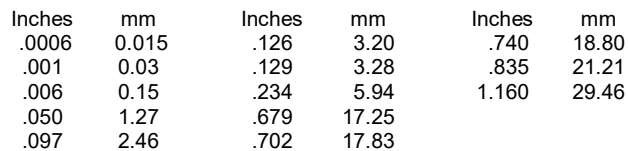


MIL-PRF-29504/18
w/AMENDMENT 3
25 February 2019
SUPERSEDING
MIL-PRF-29504/18
w/AMENDMENT 2
18 December 2013

TERMINI, FIBER OPTIC, NON-KEYED, CONNECTOR, REMOVABLE, ENVIRONMENT RESISTING,
PIN TERMINUS, REAR INSERT/REAR RELEASE, 1.25 MM CERAMIC FERRULE,
(FOR MIL-PRF-64266 CONNECTORS)

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



AMSC N/A

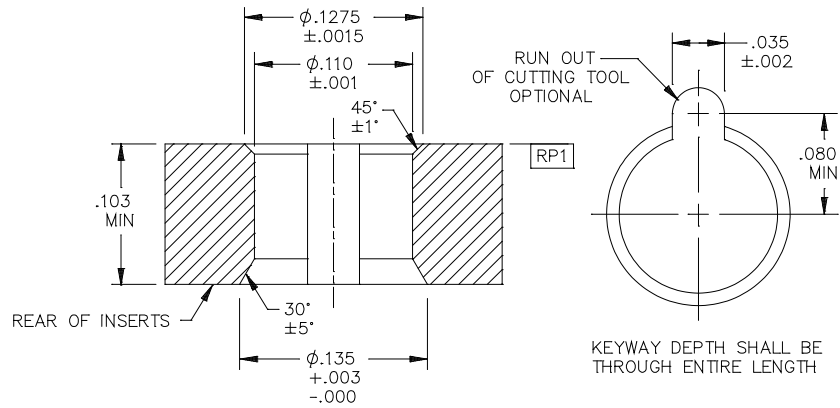


NOTES:

1. Dimensions are in inches except for diameter "A", circular runout, surface roughness (note 13) and ferrule outside diameter which are dimensioned in metric units only.
2. Metric equivalents are given for general information only.
3. All diameters are to be concentric within .002 inch (0.05 mm).
4. Dimensions apply to plated/finished part.
5. Dimension .740 inch (18.80 mm) is to be measured when installed in connector equivalent gauge fixture and when subjected to minimal compressive force. See figure 2.
6. The TICC marking shall be at the front of the terminus. The TICC marking shall be represented directly as alphabetical characters. An alternative location of the marking shall be allowed only in the case of insufficient surface area and only if approved by the qualifying activity.
7. The individual bag or container shall have the MIL-PRF-29504 Part Identifying Number (PIN) marking on container or on a tag inside the container.
8. All terminus metal parts are to be corrosion resistant.
9. Crimp sleeve is to be metal.
10. Crimp grooves are permissible on the crimp diameter.
11. See table II for ferrule hole diameter. Ferrule hole circular runout (concentricity) in table II is relative to datum A.
12. The non-optical disconnect (NOD) dimension is the maximum distance the terminus can be compressed. The terminus design shall include features to restrict the compression of the terminus such that the NOD dimension is met.
13. Overall ferrule length shall be $7.62 \pm .05$ mm ($.300 \pm .002$ inch). Ferrule outside diameter shall have a surface roughness of 0.2 micrometers.
14. Terminus end face shall exert a load of $3.25 \pm .25$ pounds (at nominal pushback) when the terminus has been deflected to a dimension of .702 inches (spring working height). Verification of compliance shall be by means of installing the terminus into the fixture shown in figure 2 and deflecting the terminus to a dimension of $.702 \pm .002$ inches. The resultant load at this height or deflection must be within $3.25 \pm .25$ pounds. The deflection to dimension .702 inches is the distance measured from the clip-to-tip (from dimension RP1 to ferrule end face, see figure 1). The tolerance of $\pm .002$ on dimension 0.702 is specified only for use to measure the spring force for verification of compliance. Spring shall not take a set at any position along the full length of travel.
15. Withdraw force of the terminus from the ASR alignment sleeve is dependent upon both alignment sleeve (see MIL-PRF-64266/9) and ferrule.
16. Alignment sleeve shall meet a withdraw force between 1.0 N to 2.5 N when tested for breakaway frictional force in alignment sleeves in accordance with TIA/EIA-455-158 using a gauge pin meeting the outside diameter (dimension CK), surface roughness and cylindricity requirements specified in figure 2.2.2 of TIA-604-10.
17. Manufacturer's symbol or trademark location is in front of the first TICC band (see figure 1 of MIL-PRF-29504). An alternate location of the marking shall be allowed only in the case of insufficient surface area and only if approved by the qualifying activity. The manufacturer shall list the symbol or trademark in accordance with SAE AIR 1351.
18. Terminus compression spring shall withstand an applied force of 8 pounds or less with no damage.
19. If using epoxy to bond ferrule, no epoxy meniscus is permitted at ferrule-to-barrel interface.
20. One of the standardized strip dimensions of this terminus is based on a buffer insertion of the optical fiber to the back of the ferrule. Also, the intent is to allow insertion of a 20 gauge dispensing tip (syringe needle) to make contact with the ferrule (no neck down or dead zone/expansion zone at ferrule interface) and to have fiber supported with buffer up to entry into the ferrule. Compliance is conformance to the standardized strip length (see "Design and construction: Dimensions and configuration" in this specification sheet - the termination procedures cited contain the reference for the standardized cable strip lengths).
21. This dimension is the resultant length when the retention clip is in the most forward position in an insert equivalent fixture. See figure 3. This dimension is measured from the rear surface of the of insert equivalent fixture in figure 3 to the point shown at the rear of the retention clip. The rear (crimp area) of the terminus shall be pressed into the insert equivalent fixture in figure 3 using hand (finger) pressure to place the retention clip in the most forward position prior to obtaining the measurement.
22. The specified .030 maximum gap between the back of the retention clip and the front (leftmost surface) of the rear shoulder is the resultant exposed length (or gap) when the retention clip is in the most forward position in an unmated condition.

FIGURE 1. Terminus - Continued.

MIL-PRF-29504/18
w/AMENDMENT 3



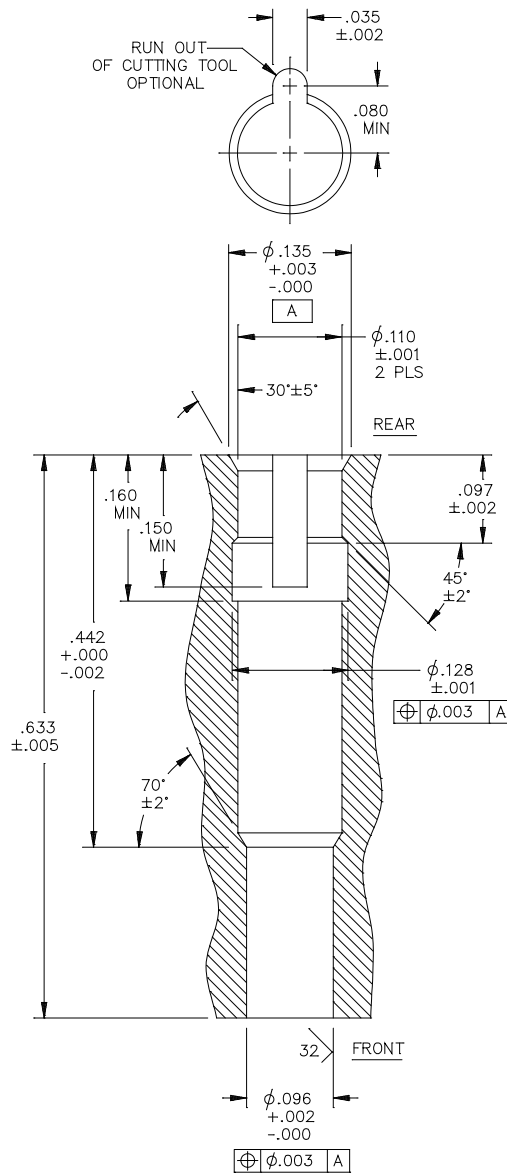
<u>Inches</u>	<u>mm</u>	<u>Inches</u>	<u>mm</u>	<u>Inches</u>	<u>mm</u>	<u>Inches</u>	<u>mm</u>
.001	0.03	.005	0.13	.110	2.79	.130	3.30
.002	0.05	.097	2.46	.125	3.18		

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. All diameters are to be concentric within .002 inch (0.05 mm).
4. Dimensions apply to plated/finished part.
5. Tolerance on all angles is ± 1 degrees, unless otherwise noted.
6. Terminus keyway added to allow fixture use with MIL-PRF-29504/20 termini.

FIGURE 2. Insert equivalent fixture for terminus spring working height measurement (see note 14 of figure 1).

MIL-PRF-29504/18
w/AMENDMENT 3



<u>Inches</u>	<u>mm</u>	<u>Inches</u>	<u>mm</u>	<u>Inches</u>	<u>mm</u>	<u>Inches</u>	<u>mm</u>
.001	0.03	.005	0.13	.110	2.79	.130	3.30
.002	0.05	.097	2.46	.125	3.18		

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. All diameters are to be concentric within .002 inch (0.05 mm).
4. Dimensions apply to plated/finished part.
5. Tolerance on all angles is ± 1 degrees, unless otherwise noted.
6. Terminus keyway added to allow fixture use with MIL-PRF-29504/20 termini.

FIGURE 3. Insert equivalent fixture for terminus retention clip exposed length measurement (see note 21 of figure 1).

REQUIREMENTS:

Temperature ranges: Temperature range designations shall be in accordance with [table I](#).

TABLE I. Temperature range designation.

Temperature range designation	Operating temperature		Non-operating temperature		Storage temperature	
	°F	°C	°F	°C	°F	°C
1	-18 to +185	-28 to +85	-40 to + 158	-40 to +70	-40 to +158	-40 to +70
2	-67 to +329	-55 to +165	-67 to +185	-55 to +85	-67 to +185	-55 to +85

Design and construction:

Dimensions and configuration: See figures 1, 2, and 3, and [table II](#). For both temperature ranges 1 and 2, termini shall meet the requirements of this specification when terminated using the procedures specified in requirement 4103 of [MIL-STD-1678-4](#).

TABLE II. TICC numbers and dimensions for ferrules.

Fiber size (core/cladding) or (core/cladding /polyimide coat) (um)	Ferrule hole “A” diameter (um)	“A” Diameter tolerance (um)	Circular run-out (um)	Temperature Range 1 TICC 1/	Temperature Range 2 TICC 1/
Single mode 9/125	125.3	+1/-0	0.50	AA	AH
Single mode 9/125	125.5			AB	AJ
Single mode 9/125	126.0	+1/-0		AC	AK
50/125, 62.5/125	126.0			AD	AL
50/125, 62.5/125	127.0			AE	AM
62.5/125/155	156	+3/-0	3	-----	AN
62.5/125/155	157			-----	AP

Notes:

1/ Unless otherwise specified, TICC shall be marked on the terminus as numerals (digits) and not color bands. Note that the leftmost digit does not represent yellow for fiber optic component per 3.7.3 of [MIL-PRF-29504](#).

Tools: See [table III](#).

TABLE III. Tools.

Tool	PIN
Insertion tool	See Requirement 4103 of MIL-STD-1678-4
Removal tool	
Polishing tool	

Ferrule end face geometry shall be either domed or flat before polishing and shall be domed after polishing. The apex offset shall be 35 microns or less before polishing (as supplied by the terminus vendor) and 50 microns or less after all polishing procedures have been completed by the user/installer. For a user performed PC polish, the end face geometry requirements shall be in accordance with Measurement 5201 of MIL-STD-1678-5.

Size. For ferrule inside diameter and ferrule outside diameter inspection, ferrule manufacturer certification of compliance may be used in lieu of in-house inspection by the manufacturer at the terminus production facility.

Weight: 0.0022 lbs. (1.0 gram) maximum.

Mating termini: Same

Crimp sleeve: The crimp sleeve shall accept single fiber cable with a maximum outer diameter of .094 inch (2.4 mm). The terminus shall meet all requirements when the crimp sleeve is assembled to the terminus using a hex crimp die with flats measuring .0945 inch +.002/-.001 inch (2.400 mm +.050/-.025 mm) across and .285 inch (7.2 mm) maximum long or as approved by the qualifying activity. Crimp sleeve is to be supplied with termini unless specified in PIN.

Circular runout: The circular runout of the ferrule bore to the ferrule outer diameter shall be not greater than the value specified for applicable hole size in [table II](#). For ferrule circular run-out (concentricity) inspection, ferrule manufacturer certification of compliance may be used in lieu of in-house inspection by the manufacturer at the terminus production facility.

Material:

Ferrule: Ferrule materials shall be zirconia ceramic. Termini shall meet all of the requirements of this specification when mated to qualified termini in a qualified [MIL-PRF-64266](#) 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 adhesive for each temperature range in accordance with Requirement 4103 of MIL-STD-1678-4.

Optical performance:

Insertion loss: The initial insertion loss of a mated terminus pair shall be not greater than 0.50 dB. The maximum insertion loss of a mated terminus pair at any time during testing shall be not greater than the values specified in [table II](#) of [MIL-PRF-64266](#).

Bit error rate (BER).

Method: Test in accordance TIA-455-235 using the "Variable decision threshold method". Bit error sampling rates for 50 um core Multimode fiber connections shall include 1, 10, and 40 Gbits per second using a 850 nm VCSEL source. Single mode fiber connections shall include 1, 10, and 40 Gbits per second test setups using a 1310 nm laser source. In addition, the Single mode interconnection shall be test in a WDM condition using 10 different wavelengths from the C Band (1530-1565 nm) with a data rate of 10 Gbits per second.

Requirement: Test Bit pattern sequences at a minimum shall include PRBS 31, and K28.5. Mean bit error ratio shall be less than 10^{-12} .

Material performance:

Salt spray: Test samples (termini on single fiber cable) shall be tested in accordance with [TIA455.16](#), test condition C. Terminus ferrule may be covered up to half way from the end face to the shoulder with plastic protective (dust) covers. No corrosive effects shall be seen on the external terminus parts that would be detrimental to the operation of the terminus. No optical degradation shall occur as a result of this test. The criterion for insertion loss verification shall be used to determine if this optical requirement is met. Insertion loss verification, with termini inserted into a [MIL-PRF-64266](#) shell size 15 connector, shall be performed both prior to and after the salt spray test.

Fluid immersion: Test samples (termini on single fiber cable) shall be tested in accordance with [TIA455.12](#) using the test fluids in table 3409-AI of [MIL-STD-1678-3](#). Termini shall be immersed in each fluid. Terminus ferrule may be covered up to half way from the end face to the shoulder with plastic protective (dust) covers. Previous tests must first show that plastic protective covers are not susceptible to the test fluids. Examination of the termini tested shall reveal no swelling or softening of material, no loss of sealing capability or identification marking, and no discoloration or other effects detrimental to the intended use of these termini, such as corrosion, distortion, blistering, or delamination of plating as a result of fluid immersion. No optical degradation shall occur as a result of this test. The criterion for insertion loss verification shall be used to determine if this optical requirement is met. Insertion loss verification, with termini inserted into a [MIL-PRF-64266](#) shell size 15 connector, shall be performed both prior to and after the fluid immersion test.

Environmental/mechanical:

Termini shall be tested to and meet the requirement as specified in [MIL-PRF-64266](#) for the [table IV](#) group 3 mechanical and environmental tests performed under "Tests for termini as an integral part of a multiple termini connector. Change in optical transmittance and optical discontinuity requirements shall be as specified in [MIL-PRF-64266](#). Unless otherwise specified, the environmental and mechanical tests shall be performed as specified in [MIL-PRF-64266](#).

TABLE IV. Qualification inspections.

Temperature range:	Temperature range 1		Temperature range 2 3/	
Test performed 1/ 2/, 4/	SM	MM	SM	MM
Tests for unterminated termini 14/				
Group 1				
Size 5/	X	X	X	X
Weight 5/	X		X	
Identification markings 5/	X		X	
Workmanship 5/	X		X	
Circular runout 5/	X	X	X	X
Group 2 4/, 6/, 7/				
Terminus insertion & removal forces 7/	X		X	
Terminus retention 5/, 7/	X		X	
Maintenance aging	X		X	
Group 3 (polymeric materials)				
Ozone	X		X	
Fungus resistance	X		X	
Group 4				
Modified SO ₂ /salt spray			X	
Tests for termini as part of a single fiber cable 14/				
Group 1				
None				
Group 2 (16 termini pair each test) 6/				
Fiber pull out force 8/	X			
Cable pull out force 8/	X		X	
Twist	X		X	
Group 3 (16 termini pair from cable pull out force)				
Salt spray			X	
Fluid immersion			X	

See next page for notes.

TABLE IV. Qualification inspections – Continued.

Temperature range:	Temperature range 1		Temperature range 2 <u>3/</u>	
Test performed <u>1/</u> <u>2/</u> , <u>4/</u>	SM	MM	SM	MM
Tests for Termini As An Integral Part Of A Multiple Termini Connector <u>14/</u>				
Group 1 (4 connector mated pair, SM)				
Interoperability <u>9/</u>	X	X	X	X
Optical tests				
Insertion loss	X	X	X	X
Return loss	X		X	
Bit error rate (BER)			X	X
Group 2 (2 connector mated pair, SM)				
Mating durability	X			
Terminus cleaning	X			
Return loss <u>10/</u>	X			
Group 3				
Mechanical tests (2 connector mated pair, SM) <u>11/</u>				
Vibration <u>12/</u>	X		X	X
Shock, MIL-DTL-901 <u>12/</u>	X	X	X	X
Environmental (2 connector mated pair, SM) <u>11/</u>				
Thermal shock	X		X	X
Temperature humidity cycling	X			
Temperature cycling	X		X	
Altitude immersion	X		X	
Temperature life	X		X	
Flammability <u>11/</u>	X			
Insertion loss verification <u>13/</u>	X		X	X
Return loss <u>13/</u>	X		X	

Notes:

1/ Qualification consists of performing tests in this table for temperature range 1, temperature range 2, or both temperature range 1 (TR1) and temperature range 2 (TR2). There is no separate qualification for only one fiber size.

2/ "X" indicates test applies when performing a terminus qualification.

3/ Assumes same terminus material and physical configuration as used for Temperature Range 1 (see note 9/).

4/ Sample size. Sample size, test sample configuration and test sample fabrication shall conform to MIL-STD-1678-4 Requirement 4103.

a. Unterminated termini. One test sample is a MIL-PRF-29504/20 terminus that has not been terminated (fabricated) onto the end of a fiber optic cable or optical fiber.

b. Termini as part of a single fiber cable. One termini mated pair = one pin terminus and one socket terminus (i.e., two pin termini for this configuration).

c. Termini as part of a single fiber cable. One connector mated pair = A multiple fiber cable assembly with a mated MIL-PRF-64266 connector plug and connector receptacle fully populated with MIL-PRF-29504/20 termini.

5/ These inspections are to be performed by the manufacturer at the production facility. Exception may be taken for weight, circular run out, terminus retention, and terminus insertion and removal forces and maintenance aging.

6/ Test fixture for this test is to include fiber optic; [MIL-PRF-64266](#) connectors; both plug and receptacle for retaining the termini during testing.

7/ Test performed using connector in which the ASR is not inserted.

TABLE IV. Qualification inspections (except interoperability) – Continued.

- 8/ Each terminus is to be terminated on one end of a single fiber cable. Cable used is to have provisions compatible with termini strain relief, as applicable. Termini, selected from the group that underwent inspections for un-terminated termini, shall be used. A minimum sample size of 16 pin termini and 16 of the applicable counterpart socket termini (i.e., 32 pin termini for this configuration), selected from the group that underwent inspections for un-terminated termini, shall be used for each of these tests. Fiber pullout. Separate test samples for the termini must be prepared on single fiber cable without any strain relief. The change in optical transmittance shall be met after the test. Cable pullout. Separate test samples for the termini must be prepared on single fiber cable with strain relief (aramid yarn on cable affixed to terminus via the crimp sleeve). The change in optical transmittance shall be met after the test.
- 9/ Interoperability. This testing is done by DLA Land and Maritime - VTP which maintains/retains the interoperability standards. Please note that separate test samples are required for interoperability testing. These test samples will then be retained by DLA Land and Maritime as interoperability standards. Interoperability needs to be performed for one temperature range, not both when the constraints specified under note 3/ are met.
- 10/ Return loss after mating durability. If failure occurs, ferrule end faces may be repolished and test redone.
- 11/ Mechanical tests. Use separate test samples from Group 2 for Group 3 Mechanical test. Separate test samples are used for Group 3 Environmental tests.
- 12/ Shock and vibration. Two connector mated pair must be tested. At least four termini pair in the two connector mated pair are to be monitored for optical signal discontinuity (and for change in optical transmittance). Any other mated pair not monitored for optical signal discontinuity is to be monitored for change in optical transmittance.
- 13/ Per MIL-PRF-64266, an insertion loss verification and a return loss test is required near or after the conclusion of the mechanical tests and after the environmental tests. If both the mechanical tests and the environmental tests are done on the same mated pair, then only one insertion loss verification and one return loss test is performed (after the conclusion of the mechanical and environmental tests).
- 14/ When the MIL-PRF-29504/18 qualification is performed along with the MIL-PRF-64266 qualification, test for unterminated termini and tests for termini as part of a single fiber cable in this table shall be performed separately. Tests for termini as part of a multiple termini connector do not need to be performed separately when the termini are included in the MIL-PRF-64266 test sequence.

Optical signal discontinuity.

Temperature range 1. Applicable.

Temperature range 2. Applicable except for single mode termini, a discontinuity is considered to be a reduction of optical transmittance of 0.5 dB or more for a duration of 50 microseconds or more (during vibration) or 100 milliseconds or more (during shock).

Fiber pull out force: Applicable

Cable pull out force: Applicable.

Maintenance aging: Applicable. Terminus marking shall remain legible upon completion of testing.

Twist: Applicable except perform as specified in MIL-PRF-64266 on termini as a part of a single fiber cable. A terminus held fixture shall be used in lieu of a connector held fixture.

Thermal shock. Applicable except for temperature range 2, temperatures of -55°C +0°C -5°C and +165°C +5°C - 0°C shall be used for the high and low soak temperatures, respectively.

To qualify or re-qualify termini to this specification sheet, all requirements of MIL-PRF-64266 shall be met using the qualifying terminus in a connector qualified to MIL-PRF-64266.

Qualification connector: The qualification connector for this terminus shall be a qualified MIL-PRF-64266 connector.

Test specimens:

Test samples constructed and fiber sizes used shall be as specified in Requirement 4103 of MIL-STD-1678-4. As specified, separate test samples shall be constructed for interoperability, temperature range 1 and temperature range 2 using the fiber sizes listed for each configuration constructed.

Qualification:

Qualification shall consist of performing testing specified for temperature range 1 or temperature range 2, or both temperature ranges 1 and 2 as listed in table IV.

Qualification by similarity.

- a. Qualification of termini with different ferrule hole diameters and with single mode fiber sizes for each temperature range:
 - (1) Qualification inspection shall be performed on termini with a ferrule hole diameter of 125.5 microns when termini with 125.3, 125.5 and the 126 micron ferrule hole diameters are offered. Manufacturers who qualify under this specification sheet for the 125.5 micron ferrule hole diameter are qualified under this specification sheet for the 125.3 and the 126 micron ferrule diameter (see table V).
 - (2) Constraint for qualification by similarity case listed above. This qualification by similarity case is valid if the only difference between the qualified termini (single mode 125.5 micron) and the 125.3 other ferrule hole size termini is a change in the terminus ferrule hole diameter and TICC markings.
- b. Qualification of termini for multimode fiber sizes for each temperature range.
 - (1) Manufacturers who qualify under this specification sheet for the terminus with the ferrule hole diameter specified in column three of table V are qualified under this specification sheet for the other ferrule hole diameter in column five on the same row of table V.
 - (2) Constraint for qualification by similarity case listed above. This qualification by similarity case is valid if the only difference between the termini column three of table V and the other ferrule hole size termini listed in the same row of table V is a change in the terminus ferrule hole diameter and TICC markings.

Table V. Termini qualification by similarity for each temperature range.

Fiber Type 1/	Temperature Range	Qualified with Hole Diameter	Qualified TICC	Get Other Hole Diameter(s)	Get Other TICC	Remarks
SM	1	125.5	AB	125.3, 126	AA,AC	1/, 2/
SM	2	125.5	AJ	125.3, 126	AH,AK	1/, 3/
MM	1	126	AD	127	AE	1/, 2/
MM	2	126	AL	127	AM	1/, 3/
MM	2	156	AN	157	AP	1/, 3/, 4/
1/ SM = Single mode, MM = Multimode (50/125, 62.5/125, 62.5/125/155 micron fiber sizes) 2/ Temperature range 1: see MIL-STD-1678-4 Requirement 4101 Appendix A. 3/ Temperature range 2: see MIL-STD-1678-4 Requirement 4101 Appendix B. 4/ Qualified with polyimide coated optical fiber, see MIL-STD-1678-4 Requirement 4101 for cable type.						

Usage: Termini compliant with this specification sheet may be used in connectors other than MIL-PRF-64266 at the discretion of the acquiring activity.

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

<u>M29504/18</u>	-	<u>XX</u>	<u>X</u>
Basic specification and specification sheet		TICC Code (see table II)	Crimp sleeve Y = Yes, N = No

Conformance tests (Group A, B and C).

- a. Group A. Group A shall consist of the inspections/tests specified for Group A in [table VI](#).

Group A sampling plan. Group A shall be performed by random sampling for product supplied under this specification. This random sampling shall be performed to [MIL-STD-1678-1](#) Requirement 1304. Number of samples for random sampling inspected per lot size is specified in table 1304-1 of [MIL-STD-1678-1](#) Requirement 1304. The required acceptance criterion is a zero nonconformance regardless of sample size.

Group A sampling plan for occurrence of a nonconformance. If any nonconformance is found, then 100 percent inspection shall be used until the qualifying activity is satisfied that the cause for the nonconformance has been corrected and will not reoccur. Also, until the nonconformance has been corrected, inspection with the requirement that data be provided (in lieu of inspection by attribute) may be specified by the qualifying activity.

TABLE VI. Conformance inspections (Groups A, B and C).

Test performed <u>1/</u> , <u>2/</u>	Groups A, B ,C		Group C Groups I, II, III	Number of Termini/ Number of mated pair <u>9/</u> , <u>13/</u>
	Temperature Range 1	Temperature Range 2 <u>3/</u>		
Tests for unterminated termini				
Group 1				
Size <u>5/</u>	A	A	---	---
Identification markings <u>5/</u>	A	A	---	---
Workmanship <u>5/</u>	A	A	---	---
Circular runout <u>5/</u>	B	B	---	---
Group 2 <u>5/</u> , <u>6/</u> , <u>7/</u>				
Terminus insertion & removal forces	B	B	---	16 termini <u>14/</u>
Terminus retention	B	B	---	16 termini
Maintenance aging	B	B	---	16 termini from terminus retention
Group 3 (polymeric materials)				
Ozone		C	Group III	
Tests for termini as part of a single fiber cable				
Group 2				
Fiber pull out force <u>8/</u>	C		Group II	16 termini
Cable pull out force <u>8/</u>	C	C	Group II	16 termini
Twist	C	C	Group II	8 termini from Cable pull out
Salt spray		C	Group III	8 termini from Twist
Tests for termini as an integral part of a multiple termini connector				
Group 1 <u>4/</u> , <u>9/</u> , <u>12/</u>				
Optical tests				
Insertion loss <u>11/</u>	C	C	Group I	2 mated pair - # 1,2
Return loss <u>11/</u>	C	C	Group I	2 mated pair - # 1,2
Group 2 <u>4/</u> , <u>9/</u> , <u>12/</u>				
Mating durability	C	C	Group II	1 mated pair - # 1
Group 3 <u>4/</u> , <u>9/</u> , <u>12/</u>				
Mechanical tests <u>9/</u>				
Vibration <u>10/</u>	C	C	Group III	1 mated pair - # 1
Shock, MIL-S-901 <u>10/</u>	C	C	Group III	1 mated pair - # 1
Environmental <u>4/</u> , <u>9/</u> , <u>12/</u>				
Thermal shock		C	Group III	1 mated pair - # 2
Temperature humidity cycling	C		Group III	1 mated pair - # 2
Temperature cycling	C		Group III	1 mated pair - # 2
Temperature life		C	Group III	1 mated pair - # 2

See footnotes at end of table

TABLE VI. Conformance inspections (Groups A, B and C) – Continued.

Notes:

- 1/ Conformance consist of performing tests in this table for temperature range 1, for temperature range 2, or for both temperature range 1 (TR1) and temperature range 2 (TR2). Conformance tests are those inspections specified for unterminated termini (groups A, B), termini as part of a single fiber cable (group C) and termini as an integral part of a multiple termini connector (group C).
- 2/ "A", "B" and "C" indicates test applies when performing a Group A, B or C Conformance test.
- 3/ Assumes same terminus material and physical configuration as used for Temperature range 1 (see note 9/).
- 4/ For Group C conformance testing, use a [MIL-PRF-64266](#) shell size 11 connectors with a 4 cavity insert. Connector is to be fully populated with PC polished termini. All insert cavity positions are to be active (monitored). Use of other connector configurations is not allowed (such as one MIL-PRF-64266 shell size 15 with an 8 cavity insert in lieu of two MIL-PRF-64266 shell size 11 connectors with 4 cavity inserts).
- 5/ These inspections are to be performed by the manufacturer at the production facility. Exception may be taken for weight, circular run out, terminus retention, terminus insertion and removal forces and maintenance aging.
- 6/ Test fixture for this test is to include fiber optic; [MIL-PRF-64266](#) connectors; either plug or receptacle for retaining the termini during testing.
- 7/ Test performed using connector in which the ASR is not inserted.
- 8/ Each terminus is to be terminated on one end of a single fiber cable. Cable used is to have provisions compatible with termini strain relief, as applicable. Termini, selected from the group that underwent inspections for un-terminated termini, shall be used. A minimum sample size of 8 pin termini and 8 of the applicable counterpart socket termini (i.e., 16 pin termini for this configuration), selected from the group that underwent inspections for un-terminated termini, shall be used for each of these tests.
 - Fiber pullout. Separate test samples of the termini must be prepared on single fiber cable without any strain relief. The change in optical transmittance shall be met after the test.
 - Cable pullout. Separate test samples of the termini must be prepared on single fiber cable with strain relief (aramid yarn on cable affixed to terminus via the crimp sleeve). The change in optical transmittance shall be met after the test.
- 9/ Number of connector mated pair for group C. Two connector mated pair shall be tested for each PIN undergoing group C testing. The group C tests must be performed for each row in [table VIII](#) for which termini are offered.
- 10/ Shock and vibration. One connector mated pair shall be tested (see note 4/). The four termini pair in the connector mated pair are to be measured for optical signal discontinuity and for change in optical transmittance.. For temperature range 1 vibration, testing is limited to performing the 5.2.c random vibration in Measurement 3201 of [MIL-STD-1678-3](#). For temperature range 2 vibration, testing is limited to performing the 5.3.c random vibration in Measurement 3201 of [MIL-STD-1678-3](#).
- 11/ An insertion loss verification and a return loss test shall be performed at the start of Group C testing and on any terminus mated pair used in Group B. The initial insertion loss and return loss shall be performed on any new mated pair used in Group C testing. The one exception is that return loss shall be performed only on termini with single mode fiber.
- 12/ Termini to be placed in each mated pair shall be selected based on [table VIII](#).
- 13/ For each test in group C (under tests for termini as a part of a multiple termini connector), the column for "Number of mated pair" first specifies the total number of connector mated pair tested followed by which or both connector mated pair are used for that test (each connector mated pair being assigned a number 1 or 2).
- 14/ When maintenance aging is performed, the first and last maintenance aging cycle can be used as the terminus insertion and removal force test. Otherwise, perform in the sequence listed (on the 16 termini prior to and used for the terminus retention test).

- b. Group B. Group B shall consist of the inspections/tests specified for Group B in [table VI](#) on termini 24 months after initial qualification and within each 2 year period thereafter.

Group B test sample configurations.

- (1) Unterminated termini. No test sample preparation is required for circular runout, terminus insertion and removal forces, terminus retention, and maintenance aging.
- (2) Termini as part of a single fiber cable. Test samples shall be fabricated on termini of the same PIN as described in the applicable note in [table VI](#) for single fiber cables.

Group B sampling plan. A minimum of sixteen sample units shall be selected from a lot of the same PIN within 24 months after the date of notification of qualification and during every 24 month period thereafter. When a manufacturer is qualified for multiple TICC/PINs, then the group B inspection shall be performed every two year period on at least one TICC from each row in [table VII](#) where the manufacturer has qualified parts. The terminus selected from each row shall be such that after three consecutive group B inspections, all qualified TICC/PINs from the same row in [table VII](#) have been inspected. If a manufacturer is qualified for only 1 TICC in a particular row, then that TICC shall be inspected during every two year period. If a manufacture is qualified for 2 TICC in a row the manufacturer shall alternate inspections during each two year period.

Table VII. Termini Group B sampling plan by TICC.

Temperature Range/ Fiber Diameter	TICC <u>1/</u>	Fiber Type <u>2/</u>	Group B Period 1	Group B Period 2	Group B Period 3	Fabrication Remarks
1, 125 µm	AA,AB,AC	SM	AC	AB	AA	<u>3/</u>
1, 125 µm	AD,AE	MM	AE	AD	AE	<u>3/</u>
2, 125 µm	AH,AJ,AK	SM	AK	AJ	AH	<u>4/</u>
2, 125 µm	AL,AM	MM	AM	AL	AM	<u>4/</u>
2, 155 µm	AN,AP	MM	AN	AP	AN	<u>5/</u>
<u>1/</u> If not qualified for all TICC's in a particular row alternating inspections shall be performed for the qualified TICC's. (Ex: If qualified for AA and AC, but not AB, perform inspection on AC during Period 1 and AA during Period 2). <u>2/</u> SM = single mode, MM = multimode. <u>3/</u> Temperature range 1: see MIL-STD-1678-4 Requirement 4101 Appendix A. <u>4/</u> Temperature range 2: see MIL-STD-1678-4 Requirement 4101 Appendix B. <u>5/</u> Qualified with polyimide coated optical fiber, see MIL-STD-1678-4 Requirement 4101 for cable type.						

- c. Group C. Group C shall consist of the inspections/tests specified for Group C in [table VI](#) on termini 60 months after initial qualification and within each 5 year period thereafter.

Group C test sample configurations.

(1) Unterminated termini. Test samples for ozone shall consist of a minimum of 16 seals (O-rings or other configurations used) on a dowel or similar fixture. Diameter of dowel shall be the same as that of the terminus. Other, 16 termini shall be tested.

(2) Termini as part of a single fiber cable. Test samples shall be fabricated on termini of the same PIN as described in the applicable note in [table VIII](#) for single fiber cables.

(3) Termini as part of a multiple termini connector. Test samples shall be fabricated as specified in Requirement 4103 of MIL-STD-1678-4 with one exception. Termini of the same PIN shall be cabled and inserted into the insert cavities of [MIL-PRF-64266](#) shell size 11 connectors with a 4 cavity insert (i.e., four termini mated pair per each connector mated pair) as specified in Requirement 4103 of [MIL-STD-1678-4](#). Two connector mated pair shall be used for each row as listed in [table VIII](#).

Group C sampling plan. Group C inspection shall be performed on termini of the same PIN from the highest production volume of each row in [table VIII](#). For tests on termini as an integral part of a multiple termini connector, the two connector mated pair shall be subjected to group 1 tests for each row in [table VIII](#). For one mated pair in each row of [table VIII](#), the connector mated pair undergoes the group 1 tests followed by the group 2 and group 3 mechanical tests. For the other mated pair in each row of [table VIII](#), the other connector mated pair undergo group 1 tests followed by group 3 environmental tests. The terminus shall be selected such that the terminus is chosen with the ferrule hole diameter in each row of [table VIII](#) with the largest volume of product produced during the five year Group C period.

Table VIII. Termini Group C sampling plan by temperature range and TICC.

Temperature Range/Fiber Diameter	TICC <u>1/</u>	Fiber Type <u>2/</u>	Sampling Plan (base on production volume)	Termini as a part of a		Fabrication Remarks
				Single Fiber Cable	Multiple Fiber Connector <u>4/</u>	
1 125 µm	AA,AB,AC	SM	Select highest volume SM from 5 year period; AA, AB or AC	<u>3/</u>	Mated Pair 1 Mated Pair 2	<u>5/</u>
1 125 µm	AD,AE	MM	Select highest volume MM from 5 year period; AD or AE	<u>3/</u>	Mated Pair 1 Mated Pair 2	<u>5/</u>
2 125 µm	AH,AJ,AK	SM	Select highest volume SM from 5 year period; AH, AJ or AK	<u>3/</u>	Mated Pair 1 Mated Pair 2	<u>6/</u>
2 125 µm	AL,AM	MM	Select highest volume MM from 5 year period; AL or AM	<u>3/</u>	Mated Pair 1 Mated Pair 2	<u>6/</u>
2 155 µm	AN,AP	MM	Select highest volume MM from 5 year period; AN or AP	<u>3/</u>	Mated Pair 1 Mated Pair 2	<u>7/</u>
<u>1/</u> Select highest volume from 5 year period for each row of termini being offered. <u>2/</u> SM = single mode, MM = multimode. <u>3/</u> The number of termini of the same PIN needed for Group C inspection of termini as part of a single fiber cable is as follows: Fiber pullout force = 16, Cable pullout force = 16. <u>4/</u> See table VI for tests to be performed for each mated pair. <u>5/</u> Temperature range 1: see MIL-STD-1678-4 Requirement 4101 Appendix A. <u>6/</u> Temperature range 2: see MIL-STD-1678-4 Requirement 4101 Appendix B. <u>7/</u> Qualified with polyimide coated optical fiber, see MIL-STD-1678-4 Requirement 4101 for cable type.						

Cleaning prior to packaging. Termini shall be cleaned prior to packaging/shipment internally (for ensuring proper adherence of epoxy to terminus barrel (body) and ferrule and externally (for minimizing contamination).

Amendment notations. The margins of this specification are marked with vertical lines to indicate modifications generated by this amendment. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

Referenced documents. In addition to MIL-PRF-29504, this specification sheet references the following documents:

MIL-DTL-901
MIL-STD-1678-1
MIL-STD-1678-3
MIL-STD-1678-4
MIL-PRF-1678-5
MIL-PRF-29504/20
MIL-PRF-64266
MIL-PRF-64266/9
TIA455.12
TIA455.16
TIA/EIA-455-158
TIA-455-235
TIA-604-10
SAE AIR 1351

Custodians:
Army - CR
Navy - SH
Air Force - 85
DLA - CC

Preparing activity:
DLA - CC

(Project 6060-2018-005)

Review activities:
Navy - AS
Air Force - 13, 19, 93
NASA - NA

NOTE: The activities listed above were interested in this document on 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>.