AEROSPACE, DEFENSE & MARINE

RW-2082 Revision 2

Raychem brand Moulded Components
Semi-Flexible Zerohal (-100)

SCOPE

This Quality Assurance Specification establishes the quality standard for moulded components manufactured from cross-linked, flame-retarded, electrically-insulating, semi-flexible, zero halogen material. The dimensions of these components shrink to a predetermined size on the application of heat.

Approved Signatories*

Tyco Electronics : **Approved electronically via DMTec**

*** This document is electronically reviewed and approved - therefore no signatures will appear.**

1. REVISION HISTORY

Revision Number	Change Request	Date	Incorporated By
0	Formerly RK6717 Revn 3		
1	CR07-DM-105	18/7/07	Paul Dixon
2	CR10-DM-009	3 August 2010	Paul Dixon

2. REQUIREMENTS

2.1 Composition, Appearance and Colour

The moulded components shall be manufactured from a stabilised, flame retarded, halogen-free modified polyolefin and shall be homogeneous and essentially free from pinholes, bubbles, flaws, cracks and inclusions. The colour shall be black unless otherwise specified.

2.2 Dimensions

Dimensions shall be as specified in the relevant Specification control drawing (SCD).

2.3 Test Requirements

The moulded components and material from which they are made shall meet the requirements contained in Table 1.

3. TEST METHODS

3.1 Preparation of Test Specimens

Unless otherwise specified, tests shall be carried out on a moulded test sheet of the material 150mm x 150mm x 2.0 ± 0.3mm or on a moulded component of suitable size. For tests on the recovered moulded component, the component shall be recovered by conditioning in an oven at 150 ± 3°C for 10 mins 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 60212. In cases of dispute the tests shall be carried out at a temperature of 23 ± 2°C and at 50 ± 5% relative humidity.

3.2 Tensile Strength and Ultimate Elongation

The test method shall be as specified in IEC 62329 Part 2.
The rate of jaw separation shall be 100 ± 10mm per minute.

3.3 Secant Modulus at 2% Strain

The test method shall be as specified in IEC 62329 Part 2.

TEST METHODS (Cont'd)

3.4 Specific Gravity

The test method shall be as specified in IEC 62329 Part 2.

3.5 Heat Shock

The test method shall be as specified in IEC 62329 Part 2.
The specimens shall be conditioned as specified in Table 1.

3.6 Heat Ageing

The test method shall be as specified in IEC 62329 Part 2.
The specimens shall be conditioned as specified in Table 1.

3.7 Bending at low temperature

The test method shall be as specified in IEC 62329 Part 2.
Mandrel diameter shall be 20mm.
The specimens and mandrel shall be conditioned as specified in Table 1.

3.8 Flammability

The test method shall be as specified in ASTM D635

3.9 Electric Strength

The test method shall be as specified in IEC 62329 Part 2.

3.10 Volume Resistivity

The test method shall be as specified in IEC 60093.

3.11 Water Absorption

The test method shall be as specified in Method 1 of ISO 62.
Three disc specimens of diameter 25 ± 1mm shall be tested.

3.12 Fluid Resistance

The test method shall be as specified in IEC 62329 Part 2.
The specimens shall be immersed in the fluids for the times and temperatures specified in Table 1. The Tensile Strength and Ultimate Elongation of each specimen shall be tested according to Clause 3.2.

TEST METHODS (Cont'd)

3.13 Oxygen Index at Ambient Temperature

The test method shall be as specified in ISO 4589-2.
Type IV test specimens shall be cut from a 3mm thick moulded test sheet.

3.14 Oxygen Index at Elevated Temperature

The test method shall be as specified in ISO 4589-3.
Type IV test specimens shall be cut from a 3mm thick moulded test sheet.

3.15 Acid Gas Generation

The test method shall be as specified in IEC 60754-2.

3.16 Smoke Index

The test method shall be as specified in IEC 62329 Part 2.

3.17 Toxicity Index

The test method shall be as specified in IEC 62329 Part 2.

4. RELATED STANDARDS & ISSUE

ASTM D635-10	Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.
IEC 62329-2:2006	Heat Shrinkable Moulded Shapes. Part 2: Methods of Test.
ASTM D2671-09	Standard Test Methods for Heat-Shrinkable Tubing for Electrical Use.
IEC 60093: 1980	Method of Test for Volume Resistivity and Surface Resistivity of Solid Electrical Insulating Materials.
IEC 60212: 1971	Standard Conditions for Use Prior to and During Testing of Solid Electrical Insulating Materials.
IEC 60754-2: 1991	Test on Gases Evolved During Combustion of Electric Cables – Part 2: Determination of Degree of Acidity of Gases Evolved During the Combustion of Materials Taken from Electric Cables by Measuring pH And Conductivity.
ISO 62: 2008	Determination of Water Absorption.

4. RELATED STANDARDS & issue (Cont'd)

ISO 4589-2: 2005	Plastics – Determination of Burning Behaviour by Oxygen Index - Part 2: Ambient-Temperature Test.
ISO 4589-3: 1996	Plastics – Determination of Burning Behaviour by Oxygen Index - Part 3: Elevated-Temperature Test.
MIL DTL 24643B Clause 4.8.24	Cables and Cords, Electric, Low Smoke, for Shipboard Use, General Specification for

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 of material taken at random from each batch of moulding compound. A batch of moulding compound is defined as that quantity of moulding compound manufactured at any one time. Testing frequency shall be Production Routine or Qualification. Production Routine tests consisting of Visual Examination, Dimensions, Tensile Strength, Ultimate Elongation, Secant Modulus at 2% Strain, Specific Gravity and Electric Strength shall be carried out on every batch of moulding compound. 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 quantity, part number 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 SCD
Tensile Strength	IEC 62329 part 2	8 MPa minimum (1,150 psi)
Ultimate Elongation	IEC 62329 part 2	250 % minimum
Secant Modulus at 2% Strain	IEC 62329 part 2	50 – 130 MPa (7,250 – 18850 psi)
Specific Gravity	IEC 62329 part 2	1.5 maximum
Heat Shock (4h ± 15m at 225 ± 5°C)	IEC 62329 part 2	No dripping, cracking or flowing
Heat Ageing (168h ± 2h at 150 ± 3°C) - Tensile Strength - Ultimate Elongation	IEC 62329 part 2	 8 MPa minimum (1,150 psi) 100% minimum
Bending at low temperature (4h ± 15m at -30 ± 2°C)	IEC 62329 part 2	No cracking
Flammability	ASTM D635	Burn Time : 100 s maximum Burn Length : 25 mm maximum
Electric Strength	IEC 62329 part 2	15 MV/m minimum (KV/mm)
Volume Resistivity	IEC 60093	10^{12} ohm.cm minimum
Water Absorption (24 ± 2h immersion at 23 ± 2°C) (24 ± 2h immersion at 70 ± 2°C)	ISO 62	 0.5 % maximum 1.5 % maximum

TABLE 1 Test Requirements (Cont'd)

Test	Test Method	Test Requirements
Fluid Resistance (24 ± 2h immersion at 23 ± 2°C) • Hydraulic Fluid to H-515 (Mil-H-5606) • Gasoline Fuel to ISO 1817 Test Liquid B (ASTM D471 Fuel B) • JP8 (Mil-DTL-83133) • Hydraulic Fluid DTD900/4881D (Skydrol 500B4) • Water	IEC 62329 part 2	
- Tensile Strength	IEC 62329 part 2	5 MPa minimum (725 psi)
- Ultimate Elongation		150% minimum
Fluid Resistance (24 ± 2h immersion at 50 ± 2°C) • Lubricating Oil to O-149 • Lubricating Oil to O-156 (Mil-L-23699) • Insulating Oil, Electrical S-756 to IEC 296 Class 1 (ASTM D 3487 type 1) • IRM 902 Standard Oil (ASTM D471)	IEC 62329 part 2	
- Tensile Strength	IEC 62329 part 2	5 MPa minimum (725 psi)
- Ultimate Elongation		150% minimum

TABLE 1 Test Requirements (Cont'd)

Test	Test Method	Test Requirements
Oxygen Index at Ambient Temperature	ISO 4589-2	29 minimum
Oxygen Index at Elevated Temperature	ISO 4589-3	250°C minimum
Acid Gas Generation		
-pH Index	IEC 60754-2	4.3 - 10.5
-Electrolytic Conductivity		10 μS/mm maximum
-HCl equivalent	MIL-DTL-24643B	1.5 maximum
Smoke Index	IEC 62329 part 2	20 maximum
Toxicity Index	IEC 62329 part 2	5 maximum per 100 grams