Two Position HVA280 Plug and Header Assembly, Sealed Shielded Connection System

1. SCOPE

1.1. Content

This specification covers performance, tests and quality requirements for the TE Connectivity Two Position HVA280 Plug and Header Assembly, Sealed Shielded Connection 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.

1.3 Successful qualification testing on the subject product line was completed on 21Jan10. The Qualification Test Report number for this testing is 501-727. This documentation is on file at and available from Engineering Practices and Standards (EPS).

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1. TE Connectivity Documents

501-727: Qualification Test Report (Two Position HVA280 Plug and Header Assembly, Sealed Shielded Connection System)

2.2. Industry Documents

- IEC-60529: Degrees of Protection Provided by Enclosures (IP Code)
- USCAR 2: Performance Specification for Automotive Electrical Connector Systems
- USCAR 25: Electrical Connector Assembly Ergonomic Design Criteria
- USCAR 37: High Voltage Connector Performance Supplement to USCAR 2

3. REQUIREMENTS

3.1. Design and Construction

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

3.2. Materials

Materials used in the construction of this product shall be as specified on the applicable product drawing.

| Indicates Change

3.3. Ratings

- Voltage: 1000 volts DC
- Current:
  - 40 amperes at 85°C
  - 27 amperes at 125°C
- Temperature: -40 to 125°C

3.4. Performance and Test Description

Product is designed to meet the electrical, mechanical and environmental performance requirements specified in Figure 1. Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

3.5. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Terminal-to-connector insertion, 2.8 mm terminals.	USCAR 37, Section 5.4.1.4. 75 N maximum.	USCAR 37, Section 5.4.1.
Forward stop, 2.8 mm terminals.	USCAR 37, Section 5.4.1.4. 50 N minimum or terminal insertion force, whichever is greater.	USCAR 37, Section 5.4.1.
Terminal-to-connector extraction, dry as molded, 2.8 mm terminals.	USCAR 37, Section 5.4.1.4. 80 N minimum.	USCAR 37, Section 5.4.1.
Terminal-to-connector extraction, moisture conditioned, 2.8 mm receptacles.	USCAR 37, Section 5.4.1.4. 100 N minimum.	USCAR 37, Section 5.4.1.
Terminal-to-connector extraction, after temperature/humidity.	USCAR 37, Section 5.4.1.4. 50 N minimum.	USCAR 37, Section 5.4.1.
Terminal-to-connector insertion, 0.64 mm receptacles.	USCAR 2, Section 5.4.1.4. 30 N maximum.	USCAR 2, Section 5.4.1.
Forward stop, 0.64 mm receptacles.	USCAR 2, Section 5.4.1.4. 50 N minimum or until wire buckles.	USCAR 2, Section 5.4.1.
Terminal-to-connector extraction, dry as molded, 0.64 mm receptacles.	USCAR 2, Section 5.4.1.4. 30 N minimum.	USCAR 2, Section 5.4.1.
Terminal-to-connector extraction, moisture conditioned, 0.64 mm receptacles.	USCAR 2, Section 5.4.1.4. 60 N minimum.	USCAR 2, Section 5.4.1.
Terminal-to-connector extraction, moisture conditioned, 2.8 mm tabs.	USCAR 37, Section 5.4.1.4. 110 N minimum.	USCAR 37, Section 5.4.1.
Mating force.	USCAR 25, Table 6.3. 75 N maximum.	USCAR 2, Section 5.4.2.
Unmating force, final lock position, primary lock engaged.	USCAR 2, Section 5.4.2.4. 110 N minimum.	USCAR 2, Section 5.4.2.
Unmating force, pre-lock position, primary lock engaged.	USCAR 2, Section 5.4.2.4. 110 N minimum.	USCAR 2, Section 5.4.2.
Unmating force, final lock position, primary lock disengaged.	USCAR 2, Section 5.4.2.4. 75 N maximum.	USCAR 2, Section 5.4.2.

Figure 1 (continued)

Test Description	Requirement	Procedure
Primary lock, final lock latch disengage force.	USCAR 2, Section 5.4.2.4. 70 N maximum.	USCAR 2, Section 5.4.2.
Primary lock, pre-lock latch disengage force.	USCAR 2, Section 5.4.2.4. 70 N maximum.	USCAR 2, Section 5.4.2.
Polarization feature effectiveness, pol A plug to pol A header orientation mis-mate.	USCAR 2, Section 5.4.4.4. 150 N minimum or 3 times mating force.	USCAR 2, Section 5.4.4.
Cable seal retainer insertion.	USCAR 2, Section 5.4.5.4. 60 N maximum.	USCAR 2, Section 5.4.5.
Cable seal retainer retention.	USCAR 2, Section 5.4.5.4. 110 N minimum.	USCAR 2, Section 5.4.5.
Ring seal retainer retention.	USCAR 2, Section 5.4.5.4. 110 N minimum.	USCAR 2, Section 5.4.5.
Inner housing retention, plug assembly.	USCAR 2, Section 5.4.5.4. 110 N minimum.	USCAR 2, Section 5.4.5.
Voltage drop, HV conductors only.	USCAR 2, Section 5.3.2.4. 5 milliohms maximum.	USCAR 2, Section 5.3.2.
Voltage drop, HVIL conductors only.	USCAR 2, Section 5.3.2.4. 20 milliohms maximum.	USCAR 2, Section 5.3.2.
Dry circuit, shield only.	No requirement, readings for information only.	USCAR 2, Section 5.3.1.
Vibration/mechanical shock.	USCAR 2, Section 5.4.6.4 No damage.	USCAR 2, Section 5.6.4.
Connector-to-connector audible click.	USCAR 2, Section 5.4.7.4. 7 dB minimum above ambient.	USCAR 2, Section 5.4.7.
Connector-to-connector audible click, moisture conditioned.	USCAR 2, Section 5.4.7.4. 5 dB minimum above ambient.	USCAR 2, Section 5.4.7.
Connector drop.	USCAR 2, Section 5.1.8.4. No damage.	USCAR 2, Section 5.4.8.
Terminal/cavity polarization, plug.	USCAR 2, Section 5.1.8.4. No damage.	USCAR 2, Section 5.4.10.
Terminal/cavity polarization, header, 2.8 mm terminals.	USCAR 2, Section 5.1.8.4. No damage.	USCAR 2, Section 5.4.10.
Terminal/cavity polarization, header, 0.64 mm terminals.	USCAR 2, Section 5.1.8.4. No damage.	USCAR 2, Section 5.4.10.
Maximum test current capability of connector assembly.	Current at which terminal absolute temperature is 155°C.	USCAR 2, Section 5.3.3.
Isolation resistance, circuit 1 to circuit 2, and circuits 1 and 2 to shield, USCAR 2.	1 milliampere maximum leakage at 500 volts DC.	USCAR 2, Section 5.5.1.
Isolation resistance, circuit 1 to circuit 2, and circuits 1 and 2 to shield, USCAR 37.	10 microamperes maximum leakage at 1000 volts DC.	USCAR 37, Section 5.2.5.
Dielectric withstanding, circuit 1 to circuit 2, and circuits 1 and 2 to shield, 2400 volts.	No arcing or flashover at 2400 volts DC.	USCAR 37, Section 5.5.2.

Figure 1 (continued)

Test Description	Requirement	Procedure
Dielectric withstanding, circuit 1 to circuit 2, and circuits 1 and 2 to shield, 5000 volts.	Start at 2400 volts DC increasing the voltage by 100 volts every 60 seconds to 5000 volts DC.	USCAR 37, Section 5.5.2.
Thermal shock, 85°C.	USCAR 2, Section 5.6.1.	USCAR 2, Section 5.6.1.
Thermal shock, 125°C.	USCAR 2, Section 5.6.1.	USCAR 2, Section 5.6.1.
Isolation resistance, circuit to circuit and each circuit to shield.	100 megohms minimum at 500 volts DC.	USCAR 2, Section 5.5.1.
Temperature/humidity cycling, 85°C.	USCAR 2, Section 5.6.2.	USCAR 2, Section 5.6.2.
Temperature/humidity cycling, 125°C.	USCAR 2, Section 5.6.2.	USCAR 2, Section 5.6.2.
High temperature exposure, 85°C.	USCAR 2, Section 5.6.3.	USCAR 2, Section 5.6.3.
High temperature exposure, 125°C.	USCAR 2, Section 5.6.3.	USCAR 2, Section 5.6.3.
Fluid resistance.	USCAR 2, Section 5.6.4.	USCAR 2, Section 5.6.4.
Visual inspection.	No deformities.	USCAR 2, Section 5.1.8.
Submersion, salt water.	USCAR 2, Section 5.6.5.	USCAR 2, Section 5.6.5.
Submersion, salt water, new wire.	USCAR 2, Section 5.6.5.	USCAR 2, Section 5.6.5.
Pressure/vacuum leak, initial.	USCAR 2, Section 5.6.6.4. No leaks at 48 kPa.	USCAR 2, Section 5.6.6.
Pressure/vacuum leak, final.	USCAR 2, Section 5.6.6.4. No leaks at 28 kPa final.	USCAR 2, Section 5.6.6.
Pressure/vacuum leak, initial, new wire.	USCAR 2, Section 5.6.6.4. No leaks at 48 kPa.	USCAR 2, Section 5.6.6.
Pressure/vacuum leak, final, new wire.	USCAR 2, Section 5.6.6.4. No leaks at 28 kPa final.	USCAR 2, Section 5.6.6.
Header and plug touch, safe when unmated.	No contact between HV and 12 mm diameter finger probe.	IEC-60529, IP2B.
Spray exposure at 9K level.	USCAR 2, Section 5.8.1.4. No ingress of water.	USCAR 2, Section 5.8.1.
Ferrule retention.	REFER NOTE 1	USCAR 37, Section 5.2.4.

Figure 1 (end)

Note1

FERRULE RETENTION FORCE VALUES ARE DEPENDENT ON WIRE TYPE/SIZE AND PRODUCT OR PROCESS. PLEASE CHECK WITH TE ENGINEERING ON EXPECTED RETENTION FORCE VALUES WITH SPECIFIC WIRE TYPES/SIZES.

3.6. Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)															
	1	2	3	4	5	6	7	8	9	101	102	103	104	10	11	12
	Test Sequence (b)															
Terminal-to-connector insertion, 2.8 mm terminals	1		1													
Forward stop, 2.8 mm terminals 2.8 mm terminals	2		2													
Terminal-to-connector extraction, dry as molded, 2.8 mm terminals	3		3													
Terminal-to-connector extraction, moisture conditioned, 2.8 mm receptacles	4															
Terminal-to-connector extraction, after temperature/humidity	5	5	5													
Terminal-to-connector insertion, 0.64 mm receptacles		1														
Forward stop, 0.64 mm receptacles		2														
Terminal-to-connector extraction, dry as molded, 0.64 mm receptacles		3														
Terminal-to-connector extraction, moisture conditioned, 0.64 mm receptacles		4														
Terminal-to-connector extraction, moisture conditioned, 2.8 mm tabs			4													
Mating force				1												
Unmating force, final lock position, primary lock engaged				2												
Unmating force, pre-lock position, primary lock engaged				3												
Unmating force, final lock position, primary lock disengaged				4												
Primary lock, final lock latch disengage force				5												
Primary lock, pre-lock latch disengage force				6												
Polarization feature effectiveness, pol A plug to pol A header orientation mis-mate					1											
Cable seal retainer insertion						1										
Cable seal retainer retention						2										
Ring seal retainer retention						3										
Inner housing retention, plug assembly						4										
Voltage drop, HV conductors only							1,5									
Voltage drop, HVIL conductors only							2,6									
Dry circuit, shield only							3,7									
Vibration/mechanical shock							4									
Connector-to-connector audible click								1								
Connector-to-connector audible click, moisture conditioned								2								
Connector drop									1	1						
Terminal/cavity polarization, plug											1					
Terminal/cavity polarization, header, 2.8 mm terminals												1				
Terminal/cavity polarization, header, 0.64 mm terminals												2				
Maximum test current capability of connector assembly													1			
Isolation resistance, circuit 1 to circuit 2, and circuits 1 and 2 to shield, USCAR-2														1	1	1
Isolation resistance, circuit 1 to circuit 2, and circuits 1 and 2 to shield, USCAR-37														2	2	2
Dielectric withstanding, circuit 1 to circuit 2, and circuits 1 and 2 to shield, 2400 volts																
Dielectric withstanding, circuit 1 to circuit 2, and circuits 1 and 2 to shield, 5000 volts																
Thermal shock, 85°C																
Thermal shock, 125°C																
Isolation resistance, circuit to circuit and each circuit to shield																
Temperature/humidity cycling, 85°C																
Temperature/humidity cycling, 125°C																
High temperature exposure, 85°C																
High temperature exposure, 125°C																
Fluid resistance																
Visual inspection																
Submersion, salt water																
Submersion, salt water, new wire																
Pressure/vacuum leak, initial																
Pressure/vacuum leak, final																
Pressure/vacuum leak, initial, new wire																
Pressure/vacuum leak, final, new wire																
Header and plug touch, safe when unmated																
Spray exposure at 9K level																
Ferrule retention																

Figure 2 (continued)

Test or Examination	Test Group (a)																
	13	14	15	16	105	17	106	18	107	19	20A	20B	21A	21B	22	23	112
	Test Sequence (b)																
Terminal-to-connector insertion, 2.8 mm terminals																	
Forward stop, 2.8 mm terminals																	
Terminal-to-connector extraction, dry as molded, 2.8 mm terminals																	
Terminal-to-connector extraction, moisture conditioned, 2.8 mm receptacles																	
Terminal-to-connector extraction, after temperature/humidity																	
Terminal-to-connector insertion, 0.64 mm receptacles																	
Forward stop, 0.64 mm receptacles																	
Terminal-to-connector extraction, dry as molded, 0.64 mm receptacles																	
Terminal-to-connector extraction, moisture conditioned, 0.64 mm receptacles																	
Terminal-to-connector extraction, moisture conditioned, 2.8 mm tabs																	
Mating force																	
Unmating force, final lock position, primary lock engaged																	
Unmating force, pre-lock position, primary lock engaged																	
Unmating force, final lock position, primary lock disengaged																	
Primary lock, final lock latch disengage force																	
Primary lock, pre-lock latch disengage force																	
Polarization feature effectiveness, pol A plug to pol A header orientation mis-mate																	
Cable seal retainer insertion																	
Cable seal retainer retention																	
Ring seal retainer retention																	
Inner housing retention, plug assembly																	
Voltage drop, HV conductors only				1,5	1,5	1,5	1,5	1,5	1,5								
Voltage drop, HVIL conductors only				2,6	2,6			2,6	2,6								
Dry circuit, shield only				3,7	3,7	2,6	2,6	3,7	3,7								
Vibration/mechanical shock																	
Connector-to-connector audible click																	
Connector-to-connector audible click, moisture conditioned																	
Connector drop																	
Terminal/cavity polarization, plug																	
Terminal/cavity polarization, header, 2.8 mm terminals																	
Terminal/cavity polarization, header, 0.64 mm terminals																	
Maximum test current capability of connector assembly																	
Isolation resistance, circuit 1 to circuit 2, and circuits 1 and 2 to shield, USCAR-2																	
Isolation resistance, circuit 1 to circuit 2, and circuits 1 and 2 to shield, USCAR-37																	
Dielectric withstanding, circuit 1 to circuit 2, and circuits 1 and 2 to shield, 2400 volts	1	1	1														
Dielectric withstanding, circuit 1 to circuit 2, and circuits 1 and 2 to shield, 5000 volts	2	2	2														
Thermal shock, 85°C				4													
Thermal shock, 125°C					4												
Isolation resistance, circuit to circuit and each circuit to shield						3,7	3,7				1,3	1,3	1,3,5	1,3,5			
Temperature/humidity cycling, 85°C						4											
Temperature/humidity cycling, 125°C							4										
High temperature exposure, 85°C								4									
High temperature exposure, 125°C									4								
Fluid resistance										1							
Visual inspection										2							
Submersion, salt water											2						
Submersion, salt water, new wire												2					
Pressure/vacuum leak, initial													2				
Pressure/vacuum leak, final													4				
Pressure/vacuum leak, initial, new wire														2			
Pressure/vacuum leak, final, new wire														4			
Header and plug touch, safe when unmated															1		
Spray exposure at 9K level																1	
Ferrule retention																	1

NOTE

(a) See paragraph 4.1.A.
(b) Numbers indicate sequence in which tests are performed.

Figure 2 (end)

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Specimen Selection

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

- Test group 1 shall consist of 10, 2.8 mm receptacles and 10 plugs.
- Test group 2 shall consist of 10, 0.64 mm receptacles and 10 headers.
- Test group 3 shall consist of 10, 2.8 mm tabs and 10 headers.
- Test group 4 shall consist of 15 plugs and 15 headers.
- Test group 5 shall consist of 3 plugs and 3 headers.
- Test groups 6, 7, 9, 12, 15, 16, 17, 18, 21A, 21B, 23, 105, 106 and 107 shall each consist of 10 plugs and 10 headers.
- Test groups 8, 19, 20A, and 20B shall each consist of 8 plugs and 8 headers.
- Test groups 10, 13, and 102 shall each consist of 10 plugs.
- Test groups 11, 14, 101 and 103 shall each consist of 10 headers.
- Test group 22 shall consist of 1 plug and 1 header.
- Test group 104 shall consist of 12 plugs and 12 headers.
- Test group 112 shall consist of 10 leads.

B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figure 2.

4.2. Requalification Testing

If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

4.3. Acceptance

Acceptance is based on verification that the product meets the requirements of Figure 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. If product failure occurs, corrective action shall be taken, and specimens resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

4.4. Quality Conformance Inspection

The applicable quality inspection plan shall specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.