



METRIC AEROSPACE STANDARD

MA5405™

REV. B

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Stabilized 2018-03

Superseding MA5405A

Splices, Fiber Optics, For Aerospace Inter-Connection Systems

RATIONALE

This standard has not been revised for many years and is due to be replaced by AS5405. It has been agreed in committee that it should be stabilized.

STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE AS-3 Fiber Optics and Applied Photonics Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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1. SCOPE

1.1 Purpose

This specification covers design and performance requirements of fiber optic splices for optical distribution systems in aerospace vehicles and provides a means of procurement of such devices.

1.2 Specification Approach

Fiber optic cable design characteristics are uniquely related to various aerospace vehicle applications. As a result, splices are necessarily constructed for specific cable types. Evaluation of the splice performance shall be with the cable type for which it was intended as defined in the splice detail specification (see Section 3). Typically, fiber optic splices have unique assembly instructions. Splices that are qualified to the same detail specification must be assembled using the same procedure and tools. All assembly instructions shall be presented and documented in accordance with this specification.

1.3 Part Number Structure

The part number structure for each splice shall be as follows:

MA5405/1-001

MA5405: Procurement Specification

MA5405/1: Assembly Type

MA5405/1-001: Assembly Type and Size

1.4 Condition of Listing

Splices will be specified in this document when requested for the purpose of specifying the splice in a user, government, or non-government standard body optical distribution system (see Section 7).

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.2 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

- AS1241 Fire Resistant Phosphate Ester Hydraulic Fluid for Aircraft
- AMS1432 Fluid, Deicing/Anti-icing, Runways and Taxiways, Potassium Acetate Base
- AIR1351 Manufacturer's Identification of Aerospace Electrical and Electronic Wiring Devices and Accessories

2.3 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <http://assist.daps.dla.mil/quicksearch/>.

- MIL-STD-202 Test Methods for Electronic and Electrical Component Parts
- TT-I-735 Isopropyl Alcohol
- DoD-STD-1678 Fiber Optic Test Methods and Instrumentation
- SD-6 Provisions Governing Qualification

2.4 American Society For Quality Control Publications

Available from American Society of Quality Control, PO Box 3005, 611 East Wisconsin Ave, Milwaukee, WI 53201-46004.

- ASQC Z1.4 Sampling Procedures and Tables for Inspection by Attributes

2.5 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

- ASTM D 1153 Methyl Isobutyl Ketone (for use in organic coatings)

2.6 EIA Publications

Available from Electronic Industries Alliance, 2500 Wilson Boulevard, Arlington, VA 22201-3834, Tel: 703-907-7500, www.eia.org.

- EIA-364 Electrical Connector/Socket Test Procedures Including Environmental Classifications
- EIA-364-10 Fluid Immersion Test Procedure For Electrical Connectors

2.7 Telecommunication Industry Association Publications

Available from Telecommunication Industry Association, 2500 Wilson Boulevard, Suite 300, Arlington VA 22201, Tel: 703-907-7700, www.tiaonline.org/standards/.

TIA/EIA-455 Fiber Optic Test Procedures

2.8 American National Standards Institute (ANSI) Publications

Available from American national Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

NCSL Z540 General Requirements for Calibration Laboratories and Measuring and Test Equipment

3. TECHNICAL REQUIREMENTS

The splice shall comply with the requirements herein. In the event of a conflict between the procurement specification and the detail specification which defines the unique technical requirements, the detail specification shall govern. Unless otherwise specified by contract or purchase order, product purchased to this specification will be supplied to the latest revision in effect at issuance of the contract or purchase order (see 6.3).

3.1 Material Properties (see 5.1)

Materials shall be as specified in the detail specification. When the detail specification does not specify a material, the material properties shall be in compliance with the manufacturer's engineering drawing. The manufacturer shall certify that all materials are in compliance with this specification and all relevant engineering drawings. If a change in material occurs after initial qualification, the manufacturer is required to perform an engineering analysis to determine if requalification is necessary. An Engineering Analysis Report shall be provided to the qualifying activity at the next periodic qualification inspection (see 4.1).

3.2 Design and Marking Dimensions (see 5.2)

Dimensions shall be as specified in the detail specification. The splice, as specified in the detail specification, or its packaging shall be marked with the part number (see 1.3) and the manufacturer symbol. The manufacturer symbol shall be listed in AIR1351.

3.2.1 Assembly Instruction (see 5.3)

Each splice or package shall be provided with concise, clearly written instruction containing the following information in the order shown.

- a. Title
- b. Splice specification part number
- c. Cable specification part number(s)
- d. Manufacturer assembly part number
- e. National stock number (if available)
- f. Detail assembly instructions
- g. Piece part drawing sufficient to enable proper use
- h. Piece part numbers when applicable for replacement
- i. Detail accessory drawings sufficient to enable proper use

- j. Accessory part numbers when applicable for replacement
- k. Tools (cleaving, crimping, polishing pucks, etc.)
- l. Address and telephone number of manufacturer

3.3 Optical Performance (see 5.4)

3.3.1 Insertion Loss

The splice assembly shall not exceed insertion loss limits specified in the detail specification when tested in accordance with 5.4.3.

3.3.2 Change in Optical Transmittance

The permanent change in optical transmittance of the splice due to exposure to mechanical and physical tests shall be less than 0.5 dB when tested in accordance with 5.4.4.

3.4 Altitude Immersion (see 5.5)

The splice shall be subjected to altitude immersion test in accordance with 5.5, then comply with optical performance requirements of 3.4.

3.5 Vibration/Temperature Cycle (see 5.6)

The splice shall be subjected to vibration/temperature cycle test in accordance with 5.6 at the maximum and minimum operating temperature specified in the detail specification. The splice shall comply with insertion loss requirements of 3.4 continuously throughout the test and comply with the change in optical transmittance after the test (see 3.4.2).

3.6 Tensile Strength (see 5.7)

The splice shall be assembled in accordance with the assembly instruction (see 3.3) and subjected to the tensile strength test (see 5.7), and will comply with the minimum tensile strength requirement specified in the detail specification. The splice shall comply with insertion loss requirements of 3.4 continuously throughout the test and comply with the change in optical transmittance after the test (see 3.4.2).

3.7 Heat Aging (see 5.8)

The splice shall be assembled subjected to the heat aging test in accordance with 5.8, at the maximum operating temperature specified in the detail specification. and will comply with the optical performance requirements of 3.4. Failure of the cable does not constitute failure of the splice.

3.8 Humidity (see 5.9)

The splice shall be subjected to the humidity test in accordance with 5.9, and will comply with the optical performance requirements of 3.4.

3.9 Salt Spray (see 5.10)

The salt spray test is applicable only for splices with metal piece parts. The splice shall be subjected to the salt spray test in accordance with 5.10, and will comply with the optical performance requirements of 3.4.

3.10 Fluid Immersion (see 5.11)

The splice shall be subjected to the fluid immersion test in accordance with 5.11, and will comply with the optical performance requirements of 3.4.