



**NSAI**  
Standards

Irish Standard  
I.S. EN ISO 15614-1:2017

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 15614-1:2017)

## I.S. EN ISO 15614-1:2017

*Incorporating amendments/corrigenda/National Annexes issued since publication:*

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

*This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):*

*NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.*

*This document is based on:*

EN ISO 15614-1:2017

*Published:*

2017-06-21

*This document was published under the authority of the NSAI and comes into effect on:*

2017-07-09

ICS number:

25.160.10

NOTE: If blank see CEN/CENELEC cover page

NSAI  
1 Swift Square,  
Northwood, Santry  
Dublin 9

T +353 1 807 3800  
F +353 1 807 3838  
E standards@nsai.ie  
W NSAI.ie

Sales:  
T +353 1 857 6730  
F +353 1 857 6729  
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

## National Foreword

I.S. EN ISO 15614-1:2017 is the adopted Irish version of the European Document EN ISO 15614-1:2017, 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 15614-1:2017)

This document does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

For relationships with other publications refer to the NSAI web store.

**Compliance with this document does not of itself confer immunity from legal obligations.**

*In line with international standards practice the decimal point is shown as a comma (,) throughout this document.*

This page is intentionally left blank

EUROPEAN STANDARD

**EN ISO 15614-1**

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2017

ICS 25.160.10

Supersedes EN ISO 15614-1:2004

English Version

**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 15614-1:2017)**

Descriptif et qualification d'un mode opératoire de soudage pour les matériaux métalliques - Épreuve de qualification d'un mode opératoire de soudage - Partie 1: Soudage à l'arc et aux gaz des aciers et soudage à l'arc du nickel et des alliages de nickel (ISO 15614-1:2017)

Anforderung und Qualifizierung von Schweißverfahren für metallische Werkstoffe - Schweißverfahrensprüfung - Teil 1: Lichtbogen- und Gasschweißen von Stählen und Lichtbogenschweißen von Nickel und Nickellegierungen (ISO 15614-1:2017)

This European Standard was approved by CEN on 17 April 2017.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

**EN ISO 15614-1:2017 (E)**

<b>Contents</b>	<b>Page</b>
<b>European foreword.....</b>	<b>3</b>
<b>Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2014/68/EU (PED) .....</b>	<b>4</b>
<b>Annex ZB (informative) Relationship between this International Standard and the Essential Requirements of EU Directive 2014/29/EU (SPVD).....</b>	<b>5</b>

## **European foreword**

This document (EN ISO 15614-1:2017) 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 2017 and conflicting national standards shall be withdrawn at the latest by December 2017.

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 15614-1:2004.

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 relationship with EU Directive(s), see informative Annex ZA, B, 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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

### **Endorsement notice**

The text of ISO 15614-1:2017 has been approved by CEN as EN ISO 15614-1:2017 without any modification.

## Annex ZA (informative)

### Relationship between this European Standard and the Essential Requirements of EU Directive 2014/68/EU (PED)

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 Directive 2014/68/EU (PED)**

Essential Requirements of Directive 2014/68/EU (PED)	Clauses of this European Standard	Remarks/Notes
Annex I, 3.1.2	All clauses limited to level 2	Permanent joining

**WARNING 1** — Presumption of conformity stays valid only as long as a reference to this International 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.



## Annex ZB (informative)

### Relationship between this International Standard and the Essential Requirements of EU Directive 2014/29/EU (SPVD)

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 2014/29/EU (SPVD) on the harmonisation of the laws of the Member States relating to the making available on the market of simple pressure vessels.

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 ZB.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 ZB.1 — Correspondence between this European Standard and Directive 2014/29/EU (SPVD)**

Essential Requirements of Directive 2014/29/EU (SPVD)	Clauses of this European Standard	Remarks/Notes
Annex II, 3.c.iii	Clause 9, Annex B	Report on Welding procedure test

**WARNING 1** — Presumption of conformity stays valid only as long as a reference to this International 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.

This page is intentionally left blank

INTERNATIONAL  
STANDARD

ISO  
15614-1

Second edition  
2017-06

---

---

**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**

*Descriptif et qualification d'un mode opératoire de soudage pour  
les matériaux métalliques — Épreuve de qualification d'un mode  
opératoire de soudage —*

*Partie 1: Soudage à l'arc et aux gaz des aciers et soudage à l'arc du  
nickel et des alliages de nickel*



Reference number  
ISO 15614-1:2017(E)

© ISO 2017

**ISO 15614-1:2017(E)**



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, 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  
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
<b>Foreword</b> .....	<b>v</b>
<b>Introduction</b> .....	<b>vi</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>2</b>
<b>3 Terms and definitions</b> .....	<b>3</b>
<b>4 Preliminary welding procedure specification (pWPS)</b> .....	<b>3</b>
<b>5 Welding procedure test</b> .....	<b>3</b>
<b>6 Test piece</b> .....	<b>3</b>
6.1 General.....	3
6.2 Shape and dimensions of test pieces.....	4
6.2.1 General.....	4
6.2.2 Butt joint in plate with full penetration.....	4
6.2.3 Butt joint in pipe with full penetration.....	4
6.2.4 T-joint.....	4
6.2.5 Branch connection.....	4
6.3 Welding of test pieces.....	4
<b>7 Examination and testing</b> .....	<b>8</b>
7.1 Type and extent of testing.....	8
7.2 Location and taking of test specimens.....	9
7.3 Non-destructive testing.....	13
7.4 Destructive testing.....	13
7.4.1 Transverse tensile test.....	13
7.4.2 Bend test.....	13
7.4.3 Macroscopic examination.....	13
7.4.4 Impact testing.....	14
7.4.5 Hardness testing.....	14
7.5 Acceptance levels.....	15
7.6 Re-testing.....	16
<b>8 Range of qualification</b> .....	<b>16</b>
8.1 General.....	16
8.2 Related to the manufacturer.....	16
8.3 Related to the parent material.....	17
8.3.1 Parent material grouping.....	17
8.3.2 Material thickness.....	19
8.3.3 Diameter of pipes and branch connections.....	21
8.3.4 Angle of branch connection.....	21
8.4 Common to all welding procedures.....	22
8.4.1 Welding processes.....	22
8.4.2 Welding positions.....	22
8.4.3 Type of joint/weld.....	23
8.4.4 Filler material, manufacturer/trade name, designation.....	24
8.4.5 Filler material size.....	24
8.4.6 Type of current.....	25
8.4.7 Heat input (arc energy).....	25
8.4.8 Preheat temperature.....	25
8.4.9 Interpass temperature.....	25
8.4.10 Post-heating for hydrogen release.....	26
8.4.11 Heat-treatment.....	26
8.5 Specific to processes.....	26
8.5.1 Submerged arc welding (process 12).....	26
8.5.2 Gas-shielded metal arc welding (process 13).....	27

**ISO 15614-1:2017(E)**

8.5.3	Gas-shielded arc welding with non-consumable electrode (process 14).....	29
8.5.4	Plasma arc welding (process 15).....	29
8.5.5	Oxy-acetylene welding (process 311).....	29
8.5.6	Backing gas.....	29
<b>9</b>	<b>Welding procedure qualification record (WPQR).....</b>	<b>29</b>
<b>Annex A</b>	<b>(normative) Filler material, designation.....</b>	<b>31</b>
<b>Annex B</b>	<b>(informative) Welding procedure qualification record form (WPQR).....</b>	<b>33</b>
<b>Bibliography</b>	<b>.....</b>	<b>38</b>

## 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](http://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](http://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 on 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 the following URL: [www.iso.org/iso/foreword.html](http://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*.

This second edition cancels and replaces the first edition (ISO 15614-1:2004), which has been technically revised. It also incorporates the Amendments ISO 15614-1:2004/Amd 1:2008 and ISO 15614-1:2004/Amd 2:2012 and the Technical Corrigendum ISO 15614-1:2004/Cor. 1:2005.

A list of all parts in the ISO 15614 series can be found on the ISO website.

Requests for official interpretations of 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](http://www.iso.org).

## **ISO 15614-1:2017(E)**

### **Introduction**

All new welding procedure tests are to be carried out in accordance with this document from the date of its issue. However, this document does not invalidate previous welding procedure tests made to former national standards or specifications or previous issues of 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.

Level 1 is based on requirements of ASME Section IX and level 2 is based on the previous issues of this document.



# 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

## 1 Scope

This document specifies how a preliminary welding procedure specification is qualified by welding procedure tests.

This document applies to production welding, repair welding and build-up welding.

This document defines the conditions for the execution of welding procedure tests and the range of qualification for welding procedures for all practical welding operations within the qualification of this document.

The primary purpose of welding procedure qualification is to demonstrate that the joining process proposed for construction is capable of producing joints having the required mechanical properties for the intended application.

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.

This document applies to the arc and gas welding of steels in all product forms and the arc welding of nickel and nickel alloys in all product forms.

Arc and gas welding are covered by the following processes in accordance with ISO 4063.

111 — manual metal arc welding (metal-arc welding with covered electrode);

114 — self-shielded tubular-cored arc welding;

12 — submerged arc welding;

13 — gas-shielded metal arc welding;

14 — gas-shielded arc welding with non-consumable electrode;

15 — plasma arc welding;

311 — oxy-acetylene welding.

The principles of this document may be applied to other fusion welding processes.

**NOTE** A former process number does not require a new qualification test according to this document.

Specification and qualification of welding procedures that were made in accordance with previous editions of this document may be used for any application for which the current edition is specified. In this case, the ranges of qualification of previous editions remain applicable.

## ISO 15614-1:2017(E)

It is also possible to create a new WPQR (welding procedure qualification record) range of qualification according to this edition based on the existing qualified WPQR, provided the technical intent of the testing requirements of this document has been satisfied. Where additional tests have to be carried out to make the qualification technically equivalent, it is only necessary to perform the additional test on a test piece.

## 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 3452-1, *Non-destructive testing — Penetrant testing — Part 1: General principles*

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

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

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

ISO 5817, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections*

ISO 6520-1, *Welding and allied processes — Classification of geometric imperfections in metallic materials — Part 1: Fusion welding*

ISO 6947, *Welding and allied processes — Welding positions*

ISO 9015-1, *Destructive tests on welds in metallic materials — Hardness testing — Part 1: Hardness test on arc welded joints*

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

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

ISO 15609-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 1: Arc welding*

ISO 15609-2, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 2: Gas welding*

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

ISO 17636-1, *Non-destructive testing of welds — Radiographic testing — Part 1: X- and gamma-ray techniques with film*

ISO 17636-2, *Non-destructive testing of welds — Radiographic testing — Part 2: X- and gamma-ray techniques with digital detectors*

ISO 17637, *Non-destructive testing of welds — Visual testing of fusion-welded joints*

ISO 17638, *Non-destructive testing of welds — Magnetic particle testing*

ISO 17639, *Destructive tests on welds in metallic materials — Macroscopic and microscopic examination of welds*

ISO 17640, *Non-destructive testing of welds — Ultrasonic testing — Techniques, testing levels, and assessment*

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

- 
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
  - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-