Irish Standard
I.S. EN ISO 21432:2020&LC:2020

Non-destructive testing - Standard test method for determining residual stresses by neutron diffraction (ISO 21432:2019)

I.S. EN ISO 21432:2020&LC:2020

Incorporating amendments/corrigenda/National Annexes issued since publication:

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National Foreword

I.S. EN ISO 21432:2020&LC:2020 is the adopted Irish version of the European Document EN ISO 21432:2020, Non-destructive testing - Standard test method for determining residual stresses by neutron diffraction (ISO 21432:2019)

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Correction Notice

Reference: **EN ISO 21432:2020**

Title: Non-destructive testing - Standard test method for determining residual stresses by neutron diffraction (ISO 21432:2019)

Work Item: 00138265

Brussels, 2020-10-21

Please include the following minor editorial correction(s) in the document related to:

the following language version(s) :
- ☒ English
- ☒ French
- ☐ German

for the following procedure :
- ☐ PQ/UQ
- ☐ Enquiry
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- ☐ 2nd Parallel Formal Vote
- ☐ UAP
- ☐ TC Approval
- ☐ 2nd TC Approval
- ☐ Publication
- ☒ Parallel Publication

It has been brought to our attention that this document, issued on 2020-09-23, requires modification.

Missing superseding information

Please find enclosed the updated English and French version.

We apologise for any inconvenience this may cause.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 21432

September 2020

ICS 19.100

Supersedes CEN ISO/TS 21432:2005

English Version

Non-destructive testing - Standard test method for determining residual stresses by neutron diffraction (ISO 21432:2019)

Essais non destructifs - Méthode normalisée de détermination des contraintes résiduelles par diffraction de neutrons (ISO 21432:2019)

Zerstörungsfreie Prüfung - Standardprüfverfahren zur Bestimmung von Eigenspannungen durch Neutronenbeugung (ISO 21432:2019)

This European Standard was approved by CEN on 31 August 2020.

This European Standard was corrected and reissued by the CEN-CENELEC Management Centre on 21 October 2020.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN ISO 21432:2020 E

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European foreword

The text of ISO 21432:2019 has been prepared by Technical Committee ISO/TC 135 "Non-destructive testing" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 21432:2020 by Technical Committee CEN/TC 138 "Non-destructive testing" 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 March 2021, and conflicting national standards shall be withdrawn at the latest by March 2021.

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 CEN ISO/TS 21432:2005.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 21432:2019 has been approved by CEN as EN ISO 21432:2020 without any modification.

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INTERNATIONAL STANDARD

ISO 21432

First edition
2019-12

Non-destructive testing — Standard test method for determining residual stresses by neutron diffraction

Essais non destructifs — Méthode normalisée de détermination des contraintes résiduelles par diffraction de neutrons

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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 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 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 was prepared by Technical Committee ISO/TC 135, *Non-destructive testing*, Subcommittee SC 5, *Radiographic Testing*.

This first edition cancels and replaces ISO/TS 21432:2005, which has been technically revised. It also incorporates the Technical Corrigendum ISO/TS 21432:2005/Cor 1:2008. Furthermore this document replaces ISO/TTA3:2001.

The main changes compared to ISO/TS 21432 are as follows:

— Figures 1 and 5 were replaced with updated, more suitable versions. The keys for several figures were updated in order to better reflect and explain the content of the figures.

— 5.4 was rearranged to emphasize the distinction between monochromatic instruments and time-of-flight instruments.

— The former Clause 7 became Clause 6 and vice versa. The new order reflects better the real order of steps taken in the preparation of a measurement.

— 7.6 was updated to provide additional details on the determination of the stress-free reference value.

— Clause 10 was slightly modified and the references to the ISO/IEC Guides relevant to uncertainty determination were updated.

— 11.7 was added in order to include uncertainties and errors in the reporting.

— A.5.4 was revised and amended to provide more information on grain size effects and the possibilities to mitigate these.

— A.9 was added to explain the calculation of stresses in the case of macroscopically anisotropic material.

— The Bibliography was updated by including a few new references.

— Throughout the document minor revisions of the text were implemented in order to correct small errors and to improve the clarity.

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.

Introduction

Neutron diffraction is a non-destructive method that can be employed for determining residual stresses in crystalline materials. It can also be used to determine internal stresses in samples subjected to applied stresses. The procedure can be employed for determining stresses within the interior of materials and adjacent to surfaces. It requires specimens or engineering components to be transported to a neutron source. Elastic strains are derived from the measurements, which in turn are converted into stresses. The purpose of this document is to provide an International Standard for reliably determining stresses that are relevant to engineering applications.

Non-destructive testing — Standard test method for determining residual stresses by neutron diffraction

WARNING — This document does not purport to address the safety concerns, if any, associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This document describes the test method for determining residual stresses in polycrystalline materials by neutron diffraction. It is applicable to both homogeneous and inhomogeneous materials including those containing distinct phases.

The principles of the neutron diffraction technique are outlined. Suggestions are provided on:

— the selection of appropriate diffracting lattice planes on which measurements should be made for different categories of materials,

— the specimen directions in which the measurements should be performed, and

— the volume of material examined in relation to the material grain size and the envisaged stress state.

Procedures are described for accurately positioning and aligning test pieces in a neutron beam and for precisely defining the volume of material sampled for the individual measurements.

The precautions needed for calibrating neutron diffraction instruments are described. Techniques for obtaining a stress-free reference are presented.

The methods of making individual measurements by neutron diffraction are described in detail. Procedures for analysing the results and for determining their statistical relevance are presented. Advice is provided on how to determine reliable estimates of residual stresses from the strain data and on how to estimate the uncertainty in the results.

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.

EN 13925-3:2015, *Non-destructive testing — X-ray diffraction from polycrystalline and amorphous materials — Part 3: Instruments*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

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