



**SLOVENSKI STANDARD**  
**SIST EN ISO 14555:2007**

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Welding - Arc stud welding of metallic materials (ISO 14555:2006)

Schweißen - Lichtbogenbolzenschweißen von metallischen Werkstoffen (ISO 14555:2006)

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Soudage - Soudage a l'arc des goujons sur les matériaux métalliques (ISO 14555:2006)

**Ta slovenski standard je istoveten z: EN ISO 14555:2006**  
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**ICS:**

25.160.10 Varilni postopki in varjenje Welding processes

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English Version

Welding - Arc stud welding of metallic materials (ISO  
14555:2006)

Soudage - Soudage à l'arc des goujons sur les matériaux  
métalliques (ISO 14555:2006)

Schweißen - Lichtbogenbolzenschweißen von metallischen  
Werkstoffen (ISO 14555:2006)

This European Standard was approved by CEN on 22 September 2006.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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## Foreword

This document (EN ISO 14555:2006) has been prepared by Technical Committee ISO/TC 44 "Welding and allied processes" in collaboration with Technical Committee CEN/TC 121 "Welding", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2007, and conflicting national standards shall be withdrawn at the latest by April 2007.

This document supersedes EN ISO 14555:1998.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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# INTERNATIONAL STANDARD

# ISO 14555

Second edition  
2006-10-01

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## Welding — Arc stud welding of metallic materials

*Soudage — Soudage à l'arc des goujons sur les matériaux métalliques*

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 14555 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 10, *Unification of requirements in the field of metal welding*.

This second edition cancels and replaces the first edition (ISO 14555:1998), which has been technically revised.

Requests for official interpretations of any aspect of this International Standard should be directed to the Secretariat of ISO/TC 44/SC 10 via your national standards body. A complete listing of these bodies can be found at <http://www.iso.org>.

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## Introduction

The purpose of arc stud welding is to weld predominantly pin-shaped metal parts to metal workpieces. In this International Standard it is referred to simply as stud welding. Amongst other things, stud welding is used in bridge building (especially in composite structures), steel structures, shipbuilding, facade-wall fabrication, vehicle manufacture, equipment design, steam-boiler construction, and the manufacture of household appliances.

The quality of a stud weld depends not only on strict compliance with the welding procedure specification but also on the correct function of the actuating mechanism (e.g. welding guns), and on the condition of the components, of the accessories and of the power supply.

This International Standard does not invalidate former specifications, providing the technical requirements are equivalent and satisfied.

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# Welding — Arc stud welding of metallic materials

## 1 Scope

This International Standard covers arc stud welding of metallic materials subject to static and dynamic loading. It specifies requirements that are particular to stud welding, in relation to welding knowledge, quality requirements, welding procedure specification, welding procedure qualification, qualification testing of operators and testing of production welds.

This International Standard is appropriate where it is necessary to demonstrate the capability of a manufacturer to produce welded construction of a specified quality.

**NOTE** General quality requirements for fusion welding of metallic materials are given in ISO 3834-1, ISO 3834-2, ISO 3834-3, ISO 3834-4 and ISO 3834-5.

This International Standard has been prepared in a comprehensive manner, with a view to its being used as a reference in contracts. The requirements contained within it can be adopted in full, or partially, if certain requirements are not relevant to a particular construction (see Annex B).

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## 2 Normative references (standards.iteh.ai)

The following referenced documents are indispensable for the application 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 857-1, *Welding and allied processes — Vocabulary — Part 1: Metal welding processes*

ISO 3834-1, *Quality requirements for fusion welding of metallic materials — Part 1: Criteria for the selection of the appropriate level of quality requirements*

ISO 3834-2, *Quality requirements for fusion welding of metallic materials — Part 2: Comprehensive quality requirements*

ISO 3834-3, *Quality requirements for fusion welding of metallic materials — Part 3: Standard quality requirements*

ISO 3834-4, *Quality requirements for fusion welding of metallic materials — Part 4: Elementary quality requirements*

ISO 4063, *Welding and allied processes — Nomenclature of processes and reference numbers*

ISO 6947, *Welds — Working positions — Definitions of angles of slope and rotation*

ISO 9606-1, *Approval testing of welders — Fusion welding — Part 1: Steels*

ISO 9606-2, *Qualification test of welders — Fusion welding — Part 2: Aluminium and aluminium alloys*

ISO 13918:—<sup>1)</sup>, *Welding — Studs and ceramic ferrules for arc stud welding*

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1) To be published. (Revision of ISO 13918:1998)

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ISO 14175, *Welding consumables — Shielding gases for arc welding and cutting*

ISO 14731, *Welding coordination — Tasks and responsibilities*

ISO 14732:1998, *Welding personnel — Approval testing of welding operators for fusion welding and of resistance weld setters for fully mechanized and automatic welding of metallic materials*

ISO 15607:2003, *Specification and qualification of welding procedures for metallic materials — General rules*

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

ISO 15611, *Specification and qualification of welding procedures for metallic materials — Qualification based on previous welding experience*

ISO 15613, *Specification and qualification of welding procedures for metallic materials — Qualification based on pre-production welding test*

ISO 15614-1:2004, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys*

ISO 15614-2, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 2: Arc welding of aluminium and its alloys*

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

ISO 17662, *Welding — Calibration, verification and validation of equipment used for welding, including ancillary activities*

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### 3 Terms and definitions

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For the purposes of this document, the terms and definitions given in ISO 857-1, ISO 3834-1, ISO 4063, ISO 14731, ISO 14732 and ISO 15607 and the following apply.

#### 3.1

##### **stud**

fastener to be attached by stud welding

#### 3.2

##### **auxiliaries**

ceramic ferrules and shielding gases

#### 3.3

##### **stud-welding operator**

operating personnel for stud-welding equipment

NOTE In special cases (e.g. mass production at the manufacturer's factory) the welding can be carried out by suitable auxiliary personnel, appropriately trained and supervised.

#### 3.4

##### **stud diameter**

$d$

stud nominal diameter

NOTE See ISO 13918.

#### 3.5

##### **welding diameter**

$d_w$

diameter at the weld base

**3.6****weld zone**

welded area underneath the welding diameter

**3.7****current intensity**

root-mean-square (RMS) value of the welding current in the steady state during the burning time of the arc

NOTE Current intensity is not applicable to capacitor discharge.

**3.8****welding time**

time difference between the ignition and the final extinction of the main arc

**3.9****lift**

*L*

distance between the stud tip and the work piece surface with the stud-lifting mechanism in position and activated

NOTE 1 For tip ignition, this definition applies to the ignition gap.

NOTE 2 See Figure A.1.

**3.10****plunge**

axial movement of the stud towards the surface of the work piece

**3.11****protrusion**

*P*

(unregulated lifting mechanism) distance between the tip of the stud and the face of the support device in their initial positions, where the support device faces the work piece

NOTE 1 A spring-loaded lifting mechanism is an unregulated lifting mechanism.

NOTE 2 See Figure A.1.

**3.12****arc blow**

magnetic deflection of the arc from the axial direction of the stud

**3.13****flux**

aluminium additive on the weld end of the stud, which improves the ignition and de-oxidizes the weld pool

**3.14****dual-material stud**

two-material stud composed of a material at the weld tip, similar to that of the parent material, and a dissimilar material outside the weld tip, which are joined by a friction weld, thus avoiding a mixed structure in the weld zone when stud welding

**3.15****structure subjected to fatigue loading**

structure subject to a set of typical load events described by the positions or movements of loads, their variation in intensity and their frequency and sequence of occurrence

## 4 Symbols and abbreviated terms

### 4.1 Symbols

For the purposes of this International Standard, the following symbols apply.

<i>C</i>	capacitance (expressed in mF)
<i>d</i>	stud diameter (expressed in mm)
<i>d<sub>w</sub></i>	welding diameter (expressed in mm)
<i>h</i>	length of the threaded part of the nut
<i>I</i>	current intensity (expressed in A)
<i>L</i>	lift
<i>P</i>	protrusion
<i>t</i>	thickness of plate
<i>t<sub>w</sub></i>	welding time (expressed in ms or s)
<i>T</i>	torque (expressed in Nm)
<i>U</i>	charging voltage (expressed in V)
<i>W</i>	charging energy (expressed in Ws)
<i>a</i>	bending angle (expressed in °)

### 4.2 Abbreviated terms

For the purposes of this International Standard, the following abbreviated terms apply.

CF	ceramic ferrule
HAZ	heat-affected zone
NP	no protection
PA	flat welding position
PC	horizontal welding position
PE	overhead welding position
pWPS	preliminary welding procedure specification
SG	shielding gas
WPS	welding procedure specification
WPQR	welding procedure qualification record

## 5 Technical review

When a technical review is required by an application standard, by specification or by use of ISO 3834-2, ISO 3834-3 or ISO 3834-4, the manufacturer shall check, as appropriate, the following aspects:

- a) the accessibility and welding position of the stud weld;
- b) the nature of the surface and the collar shape of the welded joint;
- c) materials and combinations of materials (see Tables A.3 and A.4);
- d) the ratio of stud diameter to sheet metal thickness (avoidance of damage on the reverse side of the sheet);
- e) dimensions and details of the weld preparation and of the finished weld, including the nature of the stud and sheet-metal surfaces, positional and angular accuracy and the length tolerance of the welded stud;
- f) the use of special techniques to avoid damage to the reverse side of the sheet;
- g) techniques to assure the angular position of the welded stud.

NOTE Consideration is paid to the multi-axial stress state arising from localized heating/cooling. This stress concentration reduces the dynamic strength of a component with welded studs.

## 6 Welding personnel

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### 6.1 Stud-welding operators

Stud-welding operators shall be qualified in accordance with ISO 14732:1998, 4.2.1 or 4.2.2. They shall have appropriate knowledge to operate the equipment, to adjust it properly, to carry out the welding correctly and, while doing so, to pay attention to good contact and suitable connection between the work piece cables and uniform distribution of ferromagnetic materials (see Table A.8).

The qualification shall include testing in accordance with the acceptance criteria specified in 12.2.

A test of job knowledge is required for all qualification methods. This test shall cover, as a minimum:

- a) setting up the welding equipment in accordance with the welding procedure specification;
- b) basic knowledge of the way in which suitable connection of work piece cables, the polarity of the stud, and arc blowing can influence the weld result (see Table A.8);
- c) basic assessment of the welded joint for imperfections (see Tables A.5, A.6 and A.7);
- d) safe execution of the welding operations, i.e. good contact of the stud in the stud holder, no movement during the welding process, operation checking and correct positioning of the guns).

### 6.2 Welding coordination

Welding coordination shall be performed in accordance with ISO 14731.

Welding coordination personnel for stud welding shall have knowledge of and experience in the relevant stud-welding process, and shall be able to select and set the correct parameters, e.g. lift, protrusion (plunge), current intensity, and welding time.

A welding coordinator is not required for stud welding to structures subjected to unspecified static loading (see Annex B).