TECHNICAL REPORT

ISO/TR 25901-3

First edition

Welding and allied processes — Vocabulary —

Part 3: Welding processes

Soudage et techniques connexes — Vocabulaire —

Partie 3: Procédés de soudage

PROOF/ÉPREUVE

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

Contents

Page

Foreword

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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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 44, *Welding and allied processes*, Subcommittee SC 7, *Representation and terms*, in collaboration with Commission VI, *Terminology, of the International Institute of Welding* (*IIW*).

This first edition of ISO/TR 25901-3, together with the other parts of ISO/TR 25901, cancels and replaces ISO 857-1:1998 and ISO/TR 25901:2007, of which it constitutes a revision.

ISO/TR 25901 consists of the following parts, under the general title *Welding and allied processes — Vocabulary*:

— *Part 1: General terms [Technical Report]*

— *Part 3: Welding processes [Technical Report]*

— *Part 4: Arc welding [Technical Report]*

The following parts are under preparation:

— *Part 2: Safety and health [Technical Report]*

Friction welding is to form the subject of a future part 5.

Requests for official interpretations of any aspect of this International Standard should be directed to the Secretariat of ISO/TC 44/SC 7 via your national standards body. A complete listing of these bodies can be found at www.iso.org.

Welding and allied processes — Vocabulary —

Part 3: Welding processes

1 Scope

This part of ISO/TR 25901 contains terms and definitions for welding processes, classified in accordance with their physical characteristics and to the relevant energy carrier.

It does not contain terms and definitions related to specific processes or particular aspects of welding and allied processes that are covered in other parts of this Technical Report (see Foreword) or in other ISO standards.

In the main body of this part of ISO/TR 25901, terms are arranged in a systematic order. Annex A provides an index in which all terms are listed alphabetically with reference to the appropriate subclause. In addition, it provides French translations, covering two of the three official ISO languages (English, French and Russian). German translations are also provided; these are published under the responsibility of the member body for Germany (DIN) and are given for information only.

NOTE 1 Only the terms given in the official languages (English, French and Russian) are to be considered as ISO terms and definitions.

NOTE 2 All these terms and definitions are also available on the ISO Online Browsing Platform (OBP): https://www.iso.org/obp/ui/

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1 Basic terms and definitions

2.1.1
metal welding
operation which unifies metal(s) by means of heat or pressure, or both, in such a way that there is continuity in the nature of the metal(s) which has (have) been joined

Note 1 to entry: A filler metal, the melting temperature of which is of the same order as that of the parent metal(s), can be used and the result of welding is the weld.

Note 2 to entry: This definition also includes surfacing.

2.1.2
welding with pressure
welding in which sufficient external force is applied to cause a greater or lesser degree of plastic deformation of both the faying surfaces, generally without the addition of filler metal

Note 1 to entry: Usually, but not necessarily, the faying surfaces are heated in order to permit or to facilitate unifying.

2.1.3
fusion welding
welding without application of external force in which the faying surface(s) has (have) to be molten

Note 1 to entry: Usually, but not necessarily, molten filler metal is added.

2.1.4
energy carrier
physical phenomenon which provides the energy required for welding either by transmission to or by transformation within the workpiece(s)

Note 1 to entry: The following energy carriers with their respective sequential numbers are used in 2.2:

1) solid body;

2) liquid;

3) gas;

4) electrical discharge;

5) radiation;

6) movement of a mass;

7) electric current;

8) unspecified.

Note 2 to entry: When welding using a solid body, a liquid, a gas or an electrical discharge, the heat required for welding should be applied to the workpiece(s), while when welding by means of a beam of radiant energy, movement of mass or electric current, the heat (or the mechanical energy in cold welding with pressure) is generated by energy transformation within the workpiece itself.

For a solid body, liquid and gas, the decisive factor is their enthalpy. Electrical discharge and current passage are mechanisms guiding the energy of moving charged particles to the welding zone. In the case of an electrical discharge, this is done by plasma or sparks and in the case of electric current, by resistance heat where the current is produced by induction or transmitted by conduction.

Radiation is propagation of energy in the sense of dissemination of waves by light or charged particle beams. For movement of a mass, the characteristic factors are force and displacement in time. Different kinds of movement are translational motion, rotation and oscillation.

2.2 Terms related to welding processes

2.2.1 Welding with pressure

2.2.1.1 Energy carrier: solid body

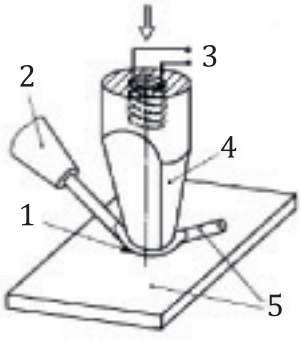
2.2.1.1.1
heated element welding
welding with pressure where the workpieces are heated by the heating tool in the area where the joint will be made

Note 1 to entry: Heating can be constant or pulsating and the weld is made by the application of force without the addition of a filler material. The force is applied by either a wedge shaped tool or through a nozzle through which one of the workpieces is fed.

2.2.1.1.2
heated wedge welding
heated element welding by means of a heated wedge

Note 1 to entry: Heated wedge welding can also be carried out by energy carrier movement of mass (ultrasonic welding) or as a combination of both.

Note 2 to entry: Heated wedge welding is illustrated in Figure 1.



Key

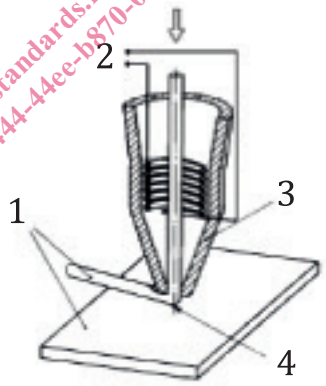
1 weld
2 workpiece feed
3 power source
4 wedge-shaped tool
5 workpiece

Figure 1 — Heated wedge welding

2.2.1.1.3
heated nozzle welding
heated element welding by means of a heated nozzle

Note 1 to entry: Heated nozzle welding can also be carried out by energy carrier movement of mass (ultrasonic welding) or as a combination of both.

Note 2 to entry: Heated nozzle welding is illustrated in Figure 2.



Key

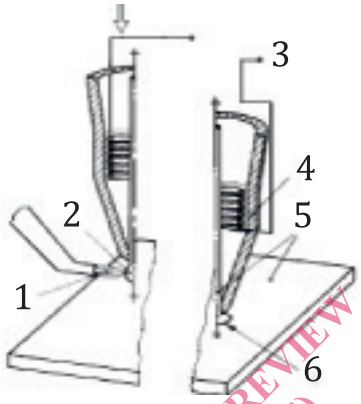
1 workpiece
2 power source
3 nozzle
4 weld

Figure 2 — Heated nozzle welding

2.2.1.1.4
nail head welding
heated nozzle welding in which the end of one or two wires which has been fed through the nozzle and heated by a flame or electric discharge, forms a small globule, which under the effect of the applied force is flattened into the shape of a nail head

Note 1 to entry: Nail head welding can also be carried out by energy carrier movement of mass (ultrasonic welding) or as a combination of both.

Note 2 to entry: Nail head welding is illustrated in Figure 3.



Key
1 flame
2 molten metal globule
3 power source
4 nozzle
5 workpiece
6 weld

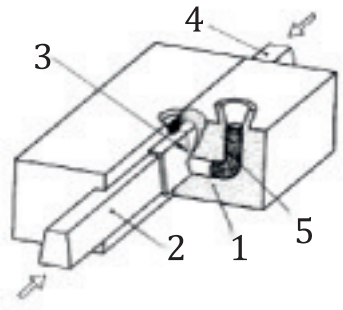
Figure 3 — Nail head welding

2.2.1.2 Energy carrier: liquid

2.2.1.2.1
flow welding with pressure
welding with pressure where the joint assembly is in a mould and molten metal is poured over the surfaces to be welded until the joint is made

Note 1 to entry: The molten metal is often produced by an aluminothermic reaction (see 2.2.2.2.2).

Note 2 to entry: Flow welding with pressure is illustrated in Figure 4.



Key

1 mould
2 workpiece
3 weld
4 workpiece
5 molten metal

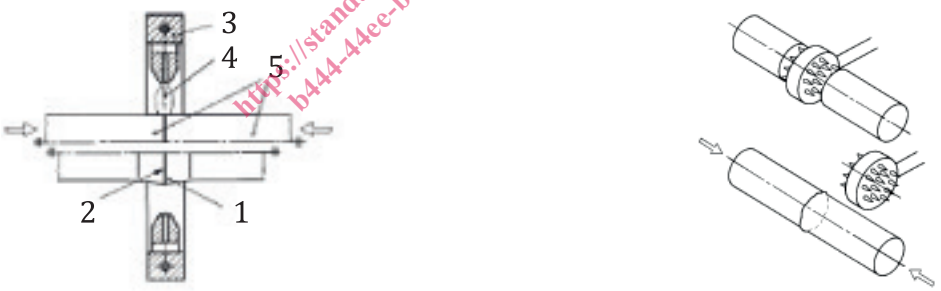
Figure 4 — Flow welding with pressure

2.2.1.3 Energy carrier: gas

2.2.1.3.1
oxyfuel gas pressure welding
welding with pressure in which the workpieces are heated at the faying surfaces by an oxyfuel gas flame and the weld is made by applying a force without addition of filler metal

Note 1 to entry: The assembly may be of the open or closed type.

Note 2 to entry: Oxyfuel gas pressure welding is illustrated in Figure 5.



a) Closed assembly **b) Opened assembly**

Key

1 upset
2 weld
3 welding blowpipe
4 gas flame
5 workpiece

Figure 5 — Oxyfuel gas pressure welding

2.2.1.4 Energy carrier: electric discharge

2.2.1.4.1
magnetically impelled arc welding
DEPRECATED: magnetically impelled arc butt welding
arc welding with pressure in which an arc, impelled by a magnetic field, moves along the joint, heating the faying surfaces which are then brought together by a force and welded

2.2.1.4.2
percussion welding
welding with pressure employing the heat from an arc produced by a rapid discharge of electrical energy

Note 1 to entry: Pressure is applied percussively during or immediately following the electrical discharge. It can be accompanied by additional resistance heating.

Note 2 to entry: This process is mainly used for the welding of studs.

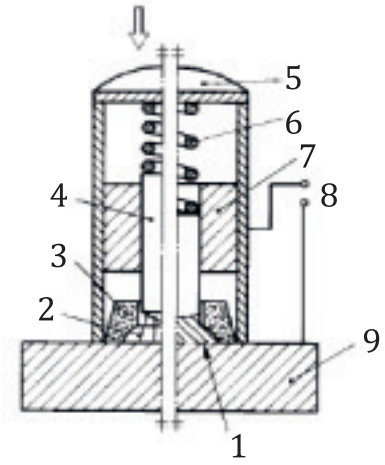
2.2.1.4.3
arc stud welding
arc welding with pressure that uses an arc between a metal stud, or similar part, and the workpiece

Note 1 to entry: Ceramic ferrule, shielding gas or both may be used.

2.2.1.4.4
drawn arc stud welding
drawn arc stud welding with ceramic ferrule or shielding gas
arc stud welding where a discharge is ignited by lifting the stud and the weld pools are shielded by a ceramic ferrule, shielding gas or both

Note 1 to entry: The welding time is usually more than 100 ms.

Note 2 to entry: Drawn arc stud welding is illustrated in Figure 6.



Key

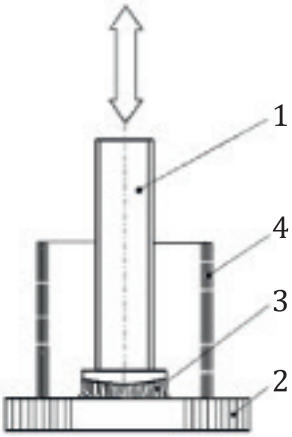
1 weld
2 arc
3 ceramic ferrule
4 stud (workpiece)
5 welding gun
6 spring
7 lifting magnet
8 power source
9 workpiece

Figure 6 — Drawn arc stud welding with ceramic ferrule

2.2.1.4.5
short-cycle drawn arc stud welding
drawn arc stud welding where the welding time is between 10 ms and 100 ms

2.2.1.4.6
capacitor discharge drawn arc stud welding
drawn arc stud welding in which the electrical energy is provided by the discharge of a capacitor and the welding time is between 1 ms and 10 ms

Note 1 to entry: Capacitor discharge drawn arc stud welding is illustrated in Figure 7.



Key

1 stud
2 workpiece
3 arc
4 support tube

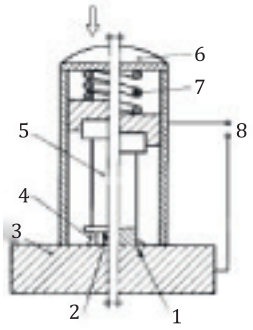
Figure 7 — Capacitor discharge drawn arc stud welding

2.2.1.4.7
capacitor discharge stud welding with tip ignition
arc stud welding where the arc is ignited by explosively melting and partially vaporizing a specially formed tip of the stud

Note 1 to entry: The workpieces are pressed together before the capacitor is totally discharged.

Note 2 to entry: Welding time is usually between 0,5 ms and 5 ms.

Note 3 to entry: Capacitor discharge stud welding with tip ignition is illustrated in Figure 8.



Key

1 weld
2 stud tip
3 workpiece
4 arc
5 stud (workpiece)
6 welding gun
7 spring
8 power source

Figure 8 — Capacitor discharge stud welding with tip ignition

2.2.1.4.8
drawn arc stud welding with fusible collar
drawn arc stud welding where a discharge is ignited by lifting the stud which has a fusible collar

2.2.1.5 Energy carrier: radiation

(No processes known so far)

2.2.1.6 Energy carrier: movement of a mass

2.2.1.6.1
ultrasonic welding
welding with pressure in which mechanical vibrations of high frequencies and of low amplitude, superimposed on a static force, make a weld between the two workpieces to be joined at a temperature well below the melting point of the material

Note 1 to entry: Additional heat can be applied.

Note 2 to entry: Ultrasonic welding is illustrated in Figure 9.