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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 1173-2013

Replacing GB/T 1173-1995

Casting aluminum alloy

铸造铝合金

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This standard replaces GB/T 1173-1995 "Casting aluminium alloys". Compared with GB/T 1173-1995, the main technical changes are as follows:

- the chemical composition of the alloys was revised: in alloy ZAlSi7Mg1A (ZL114A) the mass fraction of Mg was changed from 0.45 % to 0.6 % into 0.45 % to 0.75 %, and the mass fraction of Be from 0.04 % to 0.07 % into 0 % to 0.07 %; - the alloy grade ZAlSi7Cu2Mg was added; - the mass fraction of the impurity element Sn was changed from 0 % to 0.01 % into 0 % to 0.05 %; - a spectrometric method for checking the chemical composition of the alloys was added; - the sampling method for the chemical composition and the mechanical properties of the alloys was revised; - a re-test rule for non-conforming hardness was added.

This standard was proposed by and is under the jurisdiction of the National Technical Committee on Foundry of Standardization Administration of China (SAC/TC 54).

Organization responsible for drafting: Shenyang Research Institute of Foundry.

Participating drafting organizations: Anhui Huiling West Kitchen Equipment Co., Ltd.; Tianjin Lizhong Alloy Group Co., Ltd.; Fuxin Wanda Foundry (Group) Co., Ltd.; Ningbo Branch of China Ordnance Science Research Academy; Anhui Hengtai Power Technology Co., Ltd.; Qingdao Zhengda Foundry Co., Ltd.; Beijing Institute of Aeronautical Materials of AVIC; FAW Foundry Co., Ltd.

Principal drafters: Feng Zhijun, Wang Mingcang, Ge Sujing, Gao Yuliang, Zhan Liang, Chen Dahui, Liu Chuang, Zhang Gaowei, Song Jingqing, Liu Guoli, Meng Ying.

The previous editions of the standard replaced by this standard are: GB/T 1173-1986 and GB/T 1173-1995.

1 Scope

This standard specifies the grades and codes, the technical requirements, the test methods and the inspection rules of casting aluminium alloys.

This standard applies to the casting aluminium alloys used for aluminium alloy castings, die castings excepted.

2 Normative references

The following documents are indispensable to the application of this document. For dated references, only the edition bearing the date applies; for undated references, the latest edition (including all amendments) applies.

GB/T 228.1 Metallic materials - Tensile testing - Part 1: Method of test at room temperature · GB/T 231.1 Metallic materials - Brinell hardness test - Part 1: Test method · GB/T 5678 Sampling methods for spectrum analysis of casting alloys · GB/T 7999 Method for photoelectric emission spectrometric analysis of aluminium and aluminium alloys · GB/T 8063 Designation of cast non-ferrous metals and their alloys · GB/T 8170 Rules of rounding off for numerical values and expression and judgement of limiting values · GB/T 9438 Aluminium alloy castings · GB/T 20975 (all parts) Methods for chemical analysis of aluminium and aluminium alloys

3 Alloy grades and codes

3.1 Designation of the alloy grades - the grades of casting aluminium alloys are designated in accordance with GB/T 8063.

3.2 Alloy codes - in this standard the alloy code consists of the letters "ZL", from the Chinese phonetic spelling for cast aluminium, followed by three Arabic numerals. The first numeral after ZL indicates the series of the alloy, 1, 2, 3 and 4 standing respectively for the aluminium-silicon, aluminium-copper, aluminium-magnesium and aluminium-zinc series, and the second and third numerals indicate the serial number of the alloy within the series. The letter "A" is appended to the code of a high-quality alloy.

3.3 Codes for the casting method and the modification treatment - S, sand casting; J, permanent mould casting; R, investment casting; K, shell mould casting; B, modification treatment.

3.4 Codes for the heat treatment condition of the alloy - F, as-cast; T1, artificial ageing; T2, annealing; T4, solution treatment plus natural ageing; T5, solution treatment plus incomplete artificial ageing; T6, solution treatment plus full artificial ageing; T7, solution

treatment plus stabilizing treatment; T8, solution treatment plus softening treatment.

4 Technical requirements

4.1.1 The chemical composition of the casting aluminium alloys is given in Table 1 and the permissible content of their impurities in Table 2. The main elements of the alloy composition and the main impurity elements, as determined by the purchaser, are the elements that shall be checked; the remaining impurity elements are analysed only when the purchaser so requires.

4.1.2 Aluminium-silicon alloys requiring modification shall be modified with sodium or strontium, sodium salts and aluminium-strontium master alloys included; other modifiers or modification methods are permitted provided the service properties of the alloy are not impaired.

4.1.3 For service in a marine environment, the copper content of alloy ZL101 shall be not greater than 0.1 %.

4.1.4 For permanent mould casting, the silicon content of alloy ZL203 is permitted to be at most 3.0 %.

4.1.5 Where the iron content of alloy ZL105 is greater than 0.4 %, the manganese content shall be greater than half the iron content.

4.1.6 Where alloys ZL201 and ZL201A are used for parts working at high temperature, zirconium shall be added in a proportion of 0.05 % to 0.20 %.

4.1.7 To raise the mechanical properties, alloys ZL101 and ZL102 are permitted to contain 0.08 % to 0.20 % of yttrium and alloy ZL203 0.08 % to 0.20 % of titanium; their iron content shall then be not greater than 0.3 %.

4.1.8 Aluminium alloy products in contact with food shall not contain beryllium; the arsenic content shall be not greater than 0.015 %, the zinc content not greater than 0.3 % and the lead content not greater than 0.05 %.

4.1.9 Where the impurity content is expressed as the sum of the impurities, the content of each element not listed shall, unless otherwise specified, be not greater than 0.05 %.

4.2.1 The mechanical properties of separately cast test bars of the casting aluminium alloys under sand casting, permanent mould casting, investment casting and shell mould casting are given in Table 3. The mechanical properties of casting aluminium alloys are checked on separately cast or cast-on test bars, and may also be checked on test bars cut from the body of a casting of the same melt; the acceptance indices for cast-on test bars and for test bars taken from the body of the casting shall be those specified in GB/T 9438.

4.2.2 Except where the purchaser specifies that it be checked against the requirements of Table 3, the hardness value is for reference only and is not a basis for acceptance.

4.3 Heat treatment process - the heat treatment process of the alloy shall be agreed between the supplier and the purchaser. The recommended heat treatment processes are given for information in Annex A.

5 Test methods

5.1 Chemical composition - the chemical composition of the alloys shall be checked by the methods specified in GB/T 20975 or GB/T 7999. Other test methods are permitted provided the accuracy of the analysis is assured. In case of dispute over the analytical result, arbitration shall be carried out in accordance with GB/T 20975.

5.2.1 The tensile test shall be carried out in accordance with GB/T 228.1.

5.2.2 The hardness test shall be carried out in accordance with GB/T 231.1.