

Translated English of Chinese Standard: GB/T13304.2-2008

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NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA

ICS 77.140.01

H 40

GB/T 13304.2-2008

Partially replacing GB/T 13304-1991

Steels Classification - Part 2: Classification of According to Main Quality Classes and Main Property or Application Characteristics

钢分类 第2部分：按主要质量等级和主要性能或使用特性的分类
(ISO 4948-2:1981, MOD)

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Issued on: August 5, 2008

Implemented on: March 1, 2009

Jointly issued by: General Administration for Quality Supervision and
Inspection and Quarantine;
Standardization Administration of China.

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Foreword

GB/T 13304 "Steels Classification" is divided into two parts:

- Part 1: Classification according to chemical composition;
- Part 2: Classification of according to main quality classes and main property or application characteristics.

This Part is the Part 2 of GB/T 13304 "Steels Classification".

This Part modifies and adopts ISO 4948-2:1981 "Steels - Classification - Part 2: Classification of unalloyed and alloy steels according to main quality classes and main property or application characteristics".

This Part is redrafted according to ISO 4948-2:1981. For convenience of comparison, Appendix B (informative) in this Part gives the comparison list of the provisions of this standard and ISO 4948-2:1981.

This Part replaces the Part 2 of GB/T 13304-1991 "Steels Classification".

The main differences between this Part and Part 2 of GB/T 13304-1991 are as follows:

- The standards in "normative references" are listed as Appendix A (Chapter 2 of edition 1991 is changed to Appendix A in this edition);
- Add "terms and definitions" (see Chapter 3);
- The steel classification is compiled according to "brief", "definition" and "example" (chapters 3, 4 and 5 in edition 1991 are changed to chapters 4, 5 and 6 in this edition);
- Update and supplement the normative references (see Chapter 2);
- Update, delete, and supplement the steel classification examples (see Table 1, Table 2 and Table 3);
- Delete same steel classification example; change it to be reference to Table 1, Table 2 and Table 3 (3.1.1.2, 3.1.2.2, 3.1.3.2, 4.1.1.2, 4.1.2.2, 4.1.3.2 and 5.1.2.2 in edition 1991);
- Adjust the "sulphur or phosphorus content maximum" in definitions of "common-quality non-alloy steel" and "common-quality low-alloy steel" from 0.045% to 0.040% (3.1.1.1c) and 4.1.1.1c) in edition 1991; 4.1.1.2c) and 5.1.1.2c) in this edition);

Steels Classification - Part 2: Classification of according to Main Quality Classes and Main Property or Application Characteristics

1 Scope

This Part specifies fundamental principles and requirements of classification for non-alloy steel, low-alloy steel and alloy steel according to main quality class and main property or application characteristics.

This Part is applicable to classification of non-alloy steel, low-alloy steel and alloy steel according to main quality class and main property or application characteristics.

2 Normative References

Provisions of the following documents constitute the provisions of this Part of GB/T 13304 through reference. For dated reference, the subsequent amendments (excluding corrections) or revisions of these publications do not apply. However, the parties who enter into agreement according to these specifications are encouraged to research whether the latest editions of these documents are applicable. For undated references, the latest editions of the normative documents are applicable to this Part.

See Appendix A.

3 Terms and Definitions

For the purpose of this Part, the following terms and definitions apply.

4 General Classification Of Non-alloy Steels

The general classification of non-alloy steels is as follows:

- A) Classification according to main quality class of steel (see 4.1);
- B) Classification according to main property or application characteristics of steel (see 4.2).

4.1 Classification according to main quality class

Non-alloy steels are classified according to the main quality class as follows:

4.2.1 The main property or application characteristic stated in this Part refer to the characteristics considered in priority under some conditions like in formulation system or steel classification.

4.2.2 The classification of non-alloy steels listed in Table 1 according to main property or application characteristic is as follows:

- A) Non-alloy steel with principal characteristic of required strength (or hardness) maximum, e.g., sheet steel for cold forming;
- B) Non-alloy steel with principal characteristic of required strength minimum, e.g. structural steels for ship, pressure vessel and tube/pipe;
- C) Non-alloy steel with major characteristic of required carbon content (except steels specified in item d and e below), e.g. wire rod and quenched and tempered steels;
- D) Unalloyed free cutting steel with sulfur content minimum and smelting assay value not less than 0.070% and (or) added with elements like Pb, Bi, Te, Se, Sn, Ca or P;
- E) Non-alloy tool steel;
- F) Non-alloy steel with specially required magnetic property or electric property, e.g. electromagnetic pure iron;
- G) Other non-alloy steels, e.g. pure iron for raw material.

5 General Classification of Low-alloy Steel

The general classification of low-alloy steel is as follows:

- A) Classification according to main quality class of steel (see 5.1);
- B) Classification according to main property or application characteristics of steel (see 5.2).

5.1 Classification according to main quality class

The main quality class of low-alloy steel is divided into:

- A) Common-quality low-alloy steel;
- B) Good-quality low-alloy steel;
- C) Special-quality low-alloy steel.

(see 6.2).

6.1 Classification according to main quality class

The main quality class of alloy-steel is divided into:

- A) Good-quality alloy-steel (see 6.1.1);
- B) Special-quality alloy-steel (see 6.1.2).

6.1.1 Good-quality alloy-steel

6.1.1.1 Brief

Good-quality alloy-steel refers to the steel that the quality and property (like grain fineness number or formability) shall be specially controlled in the manufacturing process. But the production control of such steel is not stricter than the one for special-quality alloy-steel.

6.1.1.2 Definition

Good-quality alloy-steels are as follows:

- A) Alloy-steel for general engineering structures, like alloy-steel for steel sheet pile (Q420bz in GB/T 20933) and alloy-steel for mine (all designations, except 20Mn2A, 20MnV and 25MnV, in GB/T 10560);
- B) Alloy concrete steel, like alloy-steel in GB/T 20065;
- C) Electrical alloy-steel, mainly containing silicon or silicon/ aluminum, not required in magnetic permeability;
- D) Alloy-steel for rail, like 30CuCr in GB 11264;
- E) Steel for rock and exploratory drilling, like alloy-steel in GB/T 1301;
- F) Wear-resistant steel with sulphur/phosphorus content higher than 0.035%, like high manganese cast steel in GB/T 5680.

6.1.2 Special-quality alloy-steel

6.1.2.1 Brief

Special-quality alloy-steel refers to the steel that the chemical component and specific manufacturing/ technological conditions shall be controlled strictly, to ensure the overall performance improved within the required limit.

6.1.2.2 Definition

Alloy steels, except good-quality alloy-steel defined in 6.1.1.2, are special-quality alloy-steels.

6.1.2.3 General classification and example of special-quality alloy-steel

The general classification and example of special-quality alloy-steel is detailed in column 2~8 in Table 3.

6.2 Classification according to main property and application characteristic

6.2.1 The brief for main property or application characteristic of non-alloy steel stated in 4.2.1 is also applicable to alloy-steel.

6.2.2 The classification of alloy-steel (Table 3) according to main property or application characteristic is as follows:

- A) Alloy-steels for engineering structures, including alloy-steel for general engineering structures, alloy-steels for hot-rolled or cold-rolled product (for cold forming) (steels for pressure vessel, automobile and delivery line), pre-stressing alloy-steel, alloy-steel for mine, high manganese wear-resistant steel, etc.;
- B) Alloy-steels for mechanical structure, including quenched and tempered alloy constructional steel, surface-hardening alloy constructional steel, alloy constructional steel for cold shaping (upsetting and cold extruding), alloy spring steel, except stainless, corrosion-resisting, heat resisting steels and bearing steel;
- C) Stainless, corrosion-resisting and heat resisting steels, including corrosion resisting steel, acid-proof steel, oxidation resisting steel and refractory steel, which microstructure comes with Martensite shaped steel, ferrite shaped steel, austenite shaped steel, austenite-ferrite shaped steel, precipitation hardening shaped steel, etc.;
- D) Tool steels, including alloy tool steel and rapid tool steel. alloy tool steel comes with steel for measuring and cutting tools and impact resisting tool, cold working die steel, hot-work die steel, non-magnetic die steel, plastic die steel; rapid tool steel comes with wolfram-molybdenum series rapid tool steel, wolfram series rapid tool steel and cobalt series rapid tool steel, etc.;
- E) Bearing steel, including high carbon chrome bearing steel, carburizing bearing steels, stainless bearing steel, hot-temperature bearing steel, etc.;
- F) Steels with special physical properties, including magnetically soft steel, permanent magnetic steel, nonmagnetic steel, and high resistance steel and alloy;
- G) Others, like welded alloy-steel.

carbon content	All designations in YB/T 170.2 (except C4D and C7D) B) Low carbon steel wire for general purpose All carbon steel designations in YB/T 5294 C) Hot-rolled checkered steel plate and strip Common-quality carbon structural steel in YB/T 4159	B) Steel for cold heading BL1, BL2 and BL3 in YB/T 4155 ML10 ~ ML45 in GB/T 5953 ML15 and ML20 in YB/T 5144 ML08Mn, ML22Mn, ML25 ~ ML45 and ML15Mn ~ ML35Mn in GB/T 6478 C) Checkered steel plate Good-quality non-alloy steel in YB/T 4159 D) Wire rod steel 25~65 and 40Mn~ 60Mn in GB/T 4354 E) Unalloyed quenched and tempered steel (except special-quality steel) F) Unalloyed surface-hardened steel (except special-quality steel) G) Unalloyed spring steel (except special-quality steel)	H08E and H08C in GB/T 14957 H04E, H08E and H08C in GB/T 3429 B) Carbon spring steel 65~85 and 65Mn in GB/T 1222 All non-alloy steels in GB/T 4357 C) Special wire rod steel 60, 60Mn, 65, 65Mn, 70, 70Mn, 75, 80, T8MnA and T9A (all designations) in YB/T 5100 All non-alloy steels in YB/T 146 D) Unalloyed quenched and tempered steel (meeting the requirement of the requirements in this Part) E) Unalloyed surface-hardened steel (meeting the requirement of the requirements in this Part) F) Flame and induction quenching quenched steel (meeting the requirement of the requirements in this Part) G) Steel for cold upsetting and cold extruding (meeting the requirement of the requirements in this Part)
Unalloyed free-cutting steel		A) Free-cutting structural steels Designations Y08~ Y45, Y08Pb, Y12Pb, Y15Pb and Y45Ca in GB/T 8731	A) Special free cutting steel Requiring testing impact flexibility after heat treatment, etc. Y75 in GJB 1494
Non-alloy tool steel			A) Carbon tool steels All designations in GB/T 1298
Non-alloy steel without magnetic and electric property requirements		A) Unalloyed electrical plates and strips Electrical plates and strips in GB/T 2521 B) Unalloyed electric plates with specified electric conductivity (<9S/m)	A) Unalloyed electric plates with specified electric conductivity ($\geq 9S/m$) B) Unalloyed soft magnetic material with required magnetic property Non-alloy steel specified in GB/T 6983
Other non-alloy steels	A) Steel wire for fence Common-quality non-alloy steel designations in YB/T 4026		A) Pure iron for raw material YT1, YT2 and YT3 in GB/T 9971

Table 2 General Classification and Example of Low Alloy Steels

Classification according to main property	Classification according to main quality class		
	1	2	3
	Common-quality low-alloy steel	Good-quality low-alloy steel	Special-quality low-alloy steel
Weld-able high-tensile alloy structural steel	A) Low alloy structural steels for general purpose Class A steel of designation Q295 and Q345 in GB/T 1591	A) Low alloy structural steels for general purpose Q295B, Q345 (except Class A steel) and Q390 (except Class E steel) in GB/T 1591 B) Low-alloy steel for boiler and pressure vessel All designations, except Q245, in GB 713 All designations, except HP235 and HP265, in GB 6653 16Mn and 15MnV in GB 6479 C) Low-alloy steel for ship A32, D32, E32, A36, D36, E36, A40, D40 and E40 in GB 712 High strength steel in GB/T 9945 D) Low-alloy steel for automobile All designations in GB/T 3273 08Z and 20Z in YB/T 5209 440CL, 490CL and 540CL in YB/T 4151 E) Low-alloy steel for bridge Steels, except Q235q, in GB/T 714 F) Low-alloy steel for delivery line Q295A, Q295B, Q345A and Q345B in GB/T 3091 Q295 and Q345 in GB/T 8163 G) Low-alloy steel for anchor chain CM490 and CM690 in GB/T 18669 H) Steel sheet pile Q295bz and Q390bz in GB/T 20933	A) Low alloy structural steels for general purpose Q390E, Q345E Q420 and Q460 in GB/T 1591 B) Low-alloy steel for pressure vessel 12MnNiVR in GB/T 19189 All designations in GB 3531 C) Low-alloy steel subject to through-thickness characteristics All designations, except Q235GJ, in GB/T 19879 All low alloy designations in GB/T 5313 D) Low-alloy steel for ship F32, F36 and F40 in GB 712 E) Low-alloy steel for automobile CR300/500DP in GB/T 20564.2 590CL in YB/T 4151 F) Low-welding crack-sensitivity steel All designations in YB/T 4137 G) Low-alloy steel for delivery line L390, L415, L450 and L485 in GB/T 21237 H) Low-alloy steel for ship and weapon I) Low-alloy steel for nuclear application
Low-alloy weathering steel		A) Low alloy weathering steel All designations in GB/T 4171	
Low alloy steel for concrete	A) Low alloy concrete steel for general purpose All designations in GB 1499.2		A) Steel for pre-stressed concrete 30MnSi in YB/T 4160
Low-alloy steel for rail	A) Low-alloy light rail steel 45SiMnP and 50SiMnP in GB/T 11264	A) Low-alloy heavy rail steel Designations, except U74, in GB 2585 B) Low alloy rail steel for crane U71Mn in YB/T 5055 C) Profiled steels for railway 09CuPRE in YB/T 5181 09V in YB/T 5182	A) Low alloy wheel steel for railway CL45MnSiV in GB 8601
Low-alloy steel for mine	A) Low-alloy steel for mine M510, M540 and M565 hot-rolled steels in GB/T 3414 All designations in GB/T 4697	A) Low-alloy structural steels for mine M540 and M565 heat-treated steels in GB/T 3414	A) Low-alloy structural steels for mine 20Mn2A, 20MnV and 25MnV in GB/T 10560
Other low-alloy steels		A) Free-cutting structural steels Y08MnS, Y15Mn, Y40Mn, Y45Mn, Y45MnS and Y45MnSPb in GB/T 8731 B) Welding electrode steel H08MnSi and H10MnSi in GB/T 3429	Welding electrode steel H05MnSiTiZrAlA, H11MnSi and H11MnSiA in GB/T 3429

Appendix A
(Normative)
Normative References

GB/T 699-1999 Quality carbon structural steels

GB/T 700-2006 Carbon Structural Steels

GB/T 701-2008 Hot-rolled Low-carbon Steel Wire Rods

GB 712-2000 Hull structural steel

GB 713-2008 Steel Plates for Boiler and Pressure Vessels

GB/T 714-2000 Structural steel for bridge

GB 912-8008 Hot-rolled plates and strips of carbon structural steels and high strength low alloy structural steels

GB/T 1220-2007 Stainless steel bars

GB/T 1221-2007 Heat-resistant steel bars

GB/T 1222-2007 Spring Steel

GB/T 1234 High resistance alloys for electrical heating

GB/T 1298-2008 Carbon tool steels

GB/T 1299-2000 Alloy Tool Steel

GB/T 1301-2008 Hollow drill steels for rock drilling

GB 1499.1-2008 Steel for the reinforcement of concrete - Part 1: Hot rolled plain bars

GB 1499.2-2007 Steel for the reinforcement of concrete - Part 2: Hot rolled ribbed bars

GB/T 1591-1994 Low Alloy High Tensile Structural Steel

GB/T 2100-2002 Corrosion-resistant steel castings for general applications

GB/T 2518-2004 Continuous hot-dip zinc-coated steel sheets and strips

GB/T 2520-2000 Cold-reduced electrolytic tinplate

GB/T 2521-2008 Cold-rolled grain-oriented and non-oriented electrical steel strip (sheet)

GB 2585-2007 Hot-rolled steel rails for railway

GB/T 3007-1999 Alloy Structure Steels

GB/T 3086-2008 High carbon chromium stainless bearing steels

GB 3087-2008 Seamless steel tubes for low and medium pressure boiler

GB/T 3091-2008 Welded steel pipes for low pressure liquid delivery

GB/T 3203-1982 Specification for carburizing steels of bearings

GB/T 3273-2005 Hot-rolled steel plates (sheets) and strips for automobile frames

GB/T 3414-1994 Hot-rolled profiled steels for coal mechanism

GB/T 3429-2002 Wire rod for electrode

GB 3531-2008 Low alloy steel plates for low temperature pressure vessels

GB/T 4171-2008 Weathering Steel

GB/T 4354-2008 Hot rolled quality carbon steel wire rods

GB/T 4357-1989 Carbon spring steel wires

GB/T 4697-2008 Hot-rolled U-type steel for mine timbering

GB 5068-1999 Axles steel for railway locomotive and wagons

GB/T 5213-2008 Cold rolled low carbon steel sheet and strip

GB/T 5216-2004 Structural steels subject to end-quench hardenability requirements

GB 5310-8008 Seamless steel tubes and pipes for high pressure boiler

GB/T 5312-1999 Carbon and carbon-manganese seamless steel tubes and pipes for ship

GB/T 5313-1985 Steel plate with through-thickness characteristics

GB/T 5680-1998 Austenitic manganese steel castings

GB/T 5953-1999 Steel wires for cold heading

GB/T 6478-2001 Steels for cold heading and cold extruding

GB 6479-2000 Seamless steel tubes for high-pressure chemical fertilizer equipment

GB 6653-2008 Steel plates and strips for welded gas cylinders

GB/T 6983-2008 Electromagnetic Pure Iron

GB/T 6967-1986 Medium and high strength stainless steel castings for engineering structure purposes

GB/T 7659-1987 Carbon steel castings suitable for welded structure

- GB/T 21237-2007 Wide and heavy plates for line pipe of petroleum and natural gas
- GJB 1494-1992 Specification for free cutting bright steel wires for special use
- YB/T 146-1998 Hot rolled wire rods for prestressed steel wires and wire ropes
- YB/T 170.2-2000 Non-alloy steel rods for conversion to wire - Part 2: Specific requirements for general purpose wire rod
- YB/T 4026-1991 Galvanized steel wire for net fence
- YB/T 4137-2005 Low welding crack-susceptibility high strength steel plates
- YB/T 4151-2006 Hot rolled steel plate and strip for automobile wheel
- YB/T 4155-2006 Hot-rolled round carbon steel bars and rods for standard parts
- YB/T 4159-2007 Hot-rolled checkered steel plate and strip
- YB/T 4160-2007 Hot rolled wire rods for prestressed concrete steel bar
- YB/T 5035-1996 Seamless steel tubes for automotive axle housing
- YB/T 5055-1993 Crane Rail
- YB/T 5100-1993 Piano wire rods
- YB/T 5144-2006 Carbon structural steel wires for bearing cages
- YB/T 5181-1993 22 Hat shape steel
- YB/T 5182-1993 310 Z Shape steel
- YB/T 5209-2000 Electric-welded tubes for cardan shafts
- YB/T 5227-2000 Hot rolled section steel for automobile wheel felloe
- YB/T 5294-2006 Low carbon steel wire for general uses
- YB/T 5065-2004 Hot-dip lead-tin alloy coated cold rolled carbon steel sheets and strips

Appendix B

(Informative)

Technical Difference and Its Reasons of This Part and ISO 4948-2:1981

Table B.1 gives the list of technical difference and its reasons of this Part and ISO 4948-2:1981

Table B.1 List of technical difference and its reasons of this Part and ISO 4948-2:1981

No. of chapter/article of this standard	Technical difference	Reason
1	Add low-alloy steels	To adapt the actual requirements of the standard system in China
2	Quote some Chinese National Standards, add the standard code and year code, and list the reference standards in Appendix A	To adapt the requirements in standard referencing and formulation in China
4.1.1.2	Revise the specified values of the "sulphur or phosphorus content maximum", "elongation after fracture" and "bending diameter minimum value" according to the actual conditions in China	To adapt the actual conditions of the standard system in China
5	Add this chapter in this standard, which no content in ISO 4948-2:1981 corresponds to	To adapt the actual demand of the standard system in China
6.1.1.1	The content corresponds to the 5.2.1-1 in ISO 4948-2:1981, but it is re-compiled according to the actual conditions in China	To adapt the actual conditions of the standard system in China
6.1.1.2	The content corresponds to the 5.2.1.2 in ISO 4948-2:1981, but it is re-compiled according to the actual conditions in China	To adapt the actual demand of the standard in China
6.1.2.1	Add this article in this standard according to the actual conditions in China, which no content in ISO 4948-2:1981 corresponds to, so as to unify the drafting format	To adapt the actual requirements of the standard format and actual conditions in China
6.2.2	Add this article in this standard according to the actual conditions in China, which no content in ISO 4948-2:1981 corresponds to, so as to unify the drafting format	To adapt the actual requirements of the standard format and actual conditions in China
Table 1	The content corresponds to Table 1 in ISO 4948-2:1981, but it is re-compiled according to the actual conditions in China	To adapt the actual demand of the standard in China
Table 2	The content corresponds to Table 2 in ISO 4948-2:1981, but it is added with new content according to the actual conditions in China	To adapt the actual demand of the standard in China
Table 3	The content corresponds to Table 3 in ISO 4948-2:1981, but it is re-compiled according to the actual conditions in China	To adapt the actual demand of the standard in China

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