

MIL-M-26696(USAF)

24 November 1959

## MILITARY SPECIFICATION

### MAGNESIUM ALLOY BARS, RODS, AND SPECIAL SHAPED SECTIONS, EXTRUDED, (P)ZK60B

#### 1. SCOPE

1.1 Scope.- This specification covers the requirements for magnesium alloy bars, rods, and shapes extruded from (P)ZK60B alloy pellets, and furnished in the T-5 condition, artificially aged. (see 6.3.)

#### 2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids, form a part of this specification:

##### SPECIFICATIONS

###### Military

MIL-A-20695	Aluminum Products, Preparation for Storage and Shipment of
MIL-M-3171	Magnesium Alloy, Processes for Corrosion Protection of

##### STANDARDS

###### Federal

Fed Test Method	
Std No. 151	Metals; Test Methods
FED-STD-245	Tolerances for Aluminum Alloy and Magnesium Alloy wrought Products

###### Military

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-184	Identification Marking of Aluminum, Magnesium and Titanium

(Copies of documents required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

FSC 9530  
9540

MIL-M-26696(USAF)

## 3. REQUIREMENTS

## 3.1 Chemical composition

3.1.1 The chemical composition shall conform to the requirements specified in table I.

Table I. Chemical composition

Element	Percent	
	Minimum	Maximum
Zinc	4.8	6.8
Zirconium	0.45	---
Other elements, total	---	0.30
Magnesium	Remainder	

3.1.2 The contractor shall furnish an analysis of each melt in the lot showing the percentage of each of the elements designated in table I.

3.1.2.1 Chemical analysis by the contractor of the individual melts may be waived at the discretion of the procuring activity provided the producer's method of composition control is acceptable, or that all material in the lot can be identified as being from melts previously analyzed and found to conform to the chemical composition requirements of this specification. (See 6.2.)

## 3.2 Mechanical properties

3.2.1 The mechanical properties in the direction of extrusion shall conform to the requirements specified in table II.

Table II. Mechanical properties (T-5 condition)

Dia. or thickness in least dimensions	Cross-section area	Tensile strength minimum	Tensile yield strength minimum	Elongation in 2 in. minimum	Compressive yield strength minimum
inches	sq inches	psi	psi	percent	psi
Up to 2.999	Under 20.000	45,000	35,000	4	35,000

3.3 Tolerances.- The tolerances shall not exceed those specified in Standard FED-STD-245. When certain classes of products require broader dimensional tolerances, these tolerances shall be subject to negotiation between the vendor and purchaser (see 6.4).

MIL-M-26696(USAF)

3.4 Marking for identification.- Unless otherwise specified, each bar, rod, and shape shall be marked for identification in accordance with Standard MIL-STD-184 (see 6.2). The alloy and condition designation shall be (P)ZK60B-15. The markings shall include this specification number.

3.5 Protective treatment.- As a final process, magnesium alloy bars, rods, and shapes shall be given a chrome-pickled treatment in accordance with type 1 of Specification MIL-M-3171, or oiled as specified by the procuring activity. (See 6.2.)

3.6 Requirements for sizes not specifically covered.- Mechanical properties and tolerances of material falling outside the limits covered in this specification shall be as specified in the contract or order. (See 6.2.)

3.7 Workmanship.- The extruded bars, rods, and shapes shall be uniform in quality and condition, clean, sound, smooth, and free from seams, slivers, laminations, grooves, cracks and other injurious defects. Discoloration due to thermal treatment will not be cause for rejection.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection.- Unless otherwise specified herein, the supplier shall be responsible for the performance of all inspection requirements prior to submission for Government inspection and acceptance. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. Inspection records of the examinations and tests shall be kept complete and available to the Government as specified in the contract or order.

4.2 Sampling, inspection, and testing shall be in accordance with the requirements of the applicable methods of Fed Test Method Std No. 151 and as specified herein.

##### 4.3 Sampling

4.3.1 Lot.- A lot shall consist of all material of the same section and size submitted for inspection at one time.

4.3.2 Samples for chemical analysis.- A sample for chemical analysis shall be selected in accordance with method 111 of Fed Test Method Std No. 151 from each 4,000 pounds, or less, of the alloy when chemical analysis is made at the time of melting. When the sample for wet chemical analysis is taken from the fabricated product, it shall

# MIL-M-26696(USAF)

consist of equal quantities of chips taken from at least four representative pieces and shall represent the full cross-section of the material. Samples for spectrochemical analysis shall be in accordance with method 112 of Fed Test Method Std No. 151.

4.3.2.1 If the producer's method of composition control is acceptable, samples for check chemical analysis may be waived at the discretion of the procuring activity (see 6.2).

4.3.3 Samples for mechanical property tests.- From material having a nominal weight of less than 1 pound per linear foot, one tension-test sample shall be selected from each lot weighing 500 pounds, or less; from lots weighing more than 500 pounds, one additional sample shall be taken for each 1,000 pounds or fraction thereof in excess of the first 500 pounds. For material having a nominal weight of 1 pound or more per linear foot, one tension-test sample shall be taken from each lot consisting of 500 feet, or less; from lots consisting of more than 500 feet, one additional sample shall be taken for each 1,000 feet or fraction thereof in excess of the first 500 feet.

## 4.4 Examinations

4.4.1 Workmanship, marking, and dimensions.- Each bar, rod, and shape shall be carefully examined to determine conformance to this specification with respect to workmanship and identification marking. Sufficient spot checks shall be made to ensure conformance to the tolerances specified. On approval of the procuring activity, a system of statistical quality control may be used for dimensional, marking, and workmanship inspection.

4.4.2 Preparation for delivery.- The preservation, packaging, packing, and marking shall be examined to determine compliance with the requirements of 3.5 and section 5 herein.

## 4.5 Test methods

4.5.1 Chemical analysis.- Chemical analysis shall be made by the wet chemical method in accordance with method 111 of Fed Test Method Std No. 151, or by the spectrochemical method in accordance with method 112 of Fed Test Method Std No. 151. In case of dispute, the chemical analysis by wet chemical methods shall be the basis for acceptance.

## 4.5.2 Mechanical properties

4.5.2.1 Types of specimens.- Tension-test specimens shall conform to the requirements of method 211, Fed Test Method Std No. 151. Whenever

MIL-M-26696(USAF)

practicable, the material should be tested in full section. For material less than 1/2 inch in section thickness and of suitable width, which is not tested in full section, a test specimen of type F2, R3, R4, or R5 shall be used. For material 1/2 inch or more in section thickness which is not tested in full section, a test specimen of type R1 or R2 shall be used. For shapes from which a standard test specimen cannot be taken and which cannot be tested satisfactorily in full section, a scaled-down model of a type F2 specimen shall be used.

4.5.2.2 Location of test specimens.- For sections which are wholly or predominantly symmetrical, the tension-test specimens shall be taken from the locations specified in table III. For sections of which the predominant part is unsymmetrical, the specimen shall be taken from a location that most nearly satisfies the intent of table III. For odd-shaped sections only, the predominant part shall be tested, unless otherwise specified in the contract or order (see 6.2).

Table III. Location of axis of specimen

Thickness (inches)	Location of axis of specimen with respect to thickness (T) and width (W) of section		
	Width		
	Thickness	Equal to or less than 1.50 inches	Greater than 1.50 inches
Less than 0.500	T/2	---	---
0.500 to 1.500, incl.	T/2	W/2	W/4
Greater than 1.500	T/4	---	W/4

#### 4.5.2.3 Tensile tests

4.5.2.3.1 Tensile strength.- Tensile strength shall be determined in accordance with method 211 of Fed Test Method Std No. 151.

4.5.2.3.2 Yield of strength.- The yield strength shall be determined by the offset method in accordance with method 211 of Fed Test Method Std No. 151.

#### 4.6 Rejection and retest

4.6.1 Rejection.- If a test specimen fails to meet any of the tests required by this specification, the lot represented by the sample shall be rejected.

MIL-M-26696(USAF)

4.6.2 Retest.- Retests will be permitted in accordance with Fed Test Method Std No. 151.

## 5. PREPARATION FOR DELIVERY

5.1 Packaging and packing.- Unless otherwise specified by the procuring activity, material shall be separated by size, and packaged and packed in accordance with Specification MIL-M-20695. When the levels of packaging and packing are not specified, level C shall be used. (See 6.2.)

5.2 Marking for shipment.- Unless otherwise specified by the procuring activity (see 6.2), marking for shipment shall be in accordance with Standard MIL-STD-129. The shipment marking nomenclature shall be:

Magnesium alloy (Bars, Rods, Special Shaped Sections 1/),  
Extruded, (P)ZK60B

1/ Whichever is applicable.

## 6. NOTES

6.1 Intended use.- This alloy is intended for structural applications where maximum strength combined with good ductility is required.

6.2 Ordering data.- Procurement documents should specify the following:

- a. Title, number, and date of this specification.
- b. Number of pieces or pounds desired.
- c. Length of pieces desired.
- d. Size (die number for shapes) desired.
- e. Marking, if different from 3.4.
- f. Type of protective treatment (see 3.5).
- g. Mechanical properties and tolerances for materials not covered in this specification (see 3.6).
- h. If samples for check chemical analysis are waived (see 3.1.2.1 and 4.3.2.1).
- i. Testing for odd-shaped sections if different from 4.5.2.2.
- j. Levels of packaging and packing (see 5.1).
- k. If special marking is required (see 5.2).

6.3 Base material.- A base material symbol (P) is placed before the alloy designation ZK60B thus: (P)ZK60B, to indicate an extrusion made from pellets instead of solid ingots or billets. Pellets are finely divided particles relatively smooth and spherical in shape formed by rapidly freezing molten droplets of the alloy.

MIL-M-26696(USAF)

6.4 Tolerances.- The character of the pellet extrusion process is such that consideration for broader dimensional tolerances is required for certain classes of product, particularly for complicated shapes.

NOTICE.- When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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