

METRIC

MIL-PRF-49291/7D

03 July 2018

SUPERSEDING

MIL-PRF-49291/7C

10 January 2003

PERFORMANCE SPECIFICATION SHEET

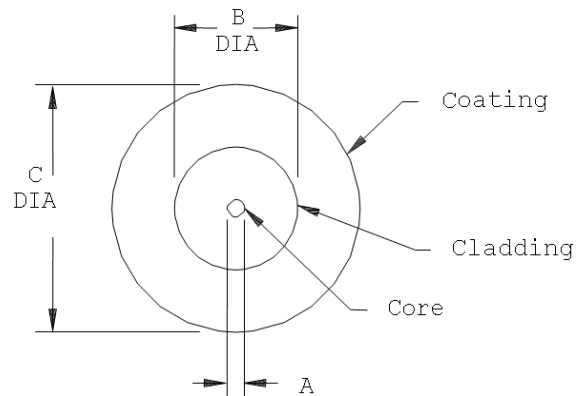
FIBER, OPTICAL, TYPE II, CLASS 5, SIZE II, COMPOSITION A, WAVELENGTH D,
RADIATION RESISTANT

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-49291.

DIMENSIONS AND CONFIGURATION REQUIREMENTS:

Diameter: See [figures 1](#) and [2](#).



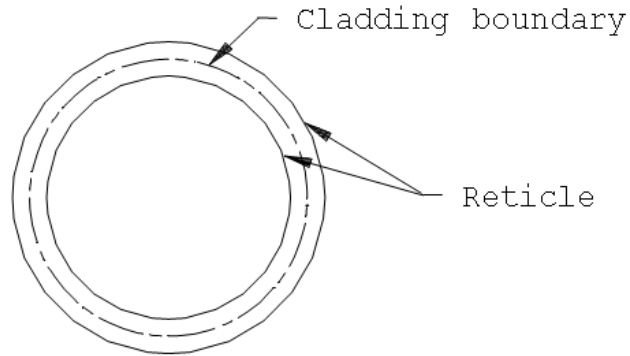
PIN	Dimensions		
	A (μm)	B (μm)	C (μm)
M49291/7-01	1/	125±1	250±15
M49291/7-01A			
M49291/7-02	1/	125±1	500±25
M49291/7-02A			
M49291/7-02BF 2/			
NOTES:			
1/ Core diameter is not a specified attribute. Refer to the mode field diameter specifications.			
2/ Intended for use in blown fiber applications with MIL-PRF-85045 tube cable.			

FIGURE 1. Dimensions and configuration of optical fiber construction.

AMSC N/A

FSC 6010

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.



Circle (solid)	Diameter (μm)
Inner	124.0
Second	126.0

FIGURE 2. Tolerance fields.**Ovality:**

Core: Not applicable.

Cladding: ≤ 2 percent.**Offset:**Core-to-cladding: ≤ 1 micrometer (μm).Fiber-to-coating: Coating-cladding concentricity error $\leq 10.5 \mu\text{m}$.Overall coating concentricity ratio (OCCR) ≥ 0.70 for 250- μm diameter coatings and ≥ 0.84 for 500- μm diameter coatings.Mode field diameter: Nominal range 8.5 to 10.0 μm ; maximum tolerance of each individual production unit $\pm 0.7 \mu\text{m}$.

Splices: Not allowed.

Tensile strength (proof test): 690 megapascals (MPa).

Fiber mass/unit length: 0.1 kilogram/kilometer (kg/km) maximum.

0.23 kg/km maximum for M49291/7-02BF.

Change in optical transmittance: Measurements to be made at 1310 ± 20 nanometers (nm).Maximum attenuation rate: 0.4 decibel/kilometer (dB/km) at 1310 ± 20 nm.0.3 dB/km at 1550 ± 20 nm.

Numerical aperture: Not applicable.

Bandwidth: Not applicable.

Chromatic dispersion: ≤ 3.2 picoseconds/(nanometer-kilometer) [ps/(nm-km)] at 1310 $\pm$ 20 nm.

≤ 22 ps/(nm-km) at 1550 $\pm$ 20 nm.

Transient attenuation: Not applicable.

Macrobend attenuation: Performed at 1310 $\pm$ 20 nm.

ENVIRONMENTAL REQUIREMENTS:

Temperature range: See [table I](#).

TABLE I. Temperature range.

PIN	Operating (°C)	Nonoperating (°C)	Storage (°C)
M49291/7-01 M49291/7-02	-46 to +85	-55 to +85	-55 to +85
M49291/7-01A M49291/7-02A	-46 to +85	-55 to +85	-55 to +85
M49291/7-02BF	-28 to +85	-55 to +85	-55 to +85

Fluid immersion aging: Not applicable.

Dynamic tensile strength: Applicable.

Fungus: Applicable.

Storage temperature: Applicable.

Nuclear radiation resistance: Nuclear radiation resistance requirements and test conditions shall be as shown below in [tables II](#) through [VI](#):

TABLE II. Nuclear radiation requirement applicability.

PIN	Steady state gamma	Prompt gamma	Neutron
M49291/7-01 M49291/7-02 M49291/7-02BF	Applicable	Not applicable	Not applicable
M49291/7-01A M49291/7-02A	Applicable	Applicable	Applicable

TABLE III. Steady state gamma radiation test conditions.

PIN	Test temperature (°C)	Dose rate (rad (Si)/second)	Total dose
M49291/7-01 M49291/7-02 M49291/7-02BF	-28±2 25±2 85±2	50+0, -20	Classified ^{1/}
M49291/7-01A M49291/7-02A	-46±2 25±2 75±2	3000+0, -20	3000 rad (Si)
NOTE: ^{1/} Some nuclear radiation resistance characteristics of this optical fiber are classified. Applications to receive these requirements can be made through the Department of the Navy, Naval Surface Warfare Center, Dahlgren Division, ATTN: Code A31, 17320 Dahlgren Road, Dahlgren, VA 22448-5100. Information concerning security clearance classification and “need to know” shall be detailed in the request.			

TABLE IV. Prompt gamma radiation test conditions.

Parameter	Value
Test temperature (°C)	-46±2 25±2 71±2
Total dose (rad [Si])	≥ 450
Pulse duration (nanosecond [ns])	≤ 100
Dose rate (rad ([Si]/second)	1.4 x 10 ¹⁰ nominal
Dose deposition profile	variance ≤ 20 %
Energy spectrum	simulate hard x-ray with end point energy ≥ 2 mega electron-volt (MeV)

TABLE V. Neutron radiation test conditions.

Parameter	Value
Test temperature (°C)	-46±2 25±2 71±2
Nominal fluence	1.0 x 10 ¹² neutrons/square centimeter (cm ²)
Pulse duration (millisecond [ms])	≤ 1
Equivalent energy	1.0 MeV equivalent damage in silicon (Si)
Dose deposition profile	variance ≤ 10 %
Gamma radiation total dose	Minimized to the maximum extent practicable

TABLE VI. Radiation test requirements.

PIN	Maximum induced attenuation (dB/km)	Attenuation at specified recovery time (dB/km)	Specified recovery time (seconds)
M49291/7-01 M49291/7-02 M49291/7-02BF	≤ 50 ^{1/}	≤ 15 at -28 °C ≤ 5 at 25 °C ≤ 5 at 85 °C ^{1/}	1,000
M49291/7-01A M49291/7-02A	None	≤ 2.0 at -46 °C ≤ 1.5 at 25 °C ≤ 1.0 at 71 °C ^{1/}	^{2/}
NOTES: ^{1/} The radiation induced loss for a given threat. The total dose associated with the threat is classified and not necessarily equal to the test total dose. ^{2/} There is no specified maximum recovery time. However, the time taken to recover within the specified maximum attenuation shall be recorded.			

Light launch conditions: In accordance with TIA-455-78.

Wavelength: 1310±25 nm.

Source type: Laser diode with full width at half maximum (FWHM) spectral width ≤ 10 nm.

CONFORMANCE:

Qualification: Qualification shall consist of the testing specified in [table VII](#).

TABLE VII. Qualification inspection.

Test	Initial qualification
<i>Group I (three spools – 2 km each) ^{1/}</i>	
Visual and mechanical	X
Optical Time Domain Reflectometer (OTDR) tests:	
Fiber length	X
Attenuation uniformity	X
Parameter tests:	
Attenuation rate	X
Cutoff wavelength (SM only)	
Mode field diameter (SM only)	
Macrobend attenuation	X
Chromatic dispersion	X
Mass/unit length	X
Geometry tests:	
End view:	
Cladding diameter	X
Cladding ovality	X

TABLE VII. Qualification inspection - Continued.

Test	Initial qualification
Core-to-cladding offset	X
Side view ^{2/} :	
Coating diameter	X
Coating-cladding concentricity error	X
Overall coating concentricity ratio	X
<i>Group II (samples off three spools) ^{1/}</i>	
Tensile proof	X
Mechanical strippability	X
Dynamic tensile strength	X
<i>Group III (same three spools – 2 km each) ^{1/, 3/, 4/, 5/}</i>	
Thermal shock ^{6/}	X
Storage temperature ^{7/}	X
Temperature humidity cycling ^{7/}	X
Temperature cycling ^{7/}	X
Temperature life (life aging) ^{6/, 8/}	X
Mechanical strippability (post temperature life)	X
<i>Group IV</i>	
Nuclear radiation resistance ^{7/}	X
Fungus resistance	X
NOTE: SM = Single-mode FOOTNOTES: ^{1/} See table I in MIL-PRF-49291 for specimen lengths. ^{2/} End view measurement acceptable for M49291/7-02BF. ^{3/} OOT = Change in optical transmittance. Perform in accordance with TIA-455-20 for transmitted power adhering strictly to the setup and test procedure specified in Measurement 2102 of MIL-STD-1678-2. ^{4/} Sample lengths: Recommend to prepare before group 1. For mechanical strippability, place in pans and remove from chamber after specified environmental test. Mechanical strippability: each spool, 2 samples, 91.4 cm (3 ft) long. Mechanical strippability - post temp/humidity: each spool, 2 samples, 91.4 cm (3 ft) long. Mechanical strippability - post life aging: each spool, 2 samples, 91.4 cm (3 ft) long. Dynamic tensile strength: each spool, 30 samples, 198.1 cm (6.5 ft) long (no humidity). Nuclear radiation resistance: each spool, 1 sample, 200 meters (165.1 ft) long on spool. Fungus resistance: each spool, 1 sample, 30.5 cm (1 ft) long. ^{5/} Prepare in loose coils and place in pans. Recommend to terminate with single ferrule connectors (such as straight tip [ST] connectors) on the fiber ends (for attachment to test instrumentation optical ports – to obtain more stabilized measurements).	

TABLE VII. Qualification inspection - Continued.

^{6/}	Perform OOT after the test only.
^{7/}	Perform OOT both during and after the test.
^{8/}	Measurements requested daily for informational purposes.

In group A inspection testing, SM fiber attenuation may be measured using the backscattering method specified in Measurement 2106 of MIL-STD-1678-2.

In group C inspection testing, the mechanical strippability test may be omitted if the optical fiber coatings have not changed from when the mechanical strippability test was last performed and the manufacturer provides a certificate of compliance for mechanical strippability.

Part or identifying numbers (PIN) (see [figure 1](#) and [table VIII](#)):

M49291/7-01

M49291/7-01A

M49291/7-02

M49291/7-02A

M49291/7-02BF

TABLE VIII. Supersession data.

PIN	Superseding
M49291/7-01	M49291/01-007 ^{1/}
M49291/7-01A	None
M49291/7-02	None
M49291/7-02A	None
M49291/7-02BF	M49291/7-02 ^{2/}
NOTES: ^{1/} PIN is as shown in MIL-F-49291/7(NAVY). ^{2/} Intended for use in blown fiber applications with MIL-PRF-85045 tube cable.	

Qualification by similarity:

Manufacturers who are qualified under this specification sheet and whose optical fiber, with a change in the glass (composition, profile, etc.), passes the tests listed in [table IX](#) are qualified under this specification sheet for the optical fiber with changed glass.

TABLE IX. Qualification by similarity: change in glass.

Fiber length
Attenuation uniformity
Attenuation rate
Cutoff wavelength (SM only)
Mode field diameter (SM only)

TABLE IX. Qualification by similarity: change in glass – Continued.

Macrobend attenuation
Chromatic dispersion
Temperature cycling
Nuclear radiation resistance

Manufacturers who are qualified under this specification sheet and whose optical fiber, with a change in the coating (composition, thickness, etc.), passes the tests listed in [table X](#) are qualified under this specification sheet for the optical fiber with changed coating.

TABLE X. Qualification by similarity: change in coating.

Fiber length
Attenuation rate
Macrobend attenuation
Coating diameter
Overall coating concentricity ratio
Mechanical strippability
Dynamic tensile strength
Thermal shock
Storage temperature
Temperature humidity cycling
Temperature cycling
Temperature life (life aging)
Fungus resistance

Manufacturers who are qualified under this specification sheet and whose optical fiber, with a change in the buffer build-up from 250 μm to 500 μm , passes the tests listed in [table XI](#) are qualified under this specification sheet for the optical fiber with changed buffer build-up.

TABLE XI. Qualification by similarity: change in buffer build-up.

Attenuation rate
Mass/unit length
Coating diameter
Overall coating concentricity ratio
Mechanical strippability
Storage temperature
Temperature humidity cycling
Temperature cycling
Temperature life (life aging)
Fungus resistance

CHANGES FROM PREVIOUS ISSUE. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

CONCLUDING MATERIAL

Custodians:

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

Preparing activity:

Navy – SH
(Project 6010-2018-002)

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>.