SLOVENSKI STANDARD
oSIST prEN ISO 17405:2021

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Neporušitveno preskušanje - Ultrazvočno preskušanje - Tehnika preskušanja oblog, pripravljenih z varjenjem, zvijanjem in eksplozijo (ISO/DIS 17405:2021)

Non-destructive testing - Ultrasonic testing - Technique of testing claddings produced by welding, rolling and explosion (ISO/DIS 17405:2021)

Zerstörungsfreie Prüfung - Ultraschallprüfung - Techniken zur Prüfung von Plattierungen hergestellt durch Schweißen, Walzen und Sprengen (ISO/DIS 17405:2021)

Essais non destructifs - Essais par ultrasons - Technique d'essai des placages produits par soudage, laminage et explosion (ISO/DIS 17405:2021)

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Contents

Page

Foreword ..... **iv**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **1**

4 Ultrasonic test system **1**
4.1 General 1
4.2 Requirements regarding probes 2
4.2.1 Single-transducer straight-beam probes for longitudinal waves 2
4.2.2 Dual-transducer straight-beam probes for longitudinal waves 2
4.2.3 Dual-transducer angle-beam probes for longitudinal waves 2
4.2.4 Matching probes to curved surfaces 2
4.3 Additional requirements 3
4.3.1 Test ranges 3
4.3.2 Echo width 3
4.4 Instrument settings 3
4.4.1 Range setting 3
4.4.2 Sensitivity setting 5

5 Preparation of the test object **7**

6 Test procedure **8**
6.1 General 8
6.2 Checking the instrument setting 8
6.3 Recording levels 8

7 Test report **8**

Annex A (informative) **Determination of the focal zone** **10**

Bibliography **11**

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 17405:2014), which has been technically revised.

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

— normative references are updated;

— terms are aligned with ISO 5577;

— editorial corrections are made.

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.

Non-destructive testing — Ultrasonic testing — Technique of testing claddings produced by welding, rolling and explosion

1 Scope

This document specifies the techniques for manual ultrasonic testing of claddings on steel applied by welding, rolling, and explosion using single-transducer or dual-transducer probes.

The test is intended to cover detection of two-dimensional or three-dimensional discontinuities in the cladding and in the region of the interface.

This document does not give acceptance criteria nor define the extent of testing.

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 2400, *Non-destructive testing — Ultrasonic testing — Specification for calibration block No. 1*

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

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

ISO 22232-2, *Non-destructive testing — Characterization and verification of ultrasonic test equipment — Part 2: Probes*

ISO 22232-3, *Non-destructive testing — Characterization and verification of ultrasonic test equipment — Part 3: Combined equipment*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5577 and the following apply.

ISO and IEC maintain terminological 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
test object
part to be tested

4 Ultrasonic test system

4.1 General

The ultrasonic pulse-echo technique is used.

For two-dimensional discontinuities parallel to the test surface and three-dimensional discontinuities, straight-beam probes (dual-transducer or single-transducer) shall be used for testing with longitudinal waves.

For discontinuities with any other orientation, dual-transducer angle-beam probes for longitudinal waves can be used.

The nominal frequency shall be selected according to the purpose of the test and the characteristics of the materials.

Frequencies from 2 MHz to 6 MHz should be preferred.

The instrument used shall comply with the requirements given in ISO 22232-1, and the probes shall comply with the requirements of ISO 22232-2.

The whole test system shall be checked by the operator periodically as given in ISO 22232-3.

4.2 Requirements regarding probes

4.2.1 Single-transducer straight-beam probes for longitudinal waves

A depth zone providing optimum sensitivity is defined (see Annex A) by the size of the transducer used in the probes. The position of this zone shall be selected according to the expected position of the discontinuities.

4.2.2 Dual-transducer straight-beam probes for longitudinal waves

A depth zone providing optimum sensitivity is defined (see Annex A) by the size of the transducers used in the probes and their roof angle. The position of this zone shall be selected according to the expected position of the discontinuities.

4.2.3 Dual-transducer angle-beam probes for longitudinal waves

The beam angle should be between 65° and 80°. The skewing angle, and the shape and size of the transducers, shall be selected so that the depth range for optimum sensitivity (see Annex A) covers the expected position of the discontinuities.

4.2.4 Matching probes to curved surfaces

The distance between the test surface and the contact surface of the probe shall not exceed 0,5 mm when the centre of the probe is in contact. To achieve this, a flat probe shall be matched to the curvature of the test object by grinding, using adaptors or other aids if the radius of curvature, R, is within the range

$$R < \frac{A_P^2}{4\ \text{mm}} \tag{1}$$

where

R is the radius of the curvature of the test surface, in mm;

A_P is the dimension of the contact surface of the probe in the direction of curvature, in mm, i.e. for testing cylindrical parts in the longitudinal direction, it is the width, and for testing in the circumferential direction, it is the length of the contact surface.

4.3 Additional requirements

4.3.1 Test ranges

There shall be a facility for an expanded time base (“zoom mode”).

4.3.2 Echo width

The echo width visible on the screen shall be taken into account when assessing the suitability for coverage of the selected depth zone. This applies to all types of probes: single-transducer straight-beam probes, dual-transducer straight-beam probes, and dual-transducer angle-beam probes.

4.4 Instrument settings

4.4.1 Range setting

Range setting of the ultrasonic instrument for accurate localization of discontinuities when using dual-transducer probes can be carried out using reference blocks (see Reference[2]) as shown in Figure 1 or Figure 2 for example, made of materials similar to the test object, or it can be carried out on the test object itself.

In the case of a dual-transducer straight-beam probe, the probe can, for example, be placed on the various steps of a stepped wedge calibration block.

When dual-transducer angle-beam probes are used on a reference block as shown in Figure 2, for example, the reduced projected sound path length shall be lined up with the appropriate marks on the screen.

In this manner, it is possible to read the position of a reflection point directly on the screen, i.e. for the setting with reduced projected sound path length as well as with depth positions.

NOTE 1 It is recommended to mark the range of any discontinuities to be detected on the screen according to their depth position (normally corresponding to the thickness of the cladding).

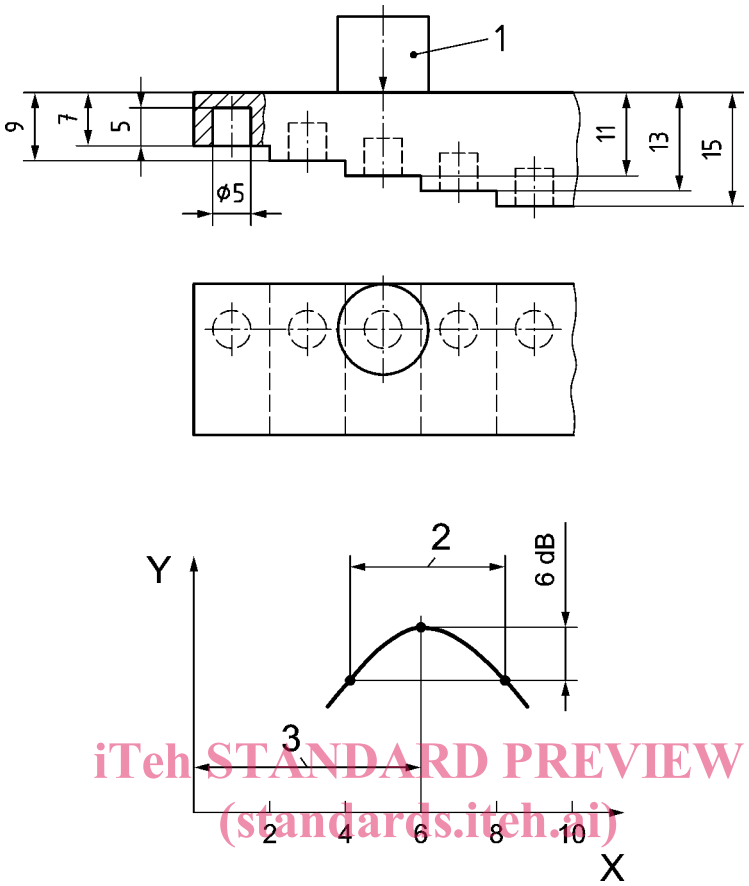
When straight-beam probes are used, the range of the ultrasonic instrument can be set using multiple-echo series from a plane-parallel steel plate of known thickness and sound velocity (e.g. calibration block No. 1 according to ISO 2400).

NOTE 2 Since when angle-beam probes are used for longitudinal waves, transverse waves are also generated, care has to be taken to ensure that no erroneous indications of transverse waves are used during the setting procedure.

In any case, these indications have a considerable larger time of flight than those of longitudinal waves.

When reference blocks are used, all dimensions not specified shall be selected so that the measurement or setting is not impaired by echoes from the geometry of the test block.

Dimensions in millimetres



Key

1 probe
2 length of the focal zone
3 focal distance
X reflector depth position
Y echo height

Figure 1 — Reference block for dual-transducer straight beam probes with representation of the focal zone

When reference blocks are used, all unspecified dimensions shall be selected so that the placing of the probe on the test surface and the measurement or or setting is not impaired by echoes from the geometry of the test block.