

Hongshang

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Spec. H-2F(XX)

**TECHNICAL REPORT ON
H-2F (XX) ENVIRONMENT FRIENDLY FLEXIBLE
HIGHLY FLAME RETARDANT HEAT SHRINKABLE TUBING**



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1 SCOPE

This specification covers the requirements for one type of flexible electrical insulating, extruded tubing whose diameter will reduce to a predetermined size upon the application of heat in excess of 110°C .This tubing meets the requirements of SAE-AMS-DTL-230-53/5 and UL 224 with a continuous operating temperature range of -55 to +135 °C H-2F(XX) is free of polybrominated biphenyls (PBB) and polybrominated biphenyl oxides (PBBO). H-2F(XX) is also a 125°C, VW-1 rated, UL recognized tubing meeting the requirements of UL 224 as well as meeting the requirements of Standard C22.2 No. 198.1 and will be CSA certified after Nov. 2007

For H-2F(XX), the first XX can be 2X, 3X and 4X, represents separately the 2:1, 3:1 and 4:1 shrink ratio

2 APPLICABLE DOCUMENTS

This specification takes precedence over documents referenced herein. Unless otherwise specified, the latest issue of referenced documents applies. The following documents form a part of this specification to the extent specified herein.

SAE-AMS-DTL-230-53/5

Aerospace Material Specification for Insulation Sleeving,
Electrical, Heat Shrinkable, Polyolefin, Flexible, Crosslinked
UL 224 Extruded Insulating Tubing

CSA CANADIAN STANDARDS ASSOCIATION

C22.2 No. 198.1 Extruded Insulating Tubing

ASTM D 2671 Standard Test Method for Heat Shrinkable Tubing for
Electrical Use

IEC 60093-1980 Methods of test for volume resistivity and surface resistivity
of solid electrical insulating materials

3 REQUIREMENTS

3.1 Materials

H-2F (XX) flexible heat shrinkable tubing is made from radiation crosslinked Polyolefin. Specially designed formulation make the tubing to have outstanding physical , chemical and electrical properties, and also meet the requirement of RoHS and other environment concerned standards.

3.2 Color

The Standard colors for the tubing shall be black, red, blue, yellow, green white

3.3 Properties

The tubing shall meet all requirements of Table 1

3.4 Test Procedures

Unless otherwise specified, tests shall be performed on specimens which have been fully recovered by conditioning for 3 minutes in a $200 \pm 2^\circ\text{C}$ oven. All ovens shall be of the mechanical convection type

3.4.1 Dimensions and Longitudinal Change

Three 150-mm specimens of tubing, as supplied, shall be measured for length ± 1 mm and inside diameter in accordance with ASTM D 2671, conditioned for 3 minutes in a $200 \pm 2^\circ\text{C}$ oven, cooled to $23 \pm 3^\circ\text{C}$ and then remeasured.

Prior to and after conditioning, the dimensions of the tubing shall be in accordance with Table 1 and the longitudinal change shall be in accordance with Table 3. Longitudinal change (LC) shall be calculated as follows:

$$\text{LC} = (L1 - L0)/L0 \times 100$$

LC = longitudinal change

L0 = length before shrinkage

L1 = length after shrinkage

3.4.1 Eccentricity

Perform the test in accordance with UL 224.

$$\text{Eccentricity \%} = (1 - W1/W2) \times 100$$

W1 = minimum wall thickness

W2 = maximum wall thickness

3.4.2 Tensile Strength and Ultimate Elongation

Three specimens of tubing shall be tested for tensile strength, and ultimate elongation in accordance with ASTM D 2671. The rate of jaw separation shall be 50.8mm per minute.

3.4.3 Volume resistance

Perform the test in accordance with ASTM D 876

3.4.4 Dielectrical strength

Perform the test in accordance with ASTM D 150

3.4.5 Water absorption

Perform the test in accordance with ASTM D 570 24 hrs. / 23°C .

3.4.6 Heat shock

Perform the test in accordance with UL 224. The specimen may be placed horizontally in the oven at 250°C for 4 hours. While in the oven and after removal from the oven, the specimen shall be examined for evidence of cracking.

3.4.7 Thermal aging

Perform the test in accordance with UL 224. Aging condition shall be 175°C for 168 hrs.

3.4.8 Flammability test

Perform the test in accordance with UL 224 VW-1Test.

3.4.9 Cold bend test

Perform the test in accordance with UL 224. -30°C/1 hrs

3.4.10 Fluid resistance

Not applicable.

3.4.11 Copper corrosion test

Specimen tubing was shrunk on a bare copper tube followed by aging at 158 °C for 168 hrs. The surface of copper tube shall be no sign of corrosion except for thermal oxidation.

3.4.12 Shrinking curve

Shrinking curve is obtained by shrinking of samples in air-circulated oven at give temperature for three minutes and followed by cooling at room temperature for five minutes and then measured the inner diameter.

3 Test results

3.1 Shrinking properties

Property	Unit	Required Value	Test Value
Longitudinal Changes	%	+1 to -5%	-1.3%
Eccentricity	%	Max. 30%	13%

3.2 Physical properties

Property	Unit	Required Value	Test Value
Tensile strength	MPa	Min. 10.3 MPa	14.3 MPa
Elongation	%	Min. 200%	840%
After aging at 175°C /168 hrs			
Ultimate Elongation	%	Min. 100%	460%
Tensile strength	MPa	Min.7.2 MPa	12 MPa
Heat shock		No cracking	No cracking
Cold bend test		No cracking	No cracking

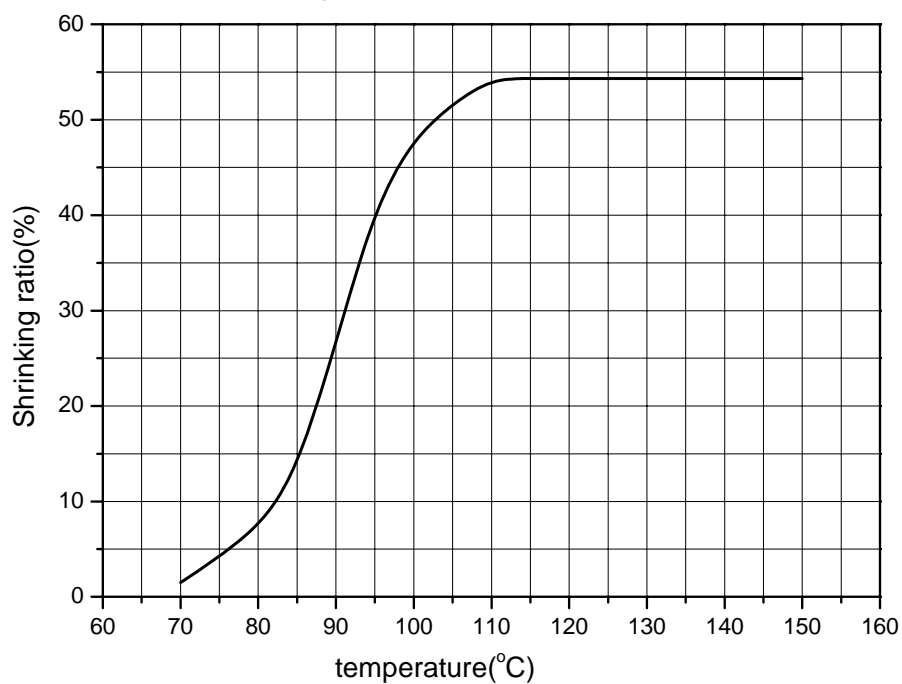
3.3 Electrical properties

Property	Unit	Required Value	Test Value
Dielectric strength	kV/mm	Min. 19.7	22
Volume resistance	Ω .cm	Min. 10^{14}	10^{14}

3.4 Chemical properties

Property	Unit	Required Value	Test Value
Flammability		Pass VW-1	Pass VW-1
Water absorption	%	Max. 0.5	0.2
Copper corrosion		No corrosion	No corrosion

Shrinking Curve of H-2F(3X) (Black 6.4)



Checked by: Liu Jian

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Approved by: Dr. Zhong Xiaoguang

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