

COMMERCIAL ITEM DESCRIPTION

FUSION SPLICER AND CLEAVER, OPTICAL FIBER

The General Services Administration has authorized the use of this commercial item description for all federal agencies.

1. **SCOPE.** This commercial item description (CID) covers the general requirements for an optical fiber fusion splicer capable of performing splices with the following attributes: superior optical performance, high reliability, field-ready, and compatible with both loose tube and tight buffered multimode and single-mode optical fiber. This CID also covers the general requirements for an optical fiber cleaver with the following attributes: high precision cleaver, high reliability, field-ready, and compatible with both loose tube and tight buffered multimode and single-mode optical fiber. The optical fiber fusion splicer and optical fiber cleaver are intended for commercial/industrial applications.

2. CLASSIFICATION.

2.1 Fusion splicer equipment configurations. The splicer shall be of the following configurations, as specified in [Table I](#). The configuration should be specified in the contract or order (see 7.5).

TABLE I. Splicer configurations.

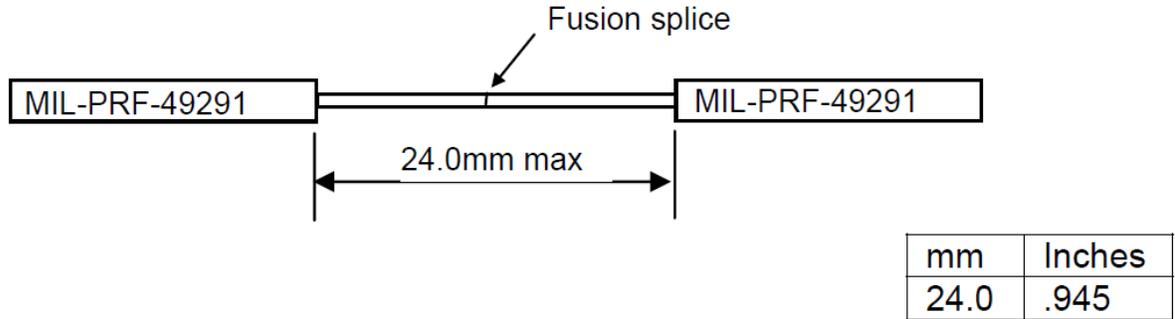
Configuration	Description
A	Fusion splicer, multi-axis/core alignment, high precision cleaver, fixed mount fiber clamps
B	Fusion splicer, multi-axis/core alignment, high precision cleaver, removable fiber holders and fixed mount fiber clamps
C	Fusion splicer, multi-axis/core alignment, high precision cleaver, removable fiber holders and fixed mount fiber clamps, electromagnetic compatibility (EMC) resistant

3. SALIENT CHARACTERISTICS.

3.1 Physical. The fusion splicing tools supplied to this CID and splices made with those tools shall have the following characteristics.

3.1.1 Splice dimensions. The fusion splicing tools shall be capable of completing a splice in accordance with MIL-PRF-24623/6 with an exposed glass length not to exceed 24.0 mm (see [Figure 1](#)).

Beneficial comments, recommendations, additions, deletions, clarifications, etc. and any data that may improve this document should be sent to: Commander, Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to CommandStandards@navy.mil, with the subject line "Document Comment". Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

FIGURE 1. Interface dimensions.

3.1.2 Equipment.

3.1.2.1 Dimensions. The self-contained multi-axis/core alignment splicing unit shall not exceed 4588.4 cubic cm (280 cubic inches).

3.1.2.2 Weight. The weight of the fusion splicer shall not exceed 3.5 kg (6.8 pounds) (including batteries).

3.1.3 Equipment construction.

3.1.3.1 Enclosure. The enclosure shall protect critical components from environment hazards and handling.

3.1.3.2 Workmanship. When visually inspected, the fusion splicer shall be uniform in quality.

3.1.4 Interchangeability. All fusion splicing tools and accessories of the same design (such as the same part number and configuration) shall be physically and functionally interchangeable without need for modification of such items or of the mating equipment. All cleaving tools of the same design (such as the same part number and configuration) shall be physically and functionally interchangeable without need for modification of such items or of the mating equipment.

3.1.5 Fiber holder/clamp mechanism. The removable fiber holders and the fixed mount fiber clamps shall be compatible with all required fibers (see 3.4).

3.1.5.1 Removable fiber holders. The removable fiber holder shall allow the operator to load the fiber into the holder while the holder is not in the splicer. This style holder allows the operator to remove the coating and complete a splice in accordance with MIL-PRF-24623/6.

3.1.5.2 Fixed mount fiber clamps. The fixed mount fiber clamp shall require the operator to load the fiber into the clamp while the clamp is fixed to the splicer. Additionally, the operator shall remove the coating and clean and cleave the fiber prior to inserting the fiber into the fixed mount fiber clamp for splicing. This style clamp allows the operator to complete a splice in accordance with MIL-PRF-24623/6.

3.2 Splice protection sleeve heater. The fusion splicer shall be equipped with a device capable of shrinking fiber protection sleeves that are in accordance with MIL-PRF-24623/6.

3.3 Splicer tensile test. Equipment shall be capable of applying 2.0 N (0.45 lbf) \pm 3 percent of load (23.7 kpsi on 125 μ m fiber) to completed bare fiber splice for no less than 1 second after splicing without relocating the splice.

3.4 Optical fiber compatibility. Fusion splicing tools shall be compatible with optical fiber that is in accordance with the following optical fiber dimensions:

- a. Coating diameter: 100 μ m to 1000 μ m (0.004 to 0.039 inches)
- b. Cladding diameter: 80 μ m to 150 μ m (0.003 to 0.006 inches)
- c. Core diameter: 5.8 μ m to 100 μ m (0.0002 to 0.004 inches)

3.5 Splice performance.

3.5.1 Splice loss performance. The equipment shall be capable of creating defect-free splices with insertion loss measurements that do not exceed the insertion loss requirements listed in [Table II](#) for the fibers indicated under laboratory conditions when tested in accordance with Measurement 2101 in MIL-STD-1678-3. For multimode splices, initial insertion loss shall be measured using both overfilled and restricted (70/70) launch conditions. For multimode splices, the insertion loss requirement is specified for and verified using a 62.5/125-micron fiber size.

TABLE II. Insertion loss.

	Homogeneous ^{1/}	Heterogeneous ^{2/}
M49291/7 SMF		
Typical	0.02 dB	0.05 dB
Mean	0.03 dB	0.08 dB
Max.	0.10 dB	0.15 dB
M49291/6 MMF		
Typical	0.01 dB	0.02 dB
Mean	0.03 dB	0.05 dB
Max.	0.05 dB	0.08 dB
<p>NOTES:</p> <p>^{1/} Homogeneous splices are defined as those between identical fibers (cut from the same reel) with the core eccentricity of <0.4 micron.</p> <p>^{2/} Heterogeneous splices are defined as those between fibers which are nominally the same type, but taken from random reels or sources with no control for fiber parameters within nominal manufacturing tolerances.</p>		

3.5.2 Return loss. When tested in accordance with Measurement 2105 in MIL-STD-1678-2, the minimum return loss for single-mode shall be 65 dB per splice.

3.5.3 Fiber splice dynamic strength. Independent of the capacity of the splicer for self-test, the splices without sleeve protection made with the equipment shall survive a tensile test in accordance with TIA-455-28 (2.5 percent strain rate, 0.5-m gage length) and meet the following requirement: minimum dynamic strength shall be >45 kpsi (310 MPa). Splices made using the equipment and containing sleeve protection shall meet the tensile strength requirements in MIL-PRF-24623/6.

3.6 Common characteristics.

3.6.1 Interface.

3.6.1.1 Equipment. Equipment shall have a monitor and control panel for input/output.

3.6.1.2 Display. The display shall have contrast/brightness adjustment and shall be visible in direct sunlight. Display and control unit design should permit the ability to be separated or arranged to reduce splicing system size within the specified working volume.

3.6.1.3 Controls. User controls shall be legible and interface shall be in simple everyday language.

3.6.2 Software functions.

3.6.2.1 Alignment. The equipment shall automatically align the optical fibers and perform the splice without the need for user intervention. The alignment accuracy shall be such that the splice meets the performance requirements of 3.5.

3.6.2.2 Self-test mode. The splicer shall have an automatic self-diagnostic test to confirm basic operational check.

3.6.2.3 Splice programs. The equipment shall have pre-set programs to splice MIL-PRF-49291 fiber types that are within the optical fiber compatibility requirements identified in 3.4, and the equipment shall control access to programs that create and make modifications/updates to the fusion splicing programs.

3.6.2.4 Pass/fail assessment. The splicer shall be capable of programming/storing optical loss criteria according to commercial and military standards as Pass/Fail test criteria for the estimated loss. Optical loss test criteria shall be editable as standards evolve. Pass/Fail indicators shall be provided.

3.6.2.5 Arc power compensation. The splicer shall automatically compensate arc power for environmental conditions, fiber type, or electrode wear with the user intervention being limited to loading prepared optical fibers, such as through arc melt-back method.

3.6.2.5.1 Electrode counter. Equipment using electrodes for generating the arc shall maintain a count of arc discharges with respect to the current set of electrodes for maintenance purposes.

3.6.2.6 Error detection. The equipment shall inspect the fibers/splice and halt the splicing process, without user intervention, if a condition has been detected, prior to the arc or after the arc, by the equipment that will not yield splice performance in accordance with 3.5. If the splice has already been completed and an error is detected, a clear message will be provided to the user that the splice does not meet the splice performance requirements of 3.5.

3.6.2.7 Insertion loss estimation due to splice. Equipment shall be capable of automatically estimating the quality of each fusion splice, reporting the estimate to the user, and warning the user of splices estimated to be defective. Loss estimation shall meet the following requirements:

a. Measured Loss ≤ 0.15 dB: 90 percent of all splices made, for loss range specified, shall have estimates that fall in a range within ± 0.03 dB of measured loss.

b. Measured Loss > 0.15 dB: 90 percent of all splices made, for loss range specified, shall have estimates that fall in a range within ± 25 percent of measured loss.

3.6.2.8 Power conservation. The equipment shall have automatic power conservation features that are activated after a period of inactivity with the equipment. The period of time shall be user configurable.

3.6.2.9 Power level indicator. The equipment shall provide the user with information regarding the remaining power level in the battery.

3.7 Power.

3.7.1 Alternating current (AC) operation. AC operation shall operate over a voltage range of 100 to 240 V (50/60 Hz). Equipment shall be operable from both grounded and ungrounded power supplies.

3.7.2 Direct current (DC) battery. Rechargeable batteries shall afford portable operation of the assembled unit (splicer and battery). Size and weight of the assembled unit shall be in accordance with 3.1.2.1 and 3.1.2.2. Rechargeable batteries shall be provided for portable operation. Batteries shall either permit attachment to or be contained within the splicer shell and meet the size and weight requirements specified herein. The rechargeable battery provided shall be capable of performing the number of splices identified in 3.7.2.1, including heat cycle, following a maximum recharge time of 4 hours. A battery option should be available that allows the use of commercial-off-the-shelf (COTS) batteries.

3.7.2.1 Battery lifetime requirements. Equipment shall meet the following minimum operations under the conditions specified:

- a. Battery lifetime with heat shrink protector at 0 °C (50 splices)
- b. Battery lifetime with heat shrink protector at 22.5 °C (80 splices)

3.7.3 Lithium batteries. In accordance with MIL-PRF-28800, lithium batteries are prohibited without prior authorization. Approval for the use of lithium batteries, including those encapsulated in integrated circuits, is required. Reporting and design requirements for lithium cells and batteries shall conform to MIL-STD-1678-6, Requirement 6404.

3.8 Environmental and mechanical performance.

3.8.1 Altitude. The splicer shall be capable of performing splices in accordance with 3.5 on 125-micron fibers at the following altitude extremes: 0 to 4000 m.

3.8.2 Storage condition. The splicer shall be capable of performing splices in accordance with 3.5 after the following environmental exposures:

- a. -40 °C for 24 hours, uncontrolled humidity
- b. 71 °C for 24 hours, 95 percent RH

3.8.3 Vibration. The splicer shall meet Requirement R4-107 from Telcordia GR-765 and perform splices in accordance with 3.5 after the test.

3.8.4 Shock. The splicer shall meet Requirement R4-105 from Telcordia GR-765 and perform splices in accordance with 3.5 after the test.

3.8.5 Operating condition. The splicer shall be capable of performing splices in accordance with 3.5 during the following environmental exposures:

- a. -10 °C, uncontrolled humidity
- b. 55 °C, uncontrolled humidity
- c. 38 °C, 75 percent RH

3.8.6 Operating orientation. The splicer shall be capable of performing splices in accordance with 3.5 in physical orientations ranging from -45 degrees minimum to +45 degrees minimum of a vertical orientation.

3.8.7 Electromagnetic compatibility (EMC). When specified, the equipment shall be verified to meet EMC requirements of MIL-PRF-28800, without the electrostatic discharge immunity requirement.

3.9 Operation.

3.9.1 Setup time. The equipment setup time shall not exceed 15 minutes.

Note: Equipment setup time includes all necessary actions prior to performing first permanent splice.

3.9.2 Splice time. A newly certified operator shall be able to complete and protect a splice that meets all of the performance requirements outlined herein within a 15-minute timeframe adaptable to the fibers and cables specified in this document.

3.9.3 Splicer time. The fusion splicer shall be capable of performing pre-screening, alignment, arcing, and post-screening (including estimation) in less than 20 seconds.

3.9.4 Heater time. The fusion splicer shall be capable of shrinking fiber protection sleeves that are in accordance with MIL-PRF-24623/6 in less than 50 seconds.

3.9.5 Working volume. The splicing system shall be optimized for use in difficult-to-reach locations, in confined workspaces or openings, and where visibility is limited. Working volume shall be 8603.2 cubic cm (525 cubic inches) max.

Note: A working volume of less than 7226.7 cubic cm (441 cubic inches) is desired.

3.9.6 Cable preparation length. Equipment shall not require more than 114.3 mm (4.5 inches) of cable jacket to be removed from either of the cables being spliced.

3.10 Safety.

3.10.1 Protective cover. The splicer shall have an interlocked protective cover that shall not allow arcing to occur when the protective cover is in the open position.

3.10.2 Low voltage safety. The equipment shall comply with the safety requirements of IEC 61010-1.

3.11 Maintainability.

3.11.1 Cleaning. Cleaning operations shall not degrade the performance of the fusion splicer. Optical lenses and mechanical hardware shall be accessible to facilitate cleaning. Disassembly of the splicer shall not be required for cleaning. Special cleaning tools or chemicals shall not be required.

3.11.2 Field maintenance. The fusion splicer shall not require special tooling for field maintenance operations.

3.11.3 Replacement parts.

3.11.3.1 Electrodes. Electrodes shall be easily replaceable using standard tools.

3.11.3.2 Electrode life. Electrodes shall have a service life of at least 1000 splices and shall not require maintenance or cleaning during that time.

3.11.3.3 Cleaver life. The cleaver shall have a service life of at least 1000 cleaves per blade position and shall not require maintenance during that time.

3.11.3.4 Service interval. The service interval shall be 12 months minimum. At the end of this interval, the equipment shall be within splice loss performance (see 3.5.1) and insertion loss estimation (see 3.6.2.7) requirements specified herein. Confirmation of compliance with these requirements shall be as specified in the contract or order (see 7.5).

3.11.3.5 Service life. The service life shall be no less than 10 years based on part availability, and replacement parts shall be available for no less than 7 years.

3.12 Cleaver.

3.12.1 High precision cleaver. A high precision cleaver shall be provided with the splicing equipment and it shall be of the same type used to perform the splice in accordance with 3.5.

3.12.2 Cleave angle. The cleaver shall meet the requirements of Cleave Angle Distribution and Cleave Angle Maximum in accordance with Telcordia GR-264.

3.13 Accessories.

3.13.1 Transit case. A protective hard carrying case shall be provided for transporting the equipment. The case shall be capable of accommodating the equipment, accessories, consumables, electrodes, and the operation manual.

3.13.2 Technical manual. A use and installation manual (operator's manual) shall be provided with each piece of equipment. A maintenance and servicing manual shall be provided with all appropriate levels of maintenance: unit operational verification, module level (cleaver blade), and component level (electrode). Manuals shall be provided in both printed and electronic formats. A statement of copyright release for reproduction of the technical manual for government use shall be provided.

3.14 Materials.

3.14.1 Nonmetallic materials. Nonmetallic materials shall not be affected by the use of alcohol-based cleaning solutions.

3.14.2 Toxic and hazardous products and formulations. The materials used shall have no adverse effect on the health of personnel when used for the intended purpose.

3.14.3 Radioactive materials. Radioactive materials shall not be used.

3.15 Marking. Fusing splicing tools supplied to this CID shall be marked with the manufacturer’s standard commercial part or identification number (PIN) and serial number. Markings shall be legible and permanent.

Note: The part number marked on the unit pack shall be the CID PIN.

4. REGULATORY REQUIREMENTS. The offeror/contractor is encouraged to use recovered materials to the maximum extent practicable, in accordance with paragraph 23.403 of the Federal Acquisition Regulation (FAR).

5. PRODUCT CONFORMANCE PROVISIONS.

5.1 Product conformance. The products provided shall meet the salient characteristics of this Commercial Item Description, conform to the producer’s own drawings, specifications, standards, and quality assurance practices, and be the same product offered for sale in the commercial marketplace. The government reserves the right to require proof of such conformance.

5.2 Market acceptability. The item offered must have been sold to the government or commercial market for a minimum of 6 months.

5.3 Certificate of compliance. A certificate of compliance shall accompany all splicers supplied to this CID.

6. PACKAGING. Preservation, packing, and marking shall be as specified in the contract or order (see 7.5).

7. NOTES.

7.1 Part or identification number (PIN). The following part or identification numbering procedure is for government purposes and does not constitute a requirement for the contractor.

<u>AA59799</u>	-	<u>X</u>
CID number		Splicer configuration (see Table I)

7.2 Environmentally preferable materials. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. [Table III](#) lists the Environmental Protection Agency’s (EPA’s) top 17 hazardous materials targeted for major usage reduction. Use of these materials should be minimized or eliminated unless needed to meet the requirements specified herein.

TABLE III. EPA top 17 hazardous materials.

Benzene	Dichloromethane	Tetrachloroethylene
Cadmium and Compounds	Lead and Compounds	Toluene
Carbon Tetrachloride	Mercury and Compounds	1,1,1 - Trichoroethane
Chloroform	Methyl Ethyl Ketone	Trichloroethylene
Chromium and Compounds	Methyl Isobutyl Ketone	Xylenes
Cyanide and Compounds	Nickel and Compounds	

7.3 Abbreviations. Definitions of abbreviations used in this CID are listed in [Table IV](#).

TABLE IV. Abbreviations.

Abbreviation	Definition
µm	micrometer
°C	degrees Celsius
cm	centimeter
dB	decibel
Hz	hertz
kg	kilogram
kpsi	kilopound per square inch
lbf	pound force
m	meter
mm	millimeter
MMF	multimode fiber
MPa	Megapascal
N	newton
RH	relative humidity
SMF	single mode fiber
V	volt

7.4 Source of documents.

7.4.1 Defense specifications and standards. Defense specifications and standards are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094 or online at <http://quicksearch.dla.mil>.

7.4.2 FAR. The FAR may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 or online at <https://www.acquisition.gov/far>.

7.4.3 International Electrotechnical Commission (IEC). IEC standards are available from the ANSI Attn: Customer Service Department, 25 W 43rd Street, 4th Floor, New York, NY 10036 or online at <http://webstore.ansi.org/>.

7.4.4 Telcordia. Telcordia Technologies standards are available from Customer Service Center, Ericsson Inc., One Ericsson Drive, P106.03.S484.050, Piscataway, NJ 08854-4156 or online at <http://telecom-info.telcordia.com/site-cgi/ido/index.html>.

7.4.5 Telecommunications Industry Association (TIA). TIA standards are available from the Telecommunications Industry Association, 2500 Wilson Blvd., Suite 300, Arlington, VA 22201-3834 or online at www.tiaonline.org.

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

7.5 Ordering data. The contract or order should specify the following:

- a. CID document number, revision, and CID PIN.
- b. Configuration required (see 2.1).
- c. Confirmation of compliance with 3.5.1 and 3.6.2.7 (see 3.11.3.4).
- d. Product conformance provisions (see section 5).
- e. Packaging requirements (see section 6).
- f. Quantity and type of fusion splicing tools required.

7.6 Storage. Fusion splicing tools' performance may be impacted upon extended exposure to dirty environments. Storage of fusion splicing tools in the storage case provided is recommended.

7.7 Commercial products. As part of the market analysis and research effort, this CID was coordinated with manufacturers of commercial products. For a list of manufacturers known to meet the requirements of this CID, see the Navy Recommended Fiber Optic Components Parts List website at <http://www.navsea.navy.mil/Home/WarfareCenters/NSWCDahlgren/WhatWeDo/NavyShipboardFiberOptics/RecommendedPartsList.aspx>.

Note: This information should not be considered as a list of approved manufacturers or be used to restrict procurement to only those manufacturers.

7.8 Government users. To acquire information on obtaining these fusion splicers from the Government inventory system, contact Defense Supply Center, Columbus, ATTN: DSCC-FMXB, P.O. Box 3990, Columbus, OH 43218-3990, or telephone 614.692.1636.

MILITARY INTERESTS

Custodians:

Army – CR
Navy – SH
Air Force – 85

Preparing Activity:

Navy – SH
(Project 6099-2016-001)

Review Activities:

Air Force – 13, 19, 93, 99

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>.