Metallic materials - Method of test for the determination of quasistatic fracture toughness of welds (ISO 15653:2018)

EESTI STANDARDIKESKUS
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NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 15653:2018 sisaldab Euroopa standardi EN ISO 15653:2018 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 15653:2018 consists of the English text of the European standard EN ISO 15653:2018.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 31.01.2018.	Date of Availability of the European standard is 31.01.2018.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

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EUROPEAN STANDARD

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EN ISO 15653

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English Version

Metallic materials - Method of test for the determination of quasistatic fracture toughness of welds (ISO 15653:2018)

Matériaux métalliques - Méthode d'essai pour la détermination de la ténacité quasi statique à la rupture des soudures (ISO 15653:2018)

Metallische Werkstoffe - Prüfverfahren zur Bestimmung der quasistatischen Bruchzähigkeit von Schweißverbindungen (ISO 15653:2018)

This European Standard was approved by CEN on 10 November 2017.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN ISO 15653:2018) has been prepared by Technical Committee ISO/TC 164 "Mechanical testing of metals" in collaboration with Technical Committee CEN/TC 121 “Welding and allied processes” 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of an identical text or by endorsement, at the latest by July 2018, and conflicting national standards shall be withdrawn at the latest by July 2018.

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.

This document supersedes EN ISO 15653:2010.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 15653:2018 has been approved by CEN as EN ISO 15653:2018 without any modification.

Contents

Page

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 documents 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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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 164, *Mechanical testing of metals*, Subcommittee SC 4, *Toughness testing — Fracture (F), Pendulum (P), Tear (T).*

This second edition of ISO 15653 cancels and replaces the first edition (ISO 15653:2010), which has been technically revised.

The main changes compared to the previous edition are as follows:

— new formulae for the calculation of single-point determination of CTOD (12.2.2) have been added;

— introduction for reverse bending in C.3 has been added;

— assessment of pop-in in D.1 has been clarified;

— new formula for the calculation for single-point determination of CTOD in shallow notched specimens in E.4 has been added.

Metallic materials — Method of test for the determination of quasistatic fracture toughness of welds

1 Scope

This document specifies methods for determining fracture toughness in terms of stress intensity factor (K), crack tip opening displacement or CTOD (δ) and experimental equivalent of the J-integral for welds in metallic materials (J).

This document complements ISO 12135, which covers all aspects of fracture toughness testing of parent metal and which needs to be used in conjunction with this document. This document describes methods for determining point values of fracture toughness. It should not be considered a way of obtaining a valid R-curve (resistance-to-crack-extension curve). However, the specimen preparation methods described in this document could be usefully employed when determining R-curves for welds. The methods use fatigue precracked specimens which have been notched, after welding, in a specific target area in the weld. Methods are described to evaluate the suitability of a weld for notch placement within the target area, which is either within the weld metal or within the weld heat-affected zone (HAZ), and then, where appropriate, to evaluate the effectiveness of the fatigue crack in sampling these areas.

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 12135:2016, *Metallic materials — Unified method of test for the determination of quasistatic fracture toughness*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12135 and the following apply.

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

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
stretch zone width
SZW
increase in crack length associated with crack tip blunting, i.e. prior to the onset of unstable crack extension, *pop-in* (3.3) or slow stable crack extension, and occurring in the same plane as the fatigue precrack

3.2
target area
intended fatigue crack tip position within the *weld metal* (3.7) or *HAZ* (3.9)

3.3
pop-in
abrupt discontinuity in the force versus displacement record, featured as a sudden increase in displacement and, generally, a sudden decrease in force, subsequent to which displacement and force increase to above their values at the initiation of the discontinuity