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BSI Standards Publication

Non-destructive testing of welds – Ultrasonic testing – Use of time-of-flight diffraction technique (TOFD)

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National foreword

This British Standard is the UK implementation of EN ISO 10863:2020. It is identical to ISO 10863:2020. It supersedes BS EN ISO 10863:2011, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee WEE/2, Destructive Testing of Welds.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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English Version

Non-destructive testing of welds - Ultrasonic testing - Use of time-of-flight diffraction technique (TOFD) (ISO 10863:2020)

Essais non destructifs des assemblages
soudés - Contrôle par ultrasons - Utilisation
de la technique de diffraction des temps
de vol (TOFD) (ISO 10863:2020)

Zerstörungsfreie Prüfung von Schweißverbindungen
- Ultraschallprüfung - Anwendung der
Beugungslaufzeittechnik (TOFD) (ISO 10863:2020)

This European Standard was approved by CEN on 19 May 2020.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN ISO 10863:2020) 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 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of an identical text or by endorsement, at the latest by December 2020, and conflicting national standards shall be withdrawn at the latest by December 2020.

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 10863:2011.

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 10863:2020 has been approved by CEN as EN ISO 10863:2020 without any modification.

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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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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 44, *Welding and allied processes*, Subcommittee SC 5, *Testing and inspection of welds*.

This second edition cancels and replaces the first edition (ISO 10863:2011), which has been technically revised.

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

- the whole document has been updated to the state of the art; ISO 22232 series has been taken into account;
- [Clause 3](#) has been updated;
- [Figure 1](#) to [Figure 6](#) have been added;
- [Figure B.1](#) to [Figure B.18](#) have been updated.

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 ISO/TC 44 documents, where they exist, are available from this page: <https://committee.iso.org/sites/tc44/home/interpretation.html>.

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Non-destructive testing of welds – Ultrasonic testing – Use of time-of-flight diffraction technique (TOFD)

1 Scope

This document specifies the application of the time-of-flight diffraction (TOFD) technique to the semi- or fully automated ultrasonic testing of fusion-welded joints in metallic materials of minimum thickness 6 mm.

It applies to full penetration welded joints of simple geometry in plates, pipes, and vessels, where both the weld and the parent material are low-alloyed carbon steel. Where specified and appropriate, TOFD can also be used on other types of materials that exhibit low ultrasonic attenuation (especially that due to scatter).

Where material-dependent ultrasonic parameters are specified in this document, they are based on steels having a sound velocity of $(5\,920 \pm 50)$ m/s for longitudinal waves and $(3\,255 \pm 30)$ m/s for transverse waves. It is necessary to take this fact into account when testing materials with a different velocity.

This document makes reference to ISO 16828 and provides guidance on the specific capabilities and limitations of TOFD for the detection, location, sizing and characterization of discontinuities in fusion-welded joints. TOFD can be used as a stand-alone method or in combination with other non-destructive testing (NDT) methods or techniques, for manufacturing inspection, and for in-service inspection.

This document specifies four testing levels (A, B, C, D) in accordance with ISO 17635 and corresponding to an increasing level of testing reliability. Guidance on the selection of testing levels is provided.

This document permits assessment of TOFD indications for acceptance purposes. This assessment is based on the evaluation of transmitted, reflected and diffracted ultrasonic signals within a generated TOFD image.

This document does not include acceptance levels for discontinuities.

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 5577, *Non-destructive testing — Ultrasonic testing — Vocabulary*

ISO 9712, *Non-destructive testing — Qualification and certification of NDT personnel*

ISO 16828, *Non-destructive testing — Ultrasonic testing — Time-of-flight diffraction technique as a method for detection and sizing of discontinuities*

ISO 17640, *Non-destructive testing of welds — Ultrasonic testing — Techniques, testing levels, and assessment*

ISO 22232-1¹⁾, *Non-destructive testing — Characterization and verification of ultrasonic test equipment — Part 1: Instruments*

1) Under preparation. (Preparation at the time of publication: ISO/FDIS 22232-1.)