

PERFORMANCE SPECIFICATION SHEET

TERMINI, FIBER OPTIC, CONNECTOR, REMOVABLE, ENVIRONMENT RESISTING,
SOCKET TERMINUS, FRONT RELEASE, CERAMIC FERRULE, QUICK CONNECT
TYPE FIBER OPTIC TERMINI (QCT)
(FOR MIL-PRF-28876 CONNECTORS/RECEPTACLES WITH BACKSHELLS)

This specification is approved for use by all Departments
and Agencies of the Department of Defense.

The requirements for acquiring the product described herein
shall consist of this specification and MIL-PRF-29504.

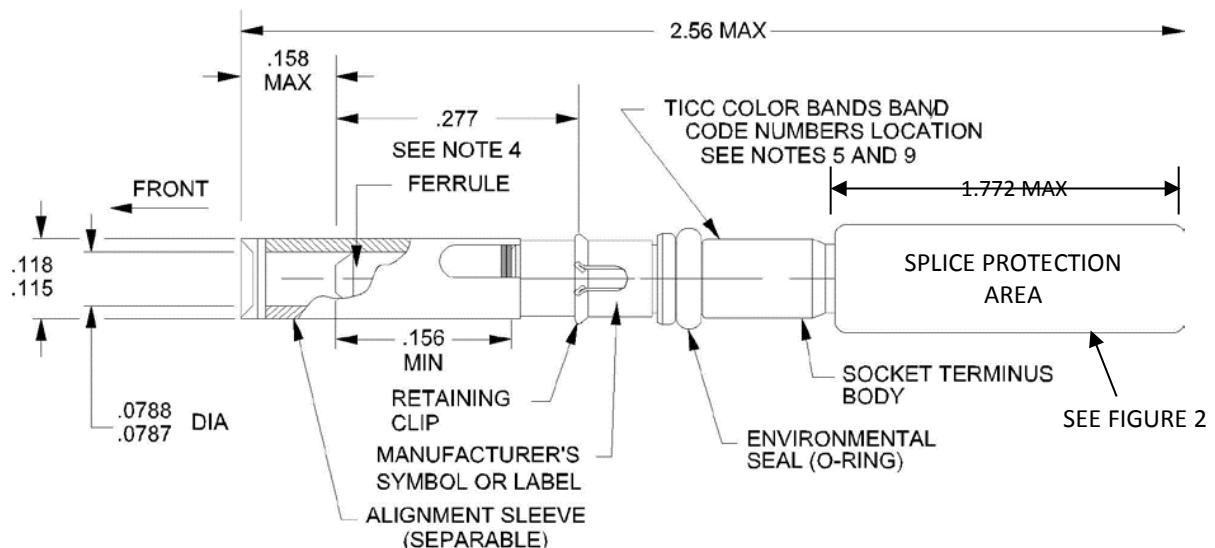
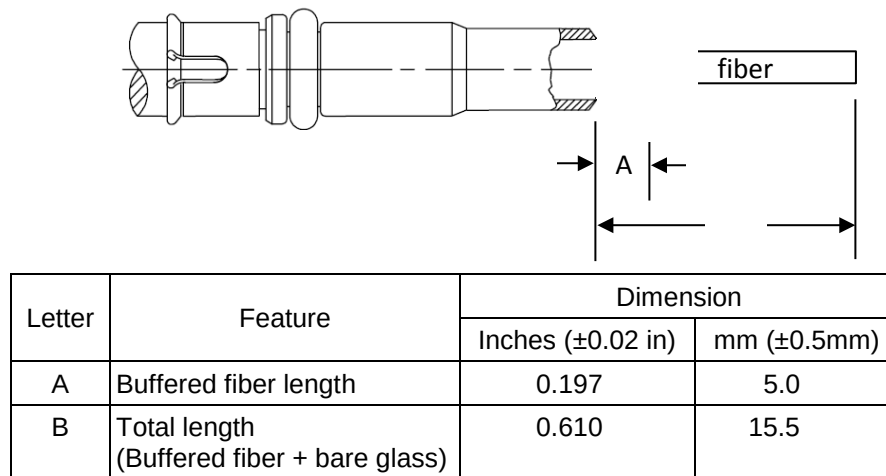


FIGURE 1: Quick Connect Socket Terminus Assembly.

NOTES:

1. Dimensions are in inches.
2. All diameters are to be concentric within 0.002 inch.
3. Dimensions apply to plated/finished part.
4. Dimension 0.277 inch is to be measured when installed in a connector equivalent gauge fixture and when subjected to minimal compressive force. See Figure 3 in MIL-PRF-29504/15.
5. The TICC bands or band code numbers shall be at the rear of the socket terminus.
6. All terminus metal parts are to be corrosion resistant. Crimp bushing is to be metal.
7. Terminus shown with flat end face. End faces shall meet requirements herein.
8. The dimension shown is effective prior to the application of the TICC band color/code number marking.
9. Crimp grooves are permissible on the crimp diameter.
10. Exposed end of ferrule is to be a minimum of 0.156 inch in length. The 0.156 inch min. extension value specified represents the minimum acceptable length after polishing. Removal of material past this point will detrimentally affect the performance of the fiber optic connection.



FIGURE 2: Quick Connect Termini (QCT) Socket Fiber Length.**REQUIREMENTS:**

Temperature range:

	°F	°C
Operating	-18 to +149	-28 to +65
Non-operating	-40 to +158	-40 to +70
Storage	-40 to +158	-40 to +70

Design and construction:

Dimensions: See figures 1 and 2.

Optical Fiber Termination: The optical fiber termination to the quick connect termini fiber shall be by fusion splice or mechanical splice.

Fusion/Mechanical Splice: The mechanical or fusion fiber splice shall be integral to the terminus body and include the splice housing.

Fusion/Mechanical Fiber Splice Housing: The fiber splice housing shall restore the environmental and mechanical integrity of the optical fiber terminating to it. The housing shall not affect the operation of the terminus insertion tool (P/N 6872813-2) or the terminus removal tool (P/N 6872813-6) when installing or removing the QCT.

Fiber Compatibility: The QCT shall terminate fibers with the properties, dimensions, and dimensional tolerances specified in MIL-PRF-49291/6 (multimode (MM) fiber) and MIL-PRF-49291/7 (single mode (SM) fiber).

End face geometry: End face geometry requirement shall be a domed ferrule end face with a PC polish for termini with ceramic ferrules. End face geometry shall be as specified in MIL-STD-1678-5 Measurement 5201.

End face condition: End face shall be smooth and free of scratches, pits, chips, and fractures under 400X magnification.

Cleaved Fiber Stub End Face Condition: The end face angle for the cleaved fiber stub shall be less than 2 degrees from perpendicular to the fiber axis. Cleaved fiber stub surfaces shall be unshattered, free of large chips, fractures, pits, lips, spirals, or other defects (i.e., hackle/mist) that are detrimental to splice performance. Refer to TIA-455-179 for detailed descriptions, illustrations, and interferomic fringe patterns for the various end face defect conditions.

Backshell Compatibility: Shall be compatible with each qualified manufacturer's MIL-PRF-28876 straight backshell of shell sizes 13, 15, and 23. Shall be compatible with each qualified manufacturer's MIL-PRF-28876 45 degree or 90 degree backshells of shell sizes 15 and 23. Completed cable assembly with QCTs installed shall permit installation of connectors and backshells using the procedures specified in MIL-STD-2042.

Weight: 1.5 gram maximum.

Material:

Ferrule: Ferrule shall be ceramic. Termini shall meet all of the requirements of this specification when mated to qualified termini in a qualified MIL-PRF-28876 connector.

Sealing compounds: Sealing compounds which may flow at the maximum specified operating temperature or exhibit cracking at the minimum specified operating temperature shall not be used.

Adhesives: Use MIL-PRF-24792 or as approved by the qualifying activity.

Index Matching Gel (Mechanical splice designs only.): Index matching gel shall be in accordance with MIL-PRF-24794 or an index matching gel approved by the qualifying activity.

Mechanical/Fusion Splice Exterior Parts: Exterior parts of the assembled splice, if metallic, shall have a passivated finish.

Optical performance:

Insertion loss: The initial insertion loss of a mated terminus pair shall be not greater than 0.75 dB. The maximum insertion loss of a mated terminus pair at any time during testing shall not be greater than the values specified in table II of MIL-PRF-28876. Initial insertion loss of multimode QCTs shall be measured in accordance with Method A of TIA/EIA-455-34 using the guidance found in Measurement 2101 of MIL-STD-1678-2. Initially, both the 70/70 and overfill launch conditions shall be measured. For subsequent insertion loss tests, 70/70 launch conditions or equivalent will be used. The insertion loss of single mode QCTs shall be measured in accordance with Method B of TIA/EIA-455-34 and Measurement 2101 of MIL-STD-1678-2.

Return loss: The return loss of multimode QCTs shall not be greater than -30 dB. The return loss of single mode optical QCTs shall not be greater than -40 dB. Both multimode and single mode QCTs shall be measured for return loss in accordance with TIA-455-107 using the guidance found in Measurement 2105 of MIL-STD-1678-2.

Environmental/Mechanical:

QCT shall be tested to the following MIL-PRF-28876 environmental and mechanical requirements. Change in optical transmittance and optical discontinuity requirements shall be as specified in MIL-PRF-28876.

Impact	Temperature Cycling
Vibration	Temperature Life
Shock	Flammability
Thermal Shock	Ozone Exposure
Temperature/Humidity Cycling	Fungus Resistance

Terminus Retention: After being subjected to axial loads of 22 pounds (98 N), QCTs shall be retained in their inserts and not exceed 0.015 inch (0.38 mm) displacement. Spring loaded QCTs may deflect more than 0.015 inch (0.38 mm), but must return to within 0.015 inch (0.38 mm) of original position after load is removed. This requirement applies only to QCTs with retention mechanisms.

Fiber-to-Terminus Pullout Force: The minimum fiber-to-terminus pullout strength shall be 3.1 lbs (14 N). The change in optical transmittance shall be monitored during and after the test.

Fiber-to-Splice Pullout Force: The fiber-to-splice dynamic strength test load (force in axial tension) at optical failure shall not be less than the values indicated in table I. The QCT shall meet the change in optical requirements during the test. Specimens shall be preconditioned at 23° C ($\pm 2^\circ$ C) and 50% R. H. ($\pm 5\%$) for 12 hours before undergoing testing. A minimum gage length of 500 mm with a fixed nominal strain rate of 3.5% (of the gage length) per minute shall be used. The change in optical transmittance shall be monitored during the test.

TABLE I: Dynamic Strength Test Loads.

Splice type	Fiber Coating Diameter	Force
Mechanical	250 μ m	≥ 1.0 lb (≥ 4.4 N)
	900 μ m	≥ 1.5 lb (≥ 6.7 N)
Fusion	250-900 μ m	≥ 2.0 lb (≥ 8.9 N)

Part or identifying number (PIN): See table II herein and 6.2 of MIL-PRF-29504.

<u>M29504/23</u>	-	<u>XX</u>
Basic specification and specification sheet		TICC code (see table II)

TABLE II. TICC numbers by Fiber Size and Termination Category.

Fiber size (core/cladding) (μm)	Category	TICC
62.5/125	Fusion	03
Single mode 9/125	Fusion	04
62.5/125	Mechanical	13
Single mode 9/125	Mechanical	14

Tools: See table III.

TABLE III. Tools.

Tool <u>1/</u>	PIN
Insertion tool	See Requirement 4102 of MIL-STD-1678-4
Removal tool	
Fusion splicer	See CID-A-A-59799

1/ Termini are pre-polished. No polishing tools required.

Qualification:

Qualification shall consist of performing testing specified in MIL-PRF-29504/15 and table IV. Manufacturers who are currently qualified to MIL-PRF-29504/15, and whose QCT uses their currently qualified MIL-PRF-29504/15 as a subcomponent to the candidate QCT, shall perform testing specified in table IV, otherwise qualification shall consist of both the MIL-PRF-29504/15 qualification requirements and table IV testing. Group I and II inspections may be performed in any order, however, Group III inspections shall be performed in the sequence specified in MIL-PRF-28876.

Qualification connector: The qualification connector for this terminus shall be a qualified MIL-PRF-28876 connector.

Test Specimens: Except for the Group I inspection of table IV, and unless otherwise specified, QCTs shall be fully assembled utilizing two lengths of cable, each at least 5 meters long, containing the fiber type required for testing the version of QCT undergoing qualification (i.e., MM or SM).

TABLE IV. Qualification and Conformance Inspections.

Group	Inspection	Qualification Inspection	Conformance Inspection	Unterminated QCT	QCT on Simplex Cable	QCT in M28876
I	Interoperability	X				
	Visual and Mechanical			1-24		
	Design and Construction	X	A <u>5/</u>			
	Weight	X				
	Identification Marking	X	A			
	Workmanship	X	A			
	Terminus End Face Geometry/Condition <u>1/</u>	X	A/B <u>6/</u>			
	Cleaved Fiber Stub End Face Condition <u>1/</u>	X	A	25-49		
	Optical					
	Insertion Loss	X	B		17-24	
	Return Loss	X	B			
	Ambient Light Susceptibility	X			21-24	
II	Fiber-to-Terminus Pullout Force <u>2/</u> , <u>3/</u>	X	C		<u>2/</u>	
	Fiber-to-Splice Pullout Force <u>2/</u>	X	C		17-24	
	Cable Pullout Force	X	C			1-16
	Impact (Fiber Splice)	X	C		21-24	
III (IAW MIL-PRF-28876)	Impact	X	C			1-16
	Vibration	X	C			
	Shock	X	C			
	Thermal Shock	X	C			
	Temperature/Humidity Cycling	X	C			
	Temperature Cycling	X	C			
	Temperature Life	X	C			
	Flammability <u>4/</u>	X	C			
	Ozone Exposure	X	C	50-53		
	Fungus resistance	X				

TABLE IV. Qualification and Conformance Inspections, Continued.

- 1/ Interferometric pictures of ferrule end faces and cleaved fiber stub ends from test samples shall be included in Qualification Test Report.
- 2/ Four (4) QCT samples of each part number for which qualification is desired, and that have undergone Group I inspection, shall be selected for this test.
- 3/ Verification for this test may be conducted using qualified MIL-PRF-29504 termini (from the same manufacturer) in lieu of QCTs, if the manufacturer confirms that the identical epoxy is utilized and the same epoxy mixing, de-airing, and curing schedule is employed.
- 4/ With regard to Para. 4.6.6.11 (Flammability) in MIL-PRF-28876, the test requirement for unmated cable-connector assemblies does not apply. Specifically: *"The sample shall then be demated, and the unmated connector assembly with backshell and dust cover exposed to a 1.50 inch (38.1 mm) flame height applied for the backshell-cable interface region"* is not applicable.
- 5/ In-process controls may be used by the manufacturer to verify conformance of this Group A inspection.
- 6/ Only the 400X visual inspections are required to be performed for Group A. End face geometry is required for Group B.

Group C Sampling Plan: Every 60 months, a minimum of 20 socket QCTs of the same part number that have passed Group B inspection shall be selected. If the manufacturer decides not to utilize similarly designed MIL-PRF-29504 termini in the performance of the Fiber-to-Terminus Pullout Force inspection (see Note 2/ in table V), an additional 4 socket QCTs of the same part number will be required for a total of 24 socket QCTs and 24 pin termini (P/N M29504/14 or QCT). All specimens shall be subjected to the inspections of Groups I, II, and III.

Qualification by similarity:

Qualification of a MM Socket Version of the QCT: Manufacturers who are qualified for single mode (SM) socket QCTs, and whose multimode (MM) socket QCTs pass the tests and inspections specified in table VI are qualified under this specification sheet for MM QCT of the same category (Fusion or Mechanical). Testing is to be performed using four mated pairs. This qualification by similarity is valid if the only difference between the previously qualified single mode socket QCT and the multimode socket QCT is a change in the terminus ferrule dimensions and a change from the MIL-PRF-49291/7 (SM fiber) to MIL-PRF-49291/6 (MM fiber) type.

TABLE V. Qualification and Conformance by Similarity (SM to MM).

Group	Inspection	Qualification Inspection <u>1/</u>	Conformance Inspection <u>2/</u>
I	Visual and Mechanical		
	Size	X	A
	Optical		
	Insertion Loss	X	B
	Return Loss	X	B
III (IAW MIL-PRF-28876)	Shock	X	C

NOTES:

1/ Where manufacturers are qualified for SM QCT and are pursuing qualification for MM QCT.

2/ Where manufacturers are qualified for SM and MM QCT and are performing conformance testing for MM QCT.

Qualification of an SM Socket Version of the QCT: Manufacturers who are qualified for multimode socket QCTs, and whose single mode socket QCTs pass the tests and inspections specified in Table VI are qualified under this specification sheet for SM QCT termini of the same category (Fusion or Mechanical). Testing is to be performed using four mated pairs. This qualification by similarity is valid if the only difference between the previously qualified multimode socket QCT and the single mode socket QCT is a change in the terminus ferrule dimensions and a change from the MIL-PRF-49291/6 (MM fiber) to MIL-PRF-49291/7 (SM fiber) type.

TABLE VI. Qualification and Conformance by Similarity (MM to SM).

Group	Inspection	Qualification Inspection <u>1/</u>	Conformance Inspection <u>2/</u>
I	Visual and Mechanical		
	Size	X	A
	Identification Marking	X	A
	Workmanship	X	A
	Optical		
	Insertion Loss	X	B
	Return Loss	X	B
II	Cable Pullout Force	X	C
	Mating Durability	X	C
III (IAW MIL-PRF-28876)	Shock	X	C
	Temperature Cycling	X	C
	Temperature Life	X	C
	Flammability <u>3/</u>	X	C

NOTES:

1/ Where manufacturers are qualified for MM QCT and are pursuing qualification for SM QCT.

2/ Where manufacturers are qualified for SM and MM QCT and are performing conformance testing for SM QCT.

3/ With regard to Para. 4.6.6.11 (Flammability) in MIL-PRF-28876, the test requirement for unmated cable-connector assemblies does not apply. Specifically: *"The sample shall then be demated, and the unmated connector assembly with backshell and dust cover exposed to a 1.50 inch (38.1 mm) flame height applied for the backshell-cable interface region"* is not applicable.

Intended use: The QCT is intended for use only within MIL-PRF-28876 connectors with backshells or MIL-PRF-28876 receptacles with backshells.

Referenced Documents: In addition to MIL-PRF-29504, this specification sheet references:

MIL-PRF-28876	MIL-PRF-24794	TIA/EIA-455-34
MIL-PRF-29504/15	MIL-STD-1678-2	TIA-455-107
MIL-PRF-49291/6	MIL-STD-1678-4	TIA-455-179
MIL-PRF-49291/7	MIL-STD-1678-5	A-A-59799
MIL-PRF-24792	MIL-STD-2042	

Custodians:

Army – CR
Navy – SH
Air Force – 85
DLA – CC

Preparing Activity:

DLA – CC

(Project: 6060-2017-002)

Review Activities:

Navy – AS
Air Force – 13, 19, 93, 99
NASA – NA

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil/>.