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Replacing YS/T 67-2012

Wrought Aluminum and Aluminum Alloy Billets

变形铝及铝合金圆铸锭

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Wrought Aluminum and Aluminum Alloy Billets

1 Scope

This Standard specifies the requirements, test methods, inspection rules, marking, packaging, transportation, storage and quality certificate and order (or contract) content of wrought aluminum and aluminum alloy billets.

This Standard applies to billets (hereinafter referred to as billets) of wrought aluminum and aluminum alloys (except 4××× series alloys) for processing such as extrusion and forging.

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) is applicable to this Document.

GB/T 3190 Wrought aluminum and aluminum alloy - Chemical composition

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 8005.1 Aluminum and aluminum alloy terms and definitions - Part 1: Product and method of processing and treatment

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

mass fractions".

5.1.4 The rounding comparison method is used to determine the analytical value. The numerical rounding rules are in accordance with the relevant provisions of GB/T 8170. The rounding digits shall be consistent with the limit digits specified in GB/T 3190.

5.2 Purity

5.2.1 Hydrogen content

5.2.1.1 The hydrogen content can be detected by online liquid hydrogen measurement or solid-state hydrogen measurement. Solid-state hydrogen measurement shall be used during arbitration analysis.

5.2.1.2 The test method for liquid hydrogen measurement shall be carried out in accordance with the provisions of YS/T 600.

5.2.1.3 The test method for solid-state hydrogen measurement shall be carried out in accordance with the provisions of Appendix B in GB/T 33911-2017.

5.2.2 Slag content

The test method for slag content is carried out in accordance with the corresponding test methods given in GB/T 32186-2015.

5.3 Dimensional-deviation

5.3.1 Dimension rounding

Dimensional measurements do not allow for rounding.

5.3.2 Outer and inner diameters

5.3.2.1 The outer diameter shall be measured anywhere between or on both end faces of the billet by measuring tools of corresponding accuracy.

5.3.2.2 The inner diameter shall be measured on both ends of the billet by measuring tools of corresponding accuracy.

5.3.3 Length

Use measuring tools of appropriate accuracy for measurements.

5.3.4 Curvature

Use a 1000 mm long ruler and place it against the surface of the billet along the length direction. Then use a measuring tool of corresponding accuracy to measure the maximum gap (h_1) between the billet and the ruler. This value (h_1) is the curvature of the billet on a length of 1000

5.4 Macrostructure

The test method of macrostructure shall be carried out in accordance with the provisions of GB/T 3246.2.

5.5 Microstructure

The test method of microstructure shall be carried out in accordance with the provisions of GB/T 3246.1.

5.6 Appearance quality

Visually inspect the appearance quality under natural scattered light. If necessary, the size of the defect can be defined by a dimensional measuring tool; and the depth of the defect can be measured through grinding.

6 Inspection Rules

6.1 Inspection and acceptance

6.1.1 The billets shall be inspected by the supplier to ensure that the quality of the billets complies with the provisions of this Standard and the order form (or contract); and a quality certificate shall be filled out.

6.1.2 The purchaser shall inspect the billets received in accordance with the provisions of this Standard. If the inspection results are inconsistent with the provisions of this Standard and the order form (or contract), it shall be submitted to the supplier in written, and the matter shall be resolved through negotiation between the supplier and the purchaser. Objections related to appearance quality and dimensional deviations shall be raised within one month from the date of receipt of the billets. Objections related to the structure and performance shall be raised within three months from the date of receipt of the billets. If arbitration is needed, it can be entrusted to an organization recognized by both the supplier and the purchaser, and sampling can be done jointly at the purchaser side.

6.2 Batching

Billets shall be submitted for acceptance in batches; and each batch shall be composed of billets of the same casting time and specifications.

6.3 Weighting

Products should be checked for weight.

6.4 Inspection items

Each batch of billets shall be inspected for chemical composition, dimensional deviation,

6.6 Judgment of inspection results

6.6.1 If the chemical composition of any specimen is unqualified, the batch of billets shall be deemed to be unqualified.

6.6.2 If the hydrogen content or slag content of any specimen is unqualified, the batch of billets shall be deemed to be unqualified.

6.6.3 If the dimensional deviation of any billet is unqualified, the billet shall be deemed to be unqualified. Other billets shall be inspected one by one and those that pass shall be delivered.

6.6.4 When the macrostructure of any specimen is unqualified, the judgment shall be as follows:

a) If the oxide film is unqualified, the batch of billets shall be deemed to be unqualified.

b) If the specimen is unqualified due to unqualified non-metallic inclusions, looseness, coarse compounds, or compound segregation, 400mm from both ends of the billet represented by the specimen shall be cut; and then resample for repeated test. Only 1 repeat test is allowed. When the repeated test results are all qualified, other billets in the batch shall be delivered after cutting off 400mm from both ends. If any specimen is unqualified as a result of repeated test, the batch of billets shall be deemed to be unqualified.

c) If the specimen is unqualified due to other defects, resample and repeat the test. When the repeated test results are all qualified, other billets in the batch shall be delivered after cutting off the top and end to the same length as that of the retaken specimen. When the repeated test results show any sample is unqualified, the supplier is allowed to inspect the billet piece by piece; and deliver the qualified ones.

6.6.5 When the microstructure of any specimen is unqualified, if the product can distinguish the heat treatment furnace number, the furnace number represented by the specimen shall be judged to be unqualified. Other furnace numbers shall be inspected in sequence, and the qualified ones shall be delivered. If the furnace number cannot be distinguished, the batch of billets shall be unqualified.

6.6.6 If the appearance quality of any billet is unqualified, the billet shall be deemed to be unqualified.

7 Marking, Packaging, Transportation, Storage and Quality Certificate

7.1 Marking

7.1.1 The end face of each billet is marked with the alloy designation, melting number, root

number, blank number, state and inspection stamp.

7.1.2 Each bundle of billets shall be accompanied by a label, indicating:

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

b) Product name;

c) Designation;

cl) Melting number;

e) State.

7.2 Packaging, transportation and storage

Billets are packaged as bare parts, and transportation and storage are carried out in accordance with the provisions of GB/T 3199. Other packaging, transportation, and storage methods can be determined through negotiation between the supplier and the purchaser and then specified in the order form (or contract).

7.3 Quality certificate

Each batch of billets shall be accompanied by a product quality certificate that meets the requirements of this Standard, indicating:

a) Supplier's name, address, telephone, and fax;

b) Product name;

c) Designation;

d) Melting number;

e) Casting number;

f) Dimensional specifications;

g) Net weight and number of pieces;

h) Various inspection results and technical supervision department stamps;

i) This standard number;

j) Exit-factory date or date of packaging.

content of MgCl-KCl series can be relaxed to 2%; and other requirements shall be implemented in accordance with YS/T 491.

A.2.7 The flux is not allowed to contain SO_4^{2-}, PO_4^{2-}, NO^{3-}, heavy metals and other harmful components that have adverse effects on the environment. It is not allowed to contain organic matter or anti-caking agent that can decompose other toxic substances at the melting temperature of pure aluminum and aluminum alloys.

A.2.8 The concentration of alkali metals and alkaline earth metals Na^+, Li^+, and Ca^{2+} in the flux should be controlled, and the presence of free Na^+ is not allowed to exist.

A.3 Online treatment

A.3.1 The inert gas used for online degassing should use argon gas with a content greater than 99.994%; online degassing should use a fully enclosed degassing device with a degassing rate greater than 50% and a temperature change of inlet and outlet less than 15°C; others shall be implemented according to YS/T 851.

A.3.2 When selecting online degassing equipment, the relationship between degassing efficiency and residence time should be carefully considered.

A.3.3 For the grain refinement, Al-Ti-B or Al-Ti-C wire should be added online. For double-zero foil and hot-rolled strips for CTP printing, plates for beverage cans, level-AA, level-A flaw detection products and materials used for important engineering, and other aluminum and aluminum alloy which have high requirements on the internal structure, Al-Ti-B or Al-Ti-C wires that meet the requirements of Grade A in YS/T 447 should be used.

A.3.4 Appropriate filter media and degassing devices should be selected according to product requirements and YS/T 601.

A.4 Casting

A.4.1 The thermal-insulating furnace should be a tilting furnace.

A.4.2 The overall slope of the launder between the furnace outlet and the casting platform inlet shall be controlled to avoid surface disturbance of the aluminum melt during the flow process.

A.4.3 According to the flow rate of the melt during casting, a launder with a smaller cross-section or a launder with good thermal insulation performance should be used.

A.4.4 The cooling water temperature should be controlled between 24°C and 35°C.

A.4.5 Chemical composition sample blanks should also be taken before the last filter inlet.

A.4.6 During the casting process, the liquid level difference between the inlet and outlet of the filter device shall be observed at any time. The normal liquid level difference is between 5 mm and 25 mm. If the liquid level difference is too high or too low, the filter medium shall be

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