



HDP Series Connector System

1. SCOPE

1.1. Content

This specification covers performance, tests and quality requirements for the TE Connectivity (TE) HDP 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 1992. The Qualification Test Report number for this testing is 501-151033_DTR-HDP. This document is 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

- ◆ [0425-013-1800](#): Arrangement of Contact Locations for size 18 HDP20
- ◆ [0425-014-2400](#): Arrangement of Contact Locations for size 24 HDP20
- ◆ [0425-021-0000](#): HDP20 Series Performance and Application Characteristics
- ◆ [109-1](#): General Requirements for Testing
- ◆ [114-151000](#): Application Specification for DEUTSCH Size 16 S&F Pin & Socket
- ◆ [408-151007](#): Instruction Guide DEUTSCH Extraction Tools
- ◆ [501-151033](#): HDP Qualification Test Report

◆ Product Drawings

[HDP24-18-XXP/SX](#) – Size 18 Receptacles

[HDP24-24-XXP/SX](#) – Size 24 Receptacles

[HDP26-18-XXP/SX](#) – Size 18 Plugs

[HDP26-24-XXP/SX](#) – Size 24 Plugs

◆ Products

X refers to N, T, E seal type. XXXX refers to special modification.

HDP24-18-6PX-XXXX	6 pin receptacle	HDP26-18-6PX-XXXX	6 pin plug
HDP24-18-6SX-XXXX	6 socket receptacle	HDP26-18-6SX-XXXX	6 socket plug
HDP24-18-8PX-XXXX	8 pin receptacle	HDP26-18-8PX-XXXX	8 pin plug
HDP24-18-8SX-XXXX	8 socket receptacle	HDP26-18-8SX-XXXX	8 socket plug
HDP24-18-14PX-XXXX	14 pin receptacle	HDP26-18-14PX-XXXX	14 pin plug
HDP24-18-14SX-XXXX	14 socket receptacle	HDP26-18-14SX-XXXX	14 socket plug
HDP24-18-20PX-XXXX	20 pin receptacle	HDP26-18-20PX-XXXX	20 pin plug
HDP24-18-20SX-XXXX	20 socket receptacle	HDP26-18-20SX-XXXX	20 socket plug
HDP24-18-21PX-XXXX	21 pin receptacle	HDP26-18-21PX-XXXX	21 pin plug
HDP24-18-21SX-XXXX	21 socket receptacle	HDP26-18-21SX-XXXX	21 socket plug
HDP24-24-7PX-XXXX	7 pin receptacle	HDP26-24-7PX-XXXX	7 pin plug
HDP24-24-7SX-XXXX	7 socket receptacle	HDP26-24-7SX-XXXX	7 socket plug
HDP24-24-9PX-XXXX	9 pin receptacle	HDP26-24-9PX-XXXX	9 pin plug
HDP24-24-9SX-XXXX	9 socket receptacle	HDP26-24-9SX-XXXX	9 socket plug
HDP24-24-14PX-XXXX	14 pin receptacle	HDP26-24-14PX-XXXX	14 pin plug
HDP24-24-14SX-XXXX	14 socket receptacle	HDP26-24-14SX-XXXX	14 socket plug
HDP24-24-16PX-XXXX	16 pin receptacle	HDP26-24-16PX-XXXX	16 pin plug
HDP24-24-16SX-XXXX	16 socket receptacle	HDP26-24-16SX-XXXX	16 socket plug
HDP24-24-18PX-XXXX	18 pin receptacle	HDP26-24-18PX-XXXX	18 pin plug
HDP24-24-18SX-XXXX	18 socket receptacle	HDP26-24-18SX-XXXX	18 socket plug
HDP24-24-19PX-XXXX	19 pin receptacle	HDP26-24-19PX-XXXX	19 pin plug
HDP24-24-19SX-XXXX	19 socket receptacle	HDP26-24-19SX-XXXX	19 socket plug
HDP24-24-21PX-XXXX	21 pin receptacle	HDP26-24-21PX-XXXX	21 pin plug
HDP24-24-21SX-XXXX	21 socket receptacle	HDP26-24-21SX-XXXX	21 socket plug
HDP24-24-23PX-XXXX	23 pin receptacle	HDP26-24-23PX-XXXX	23 pin plug
HDP24-24-23SX-XXXX	23 socket receptacle	HDP26-24-23SX-XXXX	23 socket plug
HDP24-24-29PX-XXXX	29 pin receptacle	HDP26-24-29PX-XXXX	29 pin plug
HDP24-24-29SX-XXXX	29 socket receptacle	HDP26-24-29SX-XXXX	29 socket plug
HDP24-24-31PX-XXXX	31 pin receptacle	HDP26-24-31PX-XXXX	31 pin plug
HDP24-24-31SX-XXXX	31 socket receptacle	HDP26-24-31SX-XXXX	31 socket plug
HDP24-24-33PX-XXXX	33 pin receptacle	HDP26-24-33PX-XXXX	33 pin plug
HDP24-24-33SX-XXXX	33 socket receptacle	HDP26-24-33SX-XXXX	33 socket plug
HDP24-24-35PX-XXXX	35 pin receptacle	HDP26-24-35PX-XXXX	35 pin plug
HDP24-24-35SX-XXXX	35 socket receptacle	HDP26-24-35SX-XXXX	35 socket plug
HDP24-24-47PX-XXXX	47 pin receptacle	HDP26-24-47PX-XXXX	47 pin plug
HDP24-24-47SX-XXXX	47 socket receptacle	HDP26-24-47SX-XXXX	47 socket plug
HDP24-24-91PX-XXXX	9 pin receptacle	HDP26-24-91PX-XXXX	9 pin plug
HDP24-24-91SX-XXXX	9 socket receptacle	HDP26-24-91SX-XXXX	9 socket plug

2.2. Industry Documents

- ◆ DIN 40050-9: Road Vehicles Degrees of Protection (IP Code)
DIN 72551-6: Road Vehicles—Low-Tension Cables—Part 6: Single-Core, Unscreened with Thin Insulation Wall; Dimensions, Materials, Marking
- ◆ 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 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 V AC/DC, except 24-29, 24-31, 24-47 arrangements are 200 V AC/DC
- ◆ Current (Amp): See Figure 1

Contact Size	Wire Size AWG [mm ²]	All Circuits Energized (A)
4	4 [25.0-21.0]	100
	6 [16.0-13.0]	
8	8 [10.0-8.0]	60
	10 [6.0-5.0]	40
12	10 [6.0-5.0]	25
	12 [4.0-2.5]	
	14 [2.0]	18
16	12 [2.5]	13
	14 [2.0]	
	16 [1.5-1.0]	10
	18 [0.8-0.75]	
	20 [0.5]	
20	16 [1.5-1.0]	7.5
	18 [0.8-0.75]	
	20 [0.5]	5
	22 [0.35]	

Figure 1

- ◆ Temperature: -55°C to +125°C
- ◆ Ingress Protection (IP) Level: IP67
- ◆ Flammability: UL94 V-1. Parts have been successfully tested to the 20 mm Flame Test per Standard UL-94.

3.3. Test Requirements and Procedures Summary

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

See Appendix A for additional test requirements

See Appendix B for Test Procedure Comparison Chart

Test Description	Requirement	Procedure
Examination of Product	The connectors shall be correctly constructed, marked and shall show good quality and workmanship and match the customer drawing.	EIA-364-18 Visually inspected for 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 were considered adequate basis for rejection.
ELECTRICAL		
Insulation Resistance	1000 MΩ minimum at 25°C	MIL-STD-1344, Method 3003.1 Using a 500 VDC megaohmmeter check each contact to all other contacts and the shell electrically connected together.
Dielectric Withstanding Voltage	No evidence of breakdown or flashover or current leakage in excess of 2.0 milliamps.	MIL-STD-1344, Method 3001.1 Check each contact to all other contacts and the shell electrically connected together for breakdown / flashover when subjected to a 1500 VAC test potential for a period of 1 minute.
Contact Resistance	Calculated resistance across mated contact pairs shall not exceed 7.5 mOhms using 100 mA current	MIL-STD-1344, Method 3004.1 The resistance of an equal length of wire will be subtracted from measured reading to determine the increase in resistance due to the terminal. Test current: 10A for size 16 (18AWG)
Low Voltage Resistance	Maximum voltage drop for wire/contact assembly shall be 60 mV for solid and 100 mV for S&F terminals	MIL-STD-1344 method 3002.1 The resistance of an equal length of wire shall be subtracted from all readings to determine the added resistance of the terminal. Test voltage: 20 mV max open circuit. Test current: 100 mA

Figure 2 Cont.

Test Description	Requirement	Procedure
MECHANICAL		
Maintenance Aging	Failure shall consist of the inability to complete 10 cycles or breakage of any of the contact retention mechanism	MIL-STD-1344, Method 2002.1 Subject 10% of the cavities to 10 cycles of inserting and removing its respective contact pin and socket. Insert by hand, remove using removal tool.
Contact Retention	The contact shall remain in place.	MIL-STD-1344, Method 2007.1 Subject each wired contact to an applied load of 25 lbf (size 16) for a period of 15 seconds in a direction tending to push the contact or of the rear of the connector.
Durability	No evidence of damage to the contacts, contacting plating, connector housing or seals detrimental to reliable connector performance. Coupling torque must not increase as a result of cycling past the point where it can reasonably be done by hand.	MIL-STD-1344, Method 2016 The connector shall be mated and unmated for a total of 100 complete cycles at room temperature
Tool Abuse	Test up to five cavities from each sample. Test three times on the each cavity. Pin and socket. There shall be no damage to the locking fingers or rear wire seals.	The applicable removal tool shall be inserted into the connector. With an axial load of 5 pounds applied, the tool shall be rotated 180° and then removed, also removing the terminal.
Vibration	No discontinuity in excess of 1.0 μ s at 20 mV and 100 mA during the last hour of each axis. Shall meet visual requirements, show no physical damage and meet requirements of additional tests as needed.	MIL-STD-1344, Method 2005.1 Sine Sweep: 10 to 2000 Hz Sweep Cycle: 20 minutes Initial Displacement: .07 inch DA Maximum Max Acceleration: 20G's Test Duration: 12 hours Time Per Axis X, Y, Z: 4 hours Test Current first 3 hours each axis: 18AWG = 8A
Impact	No There shall be no cracking, uncoupling, or part breakage as a result of impact testing.	Wired mated connectors to be dropped from a height of 4 feet on to a concrete floor a total of 5 times.
Insert Retention	There shall be no damage as a result of the pull test. Connector halves to remain mated.	Apply a pulling force to the wire bundle that exist the rear of the connector for a period of 1 minute. The amount of load is to be 25 lbf times the number of cavities up to maximum of 100 lbf
ENVIRONMENTAL		
Temperature Life	There shall be no evidence of torn seals, cracking, distortion or detrimental damage to the connector following the test.	MIL-STD-1344, Method 1005.1 The wired mated connectors shall be subjected to 1000 hours at 125°C.
Salt Spray	There should be no evidence of corrosion on the connector or terminals after the connector is removed from the test and cleaned with tap water.	MIL-STD-1344, Method 1001.1 Connector shall be fully mated, then submerged in a fine mist of 5% by weight of salt solution for 96 hour.

Figure 2 Cont.

Test Description	Requirement	Procedure														
Fluid Immersion	There shall be no evidence of cracking, distortion or detrimental damage to the connector following the test.	<p>MIL-STD-1344, Method 1016 Subject each connector to one fluid only. The wired mated connectors shall be submerged in the fluids below at listed temperature. 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.</p> <table border="1"> <thead> <tr> <th>Fluid</th> <th>Temperature (°C)</th> </tr> </thead> <tbody> <tr> <td>Motor Oil 30 weight</td> <td>60</td> </tr> <tr> <td>Brake Fluid (disc type 1)</td> <td>60</td> </tr> <tr> <td>Gasoline</td> <td>25</td> </tr> <tr> <td>Diesel Fluid #2</td> <td>60</td> </tr> <tr> <td>50/50 Antifreeze/Water</td> <td>60</td> </tr> <tr> <td>Gear Oil 90 weight</td> <td>60</td> </tr> </tbody> </table>	Fluid	Temperature (°C)	Motor Oil 30 weight	60	Brake Fluid (disc type 1)	60	Gasoline	25	Diesel Fluid #2	60	50/50 Antifreeze/Water	60	Gear Oil 90 weight	60
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Thermal Cycling	There shall be no evidence of cracking, distortion or detrimental damage to the connector following the test.	Cycle mated connectors for 1 hour minimum at -55°C followed by 1 hour minimum at +125°C at a rate of 3°C per minute. Repeat for 20 cycles.														
Water Immersion	All samples must pass insulation resistance. Then un-mate and check for water intrusion.	Heat mated connectors to 125° C for 2 hours. Immediately submerge mated connectors in water to a depth of 3 feet free ends (service connectors) remain out of water. Samples to remain in water 4 hours minimum. Then check insulation resistance.														

Figure 2 end

3.4. Product Qualification and Requalification Test Sequence

Test	Test Group No. (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
Fluid Immersion	6	7	8	6	6	6
Thermal Cycling	7	8				7
Vibration	8			7	7	
Impact Test	9			8	8	
Insert Retention	10		9		9	
Water Immersion	11	9	10	9	10	8
Low Voltage Resistance		10	11			
Contact Resistance	12	11	12	10	11	9
Final Examination	13	12	13	11	12	10



NOTE

- (a) Specimens shall be prepared in accordance with applicable product drawings and shall be selected at random from current production.
- (b) All cavities use wire gauge per SAE J1128 suitable for the terminal size and with sufficient length to accommodate testing. The wire insulation shall be within the connector wire sealing range. Crimp characteristics (i.e. crimp height, crimp width, etc.) shall be checked prior to testing.
- (c) Specimen shall consist of 24-23 arrangement connectors with DEUTSCH Solid Terminal System size 16 nickel plated pins and sockets on 18 AWG SXL and DEUTSCH Stamped & Formed Terminal System size 16 nickel plated pins and sockets on 18 AWG SXL.
- (d) 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
- (e) Numbers indicate sequence in which tests are performed.

3.5 Appendix A Additional Test Requirements

Test Description	Requirement	Procedure																																											
ELECTRICAL																																													
Low Level Contact Resistance	<table border="1"> <thead> <tr> <th>Wire Size</th> <th>Resistance</th> </tr> <tr> <th>AWG [mm²]</th> <th>(mΩ max)</th> </tr> </thead> <tbody> <tr> <td>16 [1.0]</td> <td>6.0</td> </tr> <tr> <td>18 [0.80]</td> <td>7.5</td> </tr> <tr> <td>20 [0.50]</td> <td>11.0</td> </tr> <tr> <td>22 [0.35]</td> <td>17.0</td> </tr> </tbody> </table>	Wire Size	Resistance	AWG [mm ²]	(mΩ max)	16 [1.0]	6.0	18 [0.80]	7.5	20 [0.50]	11.0	22 [0.35]	17.0	EIA-364-23 Test with applied voltage not to exceed 20 mV open circuit and the test current shall be limited to 100 mA. The resistance of an equal length of wire (reference wire) shall be subtracted from the same reel as used for the connector wiring.																															
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Contact Size	Wire Size		Test Current		Voltage Drop (mV max)																																								
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Vibration	There shall be no discontinuity in excess of one (1) μ s at 20mV and 100 mA during the last hour of each axis. Shall meet visual requirements, show no physical damage and meet requirements of additional tests as needed.	<p>EIA-364-28 Sine Sweep: 10 to 2000 Hz Initial Displacement: 1.78 mm 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:</p> <table border="1" data-bbox="1013 506 1455 1263"> <thead> <tr> <th rowspan="2">Contact Size</th> <th>Wire Size</th> <th>Test Current</th> </tr> <tr> <th>AWG [mm²]</th> <th>Amp</th> </tr> </thead> <tbody> <tr> <td rowspan="2">4</td> <td>4 [25.0-21.0]</td> <td rowspan="2">46</td> </tr> <tr> <td>6 [16.0-13.0]</td> </tr> <tr> <td rowspan="2">8</td> <td>8 [10.0-8.0]</td> <td>33</td> </tr> <tr> <td>10 [6.0-5.0]</td> <td>23</td> </tr> <tr> <td rowspan="3">12</td> <td>10 [6.0-5.0]</td> <td rowspan="2">17</td> </tr> <tr> <td>12 [4.0-2.5]</td> </tr> <tr> <td>14 [2.0]</td> <td>14</td> </tr> <tr> <td rowspan="4">16</td> <td>12 [2.5]</td> <td rowspan="4">10</td> </tr> <tr> <td>14 [2.0]</td> </tr> <tr> <td>16 [1.5-1.0]</td> </tr> <tr> <td>18 [0.8-0.75]</td> <td>8</td> </tr> <tr> <td rowspan="4">20</td> <td>20 [0.50]</td> <td>5</td> </tr> <tr> <td>16 [1.5-1.0]</td> <td rowspan="2">5</td> </tr> <tr> <td>18 [0.8-0.75]</td> </tr> <tr> <td>22 [0.35]</td> <td>3</td> </tr> </tbody> </table>	Contact Size	Wire Size	Test Current	AWG [mm ²]	Amp	4	4 [25.0-21.0]	46	6 [16.0-13.0]	8	8 [10.0-8.0]	33	10 [6.0-5.0]	23	12	10 [6.0-5.0]	17	12 [4.0-2.5]	14 [2.0]	14	16	12 [2.5]	10	14 [2.0]	16 [1.5-1.0]	18 [0.8-0.75]	8	20	20 [0.50]	5	16 [1.5-1.0]	5	18 [0.8-0.75]	22 [0.35]	3
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Contact Retention	The contact shall remain in place.	<p>EIA-364-29 Using same cavities from for maintenance aging, subject to a direct load as specified below for 15 seconds in a direction tending to push the contact out of the rear of the connector. Either a Tension Testing Machine or equivalent weights may be used.</p> <table border="1" data-bbox="1013 1617 1374 1872"> <thead> <tr> <th>Contact Size</th> <th>Pull-Out Force N [lbf]</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>156 [35]</td> </tr> <tr> <td>8</td> <td>156 [35]</td> </tr> <tr> <td>12</td> <td>133 [30]</td> </tr> <tr> <td>16</td> <td>111 [25]</td> </tr> <tr> <td>20</td> <td>89 [20]</td> </tr> </tbody> </table>	Contact Size	Pull-Out Force N [lbf]	4	156 [35]	8	156 [35]	12	133 [30]	16	111 [25]	20	89 [20]																							
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3.6 Appendix B Test Procedure Comparison Chart

Test	MIL-STD-1344 Method	EIA-364 Dash No.	Similar to SAE J2030 Paragraph	Similar to ISO 8092-2 Paragraph
Examination of Product	-	18	6.1	4.2
Insulation Resistance	3003.1	21	6.3	4.12
Dielectric Withstanding Voltage	3001.1	20	-	4.13
Low Level Contact Resistance	3002.1	23	6.2	4.8
Contact Resistance	3004.1	06	6.4	4.8
Maintenance Aging	2002.1	24	6.6	-
Contact Retention	2007.1	29	6.18	4.7
Durability	2016	09	6.11	4.3
Vibration	2005.1	28	6.15	-
Shock	2004.1	27	6.16	-
Impact	-	42	6.17	4.20
Connector Retention	-	-	6.20	-
Temperature Life	1005.1	17	6.7	4.18
Salt Spray	1001.1	26	6.12	4.16
Fluid Immersion	1016	10	6.14	4.23
Thermal Cycle	-	-	-	-
Thermal Shock	1003.1	32	6.13	4.22
Moisture	-	-	-	-
Water Immersion	-	-	6.19	4.9

3.7 Revision History

Rev Ltr	Brief Description of Change	Date	Dwn	Apvd
A	Initial Release	5-Mar-2017	PV	DM
B	General Specification clarification to reflect actual product specification, updated Figure 1 to include 4AWG and other missing wire gage specs, added missing MIL-STD-1344 test procedures as needed, updated notes on Page 7, added Appendix A. Additional test requirements and Appendix B Test Procedure Comparison Chart	19-Dec-2017	VNB	DM