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

GB/T 12770-2012

Replacing GB/T 12770-2002

Welded stainless steel tubes for mechanical structures

机械结构用不锈钢焊接钢管

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1 Scope

This standard fixes the classification and codes, the ordering information, the dimensions, shape, weight and permissible deviations, the technical requirements, the test methods, the inspection rules and the packing, marking and quality certificate of welded stainless steel tubes for mechanical structures.

It applies to welded stainless steel tubes used for machinery, motor vehicles, bicycles, furniture and other mechanical parts and structural parts (steel tubes for short).

2 Normative references

The following documents are indispensable for the application of this document. For dated references only the edition cited applies; for undated references the latest edition, all amendments included, applies.

The list opens with GB/T 222 Permissible tolerances for chemical composition of steel products and continues with the analytical standards of the GB/T 223 series: GB/T 223.9, 223.11, 223.16, 223.18, 223.19, 223.25, 223.26, 223.28, 223.36, 223.37, 223.40, 223.60, 223.62, 223.63, 223.68, 223.69, 223.72, 223.84, 223.85 and 223.86, covering the determination of aluminium, chromium, titanium, copper, nickel, molybdenum, nitrogen, niobium, silicon, phosphorus, manganese, sulfur, carbon and total carbon in iron, steel and

alloys.

GB/T 228.1 Metallic materials - Tensile testing - Part 1: Method of test at room temperature.

GB/T 232 Metallic materials - Bend test.

GB/T 242 Metallic materials - Tube - Flaring test.

GB/T 245 Metallic materials - Tube - Flanging test.

GB/T 246 Metallic materials - Tube - Flattening test.

GB/T 2102 Acceptance, packaging, marking and quality certification of steel tubes.

GB/T 2975 Steel and steel products - Location and preparation of samples and test pieces for mechanical testing.

GB/T 3323 Radiographic examination and quality classification of fusion welded butt joints in steel.

GB/T 4334-2008 Corrosion of metals and alloys - Methods of intergranular corrosion test for stainless steels.

GB/T 7735 Eddy current inspection of steel tubes.

GB/T 11170 Stainless steel - Determination of multi-element contents - Spark discharge atomic emission spectrometric method (routine 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.

GB/T 20878-2007 Stainless and heat-resisting steels - Designation and chemical composition.

GB/T 21835 Dimensions and masses per unit length of welded steel tubes.

3 Classification and codes

3.1 Steel tubes are divided into four classes according to their delivery condition; the classes and their codes are: a) welded condition, H; b) heat treated condition, T; c) cold drawn (cold rolled) condition, WC; d) ground (polished) condition, SP.

3.2 Steel tubes are divided into three grades according to dimensional accuracy; the grades and their codes are: a) high grade, PA; b) higher grade, PB; c) ordinary grade, PC.

4 Ordering information

The contract or order for steel tubes purchased under this standard shall include the following items: a) the standard number; b) the product name; c) the grade of the steel; d) the dimensional specification (outside diameter by wall thickness, in millimetres) and the accuracy grade; e) the quantity ordered (total weight or total length); f) the manufacturing method of the steel tube; g) the delivery condition; h) special requirements.

5 Dimensions, shape, weight and permissible deviations

5.1.1 The nominal outside diameter (D) and the nominal wall thickness (S) of steel tubes shall comply with GB/T 21835. On request of the purchaser and by agreement between supplier and purchaser, steel tubes of other outside diameters and wall thicknesses may be supplied.

5.1.2 The permissible deviations of the outside diameter and of the wall thickness of steel tubes shall comply with Table 1 and Table 2 respectively. On request of the purchaser, by agreement between supplier and purchaser and with a note in the contract, steel tubes with permissible dimensional deviations other than those of Table 1 and Table 2 may be supplied.

Table 1, permissible deviations of the outside diameter of steel tubes, is given in millimetres and has four columns: class, nominal outside diameter (D), and the permissible deviation for the three accuracy grades ordinary (PC), higher (PB) and high (PA). For the welded condition (H) and the heat treated condition (T) the values, in the order PC, PB, PA, are: below 25, ± 0.20 , ± 0.15 , ± 0.10 ; from 25 to below 40, ± 0.30 , ± 0.25 , ± 0.20 ; from 40 to below 63, ± 0.50 , ± 0.30 , ± 0.25 ; from 63 to below 90, ± 0.60 , ± 0.50 , ± 0.40 ; from 90 to below 159, ± 0.80 , ± 0.65 , ± 0.50 ; from 159 to below 300, $\pm 0.8\%$ D, $\pm 0.7\%$ D, $\pm 0.5\%$ D; from 300 to below 610, $\pm 1\%$ D, $\pm 0.8\%$ D, $\pm 0.6\%$ D; 610 and above, by agreement for all three grades. For the cold drawn (cold rolled) condition WC and the ground (polished) condition SP the values are: below 25, ± 0.15 , ± 0.12 , ± 0.10 ; from 25 to below 40, ± 0.20 , ± 0.15 , ± 0.13 ; from 40 to below 50, ± 0.20 , ± 0.18 , ± 0.15 ; from 50 to below 60, ± 0.25 , ± 0.20 , ± 0.18 ; from 60 to below 90, ± 0.30 , ± 0.28 , ± 0.25 ; from 90 to below 100, ± 0.40 , ± 0.35 , ± 0.30 ; from 100 to below 200, $\pm 0.5\%$ D, $\pm 0.4\%$ D and by agreement for PA; 200 and above, by agreement for all three grades.

Table 2, permissible deviations of the wall thickness of steel tubes, is given in millimetres and has two columns, nominal wall thickness S and permissible deviation of the wall thickness: below 0.5, ± 0.10 ; from 0.5 to 1.0, ± 0.15 ; above 1.0 to 2.0, ± 0.20 ; above 2.0 to below 4.0, ± 0.30 ; 4.0 and above, $\pm 10\%$ S.

5.2.1 The usual length of steel tubes is 2 000 mm to 12 000 mm.

5.2.2 By agreement between supplier and purchaser and with a note in the contract, steel

tubes of fixed length or of multiple length may be supplied. Fixed lengths and total multiple lengths shall lie within the range of the usual length; the permissible deviation on the whole length is plus 20 mm and minus zero, and a cutting allowance of 10 mm to 20 mm shall be left for each multiple length.

5.3 Out-of-roundness. The out-of-roundness of steel tubes shall not exceed the permissible tolerance on the outside diameter. For thin-walled tubes (a thin-walled tube being one whose ratio of wall thickness to outside diameter is not greater than 3 %) the difference between the maximum and the minimum measured outside diameter in any cross-section shall not exceed 1.2 % of the nominal outside diameter.

5.4 Curvature. The curvature of steel tubes shall comply with Table 3. Table 3 has two columns, nominal outside diameter in mm and curvature in mm/m not greater than: not more than 108, 1.0; above 108 to 325, 1.5; above 325, 2.5.

5.5 End shape. Both end faces of a steel tube shall be perpendicular to the tube axis and shall be square cut. Burrs at the cut shall be removed. On request of the purchaser and by agreement between supplier and purchaser, with a note in the contract of the bevel angle, both ends of the tube may be bevelled.

5.6 Weight. Steel tubes are delivered by theoretical weight; they may also be delivered by actual weight. The theoretical weight per metre of a steel tube is calculated by formula (1). In that formula W is the theoretical weight per metre of the steel tube in kilograms per metre (kg/m); π is the ratio of the circumference to the diameter, taken as 3.141 6; S is the nominal wall thickness of the steel tube in millimetres (mm); D is the nominal outside diameter of the steel tube in millimetres (mm); ρ is the density of the steel in kilograms per cubic decimetre (kg/dm³), the density of each grade being given in Table 4.

Table 4, densities of the steels and formulas for calculating the theoretical weight of the tube, has four columns: serial number, grade, density in kg/dm³ and the converted form of formula (1). Grades 1 and 2, 12Cr18Ni9 and 06Cr19Ni10, share the density 7.93 and the coefficient 0.024 91. Grade 3, 022Cr19Ni10, has 7.90 and 0.024 82. Grade 4, 06Cr25Ni20, has 7.98 and 0.025 07. Grades 5 and 6, 06Cr17Ni12Mo2 and 022Cr17Ni12Mo2, share 8.00 and 0.025 13. Grades 7 and 8, 06Cr18Ni11Ti and 06Cr18Ni11Nb, share 8.03 and 0.025 23. Grades 9, 10 and 11, 022Cr22Ni5Mo3N, 022Cr23Ni5Mo3N and 022Cr25Ni7Mo4N, share 7.80 and 0.024 50. Grade 12, 022Cr18Ti, has 7.70 and 0.024 19. Grades 13 to 17, 019Cr19Mo2NbTi, 06Cr13Al, 022Cr11Ti, 022Cr12Ni and 06Cr13, share 7.75 and 0.024 35. In every case the converted formula multiplies its coefficient by S and by the difference between D and S .

6 Technical requirements

6.1.1 The grade and the chemical composition of the steel (cast analysis) shall comply with Table 5. On request of the purchaser, by agreement between supplier and purchaser and