

DEUTSCH* DT Series Connector System IP66, IP68, IP6K9K

1. INTRODUCTION

1.1. Purpose

Testing was performed on DEUTSCH DT series connector system to determine conformance to IP66, IP68 and IP6K9K. 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 DT series connector system. Testing was performed at the Hemet Product Test Laboratory in 2014-2016 and at the Greensboro Product Test Laboratory in 2023. 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	150421-01
	WE-20140134ACL
	WE-20140156ACL
	WE-20140177ACL
	TR 2306126
	TR 2306127
2	TR 2306128
	WE-20140134ACL
	WE-20140156ACL
	WE-20140177ACL
3	WE-20160366ACL
	WE-20140134ACL
	WE-20140156ACL
	WE-20140177ACL
4	WE-20160366ACL
	WE-20140024ACL
5	WE-20150246ACL
6	WE-20160366ACL
7	TR 2310208
8	TR 2310208

Figure 1

1.3. Conclusion

The DEUTSCH DT series connector system conformed to the environmental sealing performance requirements for IP66, IP68 and IP6K9K 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	
DT04-2P	2pin, Receptacle, N-Seal	1,2,3	
DT04-2P-CE01	2pin, Receptacle, E-Seal, End Cap		
DT04-2P-E003	2pin, Receptacle, N-Seal, End Cap		
DT04-2P-C015	2pin, Receptacle, E-Seal	1,2,3,5	
DT04-2P-E005	2pin, Receptacle, N-Seal, End Cap	4	
DT04-3P	3pin, Receptacle, N-Seal	1,2,3	
DT04-3P-CE01	3pin, Receptacle, E-Seal, End Cap		
DT04-3P-E003	3pin, Receptacle, N-Seal, End Cap		
DT04-3P-C015	3pin, Receptacle, E-Seal	1,2,3,5	
DT04-3P-E005	3pin, Receptacle, N-Seal, End Cap	4	
DT04-4P	4pin, Receptacle, N-Seal	1,2,3	
DT04-4P-CE01	4pin, Receptacle, E-Seal, End Cap		
DT04-4P-E003	4pin, Receptacle, N-Seal, End Cap		
DT04-4P-C015	4pin, Receptacle, E-Seal	1,2,3,5	
DT04-4P-E005	4pin, Receptacle, N-Seal, End Cap	4	
DT04-6P	6pin, Receptacle, N-Seal	1,2,3	
DT04-6P-CE01	6pin, Receptacle, E-Seal, End Cap		
DT04-6P-E003	6pin, Receptacle, N-Seal, End Cap		
DT04-6P-C015	6pin, Receptacle, E-Seal	1,2,3,5	
DT04-6P-E005	6pin, Receptacle, N-Seal, End Cap	4	
DT04-08PA-C015	8pin, Receptacle, E-Seal	2,3,5,6	
DT04-08PA-CE01	8pin, Receptacle, E-Seal, End Cap	2,3,6	
DT04-08PA-E005	8pin, Receptacle, N-Seal, End Cap	4	
DT04-12PA	12pin, Receptacle, N-Seal	1,2,3	
DT04-12PA-CE01	12pin, Receptacle, E-Seal, End Cap		
DT04-12PA-E003	12pin, Receptacle, N-Seal, End Cap		
DT04-12PA-C015	12pin, Receptacle, E-Seal	1,2,3,5	
DT04-12PA-E005	12pin, Receptacle, N-Seal, End Cap	4	
DT04-2P-TE03	2pin, Dia 1.6mm, Recpt Assy, Sld, E, Green	1	
DT04-2P-TE07	2pin, Dia 1.6mm, Recpt Assy, Sld, E, Blue		
DT04-2P-TE09	2pin, Dia 1.6mm, Recpt Assy, Sld, E, Brown		
DT04-3P-TE03	3pin, Dia 1.6mm, Recpt Assy, Sld, E, Green		
DT04-3P-TE07	3pin, Dia 1.6mm, Recpt Assy, Sld, E, Blue		
DT04-3P-TE09	3pin, Dia 1.6mm, Recpt Assy, Sld, E, Brown		
DT04-6P-TE03	6pin, Dia 1.6mm, Recpt Assy, Sld, E, Green		
DT04-6P-TE07	6pin, Dia 1.6mm, Recpt Assy, Sld, E, Blue		
DT04-6P-TE09	6pin, Dia 1.6mm, Recpt Assy, Sld, E, Brown		
DT06-2S-EP06	2pin, Plug, N-Seal, End Cap, Seal Retention		4

Figure 2

DEUTSCH PART NUMBER	DESCRIPTION	TEST GROUP
DT06-2S	2pin, Plug, N-Seal	1,2,3
DT06-2S-CE05	2pin, Plug, E-Seal, End Cap, Seal Retention	
DT06-2S-E003	2pin, Plug, N-Seal, End Cap	
DT06-2S-CE06	2pin, Plug, E-Seal, Seal Retention	1,2,3,5
DT06-3S	3pin, Plug, N-Seal	1,2,3
DT06-3S-CE05	3pin, Plug, E-Seal, End Cap, Seal Retention	
DT06-3S-E003	3pin, Plug, N-Seal, End Cap	
DT06-3S-CE06	3pin, Plug, E-Seal, Seal Retention	1,2,3,5
DT06-3S-EP06	3pin, Plug, N-Seal, End Cap, Seal Retention	4
DT06-4S	4pin, Plug, N-Seal	1,2,3
DT06-4S-CE05	4pin, Plug, E-Seal, End Cap, Seal Retention	
DT06-4S-E003	4pin, Plug, N-Seal, End Cap	
DT06-4S-CE06	4pin, Plug, E-Seal, Seal Retention	1,2,3,5
DT06-4S-EP06	4pin, Plug, N-Seal, End Cap, Seal Retention	4
DT06-6S	6pin, Plug, N-Seal	1,2,3
DT06-6S-CE05	6pin, Plug, E-Seal, End Cap, Seal Retention	
DT06-6S-E003	6pin, Plug, N-Seal, End Cap	
DT06-6S-CE06	6pin, Plug, E-Seal, Seal Retention	1,2,3,5
DT06-6S-EP06	6pin, Plug, N-Seal, End Cap, Seal Retention	4
DT06-08SA-CE05	8pin, Plug, E-Seal, End Cap, Seal Retention	2,3,5,6
DT06-08SA-CE06	8pin, Plug, E-Seal, Seal Retention	2,3,6
DT06-08SA-EP06	8pin, Plug, N-Seal, End Cap, Seal Retention	4
DT06-12SA	12pin, Plug, N-Seal	1,2,3
DT06-12SA-CE05	12pin, Plug, E-Seal, End Cap, Seal Retention	
DT06-12SA-E003	12pin, Plug, N-Seal, End Cap	
DT06-12SA-CE06	12pin, Plug, E-Seal, Seal Retention	1,2,3,5
DT06-12SA-EP06	12pin, Plug, N-Seal, End Cap, Seal Retention	4
DT06-2S-TE03	2pin, Dia 1.6mm, Plg Assy, Sld E, Brown	1
DT06-2S-TE07	2pin, Dia 1.6mm, Plg Assy, Sld E, Green	
DT06-2S-TE09	2pin, Dia 1.6mm, Plg Assy, Sld E, Blue	
DT06-3S-TE03	3pin, Dia 1.6mm, Plg Assy, Sld E, Brown	
DT06-3S-TE07	3pin, Dia 1.6mm, Plg Assy, Sld E, Green	
DT06-3S-TE09	3pin, Dia 1.6mm, Plg Assy, Sld E, Blue	
DT06-6S-TE03	6pin, Dia 1.6mm, Plg Assy, Sld E, Brown	
DT06-6S-TE07	6pin, Dia 1.6mm, Plg Assy, Sld E, Green	
DT06-6S-TE09	6pin, Dia 1.6mm, Plg Assy, Sld E, Blue	
DT06-2S-C015	2pin, Plug, E-seal	7
DT06-2P-C015	2pin, Rec, E-seal	7, 8
DT06-3S-C015	3pin, Plug, E-seal	
DT04-3P-C015	3pin, Rec, E-seal	

Figure 2 End

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	6	7 (c)	8 (c)
	TEST SEQUENCE (b)							
Visual Examination	1,6	1,6	1,6	1,5	1,5	1,8	1,7	1,7
Insulation Resistance	2,5	2,5	2,5	2,4	2,4	2,4,7	2,4,6	2,4,6
Thermal Shock	3	3	3			5	3	3
Protection Against Dust (IP6X)		4			3			
Protection Against Water (IPX6)				3				
Protection Against Water (IPX8)	4					3,6	5	5
Protection Against High Pressure/Steam Jet Cleaning (IPX9K)			4					

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

- Groups 1 specimens consisted of 2,3,4,6,12 position connectors with DEUTSCH stamped & formed size 16 nickel pins and sockets with 0.5mm², 18 AWG and 20 AWG wire.
- Groups 2-4 specimens consisted of 2,3,4,6,8,12 position connectors with DEUTSCH stamped & formed size 16 nickel pins and sockets with 14 AWG, 18 AWG and 20 AWG wire.
- Group 5 specimens consisted of 2,3,4,6,12 position connectors with DEUTSCH solid size 16 nickel pins and sockets with 22 AWG wire.
- Group 6 specimens consisted of 8 position connectors with DEUTSCH stamped & formed size 16 nickel pins and sockets with 18 AWG wire
- Group 7 specimens consisted of 2 and 3 position connectors with DEUTSCH solid size 16 gold pins and sockets with 0.35mm² Champlain Exrad-UT [1.34mm OD] wire.
- Group 8 specimens consisted of 3 position connectors with DEUTSCH solid size 16 gold pins and sockets with 0.35mm² Champlain Exrad-UT [1.34mm OD] wire.

(b) Numbers indicate sequence that tests were performed.

(c) Wire range was selected under the recommended range described on our 108-151009 (Product specification) due to wire availability. Please adhere to the allowed ranges specified in the Customer Drawing and Product Specification.

Figure 3

2. SUMMARY OF TESTING

2.1. Visual Examination (Groups 1-6)

- 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 1-6)

- 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 1,2,3,6)

- 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) (Groups 2,5)

- 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/m².
- C. Requirement: Insulation Resistance > 20 MΩ and no dust visible inside connector.
- D. Result: **PASSED.**

2.5. Protection Against Water (IPX6) (Group 4)

- A. Procedure: IEC 60529
- B. Method: Test samples were subjected to water spray testing using a standard nozzle with an internal diameter of 12.5mm. The parts were sprayed using a water flow of 100 l/m at a distance between 2.5 to 3 meters. Each sample was sprayed for 3 minutes.
- C. Requirement: Insulation Resistance > 20 MΩ
- D. Result: **PASSED.**

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- 2.6. Protection Against Water (IPX8) (Group 1,6)
- 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.**
- 2.7. Protection Against High Pressure/Steam Jet Cleaning (IPX9K) (Group 3)
- 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: Insulation Resistance > 20 MΩ
 - D. Result: **PASSED.**

3.1 Revision History

Rev Ltr	Brief Description of Change	Date	Dwn	Apvd
A	Initial Release	03-Oct-2019	DM	DM
A1	Sec 2.6B typo (is) 3 hours (was) 30 hours	09-Oct-2019	DM	DM
B	Page 1. Added Test Reports to Figure 1. Page 2. Added Part Numbers to Figure 2. Page 3. Added Part Numbers to Figure 2 End.	03-Oct-2023	AP	DM
C	Page 1. Added Test Reports to Figure 1. Page 2. Added Part Numbers to Figure 2 End. Page 3. Added Test Groups 7 and 8.	21-Aug-2023	AJ	CB