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NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA

ICS 77.140.70

CCS H 44

GB/T 18669-2025

Replacing GB/T 18669-2012, GB/T 32969-2016

**Steel for ship anchor chain and offshore mooring chain
cables**

船用锚链和系泊链钢

Issued on: June 30, 2025

Implemented on: January 01, 2026

**Issued by: State Administration for Market Regulation;
Standardization Administration of the People's Republic of China.**

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Foreword

This document was drafted in accordance with the rules given in GB/T 1.1-2020 "Directives for standardization - Part 1: Rules for the structure and drafting of standardizing documents".

This document is a consolidated revision of GB/T 18669-2012 and GB/T 32969-2016. It replaces GB/T 18669-2012 "Steel bars for ship anchor chain" and GB/T 32969-2016 "Steel for offshore mooring chain cables". In addition to structural adjustments and editorial changes, compared to GB/T 18669-2012 and GB/T 32969-2016, the main technical changes are as follows:

- The scope has been changed. The grades and codes for Grade 4 anchor chain steel have been added, as have grades and codes for Grade 6 steel for offshore mooring chain cables (see Chapter 1 of this Edition; Chapter 1 of GB/T 18669-2012 and Chapter 1 of GB/T 32969-2016);
- The grades and codes have been changed (see Chapter 4 of this Edition; Chapter 4 of GB/T 32969-2016);
- The designation method has been deleted (see Chapter 4 of GB/T 18669-2012);
- The end shape has been changed (see 6.3 of this Edition; 5.3.3 of GB/T 18669-2012 and 6.3 of GB/T 32969-2016);
- The chemical composition has been changed (see Tables 3 and 4 of this Edition; Table 2 of GB/T 18669-2012 and Table 3 of GB/T 32969-2016);
- Manufacturing method has been changed (see 7.2 of this Edition; 6.2 of GB/T 18669-2012 and 7.2 of GB/T 32969-2016);
- Delivery condition has been changed (see 7.3 of this Edition; 6.3 of GB/T 18669-2012 and 7.3 of GB/T 32969-2016);
- Mechanical properties have been changed (see Tables 6 and 7 of this Edition; Table 3 of GB/T 18669-2012 and Table 5 of GB/T 32969-2016);
- Macro-magnification has been changed (see 7.6 of this Edition; 7.7 of GB/T 32969-2016);
- Non-metallic inclusions have been changed (see 7.7 of this Edition; 7.8 of GB/T 32969-2016);
- The sampling requirements for mechanical properties tests have been changed (see 8.2 of this Edition; 7.3 of GB/T 18669-2012 and 8.2 of GB/T 32969-2016);
- The hydrogen embrittlement of steel for offshore mooring chain cables has been

Steel for ship anchor chain and offshore mooring chain cables

1 Scope

This document specifies the grades and codes, ordering contents, dimensions, appearance, weight, technical requirements, test methods, inspection rules, packaging, marking and quality certificates for steel for ship anchor chain (grades M2, M3, M4) and steel for offshore mooring chain cables (grades R3, R3S, R4, R4S, R5, R6).

This document is applicable to hot-rolled steel for ship anchor chain with a nominal diameter of 13 mm~225 mm and hot-rolled steel for offshore mooring chain cables with a nominal diameter of 30 mm~250 mm for floating production systems, semi-submersible drilling platforms, single-point mooring chain structures, floating production storage and offloading vessels and other marine development facilities (hereinafter referred to as round steel).

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 222, *Permissible tolerances for chemical composition of steel products*

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

GB/T 223.14, *Methods for chemical analysis of iron, steel and alloy. The N-benzoyl-N-phenylhydroxylamine extraction photometric method for the determination of vanadium content*

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*

temperature

GB/T 229, *Metallic materials - Charpy pendulum impact test method*

GB/T 231.1, *Metallic materials -- Brinell hardness test -- Part 1: Test method*

GB/T 232, *Metallic materials -- Bend testing method*

GB/T 1979, *Standard diagrams for macrostructure and defect of structural steels*

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 4162-2022, *Method for ultrasonic testing of forged and rolled steel bars*

GB/T 4336, *Carbon and low-alloy steel -- Determination of multielement contents - Spark discharge atomic emission spectrometric method (routine method)*

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

GB/T 8170-2008, *Rules of rounding off for numerical values and expression and judgement of limiting values*

GB/T 10561-2023, *Determination of content of nonmetallic inclusions in steel - Micrographic method using standard diagrams*

GB/T 11260, *Method for eddy current testing of round steel*

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

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 20124, *Steel and iron -- Determination of nitrogen content -- Thermal conductimetric method after fusion in a current of inert gas*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 steel for ship anchor chain

Round steel used in the manufacture of ship anchor chains.

3.2 steel for offshore mooring chain cables

Round steel used in the manufacture of mooring chains.

3.3 black surface steel

Hot rolled or annealed material with unpeeled surface.

3.4 flake steel

Round steel that has been peeled by a grinding wheel or peeled by turning.

4 Grades and codes

Round steel is divided into different grades and codes according to its tensile strength index, see Table 1.

5 Ordering contents

Contracts or orders for goods ordered under this document must include at least the following:

- a) Reference to this document;

- b) Product name;
- c) Designation;
- d) Specification;
- e) Weight (or quantity);
- f) Surface finish, e.g., black surface steel or flake steel;
- g) Heat-treated finish, e.g., hot-rolled or annealed;
- h) Special requirements.

6 Dimensions, shape, weight

6.1 Dimensions, shapes and tolerances

The dimensions, shape and permissible deviation of round steel shall comply with the provisions of Table 2. Upon negotiation between the supplier and the purchaser and with indication in the contract, the diameter and permissible deviation of steel for offshore mooring chain cables may also be delivered in accordance with Annex A.

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