

**MIL-B-15894B**

21 December 1966

**SUPERSEDING****MIL-B-15894A**

14 November 1951

**MILITARY SPECIFICATION****BRASS: DIE CASTINGS**

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

**1. SCOPE**

1.1 This specification covers brass die castings for military applications.

- \* 1.2 Classification - Brass die castings shall be of the following classes (see 6.2) according to chemical composition (see 3.2):

Class 1 (formerly Class A)

Class 2

Class 3

**2. APPLICABLE DOCUMENTS**

- \* 2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

**SPECIFICATIONS****Federal**

PPP-B-585	Boxes, Wood, Wirebound
PPP-B-601	Boxes, Wood, Cleated - Plywood
PPP-B-621	Boxes, Wood, Nailed and Lock-Corner

**FSC MECA**

MIL-B-15894B

Military

MIL-P-116

Preservation, Methods of

MIL-B-13239

Barrier Material, Waterproofed, Flexible,  
All Temperature

## STANDARDS

FederalFed. Test Method  
Std. No. 151

Metals, Test Methods

Military

MIL-STD-105

Sampling Procedures and Tables for Inspection  
by Attributes

MIL-STD-129

Marking for Shipment and Storage

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

## 3. REQUIREMENTS

- \* 3.1 Manufacture - The die castings shall be made by forcing molten metal under pressure into a mold or die. Unless otherwise specified or shown on the applicable drawing, die castings shall be made by the cold-chamber process.
- \* 3.1.1 Location of ejector pin marks and parting lines - Unless otherwise specified on the drawing or in the contract or order, the location of ejector pin marks and parting lines shall be at the option of the contractor.
- \* 3.2 Chemical composition - The die castings shall conform to the chemical requirements shown in Table I.
- \* 3.2.1 The contractor shall furnish an analysis of each melt or heat of castings produced. When preanalyzed ingot conforming to Table I is remelted for production, the analysis may represent a lot of castings (see 4.2), subject to approval of the procuring activity.

TABLE I  
CHEMICAL COMPOSITION

	Class 1	Class 2	Class 3
Composition-percent			
Copper	57.0 min.	63.0 to 67.0	80.0 to 83.0
Silicon	0.25 max.	0.75 to 1.25	3.75 to 4.25
Lead, max.	1.50	0.25	0.15
Tin, max.	1.50	0.25	0.25
Manganese, max.	0.25	0.15	0.15
Aluminum, max.	0.25	0.15	0.15
Iron, max.	0.25	0.15	0.15
Magnesium, max.	--	--	0.01
Other elements, total, max. <u>1/</u>	0.50	0.50	0.25
Zinc	30.0 min.	Remainder	Remainder

1/ Of the total of other elements, arsenic, antimony and sulphur shall not exceed 0.05 percent for each, and phosphorus shall not exceed 0.01 percent.

\* 3.2.2 The analysis shall show percentages for all elements designated in Table I, and all others intentionally added to the molten metal as fluxes or metal-conditioners. When the presence of other elements is indicated in the course of routine analysis, a determination shall be made for each, and also to establish conformity to Table I, note 1/.

\* 3.3 Foundry control - Unless otherwise specified in the contract or order (see 6.2), die castings shall be produced only after a pre-established foundry control procedure has been submitted to and approved by the procuring activity. Foundry control shall consist of examination of die castings by fracture, sectionalized deep-etch testing, radiographic, proof-testing or other approved methods for determining soundness until die-design and casting operations have been established which produce die castings conforming to the requirements of this specification. When foundry practices have been so established and approved, the production procedure and foundry controls shall not be changed without first terminating production and then demonstrating to the satisfaction of the procuring activity that the change has not impaired the quality of the die castings, and change-approval obtained. (See 4.2.)

\* 3.4 Soundness - When specified (see 6.2), the soundness of the castings shall conform to standards furnished or approved by the procuring activity. The number and extent of blow-holes, sponginess, and other defects in the castings shall not be greater than indicated by the standard, and any such defects shall be

MIL-B-15894B

confined to those parts of the castings which are not designated as critical. Either or both of the following methods for determining compliance with soundness standards shall apply, as specified (see 4.3.2).

(a) Comparison with sectionalized standard castings or photographs thereof.

(b) Radiographic examination.

\* 3.5 Mechanical properties, strength - When specified (see 6.2), the die castings shall withstand a specified minimum load, applied in the manner specified, without failure. Failure shall be defined as breaking, cracking or producing permanent deformation (or set) greater than a specified maximum deformation (or set).

\* 3.5.1 Hardness - The die castings shall conform to the following Rockwell hardness values:

Rockwell Hardness: B Scale

Class 1:	53 to 63
Class 2:	65 to 75
Class 3:	80 to 90

\* 3.6 Dimensions - Castings shall conform to finished dimensions within the tolerances specified (see 6.2), or shown on applicable drawings, and shall conform to such gages as may be specified in individual cases.

\* 3.7 Identification marking - Unless otherwise specified in the contract or order, each die casting shall be identified with the part number and manufacturer's name, brand, or trademark, by the use of raised numerals in a location indicated on the drawing. When no location is shown on the drawing, the number shall be so located as not to be machined off in finishing to the required dimensions.

\* 3.8 Workmanship - The die castings shall be of uniform quality, free from injurious blowholes and porosity, hard spots, shrinkage defects, cracks, and other injurious defects which will adversely affect their serviceability, and they shall be smooth and well cleaned before inspection. Porosity and other defects inherent in die castings shall not be cause for rejection provided it is demonstrated that the die castings are in accordance with the requirements and standards of the procuring activity.

\* 3.8.1 Repairing of defects - Castings shall not be repaired, plugged, or welded.

- \* 3.8.2 Impregnation shall not be performed without the approval of the procuring activity.

#### 4. QUALITY ASSURANCE PROVISIONS

- \* 4.1 Responsibility for inspection - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to 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 the prescribed requirements.

4.2 Lot - An inspection lot shall consist of the production of each die or compound die of each machine for each 24 hours during the first week of continuous operation and the production for each 48 hours thereafter of continuous operation. Any change in the machine, composition, die, or continuity of operation shall be considered as the start of a new lot. Die castings inspected by this method shall be so marked or handled during the finishing operations as not to lose their identity.

- \* 4.3 Sampling - Samples taken for purposes of tests prescribed in this specification shall be selected in a manner as to represent correctly the material furnished and avoid needless destruction of finished material when samples representative of the material are available from other sources. All samples shall represent either one melt or heat of castings or a lot, in accordance with 3.2.1.

- \* 4.3.1 Sampling for chemical analysis - Sampling shall be in accordance with Method 111 of Fed. Test Method Std. No. 151.

4.3.1.1 Spectrographic methods - Sampling shall be in accordance with Method 112 of Fed. Test Method Std. No. 151.

- \* 4.3.1.2 Visual and dimensional examination - A random sample shall be selected from each lot in accordance with MIL-STD-105, Inspection Level II, Acceptable Quality Level 2.5 percent defective for examination of 4.4.3.2.

- \* 4.3.2 Sampling for soundness and mechanical properties, strength - Unless otherwise specified in the contract or order, sampling for sectionalized comparison with standards (3.4(a)), or radiographic comparison with standards (3.4(b)), shall be in accordance with Table II.

- \* 4.3.3 Sampling for hardness and dimensions - Two die castings are required for each melt, heat or lot. One sample shall represent the metal cast at the beginning, and the other shall represent the metal cast at the completion of each melt, heat or lot.

MIL-B-15894B

TABLE II

## SIZE OF SOUNDNESS AND MECHANICAL PROPERTIES INSPECTION SAMPLE

Number of die castings in melt or lot	Sample number of die castings	Acceptable number defective die castings, maximum
1 - 5	All	0
6 - 100	6	0
101 - 500	7	0
501 - 2000	17	1
2001 - 6000	27	2
Over 6000	39	3

- \* 4.3.4 Sampling for surface examination - Each casting in the melt, heat or lot shall be examined for surface defects to determine compliance to 3.7 and 3.8.
- 4.4 Inspection -
- \* 4.4.1 Chemical analysis - The sample selected in accordance with 4.3.1 shall be analyzed in accordance with Method 111 or 112 of Fed. Test Method Std. No. 151. In case of dispute, referee analysis shall be by Method 111.
- \* 4.4.2 Soundness - Comparison of the samples shall be made with the standards in 3.4 to determine acceptance or rejection of the castings represented, based upon acceptance requirements of Table II. Die castings in rejected lots may be individually radiographed for reinspection, per 4.5.1.
- \* 4.4.3 Mechanical properties, strength - Testing shall conform to specified or approved procedures to determine conformity with requirements in 3.5.
- \* 4.4.3.1 Hardness - Testing shall be in accordance with Method 243 of Fed. Test Method Std. No. 151 to determine compliance with 3.5.1.
- \* 4.4.3.2 Visual and dimensional examination - Castings shall be examined for surface imperfections, identification of product, dimensions, and workmanship requirements of 3.6, 3.7, and 3.8 respectively.
- \* 4.4.3.3 Examination of preparation for delivery - Preservation, packing, and marking shall be examined for conformance with Section 5 of this specification.
- \* 4.5 Rejection and retest - Except for failures permitted in Table II, if any sample fails to conform to this specification the entire melt, heat or lot so represented shall be rejected, subject to retest provisions in Fed. Test Method Std. No. 151.

- \* 4.5.1 At the option of the contractor, die castings in lots rejected under the provisions of 4.4.2 may be individually subjected to radiographic examination, and such die castings as meet the soundness requirements may be resubmitted for acceptance.
- \* 4.5.2 At the option of the contractor, die castings in lots rejected under the provisions of 3.5, 3.5.1 and 3.6 may be individually tested for acceptance.

## 5. PREPARATION FOR DELIVERY

- \* 5.1 Segregation - Die castings shall be separated by drawing number or piece number (3.7) and by melt, heat or lot number, when prepared for delivery.
- \* 5.2 Packaging - Packaging shall be Level A or C as specified by the procuring activity (see 6.2).
  - \* 5.2.1 Level A - Level A packaging shall be in accordance with Method III of MIL-P-116.
  - \* 5.2.2 Level C - Level C die castings shall be packaged to afford adequate protection against deterioration and damage in accordance with the manufacturer's commercial practice.
- \* 5.3 Packing - Packing shall be Level A, B or C as specified by the procuring activity (see 6.2).
  - \* 5.3.1 Level A - The die castings, packaged as specified in 5.2, shall be packed in cleated-plywood, nailed, or wirebound wood boxes, conforming to PPP-B-601, PPP-B-621, or PPP-B-585, respectively. The gross weight of wood boxes shall not exceed approximately 200 pounds. Containers shall be lined with a sealed waterproof liner, made from barrier material conforming to MIL-B-13239.
  - \* 5.3.2 Level B - The die castings, packaged as specified in 5.2, shall be packed in cleated-plywood, nailed wood, or wirebound wood boxes, conforming to PPP-B-601, PPP-B-621, or PPP-B-585, respectively. The gross weight of wood boxes shall not exceed approximately 200 pounds.
  - \* 5.3.3 Level C - Packages that require overpacking for acceptance by the carrier shall be packed in exterior type shipping containers in a manner that will ensure safe transportation at the lowest rate to the point of delivery, and shall meet, as a minimum, the requirements of the following rules and regulations, as applicable to the mode of transportation selected:

MIL-B-15894B

- (a) Postal Regulations
- (b) Interstate Commerce Commission Regulations
- (c) Civil Air Regulations
- (d) Consolidated Freight Classification Rules
- (e) Truckers' Association Rules
- (f) Other applicable carriers rules

5.4 Marking - Shipping containers shall be plainly marked with the name and drawing number of the piece, the quantity contained therein, the name of the contractor, the number of the contract or purchase order, and the gross weight. In addition to the foregoing, marking of shipping containers shall be in accordance with MIL-STD-129.

## 6. NOTES

\* 6.1 Intended use - Brass die castings show high strength, good toughness and corrosion resistance. Of these three, the Class 3 alloy possesses higher strength, hardness, corrosion resistance and wear properties, while Classes 1 and 2 have proven applications as torpedo parts, fire control instruments and machinery components.

\* 6.2 Ordering data - Purchasers should exercise any desired options offered herein, and procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Alloy and dimensions required.
- (c) Foundry control (see 3.3).
- (d) Soundness (see 3.4 and 4.4.2).
- (e) Mechanical properties (see 3.5 and 4.4.3).
- (f) Dimensional tolerances and gages (see 3.6).
- (g) Identification marking (see 3.7).
- (h) Level of packaging and packing desired (see Section 5).



\* 6.3 The use of separately die-cast test bars was omitted from this specification revision because they are considered unreliable. Different machines and dies continue to be necessary for die castings and test bars. Comparison between static breakdown or proof test and the mechanical properties of separately die-cast test bars revealed that test bars made in a different machine in a different die had no correlation with the die casting other than a common chemical composition. In view of this, it is considered that the only practical method is to have die castings produced under foundry control (see 3.3) and mechanical property control based on proof testing of whole die castings (see 3.5).

\* 6.4 For information only, Table III contains data considered reliable, supplied by the American Die Casting Institute and other sources. All values are average typical properties for separately die cast test bars.

TABLE III

	Class 1	Class 2	Class 3
Tensile Strength, psi	55,000	70,000	85,000
Yield Strength (0.2% offset) psi	30,000	35,000	50,000
Elongation, % in 2 in.	15	25	25
Impact Strength, Charpy, ft. lb.	40	50	70
Hardness, Rockwell B Scale	55-60	68-72	85-90
Modulus of Elasticity <u>1</u> /	15	15	20
Weight per cubic inch, lbs.	0.304	0.308	0.297

1/ Multiplied by  $10^6$ .

\* 6.5 Changes from previous issues - The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. 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 and relationship to the last previous issue.

## Custodians:

Army - MR

Navy - AS

Air Force - 69

## Preparing activity:

Navy - AS

(Project No. MECA-0016)

## Review activities:

Army - MI, MR, MU

Air Force - 69

Navy - YD

MIL-B-15894B

User activities:

Army - EL, GL, ME

Review/user information is current as of date of this document. For future coordination of changes to this document, draft circulation should be based on the information in the current DODISS.

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