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oSIST prEN ISO 9606:2024
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Preskušanje usposobljenosti varilcev - Talično varjenje (ISO/DIS 9606:2024)

Qualification testing of welders - Fusion welding (ISO/DIS 9606:2024)

Prüfung von Schweißern - Schmelzschweißen (ISO/DIS 9606:2024)

Épreuve de qualification des soudeurs - Soudage par fusion (ISO/DIS 9606:2024)

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 11, *Qualification requirements for welding and allied processes personnel*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 121, *Welding and allied processes*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Any feedback, question or request for official interpretation related to any aspect of this document should be directed to the Secretariat of ISO/TC 44/SC 11 via your national standards body. A complete listing of these bodies can be found at www.iso.org/members.html. Official interpretations, where they exist, are available from this page: <https://committee.iso.org/sites/tc44/home/interpretation.html>.

This first edition cancels and replaces ISO 9606-1:2012, ISO 9606-2:2004, ISO 9606-3:1999, ISO 9606-4:1999, and ISO 9606-5:2000.

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Introduction

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

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

The principle of this document is that a qualification test, for a particular material, 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 document. It is presumed that the welder has received training and/or has industrial practice within the qualification range prior to performing the qualification test.

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

All new qualifications are to be in accordance with this document from its date of issue.

At the end of its period of validity, existing welder qualification tests in accordance with the requirements of ISO 9606-1, ISO 9606-2, ISO 9606-3, ISO 9606-4 and ISO 9606-5 or a national standard may be revalidated in accordance with this document. This is providing that the technical intent of this document is satisfied. It is necessary for the new qualification range to be interpreted in accordance with the requirements of this document.

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Qualification testing of welders — Fusion welding

1 Scope

This document specifies the requirements for qualification testing of welders for fusion welding of steels, aluminium, copper, nickel, titanium and zirconium.

In this document, the terms "aluminium", "copper", "nickel", "titanium" and "zirconium" refer to the materials and their alloys.

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

When qualifying welders, the emphasis is placed on the welder's ability to manually manipulate the electrode, welding torch, welding blowpipe, or laser gun, with or without filler material, to produce a weld of acceptable quality.

The fusion welding processes referred to in this document include welding processes which are designated as manual or partly mechanized.

This document does not cover fully mechanized and automated welding processes which are covered by ISO 14732.

The principles of this document can be applied to other fusion welding processes.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 3834-2, *Quality requirements for fusion welding of metallic materials — Part 2: Comprehensive quality requirements*

ISO 3834-3, *Quality requirements for fusion welding of metallic materials — Part 3: Standard quality requirements*

ISO 4063:2023, *Welding, brazing, soldering and cutting — Nomenclature of processes and reference numbers*

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

ISO 5817:2023, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections*

ISO 6520-1:2007, *Welding and allied processes — Classification of geometric imperfections in metallic materials — Part 1: Fusion welding*

ISO 6947, *Welding and allied processes — Welding positions*

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

ISO 10042:2018, *Welding — Arc-welded joints in aluminium and its alloys — Quality levels for imperfections*

ISO 10863, *Non-destructive testing of welds — Ultrasonic testing — Use of time-of-flight diffraction technique (TOFD)*

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ISO 13588, *Non-destructive testing of welds — Ultrasonic testing — Use of automated phased array technology*

ISO 13919-1, *Electron and laser-beam welded joints — Requirements and recommendations on quality levels for imperfections — Part 1: Steel, nickel, titanium and their alloys*

ISO 13919-2, *Electron and laser-beam welded joints — Requirements and recommendations on quality levels for imperfections — Part 2: Aluminium, magnesium and their alloys and pure copper*

ISO 14175, *Welding consumables — Gases and gas mixtures for fusion welding and allied processes*

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

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

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

ISO 15609-4, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 4: Laser beam welding*

ISO 17636-1, *Non-destructive testing of welds — Radiographic testing — Part 1: X- and gamma-ray techniques with film*

ISO 17636-2, *Non-destructive testing of welds — Radiographic testing — Part 2: X- and gamma-ray techniques with digital detectors*

ISO 17637, *Non-destructive testing of welds — Visual testing of fusion-welded joints*

ISO/TR 25901-1:2016, *Welding and allied processes — Vocabulary — Part 1: General terms*

ISO/TR 25901-3:2016, *Welding and allied processes — Vocabulary — Part 3: Welding processes*

ISO/TR 25901-4, *Welding and allied processes — Vocabulary — Part 4: Arc welding*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TR 25901-1, ISO/TR 25901-3, ISO/TR 25901-4 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 welder

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

3.2 manufacturing organization

<welding> workshop or site or both which is (are) under the same technical and quality management

3.3 examiner

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

Note 1 to entry: In certain cases, an external independent examiner can be required.

ISO/DIS 9606:2024(en)**3.4****examining body**

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

Note 1 to entry: In certain cases, an external independent examining body can be required.

3.5**certificate**

<welder qualification> notification of attainment by the examiner or examining body when all qualification requirements have been satisfied

3.6**material backing**

backing using material for the purpose of supporting molten weld metal

3.7**gas backing**

backing using gas primarily for the purpose of preventing atmospheric reaction

3.8**flux backing**

backing using flux primarily for the purpose of preventing atmospheric reaction

3.9**consumable insert**

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

3.10**layer**

stratum of weld metal consisting of one or more runs

3.11**root run****root pass**

<multi-layer welding> first run deposited in the root of a multi-run weld

3.12**filling run**

<multi-layer welding> run(s) deposited after the root run(s) and before the capping run(s)

3.13**capping run**

<multi-layer welding> run(s) visible on the weld face(s) after completion of welding

3.14**penetration depth****deposited thickness**

thickness of the weld metal excluding any reinforcement

3.15**leftward welding**

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

3.16**rightward welding**

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

3.17**branch joint**

joint of one or more tubular parts to the main pipe or to a shell or to a plate

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3.18

fillet weld

triangular weld between two or more parts for joining a T-joint, corner joint or lap joint

3.19

butt weld

groove weld

weld other than a fillet weld made in a groove or in a square preparation

3.20

verification

confirmation, through the provision of objective evidence, that specified requirements have been fulfilled

3.21

manual welding

welding in which the electrode holder, gun, torch or blowpipe is manipulated by hand

3.22

partly mechanized welding

semiautomatic welding

manual welding ([3.21](#)) where wire feed is mechanized

4 Reference numbers, 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 Welding processes and reference numbers

This document is applicable to the following manual or partly mechanized fusion welding processes defined in ISO/TR 25901-3, with reference numbers in accordance with ISO 4063:2023:

<https://standards.iteh.ai/>

<https://standards.iteh.ai/> 111 - manual metal arc welding

114 - self-shielded tubular cored arc welding

121 - submerged arc welding with solid wire electrode

125 - submerged arc welding with tubular cored electrode

131 - MIG welding with solid wire electrode

135 - MAG welding with solid wire electrode

136 - MAG welding with flux cored electrode

138 - MAG welding with metal cored electrode

141 - TIG welding with solid filler material

142 - autogenous TIG welding

143 - TIG welding with tubular cored filler material

145 - TIG welding using reducing gas and solid filler material

146 - TIG welding using reducing gas and tubular cored filler material

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147 - TAG welding (TIG welding using active gas)

15 - plasma arc welding

311 - oxyacetylene welding

52 - laser welding

The principles given in this document can be applied to other fusion welding processes.

4.3 Symbols and abbreviated terms

4.3.1 Welding process variants

WF - waveform control (only when waveform control is used).

NOTE Waveform controlled power sources can be used without WF control.

Transfer modes in accordance with ISO 4063:2023 (for process 131, 135, and 138 only):

D - Short-circuit transfer (dip transfer)

G - Globular transfer

S - Spray transfer

Example 1 MIG welding with solid wire electrode using short circuit transfer is designated as: 131-D.

Example 2 MAG welding with solid wire electrode, using spray transfer and waveform control is designated as: 135-S-WF.

4.3.2 Test pieces

a - design throat thickness

BW - butt weld

BBW - Branch butt weld

BFW - Branch fillet weld

D - pipe outside diameter

FW - fillet weld

l_1 - test piece length

l_2 - test piece half-width

l_f - examination length

P - Plate (product form)

s - deposited thickness or fused metal thickness in butt welds (excluding any reinforcement)

T - pipe (also covers tube, all forms of hollow and solid sections)

t - test piece thickness (plate or pipe wall thickness)

z - fillet weld leg length

ISO/DIS 9606:2024(en)**4.3.3 Bend testing**

A - minimum percentage elongation required by the material specification

d - diameter of the former or the inner roller

t_s - bend test specimen thickness

4.3.4 Welding consumables – type of covering or core

nm - no filler material (processes 15, 52, 142, and 311 when no filler material is used)

The symbol for the type of covering or core is in accordance with ISO welding consumable standards as follows:

03 - titania basic

10 - high cellulose, sodium

11 - high cellulose, potassium

12 - high titania, sodium

13 - high titania, potassium

14 - iron powder, titania

15 - basic, sodium

16 - basic, potassium

18 - basic, potassium, iron powder

19 - iron oxide titania, potassium

20 - high iron oxide

24 - iron powder, titania

27 - high iron oxide, iron powder

28 - low-hydrogen potassium, iron powder

40 - not specified

45 - basic, sodium (not including PF)

48 - basic potassium, iron powder (not including PF)

A - acid covering

B - basic covering or electrode core — basic

C - cellulosic covering

R - rutile covering or electrode core — rutile, slow-freezing slag

RA - rutile — acid covering

RB - rutile — basic covering

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