CeeLok Fas-T* Nano Circular Connector

1. INTRODUCTION

1.1 Purpose

Testing was performed on the TE Connectivity (TE) NANONICS* CeeLok Fas-T Nano Circular Connector to determine its conformance to the requirements of Product Specification 108-32048, Rev C.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the TE NANONICS CeeLok Fas-T Nano Circular Connector. Testing was performed at the Harrisburg Electrical Components Test Laboratory between 6-June-2013 and 25-March-2014. This test documentation is on file and maintained at the TE Harrisburg Electrical Components Test Laboratory under test numbers EA20130332T and EA20140109T.

1.3 Conclusion

The TE NANONICS CeeLok Fas-T Nano Circular Connector listed in paragraph 1.5 conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-32048, Rev C.

1.4 Product Description

TE NANONICS CeeLok Fas-T Nano Circular Connectors are permanently assembled, non-field repairable devices which consist of seamless pin and socket contacts which are crimp-terminated to conductors which are housed in a thermoplastic insulator that is shrouded by an outer metal shell for added durability, ruggedness, polarization, and sealing capability. The connector types are such that plug connectors use pin contacts that are recessed within the connector shell, and receptacles use socket contacts which are also recessed within the shell.

1.5 Test Specimens

The test specimens were representative of normal production lots, and the following part numbers were used.

Table 1- Test Specimens

Test Group	Test Set ID[1]	Qty	Part Number	Description
1	1	3	1925255-1	quick disconnect wired plug, 30 AWG 10G turbo twin pair cable, 75°C rated
		3	1925259-1	quick disconnect wired receptacle, 30 AWG 10G turbo twin pair cable, 75°C rated
	2	3	1925252-1	thread coupling wired plug, 30 AWG 10G turbo twin pair cable, 75°C rated
		3	1925261-1	thread coupling PCB receptacle
2	3	3	1925252-1	thread coupling wired plug, 30 AWG 10G turbo twin pair cable, 75°C rated
		3	1925261-1	thread coupling PCB receptacle
3	4	2	1925255-1	quick disconnect wired plug, 30 AWG 10G turbo twin pair cable, 75°C rated
		2	1925259-1	quick disconnect wired receptacle, 30 AWG 10G turbo twin pair cable, 75°C rated
	5	2	1925252-1	thread coupling wired plug, 30 AWG 10G turbo twin pair cable, 75°C rated
		2	1925261-1	thread coupling PCB receptacle
	8	2	1925255-1	quick disconnect wired plug, 30 AWG 10G turbo twin pair cable, 125°C rated
		2	1925259-1	quick disconnect wired receptacle, 30 AWG 10G turbo twin pair cable, 125°C rated
	9	2	1925252-1	thread coupling wired plug, 30 AWG 10G turbo twin pair cable, 125°C rated
		2	1925261-1	thread coupling PCB receptacle
4	6	2	1925255-1	quick disconnect wired plug, 30 AWG 10G turbo twin pair cable, 75°C rated
		2	1925261-1	thread coupling PCB receptacle
5	7	2	1925255-1	quick disconnect wired plug, 30 AWG 10G turbo twin pair cable, 75°C rated
		2	1925259-1	quick disconnect wired receptacle, 30 AWG 10G turbo twin pair cable, 75°C rated

Note 1 – Test Set ID numbers 1 through 7 are represented by the testing of Test Set ID numbers 1 through 7 of EA20130332T. Test Set ID numbers 8 and 9 are represented by the testing of Test Set ID numbers 1 and 2 of EA20140109T.

1.6 Qualification Test Sequence

Table 2 - Test Sequence

Test or Examination	Test Group(a)				
	1	2	3	4	5
	Test Sequence(b)				
Initial Examination of Product	1	1	1	1	1
Low Level Contact Resistance	4, 9	2, 6			
Contact Resistance at Rated Current	5, 10	3, 7			
Insulation Resistance			2, 8		
Dielectric Withstanding Voltage			3, 9		
Insulation Resistance @ Temperature			4		
Dielectric Withstanding Voltage @ Altitude			5		
Shell To Shell Conductivity		4, 8			
Contact Engagement & Separation Force	2				
Contact Retention				3	
Insert Retention				4	
Sinusoidal Vibration	7(c)				
Random Vibration	7(d)				
Mechanical Shock	8				
Durability	6				
Magnetic Permeability				2	
Coupling Torque	3(d)				
Uncoupling Torque	11(d)				
Jam Nut Torque				5(e)	
Mating & Unmating Force	3(c), 11(c)				
Thermal Shock			6		
Humidity			7		
Hydrostatic Water Immersion					3
Water Jet Spray					2
Dust					4
Salt Spray		5			
Final Examination of Product	12	9	10	6	5

(a) See paragraph 1.5
(b) The numbers indicate sequence in which tests were performed
(c) Applicable to quick disconnect coupling connectors only
(d) Applicable to thread coupling connectors only
(e) Applicable to panel mount receptacle connectors only

1.7 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 – All Groups

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, 2

Specimens met the requirements of Product Specification 108-32048, Rev C. All low level contact resistance measurements were less than 70 milliohms initially and 70 milliohms after testing. See Tables 3 through 5 for summary results.

Table 3 – LLCR, Test Set 1, Test Group 1, PN 1925255-1 & 1925259-1

Condition	Initial (milliohms)	Final (milliohms)
Data Points	24	24
Min	43.93	44.79
Max	53.08	52.98
Avg	48.96	49.18
Stdev	2.38	2.06

Table 4 – LLCR, Test Set 2, Test Group 1, PN 1925252-1 & 1925261-1

Condition	Initial (milliohms)	Final (milliohms)
Data Points	24	24
Min	47.71	48.62
Max	55.97	56.77
Avg	53.35	53.54
Stdev	2.09	2.27

Table 5 – LLCR, Test Set 3, Test Group 2, PN1925252-1 & 1925261-1

Condition	Initial (milliohms)	Final (milliohms)
Data Points	24	24
Min	55.10	55.06
Max	56.82	56.85
Avg	55.95	55.79
Stdev	0.45	0.47

2.3 Contact Resistance at Rated Current – Groups 1, 2

Specimens met the requirements of Product Specification 108-32048, Rev C. All contact resistance measurements taken at rated current were less than 70 millivolts initially and 70 millivolts after testing. See Table 6 through 8 for summary results.

Table 6 – Contact Resistance, Test Set 1, Test Group 1, PN 1925255-1 & 1925259-1

Condition	Initial (millivolts)	Final (millivolts)
Data Points	24	24
Min	44.03	49.44
Max	57.02	61.42
Avg	51.53	54.57
Stdev	2.78	2.98

Table 7 – Contact Resistance, Test Set 2, Test Group 1, PN 1925252-1 & 1925261-1

Condition	Initial (millivolts)	Final (millivolts)
Data Points	24	24
Min	50.83	53.75
Max	59.54	60.54
Avg	56.30	57.96
Stdev	2.41	1.86

Table 8 – Contact Resistance, Test Set 3, Test Group 2, PN 1925252-1 & 1925261-1

Condition	Initial (millivolts)	Final (millivolts)
Data Points	24	24
Min	56.73	56.19
Max	58.76	58.89
Avg	57.36	57.41
Stdev	0.47	0.66

2.4 Insulation Resistance – Group 3

Specimens met the requirements of Product Specification 108-32048, Rev C. All insulation resistance measurements at ambient conditions were greater than 5000 MegOhms. All insulation resistance measurements immediately following exposure to humidity were greater than 1 MegOhms. All insulation resistance measurements following 24 hours of post-humidity ambient conditioning were greater than 1000 MegOhms.

2.5 Dielectric Withstanding Voltage – Group 3

Specimens met the requirements of Product Specification 108-32048, Rev C. No dielectric breakdown or flashover occurred.

2.6 Insulation Resistance @ Temperature – Group 3

Specimens met the requirements of Product Specification 108-32048, Rev C. All insulation resistance measurements at an elevated temperature of either 75°C or 125°C, as applicable to the temperature rating of the cable, were greater than 1000 MegOhms.

2.7 Dielectric Withstanding Voltage @ Altitude – Group 3

Specimens met the requirements of Product Specification 108-32048, Rev C. No dielectric breakdown or flashover occurred when tested at an altitude of 70,000 feet.

2.8 Shell to Shell Conductivity – Group 2

Specimens met the requirements of Product Specification 108-32048, Rev C. Specimens maintained electrical continuity when energized at 1 ampere.

2.9 Contact Engagement & Separation Force – Group 1

Specimens met the requirements of Product Specification 108-32048, Rev C. All specimens had an engagement force of less than 6.0 oz and separation force of greater than 0.5 oz. See Table 9 for summary results. See Figure 1 for a typical engagement & separation force profile plot.

Table 9– Contact Engagement & Separation Force
Test Set 1, Test Group 1, PN 1925259-1
Test Set 2, Test Group 1, PN 1925261-1

Test Set	1		2	
Condition	Engagement	Separation	Engagement	Separation
Data Points	24	24	24	24
Min	1.01	1.06	1.00	0.91
Max	4.84	4.32	5.37	4.80
Avg	2.56	2.41	2.99	2.85
StDev	1.01	0.87	1.34	1.20

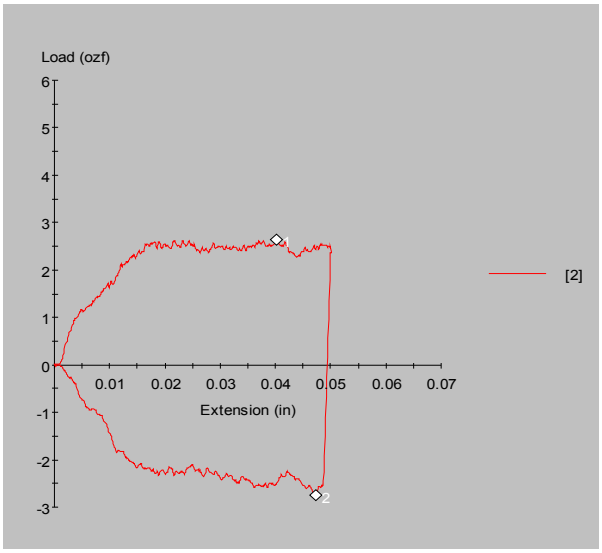

Figure 1 – Typical Engagement & Separation Force Profile Plot

2.10 Contact Retention – Group 4

Specimens met the requirements of Product Specification 108-32048, Rev C. All contacts had a maximum displacement of less than 0.002 inches. See Table 10 for summary results.

Table 10 – Contact Retention, Test Set 6, Test Group 4, PN 1925255-1 & 1925261-1

Test Set	1
Measurement	Displacement Under Load (in)
Data Points	32
Min	0.0002
Max	0.0017
Avg	0.0009
StDev	0.0006

2.11 Insert Retention – Group 4

Specimens met the requirements of Product Specification 108-32048, Rev C. All specimens retained their inserts while under load.

2.12 Sinusoidal Vibration – Group 1

Specimens met the requirements of Product Specification 108-32048, Rev C. No discontinuities greater than 1 microsecond were detected during vibration. Following vibration testing, no cracks, breaks, or loose parts on the specimens were visible.

2.13 Random Vibration – Group 1

Specimens met the requirements of Product Specification 108-32048, Rev C. No discontinuities greater than 1 microsecond were detected during vibration. Following vibration testing, no cracks, breaks, or loose parts on the specimens were visible.

2.14 Mechanical Shock – Group 1

Specimens met the requirements of Product Specification 108-32048, Rev C. No discontinuities greater than 1 microsecond were detected during mechanical shock. Following mechanical shock testing, no cracks, breaks, or loose parts on the specimens were visible.

2.15 Durability – Group 1

Specimens met the requirements of Product Specification 108-32048, Rev C. No physical damage occurred to the specimens as a result of manually mating and unmating the specimens 500 times.

2.16 Magnetic Permeability – Group 4

Specimens met the requirements of Product Specification 108-32048, Rev C. Specimens did not exceed the maximum requirement of 2 µ.

2.17 Coupling Torque – Group 1

Specimens met the requirements of Product Specification 108-32048, Rev C. Specimens had a coupling torque of less than 10.0 in-lbs. See Table 11 for summary results.

Table 11 – Coupling Torque, Test Set 2, Test Group 1, PN 1925252-1 & 1925261-1

	Coupling Torque (in.oz)
Min	3.60
Max	4.01
Avg	3.78
Stdev	0.21

2.18 Uncoupling Torque – Group 1

Specimens met the requirements of Product Specification 108-32048, Rev C. Specimens had a minimum uncoupling torque greater than of 4.0 in-oz. See Table 12 for summary results.

Table 12 – Uncoupling Torque, Test Set 2, Test Group 1, PN 1925252-1 & 1925261-1

	Uncoupling Torque (in.oz)
Min	4.92
Max	6.70
Avg	5.63
Stdev	0.94

2.19 Jam Nut Torque – Group 4

Specimens met the requirements of Product Specification 108-32048, Rev C. When the jam nut was tightened to 20.0 in-lbs, the specimens showed no signs of damage, breakage, stripping, or any other condition that would affect performance.

2.20 Mating & Unmating Force – Group 1

Specimens met the mating & unmating force requirements of Product Specification 108-32048, Rev C. Specimens had a mating force less than the required maximum of 8.0 lbs. Specimens had an unmating force greater than the required minimum of 2.0 lbs. See Table 13 for mating and unmating force data. See Figures 2 and 3 for typical mating and unmating force profile plots.

Table 13 – Mating Unmating Force, Test Set 1, Test Group 1, PN1925255-1 & 1925259-1

	Initial		Final	
Specimen	Mating (lbs)	Unmating (lbs)	Mating (lbs)	Unmating (lbs)
1	6.24	3.22	5.04	2.47
2	6.08	2.62	4.14	2.39
3	7.07	3.14	6.03	3.50

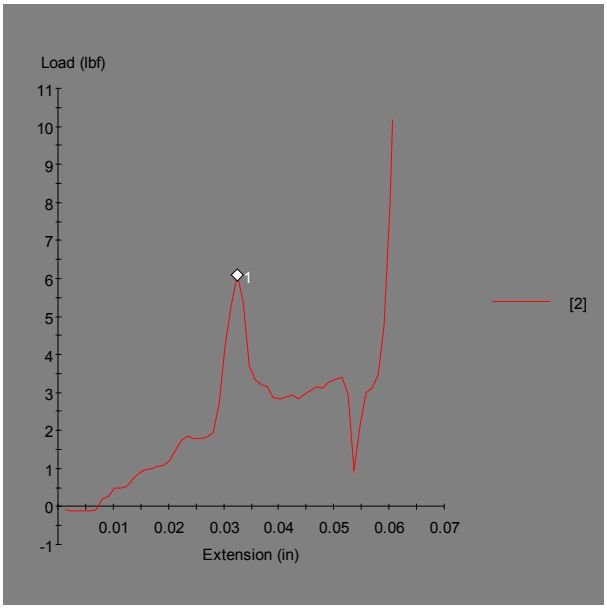

Figure 2 – Typical Mating Force Profile Plot

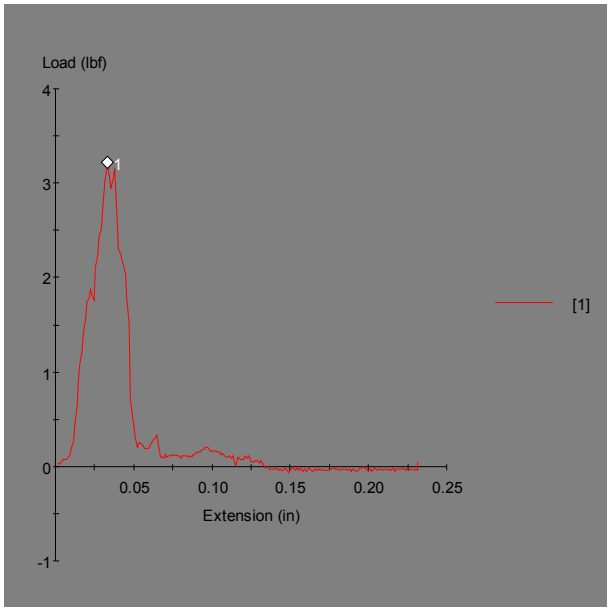

Figure 3 – Typical Unmating Force Profile Plot

2.21 Thermal Shock – Group 3

Specimens met the requirements of Product Specification 108-32048, Rev C. No evidence of physical damage was visible as a result of exposure to thermal shock.

2.22 Humidity – Group 3

Specimens met the requirements of Product Specification 108-32048, Rev C. No evidence of physical damage was visible as a result of exposure to humidity.

2.23 Hydrostatic Water Immersion – Group 5

Specimens met the requirements of Product Specification 108-32048, Rev C. No ingress of water was observed. No evidence of physical damage was visible as a result of exposure to hydrostatic water immersion.

2.24 Water Jet Spray – Group 5

Specimens met the requirements of Product Specification 108-32048, Rev C. No ingress of water was observed. No evidence of physical damage was visible as a result of exposure to water jet spray.

2.25 Dust – Group 5

Specimens met the requirements of Product Specification 108-32048, Rev C. No ingress of dust was observed. No evidence of physical damage was visible as a result of exposure to dust.

2.26 Salt Spray – Group 2

Specimens met the requirements of Product Specification 108-32048, Rev C. No evidence of physical damage was visible as a result of exposure to salt spray.

2.27 Final Examination of Product – All Groups

Specimens met the requirements of Product Specification 108-32048, Rev C. No evidence of physical damage detrimental to product performance was observed.

3. TEST METHODS

3.1 Initial Examination of Product – All Groups

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

3.2 Low Level Contact Resistance – Groups 1, 2

Testing was conducted in accordance with EIA-364-23C. Mated specimens where measured using a four terminal technique while maintaining 100 milliamperes maximum and 20 millivolts open circuit (source) voltage maximum. Voltage probes were placed on the conductors a distance of 152.4 millimeters ± 3.0 millimeters (6.00 inch ± 0.12 inch) from each other, with the mated contacts in the center of that distance.

3.3 Contact Resistance at Rated Current – Groups 1, 2

Testing was conducted in accordance with EIA-364-06C. Mated specimens where measured using a four terminal technique while maintaining 1 amperes maximum and 1 volt open circuit (source) voltage maximum. Voltage probes were placed on the conductors a distance of 152.4 millimeters ± 3.0 millimeters (6.00 inch ± 0.12 inch) from each other, with the mated contacts in the center of that distance.

3.4 Insulation Resistance – Group 3

Testing was conducted in accordance with EIA-364-21D. Unmated specimens were energized with 500 VDC for a period of 2 minutes. Following 2 minutes the Insulation resistance was recorded. Each of the 4 contact pairs was tested. All contacts were also tested to the shell.

3.5 Dielectric Withstanding Voltage – Group 3

Testing was conducted in accordance with EIA-364-20D. At ambient conditions unmated specimens were energized with 500 VAC for a period of 1 minute. Following humidity exposure specimens were energized with 100 VAC for a period of 1 minute. Each of the 4 contact pairs was tested. All contacts were also tested to the shell.

3.6 Insulation Resistance @ Temperature – Group 3

Testing was conducted in accordance with EIA-364-21D. Unmated specimens were placed in an air circulation oven and allowed to stabilize at either 75°C or 125°C, as applicable to the temperature rating of the cable, prior to taking measurements. Specimens were energized with 500 VDC for a period of 2 minutes. Following 2 minutes the Insulation resistance was recorded. Each of the 4 contact pairs was tested. All contacts were also tested to the shell.

3.7 Dielectric Withstanding Voltage @ Altitude – Group 3

Testing was conducted in accordance with EIA-364-20D. Unmated specimens were placed in an altitude chamber and allowed to stabilize at 70,000 ft for a minimum of 5 minutes prior to taking measurements. Specimens were energized with 100 VAC for a period of 1 minute. Each of the 4 contact pairs was tested. All contacts were also tested to the shell.

3.8 Shell to Shell Conductivity – Group 2

Testing was conducted in accordance with EIA-364-83 with the exception that only one test probe with spherical end of 1.27 mm (0.050 in) minimum radius was used. Mated specimens were measured using a four terminal technique while maintaining 1 amperes maximum and 1 volt open circuit (source) voltage maximum. Voltage probes were placed on a point on the rear accessory thread on the plug to the mounting flange on the receptacle and adjacent to the o-ring on the front or mounting side of the flange. Special attention was given to ensure that the force to apply the probes did not alter or move the interface.

3.9 Contact Engagement & Separation Force – Group 1

Specimens were mounted to a test panel that was secured in a vise. A radius tipped 0.0127 inch test pin was used for testing. The test pin was inserted into the socket contacts to a maximum depth of approximately 0.050 inches at a rate of 0.10 inches per minute. The force required to insert and remove the test pin were recorded in ounces. See Figures 4 and 5.

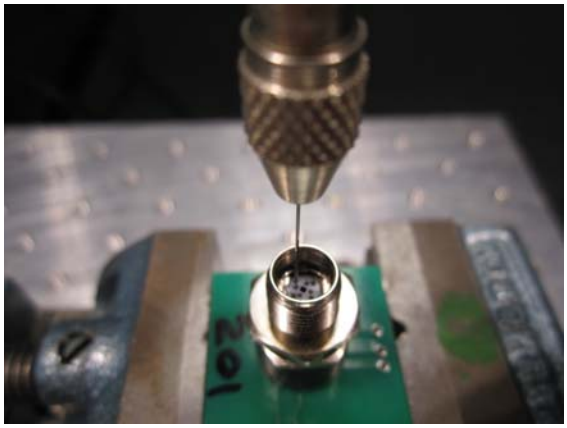

Figure 4 - Contact Engagement & Separation Force

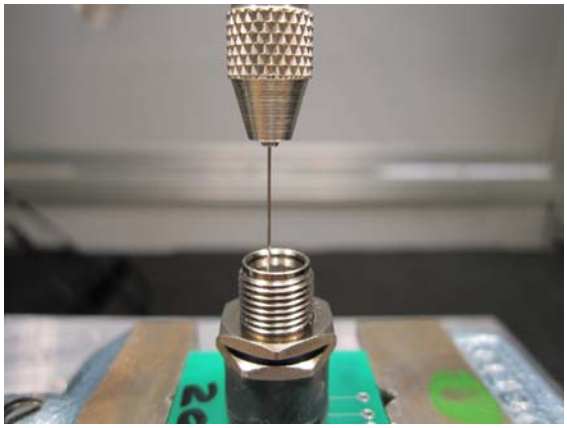

Figure 5 - Contact Engagement & Separation Force

3.10 Contact Retention – Group 4

Testing was conducted in accordance with EIA-364-29C, Method B with the exception that testing was performed in one direction only. A test probe with a recessed tip was used to apply an axial load to each pin contact under test. A 0.012 inch test probe was used to apply an axial load to each socket contact under test. The load was applied to each contact at the rate of 0.01 inches per minute until the minimum specified force of 2 pounds was reached and then the load was maintained for 6 seconds. The maximum displacement was measured when the specified force was reached. The displacement was considered the difference between the points at which the load reached 0.2 pounds to the point at which the maximum displacement was observed. See Figures 6 and 7.

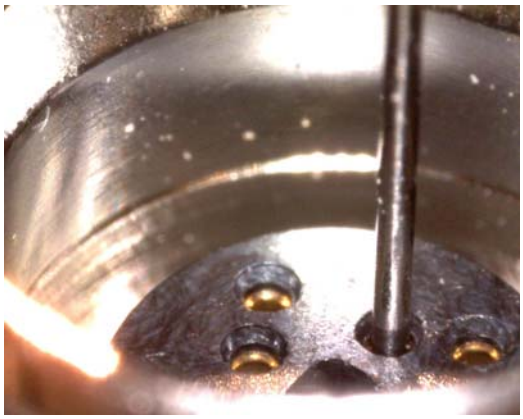

Figure 6 – Contact Retention

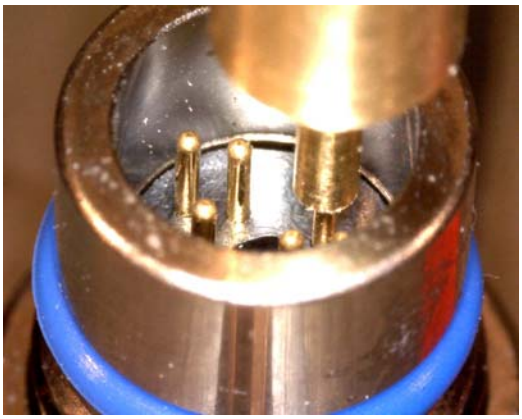

Figure 7 – Contact Retention

3.11 Insert Retention – Group 4

Specimens were tested in accordance with EIA-364-35C. A test probe was placed on the front connector insert and force was applied using a flat rock technique. A load of 50 psi (approx 0.884 lbs) was applied in one direction. See Figure 8.

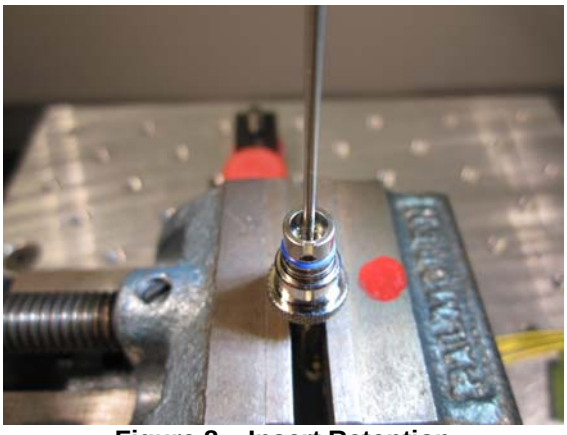

Figure 8 – Insert Retention

3.12 Sinusoidal Vibration – Group 1

Testing was conducted in accordance with specification EIA-364-28F, test condition IV. 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 was less. 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. 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 mated test specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

3.13 Random Vibration – Group 1

Testing was conducted in accordance with specification EIA-364-28F, test condition V, Test Letter K. The parameters of this test condition are specified by a random vibration spectrum, with excitation frequency bounds of 50 and 2000 hertz. The power spectral density at 50 Hz was 0.25 G^2/Hz. The spectrum sloped up at 6 dB per octave to a PSD of 1.5 G^2/Hz at 100 Hz. The spectrum was flat at 1.5 G^2/Hz from 100 to 1000 Hz. The spectrum sloped down at 6 dB per octave to the upper bound frequency of 2000 Hz at which the PSD was 0.25 G^2/Hz. The root-mean square amplitude of the excitation was 46.30 GRMS. This was performed for 90 minutes in each of three mutually perpendicular planes for a total vibration time of 270 minutes. The mated test specimens were monitored for discontinuities of one microsecond or greater using a current of 100 milliamperes in the monitoring circuit.

3.14 Mechanical Shock – Group 1

Testing was conducted in accordance with specification EIA-364-27C, test condition D. The parameters of this test condition are a half-sine waveform with an acceleration amplitude of 300 gravity units (g's peak) and a duration of 3 milliseconds. Three shocks in each direction were applied along the three mutually perpendicular axes of the test specimens, for a total of eighteen shocks. The mated test specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

3.15 Durability – Group 1

Testing was conducted in accordance with TE test procedure 408-10411 Rev D. Specimens were manually cycled 500 times at a maximum rate of 300 cycles per hour. Specimens were cycled using the “pre-aligned” method stated in TE test procedure 408-10411. Specimens were mounted in their corresponding vibration fixtures to ensure the stability and proper cycling technique.

3.16 Magnetic Permeability – Group 4

Testing was conducted in accordance with EIA-364-54A. The relative permeability of the samples was tested with a permeability indicator conforming to ASTM A342/A342M Revision 2004.The indicator was run along the entire surface of the connector to determine whether the relative permeability would exceed the 2 μ limit.

3.17 Coupling Torque – Group 1

Unmated specimens were secured in a vise that was attached to a torque meter. The specimens were mated and the maximum torque required to mate the specimens was recorded.

3.18 Uncoupling Torque – Group 1

Mated specimens were secured in a vise that was attached to a torque meter. The specimens were unmated and the maximum torque required to unmate the specimens was recorded.

3.19 Jam Nut Torque – Group 4

The unmated specimens were mounted on a 0.125 inch thick plate. Using a socket attached to a torque indicator the jam nut was tightened to 20 in-lbs. The jam nut was then removed and the specimen was evaluated for damage.

3.20 Mating & Unmating Force – Group 1

Testing was done in accordance with EIA-364-13E, Method A. Specimens were mounted to a test panel that was secured in a vise. A slotted plate was used to apply axial load in a downward direction to rear of the coupling sleeve. The maximum force required to mate the specimens was recorded. The slotted plated was then placed under the coupling sleeve. An axial load was applied in an upward direction until the specimens unmated. The maximum force required to unmate the specimens was recorded. See Figures 9 and 10.

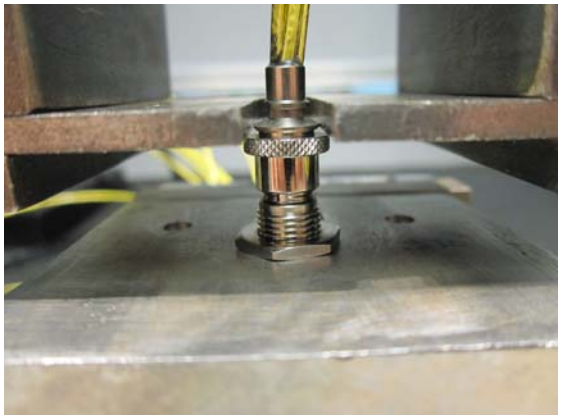

Figure 9 – Mating Force

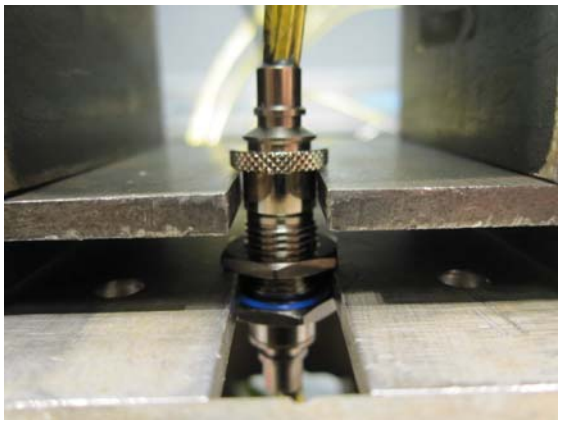

Figure 10 – Unmating Force

3.21 Thermal Shock – Group 3

Testing was conducted in accordance with EIA-364-32F; Condition I. Mated specimens were exposed to either 5 cycles between -55°C and 75°C, or 5 cycles between -55°C and 125°C, as applicable to the temperature rating of the cable.

3.22 Humidity – Group 3

Testing was conducted in accordance with EIA-364-31C; Method IV. Steps 7a and 7b were not required. Specimens were mated during exposure.

3.23 Hydrostatic Water Immersion – Group 5

The specimen conductors were sealed to prevent any ingress of water via the wire. This was done by first cutting the specimens conductors to length. The conductors were then dipped in dielectric wax to ensure an even and consistent protective coating. Following the wax dip, the conductors where covered with heat shrink tubing to add additional protection. See Figure 11. Care was taken not to seal the rear conductor entry point of the specimens. This portion of the connector is sealed in production, and is to be considered under test. The specimens where then inspected to ensure the interface was free of debris and/or contaminants. The specimens were then mated.

Testing was conducted in accordance with IEC 60529 edition 2.1, IPX8, and Standard Procedure 351-0050 Rev C. Specimens were immersed in water at a depth of 1 m (3.28 ft) for a period of 2 hours. Following the exposure specimens were dried with a paper towel. Compressed air was used to dry any areas that where not easily dried with the paper towels. Care was taken not to blow any air or water into the mating area. The specimens were carefully unmated and evaluated for ingress of water. Following the visual examination, specimens were subjected to DWV testing as TE Test Specification 351-0050 Rev C.

Figure 11 – Hydrostatic Water Immersion Specimen Preparation

3.24 Water Jet Spray – Group 5

The specimen conductors were sealed to prevent any ingress of water via the wire. This was done by first cutting the specimens conductors to length. The conductors were then dipped in dielectric wax to ensure an even and consistent protective coating. Following the wax dip the conductors where covered with heat shrink tubing to add additional protection. See Figure 11. Care was taken not to seal the rear conductor entry point of the specimens. This portion of the connector is sealed in production and to be considered under test. The specimens were mounted in a water tight enclosure with a panel thickness of 0.125 inches. The jam nut was tightened to the specified 20 inch-pounds. The specimens where then inspected to ensure the interface was free of debris and/or contaminants. The specimens were then mated. See Figure 12. Testing was conducted in accordance with IEC 60529 edition 2.1, IPX6. Specimens were subjected to a stream of water delivered from a 12.5 mm (0.49 in) nozzle at a rate of 100l/min ±5% (26.42 gal/min). Specimens were subjected to the water jet spray test for 3 minutes. Following the exposure the exterior of the enclosure was dried off. The enclosure was then examined to determine if any water had entered via the specimen.

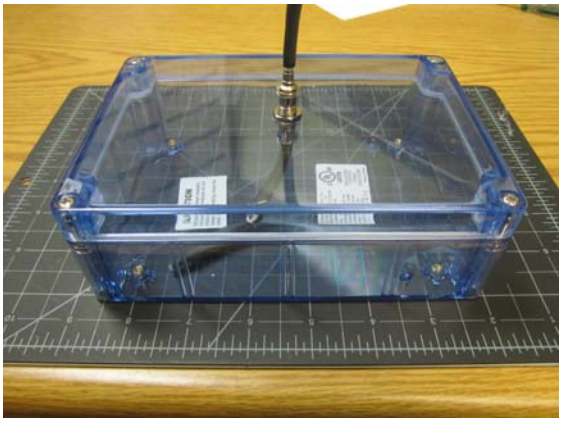

Figure 12 – Water Jet Specimen Preparation

3.25 Dust – Group 5

The specimens were prepared by drilling a small hole in the connector housing. See Figure 13. This hole was used as an access port for the vacuum line. Another hole was dilled in an axial direction through the connector interface to ensure the vacuum line would generate the proper vacuum inside the connector. See Figure 14. A syringe tip was attached to the access port using epoxy. See Figure 15. This was done to provide an attachment mechanism for the vacuum line. Once prepared, the specimens were placed inside the chamber and attached to the vacuum line. See Figure 16. Mated specimens were tested in accordance with IEC 60529, Edition 2.1, IP6X. Specimens were subjected to talcum powder maintained in suspension in a closed chamber for a period of 8 hours. The pressure inside each specimen was maintained below the surrounding atmosphere. This was done with a vacuum pump that maintained an extraction rate of approximately 2 kPa (20 mbar).

Figure 13 – Access Port

Figure 14 – Access Port

Figure 15 – Access Port

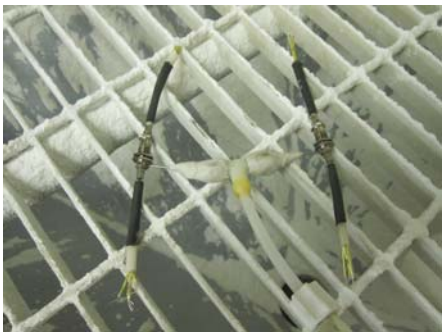

Figure 16 – Dust Test Setup

3.26 Salt Spray – Group 2

Testing was conducted in accordance with EIA-364-26B; Condition B. The specimens conductors were protected with heat shrink tubing during the exposure. Mated specimens were exposed to salt spray for 48 hours. Specimens were mounted with the engaging axis horizontal. See Figure 17.

Figure 17 – Salt Spray Test Setup

3.27 Final Examination of Product – All Groups

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