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Specification and qualification of welding procedures for metallic materials — Welding procedure specification —

Part 1: Arc welding

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

Partie 1: Soudage à l'arc

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RECTIFICATIF TECHNIQUE 1

Technical Corrigendum 1 to ISO 15609-1:2004 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 10, *Unification of requirements in the field of metal welding*.

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Foreword

Replace the sixth paragraph with the following text:

> "This first edition cancels and replaces ISO 9956-2:1995 and ISO 9956-2:1995/Amd.1:1998, which have been technically revised."

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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 15609-1 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).

This first edition of ISO 15609-1 cancels and replaces ISO 9956-2:1995 which has been technically revised.

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

ISO 15609 consists of the following parts, under the general title *Specification and qualification of welding procedures for metallic materials — Welding procedure specification*:

— *Part 1: Arc welding*

— *Part 2: Gas welding*

— *Part 3: Electron beam welding*

— *Part 4: Laser beam welding*

— *Part 5: Resistance welding*

— *Part 6: Laser beam cladding*

Annex ZA provides a list of corresponding International and European Standards for which equivalents are not given in the text.

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Foreword

This document (EN ISO 15609-1:2004) has been prepared by Technical Committee CEN/TC 121 “Welding”, the secretariat of which is held by DIN, in collaboration with Technical Committee ISO/TC 44 “Welding and allied processes”.

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 2005, and conflicting national standards shall be withdrawn at the latest by April 2005.

This document supersedes EN 288-2:1992.

NOTE Normative references to International Standards are listed in annex ZA (normative).

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, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This standard specifies requirements for the content of welding procedure specifications for arc welding processes.

This standard is part of a series of standards, details of this series are given in EN ISO 15607:2003, Annex A.

The variables listed in this standard are those influencing the quality of the welded joint.

2 Normative references

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.

EN 439, *Welding consumables – Shielding gases for arc welding and cutting.*

EN 26848, *Tungsten electrodes for inert gas shielded arc welding and for plasma cutting and welding – Codification.*

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

EN ISO 6947, *Welds – Working positions - Definitions of angles of slope and rotation. (ISO 6947:1993)*

EN ISO 13916, *Welding – Guidance on the measurement of preheating temperature, interpass temperature and preheat maintenance temperature. (ISO 13916:1996)*

EN ISO 15607:2003, *Specification and qualification of welding procedures for metallic materials – General rules. (ISO 15607:2003)*

CR ISO 15608, *Welding – Guidelines for a metallic material grouping system (ISO/TR 15608:2000).*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 15607:2003 apply.

4 Technical content of welding procedure specification (WPS)

4.1 General

A preliminary Welding Procedure Specification/Welding Procedure Specification (pWPS/WPS) shall provide all the necessary information required to make a weld. The information required in a pWPS/WPS is given in 4.2 to 4.5.

NOTE For some applications it may be necessary to supplement or reduce the list.

Welding procedure specifications cover a certain range of material thickness and also cover a range of parent materials and even welding consumables. Some manufacturers prefer additionally to prepare work instructions for each specific job as part of detailed production planning.

Ranges and tolerances, according to the relevant standard of the series (see EN ISO 15607) and to the manufacturer's experience, shall be specified where appropriate.

An example of the WPS-format is shown in annex A.

4.2 Related to the manufacturer

— Identification of the manufacturer;

— Identification of the WPS;

— Reference to the Welding Procedure Qualification Record (WPQR) or other documents as required (see EN ISO 15607:2003, Annex C).

4.3 Related to the parent material

4.3.1 Parent material type

— Designation of the material(s), and reference standard(s);

— Number(s) of the group(s) as given in CR ISO 15608.

A WPS may cover a group of materials.

4.3.2 Material dimensions

— Thickness ranges of the joint;

— Outside diameter ranges for pipes.

4.4 Common to all welding procedures

4.4.1 Welding process

Welding process(es) used in accordance with EN ISO 4063.

4.4.2 Joint design

— A sketch of the joint design/configuration and dimensions or reference to standards which provide such information.

— Weld run sequence given on the sketch if essential for the properties of the weld.

4.4.3 Welding position

Applicable welding positions in accordance with EN ISO 6947.

4.4.4 Joint preparation

— Joint preparation methods, cleaning, degreasing, including methods to be used;

— Jigging, fixtures and tack welding.

4.4.5 Welding technique

— Weaving if applicable

a) For manual welding maximum width of the run.

b) For mechanized and automatic welding maximum weaving or amplitude, frequency and dwell time of oscillation.

- Torch, electrode and/or wire angle.

4.4.6 Back gouging

— The method to be used.

— Depth and shape.

4.4.7 Backing

— The method and type of backing, backing material and dimensions.

— For gas backing, gas in accordance with EN 439.

4.4.8 Welding consumables

— Designation, make (manufacturer and trade name).

— Dimensions (size).

— Handling (baking, exposure to atmosphere, re-drying, etc.).

4.4.9 Electrical parameters

— Type of current (alternating current (AC) or direct current (DC)) and polarity.

— Pulse welding details (machine settings, programme selection) if applicable.

— Current range.

4.4.10 Mechanized and automatic welding

— Travel speed range.

— Wire/strip feed speed range.

If the equipment does not permit control of one of either variable, the machine settings shall be specified instead. The range of application for the WPS shall then be limited to equipment of that particular type. This applies to 4.4.9 and 4.4.10.

4.4.11 Preheat temperature

— The minimum temperature applied at the start of welding and during welding.

— If pre-heating is not required the lowest work piece temperature prior to welding.

4.4.12 Interpass temperature

Maximum and if necessary minimum interpass temperature.

4.4.13 Preheat maintenance temperature

The minimum temperature in the weld zone which shall be maintained if welding is interrupted.

See EN ISO 13916 for application of 4.4.11, 4.4.12 and 4.4.13.

4.4.14 Post-heating for hydrogen release

— Temperature range.

— Minimum holding time.

4.4.15 Post-weld heat-treatment

The minimum time and temperature range for post-weld heat treatment or ageing shall be specified or reference shall be made to other standards which specify this information.

4.4.16 Shielding gas

Designation in accordance with EN 439 and, where applicable, the composition, manufacturer and trade name.

4.4.17 Heat input

Range of heat input (if specified).

4.5 Specific to a group of welding processes

4.5.1 Process 111 (Manual metal arc welding)

For process 111, the run-out length of electrode consumed or travel speed.

4.5.2 Process 12 (Submerged arc welding)

— For multiple electrode systems the number and configuration of wire electrodes and polarity.

— Distance contact tube/work piece: The distance from contact tip nozzle to the surface of the work piece.

— Flux: Designation, manufacturer and trade name.

— Additional filler material.

— Arc voltage range.

4.5.3 Process 13 (Gas-shielded metal arc welding)

— Shielding gas flow rate and nozzle diameter.

— Number of wire electrodes.

— Additional filler material.

— The distance from the contact tip/contact tube to the surface of the workpiece.

— Arc voltage range.

— Mode of metal transfer.

4.5.4 Process 14 (Gas-shielded welding with non-consumable electrode)

— Tungsten electrode: the diameter, and codification in accordance with EN 26848.

— Shielding gas flow rate and nozzle diameter.

— Additional filler materials.

4.5.5 Process 15 (Plasma arc welding)

— Plasma gas parameters, e.g. composition, nozzle diameter, flow rate.

— Shielding gas flow rate and nozzle diameter.

— Type of torch.

— Distance contact tube/work piece: the distance from the nozzle to the surface of the work piece.

Annex A
(informative)

Welding Procedure Specification (WPS)

Welding Procedure Specification:
WPQR No. :
Manufacturer :
Mode of metal transfer :
Joint Type and Weld Type:
Weld Preparation Details (Sketch)*

Method of Preparation and Cleaning :
Parent Material Designation :
Material thickness (mm) :
Outside Diameter (mm) :
Welding Position :

Joint Design	Welding Sequences

Welding Details

Run	Welding Process	Size of Filler Material	Current A	Voltage V	Type of current/ Polarity	Wire Feed Speed	Run out length/Travel Speed*	Heat input*

Filler material designation and make:

Any Special Baking or Drying :

DesignationGas/Flux : - Shielding :
- Backing :
Gas Flow Rate - Shielding :
- Backing :
Tungsten Electrode Type/Size :
Details of Back Gouging/Backing :
Preheat Temperature :
Interpass Temperature :
Post-heating:
Pre-heat maintenance temperature :
Post-Weld Heat treatment and/or Ageing :
(Time, Temperature, Method :
Heating and Cooling Rates*):

Other information*, e.g.:
Weaving (maximum width of run) :
Oscillation : amplitude, frequency, dwell time :
Pulse welding details :
Distance contact tube/work piece :
Plasma welding details :
Torch angle :

.....
Manufacturer
(name, signature, date)

* If required

Annex ZA
(normative)

Normative references to International publications with their relevant European publications

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):

NOTE Where an International Publication has been modified by common modifications, indicated by (mod.), the relevant EN/HD applies.

Publication	Year	Title	EN	Year
ISO 14175		Welding consumables – Shielding gases for arc welding and cutting	EN 439	
ISO 6848		Tungsten electrodes for inert gas shielded arc welding and for plasma cutting and welding – Codification	EN 26848	

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