Raychem RW-175 TUBING
Poly (Vinylidene Fluoride)
Modified, Irradiated, Heat-Shrinkable

Formerly RW-3029/2

108-120022

RW-175 heat-shrinkable tubing is a tough, semi rigid, very-thin-wall insulation. It is especially suitable for applications requiring high-temperature performance, outstanding abrasion and cut-through resistance, or superior chemical and solvent properties. The translucent polyvinylidene fluoride material permits visual inspection of covered components.
RW-175 tubing provides electrical insulation and strain relief of multipin connectors and solder joints. It is also widely used as insulation for high temperature components and heater leads. With its thin-wall construction, RW-175 is ideal for applications that require dense packing of components.
RW-175 provides protection from most industrial solvents, fuels, and chemicals – including JP-8, oxidants, and strong acids. It is UL-recognized and CSA-certified at 150°C, 600 V, with VW-1 and OFT flame-retardancy ratings.
RoHS and REACH compliant.
Continuous operating temperature -55 to 175°C *(-67 to 347 °F)*.
Recommended maximum temperature for use as a primary insulator 135°C *(275 °F)*.

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1. SCOPE

This specification covers the requirements for one type of electrical insulating, extruded tubing whose diameter will reduce to a predetermined size upon the application of heat in excess of 175°C *(347°F).*

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.

2.1. GOVERNMENT-FURNISHED DOCUMENTS

Military

MIL-PRF-5606H	Hydraulic Fluid, Petroleum Base, Aircraft, Missile and Ordnance
MIL-T-83133	Turbine Fuel, Aviation, Kerosene Type, JP-8
MIL-L-7808	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base

2.2. OTHER PUBLICATIONS

ISO 846 Plastics – Evaluation of the action of microorganisms.

ASTM D2671 Standard Methods of Testing Heat-Shrinkable Tubing for Electrical use
ASTM E 595 Standard Methods of Test for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment
ASTM D910 Standard Specification for Leaded Aviation Gasolines

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

AMS1424 De-icing/Anti-Icing Fluid, Aircraft, SAE Type I

3. REQUIREMENTS

3.1. MATERIAL

The tubing shall be fabricated from modified poly (vinylidene fluoride) compounded to produce a homogenous, uniform material, essentially free from flaws, defected, pinholes, seams, cracks or inclusions.

3.2. COLOR

The tubing described herein shall be supplied in a standard unpigmented state, transparent to translucent light tan (clear) in color, unless otherwise specified.

3.3. PROPERTIES

The tubing shall meet the requirements of Table 2.

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4. QUALITY ASSURANCE PROVISIONS

4.1. CLASSIFICATION OF TESTS

4.1.1. Qualification Tests

Qualification tests are those performed on samples submitted for qualification as a satisfactory product and shall consist of all tests listed in this specification. Qualification of any size within each size range specified below shall qualify all sizes within that size range:

Expanded ID Size Ranges		
3/64	through	3/16
1/4	through	2

4.1.2. Acceptance Tests

Acceptance tests are those performed on tubing submitted for acceptance under contract. Acceptance tests shall consist of the following tests: dimensional recovery, longitudinal change, tensile strength, ultimate elongation, secant modulus and heat shock. Statistical process control data may be used to demonstrate conformance for dimensions.

4.2. SAMPLING INSTRUCTIONS

4.2.1. Qualification Test Samples

Qualification test samples shall consist of 15 m *(50 ft.)* of tubing of the size specified.

4.2.2. Acceptance Test Samples

Acceptance test samples shall consist of not less than 5 m *(16 ft.)* of tubing selected at random from each compound batch or the first sleeving production lot of the batch compound. Physical property tests performed at this time qualify subsequent sleeving lots produced from the same compound batch.

4.3. TEST PROCEDURES

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

4.3.1. Dimensions and Longitudinal Change

Three 150-mm *(6-inch)* specimens of tubing, as supplied, shall be measured for length ± 1 mm *(± 1/32 inch)* and inside diameter in accordance with ASTM D 2671. These specimens shall be conditioned for 3 minutes in a 200 ± 5°C *(392 ± 9°F)*

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oven, removed from the oven and cooled to 23 ± 3°C *(73 ± 5°F),* and remeasured for length, inside diameter and wall thickness. Longitudinal change shall be calculated as follows:

$$LC = \frac{(L_1 - L_0)}{L_0} \times 100$$

Where: LC = Longitudinal Change [percent]
L_0 = Length Before Conditioning
L_1 = Length After Conditioning

4.3.2.Tensile Strength and Ultimate Elongation

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

4.3.3.Low Temperature Flexibility

For tubing of expanded diameter 6 mm *(1/4 inch)* or greater, three strip specimens 6 mm *(1/4 inch)* wide and 300 mm *(12 inches)* long shall be cut from the expanded tubing. For tubing of expanded diameter less than 6 mm *(1/4 inch)* three tubular specimens, 300 mm *(12 inches)* long, shall be cut from the expanded tubing. The specimens shall be recovered in accordance with Section 4.3 and conditioned with appropriate mandrels for 4 hours at -55 ± 2°C *(-67 ± 4°F)*. The mandrel diameter shall be 10 times the specimen thickness, ± 10%. For tubular specimens, the specimens thickness shall be equivalent to the outside diameter. While at the specified temperature, and without removing the specimens from the cold chamber, the specimens shall be wrapped for 360 degrees around the mandrel in approximately 2 seconds. Any side cracking, caused by flattening of the specimens on the mandrel, shall be disregarded.

4.3.4.Heat Shock

Three 150-mm *(6-inch)* specimens of tubing shall be conditioned for 4 hours in a 300 ± 5°C *(572 ± 9°F)* oven. After this conditioning, the specimens shall be removed from the oven, cooled to 23 ± 3°C *(73 ± 5°F),* wrapped 180 degrees around a mandrel selected in accordance with Table 1, and then visually examined for evidence of dripping, flowing or cracking. Any side cracking caused by flattening of the specimen on the mandrel shall not constitute failure.

4.3.5.Heat Resistance

Three 300-mm *(12-inch)* specimens of tubing shall be conditioned for 168 hours in a 250 ± 5°C *(482 ± 9°F)* oven. After conditioning, the specimens shall be removed from the oven, cooled to 23 ± 3°C *(73 ± 5°F)* and tested for ultimate elongation in accordance with Section 4.3.2.

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4.3.6. Corrosive Effect

4.3.6.1. Copper Mirror Corrosion

The tubing shall be tested for copper mirror corrosion in accordance with ASTM D 2671, Procedure A, for 16 hours at 175 ± 3°C *(347 ± 5°F)*. Evidence of corrosion shall be the removal of copper from a mirror, leaving an area of transparency greater than 5 percent of its total area.

4.3.6.2. Corrosion in Contact with Copper

The tubing shall be tested for corrosion in contact with copper in accordance with ASTM D 2671, Procedure B, for 168 hours at 175 ± 3°C *(347 ± 5°F)*. After conditioning, the tubing shall be tested for ultimate elongation in accordance with Section 4.3.2. Examine the copper for evidence of pitting or blackening.

4.3.7. Fluid Resistance

Six 150-mm *(6-inch)* specimens of tubing, prepared and measured in accordance with ASTM D 2671, shall be completely immersed in each of the fluids listed in Table 2 for 24 ± 2 hours at 23 ± 3°C *(73 ± 5°F)*. The volume of the fluid shall be not less than 20 times that of the specimens. After immersion, the specimens shall be lightly wiped and air dried for 30 to 60 minutes at room temperature. Three specimens then shall be tested for dielectric strength and the other three for tensile strength.

4.4. REJECTION AND RETEST

Failure of a 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 defect and then resubmitted for acceptance. Before resubmitting, full particulars concerning the rejection and the action taken to correct the defect shall be furnished to the inspector.

5. PREPARATION FOR DELIVERY

5.1. FORM

The tubing shall be supplied in lengths of 1200 +25, -0 mm *(48 +1, -0 inches)* unless otherwise specified.

5.2. PACKAGING

Packaging shall be in accordance with good commercial practice.

5.3. MARKING

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Each container of tubing shall be permanently and legibly marked with the product designation, size, quantity, manufacturer's identification and lot number

APPENDIX

TABLE 1
Mandrel Dimensions

Tubing Expanded ID Size	Mandrel Diameter	
mm *(inches)*	**mm.**	***in***
1.16 *(3/64)* through 4.79 *(3/16)*	7.9	*5/16*
4.80 *(1/4)* through 50.8 *(2.000)*	19.1	*3/4*

TABLE 2
Requirements

PROPERTY	UNIT	REQUIREMENT	TEST METHOD
PHYSICAL Dimensions	mm *(inches)*	In accordance with RW-175 SCD	Section 4.3.1
Longitudinal Change	Percent	+0, -10 maximum	ASTM D 2671
Tensile Strength	MPa *(psi)*	34.5 minimum *(5000)*	Section 4.3.2
Ultimate Elongation	Percent	150 minimum	ASTM D 2671
2% Secant Modulus (expanded)	MPa *(psi)*	690 minimum *(1 x 10^5)*	ASTM D 2671
Specific Gravity		1.8 maximum	ASTM D 2671
Low Temperature Flexibility 4 hours at -55 ± 2°C *(-67 ± 4°F)*	---	No cracking	Section 4.3.3
Heat Shock 4 hours 300 ± 5°C *(572 ± 9°F)*	---	No dripping, flowing, or cracking	Section 4.3.4
Heat Resistance 168 hours at 250 ± 5°C *(482 ± 9°F)* Followed by test for:	---	---	Section 4.3.5
Ultimate Elongation	Percent	50 minimum	
Vacuum Outgassing TML (Total Mass Loss) VCM (Volatile Condensable Material)	 Percent Percent	 1.0 maximum 0.1 maximum	ASTM E 595
ELECTRICAL Dielectric Strength Sizes 3/64 through 1/2 Sizes 3/4 through 2	 Volts/mm *(Volts/mil)*	 31,500 minimum *(800)* 23,600 minimum *(600)*	ASTM D 2671
Volume Resistivity	ohm-cm	$1x10^{13}$ minimum	ASTM D 2671

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CHEMICAL Corrosive Effect Copper Mirror 16 hours at 175 ± 3°C *(347 ± 5°F)*	---	Non-Corrosive	Section 4.3.6.1 ASTM D 2671 Procedure A
Copper Contact 168 hours at 175 ± 3°C *(347 ± 5°F)* Followed by test for:	---	No pitting or blackening of copper	Section 4.3.6.2 ASTM D 2671 Procedure B
Ultimate Elongation	Percent	100 minimum	Section 4.3.2
Flammability Average Time of Burning	Seconds	15 maximum	ASTM D 2671 Procedure A
Fungus Resistance Followed by tests for: Tensile Strength Ultimate Elongation Dielectric Strength Sizes 3/64 through 1/2 Sizes 3/4 through 2	 MPa *(psi)* percent Volts/mm *(volts/mil)*	 34.5 minimum *(5000)* 150 minimum 31,500 minimum *(800)* 23,600 minimum *(600)*	ISO 846 Method B Section 4.3.2 ASTM D 2671 ASTM D 2671
Water Absorption 24 hours at 23 ± 3°C *(73 ± 5°F)*	Percent	0.5 maximum	ASTM D 2671
CHEMICAL (continued) Fluid Resistance 24 hours at 23 ± 3°C *(73 ± 5°F)* JP-8 Fuel (MIL-T-83133) Skydrol* 500 Hydraulic Fluid (MIL-H-5606) Aviation Gasoline 100/130 (ASTM D910) Salt Water (5% salt) Anti-icing Fluid (AMS1424) Lubricating Oil (MIL-L-7808) Followed by tests for:	---	---	Section 4.3.7
Dielectric Strength Sizes 3/64 through 1/2 Sizes 3/4 through 2	Volts/mm *(Volts/mil)*	27,600 minimum *(700)* 19,700 minimum *(500)*	ASTM D 2671
Tensile Strength	MPa *(psi)*	34.5 minimum *(5000)*	Section 4.3.2 ASTM D 2671

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6. REVISION HITROY

Revision number	Change request	Date	Incorporated By
A	New Release	23 July 2019	Basavaraj
A1	Clause 4.3.6.2 testing hrs text error correction	20 Feb 2026	Ravi tejaswini G

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