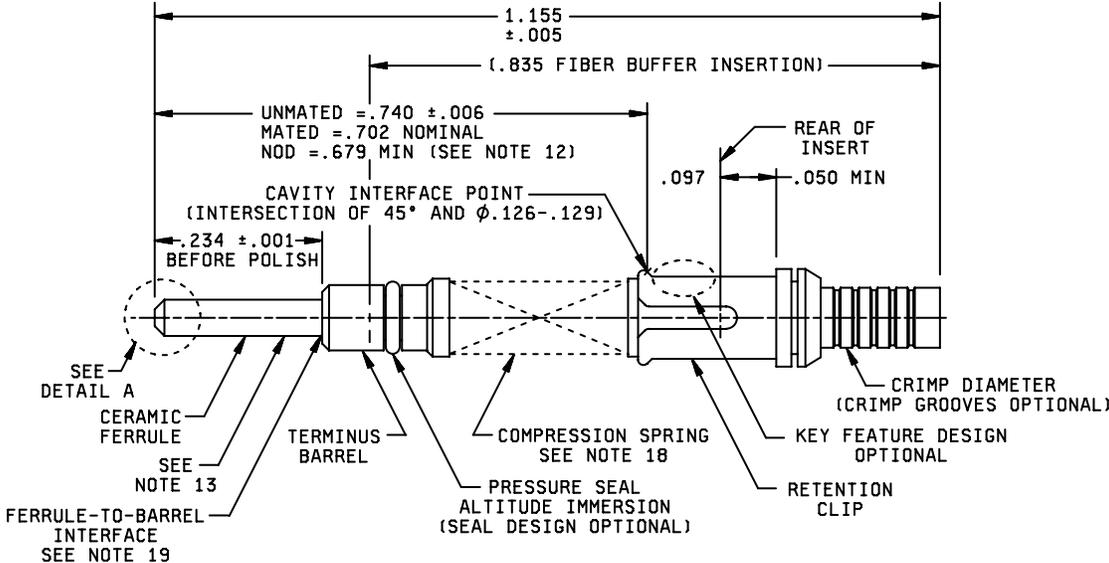


PERFORMANCE SPECIFICATION SHEET

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

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.



	Inches	mm
	.0006	.02
	.001	.03
	.006	.15
	.050	1.27
	.097	2.46
	.126	3.20
	.129	3.28
	.234	5.94
	.679	17.25
	.702	17.83
	.740	18.80
	.835	21.21
	1.155	29.34

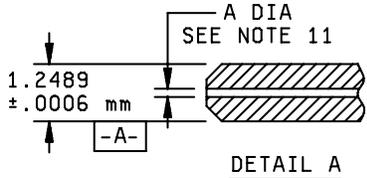


FIGURE 1. Keyed terminus.

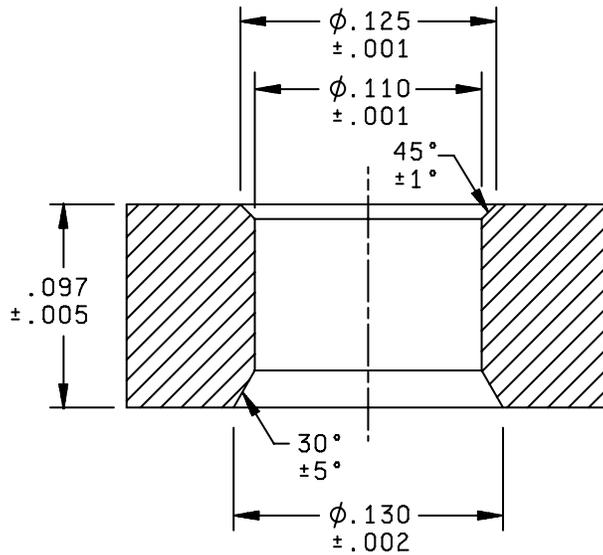
NOTES:

1. Dimensions are in inches except for diameter "A", circular runout 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 may be represented directly as an alpha-numeric or by the associated color bands. 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 or Identifying Number (PIN) marking on container or on a tag inside the container.
8. All terminus metal parts are to be corrosion resistant. Crimp sleeve is to be metal.
9. The dimension shown is effective prior to the application of the TICC marking.
10. Crimp grooves are permissible on the crimp diameter.
11. See table II for ferrule hole diameter. Ferrule hole circular runout 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. Ferrule outside diameter shall have a surface roughness of 0.2 micrometers.
14. Terminus end face shall exert a load of 4 ± 1 pounds when the terminus has been deflected to a dimension of .702 inches. 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 4 ± 1 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 .702 is specified only for use to measure the spring force for verification of compliance.
15. Alignment sleeve shall have an internal lead-in chamfer or radius in lieu of a sharp edge.
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 gage pin meeting the outside diameter (dimension CK), surface roughness and cylindricity requirements specified in figure 2.2.2 of TIA/EIA-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 with SAE in accordance with AIR 1351.

FIGURE 1. Terminus - Continued.

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.

FIGURE 1. Terminus - Continued.



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

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 $\pm 1^\circ$, unless otherwise noted.

FIGURE 2. Insert equivalent fixture for terminus measurement.

REQUIREMENTS:

Temperature ranges: Temperature range designations shall be in accordance with table I.

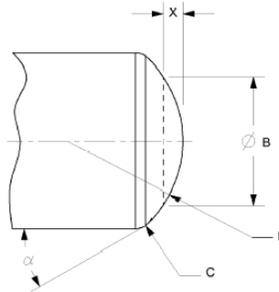
TABLE I. Temperature range designation.

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

Design and construction:

Dimensions and configuration: See figures 1, 2, 3, 4 and table II. For range 1, termini shall meet the requirements of this specification when terminated using the procedures specified in NAVSEA Drawing 8283460. For range 2, termini shall meet the requirements of this specification when terminated using the standard procedure specified in NAVSEA Drawing 8283460.

Ferrule end face geometry shall be domed and in accordance with figure 3 before polishing. Ferrule end face geometry shall be on an 8 +/- 0.2 degree angle and in accordance with figure 4 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. The radius of curvature shall be between 5 to 12 mm after polishing.



Dimension	Minimum value (mm)	Maximum value (mm)	Notes
B	0.60	0.85	1
X	0.0041	0.0145	2
R	7	25	3
C	---	---	4
a	32.5	37.5	Degrees

FIGURE 3. Ferrule end face geometry before polish.

NOTES:

1. B is the diameter of a circle on the surface of the ferrule that is concentric with the axis of the ferrule.
2. x is the distance that the apex of the end of the ferrule extends beyond the circle described in note 1.
3. The values of R are reference values for a pre-polished ferrule. The values are the radii of the end of the ferrule when the surface of the ferrule is spherical and "B" is as given: R_{min} radius when $X = X_{max}$; R_{max} radius when $X = X_{min}$.
4. Break corner or edge "C".

FIGURE 3. Ferrule end face geometry before polish - Continued.

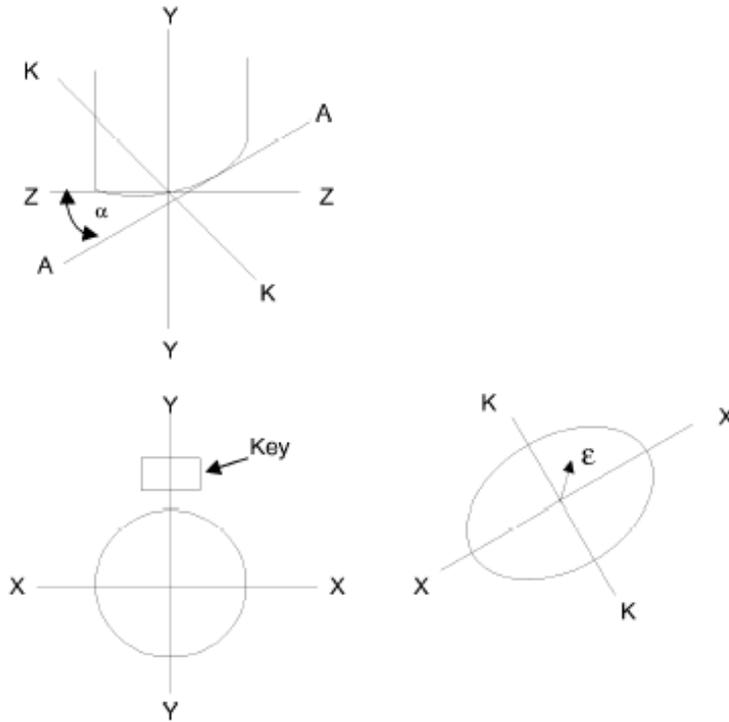


FIGURE 4. Ferrule end face geometry after polishing.

NOTES:

1. Contact angle a , an angle of 8 degrees, is the angle that the plane of contact makes to a plane perpendicular to the axis of the ferrule. The plane of contact is defined as plane A-A.
2. Plane Y-Y contains the centerline of the ferrule, and passes through the center of the key.
3. Plane X-X contains the centerline of the ferrule, and is perpendicular to plane Y-Y.
4. Plane Z-Z is perpendicular to planes X-X and Y-Y and contains the point at which the centerline of the ferrule intersects the end of the ferrule.
5. Plane A-A is inclined at an angle a to plane Z-Z, is perpendicular to plane X-X, and is tangent to the end of the ferrule.
6. Plane K-K is perpendicular to planes A-A and X-X and contains the point at which the centerline of the ferrule intersects the end of the ferrule.
7. Ferrule apex is the point of tangency between planes A-A and the end of the ferrule.
8. "e" is the distance on plane A-A between the apex, and the projection on plane A-A, of the point at which the centerline of the ferrule intersects the end of the ferrule. The true position for the apex is at the center of the ferrule as projected on the plane of contact (for condition $e = 0$).

FIGURE 4. Ferrule end face geometry after polishing - Continued.

Weight: 1.0 gram maximum.

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

Material:

Ferrule: Ferrule materials shall have similar performance to zirconia. Termini shall meet all of the requirements of this specification when mated to qualified termini utilizing a qualified MIL-PRF-64266/9 alignment sleeve retainer (ASR) 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.

Tools: See table III.

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 $.0945 \pm .001$ inch (2.400 mm \pm .025 mm) across and .260 inch (6.6 mm) maximum long or as approved by the qualifying activity. Crimp sleeve is to be supplied with termini when 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.

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.

Environmental/mechanical:

Termini shall be tested to the following MIL-PRF-64266 environmental and mechanical requirements. Change in optical transmittance and optical discontinuity requirements shall be as specified in MIL-PRF-64266.

- Twist (range 2 only)
- Impact
- Vibration
- Shock
- Thermal shock
- Temperature/humidity cycling (range 1 only)
- Temperature life
- Flammability
- Altitude immersion
- Ozone exposure
- Salt spray (range 2 only)
- Fluid immersion (range 2 only)

For range 2, an insertion loss verification and return loss (single mode only) is to be done after the completion of the mechanical test sequence and the environmental test sequence.

Fiber pull out force: Applicable

Cable pull out force: Applicable.

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

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:

Temperature range 1: Single mode test specimens shall be constructed using a 9/125 micron single mode optical fiber within a single fiber cable with an outer diameter not greater than 2.4 mm. Multimode test specimens shall be constructed using a 62.5/125 micron multimode optical fiber within a single fiber cable with an outer diameter not greater than 2.4 mm. Other construction shall be in accordance with NAVSEA Drawing 8283460.

Temperature range 2: Test samples shall be constructed and fiber sizes used as specified in NAVSEA Drawing 8283460.

Qualification:

Temperature range 1: Manufacturers shall perform all applicable tests on test samples as specified in MIL-PRF-29504, constructed as specified in NAVSEA Drawing 8283460, utilizing both single mode and multimode fibers (separate samples for each fiber type). All applicable tests for a full qualification inspection as specified in MIL-PRF-29504 shall be performed on test samples constructed utilizing single mode fiber. Test samples constructed utilizing multimode fiber shall be tested for size, insertion loss, and shock. Multimode test sample testing is to be performed using four mated connector pair for shell size 13 or two mated connector pair for shell sizes 15 and 23.

Temperature range 2: Manufacturers shall perform all applicable tests on test samples as specified in MIL-PRF-29504, constructed as specified in NAVSEA Drawing 8283460, utilizing both single mode and multimode fibers (separate samples for each fiber type). All applicable tests for a full qualification inspection as specified in MIL-PRF-29504 shall be performed on test samples constructed utilizing single mode fiber. Test samples constructed utilizing multimode fiber are to be tested for size, identification markings, workmanship, insertion loss, return loss, mating durability, return loss after mating durability, vibration, shock, thermal shock, temperature life, insertion loss verification, return loss after insertion loss verification. Multimode test sample testing is to be performed using four mated connector pair. Launch conditions for range 2 shall be as specified by NAVSEA Drawing 8283460.

Temperature range 2 after qualification of temperature range 1: Manufacturers who are qualified under this specification sheet for temperature range 1: -40 to +85°C, and whose termini pass the size, identification marking, workmanship, circular runout, insertion loss, return loss, twist, vibration, shock, thermal shock, temperature life, salt spray and fluid immersion inspections for temperature range 2: -55 to +165°C, are qualified for temperature range 2. Testing must be performed on both single mode and on multimode test samples for respective qualification by similarity for temperature range 2 single mode and multimode sizes. Additional constraints for qualification by similarity for temperature range 2 are listed for fiber size in addition to fiber type (single mode and multimode).

- a. Qualification of termini with different ferrule hole diameters and with single mode fiber sizes:
 - (1) Qualification inspection shall be performed on termini with a ferrule hole diameter of 126 microns when termini with both 125 (or 125.5) and the 126 micron ferrule hole diameters are offered. Manufacturers who qualify under this specification sheet for the 126 micron ferrule hole diameter are qualified under this specification sheet for the 125 or 125.5 micron ferrule diameter.
 - (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 126 micron) and the smaller size termini is a change in the terminus ferrule hole diameter and TICC markings.

- (3) Qualification inspection performed on the 5.8/125 micron fiber size. Qualification by similarity is then given for termini with the other single mode fiber sizes. For qualification with this fiber size, the terminus with the best fit ferrule hole diameter may be used. Qualification by similarity is given to other ferrule hole diameters for the single mode termini.

b. Qualification of termini for multimode fiber sizes.

- (1) Complete qualification inspection shall be performed on termini with optical fiber having a cladding diameter of 125 microns. Termini shall have a ferrule hole diameter of 126 +1, -0 microns. Manufacturers who qualify under this specification sheet for the terminus with the 126 +1, -0 micron ferrule hole diameter are qualified under this specification sheet for the other 125 cladding hole diameters for use with multimode fiber sizes.
- (2) Multiple fiber sizes, same ferrule hole diameter. Manufacturers who qualify under this specification sheet for termini with the 50/125 micron fiber size are qualified under this specification sheet for the 62.5/125 micron fiber size. Qualification inspection shall be performed on termini with a ferrule hole diameter of 126 +1/-0 microns.
- (3) 100/140 fiber size. Manufacturers who qualify under this specification sheet for the termini with the multimode, 50/125 or 62.5/125 micron fiber size and pass the size, insertion loss, vibration and shock inspections are qualified under this specification sheet for the 100/140 micron fiber size. Qualification inspection for the 100/140 micron fiber size shall be performed on termini with a ferrule hole diameter of 173 +3, -0 microns to cover the case for terminations of termini onto polyimide coated fiber. Manufacturers who qualify under this specification sheet for the terminus with the 173 +3/-0 micron ferrule hole diameter are qualified under this specification sheet for the other 100/140 hole diameters for use with multimode fiber sizes (both non-polyimide and polyimide).

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 and 6.6 of MIL-PRF-29504.

<u>M29504/20</u>	<u>-XXXX</u>	<u>X</u>
Basic specification and specification sheet	TICC Code (see table II)	Crimp sleeve (optional)

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)	TICC <u>1</u> / for temperature range 1	TICC <u>1</u> / for temperature range 2
Single mode < 9/125	125.0	+1/-0	0.75 <u>2</u> /	NA <u>3</u> /	404
Single mode < 9/125	125.5	+1/-0	0.75 <u>2</u> /	NA	405
Single mode < 9/125	126.0	+1/-0	0.75 <u>2</u> /	NA	406
Single mode 9/125	125.0	+1/-0	0.75 <u>2</u> /	301	401
Single mode 9/125	125.5	+1/-0	0.75 <u>2</u> /	302	402
Single mode 9/125	126.0	+1/-0	0.75 <u>2</u> /	303	403
50/125, 62.5/125	126.0	+1/-0	0.75 <u>2</u> /	326	426
50/125, 62.5/125	127.0	+1/-0	0.75 <u>2</u> /	327	427
100/140	142.0	+1/-0	0.75 <u>2</u> /	NA	442
100/140	145.0	+1/-0	0.75 <u>2</u> /	NA	445
62.5/125/155	156	+3/-0	3	NA	456
62.5/125/155	157	+3/-0	3	NA	457
100/140/172	173	+3/-0	3	NA	473
100/140/172	175	+3/-0	4	NA	475

1/ The first position in the TICC shall consist of the temperature range number. The next two positions indicate the ferrule hole diameter (last two digits of diameter for multimode sizes, consecutive values for single mode sizes).

2/ Circular runout of 0.5 micron preferred as it becomes more standard in industry.

3/ NA = Not Applicable for this temperature range.

TABLE III. Tools.

Tool	Part number
Insertion tool	See appendix A of NAVSEA Drawing 8283460
Removal tool	See appendix A of NAVSEA Drawing 8283460
Polishing tool	See appendix A of NAVSEA Drawing 8283460

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

MIL-PRF-24792
MIL-PRF-64266
MIL-PRF-64266/9
TIA/EIA-455-158
TIA/EIA-604-10
NAVSEA Drawing 8283460
SAE AIR 1351

Custodians:

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

Preparing activity:

DLA - CC

Project (6060-2006-001)

Review activities:

Navy - AS
Air Force - 13, 19, 93, 99
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 <http://assist.daps.dla.mil>.