
Translated English of Chinese Standard: GB/T4238-2015

www.ChineseStandard.net

Sales@ChineseStandard.net

GB

NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA

ICS 77.140.50

H 46

GB/T 4238-2015

Replacing GB/T 4238-2007

Heat-resisting steel plate, sheet and strip

耐热钢钢板和钢带

GB/T 4238-2015 How to BUY & immediately GET a full-copy of this standard?

1. www.ChineseStandard.net;
2. Search --> Add to Cart --> Checkout (3-steps);
3. No action is required - Full-copy of this standard will be automatically & immediately delivered to your EMAIL address in 0~25 minutes.
4. Support: Sales@ChineseStandard.net. Wayne, Sales manager

Issued on: September 11, 2015

Implemented on: June 1, 2016

**Issued by: General Administration of Quality Supervision, Inspection
and Quarantine of the People's Republic of China;**

**Standardization Administration of the People's Republic of
China.**

Table of Contents

Foreword	3
1 Scope.....	5
2 Normative references	5
3 Order content	8
4 Dimensions, shape, weight and allowable deviation	8
5 Technical requirements	8
6 Test methods	19
7 Inspection rules	20
8 Packing, marking and quality certificate	21
Annex A (informative) Comparing table of heat-resisting steel grades in different countries.....	22
Annex B (informative) Characteristics and uses of heat-resisting steels.....	25
Annex C (informative) Heat treatment system of heat-resisting steels	29

Foreword

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

This Standard replaces GB/T 4238-2007 “Heat-resisting steel plate, sheet and strip”. Compared with GB/T 4238-2007, the main technical changes are as follows:

- ADD six steel grades and related technical requirements;
- ADJUST the chemical composition of the 5 grades and the mechanical properties of 6 grades;
- CHANGE the elongation after fracture of the steel plate, sheet and strip with the thickness not more than 3 mm FROM A TO $A_{50\text{ mm}}$;
- CANCEL the requirement of “when the 16Cr25Ni20Si2 steel plate’s thickness is greater than 25 mm, the mechanical properties are for reference only”;
- REVISE the reinspection and determination rules;
- ADD the mechanical properties and rules of rounding off for chemical composition test results;
- ADD the determination rules of the grain size of some steel grades;
- ADJUST the solid solution treatment temperature of 4 grades in Annex C;
- COMPLEMENT the characteristics and uses in Annex B;
- ADD the informative Annex C, comparing table of heat-resisting steel grades in different countries.

This Standard is proposed by China Iron and Steel Association.

The Standard is under the jurisdiction of National Technical Committee on Steel of Standardization Administration of China (SAC/TC 183).

Main drafting organizations of this Standard: Shanxi Taigang Stainless Steel Co., Ltd., Baosteel Stainless Steel Co., Ltd., Metallurgical Industry Information Standards Institute.

Main drafters of this Standard: Li Guoping, Ren Yongxiu, Xu Zhongjie, Dong Li, Wang Chuandong, Zhang Weixu, Zhang Jianjun.

The previous version of the standards replaced by this Standard are as follows:

- GB/T 4238-1984, GB/T 4238-1992, GB/T 4238-2007;

Heat-resisting steel plate, sheet and strip

1 Scope

This Standard specifies the order content, dimension, shape, weight and allowable deviation, technical requirements, test methods, inspection rules, packaging, marking and quality certificates of heat-resisting steel plates, sheets and strips.

This Standard applies to hot-rolled and cold-rolled heat-resisting steel plates, sheets and strips.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the dated edition applies to this document. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 222 Permissible tolerances for chemical composition of steel products

GB/T 223.3 Methods for chemical analysis of iron, steel and alloy - The diantipyrylmethane phosphomolybdate gravimetric method for the determination of phosphorus content

GB/T 223.4 Alloyed steel - Determination of manganese content - Potentiometric or visual titration method

GB/T 223.5 Steel and iron - Determination of acid-soluble silicon and total silicon content - Reduced molybdosilicate spectrophotometric method

GB/T 223.8 Methods for chemical analysis of iron, steel and alloy - The sodium fluoride separation-EDTA titration method for the determination of aluminium 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 223.16 Methods for chemical analysis of iron, steel and alloy - The chromotropic acid photometric method for the determination of titanium content

GB/T 223.18 Methods for chemical analysis of iron, steel and alloy - The sodium thiosulfate separation iodimetric method for the determination of copper content

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 223.25 Methods for chemical analysis of iron, steel and alloy - The dimethylglyoxime gravimetric method for the determination of nickel content

GB/T 223.26 Iron steel and alloy - Determination of molybdenum content - The thiocyanate spectrophotometric method

GB/T 223.28 Methods for chemical analysis of iron steel and alloy - The α -denzoinoxime gravimetric method for the determination of molybdenum content

GB/T 223.33 Methods for chemical analysis of iron, steel and alloy - The chlorophosphonazo mA photometric method for the determination of cerium content after extraction separation

GB/T 223.36 Methods for chemical analysis of iron, steel and alloy - The neutral titration method for the determination of nitrogen content after distillation separation

GB/T 223.40 Iron steel and alloy - Determination of niobium content by the sulphochlorophenol S spectrophotometric method

GB/T 223.43 Methods for chemical analysis of iron, steel and alloy - Determination of tungsten content

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 223.60 Methods for chemical analysis of iron, steel and alloy - The perchloric acid dehydration gravimetric method for the determination of silicon content

GB/T 223.61 Methods for chemical analysis of iron, steel and alloy - The ammonium phosphomolybdate volumetric method for the determination of phosphorus content

GB/T 20878 Stainless and heat-resisting steels - Designation and chemical composition

3 Order content

The contract or order according to this Standard shall include the following contents:

- a) standard number;
- b) product name;
- c) steel grade or unified digital code;
- d) dimension and precision;
- e) weight (quantity) of the delivery;
- f) surface processing type;
- g) delivery state;
- h) items or indicators in the standard that shall be agreed upon by both supply and demand parties and indicated in the contract, if not indicated, shall be selected by the supply party;
- i) other special requirements put forward by the demand party shall be agreed upon by both supply and demand parties and indicated in the contract.

4 Dimensions, shape, weight and allowable deviation

The dimension, shape, weight and allowable deviation of cold-rolled steel plate, sheet and strip shall comply with the specifications of GB/T 3280. The dimension, shape, weight and allowable deviation of hot-rolled steel plate, sheet and strip shall comply with the specifications of GB/T4237.

5 Technical requirements

5.1 Smelting method

Steel shall adopt the primary smelting of molten steel and furnace refining process.

5.2 Chemical composition

5.2.1 The grade, classification and chemical composition (melting analysis) of steels shall comply with the specifications in Tables 1 to 4. See Annex A for heat-resisting

S31008	06Cr25Ni20	205	515	40	217	95	220
S31608	06Cr17Ni12Mo2	205	515	40	217	95	220
S31609	07Cr17Ni12Mo2	205	515	40	217	95	220
S31708	06Cr19Ni13Mo3	205	515	35	217	95	220
S32168	06Cr18Ni11Ti	205	515	40	217	95	220
S32169	07Cr19Ni11Ti	205	515	40	217	95	220
S33010	12Cr16Ni35	205	560	—	201	92	210
S34778	06Cr18Ni11Nb	205	515	40	201	92	210
S34779	07Cr18Ni11Nb	205	515	40	201	92	210
S38240	16Cr20Ni14Si2	220	540	40	217	95	220
S38340	16Cr25Ni20Si2	220	540	35	217	95	220
^a Use A_{50mm} samples when the thickness is not more than 3 mm.							

5.4.4 The mechanical properties of annealed ferritic heat-resisting steel plates, sheets and strips shall comply with the specifications in Table 6.

Table 6 Mechanical properties of annealed ferritic heat-resisting steel plates, sheets and strips

Unified digital code	Steel grade	Tensile test			Hardness test			Bending test	
		Specified plastic elongation strength $R_{p0.2}/MPa$	Tensile strength R_m/MPa	Elongation after fracture ^a $A/\%$	HBW	HRB	HV	Bending angle	Diameter of bending head D
		Not less than			Not more than				
S11348	06Cr13Al	170	415	20	179	88	200	180°	$D = 2a$
S11163	022Cr11Ti	170	380	20	179	88	200	180°	$D = 2a$
S11173	022Cr11NbTi	170	380	20	179	88	200	180°	$D = 2a$
S11710	10Cr17	205	420	22	183	89	200	180°	$D = 2a$
S12550	16Cr25N	275	510	20	201	95	210	135°	—
Note: a is the thickness of steel plates, sheets and strips.									
^a Use A_{50mm} samples when the thickness is not more than 3 mm.									

5.4.5 The mechanical properties of annealed martensitic heat-resisting steel plates, sheets and strips shall comply with the specifications in Table 7.

Table 7 Mechanical properties of annealed martensitic heat-resisting steel plates, sheets and strips

Unified digital code	Steel grade	Tensile test			Hardness test			Bending test	
		Specified plastic elongation strength	Tensile strength R_m/MPa	Elongation after fracture ^a $A/\%$	HBW	HRB	HV	Bending angle	Diameter of bending head D

223.11, GB/T 223.16, GB/T 223.18, GB/T 223.19, GB/T 223.23, GB/T 223.25, GB/T 223.26, GB/T 223.28, GB/T 223.33, GB/T 223.36, GB/T 223.40, GB/T 223.43, GB/T 223.53, GB/T 223.58, GB/T 223.60, GB/T 223.61, GB/T 223.68, GB/T 223.69, GB/T 11170, GB/T 20123 and GB/T 20124.

6.2 The inspection items, number of samples, sampling method and position and test method of each batch of steel plates, sheets and strips shall meet the requirements in Table 11.

Table 11 Inspection items, number of samples, sampling method and position and test method of steel plates, sheets and strips

Serial number	Test item	Number of samples	Sampling method and position	Test method
1	Chemical composition	1	GB/T 20066	See 6.1
2	Tensile test	1	GB/T 2975	GB/T 228.1
3	Bending test	1	GB/T 2975	GB/T 232
4	Hardness	1	Any plate or any coil	GB/T 230.1, GB/T 231.1, GB/T 4340.1
5	Grain size	1	1/4 width	GB/T 6394
6	Dimensions, shape	Plate by plate or coil by coil	—	GB/T 3280, GB/T 4237
7	Surface quality	Plate by plate or coil by coil	—	Visual observation, GB/T 3280, GB/T 4237

7 Inspection rules

7.1 Inspection of steel plates, sheets and strips shall be carried out by the quality inspection department of supply parties.

7.2 The mechanical properties of steel plates, sheets and strips used as raw materials of cold rolling shall be inspected only when the demand party requires and indicates in the contract.

7.3 Steel plates, sheets and strips shall be accepted in batches. Each batch shall consist of steel plates, sheets and strips of the same grade, the same furnace number, the same thickness and the same heat treatment system.

7.4 The reinspection and determination of other inspection items shall comply with the specifications of GB/T 17505.

	S30920	16Cr23Ni13	Used for the manufacture of furnace stents, conveyor belts, annealing furnace covers, wear-resisting tiles of power plant boiler, etc.
	S30908	06Cr23Ni13	With lower carbon content and better corrosion resistance than 16Cr23Ni13; with basically same uses with 16Cr23Ni13
	S31020	20Cr25Ni20	Oxidation resistant steel that has been heated repeatedly at below 1035 °C. Used for electric tubes, crucibles, furnace parts, nozzles and combustion chambers
	S31008	06Cr25Ni20	With lower carbon content and better corrosion resistance than 20Cr25Ni20; with basically same uses with 20Cr25Ni20
	S31608	06Cr17Ni12Mo2	With excellent creep strength at high temperature. Used for heat exchange components, high temperature corrosion resistant bolts
	S31609	07Cr17Ni12Mo2	Compared with 06Cr17Ni12Mo2, increase the carbon content and appropriately control the austenite grain (usually 7 grade or coarser), which help to improve resistance to high temperature creep and high temperature durability
	S31708	06Cr19Ni13Mo3	With good creep strength at high temperature. Used for heat exchange components
	S32168	06Cr18Ni11Ti	Used for the manufacture of parts used under corrosive conditions at 400 °C ~ 900 °C, and welded structural parts used at high temperature
	S32169	07Cr19Ni11Ti	Compared with 06Cr18Ni11, increase the carbon content and appropriately control the austenite grain (usually 7 grade or coarser), which help to improve resistance to high temperature creep and high temperature durability
	S33010	12Cr16Ni35	Steel with carburization resistance and large nitrification, which has been heated repeatedly at below 1035 °C. Used for furnaces and oil cracking devices
	S34778	06Cr18Ni11Nb	Used for the manufacture of parts used under corrosive conditions at 400 °C ~

Annex C

(informative)

Heat treatment system of heat-resisting steels

See Tables C.1 ~ C.4 for heat treatment system of heat-resisting steels.

Table C.1 Heat treatment system of austenitic steels

Unified digital code	Steel grade	Solid solution treatment
S30210	12Cr18Ni9	$\geq 1040^{\circ}\text{C}$ water cooling or other rapid cooling methods
S30240	12Cr18Ni9Si3	$\geq 1040^{\circ}\text{C}$ water cooling or other rapid cooling methods
S30408	06Cr19Ni10	$\geq 1040^{\circ}\text{C}$ water cooling or other rapid cooling methods
S30409	07Cr19Ni10	$\geq 1040^{\circ}\text{C}$ water cooling or other rapid cooling methods
S30450	05Cr19Ni10Si2CeN	$1050^{\circ}\text{C} \sim 1100^{\circ}\text{C}$ water cooling or other rapid cooling methods
S30808	06Cr20Ni11	$\geq 1040^{\circ}\text{C}$ water cooling or other rapid cooling methods
S30920	16Cr23Ni13	$\geq 1040^{\circ}\text{C}$ water cooling or other rapid cooling methods
S30908	06Cr23Ni13	$\geq 1040^{\circ}\text{C}$ water cooling or other rapid cooling methods
S31020	20Cr25Ni20	$\geq 1040^{\circ}\text{C}$ water cooling or other rapid cooling methods
S31008	06Cr25Ni20	$\geq 1040^{\circ}\text{C}$ water cooling or other rapid cooling methods
S31608	06Cr17Ni12Mo2	$\geq 1040^{\circ}\text{C}$ water cooling or other rapid cooling methods
S31609	07Cr17Ni12Mo2	$\geq 1040^{\circ}\text{C}$ water cooling or other rapid cooling methods
S31708	06Cr19Ni13Mo3	$\geq 1040^{\circ}\text{C}$ water cooling or other rapid cooling methods
S32168	06Cr18Ni11Ti	$\geq 1095^{\circ}\text{C}$ water cooling or other rapid cooling methods
S32169	07Cr19Ni11Ti	$\geq 1040^{\circ}\text{C}$ water cooling or other rapid cooling methods
S33010	12Cr16Ni35	$1030^{\circ}\text{C} \sim 1180^{\circ}\text{C}$ water cooling or other rapid cooling methods
S34778	06Cr18Ni11Nb	$\geq 1040^{\circ}\text{C}$ water cooling or other rapid cooling methods
S34779	07Cr18Ni11Nb	$\geq 1040^{\circ}\text{C}$ water cooling or other rapid cooling methods
S38240	16Cr20Ni14Si2	$1060^{\circ}\text{C} \sim 1130^{\circ}\text{C}$ water cooling or other rapid cooling methods
S38340	16Cr25Ni20Si2	$1060^{\circ}\text{C} \sim 1130^{\circ}\text{C}$ water cooling or other rapid cooling methods
S30859	08Cr21Ni11Si2CeN	$1050^{\circ}\text{C} \sim 1100^{\circ}\text{C}$ water cooling or other rapid cooling methods

This is an excerpt of the PDF (Some pages are marked off intentionally)

Full-copy PDF can be purchased from 1 of 2 websites:

1. <https://www.ChineseStandard.us>

- SEARCH the standard ID, such as GB 4943.1-2022.
- Select your country (currency), for example: USA (USD); Germany (Euro).
- Full-copy of PDF (text-editable, true-PDF) can be downloaded in 9 seconds.
- Tax invoice can be downloaded in 9 seconds.
- Receiving emails in 9 seconds (with download links).

2. <https://www.ChineseStandard.net>

- SEARCH the standard ID, such as GB 4943.1-2022.
- Add to cart. Only accept USD (other currencies - <https://www.ChineseStandard.us>).
- Full-copy of PDF (text-editable, true-PDF) can be downloaded in 9 seconds.
- Receiving emails in 9 seconds (with PDFs attached, invoice and download links).

Translated by: Field Test Asia Pte. Ltd. (Incorporated & taxed in Singapore. Tax ID: 201302277C)

About Us (Goodwill, Policies, Fair Trading...): <https://www.chinesestandard.net/AboutUs.aspx>

Contact: Wayne Zheng, Sales@ChineseStandard.net

Linkin: <https://www.linkedin.com/in/waynezhengwenrui/>

----- The End -----