



**SLOVENSKI STANDARD**  
**SIST EN 15317:2007**

**01-september-2007**

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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

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**ICS:**

19.100          Neporušitveno preskušanje          Non-destructive testing

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ICS 19.100

English Version

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

Essais non destructifs - Contrôle ultrasonore -  
Caractérisation et vérification de l'appareillage de contrôle  
par ultrasons pour le mesurage de l'épaisseur

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

This European Standard was approved by CEN on 13 January 2007.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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

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## Contents

Page

Foreword.....	4
1 Scope .....	5
2 Normative references .....	5
3 Terms and definitions .....	5
4 General requirements for compliance.....	5
5 Manufacturer's technical specification for ultrasonic thickness measuring equipment.....	6
5.1 General.....	6
5.2 General attributes .....	6
5.3 Display .....	6
5.4 Transmitter .....	7
5.5 Receiver .....	7
5.6 Other information.....	7
6 Calibration blocks.....	7
6.1 General.....	7
6.2 Material .....	7
6.3 Shape and size .....	8
7 Performance requirements for ultrasonic thickness measuring equipment .....	9
8 Probes.....	10
9 Group 1 tests.....	11
9.1 General.....	11
9.2 Equipment required for Group 1 tests.....	11
9.3 Stability against temperature .....	11
9.4 Low battery warning.....	11
9.5 Battery operational time.....	12
9.6 Operational voltage range .....	12
9.7 Operational current range.....	12
9.8 Operational temperature range .....	13
9.9 Pulse repetition frequency, PRF .....	13
9.10 Transmitter pulse shape, rise-time and peak voltage.....	13
9.11 Receiver frequency range of operation.....	15
9.12 Minimum and maximum measurable thicknesses .....	15
9.13 Accuracy and resolution.....	15
9.14 Range of velocity setting (calibration) .....	15
9.15 Calibration mechanisms .....	15
9.16 Calibration setting storage .....	16

9.17	Data storage .....	16
9.18	Printing .....	16
9.19	Display and recall .....	17
9.20	Display response time .....	17
10	Group 2 tests .....	17
10.1	General .....	17
10.2	Equipment required for Group 2 tests .....	17
10.3	General characteristics .....	18
10.4	General mechanical state and external aspects .....	18
11	Group 3 tests .....	18
11.1	General .....	18
11.2	General mechanical state and external aspects .....	18
11.3	Calibration mechanisms .....	18
11.4	Calibration setting storage .....	18
11.5	Data storage .....	19

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## Foreword

This document (EN 15317:2007) 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 August 2007, and conflicting national standards shall be withdrawn at the latest by August 2007.

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

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## 1 Scope

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

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

This document may be used for verifying equipment covered by EN 12668 parts 1 through 3 when used for thickness measurement.

## 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 1330-4:2000, *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 12668-2, *Non-destructive testing – Characterization and verification of ultrasonic examination equipment – Part 2: Probes*.

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## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1330-4:2000 apply.

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## 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 standard;
- b) either a declaration of conformity, issued by an organisation certified in accordance with EN ISO 9001; or a certificate issued by an organisation 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 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; [SIST EN 15317:2007](https://standards.iteh.ai/catalog/standards/sist/1ab35ccb-e769-4dc0-8175-41e27b33a28/sist-en-15317-2007)
- 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 S355JO 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 air.

The velocity for longitudinal waves in the calibration block material shall be  $(5\,920 \pm 30) \text{ ms}^{-1}$ .

The surfaces used for measurement shall be machined to an  $R_a$  value not greater than 0,8  $\mu\text{m}$ .

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.

NOTE 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,  $L$ , and as shown in Table 1.

**Table 1 – Size of calibration blocks**

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

where

$L_A$  is the height of block A; and

$L_E$  is the height of block E.

NOTE If  $L_A < 0,1 L_E$  the subtraction of  $L_A$  may be omitted.

$D$  shall not be  $< 3$  x the probe face diagonal dimension.

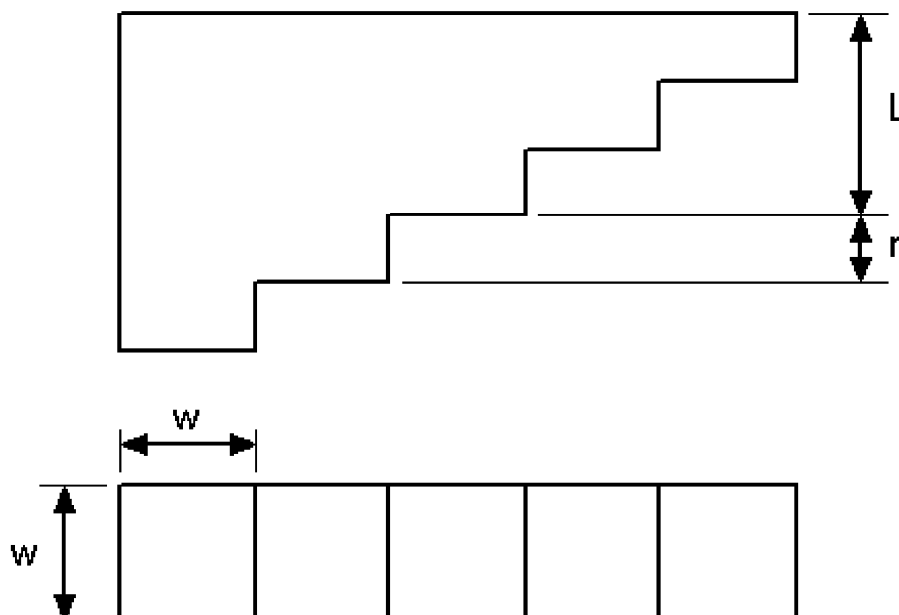
The values 0,25, 0,5 and 0,75 may be varied by up to 10 % of the value in question.

The overall height of the block shall be  $\leq 3 (10^{-4} L)$  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.  $L = 50,333 \text{ mm}$ , and a unique identity (serial number).

### 6.3.2 Resolution block (see Figure 1)



#### Key

- $w$  step width  
 $r$  step height  
 $L$  length of block C (see Table 1)

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**Figure 1 – Resolution block**

Where  $w$  shall be  $\geq 3x$ , the diagonal dimension of the probe face and  $r$  shall be  $\leq$  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.

**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.

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

- 1) by the manufacturer, or the manufacturer's agent prior to the supply of the equipment (pre-commissioning test);
- 2) by the manufacturer, the owner, or a laboratory at annual intervals to verify the performance of the equipment during its lifetime;
- 3) following any equipment repairs.

**Group 3:** Tests to be completed by the operator on site prior to and at the completion of any series of measurements.