SLOVENSKI STANDARD

SIST EN 583-2

prva izdaja
oktober 2001

Neporušitveno preskušanje - Ultrazvočne preiskave - 2. del: Nastavitev občutljivosti in območja (prevzet standard EN 583-2:2001 z metodo platnice)

Non destructive testing - Ultrasonic examination - Part 2: Sensitivity and range setting

Essais non destructifs - Contrôle ultrasonore - Partie 2: Réglage de la sensibilité et de la base de temps

Zerstörungsfreie Prüfung - Ultraschallprüfung - Teil 2: Empfindlichkeits- und Entfernungsjustierung

Deskriptorji: neporušitveno preskušanje, ultrazvočne preiskave, oprema, nastavitev

ICS 19.100

Referenčna številka
SIST EN 583-2:2001 ((sl),en)

Nadaljevanje na straneh od II do III in od 1 do 44

NACIONALNI UVOD

Standard SIST EN 583-2 ((sl),en), Neporušitveno preskušanje - Ultrazvočne preiskave - 2. del: Nastavitev občutljivosti in območja, prva izdaja, 2001, ima status slovenskega standarda in je z metodo platnice prevzet evropski standard EN 583-2 (en), Non-destructive testing - Ultrasonic examination - Part 2: Sensitivity and range setting, 2001-01.

NACIONALNI PREDGOVOR

Evropski standard EN 583-2:2001 je pripravil tehnični odbor Evropske organizacije za standardizacijo CEN/TC 138 Neporušitvene preiskave.

Odločitev za prevzem tega standarda po metodi platnice je dne 2001-05-10 sprejel tehnični odbor USM/TC PKG Preskušanje kovinskih gradiv.

ZVEZE S STANDARDI

S prevzemom tega evropskega standarda veljajo za omejeni namen referenčnih standardov vsi standardi, navedeni v izvirniku, razen tistih, ki smo jih že sprejeli v nacionalno standardizacijo:

SIST EN 12223:2000 (en)	Neporušitveno preskušanje - Ultrazvočne preiskave - Specifikacije za umeritveni vzorec št. 1 *Non-destructive testing - Ultrasonic examination - Specification for calibration block No. 1*
SIST EN 27963:1996 (en)	Zvari v jeklu - Kalibracijski blok št. 2 za ultrazvočno preiskavo zvarov *Welds in steel - Calibration block No. 2 for ultrasonic examination of welds (ISO 7963:1985)*
SIST EN 12668-3:2001 (en)	Neporušitveno preskušanje - Določanje lastnosti in preverjanje naprav za ultrazvočne preiskave - 3. del: Sestavljeni sistemi *Non-destructive testing - Characterization and verification of ultrasonic examination equipment - Part 3: Combined equipment*

OPOMBI

- Povsod, kjer se v besedilu standarda uporablja izraz “evropski standard”, v SIST EN 583-2:2001 to pomeni “slovenski standard”.

- Nacionalni uvod in nacionalni predgovor nista sestavni del standarda.

VSEBINA **Stran**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 583-2

January 2001

ICS 19.100

English version

Non-destructive testing - Ultrasonic examination - Part 2: Sensitivity and range setting

Essais non destructifs - Contrôle ultrasonore - Partie 2: Réglage de la sensibilité et de la base de temps

Zerstörungsfreie Prüfung - Ultraschallprüfung - Teil 2: Empfindlichkeits- und Entfernungsjustierung

This European Standard was approved by CEN on 5 January 2001.

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 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

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Ref. No. EN 583-2:2001 E

CONTENTS

Foreword

This European Standard 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 July 2001, and conflicting national standards shall be withdrawn at the latest by July 2001.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association . This European Standard is considered to be a supporting standard to those application and product standards which in themselves support an essential safety requirement of a New Approach Directive and which make reference to this European Standard.

This standard consists of the following parts:

EN 583-1, Non-destructive testing - Ultrasonic examination - Part 1: General principles

EN 583-2, Non-destructive testing - Ultrasonic examination - Part 2: Sensitivity and range setting.

EN 583-3, Non-destructive testing - Ultrasonic examination - Part 3: Transmission technique

EN 583-4, Non-destructive testing - Ultrasonic examination - Part 4: Examination for discontinuities perpendicular to the surface

EN 583-5, Non-destructive testing - Ultrasonic examination - Part 5: Characterisation and sizing of discontinuities

ENV 583-6, Non-destructive testing - Ultrasonic examination - Part 6: Time-Of-Flight Diffraction Technique as a method for detection and sizing of discontinuities.

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 part of the standard specifies the general rules for setting the timebase range and sensitivity (i. e. gain adjustment) of a manually operated ultrasonic flaw detector with A-scan display in order that reproducible measurements may be made of the location and echo height of a reflector.

It is applicable to techniques employing a single contact probe with either a single or twin transducers, but excludes immersion technique and techniques employing more than one probe.

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 (including amendments).

EN 12223	Non-destructive testing - Ultrasonic examination - Specification for calibration block No. 1
EN 27963	Welds in steel - Calibration block No. 2 for ultrasonic examination of welds. (ISO 7963:1985)
EN 12668-3	Non-destructive testing - Characterization and verification of ultrasonic examination equipment - Part 3: Combined equipment

3 General

3.1 Quantities and symbols

A full list of the quantities and symbols used throughout this part of the standard is given in annex A.

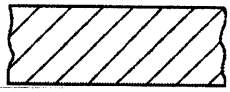
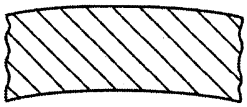
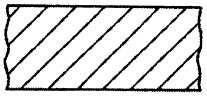
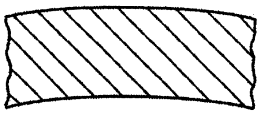
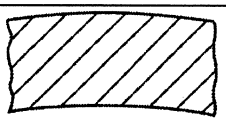
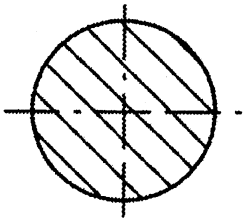
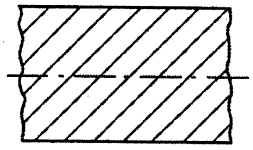
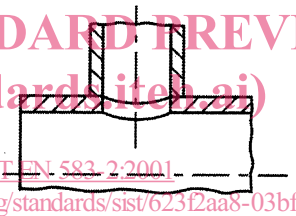
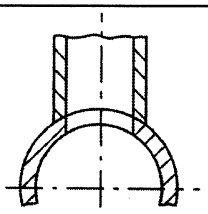
3.2 Test objects, reference blocks and reference reflectors

Requirements for geometrical features of test object, reference blocks and reference reflectors in general are contained in annex B.

3.3 Categories of test objects

The requirements for range and sensitivity setting will depend on the geometrical form of the test object. Five categories of test objects are defined in Table 1.

Table 1 - Categories of test objects

Class	Feature	Section in x-direction	section in *y*-direction
1	Plane parallel surfaces (e.g. plate/sheet)		
2	Parallel, uniaxially curved surfaces (e.g. tubes)		
3	Parallel surfaces curved in more than one direction (e.g. dished ends)		
4	Solid material of circular cross section (e.g. rods and bars)		
5	Complex shapes (e.g. nozzles, sockets)		

3.4 Contouring of probes

Contouring of the probe shoe, for geometry categories 2 to 5, may be necessary to avoid probe rocking, i.e. to ensure good, uniform, acoustic contact and a constant beam angle in the test object. Contouring is only possible with probes having a hard plastic stand-off (normally twin-transducer straight beam probes or angle beam probes with wedges).

The following conditions for the different geometric categories exist (see Table 1 and Figure 1):

- category 1: No probe contouring necessary for scanning in either X- or Y-direction;

- categories 2 and 4: scanning in X-direction: Probe face longitudinally curved, scanning in Y-direction: Probe face transversely curved;

- categories 3 and 5: scanning in either X or Y-direction: Probe face longitudinally and transversely curved.

The use of contoured probes necessitates setting the range and sensitivity on reference blocks contoured similar to the test object, or the application of mathematical correction factors.

When using equations (1) or (2), problems due to low energy transmission or beam misalignment are avoided.

3.4.1 Longitudinally curved probes

3.4.1.1 Convex scanning surface

For scanning on convex surfaces the probe face shall be contoured when the diameter of the test object, D_{obj}, is below ten times the length of the probe shoe, l_{ps}, (see Figure 1):

$$D_{obj} < 10 l_{ps} \quad (1)$$

3.4.1.2 Concave scanning surface

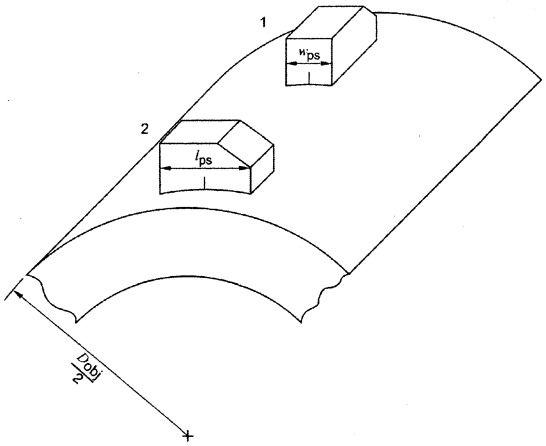
On a concave scanning surface the probe face shall always be contoured, unless adequate coupling can be achieved due to very large radii of curvature.

3.4.2 Transversely curved probes

3.4.2.1 Convex scanning surface

For scanning on convex surfaces the probe face shall be contoured when the diameter of the test object, D_{obj}, is below ten times the width of the probe shoe, w_{ps}, (see Figure 1):

$$D_{obj} < 10 w_{ps} \quad (2)$$



Key
1 Transversely curved
2 Longitudinally curved

Figure 1 - Length, l_{ps}, and width, w_{ps}, of probe shoe in direction of curvature of the test object

3.4.2.2 Concave scanning surface

On a concave scanning surface the probe face shall always be contoured, unless adequate coupling can be achieved due to very large radii of curvature.

3.4.3 Longitudinally and transversely curved probes

The probe face shall fulfil the requirements of 3.4.1 and 3.4.2.

4 Determination of probe index and beam angle

4.1 General

For straight beam probes there is no requirement to measure probe index and beam angle as it is assumed that the probe index is in the centre of the probe face and the angle of refraction is zero degrees.

When using angle probes, these parameters shall be measured in order that the position of a reflector in the test object can be determined in relation to the probe position. The techniques and reference blocks employed depend on the contouring of the probe face.

Measured beam angles depend on the sound velocity of the reference block used. If the block is not made of non-alloy steel its velocity shall be determined and recorded.

4.2 Flat probes

4.2.1 Calibration block technique

Probe index and beam angle shall be determined using Calibration Block No. 1 or Calibration Block No. 2 according to the specifications given in EN 12223 or EN 27963 respectively, depending on the size of the probe.

4.2.2 Reference block technique

An alternative technique using a reference block containing at least 3 side-drilled holes as given in EN 12668-3 may be used.

4.3 Probes curved longitudinally

4.3.1 Mechanical determination

Before contouring the probe face, the probe index and beam angle shall be measured as described in 4.2.1.

The incident angle at the probe face (α_d) shall be calculated from the measured beam angle (α) and a line, originating from the probe index and parallel to the incident beam, shall be marked on the side of the probe, as shown in Figure 2.

The incident angle is given by equation 3:

$$\alpha_d = \arcsin\left(\frac{c_d}{c_t}\sin\alpha\right) \qquad (3)$$

where:

c_d is the longitudinal wave velocity in the probe wedge (normally 2730 m/s for acrylic glass)

c_t is the transverse wave velocity in the test object (3255 m/s ± 15 m/s for non-alloy steel).

After contouring, the probe index will have moved along the marked line, and its new position can be measured by mechanical means directly on the probe housing, as shown in Figure 2.

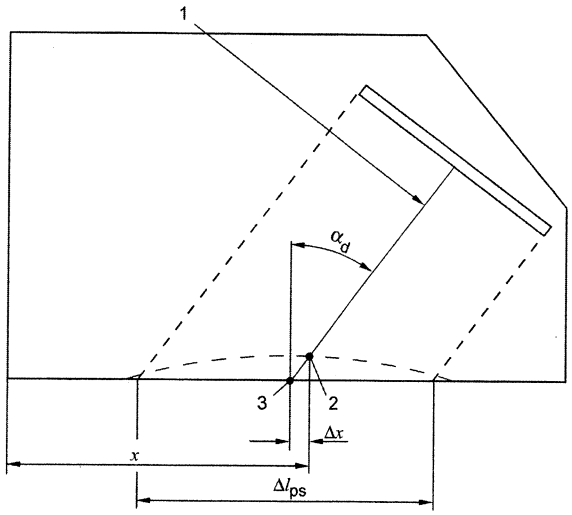
The beam angle shall be determined by maximising the echo from a side-drilled hole satisfying the conditions given in annex B. The beam angle may then be measured directly on the test object, on the reference block, or on a scale drawing. See Figure 3.

Alternatively, the beam angle may be determined by calculation on the basis of the sound path length measured on the reference block by mechanical means, using equation (4). This may be accomplished together with the range setting as described in 5.4.4.

$$\alpha = \arccos\left\{\frac{\left[(D_{SDH}/2)^2 + s^2 - t^2 + sD_{SDH} + tD_{Obj}\right]}{D_{Obj}\left[s + (D_{SDH}/2)\right]}\right\} \qquad (4)$$

The symbols used in this equation are illustrated in Figure 3.

The radius of curvature of the surface used for the calibration, shall be within ± 10 % of that of the test object.



Key

1 Marked line for index shift
2 Index point after contouring
3 Index point before contouring

Figure 2 - Determination of index shift for longitudinally curved probes

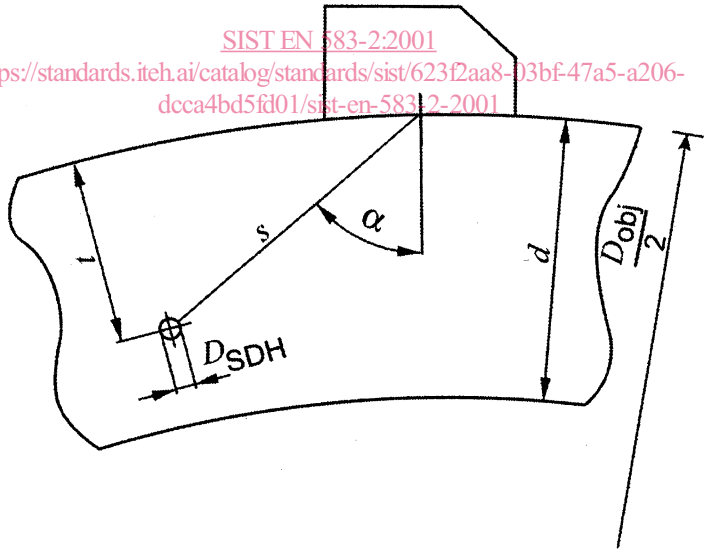


Figure 3 - Determination of beam angle α for a longitudinally contoured probe faces

4.3.2 Reference Block Technique

This is similar to that referenced in 4.2.2, except that the test block shall have a radius of curvature within ± 10% of that of the test object.