SLOVENSKI STANDARD
SIST EN 10246-7:2005

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Nadomeġļa:
SIST EN 10246-7:1997

Neporuġitvene preiskave jeklenih cevi ï 7. del: Avtomatiļno odkrivanje vzdolġnih napak na obodu nevarjenih in varjenih (razen obloļno varjenih pod praġkom) jeklenih cevi z ultrazvokom

Non-destructive testing of steel tubes - Part 7: Automatic full peripheral ultrasonic testing of seamless and welded (except submerged arc welded) tubes for the detection of longitudinal imperfections

Zerstörungsfreie Prüfung von Stahlrohren - Teil 7: Automatische Ultraschallprüfung nahtloser und geschweißter (ausgenommen unterpulvergeschweißter) Stahlrohre über den gesamten Rohrumfang zum Nachweis von Längsfehlern

Essais non destructifs des tubes en acier - Partie 7 : Contrôle automatique par ultrasons sur toute la circonférence des tubes en acier sans soudure et soudés (sauf a l'arc immergé sous flux en poudre) pour la détection des imperfections longitudinales

Ta slovenski standard je istoveten z: **EN 10246-7:2005**

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 10246-7:2005 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 10246-7

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ICS 23.040.10; 77.040.20

Supersedes EN 10246-7:1996

English Version

Non-destructive testing of steel tubes - Part 7: Automatic full peripheral ultrasonic testing of seamless and welded (except submerged arc welded) tubes for the detection of longitudinal imperfections

Essais non destructifs des tubes en acier - Partie 7 : Contrôle automatique par ultrasons sur toute la circonférence des tubes en acier sans soudure et soudés (sauf à l'arc immergé sous flux en poudre) pour la détection des imperfections longitudinales

Zerstörungsfreie Prüfung von Stahlrohren - Teil 7: Automatische Ultraschallprüfung nahtloser und geschweißter (ausgenommen unterpulvergeschweißter) Stahlrohre über den gesamten Rohrumfang zum Nachweis von Längsfehlern

This European Standard was approved by CEN on 26 August 2005.

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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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COMITÉ EUROPÉEN DE NORMALISATION
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Contents

Foreword

This European Standard (EN 10246-7:2005) 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 April 2006, and conflicting national standards shall be withdrawn at the latest by April 2006.

This European Standard supersedes EN 10246-7:1996.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This part of EN 10246 specifies the requirements for automatic full peripheral ultrasonic shear wave (including phased array technique) and Lamb wave testing of seamless and welded steel tubes, with the exception of submerged arc-weld (SAW) tubes, for the detection of longitudinal imperfections. This European Standard specifies acceptance levels and calibration procedures.

This part of EN 10246 is applicable to the inspection of tubes with an outside diameter > 10 mm, and with an outside diameter-to-thickness ratio ≥ 5.

For tubes with an outside diameter-to-thickness ratio < 5, one of the options specified in Annex B shall be used by agreement between purchaser and manufacturer.

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

2 General requirements

2.1 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.

The inspection shall be carried out by suitably trained, qualified and competent personnel approved by the manufacturer.

2.2 The tubes to be tested shall be sufficiently straight to ensure the validity of the test. The surfaces shall be sufficiently free from foreign matter, which could interfere with the validity of the test.

3 Method of test

3.1 The tubes shall be tested using an ultrasonic shear wave or Lamb wave technique for the detection of predominantly longitudinal imperfections.

3.2 During testing, the tubes and the transducer assembly shall be moved relative to each other so that the whole of the tube length is scanned.

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 (see also Annex C).

The relative speed of movement during testing shall not vary by more than ± 10%.

3.3 During testing, the tubes shall be scanned in two opposing circumferential directions of beam travel, unless otherwise agreed between purchaser and manufacturer.

3.4 The ultrasonic test frequency to be applied shall be in the range of 1 MHz to 15 MHz for shear wave technique and in the range of 0,3 MHz to 1 MHz for Lamb waves, depending upon the thickness and surface finish of the tube to be tested.

3.5 The maximum width of each individual transducer, measured parallel to the major axis of the tube, shall be 25 mm for shear waves and 35 mm for Lamb waves.

For U1 and U2 category tubes with an outside diameter equal to or less than 50mm, the width of any one shear wave transducer is normally restricted to a maximum of 12,5 mm (see also 4.3).

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

3.7 Where manual ultrasonic testing of untested tube ends and/or local suspect areas is required, this shall be carried out in accordance with Annex C.

4 Reference standards

4.1 General

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

4.1.2 The ultrasonic equipment shall be calibrated using a longitudinal reference notch on the outside and inside surfaces of a reference tube.

However, the internal notch shall not be used when the tube internal diameter is less than 20 mm, unless otherwise agreed between purchaser and manufacturer.

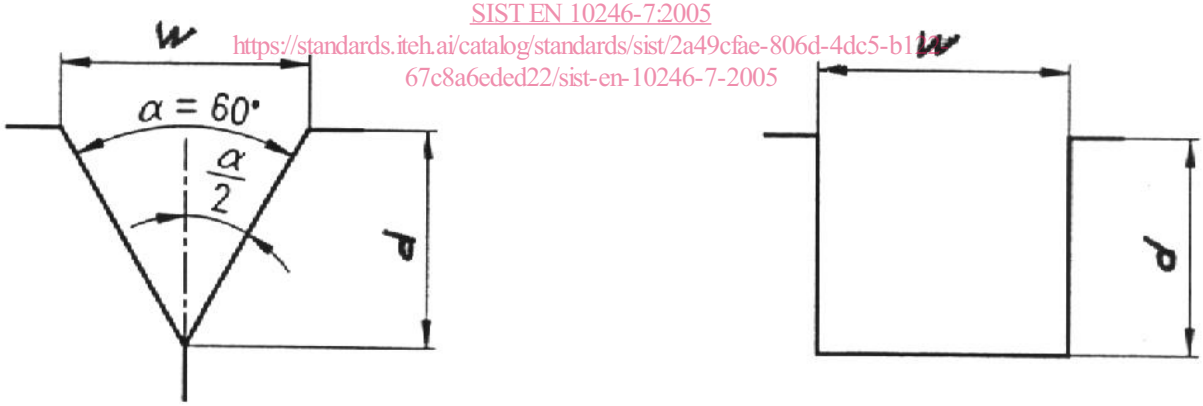
4.1.3 The reference tube shall have the same specified diameter, thickness, surface finish and heat treatment conditions as the tube to be tested, and shall have similar acoustic properties (for example velocity, attenuation coefficient).

4.1.4 In order to obtain clearly distinguishable signal indications, the notch(es) shall be sufficiently separated from the ends of the reference tube and, when both notches are used, from each other.

4.2 Types of reference notches

4.2.1 The reference notch or notches shall lie parallel to the major axis of the reference tube.

The reference notch or notches shall be of the "N" type except that the "V" type notch may be used at the discretion of the manufacturer when the specified notch depth is less than or equal to 0,5 mm (see figure 1). In the case of the "N" type notch, the sides shall be nominally parallel and the bottom shall be nominally square to the sides.



a) "V" type notch (only to be used when d ≤ 0,5 mm)

b) ”N” type notch

Key

w = width

d = depth

α = 60°

Figure 1 - Reference notch forms

4.2.2 The reference notch shall be formed by machining, spark erosion or other methods.

NOTE It is recognised that the bottom or the bottom corners of the notch may be rounded.

4.3 Dimensions of reference notches

4.3.1 Width, w (see figure 1)

The width of the reference notch shall not be greater than 1,0 mm.

4.3.2 Depth, d (see figure 1)

The depth of the reference notch shall be as given in table 1.

Table 1 — Acceptance level design and corresponding reference notch depth

Acceptance level	Notch depth in % of the specified thickness [a]
U1 [b]	3
U2 [c]	5
U3	10
U4	12,5
U5	15
U6	20

a The values of notch depth specified in this table are the same, for the corresponding categories, in all European Standards concerning non-destructive testing of steel tubes where reference is made to different acceptance levels. It should, however, be kept in mind that although the reference standards are identical, the various test methods involved can give different test results. Accordingly the acceptance level designation prefix U (ultrasonic) has been adopted to avoid any inferred direct equivalence with other test methods.

b Acceptance level U1 is not applicable to as-welded or hot stretch reduced welded tubes.

c For welded tubes, acceptance level U2 can be used as an alternative to or in combination with U3 by agreement between purchaser and manufacturer.

4.3.2.1 The minimum notch depth is related to the type of tube used for a particular application and is denoted by a sub-category as given in table 2, unless otherwise agreed between purchaser and manufacturer.

Table 2 — Minimum notch depth categories

Sub-category	Minimum notch depth in mm[a]	Typical tube condition
A [b]	0,1	Cold-finished or machined tubes
B [b]	0,2	
C	0,3	All other conditions
D	0,5	

a The minimum notch depth that can be used is related to specific tube manufacturing methods where the surface finish plays a dominant role in the minimum notch depth that can be adopted for ultrasonic equipment calibration in order to achieve an acceptable signal/noise ratio.

b Sub-categories A and B do not apply to as-welded or hot stretch reduced welded tubes.

4.3.2.2 The maximum depth of the notch for all acceptance levels and sub-categories shall be 1,5 mm, except for tubes with a wall thickness greater than 50 mm for which it can be increased to 3 mm unless otherwise agreed.

4.3.3 Tolerance on notch depth

The tolerance on depth shall be ± 15 % of reference notch depth or ± 0,05 mm. whichever is the larger, with the exception that when the notch depth is less than 0,2 mm, the tolerance on the depth shall be ± 0,03 mm.

4.3.4 Notch length

The length of the reference notch or notches shall be twice the width of the transducers but not more than 50 mm, with the following exception:

— U1 and U2 category tubes with an outside diameter less than or equal to 50 mm and where the width of any one transducer exceeds 12,5 mm, the length of the reference notch or notches shall not exceed 12,5 mm (at full depth).

4.4 Verification

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

5 Equipment calibration and checking

5.1 The equipment, independent of the applied type of waves, shall be calibrated to produce consistently (e.g., from three consecutive passes of the reference tube through the equipment), clearly identifiable signals from the reference notches (see 4.2). The full amplitude of these signals shall be used to set the trigger/alarm level(s) of the equipment.

Where a single trigger/alarm level is used, the transducers shall be adjusted so that the signals from the internal and external reference notches are equal, as far as possible, and the full signal amplitude of the lesser of the two signals shall be used to set the trigger/alarm level of the equipment. Where separate trigger/alarm levels are used for internal and external reference notches, the full signal amplitude from each notch shall be used to set the relevant trigger/alarm level of the equipment. The position and width of the gates shall be adjusted in such a way that the entire wall thickness of the tube is examined.

5.2 During calibration check, the relative speed of movement between the reference tube and the transducer assembly shall be the same as that to be used during the production test. Semi-dynamic calibration checking may be used. When requested, the manufacturer shall demonstrate that the semi-dynamic calibration check gives the same results as the dynamic calibration check.

5.3 The calibration of the equipment shall be checked at regular intervals during the production testing of tube of the same specified diameter, thickness and grade, by passing the reference tube through the inspection equipment.

The frequency of checking the calibration shall be at least every 4 hours, but also whenever, there is an equipment operator change-over and at the start and end of the production run.

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

5.5 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 equipment check shall be retested after the equipment has been recalibrated.

6 Acceptance

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

6.2 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 as specified above.