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Quality Carbon Structure Steels and Alloy Structure Steels for Large Forgings

大型锻件用优质碳素结构钢和合金结构钢

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Foreword

This Standard was drafted according to the rules given in GB/T 1.1-2009.

This Standard was proposed by China Iron and Steel Association.

The Standard shall be under the jurisdiction of the Technical Committee on Steel of Standardization Committee of China (SAC/TC 183).

The drafting organizations of this Standard: Dongbei Special Steel Group Beiman Special Steel Co., Ltd., China Metallurgical Information and Standardization Institute, Baosteel Special Steel Co., Ltd. and Daye Special Steel Co., Ltd.

The main drafters of this Standard: Qian Chengyun, Luan Yan, Dai Qiang, Zhang Shu Ping and Huang Chenggang.

Quality Carbon Structure Steels and Alloy Structure Steels for Large Forgings

1 Scope

This Standard specifies the classification and codes, order content, dimensions, shape, weight and allowable deviations, technical requirements, test methods, inspection rules, packaging, marking and quality certificates of high quality carbon structure steels and alloy structure steels for large forgings.

This Standard is applicable to forged round steels with nominal diameter greater than 250 mm ~ 1500 mm, forged square steels with side length greater than 250 mm ~ 1300 mm, and forged flat steels with thickness greater than 250 mm ~ 1000 mm and width greater than 250 mm ~ 1700 mm for normal use (hereinafter referred to as forged steels).

2 Normative References

The following documents are essential to the application of this Standard. For the dated references, only the dated editions are applicable to this Standard. For the undated references, their latest editions (including all amendments) are applicable to this Standard.

- GB/T 223 Methods for Chemical Analysis of Iron, Steel and Alloy
- GB/T 225 Steel - Hardenability Test by End Quenching (Jominy Test)
- GB/T 226 Test Method for Macrostructure and Defect of steel by etching
- GB/T 228.1 Metallic Materials - Tensile Testing - Part 1: Method of Test at Room Temperature
- GB/T 229 Metallic Materials - Charpy Notch Impact Test
- GB/T 231.1 Metallic Materials - Brinell Hardness Test - Part 1: Test Method
- GB/T 699 Quality Carbon Structural Steels
- GB/T 908 Forged Bars - Dimensions, Shape, Weight and Tolerances
- GB/T 1979 Standard Diagrams for Macrostructure and Defect of Structural Steels

GB/T 2101 General Provisions on Acceptance, Package, Marking and Quality Certificate for Profile Steel

GB/T 2975 Steel and Steel Products - Location and Preparation of Test Pieces for Mechanical Testing

GB/T 3077 Alloy Structure Steels

GB/T 4162 Forged and Rolled Steel Bars — Method for Ultrasonic Testing

GB/T 4336 Carbon and Low-Alloy Steel—Determination of Multi-Element Contents -Spark Discharge Atomic Emission Spectrometric Method (Routine Method)

GB/T 6394 Metal - Methods for Estimating the Average Grain Size

GB/T 6402-2008 Steel Forgings - Method for Ultrasonic Testing

GB/T 7736 Ultrasonic Inspecting Method for Macro-structure and Imperfection of Steel

GB/T 8170-2008 Rules of Rounding off for Numerical Values & Expression and Judgement of Limiting Values

GB/T 10561 Steel - Determination of Content of Nonmetallic Inclusions - Micrographic Method Using Standards Diagrams

GB/T 11261 Steel and Iron - Determination of Oxygen Content - The Pulse Heating Inert Gas Fusion - Infra-Red Absorption Method

GB/T 13298 Inspection Methods of Microstructure for Metals

GB/T 13299 Steel - Determination of Microstructure

GB/T 15711 Steel Products - Method for Etch Test of Tower Sample

GB/T 17505 Steel and Steel Products - General Technical Delivery Requirements

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 Sulphur Content Infrared Absorption Method after Combustion in an Induction Furnace (Routine Method)

GB/T 20124 Steel and Iron - Determination of Nitrogen Content - Thermal Conductimetric Method after Fusion in a Current of Inert Gas

6.3 Delivery state

6.3.1 The forgings are normally delivered in the state of annealing treatment.

6.3.2 If the purchaser requires and it is indicated in the contract, they can also be delivered in the state of high temperature tempering, normalizing and tempering + normalizing treatment.

6.3.3 If the purchaser requires and it is indicated in the contract, they can also be delivered in the state of special surface treatment (polishing or skinning).

6.4 Manufacturing process

The forgings shall be forged and formed with a forging press with sufficient capacity. Their forging ratio shall meet the following requirements:

a) For the forgings for thermal pressure processing or the forgings made of electroslag steel ingot, their forging ratio shall not be less than 2.0;

b) For the forgings upset in the middle, their forging ratio shall not be less than 2.5;

c) For the forgings used in cutting processing, their forging ratio shall not be less than 3.0.

6.5 Mechanical properties

6.5.1 The delivery hardness of the forgings shall meet the requirements of GB/T 699 and GB/T 3077. When it is not specified, the hardness value of actual measurement shall be provided.

6.5.2 If the purchaser requires and it is negotiated by supplier and purchaser and indicated in the contract, it is allowed to take samples from the test piece forged into 90 mm ~ 100 mm for the test on the mechanical properties of the forgings with nominal dimension not more than 400 mm. Its results shall meet the requirements of GB/T 699 and GB/T 3077.

6.6 Macrostructure

6.6.1 No visible defect is allowed in the test pieces of the cross-section etch macrostructure of the forgings, including residual shrinkage, bubble, crack, inclusion, skull patch and flake.

6.6.2 If the purchaser requires and it is indicated in the contract, for the forgings with nominal dimensions not more than 400 mm, the qualifying level of the etch macrostructure shall meet the requirements of Table 5.

depth and shall transit smoothly. Indentations or pits not exceeding half of the tolerances calculated from the actual dimensions or cracks not exceeding 0.2 mm in depth are allowed.

6.9 Special requirements

If it is agreed by supplier and purchaser and indicated in the contract, the forgings of the following special requirements can be supplied:

- a) Reduce or increase the chemical composition range of the designations listed in GB/T 699 and GB/T 3077;
- b) Control the sulphur content within 0.015% ~ 0.035%;
- c) Use the electroslag remelting process;
- d) Require the analysis of oxygen content or other residual elements;
- e) Provide the V notch impact test values;
- f) Provide the forgings which meet the hardenability requirements;
- g) Macrostructure (when the nominal dimension is more than 400 mm);
- h) Mechanical properties (when the nominal dimension is more than 400);
- i) Test grain size;
- j) Test non-metallic inclusion;
- k) Test tower sample;
- l) Test microstructure;
- m) Conduct test according to GB/T 4162;
- n) and so on.

7 Test Methods

The test items and test methods of the forgings shall meet the requirements of Table 7.

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