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Welded Stainless Steel Pipes for Fluid Transport

流体输送用不锈钢焊接钢管

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Welded Stainless Steel Pipes for Fluid Transport

1 Scope

This Standard stipulates the classification, code, order content, dimensions, appearance and weight, technical requirements, test methods, inspection rules, packaging, marking and quality certificate of welded stainless steel pipes for fluid transport.

This Standard is applicable to welded stainless steel pipes for fluid transport (hereinafter referred to as steel pipes).

2 Normative References

The following documents are indispensable to the application of this document. 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 223.9 *Iron, Steel and Alloy - Determination of Aluminum Content - Chrome Azurol S Photometric Method;*

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

GB/T 223.18 *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-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;*

GB/T 223.37 *Methods for Chemical Analysis of Iron, Steel and Alloy - The Indophenol Blue Photometric 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 223.59 *Iron, Steel and Alloy - Determination of Phosphorus Content - Bismuth Phosphomolybdate Blue Spectrophotometric Method and Antimony Phosphomolybdate Blue Spectrophotometric Method;*

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 223.63 *Methods for Chemical Analysis of Iron, Steel and Alloy - The Sodium (potassium) Periodate Photometric Method for the Determination of Manganese Content;*

GB/T 223.68 *Methods for Chemical Analysis of Iron, Steel and Alloy - The Potassium Iodate Titration Method after Combustion in the Pipe Furnace for the Determination of Sulfur Content;*

GB/T 223.69 *Iron, Steel and Alloy - Determination of Carbon Contents - Gas-volumetric Method after Combustion in the Pipe Furnace;*

GB/T 223.84 *Steel and Iron - Determination of Titanium Content - Diantipyrylmethane Spectrophotometric Method;*

GB/T 223.85 *Steel and Iron - Determination of Sulfur Content - Infrared Absorption Method after Combustion in an Induction Furnace;*

GB/T 223.86 *Steel and Iron - Determination of Total Carbon Content - Infrared Absorption Method after Combustion in an Induction Furnace;*

GB/T 228.1 *Metallic Materials - Tensile Testing - Part 1: Method of Test at Room Temperature;*

GB/T 241 *Metal Materials - Tubes - Hydrostatic Pressure Test;*

GB/T 245 *Metallic Materials -Tube - Flanging Test;*

GB/T 246 *Metallic Materials -Tube - Flattening Test;*

GB/T 2102 *Acceptance, Packing, Marking and Quality Certification of Steel Pipe;*

welding; welding seam receives 100% full-length radiographic inspection;

c) III---steel pipes are manufactured through the method of double-sided automatic welding; welding seam receives partial radiographic inspection;

d) IV---steel pipes are manufactured through the method of single-sided automatic welding; welding seam receives partial radiographic inspection;

e) V---steel pipes are manufactured through the method of double-sided automatic welding; welding seam does not receive radiographic inspection;

f) VI---steel pipes are manufactured through the method of single-sided automatic welding; welding seam does not receive radiographic inspection.

3.2 In accordance with delivery status, the classification and code of steel pipes are as follows:

a) Status of welding +H;

b) Status of thermal treatment +T;

c) Status of grinding (polishing) +SP.

4 Order Content

Contract or order form that purchase steel pipes in accordance with this Standard shall include the following content:

a) Serial No. of this Standard;

b) Product name;

c) Steel designation;

d) Dimensions and specifications (external diameter × wall thickness, expressed in millimeter);

e) Quantity ordered (total weight or total length);

f) Delivery status;

g) Special requirements.

5 Dimensions, Appearance and Weight

5.1 External Diameter and Wall Thickness

with the stipulations in Table 4. However, in arbitration, longitudinal tensile test shall be subject to.

6.4.2 Tensile test of welded joints

Steel pipes whose external diameter is not less than 168 mm shall receive horizontal tensile test on welded joints. Samples shall be horizontally taken along the steel pipes, or, be cut out from test pieces of welding. The test pieces of welding shall be under the same designation, the same furnace No., the same welding process and the same thermal treatment system as the steel pipes. Welding seam shall be in the center of the sample and vertical to the axes of the sample. The tensile strength of welded joints shall comply with the stipulations of tensile strength of base metals in Table 4.

6.5 Process Performance

6.5.1 Flattening

Steel pipes whose external diameter is not more than 168 mm shall receive flattening test. During the test, welding seam shall be located in a location that is 90° of the force-bearing direction. In terms of steel pipes which receive thermal treatment, samples shall be flattened to 1/3 of the external diameter of steel pipes. In terms of steel pipes which do not receive thermal treatment, samples shall be flattened to 2/3 of the external diameter of steel pipes. After flattening, samples shall not manifest any cracks or breakages.

6.5.2 Horizontal bending test of welding seam

Steel pipes whose external diameter is more than 168 mm shall receive horizontal bending test of welding seam. Samples for the bending test shall be cut out from steel pipes or test pieces of welding. The test pieces of welding shall be under the same designation, the same furnace No., the same welding process and the same thermal treatment system as the steel pipes. A group of bending tests shall include: one positive bending test and one negative bending test (namely, the external welding seam and the internal welding seam of steel pipes are respectively located on the maximum curved surface). In terms of steel pipes whose wall thickness is more than 10 mm, two side bending samples may be used to replace positive bending and negative bending samples. In bending test, the diameter of bent indenter shall be 4 times of the thickness of the samples; bending angle shall be 180°. After bending, the welding seam area of the samples shall not manifest any cracks or breakages.

6.6 Intergranular Corrosion

Except from designations 07Cr19Ni10、07Cr17Ni12Mo2、07Cr19Ni11Ti、07Cr18Ni11Nb, the remaining Austenitic stainless steel pipes shall receive intergranular corrosion test in accordance with the stipulations of Method E in GB/T 4334-2008. After the test, samples shall not manifest tendency of intergranular corrosion. In accordance with the demand-side's demands, through the negotiation between the demand-side and the

pipes under the designations 07Cr19Ni10、07Cr17Ni12Mo2、07Cr19Ni11Ti、07Cr18Ni11Nb may receive grain size test; the average grain size shall be Level-7 or coarser.

6.9 Nondestructive Testing

6.9.1 In accordance with the demand-side's demands, through the negotiation between the demand-side and the supply-side, and statement in the contract, steel pipes may receive full-length or partial radiographic inspection of welding seam. When it is stipulated in the contract that partial radiographic inspection shall be conducted, the proportion and the location (it shall at least include two pipe ends) of the inspection shall be indicated.

6.9.2 Radiographic inspection may be conducted and determined through the method of photographic film or real-time imaging as stipulated in GB/T 3323, NB/T 47013.2 or NB/T 47013.11. The grade of radiographic testing technology shall comply with the stipulations of Grade-AB in NB/T 47013.2 or NB/T 47013.11, or the stipulations of Grade-A in GB/T 3323. The result evaluation and quality grade of 100% radiographic inspection and partial radiographic inspection shall comply with the stipulations in GB/T 3323 or Grade-II in NB/T 47013.2.

6.9.3 Through the negotiation between the demand-side and the supply-side, and statement in the contract, other inspection technology grades and/or quality grades may also be stipulated.

6.9.4 Radiographic inspection may be conducted before thermal treatment.

6.10 Surface Quality

6.10.1 The internal and external surface of steel pipes shall be smooth; there shall be no defects of stratification, crack, unthorough welding, unthorough fusion, folding, double skin, twisting, over-pickling and other defects that would affect the usage. The above-mentioned defects shall be completely eliminated. The actual wall thickness of the elimination area shall be not less than the allowable minimum value of nominal wall thickness. The surface of steel pipes may allow the existence of partial scratches and indentations, but the depth shall not exceed 50% of the lower deviation of wall thickness; those that exceed this value may allowed to be polished, and the actual wall thickness of the polishing area shall be not less than the allowable minimum value of nominal wall thickness.

6.10.2 In terms of steel pipes which are manufactured through the method of double-sided automatic welding, the internal and external welding seam shall be flush with the base metals, or, have a uniform surplus height of less than 3 mm.

6.10.3 In terms of steel pipes which are manufactured through the method of single-sided automatic welding, the external welding seam shall be flush with the base metals, or, have a uniform surplus height of less than 3 mm; the surplus height of the internal welding seam shall comply with the following stipulations:

The inspection and acceptance inspection of steel pipes shall be conducted by the supply-side's quality and technology supervision department.

8.2 Batch Rules

The chemical composition of steel pipes may be inspected and accepted in accordance with furnace. The remaining inspection items of steel pipes shall be inspected and accepted in accordance with batch. Each batch shall be constituted of steel pipes of the same designation, the same furnace No., the same dimensions, the same welding process and the same thermal treatment system. The quantity of each batch of steel pipes shall not exceed the following stipulations:

a) External diameter is not more than 57 mm: 400 PCS;

b) External diameter is more than 57 mm, but not more than 219 mm: 200 PCS;

c) External diameter is more than 219 mm: 100 PCS.

8.3 Sampling Quantity

The sampling quantity of steel pipes for each inspection item shall comply with the stipulations in Table 5.

8.4 Re-inspection and Determination Rules

Re-inspection and determination rules of steel pipes shall comply with the stipulations in GB/T 2102.

9 Packaging, Marking and Quality Certificate

9.1 The marking of steel pipes shall include the code, which is classified in accordance with manufacturing method and radiographic testing. The remaining requirements shall comply with the stipulations in GB/T 2102. Example 1 and Example 2 provide marking examples of steel pipes.

Example 1: nominal external diameter 508 mm; wall thickness 8.0 mm; length 6,000 mm; designation 06Cr19Ni10; manufacturing method Type-I steel pipes, shall be marked as:

508×8.0×6 000-06Cr19Ni10-Ⅰ-GB/T 12771—2019.

Example 2: nominal external diameter 159 mm; wall thickness 3.0 mm; length 6,000 mm; designation 07Cr18Ni11Nb; manufacturing method Type-IV steel pipes, have received stabilized thermal treatment, shall be marked as:

159×3.0×6 000-07Cr18Ni11Nb-Ⅳ-ST-GB/T 12771—2019.

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