



1. SCOPE

1.1. Content

This specification covers the performance, tests and quality requirements for the TE Connectivity Optical Expanded Beam Termini, Size 16, for single channel multi-mode fiber. The termini are to be evaluated when mounted into a MIL-DTL-38999 series III style circular connector.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 2 shall be used. All inspections shall be performed using the applicable inspection plan(s) and product drawing(s).

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 Documents
 - A. 408-32132: Instruction Sheet (Termination of Optical Expanded Beam Termini, size 16, MM)
 - B. 501-32028: Qualification Test Report (Optical Expanded Beam Termini, size 16, MM)

2.2. Industry Documents

- A. IEC 62614: Fibre-Optics Launch Condition Requirements for Measuring Multimode Attenuation
- B. TIA/EIA-455-B: Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices and Other Fiber Optic Components

3. **REQUIREMENTS**

3.1. Design and Construction

Product shall be of the design, construction and physical dimensions specified on the applicable product drawing. The cable is a 1.8-2.2mm Flight Grade jacketed cable with internal strength members.

3.2. Optical Power Source

The optical power source wavelengths shall be 850 ± 30 and 1300 ± 30 nanometers for 50/125 multimode product with the exception that all Optical Discontinuity Monitoring (ODM) shall be conducted at 1300 ± 30 nm. The MM launch shall meet Encircled Flux requirement of IEC 62614 at the launch lead transmit connector.

3.3. Ratings

Performance	Value at 850 nm	Value at 1300 nm	Units
Initial insertion Loss, Max	1.5	1.5	dB
Storage Temperature	-50	°C	
Operating Temperature	-40	°C	
Durability	3	Cycles	

Figure1



NOTE

See Figure 2 for maximum attenuation and minimum return loss requirements.

3.4. Performance and Test Description

Product is designed to meet the mechanical, environmental, and optical transmittance performance requirements specified in Figure 2. Unless otherwise specified, all tests shall be performed at ambient environmental conditions. All measurements shall be recorded at the two optical wavelengths specified in section 3.2.

- 3.5. A similar product using a 62.5/125um fiber shall be regarded as qualified by comparison.
- 3.6. Test Requirements and Procedures Summary

Test Description	Requirements	Procedures
Visual and Mechanical Inspection	Termini shall meet the requirements of product drawings.	Visual, dimensional and functional per applicable quality inspection plan. TIA/EIA-455-13A
Insertion Loss for New Product	Each specimen of the test group shall meet the optical performance criteria: Max. IL ≤ 1.5dB	If needed, clean prior to initial measurement and as subsequently permitted per paragraph 5.1. TIA/EIA-455-34A, Method A2
Vibration, Sinusoidal	Each fiber channel of the test group shall meet the following optical performance criteria after testing each plane: After any test: Max. Attn. ≤ 1.7dB Max. Attn. Increase ≤ 0.5dB No optical discontinuities exceeding 0.5dB for more than 10µsec.	10 to 2000 Hz sine motion, except velocity of 10 inch/sec from 10 to 50Hz, 0.06 inch double amplitude from 50 to 140 Hz, and 60g from 140 to 2000 Hz. Conduct 36 sweeps of 20 minutes each, applied in 3 mutually perpendicular axis, for a total test time of approximately 12 hrs (4 hrs for each axis) at ambient temperature. Record optical transmittances before test and after specimens have been tested in each axis. Monitor 6 channels for discontinuities during the test (see NOTE). TIA/EIA-455-11C, Test Condition IV

Figure 2 (cont)



Test Description	Requirements	Procedures	
Vibration, Random	Each fiber channel of the test group shall meet the following optical performance criteria after testing each plane: : After test:	Test shall be applied for 8 hours in the longitudinal direction and 8 hours in a perpendicular direction for a total of 16 hours.	
	Max. Attn. ≤ 1.7dB Max. Attn. Increase ≤ 0.5dB No optical discontinuities exceeding 0.5dB for more than 10µsec.	Test temperature shall be ambient, record optical transmittance before test and following the test in each plane. Monitor 6 channels for discontinuities during the test (see NOTE) TIA/EIA-455-11C. Test Condition VI-1	
Mechanical shock	Each fiber channel of the test group shall meet the following optical performance criteria: After test: Max. Attn. ≤ 1.7dB Max. Attn. Increase ≤ 0.5dB No optical discontinuities exceeding 0.5dB for more than 10µsec.	100G, 6ms half-sine pulse. Three shocks in each direction shall be applied along the three mutually perpendicular axes of the test sample (18 shocks) Record optical transmittance before and after test. Monitor 6 channels for discontinuities during the test (see NOTE). TIA/EIA-455-14A, Test Condition C	
Durability	Each fiber channel of the test group shall meet the following optical performance criteria: After/during test: Max. Attn. ≤ 1.7dB Max. Attn. Increase ≤ 0.5dB	Perform initial cleaning of lenses and connector interfaces. Mate and unmate the connectors 300 times at a maximum rate of 300 cycles per hour. Measure insertion loss every 50 cycles. Cleaning is permitted as needed in order to meet the optical requirements. Use the cleaning schedule described in paragraph 5-1. Record attenuation immediately before and immediately cleaning if cleaning is applied. At the completion of the test, make final IL measurements after cleaning and inspecting (301 st cycle) TIA/EIA-455-21A	
Temperature Life, Hot	Each fiber channel of the test group shall meet the following optical performance criteria: After test: Max. Attn. ≤ 1.7dB Max. Attn. Increase ≤ 0.5dB	Specimen shall be mated and optically functioning. Maintain specimens undisturbed in the chamber at room ambient $(23 \pm 5^{\circ}$ C and 20 to 70%RH) for 2 hours prior to recording initial attenuation. Subject specimens to $85 \pm 2^{\circ}$ C for 50 hours. At the completion of testing, measure final attenuation 1 to 2 hours after the chamber returns to ambient conditions, with specimens undisturbed in the test chamber. TIA/EIA -455-4C	

Figure 2 (cont)



Test Description	Requirements	Procedures
Temperature Life, Cold	Each fiber channel of the test group shall meet the following optical performance criteria: After test: Max. Attn. ≤ 1.7dB Max. Attn. Increase ≤ 0.5dB	Specimen shall be mated and optically functioning. Maintain specimens undisturbed in chamber at room ambient (23 ±5°C and 20 to 70%RH) for 2 hours prior to recording initial attenuation. Subject specimens to -50±2°C for 50 hours. At completion of testing, measure final attenuation 1 to 2 hours after the chamber returns to ambient conditions, with specimens undisturbed in test chamber. TIA/EIA-455-4C
Thermal Cycling	Each fiber channel of the test group shall meet the following optical performance criteria: After/during test: Max. Attn. ≤ 1.7dB Max. Attn. Increase ≤ 0.5dB	Subject mated specimens to 20 cycles from -40°C to +85°C. Dwell 1 hour at every 23°C crossing and at each temperature extreme. Measure insertion loss at least 30 minutes into each dwell. After completion of the final cycle, measure insertion loss within 1 to 2 hours after the chamber returns to ambient conditions, with specimens undisturbed in the test chamber. TIA/EIA-455-3B, Test Condition C-2
Thermal Shock	Each fiber channel of the test group shall meet the following optical performance criteria: After/during test: Max. Attn. ≤ 1.7dB Max. Attn. Increase ≤ 0.5dB	The high and low soak temperatures shall be 125C +5C/-0C and -55C +0C/-5C. At completion of testing, measure final attenuation and change 1 to 2 hours after t chamber returns to ambient conditions; specimens undisturbed in test chamber. TIA/EIA-455-71, Schedule C-0 (5 cycles)

Figure 2 (end)

3.7. Product Qualification Test Sequence

Test	Test Group 1	Test Group 2			
Examination of Product	1	1			
Attenuation (insertion loss)	2, 6	2, 7			
Vibration, Sinusoidal	3	-			
Vibration, Random	4	-			
Mechanical Shock	5	-			
Mating Durability	7	-			
Temperature Life, Hot	-	3			
Temperature Life, Cold	-	4			
Thermal Cycling	-	5			
Thermal Shock	-	6			
Figure 0					

Figure 3

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NOTE

GROUP1 discontinuity: during Vibration and Mechanical Shock, monitor six channels for discontinuities. The channels shall be randomly selected as 4 channels from the 38999 size 23 assembly and one channel each from the 38999 size 17 assemblies. All testing where ODM is used shall be conducted at 1300 ± 30 nm.



NOTE

Numbers indicate sequence in which tests shall be performed.

3.8. Cable Assemblies in Each Group

	Group	Qty	D38999-style	Plug	Rcpt	Pin-LC	Socket-LC	Channels (total)
Cable Assembly	1	1	26WH21AN	Х	-	2226428-1	-	15 active,
Cable Assembly		1	24WH21BN	-	Х	-	2226427-1	6 plug seals
Cable Assembly	1	2	26WE8AN	Х	-	2226426-1	-	10 antivo
Cable Assembly		2	24WE8BN	-	Х	-	2226427-1	To active
Cable Assembly	2	1	26WH21AN	Х	-	2226426-1	-	15 active,
Cable Assembly		1	24WH21BN	-	Х	-	2226427-1	6 plug seals
Cable Assembly	2	2	26WE8AN	Х	-	2226428-1	-	10 antivo
Cable Assembly		2	24WE8BN	-	Х	-	2226427-1	To active
Cable Assembly	2	2	26WE8AN	Х	-	2226426-1	-	10 antivo
Cable Assembly		2	24WE8BN	-	Х	-	2226427-1	ro active
Control Cable	2	1	2226425-1	-	-	22264	425-1	1 active

Figure 4

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

Specimen Selection				
Size 16 EB Pin (F) to LC, 50/125mm OM4 Fiber, 3 Meters Long	TE Connectivity PN 2226426-1			
Size 16 EB Socket to LC, 50/125mm OM4 Fiber, 3 Meters Long	TE Connectivity PN 2226427-1			
Size 16 EB Pin (C) to LC, 50/125mm OM4 Fiber, 3 Meters Long	TE Connectivity PN 2226428-1			
Circular D38999 Plug, Size 17 with 8-Posn Pin Insert	Mil Std PN D38999/26WE8AN			
Circular D38999 Rcpt, Size 17 with 8-Posn Socket Insert	Mil Std PN D38999/24WE8BN			
Circular D38999 Plug, Size 23 with 21-Posn Pin Insert	Mil Std PN D38999/26WH21AN			
Circular D38999 Rcpt, Size 23 with 21-Posn Socket Insert	Mil Std PN D38999/24WH21BN			
Fiber Optic Cable Assy, LC-LC, Simplex, 50/125 μ m OM4 Fiber, 6 Meters Long	TE Connectivity PN 2226425-1			
Size 16 Empty Cavity Plug Seal	TE Connectivity PN 203839-2			

Figure 5



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

4.2. Requalification Testing

NOTE

If changes significantly affecting form, fit or functions 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 2. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and specimens resubmitted for qualification. Testing to confirm corrective action is required before resubmitted.

4.4. Quality Conformance Inspection

The applicable quality inspection plan will 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.

5. SPECIAL INSTRUCTIONS

5.1. Cleaning

Cleaning shall be performed prior to initial attenuation measurements and any time a connector specimen is uncoupled during qualification testing. The lenses and mating face are to be cleaned per the procedures of specification 408-32132. If, after cleaning the connector as prescribed, loss performance exceeds the specified limit, or, if the operator suspects the presence of debris at the optical or mechanical interface, perform the cleaning procedure a second time. If the resultant optical reading still exceeds the specification, clean the interface a third time and accept that reading.

Cleaning is permitted between any two tests.

5.2. Control Cables

Control cables shall be subjected to climatic environmental tests. Transmittance shall be recorded each time a specimen transmittance is made. Changes in control cable power of less than 0.05 dB may be neglected in the test specimen power and loss calculations. If control cable power changes by more than 0.05 dB during the duration of the test or sequence of tests, change in control cable power shall be included in power and loss calculations per TIA/EIA-455-20A.