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**Non-destructive testing of welds —  
Time-of-flight diffraction technique  
(TOFD) — Acceptance levels**

*Essais non destructifs des assemblages soudés — Technique  
de diffraction des temps de vol (méthode TOFD) — Niveaux  
d'acceptation*

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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](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

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](http://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*.

Any feedback, question or request for official interpretation related to any aspect of this document should be directed to the Secretariat of ISO/TC 44/SC 5 via your national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html). Official interpretations, where they exist, are available from this page: <https://committee.iso.org/sites/tc44/home/interpretation.html>.

This second edition cancels and replaces the first edition (ISO 15626:2011), which has been technically revised. The main changes compared to the previous edition are as follows:

- in [6.3.1](#), method 4 has been described;
- for all figures, the keys have been completed.

# Non-destructive testing of welds — Time-of-flight diffraction technique (TOFD) — Acceptance levels

## 1 Scope

This document specifies acceptance levels for the time-of-flight diffraction technique (TOFD) of full penetration welds in ferritic steels from 6 mm up to 300 mm thickness which correspond to the quality levels of ISO 5817.

These acceptance levels are applicable to indications classified in accordance with ISO 10863.

## 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*

## 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

#### **embedded discontinuity**

discontinuity within the volume of the material, separated from the surfaces

### 3.2

#### **surface-breaking discontinuity**

discontinuity connected to the near (scanning) surface or far (opposite) surface

## 4 Symbols

$h$  height of an indication

$l$  length of an indication

$t$  nominal wall thickness in accordance with construction drawing or dimension table

## 5 Relation between quality levels and acceptance levels

Three different acceptance levels are defined. The relation between these acceptance levels and the quality levels as mentioned in ISO 5817 are given in [Table 1](#).

Table 1 — Acceptance levels

Quality level according to ISO 5817	Examination level according to ISO 10863	Acceptance level
B (Stringent)	C	1
C (Intermediate)	at least B	2
D (Moderate)	at least A	3

## 6 Definition and determination of length and height

### 6.1 General

The size of a discontinuity is described by the length and height of its indication.

Length is defined by the difference of the *x*-coordinates of the indication.

The height is defined as the maximum difference of the *z*-coordinates at any given *x*-position.

### 6.2 Determination of length

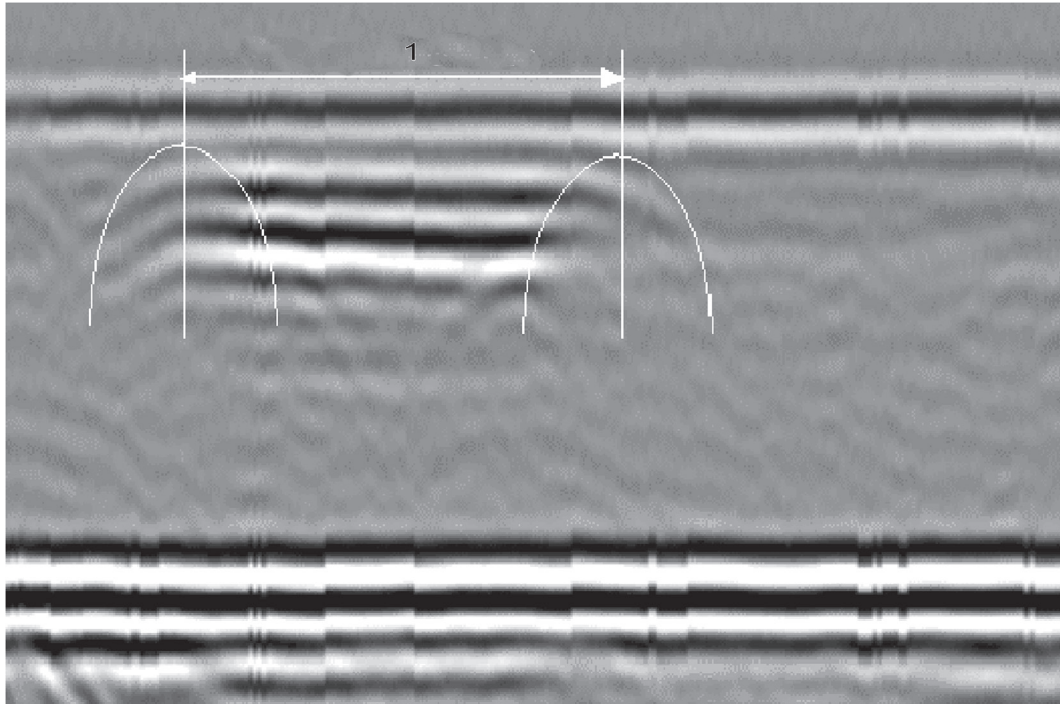
#### 6.2.1 General

Depending on the type of indication, one of the techniques for length sizing according to [6.2.2](#) or [6.2.3](#) shall be applied.

#### 6.2.2 Length sizing of elongated straight indications

This type of indication does not change significantly in the through-wall direction.

A hyperbolic cursor is fitted to the indication. Assuming the discontinuity is elongated and has a finite length, this is only possible at each end. The distance moved between acceptable fits at each end of the indication is taken to represent the length of the discontinuity (see [Figure 1](#)).

**Key**

1 length of indication

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**Figure 1 — Length sizing by fitting arc-shaped cursors**

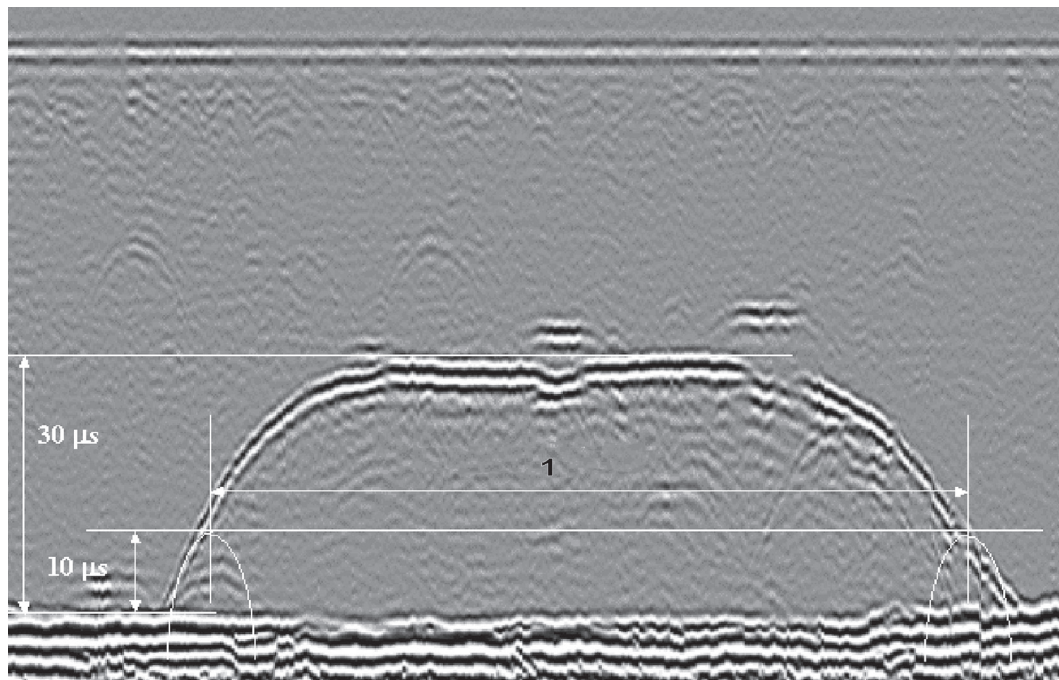
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**6.2.3 Length sizing of elongated curved indications**

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This type of indication does change significantly in the through-wall direction.

A hyperbolic cursor is positioned at either end of the indication at a time delay of one third of the indication penetration. The distance moved between the cursor positions at each end of the indication is taken to represent the length of the discontinuity (see [Figure 2](#)).



**Key**

- 1 length of indication

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**Figure 2 — Length sizing of elongated curved indication**  
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**6.3 Determination of height**

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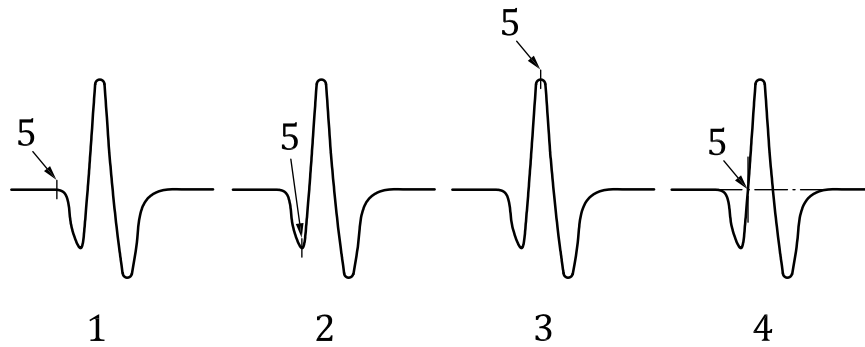
<https://standards.iteh.ai/catalog/standards/sist/b9d34651-f845-449d-9543-7651a8d5f360/iso-15626-2018>

**6.3.1 General**

The height measurement shall be done from the A-scan and by choosing a consistent position on the signals, considering phase reversals. It is recommended to use one of the following methods (as shown in [Figure 3](#)):

- Method 1: by measuring the transit time between the leading edges of the signals;
- Method 2: by measuring the transit time between the first peaks;
- Method 3: by measuring the transit time between the maximum amplitudes;
- Method 4: by measuring the transit time between the first zero crossings of the signals.





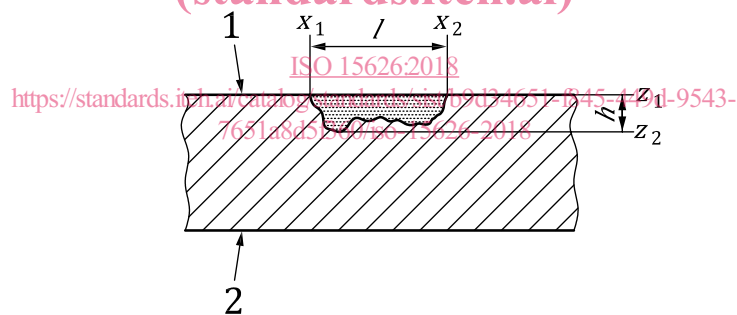
**Key**

- 1 method 1
- 2 method 2
- 3 method 3
- 4 method 4
- 5 positions for measuring the transit time

**Figure 3 — Position of the cursor for time measurement — Methods 1, 2, 3 and 4**

**6.3.2 Surface-breaking discontinuities**

The height of an indication of a surface-breaking discontinuity is determined by the maximum difference between the lateral wave and the lower-tip diffraction signal.



**Key**

- |                                       |                                    |
|---------------------------------------|------------------------------------|
| 1 scanning surface                    | $z_1$ start depth of discontinuity |
| 2 opposite surface                    | $z_2$ end depth of discontinuity   |
| $x_1$ start position of discontinuity | $h$ height (= $z_2 - z_1$ )        |
| $x_2$ end position of discontinuity   | $l$ length (= $x_2 - x_1$ )        |

**Figure 4 — Height definition of a scanning surface-breaking discontinuity**

For an opposite surface-breaking discontinuity, the height is determined by the maximum difference between the upper-tip diffraction signal and the back wall reflection (see [Figure 5](#)).