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Non-destructive testing of steel tubes - Part 16: Automatic ultrasonic testing of the area adjacent to the weld seam of welded steel tubes for the detection of laminar imperfections

Zerstörungsfreie Prüfung von Stahlrohren - Teil 16: Automatische Ultraschallprüfung des an die Schweißnaht angrenzenden Bereiches geschweißter Stahlrohre zum Nachweis von Dopplungen

Essais non destructifs sur des tubes en acier - Partie 16: Contrôle automatique par ultrasons pour la détection des dédoubleurs dans la zone soudée des tubes en acier soudés

**Ta slovenski standard je istoveten z: EN 10246-16:2000**

**ICS:**

23.040.10	Železne in jeklene cevi	Iron and steel pipes
25.160.40	Varjeni spoji in vari	Welded joints
77.040.20	Neporušitveno preskušanje kovin	Non-destructive testing of metals

**SIST EN 10246-16:2000****en**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

EN 10246-16

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English version

## Non-destructive testing of steel tubes – Part 16: Automatic ultrasonic testing of the area adjacent to the weld seam of welded steel tubes for the detection of laminar imperfections

Essais non destructifs sur des tubes en acier – Partie 16:  
Contrôle automatique par ultrasons pour la détection des  
dédoublures dans la zone soudée des tubes en acier  
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Automatische Ultraschallprüfung des an die Schweißnaht  
angrenzenden Bereiches geschweißter Stahlrohre zum  
Nachweis von Dopplungen

This European Standard was approved by CEN on 25 December 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 August 2000, and conflicting national standards shall be withdrawn at the latest by August 2000.

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.

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## 1 SCOPE

This part of EN 10246 specifies requirements for the ultrasonic testing of the area adjacent to the weld of welded steel tubes for the detection of laminar imperfections. The standard specifies acceptance levels and calibration procedures.

**NOTE:** This inspection may alternatively, in accordance with EN 10246-15, be carried out on longitudinal edges of strip/plate (used in the manufacture of welded tubes) in the flat form prior to seam welding. Electric welded tubes may alternatively be inspected in accordance with EN 10246-14 assuming that the scanning coverage used is sufficient to detect the minimum imperfection length given in table 1.

This part of EN 10246 is applicable to the inspection of welded 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 10246-10 Non-destructive testing of steel tubes - Part 10: Radiographic testing of the weld seam of automatic fusion arc welded steel tubes for the detection of imperfections

## 3 GENERAL REQUIREMENTS

**3.1** The ultrasonic inspection covered by this part of EN 10246 may be performed at any stage in the production process after seam welding.

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

## 4 METHOD OF TEST

**4.1** The area adjacent to the weld seam of the welded tube shall be tested using the 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 at least a 15 mm wide band on either side of the weld as close as possible to the parent metal/weld interface is 100 % ultrasonically inspected for the detection of laminar imperfections in order to detect the relevant minimum imperfection length  $L_{min}$  (parallel to the weld) as given in table 1.

It is recognized 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 laminar imperfection length ( $L_{\min}$ ) to be detected (trigger/alarm condition)**

Acceptance level	Minimum laminar imperfection length
	$L_{\min}$ mm
U1	10
U2	20
U3	30

**4.3** The maximum width of each individual transducer, measured at right angles to the direction of scanning, shall be 30 mm. The ultrasonic transducer test frequency shall be 2 to 10 MHz.

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**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.

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## 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 flat bottomed circular or rectangular recess (see 6.1.b)) machined into the inner surface or on the external surface of a tubular test piece. For the external surface, the reference standard may be blocked off by means of a piece of steel of corresponding dimension and fixed by welding.

The flat bottomed circular recess shall be used as the primary means of establishing the test sensitivity. When using the rectangular recess, 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 nominal 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 standards

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

- width,  $w$ : 6 mm,  $^{+10\%}_0$ ;
- length,  $l$ : 6 mm min;
- 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 standards (see figure 1) shall be as follows:

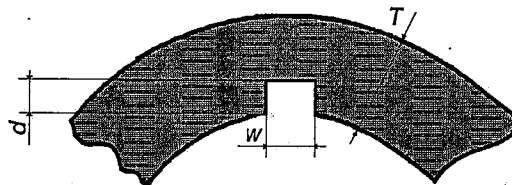
- width or diameter,  $w$ : 6 mm,  $^{+10\%}_0$ ;
- depth,  $d$ :  $T/4 < d < T/2$ , with a maximum of 10 mm.

## 5.3 Verification of reference standards

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

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$l$  = 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).

### 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 can also be established with DAC<sup>1)</sup> 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 circular recess reference standard as given in 5.1.2 and figure 1. 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 recess, 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 the production testing of the tubes, the relative translational speed and pulse repetition frequency shall be chosen in order to detect the minimum laminar imperfection length  $L_{\min}$  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 the production run.

6.4 The equipment shall be recalibrated if any of the test parameters which were used during 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.

## 7 ACCEPTANCE

7.1 Any tube producing signals lower than the trigger/alarm level shall be deemed to have passed this test.

7.2 Any tube producing signals equal to or greater than the trigger/alarm level shall be designated suspect or, at the manufacturer's option, may be retested.

<sup>1)</sup> DAC = Distance amplitude correction