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## **DTSK Series Connector System**

### **SCOPE**

#### 1.1. Content

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

#### 1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

### **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 Documents

- [109-1](#): General Requirements for Testing
- [114-151028](#): Application Specification for DTSK Series Connector System
- [114-151039](#): Application Specification for DEUTSCH Ø8mm Pin & Socket
- [501-151030](#): Qualification Test Report (DTSK Series Connector System)

#### 2.2. Industry Documents

- DIN 40050-9: Road vehicles Degrees of Protection (IP Code)
- EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications
- IEC 60512: Electronic Equipment - Tests and Measurements
- IEC 60529: Degrees of Protection Provided by Enclosures (IP Code)
- ISO 6722: Road Vehicles—60 V and 600 V Single-Core Cables—Dimensions, Test Methods, and Requirements
- SAE J1127: Low Voltage Battery Cable
- SAE J2030: Heavy-Duty Electrical Connector Performance Standard

#### 2.3. Reference Documents

X refers to A,B,C keys. XXXX refers to product modification

- AS568-212: O-ring to seal DTSK04-1-08PX receptacle to flange
- DTSK04-1-08PX-XXXX: 1pin Receptacle
- DTSK06-1-08SX-XXXX: 1pin Plug
- WSK-8P: 1pin Rcpt Secondary Lock
- WSK-8S: 1pin Plug Secondary Lock
- WS-25-001: Wire Seal, 25mm<sup>2</sup>, Seal Range Ø8.17mm - Ø9.66mm, Blue
- WS-32-001: Wire Seal, 32mm<sup>2</sup>, Seal Range Ø9.49mm - Ø10.52mm, Red
- WS-35-001: Wire Seal, 35mm<sup>2</sup>, Seal Range Ø10.59mm - Ø11.59mm, Green
- DTSKF-1: Mounting Flange
- 1028-047-08005: Protective cover
- SRK-PC-080-25-601: Ø8 Pin, wire size 25mm<sup>2</sup>, 4 AWG
- SRK-SC-080-25-601: Ø8 Socket, wire size 25mm<sup>2</sup>, 4 AWG
- SRK-PC-080-32-601: Ø8 Pin, wire size 2 AWG
- SRK-SC-080-32-601: Ø8 Socket, wire size 2 AWG

- SRK-PC-080-35-601      Ø8 Pin, wire size 35mm<sup>2</sup>
- SRK-SC-080-35-601      Ø8 Socket, wire size 35mm<sup>2</sup>

**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 (for T-rise vs Current and De-rating curves see 501-151030)
- Temperature: -55 to 125°C
- Ingress Protection (IP) Level: IP68 and IP6K9K (with rear protective cover)

Connector Loading	Wire Size			
	4 AWG	2 AWG	25mm <sup>2</sup>	35mm <sup>2</sup>
All Circuits Energized at Connector Temperature 125°C	100Amp	115Amp	100Amp	125Amp

Figure 1

3.3. Test Requirements and Procedures Summary

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

Test Description	Requirement	Procedure
Examination of product.	The connectors shall be correctly constructed, marked and shall show good quality and workmanship	SAE J2030 Visually inspected for correct use of materials, proper construction, correct part number and insert markings and overall 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 were considered adequate basis for rejection.

**ELECTRICAL**

Contact Resistance (Voltage Drop)	<table border="1"> <thead> <tr> <th>Wire Size</th> <th>Test Current</th> <th>Voltage Drop</th> </tr> <tr> <th>AWG [mm<sup>2</sup>]</th> <th>Amp</th> <th>mV max</th> </tr> </thead> <tbody> <tr> <td>4 [25.0]</td> <td>120</td> <td>100</td> </tr> <tr> <td>2 [35.0]</td> <td>150</td> <td>100</td> </tr> </tbody> </table>	Wire Size	Test Current	Voltage Drop	AWG [mm <sup>2</sup> ]	Amp	mV max	4 [25.0]	120	100	2 [35.0]	150	100	EIA-364-06 The test samples were energized by increasing the current until the test current listed in Figure 2 was achieved. The samples were allowed to stabilize at the test current. The voltage drop was measured and recorded. The reversed voltage drop was measured and recorded. The test sample voltage drop was calculated as follows:  $\text{Specimen voltage drop} = \frac{\text{forward voltage drop} + \text{reverse voltage drop}}{2}$	
	Wire Size	Test Current	Voltage Drop												
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Figure 2															

Test Description	Requirement	Procedure
Derating	Derating curve shall be documented for each terminal system.	IEC 60512-5-2, Test 5b The test samples were mounted in an enclosure which protects the immediate environment from external air movement. Thermocouple probes were assembled to the test samples to measure temperature increase as the contact as the current increases. The current was increased in 1 Amp step in held for 1 hour after thermal stability.
Temperature Rise vs. Current	The temperature shall not exceed 30°C	EIA-364-70, Method 2 Energize test samples with a test to produce 5°C to 10°C temperature rise (stabilized condition). Repeat at a minimum of 4 consecutively increasing current levels with each additional level generating an additional temperature rise (min) of 10 above previous recorded.
Insulation Resistance	The insulation resistance shall be greater than 20 MΩ.	Using a 1000 VDC insulation resistance test measurement device or equivalent, check insulation resistance between each contact to each adjacent contact or housing edge.

**MECHANICAL**

Durability	No evidence of damage to the contacts, contact plating, connector housing or seals which may be detrimental to reliable connector performance.	SAE J2030 The test samples shall be mated and unmated for a total of 50 complete cycles at room temperature.											
Vibration	No electrical discontinuity in excess of 1.0 microsecond and no disengagement of the mated connectors, no backing off of the coupling mechanism, and no evidence of cracking, breaking, or loosening of parts.	SAE J2030 Sine Sweep: 10 to 2000 Hz Initial Displacement: 0.07in [1.78mm] DA Maximum Acceleration: 20 G's Duration of Test: 24 hours Time per axis X,Y,Z 8 hours Test Current first 3-hours of each axis: <table border="1" data-bbox="1045 1402 1528 1671"> <thead> <tr> <th>Contact size</th> <th>Wire Size</th> <th>Test Current</th> </tr> <tr> <td></td> <th>AWG [mm<sup>2</sup>]</th> <th>Amp</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Ø8mm</td> <td>4 [25.0]</td> <td>72</td> </tr> <tr> <td>2 [35.0]</td> <td>90</td> </tr> </tbody> </table>	Contact size	Wire Size	Test Current		AWG [mm <sup>2</sup> ]	Amp	Ø8mm	4 [25.0]	72	2 [35.0]	90
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Terminal Retention in Connector	The terminal shall maintain its original position in the connector throughout the test.	SAE J2030 Subject the contacts to a direct pull. The terminals shall withstand a minimum force of 56 lbf [250N] for 60 seconds.											

Test Description	Requirement		Procedure
Mating / Unmating Forces	Required force to mate the plug and receptacle pair and engage latching mechanism shall not exceed 100 N. Required force to separate the plug and receptacle pair and fully disengage latching mechanism shall not exceed 100 N.		SAE J2030 and SAE J2030 For connectors without mechanical assist, test the maximum required force to mate the plug and receptacle pair and engage the latching mechanism. For connectors without mechanical assist, test the maximum force required to separate the plug and receptacle with the latch mechanism fully disengaged.
Mismating	Polarization and different keys shall resist a minimum of 178 N axial force without damage.		SAE J2030 The unintended polarization for connectors with a 178 N minimum axial force to determine resistance to damage due to improper assembly during installation.
Maintenance Aging	There shall be no visible damage to the contact cavities.		SAE J2030 Each sample was subjected to 10 cycles of engagement and disengagement from its contact.
Terminal Crimp Strength	Cable Size	Minimum Tensile lbf [N]	SAE J2030 The tensile strength of the crimped connection shall be tested by using suitable apparatus at a constant speed within the range of 20 mm to 100 mm/min. If the terminal has a cable insulation crimp it shall be rendered mechanically ineffective.
	25 mm <sup>2</sup> , 4 AWG	489 [2175]	
	2 AWG	562 [2500]	
	35 mm <sup>2</sup>	598 [2660]	
Connector Retention	There shall be no evidence of cracking, distortion or detrimental damage to the connector following the test.		SAE J2030 Apply a pulling force to the wire bundle of the mated connector at 444 N. The load was applied for 30 seconds.
Bend Test with Flange	Able to withhold between 170-180 lb. force. [756-801 N]		Push to distraction, visual separation of the flange from the metal plate. Mount the receptacle to the flange. Mount the flange to a metal plate in a horizontal position. A vertical force was applied to a point at the very end of the receptacle connectors.
<b>ENVIRONMENTAL</b>			
Temperature Life	There shall be no evidence of cracking, distortion or detrimental damage to the connector following the test.		SAE J2030 Subject wired, mated connectors to 1000 hours of heat in a circulating air oven at 125°C [257°F].

Test Description	Requirement	Procedure
Thermal Shock	There shall be no evidence of cracking, chipping or other damage detrimental to the normal operation of the connectors.	SAE J2030 The cabled-mated connector shall be 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 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
Water Immersion	Pass Insulation Resistance test	SAE J2030 The wired mated connectors shall be placed in an oven at 125 °C ± 3 °C for 1 h then immediately be placed in water with a 5% salt in weight content and 0.1 g/L wetting agent, to a depth of 1 m for 4 h. Water temperature is to be 23 °C ± 3 °C. The ends of the cable are to be sealed during this test.
Water Immersion - IPX7 / IPX8	There shall be no evidence of water ingress into the connector housing.	SAE J2030 Immerse the wired test samples under 1 m water for 30 min (IPX7). Examine the samples for water ingress, then subjected to thermal shock (see above) Immerse the wired test samples under 1 m water for 4 hours (IPX8). Examine the samples for water ingress
Dust Protection (IP6X)	There shall be no evidence of dust ingress into the connector housing.	DIN-40050-9 The mated and cabled specimens shall be mounted in its normal operating position. The specimens shall be subjected to 20 cycles of air and dust movement for 6 second intervals. Pause 15 minutes.
High Pressure Spray (IPX9K)	There shall be no evidence of water ingress into the connector housing.	DIN-40050-9 The mated and cabled specimens shall be mounted in its normal operating position. Specimens shall be subjected to water fan with rotational speed 5±1°/min, water flow 14-16 l/min, water pressure 800-1000 kPa, water temperature 80±5°C for 30 seconds per position. Spray position: 0°, 30°, 60°, 90°.

Test Description	Requirement	Procedure																
Fluid Immersion	The connectors shall show no visible evidence of damage detrimental to their normal operation.	<p>SAE J2030</p> <p>Subject each wired, mated connector to immersion in one fluid only.</p> <p>The connectors were subjected to the following fluids:</p> <table border="1" data-bbox="1057 394 1511 1073"> <thead> <tr> <th data-bbox="1057 394 1328 478">Fluid (Concentration)</th> <th data-bbox="1328 394 1511 478">Temperature</th> </tr> </thead> <tbody> <tr> <td data-bbox="1057 478 1328 562">Motor Oil 30 weight (100%)</td> <td data-bbox="1328 478 1511 562">85°C</td> </tr> <tr> <td data-bbox="1057 562 1328 653">Brake Fluid (disc type 1, 100%)</td> <td data-bbox="1328 562 1511 653">85°C</td> </tr> <tr> <td data-bbox="1057 653 1328 737">Diesel fuel #2 (90/10%)</td> <td data-bbox="1328 653 1511 737">60°C</td> </tr> <tr> <td data-bbox="1057 737 1328 821">Antifreeze/Water mixture (50/50)</td> <td data-bbox="1328 737 1511 821">85°C</td> </tr> <tr> <td data-bbox="1057 821 1328 905">Roundup Original (7.5%, 48 to 592 oz)</td> <td data-bbox="1328 821 1511 905">23°C</td> </tr> <tr> <td data-bbox="1057 905 1328 989">Gear Oil 90 weight (100%)</td> <td data-bbox="1328 905 1511 989">85°C</td> </tr> <tr> <td data-bbox="1057 989 1328 1073">Aqueous Urea (32.5%)</td> <td data-bbox="1328 989 1511 1073">23°C</td> </tr> </tbody> </table> <p>Subject the mated, wired connectors to five consecutive cycles of fluid immersion. Perform each cycle as follows:</p> <p>Submerge the mated connector in its corresponding fluid at ambient conditions for five minutes.</p> <p>Remove the mated connector and allow to air dry 24 ± 2 hours.</p> <p>After completion of the fifth cycle of fluid immersion, visually inspect the connector.</p>	Fluid (Concentration)	Temperature	Motor Oil 30 weight (100%)	85°C	Brake Fluid (disc type 1, 100%)	85°C	Diesel fuel #2 (90/10%)	60°C	Antifreeze/Water mixture (50/50)	85°C	Roundup Original (7.5%, 48 to 592 oz)	23°C	Gear Oil 90 weight (100%)	85°C	Aqueous Urea (32.5%)	23°C
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**NOTE**

*Specimens shall be wired with the minimum approved wire gauge per SAE J1127 or ISO 6722 suitable for the terminal size and with sufficient length to accommodate testing. Wire insulation shall be minimum diameter per SAE J1127 or ISO 6722 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.*

#### 4. QUALIFICATION TEST SEQUENCE

Test or Examination	Test Group (a)											11	12	13
	1	2	3	4	5	6	7	8	9	10				
	Test Sequence (b)													
Examination of product	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Contact Resistance (Voltage Drop)	2,6													
Vibration	4												2	
Durability	5													
Connector Retention			6									8		
Mating Force			2			2								
Unmating Force			3			3								
Mismating	7													
Maintenance Aging			4											
Terminal Retention in Connector			5									7		
Temperature Life	3					4								
Thermal Shock				6	2		6	2				4,6		
Water Immersion (IPX7 / IPX8)				2,7			2,7					2,5		2
Dust Protection (IP6X)				9			9							
High Pressure Spray (IPX9K)					3			3						
Water Immersion				4			4							4
Insulation Resistance												3		
Fluid Immersion		2												
Bend Test						5								
Terminal Crimp Strength											2			
Temperature Rise vs. Current										2				
Current-temperature Derating										3				
Visual Examination	8	3	7	3,5,8,10	4	6	3,5,8,10	4				9	3	3,5

a) Specimens were prepared in accordance with production drawings and were selected at random production runs.

1) Group 1-10 consisted of DTSK connectors, keys A, B and C, with DEUTSCH Ø8 contacts, with 25 and 35 mm<sup>2</sup>, 2 and 4 AWG wire, with seals from each wire ranges and shrink tubing at the end of the connector. Group 6, 7 and 8 test with flange mount.

2) Group 11-13 consisted of DTSK connectors, keys A, B and C, with DEUTSCH Ø8 contacts, with 25 and 35 mm<sup>2</sup>, 2 and 4 AWG wire, with seals from each wire, protective cover and the end of the connector. Group 13 only test with flange mount.

b) Numbers indicate sequence in which tests were performed.

#### 5. REVISION HISTORY

Rev Ltr	Brief Description of Change	Date	Dwn	Apvd
A2	1. Page 1 section 2.1: Fixed Hyperlink 114-151039. 2. Page 1 section 2.3: Updated Wire Seal Drawing Names. 3. Page 7 section 5: Added Revision History table	20-July-18	DD	DM