



RW 2080 Issue 2

TECT

SCOPE

This Quality Assurance Specification establishes the quality standard for a semi conductive heat-shrinkable, dual wall sleeving

Approved Signatories

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1. REVISION HISTORY

Revision Number	Change	Date	Incorporated By
1	Initial Issue	19 Aug 08	M.Priddle

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 jacket colour shall be black, the adhesive liner colour shall be black.

The sleeving shall be marked with Ω , such that every 30mm piece is marked with at least one Ω symbol.

2.2 DIMENSION TABLE**Table 1**

Product size	Supplied ID Min (mm)	Recovered ID max. (mm)	Recovered wall ± 0.35 (mm)	Longitudinal change (%)
13.5/4.5	13.5	4.5	1.5	0 to -10

2.3 Test Requirements

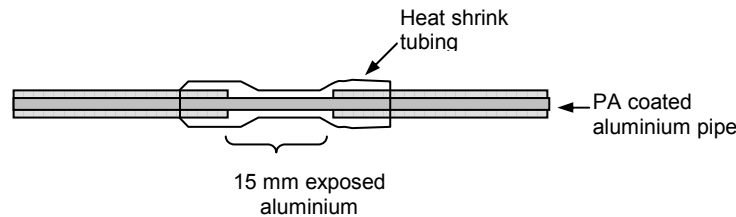
The test requirements shall be as specified in Table 2.

3. TEST METHODS

3.1 Preparation of Test Specimens

Unless otherwise specified 30mm long test samples shall be installed onto appropriate 10mm diameter (*Polyamide coated Aluminium pipe¹*) mandrels with a 15mm section of coating removed as shown in figure 1. The exposed aluminium surface shall be clean and free from contamination or polyamide residue. The installation time shall be $150 \pm 5^\circ\text{C}$ for 10 minutes in an air circulating oven.

Figure 1



3.2 Dimensions and Longitudinal Change

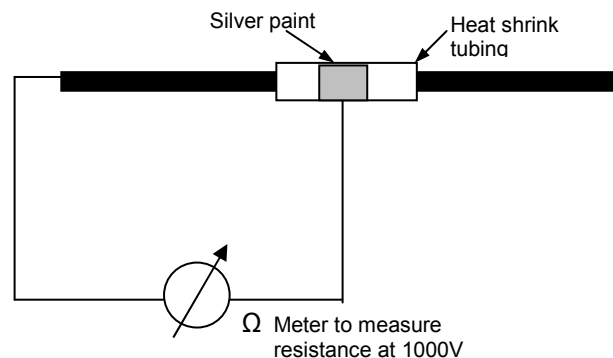
The test method shall be as specified in ASTM D2671.

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 at $150 \pm 5^\circ\text{C}$ for 10 minutes 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 Electrical Continuity

Five samples shall be prepared as in Clause 3.1. When cold a 10mm wide band of silver paint shall be applied around the center portion of the heat shrink sleeve. The conductivity of the assembly from the inside of the metal tube to the outside of the heat shrink tube (silver paint area) is recorded using a suitable meter capable of measuring resistance at 1000V. (See figure 2.)

Figure 2



N.B. ensure inside of metal tube is clean and a good electrical contact is achieved.

¹ Polyamide coated aluminium pipe used for automotive brake pipes. Example TI Bundy 'Nyal'

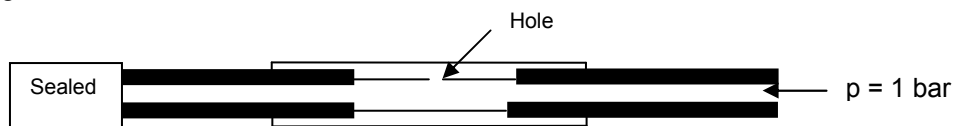
TEST METHODS (Cont'd)

3.4 Sealing Performance

Prior to installation as in Clause 3.1 a 5mm diameter hole shall be drilled through the mandrel as shown in figure 3. Five samples shall be installed as in Clause 3.1. After installation the samples shall be conditioned at ambient temperature for a minimum of 2 hours prior to testing.

After conditioning the samples are pressure tested at room temperature. The applied pressure shall be 1 bar for 2 minutes under water. Air bubbles leaking from under the test piece shall be recorded as a failure. (N.B. the open end of the pipe shall be sealed, e.g. with a suitable piece of dual wall heat shrink tubing).

Figure 3



3.5 High Temperature Withstand

Five samples shall be installed in Clause 3.1. The samples shall be supported vertically within an air circulating oven at $150^{\circ} \pm 5^{\circ}\text{C}$ for 48 hours.

After cooling the samples shall be visually examined for damage and tested for electrical continuity as described in Clause 3.3.

3.6 Heat Ageing

Five samples shall be installed as in Clause 3.1. The samples shall be supported vertically within an air circulating oven at $120^{\circ} \pm 5^{\circ}\text{C}$ for 168 hours.

After cooling the samples shall be visually examined for damage and tested for electrical continuity as described in Clause 3.3.

3.7 Temperature Humidity Cycling

Five installed samples prepared as in Clause 3.1 shall be conditioned for 16 hours \pm 15 minutes at $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 85% \pm 2% minimum relative humidity. After this period the samples shall be transferred to a cold chamber within 30 seconds at $-40 \pm 3^{\circ}\text{C}$ for 2 hours \pm 15 minutes. On removal the samples shall be transferred within 30 seconds to an air circulating oven at $125 \pm 5^{\circ}\text{C}$ for 2 hours \pm 15 minutes. The cycle shall be completed by storing the samples at ambient conditions for 4 hours \pm 15 minutes. The 24 hour cycle shall be repeated a further nine times.

On completion of these 10 cycles the samples shall be visually examined and tested for electrical continuity as in Clause 3.3.

TEST METHODS (Cont'd)**3.8 Fluid resistance**

Samples prepared as in Clause 3.1 shall be fully immersed in the following fluids for the time and temperature stated:

- | | | |
|---|---|--|
| <ol style="list-style-type: none">1. Antifreeze mixture, 50:50 in water2. Engine Oil 10W/403. Mineral Based Hydraulic Fluid4. Car wash detergent (1% Teepol in water)5. Brake Fluid DOT 46. Unleaded Petrol7. Diesel Fuel | } | Immersed in stated fluid for 30±2minutes
at ambient temperature |
|---|---|--|

After removal from stated fluid the samples shall be lightly wiped to remove excess fluid and aged in an air circulating oven at 120°±5°C for 72 hours ± 15 minutes.

After removal from ageing oven the samples shall be allowed to cool to Room Temperature.

On completion of ageing regime the samples shall be visually examined and tested for electrical continuity as in Clause 3.3.

Note. The use of silver paint may not be practical after contamination of samples with fluids. In this case the electrical contact shall be measured without the silver paint, however, a good electrical contact between the test probes and product is essential.

4.0 RELATED STANDARDS & issue

ASTM D2671-00

Standard Test Methods for Heat-Shrinkable Tubing for Electrical Use

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 or Qualification. Production Routine tests consisting of Visual Examination, Dimensions and Longitudinal Change 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 2 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 %
Electrical Continuity	Clause 3.3	$R \leq 1M\Omega$ At 1000V
Sealing Performance	Clause 3.4	No Leakage
High Temperature Withstand (48hrs At 150°C)	Clause 3.5	Visual $R \leq 1M\Omega$ At 1000V
Heat Ageing	Clause 3.6	Visual $R \leq 1m\omega$ At 1000v
Temperature Humidity Cycling	Clause 3.7	Visual $R \leq 1M\Omega$ At 1000V
Fluid Resistance	Clause 3.8	Visual $R \leq 1M\Omega$ At 1000V

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