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Aluminum Alloy Extruded Tubes for High-frequency Electric Transformer

电站高频导电用铝合金挤压管材

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Aluminum Alloy Extruded Tubes for High-frequency Electric Transformer

1 Scope

This Standard specifies the requirements, test methods, inspection rules and marking, packaging, transportation, storage, quality certificate and order form (or contract) contents of aluminum alloy extruded tubes for high-frequency electric transformer.

This Standard applies to aluminum alloy round tubes (hereinafter referred to as tubes) which are produced by divergent die extrusion in the fields of transmission, transformation and distribution.

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 231.1, Metallic materials. Brinell hardness test. Part 1: Test method

GB/T 3048.2, Test methods for electrical properties of electric cables and wires. Part 2: Test of electrical resistivity of metallic materials

GB/T 3190, Wrought aluminum and aluminum alloy. Chemical composition

GB/T 3199, Wrought aluminium and aluminium 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 3246.1, Inspection method for structure of wrought aluminum and aluminum alloy products. Part 2: Inspection method for macrostructure

GB/T 4436, Wrought aluminum and aluminum alloy tubes. Dimensions and deviations

GB/T 4437.2, Aluminium and aluminium alloy extruded tubes. Part 2: Seam tubes

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

4.1.1 The analysis method of chemical composition shall comply with requirements of GB/T 20975 or GB/T 7999; the arbitration analysis shall adopt the methods which are specified in GB/T 20975.

4.1.2 Perform routine chemical analysis only on the numerically specified elements other than those in the columns of the “Aluminum” and “Other” of grade-6101B in GB/T 3190. When the mass fraction of the non-routine analysis element is suspected to exceed the limit value of this Standard, the producer shall analyze these elements.

4.1.3 The “Al” content is calculated according to the method which is specified in GB/T 3190. When the “Al” content is calculated, take the sum value of the analytical values of the conventional analytical elements and the suspected excess unconventional analytical elements as the “sum of elemental content”.

4.1.4 The determination of analysis value is based on the rounding comparison method; the value rounding rules shall be carried out in accordance with the relevant provisions of GB/T 8170; the rounding digit shall be consistent with the limit digits which are specified in Table 3 of this Standard or GB/T 3190.

4.2 Size inspection

The tube size is tested according to the provisions of GB/T 4436.

4.3 Tensile mechanical properties at room temperature

The tensile test method of the tubes at room temperature shall be carried out in accordance with the provisions of GB/T 16865.

4.4 Brinell hardness

The Brinell hardness test of the tubes shall be carried out in accordance with the provisions of GB/T 231.1.

4.5 Conductivity

The conductivity test of the tubes shall comply with the provisions of GB/T 12966 or GB/T 3048.2. The arbitration shall be performed in accordance with the provisions of GB/T 3048.2.

4.6 Low-magnification organization

The test method of low-magnification organization of the tubes shall comply with the provisions of GB/T 3246.2.

4.7 Microstructure

The test method of microstructure of the tubes shall comply with the provisions

of GB/T 3246.1.

4.8 Appearance quality

Visually inspect the appearance quality under natural scattered light. If necessary, use dimensional measurement tools to define the defect size; determine the defect depth by grinding.

5 Inspection rules

5.1 Inspection and acceptance

5.1.1 The product shall be inspected by the supplier to ensure that the product 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 products 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 settled by negotiation between the supplier and the buyer. Objections of appearance quality and dimension deviation shall be filed within one months from the date of receipt of the product; objections of other performances shall be filed within three months from the date of receipt of the product. Arbitration, if required, may be carried out by an organization which is recognized by both the supplier and the buyer; the sampling shall be jointly done on the buyer's site.

5.2 Batch

Tubes shall be submitted for acceptance in batches. Each batch shall consist of tubes of the same alloy grade, status and dimensions.

5.3 Weight

The tubes shall be weighed on the scales.

5.4 Inspection items

Each batch of tubes, before being delivered, shall be tested for chemical composition, dimension deviation, tensile mechanical properties at room temperature, conductivity, low-magnification organization, microstructure and appearance quality.

5.5 Sampling

The sampling of the tubes shall comply with the requirements of Table 5.

represented by the sample as unqualified; inspect other melting orders in turn, and deliver the qualified ones. If the melting order cannot be distinguished, judge the batch as unqualified.

5.6.2 When the dimension deviation of any sample is unqualified, judge the batch of products as unqualified; however, it is allowed to inspect one by one, and deliver the qualified ones.

5.6.3 When the vertical tensile mechanical properties at room temperature of any sample are unqualified, take double the number of samples from the batch (or heat treatment furnace) of products to perform repeated tests; if the repeated test results are all qualified, judge the batch (or heat treatment furnace) of products to be qualified. If the sample properties are still unqualified in the repeated test result, then, judge the batch (or heat treatment furnace) of products to be unqualified. The supplier is allowed to inspect the products one by one and deliver those qualified ones. The supplier is also allowed to re-sample after another heat treatment to inspect the tensile mechanical properties at room temperature, conductivity and microstructure.

5.6.4 When the conductivity of any sample is unqualified, judge the batch (or heat treatment furnace) to be unqualified. The supplier is allowed to inspect the products one by one and deliver the qualified ones. The supplier is also allowed to re-inspect the tensile mechanical properties at room temperature, conductivity and microstructure after another heat treatment

5.6.5 When the low-magnification organization of any sample is unqualified, judge as follows:

a) If the low-magnification organization is unqualified because of metallurgical defects such as cracks, bright grains, non-metallic inclusions, foreign metal inclusions, white spots and primary crystals, judge the batch of products to be unqualified.

b) If the low-magnification organization is unqualified because of layering and shrinkage, it is allowed to cut a portion from the extrusion end of the tube for repeated test until it is qualified; then, other products of the batch shall be tailed according to the maximum length of the above defect distribution OR inspected one by one; deliver the qualified ones.

c) If the low-magnification organization is unqualified because of welding quality, it is allowed to cut a portion from the extrusion front end of the tube for repeated test until it is qualified; then, other products of the batch shall be tailed according to the maximum length of the above defect distribution OR inspected one by one; deliver the qualified ones.

5.6.6 When the microstructure of any sample is unqualified, judge the batch (or heat treatment furnace) of products to be unqualified.

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