



Specification RW 3029/1 Revision 4

RW-175 and RW-175-E SLEEVING

SCOPE

This Quality Assurance Specification establishes the quality standard for a non-burning, heat-shrinkable, electrically-insulating, polyvinylidene fluoride sleeving.

Approved Signatories*

* This document is electronically reviewed and approved by TE Connectivity Approvers therefore no signatures will appear.

1. REVISION HISTORY

| Revision Number | Change Request | Date | Incorporated By |
|-----------------|----------------|-------------------------------|-----------------|
| 1 | Initial | 4 April 2000 | Linda Abrams |
| 2 | CR04-DM-0027 | 5 February 2004 | Linda Abrams |
| 3 | DMTec | 7 th February 2014 | Colin Diss |
| 4 | Via DMTEC | 17 March 2014 | C. Diss |

2. REQUIREMENTS

The sleeving shall be homogeneous and essentially free from pinholes, bubbles, cracks and inclusions, and shall be unpigmented, transparent to translucent light tan in colour.

2.2 Dimensions

| Size | Minimum Inside Diameter as supplied mm | Maximum Inside Diameter after recovery mm | Wall Thickness after recovery mm |
|------|---|--|-------------------------------------|
| 3/64 | 1.2 | 0.6 | 0.25 ± 0.03 |
| 1/16 | 1.6 | 0.8 | 0.25 ± 0.03 |
| 3/32 | 2.4 | 1.2 | 0.27 ± 0.03 |
| 1/8 | 3.2 | 1.6 | 0.27 ± 0.03 |
| 3/16 | 4.8 | 2.4 | 0.27 ± 0.03 |
| 1/4 | 6.4 | 3.2 | 0.33 ± 0.05 |
| 3/8 | 9.5 | 4.8 | 0.33 ± 0.05 |
| 1/2 | 12.7 | 6.4 | 0.33 ± 0.05 |

Sleeving of special expanded or recovered dimensions may be supplied as specified in the contract or order.

2.3 Test Requirements

The test requirements shall be as specified in Table 1.

3. Preparation of Test Specimens

Unless otherwise specified, tests shall be carried out on specimens of sleeving recovered by conditioning in a fan assisted air circulating oven for 4 ± 1 minutes at $200 \pm 5^\circ\text{C}$ and allowed to cool in air to ambient temperature. No pre-conditioning period is required prior to testing. Unless otherwise specified, all tests shall be made under standard ambient conditions according to IEC Publication 60212. In cases of dispute the tests shall be carried out at a temperature of $23 \pm 2^\circ\text{C}$ and at $50 \pm 5\%$ relative humidity.

4. RELATED STANDARDS & issue

| | |
|-------------------|--|
| IEC 60212: 1971 | Standard Conditions for Use Prior to and During Testing of Solid Electrical Insulating Materials |
| IEC 60684-2 :1997 | Flexible insulating sleeving - Part 2: Methods of test |
| ISO 1817: 1999 | Rubber, vulcanized - Determination of the effect of liquids |
| ISO 846: 1997 | Plastics - Evaluation of the action of microorganisms. |

Subsequent amendments to, or revisions of, any of the above publications apply to this standard only when incorporated in it by updating or revision.

5. SAMPLING

Tests shall be carried out on a sample taken at random from each batch of finished sleeving. A batch of sleeving is defined as that quantity of sleeving extruded at any one time. Testing frequency shall be Production Routine, 10th batch or Qualification. Production Routine tests consisting of Visual Examination, Dimensions and Longitudinal Change shall be carried out on every batch of sleeving. 10th batch tests shall consist of Tensile Strength, Ultimate Elongation, Secant Modulus at 2% Strain and Specific Gravity. Qualification tests shall be carried out to the requirements of the Design Authority.

6. PACKAGING

Packaging shall be in accordance with good commercial practice. Each package shall bear an identification label showing material quantity, description, size, colour and batch number. Additional information shall be supplied as specified in the contract or order.

TABLE 1 Test Requirements

| Test | Test Method | Test Requirements | |
|-------------------------------------|---------------------------------------|---|----------------------------------|
| Visual Examination | - | In accordance with Clause 2.1 | |
| Dimensions | IEC 60684-2 Clause 3 | In accordance with Clause 2.2 | |
| Longitudinal Change | IEC 60684-2 Clause 9 | 0 to -10 % | |
| Tensile Strength | IEC 60684-2 Clause 19.1 and 19.2 ① | 35 MPa minimum | |
| Ultimate Elongation | IEC 60684-2 Clause 19.1 and 19.2 ① | 150 % minimum | |
| Secant Modulus at 2 % Elongation | IEC 60684-2 Clause 19.4 | 250 MPa minimum (recovered) 690 MPa minimum (expanded) | |
| Density | IEC 60684-2 Clause 4 | 1.8 maximum | |
| Bending at Low Temperature | IEC 60684-2 Clause 14 ② | 4h ± 15m at -55 ± 2°C (-67 ± 4°F) No cracking | |
| Heat Shock | IEC 60684-2 Clause 6 | 4h ± 15m at 300 ± 5°C No dripping, cracking or flowing | |
| Heat Ageing | IEC 60684-2 Clause 39 | 168 ± 2h at 200 ± 5°C | |
| - Tensile Strength | Clause 19.1 and 19.2 ① | 15 MPa minimum | |
| - Ultimate Elongation | Clause 19.1 and 19.2 ① | 75 % minimum | |
| Breakdown Voltage | IEC 60684-2 Clause 21 | <u>Recovered wall Thickness nom</u> | <u>Breakdown Voltage min</u> |
| | | 0.25 mm | 5.0 kV |
| | | 0.30 mm | 6.0 kV |
| | | 0.45 mm | 9.0 kV |
| 0.55 mm | 10.0 kV | | |
| Volume Resistivity | IEC 60684-2 Clause 23 | 10 ¹³ ohm.cm minimum | |

① Use a jaw separation rate of 100 mm/min.

Below 6.5 mm diameter test as sleeving; at 6.5 mm diameter and above as dumb-bells.

② For strips the mandrel shall be no more than 10 times the wall thickness. Full section sleeving is tested unfilled and the mandrel shall be no more than 10 times the outer diameter.

TABLE 1 Test Requirements (Cont'd)

| Test | Test Method | Test Requirements |
|-------------------------------|---------------------------------------|--|
| Flame Propagation | IEC 60684-2 Clause 26 Method C | Duration of burning 15s maximum |
| Corrosion Resistance | IEC 60684-2 Clause 32 | 168 ± 2h at 175 ± 3°C No corrosion of mandrel |
| - Ultimate Elongation | Clause 19.1 and 19.2 ① | 100 % minimum |
| Copper Corrosion | IEC 60684-2 Clause 33 | 16h ± 30m at 175 ± 3°C No corrosion of mirrors above the allowable 8% |
| Water Absorption | IEC 60684-2 Clause 40 | 24 ± 2h at 23 ± 2°C 0.5% maximum |
| Resistance to Selected Fluids | IEC 60684-2 Clause 36 | For list of fluids and test temperatures see Table 2 |
| - Tensile Strength | Clause 19.1 and 19.2 ① | 25 MPa minimum |
| - Ultimate Elongation | | 150% minimum |
| Fungus Resistance | ISO 846 Method B, 56 days exposure | |
| - Tensile Strength | IEC 60684-2 | 35 MPa minimum |
| - Ultimate Elongation | Clause 19.1 and 19.2 ① | 150% minimum |

TABLE 2 Resistance to Selected Fluids

| Fluids | Type | Standard or Symbol | Immersion Temperature |
|---|-------------------|---|-----------------------|
| Fuels | Gasoline | ISO 1817 Liquid B | 23 ± 2°C |
| | Kerosene | ISO 1817 Liquid F | 70 ± 2°C |
| Hydraulic Fluids | Phosphate Base | ISO 1817 Liquid 103 | 23 ± 2°C |
| | Silicone Base | S-1714* | 70 ± 2°C |
| | Mineral Base | H-520* | 50 ± 2°C |
| Oils | Synthetic Base | ISO 1817 Liquid 101 | 70 ± 2°C |
| | Mineral Base | ISO 1817 Oil No. 2 | 70 ± 2°C |
| | Mineral Base | O-1176* | 70 ± 2°C |
| | Mineral Base | O-142* | 50 ± 2°C |
| Cleaning Fluids | Solvent | Isopropyl alcohol | 23 ± 2°C |
| | | Propanol 25%, White Spirit 75% | 23 ± 2°C |
| | | Methyl Ethyl Ketone | 23 ± 2°C |
| De-icing Fluids | Runway de-icers | Inhibited Potassium Acetate in water, 50% | 23 ± 2°C |
| | Aircraft de-icers | Ethylene Glycol 80%, Water 20% | 23 ± 2°C |
| *These are commercially available fluids which can be identified in aviation fluid guides | | | |

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