



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

GB/T 5293-2018

**Solid wire electrodes, tubular cored electrodes and
electrode/flux combinations for submerged arc welding of
nonalloy and fine grain steels**

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Foreword

This Standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This standard replaces GB/T 5293-1999 "Carbon steel electrodes and fluxes for submerged arc welding". Compared with GB/T 5293-1999, the main changes are as follows.

- Changed the name of the Standard into "Solid wire electrodes, tubular cored electrodes and electrode/flux combinations for submerged arc welding of non alloy and fine grain steels";
- Added the classification requirements according to ISO 14171.2016;
- Added the technical requirements for double-sided single-pass welding according to ISO 14171.2016;
- Adjusted the the classification method and the mechanical properties requirements according to ISO 14171.2016;
- Deleted the technical requirements of the flux and moved the relevant content to GB/T 36037 "Fluxes for submerged arc welding and electrosag welding";
- Retained 9 welding-wire designations in the previous standard, adjusted the metallurgical designation classification and chemical composition requirements according to GB/T 3429-2015 "Wire rods for welding", and established the welding-wire types respectively;
- Added 44 welding-wire types according to ISO 14171.2016, and provided metallurgical classifications respectively according to GB/T 221-2008 "Notations for designations of iron and steel" and the domestic using-habit;

--Added technical requirements for 3 welding-wire designations --H10Mn2A, H08MnMoA and H08Mn2MoA in GB/T 12470-2003 "Low-alloy steel electrodes and fluxes for submerged arc welding" according to the range of tensile strength of this Standard. Modified the metallurgical designation classification to H13Mn2, H08MnMo and H08Mn2Mo, AND type to SU43, SUM3 and SUM31 respectively according to GB/T 3429-2015;

--Added technical requirements for 4 designations --H10MnSiO, H10Mn2Ni, H11Mn2Mo and H11Mn2Mo in GB/T 3429-2015 and established types of SU28, SU35, SU4M32 and SUN1C1C respectively according to the domestic application demand.

Solid wire electrodes, tubular cored electrodes and electrode/flux combinations for submerged arc welding of non alloy and fine grain steels

1 Scope

This standard specifies the classification, technical requirements, test methods, reinspection and technical delivery conditions of solid wire electrodes, tubular cored electrodes and electrode/flux combinations for submerged arc welding of non alloy and fine grain steels.

This standard is applicable to the classification of solid wires for submerged arc welding of non-alloy and fine grain steels, and the classification requirements of welding-wire - flux combination whose minimum tensile strength is not greater than 570MPa.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 2650 Impact test methods on welded joints (GB/T 2650-2008, ISO 9016.2001, IDT)

GB/T 2651 Tensile test method on welded joints (GB/T 2651-2008, ISO 4136.2001, IDT)

GB/T 2652 Tensile test methods on weld and deposited metal (GB/T 2652-2008, ISO 5178.2001, IDT)

GB/T 3323 Radiographic examination of fusion welded joints in metallic materials

GB/T 3965 Determination of diffusible hydrogen in deposited metal (GB/T 3965-2012, ISO 3690.2000, MOD)

GB/T 18591 Welding - Guidance on the measurement of preheating temperature, interpass temperature and preheat maintenance temperature (GB/T 18591-2001, IDT, ISO

13916.1996)

Test the wire surface quality visually according to GB/T 25775 at any part.

5.2.1 Solid wire

For chemical composition analysis of solid wire, sampling shall be done on the finished wires. Copper-free wire samples can be taken on the raw materials of the manufactured products; however, for arbitration tests, sample the finished products.

5.2.2 Flux-cored wire

For deposited metal chemical analysis, samples of flux-cored wire matching the corresponding flux shall be prepared according to the GB/T 25777. It can also be prepared on the mechanical property specimens or the torn tensile rod. For arbitration tests, prepare in accordance with the GB/T 25777.

5.2.3 Analytical methods

Chemical composition analysis can be carried out by any suitable analytical method, The arbitration test shall be conducted by analytical method agreed by both parties.

5.3.1 Base metal for testing

5.3.1.1 The base metal for the mechanical property test of the multipass weld deposited metal with the combination of wire and flux shall be made of a steel plate corresponding to the chemical composition of the deposited metal. If other base metal is used, the test welding material or other equivalent welding material shall be used to weld the isolating layer on the groove surface and the gasket surface, the thickness of which shall be not less than 3 mm after processing.

5.3.1.2 For the classification tests of double-sided single-pass welded joints with the combination of wire and flux, the base metal shall be steel plate with equivalent tensile strength. The difference of strength grade shall not be greater than 50 MPa.

5.3.2 Specification for fluxes drying

Before welding, the flux shall be dried at 250°C ~ 400°C for 1h ~ 2h or as per manufacturer's recommendation.

5.3.3.1 Preparation of multi-pass welded deposited metal specimens

Prepare the metal specimens for mechanical properties of multi-pass weld deposited metal according to GB/T 25774.1. The specimen type shall be 1.4 and the welded joint as per GB/T 25774.2. The specimen type is 2.5. When weld with solid or flux-cored wire, the welding shall be carried out in accordance with manufacturer's recommendation.

The flux suitable for single-sided single-pass welding can be tested as this type of specimen.

5.3.4.1 Tensile test of multi-pass welded deposited metals

The size and sampling point of the multi-pass weld deposited metal for tensile test shall be in accordance with GB/T 25774.1. The tensile test shall be carried out according to GB/T 2652.

5.3.4.2 Tensile test of double-sided single-pass welded joints

The size and sampling point of the double-sided single-pass welded joint for tensile test shall be in accordance with GB/T 25774.2. The transverse tensile test shall be carried out according to GB/T 2651.

5.3.5 Impact tests

5.3.5.1 The size and sampling point of multi-pass welding impact specimen are specified in GB/T 25774.1. The specimen size and sampling point of double-sided single-pass welding for impact test is specified in GB/T 25774.2.

5.3.5.2 In each set of the impact specimens, there shall be at least one sample for measuring the shape and size of the V-shaped notch. The measurement shall be done by a projector or metallographic microscope with at least 50x magnifications.

5.4 Ray inspection

5.4.1 The radiographic inspection of Multi-pass welding and double-sided single-pass weld shall be carried out before the tensile and impact specimens are taken. The gasket (if used) shall be removed before the radiographic inspection.

5.4.2 Weld ray inspection test shall be carried out according to GB/T 3323.

5.4.3 When evaluating the ray inspection negative film, the 25mm at both ends of the specimen shall not be considered.

5.5 Diffusion hydrogen test for deposited metals

The diffusion hydrogen content of deposited metal shall be determined by GB/T

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