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

GB/T 38714-2020

High thermal conductivity magnesium alloy profiles

高导热镁合金型材

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1 Scope

China's national standard for magnesium alloy profiles of high thermal conductivity. It specifies the technical requirements, the test methods, the inspection rules and the marking. The application is heat dissipation in electronics, and the reason magnesium is a candidate is weight: it is the lightest structural metal, and a heat sink or an electronics housing that must also be carried - in a laptop, a drone, a portable radio - is weighed as well as measured for thermal performance. The difficulty is that the alloying elements that give magnesium its strength are precisely the ones that scatter electrons and destroy its thermal conductivity, so a high conductivity alloy is a compromise struck differently from a structural one. Pure magnesium conducts about as well as aluminium alloys do; each per cent of aluminium or zinc added takes a substantial fraction of that away. Specifying the profile therefore means specifying a composition close to the limit of what will still extrude.

This Standard specifies the technical requirements, test methods, inspection rules and marking, packaging, transportation, storage, quality certificate and order form (or contract) contents of high thermal conductivity magnesium alloy profiles. This Standard applies to magnesium alloy extruded profiles whose thermal conductivity is not less than $110 \text{ W} \cdot (\text{m} \cdot \text{K})^{-1}$ (hereinafter referred to as profiles).

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the dated version applies to this document. For undated references, the latest edition (including all amendments) applies 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 5156-2013, Magnesium alloy extruded profiles

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 aluminium and magnesium alloys products

GB/T 17432, Methods of sampling for analyzing the chemical composition of wrought aluminum and aluminum alloys

GB/T 20967, Non-destructive testing - Visual testing - General principles

GB/T 22588, Determination of thermal diffusivity or thermal conductivity by the flash method

GB/T 32792, Packing, marking, transporting and storing of magnesium alloy wrought products

3.7.2 The surface of the profile is allowed to have defects such as squeeze marks, pressure injuries, bumps, bubbles, scrapes, scratches, humps, depressions whose depth does not exceed the negative deviation.

4 Test method

4.1 Chemical composition Perform the chemical analysis and arbitration of the profile according to the method that is specified in GB/T 13748.

4.2 Dimension deviation Use a measuring equipment of corresponding accuracy to measure the dimension deviation of the product.

4.3 Mechanical property Perform the vertical room temperature mechanical property test method of the profile according to the method that is specified in GB/T 16865.

4.4 Thermal conductivity Measure the thermal conductivity of the profile according to the thermal conductivity method that is specified in GB/T 22588.

4.5 Macro-structure Perform the test method of macro-structure of the profile according to the method that is specified in GB/T 4297.

4.6 Appearance quality Perform the test method of appearance quality of the profile according to the method that is specified in GB/T 20967.

5.1 Inspection and acceptance

5.1.1 The profile shall be inspected by the supplier to ensure that the profile quality complies with the requirements of this Standard and the order form (or the contract); the

supplier shall fill in the quality certificate.

5.1.2 The buyer shall inspect the received profiles in accordance with the provisions of this Standard. If the test result is inconsistent with the provisions of this Standard and the order form (or the contract), a written form shall be submitted to the supplier; the issue shall be decided by negotiation between the supplier and the buyer. Objections of surface quality and external dimensions shall be filed within one month from the date of receipt of the profile; objections of other properties shall be filed within three months from the date of receipt of the profile. If arbitration is required, it shall be determined through negotiation between the supplier and the buyer.

5.2 Batch Profiles shall be submitted for acceptance in batches; each batch shall consist of profiles of the same designation, the same state, the same specification, the same melting time and the same heat treatment furnace. The batch weight is not limited.

5.3 Inspection items

5.3.1 The inspection items and sampling of the profile shall comply with the provisions of Table 4. The inspection items are divided into delivery inspection items and type inspection items.

5.3.2 Each batch of profiles, before being delivered, shall be subjected to inspections of chemical composition, dimension deviation, mechanical properties, macro-structure and appearance quality.

5.3.3 In any of the following situations, type inspection shall be carried out:

- a) trial-production customization identification of new profiles or old profiles that are transferred to the factory;
- b) when the material and process of the profile are changed significantly, which may affect the performance of the profile;
- c) when the structure of the profile is changed significantly;
- d) when the production of the profile is resumed after a suspension;
- e) when the delivery inspection result is significantly different from the previous type inspection;
- f) when no type inspection has been carried out for two consecutive years;
- g) when it is requested by the buyer;
- h) when the national quality supervision institutions propose a requirement to carry out type inspection.

6.2 Packaging, transportation and storage

6.2.1 The profiles shall be protected and packed. When there are special requirements, it shall be negotiated between the supplier and the buyer and indicated in the order form (or contract).

6.2.2 Other requirements for packaging, transportation and storage of profiles shall be implemented in accordance with GB/T 32792.

6.3 Quality certificate Each batch of profiles shall be accompanied by a profile quality certificate, which indicates:

- a) supplier name, address, telephone, fax;
- b) profile name;
- e) dimensions and accuracy grade;
- f) batch number;
- g) net weight and piece number;
- h) inspection results of each analysis item;
- i) inspection stamp of the supplier's technical supervision department;
- j) number of this Standard;
- k) date of packaging (or date of manufacture).

7 Order form (or contract) contents

The order form (or contract) that orders the profiles which are listed in this Standard shall include the following contents:

- a) profile name;