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

GB/T 20928-2020

Replacing GB/T 20928-2007

Seamless inner grooved copper tube

无缝内螺纹铜管

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Foreword

This Standard is drafted in accordance with the rules given in GB/T 1.1-2009. This Standard replaces GB/T 20928-2007 "Seamless inner grooved copper tube". Compared with GB/T 20928-2007, the main technical changes are as follows: - Modify the representation method of designation and state (see Table 1; Table 1 of the 2007 edition); - ADD two designations: TU1 and TU2; specify their mechanical properties and grain size requirements (see Table 1, Table 8, Table 9); - Modify the cut slope index of straight tube, from "not greater than 2 mm" to "not greater than

0.40 mm" (see 5.2.3;

4.3.3 of the 2007 edition); - Modify the previous "specified non-proportional elongation strength RP0.2" in the mechanical properties to "specified plastic elongation strength RP0.2" (see Table 8; Table 6 of the 2007 edition); - Delete Table 7 and Table 8 of the previous standard. Modify to "The artificial defects of the standard sample tube shall meet the requirements of GB/T 5248" (see 5.6;

4.6 of the 2007 edition); - Modify the test method of mechanical properties from "in accordance with the provisions of GB/T 228" to "in accordance with the provisions of GB/T 34505" (see 6.3;

5.2 of the 2007 edition); - Modify the grain size. The grain size of the softening annealing (O60) state is changed from "

0.020 mm~

0.060 mm" to "

0.015 mm~

0.060 mm". The grain size of the light annealing (O50) state is changed from "

0.015 mm~

0.035 mm" to "

0.010 mm~

0.035 mm" (see Table 9; Table 6 of the 2007 edition); - ADD "The sampling method shall be carried out in accordance with YS/T 668. The preparation of drift-expending test pieces shall be carried out in accordance with YS/T 815." (see 7.4); - Delete the normative appendix "Measurement method of tooth profile parameters of seamless inner grooved copper tube" (see Appendix A of the 2007 edition). This Standard was proposed by China Nonferrous Metals Industry Association. This Standard shall be under the jurisdiction of National Technical Committee Seamless inner grooved copper tube

1 Scope

China's national product standard for seamless copper tube with grooves formed on the inside wall. It specifies the classification and labelling, the technical requirements, the test methods, the inspection rules, the marking, packing, transport, storage and quality certificate, and the content of the order form or contract for seamless inner grooved copper tube. Inner grooved tube is what made air conditioners smaller. In the evaporator and condenser of a refrigeration circuit, the limiting resistance to heat transfer is on the refrigerant side, and cutting a fine helical groove pattern into the bore attacks it in two ways at once: it increases the internal surface area by around half, and it disturbs the liquid film clinging to the wall, promoting turbulence and improving the wetting of the surface during evaporation. The heat transfer coefficient rises by considerably more than the area does, so a coil built from grooved tube reaches the same duty with fewer rows, less refrigerant charge and a smaller cabinet. The geometry is the product: the groove depth, the apex angle, the helix angle and the number of starts, together with the wall thickness measured at the bottom of the groove, which is the thinnest section and the one that determines the pressure rating. Those are the dimensions the standard fixes, and it fixes them tightly because the tube is bought to fit an existing coil design and to be expanded into fins mechanically. Around them sit the material and temper, the mechanical properties, the cleanliness of the inner surface - carbon residue in a refrigerant circuit blocks a capillary and degrades the compressor oil - the eddy current examination and the pressure test. Issued on 29 September 2020 and in force since 1 August 2021, it replaces GB/T 20928-2007.

This Standard specifies the classification and labeling, technical requirements, test methods, inspection rules, marking, packing, transporting, storing and quality certificate, and order form (or contract) content of seamless inner grooved copper tube. This Standard applies to seamless inner grooved copper tube for air conditioning and refrigeration equipment (hereinafter referred to as "tube").

2 Normative references

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

GB/T 242 Metal materials - Tube - Drift-expanding test

GB/T 2828.1 Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection

GB/T 5121 (all parts) Methods for chemical analysis of copper and copper alloys

GB/T 5231 Designation and chemical composition of wrought copper and copper alloys

GB/T 5248 Electromagnetic (eddy-current) examination of copper and copper alloy seamless tube

GB/T 8170 Rules of rounding off for numerical values and expression and judgement of limiting values

GB/T 8888 Wrought heavy non-ferrous metal products - Packing, marking, transporting, storing and quality certificate

GB/T 26303.1 Measuring method for dimensions and shapes of wrought copper and copper alloy - Part 1: Tube

GB/T 34505 Copper and copper alloy materials - Tensile testing at room temperature
YS/T 347 Copper and copper alloys - Estimation of average grain size
YS/T 482 Methods for analysis of copper and copper alloys - The atomic emission spectrometry
YS/T 483 Methods for analysis of copper and copper alloys - X-Ray fluorescence spectrometric (wavelength dispersive)
YS/T 668 The sampling method of physical and chemical testing for copper and copper alloys
YS/T 815 Preparation method of test pieces for mechanical and technological properties of copper and copper alloys

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 Seamless inner grooved copper tube The copper tube with a smooth outer surface, a

certain number of regular grooves on the inner surface, and a continuous section circumference.

3.2 Weight per metre The mass of the inner grooved copper tube per 1 m length, in grams per metre (g/m).

4 Classification and labeling

4.1 Product classification The designation, code, state and supply shape of the tube shall meet the requirements of Table 1. The tooth profile of the tube is shown in Figure 1. The specification and dimension range shall meet the requirements of Table 2. The inner and outer diameter and height (width) dimensions of the layer wound coil shall meet the requirements of Table 3. Refer to Appendix A for the recommended specifications of this Standard. TW - Bottom wall thickness; Hf - Tooth height; TWT - Total wall thickness; W - Groove bottom width; n - Number of grooves; alpha - Addendum angle; beta - Helix angle. Figure 1 -- Schematic diagram of tooth profile

4.2 Product labeling The labeling of the tube is indicated in the order of product name, standard number, designation, state, outer diameter, bottom wall thickness, tooth height, addendum angle, helix angle and number of grooves. Example 1: For right-handed inner grooved coil tube with a designation of TP2 (C12200), state of light annealing (O50), outer diameter of

9.52 mm, bottom wall thickness of

0.30 mm, tooth height of

0.20 mm, addendum angle of 53°, helix angle of 18, and 60 grooves, it is labeled as: Inner grooved coil tube GB/T 20928-TP2O50-9.52x0.30+0.20-53/18-

60 Or Inner grooved coil tube GB/T 20928-C12200O50-9.52x0.30+0.20-53/18-

60 Example 2: For left-handed inner grooved straight tube with a designation of TU2 (T10180), state of softening annealing (O60), outer diameter of

7.00 mm, bottom wall thickness of

0.27 mm, tooth height of

0.20 mm, addendum angle of 53°, helix angle of 18, 60 grooves, and length of 3000 mm, it is labeled as: Inner grooved straight tube GB/T

20928-TU2O60-7.00x0.27+0.20-53/L18-60x3000 Or Inner grooved straight tube GB/T

20928-T10180O60-7.00x0.27+0.20-53/L18- 60x3000 The default spiral direction is right-handed. For left-handed, add "L".

5 Technical requirements