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Friction stir welding — Aluminium —

Part 1:
Vocabulary

Soudage par friction-malaxage — Aluminium —

Partie 1: Vocabulaire

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

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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 IIW, *International Institute of Welding*, Commission III, *Resistance Welding, Solid State Welding and Allied Joining Process*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 121, *Welding*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 25239-1:2011), which has been technically revised.

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

— new definitions have been added for joint area deformation, operator, plunge phase, root flaw, stationary shoulder tool and temperature control;

— definitions of incomplete penetration, multi run welding, production welding test and single run welding have been deleted.

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. 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.

Friction stir welding — Aluminium —

Part 1:
Vocabulary

1 Scope

This document defines terms related to friction stir welding.

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

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TR 25901 (all parts) and the following apply.

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

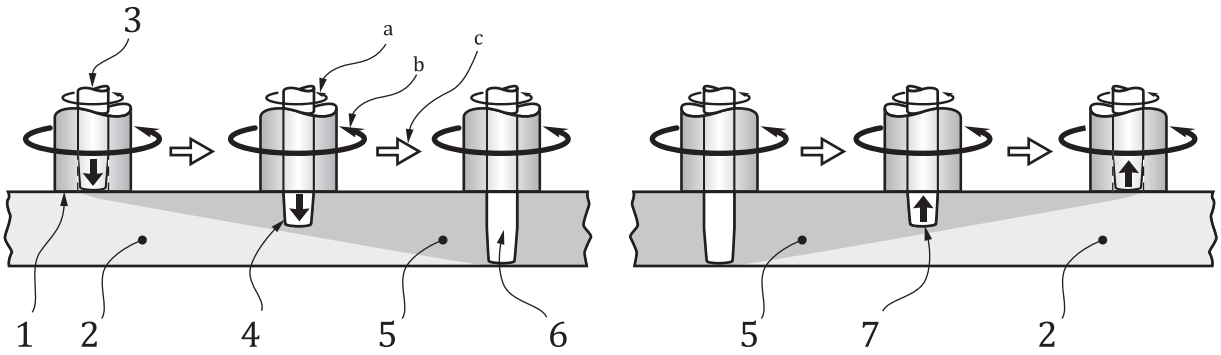
— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
adjustable tool probe
tool whose probe length, rotation speed and direction of probe rotation are adjustable. Rotation speed and direction of probe rotation may be different from those of the shoulder during welding

Note 1 to entry: See Figure 1.

Note 2 to entry: This tool enables joining to be accomplished without creating excessive toe flash at the start and exit hole.



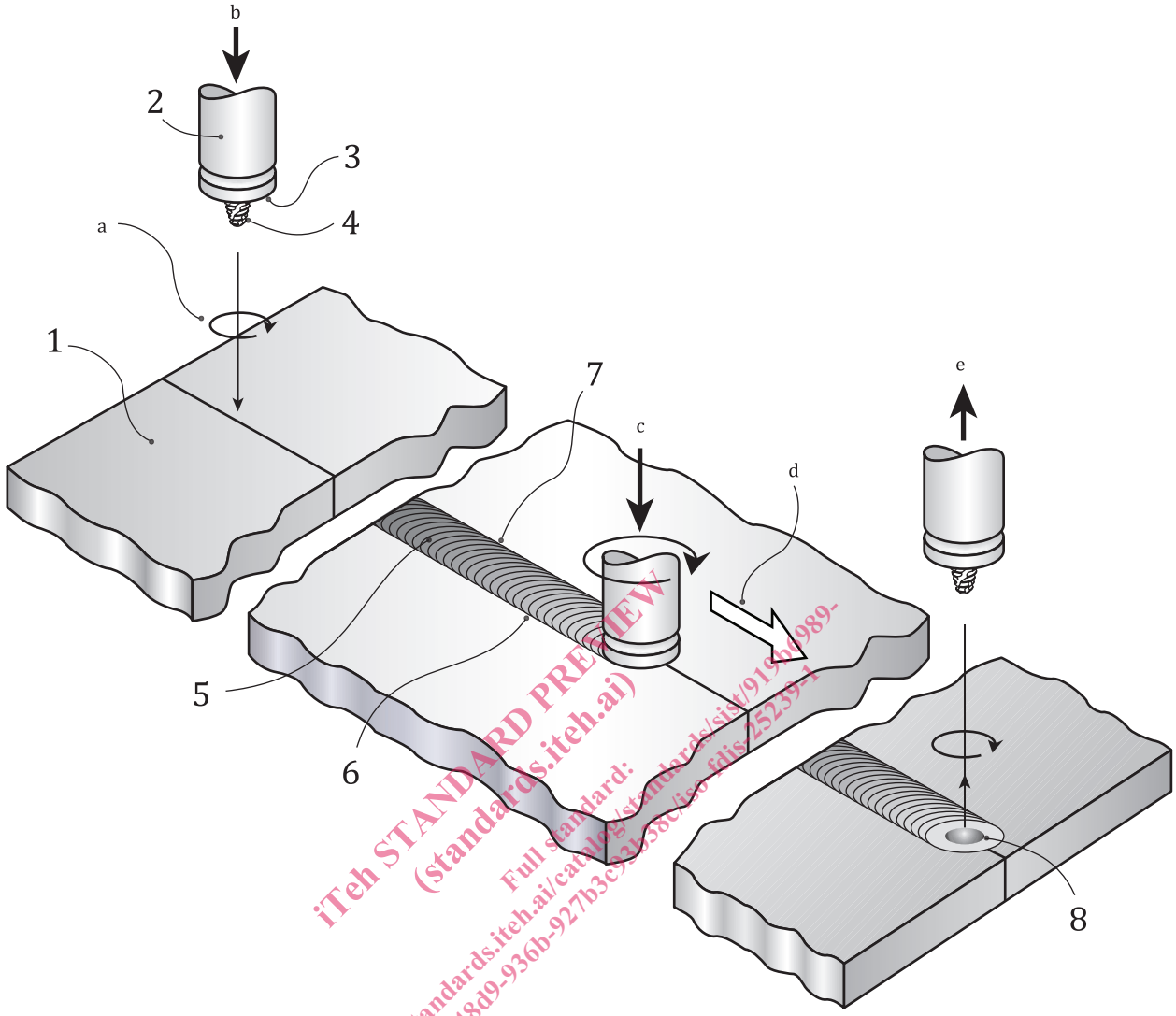
Key

1	shoulder	6	probe at required position for welding
2	unwelded workpiece	7	probe moving upward
3	probe	a	Direction of probe rotation.
4	probe moving downward	b	Direction of shoulder rotation.
5	welded workpiece	c	Direction of welding.

Figure 1 — Adjustable tool probe

3.2
advancing side
side of the weld where the direction of tool rotation is the same as the direction of welding

Note 1 to entry: See Figure 2.



Key

1 workpiece
2 tool
3 shoulder
4 probe
5 weld face
6 retreating side of weld
7 advancing side of weld
8 exit hole

a Direction of tool rotation.
NOTE A clock-wise rotation is shown in this figure.
b Downward motion of tool.
c Axial force.
d Direction of welding.
e Upward motion of tool.

Figure 2 — Basic principle of friction stir welding

3.3
axial force
<friction stir welding> force applied to the workpiece along the axis of tool rotation

Note 1 to entry: See Figure 2.

3.4
bobbin tool
tool with two shoulders separated by a fixed length or an adjustable length probe

Note 1 to entry: The self-reacting bobbin tool allows the shoulders to automatically maintain contact with the workpiece.

Note 2 to entry: See Figure 3.

3.5
dwell time at end of weld
<friction stir welding> time interval after travel has stopped, but before the rotating tool has begun to withdraw from the weld

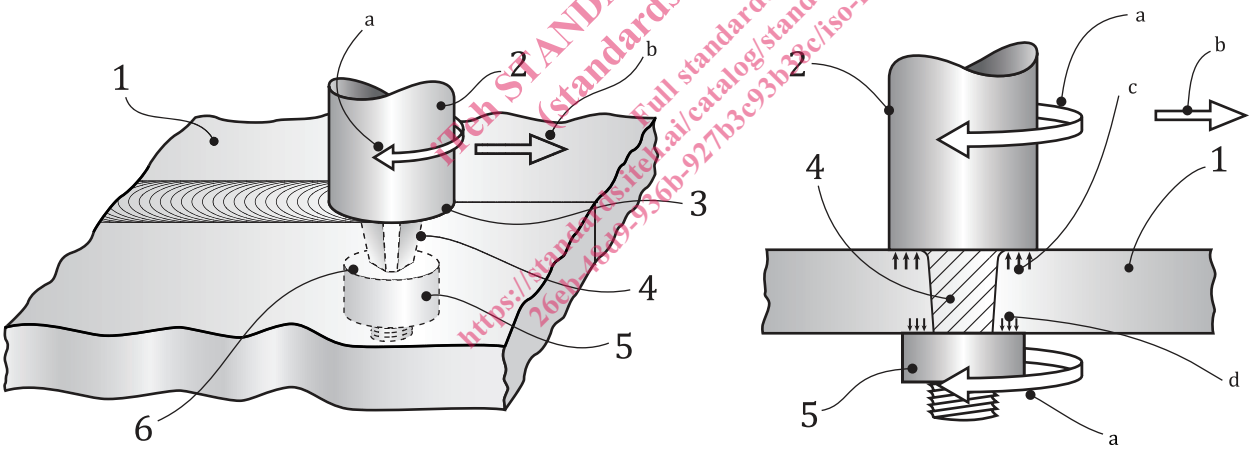
Note 1 to entry: See t_5 in Figure 4.

3.6
dwell time at start of weld
<friction stir welding> interval between the end of the plunge phase and the start of travel

Note 1 to entry: See t_3 in Figure 4.

3.7
exit hole
hole remaining at the end of a weld after the withdrawal of the tool

Note 1 to entry: See Figure 2.



a) Isometric view **b) Side view**

Key

1	workpiece	6	lower shoulder
2	upper tool	a	Direction of tool rotation.
3	upper shoulder	b	Direction of welding.
4	probe	c	Force on the upper shoulder.
5	lower tool	d	Force on the lower shoulder.

Figure 3 — Bobbin tool