

DEUTSCH* AEC Series Connector System

1. INTRODUCTION

1.1. Purpose

This report summarizes the results of testing performed on DEUTSCH AEC series connector system to determine conformance to the requirements of product specification 108-151017.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the DEUTSCH AEC series connector system. Testing was performed at the DEUTSCH Industrial Products Division Laboratory in 1993, 1995, 2005, 2012. 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	031293-02
2	03069575
3	120517-02
4	050407-01

Figure 1

1.3. Conclusion

The DEUTSCH AEC series connector system products listed in Paragraph 1.4 conform to the electrical, mechanical, and environmental performance requirements given in product specification 108-151017.

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
AEC14-40PAB	40pin Receptacle	1
AEC14-40PA	40pin Receptacle	3
AEC16-40SA	40pin Plug	1,2,3
AEC16-40SD	40pin Plug	4
0460-202-16141	Size 16 Solid Pin, Nickel	1,2,3
0462-201-16141	Size 16 Solid Socket, Nickel	1,2,3
1062-16-1422	Size 16 S&F Socket, Nickel	4

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 Sequence

TEST OR EXAMINATION	TEST GROUP (a)			
	1	2	3	4
	TEST SEQUENCE (b)			
Visual Inspection	1,8	1,3	1,6,8	1,3
Insulation Resistance 1	2,7			
Insulation Resistance 2			2	
Durability	5			
Maintenance Aging 1	4			
Maintenance Aging 2				2
Water Immersion 1	6			
Water Immersion 2			4,7	
Temperature Life			3	
Thermal Cycle	3			
Thermal Shock			5	
Fluid Resistance		2		

- (a) Specimens were prepared in accordance production drawings and were selected at random from current production.
- Groups 1-3 specimens consisted of 40-position connectors with DEUTSCH solid terminal system size 16 nickel sockets with 16 AWG wire.
 - Groups 4 specimens consisted of 40-position connectors with DEUTSCH stamped and formed terminal system size 16 nickel sleeveless sockets with 16 AWG wire.
- (b) Numbers indicate sequence that tests were performed.

Figure 3

2. TEST METHODS AND RESULTS

2.1. Visual Inspection (Groups 1-4)

- A. Procedure: Not Applicable
- B. Method: Examine samples for defects or damage (i.e. torn seals, cracked plastic, missing parts, arching, charring, identification, finish, interchangeability, workmanship, etc.)
- C. Requirement: Free of defects that could affect the electrical or mechanical performance of the part or degrade the long term performance of the part.
- D. Result: **PASSED.**

2.2. Insulation Resistance 1 (Group 1)

- A. Procedure: Not Applicable
- B. Method: Check each contact to all other contacts and the shell, if shell is conductive. Test to be performed using a 1000 VDC megohmmeter.
- C. Requirement: 10 MΩ minimum and 100 μA max current leakage
- D. Result: **PASSED.**

2.3. Insulation Resistance 2 (Group 3)

- A. Procedure: Not Applicable
- B. Method: Check each contact to all other contacts and the shell, if shell is conductive. Test to be performed using a 500 VDC megohmmeter.
- C. Requirement: 1000 MΩ minimum
- D. Result: **PASSED.**

- 2.4. Durability (Group 1)
- A. Procedure: Not Applicable
 - B. Method: Assembled connectors shall be subjected to 50 cycles of mating and unmating.
 - C. Requirement: There shall be no evidence of cracking, distortion or detrimental damage to the connector following the test.
 - D. Result: **PASSED.**
- 2.5. Maintenance Aging 1 (Group 1)
- A. Procedure: Not Applicable
 - B. Method: Remove and reinsert 20% of the contacts 8 times at room temperature and 2 times at $0\pm 3^{\circ}\text{C}$.
 - C. Requirement: No failure of the contact retention mechanism.
 - D. Result: **PASSED.**
- 2.6. Maintenance Aging 2 (Group 4)
- A. Procedure: Not Applicable
 - B. Method: Subject 10% of the cavities to 10 complete cycles of inserting and removing its respective contact. Use the recommended extraction tools. The 10 cycles shall also include any disassembly required to remove the contacts.
 - C. Requirement: No failure of the contact retention mechanism.
 - D. Result: **PASSED.**
- 2.7. Water Immersion 1 (Group 1)
- A. Procedure: Not Applicable
 - B. Method: Place the wired mated connectors in an oven at $50\pm 5^{\circ}\text{C}$ for 2 hours. Immediately immerse samples in a container of $21\pm 5^{\circ}\text{C}$ tap water (electrically conductive) to a depth of 90 cm for 120 minutes. The container shall be large enough, so the sample does not increase the water temperature more than 1°C . The wire leads shall be long enough to extend outside the container with sealed ends.
 - C. Requirement: Inspect for leakage inside dried sample
 - D. Result: **PASSED.**
- 2.8. Water Immersion 2 (Group 3)
- A. Procedure: Not Applicable
 - B. Method: The wired mated connectors shall be placed in an oven at $+125\pm 3^{\circ}\text{C}$ for 2 hours minimum then immediately be placed in water with a 5% salt by weight content and 0.1 g/L wetting solution to a depth of three 3 feet for 4 hours minimum. The free ends of the mated connectors must remain out of the water to prevent wicking of the water through the open wires. Water temperature to be $+23\pm 3^{\circ}\text{C}$.
 - C. Requirement: Insulation resistance 1000 M Ω minimum.
 - D. Result: **PASSED.**
- 2.9. Temperature Life (Group 3)
- A. Procedure: SAE J2030
 - B. Method: The wired mated connectors shall be subjected to 1000 hours at $+125^{\circ}\text{C}$ without current flowing.
 - C. Requirement: There shall be no evidence of cracking, distortion or detrimental damage to the connector following the test.
 - D. Result: **PASSED.**

2.10. Thermal Cycle (Group 1)

A. Procedure: Not Applicable

B. Method: The test samples shall be cycled between -40°C to 120°C temperature extremes.

1. Cool the test samples to the lower operating temperature limit. The minimum dwell times at the temperature extremes are a function of the mass of the sample and are listed below.
2. Bring the environmental chamber to the opposite temperature limit at a rate of 2°C to 5°C per minute. Dwell at the limit temperature for at least the minimum time per below table.
3. Repeat step 2 39 times for a total of 20 cycles. For ease of testing, samples may be held at the temperature extremes for extended time, such as overnight. On the last cycle, thoroughly soak the test samples to -50°C for 8 hours.

WEIGHT OF SPECIMEN (GRAMS)	MINIMUM TIME (HOURS)
<136	0.5
136 TO 1.36 K	1.0
1.36 K TO 13.6 K	2.0
13.6 K TO 136 K	4.0
>136	8.0

C. Requirement: There shall be no evidence of cracking, distortion or detrimental damage to the connector following the test.

D. Result: **PASSED.**

2.11. Thermal Shock (Group 3)

A. Procedure: SAE J2030

B. Method: Subjected test sample to 10 cycles. One cycle shall consist of a soak time at -55°C 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 within 2 min. 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: There shall be no evidence of cracking, distortion or detrimental damage to the connector following the test.

D. Result: **PASSED.**

2.12. Fluid Resistance (Group 2)

A. Procedure: Not Applicable

B. Method: Test sample are to be tested in a temperature chamber with the fluid stabilized to the chamber temperature listed below. Test sample shall be properly assembled and mated connectors. One sample is required for each fluid. On day 1 the sample shall be dipped for 5 seconds, removed and allowed to drip dry for 1 hour at the chamber temperature. Repeat test 6 times and allow sample to drip dry overnight at the chamber temperature. Fluid shall not be drained from recesses on sample. Repeat the 7 immersions for 4 more days.

<u>FLUIDS</u>	<u>FLUID AND CHAMBER TEMPERATURE</u>
DIESEL FUEL	60±3°C
ENGINE OIL	100±3°C
ETHYLENE GLYCOL (50%)-WATER (50%)	100±3°C
BRAKE FLUID	25±3°C

C. Requirement: Inspect for damage, such as cracked housing, seal displaced from housing, loose parts, inability to mate or unmate or couple housing, etc.

D. Result: **PASSED.**

3. REVISION HISTORY

Rev Ltr	Brief Description of Change	Date	Dwn	Apvd
A	Initial Release	18-Oct-2019	DM	DM