SLOVENSKI STANDARD
oSIST prEN ISO 23279:2016

01-april-2016

Neporušitveno preskušanje zvarnih spojev - Ultrazvočno preskušanje - Karakterizacija indikacij v zvarnih spojih (ISO/DIS 23279:2016)

Non-destructive testing of welds - Ultrasonic testing - Characterization of indications in welds (ISO/DIS 23279:2016)

Zerstörungsfreie Prüfung von Schweißverbindungen - Ultraschallprüfung - Charakterisierung von Anzeigen in Schweißnähten (ISO/DIS 23279:2016)

Contrôle non destructif des assemblages soudés - Contrôle par ultrasons - Caractérisation des indications dans les assemblages soudés (ISO/DIS 23279:2016)

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ICS:

25.160.40	Varjeni spoji in vari	Welded joints

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Non-destructive testing of welds — Ultrasonic testing — Characterization of indications in welds

Contrôle non destructif des assemblages soudés — Contrôle par ultrasons — Caractérisation des indications dans les assemblages soudés

ICS: 25.160.40

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

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Contents

Page

Foreword

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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).

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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

ISO 23279 was prepared by the European Committee for Standardization (CEN) Technical Committee TC 121, Welding, in collaboration with ISO Technical Committee TC 44, Welding and allied processes, Subcommittee SC 5, Testing and inspection of welds, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 23279:2010), which has been technically revised.

Non-destructive testing of welds — Ultrasonic testing — Characterization of indications in welds

1 Scope

This International Standard specifies how to characterize indications from embedded discontinuities by classifying them as planar or non-planar.

This procedure is also suitable for indications from discontinuities that break the surface after removal of the weld reinforcement.

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 11666, *Non-destructive testing of welds - Ultrasonic testing - Acceptance levels*

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

3 Principle

Classification of discontinuities as planar or non-planar is based on several parameters:

a) welding techniques;

b) geometrical position of the discontinuity;

c) maximum echo amplitude;

d) directional reflectivity;

e) static echo pattern (i.e. A-scan);

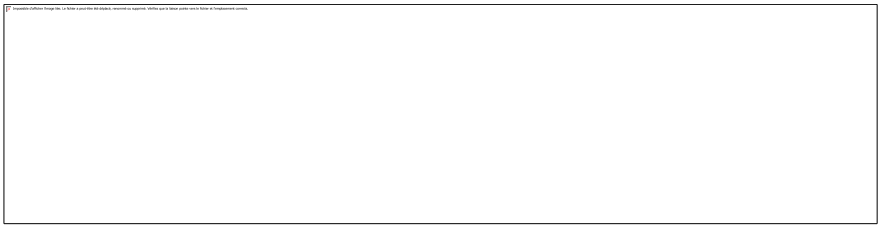
f) dynamic echo pattern (envelope).

The process of classification involves examining each of the parameters against all the others in order to arrive at an accurate conclusion.

For guidance, Figure A.1 gives the classification of indications from internal weld discontinuities suitable for general applications. Figure A.1 should be applied in conjunction with the two parameters a) and b) listed above and not taken in isolation.

The classification procedure specified in this International Standard is also suitable for indications that come from surface breaking discontinuities after removal of the weld reinforcement (see Figure 1).

Dimensions in millimetres



Key
A ground weld

Figure 1 — Origin of indications from a weld

4 Criteria

4.1 General

The classification is carried out by the successive application of several discriminatory criteria to:

a) echo amplitude;

b) directional reflectivity;

c) static echo pattern (A-scan);

d) dynamic echo pattern (envelope).

These criteria are applied using a flowchart procedure (see Annex A).

It is recommended that the same probes be used for detection and for classification of discontinuities. The flowchart procedure standardizes a system of classification. Several thresholds are defined in decibels by a comparison with the distance-amplitude curve (DAC) or by a comparison of the maximum echo heights from the discontinuity when tested from different directions.

Proposed thresholds for the different stages in the flowchart procedure are given in Table A.1.

The flowchart procedure calls for five stages:

stage 1: to avoid the classification of indications with very low echo amplitudes;

stage 2: to classify all indications with high echo amplitude as associated with planar discontinuities;

stage 3: primarily to classify lack of fusion;

stage 4: primarily to classify inclusions;

stage 5: primarily to classify cracks.

Note to entry: Indications resulting from a combination of an inclusion and lack of fusion are classified as planar by the flowchart procedure. An example of this type of discontinuity is given in Figure A.2.

4.2 Echo amplitude criteria (stages 1 and 2)

4.2.1 Low amplitudes (stage 1)

It is accepted that an indication with an echo amplitude lower than the evaluation level as specified in ISO 11666 (defined as T_1 in Figure A.1) is not significant and shall not be characterized.

For special applications, this value T_1 may be lowered, if defined by specification.

4.2.2 High amplitudes (stage 2)

It is assumed that an indication with an echo amplitude that is at least equal to the reference level plus 6 dB (defined as T_2 in Figure A.1) is associated with a planar discontinuity.

4.3 Directional reflectivity criteria (stage 3)

4.3.1 Applicability based on length

Stage 3 of the flowchart procedure shall be applied only to those indications exceeding:

a) t for the range of thicknesses 8 mm ≤ t ≤ 15 mm;

b) $t/2$ or 15 mm, whichever is the larger, for thicknesses over 15 mm.

For indications not exceeding the specified length proceed to stage 4.

4.3.2 Application conditions

The following application conditions apply:

a) echoes compared shall be obtained from the same reflector;

b) the comparison shall be made at the position where echo height, $H_{d,\ max}$, is the highest along the indication;

c) when a normal-beam probe and an angle-beam probe are used, their frequencies shall be chosen to give similar wavelengths (e.g. 4 MHz for longitudinal waves and 2 MHz for shear waves for steel);

d) when two or more beam angles are used, the differences between the nominal refracted beam angles shall be equal to or greater than 10°;

e) if the comparison is made between a beam passing through the weld and a beam passing through the base material only, the attenuation of the weld material shall be taken into account.

4.3.3 Criteria

The highest echo amplitude, $H_{d,\ max}$, obtained from the discontinuity is compared to the minimum echo amplitude, $H_{d,\ min}$, obtained from all the other directions.

To satisfy the directional reflectivity, the following conditions shall be fulfilled simultaneously:

a) $H_{d,\ max}$ is greater than or equal to T_3 (the reference level minus 6 dB);

b) the modulus of the difference of the amplitudes of the indications , $|H_{d,\,max} - H_{d,\,min}|$, from two different directions is at least:

   1) 9 dB using shear wave angle-beam probes only, or

   2) 15 dB using one shear wave angle-beam probe and one longitudinal wave normal-beam probe.

The directional reflectivities depend on refracted beam angle and test conditions (half skip, full skip).

Examples of different testing directions are given in Figure B.1.

An example of the application of these criteria is given in Figure B.2.

4.4 Static echo pattern criteria (stage 4)

At this stage, the static echo pattern (i.e. A-scan) of the discontinuity is compared with that obtained from the reference reflector (3 mm diameter side-drilled hole).

If the static echo pattern is single and smooth, the discontinuity is classified as non-planar.

If the static echo pattern is not both single and smooth, proceed to stage 5.

This criteria shall be fulfilled for at least two directions of testing.

4.5 Transverse dynamic echo pattern criteria (stage 5)

The transverse dynamic echo pattern of a discontinuity is the envelope of the resulting echoes when the ultrasonic probe is moved perpendicular to the discontinuity, in accordance with ISO 17640. The analysis takes into account not only the envelope, but also the behaviour of the echoes inside of it.

Classification of discontinuities depends on the patterns observed:

pattern 1: single, non-planar discontinuity;

pattern 2: excluded by previous stage;

pattern 3 and pattern 4: planar discontinuity, if observed for the two directions of highest reflectivity — if only observed for one reflectivity direction, use complementary tests (see 4.6);

pattern 5: cluster of non-planar discontinuities.

These patterns used for classification are given in Annex C.

This criteria shall be fulfilled for at least two directions of testing.

4.6 Complementary testing

In case of doubt, carry out additional tests, for example:

a) use of additional reflectivity directions or additional probes;

b) analysis of the dynamic echo pattern when the probe is moved parallel to the discontinuity [see Figures C.1 c), C.2 c), C.3 c), C.4 c), C.5 c)].

c) other non-destructive testing methods (e.g. radiography).

This list is not restrictive.

Annex A
(normative)

Classification of indications from internal discontinuities in welds — Flowchart procedure

The flowchart procedure is defined in Figure A.1.