1.5 mm and NG 1.5 mm Terminal Systems

1. INTRODUCTION

1.1. Purpose

Testing was performed on the Tyco Electronics 1.5 mm and Next Generation (NG) 1.5 mm Terminal Systems to determine its conformance to the requirements of Product Specification 108-2191 Revision A.

1.2. Scope

This report covers the electrical and mechanical performance of the Tyco Electronics 1.5 mm and NG 1.5 mm Terminal Systems. Testing was performed at the Americas Global Automotive Division Product Reliability Center between November 2002 and January 2006. The test file numbers for this testing are 20020154ACL, 20030207ACL, 20030224ACL, 20040003ACL, 20040004ACL, 20040145ACL, 20050053ACL, 20050054ACL, 20050096ACS, 20050097ACS, 20050156ACL, and 20050283ACS. This documentation is on file at and available from the Americas Global Automotive Division Product Reliability Center.

1.3. Conclusion

The Tyco Electronics 1.5 mm and NG 1.5 mm Terminal Systems listed in paragraph 1.5., conformed to the electrical and mechanical performance requirements of Product Specification 108-2191 Revision A.

1.4. Product Description

The Tyco Electronics 1.5 mm and NG 1.5 mm Terminal Systems are comprised of a 1.5 mm wide X 0.80 mm thick blade which mates to a trapezoidal receptacle.

1.5. Test Specimens

Test specimens were representative of normal production lots. Specimens identified with the following part numbers were used for test:

Part Number	Description
638652-1	1.5 mm receptacle, 14-16 AWG grip
638652-2	1.5 mm receptacle, 18-20 AWG grip
1488657-1	NG 1.5 mm blade, 14-16 AWG grip
1488657-2	NG 1.5 mm blade, 18-20 AWG grip

Figure 1

1.6. Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

- Temperature: 15 to 35˚C
- Relative Humidity: 25 to 75%

* Trademark
| Indicates change

1.7. Qualification 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 1.5.*
(b) Numbers indicate sequence in which tests are performed.

Figure 2

2. SUMMARY OF TESTING

2.1. Visual Inspection - Test Groups 1, 2 and 3

All specimens submitted for testing were representative of normal production lots. Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Terminal-to-Terminal Engaging Force - Test Group 1

All engaging force measurements, when measured on the first cycle, were less than 3.5 N.

2.3. Terminal-to-Terminal Disengaging Force - Test Group 1

All disengaging force measurements when measured on the tenth cycle were greater than 0.5 N.

2.4. Terminal Bend Resistance - Test Group 2

No specimens fractured, or bent more than 30 degrees when subjected to a minimum force of 10 N.

2.5. Dry Circuit Resistance - Test Group 3

All low level contact resistance measurements were less than 10 milliohms.

2.6. Voltage Drop - Test Group 3

All low level contact resistance measurements were less than 10 milliohms.

2.7. Maximum Current Rating - Test Group 3

All specimens had a temperature rise of less than 55˚C above ambient when tested using the specified current based on the specimens wiring configuration shown in Figure 3.

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 3
Maximum Current Rating

2.8. 1008 Hour Current Cycling - Test Group 3

Specimens did not exceed 55˚C temperature rise over ambient at any time, or 10 milliohms maximum total resistance, at the rated current and specified wire size shown in Figure 3.

2.9. Appearance - Test Groups 4, 5 and 6

All specimens submitted for testing were representative of normal production lots. Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.10. CCH, CCW, ICH, ICW - Test Group 4

No specimens exceeded the specified crimp measurements.

2.11. Cross-section - Test Group 4

All specimens possessed the proper crimp attributes of symmetry, strand compaction, "wing lock", wing penetration depth, and material free of cracks or breaks. No specimens possessed the undesirable attributes such as "ram-horning", excess penetration, overlapping or folded back wings, open wings, insufficient strand compaction, exposed or loose strands.

2.12. Conductor Crimp Pull-out Force - Test Group 5

No specimens exceeded the specified crimp tensile values.

2.13. Accelerated Environmental Test Sequence (ENV) - Test Group 6

Specimens did not exceed 0.55 milliohm maximum total resistance or 0.33 milliohm maximum change in resistance (ΔR).

3. TEST METHODS

3.1. Visual Inspection

A Certificate of Conformance was issued stating that all specimens in this test package were produced, inspected, and accepted as conforming to product drawing requirements, and were manufactured using the same core manufacturing processes and technologies as production parts.

3.2. Terminal-to-Terminal Engaging Force

The force required to engage the leading edge of the blade to a depth of 7.0 mm beyond the leading edge of the receptacle at a rate of 50 ± 10 mm per minute was measured using a tensile/compression device with a free floating fixture.

3.3. Terminal-to-Terminal Disengaging Force

The force required to separate the terminals after 10 successive engaging cycles at a maximum rate of 50 ± 10 mm per minute was measured using a tensile/compression device with a free floating fixture.

3.4. Terminal Bend Resistance

Specimens were held in a pin vise while a 10 N minimum force was applied to the back of the wire crimp. This force was held for 15 seconds without the terminal bending and/or the force was increased over 12 N to bend the terminal more than 30 degrees. Specimens were then visually examined for bends, cracks and deformities.

3.5. Dry Circuit Resistance

Low level contact resistance measurements were made using a 4 wire probe method. The test current was maintained at 100 milliamperes maximum.

3.6. Voltage Drop

Low level contact resistance measurements were made using a 4 wire probe method. A 20 millivolt maximum open circuit voltage was used.

3.7. Maximum Current Rating

Specimens were energized to 80% of the expected maximum current capability (see Figure 3) and allowed to stabilize. The current was then increased in small increments and the specimens were allowed to stabilize between each increase until a 55˚C temperature rise was achieved.

3.8. 1008 Hour Current Cycling

Testing consisted of 1008 current cycles, with each cycle having current ON for 45 minutes and current OFF for 15 minutes (see Figure 3).

3.9. Appearance

A Certificate of Conformance was issued stating that all specimens in this test package were produced, inspected, and accepted as conforming to product drawing requirements, and were manufactured using the same core manufacturing processes and technologies as production parts.

3.10. CCH, CCW, ICH, ICW

Crimp inspection was conducted of a representative sample of the terminated contacts. Conductor and insulation crimp heights and widths for both receptacle and blade were verified.

3.11. Cross-section

Specimens were intentionally produced at minimum, nominal, and maximum conductor crimp heights. These specimens were potted, cross-sectioned, and visually inspected.

3.12. Conductor Crimp Pull-out Force

The force required to remove the wire from the crimp barrel at a rate of 100 ± 10 mm per minute was measured using a tensile/compression device with a free floating fixture.

3.13. Accelerated Environmental Test Sequence (ENV)

Specimens produced at minimum, nominal, and maximum conductor crimp heights were exposed to an aggressive series of thermal shock cycles and temperature humidity cycles. Dry circuit resistance was checked at the beginning, between the thermal shock cycling and temperature humidity cycling, and at the end of conditioning to verify crimp integrity.