Micro-Circular HD Connector

1. INTRODUCTION

1.1. Purpose

Testing was performed on the TE Connectivity (TE) Micro-Circular HD Connector (7 and 40 position) to determine their conformance to the requirements of Product Specification 108-127005 Revision A.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the Micro-Circular HD Connector. Testing was performed at the Harrisburg Electrical Components Test Laboratory between 18Feb11 and 31Oct11. The test file number for this testing is EA20110140T Revision A. This documentation is on file at and available from the Harrisburg Electrical Components Test Laboratory.

1.3. Conclusion

The Micro-Circular HD Connector listed in paragraph 1.5., conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-127005 Revision A.

1.4. Product Description

The TE Micro-Circular HD Connector is a high-density, small form circular connector having the ease of push/pull self-locking mating. The connectors have the advantage of being able to be blind mated into tight spaces.

1.5. Test Specimens

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

Test Group	Quantity	Part Number	Rev	Description
1,3	2 each	2101955-1	A	7 position receptacle with 24 AWG stranded wire
	2 each	2101550-1	A	7 position plug with 24 AWG stranded wire
1,4	2 each	2101953-1	A	40 position receptacle with 28 AWG stranded wire
	2 each	2101551-1	A	40 position plug with 28 AWG stranded wire
2,3	2 each	2101954-1	A	40 position receptacle with 28 AWG stranded wire
	2 each	2101551-2	A	40 position plug with 28 AWG stranded wire
2	2	2101956-1	A	7 position receptacle with 24 AWG stranded wire
	2	2101550-2	A	7 position plug with 24 AWG stranded wire
4	1	2101955-1	A	7 position receptacle with 24 AWG stranded wire
	1	2101550-1	A	7 position plug with 24 AWG stranded wire
	1	2101956-1	A	7 position receptacle with 24 AWG stranded wire
	1	2101550-2	A	7 position plug with 24 AWG stranded wire

Figure 1

| Indicates Change

LOC B

1.6. Environmental Conditions

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

- Temperature: 15 to 35℃
- Relative Humidity: 20 to 80%

1.7. Qualification Test Sequence

Test or Examination	Test Group (a)			
	1	2	3	4
	Test Sequence (b)			
Initial examination of product	1	1	1	1
Contact resistance	2,6,8,10		2,6	
Insulation resistance, room temperature		2,6		
Insulation resistance, elevated temperature		8		
Withstanding voltage, sea level		3,7		
Withstanding voltage, 70,000 feet		9		
Electrical continuity between shells	4			3,6
Random vibration	7			
Mechanical shock	9			
Mechanical endurance	5(c)		4(d)	4(d)
Engagement force	3,11		3,7	2,7
Thermal shock		5		
Humidity/temperature cycling		4		
Temperature life			5	
Water immersion, receptacle connector		10		
Salt spray				5
Final examination of product	12	11	8	8

NOTE

(a) See paragraph 4.1.A.
(b) Numbers indicate sequence in which tests are performed.
(c) 1000 cycles.
(d) 300 cycles.

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 (C of C) was issued by Product Assurance. Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Contact Resistance - Test Groups 1 and 3

All contact resistance measurements were less than 21 milliohms.

Test Group	Specimen Type	Number of Data Points	Condition	Contact Resistance		
				Minimum	Maximum	Mean
1	7 position	14	Initial	3.81	4.74	4.09
			After mechanical endurance	3.79	4.45	4.14
			After random vibration	3.73	6.87	5.18
			After mechanical shock	3.85	5.99	4.76
	40 position	30	Initial	7.26	9.31	8.36
			After mechanical endurance	5.61	8.83	7.09
			After random vibration	7.03	13.27	9.73
			After mechanical shock	7.50	12.45	9.02
3	7 position	14	Initial	3.81	5.82	4.26
			After temperature life	3.90	5.40	4.26
	40 Position	30	Initial	7.73	9.81	8.92
			After temperature life	7.94	10.56	9.05

NOTE *(a) All values in milliohms.*
(b) Bulk wire resistance was subtracted from measurements.

Figure 3

2.3. Insulation Resistance, Room Temperature - Test Group 2

All insulation resistance measurements were greater than 5000 megohms initially and greater than 100 megohms after testing.

2.4. Insulation Resistance, Elevated Temperature - Test Group 2

All insulation resistance measurements were greater than 100 megohms when tested at 125℃.

2.5. Withstanding Voltage, Sea Level - Test Group 2

No dielectric breakdown or flashover occurred.

2.6. Withstanding Voltage, 70,000 Feet - Test Group 2

No dielectric breakdown or flashover occurred when tested at a simulated altitude of 70,000 feet.

2.7. Electrical Continuity Between Shells - Test Groups 1 and 4

All shell to shell continuity measurements were less than 200 milliohms.

2.8. Random 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. Mechanical Endurance - Test Groups 1, 3 and 4

No evidence of physical damage detrimental to product performance was visible as a result of mating and unmating the specimens in test group 1, 1,000 times, and test groups 3 and 4, 300 times.

2.11. Engagement Force - Test Groups 1, 3 and 4

All 7 position specimen engagement force measurements were less than 40 N [9 lbf]. All 40 position specimen engagement force measurements were less than 240 N [54 lbf].

2.12. Thermal Shock - Test Group 2

No evidence of physical damage detrimental to product performance was visible as a result of thermal shock testing.

2.13. Humidity/temperature Cycling - Test Group 2

No evidence of physical damage detrimental to product performance was visible as a result of humidity/temperature cycling.

2.14. Temperature Life - Test Group 3

No evidence of physical damage detrimental to product performance was visible as a result of temperature life testing.

2.15. Water Immersion, Receptacle Connector - Test Group 2

There was no ingress of water and no evidence of physical damage detrimental to product performance was visible as a result of submerging the specimens in water to a depth of 1 m [39.4 in] for 2 hours.

2.16. Salt Spray - Test Group 4

No evidence of physical damage detrimental to product performance was visible as a result of exposure to a salt-laden 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 C of C 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. Testing was in accordance with EIA-364-18B.

3.2. Contact Resistance

Contact resistance was measured for all 7 contacts of each mated 7 position specimen, and 15 contacts of each mated 40 position specimen using a 4 terminal measuring system in accordance with EIA-364-6C. The test current applied to the mated contacts was 3 amperes for 7 position specimens and 1.5 amperes for 40 position specimens.

3.3. Insulation Resistance, Room Temperature

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 in accordance with EIA-364-21D.

3.4. Insulation Resistance, Elevated Temperature

Insulation resistance was measured between adjacent contacts of mated specimens at 125℃. A test voltage of 500 volts DC was applied for 2 minutes before the resistance was measured in accordance with EIA-364-21D.

3.5. Withstanding Voltage, Sea Level

A test potential of 750 volts AC RMS was applied between adjacent contacts of mated specimens for 1 minute and then returned to zero in accordance with EIA-364-20D.

3.6. Withstanding Voltage, 70,000 Feet

A test potential of 175 volts AC RMS was applied between adjacent contacts of mated specimens at a simulated altitude of 70,000 feet for 1 minute and then returned to zero in accordance with EIA-364-20D.

3.7. Electrical Continuity Between Shells

Mated specimens were tested in accordance with EIA-364-83. A direct current of 1.0 ± 0.1 ampere was applied through the shells of the specimens. Testing was conducted using a 4 wire terminal network to measure the resistance across the shell. The current was applied to the rear of each shell while applying the voltage probes to the back of each shell.

3.8. Random Vibration

Mated specimens were subjected to a random vibration test in accordance with EIA-364-28F, Test Condition V, Condition Letter E. The parameters of this test are specified by a random vibration spectrum with excitation frequency bounds of 50 and 2000 Hz. The Power Spectral Density (PSD) at 50 Hz is 0.050 G^2/Hz. The spectrum slopes up at 6 dB per octave to a PSD of 0.20 G^2/Hz at 100 Hz. The spectrum is flat at 0.20 G^2/Hz from 100 Hz to 1000 Hz. The spectrum slopes down at 6 dB per octave to a PSD of 0.050 G^2/Hz at the upper bound frequency of 2000 Hz. The root-mean square amplitude of the excitation was 16.91 GRMS. The specimens were subjected to this test for 8 hours in each of the 3 mutually perpendicular axes for a total test time of 24 hours per specimen. Specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

3.9. Mechanical Shock

Mated specimens were subjected to a mechanical shock test in accordance with EIA-364-27B, Test Condition A. The parameters of this test are a half-sine waveform with an acceleration amplitude of 50 gravity units (g's peak) and a duration of 11 milliseconds. Three shocks in each direction were applied along the 3 mutually perpendicular axes for a total of eighteen shocks. Specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

3.10. Mechanical Endurance

Specimens in test group 1 were manually mated and unmated 1,000 times at a maximum rate of 300 cycles per hour. Specimens in test groups 3 and 4 were manually mated and unmated 300 times at a maximum rate of 300 cycles per hour. Testing was performed in accordance with EIA-364-9C.

3.11. Engagement Force

The force required to engage individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of 12.7 mm [.5 in] per minute in accordance with EIA-364-13D.

3.12. Thermal Shock

Mated specimens were subjected to 5 cycles of thermal shock with each cycle consisting of 30 minute dwells at -55 and 125℃ with 1 minute transition be tween temperatures in accordance with EIA-364-32F.

3.13. Humidity/temperature Cycling

Specimens were exposed to 10 humidity/temperature cycles with optional cold shock in accordance with EIA 364-31C, Method IV. Each cycle lasted 24 hours and consisted of cycling the temperature between 25C and 65℃ while maintaining 90% to 98% r elative humidity except during descending temperature periods when the relative humidity may drop as low as 80%.

3.14. Temperature Life

Mated specimens were exposed to a temperature of 125℃ for 1,000 hours in accordance with EIA-364-17B.

3.15. Water Immersion, Receptacle Connector

Specimens were immersed to a depth of 1 m [39.4 in] in water for 2 hours in accordance with IEC-60529, Edition 2.1. While submerged, the specimens were monitored for the ingress of water from the connector or through the seal.

3.16. Salt Spray

Specimens were subjected to a 5% salt concentration for 96 hours in accordance with EIA-364-26B.

3.17. Final Examination of Product

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