

ICS 77.140.10

CCS H 40



**NATIONAL STANDARD OF THE  
PEOPLE'S REPUBLIC OF CHINA**

**GB/T 3203-2016**

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**Carburizing steels for bearings**

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**Issued on: December 30, 2016**

**Implemented on: September 1, 2017**

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**Issued by: General Administration of Quality Supervision, Inspection and  
Quarantine;  
Standardization Administration of the PRC**

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### Foreword

This Standard was drafted in accordance with the rules given in GB/T 1.1-2009. This Standard replaces GB/T 3203-1982 Specification for carburizing steels of bearings. Compared with GB/T 3203-1982, the main technical modifications are as follows: - added bright round steel; deleted "steel billet" (see Clause 1 of this Edition); - added "normative references" (see Clause 2 of this Edition); - added "classifications and codes" (see Clause 3 of this Edition); - added "order content" (see Clause 4 of this Edition); - modified size, shape and tolerance (see Clause 5 of this Edition; Clause 1 of Edition 1982); - added designation G23Cr2Ni2Si1Mo and relative technical requirements (see 6.1.1, 6.5, 6.6,

6.8 of this Edition); - added requirements for nickel content in G20CrMo steel and molybdenum content in G20Cr2Ni4 steel (see Table 4 of this Edition; Table 2 of Edition 1982); - modified requirements for silicon, manganese, chromium contents in G20CrNiMo and G20CrNi2Mo steels (see Table 4 of this Edition; Table 2 of Edition 1982); - tightened phosphorus and sulfur contents and added requirements for aluminum, titanium, calcium, oxygen, hydrogen contents (see Table 5 of this Edition; Table 2 of Edition 1982); - deleted flat furnace smelting method (see

2.2 of Edition 1982); - modified mechanical properties to agreement requirements and added G20CrMo steel mechanical properties; modified G20CrNiMo mechanical performance index (see

6.5 of this Edition;

2.4 of Edition 1982); Carburizing steels for bearing

## 1 Scope

China's national standard for carburizing bearing steels, and the current edition of GB/T 3203, replacing the 1982 edition. It specifies the classifications and codes, the order content, the size, shape and weight, the technical requirements, the test methods, the inspection rules, and the packaging, marking and quality certificate for these steels. It applies to hot rolled, forged, cold drawn and bright round carburizing bearing steel used to make bearing rings and rolling elements, and other designations and sizes may be supplied by agreement. A carburizing bearing steel is a low carbon alloy steel that is case hardened rather than through hardened: carbon is diffused into the surface at high temperature and the part is then quenched, so it finishes with a hard, high carbon case over a tough, low carbon core. That structure is what distinguishes it from the through hardening bearing steel of GB/T 18254, and it is chosen where a bearing has to survive shock loading, misalignment or contaminated lubrication - a railway axlebox, a rolling mill, a wind turbine gearbox, a heavy vehicle transmission. A through hardened ring is uniformly hard and correspondingly brittle; a case hardened ring has a core that can absorb an impact without cracking, and a case in residual compression, which resists the fatigue cracking that contaminated lubrication causes. The 1982 edition was thirty-four years old when this revision replaced it, and the changes are correspondingly large: bright round steel added, classifications, codes and order content introduced as clauses, a new designation G23Cr2Ni2Si1Mo added with its requirements, several compositions revised, phosphorus and sulfur tightened, and limits added on aluminium, titanium, calcium, oxygen and hydrogen. Issued on 30 December 2016 and in force since 1 September 2017.

This Standard specifies the classifications and codes, order contents, size, shape, technical requirements, test methods, inspection rules, packaging, marks and quality certificate of carburizing steels for bearing. This Standard is applicable to hot-rolled, forged, cold-drawn carburizing steels for bearing and bright round steel (hereinafter referred to as steel) for production of bearing rings and rolling body use. Agreed by the supplier and the purchaser, the steels of other designations and sizes shall be supplied. The requirements shall be specified in the contract.

## 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, Methods for chemical analysis of iron, steel and alloy - The reduced molybdsilicate spectrophotometric method for the determination of acid-soluble silicon content

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

photometric method

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

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

GB/T 223.23, 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 223.59, 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 223.63, Methods for chemical analysis of iron, steel and alloy--The sodium (potassium) periodate photometric method for the determination of manganese content

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 223.69, Iron, Steel and Alloy-Determination of Carbon Contents- Gas-volumetric Method after Combustion in the Pipe Furnace

GB/T 223.77, Methods for chemical analysis of iron, steel and alloy - The flame atomic absorption spectrometric method for the determination of calcium content

GB/T 223.82, Steel and iron - Determination of hydrogen content - Inert gas impulse fusion heat conductivity method

### 3 Classifications and codes

3.1 Classified according to metallurgical quality.

a) high-quality steel;

b) advanced high-quality steel ("A" is added after designation).

6.2 Smelting method Steel shall be vacuum degassed or electroslag-remelting smelt. High-quality steel shall use electroslag remelting smelting.

6.3 Delivery status The delivery status of steel shall comply with the requirements of Table

7. Agreed by the supplier and the purchaser, indicated in the contract, it can be delivered in other statuses. Table 7 -- Steel delivery status Steel type Delivery status Code Delivery hardness / HBW not greater than G20Cr2Ni

4 Other designation Hot rolled round steel Hot rolled WHR (or AR) - - Hot-rolled annealing WHR + SA 241 229 Forged round steel Hot forged WHF - - Hot-forged annealing WHF + SA 241 229 Cold drawn round steel Cold drawn WCD 241 229 Bright round steel Peeled or polished a SF or SP 241 229 a Agreed by both parties, it can be delivered in coil status.

6.4 Delivery hardness The delivery hardness of steel shall comply with the provisions of Table 7. The hardness of other delivery status of steel shall be agreed by the supplier and the purchaser, indicated in the contract.

6.5 Mechanical properties According to user requirements, steel mechanical properties can be tested. The longitudinal mechanical properties of steel of which the sample is prepared by heat treatment through rough blank shall be determined in accordance with the requirements of Table 8.