



## 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 <sup>th</sup> 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  $4 \pm 1$  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 <sup>13</sup> 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

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**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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