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Oförstörande provning av stålrör – Del 2: Automatiserad virvelströmsprovning av sömlösa och svetsade (förutom pulverbågsvetsade) stålrör för detektering av imperfectioner (ISO 10893-2:2011)

Non-destructive testing of steel tubes – Part 2: Automated eddy current testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of imperfections (ISO 10893-2:2011)

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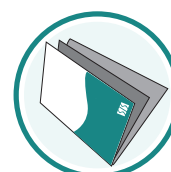
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Denna standard ersätter SS-EN 10246-3, utgåva 1.

The European Standard EN ISO 10893-2:2011 has the status of a Swedish Standard. This document contains the official version of EN ISO 10893-2:2011.

This standard supersedes the Swedish Standard SS-EN 10246-3, edition 1.

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**Förhållandet till övriga delar under samma huvudtitel - Utdrag ur Förord i ISO 10893-2:2011/
Relations to other parts under the same general title - Extract from the Foreword of
ISO 10893-2:2011**

ISO 10893 consists of the following parts, under the general title *Non-destructive testing of steel tubes*:

- *Part 1: Automated electromagnetic testing of seamless and welded (except submerged arc-welded) steel tubes for the verification of hydraulic leaktightness*
- *Part 2: Automated eddy current testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of imperfections*
- *Part 3: Automated full peripheral flux leakage testing of seamless and welded (except submerged arc-welded) ferromagnetic steel tubes for the detection of longitudinal and/or transverse imperfections*
- *Part 4: Liquid penetrant inspection of seamless and welded steel tubes for the detection of surface imperfections*
- *Part 5: Magnetic particle inspection of seamless and welded ferromagnetic steel tubes for the detection of surface imperfections*
- *Part 6: Radiographic testing of the weld seam of welded steel tubes for the detection of imperfections*
- *Part 7: Digital radiographic testing of the weld seam of welded steel tubes for the detection of imperfections*
- *Part 8: Automated ultrasonic testing of seamless and welded steel tubes for the detection of laminar imperfections*
- *Part 9: Automated ultrasonic testing for the detection of laminar imperfections in strip/plate used for the manufacture of welded steel tubes*
- *Part 10: Automated full peripheral ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of longitudinal and/or transverse imperfections*
- *Part 11: Automated ultrasonic testing of the weld seam of welded steel tubes for the detection of longitudinal and/or transverse imperfections*
- *Part 12: Automated full peripheral ultrasonic thickness testing of seamless and welded (except submerged arc-welded) steel tubes*

EUROPEAN STANDARD

EN ISO 10893-2

NORME EUROPÉENNE

EUROPÄISCHE NORM

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English Version

Non-destructive testing of steel tubes - Part 2: Automated eddy current testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of imperfections (ISO 10893-2:2011)

Essais non destructifs des tubes en acier - Partie 2: Contrôle automatisé par courants de Foucault pour la détection des imperfections des tubes en acier sans soudure et soudés (sauf à l'arc immergé sous flux en poudre) (ISO 10893-2:2011)

Zerstörungsfreie Prüfung von Stahlrohren - Teil 2: Automatisierte Wirbelstromprüfung nahtloser und geschweißter (ausgenommen unterpulvergeschweißter) Stahlrohre zum Nachweis von Unvollkommenheiten (ISO 10893-2:2011)

This European Standard was approved by CEN on 10 December 2010.

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 CEN-CENELEC Management Centre or to any CEN member.

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Foreword

This document (EN ISO 10893-2:2011) has been prepared by Technical Committee ISO/TC 17 "Steel" in collaboration with Technical Committee ECISS/TC 110 "Steel tubes, and iron and steel fittings" 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 October 2011, and conflicting national standards shall be withdrawn at the latest by October 2011.

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Endorsement notice

The text of ISO 10893-2:2011 has been approved by CEN as a EN ISO 10893-2:2011 without any modification.

Non-destructive testing of steel tubes —

Part 2:

Automated eddy current testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of imperfections

1 Scope

This part of ISO 10893 specifies requirements for automated eddy current testing of seamless and welded tubes with the exception of submerged arc-welded (SAW) tubes, for the detection of imperfections according to the different acceptance levels as shown in Tables 1 and 2. It is applicable to the inspection of tubes with an outside diameter greater than or equal to 4 mm.

This part of ISO 10893 can also be applicable to the testing of hollow sections.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 9712, *Non-destructive testing — Qualification and certification of personnel*

ISO 11484, *Steel products — Employer's qualification system for non-destructive testing (NDT) personnel*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11484 and the following apply.

3.1

reference standard

standard for the calibration of non-destructive testing equipment (e.g. drill holes, notches and recesses)

3.2

reference tube

tube or length of tube containing the reference standard(s)

3.3

reference sample

sample (e.g. segment of tube, plate or strip) containing the reference standard(s)

NOTE Only the term “reference tube” is used in this part of ISO 10893, also covering the term “reference sample”.

3.4

tube

hollow long product open at both ends, of any cross-sectional shape

3.5
seamless tube
tube made by piercing a solid product to obtain a tube hollow, which is further processed, either hot or cold, into its final dimensions

3.6
welded tube
tube made by forming a hollow profile from a flat product and welding adjacent edges together, and which after welding can be further processed, either hot or cold, into its final dimensions

3.7
manufacturer
organization that manufactures products in accordance with the relevant standard(s) and declares the compliance of the delivered products with all applicable provisions of the relevant standard(s)

3.8
agreement
contractual arrangement between the manufacturer and purchaser at the time of enquiry and order

4 General requirements

4.1 Unless otherwise specified by the product standard or agreed on by the purchaser and manufacturer, this eddy current inspection shall be carried out on tubes after completion of all the production process operations, such as rolling, heat treating, cold forming and hot working, sizing and primary straightening.

4.2 The tubes being tested shall be sufficiently straight to ensure the validity of the test. The surfaces shall be sufficiently free of foreign matter which can interfere with the validity of the test.

4.3 This inspection shall be carried out by trained operators qualified in accordance with ISO 9712, ISO 11484 or equivalent and supervised by competent personnel nominated by the manufacturer. In the case of third-party inspection, this shall be agreed on between the purchaser and manufacturer.

The operating authorization issued by the employer shall be according to a written procedure. NDT operations shall be authorized by a level 3 NDT individual approved by the employer.

NOTE The definition of levels 1, 2 and 3 can be found in appropriate International Standards, e.g. ISO 9712 and ISO 11484.

5 Test method

5.1 Test techniques

5.1.1 The tubes shall be tested by the eddy current method for the detection of imperfections using in "absolute mode" and/or in "differential mode" one of the following alternative automated or semi-automated techniques:

- a) concentric coil technique — full peripheral (see Figure 1);
- b) fixed or rotating probe/pancake coil technique — full peripheral (see Figure 2);
- c) segment coil technique — weld seam only (see Figure 3) or full body (see Figure 4).

For all techniques, the chosen relative speed of movement during the testing shall not vary by more than $\pm 10\%$.

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.

NOTE See Annex A for guidelines on the limitations of the eddy current test method.

5.1.2 When testing tubes using the concentric coil technique, the maximum tube outside diameter that shall be tested shall be restricted to 180 mm (250 mm for E4H).

Square and rectangular tubes, used for structural purposes, with a maximum dimension across the diagonal of 180 mm may also be tested using this technique with adequately shaped coils.

5.1.3 When testing tubes using the rotating or fixed probe/pancake coil technique, the tube and the probe/pancake coil shall be moved relative to each other or the movement shall be simulated by electronic commutation through the individual probes composing the pancake, such that the whole of the tube surface is scanned. There is no restriction on the maximum tube outside diameter using this technique.

NOTE It is emphasized that only external surface breaking imperfections can be detected using this technique.

5.1.4 When testing the weld of welded tubes using the segment coil technique, there is no restriction on the maximum tube outside diameter. The test coil shall be maintained in proper alignment with the weld, such as that the whole of the weld is scanned.

5.1.5 When testing the full body of tubes using the segment coils technique, the maximum tube outside diameter that shall be tested shall be limited to:

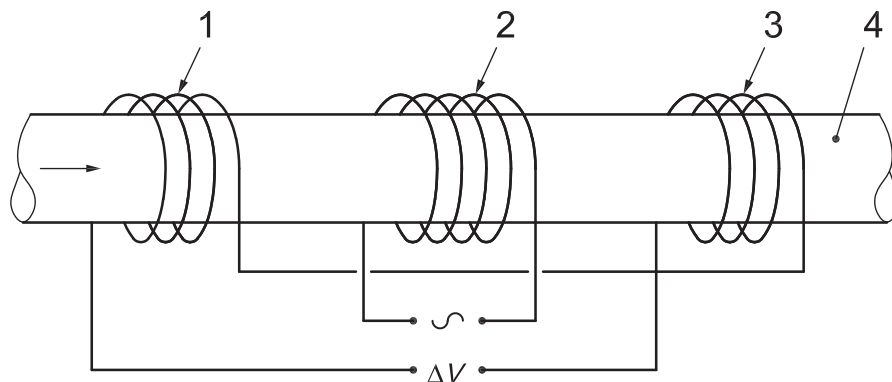
— \varnothing 219,1 mm for $2 \times 180^\circ$ coils,

— \varnothing 508,0 mm for $4 \times 100^\circ$ coils.

NOTE It is emphasized that the test sensitivity is at a maximum at the tube surface adjacent to the test coil and decreases with increasing thickness (see Annex A).

5.2 Test equipment

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



Key

1 secondary coil 1

2 primary coil

3 secondary coil 2

4 tube

~ alternate energizing current

ΔV signal output

NOTE The above diagram is a simplified form of a multi-coil arrangement which can contain, for example split primary coils, twin differential coils and calibrator coil.

Figure 1 — Simplified diagram of the concentric coil technique