Tyco Electronics

Raychem

RK 6765 Revision 3

RPT-120

SCOPE

This Quality Assurance Specification establishes the quality standard for a heat-shrinkable, semi-flexible, polyolefin sleeving

Approved Signatories*

	Quality Assurance	Technical	Product Management
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* This document is electronically reviewed and approved - therefore no signatures will appear.

1. REVISION HISTORY

Revision Number	Change Request	Date	Incorporated By
1	Initial Issue	24 May 2005	Colin Diss
2	CR08-DM-024	20 Feb 2008	Colin Diss
3	Via DMTech	06-01-2011	Colin Diss

2. REQUIREMENTS

2.1 Composition, Appearance and Colour

The sleeving shall be free from holes, cuts, pressure marks, blisters, pores, colour irregularities and deviation from dimensional requirements. 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
19/6	**19.0**	**6.0**	**0.92 - 1.08**
27/12.7	**27.0**	**12.7**	**0.78 - 0.94**

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 150 ± 5°C for 3 ± 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 212. In cases of dispute the tests shall be carried out at a temperature of 23 ± 2°C and at 50 ± 5% relative humidity.

3.1.1 Abrasion test

3 Samples of RPT-120 (size 19/6) shall be installed on a 9.6mm diameter hollow aluminium tube in an air circulating oven 10 mins at 200°C. Samples should be allowed to cool for 1 hour before the abrasion test is started.

TEST METHODS (Cont'd)

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 ± 10mm per minute.
The test shall be carried out at a temperature of 23 ± 2°C.

3.4 Heat Shock

The test method shall be as specified in ASTM D2671. Five strip specimens, 6mm wide, shall be cut from the recovered sleeving, with their lengths parallel to the extruded axis
The specimens shall be conditioned in a fan assisted air circulating oven as specified in Table 1.

3.5 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.

3.6 Low Temperature Flexibility

The test method shall be as specified in Procedure C of ASTM D2671.
Five strip specimens, 6mm wide, shall be cut from the recovered sleeving, with their lengths parallel to the extruded axis. Mandrel diameter shall be 10 x specimen thickness ± 10%.
The specimens and mandrel shall be conditioned as specified in Table 1.

3.7 Flammability

The test method shall be as specified in MVSS 302

TEST METHODS (Cont'd)

3.8 Abrasion performance

Three installed samples prepared as in Clause 3.1.1 shall be fixed horizontally to the sample carriage of the abrasion rig (see Figure 1). The abrasion probe shall be fixed to the moving probe assembly such that the probe and sample are positioned at an angle of 45° to each other.

The conditions of the test shall be as follows:

Temperature = as specified in Table 1

Frequency = 10 Hz

Load = 50g

Test duration (no of cycles) = as specified in Table1

Abrasion probe= Radius blade (see Figure 2)

Blade stroke = 10mm (i.e ± 5mm)

After the specified duration the sample is removed from the abrasion rig and the installed sample removed from the rig. The tube shall then be examined by eye for any signs of breakthrough to the aluminium pipe.

Note: The abrasion rig must be in good condition, running smoothly with the minimum amount of vibration. The middle section of the probe shall be used and inspected for wear prior to each test (see Figure 2.)

3.9 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.

3.10 Adhesion to Aluminium

The test shall be carried out on Size 27/12.7 RPT-120. Three cylindrical Aluminium rolling drum adhesion test mandrels 25 mm long by 25 mm diameter shall be degreased using Iso propyl alcohol. Specimens of Size 27/12.7 RPT-120 approximately 50 mm long shall be recovered on to the mandrels by conditioning in a fan assisted air circulating oven at 215 ± 3°C for 15 minutes. After conditioning the specimens shall be removed from the oven and allowed to cool naturally to room temperature. Surplus lengths of RPT-120 shall be trimmed level with the ends of the mandrels. The specimens shall be slit axially and peeled from the mandrels in a suitable tensile testing machine such that the sleeving peels off at a rate of 50 ± 5 mm length per minute as the mandrel rotates. The test shall be carried out at a temperature of 23 ± 2°C. The mean peel-off force for each specimen shall be recorded, and the mean of the three recorded measurements reported as the Adhesion to Aluminium.

4.0 RELATED STANDARDS & issue

D141428	PSA Specification Resistance to shot blasting
ASTM D2671-09	Standard Test Methods for Heat-Shrinkable Tubing for Electrical Use
IEC 60212: 1971	Standard Conditions for Use Prior to and During Testing of Solid Electrical Insulating Materials
ISO 37: 2008	Rubber, vulcanized or thermoplastic - Determination of Tensile Stress-Strain Properties
ISO 188: 2007	Rubber, vulcanized - Accelerated Ageing or Heat Resistance Tests.
ISO 1817: 2005	Rubber, vulcanized - Determination of the effect of liquids
MVSS 302: 1975	Flammability of Materials - Passenger Cars, Multiple Passenger Vehicles, Trucks and Buses (Docket N. 3-3;Notice 4)

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

5.0 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, Heat Shock and Low Temperature Flexibility.
Qualification tests shall be carried out to the requirements of the Design Authority.

6.0 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.

Figure 1 - Abrasion Rig

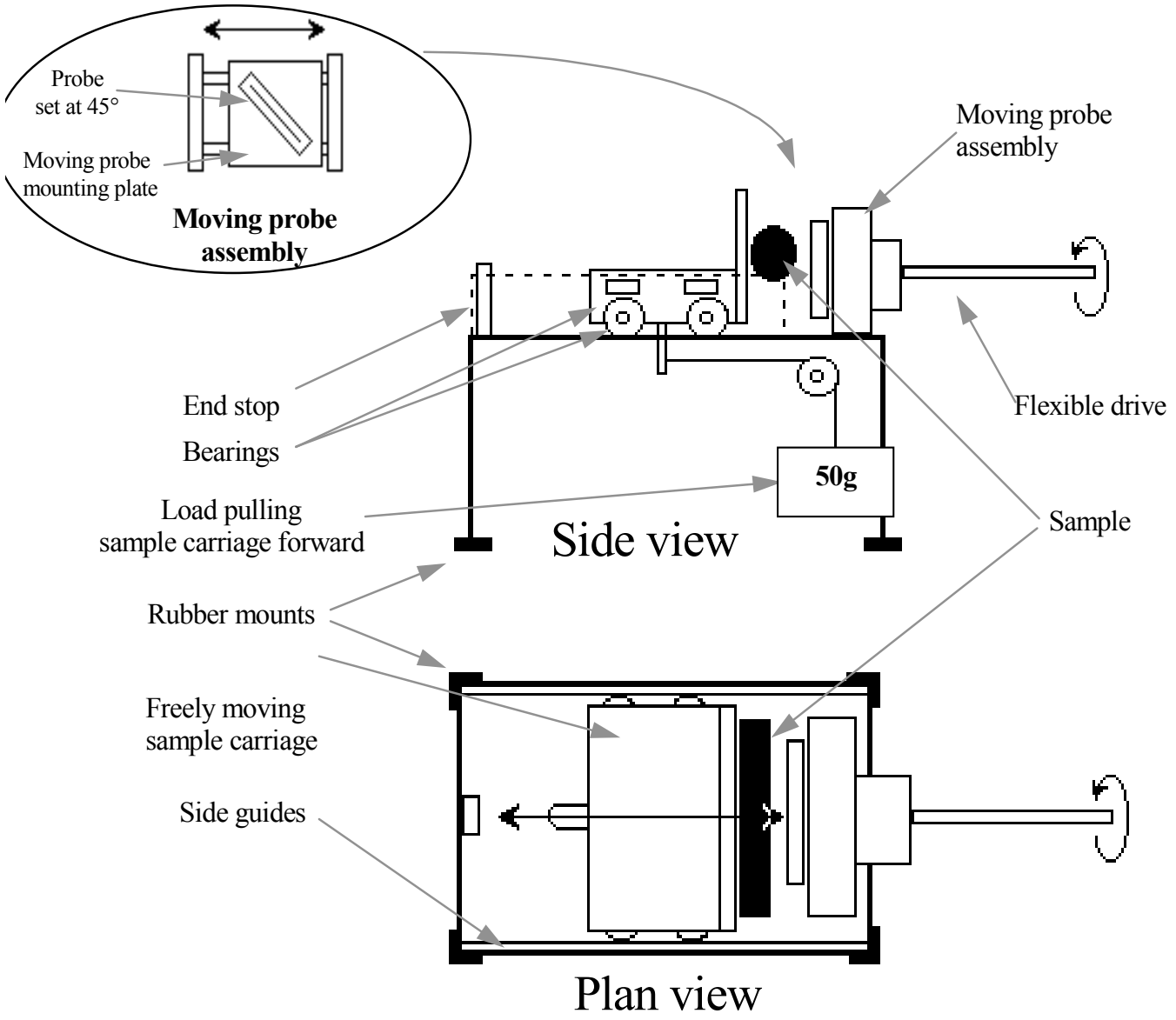

Figure 2 - Abrasion Rig Probe

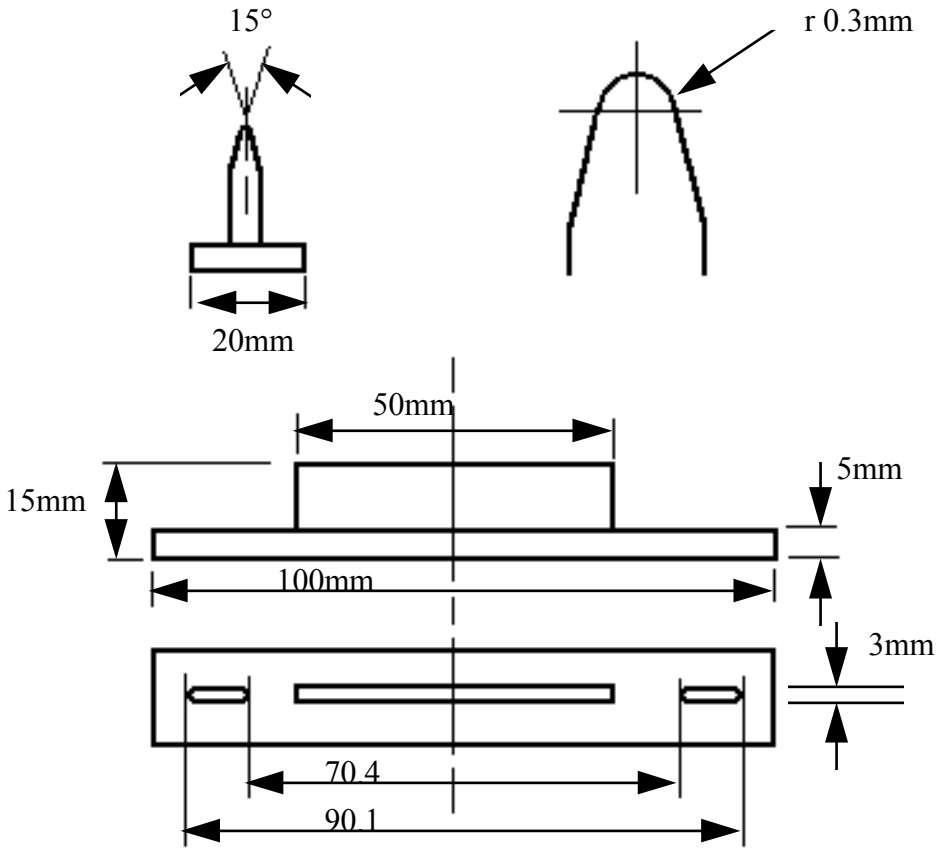

TABLE 1Test Requirements

Test	Test Method	Test Requirements
Visual Examination	-	As per Clause 2.1
Dimensions	ASTM D2671	In accordance with SCD
Longitudinal Change	ASTM D2671	-5 to -15 %
Tensile Strength	ISO 37	15.0 MPa minimum
Ultimate Elongation	ISO 37	250 % minimum
Heat Shock (4h ± 15m at 175 ± 3°C)	ASTM D2671	No dripping, cracking or flowing
Heat Ageing (168 ± 2h at 120 ± 2°C) - Tensile Strength - Ultimate Elongation	Clause 3.7 ISO 37 ISO 37	 10 MPa minimum 150 % minimum
Low Temperature Flexibility (4h ± 15m at -55 ± 2°C)	ASTM D2671	No cracking
Flammability	MVSS 302	50 mm/min maximum
Abrasion performance @ 23°C @ 100°C	Clause 3.8	No break through to metal >14400 cycles > 7200 cycles
Adhesion to Aluminium	Clause 4.1	20N/ 25mm min

TABLE 1Test Requirements (Cont'd)

Test	Test Method	Test Requirements
Fluid Resistance (24 ± 2h immersion at 23 ± 2°C) • IRM 903 • Diesel Fuel • Unleaded Petrol • Cold Cleaner (Gunk) • Radiator Antifreeze • Windscreen Washer Fluid (Screenwash IMS based) • Ethanol (90% by vol) • Isopropanol • Distilled Water	ISO 1817	
- Tensile Strength	ISO 37	8.0 MPa minimum
- Ultimate Elongation	ISO 37	150 % minimum

In line with a policy of continual product development, Tyco reserves the right to make changes in construction, materials and dimensions without further notice. You are advised, therefore, to contact Tyco Electronics, should it be necessary to ensure that this document is the latest issue.