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Wrought aluminum and aluminum alloy ingots made of high pure materials

高纯金属为原料的变形铝及铝合金铸锭

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Wrought aluminum and aluminum alloy ingots made of high pure materials

1 Scope

This Standard specifies requirements, test methods, inspection rules, marks, packaging, transport, storage as well as contents quality certificate and order sheet (or content) for wrought aluminum and aluminum alloy ingots made of high pure materials.

This Standard is applicable to wrought aluminum and aluminum alloy ingots that require low content of impurity elements (hereinafter referred to as ingots).

2 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 3190, *Wrought aluminum and aluminum alloys - Chemical composition limits*

GB/T 3199, *Wrought aluminum and aluminum alloy products-Packing, marking, transporting and storing*

GB/T 3246.1, *Inspection method for structure of wrought aluminum and aluminum alloy products - Part 1: Inspection method for microstructure*

GB/T 3246.2, *Inspection method for structure of wrought aluminum and aluminum alloy products - Part 2: Inspection method for macrostructure*

GB/T 7999, *Optical emission spectrometric analysis method of aluminum and aluminum alloys*

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

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

GB/T 20975 (all parts), *Methods for chemical analysis of aluminum and*

extremely low content of impurity element.

3.1.2 Dimensions

Dimensions of round ingots shall comply with provisions of YS/T 67. Dimensions of flat ingots shall comply with provisions of YS/T 590.

3.1.3 Marks and examples

Ingot marks shall be represented according to a sequence of product name, reference to standard, purity level of main raw material, designation, dimensions. Marking examples are as follows:

Example 1:

Flat ingots of which designation is Al99.99, purity level of main raw material is 4N, thickness is 420mm, width is 1620mm, length is 6000mm, are marked as follow:

Flat ingots GB/T 33912-4NAl99.99 420×1620×6000

Example 2:

Round ingots of which designation is 1G50, purity level of main raw material is 5N, diameter is 220mm, length is 6000mm, are marked as follow:

Round ingots GB/T 33912-5N1G50 Φ220×6000

3.2 Chemical composition

3.2.1 Chemical composition of main raw material shall comply with provisions of Table 2. Chemical composition of other raw material shall be indicated in order sheet (or contract) after supplier and purchaser negotiate. When it is not indicated, it shall be decided by supplier.

3.2.2 Chemical composition of ingots of which designations are Al99.99, Al99.998, Al99.999, Al99.9995 shall comply with provisions of Table 2. Chemical composition of ingots of which designations are 1G50, 4G60, 5G82, 6G61 shall comply with provisions of Table 3.

supplier and purchaser. Arbitration analysis shall adopt method specified in GB/T 20975 or method agreed by supplier and purchaser.

4.1.2 Conventional chemical analysis is only carried out for elements that have numerical regulation other than columns of “Al” and “Other” in Table 2, Table 3. When it is suspected that mass fraction of non-conventional analysis elements exceeds limit value of this Standard, manufacturer shall analyze these elements.

4.1.3 “Al” content is calculated by method specified in GB/T 3190. When calculating “Al” content, take the sum of analysis values of conventional analysis element and suspected excess unconventional analysis elements as “Sum of element content”.

4.1.4 Determination of analysis value uses rounding-off comparison method. Value rounding-off rules are in accordance with relevant provisions in GB/T 8170. Rounding-off digit shall be the same as limit digit specified in Table 2, Table 3 or agreed between supplier and purchaser.

4.2 Hydrogen content

4.2.1 Testing of hydrogen content may use online liquid-state hydrogen measurement or solid-state hydrogen measurement. In arbitration, it shall use solid-state hydrogen measurement.

4.2.2 Liquid-state hydrogen measurement method shall be in accordance with provisions on closed-loop method in YS/T 600-2009.

4.2.3 Solid-state hydrogen measurement method shall be in accordance with provisions in Annex B of GB/T 33911-2017.

4.3 Slag content

Inspection method for slag content shall be determined by supplier and purchaser after negotiation.

4.4 Size deviation

Testing method for size deviation of round ingots shall be in accordance with method specified in YS/T 67. Testing method for size deviation of flat ingots shall be in accordance with method specified in YS/T 590.

4.5 Macrostructure

Inspection method for macrostructure shall be in accordance with provisions of GB/T 3246.2.

4.6 Microstructure

Inspection of grain size shall be performed according to provisions of GB/T 3246.1.

4.7 Appearance quality

Under natural scattered light, visually check appearance quality. When necessary, it may borrow dimensional measurement tools to define defect size. Determine defect depth by grinding.

5 Inspection rules

5.1 Inspection and acceptance

5.1.1 Ingots are inspected by supplier to ensure ingot quality complies with provisions of this Standard and order sheet (or contract). Fill quality certificate by supplier.

5.1.2 Purchaser shall inspect received ingots according to this Standard. When inspection results fail to comply with provisions of this Standard and order sheet (or contract), it shall be proposed to supplier in written form and be solved by supplier and purchaser after negotiation. Objections to appearance quality and size deviation shall be proposed within one month since ingots are received. Objections to other performances shall be proposed within three months since ingots are received. If arbitration is required, it may entrust authority recognized by supplier and purchaser to perform. Sampling shall be conducted jointly at purchaser's site.

5.2 Batching

Ingots shall be submitted for acceptance in batches. Each batch shall be composed of ingots of same furnace time (or two furnace times), of same dimensions.

5.3 Weighing

Ingots shall be weighed out.

5.4 Inspection items

5.4.1 Each batch of ingots shall be subject to inspections of chemical composition, size deviation and appearance quality.

5.4.2 Selectively check hydrogen content, slag content, grain size and macrostructure.

5.5 Sampling

Only accepted products are delivered.

5.6.6 When appearance quality of any ingot fails, this ingot shall be rejected.

6 Marks, packaging, transport, storage and quality certificate

6.1 Marks

On side and sawing upper part of ingots that are inspected as accepted, print mark that contains following information (or stick label that contains following information):

a) inspection seal of supplier's quality inspection department (signature or stamp of inspector);

b) melting sequence number, designation and dimensions;

c) product lot number or date of production.

6.2 Packaging

Ingots are not applied with oils, are not packed in case. Others are in accordance with GB/T 3199. If oil application, casing or packing mode, method different from GB/T 3199 is required, it shall be agreed by supplier and purchaser and indicated in order sheet (or contract).

6.3 Transport and storage

Transport and storage of ingots shall comply with provisions of GB/T 3199.

6.4 Quality certificate

Each batch of ingots shall be attached with quality certificate, indicating:

a) supplier's name;

b) product name and dimensions;

c) designation;

d) melting sequence number;

e) weight, number of pieces;

f) reference to this Standard;

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