



TUBING, POLYOLEFIN – CROSSLINKED – HEAT SHRINKABLE

ESF-M3L66-A

1. SCOPE

The material defined by this specification is an irradiated polyolefin tubing which is heat shrinkable. Because of the irradiation it has no true melting point. It shrinks to a predetermined size when heated above 135 °C.

2. APPLICATION

This specification was released originally for material used as insulation by placing over the part to be protected and heating until it shrinks down tight, such as on the aircraft starting motor brush leads and windshield wiper switch leads.

3. REQUIREMENTS

3.0 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

Material suppliers and part producers must conform to the Company's Standard Requirements For Production Materials (WSS-M99P1111-A).

3.1 DIMENSIONS
(ASTM D 876)

As specified on
engineering drawing
(see Table I)

Should be specified before shrink. For example, 1/4 in (6.4 mm) tubing will be supplied at a minimum I.D. of 1/4 in. (6.35 mm). It will then free shrink to 1/8 in. (3.18 mm) I.D. maximum with a wall thickness between 0.022 – 0.028 in. (0.56 – 0.71 mm). This material will shrink 5% longitudinally.

3.2 CLASSIFICATION OF TUBING

3.2.1 Grade "A", Semirigid

Type I

Flame retarded,
colored

(ASTM D 2671, self-extinguishing in 1 min, no dripping or flowing and no more than 25% of the indicator flag burned)

Type II

Not flame retarded,
clear

Date	Action	Revisions
2003 07 24	Revised	Para 3.0 inserted; Para 3.8 & 4 deleted
1978 11 07		Metricated and Retyped CF4H-RD567168-41
1966 06 06		Released (was XF-M3LX12) F6-2795

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Documents

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- 3.2.2 Grade "B", Flexible
- Type I Flame retarded, colored
(ASTM D 876, self-extinguishing in 15 s, no dripping or flowing and no charring or burning of indicator flag)
- Type II Not flame retarded, clear
- 3.2.3 Grade "C", Extra flexible
- Type I Flame retarded, colored
(ASTM D 2671, para 67-72, self-extinguishing in 1 min, no dripping or flowing and no more than 25% of the indicator flag burned)
- Type II Not Flame retarded, clear
- 3.3 **SPECIFIC GRAVITY, max**
(ASTM D 792)
- Type I 1.3
Type II 1.0
- 3.4 **LOW TEMPERATURE FLEXIBILITY AT – 55 °C** No cracking
- Test Method: Three 12 in (300 mm) specimens of tubing (on sizes $\frac{3}{4}$ - 4 in, (19-100 mm) cut 12 x $\frac{1}{4}$ in (300 x 6.4 mm) strips from tubing) and a mandrel (see Table II 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.
- 3.5 **HEAT SHOCK** 250 °C
- Test Method: Condition three 6 in. (150 mm) specimens of tubing at 250 +/- 5 °C for 4 h. After this conditioning Grade "A" shall be examined and will show no signs of dripping, flowing, or cracking. Grade "B" shall be bent 180° over the mandrel specified in Table II with no cracking observed. Side cracking caused by flattening of the tubing shall not be cause for rejection.
- 3.6 **COPPER CORROSION** No pitting or blackening
- Test Method: Three 6 in (150 mm) specimens of the tubing shall be slipped over a straight clean bare copper conductor. For $\frac{1}{4}$ in (6.4 mm) and smaller a single conductor is adequate; for 3.8 in (9.5 mm) and larger, several conductors shall be used, 18 AWG or smaller. The conductors should fit snugly in the tubing after shrinking. The specimens shall be conditioned for 16 h at 175 +/- 3 °C. When cooled to room temperature, there shall be no evidence of pitting or blackening of the conductor under the tubing. A slight discoloration (normal oxidation) of the wires is permitted.
- 3.7 **DIELECTRIC STRENGTH, min** 500 V/mil (20 kV/mm)
(ASTM D 876, short time)