SLOVENSKI STANDARD
SIST EN 12668-3:2014

01-julij-2014

Nadomešča:
SIST EN 12668-3:2001
SIST EN 12668-3:2001/A1:2004

Neporušitvene preiskave - Karakterizacija in preverjanje naprav za ultrazvočne preiskave - 3. del: Sestavljeni sistemi

Non-destructive testing - Characterization and verification of ultrasonic examination equipment - Part 3: Combined equipment

Zerstörungsfreie Prüfung - Charakterisierung und Verfizierung der Ultraschall-Prüfausrüstung - Teil 3: Komplette Prüfausrüstung

Essais non destructifs - Caractérisation et vérification de l'appareillage de contrôle par ultrasons - Partie 3: Equipement complet

Ta slovenski standard je istoveten z: **EN 12668-3:2013**

ICS:

19.100	Neporušitveno preskušanje	Non-destructive testing

SIST EN 12668-3:2014 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12668-3

November 2013

ICS 19.100

Supersedes EN 12668-3:2000

English Version

Non-destructive testing - Characterization and verification of ultrasonic examination equipment - Part 3: Combined equipment

Essais non destructifs - Caractérisation et vérification de l'appareillage de contrôle par ultrasons - Partie 3: Equipement complet

Zerstörungsfreie Prüfung - Charakterisierung und Verfizierung der Ultraschall-Prüfausrüstung - Teil 3: Komplette Prüfausrüstung

This European Standard was approved by CEN on 29 September 2013.

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-CENELEC 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-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

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

Contents

Page

Foreword

This document (EN 12668-3:2013) 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12668-3:2000.

This European Standard is composed of the following parts:

— 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 12668-3, *Non-destructive testing — Characterization and verification of ultrasonic examination equipment — Part 3: Combined equipment* (this document).

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, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard describes methods and acceptance criteria for verifying the performance of ultrasonic equipment (i.e. instrument and probe combined as defined in EN 12668-1 and EN 12668-2) by the use of appropriate standard calibration blocks. These methods are not intended to prove the suitability of the equipment for particular applications. The methods described are suitable for the use by operators working under site or shop floor conditions. The methods only apply to pulse echo equipment using A-scan presentation, with gain controls or attenuators calibrated in steps not greater than 2 dB and used essentially in contact testing. These methods are specifically intended for manual testing equipment. For automated testing different tests can be needed to ensure satisfactory performance.

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 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 ISO 2400, *Non-destructive testing - Ultrasonic testing - Specification for calibration block No. 1 (ISO 2400)*

EN ISO 7963, *Non-destructive testing - Ultrasonic testing - Specification for calibration block No. 2 (ISO 7963)*

3 Description of tests and reporting

3.1 General

The methods described in this European Standard, together with the frequency of checking, are summarized in Table 1.

Compliance with the checks shall be recorded on the ultrasonic test report.

Table 1 — Tests for combined equipment

Subclause	Title	Frequency of checking
3.2.1	Linearity of timebase	Weekly [a]
3.2.2	Linearity of equipment gain	Weekly [a]
3.3.1	Probe index	Daily
3.3.2	Beam angle	Daily
3.4.2	Physical state and external aspects	Daily
3.4.3	Sensitivity and signal-to-noise ratio	Weekly [a]
3.4.4	Pulse duration	Weekly [a]

[a] To simplify the recording of weekly checks it may be more convenient for the user to perform them each time the equipment is used.

3.2 Ultrasonic instrument checks

3.2.1 Linearity of the timebase

3.2.1.1 General

This check is carried out using a standard calibration block defined in EN ISO 2400 or EN ISO 7963, and a normal-beam compression wave probe or shear wave angle-beam probe. The linearity shall be checked over a range at least equal to that which is to be used in subsequent testing. Where appropriate, due allowance can be made for the fact that a range of 91 mm for compressional waves in steel is equivalent to a range of only 50 mm for shear waves.

3.2.1.2 Procedure

Place the probe on the calibration block in a position where the range to the last backwall or radius echo is equal to or exceeds the range over which the linearity shall be checked. Adjust the timebase so that the first and the sixth backwall echoes coincide with the first and last scale marks respectively. Check the linearity with the four other echoes.

Bring the backwall echoes, in turn, to approximately the same height e.g. 80 % full screen height. The leading edge of each echo should line up with the appropriate graticule line. Check that any deviations from the ideal positions are within the specified tolerance when measured at the same screen height when the first and the sixth echo were positioned.

3.2.1.3 Tolerance

The deviation from linearity shall not exceed ± 2 % of full screen width.

3.2.1.4 Frequency of checking

The check shall be carried out at least once per week for ultrasonic instruments to be used during that week.

3.2.2 Linearity of equipment gain

3.2.2.1 General

This check monitors the combined result of two characteristics that affect the linearity of the equipment gain, i.e. the linearity of amplifier and the accuracy of the calibrated gain control. Any standard calibration block can be used for this test, preferably in conjunction with the probe that will be used in subsequent testing.

The linearity shall be checked with the ultrasonic instrument controls (frequency, range, pulse energy, etc.) switched to positions to be employed in subsequent testing. Variable suppression and swept gain controls shall be switched to “off”.

3.2.2.2 Procedure

Position the probe on a calibration block to obtain a reflected signal from a small reflector e.g. the 5 mm hole in the EN ISO 7963 block.

Adjust the gain to set this signal to 80 % of full screen height and note the value of the calibrated gain control (dB). Then increase the gain by 2 dB and confirm that the signal rises to more than full screen height (101 %). Restore the gain to its original value and then reduce it by a further 6 dB. Confirm that the signal amplitude falls to approximately 40 % screen height. Successively reduce the signal by three further increments of 6 dB and confirm that the signal amplitude falls respectively to 20 %, 10 % and 5 % screen height.

3.2.2.3 Tolerance

To be acceptable, signal amplitude shall be within the limits given in the following Table 2.

Table 2 — Acceptance limits for gain linearity

Gain dB	Expected screen height (%)	Limits
+2	101	not less than 95 %
0	80	(reference line)
−6	40	37 % to 43 %
−12	20	17 % to 23 %
−18	10	8 % to 12 %
−24	5	visible, below 8 %

3.2.2.4 Logarithmic amplifiers

If the ultrasonic instrument is using a logarithmic amplifier, subclauses 3.2.2.1 to 3.2.2.3 shall be replaced by an overall input/output amplitude accuracy test of the instrument according to manufacturer’s specification. The test shall verify that errors do not exceed ± 1 dB in any 20 dB span and ± 2 dB in any 60 dB span.

3.2.2.5 Frequency of checking

The check shall be carried at least once per week for ultrasonic instruments to be used during that week.

3.3 Probe checks

3.3.1 Probe index point

3.3.1.1 General

This check applies only to angle beam probes. The probe index point can be checked on the standard EN ISO 2400 or EN ISO 7963 calibration block each of which has a cylindrical reflector (quadrant).

The probe index point shall be checked prior to checking the beam angle.

3.3.1.2 Procedure

Position the probe on the appropriate side of the block to obtain a reflection from the quadrant. Move the probe backwards and forwards to maximize the amplitude of the reflected signal, taking care to move the probe parallel to the block sides.

When the amplitude is at maximum, the true probe index point will correspond to the engraved line on the block which marks the geometrical centre of the quadrant.

The probe index point measurement should be repeatable to within ± 1 mm. If the measured position differs from the existing mark by more than 1 mm the new position shall be marked on the probe sides, and recorded, and shall be used in subsequent probe checks and defect plotting.

3.3.1.3 Tolerance

Tolerance will depend on application, but for plotting of defects it is recommended that the probe index point position is known to within ± 1 mm.

3.3.1.4 Frequency of checking

This will depend on the rate of probe wear due to usage and to the roughness of the scanning surface. When a probe is in continuous use, the check shall be carried out at least every few hours; otherwise, a daily check shall be performed for probes to be used during that day.

3.3.2 Beam angle

3.3.2.1 General

The reference blocks defined in EN ISO 2400 or EN ISO 7963 provide a means of rapidly checking the beam angle. If a higher accuracy is needed, the angle shall be determined using one of the methods described in EN 12668-2.

3.3.2.2 Procedure

Place the probe on the calibration block and establish a signal from the selected hole. Move the probe backwards and forwards to maximize the signal from the hole. When the signal is at its maximum amplitude, the beam angle can be read from the engraved scale on the calibration block at a point directly below the measured probe index point. The deviation between measured and nominal angle shall be recorded.

3.3.2.3 Tolerance

Using the method previously described it is possible to measure the beam angle to an accuracy of approximately ± 1,5°. Unless the probe history is known, previously marked probe angles should not be regarded as accurate, especially on 70° or higher angle beam probes, or on worn probes. It is recommended