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**RK6766 Revision 1**

**BRST**

**SCOPE**

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

**Approved Signatories\***

	<u>Quality Assurance</u>	<u>Technical</u>	<u>Product Management</u>
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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	August 2005	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 as specified in the contract or order

**2.2 Dimensions**

Product size	Inside Diameter as supplied (min) mm	Inside Diameter after recovery (max) mm	Wall Thickness after recovery mm
BRST 4/2	4.0	2.0	0.4 ± 0.08
BRST 6/3	6.0	3.0	0.4 ± 0.08
BRST 10/5	10.0	5.0	0.5 ± 0.08
BRST 16/8	16.0	8.0	0.75 ± 0.08
BRST 24/12	24.0	12.0	0.85 ± 0.08

**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  $150 \pm 5^\circ\text{C}$  for  $4 \pm 1$  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  $23 \pm 2^\circ\text{C}$  and at  $50 \pm 5\%$  relative humidity.

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#### **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.

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#### **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  $23 \pm 2^\circ\text{C}$ .

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#### **3.4 Heat Shock**

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.

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#### **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.

**TEST METHODS (Cont'd)****3.6 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 10 x 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.

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**3.7 Flammability**

The test method shall be as specified in MVSS 302

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**3.8 Glow wire test**

Glow wire flammability test on materials (GWFI) in accordance with BS EN 60695-2-12

This test should be carried out on moulded and beamed plaques with dimensions 60mm x 60mm x 3mm.

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**3.9 Electric Strength**

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

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**3.10 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  $25 \pm 1$  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.

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**3.11 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.

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**3.11 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  $1\text{h} \pm 15\text{m}$ . 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

**4.0 RELATED STANDARDS & issue**

ASTM D2671-00	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
IEC 60243-1: 1998	Electrical Strength Of Insulating Materials - Test Methods - Tests At Power Frequencies
ISO 37: 1994	Rubber, vulcanized or thermoplastic - Determination of Tensile Stress-Strain Properties
ISO 62: 1999	Determination of Water Absorption
ISO 188: 1998	Rubber, vulcanized - Accelerated Ageing or Heat Resistance Tests.
ISO 1817: 1999	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)
BS EN / IEC 60695-2-12	Glow wire flammability test on materials.

**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.

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	-5 to -15 %
Tensile Strength	ISO 37	10 MPa minimum
Ultimate Elongation	ISO 37	200 % minimum
Heat Shock (4h ± 15m at 175 ± 3°C)	ASTM D2671	No dripping, cracking or flowing
Heat Ageing (168 ± 2h at 125 ± 2°C)	Clause 3.5	
- Tensile Strength	ISO 37	8 MPa minimum
- Ultimate Elongation	ISO 37	150 % minimum
Low Temperature Flexibility (4h ± 15m at -40 ± 2°C)	ASTM D2671	No cracking
Flammability	MVSS 302	50 mm/min maximum
Glow wire *	GWFI BS EN 60695-2-12	650C min
Electric Strength	IEC 60243-1	20 MV/m minimum
Water Absorption (24 ± 2h immersion at 23 ± 2°C)	ISO 62	0.5 % maximum

\* This is an external test

**TABLE 1 Test Requirements (Cont'd)**

Test	Test Method	Test Requirements
Copper Contact Corrosion (24 ± 2h on copper mandrel at 90-95% RH, 23 ± 2°C, followed by 168 ± 2h on mandrel at 125 ± 3°C) - Ultimate Elongation	ASTM D2671  ISO 37	No corrosion of mandrel  200% minimum
Fluid Resistance (24 ± 2h immersion at 23 ± 2°C) <ul style="list-style-type: none"> <li>• Gasoline Fuel to ISO 1817 Test liquid B</li> <li>• Lubricating Oil. (Ester based) to ISO 1817 Test Liquid 101</li> <li>• 1M Hydrochloric acid</li> <li>• Distilled Water</li> <li>• 1M Sodium hydroxide</li> <li>• Iso Propyl alcohol</li> </ul> - Tensile Strength - Ultimate Elongation	ISO 1817          ISO 37 ISO 37	8 MPa minimum          150 % minimum

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