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

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**Qualification test of welders -- Fusion welding for aluminium
and aluminium alloys
(English Translation)**

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1 Scope

This standard specifies the requirements for qualification of welders for fusion welding of aluminum and aluminum alloys.

To ensure that the exam is suitable for different product types, regions, and testing organizations, this standard provides a set of technical rules for systematic qualification.

This standard focuses on qualifying the skills of the welder to manually operate the welding tongs, welding guns, welding torches, and thereby produce a weld of acceptable quality.

This standard applies to manual welding and semi-automatic welding methods.

2 Normative references

The provisions in following documents become the provisions of this standard through reference in this standard. For the dated references, the subsequent amendments (excluding corrections) or revisions do not apply to this standard;

however, parties who reach an agreement based on this standard are encouraged to study if the latest versions of these documents are applicable.

For undated references, the latest edition of the referenced document applies.

GB/T 2653 Bend test methods on welded joints (GB/T 2653-2008, ISO 5173.2000, IDT)

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

GB/T 3375 Welding terminology

GB/T 5185 Welding and allied processes - Nomenclature of processes and reference numbers (GB/T 5185-2005, ISO 4063.1998, IDT)

GB/T 16672 Welds - Working positions - Definitions of angles of slope and rotation (GB/T 16672-1996, ISO 6947.1993, IDT)

GB/T 19866 Specification and qualification of welding procedures for

Material placed at the reverse side of a joint preparation for the purpose of supporting molten weld metal.

3.5

Root run

In multi-layer welding, the runs of the first layer deposited in the root.

3.6

Filling run

In multi-layer welding, the runs deposited after the root runs and before the capping runs.

3.7

Capping run

In multi-layer welding, the runs visible on the weld faces after completion of welding.

3.8

Weld metal thickness

Thickness of the weld metal excluding any reinforcement.

4.1 General

When filling the welder's qualification certificate (see Appendix A), it shall use the following symbols and abbreviations.

4.2 Reference numbers of welding processes

This standard includes the following manual and semi-automatic welding methods (see GB/T 5185 for the reference number of welding process).

141 Tungsten inert gas shielded arc welding (TIG welding)

15 Plasma arc welding.

4.3 Abbreviations

sl - Single-layer welding;

ss - Single-sided welding.

5.1 General

The qualification of welder is based on the main parameters. This standard determines the scope of approval for each main parameter. Except as described in 5.7 and 5.8, all test pieces shall be welded using the main parameters. If the welder is engaged in welding outside the range of qualification, a new qualification test is required. The main parameters are.

- a) Welding processes;
- b) Type of test piece (plate and tube);
- c) Type of weld (butt weld and fillet weld);
- d) Base metal;
- e) Welding consumables;
- f) Size (base metal's thickness and tube's outer diameter);
- g) Welding position;
- h) Weld details (welding with backing, single-sided welding, double-sided welding, single-layer welding, multi-layer welding).

5.2 Welding processes

Each test usually qualifies only one welding process. A change of welding process requires a new qualification test. However, it is permitted for a welder to be qualified for two or more welding processes by welding a single test piece (combined welding method) or by two or more separate qualification tests. Table

1 provides the ranges of qualification for single welding process and multi- welding process against the butt weld.

For the welding process 141, if the current is changed from DC to AC and vice versa, it needs a new qualification test.

5.6 Welding consumables

Qualification with filler metal (e.g. welding processes 141 and 15) qualifies for welding without filler metal, but not vice versa.

Qualification with AlMg alloy type filler metals qualifies the use of AlSi alloy types, but not vice versa.

For the welding process 131, an increase of the Helium content of the shielding gas greater than 50% requires a new qualification test.

5.7 Dimensions

The welder qualification test of butt welds is based on the material thickness and tube's outer diameters. Tables 3 and 4 specify the range of qualification.

Table 5 specifies the range of qualification of the base metal's thickness for fillet welds.

For branch tube's welding, based on the following conditions, the range of qualification of the base metal's thickness is determined in accordance with

Table 3, the range of qualification of the tube's outer diameter is determined in accordance with Table 4.

- Set-in type. the thickness and outer diameter of the base metal of the branch tube;
- Set-in or set-through type. the thickness of the base metal of the main tube or housing and the outer diameter of the branch tube.

For test pieces with different outer diameters and base metal thicknesses, welders are qualified as follows.

1) The range of qualification of base metal's thickness is as specified in

Table 3;

2) The range of qualification of tube's outer diameter is as specified in

Table 4.

Table 3 -- Range of qualification of base metal's thickness for test piece of butt weld (multiple welding methods), Unit in mm

Thickness of test piece, t Range of qualification $t \leq 6$ $0.5t \sim 2t$ $t > 6$ ≥ 6 l_2 - Length of test plate;

t - Thickness of test piece (plate thickness or wall thickness);

z - Dimension of weld leg;

$0.5t \leq \alpha \leq 0.7t$.