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Tubular Cored Electrodes for Gas Shielded and Non-Gas Shielded Metal Arc Welding of Nickel and Nickel Alloys

镍及镍合金药芯焊丝

(ISO 12153:2011, Welding Consumables – Tubular Cored Electrodes for Gas Shielded and Non-Gas Shielded Metal Arc Welding of Nickel and Nickel Alloys – Classification, MOD)

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Tubular Cored Electrodes for Gas Shielded and Non-Gas Shielded Metal Arc Welding of Nickel and Nickel Alloys

1 Scope

This Document specifies the models, technical requirements, test methods, re-inspection and supply technical conditions of tubular cored electrodes of nickel and nickel alloys.

This Document is applicable to tubular cored electrodes for gas shielded and non-gas shielded metal arc welding of nickel and nickel alloys (hereinafter referred to as "welding wire"), and the nickel content in the deposited metal exceeds the content of any other element.

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

GB/T 2652 Tensile Test Methods on Weld and Deposited Metal (GB/T 2652-2008, ISO 5178:2001, IDT)

GB/T 3323.1 Non-Destructive Testing of Welds - Radiographic Testing - Part 1: X- and Gamma-Ray Techniques with Film (GB/T 3323.1-2019, ISO 17636-1:2013, MOD)

GB/T 16672 Welds - Working Positions - Definitions of Angles of Slope and Rotation (GB/T 16672-1996, idt ISO 6947:1990)

GB/T 18591 Welding - Guidance on the Measurement of Preheating Temperature, Interpass Temperature and Preheat Maintenance Temperature (GB/T 18591-2001, ISO 13916:1996, IDT)

GB/T 25774.1 Test Methods for Welding Consumables - Part 1: Preparation and Testing of Deposited Metal Specimens for Mechanical Properties in Steel Nickel and Nickel Alloys (GB/T 25774.1-2010, ISO 15792-1:2000, MOD)

GB/T 25775 Technical Delivery Conditions for Welding Consumables - Type of Product Dimensions Tolerances and Markings (GB/T 25775-2010, ISO 544:2003, MOD)

GB/T 25777 Preparation Methods of Deposited Metal Specimens for Chemical Analysis (GB/T 25777-2010, ISO 6847:2000, IDT)

GB/T 25778 Procurement Guidelines for Welding Consumables (GB/T 25778-2010, ISO 14344:2010, MOD)

GB/T 37910.1-2019 Non-Destructive Testing of Welds - Acceptance Levels for Radiographic Testing - Part 1: Steel, Nickel, Titanium and Their Alloys (ISO 10675-1:2016, MOD)

GB/T 39255 Gases and Gas Mixtures for Welding and Cutting Processes (GB/T 39255-2020, ISO 14175:2008, MOD)

3 Terms and Definitions

For the purposes of this Document, no terms and definitions apply.

4 Models

4.1 Classification of models

The models of welding wires are divided according to the chemical composition of the deposited metal, the type of flux core, the type of shielding gas and the welding position. See Appendix C for the comparison of the flux-cored wire types between this Document and other relevant standards.

4.2 Formulation method of model

The model of welding wire consists of five parts:

a) Part I: Use the letter "T" to indicate flux-cored wire;

b) Part II: Use "Ni" plus 4 digits to indicate the numerical code of the chemical composition classification of nickel-based deposited metal, see 5.2; where the code indicating the main type of added alloy (deposited metal category) is:

1) 4××× means nickel-copper alloy;

2) 6××× means nickel-chromium alloys, including nickel-chromium, nickel-chromium-iron, nickel-chromium-molybdenum and nickel-chromium-cobalt-molybdenum alloys with an iron content of no more than 25%;

3) 10×× means nickel-molybdenum alloy with a small amount of chromium;

4) Other numbers indicate nickel alloys containing other specific elements;

6 Test Methods

6.1 Dimension and surface quality

6.1.1 Dimension

The measuring tool with an accuracy of 0.01mm shall be used for the inspection of the diameter of the welding wire; and shall be measured at the same position in the direction perpendicular to each other; and the measurement positions shall not be less than two.

6.1.2 Surface quality

The surface quality of the welding wire shall be visually inspected at any part of the welding wire according to the provisions of GB/T 25775.

6.2 Chemical analysis

6.2.1 The samples for chemical composition analysis of deposited metal shall be prepared according to the provisions of GB/T 25777 and Table 5; and can also be prepared on the mechanical properties test piece or on the pull rod after breaking. During the arbitration test, It shall be carried out according to the provisions of GB/T 25777 and Table 5.

6.2.2 Any suitable analytical method may be used for chemical composition analysis. The arbitration test shall be carried out according to the analysis method confirmed by both parties.

6.3 Mechanical property test

6.3.1 Base metal for test

For the base metal used for the mechanical property test of the deposited metal, nickel and nickel alloys with the same chemical composition as the deposited metal shall be used. If other base metals are used, the test welding consumables or other equivalent welding consumables shall be used to weld the isolation layer on the groove surface and the backing plate surface, and the thickness of the isolation layer shall be no less than 3mm after processing.

6.3.2 Preparation of specimen

6.3.2.1 The test piece for the mechanical properties of the deposited metal shall be prepared according to GB/T 25774.1; the test piece type 1.3 shall be used; the width of the test plate shall be no less than 125mm; and the welding wire of ϕ1.2mm shall be used for welding; or the welding wire of other specifications shall be agreed between the supplier and the purchaser. Welding parameters are recommended by the manufacturer. The control requirements for the type of test piece, the number of welding passes and the number of layers shall be as specified in Table 6.

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