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

GB/T 713.2-2023

**Steel plate, sheet and strip for pressure equipment - Part 2:
Non-alloy and alloy steel with specified elevated temperature
properties**

承压设备用钢板和钢带 第2部分：规定温度性能的非合金钢和合金钢

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Foreword

This document was drafted in accordance with the rules provided in GB/T 1.1-2020
Directives for standardization - Part

1. Rules for the structure and drafting of standardizing documents. This document is Part 2 of GB/T 713, Steel plate, sheet and strip for pressure equipments. The following parts have been issued for GB/T 713. -- Part

1 Scope

Part 2 of China's national series on steel for pressure equipment, covering non-alloy and alloy steels with specified elevated temperature properties. A pressure vessel operating hot is designed against strength values at its working temperature, not at room temperature, and that is the whole reason this category exists: an ordinary structural plate has no guaranteed yield strength at 400 degrees C, and above about that temperature creep begins to govern, so the material's behaviour over the vessel's whole design life becomes the design basis rather than a single test result. The steels covered run from carbon plate for moderate service to the chromium-molybdenum grades used in refinery and power plant

vessels, where molybdenum's resistance to creep and chromium's to hydrogen attack are what make the service possible at all. The part specifies the designation system, order content, dimensions, shape, weight, technical requirements, test methods, inspection rules, packaging, marking and quality certificates, for service at or above -20 degrees C, in strip and cut coil up to 25.4 mm and single-rolled plate from 3 to 250 mm.

This document specifies the designation representation, order content, size, shape, weight, technical requirements, test methods, inspection rules, packaging, marking and quality certificates of non-alloy steel and alloy steel plates and strips with specified temperature properties for pressure equipment. This document is applicable to the manufacture of steel strips and coil-cut steel plates with a temperature of no less than -20 °C and a thickness of no more than

25.4 mm for pressure equipment and single-rolled steel plates (hereinafter referred to as steel plates) with a thickness of 3 mm ~ 250 mm.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

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 223.9, 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 223.12, Methods for chemical analysis of iron, steel and alloy - The sodium carbonate separation-diphenyl carbazide photometric method for the determination of chromium content

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 223.18, 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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in GB/T 713.1 apply.

4 Designation representation

The designation of carbon steel and low-alloy high-strength steel is represented by the yield strength value, the first letter of the Chinese Pinyin of the word "Qu" (yield) and the first letter of the Chinese Pinyin of the word "Rong" (vessel) of the pressure vessel, for example. Q345R.

5 Order content

The order content of steel plates shall comply with the regulations of GB/T 713.1.

6 Size, shape, weight

The size, shape, and weight of steel plates shall comply with the regulations of GB/T 713.1.

7.1 Designation and chemical composition

7.1.1 The designation and chemical composition (melting analysis) of steels shall comply with the requirements in Table 1.

7.1.2 For Q345R and Q370R steel plates with a thickness greater than 60 mm, the upper limit of carbon content can be increased to 0.22% and 0.20% respectively; for Q245R steel plates with a thickness greater than 60 mm, the upper limit of manganese content can be increased to 1.20%.

7.1.3 Trace amounts of niobium, vanadium and titanium can be added to Q245R, Q345R and Q370R steels, and their contents shall be stated in the quality certificate. The total content of the above three elements shall not exceed 0.050%, 0.120% and 0.150% respectively.

7.1.4 According to the requirements of the buyer, the nitrogen content of Q420R and Q460R steel plates shall not exceed 0.020% and 0.025% respectively.

7.1.5 According to the requirements of the buyer, an appropriate amount of rare earth elements can be added to 07Cr2AlMoR steel.

7.1.9 See Appendix A for a comparison of similar designations between this document and relevant foreign standards.

7.2 Manufacturing method The manufacturing method of steel shall comply with the

regulations of GB/T 713.1.

7.3 Delivery state

7.3.1 The delivery state of steel plates and steel strips shall be as specified in Table 2.

7.4 Mechanical and technological properties

7.4.1 The general requirements for various mechanical and technological properties of steel plates shall comply with the provisions of GB/T 713.1.

7.4.2 The results of the tensile test, Charpy (V-notch) impact test and bending test of steel plates shall comply with the requirements in Table 2.

7.4.3 For steel plates with a thickness greater than 60 mm, the bending test may not be required upon agreement between the supplier and the buyer and as stated in the contract.

7.4.7 According to the requirements of the buyer, the thickness direction tensile test can be carried out, and the technical requirements shall be noted in the contract.

7.4.8 According to the requirements of the buyer, a drop weight test can be carried out, and the technical requirements shall be noted in the contract.

7.5 Hydrogen-induced cracking resistance test According to the requirements of the buyer, additional technical requirements for non- alloy steel and alloy steel used for hydrogen-induced cracking (HIC) resistance may be specified. The specific requirements shall comply with the provisions of Appendix C, and the qualification level shall be indicated in the contract.

7.7 Surface quality The surface quality of steel plates and steel strips shall comply with the regulations of GB/T 713.1.

7.8 Other additional requirements According to the requirements of the buyer, additional technical requirements for chromium-molybdenum steel plates for hydrogen service may be specified upon agreement between the supplier and the buyer and being noted in the contract.

8 Test methods

8.1 The chemical composition test of steel is generally carried out in accordance with GB/T 4336, GB/T 20123, GB/T 20124, GB/T 20125 or other general methods.

8.2 The test methods for the inspection items of each batch of steel plates shall comply with the provisions of Table 4.

9 Inspection rules