SLOVENSKI STANDARD
oSIST prEN ISO 15614-11:2022

01-september-2022

Popis in kvalifikacija varilnih postopkov za kovinske materiale - Preskušanje varilnih postopkov - 11. del: Varjenje z elektronskim snopom in z laserskim žarkom (ISO/DIS 15614-11:2022)

Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 11: Electron and laser beam welding (ISO/DIS 15614-11:2022)

Anforderung und Qualifizierung von Schweißverfahren für metallische Werkstoffe - Schweißverfahrensprüfung - Teil 11: Elektronen- und Laserstrahlschweißen (ISO/DIS 15614-11:2022)

Descriptif et qualification d'un mode opératoire de soudage pour les matériaux métalliques - Épreuve de qualification d'un mode opératoire - Partie 11: Soudage par faisceau d'électrons et par faisceau laser (ISO/DIS 15614-11:2022)

Ta slovenski standard je istoveten z: **prEN ISO 15614-11**

ICS:

25.160.10 Varilni postopki in varjenje Welding processes

oSIST prEN ISO 15614-11:2022 **en,fr,de**

DRAFT INTERNATIONAL STANDARD
ISO/DIS 15614-11

ISO/TC **44**/SC **10** Secretariat: **DIN**

Voting begins on:
2022-08-03

Voting terminates on:
2022-10-26

Specification and qualification of welding procedures for metallic materials — Welding procedure test —

Part 11:
Electron and laser beam welding

Descriptif et qualification d'un mode opératoire de soudage pour les matériaux métalliques — Épreuve de qualification d'un mode opératoire —

Partie 11: Soudage par faisceau d'électrons et par faisceau laser

ICS: 25.160.10

This document is circulated as received from the committee secretariat.

ISO/CEN PARALLEL PROCESSING

Reference number
ISO/DIS 15614-11:2022(E)

COPYRIGHT PROTECTED DOCUMENT

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

Published in Switzerland

Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **2**
4 Preliminary welding procedure specifications (pWPS) **2**
5 Welding procedure test **2**
6 Test piece **2**
6.1 General 2
6.2 Shape and dimensions of test pieces 3
6.2.1 Linear butt weld 3
6.2.2 Circular butt weld 3
6.2.3 Other types 6
6.3 Welding of test pieces 7
7 Examination and testing **7**
7.1 Extent of examination and testing 7
7.2 Location and cutting of test specimens 10
7.3 Non-destructive examination 15
7.3.1 Method 15
7.3.2 Acceptance level 15
7.4 Destructive tests 15
7.4.1 Transverse tensile testing 15
7.4.2 Bend testing 15
7.4.3 Toughness testing 16
7.4.4 Hardness testing 16
7.4.5 Metallographic examination 16
7.5 Re-testing 16
8 Range of qualification **17**
8.1 General 17
8.2 Related to the manufacturer 17
8.3 Related to the equipment 17
8.4 Related to the jigs, fixtures and tooling 17
8.5 Related to the parent material 17
8.5.1 Grades 17
8.5.2 Geometry of the assembly 17
8.6 Related to the filler materials 18
8.7 Related to the joint geometry 18
8.8 Related to the presence of a weld backing 18
8.9 Related to the weld type 18
8.10 Related to the welding position 18
8.11 Related to the welding parameters 19
8.11.1 Electron beam welding 19
8.11.2 Laser beam welding 19
8.12 Related to preheating 19
8.13 Related to post weld heat treatment 19
8.14 Related to the number of passes 19
8.15 Duration of validity 19
9 Welding Procedure Qualification Record (WPQR) **19**
Annex A (informative) **Example Welding Procedure Qualification Record form (WPQR)** **20**

Annex ZA (informative) **Relationship between this European Standard and the Essential Requirements of EU Directive 2014/68/EU (PED) aimed to be covered** **25**

Annex ZB (informative) **Relationship between this European Standard and the Essential Requirements of EU Directive 2014/29/EU (SPVD) aimed to be covered** **26**

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 10, *Quality management in the field of welding*.

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 10 via your national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Official interpretations of ISO/TC 44 documents, where they exist, are available from this page: https://committee.iso.org/sites/tc44/home/interpretation.html.

This second edition cancels and replaces the first edition (ISO 15614-11:2004), which has been technically revised.

The main changes compared to the previous edition are as follows:

— the normative references have been updated;

— to update closer to publication.

Introduction

Qualification of welding procedures serves to demonstrate that production operations fully comply with the agreed welding procedure including preliminary and subsequent treatment.

Before a particular welding procedure is used in a production operation, the manufacturer should determine and document the suitability of the Welding Procedure Specification (WPS) to produce a weld of the required quality.

Specification and qualification of welding procedures for metallic materials — Welding procedure test —

Part 11: Electron and laser beam welding

1 Scope

This document specifies how a welding procedure specification for electron or laser beam welding is qualified by a welding procedure test.

This standard is a part of a series of standards, details of this series are given in ISO 15607:2019, annex A.

This document defines the conditions for the execution of welding procedure qualification tests and the limits of validity of a qualified welding procedure for all practical welding operations within the range of variables listed in Clause 8.

Tests shall be carried out in accordance with this standard together with additional tests when specified.

This document applies to metallic materials, irrespective of the shape of the parts, their thicknesses, manufacturing method (rolling, forging, casting, sintering, etc.) and their heat treatment. It covers both the production of new parts and repair work.

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 3452-1, *Non-destructive testing — Penetrant testing — Part 1: General principles*

ISO 4136, *Destructive tests on welds in metallic materials — Transverse tensile test*

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

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

ISO 9015-2, *Destructive tests on welds in metallic materials — Hardness testing — Part 2: Microhardness testing of welded joints*

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

ISO 15609-3:2004, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 3: Electron beam welding*

ISO 15609-4:2009, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 4: Laser beam welding*

ISO 17636 (all parts), *Non-destructive testing of welds — Radiographic testing*

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

ISO 17638, *Non-destructive testing of welds — Magnetic particle testing*

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

ISO 17640, *Non-destructive testing of welds — Ultrasonic testing — Techniques, testing levels, and assessment*

ISO/TR 25901 (all parts), *Welding and allied processes — Vocabulary*

ISO 20601, *Non-destructive testing of welds — Ultrasonic testing — Use of automated phased array technology for thin-walled steel components*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in the ISO/TR 25901 series, apply.

ISO and IEC maintain terminological 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/

4 Preliminary welding procedure specifications (pWPS)

A pWPS (preliminary welding procedure specification) shall be prepared in accordance with ISO 15609-3 for electron beam welding and ISO 15609-4 for laser beam welding. It shall specify the tolerances for all the relevant parameters.

A WPS shall be classified as pWPS until it is qualified in accordance with this standard.

The welding procedure specification (WPS) shall give details on how a welding operation is to be performed, including tacking and fixturing.

5 Welding procedure test

The manufacture and testing of test pieces shall be in accordance with Clauses 6 and 7 of this standard.

In order to take into account the service performance needs of the products, the qualification may be made according to any of the acceptance levels B, C or D as defined in ISO 13919-1 for steels or in ISO 13919- 2 for aluminium and its alloys.

The quality level necessary in each case should be specified by the application standard or the responsible designer.

6 Test piece

6.1 General

The assembly to which the electron or laser beam welding procedure applies in production may be represented by one or more standardized test pieces as defined in 6.2.

6.2 Shape and dimensions of test pieces

The test pieces shall be of sufficient size to ensure an adequate heat distribution and for the application of non- destructive and/or destructive tests.

The test piece shall be designed to represent, as far as possible, the component and joint geometry and shall be specified.

One or more additional test pieces or a longer test piece than the minimum size, may be used in order to allow for extra and/or for re-testing specimens, according to 7.5.

For plate material, the principal direction of rolling shall be marked on the test piece, if requested by the application standard or the specification.

The thickness and/or pipe outside diameter of the test pieces shall be selected in accordance with 8.5.2.1 to 8.5.2.2.

Unless otherwise specified, the shape and minimum dimensions of the test piece shall be as defined hereafter. Nonetheless, the length of the test piece shall be such as to permit the appropriate number of test specimens (as given in Table 1 to Table 3) to be prepared.

6.2.1 Linear butt weld

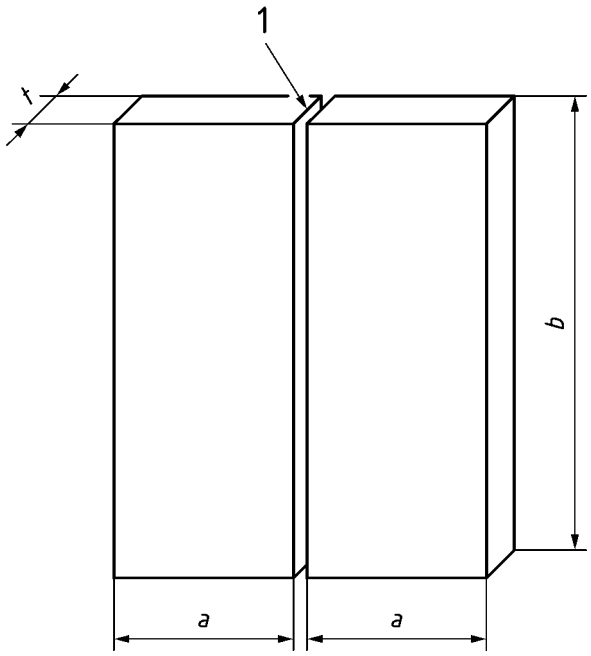
The test piece shall be in accordance with Figure 1.

6.2.2 Circular butt weld

The test piece shall be in accordance with Figures 2 a) or 2 b). When small pipe diameters are used, several test pieces may be necessary.

In cases where the diameter, D, of the part is greater than 150 mm and $D > 20\ t$, the qualification of the procedure may be achieved by welding a linear test piece. The test shall be designed to incorporate the weld overlap and slope down areas.

NOTE The word pipe is used to mean "pipe", "tube" or "hollow section".



Key

1 edge preparation and fit-up as detailed in the preliminary Welding Procedure Specification (pWPS)

a = 3 x t; minimum value 150 mm

b = 6 x t; minimum value 300 mm

t = thickness of the thinner material in a dissimilar thickness joint

Figure 1 — Test piece for a linear butt weld

6.2.2.1 Radial butt weld in pipe (in accordance with Figure 2 a)

6.2.2.2 Axial weld in pipe to pipe or pipe to plate (in accordance with Figure 2 b)