RAYCHEM RT-3 TUBING
Polyolefin, Semi-rigid, Heat-Shrinkable

108-120017

RT-3 tubing is ideally suited for wire strain-relief applications. It provides excellent strain relief and insulation of “weak points,” transferring flex stress away from solder and crimp joints and other typically sensitive wire splice and termination points.
RT-3 is especially well suited for semi-automated production equipment requiring tubing with a tightly controlled expanded diameter. Sizes and expansion ratios of RT-3 are available for specific spade/disconnect terminals.
RT-3 tubing is made from a semi-rigid, radiation-crosslinked, flame-retardant polyolefin.
RT-3 is UL-recognized in all colors and CSA- certified in black at 125°C, 600 V.
Continuous operating temperature: –55°C to 135°C

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1. SCOPE

This specification covers the requirements for RT-3 a semi-rigid electrical insulating, extruded tubing whose diameter will reduce to a predetermined size upon the application of heat in excess of 135°C (275°F).

2. REVISION HISTORY

Revision Number	Change Request	Date	Incorporated By
A	New release	23-Feb-2024	Ayeshabanu N
A1	Clarification about flammability	28-Feb-2024	Ayeshabanu N

3. 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.

3.1. GOVERNMENT-FURNISHED DOCUMENTS

Military

MIL-G-5572	Gasoline, Aviation, Grades 80/87, 100/130, and 115/145
MIL-PRF-5606	Hydraulic Fluid, Petroleum Base, Aircraft, Missile and Ordinance
MIL-T-83133	Turbine Fuel, Aviation, Grades JP-8

3.2. OTHER PUBLICATIONS

American Society for Testing and Materials (ASTM)

D 2671 Standard Methods of Testing Heat-Shrinkable Tubing for Electrical Use

(Copies of ASTM publications may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.)

International Organization for Standardization (ISO)

ISO 846 Plastics – Evaluation of the action of Microorganisms

(Copies of ISO publications may be obtained from the International Organization for Standardization, 1, rue de Varembé, CH-1211 Geneva 20, Switzerland or via the ISO website at http://www.iso.ch/iso/en/ISOOnline.frontpage)

4. REQUIREMENTS

4.1. MATERIALS

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.

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4.2. PROPERTIES

The tubing shall meet the requirements of Table 3.

5. QUALITY ASSURANCE PROVISIONS

5.1. CLASSIFICATION OF TESTS

5.1.1. Qualification Tests

Qualification tests are those performed on tubing submitted for qualification as a satisfactory product and shall consist of all tests listed in this specification.

5.1.2. Acceptance Tests

Acceptance tests are those performed on tubing listed. Acceptance tests shall be: dimensions, longitudinal change, tensile strength, ultimate elongation, secant modulus, flammability, and heat shock. Statistical process control data may be used to demonstrate conformance for dimensions.

5.2. SAMPLING INSTRUCTIONS

5.2.1. Qualification Test Samples

Qualification test samples shall consist of 50 feet (15 m) of RT-3-No.1 and RT-3-No.4 which will qualify all sizes.

5.2.2. Acceptance Test Samples

Acceptance test samples shall consist of not less than 5 m (16 feet) of tubing selected at random from each lot. A lot shall consist of all tubing of the same size from the same production run and offered for inspection at the same time.

5.3. TEST PROCEDURES

Unless otherwise specified, perform tests on specimens which have been fully recovered by conditioning for 3 minutes in a 200 ± 5°C (392 ± 9°F) oven. Condition the test specimens (and measurement gauges, when applicable) for 3 hours at 23 ± 3°C (73 ± 5°F) and 50 ± 5 percent relative humidity for 3 hours prior to all testing. Use mechanical convection type ovens in which air passes the specimens at a velocity of 100 to 200 feet (30 to 60 m) per minute.

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5.3.1. Dimensions and Longitudinal Change

Measure three 150 mm *(6-inch)* specimens of tubing, as supplied, for length ±1 mm *(±1/32 inch)*, and inside diameter in accordance with ASTM D 2671. Condition the specimens for 3 minutes in a 200 ± 5°C *(392 ± 9°F)* oven, cool to 23 ± 3°C *(73 ± 5°F)* and remeasure. 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.

Calculate the longitudinal change as follows:

$$C = ((L_1 - L_0)/ L_0)x100$$

Where: C = Longitudinal Change [Percent]
L_0 = Length Before Conditioning [Inches *(mm)*]
L_1 = Length After Conditioning [Inches *(mm)*]

5.3.2. Tensile Strength and Ultimate Elongation

Determine the tensile strength and ultimate elongation of the tubing in accordance with ASTM D 2671 using 25-mm *(1-inch)* bench marks, a 50-mm *(2-inch)* initial jaw separation, and jaw separation speed of 50 ± 5 mm *(2 ± 0.2 inches)* per minute.

5.4. REJECTION AND RETEST

Failure of any sample of tubing to conform to any one of the requirements of this specification shall be cause for rejection of the lot represented. Tubing which has been rejected may be replaced or reworked to correct the defects and resubmitted for acceptance. Before resubmitting, full particulars concerning previous rejection and action taken to correct the defects shall be furnished to the inspector.

6. PREPARATION FOR DELIVERY

6.1. PACKAGING

Packaging shall be in accordance with good commercial practice.

6.2. MARKING

Each container of tubing shall be permanently and legibly marked with the size, quantity, manufacturer's name, part number, specification number, and lot number.

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Appendix

TABLE 1 Tubing Dimensions

Size	As Supplied		Recovered			
	Inside Diameter (D)		Inside Diameter Maximum (d)		Wall Thickness Nominal (W)	
	mm	*inches*	mm	*inches*	mm	*inches*
No.1	6.1 ± 0.4	*0.240 ± 0.015*	2.4	*0.095*	0.79	*0.031*
No.2	8.1 ± 0.4	*0.320 ± 0.015*	3.2	*0.125*	0.79	*0.031*
No.3	9.5 ± 0.5	*0.375 ± 0.020*	3.8	*0.150*	0.79	*0.031*
No.4	12.3 ± 0.5	*0.485 ± 0.020*	5.1	*0.200*	0.79	*0.031*

TABLE 2 Mandrel Dimensions for Bend Testing

Tubing Size mm *(inches)*	**Mandrel Diameter**	
	mm.	***in.***
1.19 *(3/64)* to 6.35 *(1/4)* inclusive	7.9	*5/16*
6.36 *(3/8)* to 12.7 *(1/2)* inclusive	9.5	*3/8*

TABLE 3 Requirements

PROPERTY	**UNIT**	**Requirement**	**TEST METHOD**
PHYSICAL Dimensions	mm *(inches)*	In accordance with Table 1	Section 4.3.1 ASTM D 2671
Longitudinal Change	Percent	-10 to 0	
Tensile Strength	MPa *(psi)*	13.8 *(2,000)* minimum	Section 4.3.2 ASTM D 2671
Ultimate Elongation	Percent	200 minimum	
Secant Modulus (Expanded)	MPa *(psi)*	172 *(2.5 x 10^4)* minimum	ASTM D 2671
Specific Gravity	---	1.35 maximum	ASTM D 2671
Low Temperature Flexibility 4 hours at -55 ± 1°C *(-67 ± 2°F)*	---	No cracking	Table 2 ASTM D 2671 Procedure C
Heat Shock 4 hours at 250 ± 3°C *(482 ± 5°F)*	---	No dripping, flowing or cracking	Table 2 ASTM D 2671
Heat Resistance 168 hours at 175 ± 2°C *(347 ± 4°F)* Followed by test for: Ultimate Elongation	--- Percent	--- 150 minimum	ASTM D 2671

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TABLE 3 Requirements
(continued)

PROPERTY	UNIT	Requirement	TEST METHOD
ELECTRICAL Dielectric Strength	Volts/mm *(Volts/mil)*	10,680 *(500)* minimum	NOTE 1 ASTM D 2671
Volume Resistivity	ohm-cm	10^{14} minimum	ASTM D 2671
CHEMICAL Copper Mirror Corrosion 16 hours at 150 ± 2°C *(302 ± 4°F)*	---	No removal of copper	ASTM D 2671 Procedure A
Copper Contact Corrosion 168 hours at 150 ± 2°C *(302 ± 4°F)*	---	No pitting or blackening of copper	ASTM D 2671 Procedure B
Flammability	---	Self-extinguishing within 1 minute, 25% maximum flag burn, no falling burning particles	ASTM D 2671 Procedure C
Fungus Resistance Followed by tests for: Tensile Strength Ultimate Elongation Dielectric Strength	 MPa *(psi)* percent Volts/mm *(volts/mil)*	 13.8 *(2,000)* minimum 200 minimum 19,680 *(500)* minimum Rating - 0	ISO 846 Method B Section 4.3.2 ASTM D 2671 ASTM D 2671 Or ASTM G 21
Water Absorption 24 hours at 23 ± 3°C *(73 ± 5°F)*	Percent	0.5 maximum	ASTM D 2671
Fluid Resistance 24 hours at 23 ± 3°C *(73 ± 5°F)* in: JP-8 Fuel (MIL-T-83133) Skydrol- 500 Hydraulic Fluid (MIL-PRF-5606) Aviation Gasoline (100/130) (MIL-G-5572) Water Followed by tests for: Dielectric Strength Tensile Strength	--- Volts/mm *(volts/mil)* MPa *(psi)*	--- 15,760 *(400)* minimum 11.0 *(1,600)* minimum	ASTM D 2671

NOTE 1: Recover the specimens on the metal mandrels for 10 minutes minimum, at 175 ± 3° C *(347 ± 5° F)* or until the tubing is completely shrunk on the mandrels.

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