CeeLok FAS-T Connector

1. SCOPE

1.1. Content

This specification covers performance, tests and quality requirements for the TE Connectivity (TE) CeeLok FAS-T Connector, a small, ruggedized high speed circular connector suitable for aerospace and military applications. Data transmission rates of 10 Gb/s are achieved when terminated to CAT6A or CAT7 cable.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1. TE Connectivity (TE) Documents

- 114-32025: Application Specification (CeeLok FAS-T High Speed Circular Connector System)
- 501-134002: Qualification Test Report (CeeLok FAS-T Connector)

2.2. Industry Documents

- EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications
- IEC 529: Degrees of Protection Provided by Enclosures (IP Code)

2.3. Government Documents

- MIL-DTL-38999: Series III Connectors, Electrical, Circular, Miniature, High Density, Quick Disconnect (Bayonet, Threaded, and Breech Coupling), Environment Resistant, Removable Crimp and Hermetic Solder Contacts, General Specification for
- MIL-STD-202: Department of Defense Test Method Standard: Electronic and Electrical Component Parts

2.4. Reference Document

109-197: Test Specification (TE Test Specifications vs EIA and IEC Test Methods)

3. REQUIREMENTS

3.1. Design and Construction

Product shall be of the design, construction and physical dimensions specified on the applicable product drawing.

3.2. Materials

Materials used in the construction of this product shall be as specified on the applicable product drawing.

| Indicates Change

3.3. Ratings

- Voltage: 500 volts AC
- Current: 5 amperes maximum
- Temperature: -65 to 170°C
- Characteristic Impedance: 100 ohms
- Frequency Range: 1 to 500 MHZ

3.4. Performance and Test Description

Product is designed to meet the electrical, mechanical and environmental performance requirements specified in Figure 1. Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

3.5. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Initial examination of product.	Meets requirements of product drawing	EIA-364-18. Visual examination and dimensional (C of C) inspection per product drawing.
Final examination of product.	Meets visual requirements	EIA-364-18. Visual examination.
ELECTRICAL		
Low Level Contact Resistance (LLCR).	30 milliohms maximum ΔR 10 milliohms maximum	EIA-364-23. Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage.
Contact resistance at rated current.	52 millivolts at 2 amperes for 26 AWG wire 45 millivolts at 3 amperes for 24 AWG wire	EIA-364-6. Measure voltage drop at specified currents.
Insulation resistance at ambient.	5000 megohms minimum	EIA-364-21. 500 ± 10% volts DC, 2 minute hold. Test between adjacent contacts.
Insulation resistance at 175°C.	1000 megohms minimum	EIA-364-21. 500 ± 10% volts DC, 2 minute hold. Test between adjacent contacts.
Withstanding voltage at sea level.	One minute hold with no breakdown or flashover	EIA-364-20, Method A, Condition I. 500 volts AC at sea level. Test between adjacent contacts.
Withstanding voltage at altitude.	One minute hold with no breakdown or flashover	EIA-364-20, Method A,Condition III. 100 volts AC at 50,000 feet simulated altitude. Test between adjacent contacts and contacts to shell.
Shell-to-shell conductivity.	5 mV maximum voltage drop initial 10 mV maximum voltage drop final	EIA-364-83. Measure voltage drop across the shells of mated specimens at 1amp
Braid-to-shell conductivity.	One milliohm maximum	EIA-364-6. Unmated Measure voltage drop at 1 amp
Indirect lightning strike.	3k ampere current	EIA-364-75, Type B, Level 1

Figure 1 (Continued)

Test Description	Requirement	Procedure
	MECHANICAL	
Random vibration (1).	No discontinuities of 1 microsecond or longer duration See Note.	EIA-364-28, Test Condition V, Test Condition Letter J. Subject mated specimens to 37.80 G's rms between 50 to 2000 Hz. Ninety minutes in each of 3 mutually perpendicular planes.
Random vibration (2).	No discontinuities of 1 microsecond or longer duration See Note.	EIA-364-28, Test Condition VI, Test Condition Letter J. Subject mated specimens to 43.92G's rms between 50 to 2000 Hz. Ninety minutes in each of 3 mutually perpendicular planes.
Sinusoidal vibration (1).	No discontinuities of 1 microsecond or longer duration See Note.	MIL-STD-202, Method 204, Condition G.
Sinusoidal vibration (2).	No discontinuities of 1 microsecond or longer duration See Note.	MIL-DTL-38999 Series III. Subject mated specimens to 60G's between 10 to 2000Hz. 4 hrs in each of 3 mutually perpendicular planes.
Mechanical shock.	No discontinuities of 1 microsecond or longer duration See Note.	EIA-364-27, Test Condition D. Subject mated specimens to 300 G's half-sine shock pulses of 3 milliseconds duration. Three shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks.
Durability.	See Note.	EIA-364-9. Mate and unmate specimens for 500 cycles at a maximum rate of 500 cycles per hour.
Magnetic permeability.	2µ maximum	EIA-364-54. Apply indicator with 2µ pellet to all areas of the specimen.
Coupling torque.	0.9 N•m [8 lbf•in] maximum	EIA-364-13, Method A. Measure force necessary to mate specimens at a maximum rate of 12.7 mm [.5 in] per minute.
Uncoupling torque.	0.2 N•m [2 lbf•in] minimum	EIA-364-13, Method A. Measure force necessary to unmate specimens at a maximum rate of 12.7 mm [.5 in] per minute.
Insert retention.	111.2 N [25 lbf].	EIA-364-35. Apply specified axial load in a direction to cause the insert to be dislodged from the housing.
Electrical engagement.	1.27 mm [.05 in] minimum engagement	MIL-DTL-38999, paragraph 4.5.15
Contact retention.	26.7 N [6 lbf] minimum. 0.3 mm [.012 in] maximum displacement	EIA-364-29 Method B Apply axial load of 6 lbf in a direction that would cause the contact to dislodge from the housing.

Test Description	Requirement	Procedure
Maintenance aging.	See Note.	EIA-364-24. Remove and replace contacts 5 times.
	ENVIRONMENTAL	
Thermal shock.	See Note.	EIA-364-32, Method A, Test Condition V, Test Duration A. Subject mated specimens to 5 cycles between -65 and 175°C with 30 minute dwells at temperature extremes and 1 minute maximum transition between temperatures.
Humidity/temperature cycling.	See Note.	EIA-364-31, Method IV. Subject mated specimens to 10 cycles (10 days) between 25 and 65°C at 80 to 100% RH
Salt spray.	See Note.	EIA-364-26. Subject mated electroless nickel plated specimens to 5% salt solution for 48 hours (Condition B). Subject mated black zinc nickel plated specimens to 5% salt solution for 500 hours (Condition C).
Fluid immersion.	See Note.	EIA-364-10. Subject mated specimens to fuel, hydraulic oil, IPA and de-icer fluid
Dust.	No ingress of dust.	IEC 60529, IP5X.
Water jet spray.	No ingress of water into the enclosure.	IEC 60529, IPX6. Unmated.
Altitude immersion.	See Notes (g)&(h) of paragraph 3.6	EIA-364-3. Subject mated specimens submerged in a salt solution to 3 cycles between room ambient and altitude with 30 minute dwells at pressure extremes and 1 minute maximum transition between pressures.

NOTE

Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence

Figure 1 (End)

3.6. Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)										
	1	2	3(f)	4	5	6(f)	7	8(f)	9	10(c)	11(c)
	Test Sequence (b)										
Examination of product	1,12	1	1,10	1	1	1	1,11	1,7	1	1	1
LLCR	3,8,14						3,7,13			3,8	3,7
Contact resistance at rated current	4,9,15						4,8,14			4,9	4,8
Insulation resistance at ambient		4,8	2,7(e),12(e)								
Insulation resistance at 175°C		10									
Withstanding voltage at sea level		5,9	3,8(e),13(e)	3,5				10			
Withstanding voltage at altitude			3,9,14								
Shell-to-shell conductivity						5(d)		3,5,9			
Braid-to-shell conductivity						3(d),6(d)					
Indirect lightning strike								4			
Random vibration(1)							5				5
Random vibration(2)							12				
Sinusoidal vibration(1)	6									6	
Sinusoidal vibration(2)	13										
Mechanical shock	7						6			7	6
Durability	5									5	
Magnetic permeability						2					
Coupling torque	2			2,6			2	2,8		2	2
Uncoupling torque	10						9	6		10	9
Insert retention	11						10			11	10
Electrical engagement		3									
Contact retention		2									
Maintenance aging			5								
Thermal shock		6									
Humidity/temperature cycling		7									
Salt spray						4					
Fluid immersion				4							
Dust					2						
Water jet spray									2		
Altitude immersion			6(g),11(h)								
Final examination of product	16	11	15	7	3	8	15	11	3	12	11

Figure 2

NOTE

(a) See paragraph 4.1.A.
(b) Numbers indicate sequence in which tests are performed.
(c) Mounted on PCB's
(d) No electrical measurements on specimens with Black Zinc Nickel plating
(e) Measurements in immersion fluid
(f) Specimens to be torqued to 5 in-lb min, 8 in-lb max
(g) Altitude – 50,000 ft
(h) Altitude – 70,000 ft

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Specimen Selection

Specimens shall be prepared in accordance with applicable Instruction Sheets and shall be selected at random from current production. Each test group shall consist of a minimum of 1 specimens.

B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figure 2.

4.2. Requalification Testing

If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

4.3. Acceptance

Acceptance is based on verification that the product meets the requirements of Figure 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. If product failure occurs, corrective action shall be taken and specimens resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

4.4. Quality Conformance Inspection

The applicable quality inspection plan shall specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.