



**SLOVENSKI STANDARD
SIST EN ISO 15620:2019**

01-september-2019

**Nadomešča:
SIST EN ISO 15620:2002**

Varjenje - Torno varjenje kovinskih materialov (ISO 15620:2019)

Welding - Friction welding of metallic materials (ISO 15620:2019)

Schweißen - Reibschweißen von metallischen Werkstoffen (ISO 15620:2019)

Soudage - Soudage par friction des matériaux métalliques (ISO 15620:2019)

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Ta slovenski standard je istoveten z: EN ISO 15620:2019

<https://standards.iteh.ai/catalog/standards/sist/066e4227-6636-4427-9ef4-c92e2342533a/sist-en-iso-15620-2019>

ICS:

25.160.10 Varilni postopki in varjenje Welding processes

SIST EN ISO 15620:2019

en,fr,de

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN ISO 15620:2019

<https://standards.iteh.ai/catalog/standards/sist/066e4227-6636-4427-9ef4-e92e2342533a/sist-en-iso-15620-2019>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 15620

June 2019

ICS 25.160.10

Supersedes EN ISO 15620:2000

English Version

Welding - Friction welding of metallic materials (ISO 15620:2019)

Soudage - Soudage par friction des matériaux métalliques (ISO 15620:2019)

Schweißen - Reibschweißen von metallischen Werkstoffen (ISO 15620:2019)

This European Standard was approved by CEN on 30 May 2019.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

<https://standards.iteh.ai/catalog/standards/sist/066e4227-6636-4427-9ef4-e92e2342533a/sist-en-iso-15620-2019>



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents	Page
European foreword	3
Annex ZA (informative) Relationship between this European Standard and the essential requirements of EU Directive 2014/68/EU (PED) aimed to be covered	4

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN ISO 15620:2019](https://standards.iteh.ai/catalog/standards/sist/066e4227-6636-4427-9ef4-e92e2342533a/sist-en-iso-15620-2019)
<https://standards.iteh.ai/catalog/standards/sist/066e4227-6636-4427-9ef4-e92e2342533a/sist-en-iso-15620-2019>

European foreword

This document (EN ISO 15620:2019) has been prepared by Technical Committee ISO/TC 44 "Welding and allied processes" in collaboration with Technical Committee CEN/TC 121 "Welding and allied processes" 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 December 2019, and conflicting national standards shall be withdrawn at the latest by December 2019.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 15620:2000.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s) see informative Annex ZA, which is an integral part of this document.

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

<https://standards.iteh.ai/catalog/standards/sist/066e4227-6636-4427-9ef4-e92e2342533a/sist-en-iso-15620-2019>

Endorsement notice

The text of ISO 15620:2019 has been approved by CEN as EN ISO 15620:2019 without any modification.

Annex ZA (informative)

Relationship between this European Standard and the essential requirements of EU Directive 2014/68/EU (PED) aimed to be covered

This European Standard has been prepared under a Commission's standardization request M/071 "Mandate to CEN for standardization in the field of pressure equipment" to provide one voluntary means of conforming to essential requirements of Directive 2014/68/EU (PED) on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment.

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Annex I of the Directive 2014/68/EU (PED)

Essential Requirements of Directive 2014/68/EU (PED)	Clauses of this EN	Remarks/Notes
Annex I, 3.1	Clause 4	Welding procedures
Annex I, 3.1.1	Sub-clauses 5.1, 5.2, 5.4	Welding components quality and preparation
Annex I, 3.1.4	Sub-clause 5.3	Heat treatment
Annex I, 3.1.2 – paragraphs 1,2,3	Clauses 6, 7, 8	Welding procedure specification and approval, welding personnel

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) and services falling within the scope of this standard.

INTERNATIONAL
STANDARD

ISO
15620

Second edition
2019-05

**Welding — Friction welding of
metallic materials**

Soudage — Soudage par friction des matériaux métalliques

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN ISO 15620:2019](https://standards.iteh.ai/catalog/standards/sist/066e4227-6636-4427-9ef4-e92e2342533a/sist-en-iso-15620-2019)

<https://standards.iteh.ai/catalog/standards/sist/066e4227-6636-4427-9ef4-e92e2342533a/sist-en-iso-15620-2019>



Reference number
ISO 15620:2019(E)

© ISO 2019

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN ISO 15620:2019

<https://standards.iteh.ai/catalog/standards/sist/066e4227-6636-4427-9ef4-e92e2342533a/sist-en-iso-15620-2019>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Published in Switzerland

Contents

	Page
Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Welding knowledge	3
4.1 Process.....	3
4.1.1 General.....	3
4.1.2 Direct drive rotational friction welding.....	4
4.1.3 Stored energy (inertia) friction welding.....	6
4.1.4 Further processes.....	8
4.1.5 Friction welding arrangements.....	8
4.2 Materials and material combinations.....	8
4.3 Friction welding machines.....	9
4.3.1 General.....	9
4.3.2 Features.....	10
5 Quality requirements	10
5.1 General.....	10
5.2 Pre-welding requirements.....	10
5.2.1 Condition of raw materials.....	10
5.2.2 Preparation of the components to be welded.....	11
5.2.3 Component holding.....	11
5.3 Post-welding treatment.....	11
5.4 Quality assurance.....	11
6 Welding procedure specification (WPS)	12
6.1 General.....	12
6.2 Information related to the manufacturer.....	12
6.3 Information related to the material.....	13
6.4 Welding parameters.....	13
6.5 Joint.....	13
6.6 Optional devices.....	13
7 Welding procedure approval	13
7.1 Principles.....	13
7.2 Welding procedure tests.....	14
7.2.1 Application.....	14
7.2.2 Preliminary welding procedure specification (pWPS).....	14
7.2.3 Number of test weldments.....	14
7.2.4 Specification for test specimens.....	14
7.2.5 Test procedures.....	16
7.2.6 Acceptance criteria.....	18
7.3 Welding procedure approval record (WPQR).....	18
7.4 Previous experience.....	18
7.5 Circumstances mandating requalification.....	18
7.6 Machine-specific nature of a WPS.....	19
7.7 Requalification procedure requirements.....	19
8 Welding personnel	19
8.1 Friction welding machine operator.....	19
8.2 Friction welding machine setter.....	19
8.3 Welding coordination personnel (supervisor).....	19
Annex A (informative) Relationship of welding parameters	20

ISO 15620:2019(E)

Annex B (informative) Additional processes based on friction	22
Annex C (informative) Material combinations weldable by friction welding	25
Annex D (informative) Guidelines for quality assurance	27
Annex E (informative) Examination and test	28
Annex F (informative) Manufacturer's friction welding procedure specification (WPS)	30
Annex G (informative) Characteristics of friction welded components	32
Annex H (informative) Welding procedure approval record form (WPQR) Welding procedure approval — Test certificate	37
Bibliography	40

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN ISO 15620:2019](https://standards.iteh.ai/catalog/standards/sist/066e4227-6636-4427-9ef4-e92e2342533a/sist-en-iso-15620-2019)

<https://standards.iteh.ai/catalog/standards/sist/066e4227-6636-4427-9ef4-e92e2342533a/sist-en-iso-15620-2019>

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 Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 10, *Quality management in the field of welding*.

Any feedback, question or request for official interpretation related to any aspect of this document 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 www.iso.org/members.html. Official interpretations, where they exist, are available from this page: <https://committee.iso.org/sites/tc44/home/interpretation.html>.

This second edition cancels and replaces the first edition (ISO 15620:2000), which has been technically revised.

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

- Clause 2 has been updated;
- in Clause 3, terms not used in the text have been deleted;
- in [Annex B](#) of 4 processes based on friction have been added;
- the recommended test to perform on test weld has been clarified (addition of [Table 4](#)).

ISO 15620:2019(E)**Introduction**

Friction welding is a method for making welds in the solid phase in which one component is moved relative to and in pressure contact with the mating component to produce heat at the faying surfaces, the weld being completed by the application of a force during or after the cessation of relative motion. There are several forms of supplying energy and various forms of relative movements.

The generation of friction heating results in a comparatively low joining temperature at the interface. This is largely the reason why friction welding is suitable for materials and material combinations which are otherwise difficult to weld. The weld region is generally narrow and normally has a refined microstructure.

While the friction welding process deals primarily with components of circular cross-section it does not preclude the joining of other component shapes.

**iTeh STANDARD PREVIEW
(standards.iteh.ai)**

[SIST EN ISO 15620:2019](https://standards.iteh.ai/catalog/standards/sist/066e4227-6636-4427-9ef4-e92e2342533a/sist-en-iso-15620-2019)

<https://standards.iteh.ai/catalog/standards/sist/066e4227-6636-4427-9ef4-e92e2342533a/sist-en-iso-15620-2019>

Welding — Friction welding of metallic materials

1 Scope

This document specifies requirements for the friction welding of components manufactured from metals.

It specifies requirements particular to rotational friction welding related to welding knowledge, quality requirements, welding procedure specification, welding procedure approval and welding personnel.

This document is appropriate where a contract, an application standard or a regulatory requirement requires the demonstration of the manufacturer's capability to produce welded constructions of a specified quality. It has been prepared in a comprehensive manner to be used as a reference in contracts. The requirements given can be adopted in full or some can be deleted, if not relevant to the construction concerned.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminological database 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

axial force

force in axial direction between components to be welded

3.2

burn-off length

loss of length during the friction phase

3.3

burn-off rate

rate of shortening of the *components* (3.4) during the friction welding process

3.4

component

single item before welding

3.5

component induced braking

reduction in *rotational speed* (3.18) resulting from friction between the interfaces

3.6

external braking

braking located externally reducing the *rotational speed* (3.18)

ISO 15620:2019(E)

- 3.7**
faying surface
surface of one *component* (3.4) that is to be in contact with a surface of another *component* (3.4) to form a joint
- 3.8**
forge force
force applied normal to the *faying surfaces* (3.7) at the time when relative movement between the *components* (3.4) is ceasing or has ceased
- 3.9**
forge burn-off length
amount by which the overall length of the *components* (3.4) is reduced during the application of the *forge force* (3.8)
- 3.10**
forge phase
interval time in the friction welding cycle between the start and finish of application of the *forge force* (3.8)
- 3.11**
forge pressure
pressure (force per unit area) on the *faying surfaces* (3.7) resulting from the axial *forge force* (3.8)
- 3.12**
forge time
time for which the *forge force* (3.8) is applied to the *components* (3.4)
- 3.13**
friction force
force applied perpendicularly to the *faying surfaces* (3.7) during the time that there is relative movement between the *components* (3.4)
- 3.14**
friction phase
interval time in the friction welding cycle in which the heat necessary for making a weld is generated by relative motion and the *friction force(s)* (3.13) between the *components* (3.4), i.e. from contact of *components* (3.4) to the start of deceleration
- 3.15**
friction pressure
pressure (force per unit area) on the *faying surfaces* (3.7) resulting from the axial friction force
- 3.16**
friction time
time during which relative movement between the *components* (3.4) takes place at *rotational speed* (3.18) and under application of the *friction force(s)* (3.13)
- 3.17**
interface
contact area developed between the *faying surfaces* (3.7) after completion of the welding operation
- 3.18**
rotational speed
number of revolutions per minute of rotating *component* (3.4)
- 3.19**
stick-out
distance a *component* (3.4) sticks out from the fixture, or chuck in the direction of the mating *component* (3.4)

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN ISO 15620:2019
<https://standards.iteh.ai/catalog/standards/sist/066e4227-6636-4427-9ef4-e92e2342533a/sist-en-iso-15620-2019>

3.20**deceleration phase**

interval in the friction welding cycle in which the relative motion of the *components* (3.4) is decelerated to zero

3.21**deceleration time**

time required by the moving *component* (3.4) to decelerate from friction speed to zero speed

3.22**total length loss (upset)**

loss of length that occurs as a result of friction welding, i.e. the sum of the *burn-off length* (3.2) and the *forge burn-off length* (3.9)

3.23**total weld time**

time elapsed between *component* (3.4) contact and end of forging phase

3.24**welding cycle**

succession of operations carried out by the machine to make a weldment and return to the initial position, excluding *component* (3.4) - handling operations

3.25**weldment**

two or more components joined by welding

4 Welding knowledge

ITIH STANDARD PREVIEW
(standards.iteh.ai)

4.1 Process

SIST EN ISO 15620:2019
<https://standards.iteh.ai/catalog/standards/sist/066e4227-6636-4427-9ef4-e92e2342533a/sist-en-iso-15620-2019>

4.1.1 General

The classification of friction welding processes is listed in [Table 1](#).