



DEUTSCH* AEC Series Connector System

1. SCOPE

1.1. Content

This specification covers performance, tests and quality requirements for the TE Connectivity (TE) AEC Series Connector System.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 2 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

1.3 Successful qualification testing on the subject product line was completed in 1993, 1995, 2005, 2012. The Qualification Test Report number for this testing is [501-151017](#). These documents are on file at and available from Product Engineering, Industrial Commercial Transportation (ICT).

2. APPLICABLE DOCUMENTS AND FORMS

The following documents and forms constitute a part of this specification to the extent specified herein. Unless otherwise indicated, the latest edition of the document applies.

2.1 TE Connectivity (TE) Documents

- [109-1](#) General Requirements for Testing
- [408-151007](#) Instruction Guide DEUTSCH Extraction Tools
- [501-151017](#) AEC Qualification Test Report
- Product Drawings

X refers to A,B,C,D,U keys

XX refers to AB,CD keys

AEC14-40PXX	40pin Receptacle
AEC14-40PXXE-E019	40pin Receptacle
AEC16-40SU	40pin Plug
AEC16-40SUT	40pin Plug
AEC16-40SX	40pin Plug
AEC16-40SXE	40pin Plug
AEC16-40SXE-E019	40pin Plug
AEC16-40SXE-K001	40pin Plug
AEC16-40SXT	40pin Plug
AEC16-40SXT-K001	40pin Plug

2.2 Industry Documents

- DIN 72551-6: Road Vehicles—Low-Tension Cables—Part 6: Single-Core, Unscreened with Thin Insulation Wall; Dimensions, Materials, Marking
- ISO 6722: Road Vehicles—60 V and 600 V Single-Core Cables—Dimensions, Test Methods, and Requirements
- SAE J1128: Low Voltage Primary Cable
- SAE J2030: Heavy-Duty Electrical Connector Performance Standard

3. REQUIREMENTS

3.1 Design and Construction

Product shall be of the design, construction, materials and physical dimensions specified on the applicable product drawing.

3.2 Ratings

- Voltage: 250 VAC/VDC
- Current (Amp): See Figure 1

Contact Size	Wire Size AWG [mm ²]	All Circuits Energized (A)
16	12 [2.5]	13
	14 [2.0]	
	16 [1.5-1.0]	
	18 [0.8-0.75]	10
	20 [0.5]	7.5

Figure 1

- Temperature: -55°C to +125°C
- Ingress Protection (IP): Not tested.
- Flammability (Inline, E28476): HB. Parts have been successfully tested to the 20 mm Flame Test per Standard UL-94
- Flammability (Header): Not Tested

3.3 Test Requirements and Procedures Summary

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

Test Description	Requirement	Procedure
Visual Inspection	Free of defects that could affect the electrical or mechanical performance of the part or degrade the long term performance of the part.	Examine samples for defects or damage (i.e. torn seals, cracked plastic, missing parts, arching, charring, identification, finish, interchangeability, workmanship, etc.).
ELECTRICAL		
Insulation Resistance 1	10 MΩ minimum 100 μA max current leakage	Check each contact to all other contacts and the shell, if shell is conductive. Test to be performed using a 1000 VDC megohmmeter.
Insulation Resistance 2	1000 MΩ minimum	Check each contact to all other contacts and the shell, if shell is conductive. Test to be performed using a 500 VDC megohmmeter.
MECHANICAL		
Durability	There shall be no evidence of cracking, distortion or detrimental damage to the connector following the test.	Assembled connectors shall be subjected to 50 cycles of mating and unmating.
Maintenance Aging 1	No failure of the contact retention mechanism.	Remove and reinsert 20% of the contacts 8 times at room temperature and 2 times at 0±3°C.
Maintenance Aging 2	No failure of the contact retention mechanism.	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.
ENVIRONMENTAL		
Temperature Life	There shall be no evidence of cracking, distortion or detrimental damage to the connector following the test.	SAE J2030 The wired mated connectors shall be subjected to 1000 hours at +125°C without current flowing.
Thermal Shock	There shall be no evidence of cracking, distortion or detrimental damage to the connector following the test.	SAE J2030 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.

Figure 2

Test Description	Requirement	Procedure												
Thermal Cycle	There shall be no evidence of cracking, distortion or detrimental damage to the connector following the test.	<p>The test samples shall be cycled between -40°C to 120°C temperature extremes.</p> <ol style="list-style-type: none"> 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. 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. 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. <table border="1" data-bbox="1032 890 1508 1056"> <thead> <tr> <th>WEIGHT OF SPECIMEN (GRAMS)</th> <th>MINIMUM TIME (HOURS)</th> </tr> </thead> <tbody> <tr> <td><136</td> <td>0.5</td> </tr> <tr> <td>136 TO 1.36 K</td> <td>1.0</td> </tr> <tr> <td>1.36 K TO 13.6 K</td> <td>2.0</td> </tr> <tr> <td>13.6 K TO 136 K</td> <td>4.0</td> </tr> <tr> <td>>136</td> <td>8.0</td> </tr> </tbody> </table>	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
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Water Immersion 1	Inspect for leakage inside dried sample.	Place the wired mated connectors in an oven at 50±5°C for 2 hours. Immediately immerse samples in a container of 21±5°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.												
Water Immersion 2	Insulation Resistance 1000 MΩ minimum	The wired mated connectors shall be placed in an oven at +125±3°C for 2 hours minimum then immediately be placed in water with a 5% slat by weight content and 0.1 g/L wetting solution to a depth of three 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±3°C.												

Figure 2 Cont.

Test Description	Requirement	Procedure										
Fluid Resistance	Inspect for damage, such as cracked housing, seal displaced from housing, loose parts, inability to mate or unmate or couple housing, etc.	<p>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.</p> <table border="1" data-bbox="992 651 1526 793"> <thead> <tr> <th data-bbox="992 651 1339 688">FLUIDS</th> <th data-bbox="1339 651 1526 688">FLUID AND CHAMBER TEMPERATURE</th> </tr> </thead> <tbody> <tr> <td data-bbox="992 703 1339 724">DIESEL FUEL</td> <td data-bbox="1339 703 1526 724">60±3°C</td> </tr> <tr> <td data-bbox="992 724 1339 745">ENGINE OIL</td> <td data-bbox="1339 724 1526 745">100±3°C</td> </tr> <tr> <td data-bbox="992 745 1339 766">ETHYLENE GLYCOL (50%)-WATER (50%)</td> <td data-bbox="1339 745 1526 766">100±3°C</td> </tr> <tr> <td data-bbox="992 766 1339 787">BRAKE FLUID</td> <td data-bbox="1339 766 1526 787">25±3°C</td> </tr> </tbody> </table>	FLUIDS	FLUID AND CHAMBER TEMPERATURE	DIESEL FUEL	60±3°C	ENGINE OIL	100±3°C	ETHYLENE GLYCOL (50%)-WATER (50%)	100±3°C	BRAKE FLUID	25±3°C
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Figure 2 End

i **NOTE**

a) *All cavities wired with the minimum approved wire gauge per SAE J1128 suitable for the terminal size and with enough length to accommodate testing. Wire insulation shall be minimum diameter per SAE J1128 and shall be verified to be within the connector wire sealing range. Crimp characteristics (i.e. height, width, etc.) shall be checked prior to testing.*

All unsealed cavities shall be secured with sealing plugs. To prevent capillary action on the sealed connector, all free wire ends and test points (i.e. millivolt test connection) shall be sealed with alcohol-based RTV silicone or equivalent and covered with heat shrink tubing.

b) *Specimens shall be prepared in accordance with applicable production drawings and shall be selected at random from current production.*

3.4 Product Qualification and Requalification 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		



NOTE

(a) Specimens shall be prepared in accordance with applicable Instruction Sheets and shall be selected at random from current production.

- Groups 1-3 Specimens shall consist of 40 position connectors with DEUTSCH Solid Terminal System size 16 nickel sockets with 16 AWG wire.
- Groups 4, Specimens shall consist of 40 position connectors with DEUTSCH Stamped and Formed Terminal System size 16 nickel sleeveless sockets with 16 AWG wire.

(b) Numbers indicate sequence in which tests are performed.

3.5 Revision History

Rev Ltr	Brief Description of Change	Date	Dwn	Apvd
A	Initial Release	18-Oct-2019	David Meyer	David Meyer
B	Page 2, Sec 3.2 Flammability (Inline). Added HB & UL file number Page 2, Sec 3.2 Added Flammability (Header). Not Tested	17-Feb-2023	David Meyer	Irina Grantcharova