



RK-6008/2 Revision 9

Raychem brand DR-25-TW Sleeving

SCOPE

This Quality Assurance Specification establishes the quality standard for a heat-shrinkable, electrically insulating, flame retarded, thin wall elastomeric sleeving.

Approved Signatories*

Tyco Electronics : Approved electronically via DMTEc

*** This document is electronically reviewed and approved - therefore no signatures will appear.**

1. REVISION HISTORY

Revision Number	Change Request	Date	Incorporated By
3	P0237	02 June 1994	R. Harris
4	CR/IND/0038/0040	03 October 1996	L Abrams
5	CR01-DM-0052	15 March 2001	Paul Dixon
6	CR02-DP-0234	30 April 2002	C. Diss
7	CR03-DM-224	18 December 2003	L. Abrams
8	CR07-DM-041	9 March 2007	A. Edwards
9	CR10-DM-009	3 August 2010	P. Dixon

2. REQUIREMENTS

2.1 Composition, Appearance and Colour

The sleeving shall be manufactured from irradiation cross-linked, thermally stabilised, elastomeric material. It shall be homogenous and essentially free from pinholes, flaws, bubbles, cracks, seams, defects and inclusions. The colour shall be black.

2.2 Dimensions

Size	Inside Diameter as supplied (min) mm	Inside Diameter after recovery (max) mm	Wall Thickness after recovery mm
3/32	2.4	1.2	0.51 ± 0.08
1/8	3.2	1.6	0.51 ± 0.10
3/16	4.8	2.4	0.51 ± 0.10
1/4	6.4	3.2	0.64 ± 0.10
3/8	9.5	4.8	0.64 ± 0.10
1/2	12.7	6.4	0.64 ± 0.10
3/4	19.0	9.5	0.76 ± 0.12
1	25.4	12.7	0.89 ± 0.16
1-1/4	31.5	15.0	1.10 ± 0.10
1-1/2	38.0	19.0	1.02 ± 0.18

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. TEST METHODS

3.1 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 at $200 \pm 5^\circ\text{C}$ for 6 ± 1 minutes 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.

3.2 Dimensions and Longitudinal Change

The test method shall be as specified in ASTM D2671. The length and inside diameter of three 150mm long specimens of expanded sleeving shall be measured. The specimens shall be recovered in a fan assisted air circulating oven and the length and inside diameter of each shall be measured. The longitudinal change shall be expressed as a percentage of the original length. The minimum and maximum recovered wall thickness shall be determined.

3.3 Tensile Strength and Ultimate Elongation

The test method shall be as specified in ISO 37. For sleeving of recovered bore greater than 6mm, five Type 2 dumb-bell specimens shall be tested. For sleeving of recovered bore less than or equal to 6mm, five tubular specimens 125mm long shall be tested. Initial jaw separation shall be 50 mm and rate of jaw separation shall be $100 \pm 10\text{mm}$ per minute. The test shall be carried out at a temperature of $23 \pm 2^\circ\text{C}$

3.4 Secant Modulus at 2% Strain

The test method shall be as specified in Method A of ASTM D882. For sleeving of recovered bore greater than 6mm, five strip specimens 150mm long shall be tested. For sleeving of recovered bore less than or equal to 6mm five tubular specimens 150mm long shall be tested. Initial jaw separation shall be 100mm and rate of jaw separation $10 \pm 1\text{mm}$ per minute. The test shall be carried out at a temperature of $23 \pm 2^\circ\text{C}$.

3.5 Specific Gravity

The test method shall be as specified in Method A of ISO 1183-1.

3.6 Heat Shock

The test method shall be as specified in ASTM D2671. Five tensile test specimens prepared as in Clause 3.3 shall be conditioned in a fan assisted air circulating oven as specified in Table 1. After conditioning the specimens shall be removed from the oven, allowed to cool naturally to room temperature and tested for Tensile Strength and Ultimate Elongation according to Clause 3.3.

TEST METHODS (Cont'd)**3.7 Heat Ageing**

The test method shall be as specified in ISO 188.

Five tensile test specimens prepared as in Clause 3.3 shall be conditioned in a fan assisted air circulating oven as specified in Table 1. After conditioning the specimens shall be removed from the oven, allowed to cool naturally to room temperature and tested for Tensile Strength and Ultimate Elongation according to Clause 3.3.

3.8 Low Temperature Flexibility

The test method shall be as specified in Procedure C of ASTM D2671.

For sleeving of recovered bore 6mm or less, apply the test to whole sections of recovered sleeving. For sleeving of recovered bore greater than 6mm, apply the test to strips 6mm wide, cut from the recovered sleeving, with their lengths parallel to the extruded axis. Mandrel diameter shall be $20 \times$ specimen thickness $\pm 10\%$. For tubular specimens the thickness is the outside diameter. The specimens and mandrel shall be conditioned as specified in Table 1.

3.9 Flammability

The test method shall be as specified in VG 95343 part 5 Type D
The test shall be carried out on size 1/2".

3.10 Electric Strength

The test method shall be as specified in IEC 60243 (Short time test).

3.11 Volume Resistivity

The test method shall be as specified in IEC 60093.

3.12 Copper Contact Corrosion

The test method shall be as specified in ASTM D2671.

The specimens shall be conditioned in a fan assisted air circulating oven as specified in Table 1, allowed to cool naturally to room temperature and tested for Ultimate Elongation according to Clause 3.3.

3.13 Copper Mirror Corrosion

The test method shall be as specified in ASTM D2671.

The specimens shall be conditioned as specified in Table 1.

3.14 Water Absorption

The test method shall be as specified in Method 1 of ISO 62.

For sleeving of recovered bore greater than 8mm, three disc specimens of diameter 25 ± 1 mm shall be cut from the sleeving. For sleeving of recovered bore less than or equal to 8mm, three tubular specimens 50mm long shall be cut from the sleeving.

TEST METHODS (Cont'd)

3.15 Fluid Resistance

The test method shall be as specified in ISO 1817.
 Five tensile test specimens prepared as in Clause 3.3. shall be completely immersed in each of the fluids for the times and temperatures specified in Table 1. The volume of the fluid shall not be less than 20 times that of the specimen. After immersion, lightly wipe the specimens and allow to air dry at 23 ± 2°C for 1h ± 15m. The Tensile Strength and Ultimate Elongation of each specimen shall be tested according to Clause 3.3. The test shall be repeated on the remaining specified fluids.

3.16 Fungus Resistance

The test method shall be as specified in ISO 846.
 The specimens shall be conditioned for 56 days, and tested for Tensile Strength and Ultimate Elongation according to Clause 3.3.

Visual : The test method shall be as specified in BS2011 Part 2.1J

3.17 Adhesion Performance

Use test method relating to DR-25 in Test Requirements Section of RK6619 (S1125) and RW 2074 (Pre-coated latent-cure adhesive).

4. RELATED STANDARDS & issue

ASTM D2671-09	Standard Test Methods for Heat-Shrinkable Tubing for Electrical Use
ASTM D2240-05	Standard Test Method for Rubber Property - Durometer Hardness
BS 2011:Part 2.1J: 1989	Basic environmental testing procedures. Tests. Test J and guidance. Mould growth
IEC 60212: 1971	Standard Conditions for Use Prior to and During Testing of Solid Electrical Insulating Materials
IEC 60093: 1980	Method of test for volume resistivity and surface resistivity of solid electrical insulating materials.
IEC 60243-1: 1998	Electrical Strength Of Insulating Materials - Test Methods - Tests At Power Frequencies
ISO 1183-1: 2004	Plastics - Methods For Determining The Density Of Non-Cellular Plastics - Part 1: Immersion Method, Liquid Pyknometer Method And Titration Method

4. RELATED STANDARDS & issue (Cont'd)

ISO 1817: 2005	Rubber, vulcanized - Determination of the effect of liquids
ISO 37: 2005	Rubber, vulcanized or thermoplastic - Determination of Tensile Stress-Strain Properties
ISO 62: 2008	Determination of Water Absorption
ISO 188: 2007	Rubber, vulcanized - Accelerated Ageing or Heat Resistance Tests.
ISO 846: 1997	Plastics - Evaluation of the action of microorganisms.
RK-6619	S-1125 Adhesive
RW-2074	S-1206 Pre-Coated Latent-Cure Adhesive
VG 95343 part 5	Heat Shrinkable Components

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 Heat Shock. 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		As per Clause 2.1
Dimensions	ASTM D2671	As per Clause 2.2
Longitudinal Change	ASTM D2671	0 to -10%
Tensile Strength	ISO 37	14 MPa minimum
Ultimate Elongation	ISO 37	350 % minimum
Secant Modulus at 2% Strain	ASTM D882	50 MPa maximum
Specific Gravity	ISO 1183-1	1.45 maximum
Heat Shock (4h ± 15m at 215 ± 5°C)	ASTM D2671	No dripping, cracking or flowing
- Tensile Strength	ISO 37	8 MPa minimum
- Ultimate Elongation		200 % minimum
Heat Ageing (168h ± 2h at 160 ± 3°C)	ISO 188	
- Tensile Strength	ISO 37	10 MPa minimum
- Ultimate Elongation		200% minimum
Low Temperature Flexibility (4h ± 15m at -75 ± 2°C)	ASTM D2671	No cracking
Flammability	VG 95343 part 5	Duration of burning 15s maximum
Electric Strength	IEC 60243-1	8 MV/m minimum
Volume Resistivity	IEC 60093	10 ⁹ ohm cm minimum
Copper Contact Corrosion (24 ± 2h on copper mandrel at 90-95% RH, 23 ± 2°C, followed by 168 ± 2h on mandrel at 135 ± 3°C)	ASTM D2671	No corrosion of mandrel
- Ultimate Elongation	ISO 37	200% minimum

TABLE 1 Test Requirements (Cont'd)

Test	Test Method	Test Requirements
Copper Mirror Corrosion (16h ± 15m at 150 ± 3°C)	ASTM D2671	No corrosion of mirrors
Water Absorption (24 ± 2h immersion at 23 ± 2°C)	ISO 62	3.5 % maximum
Fluid Resistance (24 ± 2h immersion at 70 ± 2°C)	ISO 1817	
<ul style="list-style-type: none"> • Gasoline Fuel to ISO 1817 Test Liquid B • Diesel Fuel to BS 2869 Class A1 • Hydraulic Fluid to H-515 (Mil-H-5606) • Lubricating Oil to O-149 <ul style="list-style-type: none"> - Tensile Strength - Ultimate Elongation 	ISO 37	10 MPa minimum 300 % minimum
Fluid Resistance (24 ± 2h immersion at 100 ± 2°C)	ISO 1817	
<ul style="list-style-type: none"> • Lubricating Oil to O-156 (Mil-L-23699) <ul style="list-style-type: none"> - Tensile Strength - Ultimate Elongation 	ISO 37	10 MPa minimum 300 % minimum
Fungus Resistance	ISO 846	
<ul style="list-style-type: none"> - Tensile Strength - Ultimate Elongation 	ISO 37	14 MPa minimum 350 % minimum
Fungus Resistance	BS 2011 Pt 2.1J	Not greater than rating 2
Adhesion Performance	RK 6619, RW 2074	As per RK 6619, RW 2074

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