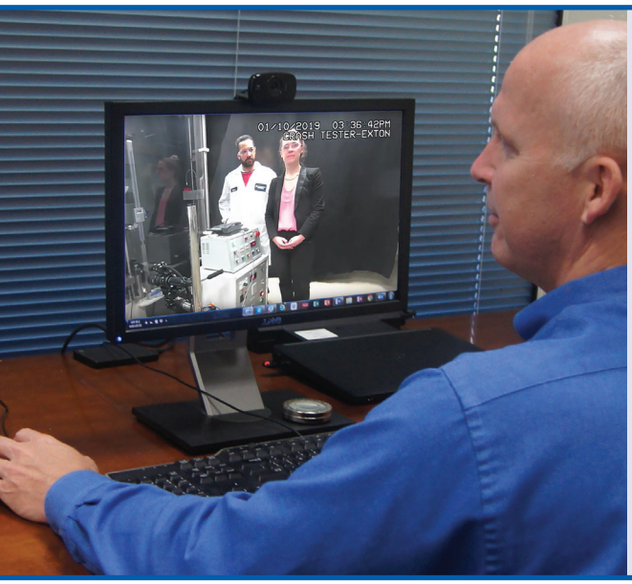
WIRE BUNDLING

Testing Capabilities & Virtual Lab

Systems Protection (TSP) is committed to providing our customers with outstanding technical support in all stages of the product application process.

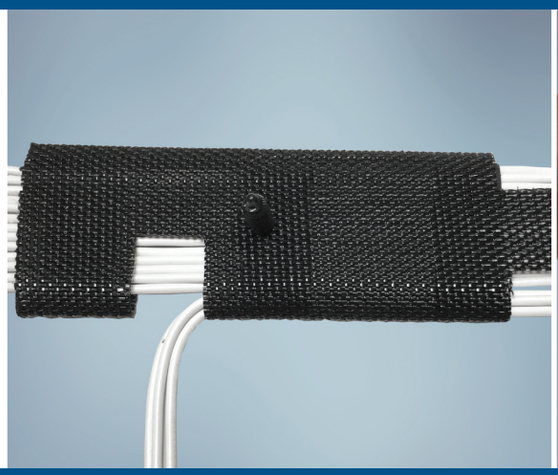
From material selection and product development through qualification and application specific testing, our world-class technology centers utilize state-of-the art test equipment to simulate real-life conditions and evaluate the full breadth of our product performance. Our testing capabilities are continually expanding to support our customer's needs and provide evaluation for the following:

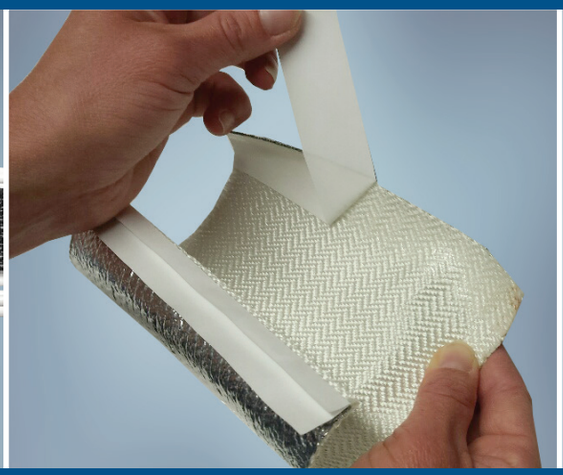
- **Acoustical:** sound damping and absorption
- **Crash / Impact:** custom crash scenario simulation, dynamic cut-through, and drop energy
- **EMI (Electromagnetic Interference):** transfer impedance, shielding effectiveness and electrical resistance
- **Environmental:** flammability, smoke density, toxicity, fluids exposure, durability, fogging, stone impingements, salt spray, and humidity
- **Material Analysis:** melting point, specific heat, infrared spectroscopy (FTIR), emissivity, thermal conductivity.
- **Mechanical:** abrasion resistance, tensile strength, elongation, tear strength, vibration resistance, peel strength, flexural strength
- **Thermal:** Thermal effectiveness, and thermal containment / insulation



Virtual Lab

As a value to our customers, SP has created and utilizes a virtual environment to allow design release engineers remote access to our labs to observe live testing and consult with testing staff. This no cost service allows our customers to better understand test methods and set up especially in the event that a relevant test method does not exist. Our teams work to develop new test methods that accurately quantify product performance and can demonstrate in real time for customer approval.





New Product Design & Customization

Systems Protection (SP) takes pride in being a solution provider and partner to our customers by working to deliver the right solution for each application.

We recognize that not every problem can be solved with a single product. By listening to our customers, we gain a better understanding of current industry challenges and are committed to developing new products to meet these demands in the ever-changing marketplace.

SP is continually evolving its product portfolio by drawing from a broad range of capabilities and expertise. Utilizing a variety of different materials, constructions, processes, and design features, we create new innovative products to meet needs for performance, survivability, and installation. Through collaboration with our customers, innovative ideas, and quick prototype fabrication, we deliver the optimal solution for each application.

Materials

Utilizing an extensive materials portfolio and the latest advancements in technology, SP strategically selects and blends unique fibers, coatings, adhesives, and other materials to create cost effective multifunctional designs capable of surviving in extreme conditions while providing varying levels of performance. SP strives to do its part in meeting environmental and eco-friendly initiatives including RoHS and REACH compliance by selecting appropriate materials.

Processes

With our textile foundation encompassing weaving, braiding, knitting and non-woven processes, SP prides itself in utilizing the best textile process for each application. Through variable construction attributes within each textile process, a balance of different metrics including technical performance, durability, install ability, expandability, and use ability can be met.

Adding Value

SP looks to add value to our textiles and products through the incorporation of secondary processes, design features and customization in order to enhance performance and functionality. Lamination and coatings allow designers to add secondary materials to the textile to meet tougher requirements and provide multi-functionality. Custom cutting, notching and forming provide superior fit and aesthetics. The incorporation of adhesive strips, snaps, and custom attachments deliver quick and repeatable installation.

Please contact us to discuss your unique requirements so that we can help to develop the best solution for your application.

Abrasion/Mechanical Protection

Product	Product Description	Temperature
 **Expando® PT Plus**	Highly expandable braid (1:3) with strong mechanical protection; treated to prevent end-fray; available in a variety of colors for identification	-70°C to +125°C (-94°F to +257°F)
 **Expando® FR Plus**	Highly expandable braid (1:3) with strong mechanical protection and outstanding flame resistance; treated to prevent end-fray	-70°C to +125°C (-94°F to +257°F)
 **ROUNDIT® 2000**	Self-wrapping sleeve with strong mechanical protection; quick and easy installation on cables. A version supplied with an adhesive allows to locate the protection on the application and insure closure.	-70°C to +125°C (-94°F to +257°F)
 **Expando® DM**	Expandable braid (1:2) with high mechanical protection; ideal protection from cut-through	-70°C to +125°C (-94°F to +257°F)
 **ProGard® / ProGard® Wrap**	Tubular woven sleeve with outstanding mechanical protection; ideal for hydraulic hose protection	-20°C to +125°C (-4°F to +257°F)
 **CrushShield®**	A self-wrapping sleeve designed to provide superior cut-through protection for electrical cables.	-50 C to +150°C (-58 F to +302°F)
 **ROUNDIT® 2000 FR**	Self-wrapping sleeve with good mechanical protection; soft to the cable structure	-50°C to +150°C (-58°F to +302°F)
 **ROUNDIT® 2000 V0**	Self-wrapping sleeve with high mechanical protection; ideal flame resistance with low toxicity and smoke emission	-50°C to +150°C (-58°F to +302°F)
 **FlattenIt™**	Advanced textile structure engineered to facilitate the installation of round wire bundles into tight or confined spaces, maintaining a flat, low profile	Up to +125°C (+257°F)"
 **Hookit™**	Lightweight, abrasion resistant sleeve utilizing a hook and integral loop closing feature which allows for quick and easy access for inspection or repair of wire harnesses	-70°C to +125°C (-94°F to +257°F)
 **Expando® TCP V0**	Expandable braid (1:2) with strong mechanical protection; with low toxicity and smoke emission	-50°C to +150°C (-58°F to +302°F)
 **Self-Amalgamating Tapes**	Supplied in both supported and unsupported versions, self-amalgamating silicone tapes provide good fluid resistance and are ideal for sealing, connecting and finishing cut ends.	-55°C to +260°C (-67°F to +500°F)
 **Expando® HR Plus**	Highly expandable braid (1:3) with good mechanical protection and outstanding chemical resistance; treated to prevent end-fray	-70°C to +150°C (-94°F to +302°F)
 **ROUNDIT® PPS**	Self-wrapping sleeve with good mechanical protection; ideal for mechanical protection of shielding metal in swamp areas	-60°C to +175°C (-76°F to +347°F)
 **Expando® 686 DM**	Expandable braid (1:2) with outstanding mechanical protection; ideal solution for high temperature mechanical performance	-70°C to +200°C (-94°F to +392°F)
 **Expando® HTNS-L/HO**	Expandable braid (1:2) with strong mechanical protection; oil and water repellent treated sleeve with the additional benefit of being soft to the cable structure	-60°C to +240°C (-76°F to +464°F)
 **ROUNDIT® 2000 NX / NX HT**	Self-wrapping sleeve with high mechanical protection; ideal solution for high temperature mechanical performance	-60°C to +260°C (-76°F to +500°F)

Nomex is a registered trademark of DuPont

Flammability	Halogen Free	Design	UL Recognized	Construction	Available Sizes	Markets Served
	✓	Tubular	✓	**Material:** Polyester **Color:** Natural, Black, Yellow, Blue, Gray, Orange	3 to 64 mm (1/8" to 2-1/2")	• Electronics
UL 1441 VW-1 FAR Part 25		Tubular	✓	**Material:** Flame retardant polyester **Colors:** Black with white tracer; White with black tracer	3 to 64 mm (1/8" to 2-1/2")	• Electronics
FMVSS-302 Test Method D45 1333 Self-extinguishing Type B	✓	Wrappable	✓	**Material:** Polyester **Color:** Black, white, orange and blue	5 to 62 mm (3/16" to 2-3/8")	• Electronics
	✓	Tubular	✓	**Material:** Nylon and polyester **Color:** Black	3 to 51mm (1/8" to 2")	• Industrial / Heavy Duty
	✓	Tubular or Wrappable		**Material:** Nylon **Color:** Black	19 to 70 mm (3/4" to 2-3/4")	• Industrial / Heavy Duty
SAE J369: Self-extinguishing	✓	Wrappable		**Material:** Polyester **Color:** Black or Orange	7 to 38mm (9/32" - 1 1/2")	• Industrial / Heavy Duty • Electronics
EN45545-2: R22: HL3 R23: HL3 NFPA 130: ASTM E-162 and ASTM E-662	✓	Wrappable		**Material:** Flame-retardant polyester **Color:** Black	5 to 50 mm (3/16" to 2")	• Railway
EN 45545-2 R22: HL3 R23: HL3 NFPA 130: ASTM E-662 and ASTM E-162	✓	Wrappable		**Material:** UL 94 V0 Polyester **Color:** Black	5 to 50 mm (3/16" to 2")	• Railway
SE per SAE J369	✓	Flat Wrappable		**Material:** Polyester **Color:** Black	30 mm to 75 mm (1 1/8"" to 3")	• Electronics
SE per SAE J369	✓	Wrappable	✓	**Material:** Polyester **Color:** Black	13 mm to 51 mm (1/2"" to 2")	• Electronics
EN45545-2: R22: HL3 R23: HL3 NFPA 130: ASTM E-162 and ASTM E-662	✓	Tubular		**Material:** UL 94 V0 Polyester **Colors:** Black with gray tracer; Gray with a black tracer	3 to 50 mm (3/16" to 2")	• Railway
FAR Part 25 § 853 & ABD 031 NF 16101 - 16102: I4 F1	✓	Flat Wrappable		**Material:** Unsupported or supported with fiberglass silicone tapes **Color:** Black and red	13 to 50 mm (1/2" to 2")	• Aerospace • Railway
UL 1441 VW-1 FAR Part 25		Tubular	✓	**Material:** Halar **Color:** Black with a white tracer; White with a black tracer	3 to 64 mm (1/8" to 2-1/2")	• Aerospace
FAR Part 25	✓	Wrappable		**Material:** PPS **Color:** Black	5 to 38 mm (3/16" to 1-1/2")	• Aerospace
UL 1441 VW-1 FAR Part 25	✓	Tubular		**Material:** PEEK & PPS **Color:** Black, Natural	3 to 64 mm (1/8" to 2-1/2")	• Aerospace
FAR Part 25	✓	Tubular		**Material:** Nomex® **Color:** Camouflage green, ivory, red, orange and grey	2 to 30 mm (5/64" to 1-3/16")	• Aerospace
FAR Part 25	✓	Wrappable		**Material:** Nomex® and PPS or PEEK **Color:** Camouflage green, Orange, Red	5 to 40 mm (3/16" to 1-5/8")	• Aerospace

Thermal Containment Solutions

Product	Product Description	Temperature
 **Industrial FyreJacket®**	Silicone-coated sleeve with good resistance to high temperatures; provides excellent protection against high temperatures, fire, and molten splashes	-54°C to +260°C (-65°F to +500°F)
 **ThermoJacket® R**	Extremely flexible braided sleeve with excellent resistance to elevated temperatures used as long-term heat protection for hoses, wire harnesses, and cables; its use of uncoated fiberglass results in low friction surfaces both inside and outside the sleeve	Up to +540°C (+1000°F)
 **ThermoJacket® S**	High temperature fiberglass braid impregnated with an anti-fray treatment for ease of handling and installation; ideal for use in certain railway applications based on its resistance to flammability, smoke density, and toxicity according to railway flammability standard EN 45545-2: R22: HL3 R23: HL3	-50°C to +240°C (-58°F to +464°F)
 **ThermoJacket® T**	Constructed of braided high bulk fiberglass yarns, Thermojacket T provides an increased wall thickness and improved thermal performances over standard Thermojacket R and S products.	Up to +538°C (Up to +1000°F)
 **ThermoJacket® C**	Nextel braided sleeve with outstanding resistance to high temperatures; used as a long-term heat protection	Up to +1200°C (Up to +2200°F)
 **ThermoJacket® P**	Unsaturated bulky knit constructed of high-temperature fiberglass yarn which withstand up to +760°C. Cost effective solution for high temperature applications.	Up to +760°C (Up to +1400°F)
 **GES 40 / 100**	Coated braided sleeve with dielectric resistance to 4kV or 10kV provides effective grounding of metal braid; resistant to salt and other harsh environments	-60°C to +220°C (-76°F to +428°F)
 **Aerospace FyreJacket®**	Silicone-coated sleeve with outstanding fire protection for 15 minutes at +1100°C and for 30 minutes at +800°C; provides excellent protection against high temperatures, fire, and molten splashes. Thermotubix Aerospace is also designed to operate in railway environments and conforms to international flammability, toxicty and smoke density standard EN 45545-2: R22: HL3 R23: HL3; NFPA 130: ASTM E-162-ASTM E-662.	-54°C to +260°C (-65°F to +500°F) 15 min at 1100°C (2012°F)
 **FyreTape®**	Silicone-coated tape with good fire protection; easy to install on big pipes; may be used to replace or compliment FyreJacket®	-54°C to +260°C (-65°F to +500°F)
 **ThermoJacket® E**	Knitted sleeve with excellent resistance to high temperatures; good thermal containment performance	Up to +650°C (Up to +1202°F)
 **ROUNDIT® Therm A**	Self-wrappable sleeve with 3 layers for fire protection for 5 minutes at +1100°C; excellent cut-through and abrasion resistance.	-60°C to +260°C (-76°F to +500°C) 5 min at +1100°C (2012°F)
 **ROUNDIT® Therm B**	Self-wrappable sleeve with 2 layers with outstanding fire protection; excellent cut-through and abrasion resistance	-60°C to +260°C (-76°F to +500°C) 15 min at 1100°C (2012°F)
 **ROUNDIT® Therm C**	Self-wrapping silica woven sleeve coated with an intumescent coating designed to provide fire protection of wire harnesses	-50°C to +150°C (-58°F to +302°F)
 **TST**	Silica braided sleeve with outstanding resistance to high temperatures; used for long-term heat protection in extreme environments	-60°C to +950°C (-76°F to +1742°F)
 **TSX**	Silica braided sleeve impregnated with an anti-fray treatment which also reduces skin irritation when cut; used for long-term heat protection in extreme environments	-60°C to +950°C (-76°F to +1742°F)

Nomex is a registered trademark of DuPont

Type of Heat Protection	Halogen Free	Design	Construction	Available Sizes	Markets Served
Convective	✓	Tubular	**Material:** Fiberglass and silicone **Color:** Reddish-brown	8 to 101 mm (5/16″ to 4″)	• Industrial / Heavy Duty • Off Road
Convective	✓	Tubular	**Material:** Fiberglass **Color:** Natural	6 to 102 mm (1/4″ to 4″)	• Industrial / Heavy Duty
Convective	✓	Tubular	**Material:** Fiberglass **Color:** Natural	6 to 102 mm (1/4″ to 4″)	• Industrial / Heavy Duty • Railway
Convective	✓	Tubular	**Material:** Fiberglass **Color:** Natural	13 to 76 mm (1/2″ to 3″)	• Industrial / Heavy Duty
Convective	✓	Tubular	**Material:** Nextel® 312 **Color:** Natural	5 to 64 mm (1/4″ to 2-1/2″)	• Aerospace • Industrial / Heavy Duty
Convective	✓	Tubular	**Material:** Fiberglass **Color:** Natural	13 to 51 mm (1/2″ to 2″)	• Industrial / Heavy Duty
Conductive	✓	Tubular	**Material:** Silicone rubber and fiberglass **Color:** Reddish-brown, black	0.5 to 32 mm (1/32″ to 1-1/4″)	• Railway
Fire-proof	✓	Tubular	**Material:** Fiberglass and silicone **Color:** Reddish-brown, black, aluminum	8 to 101 mm (5/16″ to 4″)	• Aerospace • Railway
Conductive	✓	Flat Wrappable	**Material:** Fiberglass and silicone **Color:** Reddish- brown, aluminum	25 to 152 mm (1″ to 6″)	• Railway
Convective	✓	Tubular	**Material:** Basalt **Color:** Brown	51 to 140 mm (2″ to 5-1/2″)	• Off Road
Flame-resistant	✓	Wrappable	**Material:** Nomex® and PEEK with panox and silica **Color:** Olive green	10 to 32 mm (3/8″ to 1-1/4″)	• Aerospace
Fire-proof	✓	Wrappable	**Material:** Nomex® and PEEK with fiberglass and silicone **Color:** Olive green	10 to 32 mm (3/8″ to 1-1/4″)	• Aerospace
Fire-protection	✓	Wrappable	**Material:** Silica and intumescent **Color:** Natural	5 to 32 mm (3/16″ to 1-1/4″)	• Aerospace
Conductive	✓	Tubular	**Material:** Silica **Color:** Natural	0.5 to 35 mm (1/32″ to 1-13/32″)	• Aerospace • Industrial / Heavy Duty
Conductive	✓	Tubular	**Material:** Silica **Color:** Natural	0.5 to 35 mm (1/32″ to 1-13/32″)	• Aerospace • Industrial / Heavy Duty

Thermal Radiant Solutions

Product	Product Description	Temperature
 **Therm-L-Wrap™**	Self-wrappable sleeve with an adhesive closure offers excellent radiant heat protection; provides component protection in high temperature areas	-40°C to +200°C (-40°F to +392°F)
 **ReflectSleeve® / Therm-L-Lite®**	Tubular sleeve with excellent radiant heat protection; provides component protection in high temperature areas	-50°C to +220°C (-58°F to +428°F)
 **Convoshield®**	Corrugated sleeve with good resistance to high temperatures; provides component protection in high temperature areas	-40°C to +150°C (-40°F to +302°F)
 **Therm-L-Gard® A**	Customizable, self-locating peel and stick 2D design using a pressure sensitive adhesive to adhere to flat or contoured surfaces.	-40°C to +200°C (-40°F to +392°F)
 **Therm-L-Gard® V**	Multi-layer reflective sleeve which maintains a round profile for creation of an air gap for increased thermal insulation. Available with a four or eight tine end cap engineered to accommodate a range of convolute sizes.	Up to +175C (+347F)
 **Therm-L-Gard® S**	Flexible, aluminized wrappable sleeve designed to protect components in high temperature areas. The dual layer allows for radiant heat protection from the reflective outer layer with enhanced thermal insulation from the inner layer. Reversible snaps allow the product to be installed after component assembly.	Up to +232C (+450F)
 **Therm-L-Gard® B and B HT**	Therm-L-Gard B is an engineered solution designed to protect sensors and connectors in radiant heat environments.The product can be pushed back out of the way and after connections are made, the elastic nature of the sleeve allows it to return to its original position.	Up to +150°C or +200°C (Up to +302°F or +392°F)

Flexible Corrugated Solutions

Product	Product Description	Temperature
 **Clevaflex® A-A**	Clevaflex® is a flexible, convoluted, multi-ply sleeve designed to provide an excellent level of thermal protection. Various unique constructions deliver a range of performance solutions designed to balance flexibility and durability. The products are available in slit or unslit versions aiding in installation. Customizable (Notches, holes, end caps, etc.)	Up to +400°C (Up to +752°F)
 **Clevaflex® AFS-F-AFS**		Up to +400°C (Up to +752°F)
 **Clevaflex® F-A**		Up to +400°C (Up to +752°F)
 **Clevaflex® F-A2**		Up to +400°C (Up to +752°F)

Type of Heat Protection	Halogen Free	Design	Construction	Available Sizes	Markets Served
Radiant	✓	Wrappable	**Material:** Aluminum with fiberglass **Color:** Aluminum	10 to 25 mm (3/8" to 1")	• Electronics • Off Road
Radiant	✓	Tubular	**Material:** Aluminum with fiberglass **Color:** Aluminum	10 to 51 mm (3/8" to 1-1/2")	• Electronics • Off Road
Radiant	✓	Tubular or slit (wrappable)	**Material:** Nylon **Color:** Aluminum	6 to 25 mm (1/4" to 1")	• Electronics • Off Road
Radiant	✓	Application Specific	**Material:** Aluminum laminate and fiberglass fabric **Color:** Aluminum	Custom parts can be slit to width and length, or die cut into complex geometric shapes	• Off Road
Radiant	✓	Application Specific	**Material:** Aluminum fiberglass and polyester **Color:** Aluminum	25 to 38 mm (1" to 2")	• Off Road • Industrial / Heavy Duty
Radiant	✓	Application Specific	**Material:** Aluminum laminate and fiberglass fabric **Color:** Aluminum	10 to 50 mm (3/8" to 2")	• Off Road • Industrial / Heavy Duty
Radiant	✓	Application Specific	**Material:** Fiberglass, aluminum and polyester or PPS monofilaments **Color:** Aluminum and black	Customized to application	• Railway

Type of Heat Protection	Halogen Free	Design	Construction	Available Sizes	Markets Served
Radiant & thermal containment/insulation	✓	Tubular or slit (wrappable)	**Material:** Aluminum	13 to 90 mm (1/2" to 3-1/2")	• Off Road • Industrial / Heavy Duty
Radiant	✓	Tubular or slit (wrappable)	**Material:** Aluminum fiberglass scrim layers and fiberglass multifilaments	13 to 51 mm (1/2" to 2")	• Off Road • Industrial / Heavy Duty
Radiant	✓	Tubular or slit (wrappable)	**Material:** Aluminum and fiberglass multifilaments	13 to 114 mm (1/2" to 4-1/2")	• Off Road • Industrial / Heavy Duty
Radiant	✓	Tubular or slit (wrappable)	**Material:** Aluminum and fiberglass multifilaments	13 to 32 mm (1/2" to 1-1/4")	• Off Road • Industrial / Heavy Duty

Electromagnetic Interference Solutions

Product	Product Description	Temperature
 **ROUNDIT® 2000 Cu EMI**	Tough self-wrapping solution; flexible and easy to install offering a combination of EMI shielding and abrasion resistance for long term protection	-60°C to +150°C (-76°F to +257°F)
 **ROUNDIT® V0 EMI**	Self-wrapping metal solution; flexible and easy to install providing high performance EMI shielding	-65°C to +200°C (-85°F to +392°F)
 **ROUNDIT® V0 EMI CuSN**	Self-wrapping metal solution; flexible and easy to install providing high performance EMI shielding	-40°C to +125°C (-40°F to +257°F)
 **ROUNDIT® EMI FMJ**	Self-wrapping metal solution with 95% optical coverage; flexible and easy to install providing very high performance EMI shielding	-65°C to +200°C (-85°F to +392°F)
 **ROUNDIT® 2000 NX EMI**	Self-wrapping multi-layer solution providing mechanical protection and very high performance EMI shielding; can also be delivered with an inner layer of PTFE for protection of the cables against abrasion from the metal layer	-55°C to +200°C (-65°F to + 392°F)
 **ROUNDIT® 2000 S EMI**	Self-wrapping, corrosion resistant solution providing EMI shielding for extreme environments such as marine applications	-70°C to +150°C (-94°F to +302°F)

Nomex is a registered trademark of DuPont

EMI Highlights

Electromagnetic Interference (EMI) can cause adverse effects on electronic components and equipment leading to operational malfunctions. Proper shielding and grounding of electromagnetic sensitive components can effectively eliminate this occurrence. Our EMI shielding products, constructed from materials including nickel-plated copper, tin-plated copper and stainless steel, Nomex®, PPS and polyester, provide excellent shielding properties with the added benefit of abrasion or thermal protection.

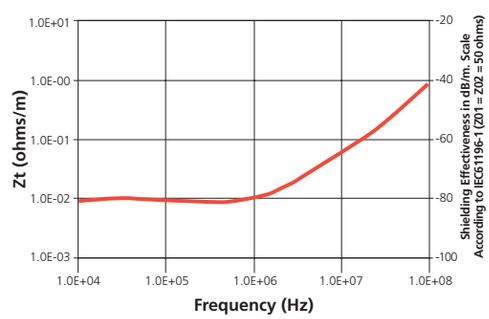
Services Provided to the Customer

Mock-up Service: We offer a unique service that provides you with the most appropriate solution in terms of shielding efficiency and installation. Using your harness, our engineers analyze your shielding needs. We define the specific products, accessories and related grounding solutions for your application as well as provide an installation guide to ensure the best solution to your EMI challenges.

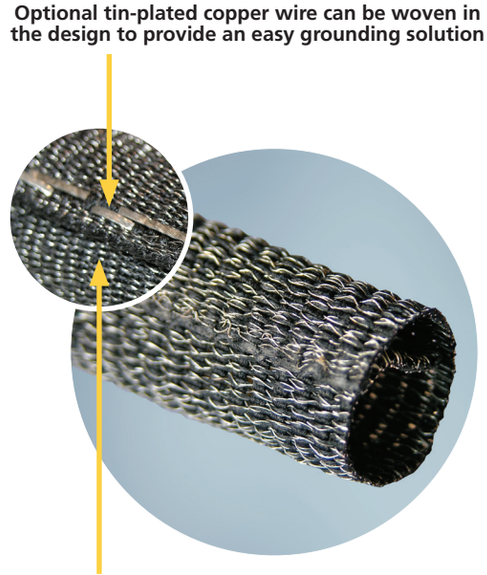
Customized Test Reporting: Our state-of-the-art test laboratory is available to evaluate your current or future wire harness shielding solutions. A detailed test report can be generated for your specific harness configuration, allowing you to benchmark various application concepts. Working together, we can help fine-tune the appropriate solution to meet your needs.

ROUNDIT® 2000 Cu EMI

Transfer Impedance Measurement (Size 13)



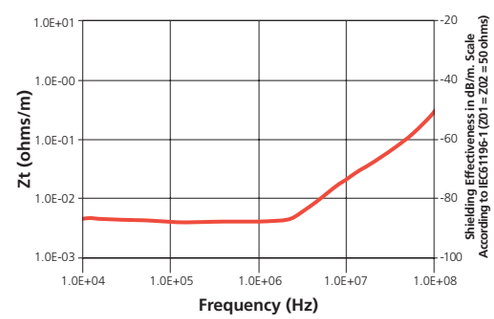
Optional tin-plated copper wire can be woven in the design to provide an easy grounding solution



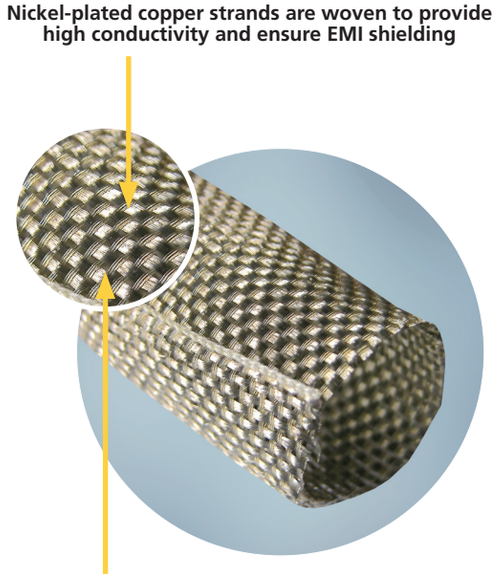
Polyester multifilament to provide abrasion resistance

ROUNDIT® V0 EMI

Transfer Impedance Measurement (Size 13)



Nickel-plated copper strands are woven to provide high conductivity and ensure EMI shielding

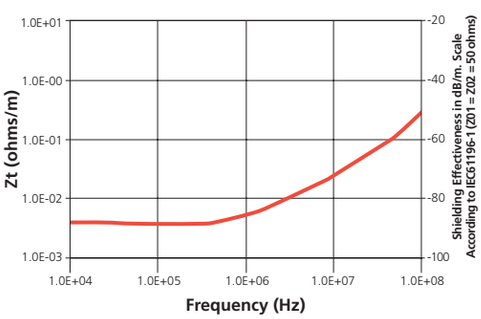


PPS monofilaments ensure a highly flexible assembly

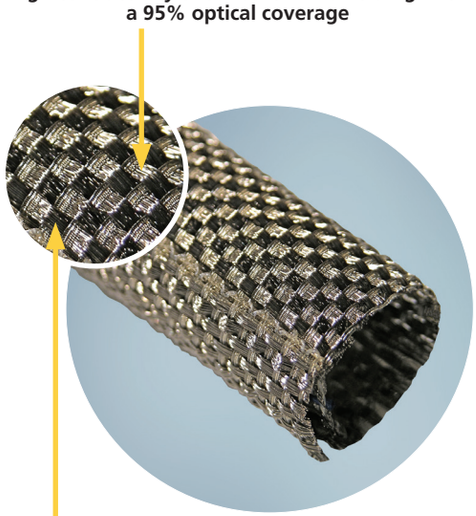
Flammability	Halogen Free	Design	Construction	Available Sizes	Markets Served
	✓	Wrappable	**Material:** Tin-plated copper and polyester mono- and multi-filaments **Color:** Black	5 to 38 mm (3/16″ to 1-1/2″)	• Electronics • Industrial / Heavy Duty
EN45545-2 R22: HL3 R23: HL3 NFPA 130: ASTM E-162 and ASTM E-662	✓	Wrappable	**Material:** Nickel-plated copper C4 according to ASTM B-355 combined with PPS mono-filament **Color:** Light gray	8 to 45 mm (5/16″ to 1-3/4″)	• Railway
EN45545-2: R22: HL3 R23: HL3	✓	Wrappable	**Material:** Tin-plated copper according to EN13602 combined with PPS monofilaments **Color:** Light gray	8 to 45 mm (5/16″ to 1-3/4″)	• Railway
EN45545-2 R22: HL3 R23: HL3 NFPA 130: ASTM E-162 and ASTM E-662	✓	Wrappable	**Material:** Nickel-plated copper C4 according to ASTM B-355 combined with PPS mono-filament **Color:** Light gray	8 to 38 mm (5/16″ to 1-1/2″)	• Aerospace
FAR 25 § 853 A & B	✓	Wrappable	**Material:** Nickel-plated copper C27 according to ASTM B-355 combined with Nomex® multifilaments and PPS monofilaments. Also available with inner layer of PTFE tape. **Color:** Olive green	6 to 38 mm (1/4″ to 1-1/2″)	• Aerospace
SE Per SAEJ369	✓	Wrappable	**Material:** Stainless steel and polyester mono- and multi-filaments **Color:** Olive Black	5 mm to 25 mm (3/16″ to 1″)	• Off Road (marine)

ROUNDIT® EMI FMJ

Transfer Impedance Measurement (Size 13)



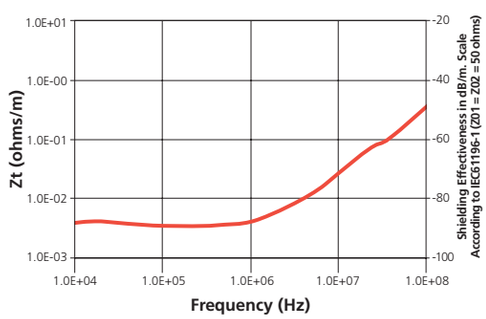
Nickel-plated copper strands are woven to provide high conductivity and insure EMI shielding with a 95% optical coverage



PPS monofilaments ensure aerospace-grade temperature and a highly flexible assembly

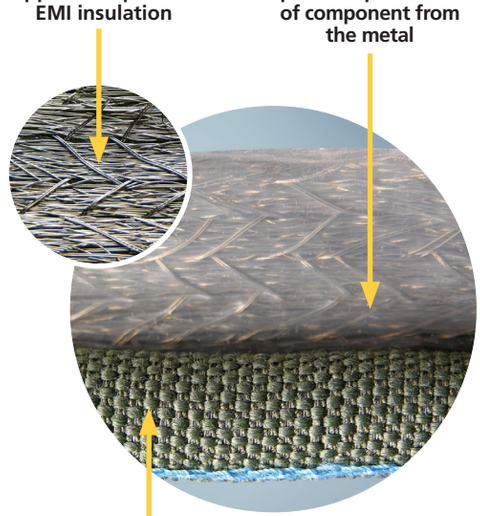
ROUNDIT® 2000 NX EMI

Transfer Impedance Measurement (Size 11)



Braided nickel-plated copper wire provides EMI insulation

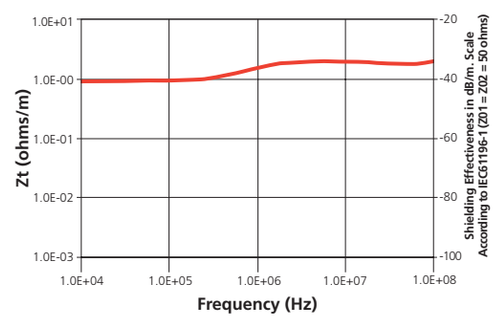
Optional PTFE inner layer provides protection of component from the metal



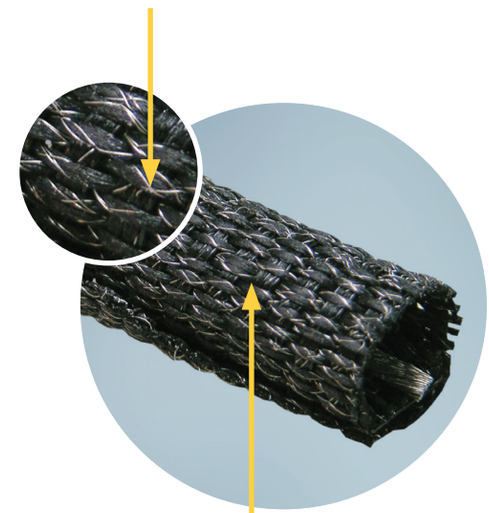
Nomex® & PPS construction with oil and water repellent treatment

ROUNDIT® 2000 S EMI

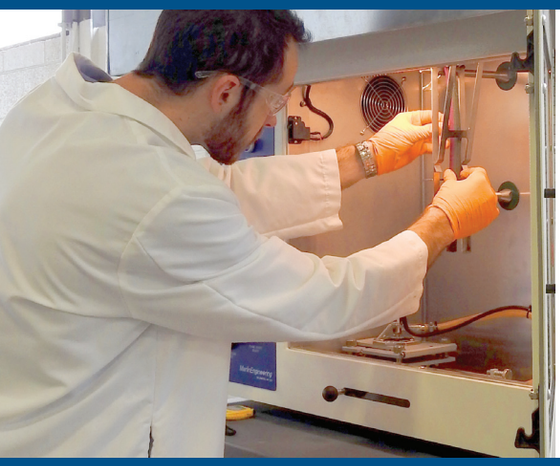
Transfer Impedance Measurement (Size 13)



Fine stainless steel wire provides EMI shielding in corrosive environments



Polyester multifilament to provide abrasion resistance



Engineering & Certifications

Systems Protection (SP) utilizes a customer focused engineering model to quickly solve technical problems and support customer challenges.

From application engineering in the field through new product design and testing, we strive to provide excellent technical support in all aspects of the engineering process.

Speed

SP employs an extensive global technical team to support both design and manufacturing challenges. When needed, we are available to work with our customers onsite to help diagnose problems, identify root causes, and select the right product from a comprehensive product portfolio to ensure that each unique application is addressed.

Expertise

Drawing from a wealth of experience and proven success in the field, we can assist in reverse engineering, application modeling, and customized testing to help simulate the application so a solution can be quickly identified and validated.

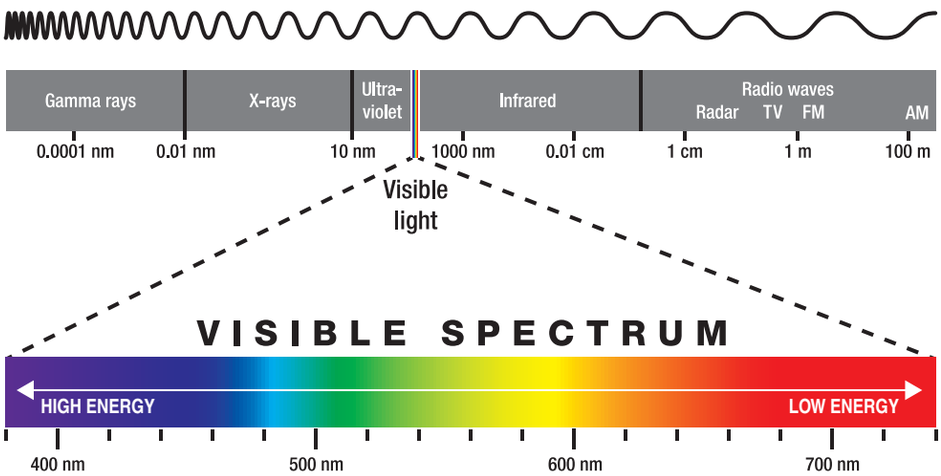
Commitment

SP embraces the demand for new products in the ever changing marketplace. Collaborating with our customers on the development of new products, we are dedicated to supporting the complete process from problem identification, through design and testing, and finally ensuring that implementation and documentation is smooth and complete.

Certifications

Systems Protection is committed to providing the highest quality systems for our customers, employees, and environment and continues to follow the rigorous requirements needed to maintain several industry certifications. We are proud to confirm the following certifications:

- ISO 9001, IATF 16949, AS/EN 9100: Quality Management Systems
- ISO14001: Environmental Management Systems
- ISO 45001: Occupational Health and Safety Management Systems



Electrical Industry Wire Sizes

AWG Size No.	Nominal Internal Diameter Inches	mm
24	0.022	0.56
22	0.027	0.69
20	0.034	0.86
19	0.038	0.97
18	0.042	1.07
17	0.047	1.19
16	0.053	1.35
15	0.059	1.50
14	0.066	1.68
13	0.076	1.93
12	0.085	2.16
11	0.095	2.41
10	0.106	2.69
9	0.118	3.00
8	0.133	3.38
7	0.148	3.76
6	0.166	4.22
5	0.186	4.72
4	0.208	5.28
3	0.234	5.94
2	0.263	6.68
1	0.294	7.47
5/16″	0.313	7.95
0	0.330	8.38
3/8″	0.375	9.53
7/16″	0.438	11.13
1/2″	0.500	12.70
9/16″	0.563	14.30
5/8″	0.625	15.88
3/4″	0.750	19.05
7/8″	0.875	22.23
1″	1.000	25.40

Thermal Industry Hose Sizes

Dash No.*	Nominal Internal Diameter Inches	mm
-04	0.25	6.4
-05	0.31	7.9
-06	0.38	9.5
-07	0.44	11.1
-08	0.50	12.7
-09	0.56	14.3
-10	0.62	15.9
-11	0.69	17.5
-12	0.75	19.1
-13	0.81	20.6
-14	0.88	22.2
-16	1.00	25.4
-18	1.12	28.6
-20	1.25	31.8
-22	1.38	34.9
-24	1.50	38.1
-25	1.56	39.7
-26	1.62	41.3
-28	1.75	44.5
-30	1.88	47.6
-32	2.00	50.8
-38	2.38	60.3
-40	2.50	63.5
-46	2.88	73.0
-48	3.00	76.2
-56	3.50	88.9
-60	3.75	95.3
-72	4.50	114.3

*** The "dash-numbers" shown refer to the nominal internal diameter in sixteenths of an inch.**

Quick Reference

Fraction	Decimal	°C	°F
1/64	0.0156	538	1000
1/32	0.0312	527	981
3/64	0.0468	516	961
1/16	0.0625	504	939
5/64	0.0781	493	919
3/32	0.0937	482	900
7/64	0.1093	471	880
1/8	0.1250	460	860
9/64	0.1406	449	840
5/32	0.1562	438	820
11/64	0.1718	427	801
3/16	0.1875	416	781
13/64	0.2031	404	759
7/32	0.2187	393	739
15/64	0.2343	382	720
1/4	0.2500	371	700
17/64	0.2656	360	680
9/32	0.2812	349	660
19/64	0.2968	338	640
5/16	0.3125	327	621
21/64	0.3281	316	601
11/32	0.3437	304	579
23/64	0.3593	293	559
3/8	0.3750	282	540
25/64	0.3906	271	520
13/32	0.4062	260	500
27/64	0.4218	249	480
7/16	0.4375	238	460
29/64	0.4531	227	441
15/32	0.4687	216	421
31/64	0.4843	204	399
1/2	0.5000	193	379
33/64	0.5156	182	360
17/32	0.5312	171	340
35/64	0.5468	160	320
9/16	0.5625	149	300
37/64	0.5781	138	280
19/32	0.5937	127	261
39/64	0.6093	116	241
5/8	0.6250	104	219
41/64	0.6406	99	210
21/32	0.6562	88	190
43/64	0.6718	77	171
11/16	0.6875	66	151
45/64	0.7031	54	129
23/32	0.7187	43	109
47/64	0.7343	38	100
3/4	0.7500	35	95
49/64	0.7656	30	86
25/32	0.7812	25	77
51/64	0.7968	20	68
13/16	0.8125	15	59
53/64	0.8281	10	50
27/32	0.8437	5	41
55/64	0.8593	0	32
7/8	0.8750	-5	23
57/64	0.8906	-10	14
29/32	0.9060	-15	5
59/64	0.9218	-18	0
15/16	0.9379	-20	-4
61/64	0.9531	-40	-40
31/32	0.9686	-60	-76
63/64	0.9843	-70	-94
1	1.0000		

Global Presence

Americas

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