
VITA 66.1 Style Fiber Optic Connectors

1. SCOPE

1.1. Content

This specification defines the performance, tests and quality requirements for the TE Connectivity (TE) VITA 66.1 Style Fiber-Optic Connectors, for multi-mode MT ferrule variants accepting a single 12-count fiber.

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 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 Documents

- 101-46: Workmanship Specification (Polished Optical End Faces)
- 501-134012: Qualification Test Report (VITA 66.1 Style Fiber Optic Connectors)

2.2. Industry Documents

- EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications
- Telcordia Technologies GR-1435-CORE, Issue 2: Generic Requirements for Multi-Fiber Optical Connectors
- TIA/EIA-455-B: Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices and Other Fiber Optic Components

2.3. Government Document

MIL-STD-810: Environmental Engineering Considerations and Laboratory Tests

3. REQUIREMENTS

3.1. Design and Construction

Product shall be of the design, construction and physical dimensions specified on the applicable product drawing. Cable is Type I Media – Multiple fibers arranged in a linear array and bound with a matrix material into a single unit (i.e., fiber ribbon).

3.2. Optical Power Source

The optical power source wavelengths shall be 850 ± 30 and 1300 ± 30 nanometers for multi-mode product, or as stated in the Test Report.

3.3. Ratings

Performance	Value at 850 nm	Value at 1300 nm	Units
Attenuation, Typical (see Note)	0.4	0.2	dB
Return Loss, Typical (see Note)	30	34	dB
Storage Temperature	-55 to 85		°C
Operating Temperature	-20 to 85		°C
Durability	100		Cycles

NOTE Typical values represent the median of the sample data for new product. See Figure 2 for maximum attenuation and minimum return loss requirements

Figure 1

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.

3.5. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Visual and mechanical inspection.	Connectors meet requirements of product drawings. MT Ferrules & cable assemblies meet end face requirements per Workmanship Specification 101-46 and Engineering Specification 115-1217-7.	TIA/EIA-455-13A. Visual, dimensional and functional per applicable quality inspection plan.
Attenuation.	For both pre-test measurements (random mate): Maximum attenuation value for any single specimen (connector joint or fiber) is 1.2 dB. Maximum average attenuation for any connector assembly is 0.7 dB. Maximum average attenuation for the test group (lot) is 0.65 dB. See Note 1.	TIA/EIA-455-171A, Method D1. Measure all fiber paths initially and at the end of the test sequence. At all other times, measure 3 fiber paths per paragraph 4.1.A. Clean per standard cleaning procedure (see GR-1435-CORE, Issue 1, Section 5.4.1). Take first pre-test measurement. Clean per TE recommended cleaning instructions. Record second pre-test measurement. See Figure 6 and Paragraph 5.1.
Return loss.	For both pre-test measurements (random mate): Minimum return loss value for any single specimen (connector joint or fiber) is 20 dB. See Note 1.	TIA/EIA-455-107A or TIA/EIA-455-8. Measure all fiber paths initially and at the end of the sequence. At all other times, measure 3 fiber paths per paragraph 4.1.A. Clean per standard cleaning procedure (see GR-1435 Issue 1, Section 5.4.1). Take first pre-test measurement. Clean per TE recommended cleaning instructions. Take second pre-test measurement. See Figure 6 and Paragraph 5.1.

Test Description	Requirement	Procedure
Thermal aging.	<p>Maximum attenuation value for any single specimen (connector joint or fiber) after testing is 1.2 dB.</p> <p>Maximum attenuation increase for any single specimen (connector joint or fiber) after testing is 0.5 dB.</p> <p>Minimum return loss for any single specimen (connector joint or fiber) after testing is 20 dB.</p> <p>See Notes 1 and 2.</p>	<p>TIA/EIA-455-4C.</p> <p>Subject mated specimens to 85±2°C for 168 hours (7 days). Measure attenuation and return loss at ambient conditions before testing and 2 hours after testing with the specimens in place in the test chamber. Record attenuation and return loss every 6 hours during test for information purposes.</p> <p>See Figure 6 and Paragraph 5.2.</p>
Humidity, steady state.	<p>Maximum attenuation value for any single specimen (connector joint or fiber) during and after testing is 1.2 dB.</p> <p>Maximum attenuation increase for any single specimen (connector joint or fiber) during and after testing is 0.5 dB.</p> <p>Minimum return loss for any single specimen (connector joint or fiber) during and after testing is 20 dB.</p> <p>See Notes 1 and 2.</p>	<p>TIA/EIA-455-5C, Method A.</p> <p>Subject mated specimens to steady state humidity at 60±2°C and 95±2% relative humidity for 168 hours (7 days). Measure attenuation and return loss at ambient conditions before testing and every 12 hours during testing with the specimens in place in the test chamber. After humidity exposure, specimens may be subjected to a dry out period (60±2°C and 0 to 20% relative humidity) for up to 24 hours. Record final optical measurements a minimum of 2 hours after returning to ambient.</p> <p>See Figure 6 and Paragraph 5.2.</p>
Temperature cycling.	<p>Maximum attenuation value for any single specimen (connector joint or fiber) during and after testing is 1.2 dB.</p> <p>Maximum attenuation increase for any single specimen (connector joint or fiber) during and after testing is 0.5 dB.</p> <p>Minimum return loss for any single specimen (connector joint or fiber) during and after testing is 20 dB.</p> <p>See Notes 1 and 2.</p>	<p>EIA/TIA-455-3A, Test Condition C, except hot extreme first.</p> <p>Subject mated specimens to 21 cycles between -20±2°C and 85±2°C. Dwell at each temperature extreme and 23±2°C for 1 hour each. Measure attenuation and return loss at least 30 minutes into each plateau during test. Record final attenuation and return loss at ambient, 2 hours after testing with the specimens in place in the test chamber.</p> <p>See Figure 6 and Paragraph 5.2.</p>
Vibration, sinusoidal.	<p>Maximum attenuation value for any single specimen (connector joint or fiber) after testing each plane is 1.2 dB.</p> <p>Maximum attenuation increase for any single specimen (connector joint or fiber) after testing each plane is 0.5 dB.</p> <p>Minimum return loss for any single specimen (connector joint or fiber) after testing each plane is 20 dB.</p> <p>See Notes 1 and 2.</p>	<p>TIA/EIA-455-11D, Test Condition 1.</p> <p>Measure attenuation after installation on test fixture. Vibrate specimens for 2 hours at an amplitude of 1.5 mm (peak-to-peak) with the frequency sweeping continuously between 10 and 55 Hz. Mount and run in other 2 planes. Measure attenuation and return loss after testing each plane.</p> <p>See Figure 7.</p>

Test Description	Requirement	Procedure
Vibration, random.	<p>Maximum attenuation value for any single specimen (connector joint or fiber) after testing each plane is 1.2 dB.</p> <p>Maximum attenuation increase for any single specimen (connector joint or fiber) after testing each plane is 0.5 dB.</p> <p>Minimum return loss for any single specimen (connector joint or fiber) after testing each plane is 20 dB.</p> <p>See Notes 1 and 2.</p>	<p>TIA/EIA-455-11D, Test Condition VI, Condition Letter D.</p> <p>Subject mated and mounted specimens to 11.95 Gs rms between 50 and 2000 Hz. Fifteen minutes in each of 3 mutually perpendicular planes.</p> <p>See Figure 7.</p>
Shock.	<p>Maximum attenuation value for any single specimen (connector joint or fiber) after testing each plane is 1.2 dB.</p> <p>Maximum attenuation increase for any single specimen (connector joint or fiber) after testing each plane is 0.5 dB.</p> <p>Minimum return loss for any single specimen (connector joint or fiber) after testing each plane is 20 dB.</p> <p>See Notes 1 and 2.</p>	<p>TIA/EIA-455-14A, Condition E.</p> <p>Subject mated and mounted specimens to 50 Gs sawtooth shock pulses of 11 milliseconds duration.</p> <p>Three shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks.</p> <p>See Figure 7.</p>
Bench handling shock.	<p>Maximum attenuation value for any single specimen (connector joint or fiber) after testing is 1.2 dB.</p> <p>Maximum attenuation increase for any single specimen (connector joint or fiber) after testing each plane is 0.5 dB.</p> <p>Minimum return loss for any single specimen (connector joint or fiber) after testing each plane is 20 dB.</p> <p>See Notes 1 and 2.</p>	<p>MIL-STD-810, Method 516.6, Procedure VI.</p> <p>Eight total drops from a height of 121.92 mm.</p> <p>See Figures 8 and 9.</p>
Durability.	<p>Applicable to measurements following a cleaning:</p> <p>Maximum attenuation value for any single specimen (connector joint or fiber) after testing and cleaning is 1.2 dB.</p> <p>Maximum attenuation increase for any single specimen (connector joint or fiber) after testing is 0.5 dB.</p> <p>Minimum return loss for any single specimen (connector joint or fiber) after testing and cleaning is 20 dB.</p> <p>See Notes 2 and 3.</p>	<p>EIA-455-21A.</p> <p>Mate and unmate specimens 100 times. Measure attenuation and return loss at 5 cycle intervals during testing and after completion of testing. Clean the specimens every 25 cycles per the cleaning schedule in Table 5-1 of GR-1435-CORE Issue 1, except double sided cleaning and up to 3 tries are permitted at all cleaning intervals. Record attenuation and return loss immediately before and immediately after cleaning. Refer to Section 5.6.6 in GR-1435-CORE Issue 1, for mounting heights.</p> <p>See Figure 10 and Paragraph 5.1.</p>

Test Description	Requirement	Procedure
End of service life.	Maximum attenuation value for any single specimen (connector joint or fiber) is 1.2 dB. Maximum attenuation increase for any single specimen (connector joint or fiber) is 0.5 dB. Maximum average attenuation for any connector assembly is 0.7 dB. Maximum average attenuation for the test group (lot) is 0.65 dB. Minimum return loss for any single specimen (connector joint or fiber) is 20 dB. See Note 1.	TIA/EIA-455-20A. After completing all testing, measure attenuation and return loss for all fibers in each specimen. Calculate change from last measurement taken for the initial attenuation test. See Fig.6 and Paragraph 5.1.
Storage Temperature Endurance	Maximum attenuation value for any single specimen (connector joint or fiber) after testing is 1.2 dB. Maximum attenuation increase for any single specimen (connector joint or fiber) after testing is 0.5 dB. Minimum return loss of any single specimen (connector joint or fiber) after testing is 20 dB. See Notes 1 & 2.	TIA/EIA-455-4C. Unmated Specimens. Maintain specimens undisturbed in the chamber at room ambient (23±5°C and 20 to 70% RH) for 2 hours prior to recording initial attenuation and return loss. Subject specimens to 85±2°C for 48 hours. At the completion of testing clean and mate the connectors and measure the final attenuation and return loss at ambient 2 hours after testing. Calculate change from last measurement taken for the initial attenuation test. See Paragraphs 5.1 and 5.2.

NOTE

1. *Test shall be performed and optical measurements made at the minimum insertion condition, corresponding to a Module Engagement Dimension of 23.5 mm as shown in Figure 11.*
2. *Shall meet visual requirements, show no physical damage, and shall meet the requirements of additional tests as specified in the Product Qualification Test Sequence in Figure 3.*
3. *For the durability test, product shall be tested at the maximum insertion condition, corresponding to a Module Engagement Dimension of 22.5 mm per Figure 11.*

Figure 2

3.6. Product Qualification Test Sequence

Test or Examination	Test Group (a)
	1
	Test Sequence (b)
Visual and mechanical inspection	1
Attenuation	2
Return loss	3
Thermal aging	4
Humidity, steady state	5
Temperature cycling	6
Vibration, sinusoidal	7
Vibration, random	8
Shock	9
Bench handling shock	10
Durability	11
End of service life	12, 14
Storage temperature endurance	13

NOTE

(a) See Paragraph 4.1.A.
 (b) Numbers indicate sequence in which tests are performed.

Figure 3

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Specimen Selection

Specimens shall be selected at random from current production per Figure 4. Cable assemblies shall be cut in half to create 2 pigtailed, each terminated with a connector plug. One pigtail of each part number are mated to form a connector pair and fiber ends attach to the measurement system. Cable used for qualification shall be of type and length specified in Figure 4. Measure the performance of fibers 1, 6 and 12. Specimens shall have insertion losses no higher than 0.5 dB against a reference-quality lead in production.

Component	Part Number/Type
Fiber size (microns / microns)	50/125
Cable type	Bare ribbon
Cable PN	5599749-2
Cable assembly PN	1938482-3
LIGHTRAY* MPO spring	492259-1
LIGHTRAY MPO pin holder	492077-2
Backplane connector	2000973-1
Module connector	2000974-1
Test cable length	10 m
Test specimens required	5
Control cable required	Yes

Figure 4

B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figure 3.

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 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 resubmittal.

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

If at any time, a connector specimen is uncoupled during qualification testing, the optical interfaces shall be cleaned according to TE recommended cleaning instructions prior to any subsequent optical measurements. Additional cleaning techniques deemed necessary by Product Engineering shall be described in the test report. 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 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.

During initial attenuation test, after impact test, during durability test, and after storage temperature endurance test follow cleaning recommendations in GR-1435-CORE, Issue 1, Table 5-1. For standard cleaning procedure, see GR-1435-CORE, Issue 1, Section 5.4.1.

After any other disconnects that occur during testing (such as to mount a specimen to a test fixture), clean per TE recommended cleaning procedure.

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.

Hours into Cycle	Temperature (°C)
0	23
1	23
2	85
3	85
4	23
5	23
6	-40
7	-40
8	23

Figure 5
Temperature Cycling Profile

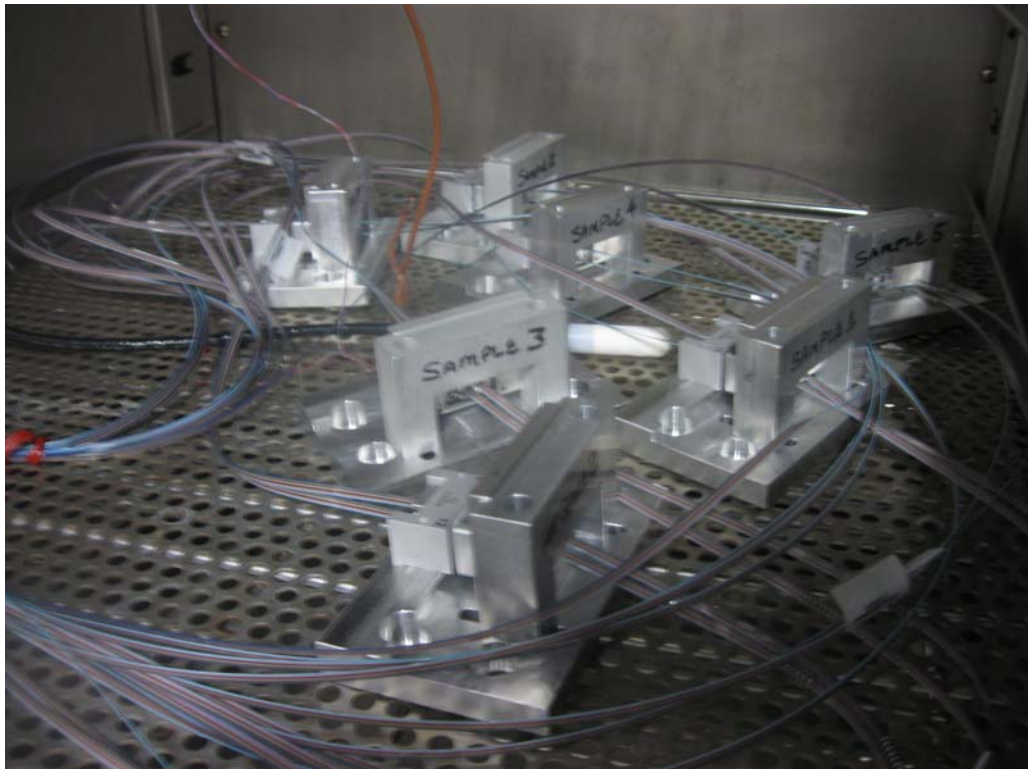


Figure 6
Attenuation, Return Loss, Thermal Aging, Humidity – Steady State and Temperature Cycling

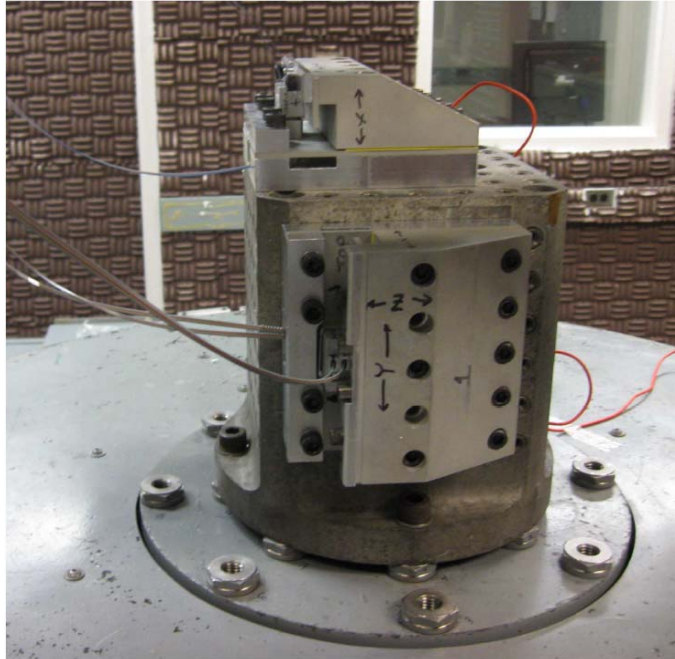


Figure 7

Vibration and Mechanical Shock



Figure 8 – Receptacle (Backplane) Connector

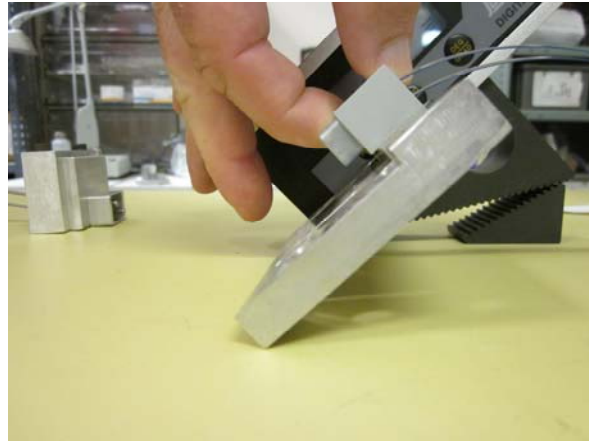


Figure 9 – Plug (Module) Connector

Bench Handling Shock

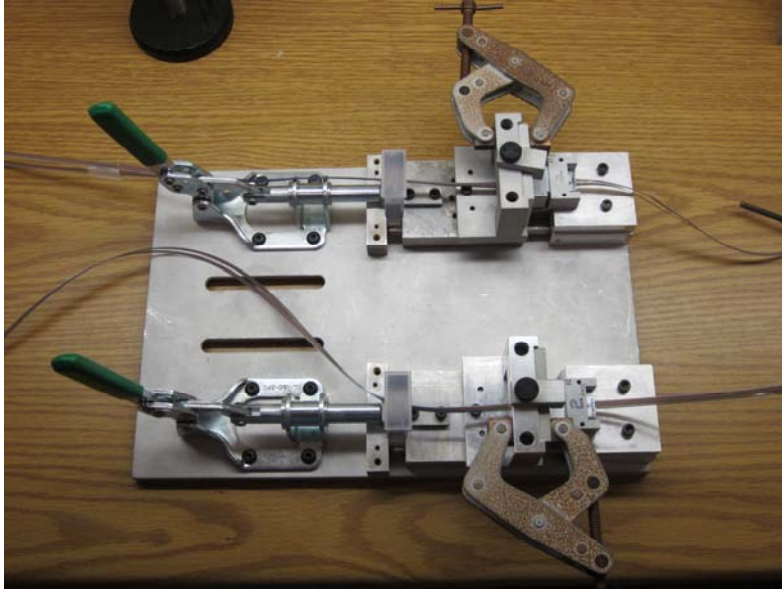


Figure 10
Durability

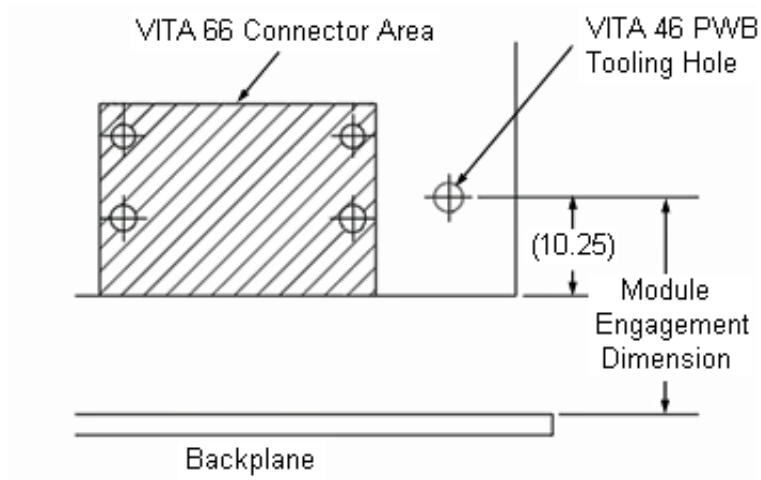


Figure 11