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**PREPARED BY**

<table>
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<tr>
<th>G. Jacobs/UNISYS CORP.</th>
<th>G. Kiernan/UNISYS CORP.</th>
<th>J. Lawrence/GSFC</th>
<th>H. Chernikoff/GSFC</th>
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**DATE**

| 12/16/87 | 12/16/87 | 1/7/88   | 1/7/88   |

**TITLE**

Cable, Fiber Optic, Single Fiber, Multi-mode, Flexible Detail Specification for

**OFFICE OF FLIGHT ASSURANCE**

- **PARTS BRANCH**
3.4.3 Radiation - For a 10 meter length of cable, attenuation shall not increase by more than 1 dB at radiation total dose levels up to 10 kilorads (Si) at 50 rads/min dose rate, and for up to 1 Megarad (Si) at 500 rads/min dose rate attenuation shall not increase by more than 3 dB. Following radiation, cable attenuation shall return to the original values (anneal) within 0.5 dB, at 24 hours. Radiation tests and measurements shall be performed at 25°C ±5°C.

3.4.4 Temperature cycling - For a 10 meter length of cable, attenuation shall not increase by more than 1 dB.

3.4.5 Tensile load - Cable attenuation shall not increase by more than 0.5 dB for tensile load of 100 N (23 lbs load).

3.4.6 Impact resistance - Cable attenuation shall not increase by more than 0.5 dB.

3.4.7 Crush - Cable attenuation shall not increase by more than 0.5 dB.

3.4.8 Moisture resistance - Cable attenuation shall not increase by more than 0.5 dB.

3.4.9 Twist-bend - Cable attenuation shall not increase by more than 0.5 dB when subjected to the twist bend test.

3.4.10 Vibration - Cable attenuation shall not increase by more than 1.0 dB.

3.4.11 Shock - Cable attenuation shall not increase by more than 1.0 dB.
3.4.12 Numerical aperture (N.A.) - Cable (fiber) numerical aperture shall be as specified in Table 1.

3.4.13 Thermal stability - Cable attenuation change shall be less than ±3 dB for a 10 meter sample over the rated temperature range of -55°C to +85°C, using the 25°C light power measurement as the reference.

3.4.14 Operating life - Cable attenuation shall not increase by more than 3 dB at any interval of the life test.

3.4.15 Flammability - When tested as specified, the after-flame time shall be 10 seconds maximum and the after-flame travel shall be 1 cm maximum.

4.0 QUALITY ASSURANCE PROVISIONS
See GSFC specification S-311-339.

5.0 PREPARATION FOR DELIVERY
See GSFC specification S-311-339.

6.0 NOTES
See GSFC specification S-311-339.

6.1 Reference is made to GSFC specifications S-311-488 and S-311-488/1 for compatible types of connectors and DOD-C-85045 for fiber optic cables.

Custodian:
The Goddard Space Flight Center
Parts Branch, Code 311
Greenbelt, Maryland 20771
1.0 SCOPE

1.1 Purpose

This specification defines the requirements for fiber optic cables for use in space flight and critical ground support equipment applications. Cable types covered by this specification shall be flexible, single fiber, multimode with graded index profiles and loose inner jacket (buffer tube).

1.2 GSFC general specification

Unless otherwise specified in this detail specification, all cable provisions of GSFC specification S-311-339 apply to this specification.

1.3 Part number and ratings - The part number and cable ratings shall be as specified in Table 1.

Table 1. Description

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Rated Temperature Range (°C)</th>
<th>Index of Refraction Profile</th>
<th>Numerical Aperture (N.A.)</th>
<th>Bandwidth MHz-km (minimum)</th>
<th>Maximum Attenuation dB/km ( \lambda = 850 + 30 \text{ nm} )</th>
<th>Buffer Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-311-339/1-1</td>
<td>-55 to +85</td>
<td>graded</td>
<td>0.29 ± .02</td>
<td>100</td>
<td>10</td>
<td>loose</td>
</tr>
</tbody>
</table>
1.4 Dimensions and configuration - See Figure 1 for cable dimensional requirements and configuration.

![Diagram showing cable components: Outer Jacket, Inner Jacket, Fiber Cladding (Glass), Fiber Core (Glass), Strength Members (Teflon/Fiberglass), Fiber Coating.]

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Fiber Diameter (um)</th>
<th>Fiber Coating Diameter (maximum) (um)</th>
<th>Buffer Diameter inches and (mm)</th>
<th>Jacket Diameter inches and (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-311-339/1-1</td>
<td>100±4 140±6</td>
<td>500±50</td>
<td>0.029/0.059 ±0.003/±0.003 (0.9)/ (1.5)</td>
<td>0.10/0.12 +0.005/+0.002 (2.5)/ (3.0)</td>
</tr>
</tbody>
</table>

Figure 1. Configuration

2.0 APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on the date of invitation for bid or request for proposal, form a part of this specification to the extent specified herein. In case of conflicts, this detail specification shall have precedence.

GSFC
S-311-339 - Cables, Fiber Optic, Single Fiber, Flexible, General Specification for,
S-311-488 - Connectors, Fiber Optic, Single Fiber, General Specification for,
S-311-488/1 - Connectors, Fiber Optic, Single Fiber, Detail Specification for,

MILITARY
DOD-C-85045 - Cables, Fiber Optic, General Specification for,
3.0 REQUIREMENTS

3.1 Dimensions - Cable dimensions and design shall be as shown in Figure 1.

3.2 Materials - Materials shall be as listed below. No other materials (such as silicone lubricants) shall be used in processing. The cable outer jacket, strength members and inner jacket shall be mechanically removable (unbonded) from the fiber. The fiber coating shall be removable by chemical solvent(s).

- **Outer Jacket**: ethylene - tetrafluoroethylene (ETFE) polymer (Tefzel-200)
- **Strength members**: fiberglass - polytetrafluoroethylene braid (Fluorglass)
- **Inner Jacket**: polyester elastomer (Hytrel 5555HS)
- **Fiber coating**: acrylate polymer
- **Fiber core/cladding**: silica based glass doped with boron and germanium

3.3 Weight - Weight shall be a maximum of 10 grams (0.36 oz.) per meter.

3.4 Performance - Performance characteristics are specified in the following paragraphs. Unless otherwise specified herein all tests shall be performed as prescribed in GSFC specification S-311-339.

3.4.1 Attenuation - Cable attenuation shall be as specified in Table 1 and herein. Maximum attenuation for a 100 meter cable length shall be 1 dB.

3.4.2 Bandwidth - Cable bandwidth shall be as specified in Table 1 and herein. Bandwidth (BW) per kilometer length shall be calculated from the pulse rise time (tr) where \( BW \text{ (MHz-km)} = \frac{350}{tr \text{ (ns)}} \). Minimum bandwidth for a 100 meter cable length shall be 100 MHz and maximum measured rise time shall be 3.5 ns.