
Metal Shell Micro Circular Connector System

1. INTRODUCTION

1.1. Purpose

Testing was performed on the Tyco Electronics Metal Shell Micro Circular Connector System (threaded version) to determine its conformance to the requirements of Product Specification 108-2169 Revision A.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the Metal Shell Micro Circular Connector System. Testing was performed at the Engineering Assurance Product Testing Laboratory and the EME Laboratory between 08May06 and 20Sep07. The test file numbers for this testing are CTLB058834-005, CTLB058834-006, CTLB058834-009, CTLB058834-014, CTLB058834-016, CTLB058834-017, CTLB058834-019 and EMEB058834-005. This documentation is on file at and available from the Engineering Assurance Product Testing Laboratory and the EME Laboratory.

1.3. Conclusion

The Metal Shell Micro Circular Connector System listed in paragraph 1.5., conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-2169 Revision A.

1.4. Product Description

The Metal Shell Micro Circular Connector System is used primarily in industrial, commercial and military applications where durability and reliability are of primary concern. Two shell sizes provide up to 19 contact positions. Shell size M11 accommodates 7 contacts while shell size M14 accommodates 19 contacts. The system is sealed to level IP67 and is available in wire-to-wire, wire-to-panel, and wire-to-board configurations. Plugs and receptacles incorporate solder cup terminals which will accommodate 24 to 30 AWG solid and stranded conductors (24 AWG is limited to 7 strands).

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
1604366-1	Overmold adapters, 19 position
1-1604366-1	Overmold adapters, 19 position
1738550-2	Plug assembly, 19 position, threaded coupling ring, pin contacts w/solder cups, shear "O" ring seal
1738551-2	Receptacle assembly, 19 position, threaded coupling ring, socket contacts w/solder cups
1738552-2	Plug assembly, 19 position, threaded coupling ring, spring probe contacts w/solder cups, shear "O" ring seal
1738552-3	Plug assembly, 19 position, threaded coupling ring, spring probe contacts w/solder cups, shear "O" ring seal with "L" clip
1738553-2	Receptacle assembly, 19 position, threaded coupling ring, spring pad contacts w/solder cups
1738941-4	Protective cap assembly
1811278-1	Receptacle assembly, 19 position, threaded, spring pad
1811547-1	Receptacle assembly, M14, threaded, board mount

Figure 1 (continued)

Part Number	Description
1811579-1	Receptacle assembly, 19 position, socket contact w/solder post
1877160-1	Receptacle, M14, threaded pad, 2 piece housing
1877169-1	Receptacle, M14, threaded, socket, 2 piece housing
1877255-1	Plug assembly, 19 position, rear mount, threaded coupling ring, spring probe contacts w/solder cups, compression seal "O" ring
1877260-1	Receptacle assembly, threading coupling, spring pad contacts w/solder post, large panel seal

Figure 1 (end)

1.6. Environmental Conditions

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

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

1.7. Qualification Test Sequence

Test or Examination	Test Group (a)						
	1	2	3	4	5	6	7
	Test Sequence (b)						
Initial examination of product	1	1	1	1	1	1	1
LLCR	2,8	2,4	2,4				
Insulation resistance				2,6			
Withstanding voltage				3,7			
Shielding effectiveness (c)						2	
Shell-to-shell conductivity (d)	3,9						
Solderability, dip test					2		
Sinusoidal vibration	5						
Mechanical shock	6						
Durability	4						3
Thermal shock				4			
Humidity/temperature cycling				5			
Temperature life		3(e)					
Mixed flowing gas			3(e)				
Temporary immersion (f)							2,4
Salt spray (d)	7						
Final examination of product	10	5	5	8	3	3	5

NOTE

- (a) See paragraph 1.5.
 (b) Numbers indicate sequence in which tests are performed.
 (c) Adapters only.
 (d) Nickel plated specimens only.
 (e) Precondition specimens with 10 durability cycles.
 (f) Specimens shall consist of mated plug and receptacle, mated receptacle to panel with "o" ring and mated dust cap to receptacle.

Figure 2

2. SUMMARY OF TESTING

2.1. Initial Examination of Product - All Test Groups

All specimens submitted for testing were representative of normal production lots. A Certificate of Conformance was issued by Product Assurance. Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Low Level Contact Resistance (LLCR) - Test Groups 1, 2 and 3

All LLCR measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 30 milliohms after testing.

2.3. Insulation Resistance - Test Group 4

All insulation resistance measurements were greater than 5000 megohms initially and 1000 megohms after testing.

2.4. Withstanding Voltage - Test Group 4

No dielectric breakdown or flashover occurred.

2.5. Shielding Effectiveness - Test Group 6

Radiation was reduced a minimum of 50 dB.

2.6. Shell-to-shell Conductivity - Test Group 1

All voltage drop measurements were less than 20 millivolts.

2.7. Solderability, Dip Test - Test Group 5

Solderable areas had a minimum of 95% solder coverage.

2.8. Sinusoidal Vibration - Test Group 1

No discontinuities were detected during vibration testing. Following vibration testing, no cracks, breaks, or loose parts on the specimens were visible.

2.9. Mechanical Shock - Test Group 1

No discontinuities were detected during mechanical shock testing. Following mechanical shock testing, no cracks, breaks, or loose parts on the specimens were visible.

2.10. Durability - Test Groups 1 and 7

No physical damage occurred as a result of mating and unmating compression seal and spring probe products 2500 times and shear seal product 500 times.

2.11. Thermal Shock - Test Group 1

No evidence of physical damage was visible as a result of thermal shock testing.

2.12. Humidity/temperature Cycling - Test Group 4

No evidence of physical damage was visible as a result of humidity/temperature cycling.

2.13. Temperature Life - Test Group 2

No evidence of physical damage was visible as a result of temperature life testing.

2.14. Mixed Flowing Gas - Test Group 3

No evidence of physical damage was visible as a result of exposure to the pollutants of mixed flowing gas.

2.15. Temporary Immersion - Test Group 7

There was no evidence of water leakage as a result of temporary immersion..

2.16. Salt Spray - Test Group 1

There was no evidence of corrosion as a result of exposure to a 5% salt atmosphere.

2.17. Final Examination of Product - All Test Groups

Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

3. TEST METHODS

3.1. Initial Examination of Product

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. Low Level Contact Resistance (LLCR)

LLCR measurements were made using a 4 terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage.

3.3. Insulation Resistance

Insulation resistance was measured between adjacent contacts of mated specimens. A test voltage of 500 volts DC was applied for 2 minutes before the resistance was measured.

3.4. Withstanding Voltage

A test potential of 450 volts AC was applied between the adjacent contacts of mated specimens. This potential was applied for 1 minute and then returned to zero.

3.5. Shielding Effectiveness

The radiated response from unshielded cable while conductors were excited between 200 MHz and 1 GHz, was measured. The procedure was repeated, using jacks and plugs terminated to shielded cable. The difference in response is the shielding effectiveness in dB.

3.6. Shell-to-shell Conductivity

Voltage drop across mated specimens was measured using 1.0 ± 0.1 ampere DC at 1.5 volts.

3.7. Solderability, Dip Test

Specimens were steam aged for 8 hours suspended in a closed container 2 inches above boiling de-ionized water. Specimens were immersed in a non-activated water white rosin maintained at room ambient for 5 to 10 seconds and allowed to drain for 5 to 20 seconds. Specimens were attached to a dipping machine and immersed at a rate of approximately 1 inch per second into a 60Sn/40Pb soldering bath controlled at $245 \pm 5^\circ\text{C}$ until the entire surface to be evaluated was coated. Specimens were held in the solder bath for 4 to 5 seconds, then removed at a rate of approximately 1 inch per second and cleaned for 5 minutes using isopropyl alcohol before being examined using 10X magnification.

3.8. Sinusoidal Vibration

Mated specimens were subjected to sinusoidal vibration, having a simple harmonic motion with an amplitude of 0.06 inch double amplitude. The vibration frequency was varied uniformly between the limits of 10 and 55 Hz and returned to 10 Hz in 1 minute. This cycle was performed 120 times in each of 3 mutually perpendicular planes for a total vibration time of 6 hours. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.9. Mechanical Shock

Mated specimens were subjected to a mechanical shock test having a half-sine waveform of 50 gravity units (g peak) and a duration of 11 milliseconds. Three shocks in each direction were applied along the 3 mutually perpendicular planes for a total of 18 shocks. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.10. Durability

Compression seal and spring probe products were mated and unmated 2500 times and shear seal product 500 times at a maximum rate of 500 cycles per hour.

3.11. Thermal Shock

Mated specimens were subjected to 5 cycles of thermal shock with each cycle consisting of 30 minute dwells at -55 and 150°C . The transition between temperatures was less than 1 minute.

3.12. Humidity/temperature Cycling

Mated specimens were exposed to 10 humidity/temperature cycles. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 and 65°C twice while maintaining high humidity.

3.13. Temperature Life

Mated specimens were exposed to a temperature of 150°C for 500 hours. Specimens were preconditioned with 10 cycles of durability.

3.14. Mixed Flowing Gas, Class IIA

Mated specimens were exposed for 20 days to a mixed flowing gas Class IIA exposure. Class IIA exposure is defined as a temperature of 30°C and a relative humidity of 75% with the pollutants of Cl_2 at 10 ppb, NO_2 at 200 ppb, H_2S at 10 ppb and SO_2 at 100 ppb. Specimens were preconditioned with 10 cycles of durability.

3.15. Temporary Immersion

Mated specimens were immersed in water to a depth of 1 meter for 30 minutes.

3.16. Salt Spray

Mated specimens were subjected to a 5% salt spray environment for 48 hours. The temperature of the box was maintained at $95 \pm 3^\circ\text{C}$, while the pH of the salt solution was between 6.5 and 7.2.

3.17. Final Examination of Product

Specimens were visually examined for evidence of physical damage detrimental to product performance.