Sealed Sensor Connector System

1. SCOPE

1.1. Content

This specification covers performance, tests and quality requirements for the Tyco Electronics Sealed Sensor Connector (SSC) 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. Qualification Test Results

Successful qualification testing on the subject product line was completed in December of 2003. The Qualification Test Report number for this testing is 501-575. 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 Documents

501-575: Qualification Test Report

2.2. Commercial Standards

- SAE/USCAR-2 (Rev 8/97): Standard for Automotive Electrical Connection Systems
- SAE/USCAR-2 (Rev 3, 4/01): Performance Standard 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: 125 volts AC/DC
- Current: See Figure 4 for applicable current carrying capability
- Operating Temperature:
  - Nylon housings: -40 to 150°C
  - PBT housings: -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
	ELECTRICAL	
Dry circuit resistance.	$\leq$ 20 milliohms final for crimp and interface.	USCAR 5.3.1. (Rev 4/01) Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage. See Figure 3.
Voltage drop.	10 mV/ampere maximum.	USCAR 5.3.2. (Rev 4/01) Measure millivolt drop at maximum rated current. See Figure 3.
Isolation resistance.	> 20 megohms at 500 volts DC.	USCAR 5.3.6. (Rev 8/97) Test between adjacent contacts of mated specimens.
	MECHANICAL	
Vibration, random.	No discontinuities $\geq$ 7 ohms for more than 1 microsecond. See Note.	USCAR 5.4.5. (Rev 4/01) Subject mated specimens to vibration profile. See Figures 5 and 6.
Mechanical shock.	No discontinuities $\geq$ 7 ohms for more than 1 microsecond. See Note.	USCAR 5.4.5. (Rev 4/01) Subject mated specimens to 35 G's shock pulses of 10 to 20 milliseconds duration. 10 shocks in each direction applied along 3 mutually perpendicular planes, 60 total shocks. See Figure 5.
Engaging force (terminal-terminal).	18 Newtons maximum.	USCAR 5.2.1. (Rev 8/97) Measure force necessary to engage virgin contacts and tabs a distance of 5 mm from point of initial contact at a rate of 25 mm per minute. Repeat 9 times and record maximum force.

Figure 1 (cont)

Test Description	Requirement	Procedure
Disengaging force (terminal-terminal).	2.5 Newtons minimum.	USCAR 5.2.1. (Rev 8/97) Measure force necessary to separate virgin contacts from tabs at a rate of 25 mm per minute. Repeat 9 times and record minimum force.
Engaging force (terminal-connector).	15 Newtons maximum.	USCAR 5.3.1. (Rev 8/97) Measure force necessary to insert contact into housing at a rate of 25 mm per minute.
Engaging force (terminal-connector).	40 Newtons minimum without TPA. 90 Newtons minimum with TPA.	USCAR 5.3.1. (Rev 8/97) Measure force necessary to extract contact from housing at a rate of 25 mm per minute.
Engaging force (connector-connector).	90 Newtons maximum.	USCAR 5.3.2. (Rev 8/97) Measure force necessary to mate specimens at a maximum rate of 25 mm per minute.
Disengaging force (connector-connector).	90 Newtons maximum with latch disabled. 110 Newtons minimum with latch operational.	USCAR 5.3.2. (Rev 8/97) Measure force necessary to unmate 15 specimens with locking latch operational, and 15 specimens with locking latch non-operational at a maximum rate of 25 mm per minute.
Locking plate (TPA) engaging force.	Position / Newtons Minimum / Newtons Maximum 1 / 6 / 25 2 / 26 / 45 3,4,6,12 / 26 / 80	USCAR 5.3.3. (Rev 8/97) Measure force necessary to engage the locking plate at a rate of 25 mm per minute.
Locking plate (TPA) disengaging force.	Position / Newtons Minimum / Newtons Maximum 1 / 2 / 5 2,3 / 10 / 35 4,6 / 20 / 45 12 / 45 / 80	USCAR 5.3.3. (Rev 8/97) Measure force necessary to disengage the locking plate at a rate of 25 mm per minute.
Terminal bend resistance.	No bend > than 30 degrees permitted. Specimens shall not tear when straightened to original position.	USCAR 5.2.2. (Rev 8/97) Crimp test wire and contact and apply 12 Newtons force for 15 seconds. See Figure 7.
ENVIRONMENTAL		
Thermal shock.	See Note.	USCAR 5.6.1. (Rev 4/01) Subject mated specimens to 15 cycles between -40 and 125°C for PBT housings and 150°C for nylon housings. Two hour dwell at temperature extremes.

Figure 1 (cont)

Test Description	Requirement	Procedure
High temperature exposure.	See Note.	USCAR 5.6.3. (Rev 4/01) Subject mated specimens to temperature life at 125°C for PBT housings and 150°C for nylon housings for 1008 hours.
Humidity-temperature cycling.	See Note.	USCAR 5.6.2. (Rev 4/01) Subject mated specimens to 15 specified cycles. See Figure 8.
Immersion.	No evidence of leakage. See Note.	USCAR 5.3.15. (Rev 8/97) Subject mated specimens to the following procedure: 1. Temperature soak specimens for 2 hours at 125°C for PBT housings and 150°C for nylon housings. 2. Remove specimens from oven and immediately immerse in 25°C 5% salt solution for 2 hours. Measure dry circuit resistance. 3. Repeat procedure 4 more times.
Pressure/vacuum leak.	No evidence of leakage. See Note.	USCAR 5.3.16. (Rev 8/97) Subject mated specimens to the following procedure: 1. Immerse specimens in 25°C 5% salt solution and slowly pressurize to 48 kpa while observing for air bubbles. 2. Remove pressure and slowly apply 48 kpa of vacuum. 3. Unmate specimens and examine for leakage. 4. Temperature soak specimens for 72 hours at 125°C for PBT housings and 150°C for nylon housings. 5. Remove specimens and repeat steps 1 and 2 using 28 kpa.

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 Figure 2.*

Figure 1 (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
	Test Sequence (b)												
Dry circuit resistance						1,3,7	1,3,6	1,3,6	1,3,6				
Voltage drop						4,8	4,7	4,7	4,7				
Isolation resistance										1,4	1,3	1,3	1,3
Durability (10 cycles)						2	2	2	2				
Vibration (Profile)						5				2			
Mechanical shock						6				3			
Engaging force (terminal-terminal)	1												
Disengaging force (terminal-terminal)	2												
Insertion force (terminal-connector)			1										
Extraction force (terminal-connector)			2										
Mating force (connector-connector)				1									
Unmating force (connector-connector)				2									
Locking plate (TPA) engaging force					1								
Locking plate (TPA) disengaging force					2								
Terminal bend resistance		1											
Thermal shock							5				2		
High temperature exposure									5				2
Humidity-temperature cycling								5				2	
Immersion										5	4	4	4
Pressure/vacuum leak										6	5	5	5

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

Figure 2

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 and 3 shall each consist of 30 contact pairs. Test groups 4 and 5 shall consist of 30 connector assemblies. Test groups 6 through 13 shall each consist of 15 connector assemblies using the smallest applicable wire size.

B. Test Sequence

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

4.2. Requalification Testing

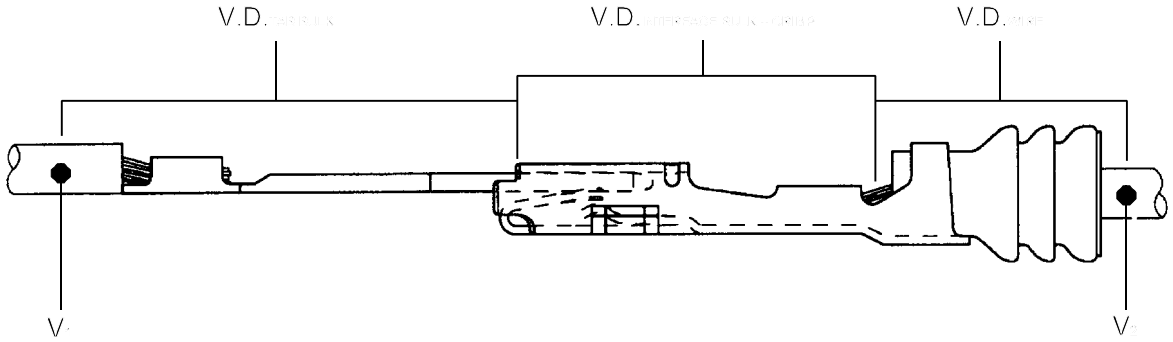
If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

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. When 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.



TOTAL VOLTAGE DROP (BETWEEN V_1 & V_2) = $V.D._{TAB\ BULK}$ + $V.D._{INTERFACE\ BULK\ CRIMP}$ + $V.D._{WIRE}$

PRIOR TO TESTING $V.D._{TAB\ BULK}$ AND $V.D._{WIRE}$ WILL BE DETERMINED

THEREFORE: $V.D._{INTERFACE\ BULK\ +\ CRIMP}$ = $V.D._{TOTAL}$ - $V.D._{TAB\ BULK}$ - $V.D._{WIRE}$

Figure 3
Termination Resistance & Voltage Drop Setup

Wire Size (AWG)	Rated Current (amperes)
20	10
18	11
16	13
14	17

Number of Positions	Reduction Coefficient
1	1
2 - 3	0.75
4 - 5	0.6
6 - 8	0.55
9 - 12	0.5

Figure 4
Current Rating

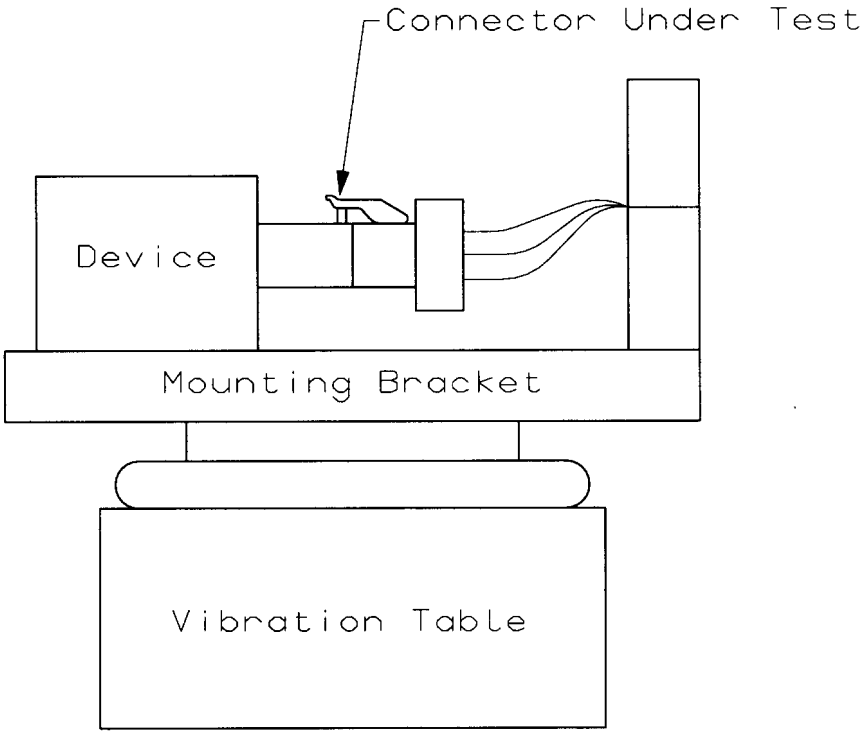


Figure 5
Vibration & Mechanical Shock Mounting Fixture

Breakpoint Frequency (Hz)	Magnitude (G^2/Hz)
60.0	0.00100
200.0	1.50000
210.0	0.10000
1000.0	0.10000

Total Spectral contend = 11.20 G(rms)

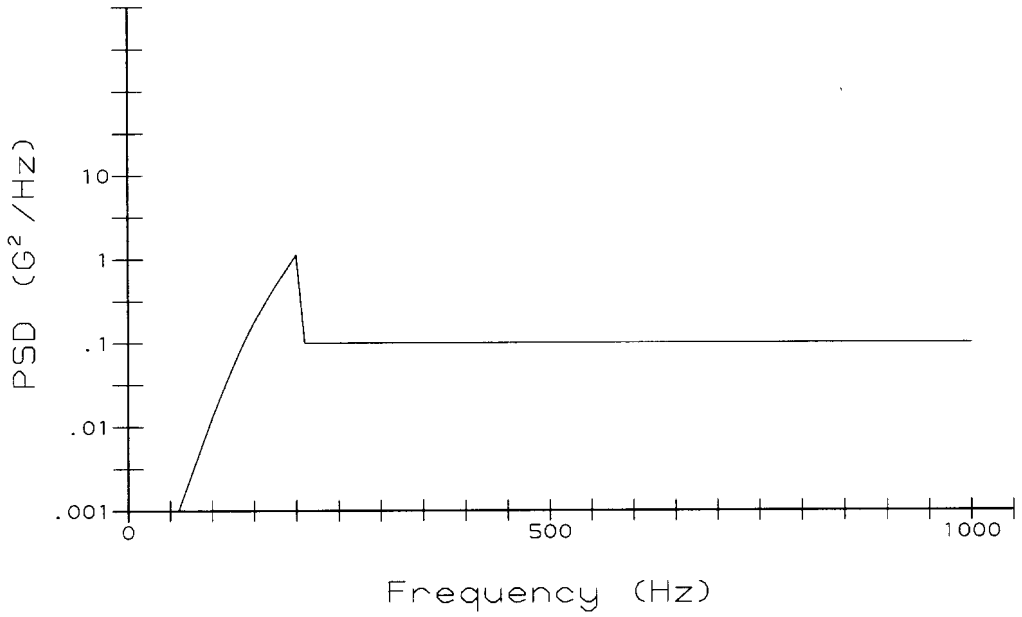


Figure 6
Vibration Profile

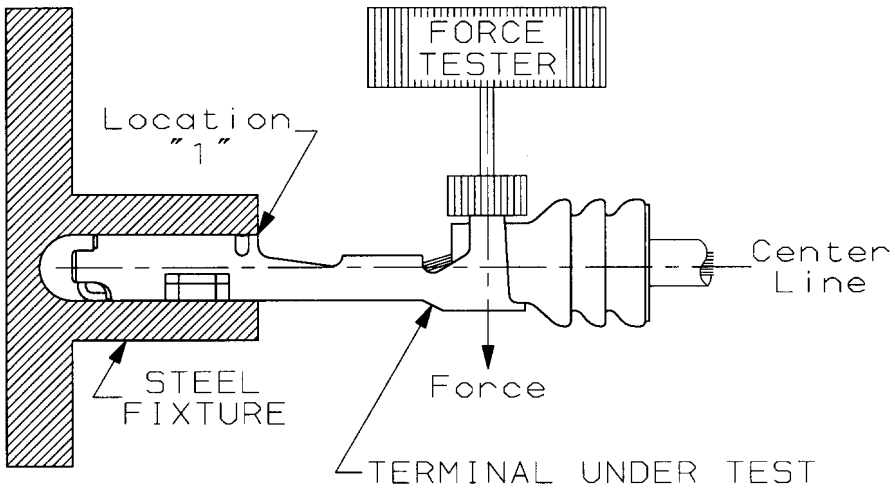


Figure 7
Contact Bend Fixture

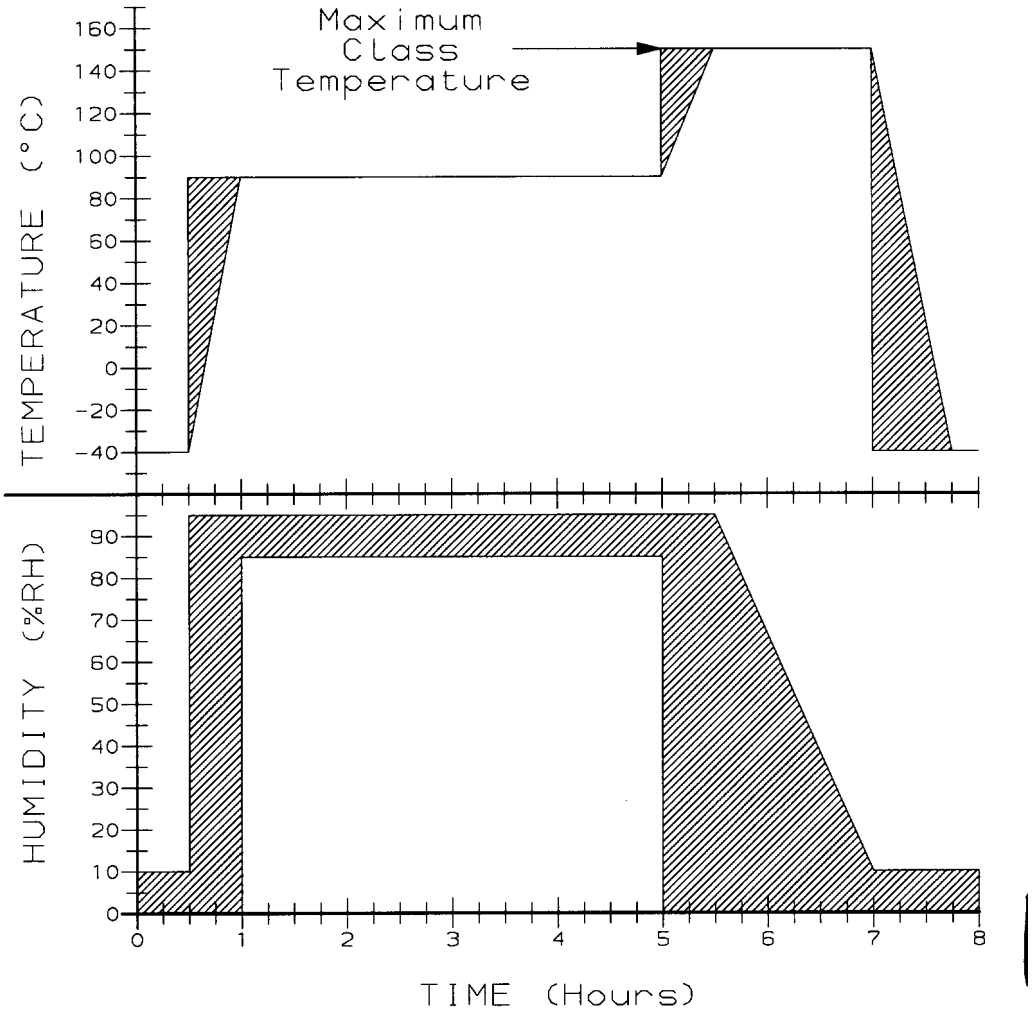


Figure 8
Humidity-Temperature Cycling Profile