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## DEUTSCH\* DRCP Series Connector System

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### 1. SCOPE

#### 1.1. Content

This specification covers performance, tests and quality requirements for the TE Connectivity (TE) DRCP 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 2012. The Qualification Test Report numbers for this testing are [501-151044](#) and [501-151064](#). 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
- [408-151008](#) Instruction Guide DEUTSCH Removal Tool DT-RT1
- [501-151044](#) DRCP Qualification Test Report, Inline
- [501-151064](#) DRCP Qualification Test Report, Header
- Product Drawings  
X refers to A, B, C, D keys. XXXX refers to product modification.

DRCP24-86PX	86pin Receptacle, Inline
DRCP25-86PXX-GX0X	86pin Receptacle, Header
DRCP28-86SX	86pin Plug
DRCPF-86A-1	Inline Frame

#### 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

### 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 <sup>2</sup> ]	All Circuits Energized (A)
12	10 [6.0-5.0]	25
	12 [4.0-2.5]	
	14 [2.0]	18
20	16 [1.5-1.0]	7.5
	18 [0.8-0.75]	
	20 [0.5]	
	22 [0.35]	5

Figure 1

- Temperature: -55°C to +125°C
- Ingress Protection (IP): Not tested
- Flammability: Not tested

3.3. Test Requirements and Procedures Summary

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

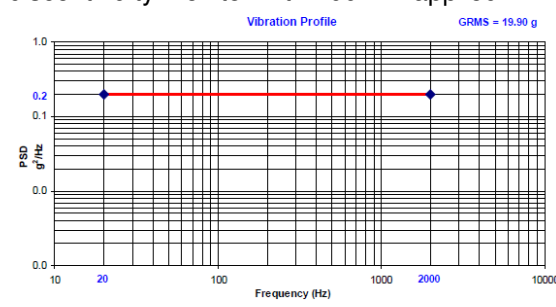
Test Description	Requirement	Procedure
Visual Inspection	The connectors shall be correctly constructed, marked and shall show good quality and workmanship. Connector after conditioning shall not show signs of damage or any detectable loss of function.	Visually inspected for correct use of materials, proper construction, correct part number and insert markings and over-all quality of workmanship Poor molding fabrication, loose materials, damaged or improperly manufactured contacts, galling of metal parts, nicks and burrs of metal parts, torn seals or cracked plastic are considered adequate basis for rejection.
<b>ELECTRICAL</b>		
Insulation Resistance	10 MΩ minimum	Check insulation resistance between each contact to all other contacts and shell using a 1000 VDC megohmmeter.
Low Level Contact Resistance	6.0 mΩ max for 16 AWG 9.0 mΩ max for 18 AWG	Test with applied voltage not to exceed 20 millivolts open circuit and the current limited to 100 milliamps. The contact resistance was obtained by subtracting the reference wire resistance from the test reading.
Voltage Drop	100 mV max	Test using 7.5A on 18 AWG and 20A on 12 AWG with the test voltage set to be $4.50 \pm 0.25$ VDC open circuit. Record voltage drop and subtract from the reference wire measurements.
Current Cycling	Voltage Drop 100 mV max	Connect sample in a series circuit and applied by a current of 10A for 16 AWG and 30A for 10 AWG. Subject to a total of 500 cycles divided by two stages: a) Place in a thermal chamber at ambient of $+125 \pm 3^\circ\text{C}$ for 200 cycles, each cycle shall consist of 45 minutes with current on and 15 minutes with current off. b) Place in a thermal chamber for 50 cycles, each cycle shall consist of 20 minutes with current on at $+125 \pm 3^\circ\text{C}$ and 60 minutes with current off at $+21 \pm 3^\circ\text{C}$ . Turn current off during the temperature transition.

Figure 2

<b>MECHANICAL</b>		
Test Description	Requirement	Procedure
Durability	No evidence of damage to the contacts, contact plating, connector housing or seals following the test. No visual or mechanical degradation is permitted.	Mate and unmate for a total of 50 complete cycles at room temperature. Re-torque to 44-62 inlb [5-7 Nm] after each cycle.
Terminal Retention Axial	Contact displacement shall not exceed 0.8mm for both 20 size and 12 size contact. The maximum bearing load for the size 20 pins and size 12 pins before separation shall be greater than 89N (20 lbf) and 111N (25 lbf) respectively.	Apply an axial load to the receptacle pins using a force of 89N (20 lbf) on size 20 pins and 111 N (25 lbf) on size 12 pins. Apply the force at a uniform rate of 0.189 in/min. Terminal position assurance device shall be utilized and in the locked position during the test. Test four size 20 pins and one size 12 pin.
Terminal Retention Rotational	There shall be no mechanical degradation or discontinuity following the test.	Rigidly mount the wired receptacle on a table such that the wires hang downward vertically. Attach a 4.54 kg (10 lb.) weight to the end of a 610 mm (2 ft) long wire. Rotate each pin in the cavity 5 full turns by spinning the weighted wire. Test eight size 20 pins and one size 12 pin.
Cross Key Mating	All connector key options, connector halves must only mate in one position. Any partial mating of connectors with electrical contact is a failure.	Apply a mating force of 350 N while attempting to cross-key mate by aligning connector halves into each geometric possible position. Perform on all keying possibilities. Test electrical contact during the test.
Scoop Proof Mating	The connector shall incorporate features preventing its contacts, either male or female, from being touched by the front of the mating connector by improper assembly.	Mate the wired connector through all kinds of intended improper orientation during assembly.
Connector Coupling Strength	No evidence of cracking, distortion or detrimental damage to the connector and no uncoupling following the test.	Apply a tensile load of 100 lb [445 N] to the wire bundle of the mated connector for a period of 1 minute.
Maintenance Aging	No mechanical degradation or failure is permitted.	Subject a total of 10 cycles of inserting and removing the contact. Disassembly of the terminal position assurance device to remove the contacts. Mate and unmate in each cycle. Insertion and removal performed using recommended tools. Test pins different from those tested in Terminal Retention Axial and Rotation. Test eight size 20 pins and two size 12 pins in the receptacle.
Drop	There shall be no evidence of cracking, distortion or detrimental damage to the connector. Small chips and dents that do not affect connector's performance or serviceability are disregarded.	Attached wired receptacle to free end of a 5 feet long cord. Fix the other end of the cord to a wall at a height of 2.5 feet above concrete floor. Hold the test sample as so that the cord was horizontal and then fell to the concrete floor 8 times. Rotate sample approximately 45 degrees at it fixing each time.

Figure 2 Cont.

Test Description	Requirement	Procedure
Crimp Tensile	18 AWG size 16: 111 N 12 AWG size 12: 311 N	Using a tensile tester without the influence of the insulation grips, apply an axial force to the wire and terminal at a speed of 25.4 ± 6 mm/min. separating the contact and conductor. Test 18 AWG for size 20 contact and 12 AWG for size 12 contact.
Over Torque	No evidence of cracking, distortion or detrimental damage to the test samples.	Torque the plug jackscrew to 92 inlb. [10.5 Nm] which is 1.5 times of the maximum allowable torque.
Vibration	No discontinuity greater than 10 Ω more than 1 μsecond. No physical damage or loosening of components is allowed.	Rigidly mount 3 wired and mated connectors to the three mutually perpendicular axis perform random vibration per below profile for 20 hours in each axis. Bend the wire harness 90° and firmly tie to the router with tie-wraps. Include the backshell. Monitor discontinuity monitor with 100 mA applied.



**ENVIRONMENTAL**

Test Description	Requirement	Procedure
Thermal Shock Liquid Dunk	Insulation Resistance: 10 MΩ minimum	Place mated wired sample in an oven at +125±3°C for 2 hours and then immediately be placed in water with 5% salt by weight content and 0.1g/L wetting solution to a depth of 1 meter for 30 minutes. Seal the free ends of wires extending out of the water.
Thermal Cycle	No evidence of cracking, distortion or other damage detrimental to the normal operation of the connector.	Test mated samples in a thermal cycle chamber for 20 cycles between -55±3°C and +125±3°C at the rate of 3°C per minute. Test sample to remain at each temperature extreme for 1 hour.
Temperature Life	No visual or mechanical performance degradation is allowed.	Test wire and mated connector to 1000 hours at 125°C ±3°C.

Figure 2 Cont.

Test Description	Requirement	Procedure																											
Temperature / Humidity	Insulation Resistance: 10 MΩ minimum	Place mated test connector in a temperature / humidity chamber and subject to 42 cycles described as follows: a) Chamber temperature was raised to 55° C at 3° C/min and hold for 16 hours at a relative humidity of 95%. b) Chamber temperature lowered to -20°C at 3 °C/min and held for 2 hours at a relative humidity of 0%. c) Chamber temperature raise to +125° C at 3° C/min and held for 2 hours at a relative humidity of 0%. d) Chamber temperature was lowered to 25° C at 30 °C/min and hold for remainder of 24 hours cycle at a relative humidity of 95%.																											
Salt Exposure	No evidence of corrosion on the connector or terminals after the connector is removed from the test. Insulation Resistance: 10 MΩ minimum	Submerge fully mated connector in a fine mist of 5% by weight of salt solution for 240 hours. The salt spray chamber to be at 35 ± 2°C. The free ends of wires to be sealed.																											
Pressure Wash	No evidence of cracking, distortion or other damage detrimental to the normal operation of the connector. Insulation Resistance: 10 MΩ minimum	Firmly mount header sample inside a sealed aluminum box then onto fixed table. Mount inline test sample onto fixed table. Expose sample to room temperature water spray for about 3 to 5 seconds period per connector for a total of 60 minutes. The fan nozzles, with a source pressure of approximately 1750 psi gage, were located 20 to 30 cm away providing 100% coverage of the test sample.																											
Sealing, External Air Pressure	No air bubbles allowed to exit the vent tube after the first fifteen minutes.	Place mated sample in a sealed pressure chamber with vent tube attached. Apply 35±5 kPa dry compressed air to the chamber for 30 minutes minimum.																											
Sealing, Internal Air Pressure	No air bubbles allowed to leak from the sample after 15 minutes.	Submerge test sample completely in water with a pressure tubing introduced into the sealed portion of the test sample. Apply pressure slowly 0 to 35 kPa at a rate 2 kPa/sec and maintained at the peak for 30 minutes minimum.																											
Chemical Exposure	No evidence of cracking, distortion or detrimental damage to the connector following the test.	Submerge one wired and mated sample in one fluid only per below table. <table border="1" data-bbox="1006 1575 1502 1806"> <thead> <tr> <th>Fluids</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>Diesel Fuel #2</td> <td>60°C</td> <td>24 hours</td> </tr> <tr> <td>Bio-Diesel Fuel (including Toyu)</td> <td>60°C</td> <td>24 hours</td> </tr> <tr> <td>Kerosene</td> <td>60°C</td> <td>24 hours</td> </tr> <tr> <td>Motor Oil 30wt</td> <td>120°C</td> <td>7 Days</td> </tr> <tr> <td>Brake Fluid (disc type 1)</td> <td>25°C</td> <td>24 hours</td> </tr> <tr> <td>50/50 Antifreeze / Water mixture</td> <td>100°C</td> <td>24 hours</td> </tr> <tr> <td>Transmission Oil 90wt</td> <td>100°C</td> <td>7 Days</td> </tr> <tr> <td>Urea (32.5%) / Water (67.5%)</td> <td>25°C</td> <td>24 hours</td> </tr> </tbody> </table>	Fluids	Temperature	Time	Diesel Fuel #2	60°C	24 hours	Bio-Diesel Fuel (including Toyu)	60°C	24 hours	Kerosene	60°C	24 hours	Motor Oil 30wt	120°C	7 Days	Brake Fluid (disc type 1)	25°C	24 hours	50/50 Antifreeze / Water mixture	100°C	24 hours	Transmission Oil 90wt	100°C	7 Days	Urea (32.5%) / Water (67.5%)	25°C	24 hours
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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	5	6	7	8	9	10	11
	TEST SEQUENCE (b)										
Visual Inspection	1,5,9,13,16,19	1,14	1,10	1,7	1,5,9,14	1,13	1,13	1,8	1,6	1,5	1,6,11
Insulation Resistance	2,4,8,12,15			3	2,4,8,11				3		3,5
Low Level Contact Resistance			2,5,8				2,5,8,11	2,7			
Voltage Drop			3,6,9				3,9,12	3		4	
Current Cycling										3	
Durability		2				2					
Terminal Retention Axial		3,9				4					9
Terminal Retention Rotational		4,10				5					10
Cross Key Mating		5				6					
Scoop Proof Mating		6				7					
Connector Coupling Strength		7				8					
Maintenance Aging		8				9					
Drop		11				10					
Crimp Tensile		12				11					
Over Torque		13				12					
Vibration			7				7,10	4,6			
Thermal Shock Liquid Dunk	3,7,11				3,7						4
Thermal Cycle	6		4		6		4	5		2	
Temperature Life	10					3	6				
Temperature/Humidity											2
Salt Exposure				2					2		
Pressure Wash	14				10						
Sealing, External Air Pressure	17			5	12						8
Sealing, Internal Air Pressure	18			6	13				5		7
Chemical Exposure				4					4		


**NOTE**

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

- Groups 1-4, Specimens shall consist of 86 position Inline connectors with DEUTSCH Stamped and Formed Terminal System size 12 nickel/tin and size 12 nickel pins & sockets with 10-14 AWG wire and size 20 tin pins & sleeveless sockets with 16-20 AWG.
- Groups 5-11, Specimens shall consist of 86 position Header connectors with DEUTSCH Stamped and Formed Terminal System size 12 nickel/tin and size 12 nickel sockets with 10-14 AWG wire and size 20 sleeveless sockets with 16-20 AWG.

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



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### 3.5 Revision History

Rev Ltr	Brief Description of Change	Date	Dwn	Apvd
A	Initial Release	10-Oct-2019	DM	DM