SLOVENSKI STANDARD
SIST EN 15317:2014

01-julij-2014

Nadomešča:
SIST EN 15317:2007

Neporušitvene preiskave - Ultrazvočne preiskave - Karakterizacija in preverjanje ultrazvočne opreme za merjenje debeline

Non-destructive testing - Ultrasonic testing - Characterization and verification of ultrasonic thickness measuring equipment

Zerstörungsfreie Prüfung - Ultraschallprüfung - Charakterisierung und Verifizierung der Ultraschall-Prüfausrüstung zur Dickenmessung

Essais non destructifs - Contrôle ultrasonore - Caractérisation et vérification des appareils de mesure de l'épaisseur par ultrasons

Ta slovenski standard je istoveten z: **EN 15317:2013**

ICS:

19.100	Neporušitveno preskušanje	Non-destructive testing

SIST EN 15317:2014 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 15317

November 2013

ICS 19.100

Supersedes EN 15317:2007

English Version

Non-destructive testing - Ultrasonic testing - Characterization and verification of ultrasonic thickness measuring equipment

Essais non destructifs - Contrôle ultrasonore - Caractérisation et vérification des appareils de mesure de l'épaisseur par ultrasons

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 15317:2013: E

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Foreword

This document (EN 15317:2013) has been prepared by Technical Committee CEN/TC 138 “Non-destructive testing”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by May 2014, and conflicting national standards shall be withdrawn at the latest by May 2014.

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This document supersedes EN 15317:2007.

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1 Scope

This European Standard specifies methods and acceptance criteria for assessing the performance of instruments for measuring thickness using pulse-echo ultrasound.

This European Standard covers both direct (digital) reading and waveform display types using single or dual element probes.

This European Standard may be used for verifying equipment covered by EN 12668-1, EN 12668-2 and EN 12668-3 when used for thickness measurement.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

EN 10025-2, *Hot rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels*

EN 12668-1, *Non-destructive testing - Characterization and verification of ultrasonic examination equipment - Part 1: Instruments*

EN 12668-2, *Non-destructive testing - Characterization and verification of ultrasonic examination equipment - Part 2: Probes*

EN 14127, *Non-destructive testing - Ultrasonic thickness measurement*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1330-4 and EN 12668-1 apply.

4 General requirements for compliance

Ultrasonic thickness measuring equipment complies with this standard if it satisfies all the following conditions:

a) ultrasonic instrument and probe comply with the technical requirements of this European Standard;

b) either a declaration of conformity, issued by an organisation certified in accordance with EN ISO 9001; or

   a certificate issued by an organization accredited according to EN ISO/IEC 17050-1 and EN ISO/IEC 17050-2, or a test report issued by an organisation performing in-house calibration;

c) ultrasonic instrument and probe are clearly marked to identify the manufacturer, type and series, and carries a unique serial number;

d) user instruction manual for the particular type and series of the ultrasonic equipment is available;

e) manufacturer's technical specification for the appropriate type and series of ultrasonic equipment which defines the performance criteria in accordance with this European Standard is available.

NOTE The manufacturer's technical specification does not in itself constitute the certificate of measured values required in b).

5 Manufacturer's technical specification for ultrasonic thickness measuring equipment

5.1 General

The manufacturer's technical specification for a particular model of ultrasonic thickness measuring equipment shall contain, as a minimum, the information listed in 5.2 to 5.5. Values obtained from the tests described in Clause 7 shall be quoted as nominal values with tolerances given as indicated.

5.2 General attributes

The following shall be detailed:

a) size;

b) weight (at an operational stage);

c) type(s) of power supply;

d) type(s) of probe sockets;

e) battery operational time (as new, at maximum power consumption with a specified duty cycle);

f) temperature and voltage (mains and/or battery) ranges, in which operation complies with the technical specification. If a warm-up period is necessary, the duration of this shall be stated;

g) form of indication given when a low battery voltage takes the ultrasonic instrument performance outside of specification;

h) pulse repetition frequencies (PRFs) (switched positions and/or variable ranges);

i) if available, monitor outputs to indicate when the measurement values fall outside a set tolerance;

j) if equipment can measure through coatings;

k) minimum measurable and maximum measurable thicknesses on a defined material;

NOTE A minimum measurable thickness of zero cannot be verified and therefore not specified.

l) accuracy and resolution shall be stated in mm.

5.3 Display

The following shall be detailed:

a) type of display (alphanumeric or graphical and also whether LED, LCD or CRT);

b) dimension of alphanumeric display;

c) dimension of graphical display.

5.4 Transmitter

The following shall be detailed:

a) shape of transmitter pulse;

b) at each pulse energy setting with the output connected to a suitable specified probe or a defined artificial load:

   1) transmitter pulse voltage (peak-to-peak);

   2) pulse rise time;

   3) pulse duration (for square wave, the range over which the pulse duration can be set).

5.5 Receiver

The following shall be detailed:

a) characteristics of gain control if user selected;

b) frequency range of operation.

5.6 Other information

In addition to the information given in 5.2 to 5.5, details should be supplied on the principles of:

a) data output and storage facilities (memory capacity);

b) calibration setting storage;

c) calibration mechanisms;

d) display and recall facilities;

e) display response time;

f) number of pixels to display the waveform;

g) printer output.

Where applicable, these details should also include sampling rates used, effect of pulse repetition frequency or display range on the sampling rate and response time.

In addition, the principles of any algorithm used to process data for display should be described.

6 Calibration blocks

6.1 General

In order to verify the ultrasonic thickness measuring equipment, it is necessary to take measurements on defined calibration blocks. These blocks are specified in 6.2 and 6.3.

6.2 Material

Blocks shall be manufactured from steel grade S355J0 specified in EN 10025-2.

Blocks shall be rough-machined before heat treatment which shall consist of:

— austenitizing at 920 °C for 30 min;

— rapid cooling (quenching) in water;

— tempering by heating to 650 °C for 3 h; and then

— cooling in still air.

The velocity for longitudinal waves in the calibration block material shall be (5 920 ± 30) m/s.

The surfaces used for measurement shall be machined to an Ra value not greater than 0,8 µm.

Prior to final machining, the block shall be proved free from internal discontinuities.

It is permissible to chromium plate or electroless nickel plate the surfaces of the block to a maximum of 0,5 % of the block thickness.

If chromium plating is used, care should be taken to use a thickness of plating that will avoid separation.

6.3 Shape and size

6.3.1 Accuracy blocks

These calibration blocks shall be cylinders with diameter D and length L as shown in Table 1.

Table 1 — Size of calibration blocks

Block	Diameter D	Length L
A	≥ 0,5 L	Minimum specified thickness (L_A)
B	≥ 0,5 L	L_A + 0,25 ($L_E - L_A$)
C	≥ 0,5 L	L_A + 0,50 ($L_E - L_A$)
D	≥ 0,5 L	L_A + 0,75 ($L_E - L_A$)
E	≥ 0,5 L	Maximum specified thickness (L_E)

If $L_A < 0{,}1\ L_E$ the subtraction of L_A may be omitted.

D shall not be smaller than 3 times the probe face diagonal dimension.

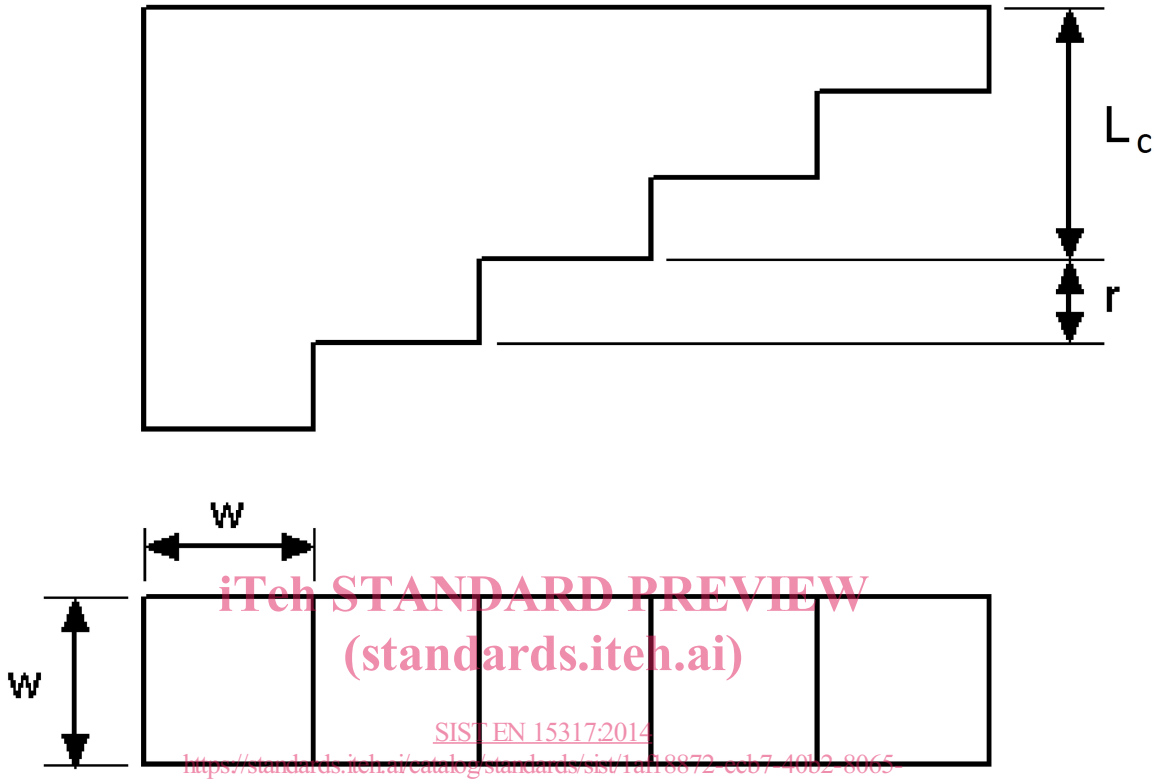
The values 0,25, 0,5 and 0,75 may be varied by up to 10 % of the value in question.

The tolerances of overall height of the block shall be ≤ 3 ($10^{-4}\ L$) across the measurement faces.

The fixed dimension for L shall be measured at the centre of the block to an accuracy of $10^{-4}\ L$.

The blocks shall be permanently, circumferentially marked with the actual length L, e.g. L = 50,333 mm, and a unique identity (serial number).

6.3.2 Resolution block (see Figure 1)



Key

w step width

r step height

L_C length of block C (see Table 1)

Figure 1 — Resolution block

Where w shall be ≥ 3 times the diagonal dimension of the probe face and r shall be ≤ to the specified resolution.

The block shall provide a minimum of five steps.

7 Performance requirements for ultrasonic thickness measuring equipment

To comply with this standard, ultrasonic thickness measuring equipment shall be verified using the tests described below and shown in Table 2.

a) **Group 1**: Tests to be performed by the manufacturer (or the manufacturer's agent) on a representative sample of the ultrasonic thickness measuring equipment produced. These tests allow the manufacturer to verify and support the technical specification for the equipment.

b) **Group 2**: Tests to be performed on all ultrasonic thickness measuring equipment: