BRITISH STANDARD

BS EN
10246-13:2000

Non-destructive testing of steel tubes —

Part 13: Automatic full peripheral ultrasonic thickness testing for seamless and welded (except submerged arc welded) steel tubes

The European Standard EN 10246-13:2000 has the status of a British Standard

ICS 23.040.10; 77.040.20

National foreword

This British Standard is the official English language version of EN 10246-13:2000.

This British Standard contains elements of BS 3889-1, *Non-destructive testing of pipes and tubes — Part 1: Methods of ultrasonic testing for the detection of imperfections in wrought steel tubes*. A complete list of the parts of EN 10246 is given in annex A of this standard. When all relevant parts have been published BS 3889-1:1983 will be withdrawn.

The UK participation in its preparation was entrusted by Technical Committee ISE/73, Steel for pressure purposes, to Subcommittee ISE/73/1, Steel tubes for pressure purposes, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

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Summary of pages

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English version

Non-destructive testing of steel tubes – Part 13: Automatic full peripheral ultrasonic thickness testing for seamless and welded (except submerged arc welded) steel tubes

Essais non destructifs sur des tubes en acier – Partie 13: Contrôle automatique de l'épaisseur par ultrasons sur toute la circonférence des tubes sans soudure et soudés (sauf à l'arc immergé sous flux en poudre)

Zerstörungsfreie Prüfung von Stahlrohren – Teil 13: Automatische Ultraschall-Dickenprüfung nahtloser und geschweißter (ausgenommen unterpulvergeschweißter) Stahlrohre über den gesamten Rohrumfang

This European Standard was approved by CEN on 25 December 1999.

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

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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.

1 SCOPE

This part of EN 10246 specifies the requirements for the full peripheral ultrasonic testing of seamless and welded steel tubes, with the exception of submerged arc welded (SAW) tubes, for wall thickness measurement. The standard specifies acceptance levels and calibration procedures.

NOTE 1: Full peripheral testing does not necessarily mean that 100 % of the tube surface will be scanned.

NOTE 2: This inspection may be carried out simultaneously with full peripheral ultrasonic testing for the detection of laminar imperfections (see EN 10246-14) using the same ultrasonic transducers for both inspection requirements. Under these circumstances, the percentage of the tube surface to be scanned is determined by the minimum lamination size to be detected as required by EN 10246-14.

This part of EN 10246 is applicable to the thickness measurement of tubes with a specified outside diameter equal to or greater than 25,4 mm and a minimum wall thickness of 2,6 mm.

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 which affect the tube thickness.

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

3 METHOD OF TEST

3.1 The tube shall be tested using the ultrasonic single or multiple pulse echo technique, with piezo-electric or electromagnetic transducer. The ultrasound shall be transmitted in the direction normal to the tube surface, to determine that the tube thickness meets the specified requirements.

3.2 During testing, the tubes and the transducer assembly shall be moved relative to each other so that (with the exception provided in NOTE 2 of clause 1) the tube surface shall be scanned over equidistant non-coincident spiral paths, not exceeding 150 mm pitch, along the entire length of the tube.

NOTE: Other scanning routes may be used by agreement between the purchaser and manufacturer.

3.3 The maximum width of each individual transducer, measured parallel to the major axis of the tube, shall be 25 mm.

3.4 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.

4 REFERENCE STANDARDS

4.1 The ultrasonic equipment shall be calibrated using a test piece which shall have similar acoustic properties (e.g. velocity) as the tube to be tested. The test piece shall be either tubular or part tubular and shall have the same specified diameter as the tube to be tested or consist of a machined block or hollow bar of steel.

4.2 The test piece shall, at the manufacturer's option, be either:

a) of a known predetermined thickness; or

b) have a machined section at the specified lower or lower and upper thickness limit.

The thickness of the test piece used for calibrating the ultrasonic equipment shall have a tolerance of ±0,05 mm or ±0,2 %, whichever is the greater.

5 EQUIPMENT CALIBRATION AND CHECKING

5.1 The equipment shall be calibrated statically using the selected test piece so that it indicates the thickness of the test piece with an accuracy better than ±0,10 mm or ±2 % whichever is the greater so that a trigger/alarm condition is produced whenever the specified thickness limit(s) is(are) exceeded.

5.2 During the production testing of the tubes, the relative rotational and translational speeds shall be chosen so that the tube surface is scanned on an inspection pitch not exceeding 150 mm in accordance with 3.2.

5.3 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.

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 taking into account an additional accuracy tolerance given in 5.6, then all the tubes tested since the previous check shall be retested after the equipment has been recalibrated.

Retesting shall not be necessary even after a change in thickness calibration exceeding that given in 5.6 since the previous calibration provided that suitable recordings from individually identifiable tubes are available which permit accurate classification into suspect or acceptable categories.

5.6 To allow for system drift, an additional thickness accuracy tolerance of ±1 % or ±0,05 mm, whichever is the larger, in excess of that stated in 5.1 shall be taken into account during checking of the equipment calibration during production testing.

5.7 By agreement between the manufacturer and the purchaser, it shall be demonstrated that at the rotating speed and pulse repetition frequency used, the equipment is capable of detecting a non-conforming thickness.

6 ACCEPTANCE

6.1 Any tube producing signals not equal to or not exceeding the lower or upper trigger/alarm level shall be deemed to have passed this test.

6.2 Any tube producing signals equal to or exceeding the lower or upper trigger/alarm level shall be designated suspect or, at the manufacturer's option, may be retested.

6.3 If on retesting, no signal is obtained equal to or exceeding the lower or upper trigger/alarm level, the tube shall be deemed to have passed this test. Tubes giving signals equal to or exceeding the lower or upper trigger/alarm level shall be designated suspect.

6.4 For suspect tubes, one or more of the following actions shall be taken, subject to the requirements of the product standard:

a) If the manufacturer can prove to the satisfaction of the purchaser that the trigger/alarm condition arises from a combination of minor imperfections, e.g. inclusion clusters, not individually or in combination extensive enough to cause rejection, the tube shall be deemed to have passed the test.

b) When applicable, the suspect area of the tube exhibiting thickening in excess of the upper tolerance limit may be dressed by a suitable method. After checking that the remaining wall thickness is within the specified tolerances, the tube shall be deemed to have passed the test.

c) Suspect tubes having small local areas exceeding the specified tolerances shall only be classified as acceptable by agreement between the purchaser and the manufacturer.

d) The suspect area shall be cropped off. The manufacturer shall ensure that all the suspect area has been removed.

e) The tube shall be deemed not to have passed this test.

7 TEST REPORTING

When specified, the manufacturer shall submit to the purchaser a test report that includes at least the following information:

a) reference to this part of EN 10246;

b) date of test report;

c) statement of conformity;

d) product designation by grade and size;

e) type and details of inspection technique;

f) description of the reference standard.

ANNEX A
(informative)

Table A.1: Parts of EN 10246 - Non-destructive testing of steel tubes

Purpose of test	Title of part	Part No.	ISO ref.
Leak Tightness	Automatic electromagnetic testing of seamless and welded (except submerged arc-welded) ferromagnetic steel tubes for verification of hydraulic leak-tightness.	1	9302
	Automatic eddy current testing of seamless and welded (except submerged arc-welded) austenitic and austenitic-ferritic steel tubes for verification of hydraulic leak-tightness.	2	-
Longitudinal and/or Transverse Imperfections	Automatic eddy current testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of imperfections.	3	9304
	Automatic full peripheral magnetic transducer/flux leakage testing of seamless ferromagnetic steel tubes for the detection of transverse imperfections.	4	9598
	Automatic full peripheral magnetic transducer/flux leakage testing of seamless and welded (except submerged arc-welded) ferromagnetic steel tubes for the detection of longitudinal imperfections.	5	9402
	Automatic full peripheral ultrasonic testing of seamless steel tubes for the detection of transverse imperfections.	6	9305
	Automatic full peripheral ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of longitudinal imperfections.	7	9303
	Automatic ultrasonic testing of the weld seam of electric welded steel tubes for the detection of longitudinal imperfections.	8	9764
	Automatic ultrasonic testing of the weld seam of submerged arc-welded steel tubes for the detection of longitudinal and/or transverse imperfections.	9	9765
	Radiographic testing of the weld seam of automatic fusion arc welded steel tubes for the detection of imperfections.	10	12096
Surface Imperfections	Liquid penetrant testing of seamless and welded steel tubes for the detection of surface imperfections.	11	12095
	Magnetic particle inspection of seamless and welded ferromagnetic steel tubes for the detection of surface imperfections.	12	13665
Thickness	Automatic full peripheral ultrasonic thickness testing of seamless and welded (except submerged arc-welded) steel tubes.	13	10543
Laminar Imperfections	Automatic ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of laminar imperfections.	14	10124
	Automatic ultrasonic testing of strip/plate used in the manufacture of welded steel tubes for the detection of laminar imperfections.	15	12094
	Automatic ultrasonic testing of the areas adjacent to the weld seam of welded steel tubes for the detection of laminar imperfections.	16	13663
	Ultrasonic testing of the tube ends of seamless and welded steel tubes for the detection of laminar imperfections.	17	11496
	Magnetic particle inspection of the tube ends of seamless and welded ferromagnetic steel tubes for the detection of laminar imperfections.	18	13664

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