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Qualification test of welders — Fusion welding —

Part 1: Steels

Épreuve de qualification des soudeurs — Soudage par fusion —

Partie 1: Aciers

[Revision of first edition (ISO 9606-1:1994)]

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 9606-1 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 11, *Qualification requirements for welding and allied processes personnel*.

This second/third/... edition cancels and replaces the first/second/... edition (), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

ISO 9606 consists of the following parts, under the general title *Qualification test of welders — Fusion welding*:

- *Part 1: Steels*
- *Part 2: Aluminium and aluminium alloys*
- *Part 3: Copper and copper alloys*
- *Part 4: Nickel and nickel alloys*
- *Part 5: Titanium and titanium alloys, zirconium and zirconium alloys*

Annexes A and B of this part of ISO/DIS 9606-1:2007 are for information only.

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Qualification test of welders — Fusion welding — Part 1: Steels

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Introduction

The ability of a welder to follow verbal or written instructions and verification of a person's skills are important factors in ensuring the quality of the welded product.

The testing of a welder's skill in accordance with this standard depends on welding techniques and conditions used in which uniform rules are complied with, and standard test pieces are used.

The principle of this standard is that a qualification test qualifies a welder not only for the conditions used in the test, but also for all other conditions which are considered easier to weld in accordance with this standard. It is presumed that the welder has received training and/or has industrial practice within the range of qualification.

The qualification test can be used to qualify a welding procedure and a welder provided that all the relevant requirements e.g. test piece dimensions and testing requirements are satisfied (see ISO 15614-1).

Qualifications in accordance with ISO 9606-1 or any other welder qualification standard existing at the date of publication of this standard are, at the end of their period of validity, to be interpreted in accordance with the requirements of this standard.

Requests for official interpretations of any aspect of this standard should be directed to the Secretariat of ISO/TC 44/SC 11 via your national standards body, a complete listing which can be found at www.iso.org.

1 Scope

This International Standard defines the requirements for qualification testing of welders for fusion welding of steels.

It provides a set of technical rules for a systematic qualification test of the welder, and enables such qualifications to be uniformly accepted independently of the type of product, location and examiner/examining body.

When qualifying welders, the emphasis is placed on the welder's ability to manually manipulate the electrode/welding torch/welding blowpipe and thereby producing a weld of acceptable quality.

The welding processes referred to in this standard include those fusion welding processes which are designated as manual or partly mechanized welding. It does not cover fully mechanized and automated welding processes (see ISO 14732).

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 referred document (including any amendments) applies.

ISO 857-1, *Welding and allied processes — Vocabulary — Part 1: Welding processes*

ISO 4063, *Welding and allied processes — Nomenclature of processes and reference numbers*

ISO 5173, *Destructive tests on welds in metallic materials — Bend tests*

ISO 5817, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections*

ISO 6947, *Welds — Working positions — Definitions of angles of slope and rotation*

ISO 9017, *Destructive tests on welds in metallic materials — Fracture test*

ISO 15607, *Specification and approval of welding procedures for metallic materials — General rules*

ISO/TR 15608, *Welding — Guidelines for a metallic material grouping system*

ISO 15609-1, *Specification and approval of welding procedures for metallic materials — Welding procedure specification — Part 1: Arc welding*

ISO 15609-2, *Specification and approval of welding procedures for metallic materials — Welding procedure specification — Part 2: Gas welding*

ISO 17636, *Non-destructive examination of welds — Radiographic examination of welded joints*

ISO 17637, *Non-destructive examination of fusion welds — Visual examination*

ISO 17639, *Destructive tests on welds in metallic materials — Macroscopic and microscopic examination of welds*

ISO 17640, *Non destructive examination of welds — Ultrasonic examination of welded joints*

ISO/TR 25901, *Welding and related processes — Vocabulary*

3 Terms and definitions

For the purposes of this part of ISO 9606, the following terms and definitions apply.

3.1

welder

person who holds and manipulates the electrode holder, welding torch or blowpipe by hand

[ISO/TR 25901]

3.2

examiner

person who has been appointed to verify compliance with the applicable standard

NOTE In certain cases, an external independent examiner can be required.

[ISO/TR 25901]

3.3

examining body

organization that has been appointed to verify compliance with the applicable standard

NOTE In certain cases, an external independent examining body can be required.

[ISO/TR 25901]

3.4

material backing

backing using material for the purpose of supporting molten weld metal

3.5

gas backing

backing using gas primarily for the purpose of preventing oxidation

3.6

flux backing

backing using flux primarily for the purpose of preventing oxidation

NOTE In submerged arc welding flux backing may also reduce the risk of a weld pool collapse

3.7

consumable insert

filler material that is placed at the root of the joint before welding to be completely fused into the root

3.8

layer

stratum of weld metal consisting of one or more runs

[ISO/TR 25901]

3.9

root run

in multi layer welding, the run(s) of the first layer deposited in the root

[ISO/TR 25901]

3.10

filling run

in multi layer welding, the run(s) deposited after the root run(s) and before the capping run(s)

[ISO/TR 25901]

3.11

capping run

in multi layer welding, the run(s) visible on the weld face(s) after completion of welding

[ISO/TR 25901]

3.12

weld metal thickness

thickness of the weld metal excluding any reinforcement

[ISO/TR 25901]

3.13

leftward welding

gas welding technique in which the filler rod is moved ahead of the blow pipe in relation to the welding direction

[ISO/TR 25901]

3.14

rightward welding

gas welding technique in which the filler rod is moved behind the blow pipe in relation to the welding direction

[ISO/TR 25901]

3.15**pulsed welding**

controlled metal transfer

3.16**short circuit transfer (dip transfer)**

metal transfer in which a short circuiting current enhances the detachment of the molten wire tip during bridging by the electromagnetic pinch effect

[ISO/TR 25901]

3.17**globular transfer**

metal transfer in which droplets of diameter larger than that of the consumable electrode are transferred

[ISO/TR 25901]

3.18**spray transfer**

metal transfer in which rapidly accelerated droplets of diameter smaller than that of the wire are transferred

[ISO/TR 25901]

3.19**preheating temperature**

temperature of the work piece in the weld zone immediately prior to any welding operation

[ISO/TR 25901]

4 Symbols and abbreviated terms**4.1 General**

The following abbreviations and reference numbers shall be used when completing the welder's qualification test certificate (see Annex A).

4.2 Reference numbers of welding processes

This standard covers the following manual or partly mechanized welding processes (reference numbers of welding processes for symbolic representations are listed in ISO 4063):

- 111 manual metal arc welding;
- 114 self-shielded tubular-cored arc welding;
- 121 submerged arc welding with one wire electrode;
- 125 submerged arc welding with tubular cored electrode;
- 131 metal inert gas welding (MIG welding);
- 131-D metal inert gas welding (MIG welding) with short circuiting transfer;
- 131-G metal inert gas welding (MIG welding) with globular transfer
- 131-S metal inert gas welding (MIG welding) with spray transfer
- 131-P metal inert gas welding (MIG welding) with pulsed transfer
- 135 metal active gas welding (MAG welding);
- 135-D metal active gas welding (MAG welding) with short circuiting transfer
- 135-G metal active gas welding (MAG welding) with globular transfer
- 135-S metal active gas welding (MAG welding) with spray transfer
- 135-P metal active gas welding (MAG welding) with pulsed transfer