

**Raychem****RK 6768 Revision 1**

## PTCM

### SCOPE

This Quality Assurance Specification establishes the quality standard for a dual wall sleeving which shall consist of a non-meltable, heat-shrinkable jacket and a meltable adhesive inner liner. The sleeving will shrink fully and the adhesive will melt on the application of heat at 80°C or above.

#### Approved Signatories\*

**Quality Assurance**Tyco Electronics UK:    **Iain Brown****Technical****Colin Diss****Product Management****Richard Kewell**

\* 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	July 2008	Colin Diss

**2. REQUIREMENTS****2.1 Composition, Appearance and Colour**

The sleeving shall be homogeneous and free from pinholes, bubbles, cracks and inclusions. The standard product shall be clear.

**2.2 Dimensions**

Size	Inside Diameter as supplied (min) mm	Inside Diameter after recovery (max) mm	Total Wall Thickness after recovery mm
PTCM-9/1.5-X	9.0	1.5	1.4 to 1.8

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****3.1.1 Preparation of Test Specimen**

Unless otherwise specified, tests shall be carried out on specimens of sleeving recovered by conditioning in a fan assisted air circulating oven at  $150 \pm 5^\circ\text{C}$  for 3 minutes  $\pm$  10 seconds 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.

**3.1.2 Preparation of Test Specimen (Installed Product)**

For these tests the product shall be installed onto a metal pipe as defined below.

Size	Pipe / Mandrel Dimensions
9/1.5	3.17 mm (1/8")

The sleeving shall be installed by heating in an air circulating oven at a temperature not exceeding  $150^\circ\text{C}$  (or with a hot air gun) until the product is just recovered and the adhesive has melted onto the substrate. (Note: with this rapidly recovering product excessive heating must be avoided to prevent splitting.) Samples shall then be allowed to cool at room temperature for 10 minutes minimum.

**TEST METHODS (continued)****3.2 Dimensions and Longitudinal Change**

The test method shall be as specified in ASTM D2671.

The length and inside diameter of three 150 mm 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.

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**3.3 Tensile Strength and Ultimate Elongation**

The test method shall be as specified in ISO 37.

Determine the Tensile Strength based on the cross-sectional area of the jacket only. Use suitable optical method (e.g. microscope) to measure the thickness of the outer wall for this calculation.

For sleeving of recovered bore greater than 6 mm, five Type 2 dumb-bell specimens shall be tested. For sleeving of recovered bore less than or equal to 6 mm, five tubular specimens 125 mm long shall be tested. Initial jaw separation shall be 50 mm and rate of jaw separation shall be  $100 \pm 10$  mm/minute.

The test shall be carried out at a temperature of  $23 \pm 2^\circ\text{C}$ .

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**3.4 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 Ultimate Elongation according to clause 3.3.

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**3.5 Split Resistance**

For these tests the product shall be installed onto a metal pipe or mandrel selected as being conveniently close to the dimensions recommended in Clause 3.1.2. Five samples each 100 mm in length, cut with a sharp blade from the sleeving supplied, shall be installed as specified in Clause 3.1.2. The samples 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 for 10 minutes minimum and examined for splitting.

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**3.6 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  $23 \pm 2^\circ\text{C}$  for  $1 \text{ h} \pm 15 \text{ min}$ . 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.

**4. RELATED STANDARDS & issue**

ASTM D2671-07	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: 2005	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

**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 or Qualification. Production Routine tests consisting of Visual Examination, Dimensions, Longitudinal Change and Split Resistance shall be carried out on every batch of sleeving.

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 or the relevant SCD
Longitudinal Change	ASTM D2671	0 to -15%
Tensile Strength	ISO 37	15.0 MPa minimum
Ultimate Elongation	ISO 37	150 % minimum
Heat Ageing (168 ± 2h at 100 ± 3°C)	ISO 188	
- Ultimate Elongation	ISO 37	100% minimum
Split Resistance (20 min ± 15 sec at 100 ± 2 °C)	Clause 3.6	No splitting
Fluid Resistance 24 ± 2 h immersion at 23 ± 2°C	ISO 1817	
<ul style="list-style-type: none"> <li>Gasoline fuel to ISO 1817 Test liquid B</li> <li>Lubricating oil to 0-149</li> <li>Hydraulic fluid DTD900/48881</li> </ul>		
- Tensile Strength	ISO 37	5 MPa minimum
- Ultimate Elongation		100% 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.**