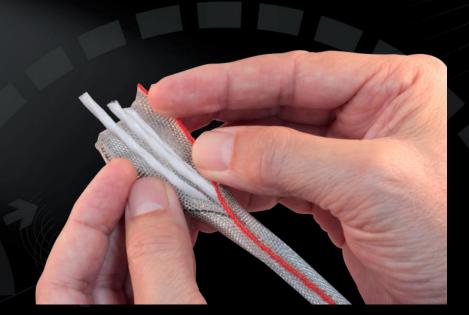
The widest range of mission-critical interconnect technologies in the world





### **Braided Wire Protection**

EMI/RFI Shielding · Mechanical Wire Protection · Grounding

### **Braided Wire Protection Technologies**



### For EMI/RFI shielding and mechanical wire protection









EMI/RFI Tubular Expandable Shielding



Non-Metallic Expandable Shielding





MasterWrap™ and Other Shielding Solutions







Shield Termination Backshells and Tools

### **Braid Selection Guide: Metallic**





Principal Selection Criteria	ARMORLIYE Strength	Weight Reduction and Temperature To	with Optimized olerance	<b>Omber</b> Weight R		General-Duty				High Temperature plus Corrosion Resistance
Braid Part										
Number and	103-051	103-052	103-071	103-026	103-027	100-001	100-002	100-003	100-005	100-004
Material Construction	Microfilament ArmorLite <sup>™</sup> 100% SS Nickel Plated	Microfilament ArmorLite™ 75% SS/25% NiCu	Microfilament ArmorLite™ 50% SS/50% NiCu	Microfilament AmberStrand* 100% Nickel Plated	Microfilament AmberStrand® 75% / 25% NiCu	Soft Drawn Tin Plated Copper	Soft Drawn Silver Plated Copper	Soft Drawn Nickel Plated Copper	Soft Drawn Tin Plated Copper-Clad Steel	Soft Drawn Stainless Steel
RoHS- Compliance	RoHS	RoHS	RoHS	RoHS	RoHS	RoHS	RoHS	RoHS	RoHS	RoHS
EMI Frequency Effectiveness Range	10 KHz to 1 GHz+	10 KHz to 1 GHz+	10 KHz to 1 GHz+	10 KHz to 1 GHz+	10 KHz to 1 GHz+	10 KHz to 1 GHz+	10 KHz to 1 GHz}+	10 KHz to 1 GHz+	Good (H Field) Poor (E Field)	Good (H Field) Poor (E Field)
Temperature Range	+260°C	+200°C	+200°C	+220°C	+200°C	+150°	+200°	+200°	+175°	+260°
Pull Strength*	150 Lbs. minimum	125 Lbs. minimum	125 Lbs. minimum	150 Lbs. minimum	125 Lbs. minimum	125 Lbs.	125 Lbs.	125 Lbs.	175 Lbs.	225 Lbs.
Corrosion Resistance Rating	500 Hours Salt Spray	500 Hours Salt Spray	500 Hours Salt Spray	500 Hours Salt Spray	500 Hours Salt Spray	48 Hours Salt Spray	48 Hours Salt Spray	500 Hours Salt Spray	96 Hours Salt Spray	1000 Hours Salt Spray
Abrasion Resistance	Good	Good	Good	Good	Good	Good	Fair	Good	Good	Very Good
Material Specification	ASTM A580	ASTM A580/ ASTM B355	ASTM A580/ ASTM B355	ZYLON AS	ZYLON AS ASTM B355	ASTM B33	ASTM B298	ASTM B355	ASTM B520	QQ-W-423/ ASTM A580

# Microfilament EMI/RFI Shielding

### Average 70+% lighter than standard metal EMI/RFI braid

- Expandable, flexible, high-strength, lightweight, conductive, microfilament material
- Provides abrasion resistance and EMI shielding at a fraction of the weight of standard metallic braid
- Maintains metallic core conductivity in event of plating damage during assembly or maintenance







### Performance advantages

- Shields from 80dB to 40dB in 100Khz @ 1Ghz
- Excellent optical braid coverage min. 85-90%
- Excellent tensile strength @ -80°C to +200°C
- High flexure strength / flexibility
- Available with nickel or silver plating
- Meets limits of 1.0% max outgas test IAW ASTM-595-90 and 0.10% max. CVCM
- Meets lightning strike ANSVEIA-364-75 specification at 3Kva, 6Kva & 10Kva thru 25Kva wave form 5B
- Excellent abrasion and FAR burn resistance





# **Amberstrond** Composite EMI/RFI Braid

# Nickel-plated microfilament composite shielding offers lightest weight solution to electromagnetic compatibility

- Electrically conductive plated composite
- Superior high-frequency shielding in high temperature applications
- Comparable shielding performance to 36 AWG plated tubular copper braid
- Lightweight, corrosion-free
- Weight savings up to 88% per foot compared to standard nickel-copper braid





# Tin-Plated Copper EMI/RFI Braided Shielding

100-001: general duty "workhorse" wire protection

- Soft-drawn tin-plated copper braid
- EMI frequency effective from 10KHz to 1 GHz
- 150°C temperature tolerant
- 125 lbs. pull strength (.500 dia. braid)
- 48 hours salt spray corrosion resistant
- Good abrasion resistance



# Silver/Copper EMI/RFI Braided Shielding

100-002: general duty with high temperature tolerance

- Soft-drawn silver-plated copper braid
- EMI frequency effective from 10KHz to 1 GHz
- 200°C temperature tolerant
- 125 lbs. pull strength (.500 dia. braid)
- Good corrosion resistance



# Nickel/Copper EMI/RFI Braided Shielding

**100-003:** general duty, highly conductive, temperature tolerant

- Soft-drawn nickel-plated copper braid
- EMI frequency effective from 10KHz to 1 GHz
- 200°C temperature tolerant
- 125 lbs. pull strength (.500 dia. braid)
- 500 hours salt spray corrosion resistant



# Stainless Steel EMI/RFI Braided Shielding

**100-004:** corrosion-resistant, high-temperature-tolerant alternative to plated copper braid

- Soft-drawn stainless steel braid
- Good H Field EMI frequency effectiveness
- 260°C temperature tolerant
- 225 lbs. pull strength (.500 dia. braid)
- 1000 hours salt spray corrosion resistant
- Abrasion resistant



### Tin-Plated Copper-Clad Steel EMI/RFI Shielding

### 100-005: versatile general-duty braid

- Soft-drawn tin-plated copper-clad steel braid
- Good H Field EMI frequency effectiveness
- 175°C temperature tolerant
- 175 lbs. pull strength (.500 dia. braid)
- 96 hours salt spray corrosion resistant
- Good abrasion resistance



### **Braid Selection Guide: Non-Metallic**



Principal Selection Criteria	General Duty / Abrasion Resistance					Ecor	тоту	Temperatu	re Tolerance	Fire Re	sistance
Braid Part Number and Material	102-060	102-001 - 102-002	102-020 thru -023	103-013 - 103-080	102-080	102-073	102-072	102-051	102-040 thru -043, 103-062,103-106	100-022	102-071
Construction	Monofilament FEP	Monofilament PET Type FR	Monofilament Halar*	Yarn, Nomex*	Monofilament Ryton Type R-7	Yarn Dacron®	Yarn Nylon	Monofilament PEEK	Yarn Bonded and Unbonded, Nomex*	Yarn PTFE-Glass	Yarn, Kevlar*
Halogen-Free	NO	<b>©</b>	NO		<b>©</b>	<b>(</b>	<b>©</b>	<b>(</b>	<b>(</b>	NO	<b>(</b>
Temperature Range	-55°C to +200°C	-55°C to +125°C	-65°C to +150°C	-55°C to +200°C	-65°C to +180°C	-62°C to +125°C	-20° to +170"	-65°C to +260"C	-60°C to +240°C	-204°C to +482°C	-73°C to +160°C
Tensile Strength (PSI) Yield	3300	50,000	7000	90,000	19,000	10,000	12,400	13,000	90,000	450,000	400,000
Elongation Percentage	50%	20%	15%	25%	40%	12%	90%	38%	25%	5%	3.6%
Chemical Resistance	Excellent	Good	Excellent	Excellent	Excellent	Good	Excellent	Excellent	Excellent (Unbonded) Outstanding (Bonded)	Excellent	Excellent
Abrasion Resistance	Good	Good	Excellent	Good	Excellent	Fair	Excellent	Excellent	Good (Unbonded) Excellent (Bonded)	Excellent	Good
Weight / Duty (specific gravity)	Heavy (2.17)	Medium (1.38)	Medium (1.68)	Medium (1.58)	Light (1.25)	Medium (1.38)	Light (1.14)	Light (1.3)	Medium (1.58)	Heavy (2.5)	Medium (1.44)
Flammability	Very Low	Flammable Self-Extinguishing	Very Low	Will Not Melt	Very Low	Flammable	Flammable	Very Low	Will Not Melt , Self-Extinguishing	Will Not Burn	Will Not Melt

### Nomex: the Glenair Go-To Non-Metallic Braid

### **Excellent performance across all standards**

- -55° to +200°C temperature range
- 90,000 PSI yield tensile strength
- 25% elongation
- Excellent chemical resistance
- Good abrasion resistance
- Will not melt
- Broad range of colors, lanyard/tracer versions available
- Available bonded, unbonded, and high-temp tolerant versions



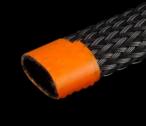


### **PEEK Tubular Expandable Wire Protection Braid**

102-051: high-temperature and crush resistance, flexible, and halogen-free

- Monofilament PEEK tubular braid
- -65° to +260°C temperature range
- 13,000 PSI yield tensile strength
- 38% elongation
- Excellent chemical resistance
- Excellent abrasion resistance







### FEP Tubular Expandable Wire Protection Braid

102-060: high lubricity and abrasion resistance. Well-suited for military and commercial transport applications.

- Monofilament FEP tubular braid
- -55° to +200°C temperature range
- 3,300 PSI yield tensile strength
- 50% elongation
- Excellent chemical resistance
- Good abrasion resistance
- Very low flammability



### Tubular Expandable Wire Protection Braid, Kevlar®

# **102-071**: fire resistant, abrasion-resistant yarn construction—our strongest non-metallic braid

- Yarn, duPont™ Kevlar® tubular braid
- -73° to +160°C temperature range
- 400,000 PSI yield tensile strength
- 3.6% elongation
- Excellent chemical resistance
- Good abrasion resistance
- Fire-resistant, will not melt

DuPont™ and Kevlar® are trademarks or registered trademarks of E.I. duPont de Nemours and Company.





### Nylon Tubular Expandable Wire Protection Braid

102-072: economical, general-duty "workhorse" wire protection

- Monofilament Nylon tubular braid
- -20° to +170°C temperature range
- 12,400 PSI yield tensile strength
- 90% elongation
- Excellent chemical resistance
- Excellent abrasion resistance





### Black Dacron® Tubular Expandable Wire Protection

# 102-073: Economical, general duty wire protection per MIL-C-572G

- Yarn Dacron® tubular braid
- -62° to +150°C temperature range
- 10,000 PSI yield tensile strength
- 12% elongation
- Good chemical resistance
- Good abrasion resistance
- Fire-resistant, will not melt





## Halar® Tubular Expandable Wire Protection Braid

102-020, -021, -022, and -023: chemically resistant to corrosive liquids / organic solvents, self-extinguishing

- Monofilament Halar® tubular braid
- -65° to +150°C temperature range
- 7,000 PSI yield tensile strength
- 15% elongation
- Excellent chemical resistance
- Excellent abrasion resistance
- Very low flammability



### Polyethylene Tubular Expandable Wire Protection Braid

102-001 and -002: general-duty wire protection for rail, marine, and vehicle applications

- Monofilament polyethylene tubular braid
- -55° to +125°C temperature range
- 50,000 PSI yield tensile strength
- 20% elongation
- Good chemical resistance
- Good abrasion resistance





### Ryton Tubular Expandable Wire Protection Braid

102-080: general duty, chemical resistant, dimensionally stable

- Monofilament Ryton tubular braid
- -65° to +180°C temperature range
- 19,000 PSI yield tensile strength
- 40% elongation
- Excellent chemical resistance
- Excellent abrasion resistance

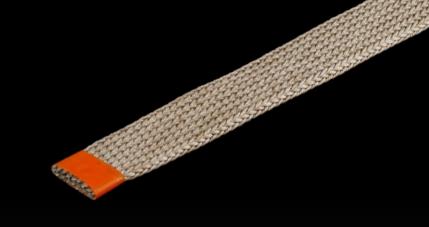




### PTFE Glass Tubular Expandable Wire Protection Braid

100-022 high-temperature range tubular braid: ideally suited for cable protection adjacent high-heat engine applications

- Highly flexible PTFE-glass tubular braided sleeving with outstanding high and lowtemperature resistance (-204°C to +482°C)
- Ideally suited for rugged wire harness protection in proximity to engines and galleys
- Highly resistant to contaminants and toxic chemicals per ASTM D-570
- Smooth surface resistant to snagging and breakage





### MasterWrap™

# Lightweight, side-entry cable wrap with Technology

- Lightweight, side entry, conductive EMI/RFI cable wrap for use in harness applications--from long runs, to spot coverage and repairs
- The faster, easier-to-apply cable covering for EMI/RFI shielding and abrasion protection applications





# MasterWrap™ ArmorLite Technology Advantages

- Saves weight: 70% material weight reduction compared QQ-B-575 / A-A-59569 nickel copper
- Simplifies Installation: Replaces harder-toinstall tubular EMI/RFI sleeving
- Saves Time: Fast and easy side-entry installation and removal
- Improves EMI/RFI shielding: Reduces windowing and coverage gaps
- Improves Performance: Delivers superior flexibility, durability and reparability



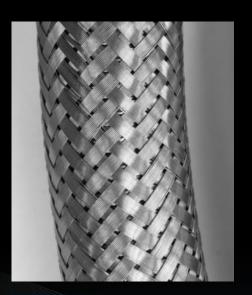


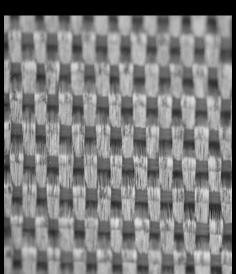


### MasterWrap™ ArmorLite

#### **Technical Overview**





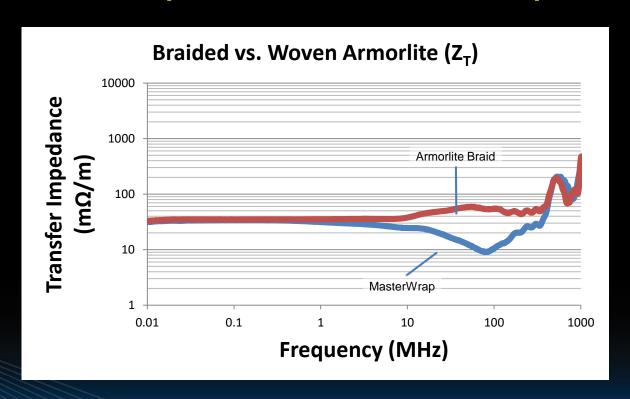


- Microfilament ARMORITE
   stainless steel core,
   conductive nickel
   plating
- Interwoven PEEK spring members
- Woven mesh with built-in twist action



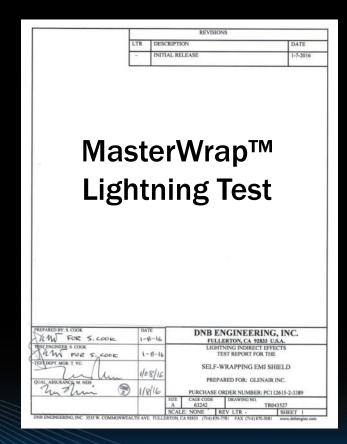
### MasterWrap™ EMI Performance

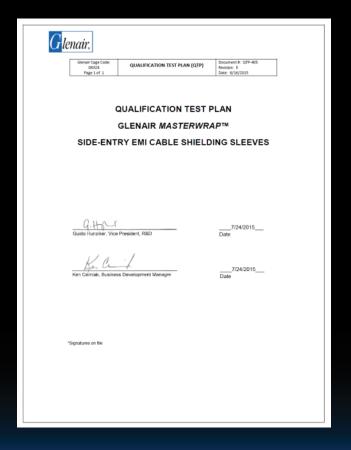
### No compromise compared to tubular braided product





# MasterWrap™ Performance Testing







### MasterWrap™ ArmorLite Testing Available

Section No. (per Table 3)	QTP 405 Table 3	Qualification Requirement:	Test Purpose:	Test Method:
9.1	X	Visual, Weight, Braid's Geometry inspections	Product conformance inspection	Glenair First Article Inspection
9.2	X	Thermal Shock	Temperature cycling test with high +215°C and low -75°C	EIA-364-32D
		Operating Temperature	Continuous high +260°C low -65°C	Glenair Material Standards
9.6	X	DC Resistance	DC linear resistance measurement	EN3475-301
9.7	X	Surface Transfer Impedance	Transfer impedance measurement	IEC 62153-4-3
9.5		Shielding Effectiveness	Shield effectiveness measurement	IEC 62153-4-4
		Tensile Strength	Test to obtain the ultimate breaking load and behavior of the product under tensile strength	Glenair QTP405
7	Х	Lightning	Test material overbraid sleeve behavior to lightning test	LTI Test Plan and Procedure: DO-160G - Wave Form 5B



### MasterWrap™ ArmorLite Testing Available

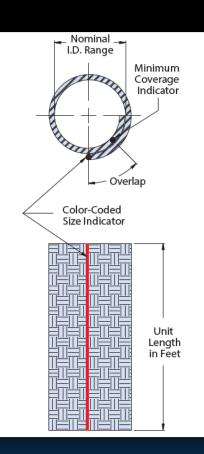
Section No. (per Table 3)	QTP 405 Table 3	Qualification Requirement:	Test Purpose:	Test Method:
8		Mass Loss and Collected Volatile Condensable Materials	Record mass loss and volatile condensable materials	ASTM E-595
9		Flexure endurance	Test material overbraid sleeve resistance to the flexion motion	BA Flex test Procedure
10		Salt Spray	Test the material overbraid sleeve resistance to corrosive environment	ASTM B117-09 Sodium Chloride. 500 Hrs
10.2	X	Random Vibration	Test the material overbraid sleeve resistance to the vibration	EN 6059-406 Par 406
12		Fluid Immersion	Test the material overbraid sleeve resistance to the fluids	AS4373D method 601
13		Flammability	Test the material overbraid sleeve resistance to the flammability	14 CFR Part 25



### MasterWrap™ ArmorLite Dimensions/How to Order

How to Order 103-079 -024
Product Series Dash No (See Table 1)

	Table I					
Dash No	Mominal I.D. (Ref)	Reference Wire Bundle Range Nominal	Approximate Weight Grams/Ft.	Appoximate Milliohms per Meter	Min. Pull Strength (lbs)	Size Indicator color code
004	.125 (3.2)	.093 (2.4) .170 (4.3)	2.1	99.8	39	BLACK
008	.250 (6.4)	.170 (4.3) .300 (7.6)	4.0	52.2	75	BROWN
012	.375 (9.5)	.300 (7.6) .406 (10.3)	5.0	41.8	94	RED
016	.500 (12.7)	.406 (10.3) .520 (13.2)	6.2	34.0	116	ORANGE
020	.625 (15.9)	.520 (13.2) .675 (17.2)	8.7	24.2	158	YELLOW
024	.750 (19.1)	.675 (17.2) .825 (21.0)	10.6	20.0	193	GREEN
032	1.000 (25.4)	.825 (21.0) 1.100 (27.9)	12.9	16.4	237	BLUE
040	1.250 (31.8)	.938 (23.8) 1.312 (38.3)	17.4	TBD	TBD	VIOLET
048	1.500 (38.1)	1.187 (30.1) 1.590 (40.4)	21.2	TBD	TBD	GRAY
064	2.000 (50.8)	1.812 (33.0) 2.090 (53.1)	25.8	TBD	TBD	WHITE





### MasterWrap™ ArmorLite Weight Savings

Weight of standard metallic tubular braided cable shielding								
EMI Braided Shielding Type (measured samples all 1/2" diameter)	Weight g/ft	Weight g/m						
Glenair nickel-clad copper braid	21.6	70.9						
Raychem RAY-103-12.5 nickel-clad copper braid	21.9	72.0						
Weight of lightweight tubular (LWB) braided cable shielding								
AmberStrand® 100%	3.7	12.1						
AmberStrand® 75% / 25%	4.9	16.1						
ArmorLite™ 100%	4.4	14.4						
ArmorLite™ 75% / 25%	5.4	17.7						
Raychem INSTALITE	13.4	44.0						
Weight of side-entry self-wrapping braided cable :	shielding							
MasterWrap™	6.2	20.3						
Federal Mogul ROUNDIT® EMI FMJ	18.0	59						
Federal Mogul ROUNDIT® EMI C27 XWS	23.5	77						



### MasterWrap™ ArmorLite Shielding Performance

	NiCu	Armorlite™	Amberstrand®	MasterWrap™				
TRANSFER IMPEDANCE (Per IEC 62153-4)								
	(Max values for 1/2 inch diameter shields)							
FREQUENCY								
10 KHz	5 mΩ/m	50 mΩ/m	60 mΩ/m	40 mΩ/m				
100 KHz	5 mΩ/m	50 mΩ/m	60 mΩ/m	40 mΩ/m				
1 MHz	12 mΩ/m	50 mΩ/m	60 mΩ/m	40 mΩ/m				
10 MHz	80 mΩ/m	50 mΩ/m	80 mΩ/m	40 mΩ/m				
100 MHz	130 mΩ/m	30 mΩ/m	110 mΩ/m	80 mΩ/m				
SHIELDING ATTENUATION (Per IEC 62153-4)								
	(Min values for 1/2 inch diameter shields)							
FREQUENCY								
1 GHz	38 dB	55 dB	48 dB	40 dB				
3 GHz	40 dB	60 dB	55 dB	35 dB				
5 GHz	44 dB	60 dB	60 dB	45 dB				
8 GHz	40 dB	50 dB	60 dB	40 dB				
WEIGHT	154 g/m	14.4 g/m	12.1 g/m	20.3 g/m				



# MasterWrap™ EWIS Wire Protection

# Applications for MasterWrap™ lightweight side-entry cable wrap



- Wiring Installation
- Rework/Repair
- System Upgrades
- Test and Development
- Enhanced Shielding





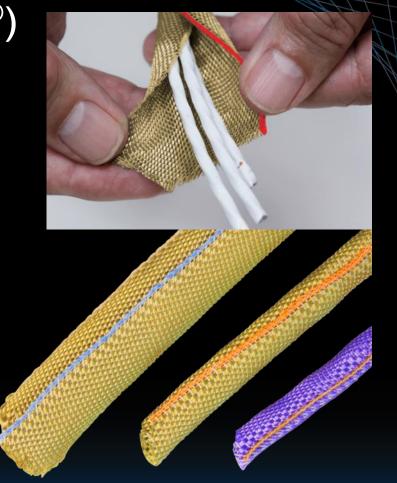
New MasterWrap™ (Nomex®)

# For spot mechanical coverage and repair of wire harnesses

- Abrasion protection
- Thermal protection
- Easy installation
- Color options for identification and labeling

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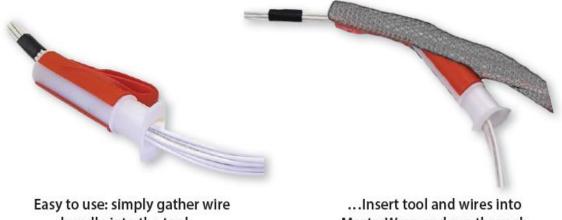


# MasterWrap Installation Tooling

#### AVAILABLE WIRE LOOM TOOL FOR EASY ASSEMBLY



Part Number	Max Bundle Dia.		
600-180-08	3/8 in (8mm)		
600-180-15	5/8 in (15mm)		
600-180-20	3/4 in (20mm)		
600-180-25	1 in (25 mm)		
600-180-32	11/4 in (32mm)		



bundle into the tool...

MasterWrap and run through

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# New ArmorLite and Nomex® Mesh Tape

**Spot EMI and mechanical protection** 





### **Grounding and Bonding Straps**

### There are many reasons for grounding/bonding straps

- Lightning strike
- Current return
- Grounding
- Power dissipation
- EMI shielding
- Abrasion resistance
- Dynamic loads, both mechanical and electrical







# Lightweight, Low-Profile Ground Straps

- Lighter in weight: 67%+
- Low resistance: 6 mOhms (1.3 width)
- High flexibility: 250K
- Lightning strike: To 100kA
- Materials: 100% Stainless Steel, Blended Copper and Stainless Steel
- Broad operating temp: up to 260° C
- Good corrosion performance : 500 hr. salt spray





### MS24749B Type IV Ground Straps

#### Lugs:

Materials: 316 L Stainless

Plating: N/A

Holes: Multiple sizes

#### **Braid:**

Materials: 50% Stainless Steel, 50% Nickel 200

Plating: N/A

Width: 1 inch per spec

Length: Any

Braid Qty: Single





### **Shield Termination Backshell Technology**

### SwingArm: Light Weight - Corrosion Free - Three-in-One

- Straight, 45° and 90°
- Integrated EMI/RFI shield sock
- Self-locking coupling nut
- Optional composite braid (319-065)
- Electroless nickel shield termination and interface
- No-braid version (627-122)





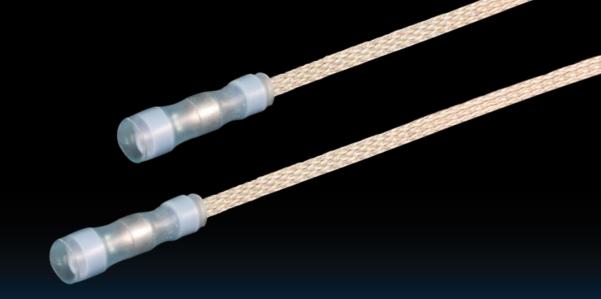


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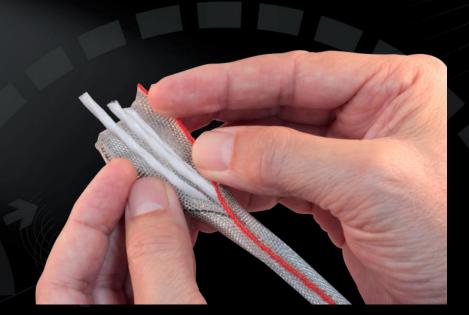
Heat Shrink Termination (HST) Sleeves with Tin-Copper, Nickel-Copper, AmberStrand, or ArmorLite braid







The widest range of mission-critical interconnect technologies in the world





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EMI/RFI Shielding · Mechanical Wire Protection · Grounding