

Technical Data Sheet**Fluid Resistant Heat Shrink Labels**

This specification is intended to outline the physical and chemical properties of *PANDUIT*'s GMUFR31 tubing material for wire identification and insulation purposes and include the following part numbers and printable material identifiers:

Part Number Prefixes	

Part Number Suffixes	
HST-2	

PRODUCT SPECIFICATIONS:

Description:	Material is RoHS compliant (European Union directive 2002/95/EC). GMUFR31 is a crosslinked, semi rigid, diesel resistant heat shrinkable thermal transfer printable polyolefin. This product meets the material and physical property requirements AMS-DTL-23053/6 Class 1 and NF F00-608 Class A & H when printed using RMER4BL-C thermal transfer ribbon. It will also meet SAE-AS5942, MIL-STD-883F Method 2015.13, Solutions A and D, and MIL-STD-202G Method 215K, Solutions A, and D.
Recommended Ribbons:	RMER4BL-C
Standard Colors:	Yellow
Shrink Ratio:	3 to 1 { 1/8" (3.2mm) ID size is 2 to 1 shrink ratio }
Service Temperature Range:	Minus 67F to 275F (Minus 55C to 135C)
Storage Conditions:	Store at 70°F(21°C) and 50% Relative Humidity

PROPERTIES:**PERFORMANCE:**

Tensile Strength:	19MPa minimum (IEC 60684-2)
Elongation Ultimate:	480% minimum (IEC 60684-2)
Dielectric Strength:	20 KV/mm minimum (IEC 243)
Volume Resistivity:	1.2 x10 ¹⁴ ohm cm (IEC 60684-2 clause 23, section 23.4.2 & 23.4.4)
Heat Shock 4 hours at 250°C:	No dripping, cracking or flowing(ASTM D2671)
Heat Aging 168 hours at 175°C:	Elongation 300% (IEC 60684-2, section 19.1)
Total Longitudinal Change:	Minus 10% maximum (IEC60684-2)
Water Absorption:	0.20% (NF F00-608 section 11.4.9 & ASTM D70)
Low Temperature Flexibility minus 55°C:	No cracking (ASTM D2671)

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Printability:	Product meets print performance of 100 rubs (Taber abraser, CS-10 wheels, 100 cycles/250 gm wt)
Flammability:	Self-extinguishing < 30 sec(NF F00-608 Section 5.5.8, ASTM D2671 Procedure B)
Specific gravity:	1.35 (ISO/R1183)
Shrink Temperature:	275 ⁰ F (135 ⁰ C) Minimum
Oxygen Index:	24% minimum (NF T 51-071)
QUV Outdoor Durability:	Observations made at *3000 hours exposure showed no loss in legend or change in material (ASTM G154).
Secant Modulus 2%	25,000 psi (172.4 Mpa) minimum (NF F 60684-2 clause 19.4 & ASTM D 882)

Corrosion Related Items:

Item	Test or Procedure	Result / Comments
Corrosion	ASTM D2671 B	No Corrosion
Copper Corrosion -Tensile	NF 00-608 11.4.7 according to NF C 93-641 paragraph 3.3.7.2.	13 Mpa
Copper Corrosion - Elongation	NF 00-608 11.4.7 according to NF C 93-641 paragraph 3.3.7.2.	240 %
Copper Corrosion -Visual	NF 00-608 11.4.7 according to NF C 93-641 paragraph 3.3.7.2.	pass

Marking Performance:

SAE-AS5942:	Samples were tested heat shrunk. Print still legible after 20 eraser rubs with hard hand pressure.
MIL-STD-202G	Method 215K, Solution A and D: 3 cycles of 3 minute immersions in specified fluids followed by toothbrush rub after each immersion. Print still legible in all test fluids.
MIL-STD-883F:	Method 2015.13, Solution A and D: 3 cycles of 1 minute immersions in specified fluids followed by toothbrush rub after each immersion. Print still legible in all test fluids.

***3000 hours aquates to 5 years of assimilated outdoor UV exposure.**

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Test Description	Test Result	Reference
Mineral oil Sample immersed 70 hours@50°C Tensile and Elongation Print legibility(10 strokes)	18MPa and 550% Pass	NF F00-608 section 5.5.3 NF F00-608 section 11.6
Acid HCL Sample immersed 168 hours@23°C Tensile and Elongation Print legibility(10 strokes)	18MPa and 400% Pass	NF F00-608 section 5.5.5 NF F00-608 section 11.6
Diesel Sample immersed 168 hours@70°C Tensile and Elongation Print legibility(10 strokes)	14MPa and 525% Pass	NF F00-608 section 5.5.4 NF F00-608 section 11.6
Base NaOH Sample immersed 168 hours@23°C Tensile and Elongation Print legibility(10 strokes)	18MPa and 545% Pass	NF F00-608 section 5.5.5 NF F00-608 section 11.6

CHEMICAL/SOLVENT RESISTANCE:

Samples were thermal transfer printed with RMER4BL-C ribbon. Test was conducted at room temperature. Testing consisted of 5 cycles of 10 minutes immersion in the specified chemical/solvent followed by 30 minute recovery periods. After final immersion, samples were rubbed with cotton swab saturated with test fluid.

Chemical/Solvent	Visual Observation	
	Tubing and print without rub	RMER4BL-C print with rub
Isopropyl alcohol	1	1
Methyl Ethyl Ketone	1	4
Skydrol	1	4
Deionized water	1	1
10% salt water solution	1	2
Toluene	1	4
Acetone	1	4
Gasoline	1	5
Diesel	1	2
Jet Fuel	1	4
ASTM #3 oil	1	1
10% Sulfuric acid	1	1
10% Sodium Hydroxide	1	1
Blasgrind HC 5	1	4

Rating scale:

- 1= no visible change
- 2= slight fade or print removal
- 3 = moderate fading or print removal(print still legible)
- 4 = severe fading or print removal(print illegible or barely legible)
- 5 = complete print removal

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