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**GH4145 alloy bars and forgings - General
specification**

GH4145 合金棒材和锻件 通用技术条件

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GH4145 alloy bars and forgings - General specification

1 Scope

This Standard specifies the technical requirements, test methods, inspection rules, marking and packaging, and quality certificates of GH4145 alloy bars and forgings.

This Standard applies to GH4145 alloy bars and forgings whose bar diameter is 50 mm ~ 250 mm and forging section thickness is not greater than 250 mm.

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 223.4, Iron, steel and alloy - Determination of manganese content - Potentiometric or visual titration method

GB/T 223.8, Methods for chemical analysis of iron, steel and alloy - The sodium fluoride separation - EDTA titration method for the determination of aluminium content

GB/T 223.11, Iron, steel and alloy - Determination of chromium content - Visual titration or potentiometric titration method

GB/T 223.18, Methods for chemical analysis of iron steel and alloy - The sodium thiosulfate separation iodimetric method for the determination of copper content

GB/T 223.23, Iron, steel and alloy - Determination of nickel content - The dimethylglyoxime spectrophotometric method

GB/T 223.40, Iron, steel and alloy - Determination of niobium content by the sulphochlorophenol S spectrophotometric method

GB/T 223.42, Methods for chemical analysis of iron, steel and alloy - The anion-exchange separation-bromopyrogallol red photometric method for the determination of tantalum content

GB/T 223.59, Iron, steel and alloy - Determination of phosphorus content - Bismuth phosphomolybdate blue spectrophotometric method and antimony phosphomolybdate blue spectrophotometric method

GB/T 223.60, Methods for chemical analysis of iron, steel and alloy - The perchloric acid dehydration gravimetric method for the determination of silicon content

GB/T 223.65, Steel, iron and alloy - Determination of cobalt content - Flame atomic absorption spectrometric method

GB/T 223.68, Methods for chemical analysis of iron, steel and alloy - The potassium iodate titration method after combustion in the pipe furnace for the determination of sulfur content

GB/T 223.71, Methods for chemical analysis of iron, steel and alloy - The gravimetric method after combustion in the pipe furnace for the determination of carbon content

GB/T 223.73, Iron, steel and alloy - Determination of iron contents - Titanium trichloride-potassium dichromate titration method

GB/T 223.84, Steel and iron - Determination of titanium content - Diantipyrylmethane spectrophotometric method

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 702, Hot-rolled steel bars - Dimensions, shape, weight and tolerances

GB/T 908, Forged bars for dimensions, shape, weight and tolerances

GB/T 2039, Metallic materials - Uniaxial creep testing method in tension

GB/T 2101, General requirement of acceptance, packaging, marking and certification for section steel

GB/T 4162, Forged and rolled steel bars. Method for ultrasonic testing

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

GB/T 6402, Steel forgings - Method for ultrasonic testing

GB/T 8541, Terminology of forging and stamping

- d) Non-vacuum induction melting + electroslag remelting;
- e) Electric arc melting + (external refining) + electroslag remelting;
- f) Electric arc melting + (external refining) + vacuum arc remelting;

4.3 Supply status

4.3.1 Bars and forgings can be delivered in hot-rolled or hot-forged state, and can also be supplied in solution treatment after forging; bars can also be supplied in polished or turned state after solution treatment; the supply status shall be indicated in the contract.

4.3.2 When bars and forgings are delivered in the heat treatment state, the heat treatment system is shown in 4.4, and the heat treatment system shall be indicated in the contract.

4.3.3 When it is necessary to supply in other heat treatment states, it shall be decided by the supplier and the buyer through consultation.

4.4 Heat treatment

The supplier stipulates the heat treatment process of the product or sample in the purchase contract or agreement according to the product use requirements:

- a) System I. Homogenization: preserve heat at 885 °C for 24 h $\pm$ 0.5 h, air cooling; aging: preserve heat at 705 °C for 20 h $\pm$ 1 h, air cooling.
- b) System II. Solid solution: preserve heat at 1 150 °C for 2 h ~ 4 h, air cooling; aging: preserve heat at 845 °C for 24 h $\pm$ 1 h, air cooling or furnace cooling to 705 °C or below within 2 h or less time; preserve heat at 705 °C for 20 h $\pm$ 1 h, air cooling.
- c) System III. Solid solution: preserve heat at 980 °C for 1 h, air cooling; aging: preserve heat at 730 °C for 8 h, cool to 620 °C at 55 °C/h; preserve heat for 8 h $\pm$ 0.25 h, air cooling; the total aging time is not less than 18 h. The cooling time of furnace cooling can be adjusted to ensure the total time.

Note 1: The above heat preservation time is the heat preservation time after the sample or product has been heated through.

Note 2: The temperature uniformity of the heat treatment furnace does not exceed ± 10 °C.

4.5 Mechanical property

Bars or forgings shall be submitted for acceptance in batches. Each acceptance batch consists of bars or forgings of the same specification or drawing number, the same production batch, the same melting furnace number, and the same heat treatment batch.

6.2 Inspection items

The inspection items and sampling quantity of bars or forgings shall meet the requirements of Table 3.

6.3 Re-inspection and determination rules

6.3.1 When the chemical composition analysis result is unqualified, re-sample at the unqualified position, and re-inspect the content of the unqualified element. If the re-inspection result is still unqualified, judge the batch of products as unqualified.

6.3.2 When a certain test result of mechanical properties is unqualified, take a double sample near the original sampling position, and re-inspect the unqualified item. If the re-inspection result of one sample is unqualified, judge the batch of bars or forgings as unqualified; for forgings with unqualified mechanical properties, it is allowed to have a re-heat treatment once as a new batch for acceptance.

6.3.3 If the tensile properties the bars or forgings are qualified, the hardness shall not be used as the basis for product rejection.

6.3.4 When the macro-structure and microstructure of bars are unqualified, re-sample at the unqualified parts; if the inspection result is still unqualified, judge the batch of bars as unqualified. When the macro-structure and microstructure of forgings are unqualified, judge the batch of forgings as unqualified.

6.3.5 When the ultrasonic inspection is unqualified, judge the unqualified bar or forging as unqualified.

6.3.6 When the dimensions, shape, and surface quality inspections are unqualified, judge the unqualified bar or forging as unqualified.

6.3.7 If any metallurgical defects that shall not exist in the accepted bars or forgings are found during use and processing, they shall be returned after confirmation by the buyer and the supplier.

7 Marking and packaging

7.1 Marking

Bars shall be marked in accordance with the requirements of GB/T 2101; bars shall be subject to head and tail management and ingot number management. Forgings shall be marked as required by the buyer.

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