INTERNATIONAL STANDARD

ISO 16823

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Non-destructive testing — Ultrasonic testing — Transmission technique

Essais non destructifs — Contrôle par ultrasons — Technique par transmission

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16823 was prepared by Technical Committee ISO/TC 135, *Non-destructive testing*, Subcommittee SC 3, *Ultrasonic testing*.

Introduction

This International Standard is based on EN 583-3:1997, *Non-destructive testing — Ultrasonic examination — Part 3: Transmission technique*.

The following International Standards are linked.

ISO 16810, *Non-destructive testing — Ultrasonic testing — General principles*

ISO 16811, *Non-destructive testing — Ultrasonic testing — Sensitivity and range setting*

ISO 16823, *Non-destructive testing — Ultrasonic testing — Transmission technique*

ISO 16826, *Non-destructive testing — Ultrasonic testing — Examination for discontinuities perpendicular to the surface*

ISO 16827, *Non-destructive testing — Ultrasonic testing — Characterization and sizing of discontinuities*

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

Non-destructive testing — Ultrasonic testing — Transmission technique

1 Scope

This International Standard specifies the principles of transmission techniques.

Transmission techniques can be used for:

— detection of imperfections;

— determination of attenuation.

The general principles required for the use of ultrasonic examination of industrial products are described in ISO 16810.

The transmission technique is used for examination of flat products, e.g. plates and sheets.

Further, it is used for examinations e.g.:

— where the shape, dimensions or orientation of possible imperfections are unfavourable for direct reflection;

— in materials with high attenuation;

— in thin products.

2 Normative references

The following referenced documents are indispensable for the application 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 inspection — Vocabulary*

EN 1330-4, *Non-destructive testing — Terminology — Part 4: Terms used in ultrasonic testing*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5577 and EN 1330-4 apply.

4 Principles of the examination

4.1 Basic techniques and set-up

In its simplest application two probes, one emitting and the second receiving, are placed so that the receiving probe receives the sound transmitted through the object. This can be achieved with straight beam probes or angle beam probes, see Table 2, e) to h).

Alternatively, the examination can be carried out using a single probe where the sound is reflected on a surface of an object on the opposite side of the examination object or on the opposite surface of the examination object (back wall), see Table 2, a) to d). See also Table 1.

Table 1 — Techniques and typical set-ups used in transmission technique

wave mode	**continuous waves**	**pulsed waves**
wave type	longitudinal or transverse	longitudinal or transverse
number of transducers	2	1 or 2
angle of incidence	normal	normal or oblique
evalution of	amplitude of transmitted sound	amplitude or time of flight of transmitted pulse or echo

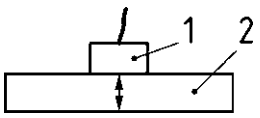
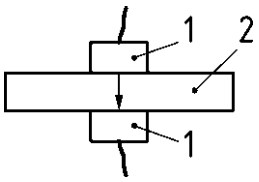
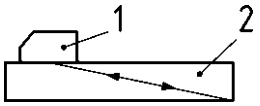
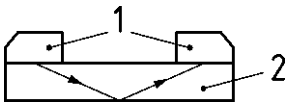
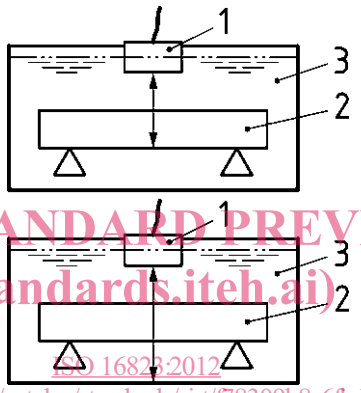
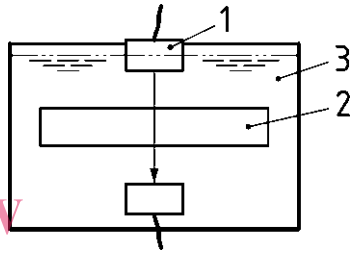
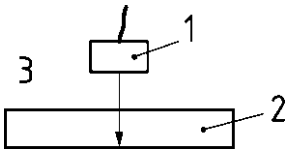
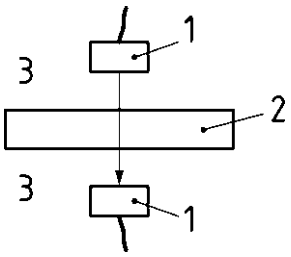
The decrease in amplitude of the transmitted signal can be used to indicate the presence of a discontinuity located in the sound path, or to indicate material attenuation. In addition, the position of the transmitted signal along the timebase of the instrument can be used to indicate material thickness.

Examination can be carried out with either continuous or pulsed ultrasonic waves, except when the technique is used for thickness measurement where only pulsed ultrasonic waves apply.

Straight beam or angle beam probes can be used depending on the scope of the examination.

A probe can be coupled to the product by means of a couplant, a squirter, by immersing the product or by applying a wheel probe.

Table 2 — Possible configurations for transmission technique

	One probe	Two probes
Straight beam contact	 a)	 e)
Angle beam contact	 b)	 f)
Total immersion	 c)	 g)
Local immersion (squirter)	 d)	 h)
Key 1 probe 2 object 3 water		

4.2 Capability of detection of imperfections

When used for the detection of imperfections, any imperfection (or group of imperfections) shall intercept a significant proportion (i.e. 25 % to 50 %) of the cross-sectional area of the ultrasonic beam before an unambiguous change in signal amplitude is observed. This technique can only be used for detecting imperfections or groups of imperfections which are relatively large compared to the ultrasonic beam area, e.g. laminations in plate material.

Within the limitations mentioned above, the technique provides positive proof of the absence of an imperfection at any position along the sound path. However, it does not indicate the position in depth of a detected imperfection.