



SLOVENSKI STANDARD
oSIST prEN ISO 25239-3:2019
01-julij-2019

Varjenje z gnetenjem - Aluminij - 3. del: Usposobljenost osebja (ISO/DIS 25239-3:2019)

Friction stir welding - Aluminium - Part 3: Qualification of welding operators (ISO/DIS 25239-3:2019)

Rührreibschweißen - Aluminium - Teil 3: Qualifizierung der Bediener (ISO/DIS 25239-3:2019)

Soudage par friction-malaxage - Aluminium - Partie 3: Qualification des opérateurs soudeurs (ISO/DIS 25239-3:2019)

Ta slovenski standard je istoveten z: prEN ISO 25239-3

ICS:

03.100.30	Vodenje ljudi	Management of human resources
25.160.10	Varilni postopki in varjenje	Welding processes
77.120.10	Aluminij in aluminijeve zlitine	Aluminium and aluminium alloys

oSIST prEN ISO 25239-3:2019

en,fr,de

DRAFT INTERNATIONAL STANDARD

ISO/DIS 25239-3

IIW

Secretariat: **ISO secretariat**Voting begins on:
2019-05-22Voting terminates on:
2019-08-14

Friction stir welding — Aluminium —

Part 3: Qualification of welding operators

Soudage par friction-malaxage — Aluminium —

Partie 3: Qualification des opérateurs soudeurs

ICS: 25.160.01; 25.160.10

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN ISO 25239-3:2020](https://standards.iteh.ai/catalog/standards/sist/49e84a7d-41e4-4fb9-b895-82d931271957/sist-en-iso-25239-3-2020)

<https://standards.iteh.ai/catalog/standards/sist/49e84a7d-41e4-4fb9-b895-82d931271957/sist-en-iso-25239-3-2020>

Member bodies are requested to consult relevant national interests in ISO/TC 44/SC 10 before casting their ballot to the e-Balloting application.

This document is circulated as received from the committee secretariat.

ISO/CEN PARALLEL PROCESSING

This draft International Standard is submitted to all ISO member bodies for voting, as a standard prepared by an international standardizing body in accordance with Council Resolution 42/1999. The proposer, the International Institute of Welding (IIW), has been recognized by the ISO Council as an international standardizing body for the purpose of Council Resolution 42/1999.

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.



Reference number
ISO/DIS 25239-3:2019(E)

© ISO 2019

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN ISO 25239-3:2020

<https://standards.iteh.ai/catalog/standards/sist/49e84a7d-41e4-4fb9-b895-82d931271957/sist-en-iso-25239-3-2020>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Requirements	1
4.1 Welding operator qualification.....	1
4.2 Essential variables and ranges of qualification.....	2
4.2.1 General.....	2
4.2.2 Friction stir welding methods.....	2
4.2.3 Welding equipment.....	2
4.2.4 Parent materials.....	2
4.2.5 Weld joint geometry.....	2
4.3 Qualification methods.....	3
4.3.1 Qualification based on standard welding test.....	3
4.3.2 Qualification based on welding procedure test.....	3
4.3.3 Qualification based on pre-production welding test or production welding test... 3	3
4.3.4 Qualification based on production welding sample test.....	4
4.4 Test welds.....	4
4.4.1 General.....	4
4.4.2 Testing and acceptance levels of test welds.....	4
4.4.3 Re-testing.....	5
4.5 Test record.....	5
5 Certificate	5
5.1 General.....	5
5.2 Period of validity.....	5
5.2.1 Initial qualification.....	5
5.2.2 Confirmation of the validity.....	5
5.2.3 Prolongation of qualification.....	5
Annex A (normative) Functional knowledge of the welding unit	7
Annex B (informative) Knowledge of welding technology	8
Annex C (informative) Qualification test certificate for FSW Welding operators	10
Bibliography	12

ISO/DIS 25239-3:2019(E)

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 IIW, International Institute of Welding, Commission III, *Resistance Welding, Solid State Welding and Allied Joining Process*.

This second edition cancels and replaces the first edition (ISO 25239-3:2011), which has been technically revised.

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

- to be entered closer to publication

A list of all parts in the ISO 25239- series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Welding processes are widely used in the fabrication of engineered structures. During the second half of the twentieth century, fusion welding processes, wherein fusion is obtained by the melting of parent material and usually a filler metal, dominated the welding of large structures. Then, in 1991, Wayne Thomas at TWI invented friction stir welding (FSW), which is carried out entirely in the solid phase (no melting).

The increasing use of FSW has created the need for this document in order to ensure that welding is carried out in the most effective way and that appropriate control is exercised over all aspects of the operation. This document focuses on the FSW of aluminium because, at the time of publication, the majority of commercial applications for FSW involved aluminium. Examples include railway carriages, consumer products, food processing equipment, aerospace structures, and marine vessels.

The parts of this document are:

Part 1: Vocabulary, defines terms specific to FSW.

Part 2: Design of weld joints, specifies design requirements for friction stir weld joints in aluminium.

Part 3: Qualification of welding operators, specifies requirements for the qualification of a welding operator for the FSW of aluminium.

Part 4: Specification and qualification of welding procedures, specifies requirements for the specification and qualification of welding procedures for the FSW of aluminium. A welding procedure specification (WPS) is needed to provide a basis for planning welding operations and for quality control during welding. Welding is considered a special process in the terminology of standards for quality systems. Standards for quality systems usually require that special processes be carried out in accordance with written procedure specifications. Metallurgical deviations constitute a special problem. Because non-destructive testing of the mechanical properties is impossible at the present level of technology, this has resulted in the establishment of a set of rules for qualification of the welding procedure prior to the release of the WPS to actual production. ISO 25239-4 defines these rules.

Part 5: Quality and inspection requirements, specifies a method for determining the capability of a fabricator to use the FSW process for the production of aluminium products of the specified quality. It defines specific quality requirements but does not assign those requirements to any specific product group. To be effective, welded structures should be free from serious problems in production and in service. To achieve that goal, it is necessary to provide controls from the design phase through material selection, fabrication, and inspection. For example, poor design can create serious and costly difficulties in the workshop, on site, or in service. Incorrect material selection can result in welding problems, such as cracking. Welding procedures have to be correctly formulated and qualified to avoid imperfections. To ensure the fabrication of a quality product, management should understand the sources of potential trouble and introduce appropriate quality and inspection procedures. Supervision should be implemented to ensure that the specified quality is achieved.

Friction stir welding — Aluminium —

Part 3: Qualification of welding operators

1 Scope

This part of ISO 25239 specifies requirements for the qualification of welding operators for friction stir welding (FSW) of aluminium. In this document, the term “aluminium” refers to aluminium and its alloys.

This document does not apply to “operators” as defined in ISO 25239-1.

This document does not apply to friction stir spot welding which is covered by the ISO 18785- series.

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

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

ISO 25239-1, *Friction stir welding — Aluminium — Part 1: Vocabulary*

ISO 25239-4:2019, *Friction stir welding — Aluminium — Part 4: Specification and qualification of welding procedures*

ISO 25239-5:2019, *Friction stir welding — Aluminium — Part 5: Quality and inspection requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 25239-1 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 <http://www.electropedia.org/>

4 Requirements

4.1 Welding operator qualification

Welding operators shall be qualified by one of the following tests, as detailed in [4.3](#):

- standard welding test, see [4.3.1](#);
- welding procedure test, see [4.3.2](#);
- pre-production welding test or production welding test, see [4.3.3](#);

ISO/DIS 25239-3:2019(E)

production welding sample test, see 4.3.4. In addition, the welding operator's knowledge of the welding unit to be used for the qualification test shall be tested. See [Annex A](#).

Any of the welding operator qualification tests can be supplemented by a test of knowledge related to welding technology. Such a test is recommended, but it is not mandatory. [Annex B](#) includes an example of such an examination.

The essential variables and ranges of qualification are specified in [4.2](#) and the validity is specified in [Clause 5](#). Provided that the welding operator works in accordance with a welding procedure specification (WPS), the range of qualification shall be limited only as specified in [4.2](#).

A suggested form for the welding operator's qualification certificate is shown in [Annex C](#).

4.2 Essential variables and ranges of qualification

4.2.1 General

The qualification of welding operators is based on essential variables, as specified in [4.2.2](#) to [4.2.5](#). For each essential variable, a range of qualification is defined. If a welding operator is required to weld outside the range of qualification, then a new qualification test is required.

NOTE Friction stir welding is a mechanized process. However, because it is also a solid-state welding process, the essential variables are different from those applicable to fusion welding processes.

4.2.2 Friction stir welding methods

A successful welding operator qualification test made with any type of FSW method qualifies an operator only for that welding method. This subclause applies to FSW methods that include, but are not limited to, robotic, single spindle, multiple spindle, bobbin tool, adjustable tool probe, or any other FSW method defined in the WPS used for that qualification test.

4.2.3 Welding equipment

The following changes require a new qualification:

- a change from welding with a joint sensor to welding without, although welding without a joint sensor also qualifies an operator to weld with a joint sensor (i.e. location, height mismatch, ...);
- a change from one type of welding machine to another type of welding machine that requires additional training to operate — a test made with any type of machine qualifies only that type of machine, although the addition or removal of jigs and fixtures, feeding units and other ancillary equipment does not change the type of machine;
- addition, removal or change of control system.

4.2.4 Parent materials

A successful test weld made in any aluminium alloy qualifies an operator for all aluminium alloys.

A successful test weld of any parent material thickness qualifies an operator for all parent material thicknesses.

A successful test weld of any parent material form (including, but not limited to, sheet, tube, castings, forgings or extrusions) qualifies an operator for all parent material forms and for all tube diameters.

4.2.5 Weld joint geometry

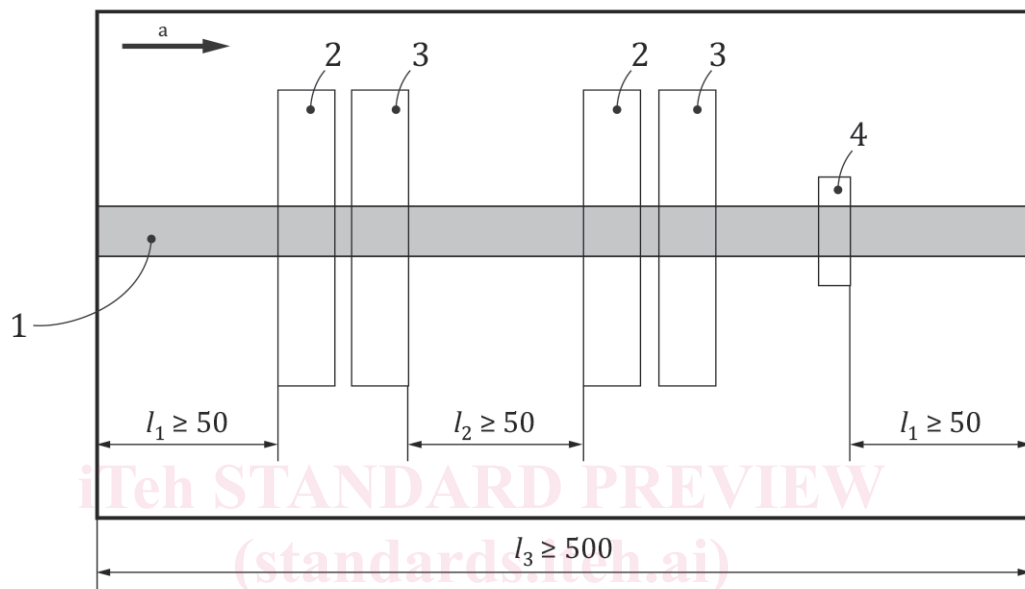
A successful test weld made in any weld joint geometry qualifies an operator for all weld joint geometries.

4.3 Qualification methods

4.3.1 Qualification based on standard welding test

The test piece shown in [Figure 1](#) shall be used for the standard welding test. A welding operator who has successfully completed the welding test in accordance with [4.4](#) shall be considered qualified for the method and type of welding machine used for the test.

Dimensions in millimetres



Key

- 1 weld <https://standards.iteh.ai/catalog/standards/sist/49e84a7d-41e4-4fb9-b895-82d931271957/sist-en-iso-25239-3-2020>
- 2 root bend test piece
- 3 face bend test piece
- 4 macroscopic examination test specimen
- l_1 minimum length of weld from the edge of the test piece to a test specimen
- l_2 minimum length of weld between face bend and root bend test specimens
- l_3 minimum total length of test piece
- a Weld direction.

The width of the test piece shall be sufficient for extracting the bend test specimens.

Figure 1 — Location of destructive test specimens

4.3.2 Qualification based on welding procedure test

A welding operator shall have successfully completed a welding procedure test in accordance with ISO 25239-4:2011, Clause 6, to be considered qualified for the method and type of welding machine used.

4.3.3 Qualification based on pre-production welding test or production welding test

A welding operator shall have successfully completed a pre-production welding test in accordance with ISO 25239-4:2011, Clause 7 or a production welding test, to be considered qualified for the FSW method and type of welding machine used for the test.