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**Three Position HVA280 Plug and Header Assembly, Sealed Shielded Connection System For Multi-Core Wire**

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**1. SCOPE**

## 1.1. Content

This specification covers performance, tests and quality requirements for the Tyco Electronics Three Position HVA280 Plug and Header Assembly, Sealed Shielded Connection System for Multi-Core Wire.

## 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 on 07Dec09. The Qualification Test Report number for this testing is 501-728. 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. Tyco Electronics Document

501-728: Qualification Test Report (Three Position HVA280 Plug and Header Assembly, Sealed Shielded Connection System for Multi-Core Wire)

## 2.2. Industry Documents

- GMW 3172 Aug 2008 Rev: General Specification for Electrical/Electronic Components Environmental/Durability
- GMW 3191 Dec 2007 Rev: Connector Test and Validation Specification
- IEC 60664-1: Insulation Coordination for Equipment Within Low-voltage Systems – Part 1: Principles, Requirements and Tests - Edition 2.0
- USCAR-2 Rev 4: Performance Specification for Automotive Connector Systems

## 2.3. Reference Documents

- 108-18513: Product Specification (MCP2.8 Contact System)
- 114-18148: Application Specification (MCP2.8 Contact System)
- 114-13253: Application Specification (HVA280-3pm Plug High-Voltage Connector System)
- 408-10273: Instruction Sheet (HVA280 Header Sealed 3-Position High-Voltage Connection System)
- IEC 60529: Degrees of Protection Provided by Enclosures (IP Code)
- USCAR-21 Rev 1: Performance Specification for Cable-To-Terminal Electrical Crimps
- USCAR-25 Rev 1: Electrical Connector Assembly Ergonomic Design Criteria
- USCAR-37 Draft: High Voltage Connector Performance Supplement to SAE/USCAR-2
- C-2103197: HVA280-3PXM HV Reference Drawing (available for part number relationships; not a saleable item)

- C-2359673: HVA280-3p HV Reference Drawing (available for part number relationships; not a saleable item).
  - The cable H+S art. 84132059 (3x2,5mm<sup>2</sup>, wire colors (BL, BN, YE / BN), is an additional version of the H+S art. 12585215 (3x2,5mm<sup>2</sup>, wire colors RD1 / RD2 / BK), and differs only from the wire colors. Cable diameter, cable design and construction are identical.

**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.

3.3. Ratings

- Voltage: see Figure 1

Conductor Size	Center Cavity Populated	Pollution Degree	Voltage Rating (Vrms)
≤ 2.5 mm <sup>2</sup>	Yes	1	1325
≤ 2.5 mm <sup>2</sup>	Yes	2	630
≤ 2.5 mm <sup>2</sup>	Yes	3	320
≤ 2.5 mm <sup>2</sup>	No	1	1900
≤ 2.5 mm <sup>2</sup>	No	2	990
≤ 2.5 mm <sup>2</sup>	No	3	495
> 2.5 mm <sup>2</sup>	Yes	1	1325
> 2.5 mm <sup>2</sup>	Yes	2	630
> 2.5 mm <sup>2</sup>	Yes	3	320
> 2.5 mm <sup>2</sup>	No	1	1390
> 2.5 mm <sup>2</sup>	No	2	670
> 2.5 mm <sup>2</sup>	No	3	335

**NOTE** Pollution degree and voltage rating are determined based on Section 2.5.1 and Table 4 of IEC 60664-1.

Figure 1

- Current: 15 amperes maximum (current carrying capability affected by cable size and ambient temperature)
- 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 2. Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

### 3.5. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Visual inspection.	No defects.	GMW 3191, Section 4.1.
Connector cycling.	Precondition 10 cycles.	GMW 3191, Section 3.3.
Dry circuit resistance, terminals.	5 milliohms maximum.	GMW 3191, Section 4.17.
Dry circuit resistance, shield.	Data only.	GMW 3191, Section 4.17.
Mechanical shock.	No discontinuities of 1 microsecond or longer duration. 7 milliohms maximum resistance.	GMW 3191, Section 4.27.
Vibration with thermal cycling, Body Profile, Temperature Class 3.	No discontinuities of 1 microsecond or longer duration. 7 milliohms maximum resistance.	GMW 3191, Section 4.28.4.3B.
Thermal aging, 1008 hours, Class 3, 125°C.	Conditioning stage.	GMW 3191, Section 4.21.
Heavy duty test, Class 3.	50°C maximum temperature rise.	GMW 3191, Section 4.24.
Thermal shock, Class 3, 300 cycles.	No discontinuities of 1 microsecond or longer duration. 7 milliohms maximum resistance.	GMW 3191, Section 4.22.
Temperature/humidity cycling, Class 3.	Conditioning stage.	GMW 3191, Section 4.23.
Terminal to connector insertion.	30 N maximum.	GMW 3191, Section 4.7.
Terminal from connector extraction.	100 N minimum.	GMW 3191, Section 4.9.
Moisture conditioning, 95 to 98% RH at 40°C for 6 hours.	Conditioning stage.	GMW 3191, Section 4.9.
Connector to connector engagement force.	75 N maximum.	GMW 3191, Section 4.11.
Locked connector disengagement force.	100 N minimum.	GMW 3191, Section 4.13.
Unlocked connector disengagement force.	100 N maximum.	GMW 3191, Section 4.14.
Force to disengage primary lock.	100 N maximum.	GMW 3191, Section 4.14.
Connector polarization effectiveness.	Three times connector insertion force without damage.	GMW 3191, Section 4.15.
Isolation resistance, circuit to circuit and each circuit to shield.	100 megohms minimum at 1000 volts DC.	GMW 3191, Section 4.19.
Fluid resistance.	Conditioning stage.	GMW 3191, Section 4.32.
Corrosion.	Conditioning stage.	GMW 3191, Section 4.26.
Dielectric strength, circuits to circuits and circuits to shield.	No breakdown at 2500 volts DC.	GMW 3191, Section 4.20.

Test Description	Requirement	Procedure
Pressure/vacuum leak, initial.	No leaks at 7 psi.	GMW 3191, Section 4.30.
Pressure/vacuum leak, post exposure.	No leaks at 4 psi.	GMW 3191, Section 4.30.
Submersion.	Conditioning stage.	GMW 3191, Section 4.29.
High pressure spray.	Conditioning stage.	GMW 3191, Section 4.31.
Crush test, elbow load.	No defects.	GMW 3172, Section 9.3.6.
Free fall.	No defects. Drop from 1 m.	GMW 3172, Section 9.3.11.
Unmating force, primary lock engaged.	USCAR-2, Section 5.4.1.4. 75 N. maximum.	USCAR-2, Section 5.4.2.

Figure 2 (end)

3.6. Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Test Sequence (b)														
Visual inspection	1,11,15	1,8	1,8	1,8	1,8	1,3	1,3	1,3	1,3	1,4	1,4	1,4	1,4	1,4	1,4
Connector cycling	2	2	2	2	2										
Dry circuit resistance, terminals	3,6,9,13	3,6	3,6	3,6	3,6										
Dry circuit resistance, shield	4,7,10,14	4,7	4,7	4,7	4,7										
Mechanical shock	5,12														
Vibration with thermal cycling, Body Profile, Temperature Class 3	8														
Thermal aging, 1008 hours, Class 3, 125°C		5										2	2		
Heavy duty test, Class 3			5												
Thermal shock, Class 3, 300 cycles				5											
Temperature/humidity cycling, Class 3					5									2	2
Terminal to connector insertion						2	2								
Terminal from connector extraction								2	2	3	3	3	3	3	3
Moisture conditioning, 95 to 98% RH at 40°C for 6 hours										2	2				
Connector to connector engagement force															
Locked connector disengagement force															
Unlocked connector disengagement force															
Force to disengage primary lock															
Connector polarization effectiveness															
Isolation resistance, circuit to circuit and each circuit to shield															
Fluid resistance															
Corrosion															
Dielectric strength, circuits to circuits and circuits to shield															
Pressure/vacuum leak, initial															
Pressure/vacuum leak, post exposure															
Submersion															
High pressure spray															
Crush test, elbow load															
Free fall															
Unmating force, primary lock engaged															

Figure 3 (continued)

Test or Examination	Test Group (a)													
	16	17	18	19	20	21	22	23	24	25	26	27	28	29
	Test Sequence (b)													
Visual inspection	1,3	1,3	1,4	1,3	1,5	1,7	1,11,15	1,11,15	1,11,15	1,3	1,3	1,3	1,3	1,3
Connector cycling					2	2	2	2	2					
Dry circuit resistance, terminals														
Dry circuit resistance, shield														
Mechanical shock														
Vibration with thermal cycling, Body Profile, Temperature Class 3														
Thermal aging, 1008 hours, Class 3, 125°C							6							
Heavy duty test, Class 3														
Thermal shock, Class 3, 300 cycles								6						
Temperature/humidity cycling, Class 3									6					
Terminal to connector insertion														
Terminal from connector extraction					6	8								
Moisture conditioning, 95 to 98% RH at 40°C for 6 hours														
Connector to connector engagement force	2													
Locked connector disengagement force		2												
Unlocked connector disengagement force			2											
Force to disengage primary lock			3											
Connector polarization effectiveness				2										
Isolation resistance, circuit to circuit and each circuit to shield					3	3,5	3,5,8,10,13	3,5,8,10,13	3,5,8,10,13					
Fluid resistance					4									
Corrosion						4								
Dielectric strength, circuits to circuits and circuits to shield						6	14	14	14					
Pressure/vacuum leak, initial							4	4	4					
Pressure/vacuum leak, post exposure							7	7	7					
Submersion							9	9	9					
High pressure spray							12	12	12					
Crush test, elbow load										2				
Free fall											2	2		
Unmating force, primary lock engaged													2	2

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

Figure 3 (end)

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#### 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 groups 1, 2, 4, 5, 16, 17, 18, 21, 22, 23 and 24 shall consist of 10 plugs and 10 headers.
- Test groups 3, 19 and 25 shall consist of 3 plugs and 3 headers.
- Test group 6 shall consist of 12 terminals and 4 inner housings.
- Test group 7 shall consist of 12 terminals and 4 headers.
- Test groups 8, 10, 12 and 14 shall consist of 9 terminals and 6 inner housings.
- Test groups 9, 11, 13 and 15 shall consist of 9 terminals and 6 headers.
- Test group 20 shall consist of 18 plugs and 18 headers.
- Test group 26 shall consist of 3 plugs.
- Test group 27 shall consist of 3 headers.
- Test groups 28 and 29 shall consist of 5 outer housing sub-assemblies and 5 shipping caps.

###### 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 2. 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.

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<u>LTR</u>	<u>REVISION RECORD</u>	<u>DWN</u>	<u>APP</u>	<u>DATE</u>
C	Removed 408-10268 spec number under section 2.3  Added Reference drawing PNs "C-2103197" & "C-2359673" under Section 2.3	Praveen HM	S. Revankar A. Herrmann Y. Soonavala	15-JUN-2020