

## MILITARY SPECIFICATION

## TOOLS, FIBER OPTIC,

## GENERAL SPECIFICATION FOR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

## 1. SCOPE

1.1 Scope. This specification covers the general requirements for tools for use in fiber optics.

1.2 Classification. Fiber optic tools covered by this specification shall be of the following types and as specified (see 3.1 and 6.2).

Type

- I - Scribes.
- II - Terminating.
- III - Cleaving.
- IV - Polishing fixture tool.
- V - Wrench.
- VI - Stripping tool.
- VII - Miscellaneous tools.

## 2. APPLICABLE DOCUMENTS

2.1 Government specifications and standards. Unless otherwise specified, the following specifications and standards, of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation, form a part of this specification to the extent specified herein.

## SPECIFICATIONS

## FEDERAL

L-P-392	-	Plastic Molding Material, Acetal, Injection and Extrusion.
L-P-393	-	Plastic Molding Material, Polycarbonate, Injection and Extrusion.
L-P-1183	-	Plastic Molding Material, Acrylonitrile-Butadiene-Styrene (ABS), Rigid.
QQ-A-250/1	-	Aluminum Alloy 1100, Plate and Sheet.
QQ-A-250/2	-	Aluminum Alloy 3003, Plate and Sheet.
QQ-A-250/4	-	Aluminum Alloy 2024, Plate and Sheet.
QQ-A-250/8	-	Aluminum Alloy 5052, Plate and Sheet.
QQ-A-250/11	-	Aluminum Alloy 6061, Plate and Sheet.
QQ-A-250/12	-	Aluminum Alloy 7075, Plate and Sheet.
QQ-B-626	-	Brass, Leaded and Nonleaded; Rod, Shapes, Forgings, and Flat Products With Finished Edges (Bar and Strip).
QQ-B-750	-	Bronze, Phosphor; Bar, Plate, Rod, Sheet, Strip, Flat Wire, and Structural and Special Shaped Sections.
QQ-C-530	-	Copper-Beryllium Alloy Bar, Rod, and Wire (Copper Alloy Numbers 172 and 173).
QQ-C-533	-	Copper-Beryllium Alloy Strip (Copper Alloy Numbers 170 and 172).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Electronic Support Division AFLC, 2750 ABW/ES, Gentile AF Station, Dayton, OH 45444, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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- QQ-P-35 - Passivation Treatments for Corrosion-Resisting Steel.
- QQ-S-763 - Steel Bars, Wire, Shapes, and Forgings, Corrosion-Resisting.
- QQ-S-766 - Steel Plate, Sheet, and Strip-Corrosion Resisting.
- PPP-P-40 - Packaging and Packing of Hand Tools.

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- MIL-M-14 - Molding Plastics and Molded Plastic Parts, Thermosetting.
- MIL-A-8625 - Anodic Coatings, For Aluminum and Aluminum Alloys.
- MIL-F-14072 - Finishes for Ground Electronic Equipment.

(See supplement 1 for list of applicable specification sheets.)

## STANDARDS

## FEDERAL

- FED-STD-406 - Plastics: Methods of Testing.

## MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection By Attributes.
- MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
- MIL-STD-454 - Standard General Requirements for Electronic Equipment.
- MIL-STD-810 - Environmental Test Methods.
- MIL-STD-889 - Dissimilar Metals.
- MIL-STD-45662 - Calibration Systems Requirements.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS or the supplement thereto, if applicable.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM A 484 - General Requirements For Stainless and Heat-Resisting Wrought Steel Products (Except Wire).
- ASTM A 582 - Free-Machining Stainless and Heat-Resisting Steel Bars, Hot-Rolled or Cold Finished.
- ANSI/ASTM E18-79 - Methods of Test for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials.

(Applications for copies should be addressed to the American Society For Testing and Materials, 1916 Race Street, Philadelphia, PA 19103).

## ELECTRONIC INDUSTRIES ASSOCIATION

- EIA RS-359 - Standard Colors for Color Identification Coding.

(Application for copies should be addressed to Electronic Industries Association, 2001 Eye Street, N.W., Washington, DC 20006.)

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

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2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

### 3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheets. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 First article. Tools furnished under this specification shall be products which have been tested and have passed the first article inspection specified (see 4.5).

3.3 Materials. Materials shall be as specified herein. However, when a definite material is not specified, a material shall be used which will enable the tools to meet the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guarantee of the acceptance of the finished product.

#### 3.3.1 Metal (parts).

3.3.1.1 Metal (operational area). Unless otherwise specified (see 3.1), the operational area shall be steel in accordance with QQ-S-763 or suitable tool steel.

3.3.1.2 Metal body or handles. Aluminum, treated for corrosion resistance, shall be used for handles or body of tools.

#### 3.3.2 Metal (materials).

3.3.2.1 Copper alloys. Copper alloys shall be beryllium copper as specified in QQ-C-530 or QQ-C-533, or phosphor bronze in accordance with QQ-B-750. Brass materials shall be in accordance with QQ-B-626.

3.3.2.2 Aluminum. Where applicable, aluminum shall be as specified in QQ-A-250/1 (Aluminum 1100), QQ-A-250/2 (Alloy 3003), QQ-A-250/4 (Alloy 2024), QQ-A-250/8 (Alloy 5052), QQ-A-250/11 (Alloy 6061), or QQ-A-250/12 (Alloy 7075), anodized to meet the requirements of MIL-F-14072 (see 3.1).

3.3.2.3 Corrosion-resistant steel. Where applicable, corrosion-resistant steel shall be 300 series, low magnetic permeability in accordance with QQ-S-763, QQ-S-766, ASTM-A-582, or ASTM-A-484, and passivated per QQ-P-35, or to finish E300 as specified in MIL-F-14072 (see 3.1).

3.3.3 Plastic. Plastic parts shall be in accordance with L-P-392, L-P-393, L-P-1183, or MIL-M-14.

3.3.4 Finish. Aluminum parts shall be anodized in accordance with MIL-A-8625 or suitable anodizing process to meet the performance requirements specified herein. Cadmium plating shall not be used.

#### 3.3.5 Restricted materials.

3.3.5.1 Flammable, explosive, or toxic. Material shall be nonflammable, nonexplosive, and nontoxic over the operating temperature range.

3.3.5.2 Corrosion resistance. Tools shall be of corrosion-resistant materials or treated to prevent corrosion.

3.3.6 Dissimilar metals. Where dissimilar metals are used in intimate contact with each other, protection against electrolysis and corrosion shall be provided. Dissimilar metals shall be as defined in MIL-STD-889. Dissimilar metals such as brass, copper, or steel (except corrosion-resisting steel, passivated in accordance with 3.3.2.3) shall not be used in intimate contact with aluminum or aluminum alloy.

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3.3.7 Fungus resistance. Finishes and materials must be certified that they meet the requirements of MIL-STD-454, requirement 4; all other materials or finishes must be tested in accordance with method 508 of MIL-STD-810.

3.4 Design and construction. Tools shall be of the design, construction, and physical dimensions specified (see 3.1).

3.4.1 Handles. Metal or plastic handles shall be designed as specified (see 3.1).

3.4.2 Operational area. The operational area shall have a smooth finish and round edges. The metal operational area shall be polished and free from nicks and burrs. Unless otherwise specified (see 3.1), break all sharp edges 0.005 inch (0.13 mm) maximum radius on metal tool tips.

3.4.3 Weight. The weight shall be as specified (see 3.1).

3.5 Performance.

3.5.1 Impact strength (tools with plastic parts). When tools are tested as specified in 4.7.2, the minimum impact strength shall be 3 foot-pounds per inch.

3.5.2 Durability. When tested as specified in 4.7.3, there shall be no evidence of breakage, cracking, chipping, or any other damage to the tool that would impair the service function of the tool.

3.5.3 Salt spray (corrosion). When tools are tested as specified in 4.7.4, there shall be no evidence of corrosion that could impair the operation of the tool.

3.5.4 Hardness (tools with metal parts). When tools are tested as specified in 4.7.5, the hardness shall be as specified (see 3.1).

3.6 Identification marking. Tools shall be identified in accordance with MIL-STD-1285.

3.6.1 Part number. Tools shall be marked to include the military part number and other marking as specified (see 3.1). Marking shall remain legible after each test.

3.7 Workmanship. Tools shall be fabricated, constructed in accordance with the best practice to produce an item free from all defects which would effect proper functioning in service. Particular attention shall be given to freedom from chips, dirt, grit, and other foreign material; also to freedom from defects, burrs, sharp edges, corners, and points.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality and quantity to permit performance of the required inspection shall be established and maintained by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with MIL-STD-45662.

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4.2 Classification of inspections. The inspections specified herein are classified as follows:

- a. Components and materials inspection (see 4.4).
- b. First article inspection (see 4.5).
- c. Quality conformance inspection (see 4.6).

4.3 Inspection conditions. Unless otherwise specified herein, all inspections shall be performed in accordance with the test conditions specified in the "GENERAL REQUIREMENTS" of MIL-STD-202.

4.4 Components and materials inspection. Components and materials inspection shall consist of certification supported by verifying inspection and test data that the components listed in table I, used in fabricating the fiber optic tools, are in accordance with the applicable referenced specification.

TABLE I. Components and materials inspection.

Component material	Requirement paragraph	Applicable specification
Plastic, molded materials - - - - -	3.3.3	MIL-M-14, L-P-392, L-P-393, L-P-1183
Phosphor bronze and beryllium copper-	3.3.2.1	QQ-B-750, QQ-C-530, or QQ-C-533
Brass (leaded and nonleaded)- - - - -	3.3.2.1	QQ-B-626
Aluminum- - - - -	3.3.2.2	QQ-A-250/1, /2, /4, /8, /11, and /12; MIL-F-14072
Steel - - - - -	3.3.2.3	QQ-P-35, QQ-S-763, QQ-S-766, ASTM-A-582, and ASTM-A-484
Dissimilar metals - - - - -	3.3.6	MIL-STD-889
Fungus resistance - - - - -	3.3.7	MIL-STD-454

4.5 First article inspection. First article inspection shall be performed by the contractor after award of contract and prior to production, at a location acceptable to the Government. First article inspection shall be performed on sample units which have been produced with equipment and procedures normally used in production. First article approval is valid only on the contract or purchase order under which it is granted, unless extended by the Government to other contracts or purchase orders.

4.5.1 Sample size. Four samples of each part number shall be subjected to first article inspection to assure that all the tools work in applicable fiber optic systems.

4.5.2 Inspection routine. The sample shall be subjected to the inspections specified in table II in the order shown.

TABLE II. Inspection routine.

Inspection	Requirement paragraph	Method paragraph
Visual and mechanical inspection- -	3.1, 3.3, 3.4, 3.6 and 3.7	4.7.1
Impact strength (tools with plastic parts)- - - - -	3.5.1	4.7.2
Durability- - - - -	3.5.2	4.7.3
Salt spray (corrosion)- - - - -	3.5.3	4.7.4
Hardness (tools with metal probes)-	3.5.4	4.7.5

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4.5.3 Failures. One or more failures shall be cause for refusal to grant approval.

4.6 Quality conformance inspection.

4.6.1 Sampling. Sampling for inspection shall be in accordance with MIL-STD-105.

4.2.6 Tests. Samples selected in accordance with 4.6.1 shall be tested in the order specified in table III.

TABLE III. Quality conformance inspection.

Type of inspection	Requirement paragraph	Method paragraph
Visual and mechanical:		
Material - - - - -	3.3	4.7.1
Finish - - - - -	3.3.4	4.7.1
Marking- - - - -	3.6	4.7.1
Workmanship- - - - -	3.7	4.7.1

4.6.3 Packaging inspection. The sampling and inspection of the preservation, packing and container marking shall be in accordance with the requirements of PPP-P-40.

4.7 Methods of inspection.

4.7.1 Visual and mechanical inspection. Tools shall be inspected to verify that the design, construction, physical dimensions, marking, and workmanship are in accordance with applicable requirements (see 3.1, 3.3, 3.4, 3.6, and 3.7).

4.7.2 Impact strength (tools with plastic parts) (see 3.5.1). Tests shall be performed in accordance with Federal Test Method Standard No. 406, method 1071. Plastic samples shall be prepared from plastic representative of the lot used to fabricate plastic parts.

4.7.3 Durability (see 3.5.2). The applicable military tools, as specified (see 3.1), shall perform their respective service function 50 cycles without breaking, cracking, chipping or any other physical damage. If the functional portion of the tool is metal, diamond, or sapphire its respective service function shall be performed 500 cycles.

4.7.4 Salt spray (corrosion) (see 3.5.3). Tools shall be tested in accordance with method 101 of MIL-STD-202. The following details and exceptions shall apply:

- a. Test-condition letter B.
- b. Inspection after test: Tools shall be inspected for evidence of corrosion, pitting, and ease of operation.

4.7.5 Hardness (tools with metal parts) (see 3.5.4). Hardness test shall be performed in accordance with ASTM E18-79. The hardness shall be obtained at each end of the parts representative of the lot.

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5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with PPP-P-40. (Until these tools are specifically listed in PPP-P-40, the packaging requirements shown for "crimping tool, terminal" shall be used.)

6. NOTES

6.1 Intended use. The types of tools covered by this specification are intended to be used with fiber optic components.

6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Title, number, and date of the applicable specification sheet, type required, and the complete part number (see 1.2 and 3.1).

6.3 Repairability. All tools covered by this specification are nonrepairable.

6.4 Operational area. The portion of the tool performing the intended use of the tool.

Custodians:

Army - CR  
Navy - EC  
Air Force - 85

Preparing activity:

Air Force - 85  
(Project 5120-B042)

Review activities:

Army - MI, AR, AT, GL  
Navy - SH, OS, AS  
Air Force - 11, 17, 99  
DLA - ES

User activities:

Army - ME, AV  
Navy - MC  
Air Force - 19

Agent:

DLA - ES

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