
**Specification and approval of welding
procedures for metallic materials —**

Part 10:

**Welding procedure specification for electron
beam welding**

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

*Partie 10: Descriptif d'un mode opératoire de soudage par faisceau
d'électrons* [O 9956-10:1996](https://standards.iteh.ai/catalog/standards/sist/e0dfdf2f-5bbf-40fc-83ab-1839c4590362/iso-9956-10-1996)

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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.

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.

International Standard ISO 9956-10 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee 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).

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ISO 9956 consists of the following parts, under the general title *Specification and approval of welding procedures for metallic materials*:

- *Part 1: General rules for fusion welding*
- *Part 2: Welding procedure specification for arc welding*
- *Part 3: Welding procedure tests for the arc welding of steels*
- *Part 4: Welding procedure tests for the arc welding of aluminium and its alloys*
- *Part 5: Approval by using approved consumables for arc welding*
- *Part 6: Approval related to previous experience*

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International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet: central@isocs.iso.ch
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- *Part 7: Approval by a standard welding procedure for arc welding*
- *Part 8: Approval by a pre-production welding test*
- *Part 10: Welding procedure specification for electron beam welding*
- *Part 11: Welding procedure specification for laser beam welding*
- *Part 12: Welding procedure test for arc welding of cast steels*

Annexes A and ZZ of this part of ISO 9956 are for information only.

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

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Foreword

The text of EN ISO 9956-10:1996 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 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 1997, and conflicting national standards shall be withdrawn at the latest by March 1997.

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

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1 Scope

This European Standard specifies requirements for the content of welding procedure specifications for electron beam welding.

Variables listed in this European Standard are those influencing the metallurgy, mechanical properties and the geometry of the welded assembly.

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.

- EN 288-1 Specification and approval of welding procedures for metallic materials - Part 1 : General rules for fusion welding
- EN 24063 Welding, brazing, soldering and braze welding of metals - Nomenclature of processes and reference numbers for symbolic representation on drawings (ISO 4063:1992)
- pr EN ISO 6947 Welds - Working positions - Definitions of angles of slope and rotation (ISO 6947:1990)

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3 Definitions

For the purpose of this standard, the following definitions apply in addition of those given in EN 288-1 :

3.1 slope up

The controlled increase of the beam power at the beginning of welding.

3.2 slope down

The 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

The 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.

3.4 tacking pass

The 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 weld pass

The pass ensuring fusion to the required depth.

3.6 cosmetic pass

Superficial remelting of the weld in order to enhance its appearance.

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

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3.7 overlap

That portion of the weld pass remelted prior to the slope down.

3.8 back or front support

A 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 beam current

The value of the electric current in the beam.

3.10 beam current pulsing

The periodic variation of the beam current.

3.11 focusing lens current

The current passing through the focusing lens coil.

3.12 beam deflection

Electromagnetic deflection of the beam from the gun axis.

3.13 beam oscillation

Periodic deflection of the beam, achieved by electromagnetic forces.

NOTE : An oscillation is defined by :

- a) signal shape e.g. circular, transversal, longitudinal ;
- b) the signal amplitude ;
- c) the frequency ;
- d) the orientation in relation to the welding direction.

4 Technical contents of welding procedure specification (WPS)

4.1 General

The welding procedure specification (WPS) shall give details of how a welding operation is to be performed and shall contain all relevant information about the welding work.

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.

The 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 the WPS format is shown in annex A.

4.2 Related to the manufacturer

4.2.1 Identification of the manufacturer

4.2.2 Identification of the WPS

4.2.3 Reference to the welding procedure approval record (WPAR) or other documents, as required