AMPSEAL 16* hybrid lever Connector System

1. SCOPE

1.1. Content

This specification covers performance, tests and quality requirements for the AMPSEAL 16 hybrid 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 referenced documents, this specification shall take precedence.

2.1. TE Documents

114-32117: Application Specification AMPSEAL 16 hybrid lever Connector System

501-32026: Qualification Test Report for AMPSEAL 16 hybrid lever Connector System

2.2. Industry Document

EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications

SAE J2030: Heavy Duty Electrical Connector Performance Standard

2.3. Reference Document

109-197: Test Specification (TE Test Specifications vs. EIA and IEC Test Methods)

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: -55 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
ELECTRICAL		
Low-Voltage Resistance	9 milliohms maximum	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	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 (AWG) / Test Current (Amperes) 10 / 25 14 / 13 20 / 05
Insulation resistance	20 megohms minimum.	SAE J2030, 6.3 1000 VDC Test between adjacent contacts.
Withstanding voltage	One minute hold with no breakdown or flashover.	EIA-364-20, Condition I. 2100 volts DC at sea level. Test between adjacent contacts.
MECHANICAL		
Random vibration	No discontinuities of 1 microsecond or longer duration. See Note.	EIA-364-28, Test Condition V, Condition Letter A Subject mated specimens to 5.35 G's rms between 20 to 2000 Hz. Eight hours in each of 3 mutually perpendicular planes.
Durability	See Note.	SAE J2030, 6.11 The connector shall be mated and unmated for a total of 50 complete cycles
Terminal Retention	Contacts shall not dislodge.	IEC 512-8, Test 15a Apply an axial load of 111 N to the contacts at a maximum rate of 10 N per second (or 25 mm per minute). See Figures 1 and 2

Figure 1 (cont'd)

Test Description	Requirement	Procedure
Mating Forces	90 N Max	USCAR-2, 5.4.3
Un-mating Forces	90 N Max	USCAR-2, 5.4.3
Maintenance Aging	See Note	SAE J2030, 6.6 Subject at least 10% or 3 circuit cavities (whichever is higher) to ten cycles of inserting and removing its respective terminal. Durability is not performed as part of Maintenance Aging.
Connector Retention	See Note	SAE J2030, 6.20 Apply an axial force of 444 N to the mated connector pair for 30 seconds.
Mismating	See Note	SAE J2030, 6.21 Attempt to mate connector against polarizing or keying feature. Apply an axial force of 178 N min.
ENVIRONMENTAL		
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. 2 min max transition time.
Humidity/Temperature cycling	See Note.	EIA-364-31, Method III. Subject mated connectors to 10 cycles (10 days) between 25 and 65°C at 80 to 100% RH. Optional cold shock and vibration not performed.
Temperature life	See Note.	SAE J2030, 6.7 Subject mated connectors to 125°C± 3°C for 500 hours.
Salt Fog	See Note.	SAE J2030, 6.12 Subject the fully mated connectors to a fine mist of 5% by weight salt solution for 96 hours at 35°C±3°C

Figure 1 (cont'd)

Test Description	Requirement	Procedure
Fluid Immersion	See Note.	SAE J2030, 6.14 Subject each mated connector to one fluid only. Submerge the mated sample to 5 cycles of a 5 minute dip in the fluid at the specified temperature then remove and allow to air dry for 24 hours. 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 Washing	See Note.	SAE J2030, 6.5 Subject specimens to spray for 3 seconds of a 6 second period for a total of 375 cycles from a distance of 20 to 30 cm. Source of pressure approximately 7000 kPa gage with a flow rate of 9.46 liters per minute and a temperature of 40 °C. No detergent.
Pressure/Vacuum Leak	48 kPa, Initial 28 kPa, Final	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.
Sealing Pressure	35 kPa , Initial 35 kPa, Final	EIA-364-2 Subject the specimens to an external pressure specified for 30 minutes. No bubbles after the first 15 minutes
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)

3.5. Product Qualification and Requalification Test Sequence

Mechanical Test Sequences

Test or Examination	Test Group (a)				
	1	2	3	4	5
	Test Sequence (b)				
Initial Examination of Product	1	1	1	1	1
Durability	4	2	2	2	2
Terminal Retention		6 (c)	7(c)	6(c)	
Mating Forces	2,5				
Un-mating Forces	3,6		5		
Maintenance Aging		7(d)	8(d)	7(d)	
Connector Retention		4	4	4	4
Mismating		5	6	5	5
Thermal Shock		3			
Humidity/Temperature Cycling			3		
Temperature Life				3	
Fluid Immersion					3
Final Examination of Product	7	8	9	8	6

(a) See Paragraph 4.1.A.
(b) Numbers indicate sequence in which tests are performed.
(c) All circuit cavities must be tested.
(d) Maintenance Aging performed on samples not used for Terminal Retention testing.

Figure 2

Environmental Sealing Test Sequences

Test or Examination	Test Group (a)					
	1(c)	2(c)	3(c)	4(d)	5(d)	6(d)
	Test Sequence (b)					
Initial Examination of Product	1	1	1	1	1	1
Insulation Resistance	2,4,6,9,11	2,4,6,10,12				
Random Vibration		8(e)			5(e)	
Thermal Shock		7			4	
Temperature Life	7			6		
Fluid Immersion			3			3
Pressure Washing	5,10	5,11		4,9	2,6	
Pressure/Vacuum Leak	3,8	3,9		2,7		2,4
Sealing Pressure			2,4			
Final Examination of Product	12	13	5	3,5,8,10	3,7	5

(a) See Paragraph 4.1.A.
(b) Numbers indicate sequence in which tests are performed.
(c) Test sequence tests integrity of the mat seal (sealing to the wires) and the peripheral seal (sealing between connector halves)
(d) Test sequence tests integrity of the flange seal (sealing between the cap assembly and the panel). Wire bundle length limited to 25 mm max for this sequence.
(e) Discontinuities not monitored.

Figure 3

Electrical Test Sequences

Test or Examination	Test Group (a)				
	1	2	3	4	5
	Test Sequence (b)				
Initial Examination of Product	1	1	1	1	1
Low-Voltage Resistance	2,6 (c)	2,5	2,5		2,7
Connection Resistance	3,7 (c)	3,6	3,6		3,8
Withstanding Voltage				2,6	
Random Vibration	5 (d)				
Durability				3	
Maintenance Aging					4(g)
Thermal Shock	4 (e)			4	
Humidity/Temperature Cycling		4(f)		5	
Temperature Life			4(f)		5
Salt Fog					6
Final Examination of Product	8	7	7	7	9

(a) See Paragraph 4.1.A.
(b) Numbers indicate sequence in which tests are performed.
(c) Measurements taken on at least 75% of the size 12 terminal circuits and at least 25% of the size 16 terminal circuits
(d) Discontinuities monitored on at least 25% of the size 12 terminal circuits and at least 25% of the size 16 terminal circuits.
(e) Samples mounted on a 5 mm plate using the mounting clip before Thermal Shock and remain mounted for the remainder of the test sequence.
(f) Precondition samples with 10 durability cycles.
(g) All circuit cavities subject to Maintenance Aging across the samples.

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 Mechanical Test Sequences

Test Group	Plug Assembly	Cap Assembly	Mounting Clip	Wire Cover	Wire (Size 16)	Wire (Size 12)	Mated Connector Quantity	Comments
1	2138839-X	2138846-X	—	—	14 TXL	10 TXL	5	Max Wire
2	2138839-X	2138846-X	—	—	14 TXL	10 TXL	6	Max Wire
3	2138839-X	2138846-X	—	—	14 TXL	10 TXL	6	Max Wire
4	2138839-X	2138846-X	—	—	14 TXL	10 TXL	6	Max Wire
5	2138839-X	2138846-X	—	—	14 TXL	10 TXL	7	Max Wire

Figure 5

Sample Quantities for Environmental Sealing Test Sequences

Test Group	Plug Assembly	Cap Assembly	Mounting Clip	Wire Cover	Wire (Size 16)	Wire (Size 12)	Mated Connector Quantity	Comments
1	2138839-X	2138846-X	—	2138853-1	20 TXL	14 GXL	5	Min Wire
2	2138839-X	2138846-X	2138852-X	2138853-1	14 TXL/20 TXL	10 TXL/14 GXL	3/3	Max/Min Wire
3	2138839-X	2138846-X	—	2138853-1	14 TXL/20 TXL	10 TXL/14 GXL	7/7	Max/Min Wire
4	2138839-X	2138846-X	2138852-X	2138853-1	14 TXL	10 TXL	5	Max Wire
5	2138839-X	2138846-X	2138852-X	2138853-1	14 TXL	10 TXL	6	Max Wire
6	2138839-X	2138846-X	2138852-X	2138853-1	14 TXL	10 TXL	7	Max Wire

Figure 6

Sample Quantities for Electrical Test Sequences

Test Group	Plug Assembly	Cap Assembly	Mounting Clip	Wire Cover	Wire (Size 16)	Wire (Size 12)	Mated Connector Quantity	Comments
1	2138839-X	2138846-X	2138852-X	2138853-1	14 TXL	10 TXL	6	Max Wire
2	2138839-X	2138846-X	—	—	14 TXL	10 TXL	8	Max Wire
3	2138839-X	2138846-X	—	—	14 TXL	10 TXL	8	Max Wire
4	2138839-X	2138846-X	—	2138853-1	14 TXL	10 TXL	5	Max Wire
5	2138839-X	2138846-X	—	2138853-1	20 TXL	14 GXL	8	Min Wire

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

Vibration Base Setup with Wire Bundle Clamped

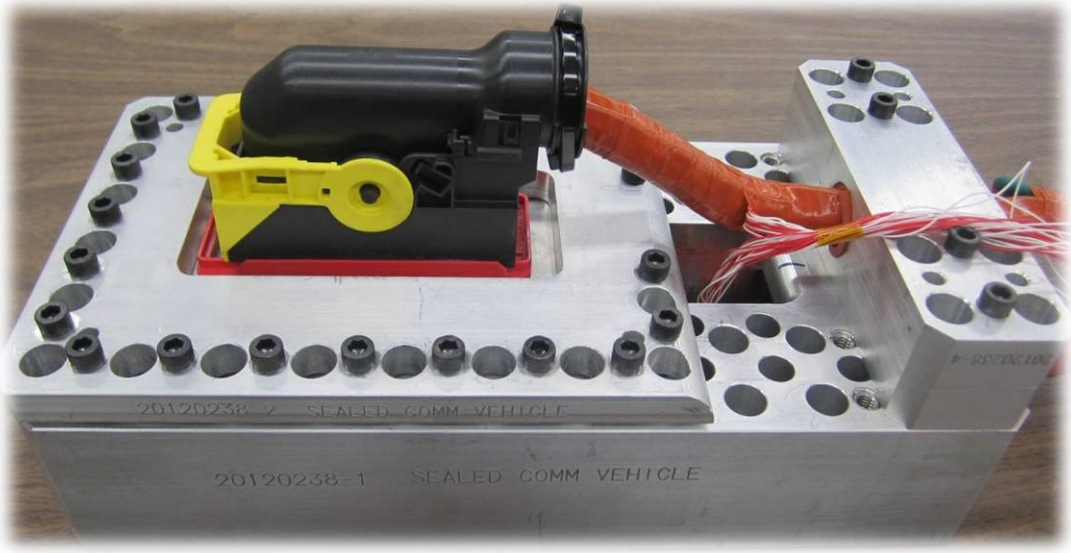

Figure 8

Vibration Setup without Wire Bundle

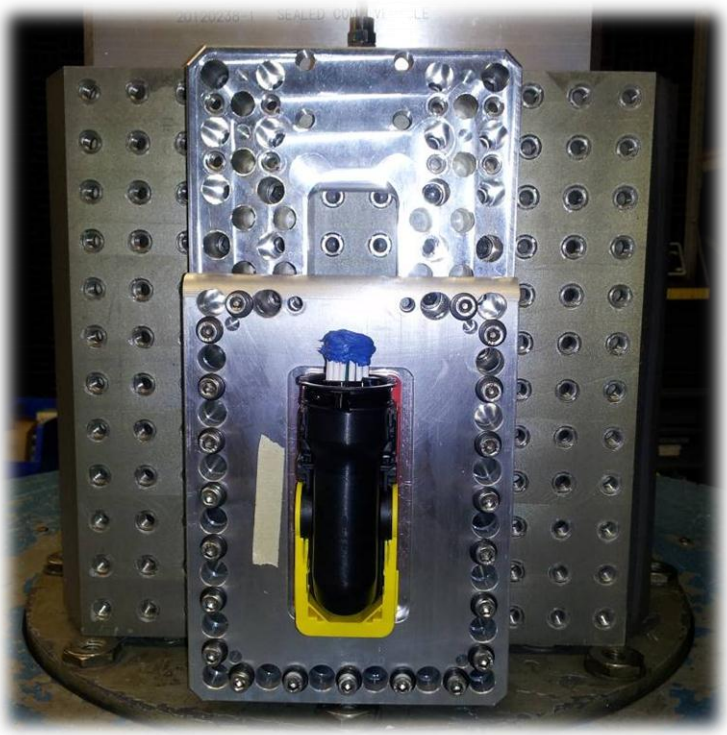

Figure 9

Samples Mounted to Vibration Cube

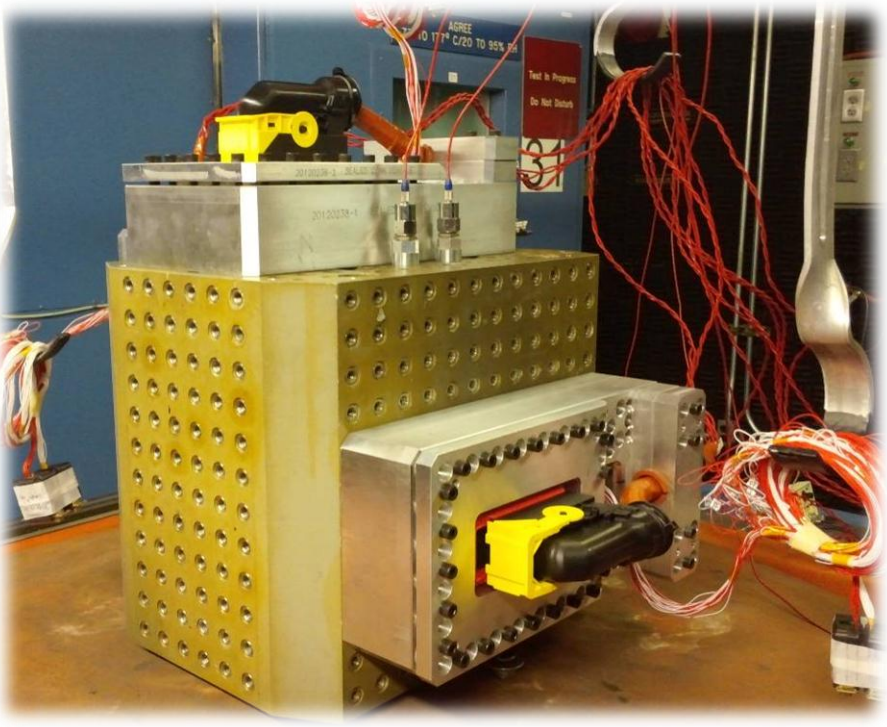

Figure 10

Plug Assembly, Terminal Retention Setup

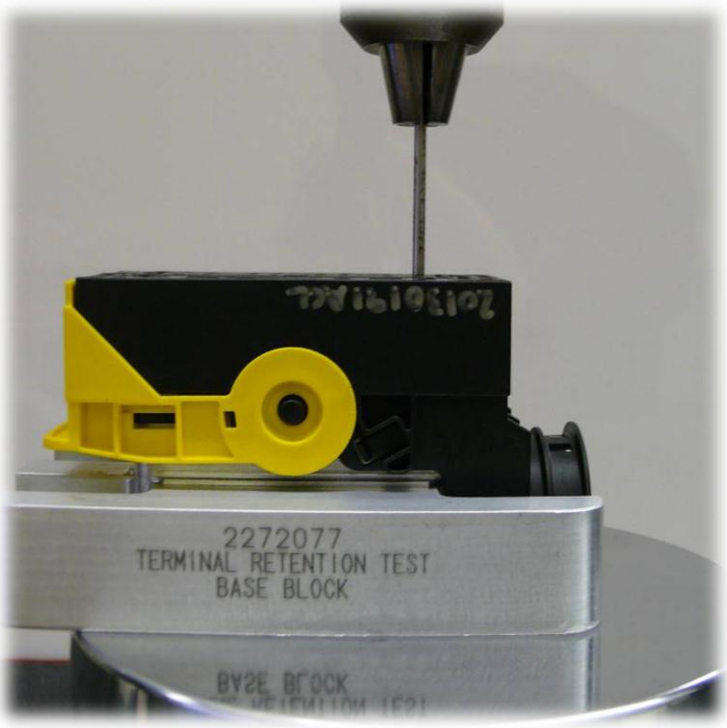

Figure 11

Cap Assembly, Terminal Retention Setup

Figure 12

Mating Force Setup, Measurement Start Point

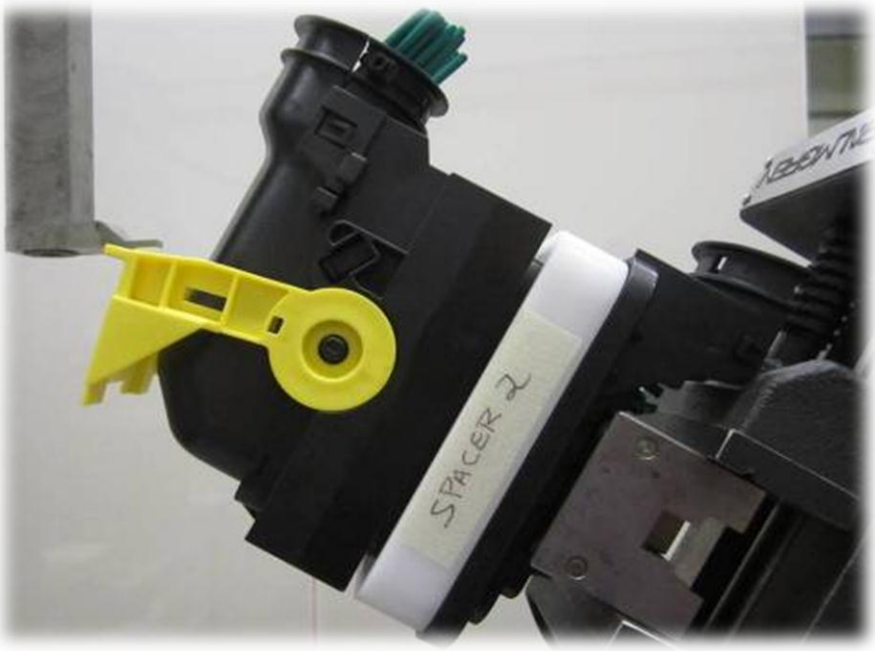

Figure 13

Mating Force Setup, Measurement End Point

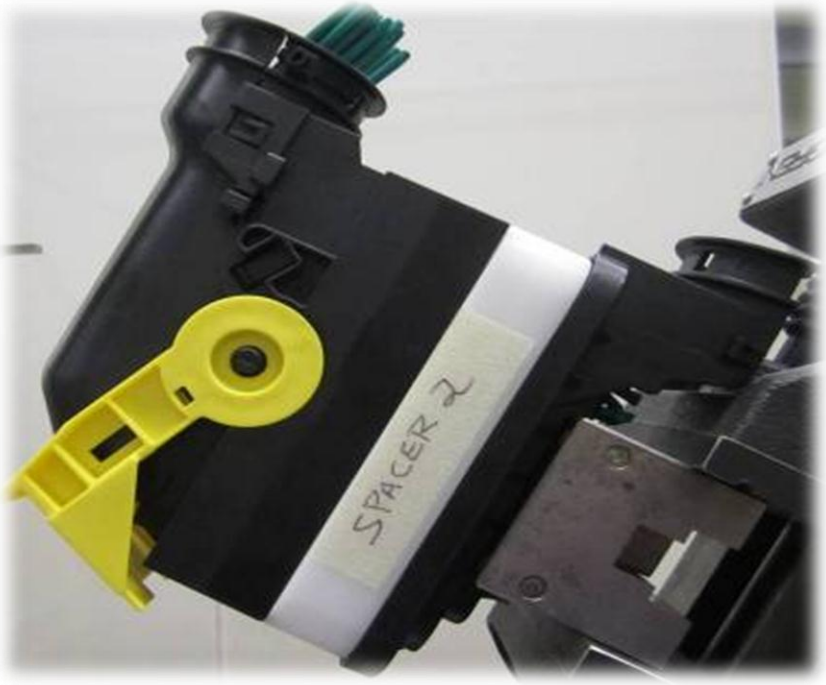

Figure 14

Un-Mating Force Setup, Measurement Start Point

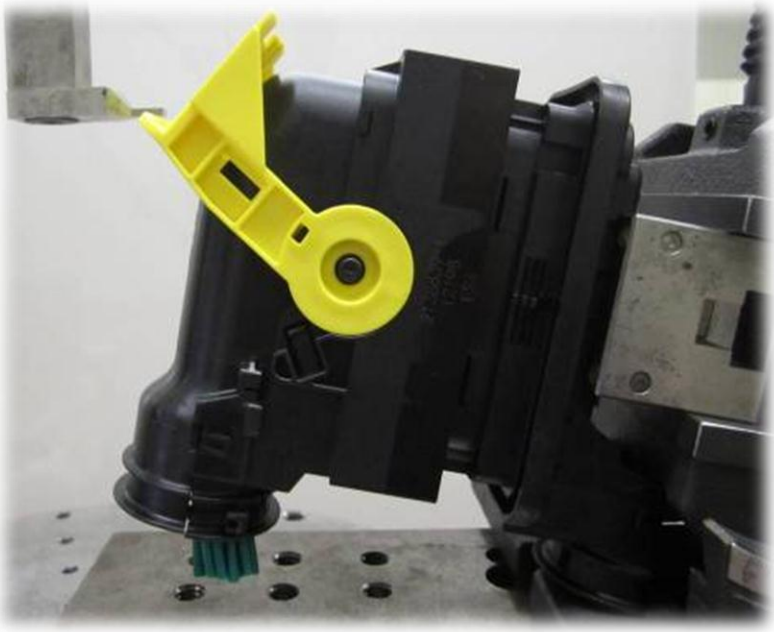

Figure 15

Connector Retention Test Setup

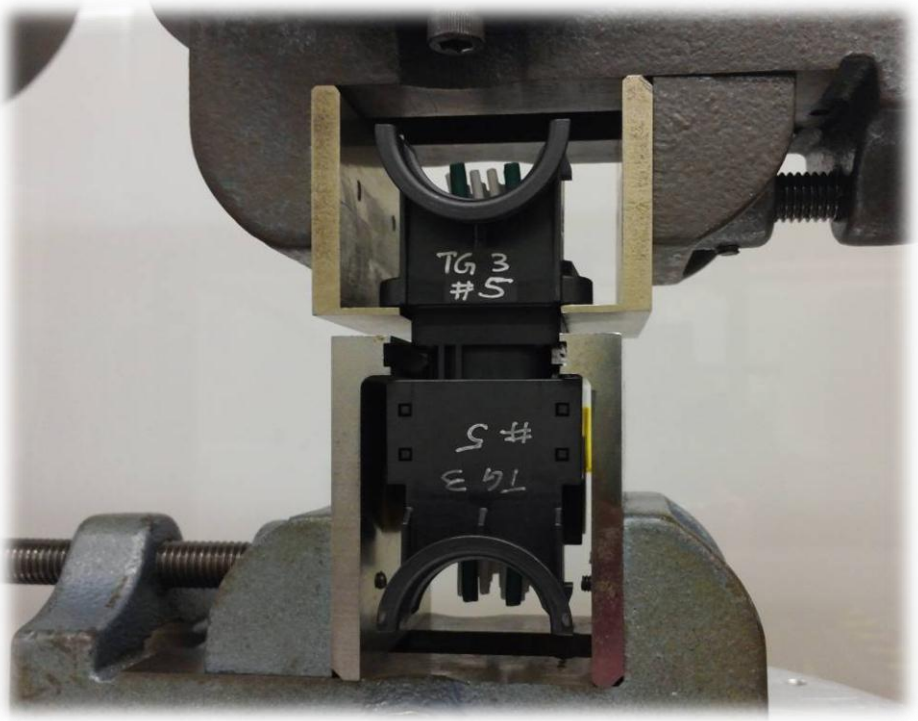

Figure 16

Mismating Test Setup

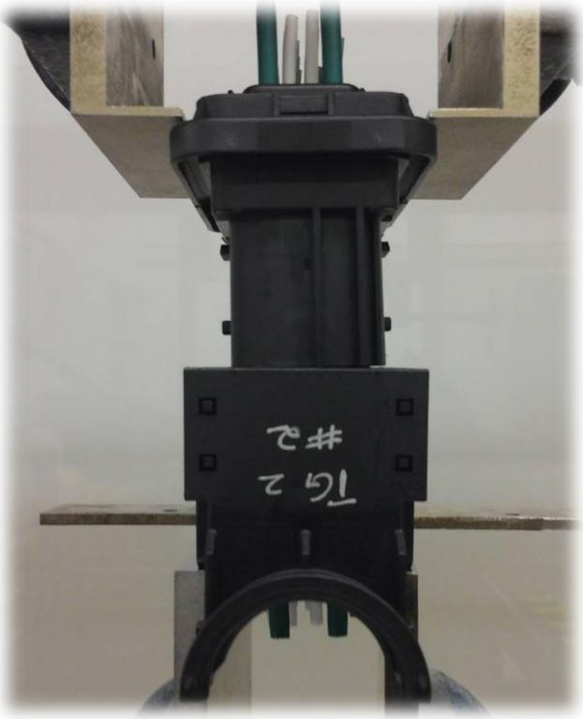

Figure 17

Flange Seal Test, Connector Mounted on Panel using Mounting Clip

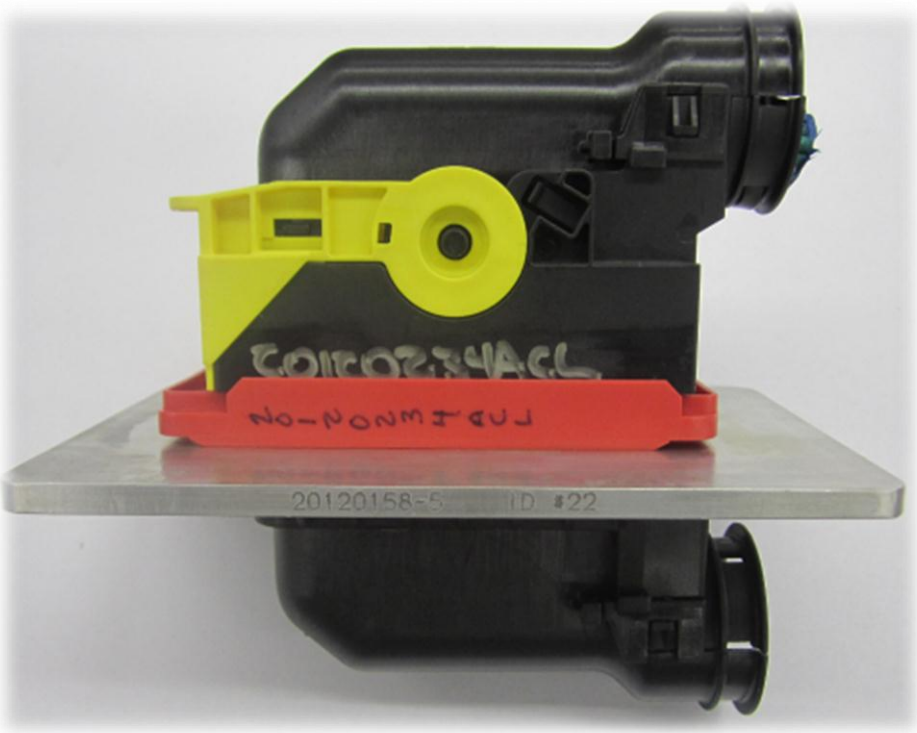

Figure 18

Flange Seal Test, Panel Along with Test Sample Placed on Test Fixture

Figure 19

Flange Seal Test, Panel Mechanically Sandwiched

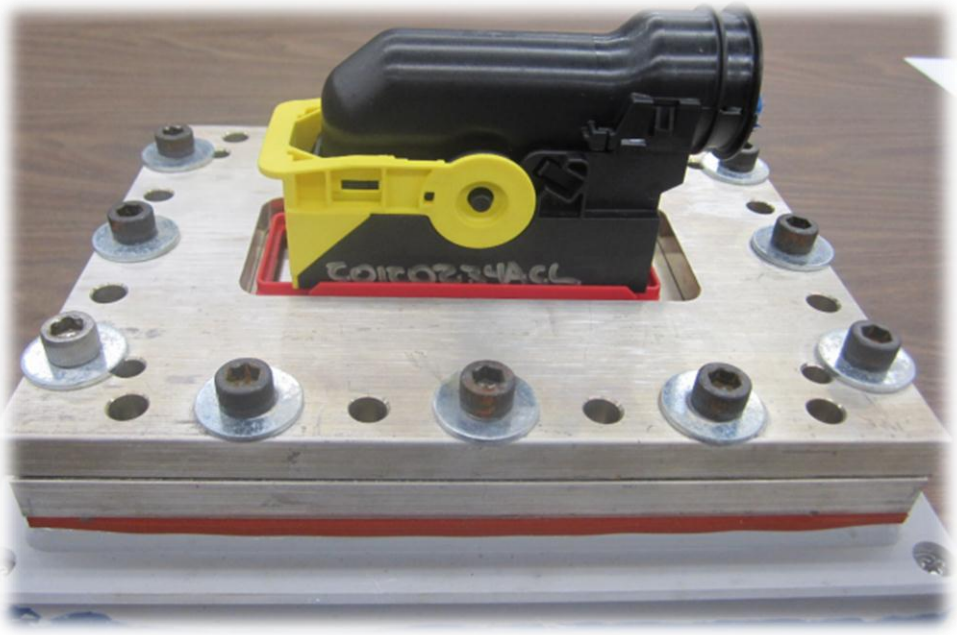

Figure 20