

INCH-POUND

MIL-DTL-15659J  
15 December 2003  
SUPERSEDING  
MIL-T-15659H  
1 October 1987

## DETAIL SPECIFICATION

TERMINAL, LUG: SOLDER, COPPER AND PHOSPHOR BRONZE

Inactive for new design after 15 December 2003

This specification is approved for use by all departments and agencies of the Department of Defense.

### 1. SCOPE

1.1 Scope. This specification covers copper and phosphor bronze or tin brass strip solder electrical lug terminals.

1.2 Classification. Lug terminals will be of the following classes as specified (see 6.2):

Class 1 - Stamped copper sheet

Class 2 - Punched copper tubing

Class 3 - Stamped phosphor bronze or tin brass strip (locking type terminal)

### 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of the documents cited in sections 3 and 4 of this specification, whether or not they are listed.

Comments, suggestions, or questions on this document should be addressed to Defense Supply Center Richmond, ATTN: DSCR-VEB, 8000 Jefferson Davis Highway, Richmond, VA 23297-5616 or e-mailed to [STDZNMGT@dla.mil](mailto:STDZNMGT@dla.mil). Since contact information can change, you may want to verify the currency of this e-mail address information using the ASSIST Online database at [www.dodssp.daps.mil](http://www.dodssp.daps.mil).

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2.2 Government documents.

2.2.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract (see 6.2).

## SPECIFICATIONS

(See Supplement 1 for list of specification sheets.)

## STANDARDS

## DEPARTMENT OF DEFENSE

MIL-STD-202	- Electronic and Electrical Component Parts.
MIL-STD-1916	- DoD Preferred Methods for Acceptance of Product.

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or [www.dodssp.daps.mil](http://www.dodssp.daps.mil) or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract (see 6.2).

## ASTM INTERNATIONAL

ASTM B 152/B 152M	- Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar (DoD adopted).
ASTM B 188	- Standard Specification for Seamless Copper Bus Pipe and Tube (DoD adopted).
ASTM B 508	- Standard Specification for Copper Alloy Strip for Flexible Metal Hose (DoD adopted).
ASTM B 545	- Standard Specification for Electrodeposited Coatings of Tin (DoD adopted).
ASTM B 591	- Standard Specification for Copper-Zinc-Tin and Copper-Zinc-Tin-Iron-Nickel Alloys Plate, Sheet, Strip, and Rolled Bar (DoD adopted).

(Copies of these documents are available online at <http://www.astm.org/> or from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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## 3. REQUIREMENTS

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

3.2 Material.

3.2.1 Class 1 material. The Class 1 lug terminals shall be fabricated of electrolytic copper strip or sheet, alloy C11000, temper O60 in accordance with ASTM B 152/B 152M.

3.2.2 Class 2 material. The Class 2 lug terminals shall be fabricated of electrolytic copper tubing, alloy C11000, temper O60 in accordance with ASTM B 188.

3.2.3 Class 3 material. The Class 3 lug terminals shall be fabricated of phosphor bronze strip (1.3 percent tin), alloy C50500, with a minimum temper of H02 in accordance with ASTM B 508. As an alternative material, copper strip, alloy C42500, with a minimum temper of H02, in accordance with ASTM B 591 may be used.

3.3 Design and fabrication. All lug terminals shall be designed for attachment to their appropriate conductor size as shown on the applicable specification sheets (see 6.2).

3.3.1 Dimensions. Dimensions and tolerances shall be in accordance with the applicable specification sheet.

3.3.2 Finish. Lug terminals shall be tinned over their entire surface by electrodepositing process in accordance with ASTM B 545.

3.3.2.1 Thickness of plating. The minimum thickness of electrodeposited tin plating shall be 0.0005 inch.

3.3.3 Tooth construction for locking type lug terminals. The number of teeth, length of teeth, and the free height (thickness of the lug over the teeth) shall be optional for the manufacturer. The teeth shall be uniform in number and symmetrical with respect to the size, shape, and angle of the twist or of the bent edges.

3.4 Performance.

3.4.1 Solderability. The lug terminal electrodeposited finish shall be considered solderable when 95 percent of the total length of the fillet between the standard wrap wire and the terminal are tangent to the surface of the terminal free of pinholes and voids. There shall not be a ragged or interrupted line at the point of tangency between the fillet and terminal (see 4.4.1).

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3.4.2 Bending. That portion of Class 1 and 3 lug terminals requiring forming around the conductor and insulation shall be capable of being bent to the shape that they will normally be subjected to in use. The lug terminal shall not exhibit evidence of cracking of the base metal or flaking or peeling of the finish (see 4.4.2).

3.4.3 Salt spray (corrosion). After being subjected to the salt spray test, the lug terminal shall show no evidence of corrosion (see 4.4.3).

3.4.4 Compression (for Class 3 only). The locking type lug terminals shall withstand compression between two steel plates without evidence of fracture of teeth (see 4.4.4).

3.4.5 Flattening resistance (for Class 3 only). The locking type lug terminals shall withstand compression between two steel plates without evidence of teeth being flattened with respect to the lug terminal.

3.5 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.6 Workmanship. Lug terminals shall be manufactured and processed in such a manner as to be uniform in quality and shall be free from burrs and other defects that would affect serviceability or appearance.

#### 4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.2).
- b. Conformance inspection (see 4.3).

#### 4.2 First article inspection.

4.2.1 Submission. When specified (see 6.2), the contractor shall submit a first article sample for evaluation in accordance with the provisions of 4.2.2. The first article sample shall consist of ten lug terminals of each class.

4.2.2 Inspections to be performed. First article lug terminals and test specimens may be subjected by the government to any or all of the examinations and tests specified in this detail specification and to any or all requirements of the applicable specification sheets. Five sample units shall undergo all the examinations listed in table I. Five sample units shall be subjected to the tests listed in table II.

4.2.3 Rejection. If any lug terminal or test specimen does not meet any of the applicable requirements, the first article sample shall be rejected. The government reserves the right to terminate its inspection upon any failure of a lug terminal or test specimen in the sample to comply with any of the stated requirements.

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TABLE I. Examinations.

Examination	Requirement paragraph	Defect classification		Method of inspection
		Major	Minor	
Material	3.2	101		Certification
Dimensions:	3.3.1	---	---	---
Diameter of holes		102		Gage
Distance between hole centers			201	Gage
Length			202	Gage
Thickness			203	Gage
Width			204	Gage
Radius incorrect			205	Visual
Protective finish missing or inadequate	3.3.2	103		Visual
Workmanship	3.6		206	Visual

TABLE II. Tests.

Inspection	Requirement paragraph	Test paragraph
Solderability	3.4.1	4.4.1
Bending	3.4.2	4.4.2
Salt spray (corrosion)	3.4.3	4.4.3
Compression	3.4.4	4.4.4
Flattening resistance	3.4.5	4.4.4

4.3 Conformance inspection.

4.3.1 Inspection lot. An inspection lot shall consist of lug terminals of the same class produced under the same production processes and offered for inspection at one time.

4.3.2 Conformance inspection. Conformance inspection shall be in accordance with MIL-STD-1916 and shall consist of sampling plan A (see 4.3.2.1) or sampling plan B (see 4.3.2.2) as specified (see 6.2).

4.3.2.1 Sampling plan A. Sampling plan A shall consist of the examinations listed in table I. Unless otherwise specified (see 6.2), the manufacturer shall select the type of sampling plan (attribute, variable, or continuous) in accordance with MIL-STD-1916. Sampling and inspection shall be in accordance with verification level I of MIL-STD-1916.

4.3.2.2 Sampling plan B. Sampling plan B shall consist of sampling plan A plus the tests listed in table II. Unless otherwise specified (see 6.2), the manufacturer shall select the type of sampling plan (attribute, variable, or continuous) in accordance with MIL-STD-1916. Sampling and inspection shall be in accordance with verification level I of MIL-STD-1916.

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4.3.4 Inspection equipment. The contractor shall be responsible for having available, and utilizing correctly, the inspection equipment required to perform the examinations and tests prescribed herein.

4.4 Tests.

4.4.1 Solderability. Terminals shall be tested in accordance with method 208 of MIL-STD-202 (see 3.4.1).

4.4.2 Bending. The test specimens shall have their wire or conductor grips shaped around a steel mandrel whose diameter is equivalent to the wire or conductor diameter normally intended for the lug terminal under test. The test specimens shall then be inspected for compliance with the requirements of 3.4.2.

4.4.3 Salt spray (corrosion). The salt fog test for corrosion shall be in accordance with method 101, test condition A, of MIL-STD-202. Lug terminals shall be mounted in a horizontal position in a salt fog chamber. Adjoining samples shall be separated by at least 1/4 inch. During this test, the lug terminals shall not come in contact with metallic or wooden objects and the salt fog shall have free access to the samples. At the end of this test the specimens shall be examined immediately to determine compliance with the requirements of 3.4.3.

4.4.4 Compression and flattening test for locking type lug terminals. The locking tooth portion of the lug terminal shall be placed between two cold rolled steel plates having a hardness on the Rockwell B scale of 85 to 90. The lock washer teeth, after being compressed to a height equal to the actual material thickness plus 0.005 inch and then released, shall have a minimum height equal to 66 percent of the free height. Upon release, there shall be no evidence of fracture of the teeth or any breakage.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the inventory control point's packaging activity within the military department or defense agency, or within the military department's system command. Packaging data retrieval is available from the managing military department's or defense agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

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## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The copper lug terminals are intended for use where normal operating temperatures are maintained in an area using connecting feeder cables to distribution panels. The locking type lug terminals are intended for applications where it is desired to maintain a positive electrical contact when equipment is subjected to vibration.

6.2 Acquisition requirements. Acquisition documents should specify the following

- a. Title, number, and date of this specification.
- b. Class of lug terminal desired (see 1.2).
- c. Specific issue of individual documents referenced (see 2.2.1 and 2.3).
- d. Applicable detail specification sheet number(s) (see 3.3).
- e. When first article inspection is required (see 3.5 and 4.2).
- f. Sampling plan A or B (see 4.3.2).
- g. Type of sampling (attribute, variable, or continuous) (see 4.3.2.1 or 4.3.2.2).
- h. Packaging requirements (see 5.1).

6.3 Subject term (key word) listing.

brass  
conductor  
electrical  
locking  
teeth  
tin

6.5 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.

## Custodians:

Army - AR  
Navy - AS  
Air Force - 11

## Preparing Activity:

DLA - GS2

(Project 5940-1434)

## Review Activities:

Army - AT, AV, CR, CR4, MI  
Navy - MC, SH

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 [www.dodssp.daps.mil](http://www.dodssp.daps.mil).