International Standard

ISO 18166

Numerical welding simulation — Execution and documentation

Simulation numérique de soudage — Exécution et documentation

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Foreword

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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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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.

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.