Hongshang

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Spec. H-5(XX)-F

TECHNICAL REPORT ON

H-5(XX)-F DUAL WALL ADHESIVE-LINED FLEXIBLE FLAME RETARDANT HEAT SHRINKABLE TUBING

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1 SCOPE

This specification covers the requirements for one type of flexible electrical insulating, extruded dual wall 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-23053/4 and UL 224 with a continuous operating temperature range of -55 to ℃+125 ℃ H-5(XX)-F is free of polybrominated biphenyls (PBB) and polybrominated biphenyl oxides (PBBO). H-5(XX)-F is also a 125°C,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

1.1 FORM

The tubing shall be flame retarded and shall be black with a thermoplastic hot melt adhesive lining.

1.2 Shrink Ratio

For H-5(XX)-F, the suffix 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-23053/4	Aerospace Material Specification for Insulation Sleeving, Electrical, Heat Shrinkable, Polyolefin, dual wall ,outer wall 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-5(XX)-F flexible heat shrinkable tubing is made from thermally stabilized, modified polyolefin and shall be crosslinked by irradiation. It shall be homogeneous and essentially free from flaws, defects, pinholes, bubbles,

seams, cracks, and inclusions. It shall have an interior coating of thermoplastic adhesive.

3.2 Color

The Standard colors for the tubing shall be black.

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 ± 2°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 ± 2°C oven, cooled to 23 ± 3°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:

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

LC = longitudinal change
L0 = length before shrinkage
L1 = length after shrinkage

3.4.1 Eccentricity

Perform the test in accordance with UL 224.
Eccentricity % = (1 – W1/W2) x 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 Dielectric 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 ℃.

3.4.6 Heat shock

Perform the test in accordance with UL 224. The specimen may be placed horizontally in the oven at 250 ℃ 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 158℃ for 168 hrs.

3.4.8 Flammability teat

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℃/1 hrs

3.4.10 Fluid resistance

Not applicable.

3.4.11 Copper corrosion test

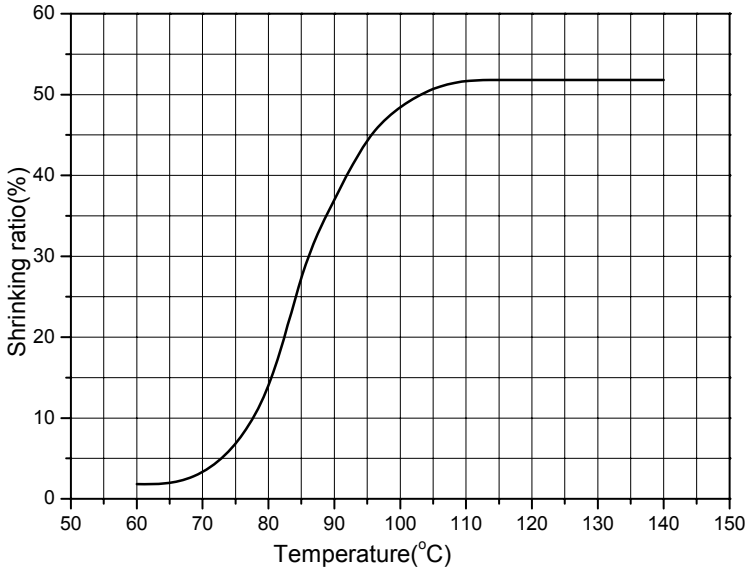
Specimen tubing was shrunk on a bare copper tube followed by aging at 158 ℃ for 168 hrs. The surface of copper tube shall be no sign of corrosion except for thermal oxidation.

Table 1 Requirements

Property	Unit	Required Value	Test Value
Shrinking properties			
Min. full Shrink temperature	℃		110℃
Longitudinal Changes	%	0 to -5%	0 to -5 %
Eccentricity	%	Max. 40%	10 to 35 %
Physical properties(jacket layer)			
Tensile strength	MPa	Min. 10.3 MPa	Min. 13 MPa
Elongation	%	Min. 200%	Min 600 %
After aging at 158℃ /168 hrs Tensile strength	Mpa	Remain 70%	Min. 11 Mpa

Ultimate Elongation	%	Min.100%	Min. 200%
Heat shock 250℃ / 4 hrs		No cracking	No cracking
Cold bend test -30℃ / 1 hrs		No cracking	No cracking
Electrical properties(jacket layer)			
Dielectric strength	kV/mm	Min. 15.8	24
Volume resistance	Ω.cm	Min. 10^{14}	10^{14}
Chemical properties(jacket layer)			
Flammability		Pass VW-1	Pass VW-1
Water absorption	%	Max. 0.5	0.20
Copper corrosion		No corrosion	No corrosion
Properties of adhesive			
Peel strength to PE		Min.35lb/in	40lb/in
Water absorption	%	Max.0.5	0.25
Softening point	℃		90 +/- 5
Corrosion		No corrosion	No corrosion

Shrinking Curve of H-5(3X)-F (Black 4.8)



Checked by: Liu Jian Date: 2009-12-4

Approved by: Dr. Zhong Xiaoguang Date: 2009-12-10