MICRODOT* Press-Fit Connector System

1. INTRODUCTION

1.1 Purpose

Testing was performed on the TE Connectivity MICRODOT press-fit connector system to determine its conformance to Product Specification 108-163000, Rev E.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the TE Connectivity MICRODOT press-fit connector system. Testing was performed at the Harrisburg Electrical Components Test Laboratory between 10/25/2016 and 12/30/2016. Detailed results are stored under EA20160562T.

1.3 Conclusion

The TE Connectivity MICRODOT press-fit connector system listed in paragraph 1.4 conformed to the, electrical, mechanical, and environmental performance requirements of Product Specification 108-16300, Rev E.

1.4 Test Specimens

Test specimens identified in Table 1 were used for testing. The test specimens were representative of normal production lots.

Table 1 – Test Specimens

Test ID	Test Group	Quantity	Part Number	Description
1	1	3	1-2302733-8 Rev 1	31 position press-fit plug, vertical, SS Shell, Au Tails
		3	1532175-1 Rev B	31 position receptacle assembly, 26 AWG
		3	60-1824898 Rev A	31 & 37 position test PCB
2	2	3	1-2302733-8 Rev 1	31 position press-fit plug, vertical, SS Shell, Au Tails
		3	1532175-1 Rev B	31 position receptacle assembly, 26 AWG
3	3	3	1-2302733-8 Rev 1	31 position press-fit plug, vertical, SS Shell, Au Tails
		3	1532175-1 Rev B	31 position receptacle assembly, 26 AWG
4	4	3	1-2302733-8 Rev 1	31 position press-fit plug, vertical, SS Shell, Au Tails
		3	1532175-1 Rev B	31 position receptacle assembly, 26 AWG
		3	60-1824898 Rev A	31 & 37 position test PCB

1.5 Test Sequence

Specimens in Table 1 were subjected to testing outlined in Table 2.

Table 2 – Test Sequence

Test or Examination	Test Groups			
	1	2	3	4
	Test Sequence (a)			
Initial Examination of Product	1	1	1	1
Low Level Contact Resistance	2, 9			3, 5
Contact Resistance	3, 10			
Insulation Resistance		3, 8		
Dielectric Withstanding Voltage		4, 9		
Dielectric Withstanding Voltage at Altitude		5		
Sinusoidal Vibration	7			
Mechanical Shock	8			
Durability	6			
Mating Force	4, 11		2, 5	
Unmating Force	5, 12		3, 6	
Compliant Pin Insertion Force				2
Thermal Shock		6		
Humidity-Temperature Cycling		7		
Temperature Life				4
Magnetic Permeability		2		
Salt Spray				6
Fluid Immersion			4	
Final Examination of Product	13	10	7	7

NOTE (a) the numbers indicate sequence in which tests were performed.

1.6 Environmental Conditions

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

Temperature: 15°C to 35°C
Relative Humidity: 20% to 80%

2. SUMMARY OF TESTING

2.1 Initial Examination of Product – Groups 1 thru 4

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

2.2 Low Level Contact Resistance – Groups 1 and 4

All low level contact resistance measurements were less than 30 milliohms initially had a change in resistance (ΔR) of less than 10 milliohms after testing. See Tables 3 and 4 for summary data.

2.2 Low Level Contact Resistance (cont.) – Groups 1 and 4

Table 3 – Test Group 1, LLCR Summary Data (milliohms)

Reading	Initial R	Final R	Delta R
Data Points	93	93	93
Minimum	25.43	25.10	-1.08
Maximum	27.56	27.13	0.40
Mean	26.17	25.98	-0.19
Std. Dev.	0.36	0.39	0.23

Table 4 – Test Group 4, LLCR Summary Data (milliohms)

Reading	Initial R	Final R	Delta R
Data Points	93	93	93
Minimum	25.25	25.07	-2.46
Maximum	28.67	26.87	0.53
Mean	26.01	25.87	-0.14
Std. Dev.	0.44	0.39	0.35

2.3 Contact Resistance – Group 1

All contact resistance measurements were less than 70 millivolts. See Table 5 for summary data.

Table 5 – Test Group 1, Contact Resistance Summary Data (millivolts)

Reading	Initial R	Final R	Delta R
Data Points	21	21	21
Minimum	63.97	63.79	-0.77
Maximum	67.61	67.83	1.04
Mean	65.81	65.92	0.11
Std. Dev.	1.06	1.11	0.45

2.4 Insulation Resistance - Group 2

All insulation resistance measurements were greater than 5000 megohms initially. All insulation resistance measurements were greater than 1 megohms within 1 hour of completing humidity temperature cycling. All insulation resistance measurements were greater than 1000 megohms 24 hours after completing humidity temperature cycling.

2.5 Dielectric Withstanding Voltage – Group 2

No dielectric breakdown or flashover occurred. All leakage current was less than 5.0 mA.

2.6 Dielectric Withstanding Voltage at Altitude – Group 2

No dielectric breakdown or flashover occurred. All leakage current was less than 5.0 mA

2.7 Sinusoidal Vibration – Group 1

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

2.8 Mechanical Shock - Group 1

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

2.9 Durability - Group 1

No physical damage occurred to the specimens as a result of mating and unmating the specimens 500 times.

2.10 Mating Force - Groups 1 and 3

All mating force measurements were less than 2.78 N average per contact. See Tables 6 and 7 for mating force results. See Figures 1 through 4 for force profile plots.

Table 6 – Test Group 1, Mating Force Results (N)

Specimen	Initial Mating Force		Final Mating Force	
	Connector	Avg per Contact	Connector	Avg per Contact
1	16.56	0.53	16.13	0.52
2	13.90	0.45	17.19	0.55
3	15.06	0.49	19.46	0.63
Minimum	13.90	0.45	16.13	0.52
Maximum	16.56	0.53	19.46	0.63
Mean	15.17	0.49	17.59	0.57
Std. Dev.	1.33	0.04	1.70	0.05

Table 7 – Test Group 3, Mating Force Results (N)

Specimen	Initial Mating Force		Final Mating Force	
	Connector	Avg per Contact	Connector	Avg per Contact
1	16.89	0.54	22.23	0.72
2	21.21	0.68	18.04	0.58
3	16.27	0.52	21.93	0.71
Minimum	16.27	0.52	18.04	0.58
Maximum	21.21	0.68	22.23	0.72
Mean	18.12	0.58	20.74	0.67
Std. Dev.	2.69	0.09	2.34	0.08

2.10 Mating Force (cont.) - Groups 1 and 3

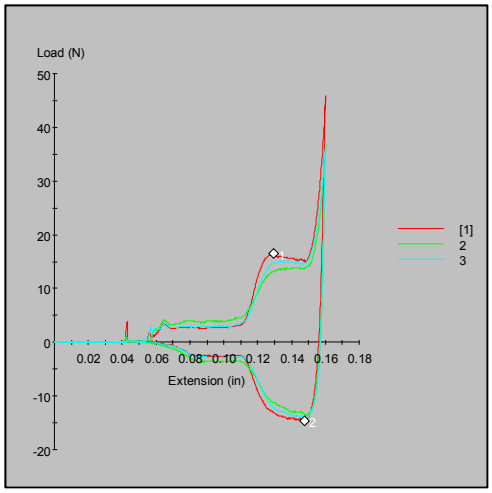

Figure 1 – TG 1 Initial Mating / Unmating

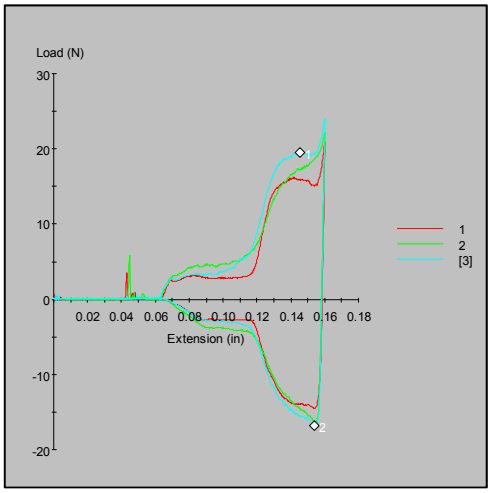

Figure 2 – TG 1 Final Mating / Unmating

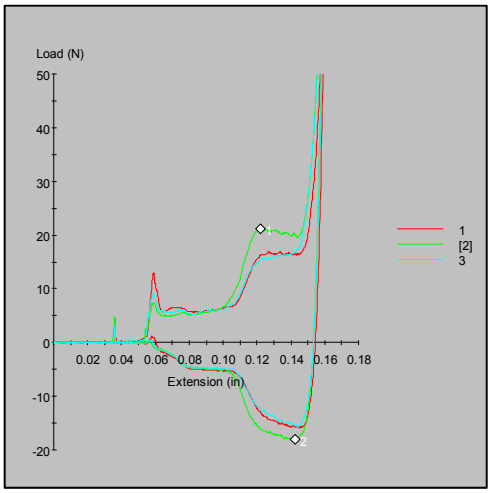

Figure 3 – TG 3 Initial Mating / Unmating

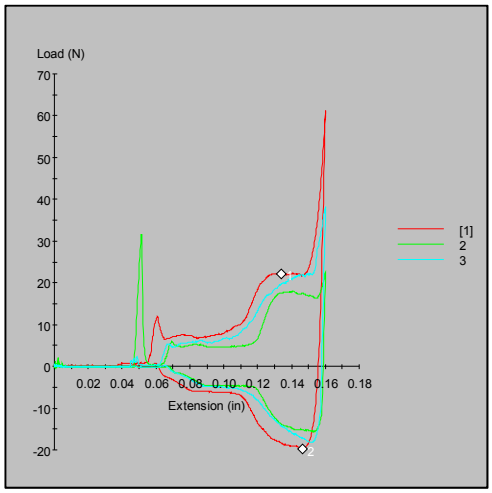

Figure 4 – TG 3 Final Mating / Unmating

2.11 Unmating Force - Groups 1 and 3

All unmating force measurements were less than 2.78 N average per contact. See Tables 8 and 9 for unmating force results. See Figures 1 through 4 for force profile plots.

Table 8 – Test Group 1, Unmating Force Results (N)

Specimen	Initial Unmating Force		Final Unmating Force	
	Connector	Avg per Contact	Connector	Avg per Contact
1	14.64	0.47	14.56	0.47
2	13.65	0.44	16.43	0.53
3	14.20	0.46	16.82	0.54
Minimum	13.65	0.44	14.56	0.47
Maximum	14.64	0.47	16.82	0.54
Mean	14.16	0.46	15.94	0.51
Std. Dev.	0.50	0.02	1.21	0.04

2.11 Unmating Force (cont.) - Groups 1 and 3

Table 9 – Test Group 3, Unmating Force Results (N)

Specimen	Initial Unmating Force		Final Unmating Force	
	Connector	Avg per Contact	Connector	Avg per Contact
1	15.87	0.51	19.72	0.64
2	18.02	0.58	15.56	0.50
3	15.67	0.51	18.26	0.59
Minimum	15.67	0.51	15.56	0.50
Maximum	18.02	0.58	19.72	0.64
Mean	16.52	0.53	17.85	0.58
Std. Dev.	1.30	0.04	2.11	0.07

2.12 Compliant Pin Insertion – Group 4

All compliant pin insertion force measurements were less than 44.5 N average per contact. See Tables 10 for compliant pin insertion force data. See Figure 5 for Compliant Pin Insertion Force Profile.

Table 10 – Compliant Pin Insertion Force Results (N)

Specimen	Compliant Pin Insertion Force	
	Connector	Avg per Contact
1	898.61	28.99
2	899.31	29.01
3	862.88	27.83
Minimum	862.88	27.83
Maximum	899.31	29.01
Mean	886.94	28.61
Std. Dev.	20.83	0.67

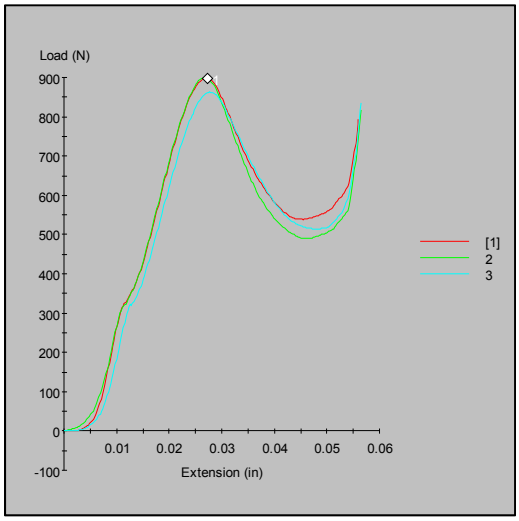

Figure 5 – Compliant Pin Insertion Force Profile

2.13 Thermal Shock – Group 2

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

2.14 Humidity-Temperature Cycling - Group 2

No evidence of physical damage was visible as a result of exposure to humidity-temperature cycling.

2.15 Temperature Life – Group 4

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

2.16 Magnetic Permeability – Group 2

The relative permeability did not exceed 2.0μ.

2.17 Salt Spray – Group 4

No evidence of physical damage was visible as a result of exposure to a salt spray atmosphere.

2.18 Fluid Immersion – Group 3

No evidence of physical damage was visible as a result of exposure to fluid immersion.

2.19 Final Examination of Product – All Groups

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

3. TEST METHODS

3.1 Examination of Product

A Certificate of Conformance was issued by Product Assurance. Where specified, specimens were visually examined for defects or damage detrimental to performance.

3.2 Low Level Contact Resistance

LLCR was conducted in accordance with EIA-364-23C. All contacts of each mated connector were tested. Low level contact resistance measurements were made using a four terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage. Measurements points extended from the plated through hole to a point on the end of the wire (Figure 6). The resistance was calculated by removing excess wire bulk resistance. A total of 13.0” of wire bulk resistance was removed to simulate a measurement from the plated through hole to a point on the wire 6.0” away.

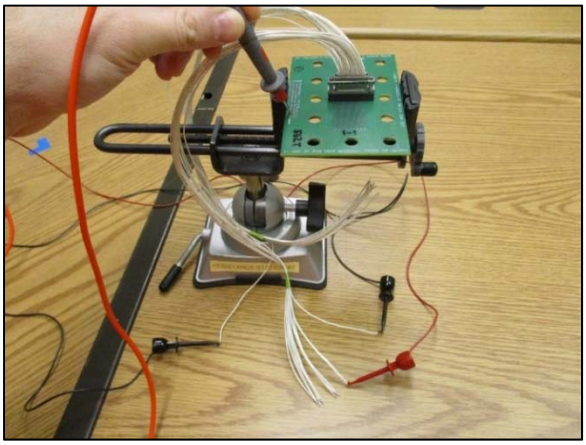

Figure 6 – Low Level Contact Resistance and Contact Resistance Test Setup

3.3 Contact Resistance

Contact resistance was conducted in accordance with MIL-DTL-83513G. Seven contacts of each mated connector were tested. Contact resistance measurements were made using a four terminal measuring technique. The test current was maintained at 2.5 amperes. Measurements points extended from the plated through hole to a point on the end of the wire (Figure 6). The millivolt drop was calculated by removing excess wire bulk. A total of 13.0” of wire bulk was removed to simulate a measurement from the plated through hole to a point on the wire 6.0” away.

3.4 Insulation Resistance

Insulation resistance was conducted in accordance with EIA-364-21E. Insulation resistance was measured between 50% of adjacent contacts of mated specimens and 50% of contacts and shell. All contacts of each circuit were bussed together and measured simultaneously (Figure 7). Adjacent contacts of circuits 1 -16 were tested on specimen 1. Adjacent contacts of circuits 17 -31 were tested on specimen 2. Adjacent rows of circuits 1 -16 and 17-31 were tested on specimen 3. Initially, a test voltage of 500 volts DC was applied for two minutes before the resistance was measured. Within 1 hour of completing humidity temperature cycling, specimens were again measured. A test voltage of 100 volts DC was applied for two minutes before the resistance was measured. Twenty-Four hours after completing humidity temperature cycling, specimens were again measured. A test voltage of 100 volts DC was applied for two minutes before the resistance was measured.

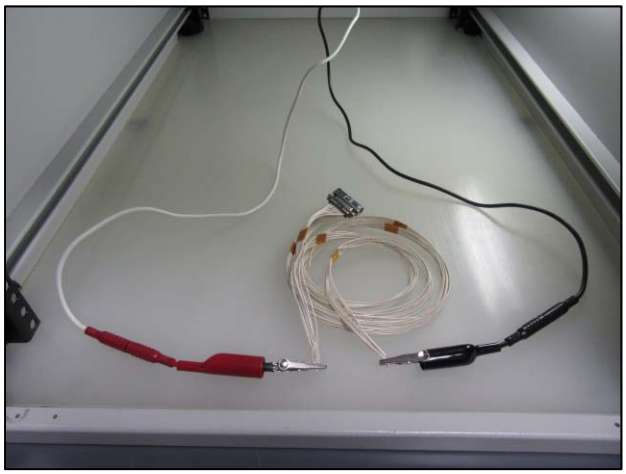

Figure 7 – Insulation Resistance and Dielectric Withstanding Test Setup

3.5 Dielectric Withstanding Voltage

Dielectric withstanding voltage was conducted in accordance with EIA-364-20E. DWV was measured between all adjacent contacts of mated specimens and all contacts and shell. All contacts of each circuit were bussed together and measured simultaneously (Figure 7). Adjacent contacts of circuits 1 -16 were tested on specimen 1. Adjacent contacts of circuits 17 -31 were tested on specimen 2. Adjacent rows of circuits 1 -16 and 17-31 were tested on specimen 3. Initially, a test voltage of 600 volts AC was applied for one minute. Within 1 hour of completing humidity temperature cycling, specimens were again measured. A test voltage of 360 volts AC was applied for one minute. Twenty-Four hours after completing humidity temperature cycling, specimens were again measured. A test voltage of 360 volts AC was applied for one minute.

3.6 Dielectric Withstanding Voltage at Altitude

Dielectric withstanding voltage was conducted in accordance with EIA-364-20E. Specimens were wired inside the altitude chamber (Figure 8). The chamber was set to simulate an altitude of 70,000ft. DWV was measured between all adjacent contacts of mated specimens and all contacts and shell. All contacts of each circuit were bussed together and measured simultaneously. A test voltage of 150 volts AC was applied for one minute. Adjacent contacts of circuits 1 -16 were tested on specimen 1. Adjacent contacts of circuits 17 -31 were tested on specimen 2. Adjacent rows of circuits 1 -16 and 17-31 were tested on specimen 3.

Figure 8 – DWV at Altitude Test Setup

3.7 Sinusoidal Vibration

Sinusoidal vibration was conducted in accordance with EIA-364-28F, test condition IV. Specimens were mounted using vibration fixtures 39-1824904-1 and 39-1824905-1 (Figure 9). The parameters of this test condition are a simple harmonic motion having an amplitude of either 0.06 inch double amplitude (maximum total excursion) or 20 gravity unit (g's peak) whichever less is. The vibration frequency was varied logarithmically between the approximate limits of 10 to 2000 Hertz (Hz). The entire frequency range of 10 to 2000 Hz and return to 10 Hz was traversed in approximately 20 minutes (Figure 10). This cycle was performed 12 times in all three mutually perpendicular axes (total of 36 times), so that the motion was applied for a total period of approximately twelve hours. The test specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

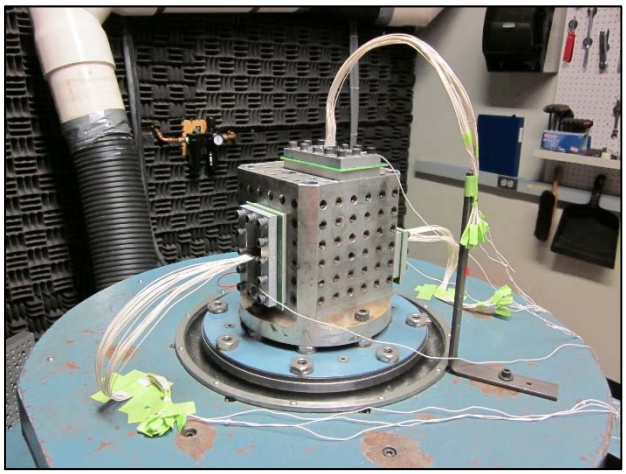

Figure 9 – Vibration and Shock Test Setup

3.7 Sinusoidal Vibration (cont.)

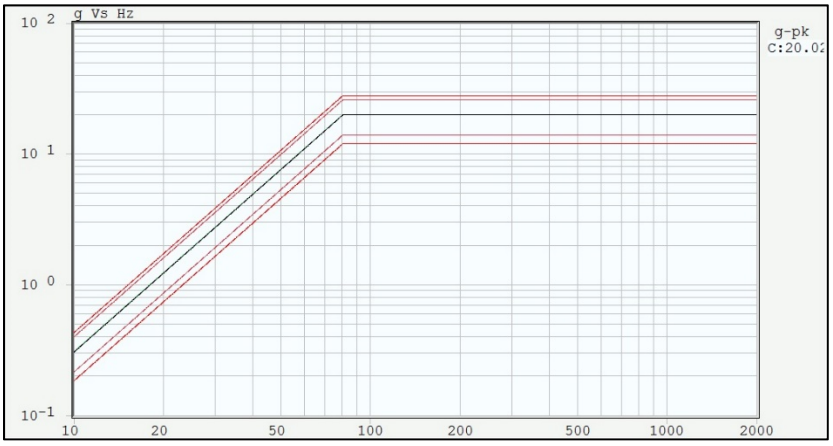

Figure 10 – Sinusoidal Vibration Profile

3.8 Mechanical Shock

Mechanical Shock was conducted in accordance with specification EIA-364-27C, test condition E. Specimens were mounted using vibration fixtures 39-1824904-1 and 39-1824905-1 (Figure 9). The parameters of this test condition are a saw-tooth waveform with an acceleration amplitude of 50 gravity units (g's peak) and a duration of 11 milliseconds (Figure 11). One shock in each direction was applied along the three mutually perpendicular axes of the test specimens, for a total of six shocks. The test specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

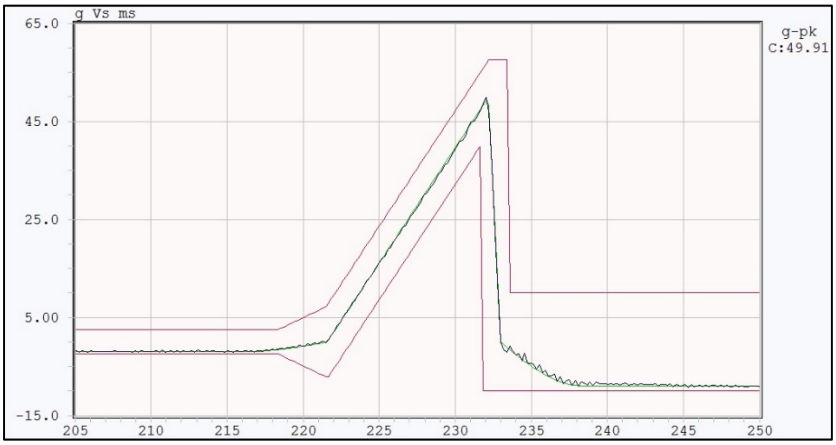

Figure 11 – Sinusoidal Vibration Profile

3.9 Durability

Durability was conducted in accordance with EIA-364-09C. Vibration fixture 39-1824905-1 was used to mount the board mount plug to a free floating X-Y-R table (Figure 12). The wired receptacle was mounted to a “goal post” type fixture. Specimens were mated and unmated 500 times at a rate of 500 cycles per hour.

3.9 Durability (cont.)

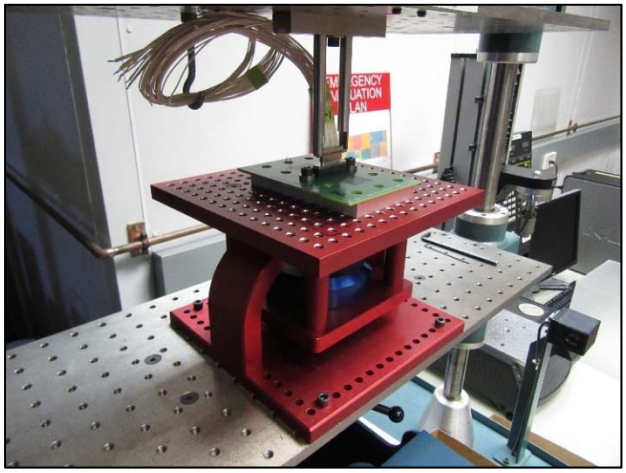

Figure 12 – Durability Test Setup

3.10 Mating Force

Mating force was conducted in accordance with EIA-364-13E. Vibration fixture 39-1824905-1 was used to mount the board mount plug to a free floating X-Y-R table (Figure 13). The wired receptacle was mounted to a "goal post" type fixture. Specimens were mated and unmated at a rate of 0.20 in/min. The average force per contact was calculated.

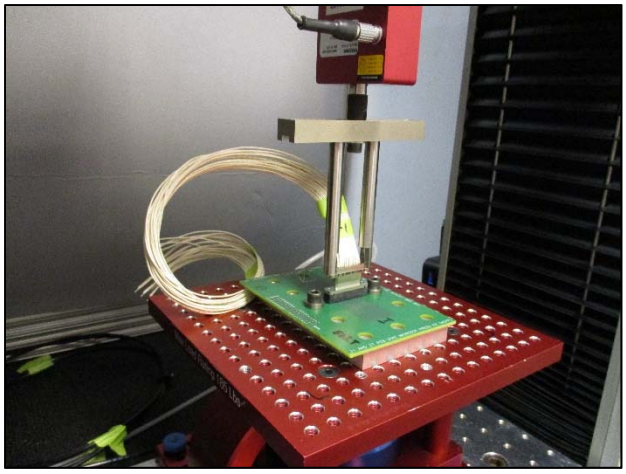

Figure 13 – Mating Unmating Force Test Setup

3.11 Unmating Force

Unmating force was conducted in accordance with EIA-364-13E. Vibration fixture 39-1824905-1 was used to mount the board mount plug to a free floating X-Y-R table (Figure 13). The wired receptacle was mounted to a "goal post" type fixture. Specimens were mated and unmated at a rate of 0.20 in/min. The average force per contact was calculated.

3.12 Compliant Pin Insertion Force

Compliant pin insertion force was conducted in accordance with EIA-364-5B. Specimens were applied to the test PCB using a flat rock technique (Figure 14). A downward force was applied to the mating surface of the specimens at a rate of 0.20 inches per minute. Force was applied until the specimens were seated.

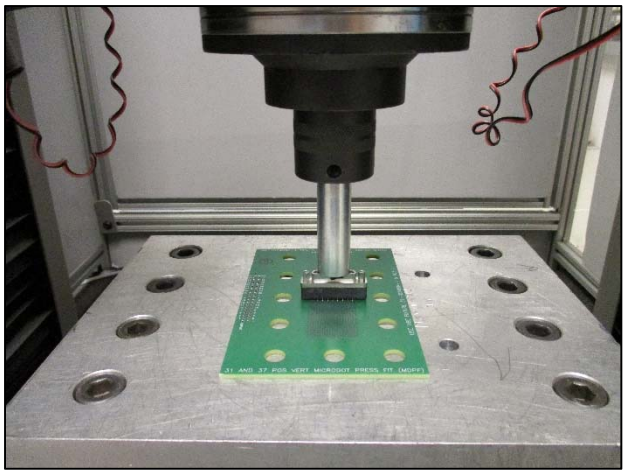

Figure 14 – Compliant Pin Insertion Force Test Setup

3.13 Thermal Shock

Thermal Shock was conducted in accordance with EIA-364-32G. Mated specimens were exposed to 5 cycles between -55°C and 125°C consisting of 30 minutes at each extreme. The transition between temperatures was less than one minute.

3.14 Humidity-Temperature Cycling with Cold Shocks

Mated specimens were exposed to 10 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25°C and 65°C twice while maintaining high humidity. During five of the first nine cycles, the specimens were exposed to a cold shock at –10°C for 3 hours (Figure 15).

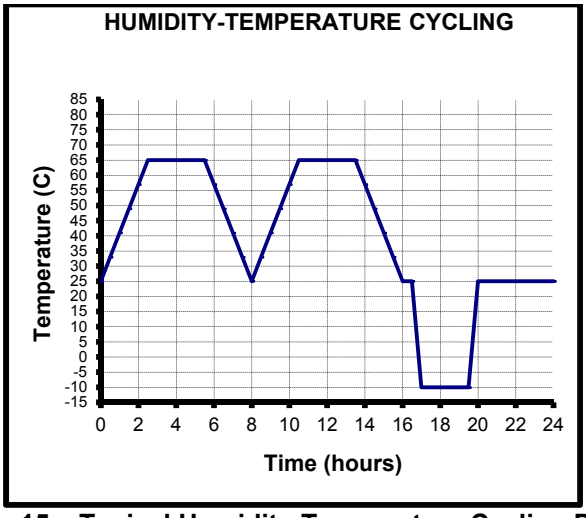

Figure 15 – Typical Humidity-Temperature Cycling Profile

3.15 Temperature Life

Temperature life was conducted in accordance with EIA-364-17C. Mated specimens were exposed to a temperature of 125°C for 1000 hours.

3.16 Magnetic Permeability

Magnetic permeability was conducted in accordance with MIL-DTL-83513G. Mated specimens were measured using a permeability indicator. The indicator was run along all surfaces of the specimens (Figure 16).

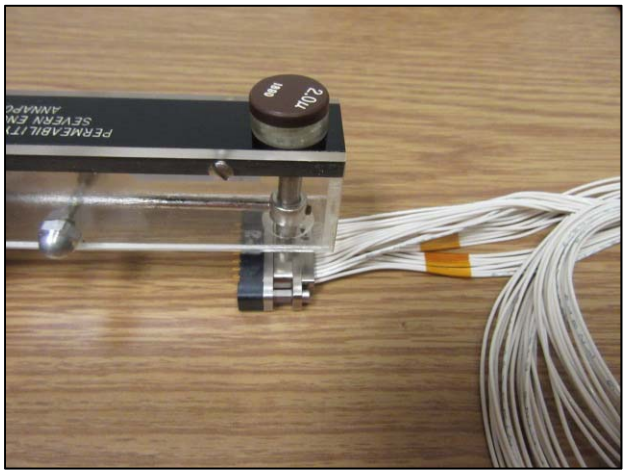

Figure 16 – Magnetic Permeability Test

3.17 Salt Spray

Salt spray was conducted in accordance with EIA-364-26C. The specimens were placed in the chamber on racks with the mating interface on a horizontal axis. The chamber was operated for a total of 48 hrs. See Table 11 for chamber run intervals. Upon completion of the test, the specimens were rinsed in warm tap water to remove salt deposits and placed in an air-circulating oven at 38 C for 12 hrs. The chamber operating parameters were as follows:

Salt Fog Chamber Operating Parameters:

- Chamber Temperature: 35°C.
- Aeration Tower temperature: 48°C.
- 5% Brine Solution Purity: Sodium Chloride with no more than .3% impurities at 95% RH.
- Aeration Tower Pressure: 15 PSI.
- Brine Solution pH Range: 6.5 to 7.2.
- Specific Gravity Range: 1.031 to 1.037.
- Collection rate: .5 to 3ml per hour.

Table 11 – Salt Spray Collections

DATE	TECHNICIAN	TOTAL HOURS	AIR PRESSURE	COLLECTION								PH				SPECIFIC GRAVITY				SOLUTION TEMP (°C)				COMMENTS
				TOTAL (ml)				RATE (ml/hr)																
				LF	LR	RF	RR	LF	LR	RF	RR	LF	LR	RF	RR	LF	LR	RF	RR	LF	LR	RF	RR	
1/3/2017	Zuvich	48	15	53	58	46	58	1.10	1.21	0.96	1.21	6.76	6.8	6.76	6.82	1.035	1.035	1.036	1.035	27.7	28	26.6	27.3	12/28/16 to 12/30/16

3.18 Fluid Immersion

Fluid Immersion was conducted in accordance with MIL-DTL-83513G. Unmated specimens were fully immersed in specified fluids for the time specified in Table 12 (Figures 17 and 18). After removal from the fluids each connector was allowed to rest for 1 hour in free air at ambient condition. Following fluid immersion specimens were subjected to mating unmating testing.

Table 12 – Fluid Immersion

Specimens	Fluid	Description	Duration
3-1, 3-2	Turbine Oil 555	Lubricating Oil for Aircraft turbine engines, synthetic base	20 Hours
3-3	Coolanol 25	Coolant-dielectric fluid synthetic silicate ester base lubricant	1 Hour ± 1 minute

Figure 17 – Fluid Immersion Lubricating oil

Figure 18 – Fluid immersion Coolant Dielectric

3.19 Final Examination of Product

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