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## AMPSEAL 16 Hybrid Mini-Lever Connector System

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### 1. SCOPE

#### 1.1 Content

This specification covers performance, tests and quality requirements for the AMPSEAL 16 Mini-Lever 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

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 reference documents, this specification shall take precedence.

#### 2.1 TE Documents

114-151063 Application Specification AMPSEAL 16 Mini-Lever Connector System  
501-151063 Qualification Test Report for AMPSEAL 16 Mini-Lever Connector System

#### 2.2 Industry Documents

EIA-364 Electrical Connector/Socket Test Procedures  
SAE J2030 Heavy Duty Electrical Connector Performance Standard  
USCAR-2 Performance Specifications for Automotive Electrical Connector Systems

### 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: 550 volts DC
- 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
Initial examination of product	Meets requirements of product drawing	SAE J2030 6.1
<b>ELECTRICAL</b>		
Insulation Resistance	20 megaohms minimum	SAE J2030, 6.3 1000 VDC Test between adjacent contacts.
Low Voltage Resistance Dry Circuit	6.7 milliohm max	SAE J2030, 6.2 Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage. Subtract bulk resistance of Equal Wire Length
Connection Resistance Voltage Drop	100 Millivolts Max Voltage Drop	SAE J2030, 6.4 Measurements taken after thermal equilibrium is reached at current levels shown. Subtract bulk resistance of Equal Wire Length. Wire Size Test Current (AWG) (Amperes) 12 25 14 10 16 7.5
<b>MECHANICAL</b>		
Connector Mating Forces	16 Position 200N max 24 Position 135N max	USCAR2-6 5.4.3
Connector Unmating Forces	16 Position 120N max 24 Position 160N max	USCAR2-6 5.4.3
Terminal Retention	Method A Contacts shall not dislodge AMPSEAL 16  Method C Deutsch Size 20 – 60N Min Deutsch Size 12 – 134N Min	EIA 364-29C Method A – Apply an axial load of 111 N to the contacts for 6 seconds  Method C – Pull to failure
Polarization	178N minimum force without damage  See Note	SAE J2030 6.21 Attempt to incorrectly mate two connector halves Attempt to mate a connector with an incorrect mate
Temperature Life with Terminal Retention	Deutsch Size 20 AMPSEAL 16 Deutsch Size 12	SAE J2030 6.7, EIA 364-29C Method A – Apply an axial load of 111 N to the contacts for 6 seconds
Durability	See Note	SAE J2030, 6.11 The connector shall be mated and unmated for a total of 50 complete cycles
Vibration	No discontinuities of 1 microsecond or longer duration. See Note.	EIA 364-28F 10 Gs between 10 to 500 Hz with 1 octave minimum sweep rate. Sixteen hours in 3 mutually perpendicular planes.

Figure 1

Test Description	Requirement	Procedure
<b>ENVIRONMENTAL</b>		
IP 6K7	Dust – No Ingress of dust Immersion – No ingress of water	ISO 20653 Dust – One cycle shall be 6 seconds of dust movement, 15-minute break for 20 cycles. Immersion – 1-meter immersion for 30 minutes
IP 6K9K	Dust – No Ingress of dust High Pressure Spray – No ingress of water	ISO 20653 Dust – One cycle shall be 6 seconds of dust movement, 15-minute break for 20 cycles. High Pressure Spray – Fan jet nozzle, 0°, 30°, 60°, 90° 30 seconds per position
Fluid Immersion	No material degradation Successful remate of connector assemblies	SAE J2030, 6.14 Subject each mated connector to one fluid only. Submerge mated sample for 5 minutes in the fluid and allow to air dry for 24 hours. Repeat for a total of 5 cycles. Following fluids shall be used: 1. Motor oil 30 wt at 85°C 2. Brake fluid at 85°C 3. Diesel fuel at 60°C 4. 50/50 antifreeze mixture at 85°C 5. Roundup Original at 23°C 6. Gear oil 90 wt at 85°C 7. Aqueous Urea at 23°C
Pressure Wash	See Note	SAE J2030, 6.5 Subject specimens to spray for 3 seconds of a 6 second cycle for a total of 375 cycles from a distance of 20 to 30 cm. Water pressure approximately 7000 kPa gage with a flow rate of 9.46 liters per minute and a temperature of 40°C. No detergent.
Thermal Shock	See Note	SAE J2030, 6.12 Subject mated connectors to 10 cycles between -55 and 125°C with 2 hour dwells at temperature extremes. Two min max transition time.
Temperature Life	See Note	SAE J2030, 6.7 Subject mated connectors to 125°C± 3°C for 500 hours.

**Figure 1 (cont.)**

Test Description	Requirement	Procedure
Pressure/Vacuum Leak	48 kPa (7 psig), Initial 28 kPa (4 psig), Final	USCAR-2 Rev 6 5.6.6 Completely submerge the samples into a container of room temperature salt water solution prepared using tap water and 15-16 grams of table salt per liter. Slowly increase the air pressure of the regulated pressure source until the gage reads the required pressure. Observe samples for 15 seconds and verify that there are no bubbles. Switch the regulated source from pressure to vacuum and slowly apply the required vacuum to the samples for 15 seconds. Remove the samples from the salt water solution, shake off excess fluids and then carefully dry all exterior surfaces of the sample.
Final examination of product	Meets visual requirements	SAE J2030 6.27

**NOTE**

*Shall meet visual requirements, show no physical damage and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence shown in Figures 2, 3 and 4*

**Figure 1 (end)**

**3.6 Product Qualification and Requalification Test Sequence**

Electrical Test Sequences		
Test or Examination	Test Group (a)	
	1	2
	Test Sequence (b)	
Initial Examination of Product	1,10	1,11
Low Voltage Resistance - Dry Circuit	2,5,8	
Connection Resistance - Voltage Drop	3,6,9	
Insulation Resistance		2,4,6,8,10
Thermal shock	4	
Random Vibration	7	
Pressure Wash		5
Temperature Life		7
Pressure Vacuum Leak		3,9

(a) See paragraph 4.1.A

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

**Figure 2**

Environmental Sealing Test Sequences				
Test or Examination	Test Group (a)			
	1	2	3	4
	Test Sequence (b)			
Initial Examination of Product	1,5	1,5	1,5	1,2
Insulation Resistance	2,4	2,4		
Maintance Aging			2	
IP 6K7	3			
IP 6K9K		3		
Fluid Immersion			3	
Pressure Wash - Flange Seal				3(c)
Unmate-Mate			4	

- (a) See paragraph 4.1.A
- (b) Numbers indicate sequence in which the tests are performed
- (c) Sequence tests the integrity of the flange seal, sealing between the cap assembly and the panel.

**Figure 3**

Mechanical Test Sequences				
Test or Examination	Test Group (a)			
	1	2	3	4
	Test Sequence (b)			
Initial Examination of Product	1,4	1,4	1,2	1,11
Low Voltage Resistance - Dry Circuit				2,5,8
Connection Resistance - Voltage Drop				3,6,9
Mating Forces	2			
Unmating Forces	3			
Terminal Insertion		2		
Terminal Retention		3 (c)		10 (c)
Polarization			3	
Temperature Life				4
Durability				7

- (a) See paragraph 4.1.A
- (b) Numbers indicate sequence in which the tests are performed
- (c) All circuit cavities must be tested

**Figure 4**

**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. See Figures 5, 6, and 7 for sample quantities.

**Sample Quantities for Electrical Test Sequences**

Test Group	Plug Assembly	Cap Assembly	Mounting Clip	Wire (Size 20)	Wire (Size 16)	Wire (Size 12)	Mated Connector Quantity
1	2203882-1	2272889-1	-	16 TXL	14 TXL	10 TXL	12
2	2203882-1	2272889-1	-	22 TXL	20 TXL	14 GXL	8

**Figure 5**

**Sample Quantities for Environmental Test Sequences**

Test Group	Plug Assembly	Cap Assembly	Mounting Clip	Wire (Size 20)	Wire (Size 16)	Wire (Size 12)	Mated Connector Quantity
1	2203882-1	2272889-1	-	22 TXL	20 TXL	14 GXL	8
2	2203882-1	2272889-1	-	22 TXL	20 TXL	14 GXL	8
3	2203882-1	2272889-1	-	22 TXL	20 TXL	14 GXL	14
4	-	2272889-1	2203876-2	-	-	-	4

**Figure 6**

**Sample Quantities for Mechanical Test Sequences**

Test Group	Plug Assembly	Cap Assembly	Mounting Clip	Wire (Size 20)	Wire (Size 16)	Wire (Size 12)	Mated Connector Quantity
1	2203882-1	2272889-1	-		14 TXL	10 TXL	36
2	2203882-1	2272889-1	-	22 TXL	20 TXL	14 GXL	8
3	2203882-1	2272889-1	-	-	-	-	3
4	2203882-1	2272889-1	-				4

**Figure 7**

B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figures 2, 3, and 4.

4.2. Requalification Testing

If changes significantly affecting form, fit or functions 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 parts can be resubmitted.

#### 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.

### 5. SETUP FIGURES

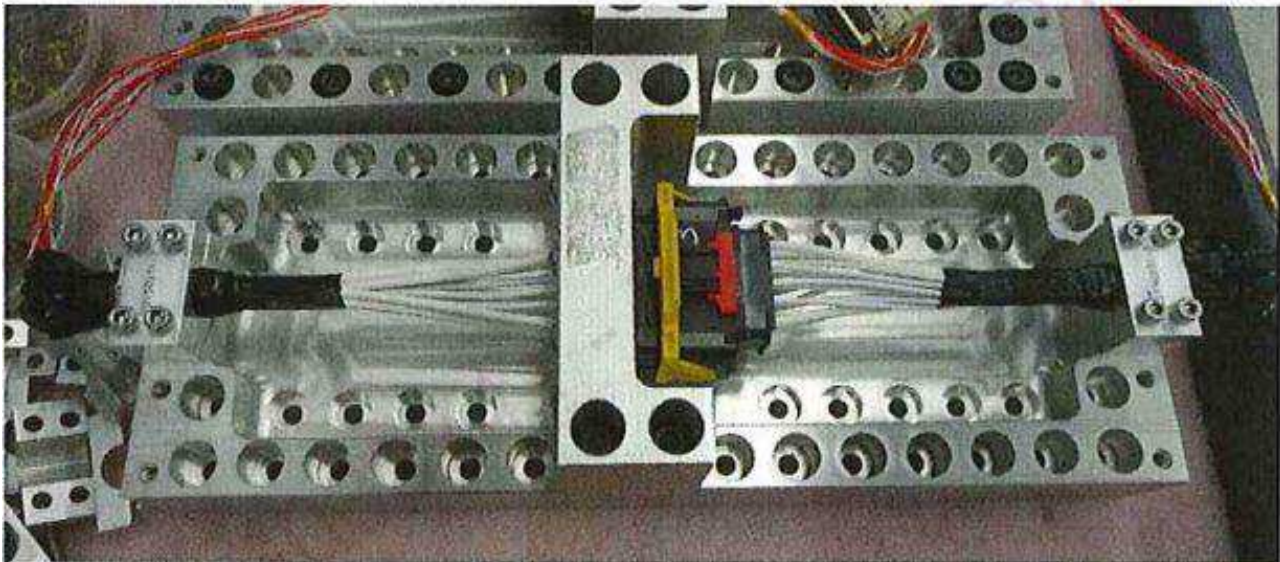


Figure 8. Vibration Base Setup

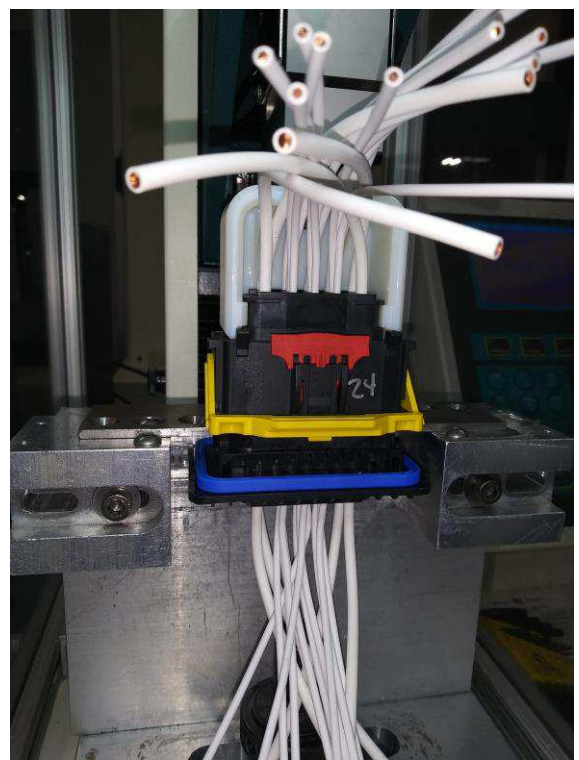




**Figure 9. High Pressure Spray**

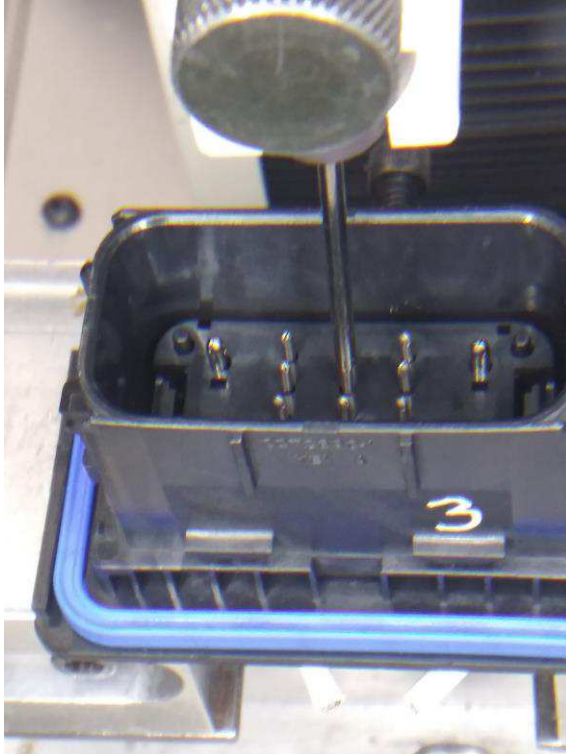


**Figure 10. Connector Mating**

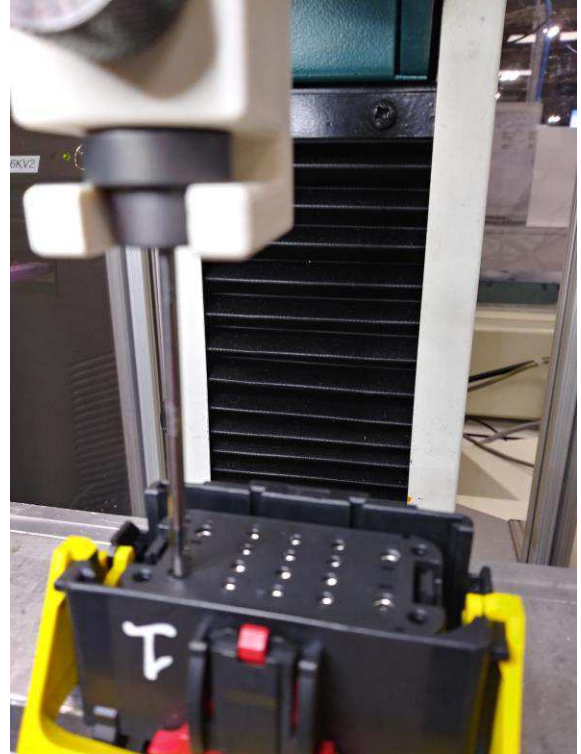


**Figure 11. Connector Unmating**

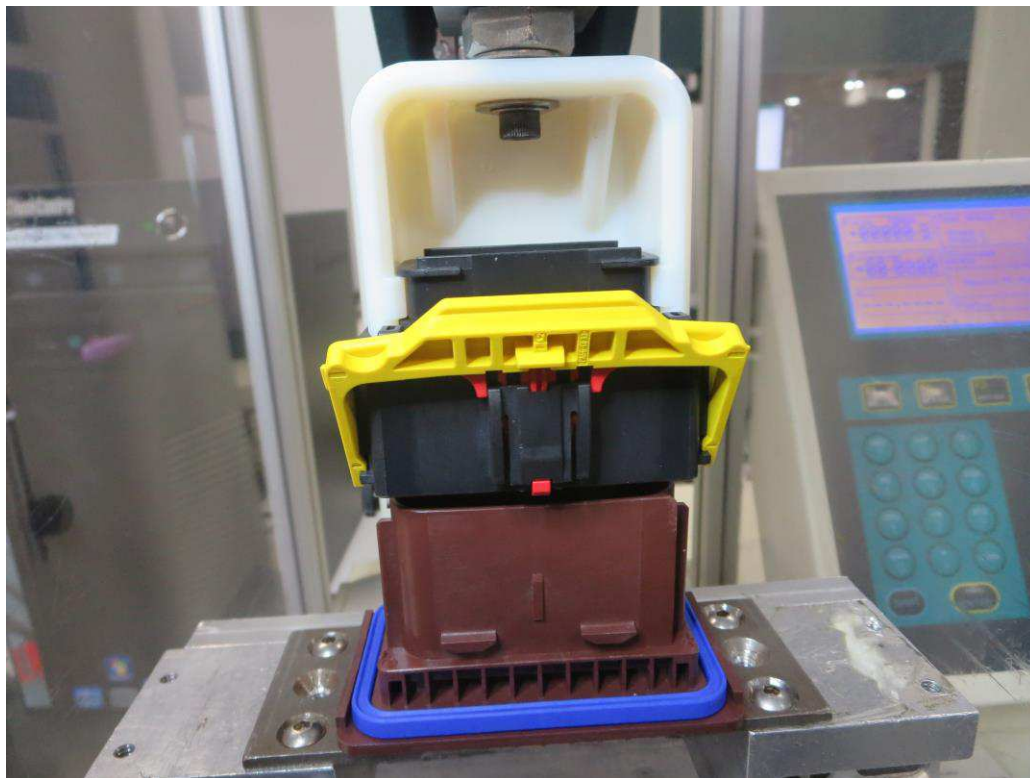




**Figure 12. Pin Retention**



**Figure 13. Socket Retention**



**Figure 14. Polarization**