

Technical Data Sheet**Halogen Free Heat Shrink Labels**

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

Part Number Prefixes	

Printable Material Suffixes	
HFT-2	HGT-2
HFT-2-B	HGT-2-B

PRODUCT SPECIFICATIONS:

Description:	Material is RoHS compliant (European Union directive 2002/95/EC). GMHSHF is a crosslinked, halogen free, flexible, flame retardant, low smoke heat shrinkable thermal transfer printable polyolefin. Satisfies BS6853; 1999 Vehicle Category 1a for burning behavior and toxic gas emissions; Smoke Density Class II. When printed using recommended ribbons, it will also meet SAE-AS5942, MIL-STD-883F Method 2015.13, Solutions A, B and D, and MIL-STD-202G Method 215K, Solutions A, C, and D.
Recommended Ribbons:	RMR4BL, RHR4BL-S, RMER4BL
Standard Colors:	White and Yellow
Shrink Ratio:	2 to 1
Service Temperature Range:	Minus 22 ⁰ F to 221 ⁰ F (Minus 30 ⁰ C to 105 ⁰ C)
Storage Conditions:	Store at 70 ⁰ F (21 ⁰ C) and 50% Relative Humidity

PROPERTIES:**PERFORMANCE**

Tensile Strength:	10N/mm ² (ASTM D638)
Elongation at Break:	200% (ASTM D 638)
Dielectric Strength:	20 KV/mm (ASTM D2671)
Volume Resistivity:	10 ¹⁴ ohm cm
Heat Shock 4 hours at 175 ⁰ C:	No dripping, cracking or flowing.
Heat Aging 168 hours at 150 ⁰ C:	Elongation 100% (ASTM D638)
Total Longitudinal Change:	Minus 10% to +5% (ASTM D2671)
Low Temperature Flexibility	Minus 40 ⁰ C: No cracking (ASTM D2671)
Water Absorption:	≤ 0.15% (ASTM D570)
Printability:	Product meets print performance of 100 rubs (Taber abraser, CS-10 wheels, 100 cycles/250 gm wt)
Flammability:	Product passes ASTM D635-HB and ASTM D2671
Specific gravity:	1.42 (ASTM D792)
Shrink Temperature:	> 194 ⁰ F (90 ⁰ C)
Smoke Density:	Class II A0 _{Max} =.051 (BS6853; 1999 Table 7)
Oxygen Index:	36% (Satisfies BS6853 Class 1a for Burning Behavior per BS EN 4859 -2:1999)

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UV Resistance :	*Observations made at 3000 hours exposure showed no loss in legend or change in material (ASTM G154).
Fungus Resistance:	No growth (AMS-DTL-7444)
Copper Corrosion:	No corrosion (ASTM D2671B)
	*3000 hours equates to 5 years of assimilated outdoor UV exposure.

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, C 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, B 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.
Halogen Content:	30 ppm Fluorine (GLI Procedure E9-3) < 17 ppm Total Halogens as Cl (GLI Procedure ME-13) Meets IEC 60754-2 (Amendment) test requirement.

Toxic Gas Emissions:

Toxic gas emissions satisfy Vehicle category 1a requirements of BS6853:1999 Table 7 and NF F16-101 Reference Values as performed in accordance with procedure NFX 70-100. This data in the table below shows quantitative analysis of certain gases produced under specified conditions of thermal degradation in the presence of air.

Gases	Conc. (mg/g)	NF F 16-10 Reference Values, cc ₁ (mg/m ³)	BS 6853 Reference Values, Fx (mg/g)	CIT (per 100g)	r value
Carbon Monoxide	91.79	1750	280	5.25	0.33
Carbon Dioxide	802.51	90000	14000	0.89	0.06
Hydrogen Chloride	0.19	150	15	0.13	0.01
Hydrogen Bromide	ND	170	20	0.00	0.00
Hydrogen Cyanide	ND	55	11	0.00	0.00
Hydrogen Fluoride	ND	17	4.9	0.00	0.00
Sulphur Dioxide	ND	260	53	0.00	0.00
Nitrous Oxides	ND	N/A	7.6	N/A	0.00

ND indicates non-detected & N/A indicates not applicable

CHEMICAL/SOLVENT RESISTANCE:

Samples were thermal transfer printed with RMR4BL ribbon. Test was conducted at room temperature. The samples were immersed in the specified chemical reagents for 5 immersions using the following cycle: a 10 minute immersion time followed by a 30 minute recovery time.

Chemical Reagent	Visual Observation
Distilled Water	No effect
Mineral Spirits	No effect
ASTM # 3 Oil	No effect
Isopropyl Alcohol	No effect
Methanol	No effect
3% Alconox Detergent	No effect
10% Sodium Hydroxide Solution	No effect

Chemical Reagent	Visual Observation
10% Sulfuric Acid Solution	No effect
5% Sodium Chloride Solution	No effect
Freon TF	No effect
Super Agitene	No effect
Jet-A Fuel	No effect
Arco Truslide 68	No effect
SAE 30 Motor Oil	No effect

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