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## **Electronics OEM Division (Europe) RW Specification**

### **RW 2101 Revision 3**

## **RBK-85**

### **Automotive Cable Sealing System**

#### **SCOPE**

**This Quality Assurance Specification establishes the quality standard for an Automotive Cable Sealing System designed to block cable bundles and wires, for continuous use at temperatures from -40°C up to and including 85°C. The adhesive profile is designed to hold the cable wires in position during assembly on the harness board or similar device, prior to recovery of the adhesive lined heat shrinkable sleeve at 150°C to complete the seal.**

#### **Approved Signatories\***

\*This document is electronically reviewed and approved by TE Connectivity Approvers therefore no signatures will appear.

**1. REVISION HISTORY**

Revision Number	Change Request	Date	Incorporated By
0	Formerly RK 6633/1 Revn 6		
1	CRF T1020 CR98-DM-0154	27 August 1997 13 August 1998	C. Woosnam L. Abrams
2	Via DMTEC	17 March 2014	C. Diss
3	Via DMTEC	17 March 2014	C. Diss

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

The jacket shall be a heat shrinkable sleeving and shall be essentially free from pinholes, bubbles, cracks, seams, defects and inclusions. The standard colour shall be black. The profile shall be manufactured from a hot melt adhesive which is amber in colour.

**2.2 Dimensions**

Dimensions shall be as specified in the relevant SCD.

**2.3 Test Requirements**

The test requirements shall be as specified in Table 1.

**3. TEST METHODS****3.1 Preparation of Test Specimens**

The samples shall be prepared using RBK-85 Kit 0510-A0 using the number of wires specified according to sizes as given below. The samples may be installed using a hot air gun or infra red equipment and should be verified for sealing effectiveness according to Clause 3.3 after allowing to cool to room temperature for 30 minutes.

**Standard Cable Bundle Components**

<b><u>Raychem 67 Wire Gauge</u></b>	<b><u>Number of Wires</u></b>
20	8
18	8
14	3
12	1

**TEST METHODS (Cont'd)****3.2 Visual Examination and Dimensions**

The kit shall be examined for the number of components and the critical dimensions as specified in the relevant SCD. After installation the sealed cable assembly shall be examined for the quality of adhesive flow etc, and a record of the conditions noted for comparison purposes.

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**3.3 Sealing Performance**

The test method shall be as described in RTM 2581. A constant pressure of 0.5 bar shall be applied for 1 min  $\pm$  5 seconds and the seal examined for evidence of bubbles indicating that leakage has occurred.

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**3.4 Electrical Performance (Insulation Resistance)**

The test method shall be as described in RTM 2583.  
The measurement of Insulation Resistance shall be made after a 500 volt dc, 2 amp load has been applied for 5 min  $\pm$  15 seconds

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**3.5 Cold Impact**

The test method shall be as described in RTM 2574 which is based on DIN VDE 0472 Part 611. Drop height shall be 100mm. Anvil weight shall be 1kg. Specimens prepared as described in Clause 3.1 shall be conditioned as specified in Table 1. At the completion of the test the sample shall be stored at ambient for 2 hours minimum prior to Visual Examination and Sealing Performance testing.

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**3.6 High Temperature Endurance**

Five samples prepared according to Clause 3.1 shall be visually examined and tested for Sealing and Electrical Performance according to Clauses 3.2, 3.3 and 3.4.  
The samples shall be placed in an air circulating oven and maintained at the maximum operating temperature ( $T_{max}$  as specified in Table 1) for a period of 3000  $\pm$  24 hours.  
On removal the samples shall be stabilised at ambient temperature for 2 hours  $\pm$  15 minutes prior to Visual Examination, Sealing and Electrical Performance testing

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**3.7 Fluid Resistance**

Five samples prepared as described in Clause 3.1 shall be immersed in each of the fluids, as specified in Table 1. On removal the specimens shall be wiped and air dried for 1 hour  $\pm$  15 minutes at ambient prior to Visual Examination and Sealing Performance testing.

## TEST METHODS (Cont'd)

### 3.8 Sequential Tests

Five specimens prepared as described in Clause 3.1 shall be visually examined and tested for Sealing and Electrical Performance according to Clauses 3.2, 3.3 and 3.4. All the steps outlined below shall be completed sequentially.

#### 3.8.1 Thermal Shock

The test method shall be in accordance with IEC 68-2-14. The samples shall be subjected to rapid temperature changes with exposure times at  $T_{\min}$  (minimum service temperature) and  $T_{\text{ex}}$  (the maximum excursion temperature) set as specified in Table 1. Fifty cycles shall be completed and the samples subjected to sinusoidal vibration in accordance with Clause 3.8.2.

#### 3.8.2 Vibration

The test method shall be in accordance with IEC 68-2-6. The samples from Thermal Shock shall be subjected to the following vibration regime:

10 - 25Hz at 1g acceleration

25 - 500Hz at 4.5g acceleration

in two orthogonal directions, reciprocating at 1 cycle/min. The test duration shall be 8 hours  $\pm$  15 minutes in each direction with the cable/connector unpowered. The first frequency sweep should be conducted at 1 octave/min to identify resonances (which should be absent). If resonances are found, these should be recorded and the test carried out at the maximum resonance. At the conclusion of the test, the samples shall be subjected to the Petrol Immersion test as described in Clause 3.8.3.

#### 3.8.3 Petrol Immersion

The samples from the Vibration test shall be immersed in Automotive Gasoline (4\* Petrol) for a period of 1 hour  $\pm$  5 minutes at  $23 \pm 2$  °C. On removal the samples shall be allowed to dry for 24  $\pm$  2 hours at ambient. On completion of the test the samples shall be subjected to the Temperature/Humidity Cycle as described in Clause 3.8.4.

#### 3.8.4 Temperature/Humidity Cycle

The samples from the Petrol Immersion test shall be subjected to the following temperature/humidity cycle:

The samples shall be conditioned in an atmosphere of 95% relative humidity at  $40 \pm 3$ °C for 16 hours  $\pm$  15 minutes. On removal the samples shall be immediately transferred (within 30 seconds) to a cold chamber at  $-40 \pm 3$ °C for 2 hours  $\pm$  15 minutes. On removal the samples shall be immediately transferred (within 30 seconds) to an air circulating oven set at the appropriate  $T_{\text{max}}$  (the maximum continuous operating temperature) as specified in the Table 1 for 2 hours  $\pm$  15 minutes. The cycle shall be completed by storing the samples at  $23 \pm 2$ °C for 4 hours  $\pm$  15 minutes. The samples shall be subjected to 10 complete cycles each of 24 hours duration. At the conclusion of the test the samples shall be re-submitted for Visual Examination, Sealing and Electrical Performance testing according to clause 3.2, 3.3 and 3.4 respectively.

**4. RELATED STANDARDS & issue**

IEC 68-2-6: 1995	Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal)
IEC 68-2-14: 1994	Environmental testing - Part 2: Tests. Test N: Change of temperature
VDE 0472 Part 611: 1985	Testing of insulated cables and flexible cords -Cold Impact Test
RTM 2574	Cold Impact Test
RTM 2581	Sealing Performance Test
RTM 2583	Electrical Performance Test

**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 product. A batch of product is defined as that quantity of sleeving or profile extruded at any one time. Testing frequency shall be Production Routine or Qualification. Production Routine tests consisting of Visual Examination and Dimensions shall be carried out on every batch. 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 and 3.2
Dimensions	ASTM D2671	As per relevant SCD
Sealing Performance	Clause 3.3	No leakage
Electrical Performance - Insulation Resistance	Clause 3.4	2 x 10 <sup>8</sup> ohm minimum
Cold Impact (4h ± 15m at -40 ± 2°C) - Visual Examination - Sealing Performance	Clause 3.5  Clause 3.3	No fracture No leakage
High Temperature Endurance (3000 hrs at 85°C) - Visual Examination - Sealing Performance - Insulation Resistance	Clause 3.7  Clause 3.2 Clause 3.3 Clause 3.4	No deterioration No leakage 2 x 10 <sup>8</sup> ohm minimum
Fluid Resistance (24 ± 2h immersion at 23 ± 2°C) • Engine Oil to SAE 10W/40 • Diesel Fuel to BS2869 Class A1 • Hydraulic Fluid to SAE J1703 • Antifreeze (Ethylene Glycol/Water 50/50 v/v) • Engine Cleaning Fluid (Gunk) • Car Wash Detergent (1% Teepol) - Visual Examination - Sealing Performance	ISO 1817       Clause 3.2 Clause 3.3	No deterioration No leakage

TABLE 1 Test Requirements (Cont'd)

Test	Test Method	Test Requirements
<b>SEQUENTIAL TESTS</b>	Clause 3.8	
• Thermal Shock ( $T_{\min} = -40^{\circ}\text{C}$ , $T_{\text{ex}} = +105^{\circ}\text{C}$ )	IEC 68-2-14	
• Vibration	IEC 68-2-6	
• Petrol Immersion	Clause 3.8.2	
• Temperature / Humidity Cycle ( $T_{\min} = -40^{\circ}\text{C}$ , $T_{\max} = +85^{\circ}\text{C}$ )	Clause 3.8.3	
- Visual Examination	Clause 3.2	No deterioration
- Sealing Performance	Clause 3.3	No leakage
- Insulation Resistance	Clause 3.4	$2 \times 10^8$ ohm minimum

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