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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 38715-2020

High strength magnesium alloy bars

高强度镁合金棒材

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1 Scope

China's national standard for high strength magnesium alloy bars. It specifies the requirements, the test methods, the inspection rules and the marking and packaging. High strength magnesium is the counterpart to the high conductivity grades, and it is developed for the opposite reason: to compete with aluminium in structural applications on the basis of specific strength. Magnesium is a third lighter than aluminium, so an alloy matching aluminium's strength would be substantially better per unit weight - and the rare earth containing magnesium alloys approach that. What holds them back is not strength but the other things a structural material must do. Magnesium's hexagonal structure gives it limited ductility at room temperature and a marked directionality after extrusion; it corrodes readily and galvanically against almost anything it touches; and it is difficult to join. A bar standard has to specify the properties in the directions that matter and the condition in which they were measured.

This Standard specifies the requirements, test methods, inspection rules and marking, packaging, transportation, storage, quality certificates and order forms (or contracts) of high strength magnesium alloy bars. This Standard is applicable to deformed magnesium alloy round bars, square bars and hexagonal bars (hereinafter referred to as bars) with room temperature tensile strength of no less than 350 MPa obtained by extrusion process.

2 Normative References

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for

the undated documents, only the latest version (including all the amendments) are applicable to this document.

GB/T 4297 Inspection Method for Macrostructure of Wrought Magnesium Alloy Products

GB/T 5153 Designation and Composition of Wrought Magnesium and Magnesium Alloys

GB/T 5155-2013 Magnesium Alloy Extruded Bars

GB/T 6519-2013 Ultrasonic Inspection of Wrought Aluminum and Magnesium Alloy Products

GB/T 13748 (all parts) Chemical Analysis Methods of Magnesium and Magnesium Alloys

GB/T 16865 Test Pieces and Method for Tensile Test for Wrought Aluminum and Magnesium Alloys Products

GB/T 17432 Methods for Sampling for Analyzing the Chemical Composition of Wrought Aluminum and Aluminum Alloys

GB/T 20967 Non-Destructive Testing-Visual Testing-General Principles The round bar with designation of AQ80M, status of H112, diameter of 40mm, and length of 3500mm shall be labelled as follows: Round bar

GB/T 38715-AQ80M H112- ϕ 40x3500 Example 2: The non-scaled hexagonal bar with designation of VW75M, status of T5, inscribed circle diameter of 120mm, accuracy of Level-A shall be labelled as follows: Hexagonal bar

GB/T 38715-VW75M T5-120-A

3.2 Quality assurance

3.2.1 Guarantee of raw materials The ingots used for the production of high-strength magnesium alloys shall meet the requirements of the bar composition and macrostructure specified in this Standard; and the other quality requirements of the ingots shall conform to the provisions of YS/T 627.

3.2.2 Guarantee of production process The supplier shall adopt production equipment and extrusion technology to effectively ensure the quality of the bar; and the extrusion ratio shall be no less than 6.

3.3 Chemical composition The chemical composition for the designations of VW93M, VW94M, VW84N, WN54M and VW92 shall conform to the provisions of Table 2; and the chemical composition of other designations shall conform to the provisions of GB/T 5153.

3.8.2 The surface of the bar is allowed to have defects such as squeeze marks, pressure injuries, damages, bubbles, scrapes, scratches, bumps, depressions, etc. with the depth not exceeding the negative deviation.

4 Test Methods

4.1 Chemical composition The chemical composition analysis method of the bar shall be carried out according to the provisions of GB/T13748 or YS/T1036; and arbitration analysis shall adopt GB/T 13748.

4.2 Dimension deviation Dimension deviation is measured by measuring tools with correspondingly accuracy.

4.3 Tensile mechanical properties at room temperature The test method of the longitudinal mechanical properties of the bar at room temperature shall be carried out according to the method specified in GB/T 16865.

4.4 Macrostructure The test method for the macrostructure of the bar shall be carried out according to the method specified in GB/T 4297.

4.5 Ultrasonic flaw detection The ultrasonic testing method of the bar shall be carried out according to the method specified in GB/T 6519-2013.

4.6 Appearance quality The test method for the appearance quality of the bar shall be carried out according to the method specified in GB/T 20967.

5.1 Inspection and acceptance

5.1.1 The bar shall be inspected by the supplier to ensure that the product quality meets the requirements of this Standard and the purchase order (or contract), and fill in the quality certificate. determined to be unqualified.

5.5.2 If the dimension deviation is unqualified, such piece of bar is determined to be unqualified.

5.5.3 When the mechanical property of any sample is unqualified, a double number of samples shall be taken from the batch of bars for repeated inspection. If all the repeated inspection results are qualified, such batch of products shall be determined to be qualified. If there are still unqualified samples in the repeated inspection results, such batch of products shall be determined to be unqualified.

5.5.4 When the macrostructure of any sample is unqualified, it shall be determined as follows:

- a) If it is unqualified due to the cracks, oxide film, metal compound and manganese compound segregation, such batch shall be rejected.
- b) If it is unqualified due to tail shrinkage, coarse crystal ring, bright ring and stratification, it is allowed to cut a certain length of the unqualified bar and repeat the inspection until it is qualified. The remaining bars may be inspected one by one; only the qualified shall be delivered; or they may be delivered according to the re-inspection to the maximum

tail-cutting length of qualified bars. When other defects occur, such batch of bars shall be dealt with through consultation between the supplier and the purchaser.

5.5.5 When the ultrasonic flaw detection is unqualified, such piece of bar is determined to be unqualified.

5.5.6 When the appearance quality is unqualified, such piece of bar is determined to be unqualified.

6 Marking, Packaging, Transportation, Storage and

Quality Certificates

6.1.1 Product marking

6.1.1.1 The following marks (or signs with the following marks) shall be stamped on the front end of the bar that has passed the acceptance test:

- a) The marks of the supplier's technical supervision department;