
AMPSEAL 16* hybrid lever Connector System, IP6K7 and IP6K9K Testing

1. INTRODUCTION

1.1. Purpose

Testing was performed on AMPSEAL 16 hybrid lever connector system to determine conformance to IP6K7 and IP6K9K. Test procedures are given in SAE J2030, dated 2009-06; IEC 60529, Edition 2.2 dated 2013-08; and DIN 40 050 part 9, dated May 1993.

1.2. Scope

This report covers the environmental sealing performance of the AMPSEAL 16 hybrid lever connector system. Testing was performed at the Winston-Salem Electronic Components Test Laboratory in 2015. The test file number is 20150203ACL. This documentation is on file at, and available from, the Global Automotive Division Product Reliability Center.

1.3. Conclusion

The AMPSEAL 16 hybrid lever connectors conformed to the environmental sealing performance requirements for IP6K7 and IP6K9K when tested per the sequences shown in Figure 2 of this document.

1.4. Test Specimens

Test specimens were representative of normal production lots. Specimen part numbers listed in Figure 1 were used for the test.

PART NUMBER	DESCRIPTION
2138839-1	28-Position Plug Assembly Key A
2138846-1	28-Position Cap Assembly Key A
2138853-1	Wire Cover
1924463-1	Size 16 Pin, 18-20 AWG
1924464-1	Size 16 Socket, 18-20 AWG
1060-12-0144	Size 12 Pin, 12-14 AWG
1062-12-0144	Size 12 Socket, 12-14 AWG

Figure 1. Test Specimen Part Numbers and Description

1.5. Environmental Conditions

Unless otherwise stated, all tests shall be performed at ambient environmental conditions.

1.6. Qualification Test Sequences

TEST OR EXAMINATION	TEST GROUP (a)		
	1 (c)	2 (c)	3 (c)
	TEST SEQUENCE (b)		
Initial Examination of Product	1	1	1
Insulation Resistance	2,4,7	2,5	2,4,7
Degrees of Protection, IPX7	3,6		
Degrees of Protection, IPX9K			3,6
Degrees of Protection, IP6KX		4	
Temperature Life	5	3	5
Final Examination of Product	8	6	8

Figure 2. Environmental Sealing Test Sequences

- (a) See Paragraph 1.4.
- (b) Numbers indicate sequence in which tests are performed.
- (c) Test sequence tests integrity of the mat seal (sealing to the wires) and the peripheral seal (sealing between connector halves). Samples were not mounted on a panel for this sequence.

2. SUMMARY OF TESTING

2.1. Environmental Sealing Test Sequences

The summary of tests, as outlined in Figure 2, are as follows:

A. Initial Examination of Product—All Test Groups

Specimens were visually inspected and no evidence of physical damage detrimental to product performance was observed.

B. Insulation Resistance— All Test Groups

All insulation resistance measurements were greater than 20 MΩ.

C. Degrees of Protection— All Test Groups

No evidence of physical damage was visible as a result of exposure to fluids or dust.

D. Temperature Life— All Test Groups

No evidence of physical damage was visible as a result of temperature life testing.

E. Final Examination of Product — All Test Groups

Specimens were visually inspected and no evidence of physical damage detrimental to product performance was observed.

3. TEST METHODS

3.1. Initial Examination of Product

Reference SAE J2030, Section 6.1

All samples were visually examined for identification, torn seals, and cracked plastic or any other defect detrimental to the performance of the product.

Visual inspection of the product was performed with the naked eye under cool white fluorescent lighting for defects that could also affect the electrical or mechanical performance of the part or the long-term performance of the part.

3.2. Insulation Resistance

Reference SAE J2030, Section 6.3

Insulation resistance was measured between adjacent contacts. A test voltage of 1000 V DC was applied for 15 seconds, and the resistance was measured.

3.3. Degrees of Protection (IPX7)

Reference the IEC 60529 Test Specification

The mated assemblies were submersed in ambient water to a depth of 1 meter for 30 minutes. Please Reference Figure 3 for a depiction of sample setup.



Figure 3

3.4. Degrees of Protection (IPX9K)

Reference the DIN 40 050 Test Specification.

Mated assemblies were attached to a rotating table. The rotation speed of the table was set at 5 ± 1 RPM. The sample was sprayed with a flat fan type nozzle for 30 seconds from a distance of approximately 5 inches (127 mm) while rotating. The water temperature was approximately $80^{\circ}\text{C} \pm 5^{\circ}\text{C}$. The spray nozzle was positioned at an angle of 0° to the test sample. This procedure was repeated three more times with the spray nozzle repositioned each time to spray at an angle of 30° , 60° , and 90° to the test sample. The water flow rate was measured at approximately 14.5 LPM, and the water pressure measured at approximately 8274 KPa (1200 psi). Please reference Figures 4-8, for a depiction of the sample setup.

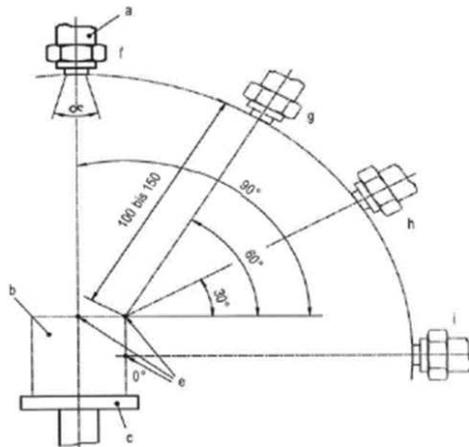


Figure 4



Figure 5



Figure 6



Figure 7



Figure 8

3.5. Degrees of Protection (IP6KX)

Reference the DIN 40 050 Test Specification

The mated assemblies were placed in a dust chamber at room ambient temperature with $<35\% \pm 5$ RH and exposed to 20 cycles. Each cycle consists of an air-blast for 6 seconds, creating dust/ air movement in the dust chamber, then followed by a 15-minute pause of the air-blast. After exposure each sample was visually inspected for dust ingress without unmating the parts.

The chamber size is 14.3 cubic ft. (36"x24"x23"H) which required 8.8 lbs. of fresh dust at the beginning of each new test to meet the dispersion rate below. Blast of air is produced by one nozzle at 58 psi downward toward the dust pile creating an upward or vertical plume of dust which then settles down onto the test samples. The dust does not circulate. Type of dust used was A2 Fine Test Dust, NIST traceable (ISO 12103-1). The dispersion or suspensions rate of dust was approximately 0.25 grams/m^2 . Please reference Figure 9 for a depiction of the sample setup.



Figure 9

3.6. Temperature Life

Reference SAE J2030, Section 6.7

Specimens were exposed to a temperature of $125 \pm 3^\circ\text{C}$ for 500 hours.

3.7. Final Examination of Product

Reference SAE J2030, Section 6.27

Specimens were visually inspected before and after un-mating connectors for conditions such as torn seals, cracked plastic, evidence of fluid or dust ingress in sealed connector systems, arcing, charring, melting, and any other defect that could affect the performance or serviceability of the product.

4. TEST SEQUENCE-TO-TEST NUMBER CROSS-REFERENCE

TEST SEQUENCE		TEST NUMBER	
Test Sequence	Test Group	Test Number	Test Group
Environmental Sealing (Refer to Figure 2)	1	20150203ACL	2
	2		3
	3		4

Figure 10

5. SAMPLE QUANTITIES FOR ENVIRONMENTAL SEALING TEST SEQUENCES

Test Group	Plug Assembly	Cap Assembly	Wire Cover	Wire (Size 12)	Wire (Size 16)	Mated Connector Quantity	Comments
1	2138839-1	2138846-1	-	14 GXL	20 TXL	6	Min Wire
2	2138839-1	2138846-1	-	14 GXL	20 TXL	6	Min Wire
3	2138839-1	2138846-1	2138853-1	14 GXL	20 TXL	6	Min Wire

Figure 11