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

GB/T 22641-2020

Replacing GB/T 22641-2008

Wrought aluminium alloy sheets and plates for ships

船用铝合金板材

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1 Scope

China's national standard for wrought aluminium alloy sheet and plate for shipbuilding. It specifies the requirements, the test methods, the inspection rules and the marks, packaging, transport, storage, quality certificate and order content. Aluminium is used in a ship for one reason and it costs a great deal to use: a hull or a superstructure in aluminium weighs roughly half what the steel equivalent does, and on a fast vessel that weight is the difference between the speed it can reach and the fuel it burns getting there. So the material goes into fast ferries, patrol craft, workboats and the superstructures of larger ships where topweight matters. What it has to survive is seawater, and that limits the alloys sharply. The 5000 series, aluminium with magnesium, and the 6000 series, aluminium with magnesium and silicon, are the only families used, because the copper-bearing high-strength alloys of the 2000 and 7000 series corrode in a marine atmosphere. Even within the 5000 series there is a trap the standard has to address: an aluminium-magnesium alloy above about three per cent magnesium can, if held warm for long enough, precipitate a continuous magnesium-rich phase at the grain boundaries, and that phase is anodic to the grain interior - the plate then becomes susceptible to exfoliation and to intergranular stress corrosion, and it fails in service years later. So the standard specifies not only the composition and the mechanical properties but the temper and the tests for exfoliation and intergranular corrosion, which are what distinguish marine plate from ordinary plate of the same alloy. Issued on 31 March 2020 and in force since 1 February 2021, it replaces GB/T 22641-2008.

This Standard specifies the requirements, test methods, inspection rules and signs,

packaging, transportation, storage, quality certificate and order form (or contract) contents of wrought aluminium alloy sheets and plates for ships. This Standard applies to wrought aluminium alloy sheets and plates for ships (hereinafter referred to as plates).

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 232, Metallic materials - Bend test

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

GB/T 3880.1, Wrought aluminium and aluminium alloy plates, sheets and strips for general engineering - Part 1: Technical conditions of delivery

GB/T 3880.3-2012, Wrought aluminium and aluminium alloy plates, sheets and strips for general engineering - Part 3: Tolerances on forms and dimensions

GB/T 6519, Ultrasonic inspection of wrought aluminium and magnesium alloy products

GB/T 7999, Optical emission spectrometric analysis method of aluminum and aluminum alloys For the plate, of which the thickness is not less than

6.00 mm, when ultrasonic flaw detection performance is required, the supplier and the buyer shall negotiate and indicate the ultrasonic flaw detection and inspection level in the order form (or contract).

3.12 Appearance quality

3.12.1 The surface of the plate shall be flat, smooth and well processed; the edges of the plate shall be flat and free of burrs.

3.12.2 The surface of the plate shall not have flaws, such as cracks, creases, nitrate marks, layering, corrosion, oxidized inclusions, peeling, air bubbles, severe metal and non-metallic intrusions or mechanical damage, that affect the subsequent processing or use.

3.12.3 The surface of the plate is allowed to have slight dents, bruises, scrapes, stickies, and imprints that do not affect the use of the buyer; but its depth shall not exceed half the

allowable negative deviation of the thickness of the plate; and the thickness deviation of the plate shall not exceed the allowable range.

3.12.4 After obtaining the consent of the user or the user representative, it is allowed to repair the surface defects of the plate by machining or grinding. The depth of the repair shall not exceed the allowable negative deviation of the thickness and shall not have any adverse effects on the material. Unless otherwise agreed, all repairs shall be performed in the presence of the user or user representative. Welding repairs are not allowed.

3.12.5 Other appearance quality requirements shall comply with the provisions of GB/T 3880.1.

4.1 Chemical composition

4.1.1 The chemical composition shall be tested according to the method that is specified in GB/T 20975 or GB/T 7999; the arbitration analysis test shall be performed according to the method that is specified in GB/T 20975.

4.1.2 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 GB/T 3190.

4.2 Hydrogen content Perform the inspection according to the method that is specified in YS/T 600.

4.12 Appearance quality Perform the inspection according to the method that is specified in GB/T 3880.1.

5.1 Inspection and acceptance

5.1.1 The plate shall be inspected by the supplier's technical supervision department to ensure that the product quality meets the requirements of this Standard or the order form (or contract); the supplier shall fill in the quality certificate.

5.1.2 The buyer shall re-inspect the received plate. If the re-inspection result is found to be inconsistent with the provisions of this Standard, it shall be submitted to the supplier in writing within three months from the date of receipt of the plate, and shall be resolved through consultation between the supplier and the buyer. If an arbitration is required, the arbitration sampling shall be carried out jointly by both parties.

5.2 Batch Plates shall be submitted for acceptance in batches; each batch shall consist of the same designation, melting time, status, specifications, dimensional accuracy grade, heat treatment furnace (or continuous heat treatment furnace). The weight of each batch is determined by negotiation between the supplier and the buyer.

5.3 Weight The products shall be weighed on the scales (unless it is otherwise agreed by

the supplier and the buyer).

5.4 Inspection classification Product inspection is divided into delivery inspection and periodic inspection.

5.5 Inspection items and process assurance items

5.5.1 The inspection items and process assurance items of the delivery inspection and periodic inspection shall comply with the requirements in Table 6.

5.7.3 When the dimension deviation of any of the samples is unqualified, judge the batch of plates as unqualified. With the permission of the buyer, it can be inspected one by one on the supplier side; the qualified ones can be delivered.

5.7.4 When the mechanical property test result of any sample is unqualified, a double number of samples shall be taken from the batch (including the original unqualified ones) for repeated testing. If the repeated test is qualified, judge the batch of plates as qualified. If there are still unqualified ones in the repeated test, judge the batch of plates as unqualified. However, the supplier is allowed to perform a repeated heat treatment to re-sample and test.

5.7.5 When the bending performance of any sample is unqualified, a double number of samples shall be taken from the batch (including the original unqualified ones) for repeated testing. If the repeated test is qualified, judge the batch of plates as qualified. If there are still unqualified ones in the repeated test, judge the batch of plates as unqualified. However, the supplier is allowed to perform a repeated heat treatment to re-sample and test.

5.7.6 When the exfoliation corrosion resistance of any sample is unqualified, judge the batch of plates to be unqualified. However, the supplier is allowed to perform a repeated heat treatment to re-sample and test.

5.7.7 When the intergranular corrosion of any sample is unqualified, judge the batch of plates to be unqualified. However, the supplier is allowed to perform a repeated heat treatment to re-sample and test.

5.7.8 When the macro-structure performance of any sample is unqualified, judge the batch of plates to be unqualified.

5.7.9 When the microstructure of any sample is unqualified, if the heat treatment furnace number of the plates can be distinguished, judge the furnace number to be unqualified; if the furnace number cannot be distinguished, judge the batch of plates to be unqualified.

5.7.10 When the ultrasonic flaw detection result of any sample is unqualified, judge the piece of plate to be unqualified.

5.7.11 When the appearance quality of any sample is unqualified, judge the piece of plate to be unqualified.