SLOVENSKI STANDARD
SIST EN 1712:1999

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Neporuġitvena preiskava zvarov - Ultrazvoļ na preiskava zvarnih spojev - Stopnje sprejemljivosti

Non-destructive examination of welds - Ultrasonic examination of welded joints - Acceptance levels

Zerstörungsfreie Prüfung von Schweißverbindungen - Ultraschallprüfung von Schweißverbindungen - Zulässigkeitsgrenzen

Contrôles non destructif des assemblages soudés - Contrôle par ultrasons des assemblages soudés - Niveaux d'acceptation

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English version

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 121 "Welding", the secretariat of which is held by DS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 1998, and conflicting national standards shall be withdrawn at the latest by February 1998.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies ultrasonic acceptance levels, 2 and 3, for full penetration welded joints in ferritic steels, which correspond to the quality levels B and C of EN 25817, respectively. Other acceptance levels can be used by agreement between the contracting parties.

An acceptance level corresponding to level D of EN 25817 has not been included in this standard as ultrasonic examination is not recommended for this weld quality.

These acceptance levels are applicable to examinations carried out in accordance with the standards referred to in EN 12062. They can, however, be applied in conjunction with other rules, where the same types of reference reflectors for sensitivity setting are used, provided it is agreed between the contracting parties.

The standard is applicable to the examination of full penetration ferritic steel welds, with thicknesses from 8 mm up to 100 mm. It can also be used for other types of welds, materials and thicknesses above 100 mm, provided the examinations have been performed with necessary consideration of the geometry and acoustical properties of the component and an adequate sensitivity can be employed to enable the acceptance levels of this standard to be applied. The nominal frequency of probes used in this European Standard is between 2 MHz and 5 MHz unless attenuation or requirements for higher resolution call for another frequency. The use of these acceptance levels in conjunction with frequencies outside this range needs to be considered carefully.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 1714	Non destructive examination of welds - Ultrasonic examination of welded joints
EN 12062	Non-destructive examination of welds - General rules for metallic materials
EN 25817	Arc-welded joints in steel - Guidance on quality levels for imperfections (ISO 5817:1992)

3 Evaluation of indications

3.1 General

Th evaluation of indications shall be performed on indications detected by examinations performed in accordance with EN 1714.

3.2 Sensitivity setting

For each scanning technique the method for sensitivity setting shall be agreed upon prior to the examination and the same method should normally be used for subsequent examinations.

The setting of sensitivity may be performed by :

- Method 1: 3 mm diameter side drilled holes ;

- Method 2: The distance gain size (DGS) system ;

- Method 3: If a probe angle $\geq 70^{o}$ is used for the thickness range 8 mm $\leq t <$ 15 mm a rectangular notch with a depth of 1 mm may be used.

The length of the side drilled holes and notches shall be greater than the width of the sound beam measured at - 20 dB. The width of the notch is not relevant in this application.

The acceptance levels for method 2 are based on the use of the following ultrasonic wave probes given in table 1.

Table 1: Ultrasonic probe frequencies for method 2

Thickness range, t in mm	Transverse wave probe frequency in MHz	Longitudinal wave probe frequency in MHz
$8 \leq t < 15$	4	4 to 5
$15 \leq t < 40$	2 to 4	2 to 5
$40 \leq t \leq 100$	2	2 to 5

If other probe frequencies are used the effect on the acceptance levels shall be considered and necessary corrections shall be made.

3.3 Reference level

One of the following methods for setting reference levels shall be used :

- Method 1: The reference level is a distance-amplitude-curve (DAC-curve) for a 3 mm diameter side drilled hole ;

- Method 2: The reference levels for transverse and longitudinal waves using the distance gain size (DGS) based on a disc shaped reflector (DSR) are given in tables A.3 and A.4 respectively ;

- Method 3: The reference level is equal to a DAC curve for a 1 mm deep rectangular notch.

- Tandem examination: D_{DSR} = 6 mm (for all thicknesses).

3.4 Evaluation level

All indications equal to or exceeding the following shall be evaluated :

- Methods 1 and 3: Reference level - 10 dB (33 % DAC) :

- Method 2: Reference level - 4 dB, in accordance with tables A.3 and A.4 respectively ;.

- Tandem examination: D_{DSR} = 6 mm (for all thicknesses).

3.5 Recording level

When recording levels are not otherwise specified, the following values shall be used :

- Recording level for methods 1 and 3 :

  - Acceptance level 2 : reference level - 6 dB (50 % DAC) ;
  - Acceptance level 3 : reference level - 2 dB (80 % DAC).

- Recording level for method 2 :

  - Acceptance level 2 : reference level ;
  - Acceptance level 3 : reference level + 4 dB.

- Recording level for tandem examination :

  - D_{DSR} = 6 mm (for all thicknesses).

3.6 Measurement of indication length

The length of the indication shall be determined by measuring the distance along the length over which the echo amplitude is above the evaluation level, using the fixed amplitude level technique described in annex B.

In order to achieve a more accurate measurement, a probe having a narrow beam width may be used or corrections for the influence of the beam width may be performed.

4 Acceptance levels

4.1 General

The acceptance levels shall be related to the examination techniques (examination levels) as defined in EN 1714. Acceptance level 2 will normally require at least examination level B, and for acceptance level 3 at least examination level A. Any other relationship between acceptance levels and examination levels shall be agreed between the contracting parties.

The acceptance levels in this clause are valid for all examination levels and for all techniques, including examinations with straight beam probes.

Indications are to be evaluated as longitudinal or transverse depending on the orientation of their major dimension. Where this distinction cannot be clearly made, the indication shall be classified as transverse if the echo amplitude obtained during the examination of transverse indications exceeds the echo amplitude obtained during the examination for longitudinal indications by 2 dB or more.

Evaluation of indications may include discrimination between different imperfection types if agreed between contracting parties. In such case, the characterisation as a planar indication may be used as the primary discrimination of an acceptable or rejectable indication. In this case all indications with echo amplitude above the evaluation level shall be characterised, and all that are characterised as planar shall be rejected.

For welds subject to fatigue loading, near surface acceptance levels may be specified subject to agreement between the contracting parties.

4.2 Longitudinal indications

All indications with echo amplitudes and lengths exceeding the following limits are unacceptable :

- Methods 1 and 3 : Figure A.1 and table A.1
- Method 2 : Figure A.2 and table A.2.

Any indication with a length exceeding t, for the thickness range of 8 mm $\leq t <$ 15 mm, or $t/2$ or 20 mm, whichever is the larger, for all other thickness ranges, shall be subject to further examination using additional probe angle(s), including the tandem technique where applicable. The final evaluation shall be based on the echo amplitude and length measured at the angle giving the maximum response.

4.3 Transverse indications

All indications exceeding the limits stated in 4.2 are unacceptable.

Transverse indications with echo amplitudes equal to or exceeding the evaluation level shall be classified by additional ultrasonic scanning, radiography or other examination method to determine their nature. Only indications that are isolated (i.e. maximum three per metre), whose length is less than 10 mm, are acceptable if they are planar. If they are non-planar the acceptance level for longitudinal indications shall apply.

4.4 Indications detected by the tandem technique

Indications detected by the tandem technique (longitudinal and transverse) shall be investigated further if their echo amplitudes exceed the recording level. Additional ultrasonic or radiographic examinations shall be carried out in order to determine the type and size of the imperfections.

The acceptability of indications detected by the tandem technique is to be agreed by the contracting parties.