

# Abrasion Protection

Panduit® abrasion protection products provide an economical and easy way to insulate, protect, bundle and color-code components and cable. A wide variety of sizes and materials are available to meet a broad range of indoor and outdoor applications. To help assure optimum quality, Panduit abrasion protection products are designed and manufactured to meet applicable quality standards including International, UL, Military, ISO, and Aerospace.



- **Pan-Wrap™ Split Harness Wrap** features a patented slot pattern to improve flexibility and abrasion protection
- **Spiral wrap** bundles and protects wire and cable while providing the largest variety of colors, materials, and sizes to meet a variety of needs
- **Grommet edging** protects wire and cable from damage caused by sharp panel edges
- **Heat shrink** is available in many different materials and sizes to meet a variety of needs
- **Corrugated loom tubing** is crush, impact, and abrasion resistant to reduce the risk of damage to wire and cable
- **Braided expandable sleeving** provides continuous abrasion resistance and lightweight durable protection, with a flexible open weave that will not trap heat or humidity

Panduit abrasion protection products provide quality at the lowest installed cost. With a continued focus on new product development, Panduit continues to meet customer needs.

A. System Overview	<div><div><div>PANDUIT®</div><div>Industrial Electrical Solutions</div></div></div>																																																										
B1. Cable Ties	<div><div><div>Abrasion Protection Materials Technical Data (continued)</div></div></div>																																																										
B2. Cable Accessories																																																											
B3. Stainless Steel Cable Ties & Accessories																																																											
C1. Wiring Duct	<div><div><div>Sleeving</div></div></div> <table><tr><td><b>Polyethylene Terephthalate (PET)</b> This material is a thermoplastic polyester material designed for indoor applications. It is rated for use up to 257°F and will tolerate short-term exposure up to 446°F. Colors: Weather Resistant Black, White and Gray.</td><td>-94°F (-70°C) to 257°F (125°C)</td><td>V-0</td><td>500°F (260°C)</td><td>—</td><td>1.39</td><td>100,000 (D876)</td><td>0.08%</td><td>Resistant to some solvents</td><td>Resistant to most weak bases</td><td>Resistant</td><td>Some Discoloration</td></tr><tr><td><b>Flame Retardant Polyethylene Terephthalate (PET)</b> This material is a self-extinguishing thermoplastic polyester that can be used indoors. It is also rated for use up to 257°F and will tolerate short term exposure up to 446°F. It is provided with tracers to identify the flame retardant material.</td><td>-94°F (-70°C) to 257°F (125°C)</td><td>UL 1441 VW-1</td><td>469°F (243°C)</td><td>—</td><td>1.39</td><td>39,295 (D876)</td><td>0.08%</td><td>Resistant to some solvents</td><td>Resistant to most weak bases</td><td>Resistant</td><td>Resistant Some Discoloration</td></tr></table>											<b>Polyethylene Terephthalate (PET)</b> This material is a thermoplastic polyester material designed for indoor applications. It is rated for use up to 257°F and will tolerate short-term exposure up to 446°F. Colors: Weather Resistant Black, White and Gray.	-94°F (-70°C) to 257°F (125°C)	V-0	500°F (260°C)	—	1.39	100,000 (D876)	0.08%	Resistant to some solvents	Resistant to most weak bases	Resistant	Some Discoloration	<b>Flame Retardant Polyethylene Terephthalate (PET)</b> This material is a self-extinguishing thermoplastic polyester that can be used indoors. It is also rated for use up to 257°F and will tolerate short term exposure up to 446°F. It is provided with tracers to identify the flame retardant material.	-94°F (-70°C) to 257°F (125°C)	UL 1441 VW-1	469°F (243°C)	—	1.39	39,295 (D876)	0.08%	Resistant to some solvents	Resistant to most weak bases	Resistant	Resistant Some Discoloration																								
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C3. Cable Management																																																											
D1. Terminals	<div><div><div>CLT</div></div></div> <table><tr><td><b>Black Polyethylene</b> Lowest cost material is for use up to 122°F. Other colors may be available.</td><td>-40°F (-40°C) to 122°F (50°C)</td><td>HB</td><td>—</td><td>—</td><td>0.926 – 0.940</td><td>1500 (D638)</td><td>—</td><td>Resistant except to halogenated hydrocarbons</td><td>Resistant</td><td>Resistant</td><td>Resistant No Discoloration</td></tr><tr><td><b>Nylon 6</b> Nylon is a strong, impact modified, heat stabilized, durable high abrasion resistant material.</td><td>-40°F (-40°C) to 230°F (110°C)</td><td>HB</td><td>410°F (211°C)</td><td>—</td><td>1.06 – 1.16</td><td>8000 (D638)</td><td>—</td><td>Resistant except to halogenated hydrocarbons</td><td>Resistant</td><td>Not recommended</td><td>Resistant No Discoloration</td></tr></table>											<b>Black Polyethylene</b> Lowest cost material is for use up to 122°F. Other colors may be available.	-40°F (-40°C) to 122°F (50°C)	HB	—	—	0.926 – 0.940	1500 (D638)	—	Resistant except to halogenated hydrocarbons	Resistant	Resistant	Resistant No Discoloration	<b>Nylon 6</b> Nylon is a strong, impact modified, heat stabilized, durable high abrasion resistant material.	-40°F (-40°C) to 230°F (110°C)	HB	410°F (211°C)	—	1.06 – 1.16	8000 (D638)	—	Resistant except to halogenated hydrocarbons	Resistant	Not recommended	Resistant No Discoloration																								
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E2. Labels	<div><div><div>PVC</div></div></div> <table><tr><td><b>PVC Non-Shrink Tubing*</b> This material provides insulation and protection for continuous use at temperature -4°F (-20°C) to 221°F(105°C).</td><td>-4°F (-20°C) to 221°F (105°C)</td><td>UL 224 VW-1 **</td><td>—</td><td>—</td><td>1.35</td><td>2500 (D876)</td><td>—</td><td>Resistant except to aromatic hydrocarbons, ketones and esters</td><td>Resistant</td><td>Resistant</td><td>Resistant No Discoloration</td></tr></table>											<b>PVC Non-Shrink Tubing*</b> This material provides insulation and protection for continuous use at temperature -4°F (-20°C) to 221°F(105°C).	-4°F (-20°C) to 221°F (105°C)	UL 224 VW-1 **	—	—	1.35	2500 (D876)	—	Resistant except to aromatic hydrocarbons, ketones and esters	Resistant	Resistant	Resistant No Discoloration																																				
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E5. Industrial Safety Solutions	<div><div><div>Grommet Edging</div></div></div> <table><tr><td><b>Natural Polyethylene</b> Lowest cost material for indoor use up to 122° F. Natural is available in all sizes.</td><td>-40°F (-40°C) to 122°F (50°C)</td><td>HB</td><td>239°F (115°C)</td><td>22 mg</td><td>0.91 – 1.09</td><td>1400 (D638)</td><td>—</td><td>Resistant below 140°F (60°C) except to chlorinated solvents</td><td>Resistant</td><td>Resistant except to oxidizing acids</td><td>Some Discoloration</td></tr><tr><td><b>Weather Resistant Polyethylene</b> This material has the same properties as natural polyethylene, and also has additives which allow it to resist the effects of ultraviolet light and acid rain in an outdoor environment. This product is available in black only.</td><td>-40°F (-40°C) to 122°F (50°C)</td><td>HB</td><td>239°F (115°C)</td><td>20 mg</td><td>0.93 – 1.09</td><td>2000 (D638)</td><td>0.03%</td><td>Resistant below 140°F (60°C) except to chlorinated solvents</td><td>Resistant</td><td>Resistant except to oxidizing acids</td><td>No Discoloration</td></tr><tr><td><b>Flame Retardant Polyethylene*</b> UL94-V-0 Rating This material is self-extinguishing and passes the UL94 flame retardant test with a V-0 rating.</td><td>-4°F (-20°C) to 122°F (50°C)</td><td>V-0</td><td>270°F (132°C)</td><td>22 mg</td><td>1.23 – 1.37</td><td>1200</td><td>0.02%</td><td>Resistant below 194°F (90°C) except to chlorinated solvents</td><td>Resistant</td><td>Resistant except to oxidizing acids</td><td>Some Discoloration</td></tr><tr><td><b>Nylon</b> Nylon is strong, durable, self-extinguishing material for indoor use up to 149°F. It offers a combination of lightweight, wide temperature range, and high abrasion resistance. This material is suitable for applications where heavy vibration or stress exists on the wiring or tubing.</td><td>-40°F (-40°C) to 149°F (65°C)</td><td>V-2</td><td>491°F (255°C)</td><td>7 mg</td><td>1.03 – 1.15</td><td>12,400 (D638)</td><td>1.5%</td><td>Resistant except to phenols and formic acid</td><td>Resistant</td><td>Resistant to most weak acids</td><td>No Discoloration</td></tr></table>											<b>Natural Polyethylene</b> Lowest cost material for indoor use up to 122° F. Natural is available in all sizes.	-40°F (-40°C) to 122°F (50°C)	HB	239°F (115°C)	22 mg	0.91 – 1.09	1400 (D638)	—	Resistant below 140°F (60°C) except to chlorinated solvents	Resistant	Resistant except to oxidizing acids	Some Discoloration	<b>Weather Resistant Polyethylene</b> This material has the same properties as natural polyethylene, and also has additives which allow it to resist the effects of ultraviolet light and acid rain in an outdoor environment. This product is available in black only.	-40°F (-40°C) to 122°F (50°C)	HB	239°F (115°C)	20 mg	0.93 – 1.09	2000 (D638)	0.03%	Resistant below 140°F (60°C) except to chlorinated solvents	Resistant	Resistant except to oxidizing acids	No Discoloration	<b>Flame Retardant Polyethylene*</b> UL94-V-0 Rating This material is self-extinguishing and passes the UL94 flame retardant test with a V-0 rating.	-4°F (-20°C) to 122°F (50°C)	V-0	270°F (132°C)	22 mg	1.23 – 1.37	1200	0.02%	Resistant below 194°F (90°C) except to chlorinated solvents	Resistant	Resistant except to oxidizing acids	Some Discoloration	<b>Nylon</b> Nylon is strong, durable, self-extinguishing material for indoor use up to 149°F. It offers a combination of lightweight, wide temperature range, and high abrasion resistance. This material is suitable for applications where heavy vibration or stress exists on the wiring or tubing.	-40°F (-40°C) to 149°F (65°C)	V-2	491°F (255°C)	7 mg	1.03 – 1.15	12,400 (D638)	1.5%	Resistant except to phenols and formic acid	Resistant	Resistant to most weak acids	No Discoloration
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F. Keystone Cabling Systems																																																											
G. Part Number Index	<div><div><div>Note: Typical operating temperature ranges are extended based on end use application and specific environment tests. *Contains halogens. Other materials are halogen free. **Limited sizes in Clear</div></div></div>																																																										

## Part Number System for Thin Wall Heat Shrink

HSTT	12	48	Q	10
Type	Expanded Diameter	Tube Length	Package Quantity	Color
HSTT = Thin Wall	05 = 3/64" (1.2mm)	3 = 3" (76.2mm)	(If Tube Length Specified)	NONE = Black
HSTTV = Thin Wall VW-1	06 = 1/16" (1.6mm)	6 = 6" (152.4mm)	1 = 1 Pc.	C = Clear
HSTTN = Thin Wall Neoprene	09 = 3/32" (2.4mm)	9 = 9" (228.6mm)	2 = 2 Pcs.	1 = Brown
HSTTK = Thin Wall PVDF	12 = 1/8" (3.2mm)	12 = 12" (304.8mm)	3 = 3 Pcs.	2 = Red
HSTTT = Thin Wall TFE‡	19 = 3/16" (4.8mm)	48 = 48" (1.2m)	5 = 5 Pcs.	3 = Orange
HSTTP = Thin Wall PVC	25 = 1/4" (6.4mm)	Y = 6" Pcs.	X = 10 Pcs.	4 = Yellow
HSTTPN = Crystal Clear Thin Wall PVC	38 = 3/8" (9.5mm)	NONE = REEL	Q = 25 Pcs.	5 = Green
HSTTVA = Flexible Adhesive Lined	50 = 1/2" (12.7mm)		LQ = 75 Pcs.	6 = Blue
HSTTRA = Semi-Rigid Adhesive Lined	75 = 3/4" (19.1mm)		CQ = 125 Pcs.	10 = White
HSTTA = Thin Wall Adhesive Lined	100 = 1" (25.4mm)		T = 200 Pcs.	45 = Yellow/Green
HSTT4A = 4:1 Thin Wall Adhesive Lined	150 = 1 1/2" (38.1mm)		TL = 250 Pcs.	
HST = Thick Wall Adhesive Lined	200 = 2" (50.8mm)			
HSEC = Heat Shrink End Caps Adhesive Lined	300 = 3" (76.2mm)			
HSECFR = Heat Shrink End Caps Flame Retardant Adhesive Lined	400 = 4" (101.6mm)			
	0.4 = 0.40" (10.2mm)			
	0.5 = 0.47" (11.9mm)			
	0.8 = 0.80" (20.3mm)			
	1.0 = 1.0" (25.4mm)			
	1.1 = 1.1" (27.9mm)			
	1.5 = 1.5" (38.1mm)			
	2.0 = 2.0" (50.8mm)			
	2.7 = 2.7" (68.6mm)			
	3.0 = 3.0" (76.2mm)			
	3.5 = 3.5" (88.9mm)			
	4.0 = 4.0" (101.6mm)			

**Reels** |  
(If No Tube Length Specified)  
Q = 25' (7.6m)  
L = 50' (15.2m)  
C = 100' (30.5m)  
T = 200' (61.0m)  
D = 500' (152.4m)  
M = 1000' (304.8m)

For Standard Packages containing 6" (152.4mm) lengths, refer to individual pages for complete part number offering.

Note: The above information is to be used as a guide. For specific part number offerings review individual pages for verification.  
‡TFE is Polytetrafluoroethylene material.

B1.  
Cable  
TiesB2.  
Cable  
AccessoriesB3.  
Stainless  
Steel Cable  
Ties &  
AccessoriesC1.  
Wiring  
DuctC2.  
Abrasion  
ProtectionC3.  
Cable  
ManagementD1.  
TerminalsD2.  
Power  
ConnectorsD3.  
Grounding  
ConnectorsE1.  
Labeling  
SystemsE2.  
LabelsE3.  
Pre-Printed  
&  
Write-On  
MarkersE4.  
Permanent  
IdentificationE5.  
Industrial  
Safety  
SolutionsF.  
Keystone  
Cabling  
SystemsG.  
Part  
Number  
Index



## HSTT Heat Shrink 4 Foot Pieces and Reels

- Applications include insulating, protecting, and color coding wires and cables
- Voltage: 600 V
- Shrink ratio: 2:1
- Flammability: Flame retardant EXCEPT clear
- Mil Spec: AMS-DTL-23053/5 Class 1 (Colors) Class 2 (Clear)\*\*
- Temperature range: -67°F to 275°F (-55°C to 135°C)
- For dry locations
- Material: Cross-linked Polyolefin
- UL: E122770
- CSA: 222627
- 5 year shelf life\*\*\*



Part Number*	Nominal Diameter		Min. Expanded I.D.		Max. Recovered I.D.		Nominal Recovered Wall Thickness		Length		Length per Reel		Std. Pkg. Qty.	Std. Ctn. Qty.
	In.	mm	In.	mm	In.	mm	In.	mm	Ft.	m	Ft.	m		
HSTT05-48-Q	0.046	1.2	0.046	1.2	0.023	0.6	0.016	0.4	4	1.2	—	—	25	—
HSTT05-48-TL	0.046	1.2	0.046	1.2	0.023	0.6	0.016	0.4	4	1.2	—	—	250	—
HSTT05-C‡	0.046	1.2	0.046	1.2	0.023	0.6	0.016	0.4	—	—	100	30.5	1	10
HSTT05-M‡	0.046	1.2	0.046	1.2	0.023	0.6	0.016	0.4	—	—	1,000	304.8	1	2
HSTT06-48-Q	0.063	1.6	0.063	1.6	0.031	0.8	0.017	0.4	4	1.2	—	—	25	—
HSTT06-48-TL	0.063	1.6	0.063	1.6	0.031	0.8	0.017	0.4	4	1.2	—	—	250	—
HSTT06-C‡	0.063	1.6	0.063	1.6	0.031	0.8	0.017	0.4	—	—	100	30.5	1	10
HSTT06-M‡	0.063	1.6	0.063	1.6	0.031	0.8	0.017	0.4	—	—	1,000	304.8	1	2
HSTT09-48-Q	0.093	2.4	0.093	2.4	0.046	1.2	0.020	0.5	4	1.2	—	—	25	—
HSTT09-48-TL	0.093	2.4	0.093	2.4	0.046	1.2	0.020	0.5	4	1.2	—	—	250	—
HSTT09-C‡	0.093	2.4	0.093	2.4	0.046	1.2	0.020	0.5	—	—	100	30.5	1	10
HSTT09-M‡	0.093	2.4	0.093	2.4	0.046	1.2	0.020	0.5	—	—	1,000	304.8	1	2
HSTT12-48-Q	0.125	3.2	0.125	3.2	0.062	1.6	0.020	0.5	4	1.2	—	—	25	—
HSTT12-48-TL	0.125	3.2	0.125	3.2	0.062	1.6	0.020	0.5	4	1.2	—	—	250	—
HSTT12-C‡	0.125	3.2	0.125	3.2	0.062	1.6	0.020	0.5	—	—	100	30.5	1	10
HSTT12-M‡	0.125	3.2	0.125	3.2	0.062	1.6	0.020	0.5	—	—	1,000	304.8	1	2
HSTT19-48-Q	0.187	4.8	0.187	4.8	0.093	2.4	0.020	0.5	4	1.2	—	—	25	—
HSTT19-48-TL	0.187	4.8	0.187	4.8	0.093	2.4	0.020	0.5	4	1.2	—	—	250	—
HSTT19-C‡	0.187	4.8	0.187	4.8	0.093	2.4	0.020	0.5	—	—	100	30.5	1	10
HSTT19-M‡	0.187	4.8	0.187	4.8	0.093	2.4	0.020	0.5	—	—	1,000	304.8	1	2
HSTT25-48-Q	0.250	6.4	0.250	6.4	0.125	3.2	0.025	0.6	4	1.2	—	—	25	—
HSTT25-48-TL	0.250	6.4	0.250	6.4	0.125	3.2	0.025	0.6	4	1.2	—	—	250	—
HSTT25-C‡	0.250	6.4	0.250	6.4	0.125	3.2	0.025	0.6	—	—	100	30.5	1	10
HSTT25-D‡	0.250	6.4	0.250	6.4	0.125	3.2	0.025	0.6	—	—	500	152.4	1	2
HSTT38-48-Q	0.375	9.5	0.375	9.5	0.187	4.8	0.025	0.6	4	1.2	—	—	25	—
HSTT38-48-TL	0.375	9.5	0.375	9.5	0.187	4.8	0.025	0.6	4	1.2	—	—	250	—
HSTT38-C‡	0.375	9.5	0.375	9.5	0.187	4.8	0.025	0.6	—	—	100	30.5	1	10
HSTT38-T‡	0.375	9.5	0.375	9.5	0.187	4.8	0.025	0.6	—	—	200	61.0	1	2

\*For colors, add C (Clear), 1 (Brown), 2 (Red), 3 (Orange), 4 (Yellow), 45 (Yellow/Green), 5 (Green), 6 (Blue) and 10 (White) to end of part number. Contact customer service for availability.

‡Part sold per reel.

\*\*Material Performance Only.

\*\*\*Shelf life applies only to expanded and recovered dimensions. Material performance is not affected.

Continues on next page