
**Specification and qualification of welding
procedures for metallic materials —
General rules**

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

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ISO 15607:2003

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Foreword

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ISO 15607 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 10, *Unification of requirements in the field of metal welding*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read “...this European Standard...” to mean “...this International Standard...”.

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Foreword

This document (EN ISO 15607:2003) has been prepared by Technical Committee CEN/TC 121 "Welding", the secretariat of which is held by DS, in collaboration with Technical Committee ISO/TC 44 "Welding and allied processes".

This European Standard EN ISO 15607:2003 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2004, and conflicting national standards shall be withdrawn at the latest by April 2004.

This document supersedes EN 288-1:1992.

Annexes A, B and C are informative.

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

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Introduction

Welding procedure specifications are needed in order to provide a well defined basis for planning of the welding operations and for quality control during welding. Welding is considered a special process in the terminology of standards for quality systems. Standards for quality systems usually require that special processes be carried out in accordance with written procedure specifications.

Preparation of a welding procedure specification provides the necessary basis for, but does not in itself ensure that the welds fulfil the requirements. Some deviations, notably imperfections and distortions, can be evaluated by non-destructive methods on the finished product.

Metallurgical deviations constitute a special problem, however, because non-destructive evaluation of the mechanical properties is impossible at the present level of non-destructive technology, this has resulted in the establishment of a set of rules for qualification of the welding procedure prior to the release of the specification to actual production. This European Standard defines these rules.

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1 Scope

This European Standard is part of a series of standards. Annex A gives details of this series of standard, annex B gives a flowchart for the use of these standards and Annex C gives a flow diagram for the development and qualification of a WPS.

This standard defines general rules for the specification and qualification of welding procedures for metallic materials. This standard also refers to several other standards as regards detailed rules for specific applications.

This standard is applicable to manual, mechanized and automatic welding.

Welding procedures are qualified by conforming to one or more welding procedure qualification records (WPQR). The use of a particular method of qualification is often a requirement of an application standard.

Qualification of pWPS by more than one method is not recommended. It is assumed that welding procedure specifications are used in production by competent welders, qualified in accordance with the relevant part of EN 287 or EN ISO 9606 or by competent operators qualified in accordance with EN 1418.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN ISO 4063, *Welding and allied processes – Nomenclature of processes and reference numbers.* (ISO 4063:1998)

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EN ISO 14555, *Welding — Arc stud welding of metallic materials.* (ISO 14555:1998).

prEN ISO 15609-1, *Specification and approval of welding procedures for metallic materials - Welding procedure specification - Part 1: Arc welding* (ISO/DIS 15609-1:2000).

EN ISO 15609-2, *Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 2: Gas welding* (ISO 15609-2:2001).

prEN ISO 15609-3, *Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 3: Electron beam welding* (ISO/DIS 15609-3:2000).

prEN ISO 15609-4, *Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 4: Laser beam welding* (ISO/DIS 15609-4:2000).

prEN ISO 15609-5, *Specification and approval of welding procedures for metallic materials - Welding procedure specification - Part 5: Resistance welding* (ISO/DIS 15609-5:2000).

EN ISO 15610, *Specification and qualification of welding procedures for metallic materials - Qualification based on tested welding consumables* (ISO 15610:2003).

EN ISO 15611, *Specification and qualification of welding procedures for metallic materials - Qualification based on previous welding experience* (ISO 15611:2003).

prEN ISO 15612, *Specification and qualification of welding procedures for metallic materials - Approval by a standard welding procedure* (ISO/DIS 15612:2000).

EN ISO 15613, *Specification and qualification of welding procedures for metallic materials - Qualification based on pre-production test* (ISO 15613:2000).

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EN ISO 15614-1, *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 15614-1:2003).*

prEN ISO 15614-2, *Specification and approval of welding procedures for metallic materials - Welding procedure tests - Part 2: Arc welding of aluminium and its alloys (ISO/DIS 15614-2:2000).*

prEN ISO 15614-3, *Specification and qualification of welding procedures for metallic materials - Welding procedure tests - Part 3: Welding procedure tests for the arc welding of cast iron (was submitted to CEN Enquiry as prEN 288-12).*

prEN ISO 15614-4, *Specification and qualification of welding procedures for metallic materials - Welding procedure tests - Part 4: Finishing welding of aluminium castings (was submitted to CEN Enquiry as prEN 288-13).*

prEN ISO 15614-5, *Specification and approval of welding procedures for metallic materials - Welding procedure tests - Part 5: Arc welding of titanium, zirconium and their alloys (ISO/DIS 15614-5:2000).*

prEN ISO 15614-6, *Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 6: Copper and copper alloys.*

EN ISO 15614-8, *Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 8: Welding of tubes to tube-plate joints (ISO 15614-8:2002).*

prEN ISO 15614-9, *Specification and qualification of welding procedures for metallic materials - Welding procedure tests - Part 9: Underwater hyperbaric wet welding (ISO/DIS 15614-9:2000).*

prEN ISO 15614-10, *Specification and approval of welding procedures for metallic materials - Welding procedure test - Part 10: Hyperbaric dry welding (ISO/DIS 15614-10:2000).*

EN ISO 15614-11, *Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 11: Electron and laser beam welding (ISO 15614-11:2002).*

prEN ISO 15614-12, *Specification and approval of welding procedures for metallic materials - Welding procedure tests - Part 12: Spot, seam and projection welding (ISO/DIS 15614-12:2000).*

prEN ISO 15614-13, *Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 13: Resistance butt and flash welding (ISO/DIS 15614-13:2002).*

EN ISO 15620, *Welding - Friction welding of metallic materials (ISO 15620:2000).*

ISO 857-1, *Welding and allied processes — Vocabulary — Part 1: Metal welding processes.*

3 Terms and definitions

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

3.1

welding procedure

specified course of action to be followed in making a weld, including the welding process(es), reference to materials, welding consumables, preparation, preheating (if necessary), method and control of welding and post-weld heat treatment (if relevant), and necessary equipment to be used

3.2

welding process

for the welding processes, the nomenclature and definitions given in ISO 857-1 are followed in this standard. The numbering system for welding processes in EN ISO 4063 is also followed

3.3**preliminary welding procedure specification (pWPS)**

a document containing the required variables of the welding procedure which has to be qualified has to be qualified using one of the methods described in accordance with clause 6

3.4**welding procedure specification (WPS)**

a document that has been qualified by one of the methods described in clause 6 and provides the required variables of the welding procedure to ensure repeatability during production welding.

3.5**work instruction**

simplified specification of the welding procedure, suitable for direct application in the workshop

3.6**welding procedure qualification record (WPQR)**

record comprising all necessary data needed for qualification of a preliminary welding procedure specification

3.7**welding procedure test**

making and testing of a standardized test piece, as indicated in the pWPS, in order to qualify a welding procedure

3.8**pre-production welding test**

welding test having the same function as a welding procedure test, but based on a non-standard test piece representative of the production conditions

3.9**standard welding procedure specification**

welding procedure specification which has been qualified by a welding procedure test not related to the manufacturer and qualified by an examiner or examining body

NOTE

A standard welding procedure may then be made available to any manufacturer.

3.10**previous welding experience**

when it can be shown by authenticated test data that the manufacturer's established production welding procedures have been capable of consistently producing welds of acceptable quality over a period of time

3.11**tested welding consumable**

welding consumable or consumable combination tested according to appropriate standards for testing of welding consumables

3.12**welding consumable**

materials consumed in the making of a weld, including filler metals and auxiliary materials

3.13**essential variable**

welding condition that requires qualification

3.14**non essential variable**

welding condition addressed in the WPS but not requiring qualification

3.15**range of qualification**

extent of qualification for an essential welding variable

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3.16

parent material

material(s) to be joined by welding

3.17

test piece

welded assembly which is used for testing purposes

3.18

test specimen

part or portion cut from the test piece in order to perform a specified destructive test

3.19

homogeneous joint

welded joint in which the weld metal and parent material have no significant differences in mechanical properties and/or chemical composition

NOTE A welded joint made of similar parent materials without filler metal is considered homogeneous.

3.20

heterogeneous joint

welded joint in which the weld metal and parent material have significant differences in mechanical properties and/or chemical composition

3.21

dissimilar material joint

welded joint in which the parent materials have significant differences in mechanical properties and/or chemical composition

3.22

imperfection

discontinuity in the weld or a deviation from the intended geometry. Imperfections are, e.g. cracks, lack of penetration, porosity, slag inclusions

NOTE EN ISO 6520-1 and EN ISO 6520-2 contain comprehensive lists of imperfections.

3.23

manufacturer

person or organization responsible for the welding production

3.24

examiner

person who has been appointed to verify compliance with the applicable standard

NOTE In certain cases, an external independent examiner can be required

3.25

examining body

organisation that has been appointed to verify compliance with the applicable standard

NOTE In certain cases, an external independent examining body can be required

3.26

manufacturer of consumables

party who manufactures the consumables totally or performs the final part of production, which determines the quality of the consumables

3.27

welding co-ordination personnel

personnel who have responsibilities in the manufacturing operation for welding and welding related activities whose competence and knowledge has been demonstrated by e.g. training, education and/or relevant manufacturing experience

3.28**heat input**

energy introduced into the weld region during welding

3.29**parent material thickness**

nominal thickness of the materials to be welded

3.30**weld metal thickness**

thickness of the weld metal excluding any reinforcement

4 Abbreviations

For the purposes of qualification of welding procedures, the abbreviations listed in Table 1 apply.

Table 1 — Abbreviations

Abbreviation	Description
pWPS	Preliminary Welding Procedure Specification
WPQR	Welding procedure Qualification Record
WPS	Welding Procedure Specification

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5 Welding procedure specification format

prEN ISO 15609-1, EN ISO 15609-2, prEN ISO 15609-3, prEN ISO 15609-4 and prEN ISO 15609-5 define a format for the welding procedure specifications for the following welding processes:

- arc welding;
- gas welding;
- electron beam welding;
- laser beam welding;
- resistance welding.

WPS for other welding processes and for special applications may be covered by specific standards, for example :

- for stud welding, see EN ISO 14555;
- for friction welding, see EN ISO 15620.

WPS shall be classified as pWPS until qualified using an appropriate method in accordance with clause 6.

6 Development and qualification of welding procedures**6.1 General**

Qualification of welding procedures shall be performed prior to actual welding in production.