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

GB/T 13296-2023

Replacing GB/T 13296-2013

Seamless stainless steel tubes for boilers and heat exchangers

锅炉、热交换器用不锈钢无缝钢管

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1 Scope

China's national standard for seamless stainless steel tube for boilers and heat exchangers - the tube that carries the fluid in a shell and tube exchanger, a condenser, a superheater or a reheater, and one of the highest duty tubular products there is. Unlike a fluid transport pipe, this tube is a heat transfer surface: it is thin so that heat passes through it, it has fluid on both sides at different temperatures and often at very different chemistries, it is expanded or welded into a tubesheet at both ends, and it spends its life in a temperature gradient that is itself the working condition. It specifies the classification and code, the content of the order, the dimensions, shapes, weights and permissible deviations, the technical requirements, the test methods, the inspection rules, and the packaging, marking

and quality certificate for seamless stainless steel tubes for boilers and heat exchangers. Being seamless rather than welded is the point: there is no seam to be a preferential path for corrosion or a discontinuity in a wall that will be expanded into a tubesheet. The requirements cover the steel grade and composition and the delivery condition, the mechanical properties at room temperature and, where the service requires it, at elevated temperature; the dimensional tolerances, which are tighter than for pipe because the tube has to fit a drilled tubesheet and be expanded into it; the surface condition inside and out; the flattening, flaring and hydrostatic or eddy current tests that every tube must pass; the grain size and the heat treatment; and the intergranular corrosion test, which on this product is not optional in most services, because a tube sensitised by its own service temperature fails at the weld or the expansion within a few years. Issued on 27 November 2023 and in force since 1 June 2024, it replaces GB/T 13296-2013.

This document specifies the classification and code, order content, dimensions, shapes, weights, allowable deviations, technical requirements, test methods, inspection rules, packaging, marking and quality certificate of seamless stainless steel tubes for boiler and heat exchanger. This document is applicable to seamless stainless steel tubes for boiler and heat exchanger (hereinafter referred to as steel tubes).

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 222 Permissible Tolerances for Chemical Composition of Steel Products

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

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 alpha-benzoinoxime Gravimetric Method for the Determination of Molybdenum Content

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

3 Terms and Definitions

The terms and definitions defined in GB/T 30062 are applicable to this document.

4 Classification and Code

4.1 In accordance with the manufacturing mode, the steel tubes are classified into two types. The categories and codes are.

4.2 The following codes are applicable to this document.

5 Order Content

The contract or order for steel tubes based on this document includes, but is not limited to the following contents.

6.1 Outer Diameter and Wall Thickness

6.1.1 Unless otherwise specified in the contract, the steel tubes shall be delivered in accordance with the nominal outer diameter (D) and minimum wall thickness (S_{min}). In accordance with the requirements of the demand-side, through negotiation between the supply-side and the demand-side, the steel tubes can be delivered in accordance with the nominal outer diameter and nominal wall thickness (S).

6.1.2 The dimensions and specifications of the steel tubes shall comply with the stipulations of GB/T 17395. In accordance with the requirements of the demand-side, through negotiation between the supply-side and the demand-side, steel tubes of other dimensions other than those specified in GB/T 17395 can be supplied.

6.1.3 When the steel tubes are delivered in accordance with the nominal outer diameter and minimum wall thickness, the allowable deviations of the nominal outer diameter and minimum wall thickness shall comply with the stipulations of Table 1

6.1.4 In accordance with the requirements of the demand-side, through negotiation between the supply-side and the demand-side, and statement in the contract, steel tubes with allowable deviations in dimensions other than those specified in Table 1 and Table 2 can be supplied.

6.2 Length

6.2.1 General length The general length of the steel tubes is 2,000 mm ~ 12,000 mm. In accordance with the requirements of the demand-side, through negotiation between the supply-side and the demand-side, and statement in the contract, steel tubes with a length exceeding 12,000 mm can be supplied.

6.3 Curvature The curvature per meter of hot rolled (extruded) steel tubes shall not be greater than

2.0 mm. The curvature per meter of cold drawn (rolled) steel tubes shall not be greater than

1.5 mm. The curvature of the entire length of the steel tubes shall not be greater than 0.15% of the length of the steel tubes.

6.4 Out-of-roundness and Uneven Wall Thickness The out-of-roundness and uneven wall thickness of the steel tubes shall respectively not exceed 80% of the tolerances of outer diameter and wall thickness.

6.5 End Shape The end faces of both ends of the steel tubes shall be perpendicular to the axis of the steel tubes, and the burrs on the cut shall be removed.

6.6 Weight

6.6.1 The steel tubes shall be delivered in accordance with the actual weight. In accordance with the requirements of the demand-side, through negotiation between the supply-side and the demand-side, the steel tubes can also be delivered in accordance with the theoretical weight.

6.6.2 When delivered in the theoretical weight per meter of the steel tubes is calculated in accordance with Formula (1).

6.6.3 When delivered in accordance with the minimum wall thickness, the average wall thickness (S_c) shall be used for the calculation of the theoretical weight per meter of the steel tubes.

7.1 Designation and Chemical Composition of Steel

7.1.1 The designation and chemical composition (smelting analysis) of steel shall comply with the stipulations of Table 3.

7.1.2 The allowable deviation of the chemical composition of finished steel tubes shall comply with the stipulations of GB/T 222.

7.2 Manufacturing Method

7.2.1 Smelting method of steel Steel shall be smelted by electric arc furnace plus external refining or converter plus external refining, or electroslag remelting method. Through negotiation between the supply-side and the demand-side, and statement in the contract,