

Raychem INTERCONNECT

A DIVISION OF **tyco** ELECTRONICS

Specification RK 6756 Revision 1

RHW TUBING

SCOPE

This Quality Assurance Specification establishes the quality standard for a Heavy walled heat shrinkable polyolefin tubing, adhesive coated, not flame retarded.

Approved Signatories*

	<u>Quality Assurance</u>	<u>Technical</u>	<u>Product Management</u>
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* This document is electronically reviewed and approved by Raychem UK Approvers therefore no signatures will appear..

1. REVISION HISTORY

Revision Number	Change Request	Date	Incorporated By
1	Initial	4 April 2000	Linda Abrams

2. REQUIREMENTS

2.1 The tubing shall be homogeneous and essentially free from pinholes, bubbles, cracks and inclusions, and the colour shall be black.

2.2 Dimensions

Size	Minimum Inside Diameter as supplied mm	Maximum Inside Diameter after recovery mm	Minimum Wall Thickness after recovery (1) mm
9/3	9	3	2.0
13/4	13	4	2.4
20/6	20	6	2.5
33/8	33	8	3.2
43/12	43	12	4.3
51/16	51	16	4.5
70/21	70	21	4.4
85/25	85	25	4.3
105/30	105	30	4.3
130.36	130	36	4.3
160/50	160	50	4.3
180/50	180	50	4.3

(1) The wall thickness of the adhesive liner, as supplied, will typically be between 0.2 mm and 0.5 mm.

Tubing 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

Test methods shall be in accordance with IEC 60684-2, unless otherwise specified.

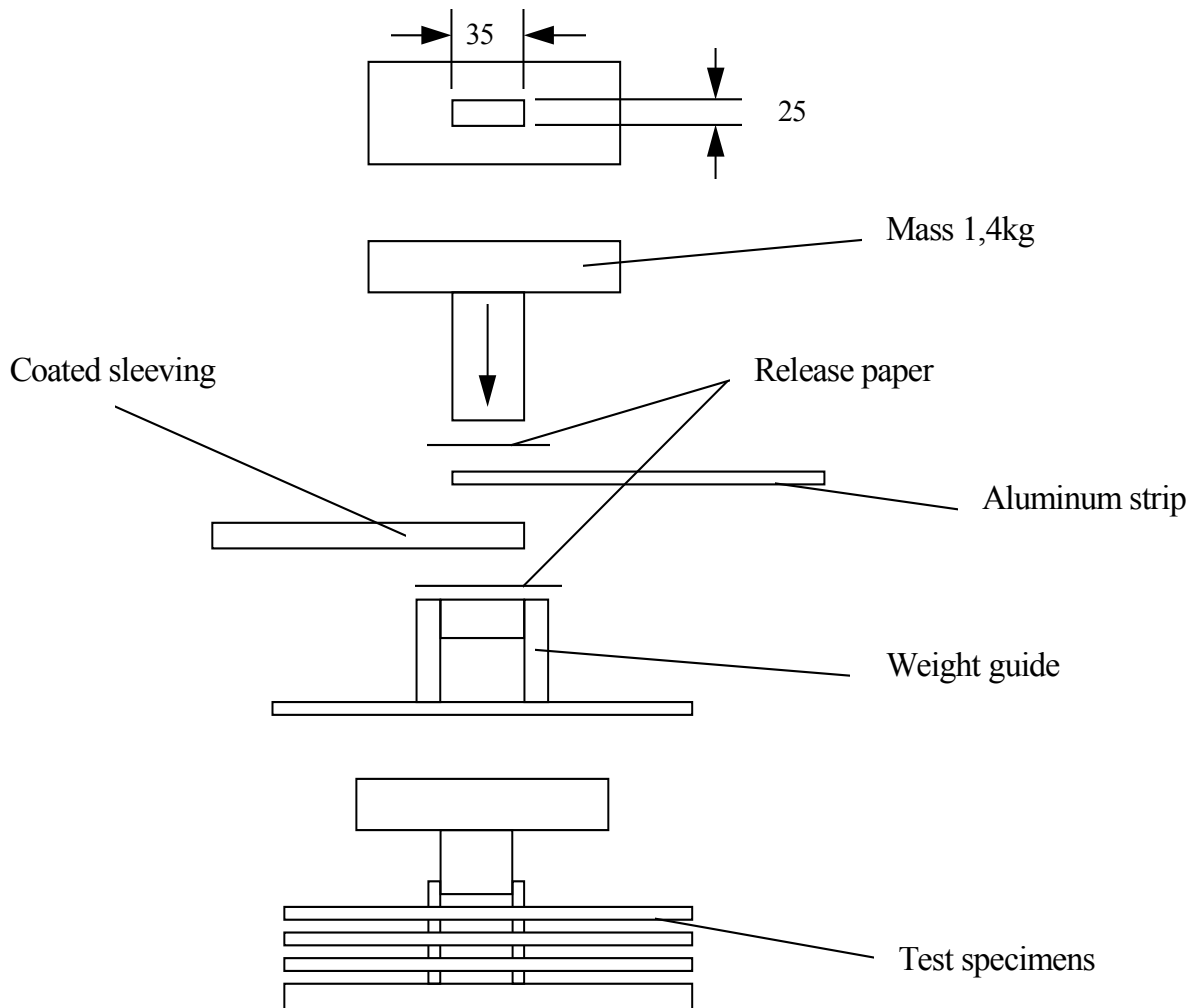
3.1 Preparation of Test Specimens

Unless otherwise specified, tests shall be carried out on specimens of tubing recovered by conditioning in a fan assisted air circulating oven for 10 ± 2 minutes at $150^\circ\text{C} \pm 5^\circ\text{C}$ 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 212. 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 Adhesive Shear Strength

Three test specimens shall be prepared. Three strips of aluminum (100 mm x 25 mm x 1 mm thick) shall be abraded and degreased one side and end for approximately 20 mm. Three lengths of tubing at least 120 mm long shall be recovered in an oven for the time and temperature as specified in clause 3. Immediately after removal the tubing shall be cut open longitudinally and laid flat on the silicone release paper, with the inside coated surface in contact with the silicone paper. A weight of sufficient mass to keep the specimens flat shall be placed on top. This assembly shall be allowed to cool to room temperature before the weight is removed. Three specimens of the tubing shall be cut longitudinally, 100 ± 5 mm x 25 ± 1 mm. The aluminum strips and cut tubing specimens shall be assembled as shown in figure 1, with the coated surface of the tubing in contact with the abraded surface of the aluminum, overlapped between 12,5 and 14.2 mm. The 1.4 kg mass shall be pre-conditioned in an oven for at least 1 hour at the assembly conditioning temperature of $150 \pm 5^\circ\text{C}$. The whole assembly, as shown in figure 1, shall be placed in an oven for 20 ± 2 minutes at $150 \pm 5^\circ\text{C}$. The assembly shall then be removed from the oven and allowed to cool to room temperature before the weight is removed. Insert the specimen in a tensile test machine by clamping at least 25 mm of the aluminum strip in the top jaw and at least 25 mm of the tubing in the bottom jaw. The rate of jaw separation shall be (50 ± 5) mm/min. Record the maximum breaking load for each specimen and calculate the average.

FIGURE 1 ASSEMBLY FOR SHEAR STRENGTH



4. RELATED STANDARDS & issue

IEC 212: 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 tubing. A batch of tubing is defined as that quantity of tubing extruded at any one time. Testing frequency shall be Production Routine or Qualification. Production Routine tests shall consist of Visual Examination, Dimensions, Longitudinal change, Tensile Strength, Ultimate Elongation and Density. 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 -15 %
Tensile Strength	IEC 60684-2 Clause 19.1 and 19.2 ① ③	12 MPa minimum
Ultimate Elongation	IEC 60684-2 Clause 19.1 and 19.2 ①	350 % minimum
Secant Modulus at 2 % Elongation	IEC 60684-2 ③ Clause 19.4	150 MPa minimum
Density	IEC 60684-2 Clause 4	1.2 maximum
Bending at Low Temperature	IEC 60684-2 Clause 14 ②	4h ± 15 min at -40 ± 2°C No cracking
Heat Shock	IEC 60684-2 Clause 6	4h ± 15 min at 200 ± 5°C No dripping, cracking or flowing of the jacket.
Heat Ageing	IEC 60684-2 Clause 39	168 ± 2h at 150 ± 3°C
- Tensile Strength	Clause 19.1 and 19.2 ① ③	12 MPa minimum
- Ultimate Elongation	Clause 19.1 and 19.2 ①	350 % 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 tubing is tested unfilled and the mandrel shall be no more than 10 times the outer diameter.

③ Calculate the cross sectional area without the adhesive

TABLE 1 Test Requirements

Test	Test Method	Test Requirements	
Breakdown Voltage	IEC 60684-2 Clause 21 Test as supplied	<u>Supplied wall Thickness nom</u> 0.7 mm 0.8 mm 1.0 mm 1.4 mm 1.5 mm	<u>Breakdown Voltage min</u> 8 kV 9 kV 12 kV 17 kV 18 kV
Volume Resistivity	IEC 60684-2 Clause 23	10 ¹² ohm.cm minimum	
Water Absorption	IEC 60684-2 Clause 40	24 ± 2h at 23 ± 2°C 0.5% maximum (Based on total wall)	
Resistance to Selected Fluids - Tensile Strength - Ultimate Elongation	IEC 60684-2 Clause 36 Clause 19.1 and 19.2 ① ③	For list of fluids and test temperatures see Table 2 10 MPa minimum 300% minimum	
Fungus Resistance - Tensile Strength - Ultimate Elongation	ISO 846 Method B, 56 days exposure IEC 60684-2 Clause 19.1 and 19.2 ① ③	12 MPa minimum 350% minimum	
Adhesive Shear Strength	Clause 3.2	500 N 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	23 ± 2°C
Hydraulic Fluids	Phosphate Base	ISO 1817 Liquid 103	23 ± 2°C
	Silicone Base	S-1714*	23 ± 2°C
	Mineral Base	H-520*	23 ± 2°C
Oils	Synthetic Base	ISO 1817 Liquid 101	23 ± 2°C
	Mineral Base	ISO 1817 Oil No. 2	23 ± 2°C
	Mineral Base	O-1176*	23 ± 2°C
	Mineral Base	O-142*	23 ± 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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