TUBING, POLYOLEFIN, SINGLE WALL, HEAT SHRINKABLE **WSS-M99D69-A1**

TUBING, POLYOLEFIN, SINGLE WALL, HEAT SHRINKABLE, FLAME RETARDANT **WSS-M99D69-A2**

1. SCOPE

The material defined by these specifications is a crosslinked polyolefin tubing whose diameter shall reduce to a predetermined size upon application of heat in excess of 135 °C. The tubing shall be fabricated from an irradiated, thermally stabilized, modified polyolefin composition.

2. APPLICATION

These specifications were originally released for material used as insulation by placing over the part to be protected and heating until it shrinks down tight, such as on eyelet terminal crimps and windshield wiper switch leads.

WSS-M99D69-A1 This material is intended for application where no flame retardant is needed.

WSS-M99D69-A2 This material is intended for application where flame retardant is required.

3. REQUIREMENTS

3.1 APPROVED SOURCES

This specification requires the use of approved sources. Only the sources identified on the Ford Approved Source List (ASL) can be used when this specification is listed on the drawing, CAD file, or other documents. The list of approved sources is located within Ford at www.mats.ford.com or available externally through a Ford Materials Engineer.

3.2 CONDITIONING AND TEST CONDITIONS

All test values are based on material conditioned for not less than 24 h prior to testing in a controlled environment of 23 +/- 2 °C and 50 +/- 5% relative humidity. Testing of the material should occur in the conditioning environment or soon after removal.

3.3 FORMED PARTS

The tubing shall be fabricated 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.

3.3.1	Dimensions (ASTM D2671)	As specified on engineering drawing
	Shall be specified before and after shrink.	
3.3.2	Longitudinal Change (ASTM D2671)	+0%, -5%

Date	Action	Revisions
2016 11 23	Released	C. Saige, NA

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3.4 SPECIFIC GRAVITY
(ASTM D2671

A1	1.00 +/- 0.10 g/cm^3
A2	1.35 +/- 0.15 g/cm^3

3.5 LOW TEMPERATURE FLEXIBILITY AT -55 °C — No cracking
(ASTM D2671, Procedure C)

Test Method: Specimens of tubing, as supplied (sizes as described in ASTM D 2671, Procedure C) and a mandrel (see Table 1 for size) shall be conditioned for 4 h at -55 +/- 2 °C. While at this temperature, the specimens shall be wrapped around the mandrel for at least 360° in approximately 2 s.

3.6 HEAT SHOCK
(ASTM D2671, 250 °C, 150 mm specimen length)

Specimens of tubing shall be conditioned for 4 h in a 250 +/- 5 °C oven. The specimens shall be removed from the oven, cooled to 23 +/-2 °C, and then visually examined for evidence of dripping, flowing, or cracking in the polyolefin. Any side cracking caused by flattening of the specimen on the mandrel shall not constitute failure

A1 Bend 180° over mandrel specified in Table II with no cracking observed.

A2 No signs of dripping, flowing, or cracking

3.7 COPPER MIRROR CORROSION — No corrosion
(ASTM D2671, Procedure A, 16 h at 175 °C)

3.8 DIELECTRIC STRENGTH — 20 kV/mm min
(ASTM D2671, short time)

3.9 FLAMMABILITY, WSS-M99D69-A2 ONLY
(SAE J1128, para 6.6 Resistance to Flame Propagation or ISO 6722-1, para 5.22 Resistance to Flame Propagation) Shall not continue to burn for more than 60 s — No dripping or flowing and no more than 25% of the indicator flag burned.

3.10 COLOR

3.10.1	WSS-M99D69-A1	Clear
3.10.2	WSS-M99D69-A2	Black or as specified on Engineering Drawing

4. GENERAL INFORMATION

The information given below is provided for clarification and assistance in meeting the requirements of this specification. Contact gmfs@ford.com for questions concerning Engineering Material Specifications.

4.1 TEMPERATURE RANGE

Material is stable from -55 °C to:

135 °C	continuous
150 °C	1000 h
175 °C	168 h
200 °C	24 h

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