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Date: 25 September 2025

Origin: International

Latest date for receipt of comments: 17 November 2025

Project No. 2024/00821

Responsible committee: WEE/0

Interested committees:

Title: Draft BS EN ISO 25116-4 BS EN ISO 25116-2 Friction stir welding - Steel. Part 2: Specification and qualification of welding procedures.

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 25116-2

Friction stir welding - Steel — Part 2: Specification and qualification of welding procedures

ICS: 25.160.10

IIW

Secretariat: **IIW**

Voting begins on:
2025-09-24

Voting terminates on:
2025-12-17

This document has not been edited by the ISO Central Secretariat.

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 COMMENTS AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

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Reference number
ISO/DIS 25116-2:2025(en)

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Published in Switzerland

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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).

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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 processes*.

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. Although such processes have experienced incremental developments, most of which consisting in various degrees of mechanisation and electrical waveform controls, they have fundamentally remained the same. In 1991, Wayne Thomas at TWI invented friction stir welding (FSW), which is carried out entirely in the solid phase (no melting).

This process was initially industrialised for the welding of aluminium as it is particularly well suited to this type of low fusion point materials. Examples of applications include railway carriages, consumer products, food processing equipment, aerospace structures, and marine vessels. Due to the potential advantages of the process, a significant development effort was dedicated worldwide to the adaptation of FSW to higher fusion point materials such as steels. This development included the commercial availability of tool materials capable of sustaining the high temperatures and forces required for welding.

Following such advancements, the increasing use of FSW for steel has created the need for this document in order to ensure that welding is carried out in a controlled manner to achieve repeatability.

Friction stir welding - Steel —

Part 2: Specification and qualification of welding procedures

1 Scope

This document specifies the requirements for the specification and qualification of welding procedures for the friction stir welding (FSW) of Steel.

In this document, the term “Steel” refers to Steels as specified by ISO 15608.

This document does not apply to friction stir spot welding.

NOTE Service requirements, materials or manufacturing conditions can require more comprehensive testing than is specified in this document.

Two levels of welding procedure tests are given in order to permit application to a wide range of welded fabrication. They are designated by levels 1 and 2. In level 2, the extent of testing is greater, and the ranges of qualification are more restrictive than in level 1.

Procedure tests carried out to level 2 automatically qualify for level 1 requirements, but not vice-versa.

When no level is specified in a contract or application standard, all the requirements of level 2 apply.

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 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

ISO 3452, *Non-destructive testing — Penetrant testing*

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

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

ISO 9016, *Destructive tests on welds in metallic materials — Impact tests — Test specimen location, notch orientation and examination*

ISO 9934, *Non-destructive testing — Magnetic particle testing*

ISO 13916, *Welding — Measurement of preheating temperature, interpass temperature and preheat maintenance temperature*

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

ISO 15607:2019, *Specification and qualification of welding procedures for metallic materials — General rules*

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

ISO 17636, *Non-destructive testing of welds — Radiographic testing*