

# SVENSK STANDARD

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### **Specifikation för och godkännande av svetsprocedurer för metalliska material – Svetsdatablad – Del 4: Lasersvetsning (ISO 15609-4:2009)**

### **Specification and qualification of welding procedures for metallic materials – Welding procedure specification – Part 4: Laser beam welding (ISO 15609-4:2009)**

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This standard supersedes the Swedish Standard SS-EN ISO 15609-4:2004, edition 1.

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**Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 4: Laser beam welding (ISO 15609-4:2009)**

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 15609-4:2009)

Anforderung und Qualifizierung von Schweißverfahren für metallische Werkstoffe - Schweißanweisung - Teil 4: Laserstrahlschweißen (ISO 15609-4:2009)

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## Foreword

This document (EN ISO 15609-4:2009) has been prepared by Technical Committee ISO/TC 44 "Welding and allied processes" in collaboration with Technical Committee CEN/TC 121 "Welding" 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of an identical text or by endorsement, at the latest by November 2009, and conflicting national standards shall be withdrawn at the latest by November 2009.

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

## Part 4: Laser beam welding

### 1 Scope

This part of ISO 15609 specifies requirements for the content of the welding procedure specification (WPS) for laser beam welding processes, including overlay welding. It is not applicable to other processes for cladding (e.g. thermal spraying).

This part of ISO 15609 is part of a series of standards, and details of this series are given in ISO 15607:2003, Annex A.

Variables listed in this part of ISO 15609 are those influencing the quality and properties of the welded joint. The dimensions mentioned in this part of ISO 15609 influence the metallurgical and mechanical qualities, the geometry of the structural member and other important performance properties.

### 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.

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

ISO 6947, *Welds — Working positions — Definitions of angles of slope and rotation*

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

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

ISO/TR 25901:2007, *Welding and related processes — Vocabulary*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15607:2003, ISO/TR 25901:2007 and the following apply.

#### 3.1

##### **slope up**

⟨beam welding⟩ controlled increase of the beam power at the beginning of the welding

[ISO/TR 25901:2007, definition 2.337]

### 3.2

#### **slope down**

controlled decrease of the beam power at the end of the welding

NOTE 1 Adapted from ISO/TR 25901:2007, definition 2.336.

NOTE 2 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 of the following areas, depending on the selected welding mode.

- a) In full penetration welding, it can consist of
  - a region where beam penetration is still complete, and
  - a region where penetration is partial or decreasing.
- b) In partial penetration welding, it can consist of
  - a region where penetration decreases continuously.

### 3.3

#### **working distance**

⟨beam welding⟩ 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

[ISO/TR 25901:2007, definition 2.472]

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 1 Adapted from ISO/TR 25901:2007, definition 2.370.

NOTE 2 This can be produced by a continuous or discontinuous pass with partial penetration.

### 3.5

#### **pass**

run

single operation of welding that is part of the production of a completed weld

NOTE 1 Adapted from ISO/TR 25901:2007, definition 2.312.

NOTE 2 The term “pass” is commonly used in beam welding.

### 3.6

#### **cosmetic pass**

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

NOTE 1 Adapted from ISO/TR 25901:2007, definition 2.75.

NOTE 2 This pass can be performed with a defocused or oscillating beam.

### 3.7

#### **overlap**

⟨beam welding⟩ portion of the weld pass remelted prior to the slope down

[ISO/TR 25901:2007, definition 2.249]

NOTE For overlay welding, portion of a welding pass remelted by the adjoining pass.

### 3.8

#### **back support**

piece of metal or other auxiliary material placed against the workpiece on the back face of the joint in order to retain the molten weld metal

NOTE Adapted from ISO/TR 25901:2007, definition 2.24.

### 3.9

#### **focal length**

⟨beam welding⟩ distance between the centre of the focusing lens or mirror and the focal spot

[ISO/TR 25901:2007, definition 2.146]

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**

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

[ISO/TR 25901:2007, 2.147]

### 3.11

#### **beam shaping**

adapting of the geometry of the beam effective area and the power density distribution by suitable optical components

### 3.12

#### **carrier gas**

⟨overlay welding⟩ gas used to transport filler material to the molten pool

NOTE Typical carrier gases are nitrogen, helium and argon.

## **4 Technical content of welding procedure specification**

### **4.1 General**

The WPS shall provide all information required to make a weld.

The WPS 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 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 is 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 ISO 4063.