



SLOVENSKI STANDARD

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Popis in kvalifikacija varilnih postopkov za kovinske materiale – Specifikacija varilnega postopka – 4. del: Varjenje z laserskim snopom (laserjem) (ISO 15609-4:2004)

Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 4: Laser beam welding (ISO 15609-4:2004)

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Anforderung und Qualifizierung von Schweißverfahren für metallische Werkstoffe - Schweißanweisung - Teil 4: Laserstrahlschweißen (ISO 15609-4:2004)

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Descriptif et qualification d'un mode opératoire de soudage pour les matériaux métalliques - Descriptif d'un mode opératoire de soudage - Partie 4: Soudage par faisceau laser (ISO 15609-4:2004)

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25.160.10 Varilni postopki in varjenje Welding processes

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en

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Descriptif et qualification d'un mode opératoire de soudage pour les matériaux métalliques - Descriptif d'un mode opératoire de soudage - Partie 4: Soudage par faisceau laser (ISO 15609-4:2004)

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This European Standard was approved by CEN on 16 January 2004.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of 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.

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Foreword

This document (EN ISO 15609-4:2004) has been prepared by Technical Committee CEN /TC 121, "Welding", the secretariat of which is held by DS, in collaboration with 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 February 2005, and conflicting national standards shall be withdrawn at the latest by February 2005.

This document supersedes EN ISO 9956-11:1996.

Annex A is informative. Normative references to International Standards are listed in annex ZA.

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.

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EN ISO 15609-4:2004 (E)

1 Scope

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

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

Variables listed in this standard are those influencing the quality and properties 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 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 11145:2001, *Optics and optical instruments — Lasers and laser-related equipment — Vocabulary and symbols* (ISO 11145:2001).

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

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3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN ISO 15607:2003 and in EN ISO 11145:2001 and the following apply.

3.1

slope up

controlled increase of the beam power at the beginning of welding

3.2**slope down**

controlled decrease of the beam power at the end of welding. The slope down region is the region on the workpiece in which the effects of slope down occur. It can consist of one or two areas, depending on the selected welding mode:

- a) in full penetration welding:
 - a region where beam penetration is still complete;
 - a region where penetration is partial or decreasing.
- b) in partial penetration welding :
 - a region where penetration decreases continuously

3.3**working distance**

distance between the surface of the workpiece and a standard reference point of the equipment which is traceable to the true focusing lens or mirror centre

NOTE This is a practical reference distance only.

3.4**tacking pass**

pass made to hold the parts to be welded in proper alignment until the final welds are made

NOTE This may be produced by a continuous or discontinuous pass with partial penetration.

3.5**welding pass**

pass ensuring fusion to the required depth

3.6**cosmetic pass**

pass for superficial remelting of the weld in order to enhance its appearance

NOTE This pass is made with a defocused or oscillating beam.

3.7**overlap**

portion of the welding pass remelted prior to the slope down

3.8**back or front support**

plate placed against the workpiece on either the back or front face of the joint in order to retain the molten weld metal

3.9**focal length**

in a lens or lens system, the distance from the principal plane, the surface at which the projection of entering and exiting rays intersect, to the focal spot

NOTE In a thick lens or system of lenses, the principal plane is often inside the lens. For set-up purposes, operators often use the 'back focal length', which is the distance from the front surface of a focusing lens or mirror system to the focal spot.

3.10**focal spot**

part of the beam beyond the focusing system where the beam comes to a minimum cross-sectional area

EN ISO 15609-4:2004 (E)**4 Technical content of welding procedure specification (WPS)****4.1 General**

The welding procedure specification (WPS) shall provide all information required to make a weld.

Welding procedure specifications may cover a certain range of thicknesses of the joined parts and may also cover a range of parent metals and even filler metals. Some manufacturers may additionally prefer to prepare work instructions for each specific job as part of the detailed production planning.

Information listed below is adequate for most welding operations. For some applications it may be necessary to supplement or reduce the list. The relevant information shall be specified in the WPS.

Ranges and tolerances, according to the manufacturer's experience, shall be specified when appropriate.

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

4.2 Welding process

The welding process is 52 in accordance with EN ISO 4063.

4.3 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.

4.4 Equipment used

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4.4.1 General

Identification of any equipment.

4.4.2 Laser welding equipment

- Type (for example YAG or CO₂), model, make;
- nominal power;
- continuous wave or pulsed;
- number of lasers combined;
- manufacturer's or measured values for the following parameters:
 - 1) beam mode;
 - 2) beam divergence ;
 - 3) wave length ;
 - 4) beam polarisation and orientation.

4.4.3 Beam delivery and focusing system

- method of transmission (fibres, mirrors, including beam collimators, if used);
- distance from beam source to focusing system, if necessary;
- beam diameter on entrance to focusing system;
- beam transmission and focusing system;
- focal length;
- if required, nominal focal spot size and method of measuring;
- beam path protection system.

4.4.4 Plasma suppression gas and shielding gas system

Description (schematic) showing design, position of nozzle(s) in relation to joint, welding direction and welding point.

4.4.5 Filler material(s) feeding system (if any)

Description (schematic) showing design, position of the filler material(s) feeding system in relation to joint, welding direction and welding point.

4.5 Related to the parent materials

4.5.1 Parent material type/grade

- Designation of the material(s) and any backing plates or supports used and any reference standard(s);
- identification of the type of product (e.g. forged, cast, rolled, extruded).

A WPS may cover a group of materials.

4.5.2 Dimensions of materials

- Thickness range of the joint;
- for circular workpieces the range of outside diameters.

4.6 Filler or other additional material(s)

- the designation and reference standard for any filler material(s) or other additional material(s) used in the joint;
- the dimensions of any filler material(s) or other additional material(s) used in the joint;
- any special handling instructions for any filler material(s) or other additional material(s) used in the joint.

If a filler or other additional material is to be cleaned before used, this shall be specified.

4.7 Joint design

A sketch showing the joint design/configuration, dimensions and tolerances, including surface finish, or reference to another standard which provides this information.