



DEUTSCH* HD10 Series Connector System IP6K9K, IP67, IP68

1. INTRODUCTION

1.1. Purpose

Testing was performed on DEUTSCH HD10 series connector system to determine conformance to IP6K9K, IP67, IP68. Test procedures are given in SAE J2030, dated 2009/2015; IEC 60529, Edition 2.1 dated 2001-02; and DIN 40050 part 9, dated May 1993.

1.2. Scope

This report covers the environmental sealing performance of the HD10 series connector system. Group 1 and Group 2 tests (in reference to the IP6K9K testing) were performed at the Winston-Salem Electronic Components Test Laboratory in 2014. The test file numbers for this testing are listed in Figure 1. This documentation is on file at, and available from the Global Automotive Division Product Reliability Center. Group 3, Group 4 and Group 5 tests were performed at the Greensboro Product Test Laboratory in 2021. The test file numbers for this testing are listed in Figure 1. This documentation is on file at, and available from Product Engineering, Industrial Commercial Transportation (ICT) Laboratory.

Test Group	Test Report
1	WE-20140251ACL
2	WE-20140252ACL
3	2103054-REPORT
4	2103056-REPORT
5	2105100-REPORT

Figure 1

1.3. Conclusion

The DEUTSCH HD10 series connector system conformed to the environmental sealing performance requirements for IP6K9K, IP67 and IP68 when tested per the sequences shown in Figure 3 of this document.

1.4. Test Specimens

Test specimens were representative of normal production lots. Specimens identified with the part numbers given in Figure 2 were used for testing.

DEUTSCH PART NUMBER	DESCRIPTION	TEST GROUP
HD10-3-96P	3pin, Receptacle	1,2
HD14-3-16P	3pin, Receptacle	
HD14-3-96P	3pin, Receptacle	
HD10-5-16P	5pin, Receptacle	
HD10-5-16P-B009	5pin, Receptacle	
HD14-5-16P	5pin, Receptacle	
HD14-6-96P	6pin, Receptacle	
HD10-9-16P	9pin, Receptacle	2
HD10-9-16P-B009	9pin, Receptacle	1,2
HD10-9-96P	9pin, Receptacle	
HD14-9-16P	9pin, Receptacle	
HD16-3-16S	3pin, Plug	
HD16-3-96S	3pin, Plug	
HD16-5-16S	5pin, Plug	
HD16-6-96S	6pin, Plug	
HD16-9-16S	9pin, Plug	
HD16-9-96S	9pin, Plug	
HD10-3BT	3pin Rubber Boot	
HD10-5BT	5pin Rubber Boot	
HD10-9BT	9pin Rubber Boot	
HD18-003	3pin Strain Relief	2
HD18-006	6pin Strain Relief	
HD18-009	9pin Strain Relief	
HDC14-3	3pin Plug Protective Cap	1,2
HDC14-6	6pin Plug Protective Cap	
HDC14-9	8pin Plug Protective Cap	
HDC16-3	3pin Receptacle Protective Cap	
HDC16-6	6pin Receptacle Protective Cap	
HDC16-9	9pin Receptacle Protective Cap	
M902-2131	3pin Backshell	3
M902-2041	3pin Compression Nut	
HD14-3-96P	3pin, Receptacle	3
HD16-3-96S	3pin, Plug	
HD14-9-1939PE	9pin, Receptacle	4
HD16-9-1939SE	9pin, Plug	
HD14-6-96P	6pin, Receptacle	5
HD16-9-96S	6pin, Plug	

Figure 2

1.5. Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

Temperature: 15° to 35°C

Relative humidity: 25 to 75%

1.6. Qualification Test Sequences

TEST OR EXAMINATION	TEST GROUP (a)				
	1	2	3	4	5
	TEST SEQUENCE (b)				
Examination of Product	1,6	1,6	1,9	1,9	1,9
Insulation Resistance	2,5	2,5	3,5, 8	3,5, 8	3,5, 8
Thermal Shock	3	3			
Temperature Life			6	6	6
Protection Against Dust (IP6X)	4		7	7	7
Protection Against High Pressure/Steam Jet Cleaning (IPX9K)		4			
Protection Against Water (IPX7)			2	2	2
Protection Against Water (IPX8)			4	4	4

(a) Specimens were prepared in accordance production drawings and were selected at random from current production.

- Groups 1-2 specimens consisted of 3,5,6,9 position connectors with DEUTSCH stamped & formed size 16 nickel pins and sockets with 14 AWG wire.
- Group 3 specimens consisted of 3 position connectors with DEUTSCH solid size 16 nickel pins and sockets with 16 AWG wire.
- Group 4 specimens consisted of 9 position connectors with DEUTSCH solid size 16 nickel pins and sockets with 16 AWG wire.
- Group 5 specimens consisted of 6 position connectors with DEUTSCH solid size 16 nickel pins and sockets with 16 AWG wire.

(b) Numbers indicate sequence that tests were performed.

Figure 3

2. SUMMARY OF TESTING

2.1. Examination of Product (Groups 1-5)

- A. Procedure: SAE J2030
- B. Method: The visual examination should be performed prior to testing, noting in detail any manufacturing or material defects such as cracks, tarnishing, deformities, etc.
- C. Requirement: No physical defects detrimental to product performance.
- D. Result: **PASSED.**

2.2. Insulation Resistance (Groups 1-5)

- A. Procedure: SAE J2030
- B. Method: Each contact was checked to all other contacts and the shell, if the shell is conductive. Test was performed using a 1000 VDC megohmmeter.
- C. Requirement: > 20 MΩ
- D. Result: **PASSED.**

- 2.3. Thermal Shock (Groups 1-2)
- A. Procedure: SAE J2030
 - B. Method: Test samples subjected to 10 cycles of thermal shock. One cycle shall consist of a soak time at -55°C ambient, then a transition within 2 min to an ambient of 125°C , with a soak time there and then a transition back to -55°C ambient within 2 minutes. The soak times shall be established as the time necessary to bring the internal connector temperature on test to within 5°C of each of the ambient temperatures.
 - C. Requirement: No evidence of cracking, chipping, or other damage detrimental to the normal operation of the connector
 - D. Result: **PASSED.**
- 2.4. Protection Against Dust (IP6X) (Group 1,3,4,5)
- A. Procedure: DIN 40050, Part 9
 - B. Method: 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.
The chamber size is 14.3 cubic ft. (36"x24"x23"H) which required 8.8 lbs. of dust 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 Arizona Fine Dust. The dispersion or suspensions rate of dust was approximately 0.25 grams/ m^2 .
 - C. Requirement: No dust visible inside connector.
 - D. Result: **PASSED.**
- 2.5. Protection Against High Pressure/Steam Jet Cleaning (IPX9K) (Group 2)
- A. Procedure: DIN 40050, Part 9
 - B. Method: 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 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).
 - C. Requirement: No water visible inside connector
 - D. Result: **PASSED.**
- 2.6. Temperature Life (Groups 3-5)
- A. Procedure: SAE J2030
 - B. Method: Mated connectors were placed in the environmental chamber at a temperature of $125 \pm 3^{\circ}\text{C}$ for 2 hours.
 - C. Requirement: No evidence of cracking, chipping, or other damage detrimental to the normal operation of the connector.
 - D. Result: **PASSED.**
- 2.7. Protection Against Water (IPX7) (Groups 3-5)
- A. Procedure: IEC 60529
 - B. Method: Test samples were first subject to thermal shock then submersed in ambient water to a depth of 1 meter for 30 minutes.
 - C. Requirement: Insulation Resistance > 20 M Ω
 - D. Result: **PASSED.**

2.8 Protection Against Water (IPX8) (Groups 3-5)

- A. Procedure: IEC 60529
- B. Method: Test samples were first subject to thermal shock then submersed in ambient water to a depth of 1 meter for 3 hours.
- C. Requirement: Insulation Resistance > 20 MΩ
- D. Result: **PASSED.**

3. REVISION HISTORY

Rev Ltr	Brief Description of Change	Date	Dwn	Apvd
A	Initial Release	28-Oct-2019	DM	DM
B	Updated spec to include IP67 and IP68 ratings. Page 1. 1. Added Group 3-5 in Figure 1 Page 2. 2. Added PNs for Group 3-5 in Figure 2. Page 3. 3. Added Test Sequence for Groups 3-5 in Figure 3. 4. Added Wire and Terminal data for Groups 3-5 in Figure 3. Page 4. 5. Added Temperature Life to Summary of Testing. 6. Added Protection Against Water (IPX7) to Summary of Testing. Page 5. 7. Added Protection Against Water (IPX8) to Summary of Testing.	4-Aug-2021	AP	IG