1.5 mm and NG 1.5 mm Terminal Systems

1. SCOPE

1.1. Content

This specification covers performance, tests and quality requirements for the Tyco Electronics 1.5 mm and Next Generation (NG) 1.5 mm Terminal Systems.

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 January 2006. The Qualification Test Report number for this testing is 501-622. 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

- 114-13091: Application Specification (1.5 mm Contact System)
- 114-13133: Application Specification (Next Generation (NG) 1.5 mm Contact System)
- 501-622: Qualification Test Report (1.5 mm and NG 1.5 mm Terminal Systems)

2.2. Commercial Standards

- SAE/USCAR-2 (Rev 3, 4/01): Performance Standard For Automotive Electrical Connector Systems
- SAE/USCAR-2 (Rev 4, 5/04): Performance Specification For Automotive Electrical Connector Systems
- SAE/USCAR-21 (Original Issue, 5/02): Performance Standard For Cable-to-Terminal Electrical Crimps
- SAE/USCAR-21 (Rev 1, 4/04): Performance Specification For Cable-to-Terminal Electrical Crimps

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 5 for maximum current carrying capability
- Operating Temperature:
  - Gold: -40 to 150°C
  - Tin: -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 Mechanical		
Visual inspection.	No defects.	SAE/USCAR-2, Rev 3, 5.1.6.3. SAE/USCAR-2, Rev 4, 5.1.8.3.
Terminal-to-terminal engaging force.	3.5 N maximum.	SAE/USCAR-2, Rev 4, 5.2.1.3., first cycle.
Terminal-to-terminal disengaging force.	0.5 N minimum.	SAE/USCAR-2, Rev 4, 5.2.1.3., tenth cycle.
Terminal bend resistance.	Terminal not damaged by 10 N minimum force.	SAE/USCAR-2, Rev 3 & 4, 5.2.2.3. See Figure 3.
Terminal Electrical		
Dry circuit resistance.	10 milliohms maximum.	SAE/USCAR-2, Rev 3 & 4, 5.3.1.3. See Figure 4.
Voltage drop.	10 milliohms maximum.	SAE/USCAR-2, Rev 3 & 4, 5.3.2.3. See Figure 4.
Maximum current rating.	55˚C maximum temperature rise over ambient at any time. 10 milliohms maximum total resistance.	SAE/USCAR-2, Rev 3 & 4, 5.3.3.3. See Figure 5.
1008 hour current cycling.	55˚C maximum temperature rise over ambient at any time. 10 milliohms maximum total resistance.	SAE/USCAR-2, Rev 3 & 4, 5.3.4.3.

Figure 1 (continued)

Test Description	Requirement	Procedure
Crimp Validation		
Appearance.	No defects.	SAE/USCAR-21, Original & Rev 1, 4.2.
CCH, CCW, ICH, ICW.	Measure and record.	SAE/USCAR-21, Original & Rev 1, Appendix E.
Cross-section.	No defects,	SAE/USCAR-21, Original & Rev 1, 4.3.
Conductor crimp pull-out force.	SAE/USCAR-21, Rev 1, Table 4.4.5. Average - 3 Standard Deviations > Limit.	SAE/USCAR-21, Original & Rev 1, 4.4.
Accelerated environmental test sequence (ENV).	0.55 milliohm maximum total resistance, or, 0.33 milliohm maximum ΔR.	SAE/USCAR-21, Rev 1, 4.5.2.

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
	Test Sequence (b)					
Visual inspection	1,4	1,3	1,8			
Terminal-to-terminal engaging force	2					
Terminal-to-terminal disengaging force	3					
Terminal bend resistance		2				
Dry circuit resistance			2,6			
Voltage drop			3,7			
Maximum current rating			4			
1008 hour current cycling			5			
Appearance				1	1	1,3
CCH, CCW, ICH, ICW				2		
Cross-section				3		
Conductor crimp pull-out force					2	
Accelerated environmental test sequence (ENV)						2

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 and 2 shall each consist of 15 contact pairs. Test group 3 shall consist of 30 contact pairs. Test group 4 shall consist of 6 contact pairs; 2 each crimped to the minimum, nominal and maximum crimp heights. Test group 5 shall consist of 60 contact pairs; 20 each crimped to the minimum, nominal and maximum crimp heights. Test group 6 shall consist of 30 contact pairs; 10 each crimped to the minimum, nominal and maximum crimp heights.

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.

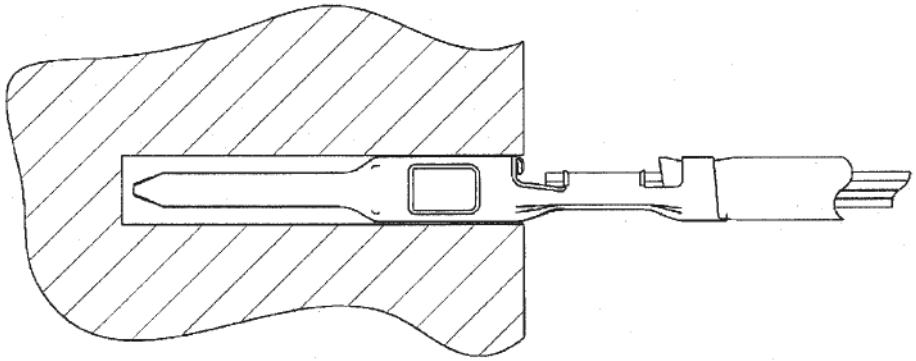
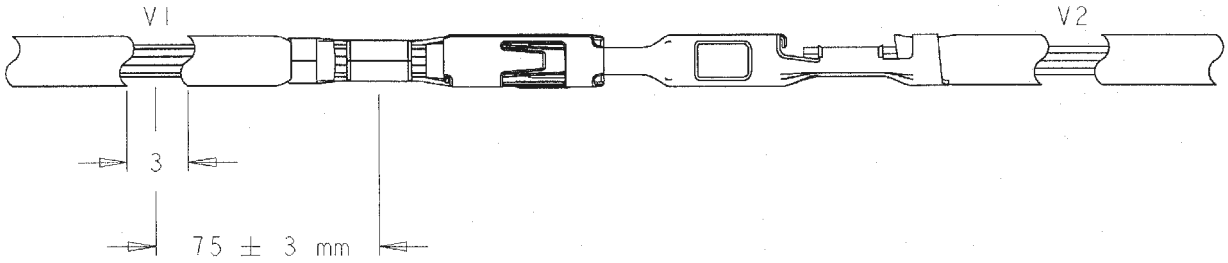


Figure 3
Terminal Bend Resistance Fixture



Total Voltage Drop (V1 to V2) = VD_{Wire} + $VD_{Entire\ Connector}$ + VD_{Wire2}
Prior to testing, VD_{Wire} will be determined
Therefore: $VD_{Entire\ Connector}$ = VD_{Total} - VD_{Wire}

For Voltage Drop: Total Connector Resistance = $VD_{Entire\ Connector}$ ÷ Test Current

Figure 4
Dry Circuit Resistance & Voltage Drop Setup

Wire Size (AWG)	Rated Current (amperes)
20	14
18	16
16	18
14	20

NOTE *Single terminal in free air with 55˚C maximum temperature rise.*

Figure 5
Maximum Current Rating