
Varjenje z gnetenjem - Aluminij - 5. del: Zahteve za kakovost in kontrolo (ISO/DIS 25239-5:2019)

Friction stir welding - Aluminium - Part 5: Quality and inspection requirements (ISO/DIS 25239-5:2019)

Rührreibschweißen - Aluminium - Teil 5: Qualitäts- und Prüfungsanforderungen (ISO/DIS 25239-5:2019)

Soudage par friction-malaxage - Aluminium - Partie 5: Exigences de qualité et de contrôle (ISO/DIS 25239-5:2019)

Ta slovenski standard je istoveten z: prEN ISO 25239-5

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| 25.160.10 | Varilni postopki in varjenje | Welding processes |
| 77.120.10 | Aluminij in aluminijeve zlitine | Aluminium and aluminium alloys |

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DRAFT INTERNATIONAL STANDARD

ISO/DIS 25239-5

IIW

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Friction stir welding — Aluminium —

Part 5: Quality and inspection requirements

*Soudage par friction-malaxage — Aluminium —**Partie 5: Exigences de qualité et de contrôle*

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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.

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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 documents 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 25239-5:2011), 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 5: Quality and inspection requirements

1 Scope

This part of ISO 25239 specifies a method for determining the capability of a fabricator to use the friction stir welding (FSW) process for the production of products of the specified quality. It specifies quality requirements, but does not assign those requirements to any specific product group.

In this document, the term “aluminium” refers to aluminium and its alloys.

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

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

ISO 9015-1, *Destructive tests on welds in metallic materials — Hardness testing — Part 1: Hardness test on arc welded joints*

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

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

ISO 9712, *Non-destructive testing — Qualification and certification of NDT personnel*

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

ISO 20807, *Non-destructive testing — Qualification of personnel for limited application of non-destructive testing*

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

ISO 25239-3, *Friction stir welding — Aluminium — Part 3: Qualification of welding operators*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 25239-1 apply.

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The list below is always included after each option:

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 Quality requirements

4.1 General

These requirements relate only to those aspects of product quality that may be influenced by FSW.

4.2 Welding personnel

4.2.1 General

Fabricators shall have at their disposal sufficient competent personnel for the planning, performance and supervision of FSW production operations in accordance with specified requirements.

4.2.2 Welding operator

Welding operators shall be qualified in accordance with ISO 25239-3. Qualification records shall be kept up to date.

4.3 Inspection and testing personnel

4.3.1 General

Fabricators shall have sufficient competent personnel for the planning, performance, and supervision of inspection and testing operations during the production of friction stir welded parts in accordance with specified requirements.

4.3.2 Personnel performing non-destructive testing and visual testing

Non-destructive and visual testing personnel shall be qualified in accordance with ISO 9712 or ISO 20807 or equivalent. When the use of an examination method not currently incorporated in ISO 9712 or ISO 20807 is specified, the fabricator shall be responsible for developing the training programme, written practice, examination, and practical demonstrations equivalent to the requirements of ISO 9712 or ISO 20807. These shall establish the capability of the personnel performing the required examination.

4.3.3 Destructive testing personnel

Personnel performing destructive testing shall be trained for those test methods.

4.4 Equipment

4.4.1 Suitability of equipment

The equipment shall be adequate for the application concerned.

Welding equipment (e.g. welding machines and FSW tools) shall be capable of producing welds that meet the acceptance levels specified in [Annex A](#). Welding equipment shall be maintained in good condition and shall be repaired or adjusted when a welding operator, inspector or welding coordinator is concerned about the capability of the equipment to operate satisfactorily.

4.4.2 New equipment

After installation of new or refurbished equipment, appropriate tests shall be performed. Such tests shall verify the equipment functions correctly.

4.4.3 Reproducibility tests for qualified machine welding settings

Reproducibility tests shall be performed to demonstrate that the welding equipment can repeatedly produce welds that meet the acceptance levels in [Annex A](#). Reproducibility tests shall be carried out when any of the following occurs:

- a critical component of the FSW machine is repaired or replaced after being damaged or after failing to operate properly;
- equipment is dislodged or moved in a manner for which it was not designed;
- stationary equipment is moved from one location to another.

The reproducibility test shall be performed in accordance with a WPS that is used in production for that machine.

A minimum of three test welds shall be made and found satisfactory.

4.4.4 Equipment maintenance

The fabricator shall have a documented plan for equipment maintenance. The plan shall ensure that maintenance checks are performed on the equipment that controls variables listed in the relevant WPSs. The maintenance plan may be limited to those items that are essential for producing welds that meet the quality requirements of this part of ISO 25239.

Examples of these items are as follows:

- condition of guides and mechanized fixtures;
- condition of meters and gauges that are used for the operation of the welding equipment;
- condition of cables, hoses, and connectors;
- condition of the control systems in mechanized or automatic welding equipment;
- condition of thermocouples and other temperature measurement instruments;
- condition of clamps, jigs, and fixtures.

Before welding, clamps, jigs, and fixtures that contact the workpieces shall be clean and sufficiently free of contaminants (e.g. oil, grease, and dirt) that could have a detrimental effect on the weld.

Defective equipment shall not be used.

4.5 Welding procedure specification

The fabricator shall ensure the WPS is used correctly in production.

4.6 Friction stir welding tool

4.6.1 Identification

The FSW tool that is used in production shall be permanently marked for identification prior to use.