

DEUTSCH* HD30 Series Connector System

1. INTRODUCTION

1.1. Purpose

This report summarizes the results of testing performed on DEUTSCH HD30 series connector system to determine conformance to the requirements of product specification 108-151014.

1.2. Scope

This report covers the electrical, environmental and mechanical performance of the DEUTSCH HD30 series connector system. Testing was performed at the DEUTSCH Industrial Products Division Laboratory in 1983. The original test report and documentation is on file in Product Engineering, Industrial Commercial Transportation (ICT) Laboratory.

1.3. Conclusion

The DEUTSCH HD30 series connector system products listed in Paragraph 1.4 conform to the electrical, mechanical, and environmental performance requirements given in product specification 108-151014.

1.4. Test Specimens

Test specimens were representative of normal production lots. Specimens identified with the part numbers given in Figure 1 were used for testing.

| DEUTSCH PART NUMBER | DESCRIPTION | TEST GROUP |
|---------------------|------------------------------|------------|
| HD34-24-19PN | 19pin Receptacle, N-seal | 1-6 |
| HD36-24-19SN | 19pin Plug, N-seal | |
| 0460-204-12141 | Size 12 Solid Pin, Nickel | |
| 0462-203-12141 | Size 12 Solid Socket, Nickel | |
| 0460-203-16141 | Size 16 Solid Pin, Nickel | |
| 0462-201-16141 | Size 16 Solid Socket, Nickel | |

Figure 1

1.5. Environmental Conditions

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

Temperature: +18° to +35°C

Relative humidity: 5% to 95%

Barometric Pressure: 650 to 800 mm Mercury

1.6. Test Equipment

Instrument calibration was performed in accordance with DEUTSCH calibration procedure manual DCPM 2000 prior to using the instrument for testing. Calibration records are maintained and are directly traceable to the National Bureau of Standards with no more than three levels of separation.

The descriptive name, laboratory identification, and date of last calibration prior to use concerning the test equipment was recorded on the data format for each test.

1.7. Documentation of Recorded Data

All measurements were recorded to as many significant digits as are meaningful under the accuracy limits of the equipment used. All data was recorded on 8½ by 11-in. data forms.

The ambient test conditions (temperature and relative humidity) and the date were recorded on the data form.

If a test was conducted on more than one day, the ambient test conditions and dates were recorded for each testing day.

Only original laboratory test data or a direct image thereof was submitted as the final report document. Data sheets were not rewritten. In the case of errors accidentally recorded on the data forms, the erroneous data was lined out by a single line and the corrected information was inserted and initialed by the technician making the change.

The data includes, whenever applicable, any diagrams and sketches of the following:

- Electrical hookups that are peculiar to this test program or might prohibit duplication of the test method and results involved if not supplied.
- The orientation of samples to the direct force imparted during any physical shock or vibration testing.
- Any fixturing that would be used as a method of mounting the test samples that is fabricated exclusively for this test sequence.

1.8. Qualification Test Sequence

| TEST OR EXAMINATION | TEST GROUP (a) | | | | | |
|---------------------------------|-------------------|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| | TEST SEQUENCE (b) | | | | | |
| Examination of Product | 1 | 1 | 1 | 1 | 1 | 1 |
| Insulation Resistance | 2 | 2 | 2 | 2 | 2 | 2 |
| Dielectric Withstanding Voltage | 3 | 3 | 3 | 3 | 3 | 3 |
| Maintenance Aging | 4 | | 4 | | | |
| Temperature Life | | 4 | | 4 | | 4 |
| Contact Retention | 5 | | 5 | | | |
| Durability | | 5 | 6 | | 4 | |
| Tool Abuse | | | | 5 | 5 | |
| Salt Spray | | 6 | 7 | | | 5 |
| Altitude Immersion | 6 | 7 | 8 | 6 | | |
| Fluid Immersion | 7 | 8 | 9 | 7 | 6 | 6 |
| Thermal Shock | 8 | | | | | 7 |
| Vibration | 9 | | 10 | 8 | | |
| Shock | 10 | | 11 | 9 | | |
| External Bending Moment | | 9 | 12 | | | 8 |
| Insert Retention | 11 | | | 10 | 7 | |
| Low Voltage Resistance | | 10 | 13 | | | |
| Coupling/Uncoupling Torque | 12 | 11 | | | 8 | |
| Contact Resistance | 13 | 12 | 14 | 11 | 9 | 9 |
| Final Examination | 14 | 13 | 15 | 12 | 10 | 10 |

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

- Groups 1-6 specimens consisted of 6 mated pairs (1 per group) 19-position connectors with DEUTSCH terminal system.
 - Size 12 solid nickel pins and sockets with 12 AWG wire crimped with HDP-400.
 - Size 16 solid nickel pins and sockets with 16 AWG wire crimped with HDP-400.

(b) Numbers indicate sequence that tests were performed.

Figure 2

2. TEST METHODS AND RESULTS

- 2.1. Examination of Product (Groups 1-6)
 - A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: Conduct a visual examination for identification of product, torn seals, cracked plastic
 - C. Requirement: The connectors shall be correctly constructed, marked and shall show good quality and workmanship. Poor molding fabrication, loose material, damaged or improperly manufactured contacts, galling of metal parts, nicks and burrs are adequate basis for rejection.
 - D. Result: **PASSED.**
- 2.2. Insulation Resistance (Groups 1-6)
 - A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: Using a 500 VDC megohmmeter check each contact to all other contacts and the shell electrically connected together.
 - C. Requirement: 1000 MΩ minimum.
 - D. Result: **PASSED.**
- 2.3. Dielectric Withstanding Voltage (Groups 1-6)
 - A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: Using a 1500 VAC test potential check each contact to all other contacts and the shell electrically connected together for a period of 60 seconds. At each test points the voltage was increased from zero to 1500 V at a rate of 500 Volts per second. The voltage was decreased to zero before switching to the next test point.
 - C. Requirement: The connector shall show no evidence of breakdown or flashover. There shall be no current leakage in excess of 2.0 mA.
 - D. Result: **PASSED.**
- 2.4. Maintenance Aging (Groups 1,3)
 - A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: Random select 10% of contacts and completely remove and reinsert 10 times. Visually inspect each contact cavity for damage. All contacts were removed by hand using DEUTSCH 114010 (size 12) and 0411-204-1605 (size 16) extraction tool for their respective contact size. Contact insertion was done by hand without an insertion tool.
 - C. Requirement: There shall be no visual change or damage to the contact cavities.
 - D. Result: **PASSED.**
- 2.5. Temperature Life (Groups 2,4,6)
 - A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: The wired mated connectors shall be subjected to 100 hours of heat in a circulating air oven at 125°C. After removal from the oven the mated connectors shall be subject to an insulation resistance test per paragraph 2.2.
 - C. Requirement: No evidence of cracking, distortion or other damage detrimental to the normal operation of the connector. Insulation resistance shall be greater than 500 MΩ.
 - D. Result: **PASSED.**

- 2.6. Contact Retention (Groups 1,3)
- A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: Test all contacts in each unmated connector. Apply an axial load of 30 lbf for size 12 and 25 lbf for size 16 for 15 seconds in a direction tending to push the contact out of the rear of the connector.
 - C. Requirement: The contacts shall not be dislodged from the connector when the specified axial load is applied.
 - D. Result: **PASSED.**
- 2.7. Durability (Groups 2,3,5)
- A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: Fully wired connector shall be mated and unmated for a total of 100 complete cycles in a way to simulate actual service. The plug and receptacle to be completely separated during each cycle.
 - C. Requirement: The connectors shall show no evidence of damage detrimental to their normal operation.
 - D. Result: **PASSED.**
- 2.8. Tool Abuse (Groups 4,5)
- A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: Test 5 cavities from each sample shall be selected. Use removal tool 114010 for size 12 and 0411-204-1605 for size 16. Insert the removal tool into the connector and apply an axial load of 5 lbf. With the force applied, the tool shall be rotated 180° and then removed, also removing the contact. The contact shall be reinserted into the cavity by hand. This test is to be completed 3 times on each 5 selected cavities.
 - C. Requirement: No visual damage to the connector seals or contact cavities.
 - D. Result: **PASSED.**
- 2.9. Salt Spray (Groups 2,3,6)
- A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: Connector shall be fully mated, then submerged in a fine mist of 5% by weight of salt solution for 96 hours. Immediately following the 96 hours exposure remove the connectors from the chamber and thoroughly wash with tap water. A soft bristle brush may be used to aid cleaning. Dry the connectors in an air circulating oven at 38°C for 12 hours maximum. Remove and inspect.
 - C. Requirement: The connectors shall show no evidence of corrosion which will affect performance of subsequent tests.
 - D. Result: **PASSED.**
- 2.10. Altitude Immersion (Groups 1,2,3,4)
- A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: Place the wired mated connectors in a test container and completely cover with tap water such that the water covers the connectors being tested. The container shall be placed in an altitude chamber and pressure reduced to 32.68 torr for 30 minutes. The pressure in the chamber shall be returned to standard room pressure and maintained for 30 minutes. Repeat for total of 3 cycles. After the 3rd cycle while the connectors are still immersed in water, perform Dielectric Withstanding Voltage test. Remove the connectors from the water, unmate to check for water and dry in an air circulating oven for 8 hours minimum at 100°C. Then re-mate the connectors and submerge in tap water in the container and place in a pressure chamber at 100 psi for 30 minutes. After this time, the chamber will then be returned to standard room pressure. Perform Dielectric Withstanding Voltage test.

- C. Requirement: Connector shall show no evidence of breakdown or flashover or no current leakage in excess of 2.0 mA.
- D. Result: **PASSED.**

2.11. Fluid Immersion (Groups 1-6)

- A. Procedure: DEUTSCH Test Procedure 51614
- B. Method: Each wired mated connector shall be immersed in one fluid only. Each connector shall be submerged for 5 minutes, then removed from the fluid to air dry for 24 hours. This cycle is to be completed a total of 5 cycles. Visual inspect for any damage after the 5th cycle.

| Fluid |
|---------------------------------------|
| Motor Oil 30 weight |
| Hydraulic Brake Fluid (disc type 1) |
| 5% Soap Solution |
| Diesel Fuel #2 |
| Antifreeze Solution (max. protection) |
| Gear Oil 90 weight |

- C. Requirement: The connectors shall show no visual evidence of damage detrimental to their normal operation.
- D. Result: **PASSED.**

2.12. Thermal Shock (Groups 1,6)

- A. Procedure: DEUTSCH Test Procedure 51614
- B. Method: Subject the wired mated connectors to 5 cycle using a cold chamber set to -67°F (-55°C) and oven stabilized at +257°F (+125°C). Place connectors in cold chamber for 30 minutes then transfer to the oven for 30 minutes with a maximum transfer time of 2 minutes between cold and hot chambers. During the last cycle with the connector exposed to +257°F (+125°C) measure the insulation resistance. After the 5 cycles, allow the connectors return to room temperature then perform visual inspection.
- C. Requirement: No evidence of cracking, distortion or other damage detrimental to the normal operation of the connector. Insulation resistance shall be greater than 500 MΩ.
- D. Result: **PASSED.**

2.13. Vibration (Groups 1,3,4)

- A. Procedure: DEUTSCH Test Procedure 51614
- B. Method: Mount the connectors to a fixture capable of transmitting the vibration conditions specified and designed so there is no resonant vibration inherent in the fixture within the specified frequency range. Connectors to be tested to the following conditions

| Parameter | Requirement |
|--------------------------------------|------------------------------|
| Sine Sweep | 10 to 2000 Hz |
| Cycle Sweep Time | 20 minutes |
| Initial Displacement | 0.07 inch DA |
| Maximum Acceleration | 20 G's |
| Test Duration | 12 hours |
| Time Per Axis X, Y, Z | 4 hours |
| Test Current first 3 hours each axis | 23A (size 12); 13A (size 16) |

Monitor for discontinuity in excess of 1 microsecond with a current of 100mA during last hour of vibration in each axis.

- C. Requirement: There shall be no discontinuities and shall have no disengagement of mated connectors, backing off of the coupling mechanism, evidence of cracking, breaking or loosening of parts.
 - D. Result: **PASSED.**
- 2.14. Shock (Groups 1,3,4)
- A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: Mount the connectors to a shock fixture by normal means. Clamp the wire bundle to fixed points at least 8 inches from the rear of the connector. Subject the test samples to 10 shocks in each of two perpendicular axis. The pulse shall be approximate ½ sine wave of 50G±15% with a duration of 11±1 milliseconds. Monitor for discontinuity in excess of 1 microsecond with a current of 100mA.
 - C. Requirement: There shall be no discontinuities and shall have no disengagement of mated connectors, backing off of the coupling mechanism, evidence of cracking, breaking or loosening of parts.
 - D. Result: **PASSED.**
- 2.15. External Bending Moment (Groups 2,3)
- A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: The receptacle panel shall be mounted as in normal service to a rigid plane. An adapter shall be attached to the rear of the plug which shall then be mated to the receptacle. Apply a 250 in-lbf bending moment at a rate of 1 lbf per second. The bending moment applied for 1 minute. Monitor for discontinuity in excess of 1 microsecond with a current of 100mA. Inspect coupling mechanism for damage after test.
 - C. Requirement: There shall be no discontinuities and show no evidence of damage detrimental to the connector normal operation.
 - D. Result: **PASSED.**
- 2.16. Insert Retention (Groups 1,4,5)
- A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: Apply pulling force of 100 lbf to the wire bundle of the mated connector at a rate of 10 lbf a second for 30 seconds.
 - C. Requirement: There shall be no evidence of cracking, breaking, separation from shell or loosening of parts.
 - D. Result: **PASSED.**
- 2.17. Low Level Contact Resistance (Groups 2,3)
- A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: Test sample connectors to MIL-STD-1344, Method 3002.1. Energize the circuit from zero until 100 mA test current is reached. Allow the test samples to stabilize. Connect the voltmeter probes to the test sample. Measure the voltage drop and calculate the resistance.
 - C. Requirement: Calculated resistance across mated pairs not to exceed 6 mΩ.
 - D. Result: **PASSED.**
- 2.18. Coupling / Uncoupling Torque (Groups 1,2,5)
- A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: Mount the receptacle connector of each mated pair on a torque test fixture such that is held stationary. The torque required to mate and unmate the plug by hand is measured.
 - C. Requirement:
 - a. Maximum Coupling Torque: 48 in-lbf
 - b. Minimum Uncoupling Toque: 7 in-lbf
 - D. Result: **PASSED.**

- 2.19. Contact Resistance (Groups 1-6)
- A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: Test in accordance with MIL-C-39029 using 23A for size 12 contacts and 13A for size 16 contacts.
 - C. Requirement: Maximum contact resistance across mated contact pairs of 6 inch wire per contact assembly is 77 mV for size 12 contacts and 89 mV for size 16 contacts.
 - D. Result: **PASSED.**
- 2.20. Final Examination (Groups 1-6)
- A. Procedure: DEUTSCH Test Procedure 51614
 - B. Method: Conduct a visual examination for identification of product, torn seals, cracked plastic.
 - C. Requirement: The test connectors shall show no evidence of damage detrimental to normal operation. All markings shall be legible.
 - D. Result: **PASSED.**

3. REVISION HISTORY

| Rev Ltr | Brief Description of Change | Date | Dwn | Apvd |
|---------|--|-------------|-----|------|
| A | Initial Release | 13-Aug-2019 | DM | DM |
| B | Rewrote original DEUTSCH test report using 501 template | 27-Jan-2020 | DM | DM |
| B1 | Corrected typo in section 1. (is) ...HD30... (was) ...HDP... | 30-Jan-2020 | DM | DM |