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High thermal conductivity magnesium alloy profiles

**高导热镁合金型材**

（English Translation）

（送审稿）

ICS 77.120.10

H 60

National Standard of the People’s Republic of China

GB/T 38714—2020

Foreword

### SAC/TC 243 is in charge of the English translation. In case of any doubt about the contents of English translation, the Chinese original shall be considered authoritative.

This standard is drafted in accordance with the rules given in the GB / T 1.1-2009 Directives for standardization-part 1： Structure and drafting of standards.

This standard was proposed by China Nonferrous Metals Industry Association.

This standard was prepared by SAC/TC 243 National Technical Committee for Standardization of Nonferrous Metals.

**High thermal conductivity magnesium alloy profiles**

1. Scope

This standard specifies the technical requirements, test methods, inspection rules and marking, packaging, transportation, storage, quality certificates and order forms (or contracts) of high thermal conductivity magnesium alloy profiles.

This standard is applicable to the magnesium alloy extruded profiles (hereinafter referred to as profiles) with the thermal conductivity not less than 110 W·(m·K)-1.

1. Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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 8170, *Rules of rounding off for numerical values & expression and judgement of limiting values*

GB/T 13748 *(all parts), Chemical analysis methods of magnesium and magnesium alloys*

GB/T 16475, *Temper designation system for wrought aluminium and aluminium alloys*

GB/T 16865, *Test pieces and method for tensile test for wrought aluminium and magnesium alloys products*

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

GB/T 20967, *Non-destructive testing―Visual testing*

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*

1. Technical requirements
	1. Classification of profiles
		1. Designation and temper

Designation and temper of the profiles shall conform to the requirements in Table 1. When the purchaser has other requirements of designations or tempers, it shall be negotiated between the supplier and the purchaser and specified in the order form (or contract).

Table 1 Designation and temper

|  |  |
| --- | --- |
| Designations | Tempers |
| M1C、M2S、ME20M、ZE20M | H112 |
| ZK60A、ZM51M | T5 |

* + 1. Marking of profiles

Marking of profiles is expressed in the order of profile’s name, this standard number, designation, temper, model and dimension. Examples of markings are expressed as follows:

Example 1:

An order of profile for designation of ME20M, temper of H112, model of XC141-7, indeterminate dimension is as follows:

Profile GB / T 38714- ME20M H112- XC141-7

Example 2:

An order of profile for designation of ZK60A, temper of T5, model of XC6283, dimension with 3800 mm in length is as follows:

Profile GB / T 38714- ZK60A T5- XC6283 × 3800

* 1. Chemical composition

The chemical composition of the profiles shall be in accordance with GB/T 5153.

* 1. Allowable deviation of dimensions

The allowable deviation of dimensions of the profiles shall be in accordance with the ordinary level in GB / T 5156-2013.

* 1. Mechanical properties at room temperature

The longitudinal tensile properties of the profiles at room temperature shall conform to the requirements in Table 2.

Table 2 Tensile properties at room temperature

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Designation | Temper | Tensile strength RmMPa | Yield strength Rp0.2MPa | Fracture Elongation A % |
| Not less than |
| M1C | H112 | 215 | 140 | 13.0 |
| M2S | H112 | 210 | 155 | 10.0 |
| ZE20M | H112 | 210 | 120 | 19.0 |
| ME20M | H112 | 185 | 135 | 8.0 |
| ZK60A | T5 | 310 | 235 | 12.0 |
| ZM51M | T5 | 310 | 260 | 10.0 |

* 1. Thermal conductivity

The thermal conductivity of the profiles shall conform to the requirements in Table 3.

Table 3 Thermal conductivity

|  |  |  |
| --- | --- | --- |
| Designation | Temper | Thermal conductivity W·(m·K)-1 |
| Not less than |
| M1C | H112 | 130 |
| M2S | H112 | 125 |
| ZE20M | H112 | 125 |
| ME20M | H112 | 120 |
| ZK60A | T5 | 115 |
| ZM51M | T5 | 120 |

* 1. Macrostructure

3.6.1 Defects such as cracks, pores, and tail shrinkage that damage the continuity of metals are not permitted in the macrostructure of profiles.

3.6.2 Lamination with a depth of no more than half of the deviation of thickness is permissible in the macrostructure of profiles.

* 1. Appearance

3.7.1 The surface of the profile shall be clean. Defects such as cracks, corrosion spots and various intrusions that affecting the application are not permitted.

3.7.2 Defects with the depth not exceeding the negative deviation, such as extrusion trail, dent, bruise, bubble, abrade, scratch, convex and concave, are permitted on the surface of the profiles.

1. Test methods

4.1 Chemical composition

The chemical analysis and arbitration of the profiles shall be conducted in accordance with GB / T 13748.

4.2 Dimensional deviation

The dimensional deviation of the profiles is measured by measuring instruments with corresponding accuracy.

4.3 Mechanical properties

The test method of mechanical properties for the profiles shall be in accordance with GB / T 16865.

4.4 Thermal conductivity

The thermal conductivity of the profiles is measured in accordance with the thermal conductivity method as specified in GB / T 22588.

4.5 Macrostructure

The macrostructural test method of the profiles shall be in accordance with GB / T 4297.

4.6 Appearance

The test method of appearance for the profiles shall be in accordance with GB / T 20967.

1. Inspection rules

5.1 Inspection and acceptance

5.1.1 The profiles shall be inspected by the supplier to ensure that quality of the profiles conforms to the requirements of this standard and the order form (or contract). The quality certificate shall be filled in.

5.1.2 The purchaser shall inspect the received profiles in accordance with the provisions of this standard. In case of dispute of inspection results with the provisions of this standard and the order form (or contract), the dispute shall be submitted to the supplier in written form, and determination should be made through consultation between the supplier and the purchaser. Objections that belonging to the surface quality or external dimensions shall be filed within one month from the date of receiving the profiles. Objections to other problems shall be filed within three months from the date of receiving the profiles. If arbitration is needed, it shall be determined through consultation between the supplier and the purchaser.

5.2 Batch

The profiles shall be submitted for acceptance in batches, and each batch shall consist of the same designation, the same temper, the same dimensions, the same melting furnace 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 profiles shall conform to the requirements in Table 4. The inspection items are divided into delivery inspection items and type inspection items.

5.3.2 Each batch of profiles shall be inspected for chemical composition, dimensional deviation, mechanical properties, macrostructure and appearance before delivery.

5.3.3 Type inspection shall be carried out when any of the following circumstances occur:

a) When new profile is developed or plant transfer of primary profile;

b) When the raw materials or production processes of the profile have changed greatly which may affect the performance of the profile;

c) When the structure of the profile is changed greatly;

d) When production of profiles is resumed after a period of stoppage;

e) When the inspection results are significantly different from the last inspection;

f) When no type inspection has been performed for two consecutive years;

g) When type inspection is requested by the purchaser;

h) When type inspection is requested by national quality supervision agency.

Table 4 Inspection items and sampling

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Inspection items | Sampling rules | Requirement Clauses | InspectionClauses | Delivery inspection | Type inspection |
| Chemical composition | In accordance with GB / T 17432, and one sample is taken from each batch | 3.3 | 4.1 | √ | √ |
| Dimensional deviation | Inspected one by one | 3.4 | 4.2 | √ | √ |
| Mechanical properties at room temperature  | Sampling in accordance with GB / T 16865. Sampling number shall be 10% of the number of profiles in each batch, but not less than two samples. Each sample should be cut in the tail end of the selected extruded profile. | 3.5 | 4.3 | √ | √ |
| Thermal conductivity | Sampling in accordance with GB / T 22588. Sampling number shall be 10% of the number of profiles in each batch, but not less than two samples. Each sampling should be cut in the tail end with small thickness of the selected extruded profile.  | 3.6 | 4.4 | - | √ |
| Macrostructure | Sampling number shall be 10% of the number of profiles in each batch, but no less than two samples. Each sampling should be cut in the tail end of the selected extruded profile | 3.7 | 4.5 | √ | √ |
| Appearance  | Inspected one by one | 3.8 | 4.6 | √ | √ |

5.4 Assessment of inspection results

5.4.1 When the chemical composition is unqualified, the batch is unqualified.

5.4.2 When the dimensional deviation is unqualified, the profile is unqualified.

5.4.3 When the mechanical properties is unqualified, reinspection shall be taken with double the quantity of samples cut from the batch of profiles (including the original unqualified profiles). If any of the samples in the reinspection is still unqualified, the batch of profiles is unqualified.

5.4.4 When thermal conductivity is unqualified, the batch is unqualified.

5.4.5 When the macrostructure of any sample is unqualified, it shall be assessed as follows:

a) When the samples have unqualified cracks, oxide films, segregation of metal compounds and manganese compounds, the batch shall be scrapped.

b) When the samples have unqualified tail shrinkage and lamination, it is allowed to reinspection after cutting off a certain length of the unqualified profile until qualified. Other profiles shall be either inspected one by one and the qualified profiles are delivered or the profiles are cut with maximum unqualified length from the retest and then delivered. In case of other defects, the batch of profiles shall be negotiated by both parties.

5.4.6 When the appearance is unqualified, the profile is unqualified.

1. Marking, packaging, transportation, storage and quality certificate

6.1 Marking

6.1.1 Profile marking

The following marking shall be stamped in the front of the qualified profile (or a label with the following marking):

a) Stamp of the supplier's technical supervision department;

b) Designation;

c) Temper;

d) Dimensions;

e) Profile batch number.

6.1.2 Packaging marking

Marking of the packaging box of the profile shall be in accordance with GB / T 32792.

6.2 Packaging, transportation and storage

6.2.1 Profiles shall be packed with protection. If there are special requirements, it shall be negotiated between the supplier and the purchaser and specified in the order form (or contract).

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

6.3 Quality certificate

Quality certificate shall be provided for each batch of profiles, which includes:

a) Supplier name, address, telephone, fax;

b) Profile name;

c) Designation;

d) Temper;

e) Dimensions and accuracy levels;

f) Batch number;

g) Net weight and number of packages;

h) All inspection results;

i) Stamp of the supplier's technical supervision department;

j) This standard number;

k) Packaging date (or manufacturing date).

1. Order form (or contract)

The order form (or contract) of the profiles using this standard shall include:

a) Profile name;

b) Designation;

c) Temper;

d) Dimensions and allowable deviation;

e) Net weight or number of packages;

f) Special requirements of purchaser:

——Special requirements for dimensional deviation;

——Special requirements for tensile properties;

——Special requirements for package;

——Other special requirements;

g) This standard number;

h) Others.