
**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*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 23279:2007

<https://standards.iteh.ai/catalog/standards/sist/89c287bc-8e64-49af-b2cc-38f711233035/iso-23279-2007>



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 23279:2007](https://standards.iteh.ai/catalog/standards/sist/89c287bc-8e64-49af-b2cc-38f711233035/iso-23279-2007)

<https://standards.iteh.ai/catalog/standards/sist/89c287bc-8e64-49af-b2cc-38f711233035/iso-23279-2007>

© ISO 2007

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword.....	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Criteria	1
3.1 General	1
3.2 Conventions used	2
3.3 Location of indications	2
3.4 Echo height criteria (Stages 1 and 2)	2
3.5 Directional reflectivity criteria (Stage 3)	3
3.6 Echostatic pattern criteria (Stage 4)	4
3.7 Echodynamic pattern criteria (Stage 5)	4
3.8 Complementary examination	4
Annex A (normative) Classification of internal indications in welds — Flowchart procedure	5
Annex B (informative) Examination incidence	9
Annex C (informative) Basic echodynamic patterns of reflectors	10

(standards.iteh.ai)

ISO 23279:2007

<https://standards.iteh.ai/catalog/standards/sist/89c287bc-8e64-49af-b2cc-38f711233035/iso-23279-2007>

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 23279 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 5, *Testing and inspection of welds*.

Requests for official interpretations of any aspect of this International Standard 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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 23279:2007
<https://standards.iteh.ai/catalog/standards/sist/89c287bc-8e64-49af-b2cc-38f711233035/iso-23279-2007>

Introduction

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

- welding techniques;
- geometrical position of the indication;
- maximum echo height;
- directional reflectivity;
- echostatic pattern (i.e. A-scan);
- echodynamic pattern.

The classification process involves comparing each parameter to all the others in order to arrive at an accurate conclusion.

The flowchart in Annex A gives the classification of internal weld indications suitable for general applications.

iteh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 23279:2007](https://standards.iteh.ai/catalog/standards/sist/89c287bc-8e64-49af-b2cc-38f711233035/iso-23279-2007)

<https://standards.iteh.ai/catalog/standards/sist/89c287bc-8e64-49af-b2cc-38f711233035/iso-23279-2007>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 23279:2007

<https://standards.iteh.ai/catalog/standards/sist/89c287bc-8e64-49af-b2cc-38f711233035/iso-23279-2007>

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

1 Scope

This International Standard defines a procedure for classifying internal indications as planar or non-planar.

This procedure is only suitable for indications located at least 5 mm below the unground surface of the joint.

Annex A defines the procedure in the form of a flowchart. Figure 1 illustrates the location of indications.

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.

EN 1712, *Non-destructive examination of welds — Ultrasonic examination of welded joints — Acceptance levels*

[ISO 23279:2007](https://standards.iteh.ai/catalog/standards/sist/89c287bc-8e64-49af-b2cc-38f711233035/iso-23279-2007)

<https://standards.iteh.ai/catalog/standards/sist/89c287bc-8e64-49af-b2cc-38f711233035/iso-23279-2007>

3 Criteria

3.1 General

The classification is carried out by the successive application of several discriminatory criteria, i.e.

- echo amplitude;
- directional reflectivity;
- echostatic pattern (A-scan);
- echodynamic pattern.

The classification is carried out in accordance with EN 1712.

The flowchart procedure is stopped as soon as one of the above criteria is fulfilled.

The probes used for the classification are, as a general rule, the same as those specified for the detection.

The flowchart procedure standardizes a quality control system of classification. Several levels are defined in decibels (dB) by a comparison with the distance amplitude curve (DAC) or by a comparison between the maximum echo heights from the discontinuity when tested at different angles of incidence.

Proposed dB levels for the different stages in the flowchart procedure are given in Table 1.

Table 1 — Proposed dB levels for the different stages in the flowchart procedure

Reflectivity level	S1	S2	S3	S4
Decibel	DAC – 10 dB	DAC + 6 dB	DAC – 6 dB	9 dB ^a /15 dB ^b
^a Shear waves.				
^b Between reflections obtained with a shear and a longitudinal wave.				

The flowchart procedure calls for five stages, each having a precise aim:

- Stage 1: to avoid the classification of indications with very low echo amplitudes;
- Stage 2: to classify all indications with high echo amplitude as planar;
- Stage 3: primarily to classify lack of fusion;
- Stage 4: primarily to classify inclusions;
- Stage 5: primarily to classify cracks.

NOTE The “hybrid” indications resulting from the association of an inclusion and a lack of fusion are classified as planar by the flowchart procedure. An example of this type of flaw is given in Figure A.3.

3.2 Conventions used

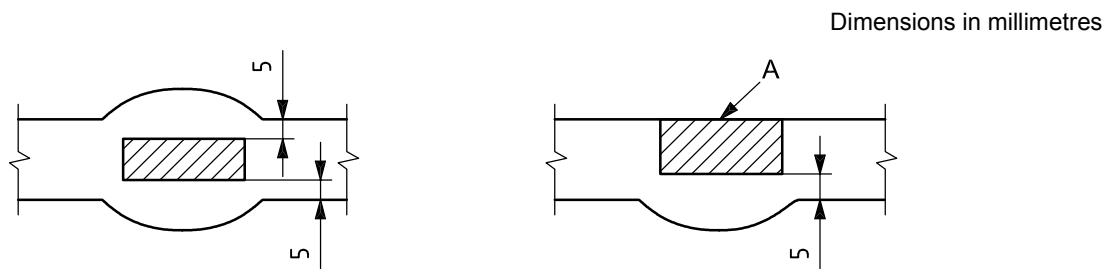
The reference echoes shall be obtained on 3 mm side drilled holes.

By convention,

- a negative level value means that the indication has a lower echo amplitude than the reference;
- a positive level value means that the indication has a higher echo amplitude than the reference.

3.3 Location of indications

Figure 1 illustrates the location of indications.



Key
A ground weld

Figure 1 — Location of indications

3.4 Echo height criteria (Stages 1 and 2)

3.4.1 Low amplitudes (Stage 1)

It is accepted that an indication with a lower echo amplitude than level S1 (DAC – 10 dB) is not significant. For special applications, this S1 value should be lowered if agreed between the contracting parties.

3.4.2 High amplitudes (Stage 2)

It is assumed that an echo height that is at least equal to the level S2 (DAC + 6 dB) comes from a planar indication.

3.5 Directional reflectivity criteria (Stage 3)

This stage of the flowchart procedure shall be applicable either to all indications or, if agreed between the contracting parties, only to those indications exceeding a specified length. For the range of thicknesses $8 \text{ mm} \leq t \leq 15 \text{ mm}$, this length is t , and for thicknesses over 15 mm, this length is $t/2$ or 20 mm, whichever is the larger. For indications not exceeding the specified length, proceed to Stage 4.

For the criteria below, the angle of incidence of examination which gives the highest echo amplitude relative to a DAC curve, H_{dmax} , is taken as reference. The minimum echo amplitude relative to a DAC curve, H_{dmin} , obtained from the other angles of incidence, is compared with H_{dmax} .

To satisfy the directional reflectivity, the two conditions below shall be fulfilled simultaneously.

- a) The reflectivity of the indication, for at least one of the angles of incidence, is higher than or equal to S3 (DAC – 6 dB).
- b) There is a high directional reflectivity, i.e.
 - 1) an imbalance of, at least, 9 dB between two angles of incidence of examination, if the examination is carried out with shear waves:

$$|H_{\text{dmax}} - H_{\text{dmin}}| \geq 9 \text{ dB, or}$$
 - 2) an imbalance of, at least, 15 dB between two angles of incidence of examination, where one of them is carried out with shear waves, the other with longitudinal waves:

$$|H_{\text{dmax}} - H_{\text{dmin}}| \geq 15 \text{ dB.}$$

The incidence of examination results from the association of a refraction angle and examination conditions (half skip, full skip). Some examples are given in Annex B.

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

The attenuation of the weld could be taken into account.

The following conditions apply.

- Normally, the wave length of the different angles of incidence of examination shall be almost the same (e.g. 4 MHz for longitudinal waves and 2 MHz for shear waves).
- In all cases, the differences between the compared angles of incidence are equal to or greater than 10° (the nominal refraction angles are taken into account).
- The comparison of reflectivities shall be made at the position on the indication which exhibits the highest reflectivity.
- Such comparisons make sense only if it is certain that the compared echoes come from the same reflectors.
- It shall be certain before the application of these criteria that:
 - there is no segregation in the base metal;

- there is no corrosion and the two sides are parallel if full skip is used;
- the materials are isotropic.

3.6 Echostatic pattern criteria (Stage 4)

At this stage, the echostatic pattern (i.e. A-scan) is considered.

With the echo height requirements met (neither very high, nor very low) and a low directional reflectivity, if the echostatic pattern is single and smooth, the indication is classified as non-planar.

If the echostatic pattern is not single and smooth, the next stage of the procedure is followed.

The shape of the echostatic pattern depends on the transducer and equipment used. It is therefore imperative to compare the pattern of the indication with that obtained from the reference reflector (3 mm diameter side drilled hole).

3.7 Echodynamic pattern criteria (Stage 5)

If the static echo is not single and smooth, it shall be classified as single and jagged, or multiple. This point is made use of at Stage 5 of the flowchart procedure.

The transverse echodynamic pattern of a reflector is the envelope of the resulting echoes when the ultrasonic beam passes it transversely. The analysis takes into account not only the envelope of the curve, but also the behaviour of the echoes inside it.

The pattern can be classified into four types, as given in Annex C.

If the transverse echodynamic exhibits Pattern 3 (varial class) for at least two angles of incidence, the indication is classified as planar.

Normally, the two angles of incidence chosen are those that give the highest reflectivities.

If only one angle of incidence of examination gives echodynamic Pattern 3, it is possible to use a third angle of incidence, or to call for some complementary examination (see 3.8).

The other types of echodynamic pattern lead to non-planar indications:

- Pattern 1: single non-planar;
- Pattern 4: cluster of non-planar.

At this stage of the flowchart procedure, a Pattern 2 cannot be obtained, since such indications would have been classified as planar from the earlier stages (high reflectivity).

3.8 Complementary examination

In case of any doubt, the following examinations should be carried out:

- analysis of echodynamic pattern in the lateral movement;
- use of additional transducers;
- results from other non-destructive testing (i.e. radiography).

The above list is not restrictive.

Annex A (normative)

Classification of internal indications in welds — Flowchart procedure

The flowchart procedure is defined in Figure A.1. The flowchart should be applied in conjunction with the two first parameters listed in the Introduction, and not taken in isolation.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 23279:2007](https://standards.iteh.ai/catalog/standards/sist/89c287bc-8e64-49af-b2cc-38f711233035/iso-23279-2007)

<https://standards.iteh.ai/catalog/standards/sist/89c287bc-8e64-49af-b2cc-38f711233035/iso-23279-2007>