



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 41115-2021

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

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foreword

This document is in accordance with the provisions of GB/T 1:1-2020 "Guidelines for Standardization Work Part 1: Structure and Drafting Rules of Standardization Documents"

drafted:

This document uses the translation method equivalent to ISO 10863:2020 "Non-destructive testing of welds, ultrasonic testing, time-of-flight diffraction (TOFD)"

Applications"

The Chinese documents that have a consistent correspondence with the international documents normatively cited in this document are as follows:

---GB/T 9445-2015 Non-destructive testing personnel qualification and certification (ISO 9712:2012, IDT)

---GB/T 11345-2013 Ultrasonic testing technology, testing level and evaluation for non-destructive testing of welds (ISO 17640:2010, MOD)

---GB/T 12604:1-2020 Nondestructive testing terminology ultrasonic testing (ISO 5577:2017, MOD)

---GB/T 23902-2021 Non-destructive testing ultrasonic testing ultrasonic diffraction sound technology testing and evaluation methods (ISO 16828: 2012, IDT)

The following minimal editorial changes have been made to this document:

--- Added a note to 10:1:3 (see 10:1:3):

Please note that some content of this document may be patented: The issuing agency of this document assumes no responsibility for identifying patents:

1 Scope

This document specifies the semi-automatic or fully automatic Ultrasonic Time-of-Flight Diffraction (TOFD) technique for fusion welded joints of metallic materials with a thickness of not less than 6mm

Applications:

This document applies to simple geometry full-penetration welded joints of plates, tubes and vessels where both the weld metal and the base metal are low carbon

steel or low alloy steel: Where appropriate, TOFD can also be used for other applications with lower ultrasonic attenuation (especially scattering attenuation)

Material:

This document provides that the material's longitudinal sound velocity is (5920 ± 50) m/s and the transverse wave sound velocity is (3255 ± 30) m/s:

Relevant regulations for the application of TOFD: When testing other materials with different sound speeds, it is necessary to consider the effect of sound speed:

This document, with reference to ISO 16828, provides the application of TOFD technology for the detection, positioning and dimensional measurement of discontinuities in fusion welded joints:

Use and guidance on the unique capabilities and limitations of this technology: TOFD can be used as a separate technology in manufacturing process inspection and in-service inspection:

It can also be used in combination with other non-destructive testing (NDT) methods or techniques:

This document establishes four test levels (A, B, C and D) as specified in ISO 17635: The higher the detection level, the more reliable the detection

higher: This document also provides guidance on selecting the level of detection:

This document allows the evaluation of TOFD indications for subsequent acceptance: The evaluation is based on the transmitted wave, reflected wave and diffraction of the TOFD image

Evaluation of wave signals:

This document does not include discrete acceptance levels:

2 Normative references

The contents of the following documents constitute essential provisions of this document through normative references in the text: Among them, dated citations

documents, only the version corresponding to that date applies to this document; for

undated references, the latest edition (including all amendments) applies to this document:

ISO 5577 Non-destructive testing ultrasonic testing terminology (Non-destructive testing-Ultrasonic testing-Vocabulary)

ISO 9712 Non-destructive testing personnel qualification and certification (Non-destructive testing-Qualification and certification-tion of NDT personnel)

ISO 16828 Non-destructive testing, ultrasonic testing, ultrasonic diffraction sound, technical testing and evaluation methods (Non-destructive testing-Ultrasonic testing-Time-of-flight diffraction technique as a method for detection and sizing of discontinuities)

ISO 17640 Ultrasonic testing techniques, testing levels and evaluation for non-destructive testing of welds (Non-destructive testing of welds-Ultrasonic testing-Techniques, testing levels, and assessment)

ISO 22232-1 Performance and inspection of ultrasonic testing equipment for nondestructive testing - Part 1: Instruments (Non-destructive testing-Characterization and verification of ultrasonic examination equipment-Part 1: Instruments)

ISO 22232-2 Performance and inspection of ultrasonic testing equipment for nondestructive testing - Part 2: Probes (Non-destructive testing-Characterization and verification of ultrasonic examination equipment-Part 2: Probes)