Oförstörande provning – Ultraljudprovning av stång av stål

Non destructive testing – Ultrasonic testing of steel bars

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This European Standard was approved by CEN on 30 September 2001.

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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.

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Foreword

This European Standard has been prepared by Technical Committee ECISS/TC 2 "Steel - Physico-chemical and 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of an identical text or by endorsement, at the latest by May 2002, and conflicting national standards shall be withdrawn at the latest by May 2002.

Annex A is informative.

This standard includes a Bibliography.

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 describes the techniques to be used for the manual, pulse-echo, ultrasonic testing of steel bars of diameter or equivalent thickness less or equal to 400 mm or equivalent section. Mechanised, semi-automatic or automatic techniques may be used but should be agreed between the purchaser and the supplier.

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 473, Non destructive testing - Qualification and certification of NDT personnel – General principles.

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

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

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

EN 12223, Non-destructive testing - Ultrasonic examination - Specification for calibration block n°1.

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.

3 Terms and definitions

Definitions for general terms of non-destructive testing can be found in other European Standards, e.g. EN 1330-1 and EN 1330-2. For the purposes of this European Standard, the following terms and definitions given in EN 1330-4 apply, together with the following.

3.1 manual testing
testing by an operator applying an ultrasonic probe, or probes, to the product surface, manually executing the appropriate scanning pattern on the product surface and assessing ultrasonic signal indications on the electronic equipment screen either by direct viewing or by built-in signal amplitude alarm devices

3.2 automatic and semi-automatic testing
testing using a mechanised means of applying the ultrasonic probe or probes to, and executing the appropriate scanning pattern on the flat product surface, together with ultrasonic signal indication evaluation by electronic means

NOTE Such testing can be either fully automatic with no operator involvement, or semi-automatic when the operator performs basic equipment operation functions.

A list of equivalent terms in several European languages in given in annex A.
4 Items for agreements

The following aspects concerning ultrasonic testing shall be agreed between the purchaser and supplier at the time of the enquiry or order:

a) the manufacturing stage(s) at which ultrasonic testing shall be performed (see clause 10);

b) the volume(s) to be tested and whether grid scanning coverage or complete scanning coverage is required (see clause 13);

c) the Quality Class required, or the Quality Classes and the zones to which they apply (see clause 15);

d) the applicable evaluation level and acceptance criteria if different from those detailed in Tables 2 and 3;

e) whether any special scanning coverage, equipment or couplant is required in addition to that detailed in clauses 8 and 13;

f) the scanning technique to be used if not manual;

g) the sizing techniques to be used for extended discontinuities (see clause 16);

h) the technique(s) to be used for setting sensitivity (see clause 12);

i) whether the test is to be conducted in the presence of the purchaser or his representative;

j) whether a written procedure shall be submitted for approval by the purchaser (see clause 6).

5 Principle

The method used is based on the reflection of ultrasonic waves (generally longitudinal), the direction of which is approximately perpendicular to the surface of the product. The examination consists of:

a) locating and evaluation of discontinuity by comparing the amplitude of the discontinuity echo with the amplitude of the echo of a flat-bottomed hole of a given diameter and located at the same depth as the discontinuity.

NOTE Only those discontinuities giving an echo in amplitude equal to or greater than that obtained with the reference flat-bottomed hole are taken into consideration.

b) determining the area of the discontinuity according to the – 6 dB beam width technique.

If areas with particular permeability are located, the testing conditions shall be adjusted in order to test these areas with the required sensitivity level.

The examination is carried out during the first ultrasonic scan (first back wall echo) for all the product thicknesses or diameter and from one side only.
6 Procedure

The inspection is normally carried out in the place of production or on the premises of the supplier. If specified on the order, the inspection may take place in the presence of the purchaser or his representative 1).

Ultrasonic testing shall be performed in accordance with a written procedure. Where specified in the enquiry or order, the written procedure shall be submitted to the purchaser for approval prior to testing.

This written procedure shall be in the form of:

a) a product specification or;
b) a procedure written specifically for the application or;
c) this European Standard may be used if it is accompanied by examination details specific to the application.

The procedure shall contain the following details as a minimum requirement:

a) description of the item to be examined;
b) reference documents;
c) qualification and certification of examination personnel;
d) stage of manufacture at which the examination is carried out;
e) examination zones specified in terms of the applicable Quality Classes;
f) any special preparation of scanning surfaces, if applicable;
g) couplant;
h) description of examination equipment;
i) calibration;
j) scanning plan;
k) description and sequence of examination operations;
l) recording level;
m) characterisation of discontinuities;
n) acceptance criteria;
o) examination report.

7 Personnel qualification

It is assumed that ultrasonic testing is performed by qualified and capable personnel. In order to prove this qualification, it is recommended to certify the personnel in accordance with EN 473 or equivalent.

1) In this case, all steps should be taken to ensure that the production process is not disturbed.