QQ-M-38B
September 18, 1969
SUPERSEDING
Fed. Spec. QQ-M-38A
October 10, 1966

FEDERAL SPECIFICATION

MAGNESIUM ALLOY DIE CASTINGS (AZ91A)

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE

1.1 Scope. This specification establishes the requirements for magnesium alloy die castings of the composition listing in table I, in the as-cast condition.

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.

Federal Standards:

Fed. Std. No. 123 - Marking for Domestic Shipment (Civilian Agencies).
Fed. Test Method Std. No. 151 - Metals; Test Methods.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, D.C., Atlanta, Chicago, Kansas City, Mo., Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, Washington.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Specification:

MIL-M-3171 - Magnesium Alloy; Processes for Pretreatment and Prevention of Corrosion on.

Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129 - Marking for Shipment and Storage
MIL-STD-453 - Inspection, Radiographic
MIL-STD-649 - Aluminum and Magnesium Products, Preparation for Shipment and Storage.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring 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. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM) Standards:

E8-66 - Tension Testing of Metallic Materials.

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

3. REQUIREMENTS

3.1 Material. The material shall be such as to produce die castings in full compliance with the requirements specified herein.

3.2 Manufacture. The castings shall be made by forcing molten metal under pressure into a mold or die.

3.3 Foundry control.

3.3.1 Unless otherwise specified (see 6.1), casting shall be produced under foundry control approved by the procuring activity. Foundry control shall consist of examination of castings by radiographic or other approved methods for determining internal defects until the gating and other foundry practices have been established to produce castings meeting the quality standards furnished by the procuring activity or agreed upon by the procuring activity and contractor. When foundry practices have been so established, the production method shall not be changed without demonstrating to the satisfaction of the procuring activity that the change does not adversely affect the quality of the castings.

3.3.2 Foundry control. Foundry control and inspection shall be made by radiographic examination conducted in accordance with the requirements of MIL-STD-453.

3.4 Soundness.

3.4.1 When specified (see 6.1), the soundness of castings shall conform to standards furnished or approved by the procuring activity. The extent of porosity, cold fills and other defects in the castings shall not exceed those shown by the standard, and such defects shall be absent in designated areas.

3.4.1.1 The standards supplied or approved by the procuring activity for determining conformance with soundness requirements may consist of sectioned castings or photographs thereof or radiographs of at least the important sections of the castings.

3.4.2 When specified (see 6.1), the weight of each casting shall be not less than a specified minimum.

3.5 Identification. Where practicable and unless otherwise specified (see 6.1), each casting shall be identified with the part number by the use of raised numerals in a location indicated on the drawing. When no location is shown on the drawing, tne number shall be so located as not to be machined off in finishing to the required dimensions.

3.5.1 Castings on which it is impracticable to provide raised numerals shall be so marked as to be properly identified at the point of delivery.

3.6 Chemical composition.

3.6.1 The chemical composition of the castings shall be within the limits specified in table I.

3.6.2 The contractor shall furnish an analysis of each lot showing the percentage of each of the elements specified in table I.

3.6.3 Chemical analysis of the individual lots by the contractor may be waived at the discretion of the procuring activity, provided the manufacturer's method of composition control is acceptable to the procuring activity.

TABLE I. Chemical composition limits 1/

Element	Percent
Aluminum	8.3 to 9.7
Manganese, min.	0.13
Zinc	0.35 to 1.0
Silicon, max.	0.50
Copper, max.	0.10
Nickel, max.	0.03
Other elements (total), max.	0.30
Magnesium	Remainder

1/ Analysis shall reguarly be made only for the elements specifically required in this table, excepting magnesium. If, however, the presence of other elements is indicated in the course of routine analysis, further analysis shall be made to determine that the total of these other elements does not exceed 0.3 percent

3.7 Mechanical properties.

3.7.1 Unless otherwise specified in the contract or order (see 6.1), the mechanical properties of the castings shall be demonstrated to be adequate by means of suitable proof tests of full-size castings, or by tests of specimens cut from castings as specified on the applicable drawings.

3.8 Location of ejector pin marks and parting lines. Unless otherwise specified (see 6.1), the location of ejector pin marks and parting lines shall be at the option of the contractor.

3.9 Finish. Unless otherwise specified (see 6.1), castings shall be supplied with a chrome-pickle protective finish in accordance with type I of MIL-M-3171.

3.10 Dimensions. The dimensions of the castings shall be within the dimensions and tolerances specified on the applicable drawings.

3.11 Workmanship. The die castings shall be of uniform quality, free from injurious porosity, hard spots, shrinkage defects, cracks, and other injurious defects which will adversely affect their serviceability, and shall be smooth and well cleaned before inspection.

3.11.1 Repair. Castings shall not be repaired in any manner without permission 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 in the contract or order, the supplier 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 that supplies and services conform to prescribed requirements.

4.2 Sampling.

4.2.1 Inspection lot. The contractor shall have the option of operating on the basis of either one of the following definitions of an inspection lot:

4.2.1.1 An inspection lot shall consist of not more than 1,000 pounds of castings of the same part number submitted for inspection at one time. However, if this method of inspection is used, the manufacturer's method of periodic composition control shall be acceptable to the inspector and no castings shall be released for finishing until the composition of the representative chemical samples has been found to conform with the composition limits of this specification.

4.2.1.2 An inspection lot shall consist of the output of one die-casting machine in continuous operation for a period not exceeding 24 hours. Castings inspected by this method shall be so marked or handled during the finishing operations as not to lose their identity.

4.2.2 Samples for chemical analysis.

4.2.2.1 Samplies of sufficient drillings for check chemical analysis shall be taken by the inspector from each lot in accordance with the requirements of Fed. Test Method Std. No. 151, method 111.

4.2.2.2 The sample for spectrochemical analysis shall conform to the requirements of Fed. Test Method Std. No. 151, method 112. It shall weigh approximately 20 grams.

4.2.3 Soundness. Unless otherwise specified, the sampling for radiographic inspection or comparison with standards shall be in accordance with MIL-STD-105, level S-4, AQL - 2.5 percent.

4.2.4 Proof test. When the contract or order requires the castings to withstand a minimum non-destructive load, castings from each lot shall be tested in the manner specified in the contract or order. Sampling shall be in accordance with MIL-STD-105, level S-2 AQL - 1.0 percent.

4.3 Examination.

4.3.1 Workmanship. Each casting shall be carefully examined to determine conformance with the requirements of this specification with respect to workmanship. Examination of a fraction of the inspection lot in accordance with a statistical sampling plan is acceptable provided the sampling plan is approved by the procuring activity.

4.3.2 Dimensions. One of the first castings made with each die, after the die has reached normal operating temperature, shall be measured and gaged. Unless otherwise specified, at least 0.1 percent of the castings subsequently made with the die shall be measured and gaged.

4.3.3 Preparation for delivery. An examination shall be made to determine that packaging, packing and marking comply with section 5 of this specification.

4.4 Tests.

4.4.1 Chemical analysis. Chemical analysis shall be performed in accordance with methods 111 or 112 of Fed. Test Method Std. No. 151. In case of dispute, method 111 shall be the basis for acceptance.

4.4.2 Soundness.

4.4.2.1 When soundness is required in accordance with 3.4.1, it shall be determined by radiographic examination of castings selected in accordance with 4.2.3, unless otherwise specified.

4.4.2.2 At the option of the contractor, castings in lots rejected under the provisions of 4.4.2.1 may be individually subjected to radiographic examination, and such of the castings as meet the soundness requirements may be resubmitted for acceptance.

4.4.2.3 When the minimum weight of each casting is specified, a sufficient number of castings from each lot shall be weighed individually to satisfy the soundness of the castings of the lot. If any of the castings weighed fall below the specified weight, each casting of the lot shall be weighed, and those weighing less than the specified weight shall be rejected.

4.4.3 Mechanical property tests. When tensile tests are required, they shall be made in accordance with the requirements of ASTM-E8 using test specimens in accordance with figure 18, therein.

4.5 Rejection. Failure of any casting to conform to any one of the requirements of this specification shall be cause for rejection of the lot represented, except when a statistical sampling plan is provided. Disposition of nonconforming lots shall be in accordance with MIL-STD-105.

5. PREPARATION FOR DELIVERY

5.1 Separation. Die castings shall be properly separated by lot when packed for shipment.

5.2 Preservation and packing. All castings shall be preserved and packed in accordance with the requirements of MIL-STD-649. The procuring agency should specify the levels required. When the levels are not specified, level C shall be used.

5.3 Marking.

5.3.1 Civil agencies. In addition to any special marking required by the contract or order, shipping containers shall be marked in accordance with Fed. Std. No. 123.

5.3.2 Military agencies. In addition to markings required by the contract or order, the shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Ordering data. Purchaser should select the preferred options offered herein and include the following information in procurement documents:

(a) Title, number, and date of this specification.
(b) Dimensions and applicable drawings (see 3.10).
(c) Whether foundry control is required (see 3.3).
(d) Required soundness standards when soundness is specified (see 3.4.1).
(e) Minimum weight when necessary (see 3.4.2).

(f) Mechanical properties, if required (see 3.7).
(g) Proof test, if required (see 3.7.1).
(h) Identification marking (see 3.5).
(i) Location of eject or pin marks and parting lines (see 3.8).
(j) Finish (see 3.9).
(k) Selection of applicable level of preservation and packing (see 5.2).

6.2 Typical properties. Typical tensile properties of tension specimens, of the form and dimensions shown in figure 18 of ASTM-E8, when cast in a die in regular production routine, and conforming to the chemical composition specified in 3.6, are as follows:

TABLE II. Tensile properties

Tensile strength	Yield strength	Elongation in 2 inches
P.s.i.	P.s.i.	Percent
29,000 to 34,000	22,000 to 24,000	2 to 5

MILITARY CUSTODIANS:

Army - MR
Navy - AS
Air Force - 84

Review activities:

NSA
Army - WC, MU, MI, AV, GL, ME

Preparing activity:

Navy - AS

Project No. MECA-0058

Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents, See section 2 of this specification to obtain extra copies and other documents referenced herein. Price 10 cents each.

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity *(as indicated on reverse hereof)*.

SPECIFICATION

QQ-M-38B MAGNESIUM ALLOY DIE CASTINGS (AZ91A)

ORGANIZATION *(Of submitter)*

CITY AND STATE

CONTRACT NO.

QUANTITY OF ITEMS PROCURED

DOLLAR AMOUNT

$

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

☐ YES ☐ NO IF "YES", IN WHAT WAY?

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED BY *(Printed or typed name and activity)*

DATE

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