

INCH-POUND

MIL-PRF-29504/4E
W/AMENDMENT 2
14 February 2022
SUPERSEDING
MIL-PRF-29504/4E
W/AMENDMENT 1
1 April 2019

PERFORMANCE SPECIFICATION SHEET

TERMINI, FIBER OPTIC, CONNECTOR, REMOVABLE, ENVIRONMENT RESISTING,
PIN TERMINUS, SIZE 16, REAR RELEASE, MIL-DTL-38999, SERIES III

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 sheet and MIL-PRF-29504.

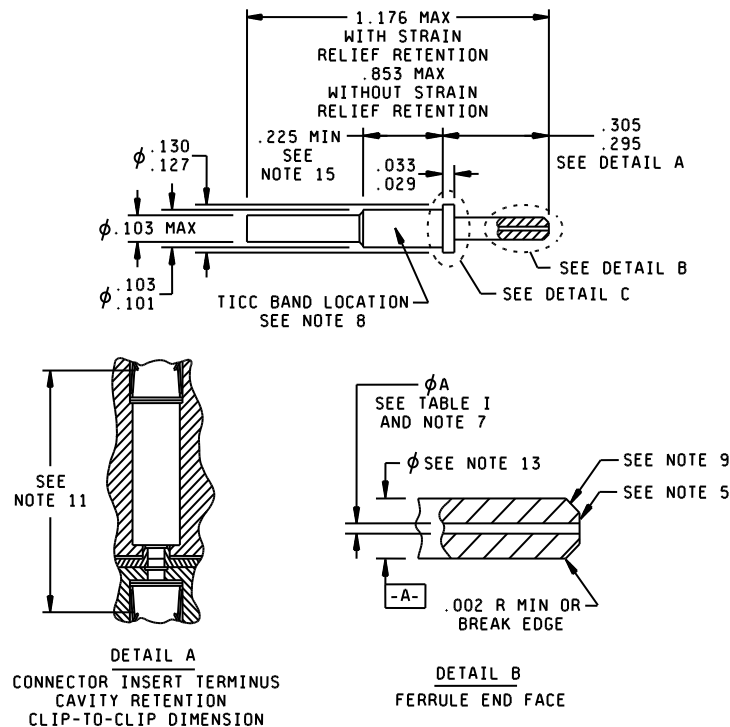


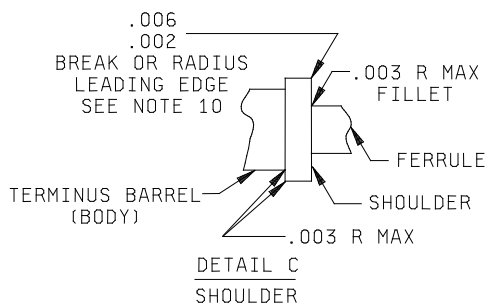
FIGURE 1. Pin terminus

AMSC N/A
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FSC 6060



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Inches	mm	Inches	mm
.002	0.05	.127	3.23
.003	0.08	.130	3.30
.006	0.15	.225	5.72
.029	0.74	.295	7.49
.033	0.84	.305	7.75
.101	2.57	.853	21.67
.103	2.62	1.176	29.87

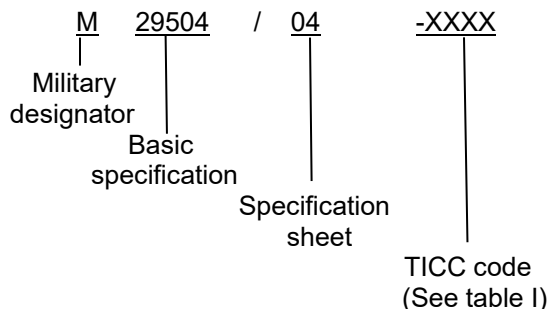
NOTES:

1. Dimensions are in inches, except diameter "A" which is dimensioned in metric microns only.
2. Metric equivalents are given for general information only.
3. Unless otherwise indicated, all diameters are to be concentric with respect to datum A within .003 inch (0.08 mm).
4. Dimensions apply after plating when applicable.
5. Ferrule end face may be flat or have a radius that does not exceed a curvature of 10 mm. Recommended inspection documentation advises that an end face curvature of 25 mm falls between that of a flat end face and one with a curvature of 10 mm.
6. Hole "A" diameter and tolerance are specified in table I.
7. Hole circular runout in table I relative to datum A.
8. Manufacturer's symbol or trademark location is in front of the first TICC band (see figure 1 of MIL-PRF-29504). As an alternative to TICC bands, each digit of the TICC may be designated by the number which corresponds to the color band. 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.
9. Ferrule surface shown to have either a chamfer within 25° to 65° angle x .010 minimum or a .010 R minimum.
10. Optional dimension: Maximum allowable edge break is .015 inch (0.38 mm).
11. Termini qualified to this specification sheet shall meet the performance requirements when inserted into a connector with clip-to-clip dimensions of .756 to .808 inch (19.20 to 20.52 mm).
12. Terminus design shall accommodate a single fiber cable with a maximum diameter of .087 inch (2.2 mm).
13. Ferrule diameter for ceramic: .06246 to .06250 inches (1.5865 to 1.5875 mm), ferrule diameter for metal: .06238 to .06248 inches (1.5824 to 1.5870 mm).
14. For interoperability with a standardized polishing puck, the length of exposed ferrule to the terminus shoulder (end face to the front of the shoulder) shall be 0.262 inch (6.62 mm) minimum.
15. For style 1 terminus only, reduction of the .225 inch (5.72 mm) minimum length to .025 inch (0.63 mm) is allowed. Additionally, there shall be a smooth ramp transition on the terminus between the terminus barrel and the heat shrink sleeve so as not to restrict the function of the insertion and removal tool during the removal operation.

FIGURE 1. Pin terminus - Continued.

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Part or identifying number (PIN): See table I of this document and 6.6 of MIL-PRF-29504.



Usage: Termini compliant with this specification sheet are intended to be used in MIL-DTL-38999 connectors as applicable, may be used in connectors other than MIL-DTL-38999 at the discretion of the acquiring activity. Termini compliant with this specification may not meet all requirements of MIL-DTL-38999 if not used in series III connectors. Termini with metal ferrules are intended primarily for legacy systems.

REQUIREMENTS:

Temperature ranges:

Operating	-67°F to 329°F	(-55°C to +165°C)
Non-operating	-40°F to 185°F	(-40°C to + 85°C)
Storage	-40°F to 185°F	(-40°C to + 85°C)

Fabrication procedure. Standard fabrication procedure (for terminus placement/termination onto the end of an optical fiber), including epoxy specified in the procedure, shall be used for test sample terminations. Test sample fabrication shall be performed as specified in Requirement 4101 of [MIL-STD-1678-4](#).

Design and construction:

Dimensions and configuration: See figure 1 and table I. Pre-polished termini may have either flat or radiused end faces. Regardless of the end face geometry, the terminus shall meet the requirements of this specification when terminated using the procedures specified.

Weight: 1.0 gram maximum.

TABLE I TICC numbers and "A" (ferrule hole) diameter for specified optical fiber sizes.

Fiber size (core/cladding/coating) μm	Ferrule hole diameter μm	Ferrule material	Circular run-out μm	TICC style 1	TICC style 2
Single mode 9/125 <u>1/</u> , <u>2/</u>	125.3 +1/-0	Ceramic	0.5	4207	4217
Single mode 9/125 <u>1/</u>	125.5 +1/-0	Ceramic	0.5	4208	4218
Single mode 9/125 <u>1/</u> , <u>4/</u>	126 +1/-0	Ceramic	1	4209	4219
50/125, 62.5/125	126 +2/-0	Ceramic	2	4210	4220
50/125, 62.5/125	127 +2/-0	Ceramic	2	4040	4221
62.5/125/153	156 +3/-0	Ceramic	3	4211	4222
62.5/125/155	157 +3/-0	Ceramic	3	4212	4223
100/140	142 +3/-0	Ceramic	4	4043	4224
100/140	145 +3/-0	Ceramic	4	4044	4225
100/140/172	173 +3/-0	Ceramic	4	4087	4226
100/140/172	175 +3/-0	Ceramic	4	4213	4227
50/125, 62.5/125	127 +3/-0	Metal <u>3/</u>	3		4231
62.5/125/155	157 +3/-0	Metal <u>3/</u>	3		4232
100/140	142 +3/-0	Metal <u>3/</u>	4		4233
100/140/172	175 +3/-0	Metal <u>3/</u>	4		4234

- 1/ Applicable to any single mode core size. Also applicable to any multimode core size when enhanced performance is required and cladding tolerances permit.
- 2/ Ferrule hole size when enhanced performance is required and cladding tolerances permit.
- 3/ Termini with metal ferrules are intended primarily for legacy systems.
- 4/ Hole size intended for legacy systems.

Cable strain relief capture mechanism. Two styles for a capture mechanism are specified for this terminus design (see table I). Cable strain relief capture mechanism shall not interfere with intended sealing performance of wire grommet seal, a component in the [MIL-DTL-38999](#) connector, or with the functionality of the insertion and removal tools (see table II).

Style 1: Captive strength member outside barrel (body) with heat shrink sleeve.

Style 2: Captive strength member inside terminus barrel (body).

Tools: See table II.

TABLE II. Tools.

TOOL	PIN <u>1/</u>
Insertion tool	M81969/14-03
Removal tool	M81969/14-03

1/ Found in SAE-AS81969/14

Mating terminus: [MIL-PRF-29504/5](#).

Circular run-out: Not greater than the value specified in table I.

Frequency of terminus end face cleaning. Unless otherwise specified, terminus may be cleaned before or after each test if the connector is de-mated. Cleaning shall not be performed during the ten successive mates for the insertion loss test. Unless otherwise specified, cleaning may be performed during mating durability before each optical transmittance measurement. Terminus end face cleaning shall be performed for the post optical transmittance measurement after the salt spray test. The optical transmittance measurement is performed after the general cleaning and inspection for corrosion. Cleaning may be performed at other times when degradation in optical performance occurs. Cleaning performed as a corrective action for degraded optical performance shall be noted on the data sheet. Unless otherwise specified, cleaning of the optical end faces is to occur without removal of termini from the connector.

Qualification inspection. Inspections and sequence shall be performed as listed in table III. Requirements and inspections apply to conformance testing also unless otherwise specified.

TABLE III. Qualification inspections.

Test procedure	Sample size 1/
Un-terminated termini	
Group 1	64 pin and 64 socket termini (unterminated termini)
Size	
Weight	
Identification markings	
Workmanship	
Circular run-out	
Group 2	16 pin & 16 socket termini (from Group 1 unterminated termini)
Terminus retention	
Terminus cleaning	
Termini as part of single fiber cable	
Group 2	
Cable pullout force	16 pin & 16 socket termini, each on terminus-to-connector jumper (termini from unterminated termini)
Group 3	
Salt spray	16 pin & 16 socket termini, each on terminus-to-connector jumper (jumpers from cable pullout force)
Termini in a multiple termini connector	
Interoperability	1 connector mated pair (termini not from unterminated termini)
Group 1	4 connector mated pair (termini from unterminated termini)
Optical	
Insertion loss (initial)	
Return loss (single mode only)	
Group 2	2 connector mated pair (from Group 1)
Mating durability	
Terminus cleaning	
Return loss (single mode only)	
Group 3 Environmental/Mechanical	
Mechanical tests	2 connector mated pair (from Group 2)
Shock	
Vibration	
Insertion loss (verification)	
Return loss (single mode only)	
Environmental tests	2 connector mated pair (from Group 1)
Thermal shock	
Temperature life	
Insertion loss (verification)	
Return loss (single mode only)	

1/ Sample size, test sample configuration and test sample fabrication shall conform to MIL-STD-1678-4 Requirement 4101. Sample size is specified for each terminus configuration to be tested for a complete test sequence (see [MIL-STD-1678-4](#) Requirement 4101).

Inspections for un-terminated termini:

Test sample configuration. Test fixture for this test shall include [MIL-DTL-38999](#) shell size 17, series III connectors, utilizing both plug and receptacle for retaining the termini during testing.

Identification markings. The Termini Identification Color Coding (TICC) bands shall be marked on the barrel of the termini or use of the allowed alternative markings as stated in footnote 8/ of figure 1. Manufacturer's symbol or trademark shall be in accordance with footnote 8/ of figure 1. The manufacturer shall list the symbol or trademark with SAE in accordance with SAE AIR 1351.

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.

Circular run-out. 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 I. 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.

Terminus insertion and removal forces. Not applicable.

Terminus retention. Terminus displacement measurement is not applicable. Test may be used as one operational means to verify acceptable shoulder construction.

Terminus engagement and separation force. Test is applicable for counterpart socket terminus ([MIL-PRF-29504/5](#)) with split alignment sleeves.

Maintenance aging. Not applicable.

Fungus resistance. Not applicable.

Inspections for the terminus as part of a single fiber cable:

Test sample configuration. 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 passed inspections for un-terminated termini, shall be used. Test sample configurations, fabrication methods shall be as specified in Requirement 4101 of [MIL-STD-1678-4](#). Specific test methods and practices shall be as specified in MIL-STD-1678-2 and MIL-STD-1678-3.

Fiber pull out force. Not applicable (This test is used for terminus configurations with no type of cable strain relief).

Cable pull out force. Applicable for terminus configurations with any mechanism for cable strain relief. The change in optical transmittance shall be measured during and after the test for a pin terminus.

Salt spray: Test samples (termini on single fiber cable) shall be tested to [TIA-455-16](#), test condition C. Terminus ferrule may be covered up to halfway 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-DTL-38999](#) shell size 17; series III connector, shall be performed both prior to and after the salt spray test.

Inspections of termini in a multiple termini connector:

Test sample configuration: Test sample configurations, fabrication methods shall be as specified in Requirement 4101 of [MIL-STD-1678-4](#). Specific test methods and practices shall be as specified in MIL-STD-1678-2 and MIL-STD-1678-3.

Interoperability. Applicable, except test for terminus insertion and removal forces is not required. Test sample configurations/fabrication shall conform to Requirement 4101 of [MIL-STD-1678-4](#). Specific test methods and practices shall be as specified in MIL-STD-1678-2 and MIL-STD-1678-3. As part of the interoperability inspection, termini on the end of single fiber cable shall be inserted and removed from the connector to verify that the strain relief is compatible with the tools listed in table II. All termini of the same PIN shall be interoperable with one addition. Termini with the same fiber size, ferrule hole diameter and ferrule material (see table I) shall be interoperable regardless of the style. This testing shall be performed by DLA Land and Maritime-VTP as specified in Requirement 4101 of [MIL-STD-1678-4](#).

Optical source wavelength. Wavelength of the optical source shall conform to [MIL-STD-1678-2](#) Measurement 2101 or Measurement 2102, as applicable.

Launch conditions shall conform to Measurement 2102 of [MIL-STD-1678-2](#).

Insertion loss. The initial insertion loss and the insertion loss verification for the various fiber sizes and ferrule materials shall be as specified in table IV. The insertion loss limits specified are the maximum allowed values for each measurement (each mating with respect to the pre-cut back measurement). It is not intended to average the ten matings or use other averaging schemes.

TABLE IV. Optical insertion loss performance. 1/

Fiber size (um)	Termini in non-tight tolerance D38999 <u>2/</u>		Termini in tight tolerance D38999/60 and D38999/61 <u>3/</u>		Ferrule material
	Initial insertion loss (dB)	Insertion loss verification (dB) <u>4/</u>	Initial insertion loss (dB)	Insertion loss verification (dB) <u>4/</u>	
Single mode 9/125	0.75	1.25	0.75	1.25	Ceramic
50/125	1.50	2.00	1.00	1.50	Ceramic
62.5/125	1.00	1.50	0.75	1.25	Ceramic
62.5/125/polyimide	1.50	2.00	1.00	1.50	Ceramic
100/140	0.75	1.25	0.75	1.25	Ceramic
100/140/polyimide	1.50	2.00	1.00	1.50	Ceramic
50/125	1.50	2.00	1.25	1.75	Metal
62.5/125	1.25	1.75	1.00	1.50	Metal
62.5/125/polyimide	1.50	2.00	1.25	1.75	Metal
100/140	1.25	2.25	1.00	1.50	Metal
100/140/polyimide	1.50	2.50	1.00	1.75	Metal

1/ Optical loss performance is based on use of specified fabrication procedure.

2/ Termini in a MIL-DTL-38999 connector that is other than MIL-DTL-38999 tight tolerance series III connector (the latter being built to specification sheets MIL-DTL-38999/60 and MIL-DTL-38999/61 specific to fiber optic applications), the former distinguished from the tight tolerance type by denoting as the MIL-DTL-38999 non-tight tolerance connector.

3/ Termini in a MIL-DTL-38999 tight tolerance series III connector (the MIL-DTL-38999/60 and MIL-DTL-38999/61 specific to fiber optic applications) for shell sizes 9 through 19. For shell sizes 21 through 25, use performance requirements when termini are used in a MIL-DTL-38999 non-tight tolerance connector.

4/ Insertion loss verification is an insertion loss performed after a series of environmental tests or mechanical tests.

Mechanical. The mechanical tests shall be performed in the sequence listed in table III. 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).

Mechanical shock. Mated connector assemblies shall be tested in accordance with the applicable mechanical shock test listed below. Optical discontinuities shall be measured during the test. A minimum of four termini shall be measured for discontinuity. The change in optical transmittance shall be measured after the test. The termini shall be visually examined after the test to the extent feasible inside the connector. Termini shall not be damaged and there shall be no loosening of parts. The requirement for optical discontinuity shall be met during the test and the requirement for the change in optical transmittance shall be met after the test. For testing, initially mate the connector assemblies and apply the specified torque value (see [MIL-STD-1678-3](#) table 3202-V). Mark the position after the torque has been applied and check/record position after each impact. Do not tighten the coupling ring after each impact if the connector is being tested in addition to the terminus. Otherwise, retighten after each impact.

- a. [MIL-DTL-901](#). Mated connector assemblies shall be tested in accordance with MIL-DTL-901, grade A, type B, class I. Standard shock fixture 4A for bulkhead mounting shall be used. Supplement test fixture with mounting shall be performed as specified in Measurement 3202 of MIL-STD-1678-3.
- b. Half-sine pulse. Mated connector assemblies shall be tested in accordance with TIA-455-14, test condition D. Three shocks in each direction shall be applied along the three mutually perpendicular axes of the test sample (18 shocks).

Vibration. Mated connector assemblies shall be tested for sinusoidal vibration in accordance with the applicable vibration tests listed below. Optical discontinuities shall be measured during the test. For connectors of shell sizes 17 and greater, a minimum of four termini shall be monitored for discontinuity. The change in optical transmittance shall be measured after the test. The termini shall be visually examined after the test to the extent feasible inside the connector. Termini shall not be damaged, there shall be no loosening of parts, and no other damage which can produce physical distortion or wear and may result in fatigue of the mechanical parts. The requirement for optical discontinuity shall be met during the test and the requirement for the change in optical transmittance shall be met after the test. For testing, initially mate the connector assemblies and apply the specified torque value (see MIL-STD-1678-3 table 3201-II). Mark the position after the torque has been applied and check/record position after each axis. Do not tighten the coupling ring during testing if the connector is being tested in addition to the terminus. Otherwise, retighten after each axis.

Sine vibration shall be performed in accordance with [MIL-STD-1678-3](#) Measurement 3201, test conditions C, 5.3.a (60 G at ambient temperature only). This cycle shall be performed 12 times in each of three mutually perpendicular directions at ambient temperature. This results in a total of 36 cycles being applied for approximately 12 hours. The sequence shall be repeated twice. (36 hours total at ambient temperature). Interruptions are permitted provided the requirements for rate of change and test duration are met. Completion of cycling within any separate band is permissible before proceeding to the next band.

Random vibration shall be performed in accordance with MIL-STD-1678-3 Measurement 3201, test conditions C, 5.3.b (41.7 G rms at a temperature of 125°C).

Random vibration shall be performed in accordance with MIL-STD-1678-3 Measurement 3201, test conditions C, 5.3.c (49.5 G rms at an ambient temperature).

Environmental. The following environmental tests shall be performed in the sequence listed: thermal shock, temperature life.

Thermal shock. The temperatures of $-55^{\circ}\text{C} +0^{\circ}\text{C}$, -5°C and $165^{\circ}\text{C} +5^{\circ}\text{C}$, -0°C shall be used for the low and high soak temperatures, respectively. Mated connector assemblies shall be tested in accordance with [TIA-455-71](#), schedule C-0 (5 cycles). The mated connector assemblies shall not be un-mated then re-mated after the test as part of the inspection. The change in optical transmittance shall be measured during (towards the end of each soak temperature) and after the test. The termini shall be visually examined after the test only if optical performance is not met. Termini shall not be damaged, and there shall be no loosening of parts or other damage detrimental to the operation of the termini. The requirement for the change in optical transmittance shall be met during and after the test with one exception. During the thermal shock test, the change in optical transmittance during the high temperature portion of the cycle shall not exceed 1.5 dB.

Temperature life. The high exposure temperature shall be $165^{\circ}\text{C} +5$, -0°C . Mated connector assemblies shall be tested in accordance with TIA455.4 for the duration of 1,000 hours at the high exposure temperature. The change in optical transmittance shall be measured after the test. The termini shall be visually examined after the test to the extent feasible inside the connector only if optical performance is not met. Termini shall not be damaged, and there shall be no loosening of parts or other damage detrimental to the operation of the termini. The requirement for the change in optical transmittance shall be met after the test. Performance of a cable/fiber retention test is not required as part of the final inspection for this test.

Insertion loss (verification): If the cut back method is used after the mechanical or environmental tests are concluded, then return loss may be performed prior to the insertion loss verification.

Qualification connector: The qualification connector for this terminus shall be a qualified MIL-DTL-38999 series III connector (see MIL-STD-1678-4 Requirement 4101).

Qualification by similarity. Qualification inspection shall be performed on test samples configured in accordance with MIL-STD-1678-4 Requirement 4101.

a. Qualification of termini with different ferrule hole diameters.

- (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(s) in column four 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 qualified termini and the other termini listed in the same row of table V is a change in the terminus ferrule hole diameter and TICC markings.

b. Qualification of termini for different cable strain relief capture mechanisms.

- (1) Manufacturers who qualify under this specification sheet for the terminus with the ferrule hole diameter specified in column three of table V for termini with one style of cable strain relief capture mechanism and pass the insertion loss, cable pullout, thermal shock, and temperature life verification for termini with the same ferrule hole diameter(s) with a different style of cable strain relief capture mechanism are qualified under this specification sheet for a different cable strain relief capture mechanism for termini in column four 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 qualified termini and the termini undergoing qualification is a different cable strain relief capture mechanism and TICC markings.

c. Qualification of termini for change in design or material.

- (1) Perform complete re-qualification.

TABLE V. Termini Qualification by Similarity.

Fiber Type <u>1/</u>	Ferrule Material	Qualified with Hole Diameter	Get Other Hole Diameter(s)	Remarks
SM	Ceramic	125.5	125.3, 126	
MM	Ceramic	126	127	<u>2/</u>
MM	Ceramic	156	157	<u>3/</u>
MM100	Ceramic	173	142, 145, 175	<u>3/</u>
MM/MM100	Metal	175	127, 142, 157	<u>4/</u>

1/ SM = Single mode, MM = Multimode (50/125, 62.5/125 fiber sizes, MM100 = Multimode 100/140 fiber sizes

2/ Qualified with 50/125-micron fiber size, see MIL-STD-1678-4 Requirement 4101

3/ Qualified with polyimide coated optical fiber, see MIL-STD-1678-4 Requirement 4101

4/ Manufacturers who qualify under this specification sheet for the termini single mode and for multimode fiber sizes with ceramic ferrules (per column 3) and perform the full qualification inspection for the 100/140/172 fiber size using a 175 +3, -0 ferrule hole diameter and meet the size and insertion loss inspections for the other ferrule hole diameter(s) listed in the same row (and column four) are qualified under this specification sheet for the other ferrule hole diameters in the same row.

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 <u>3/</u>	Number of Termini/ Number of mated pair <u>7/</u> , <u>9/</u>
Tests for unterminated termini		
Group 1		
Size <u>5/</u>	A	---
Identification markings <u>5/</u>	A	---
Workmanship <u>5/</u>	A	---
Circular runout <u>5/</u>	B	8 pin termini
Group 2 <u>5/</u> , <u>6/</u>		
Terminus retention <u>13/</u>	B	8 pin termini
Tests for termini as part of a single fiber cable fiber cable		
Group 2		
Insertion loss <u>8/</u>	B	8 pin termini
Cable pull out force <u>8/</u>	B	8 pin termini
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	2 mated pair- # 1,2
Return loss <u>11/</u>	C	2 mated pair- # 1,2
Group 2 <u>4/</u> , <u>9/</u> , <u>12/</u>		
Mating durability	C	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	1 mated pair- # 1
Shock, MIL-DTL-901 <u>10/</u>	C	1 mated pair- # 1
Environmental <u>4/</u> , <u>9/</u> , <u>12/</u>		
Thermal shock	C	1 mated pair- # 2
Temperature life	C	1 mated pair- # 2

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

Notes:

- 1/ Conformance consist of performing tests in this table for the number of 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 (see note 12/). These test sample quantities apply for each fiber size.
- 4/ For Group C conformance testing, use a MIL-DTL-38999 shell size 13 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-DTL-38999 shell size 17 with an 8 cavity insert in lieu of two MIL-DTL-38999 shell size 13 connectors with 4 cavity inserts).
- 5/ These inspections are to be performed by the manufacturer at the production facility. Exception may be taken for circular run out and terminus retention.
- 6/ Test fixture for this test is to include fiber optic; MIL-DTL-38999 connectors; either plug or receptacle for retaining the termini during testing
- 7/ For each test in group C, the column for “Number of mated pair” first specifies the total number of connector mated pair tested followed by which of the two connector mated pair are used for that test.
- 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 selected from the group that underwent inspections for un-terminated termini, shall be used.
Cable pullout. 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 must be tested (see note 4/). The four termini pair in the one connector mated pair are to be monitored for optical signal discontinuity (and for change in optical transmittance). 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 on any terminus mated pair used in Group B. 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/ Terminus retention is specified for the MIL-PRF-29504/4 pin terminus as a Group B test to verify acceptable shoulder construction. Terminus engagement and separation force is performed for the counterpart MIL-PRF-29504/5 socket terminus in lieu of terminus retention.

- 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 or terminus retention.

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 VII for single fiber cables.

Group B sampling plan. A minimum of eight 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 or four consecutive group B inspections (as applicable), 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.

Table VII. Termini Group B sampling plan by TICC.

Terminus Style/Ferrule Material	Fiber Type/ Fiber Diameter 2/	TICC 1/	Group B Period 1	Group B Period 2	Group B Period 3	Group B Period 4	Fabrication Remarks
1, Ceramic	SM, 125 um	4207,4208,4209	4207	4209	4208	4207	3/
2, Ceramic	SM, 125 um	4217,4218,4219	4217	4219	4218	4217	3/
1, Ceramic	MM, 125/155 um	4210,4040,4211,4212	4210	4211	4040	4212	3/, 4/
2, Ceramic	MM, 125/155 um	4220,4221,4222,4223	4220	4222	4221	4223	3/, 4/
1, Ceramic	MM, 140/172 um	4043,4044,4087,4213	4043	4087	4044	4213	3/, 4/
2, Ceramic	MM, 140/172 um	4224,4225,4226,4227	4224	4226	4225	4227	3/, 4/
2, Metal	MM, 125/155/172	4231,4232,4233,4234	4231	4233	4232	4234	3/, 4/

1/ If not qualified for all TICCs in a particular row alternating inspections shall be performed for the qualified TICCs. (Ex: If qualified for 4207 and 4208, but not 4209, perform alternating inspections of 4207 and 4208, i.e., perform inspection on 4207 during Period 1 and during Period 3, perform inspection of 4208 during Period 2 and during Period 4).

2/ SM = single mode, MM = multimode.

3/ Test sample fabrication: see MIL-STD-1678-4 Requirement 4101 Appendix A.

4/ 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) 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-DTL-38999 shell size 13 connectors with a 4 cavity insert (i.e., four termini mated pair per each connector mated pair). Two connector mated pair shall be used for each row as listed in table VIII.

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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 TICC.

Terminus Style/Ferrule Material	Fiber Type/ Fiber Diameter 2/	TICC 1/	Sampling Plan (base on production volume)	Termini as a part of a Multiple Fiber Connector 3/	Fabrication Remarks
1, Ceramic	SM, 125 um	4207,4208,4209	Select highest volume SM from 5 year period; 4207, 4208, or 4209	Mated Pair 1 Mated Pair 2	4/
1, Ceramic	MM, 125/155 um	4210,4040,4211,4212	Select highest volume MM from 5 year period; 4210, 4040, 4211, or 4212	Mated Pair 1 Mated Pair 2	4/
1, Ceramic	MM, 140/172 um	4043,4044,4087,4213	Select highest volume MM from 5 year period; 4043, 4044, 4087, or 4213	Mated Pair 1 Mated Pair 2	4/, 5/
2, Ceramic	SM, 125 um	4217,4218,4219	Select highest volume SM from 5 year period; 4217, 4218, or 4219	Mated Pair 1 Mated Pair 2	4/
2, Ceramic	MM, 125/155 um	4220,4221,4222,4223	Select highest volume MM from 5 year period; 4220, 4221, 4222, or 4223	Mated Pair 1 Mated Pair 2	4/, 5/
2, Ceramic	MM, 140/172 um	4224,4225,4226,4227	Select highest volume MM from 5 year period; 4224, 4225, 4226, or 4227	Mated Pair 1 Mated Pair 2	4/, 5/
2, Metal	MM, 125/155/172 um	4231,4232,4233,4234	Select highest volume MM from 5 year period; 4231, 4232, 4233, or 4234	Mated Pair 1 Mated Pair 2	4/, 5/

1/ See cell under column for Sampling Plan for which TICC to perform the inspections. Select highest volume from 5 year period for each row of termini being offered.

2/ SM = single mode, MM = multimode.

3/ See table VI for tests to be performed for each mated pair.

4/ Test sample fabrication: see MIL-STD-1678-4 Requirement 4101 Appendix A with the exception noted under Group C for connector shell size.

5/ 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).

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PIN cross reference list. M29504/4 will no longer be built nor qualified. The preferred and non-preferred markings are shown in table IX, these termini are directly interchangeable. The M29504/04 will be used in place of M29504/4. M29504/4 and M29504/04 are structurally identical. The preferred part number is M29504/04.

TABLE IX. PIN cross reference.

Non-preferred PIN	Preferred PIN
M29504/4	M29504/04

Applied coupling torque. The applied coupling torque specified for a MIL-DTL-38999 connector is based on the connector insert cavities being populated with electrical contacts. The mating electrical contacts do not contain a spring force, whereas, mated MIL-PRF-29504/4 and /5 termini do have one. There is insufficient applied coupling torque to bottom the shells of the mating connector receptacle and connector plug due to this additional termini spring force. Without being completely bottomed, the ratchet mechanism on the plug connector coupling ring may not remain engaged. Mechanical disturbances (such as shock and vibration) cause coupling ring chattering between the connector receptacle and connector plug. Also, the termini springs tend to force the two shells apart. Mechanical disturbances along with the mated termini spring force may result in unthreading of the connector plug coupling ring. The corrective measure is to apply a greater torque on the connector coupling ring to account for the additional mated termini spring force as listed MIL-STD-1678-3 Measurement 3201 or Measurement 3202, as applicable.

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

MIL-PRF-29504/5	MIL-STD-1678-1	SAE-AS81969/14
MIL-DTL-38999	MIL-STD-1678-2	TIA455.4
MIL-DTL-38999/60	MIL-STD-1678-3	TIA-455-14
MIL-DTL-38999/61	MIL-STD-1678-4	TIA-455-16
MIL-DTL-901	SAE AIR 1351	TIA-455-71

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.

CONCLUDING MATERIAL

Custodians:

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

Preparing activity:
DLA - CC

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Navy - AS
Air Force - 13, 19, 93
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>