

INCH-POUND

MIL-DTL-3922E  
18 April 2016  
SUPERSEDING  
MIL-DTL-3922D  
24 May 2011

## DETAIL SPECIFICATION

FLANGES, WAVEGUIDE, GENERAL PURPOSE,  
GENERAL SPECIFICATION FOR

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

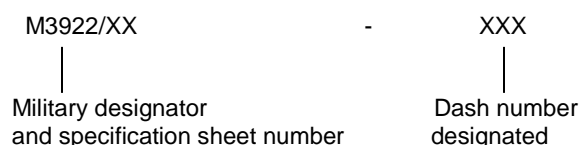
## 1. SCOPE

1.1 Scope. This specification covers the general requirements for general purpose waveguide flanges that are used to couple mechanically and electrically two sections of waveguides or waveguide parts (see 6.2).

1.2 Classification.

1.2.1 Type designation. The type designation of waveguide flanges is derived from the AN nomenclature system specified in MIL-STD-196 and from the Part or Identifying Number (PIN) (see 1.3).

1.3 Part or Identifying Number (PIN). The PIN for flanges covered by this specification consists of the letter M followed by the basic number of the specification sheet and an assigned dash number (see 3.1).



## 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 documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

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

## FEDERAL SPECIFICATIONS

FF-S-85	Screw, Cap, Slotted and Hexagon Head.
FF-S-86	Screw, Cap, Socket-Head.
FF-W-84	Washers, Lock (Spring).

Comments, suggestions or questions on this document should be addressed to DLA Land and Maritime, ATTN: VAT, Post Office Box 3990, Columbus, OH 43218-3990, or emailed to [TubesAmps@dla.mil](mailto:TubesAmps@dla.mil). 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>.

AMSC N/A

FSC 5985



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## FEDERAL STANDARDS

[FED-STD-H28](#) Screw-Thread Standards for Federal Services.

## DEPARTMENT OF DEFENSE STANDARDS

[MIL-STD-130](#) Identification Marking of U.S. Military Property.  
[MIL-STD-196](#) Joint Electronics Type Designation System.

(Copies of these documents are available online at <https://assist.dla.mil>.)

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

## NATIONAL CONFERENCE OF STANDARDS LABORATORIES (NCSL)

[NCSL-Z540.3](#) Calibration Laboratories and Measuring and Test Equipment.

(Copies are available online at <http://www.ncsli.org> or from National Conference of Standards Laboratories [NCSL], 2995 Wilderness Place Suite 107, Boulder, Colorado 80301-5405.)

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

<a href="#">ASTM-B16/B16M</a>	Rod, Brass, Free-Cutting, Bar and Shapes for use in Screw Machines.
<a href="#">ASTM-B21/B21M</a>	Rod, Bar, And Shapes, Naval Brass
<a href="#">ASTM-B26/B26M</a>	Aluminum-Alloy Sand Castings.
<a href="#">ASTM-B80</a>	Magnesium-Alloy Sand Castings.
<a href="#">ASTM-B85/B85M</a>	Aluminum-Alloy Die Castings.
<a href="#">ASTM-B91</a>	Magnesium-Alloy Forgings.
<a href="#">ASTM-B94</a>	Magnesium-Alloy Die Castings.
<a href="#">ASTM-B107/B107M</a>	Magnesium-Alloy Extruded Bars, Rods, Profiles, Tubes and Wire.
<a href="#">ASTM-B108/B108M</a>	Aluminum-Alloy Permanent Mold Castings, Standard Specification for.
<a href="#">ASTM-B124/B124M</a>	Copper and Copper-Alloy Forging Rod, Bar, and Shapes.
<a href="#">ASTM-B140/B140M</a>	Copper-Zinc-Lead (Red Brass or Hardware Bronze) Rod, Bars and Shapes.
<a href="#">ASTM-B211</a>	Aluminum and Aluminum-Alloy Bar, Rod, and Wire.
<a href="#">ASTM-B221</a>	Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
<a href="#">ASTM-B308/B308M</a>	Aluminum-Alloy 6061-T6 Standard Structural Shapes.
<a href="#">ASTM-B584</a>	Castings, Copper Alloy Sand, for General Applications.
<a href="#">ASTM-F836</a>	Steel, Stainless, Metric Nuts.

(Copies can be obtained online at <http://www.astm.org> or requested from ASTM INTERNATIONAL, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

## AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) INTERNATIONAL

[ASME-B46.1](#) Surface Texture (Surface Roughness, Waviness, and Lay).  
[ASME-Y14.5](#) Dimensioning and Tolerancing.

(Copies can be obtained online at <http://www.asme.org> or requested from ASME INTERNATIONAL, Three Park Avenue, New York, NY 10016-5990.)

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| SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) INTERNATIONAL

[SAE-AMS3304](#)

Silicone Rubber, General Purpose 70 Durometer.

(Copies can be obtained online at <http://www.sae.org> or requested from SAE World Headquarters, Inc., 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.3 Order of precedence. Unless otherwise noted herein or in the contract, 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.

| 3. REQUIREMENTS.

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheets (see Supplement 1). In the event of conflict between the requirements of this specification and those of the specification sheets, the latter shall govern.

3.2 Material. The material for each part shall be as specified herein (see 3.1).

3.2.1 Copper-base alloys.

3.2.1.1 Bar stock. When fabricated from bar stock, flanges shall be of leaded red brass, of naval brass, or, with acquiring activity approval, of free-cutting brass (Copper Alloy UNS No. C36000), in accordance with [ASTM-B16/B16M](#).

3.2.1.1.1 Leaded red brass. Composition of material for leaded red brass shall conform to the requirements for alloy B, half-hard, of [ASTM-B140/B140M](#).

3.2.1.1.2 Naval brass. Naval brass shall be of the composition for alloy A or C, half-hard, of [ASTM-B21/B21M](#).

3.2.1.2 Casting. When fabricated by casting, flanges shall be of tin bronze conforming to the composition for Copper Alloy UNS No. C90300 or C90500, in accordance with [ASTM-B584](#).

3.2.1.3 Forging. When fabricated by forging, flanges shall be of leaded brass conforming to composition for alloy 2 of [ASTM-B124/B124M](#), or naval brass conforming to composition for alloy A, half-hard, of [ASTM-B21/B21M](#).

3.2.2 Aluminum-base alloys.

3.2.2.1 Bar stock and forging. When fabricated from bar stock or by forging, flanges shall be of an aluminum alloy conforming to alloy 6061 of [ASTM-B221](#) or [ASTM-B211](#), or aluminum alloy 6063 conforming to [ASTM-B221](#) and [ASTM-B308/B308M](#). Bar stock shall be tempered T6.

3.2.2.2 Sand casting. When fabricated by sand casting, flanges shall be of an aluminum alloy conforming to alloy C4A, condition T4; alloy CS43A, condition F; alloy SG70A, condition T6; or alloy ZG61A, condition T5, of [ASTM-B26/B26M](#).

3.2.2.3 Die casting. When fabricated by die casting, flanges shall be of an aluminum alloy conforming to the composition for alloy G8A or SG100A of [ASTM-B85/B85M](#).

3.2.2.4 Permanent mold casting. When fabricated by permanent mold casting, flanges shall be of an aluminum alloy conforming to alloy ZC60A, condition T5; alloy SG70A, condition T6; or alloy SC51A, condition T6, of Publication [ASTM-B108/B108M](#).

3.2.3 Magnesium-base alloys.

CAUTION: MAGNESIUM IS INHERENTLY SUSCEPTIBLE TO CORROSION. PRECAUTIONS MUST BE TAKEN TO MINIMIZE THE POSSIBILITY OF CORROSION WHEN ASSEMBLING MAGNESIUM WAVE-GUIDES TO THE APPLICABLE FLANGES.

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3.2.3.1 Bar stock. When fabricated from bar stock, flanges shall be of a magnesium alloy conforming to the composition for alloy AZ31B, condition F, of [ASTM-B107/B107M](#).

3.2.3.2 Sand casting. When fabricated by sand casting, flanges shall be of a magnesium alloy conforming to alloy AZ91C, condition F, of [ASTM-B80](#).

3.2.3.3 Die casting. When fabricated by die casting, flanges shall be of a magnesium alloy conforming to the composition for alloy AZ91A of [ASTM-B94](#).

3.2.3.4 Forging. When fabricated by forging, flanges shall be of a magnesium alloy conforming to the composition for alloy AZ31B of [ASTM-B91](#).

3.2.4 Silicone rubber. When gaskets are required for use with individual types of flanges ([see 3.1](#)), the material shall be silicone rubber conforming to [SAE-AMS3304](#).

3.3 Design and construction. Waveguide flanges shall be of design, construction, and physical dimensions specified ([see 3.1](#)). Dimensions and tolerances shall be interpreted in accordance with [ASME-Y14.5](#).

3.3.1 Condition. When specified ([see 6.1](#)), flanges shall be annealed before finish machining.

3.3.2 Threaded parts. All threaded parts shall be in accordance with [FED-STD-H28](#).

3.3.3 Cap screws. Cap screws shall be type II, style 10P, steel alloy, in accordance with [FF-S-85](#) or type I, style 11, steel alloy in accordance with [FF-S-86](#), whichever is applicable.

3.3.4 Hexagon nuts. Hexagon nuts shall be group B, type 1 steel, in accordance with [ASTM-F836](#).

3.3.5 Lock washers. Lock washers shall be class A, steel, in accordance with [FF-W-84](#) (inactive for new design). The thickness shall be as specified ([see 3.1](#)).

3.3.6 Plating. A non-toxic, durable, corrosion-resistant plating shall be used employing best commercial practices.

3.3.7 Pure tin. The use of pure tin as an underplate or final finish is prohibited both internally and externally. Tin content of the components and solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass ([see 6.5](#)).

3.4 Surface roughness. When surface roughness is determined as specified in [4.6.2](#), all finished mating surfaces shall be 63 root mean square microinches.

3.5 Marking. Waveguide flanges shall be marked in accordance with [MIL-STD-130](#), with the part number and the manufacturer cage code. The numbers shall be marked in depressed or raised characters in proportion to the size of the flange and at least 0.0312 inch high, in the place specified ([see 3.1](#)). No periods shall be used either between the numbers or at the end of the cage code. With acquiring activity approval, the marking may be ink stamped in an appropriate size.

3.6 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.7 Workmanship. Waveguide flanges shall be processed in such a manner as to be uniform in quality and all surfaces shall be free from burrs, die marks, chatter marks, scratches, dirt, grease, scale, splinters, and other defects that will affect life, serviceability, or appearance.

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## 4. VERIFICATION

4.1 Test equipment and inspection facilities. Test equipment and inspection facilities shall be of sufficient accuracy, quality, and quantity to permit performance of the required inspection. The supplier shall establish and maintain a calibration system to control the accuracy of measuring and test equipment in accordance with [NCSL-Z540.3](#).

4.2 Classification of inspections. The examination and testing of waveguide flanges shall be classified as follows:

- a. Materials inspection ([see 4.3](#)).
- b. Conformance inspection ([see 4.5](#)).
- i. Inspection of product for delivery ([see 4.5.1](#)).

4.3 Materials inspection. Materials inspection shall consist of verification that the materials listed in [table I](#), used in fabricating the waveguide flanges, are in accordance with the applicable referenced specifications or requirements prior to fabrication.

Table I - Materials inspection.

Material	Requirement paragraph	Applicable specification
Copper-base alloys:	<a href="#">3.2.1</a>	
Bar stock:	<a href="#">3.2.1.1</a>	
Leaded red brass	<a href="#">3.2.1.1.1</a>	<a href="#">ASTM-B140/B140M</a>
Naval brass	<a href="#">3.2.1.1.2</a>	<a href="#">ASTM-B21/B21M</a>
Free-cutting brass	<a href="#">3.2.1.1</a>	<a href="#">ASTM-B16/B16M</a>
Casting (tin bronze)	<a href="#">3.2.1.2</a>	<a href="#">ASTM-B584</a>
Forging:		
Leaded brass	<a href="#">3.2.1.3</a>	<a href="#">ASTM-B124/B124M</a>
Naval brass	<a href="#">3.2.1.3</a>	<a href="#">ASTM-B21/B21M</a>
Aluminum-base alloys:	<a href="#">3.2.2</a>	
Bar stock and forging	<a href="#">3.2.2.1</a>	<a href="#">ASTM-B221, B211, B308/B308M</a>
Sand casting	<a href="#">3.2.2.2</a>	<a href="#">ASTM-B26/B26M</a>
Die casting	<a href="#">3.2.2.3</a>	<a href="#">ASTM-B85 /B85M</a>
Permanent mold casting	<a href="#">3.2.2.4</a>	<a href="#">ASTM-B108 /B108M</a>
Magnesium-base alloys:	<a href="#">3.2.3</a>	
Bar stock	<a href="#">3.2.3.1</a>	<a href="#">ASTM-B107/B107M</a>
Sand casting	<a href="#">3.2.3.2</a>	<a href="#">ASTM-B80</a>
Die casting	<a href="#">3.2.3.3</a>	<a href="#">ASTM-B94</a>
Forging	<a href="#">3.2.3.4</a>	<a href="#">ASTM-B91</a>
Silicone rubber	<a href="#">3.2.4</a>	<a href="#">SAE-AMS3304</a>
Cap screws	<a href="#">3.3.3</a>	<a href="#">FF-S-85 or FF-S-86</a>
Hexagon nuts	<a href="#">3.3.4</a>	<a href="#">ASTM-F836</a>
Lock washers	<a href="#">3.3.5</a>	<a href="#">FF-W-84</a>

4.4 Inspection conditions. Unless otherwise specified herein, all inspection shall be made at room ambient temperature, relative humidity, and atmospheric pressure.

4.5 Conformance inspection.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of group A.

4.5.1.1 Inspection lot. An inspection lot, as far as is practicable, shall consist of all the waveguide flanges of the same type designation, produced under essentially the same conditions, and offered for inspection at one time.

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4.5.1.2 Rejected lots. If an inspection lot is rejected, the supplier may withdraw the lot, rework it to correct the defects, or screen out the defective units, as applicable, and re-inspect. Such lots shall be separate from new lots and shall be clearly identified as re-inspected lots. Rejected lots shall be inspected using tightened inspection.

4.5.1.3 Group A inspection. Group A inspection shall consist of the examinations and test specified in [table II](#), and shall be made on the same set of sample units, in the order shown.

Table II - Group A inspection.

Examination or test	Requirement paragraph	Method paragraph
Visual and mechanical examination		<a href="#">4.6.1</a>
Design and construction	<a href="#">3.1</a> and <a href="#">3.3</a> to <a href="#">3.3.5</a> inclusive	---
Marking	<a href="#">3.5</a>	<a href="#">4.6.1</a>
Workmanship	<a href="#">3.6</a>	<a href="#">4.6.1</a>
Surface roughness	<a href="#">3.4</a>	<a href="#">4.6.2</a>

4.5.1.3.1 Sampling plan. Statistical sampling and inspection shall be performed on an inspection lot basis with a random sample of flanges selected in accordance with [table III](#). The acceptance level shall be based upon the zero defective sampling plan. No failures shall be permitted.

Table III. Group A sampling plan.

Lot size	Sample size
1-13	100 percent
14-150	13
151-280	20
281-500	29
501-1200	34
1201-3200	42
3201-10,000	50
10,001-35,000	60
35,001-150,000	74
150,001-500,000	90
500,001 and over	102

4.6 Methods of examination and test.

4.6.1 Visual and mechanical examination. Waveguide flanges and associated components shall be examined to verify that the design, construction, physical dimensions, marking, and workmanship are in accordance with the applicable requirements ([see 3.1, 3.3 to 3.3.5](#) inclusive, [3.5](#), and [3.6](#)).

4.6.2 Surface roughness. Surface roughness shall be determined in accordance with [ASME-B46.1](#) ([see 3.4](#)).

## 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 material is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the system commands. 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 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Title, number, and date of the applicable detail specification or MS military standard, and the complete PIN or AN nomenclature ([see 1.2.1](#) and [3.1](#)).
- (c) That the supplier must not substitute for a specified material or fabricated part without approval from the Government. Evidence to substantiate claims that a substitute is suitable must be submitted with this request.
- (d) Whether flanges are annealed before finish machining ([see 3.3.1](#)).

6.2 Engineering information. Illustrations and additional information for these waveguide parts are available in [MIL-HDBK-216](#), "R.F. Transmission Lines and Fittings."

6.3 Subject item (key word) listing.

Aluminum  
Bar stock  
Casting  
Copper  
Couple  
Electrical  
Forging  
Magnesium  
Mechanical  
Radio frequency  
Surface roughness

6.4 Tin whisker growth. The use of alloys with tin content greater than 97 percent, by mass, may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after manufacture and can develop under typical operating conditions, on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers. Alloys of 3 percent lead, by mass, have shown to inhibit the growth of tin whiskers ([see 3.3.7](#)). For additional information on this matter, refer to [ASTM-B545](#) (Standard Specification for Electrodeposited Coatings of Tin).

6.5 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate modifications generated by this revision. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

## Custodians:

Army - CR  
Navy - EC  
Air Force - 85  
DLA - CC

## Preparing activity:

DLA - CC

(Project 5985-2016-011)

## Review activities:

Army - AR, AV, MI  
Navy - AS, MC, OS  
Air Force - 19, 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/>.