



**SLOVENSKI STANDARD
SIST EN ISO 18166:2026**

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Nadomešča:

SIST-TS CEN ISO/TS 18166:2016

Numerična simulacija varjenja - Izvedba in dokumentacija (ISO 18166:2026)

Numerical welding simulation - Execution and documentation (ISO 18166:2026)

Numerische Schweißsimulation - Ausführung und Dokumentation (ISO 18166:2026)

Simulation numérique de soudage - Exécution et documentation (ISO 18166:2026)

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ICS:

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|-----------|--|---|
| 25.160.01 | Varjenje, trdo in mehko spajkanje na splošno | Welding, brazing and soldering in general |
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 18166

February 2026

ICS 35.240.50

Supersedes CEN ISO/TS 18166:2016

English Version

**Numerical welding simulation - Execution and
documentation (ISO 18166:2026)**

Simulation numérique de soudage - Exécution et
documentation (ISO 18166:2026)

Numerische Schweißsimulation - Ausführung und
Dokumentation (ISO 18166:2026)

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Ref. No. EN ISO 18166:2026 E

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European foreword

This document (EN ISO 18166:2026) has been prepared by Technical Committee ISO/TC 44 "Welding and allied processes" in collaboration with Technical Committee CEN/TC 121 "Welding and allied processes" the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by August 2026, and conflicting national standards shall be withdrawn at the latest by August 2026.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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**International
Standard**

ISO 18166

**Numerical welding simulation —
Execution and documentation**

Simulation numérique de soudage — Exécution et documentation

**First edition
2026-01**

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document has been prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 121, *Welding and allied processes*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition of ISO 18166 cancels and replaces ISO/TS 18166:2016, which has been technically revised.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html. Official interpretations of TC 44 documents, where they exist, are available from this page: <https://committee.iso.org/sites/tc44/home/interpretation.html>.

ISO 18166:2026(en)**Introduction**

This document is not intended for use in a specific industry or with a specific software. Commercial tools are not excluded. This document is beneficial for the design, manufacturing and assessment of a wide range of components if the physical phenomena, software and numerical methods meet the specifications of the scientific computational tools (SCTs) defined in [Annex A](#).

This document can be used by industrial entities to define their requirements for specific applications of computational welding mechanics (CWM).

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Numerical welding simulation — Execution and documentation

1 Scope

This document specifies the execution, validation, verification and documentation of a numerical welding simulation within the field of computational welding mechanics (CWM) and performed with a scientific computational tool (SCT).

This document is applicable to the thermal and mechanical finite element analysis (FEA) of arc, laser and electron beam welding processes for the purpose of calculating the effects of welding processes, and in particular, residual stresses and distortion, in support of structural integrity assessment.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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/TR 25901-1, *Welding and allied processes — Vocabulary — Part 1: General terms*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TR 25901-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

accuracy

closeness of agreement between a measured quantity value and a true quantity value of a measurand

Note 1 to entry: The term measurand is defined by the VIM (ISO/IEC Guide 99:2007, 2.3) as a “quantity intended to be measured”.

[SOURCE: ISO/IEC Guide 99 :2007, 2.13, modified — Note 1 to entry has been added.]

3.2

calculation strategy

set of modelling (and simulation) choices to perform a numerical simulation

Note 1 to entry: A calculation strategy defines the choice of physical models and of the coupling physics between models, the correlations, the discretization both spatial (mesh) and temporal (time step), the calculation options.

3.3

calibration

process of adjusting modelling parameter values of the scientific computing tool

Note 1 to entry: Calibration improves agreement between the calculated values and the reference values.

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3.4

distortion

permanent deformation resulting in a change in shape of a solid body

3.5

evaluation criteria

essential metrics used to assess and compare the relative significance of each phenomenon

Note 1 to entry: The importance rank of a particular phenomenon is a measure of its relative influence on the selected evaluation criteria.

Note 2 to entry: Adapted from Reference [17].

3.6

greedy algorithm

algorithm that follows the problem-solving heuristic of making the locally optimal choice at each stage

Note 1 to entry: In many cases, a greedy strategy does not produce an optimal solution, but a greedy heuristic can yield locally optimal solutions that approximate a globally optimal solution in a reasonable amount of time.

3.7

heat flux

rate at which thermal energy is transferred through a unit area of surface

3.8

heat source

<numerical> spatial and temporal numerical distribution of the thermal energy transferred to the weldment by the welding process

3.9

numerical simulation

implementation of one or more *scientific computing tools* (3.11), with calculation strategies (3.2) and input data, to produce numerical results describing the evolution of a physical situation

3.10

power density

amount of thermal power absorbed or generated per unit volume

3.11

scientific computing tool

SCT

software for *numerical simulation* (3.9) of physical phenomena

Note 1 to entry: An SCT may consist of one or more solvers and include pre- and post-processors.

Note 2 to entry: SCTs use computational methods to solve science and engineering problems.

Note 3 to entry: Refer to [Annex A](#) for technical specifications of SCTs.

3.12

reference scientific computing tool

scientific computing tool (3.11) for which the predictive performance is considered to be superior to that expected of the scientific computing tool to be validated

3.13

scope of utilization

situations and scenarios studied using the *scientific computing tool* (3.11) for computational welding mechanics

3.14

spatial discretization

distribution and type of the geometric units for subdividing the geometric model

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3.15

temporal discretization

step size and number of time units for subdividing the duration being modelled

3.16

validation case

data set considered to be pertinent and selected for carrying out separate effects or integral validation of a *scientific computing tool* (3.11)

Note 1 to entry: Data set can be experimental test, operating experience feedback, simulation using a reference scientific computing tool (3.12), analytical solution, etc.

3.17

validation experiment

experiment designed to validate the simulation results taking into account all relevant data and their uncertainty

3.18

validation file

document in which all the results of the validation of a *scientific computing tool* (3.11) are inventoried

3.19

verification file

document in which all the results of the verification of a *scientific computing tool* (3.11) are inventoried

4 Abbreviated terms

For the purposes of this document, the abbreviated terms given in [Table 1](#) apply.

Table 1 — Abbreviated terms

| Abbreviated term | Definition |
|------------------|--|
| 2D | two dimensional |
| 3D | three dimensional |
| CTE | coefficient of thermal expansion |
| CWM | computational weld mechanics |
| EBW | electron beam welding |
| FEA | finite element analysis |
| GMAW | gas metal arc welding |
| GTAW | gas tungsten arc welding |
| HAZ | heat-affected zone |
| PIRT | phenomena identification ranking table |
| PWHT | post weld heat treatment |
| QI | quantities of interest |
| SAW | submerged arc welding |
| SCT | scientific computation tool |
| SMAW | shielded metal arc welding |
| WPS | welding procedure specification |
| WPQR | welding procedure qualification record |