GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 77.140.20

H 40

GB/T 38809-2020

General Specification for Low Alloy Ultra-high Strength Steels

低合金超高强度钢通用技术条件

Issued on: June 2, 2020 **Implemented on: December 1, 2020**

Issued by: State Administration for Market Regulation;

Standardization Administration of the People's Republic of China.

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1 Scope

This Standard specifies the order content, dimensions, shape, weight, technical requirements, test methods, inspection rules, packaging, marking and quality certificate of low alloy ultra-high strength steels.

This Standard is applicable to rolled or forged low alloy ultra-high strength steel bars (hereinafter referred to as steel bars).

The designation and chemical composition specified in this Standard are also applicable to steel ingots, billets or their products.

2 Normative References

The following documents are indispensable to the application of this document. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 222 *Permissible Tolerances for Chemical Composition of Steel Products*

GB/T 223.11 *Iron, Steel and Alloy - Determination of Chromium Content - Visual Titration or Potentiometric Titration Method*

GB/T 223.17 *Methods for Chemical Analysis of Iron, Steel and Alloy - The Diantipyrylmethane Photometric Method for the Determination of Titanium Content*

GB/T 223.23 *Iron, Steel and Alloy - Determination of Nickel Content - The Dimethylglyoxime Spectrophotometric Method*

GB/T 223.26 *Iron, Steel and Alloy - Determination of Molybdenum Content - The Thiocyanate Spectrophotometric Method*

GB/T 223.43 *Iron, Steel and Alloy - Determination of Tungsten Content - Gravimetric Method and Spectrophotometric Method*

GB/T 223.53 *Methods for Chemical Analysis of Iron, Steel and Alloy - The Flame Atomic Absorption Spectrophotometric Method for the Determination of Copper Content*

GB/T 223.58 *Methods for Chemical Analysis of Iron, Steel and Alloy - The Sodium*

Arsenite-sodium Nitrite Titrimetric Method for the Determination of Manganese 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 223.69 *Iron, Steel and Alloy - Determination of Carbon Contents - Gas-volumetric Method after Combustion in the Pipe Furnace*

GB/T 223.72 *Iron, Steel and Alloy - Determination of Sulfur Content - Gravimetric Method*

GB/T 223.76 *Methods for Chemical Analysis of Iron, Steel and Alloy - The Flame Atomic Absorption Spectrometric Method for the Determination of Vanadium Content*

GB/T 224 *Determination of Depth of Decarburization of Steels*

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 702 *Hot-rolled Steel Bars - Dimensions, Shape, Weight and Tolerances*

GB/T 908 *Forged Bars - Dimensions, Shape, Weight and Tolerances*

GB/T 2101 *General Requirement of Acceptance, Packaging, Marking and Certification for Section Steel*

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

GB/T 4161 *Metallic Materials - Determination of Plane-strain Fracture Toughness*

GB/T 4162-2008 *Forged and Rolled Steel Bars - Method for Ultrasonic Testing*

GB/T 4336 *Standard Test Method for Spark Discharge Atomic Emission Spectrometric Analysis of Carbon and Low-alloy Steel (routine method)*

GB/T 6394 *Determination of Estimating the Average Grain Size of Metal*

GB/T 8170 *Rules of Rounding off for Numerical Values & Expression and Judgement*

of Limiting Values

GB/T 10121 *Steel Products - Method for Magnetic Particle Inspection of Tower Sample*

GB/T 10561-2005 *Steel - Determination of Content of Nonmetallic Inclusions - Micrographic Method Using Standards Diagrams*

GB/T 13298 *Inspection Methods of Microstructure for Metals*

GB/T 13299 *Steel - Determination of Microstructure*

GB/T 15711 *Inspection of Non-metallic Inclusions of Steel - Etching Test Method of Tower Samples*

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 Sulfur Content - Infrared Absorption Method after Combustion in an Induction Furnace (routine method)*

GB/T 36026-2018 *High-strength Corrosion-resistant Alloy Bars for Oil and Gas Engineering*

GB/T 37566 *Method of Ultrasonic Testing for Round Steel*

YB/T 5293 *Metallic Materials - Forging Test*

3 Order Content

The contract or order form that orders in accordance with this Standard shall at least include the following content:

a) Serial No. of this Standard;

b) Product name;

c) Designation;

d) Specifications and precisions (see Chapter 4);

e) Weight;

f) Smelting method (see 5.2);

g) Delivery state (see 5.3);

Appendix B

(normative)
Magnetic Particle Inspection Method

B.1 Overview

The method specified in this Appendix is merely limited to non-metallic inclusion magnetic particle inspection. During the inspection process, if real fractures are found, such as: cracks, fissures, delamination and folds, then, the steel shall be scrapped, unless these defects are caused by sample preparation.

B.2 Sample Preparation for Magnetic Particle Inspection

B.2.1 In terms of steel bars whose nominal diameter is not less than 300 mm, samples may be prepared in accordance with one of the following methods:

a) From each sample billet, cut a 1/4 section (sufficient margin should be retained) to forge into sample blank with a diameter of 75 mm ~ 150 mm. Make the center of the sample billet roughly on the surface of the sample blank; maintain the axis of the sample blank approximately parallel to the axis of the original bar;

b) Forge the entire section of the steel bar into a round bar with a diameter of 150 mm, then, in accordance with B.2.2, prepare the samples.

B.2.2 In terms of steel bars whose nominal diameter is greater than 150 mm and less than 300 mm, from each sample billet, cut a 1/4 section (sufficient margin should be retained). Through machining or forging, make a sample blank with a diameter of 75 mm ~ 150 mm. In addition, make the center of the sample billet roughly on the surface of the sample blank. Then, process the sample blank into a cylindrical sample with a length of 125 mm. The minimum cutting amount of the sample blank shall comply with the stipulations of B.2.4.

B.2.3 In terms of steel bars whose nominal diameter is not greater than 150 mm, samples may be prepared in accordance with one of the following methods:

a) From each sample billet, cut a 1/4 section (sufficient margin should be retained). Through machining, make a cylindrical sample with a length of 125 mm. In addition, make the center of the sample billet roughly on the surface of the sample. The minimum cutting amount of the sample blank shall comply with the stipulations of B.2.4;

b) Forge the entire section of the steel bar into tower-shaped samples with an equal length. The dimensions of the tower-shaped samples are shown in

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