SLOVENSKI STANDARD

SIST EN 10246-14:2000

01-november-2000

Neporušitveno preskušanje jeklenih cevi - 14. del: Ugotavljanje laminarnih napak jeklenih cevi, nevarjenih in varjenih (razen obločno varjenih pod praškom), z avtomatsko ultrazvočno preiskavo

Non-destructive testing of steel tubes - Part 14: Automatic ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of laminar imperfections

Zerstörungsfreie Prüfung von Stahlrohren - Teil 14: Automatische Ultraschallprüfung nahtloser und geschweißter (ausgenommen unterpulvergeschweißter) Stahlrohre zum Nachweis von Dopplungen

Essais non destructifs des tubes en acier - Partie 14: Contrôle automatique par ultrasons des tubes pour la détection des dédoublures des tubes en acier sans soudure et soudés (sauf a l'arc immergé sous flux en poudre)

Ta slovenski standard je istoveten z: EN 10246-14:1999

ICS:

23.040.10	Železne in jeklene cevi	Iron and steel pipes
77.040.20	Neporušitveno preskušanje kovin	Non-destructive testing of metals

SIST EN 10246-14:2000 en

EUROPEAN STANDARD
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EN 10246-14

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ICS 23.040.10; 77.040.20

English version

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This European Standard was approved by CEN on 6 October 1999.

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 Central Secretariat 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 Central Secretariat 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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee ECISS/TC 29 "Steel tubes and fittings for steel tubes", the secretariat of which is held by UNI.

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 2000, and conflicting national standards shall be withdrawn at the latest by May 2000.

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.

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 EN 10246 specifies requirements for automatic ultrasonic testing of seamless and welded steel tubes, with the exception of submerged arc welded (SAW) tubes, for the detection of laminar imperfections. The standard specifies acceptance levels and calibration procedures.

> NOTE : An alternative test method for the detection of laminar imperfections in steel strip/plate prior to tube forming of welded tubes, is given in EN 10246-15.

This Part of EN 10246 is applicable to the inspection of tubes with an outside diameter greater than 30 mm. No lower limit of wall thickness is specified but see note in 4.1.

European Standard EN 10246 "Non-destructive testing of steel tubes" comprises the parts shown in Annex A.

2 Normative references

This Part of EN 10246 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 those publications apply to this Part of EN 10246 only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 10246-15 Non-destructive testing of steel tubes - Part 15: Automatic ultrasonic testing of strip/plate used in the manufacture of welded steel tubes for the detection of laminar imperfections.

3 General requirements

3.1 The ultrasonic inspection covered by this Part of EN 10246 is usually carried out on tubes after completion of all the primary production process operations.

3.2 The tubes to be tested shall be sufficiently straight and free from foreign matter as to ensure the validity of the test.

4 Method of test

4.1 The tubes shall be tested using an ultrasonic pulse echo technique for the detection of laminar imperfections. The ultrasound shall be transmitted in the direction normal to the tube surface.

> NOTE: For wall thicknesses less than 5 mm, where difficulties may occur in detecting and sizing laminar imperfections using this method of test, an alternative method of test may be agreed between manufacturer and purchaser

4.2 During testing, the tubes and the transducer assembly shall be moved relative to each other so that the tube surface is scanned in order to detect laminar imperfections with a size equal to or greater than the relevant minimum lamination size (B_{min}) with a circumferential dimension (C) calculated as given in table 1. The relative speed of movement during testing shall not vary by more than + 10%.

It is recognised that there may be a short length at both tube ends which cannot be tested. Any untested ends shall be dealt with in accordance with the requirements of the appropriate product standards.

Table 1: Acceptance level designation and minimum size of laminar imperfections to be detected

Acceptance level	Minimum individual lamination area to considered B_{min} [1] mm^2	Circumferential dimension C mm
UO	165	12 and above
U1	$165 + \pi D/4$ [2]	between 6 and 12
U2	$165 + \pi D/2$ [2]	between 9 and 15
U3	$165 + \pi D$ [2]	between 12 and 20

1) B_{min} shall, when calculating as the product of the length and circumferential dimensions, be rounded up to the next 10 mm^2.

2) D = Specified outside diameter of the tube in mm

4.3 The maximum width of each individual transducer, measured parallel to the major axis of the tube, shall be 30 mm. The ultrasonic test frequency shall be 2 to 10 MHz.

4.4 The equipment shall be capable of classifying tubes as either acceptable or suspect by means of an automatic trigger/alarm level combined with a marking and/or sorting system.

5 Reference standards

5.1 General

5.1.1 The reference standards defined in this Part of EN 10246 are convenient standards for calibration of non-destructive testing equipment. The dimensions of these standards should not be construed as the minimum size of imperfections detectable by such equipment.

5.1.2. The ultrasonic equipment shall be calibrated either electronically using a tubular test piece (see 6.1.a) or with a reference standard comprising a flat bottomed circular, square or rectangular recess (see figure 1) machined into the inner surface of a tubular test piece, with the exception that for acceptance level U0, only the flat bottomed circular recess shall be used (see 6.1.b).

The flat bottomed circular recess shall be used as the primary means of establishing the test sensitivity. When using one of the other types of reference standard, the test sensitivity shall be adjusted such that it is equivalent to that obtained when using the flat bottomed circular recess.

5.1.3 The test piece shall be of the same specified diameter, thickness and surface finish as the tube to be tested and shall have similar acoustic properties (e.g. velocity, attenuation coefficient).

5.2 Dimensions of reference standard

5.2.1 The dimensions of the rectangular recess reference standard (see figure 1) shall be as follows:

a) width, *w*: 6 mm $^{+10}_{0}$ %;

b) length, *l*: 6 mm min.

c) depth, *d*: *T/4 < d < T/2*, with a maximum of 10 mm.

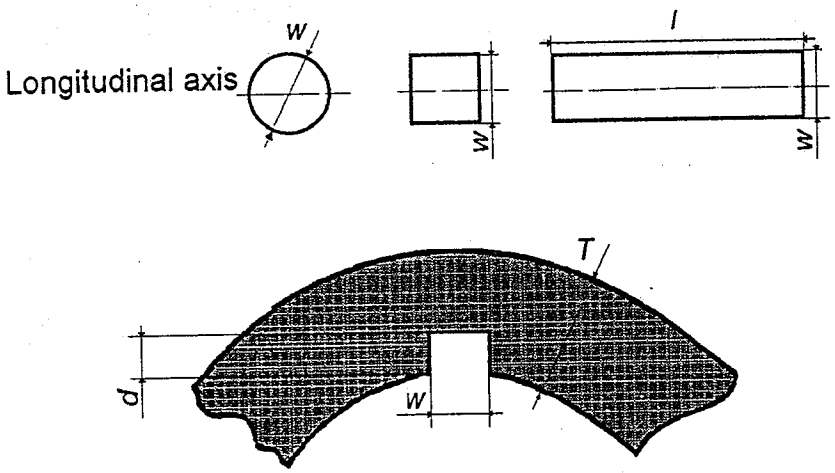
5.2.2 The dimensions of the circular and square recess reference standard shall be as follows (see figure 1):

a) width or diameter, *w*: 6 mm $^{+10}_{0}$ %;

b) depth, *d*: *T/4 < d < T/2*, with a maximum of 10 mm.

5.3 Verification of reference standard

The reference standard dimensions and shape shall be verified by a suitable technique.



l = length of rectangular recess — *w* = width or diameter of recess

d = depth of recess — *T* = specified wall thickness

Figure 1: Reference recess forms (reference standards)

6 Equipment calibration and checking

6.1 The equipment shall be calibrated statically either without reference standard in accordance with 6.1.a or using a reference standard in accordance with 6.1.b.

By agreement between the purchaser and manufacturer, the equipment may also be checked dynamically to prove that at the inspection pitch and pulse repetition frequency selected, the equipment will detect the relevant minimum lamination size B_{min} as given in table 1.

a) Calibration without reference standard

With the transducer assembly positioned on the test piece, the full amplitude of the first back wall echo minus 6 dB shall be used to set the trigger/alarm level of the equipment.

The test sensitivity may also be established with DAC[1] curves as supplied by the transducer manufacturer or with DAC curves as prepared by the tube manufacturer using, in both cases, the 6 mm flat bottom hole curve.

At the commencement of the production test run, the manufacturer shall demonstrate that at the set sensitivity, the equipment will detect under static conditions the reference standard as given in 5.1.2. If this is not the case, the necessary adjustment in sensitivity shall be made prior to the testing of production tubes.

b) Calibration using a reference standard

Under static conditions, with the transducer or each transducer of a transducer assembly centrally located over the reference standard, the full signal amplitude of the signal obtained from the reference standard shall be used to set the trigger/alarm level of the equipment.

6.2 During production testing, the relative rotational and/or translational speeds and pulse repetition frequency shall be chosen in order to detect the relevant minimum lamination size (B_{min}) with the circumferential dimension (C) as given in table 1 by producing a trigger/alarm condition.

6.3 The calibration of the equipment shall be checked at regular intervals during the production testing of tubes of the same specified diameter, thickness and grade.

The frequency of checking the calibration shall be at least every four hours but also whenever there is an equipment operator team changeover and at the start and end of production.

6.4 The equipment shall be recalibrated if any of the parameters which were used during the initial calibration are changed.

6.5 If on checking during production testing the calibration requirements are not satisfied, even after increasing the test sensitivity by 3 dB to allow for system drift, then all tubes tested since the previous check shall be retested after the equipment has been recalibrated.

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[1] DAC = distance amplitude correction