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Cryogenic-resistant controlled expansion alloys

耐低温定膨胀合金

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Cryogenic-resistant controlled expansion alloys

1 Scope

This Standard specifies the order content, classification and code, dimension, shape, weight, technical requirements, test methods, inspection rules, packaging, marking and quality certificate of cryogenic-resistant iron-nickel-cobalt-based controlled expansion alloys.

This Standard applies to iron-nickel-cobalt-based controlled expansion alloy 4J329D bars, flats, foils, strips, wires, pipes that are matched or sealed with semiconductors, hard glass, etc. in the field of space optoelectronics, semiconductor industry and other harsh deep-low temperature applications (hereinafter referred to as alloy materials).

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 223.5 Steel and iron - Determination of acid-soluble silicon and total silicon content - Reduced molybdosilicate spectrophotometric method

GB/T 223.9 Iron, steel and alloy - Determination of aluminium content - Chrome azurol S photometric method

GB/T 223.12 Methods for chemical analysis of iron, steel and alloy - The sodium carbonate separation-diphenyl carbazide photometric method for the determination of chromium content

GB/T 223.17 Methods for chemical analysis of iron, steel and alloy - The diantipyryl methane photometric method for the determination of titanium content

GB/T 223.19 Methods for chemical analysis of iron, steel and alloy - The neocuproine-chloroform extraction photometric method for the determination of copper content

GB/T 223.20 Methods for chemical analysis of iron, steel and alloy - The potentiometric titration method for the determination of cobalt content

GB/T 6394 Determination of estimating the average grain size of metal

GB/T 8651 Flaw detection method by the ultrasonic plate wave for metal plates

GB/T 11170 Stainless steel - Determination of multi-element contents - Spark discharge atomic emission spectrometric method (Routine method)

GB/T 14985-2007 General rules of dimensions, shape, surface, quality, testing method and inspection for expansion alloys

GB/T 20066 Steel and iron - Sampling and preparation of samples for the determination of chemical composition

GB/T 20123 Steel and iron - Determination of total carbon and sulfur content - Infrared absorption method after combustion in an induction furnace (routine method)

GB/T 20125 Low-alloy steel - Determination of multi-element contents - Inductively coupled plasma atomic emission spectrometric method

GB/T 24183 Metallic materials - Earing test

GB/T 38938-2020 High strength and low expansion alloy

GB/T 38939 Nickel-based alloy - Determination of multi-element contents - Spark discharge atomic emission spectrometric method (routine method)

YB/T 5242 General rules of packaging, marking and quality certification for precision alloys

YB/T 5321-2006 Determination of hermeticity of expansion alloys

3 Order content

Contracts or orders ordered in accordance with this Standard shall at least include the following content:

a) serial number of this Standard;

b) product name;

c) designation;

d) delivery state;

e) dimension and allowable deviation;

f) weight or quantity;

g) phase transition level;

h) other special requirements.

4 Classification and code

4.1 According to hardness, alloy materials can be divided into:

a) soft state (S);

b) 1/4 hard state (H 1/4);

c) 1/2 hard state (H 1/2);

d) 3/4 hard state (H 3/4);

e) hard state (H).

4.2 According to processing method, alloys can be divided into:

a) deep drawn state (DQ);

b) cold drawn (WCD);

c) cold drawn polished (WCDG);

d) hot rolled (forged) state (WH).

5 Dimension, appearance and weight

5.1 The dimension, shape and allowable deviation of alloy wires, strips, flats, bars and pipes shall comply with the relevant provisions of GB/T 14985-2007.

5.2 The dimension, shape and allowable deviation of alloy foils shall comply with the provisions of Table 1. The thickness accuracy level shall be indicated in the contract. If it is not indicated, the products shall be delivered with normal accuracy.

Table 1 -- Dimension and allowable deviation of cold rolled foils mm

Thickness	Allowable deviation of thickness		Width	Allowable deviation of width
	General accuracy	Higher accuracy		Edge-cut
0.015 ~ 0.03	±0.003	±0.0015	10 ~ 100	±0.15
> 0.03 ~ 0.05	±0.005	±0.0025	10 ~ 100	±0.20

6.6.2.2 The average grain size of alloy bars and flats in the delivery state shall be level 3 or finer. This inspection may be exempted when the phase transition inspection is qualified.

6.7 Air permeability

According to the requirements of the purchaser, bars with a diameter or side length not less than 15 mm may be subjected to air permeability inspection, and there shall be no air leakage.

6.8 Process performance

Deep drawn strips, or strips delivered in hard state after proper heat treatment, shall have good deep-drawing performance and shall not have ears during deep-drawing. The allowable earing height shall be combined with the specific stamping parts, agreed upon between the supplier and the purchaser, and indicated in the contract.

6.9 Ultrasonic testing

6.9.1 Bars with a diameter or side length not less than 12 mm shall be subjected to ultrasonic testing, and the conformity level shall meet the requirements of Level A of GB/T 4162-2008.

6.9.2 Flats and plates may be subjected to ultrasonic testing according to GB/T 8651. The conformity level shall be agreed upon between the supplier and the purchaser and indicated in the contract.

6.9.3 Pipes may be subjected to ultrasonic testing according to GB/T 5777 or other general non-destructive testing methods. The conformity level shall be agreed upon between the supplier and the purchaser and indicated in the contract. If there are disputes caused by different methods, GB/T 5777 shall be the basis for arbitration.

6.10 Surface quality

The surface quality o alloy materials shall comply with the relevant provisions of GB/T 14985-2007.

6.11 Special requirements

Agreed upon between the supplier and the purchaser and indicated in the contract, it may supply alloy materials meeting other special requirements.

7 Test methods

7.1 The inspection items and test methods of alloy materials shall comply with

supplier's technical quality supervision department. The purchaser has the right to carry out inspection and acceptance according to the provisions of this Standard. The air permeability inspection shall be carried out by the purchaser.

8.2 Batching rules

Alloy materials shall be submitted for inspection and acceptance in batches. Each batch shall consist of alloy materials of the same alloy designation, the same furnace number, the same dimension, the same processing method and the same delivery state.

8.3 Sampling quantity and sampling position

The sampling quantity and sampling position of alloy materials shall comply with the provisions of Table 7.

8.4 Re-inspection and determination rules

The re-inspection and determination rules of alloy materials shall comply with the provisions of GB/T 14985-2007.

9 Packaging, marking and quality certificate

The packaging, marking and quality certificate of alloy materials shall comply with the provisions of YB/T 5242.

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